Department of Energy
Richland Operations Office
P.O. Box 550
Richland, Washington 99352

December 21, 2018

CERTIFIED MAIL

Ms. Ann K. Brown
Open Government Coordinator
Center for Biological Diversity
P.O. Box 11374
Portland, Oregon 97211-0374

Dear Ms. Brown:

FREEDOM OF INFORMATION ACT REQUEST (FOI 2019-00160)

This letter is in response to the Freedom of Information Act (FOIA) request dated October 11, 2018, you submitted to the U.S. Department of Energy (DOE) Headquarters FOIA Office. Your request was forwarded to this office for response and was received on November 9, 2018. In your request you asked for "from October 1, 2015 to the date DOE conducts this search, every record mentioning or including DOE's implementation of Section 7(a)(1) of the Endangered Species Act, 16 U.S.C. § 1531-1544 ("ESA")."

In a telephone call on October 31, 2018, confirmed via email, with Ms. Danielle Blevins of the HQ FOIA Office, you agreed to amend you request to "documents discussing DOE's implementation of Section 7(a)(1) of the Endangered Species Act."

Your request was assigned to the DOE Richland Operations Office (RL) Site Stewardship Division, the DOE Office of River Protection and Mission Support Alliance, LLC, (MSA) to conduct a search of their files for responsive documents. DOE started its search on November 9, 2018, which is the cut-off date for responsive documents. All offices have completed their search and the following documents have been deemed responsive and are enclosed:

- Document No. DOE/RL-96-32, Revision 1, titled, "Hanford Site Biological Resources Management Plan."
- Document No. DOE/RL-96-32, Revision 2, titled, "Hanford Site Biological Resources Management Plan."
- Document No. DOE/RL-2000-27, Revision 2, titled, "Threatened and Endangered Species Management Plan: Salmon, Steelhead, and Bull Trout." Please note, revision 1 is not being provided as it falls outside the requested time period.
- Document No. DOE/RL-2000-27, Revision 3, titled, "Threatened and Endangered Species Management Plan: Salmon, Steelhead, and Bull Trout."
- RL Letter No. 17-SSD-0007, titled, "Contract No. DE-AC06-09RL14728 – Contract Deliverable CD0067 'Hanford Site Biological Resources Management Plan' (DOE/RL 2000-27, Rev 2)."

- MSA Letter No. MSA-1604082, titled, "RL Approval – Contract Deliverable CD0067, 'Hanford Site Biological Resources Management Plan.'"
- RL Letter No. 19-SSD-0009, titled, "Contract No. DE-AC06-09RL14728 – Contract Deliverable (CD) CD0071, 'Threatened and Endangered Species Management Plan: Salmon, Steelhead, and Bull Trout.'"
- MSA Letter No. MSA-1803673, titled, "RL Approval – Contract Deliverable CD0071, 'Threatened and Endangered Species Management Plan: Salmon, Steelhead, and Bull Trout.'"
- RL Letter No. 16-SSD-0064, "Contract No. DE-AC06-09RL14728 – Contract Deliverable CD0071- 'Threatened and Endangered Species Management Plan,' (DOE/RL 2000-27, Rev 2)."
- MSA Letter No. MSA-1504041, "RL Approval – Contract Deliverable CD0071, 'Threatened and Endangered Species Management Plan: Salmon, Steelhead, and Bull Trout.'"

Your request for a waiver of fees was granted by the HQ FOIA Office in a letter dated November 7, 2018. If you have any questions regarding this matter, please contact me at our address or at (509) 376-6288.

Sincerely,

-Original signed by-

Dorothy Riehle
Freedom of Information Act Officer
Office of Communications
and External Affairs

OCE:DCR

Enclosures

DOE/RL-96-32
Revision 1

Hanford Site Biological Resources Management Plan

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

U.S. DEPARTMENT OF ENERGY | Richland Operations Office

P.O. Box 550
Richland, Washington 99352

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DOE/RL-96-32
Revision 1

Hanford Site Biological Resources Management Plan

Date Published
July 2013

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

U.S. DEPARTMENT OF ENERGY | Richland Operations Office

P.O. Box 550
Richland, Washington 99352

APPROVED
By Janis D. Aardal at 4:23 pm, Aug 14, 2013

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Approved for Public Release;
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Executive Summary

Resource stewardship is an integral part of U.S. Department of Energy (DOE) responsibilities at the Hanford Site. Appropriate management strategies and actions, based on the best scientific information available, are important components of stewardship and land-use planning at the site. The *Hanford Site Biological Resource Management Plan* (BRMP) is DOE's primary implementation plan for managing natural resources under the *Hanford Comprehensive Land-Use Plan* (CLUP).

The CLUP, Chapter 6 of the *Hanford Comprehensive Land-Use Plan Environmental Impact Statement* (HCP-EIS), provides overall policies that direct land-use actions at Hanford and help ensure individual land-use actions advance the plan's comprehensive goals and objectives over time. BRMP is one of several implementation plans under the framework of the CLUP. Each addresses unique resources and key activities that, together, provide a comprehensive approach for managing land and facilities at the Hanford Site.

S.1. Introduction

The Hanford BRMP establishes DOE's management objectives, strategies, actions, and general directives for managing biological resources on the Hanford Site. The purpose of BRMP is to provide the Richland Operations Office (RL), Office of River Protection (ORP), and Hanford contractors with a consistent approach to protect and manage biological resources on the site. Essential aspects of Hanford biological resource management include resource monitoring, impact assessment, mitigation, and restoration.

The BRMP's overarching goals are to:

- Foster preservation of important biological resources.
- Minimize adverse impacts to biological resources from site development and other management activities.
- Balance the site cleanup mission with resource stewardship obligations.

The policy and guidance provided in this document apply to all actions that occur on lands managed by RL and ORP, including central Hanford and the portions of the Hanford Reach National Monument (HRNM) currently managed by RL.

This revision of BRMP incorporates two sub-tier implementation documents, the Ecological Compliance Assessment Management Plan (ECAMP) and the Hanford Site Biological Resources Mitigation Strategy (BRMiS). These documents will cease to be published separately.

S.2. Roles and Responsibilities

DOE-RL is responsible for administering and implementing BRMP for the Hanford Site. The RL and ORP site managers are ultimately responsible for the site's natural resources, but each program manager and assistant manager within RL and ORP are responsible for adhering to the resource management guidance and policies described in this document. The RL's Site Stewardship Division (SSD) is responsible for defining Hanford's approach to biological resource management and will assist other RL and ORP programs and contractors with interpretation of these guidelines. The SSD oversees monitoring and impact assessment support and tracks performance of mitigation actions.

Portions of the Hanford Site were declared part of the Hanford Reach National Monument (HRNM) by Presidential Proclamation in 2000 for their ecological, cultural, and geological values. The U. S. Fish and Wildlife Service (USFWS) manages portions of the HRNM and islands in the Hanford Reach as part of the Columbia National Wildlife Refuge complex through the *Hanford Reach National Monument Comprehensive Conservation Plan and Environmental Impact Statement* (HRNM-CCP).

Under existing DOE permits, the USFWS is responsible for protecting and managing HRNM resources and access to HRNM lands under its control. Because RL is currently the underlying landholder, it retains approval authority over certain management aspects of the monument that could affect DOE operations such as safety or security buffers, access to and operation of research sites, or seismic, meteorological, or environmental monitoring sites.

All contractors and subcontractors, or any other entity performing work on Hanford lands managed by DOE will conduct work in accordance with the policies and guidance provided in this management plan. Each contractor is responsible for incorporating biological resource protection measures into project planning, requesting ecological compliance reviews for its activities, and implementing mitigation actions, if needed, for any project for which it is responsible. Unless otherwise controlled by legal or contractual requirements, BRMP also applies to lands under lease, permit, or easement.

S.3. Regulatory Basis

The Hanford BRMP was developed in accordance with applicable federal and state laws, regulations, Executive Orders, and DOE Orders. Key federal acts and Executive Orders that apply to biological resource management include the following:

- *Endangered Species Act*
- *National Environmental Policy Act*
- *Migratory Bird Treaty Act*
- *Bald and Golden Eagle Protection Act*
- *Comprehensive Environmental Response, Compensation, and Liability Act*
- *Resource Conservation and Recovery Act*
- *Clean Water Act*
- *Sikes Act*
- *Magnuson-Stevens Fishery Conservation and Management Act.*
- Executive Order 13112, "Invasive Species"
- Executive Order 11990, "Protection of Wetlands"
- Executive Order 11988, "Floodplain Management"
- Presidential Proclamation 7319 "Establishment of the Hanford Reach National Monument"
- DOE Order 430.1B "Real Property and Asset Management" (Change 2, April 25, 2011)

In addition to assisting DOE meet federal requirements, BRMP helps RL comply with Washington State regulations regarding fish and wildlife management and noxious weed control.

S.4. Hanford's Biological Resources

The Hanford Site lies within the interior, low elevation, Columbia River Basin, which is within the shrub-steppe zone. The diversity of physical features across the Hanford Site contributes to a corresponding diversity of biological communities. The majority of the Hanford Site consists of shrub-steppe habitats, but valuable riparian, wetland, and aquatic habitats are associated with the Hanford Reach of the Columbia River.

The Hanford Site also contains a diversity of other rare terrestrial habitats such as riverine islands, bluffs/cliffs, basalt outcrops, and sand dunes. Both shrub-steppe and riparian habitats are considered "priority habitats" by the Washington Department of Fish and Wildlife. In addition, Washington's Natural Heritage Program has mapped and classified portions of the native plant communities found on Hanford as priority ecosystems.

The Hanford Site is home to at least 46 species of mammals, 10 species of reptiles, 5 species of amphibians, over 200 species of birds, well over 1000 species of insects and invertebrates, and approximately 700 species of plants. There have been 46 fish species identified in the Hanford Reach, as well as numerous insects, crayfish, and mollusks. Many of these species are considered to be rare or of special concern to federal or state resource management agencies.

The Columbia River is designated as critical habitat for 3 federal endangered or threatened fish species (Upper Columbia River spring Chinook, Upper Columbia River steelhead, and bulltrout), and there are two federal proposed-threatened terrestrial plant species (Umtanum buckwheat and White Bluffs Bladderpod) on the Hanford Site. The greater sage grouse is currently a candidate for listing under the Endangered Species Act, and if it is listed, the Hanford Site may be an important part of the recovery efforts for that species.

In addition to these species, the Washington State Natural Heritage Program lists approximately 25 plant species as endangered, threatened, or sensitive. The Washington Department of Fish and Wildlife lists 29 wildlife species as threatened, endangered, sensitive, or candidate. Also, approximately 23 plant species and 51 species of wildlife are listed as state monitor, review, and watch list.

S.5. Resource Management Approach and Implementation

The primary goals in managing Hanford's species, habitats, and ecosystem resources are to increase population levels of terrestrial and aquatic resident species and maintain or increase the quantity and quality of functioning native systems across the Hanford Site.

The overarching objective of BRMP is to provide strategies and management actions necessary to sustain Hanford's biological resources. Specific DOE resource management objectives for Hanford are to:

- Protect species and habitats of state and federal concern
- Maintain and preserve native biological diversity
- Reduce the spread of invasive species and provide integrated control of noxious weeds
- Where and when feasible, improve degraded habitats in a strategic manner

to increase landscape connectivity and native diversity

- Reduce and minimize fragmentation of habitats
- Maintain landscapes that provide regional connectivity to habitats surrounding Hanford.

To meet these objectives, BRMP provides a set of general directives for Hanford Site operations; places all site biological resources into six resource priority levels, with accompanying management guidance; and for certain species or resources, provides specific management guidance based on federal and/or state recommendations.

S.5.1 General Directives and Practices:

DOE-RL developed the following general directives and practices for biological resource management at the Hanford Site. They apply to all actions occurring within portions of the site managed by RL, including portions of the Hanford Reach National Monument RL manages:

- All actions and activities that potentially affect biological resources require an ecological compliance review and determination of potential impacts before proceeding. This directive not only applies to ground-breaking disturbances and excavation, but to any treatments or actions that alter the current natural state of the environment, habitat, or a species population, including mowing, prescribed burning, herbicide application in native vegetation, and creating excessive noise. The ecological review process should be a component of early project planning.
- If an ecological compliance review determines adverse impacts to biological resources—such as habitat alterations or disturbances that could affect the reproductive success of a species of concern—specific mitigation actions will be identified and the mitigation actions avoidance, minimization, or compensation will be implemented by the responsible contractor.
- All entities conducting work on the Hanford Site will conduct activities and work in accordance with access restrictions and administrative designations including the following:
    - Areas containing rare plant communities (element occurrences)
    - Mitigation/restoration areas
    - Collection/propagation areas for native plant materials
    - Lands used under permit and leased properties
    - Administrative control areas for species of concern which include bald eagle buffer zones, fall Chinook salmon spawning locations, ferruginous hawk and burrowing owl buffer zones, and known populations/ occurrences of plant species of concern
- Activities that increase habitat fragmentation and degrade existing native habitats should be avoided. New facilities should be located within previously disturbed areas; new linear infrastructure development should be co-located with existing roads or corridors to minimize habitat fragmentation.
- No vehicles are permitted off established roads on the Hanford Site unless specifically approved by RL's Site

Stewardship Division and the Hanford Fire Department, unless required by an emergency situation.

- Actions that remove or significantly degrade native vegetation will be required to replant with native species in areas not needed for on-going operations following the practices outlined in the *Hanford Site Revegetation Manual.*
- Plant material used for habitat improvements or habitat restoration should be native to the Hanford Site and preferably should be of locally derived genetic stock.
- Domestic livestock grazing is not allowed on Hanford lands.
- No recreational hunting, fishing, or trapping are allowed on Hanford Site Lands managed by RL.
- No agriculture is allowed on lands managed by DOE/RL.

S.5.2 Fire Management

The overall wildfire management policy for the Hanford Site is to minimize the potential for human-caused fires and to aggressively fight wildfires. The following paragraphs describe specific elements this policy.

To the greatest extent possible during a wildfire, fire suppression and control actions will be conducted to protect existing stands of late successional shrub steppe, and to avoid direct surface disturbance within late successional shrub steppe areas, plant community element occurrences, and other rare or sensitive habitat areas. To the extent practical during a firefighting effort, the Fire Department incident commander should coordinate or consult with the site natural resource subject matter experts.

Any temporary firebreaks constructed during fire-fighting should be re-contoured and reseeded with locally derived native plant species as described in the *Hanford Site Revegetation Manual.*

Replanting of areas burned by wildfire will be considered on a case-by-case basis depending on the site, the pre-existing plant community, the characteristics of the wildfire, the level of damage sustained by the native vegetation, and the likelihood that the burned area will further degrade if restoration actions are not performed. If performed, replanting should use locally derived native species.

Preventative fire control will include installation and maintenance of a system of permanent fire breaks. These will use existing roads, rail lines, and utility corridors to the extent practicable. Installation and maintenance of these fire breaks will be conducted in a manner that minimizes adverse impacts to biological resources.

Controlled burning of accumulations of dry plant material, particularly along roadways, is conducted to remove sources of fuel that could provide a mechanism for rapidly accelerating uncontrolled burns.

S.5.3 Noxious Weed Management

Noxious weeds are controlled on the Hanford Site for regulatory compliance, to prevent adverse impacts to neighboring agricultural operators, to keep deep-rooted vegetation from invading Hanford waste sites, and to protect native communities from further degradation. The goal of noxious weed management on the Hanford Site is to eliminate existing populations of noxious weeds and to prevent new populations from becoming established.

Implementation of noxious weed management, especially in less disturbed areas, must meet other biological resource management requirements, such as evaluations for the presence of rare species and unique habitats, avoidance and minimization of impacts, and habitat mitigation as applicable. The need for active reestablishment of desirable vegetation is recognized as a critical component of successful long-term control of noxious weeds and other undesirable vegetation.

S.5.4 Resource Priority Levels

To help facilitate and standardize management of resources, all species and habitats on the Hanford Site have been assigned resource priority levels that range from Level 5 (highest priority) to Level 0 (lowest priority). This hierarchical approach allows biological resources to be prioritized and appropriate actions—protection, monitoring, impact assessment, mitigation, and restoration—taken based on the type and relative ecological value of the resource. The following paragraphs describe the priority levels:

- Level 5 resources include species that are listed or proposed-to-be listed under the *Endangered Species Act* and their critical habitat, as well as rare and irreplaceable habitats. The management goal for this level is preservation, and a high level of status monitoring is appropriate. Impacts to Level 5 resources should be avoided, and compensatory mitigation will be determined on a case-by-case basis.

- Level 4 resources include federal candidate species; Washington State threatened or endangered species; habitat or exclusion buffers for federal candidates and Washington State threatened or endangered species; high-quality mature shrub steppe; wetlands and riparian areas; and buffer areas for bald eagles and ferruginous hawks. The management goal for this level is preservation, with a high level of status monitoring. Avoidance and minimization of impacts is expected, but if required, habitat compensation will be at an area ratio of 5:1.

- Level 3 resources include Washington State sensitive, candidate, and review species; Washington Department of Fish and Wildlife priority species; lower quality mature shrub-steppe—such as shrub stands that are less mature, have lower shrub density or canopy cover, and/or a greater proportion of cheatgrass in the understory than stands that qualify for Level 4. Level 3 also includes high-quality grasslands, conservation corridors, snake hibernacula, bat roosts, rookeries, burrowing owl buffer areas, and areas with significant quantities of culturally important species. The management goal for Level 3 is conservation, with a moderate level of status monitoring. Impacts should be avoided or minimized if practical and if needed, compensatory mitigation will be at a ratio of 3:1.

- Level 2 resources include migratory birds, state watch list plants and monitor list animals, recreationally and commercially important species, and lower quality steppe and shrub-steppe.

The management goal is conservation, with a low level of status monitoring. Impacts should be avoided if possible, and compensation may be at a ratio of 1:1. However, Level 2 habitat areas may often be good areas to perform actions to mitigate for impacts to higher-level habitat resources.

- Level 1 resources include individual common native plant and wildlife species, upland stands of non-native plants, and abandoned agricultural fields. Impacts should be avoided or minimized if possible, but there are no compensation requirements for impacts to Level 1 resources.
- Level 0 resources consist of non-native plants and animals (unless otherwise listed at a higher level), non-vegetated areas, and industrial areas. Management goals and actions are limited to those needed for regulatory compliance, such as the Migratory Bird Treaty Act.

S.5.5 Species Specific Management Guidance

Management of most species on the Hanford Site will be based on the general guidance provided above for the six resource priority levels. However, specific management policies and guidance have been developed for certain species that have additional legal protections, require management actions beyond habitat protection, are unusually sensitive to human disturbance, or are resources of special interest to the public or the Tribes.

Specific management guidance, based on federal or state resource management agency recommendations, is provided for the federally listed Spring Chinook salmon, steelhead, and bull trout. Specific guidance also is provided for Fall Chinook salmon, bald eagles, ferruginous hawks, burrowing owls, greater sage grouse, peregrine falcons, American white pelicans, ground squirrels, bat roosts, rookeries, snake hibernacula, and federal- or stat-listed rare plants.

S.6. Ecological Compliance Assessment

The Hanford Site ecological compliance assessment process incorporates an evaluation of potential impacts to biological resources before they occur and mitigation of adverse impacts if they do occur. This process provides an essential link between DOE's responsibility to protect biological resources and site missions, including remediation and waste management.

As noted, all actions with the potential to affect biological resources require an ecological compliance review (ECR). This includes actions covered under CERCLA, RCRA, and NEPA decisions, including categorical exclusions. Specific examples of proposed actions that require an ECR include those that:

- Require an excavation permit
- Remove or modify dead or living vegetative cover
- Will be conducted on the outside of buildings and facilities
- Will be conducted within abandoned buildings and facilities
- Have the potential to alter or affect the living environment, including landscape-scale practices such as applications of fertilizers, herbicides, prescribed fire, or fire recovery efforts.

An ECR is conducted to ensure the proposed action will not affect rare plants or animals, or adversely affect habitats of concern. The review will normally require a site-specific field survey by a qualified biologist, and also may draw on records from previous surveys, maps, photos, and the scientific literature.

If the proposed action will adversely affect rare species or habitats, the ECR will include provisions for mitigation of the impacts, commensurate with the resource priority level of the species or habitat. All projects and programs are expected to comply with the requirements identified in the ECR. This may include recommendations to avoid and/or minimize adverse impacts to ecological resources by taking the following actions:

- Implementing alternatives that would result in fewer adverse impacts
- Locating project at a less ecologically sensitive site
- Reducing or modifying the project footprints
- Scheduling project activities so disruption of key species and functions is minimized.

In unusual cases when significant impacts cannot be reasonably avoided or minimized, the ECR will provide recommendations for compensatory mitigation based on the floral and faunal characteristics of the habitat that will be disturbed.

S.7. Biological Resource Mitigation

Mitigation is a series of prioritized actions that reduce or eliminate adverse impacts to biological resources including avoidance, minimization, onsite rectification, and compensation. Avoidance and minimization are always preferable to rectification and compensation, and should always be considered and implemented first. To facilitate a balance between Hanford Site mission elements and stewardship obligations, the BRMP mitigation strategy is intended to:

- Divert impacts away from higher priority resources and towards lower priority resources.
- Ensure consistent and effective implementation of mitigation recommendations and requirements.
- Ensure that mitigation measures for biological resources meet the responsibilities committed to by DOE within a NEPA, CERCLA, or RCRA decision.
- Enable Hanford Site development and cleanup activities to anticipate and plan for mitigation needs via early identification of mitigation requirements.
- Provide guidance for implementing cost-effective and timely mitigation actions.
- Conserve Hanford's biological resources while facilitating balanced development and cleanup activities.

If compensatory mitigation is needed for a project, the specific requirements will depend on the priority level of the resource. For Level 2, 3, or 4 habitat resources, such as steppe, shrub-steppe, and other habitats, compensatory mitigation may be triggered if the impact (after avoidance, minimization, and onsite rectification) is greater than 0.5 ha (1.25 ac), regardless of the project's location on the Hanford Site.

The compensation ratio will vary depending on the priority level of the affected habitat. Level 4 resources will be replaced at a ratio of

5:1, Level 3 at 3:1 and level 2 may be replaced at a ratio of 1:1. In all cases, disturbed portions of a project site that are not needed for continued operations should be replanted using native species in accordance with the *Hanford Site Revegetation Manual.*

Habitat replacement should include all of the principle vegetation community components (i.e. native grasses, forbs, and shrubs). Projects that disturb late-successional sagebrush steppe will plan for replacement mitigation using standard replacement units. A project that is replacing habitat via rectification at a ratio of 1:1 should plan for one replacement unit/ha disturbed habitat, whereas a project that is replacing habitat via compensatory mitigation at a ratio of 3:1 should plan for three replacement units/ha habitat disturbed.

For planning purposes, a replacement unit for late-successional sagebrush steppe is defined as:

- 1500 shrubs/ha (600/acre)
- 1500 forbs / ha (600/acre)
- A native, perennial bunchgrass understory – either already present or planted according to the *Hanford Site Revegetation Manual.*

Although projects plan and implement their own mitigation actions via a mitigation action plan, it is RL's goal to coordinate all compensatory mitigation via some form of a mitigation bank. A coordinated mitigation bank would allow all actions to be implemented consistently, reduce project-by-project learning curves, take advantage of economies of scale, allow for better planning and budgeting for mitigation actions, and allow mitigation actions from multiple projects to contribute toward broader scale resource management goals.

Mitigation areas must be monitored for at least 5 years after planting to ensure the planted vegetation is developing to meet the goals of the project mitigation action plan. If the performance monitoring indicates that one or more of the performance measures are below satisfactory levels, such as transplant shrub survival is below predetermined action levels, the mitigation bank manager, project manager, or the appropriate responsible office within DOE should identify means to redress the deficiencies, including replanting shrubs, grasses, and/or forbs if necessary.

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Figures

Tables

Acronyms and Abbreviations

ALE	Fitzner/Eberhardt Arid Lands Ecology Reserve
BRMP	Biological Resources Management Plan
BRMiS	Biological Resources Mitigation Strategy
CCP	Comprehensive Conservation Plan
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CLUP	Comprehensive Land Use Plan
CWA	Clean Water Act
DOE	U.S. Department of Energy
EA	Environmental Assessment
ECAMP	Ecological Compliance Assessment Management Plan
ECR	Ecological Compliance Review
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
EVOC	Emergency Vehicle Operations Course
FONSI	Finding of No Significant Impact
FR	Federal Register
HCP-EIS	Hanford Site Comprehensive Land-Use Plan Environmental Impact Statement
HFD	Hanford Fire Department
HLAN	Hanford Local Area Network
HMS	Hanford Meteorological Station
HNRTC	Hanford Natural Resources Trustee Council
HRNM	Hanford Reach National Monument
MAP	Mitigation Action Plan
MBTA	Migratory Bird Treaty Act
MSA	Mission Support Alliance
NEPA	National Environmental Policy Act

NMFS	National Marine Fisheries Service
NPS	National Park Service
NRDA	Natural Resource Damage Assessment
ORP	Office of River Protection
PNNL	Pacific Northwest National Laboratory
PNSO	Pacific Northwest Site Office
PSRP	Public Safety and Resource Protection
RCC	River Corridor Contractor
RCRA	Resource Conservation and Recovery Act
RCW	Revised Code of Washington
RL	U.S. Department of Energy Richland Operations Office
ROD	Record of Decision
SSD	Site Stewardship Division
TNC	The Nature Conservancy
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
WAC	Washington Administrative Code
WDFW	Washington Department of Fish and Wildlife
WDNR	Washington Department of Natural Resources
WDOE	Washington Department of Ecology
WNHP	Washington Natural Heritage Program
WSR	Washington State Register

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1.0 Introduction

Biological resource stewardship is an integral part of U.S. Department of Energy (DOE) responsibilities at the Hanford Site. An appropriate management strategy, based on the best scientific information available, is an important component of responsible stewardship and land-use planning. As such, DOE developed this document as its primary implementation plan for managing biological resources under the *Hanford Comprehensive Land-Use Plan* (CLUP).

The CLUP, Chapter 6 of the *Hanford Comprehensive Land-Use Plan Environmental Impact Statement* (HCP-EIS) (DOE 1999), provides overall land-use policies that direct land-use actions and help ensure individual land-use actions collectively advance the CLUP's goals and objectives over time. The Biological Resources Management Plan (BRMP) is one of several management plans described in CLUP, each of which addresses unique resources and key activities that, together, provide a comprehensive approach for managing Hanford Site lands and facilities.

The policies and guidance provided in BRMP apply to all actions that occur on lands managed by the DOE Richland Operations Office (RL) and Office of River Protection (ORP). This includes central Hanford and portions of the Hanford Reach National Monument (HRNM) currently managed by RL (Figure 1.1). Policies described in the plan apply to all RL and ORP contractors as well as permit and lease holders if included in the permit or lease documents. Existing contracts, permits, and leases may be modified, as necessary, to meet the management objectives of this plan. The BRMP does not create any right, benefit, or trust responsibility, substantive or procedural, enforceable against the United States, its agencies, officers, or any person.

1.1 Purpose and Scope

The purpose of the Hanford BRMP is to provide RL, ORP, and Hanford contractors with a consistent approach to protect and manage biological resources on the Hanford Site. This approach includes monitoring, assessing, and mitigating impacts to biological resources from Hanford operations, environmental cleanup, and restoration activities.

The BRMP's overarching goals are to:

- Foster preservation of important biological resources
- Allow for site development with minimal adverse impacts to those resources
- Balance the site cleanup mission with resource stewardship obligations.

The BRMP formalizes a means to meet these goals and implement the primary Hanford Site missions of waste management, environmental restoration, and technology development. To achieve these goals RL has committed to the following actions:

- Inventory and monitor key ecological resources on the Hanford Site within the context of surrounding land-use and resource patterns.

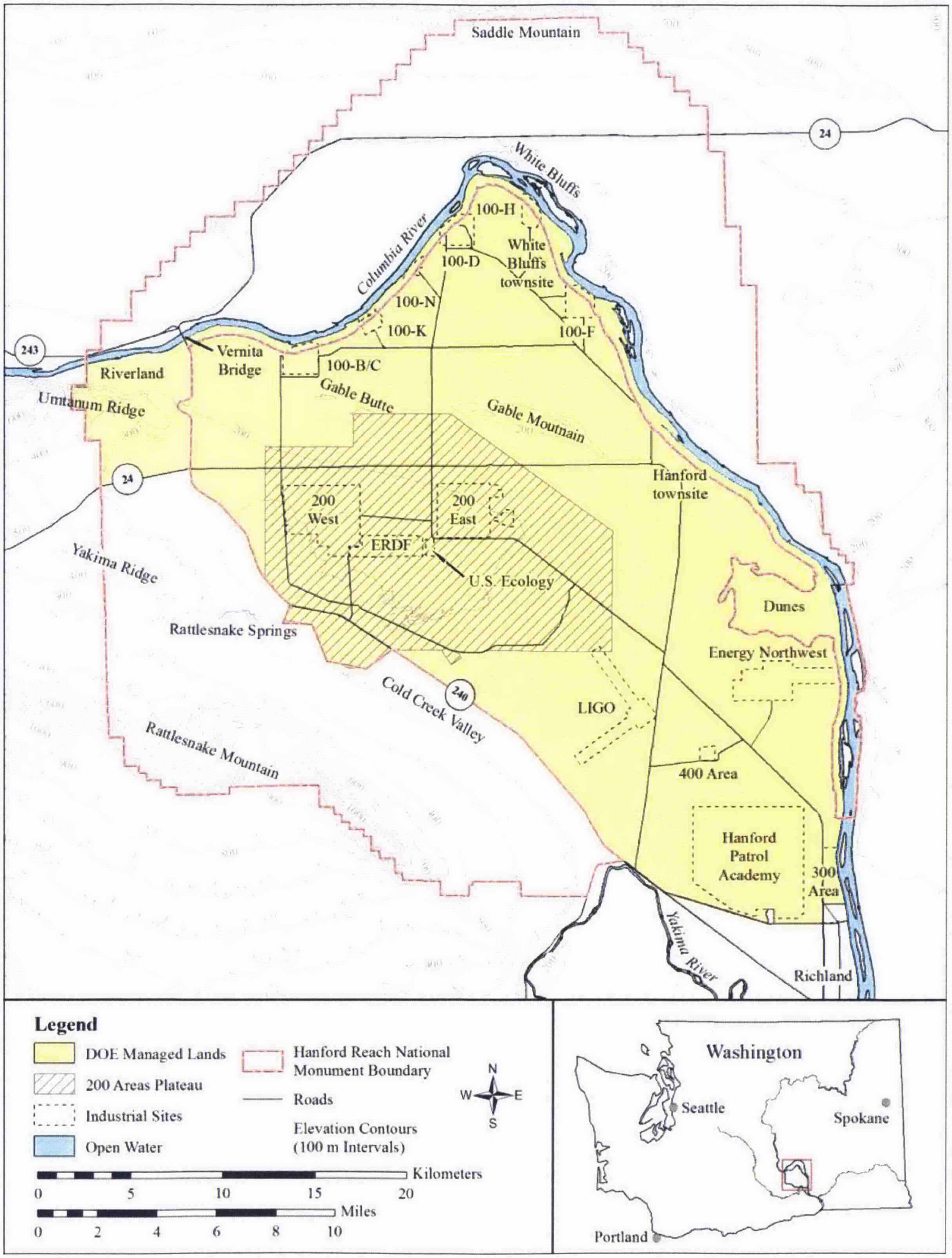

Figure 1.1 Map and General Features of the Hanford Site

- Protect and conserve significant biological resources under DOE stewardship consistent with the HCP-EIS, and as required by applicable statutes, regulations, and orders.
- Control project costs and minimize mission delays by incorporating biological resource considerations during early stages of project planning and design to minimize environmental impacts and focus scarce resources on effective mitigation when projects affect key resources.
- Facilitate project planning by incorporating biological resource requirements into land-use planning.
- Facilitate project execution by streamlining the compliance process.

Although BRMP provides overall biological resource management policies, objectives, and goals, specific management activities for particular species and habitats of concern are provided supporting documents, including the following:

- *Integrated Biological Control Program* (MSA 2010)
- *Threatened and Endangered Species Management Plan: Salmon, Steelhead, and Bull Trout, Revision 1* (DOE 2013a)
- *Bald Eagle Management Plan for the Hanford Site, South-Central Washington, Rev. 2* (DOE 2013b)

Additionally, the *Hanford Site Revegetation Manual* (DOE 2012a) provides guidance for planning and performing revegetation and restoration actions on the Hanford Site. It supports overall BRMP goals, especially in the areas of mitigation and restoration. It also provides for consistency among revegetation actions performed for various purposes, including CERCLA restoration actions, Natural Resource Damage Assessment (NRDA) restoration credits, mitigation plantings, fire recovery, and other purposes.

1.2 Relationship to the Hanford Comprehensive Land Use Plan

The Hanford Site has diverse missions associated with environmental restoration, waste management, and science and technology. The CLUP provides a comprehensive, long-term approach to planning and directing Hanford activities consistent with overall land-use objectives.

The BRMP is one of the implementation procedures and controls of the CLUP, which is listed in Chapter 6 of the HCP-EIS (DOE 1999). The policies outlined in the HCP-EIS are applied to implement and address DOE's *Land- and Facility-Use Policy* (DOE P 430.1, now covered by DOE Order 430.1B). This policy protects and sustains native species and their habitats on the site and maintains the capabilities to support site-specific missions and objectives

The CLUP fulfills DOE's responsibilities under the *Atomic Energy Act of 1954* and Congress's direction in the *National Defense Authorization Act for Fiscal Year 1997*. DOE issued the HCP-EIS in September 1999 and a record of decision (ROD) (64 FR 61615) in November 1999, which established the CLUP. The CLUP was reaffirmed in a supplemental analysis to the HCP-EIS (DOE 2008a) and in an amended ROD (73 FR 55824; September 26, 2008).

The amended ROD clarified the following points:

- When considering land-use proposals, DOE will use regulatory processes in addition to the implementing procedures in Chapter 6 of the HCP-EIS to ensure consistency with CLUP designation.
- DOE will continue to apply the process under the HCP-EIS Chapter 6 to modify and amend the CLUP, as needed.

The following elements of the CLUP address land-use activities and protect and manage unique resources of the site:

- A land-use map depicts designated land uses for areas of the Hanford Site and supports full implementation of the DOE mission elements assigned to the site.
- Land-use designations define the purpose, intent, and principal uses of each geographic area shown by the final CLUP map.
- Land-use policies direct land-use actions and help ensure individual land-use actions collectively advance CLUP's goals and objectives over time.
- Land-use plan implementation procedures and controls and administrative procedures are used to review and approve proposed land-use requests. In addition, these procedures are used to make recommendations on actions to be undertaken under the land-use plan to align and coordinate Hanford Site area and resource management plans such as the *Hanford Cultural Resource Management Plan* (DOE 2001a) and *Hanford Long-Term Stewardship Program Plan* (DOE 2010). These types of plans are used by RL as implementing procedures and controls to ensure consistency in land-use activities on the Hanford Site. They include consideration and management of the land; facilities; infrastructure; and unique biological, natural, and cultural resources on the Hanford Site.

The BRMP provides an integral part of implementing the CLUP to address management of biological resources during active and post-cleanup activities, mission support operations, and other land-management activities on the Hanford Site. When evaluating land-use requests through the established CLUP implementing procedures and controls, the BRMP provides important information to ensure appropriate protectiveness of biological and habitat resources. Like BRMP, each management plan described in the CLUP addresses unique resources and key activities. Together, these plans provide DOE with a comprehensive approach for managing Hanford lands and facilities.

1.2.1 Land-Use Designations

Decisions regarding both project planning and biological resource management at any specific location on the Hanford Site must take into account the underlying land-use designation. The CLUP includes seven land-use designations that apply to specific portions of the Hanford Site (Figure 1.2), which are defined in the HCP-EIS supplemental analysis (DOE 2008a) as follows:

- *Industrial-Exclusive*: An area suitable and desirable for treatment, storage, and disposal of hazardous, dangerous, radioactive, and nonradioactive wastes. Includes related activities consistent with Industrial-Exclusive uses.
- *Industrial*: An area suitable and desirable for activities such as reactor operations, rail, barge transport

facilities, mining, manufacturing, food processing, assembly, warehouse, and distribution operations. Includes related activities consistent with Industrial uses.

- *Research and Development*: An area designated for conducting basic or applied research that requires the use of a large-scale or isolated facility or smaller scale time-limited research conducted in the field or in facilities that consume limited resources. Includes scientific, engineering, technology development, technology transfer, and technology deployment activities to meet regional and national needs. Includes related activities consistent with Research and Development.

- *High-Intensity Recreation*: An area allocated for high-intensity, visitor-serving activities and facilities (commercial and governmental), such as golf courses, recreational vehicle parks, boat launching facilities, Tribal fishing facilities, destination resorts, cultural centers, and museums. Includes related activities consistent with High-Intensity Recreation.

- *Low-Intensity Recreation*: An area allocated for low-intensity, visitor-serving activities and facilities, such as improved recreational trails, primitive boat launching facilities, and permitted campgrounds. Includes related activities consistent with Low-Intensity Recreation.

- *Conservation (Mining)*: An area reserved for the management and protection of archeological, cultural, ecological, and natural resources. Limited and managed mining (e.g., quarrying for sand, gravel, basalt, and topsoil for governmental purposes only) could occur as a special use (i.e., a permit would be required) within appropriate areas. Limited public access would be consistent with resource conservation. Includes activities related to Conservation (Mining), consistent with the protection of archeological, cultural, ecological, and natural resources.

- *Preservation*: An area managed for the preservation of archeological, cultural, ecological, and natural resources. No new consumptive uses (i.e., mining or extraction of non-renewable resources) would be allowed within this area. Limited public access would be consistent with resource preservation. Includes activities related to Preservation uses.

For more information, see the HCP-EIS, ROD, supplement analysis, and amended ROD on DOE's EIS web site at http://www.hanford.gov/page.cfm/EnvironmentalImpactStatements.

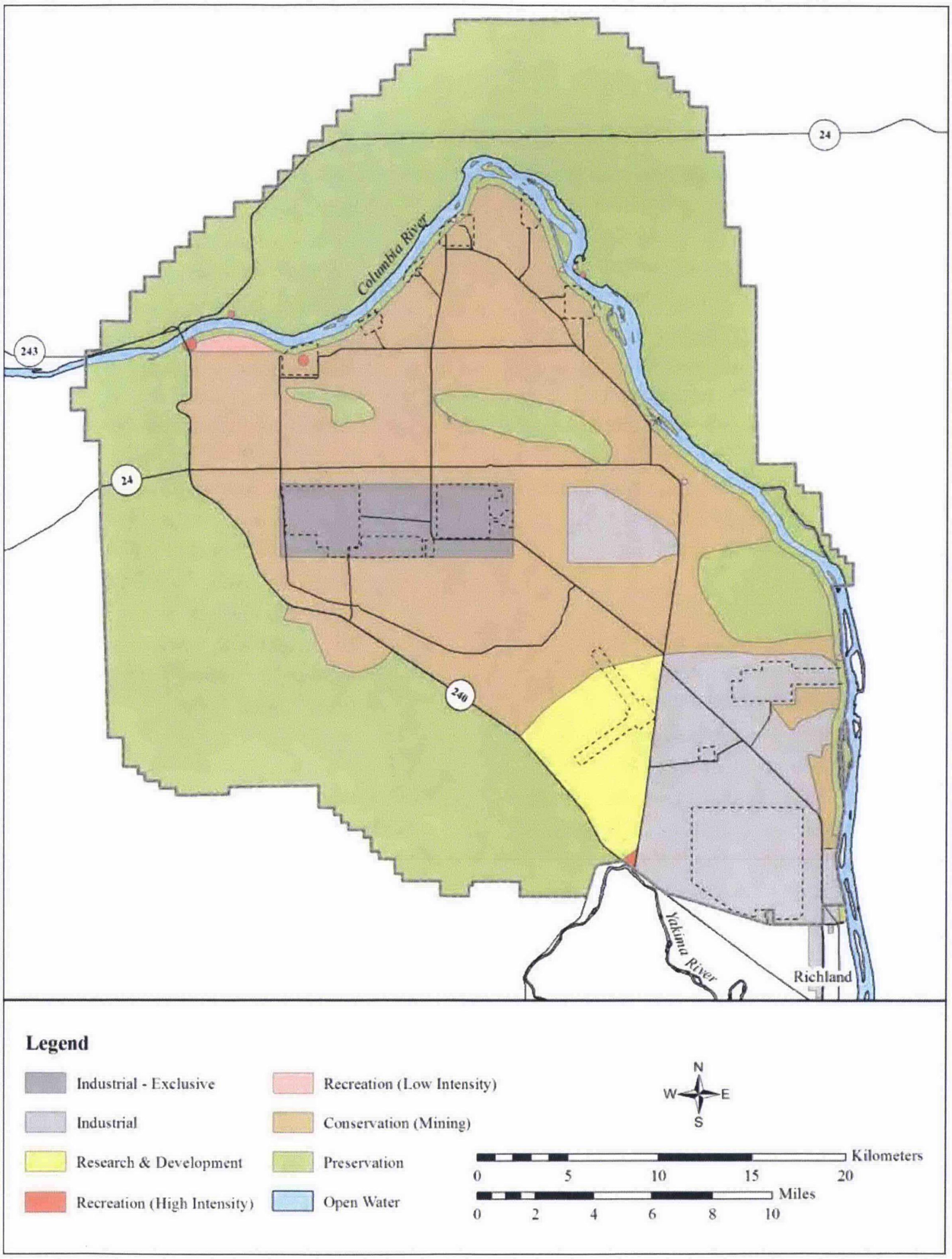

Figure 1.2 Hanford Site Comprehensive Land-Use Plan Land Use Designations

1.3 Management Requirements and Policies

The BRMP specifies RL policies, goals, and objectives relative to different biological resource management concerns and prescribes how such goals and objectives will be met. The BRMP applies to all RL and ORP programs at all locations within RL's and ORP's administrative control. RL uses the HCP-EIS (DOE 1999, 2008a) ecosystem-based strategy to manage and control development of Hanford lands and facilities.

RL has established a broad biological resources protection policy (DOE 1997) that states:

> It is the policy of the U.S. Department of Energy, Richland Operations Office to act as a responsible steward of the environment. This stewardship will be based on the principles of ecosystem management and sustainable development.

As part of this broader policy, RL has developed specific stewardship policies, including the following:

- Act to preserve and enhance the biological resources under RL stewardship as valuable national resources.
- Ensure that biological resource values are considered by all programs in all actions conducted on RL's behalf consistent with applicable treaties, laws, regulations, and obligations as a natural resource trustee.
- Endeavor to enhance an awareness of and appreciation for biological resource values and their preservation, restoration, and enhancement throughout the Hanford Site.
- Integrate biological resource management goals and administrative procedures into relevant program- and project-level activities to ensure that potential adverse impacts to biological resources are avoided or minimized.
- Integrate biological resource information into site land- and facility-use plans to ensure that broad-scale land-use planning and specific site-selection decisions consider biological resource values, apply ecosystem management principles, and minimize cumulative impacts to biological resources.
- Incorporate ecosystem management principles and tools into the program (project) planning process to facilitate meeting biological resource management goals and objectives while minimizing impacts to program (project) budgets and schedules.
- Adopt the recommendations of the Council on Environmental Quality (CEQ) to incorporate biodiversity considerations into *National Environmental Policy Act of 1969*, as amended (NEPA) environmental impact analyses (CEQ 1993).
- Mitigate as necessary, adverse impacts to biological resources that may result from present and future Hanford activities in a manner commensurate with the value of the resource and the severity of the impact. RL will follow a hierarchy of mitigation actions in the following preferred order: avoid, minimize, rectify, and/or compensate.

- As the Lead Response Agency at Hanford under the National Contingency Plan (40 CFR 300), conduct response activities, such as removal or remedial actions in a cost-effective manner that avoids or minimizes adverse impacts to biological resources.
- Cooperate with federal and state resource agencies to ensure a cost-effective information baseline on resource status is maintained for Hanford's biological resources within a bioregional context.
- Coordinate with other governmental agencies and stakeholders, as applicable, on biological resource management issues in an open and cooperative manner.
- Manage the DOE-administered portions of the HRNM in a manner consistent with the rest of the monument.

1.4 Management Plan Organization

The BRMP is designed to assist Hanford Site program and project managers and resource professionals, local Tribes, resource agencies, and other stakeholders who have an interest or a role in the management of Hanford's biological resources. Chapter 2.0 of this plan describes the roles and responsibilities of RL and its contractors with respect to biological resource management. Chapter 3.0 provides a brief description of the primary legal drivers for biological resource management and the relationship of BRMP to federal and state laws, Executive Orders, and DOE orders.

An overview of the biological resources and past land-use history of the Hanford Site is presented in Chapter 4.0. Chapter 5.0 outlines DOE's approach to biological resource management and describes implementing actions and policies. Chapter 6.0 defines the process for ecological assessment and compliance reviews for projects and work taking place on Hanford lands. Chapter 7.0 discusses mitigation and restoration strategies and policies. Chapter 8.0 provides references cited in the text, and Chapter 9.0 provides a glossary of terms.

2.0 Roles and Responsibilities

It is DOE policy to steward Hanford Site natural resources through responsible ecosystem management. This chapter outlines DOE management responsibilities and identifies the federal agencies and other entities responsible for managing biological resources on specific portions of the site.

The RL and ORP managers are ultimately responsible for the site's natural resources. The RL assistant manager for mission support is charged with development and oversight of land and resource management policies. The BRMP is an important part of implementing such policies. It is designed to provide a consistent approach in managing the site's natural resources within the context of its primary missions of environmental remediation and waste management.

2.1 Department of Energy

To ensure BRMP is applied consistently throughout the portions of the Hanford Site managed by DOE, each program manager and assistant manager within RL and ORP is responsible for adhering to the resource management guidance and policies described in this document. RL's Site Stewardship Division (SSD) is responsible for defining Hanford's approach to biological resource management and will assist other RL and ORP programs and contractors with interpreting these guidelines. The SSD oversees monitoring and impact assessment support and tracks performance of mitigation actions.

Close coordination between SSD and program and project managers within RL, ORP, and DOE's Pacific Northwest Site Office (PNSO) is required in early phases of Hanford Site project development. This is an important part of identifying areas where resource protection is a prime consideration, alternatives should be considered, or mitigation may be necessary. PNSO-sponsored work that occurs on the Hanford Site is subject to BRMP, and PNSO activities that occur on land managed by PNSO is subject to the management plan developed for the PNSO site (DOE 2008b).

The SSD also has responsibility to act as RL's point of contact for forming ecosystem management partnerships with outside organizations. The division coordinates with the U.S. Fish and Wildlife Service (USFWS) to confirm its management of DOE-owned property within the HRNM is consistent with DOE's biological resource management policies.

2.2 Contractors

All contractors and subcontractors, or any other entity performing work on Hanford lands managed by RL or ORP, will conduct work in accordance with the policies and guidance provided in this management plan.

Implementation of much of this management plan is assigned to the Public Safety and Resource Protection Program, currently managed by Mission Support Alliance, LLC (MSA). MSA implementation responsibilities include, among other actions, ecological monitoring, compliance reviews, reporting, implementing some protective measures or administrative controls, and determining mitigation requirements.

Each contractor is responsible for incorporating biological resource protection measures into project planning. Each contractor also is responsible for requesting an ecological compliance review (ECR) for its activities and implementing mitigation actions, if needed, for any project for which it is responsible.

2.3 U.S. Fish and Wildlife Service

Portions of the Hanford Site were designated as the HRNM by Presidential Proclamation in 2000 (65 FR 37253-37257) under provisions of the *Antiquities Act of 1906* as amended (16 USC 431). These areas were selected for their ecological, cultural, and geological values. The USFWS manages several portions of the 789 km^2 (195,000-ac) monument, including the north bank of the Columbia River Corridor, Saddle Mountain Unit, Rattlesnake Unit (which includes the Fitzner/Eberhardt Arid Lands Ecology (ALE) Reserve, a federal research natural area), Wahluke Unit (West and East), and the Ringold Unit (Figure 2.1). The USFWS manages these areas and various islands in the Hanford Reach as part of the Columbia National Wildlife Refuge complex.

Under existing permits from DOE, the USFWS is responsible for protecting and managing HRNM resources and access to HRNM lands under its control. This is accomplished through the *Hanford Reach National Monument Comprehensive Conservation Plan and Environmental Impact Statement* (HRNM-CCP) (USFWS 2008). Because RL is currently the underlying landholder, it retains approval authority over certain management aspects on the HRNM that could affect DOE operations such as safety or security buffers, access to and operation of research sites, or seismic, meteorological, or environmental monitoring sites.

2.4 Other Lease, Permit, or Easement Holders

Several entities use land on Hanford under permits, leases, or easements. These are managed by SSD, which oversees the protection of Hanford Site resources through the appropriate implementation plans contained in the CLUP. Unless otherwise controlled by legal or contractual requirements, the BRMP applies to lands under lease, permit, or easement.

2.5 Hanford Tribal Involvement

As a result of the *Nuclear Waste Policy Act of 1982* and the DOE American Indian Tribal Government Interactions Policy (DOE Order 144.1), the Nez Perce Tribe, Confederated Tribes of the Umatilla Reservation, and Yakama Nation all actively participate in cleanup issues at Hanford. All three tribes are members of the Hanford Natural Resource Trustee Council (HNRTC) and have cooperative agreements with DOE to provide advice and guidance on CERCLA response and NRDA issues. These Tribes work on issues related to mitigation and restoration of natural resources at Hanford. The Wanapum people, a non-federally recognized tribe, also participate in cleanup issues at Hanford.

2.6 Ecological Resources Working Group

An Ecological Resources Working Group has been established to assist and advise SSD on Hanford Site biological resource-related issues. The working group comprises representatives from the Tribes, HNRTC, resource management agencies, resource professionals from site contractors, and SSD staff. The working group typically meets at least annually to address any significant problems with BRMP implementation and new resource management issues. Staff from other DOE programs or their contractor representatives may be invited to the meetings to discuss specific resource issues, policies, or concerns.

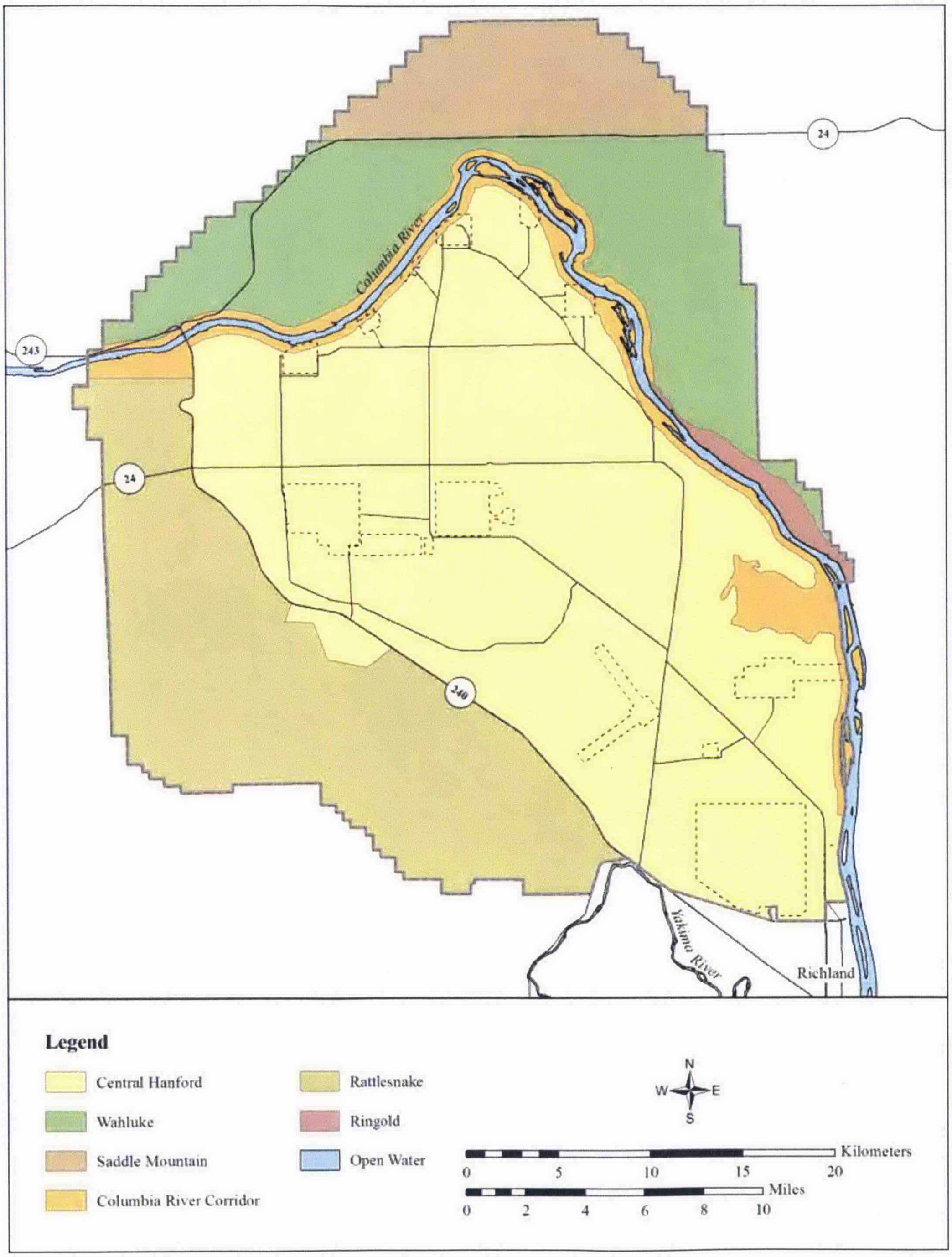

Figure 2.1 Management Units of the Hanford Reach National Monument (USFWS 2008)

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3.0 Applicable Guidance and Requirements

This chapter outlines the primary federal laws, Executive Orders, DOE Orders, and state laws considered in developing BRMP as an implementing document of the CLUP. It also discusses key factors of these laws as they apply to biological resource management and how BRMP assists RL in implementing the requirements.

BRMP considers applicable biological resource management requirements from the following federal acts:

- *Endangered Species Act*
- *National Environmental Policy Act*
- *Migratory Bird Treaty Act*
- *Bald and Golden Eagle Protection Act*
- *Comprehensive Environmental Response, Compensation, and Liability Act*
- *Resource Conservation and Recovery Act*
- *Clean Water Act*
- *Sikes Act*
- *Magnuson-Stevens Fishery Conservation and Management Act.*

Regulatory agencies responsible for enforcing these acts also promulgate pertinent regulations to implement the laws. Agencies also can develop additional guidelines specific to their organizations. For example, in addition to requirements provided in NEPA, DOE developed guidelines defining its own responsibilities under the act (10 CFR 1021).

In addition to federal laws, BRMP also helps RL implement various Executive Orders and DOE Orders, including the following:

- Executive Order 13112, "Invasive Species"
- Executive Order 11990, "Protection of Wetlands"
- Executive Order 11988, "Floodplain Management"
- Presidential Proclamation 7319 "Establishment of the Hanford Reach National Monument"
- DOE Order 430.1B "Real Property and Asset Management (Change 2, April 25, 2011).

Washington State laws and regulations that may apply to Hanford Site activities and biological resource management practices also are discussed in this plan. Particularly applicable are rules regulating fish and wildlife described in Chapter 77 of the Revised Code of Washington (RCW), Title 232 of the Washington Administrative Code (WAC), and rules regarding noxious weed control described in RCW Chapter 17 and WAC Chapter 16-750.

3.1 Endangered Species Act

The *Endangered Species Act of 1973* (ESA) provides for the designation and protection of wildlife, fish, and plant species that are endangered or threatened with extinction because of natural or human-made factors, and the conservation of the ecosystems upon which they depend. The ESA makes it illegal to kill, harm, harass, or otherwise take a listed species or adversely modify designated critical habitat.

Under Section 7 of the ESA, federal agencies are required to evaluate actions they perform, fund, or permit to determine whether any species listed as endangered or threatened at 50 CFR 17.11 and 50 CFR 17.12 may be affected by the proposed action. The USFWS and National Marine Fisheries Service (NMFS) share responsibility for implementing the ESA. Consultation with one or both of the agencies is required if a proposed action may affect listed species or designated critical habitat.

BRMP assists RL in implementing the ESA by providing a process to 1) identify whether ESA-protected species or critical habitats may be affected by DOE activities, and 2) confirm DOE compliance with ESA requirements. In addition to the ESA, management of endangered salmonids on the Hanford Site also is addressed in the *Threatened and Endangered Species Management Plan, Salmon, Steelhead and Bull Trout* (DOE 2013a).

3.2 National Environmental Policy Act

As stated in the *National Environmental Policy Act of 1969* (NEPA) implementing regulations, "The NEPA process is intended to help public officials make decisions that are based on an understanding of environmental consequences, and take actions that protect, restore, and enhance the environment" (40 CFR 1500.1c).

Executive Order 11514, "Protection and Enhancement of Environmental Quality," and Executive Order 11991, "Relating to Protection and Enhancement of Environmental Quality," further define the role of federal agencies in implementing NEPA. Executive Order 11514 states that federal agencies shall "monitor, evaluate, and control on a continuing basis their agencies' activities so as to protect and enhance the quality of the environment. Such activities shall include those directed to controlling pollution and enhancing the environment and those designed to accomplish other program objectives which may affect the quality of the environment." Executive Order 11991 requires federal agencies to "...comply with the (NEPA) regulations issued by the Council (on Environmental Quality) except where such compliance would be inconsistent with statutory requirements."

Proper application of the NEPA process requires a thorough understanding of the biological resources present, potential impacts of a proposed action on those resources, and the ultimate consequences of those actions. BRMP directly supports the NEPA decision-making process by providing the basic biological information and assessment methodology needed to determine whether adverse impacts to biological resources may occur on the Hanford Site. It also provides the resource context and management guidelines needed to determine the magnitude of potential impacts to biological resources and appropriate mitigation actions as needed. The BRMP and the *Hanford Site NEPA Characterization Report* (Duncan et al. 2007) provide RL and its contractors with guidance to ensure compliance with NEPA.

3.3 Migratory Bird Treaty Act

The *Migratory Bird Treaty Act of 1918* (MBTA) makes it illegal to take, capture, or kill any migratory bird or to take any part, nest, or egg of any such bird, included in the terms of the conventions or treaties between the United States, and Great Britain (for Canada), Mexico, Japan, and Russia (covered species are listed at 50 CFR 17.13). In addition, Executive Order 13186, "Responsibility of Federal Agencies to Protect Migratory Birds," further clarifies federal agency responsibilities under the MBTA and other regulations. It requires, among other things, that agencies "identify where unintentional take reasonably attributable to agency actions is having, or is likely to have, a measurable negative effect on migratory bird populations, focusing first on species of concern, priority habitats, and key risk factors."

In 2006, RL signed a Memorandum of Understanding with the USFWS regarding implementation of Executive Order 13186 (DOE and USFWS 2006). In 2013, when the order was modified and re-signed (DOE and USFWS 2013), DOE committed to, among other items and within statutory and budgetary limits, the following actions:

- Implement management practices that avoid or minimize adverse effects on migratory bird populations and their nesting, foraging, migration, staging or wintering habitats.

- When designing new projects, ensure that they avoid important migratory bird habitats and otherwise avoid or minimize direct and indirect effects of new projects on migratory birds and their habitats, and when practicable and appropriate, restore and enhance bird habitat.

- Institute management practices for controlling non-native plants and animals to protect migratory birds and their habitats.

- Construct or utilize engineered constraint systems to prevent migratory birds from nesting or roosting in areas of recognized hazard.

- Promote monitoring, research, and information exchange related to migratory bird conservation and program actions that may affect migratory birds, including collaborating on studies on migratory bird species that may be affected by agency actions, infrastructure, or facilities; and to identify habitat conditions essential to sustain migratory bird populations.

- Develop partnerships with other agencies and non-Federal entities to further bird conservation, as practicable.

- Identify training opportunities for DOE and contractor employees in methods and techniques to inventory and monitor migratory birds, assess population status of migratory birds, assess bird use within project areas, evaluate effects of projects on migratory birds, and develop management practices that avoid or minimize adverse effects and promote beneficial approaches to migratory bird conservation.

- Engage the FWS for coordination regarding proposed actions that may have direct and indirect adverse effects on migratory birds or their habitats.

- Engage the FWS on the development and implementation of strategies to improve the conservation of migratory birds and their habitats in the conduct of environmental cleanup activities at DOE sites.

- Engage the FWS on the development and implementation of strategies to improve or enhance the conservation of migratory birds and their habitats at National Environmental Research Parks, including the Hanford Site.
- Support efforts to promote the ecological, economic, and recreational values of migratory birds by supporting outreach and educational activities and materials, as appropriate.

BRMP and the actions described above provide RL the guidance and a defined process to determine whether protected migratory birds are on the site that may be affected by proposed actions. The plan also assists RL in determining if intentional or unintentional take is likely and the potential effects of such take. BRMP also provides the overall context to identify opportunities to enhance migratory bird habitat and populations.

3.4 Bald and Golden Eagle Protection Act

The *Bald and Golden Eagle Protection Act of 1972* makes it illegal to take (pursue, wound, kill, molest, or disturb), as applicable, any bald or golden eagle, or any part, nest, or egg of these eagles. The *National Bald Eagle Management Guidelines* issued by the USFWS define "disturb" as any activity that may cause injury or decrease productivity (USFWS 2007a). The BRMP and the *Hanford Site Bald Eagle Site Management Plan* (DOE 2013b) provide RL and its contractors with guidance to ensure compliance with the *Bald and Golden Eagle Protection Act*.

3.5 Comprehensive Environmental Response, Compensation, and Liability Act

The primary purpose of the *Comprehensive Environmental Response, Compensation, and Liability Act* of 1980 (CERCLA or Superfund) is to provide for timely compensation, cleanup, and emergency response for hazardous substances released into the environment, as well as the cleanup of inactive hazardous waste disposal sites. The CERCLA planning process requires evaluation of natural resources, including biological resources, on the Hanford Site in an area potentially affected by the release. RL, through its contractors, has primary responsibility for these evaluations when planning and performing CERCLA cleanup actions.

BRMP is the means by which RL defines which resources that may be affected by a cleanup action are important, and provides the framework for determining impacts and appropriate mitigation measures. The CERCLA planning and evaluation process can be used in place of a NEPA evaluation; in those cases, BRMP supports the CERCLA process in the same way it would support a NEPA review.

Section 107(f) of CERCLA identifies and defines natural resource trustees, who are authorized to act in the public interest with regard to natural resources. For the Hanford Site, seven trust entities organized under a Memorandum of Understanding to form the HNRTC (HNRTC 1996). The trustees are DOE, U.S. Department of the Interior (represented by the USFWS), states of Washington and Oregon, Yakama Nation, Confederated Tribes of the Umatilla Indian Reservation, and Nez Perce Tribe. These natural resource trustees are authorized to evaluate the impacts to resources resulting from the release of hazardous substances to the environment through a process called a Natural Resource Damage Assessment (NRDA), and to use the results of that assessment to direct restoration activities aimed at replacing the resources and services lost due to a hazardous substance release.

Although the trustees may make their own determinations about what resources could be damaged and how or where they should be restored, the determinations should be consistent with overall site-wide resource management goals, including BRMP and CLUP. This ensures that NRDA restoration and DOE non-CERCLA actions are synergistic and mutually beneficial. With this in mind, DOE may plan and perform "early restoration" or "enhanced mitigation" that, with HNRTC approval, could be used as credit to offset some or all impacts resulting from contaminant release. Such actions should consider the procedures and guidance provided in Chapter 7 of this document and in the *Hanford Site Revegetation Manual* (DOE 2012a).

3.6 Resource Conservation and Recovery Act

The primary purpose of the *Resource Conservation and Recovery Act of 1976* (RCRA) is to ensure the safe and environmentally acceptable management of solid wastes. RCRA outlines the framework of national programs to achieve environmentally sound management of both hazardous and non-hazardous wastes. Waste site operation activities and RCRA compliance activities may have significant adverse impacts to biota. RCRA activities must comply with other federal statutes that do not deal directly with control and abatement of solid waste or hazardous waste disposal—for example, NEPA and ESA. BRMP provides data in direct support of RCRA permits and helps ensure RCRA activities are not adversely affecting biota, and activities are in compliance with other applicable laws.

3.7 Clean Water Act

Section 404 of the *Clean Water Act of 1977* (CWA) authorizes the U.S. Army Corps of Engineers (USACE) to issue permits for the discharge into or dredging of wetlands (33 CFR 320 et seq.). The U.S. Environmental Protection Agency (EPA) guidelines (40 CFR 230) require that potential impacts to physical, chemical, and biological characteristics of the aquatic systems be considered in the permit process. BRMP provides the baseline data and resource management structure for RL to determine whether any wetlands may be affected by a proposed action.

3.8 Sikes Act

The *Sikes Act* (Public Law 86-797) originally provided for cooperation by the U.S. Department of the Interior and the U.S. Department of Defense with state agencies in "planning, development, maintenance and coordination of wildlife, fish and game conservation and rehabilitation" on military reservations throughout the United States. A 1974 amendment (Public Law 93-452) authorized conservation and rehabilitation programs on lands managed by DOE and several other federal departments and agencies. These programs are carried out in cooperation with the states by the Secretary of the Interior. BRMP provides the basis for coordination and interaction with stakeholders and resource professionals from state and Tribal agencies.

3.9 Magnuson-Stevens Fishery Conservation and Management Act

Federal agencies are obligated, under Section 305(b)(2) of the *Magnuson-Stevens Fishery Conservation and Management Act*, and its implementing regulations (50 CFR 600, Subpart K), to consult with the NMFS about actions that are authorized, funded, or undertaken by those agencies that may adversely affect Essential Fish Habitat (EFH), which is defined by the Act as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." The purpose of the procedure is to promote protection of EFH via the review of federal and state actions that may adversely affect these habitats. Activities in or near the Columbia River may affect defined EFH for anadromous salmonids. Management of EFH in the Columbia River is coordinated through BRMP and the related *Threatened and Endangered Species Management Plan: Salmon, Steelhead, and Bull Trout* (DOE 2013a).

3.10 Executive Order 13112

Executive Order 13112, "Invasive Species," requires all executive agencies to identify actions that may affect the status of invasive species; prevent the introduction of such species; detect, monitor, and control populations of invasive species; restore native species and habitats that have been invaded; and conduct research on the prevention and control of invasive species. In addition, executive agencies are prohibited from authorizing or funding activities that are likely to cause or promote the introduction or spread of invasive species, unless the benefit of such an action clearly outweighs the potential harm from the invasive species.

BRMP provides the overall guidance and philosophy for invasive species management on the Hanford Site. BRMP provides direction for prioritization of species and coordination of invasive species control activities with other site resource management priorities. However, detailed implementation may be deferred to an integrated pest management plan (MSA 2010).

3.11 Executive Orders 11988 and 11990

Executive Order 11990, "Protection of Wetlands," and Executive Order 11988, "Floodplain Management," require federal agencies to minimize the loss or degradation of wetlands on federal lands and account for floodplain management when developing water- and land-use plans, respectively. The DOE implements the requirements of these two Executive Orders via 10 CFR 1022, "Compliance with Floodplain and Wetlands Environmental Review Requirements." It is DOE policy to 1) restore and preserve natural and beneficial values served by floodplains; 2) minimize the destruction, loss, or degradation of wetlands; and 3) preserve and enhance the natural and beneficial value of wetlands. As with the wetland provisions of the *Clean Water Act*, the identification, management, protection, and when necessary, mitigation of wetlands and floodplains on the Hanford Site are coordinated through BRMP.

3.12 Presidential Proclamation 7319

Presidential Proclamation 7319 (65 FR 37253-37257) under the *Antiquities Act of 1906* established the HRNM within portions of the Hanford Site. The USFWS manages portions of the HRNM under agreements with DOE, and RL manages other portions of the HRNM.

The USFWS has prepared a comprehensive conservation plan (CCP) (USFWS 2008), and currently is developing implementing procedures that will guide its management activities to meet the policies and objectives developed in the CCP. The BRMP provides the comparable guidance for RL's management of biological resources, and it functions as the primary interface for biological resource management between the USFWS and DOE.

In addition to the proclamation, in an accompanying memorandum dated June 9, 2000 (Clinton 2000), President Clinton provided the following direction to the Secretary of Energy:

> The area being designated as the Hanford Reach National Monument forms an arc surrounding much of what is known as the central Hanford area. While a portion of the central area is needed for Department of Energy missions, much of the area contains the same shrub-steppe habitat and other objects of scientific and historic interest that I am today permanently protecting in the monument. Therefore, I am directing you to manage the central area to protect these important values where practical. I further direct you to consult with the Secretary of the Interior on how best to permanently protect these objects, including the possibility of adding lands to the monument as they are remediated.

The biological aspects of this directive are implemented through BRMP as part of the CLUP.

3.13 DOE Order 430.1B – Real Property and Asset Management

The objective of DOE Order 430.1B is to "establish a corporate, holistic, and performance-based approach to real property life-cycle asset management that links real Property and Asset planning, programming, budgeting, and evaluation to program mission projections and performance outcomes." This order establishes land-use planning requirements for DOE sites, and requires that "land use planning and resource stewardship responsibilities will be implemented consistent with the principles of ecosystem management and sustainable development." BRMP directly supports implementation of this order by identifying important resources on the Hanford Site and providing guidance for the management of those resources consistent with the HCP-EIS.

3.14 Noxious Weed Control

The need for control of undesirable species such as noxious weeds is established by several federal and state regulations, orders, and agreements, as described in the following subsections.

3.14.1 Federal Regulations

The *Federal Noxious Weed Act of 1974,* as amended by *Section 15 - Management of Undesirable Plants on Federal Lands, 1990,* authorizes the Secretary of Agriculture "to cooperate with other federal and state agencies, and others in carrying out operations or measures to eradicate, suppress, control, prevent, or retard the spread of any noxious weed. Each federal agency must 1) designate an office or person adequately trained to develop and coordinate an undesirable plants management program for control of undesirable plants on federal lands under the agency's jurisdiction, 2) establish and adequately fund an undesirable plants management program through the agency's budgetary process, 3) complete and implement cooperative agreements with State agencies regarding the management of undesirable plant species on federal lands, and 4) establish integrated management systems to control or contain undesirable plant species targeted under cooperative agreements."

A Memorandum of Understanding for the Establishment of a Federal Interagency Committee for the Management of Noxious and Exotic Weeds, 1994, identified a government interagency united effort to control exotic and noxious weeds on government properties. The Federal agencies include the U.S. Departments of the Interior, Agriculture, Defense, Transportation, and Energy.

3.14.2 Washington State Regulations

RCW Chapter 17.10 -Noxious Weed - Control Boards, provides the regulatory authority for control of noxious weeds in Washington. It also establishes county and regional noxious weed control boards and the structure for establishing county noxious weed lists. WAC 16-750, *Washington State Noxious Weed List and Schedule of Monetary Penalties,* provides the list of species categorized in Washington as noxious weeds and defines monetary penalties for failure to control their spread.

RL established an agreement with the neighboring counties' noxious weed control boards via the *Memorandum of Understanding between the Washington State Department of Agriculture, Adams County Noxious Weed Control Board, Benton County Noxious Weed Control Board, Franklin County Noxious Weed Control Board, Grant County Noxious Weed Control Board, and US. Department of Energy Richland Field Office for Management of Noxious Weeds and Undesirable Plants,* 1997, for ongoing control of noxious weeds on the Hanford Site.

4.0 Overview of Hanford Biological Resources

This chapter describes the current extent and distribution of biological resources found on the Hanford Site. It also provides a brief description of the climate, soils, and topography and characterizes how these physical features influence the vegetation and wildlife of the Hanford Site. A brief history of past land use and a fire history are also included to provide context for understanding how historic land use and wildfire have influenced the habitats and wildlife that occupy the site. Additional detailed information characterizing the geology, climate, and surface waters of the Hanford Site can be found in the *Hanford Site NEPA Characterization* report (Duncan et al. 2007).

The Hanford Site is located within the Columbia Basin Ecoregion, an area that historically included over 6 million ha (14.8 million ac) of steppe and shrub-steppe vegetation across most of central and southeastern Washington State (Franklin and Dyrness 1973) as well as portions of north-central Oregon. The current Hanford Site occupies about 1517 km^2 (about 586 mi^2) at the approximate center of the ecoregion (Figure 4.1). The Hanford Site represents one of the largest tracts of native shrub-steppe habitat remaining in Washington State.

A wide variety of habitat types and associated plant communities can be found on the Hanford Site, ranging from habitats on talus slopes, unstabilized sand dunes, and high-elevation basalt outcrops to vast expanses of sagebrush/bunchgrass communities. In addition to shrub-steppe habitats, Hanford also includes valuable riparian, wetland, and aquatic resources. A free-flowing stretch of the Columbia River, the Hanford Reach, bisects the Hanford Site, and a couple of perennial streams flow within the site boundaries.

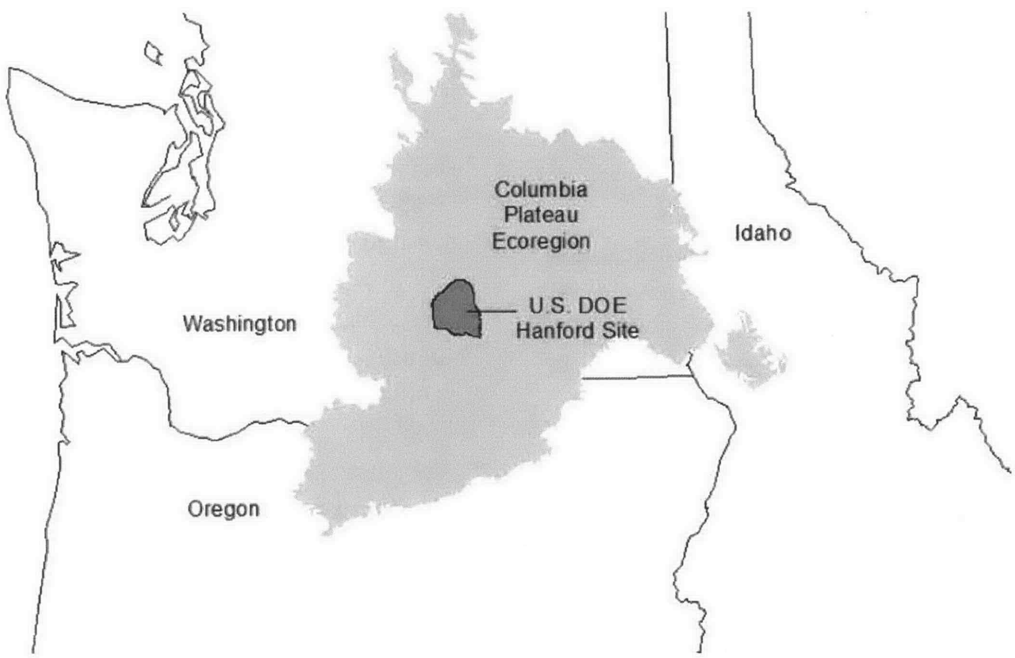

Figure 4.1 The Hanford Site within the Columbia Plateau Ecoregion

The Hanford Site's biological resources have been recognized for their state, regional, and national significance. In addition to the Presidential Proclamation designating portions of the Hanford Site as the HRNM (65 FR 37253), the entire site was designated a National Environmental Research Park by DOE (DOE 1994). This designation reflects Hanford's importance in providing a protected area for research demonstrations and education in ecology. Also, the ALE Reserve is designated a federal Research Natural Area (Franklin et al. 1972). This federal designation is based on the site's ability to provide opportunities for researchers, students, and educators to study and observe a relatively large and undisturbed ecosystem in which natural processes are retained (PNL 1993). The research natural area designation also furthers the purposes of Washington's Natural Heritage Plan by providing protection for rare plant communities.

4.1 Environmental Setting

The climate at Hanford is semi-arid with hot, dry summers and cold, wet winters. Based on data collected from 1945 through 2011 (http://www.hanford.gov/hms), the average monthly temperatures at the Hanford Meteorological Station (HMS) range from a low of -0.4°C (31.2 °F) in January to a high of 24.8°C (76.7°F) in July. Average annual precipitation at the HMS is 17 cm (6.8 in.). Most precipitation is received between October and April, and precipitation increases with elevation (Thorp and Hinds 1977). The highest elevation on the Hanford Site is 1150 m (3500 ft) at the crest of Rattlesnake Mountain. Protected areas along the ridgeline may receive 28 to 30 cm (11 to 12 in.) of precipitation annually—severe winds and freezing weather make it difficult to accurately measure precipitation on the crest. The upper slopes of this northeast-facing anticlinal ridge fall steeply to about 490 m (1600 ft) elevation, where slopes become more moderate, but continue to descend to approximately 152 m (500 ft) in the Cold Creek Valley and eastward to the Columbia River where annual average precipitation is approximately 12 cm (6 to 7 in.)(Hoitink et al. 2005).

The 200-Area plateau rises a few hundred feet above the rest of the central portion of the site, with Gable Butte and Gable Mountain rising fairly steeply to 236 m (773 ft) and 331 m (1085 ft), respectively (Figure 1.1). Soils range from silt loams and stony silt loams on the slopes of Rattlesnake Mountain, Gable Mountain, Gable Butte, and Umtanum Ridge, to sandy loams, loamy sands, and dune sands on the Columbia River Plain (Figure 4.2) (Rickard et al. 1988; Hajek 1966). There are also areas of talus and basalt scree on all of the major ridges. Variation in soils, elevation, and precipitation from the river to the top of Rattlesnake Mountain allow a variety of shrub-steppe plant species and habitats to exist across the site.

Although the Hanford Site's biological resources are characteristic of the Columbia Plateau Ecoregion, the site is unique in that it is located within the driest and hottest portion of the ecoregion (Franklin and Dyrness 1973). These climatic conditions result in somewhat unusual species assemblages relative to the rest of the ecoregion. These same conditions also may cause the Hanford shrub-steppe communities to be less resilient to disturbance, making restoration and rehabilitation after large-scale disturbance more difficult than other areas that are cooler and receive more precipitation.

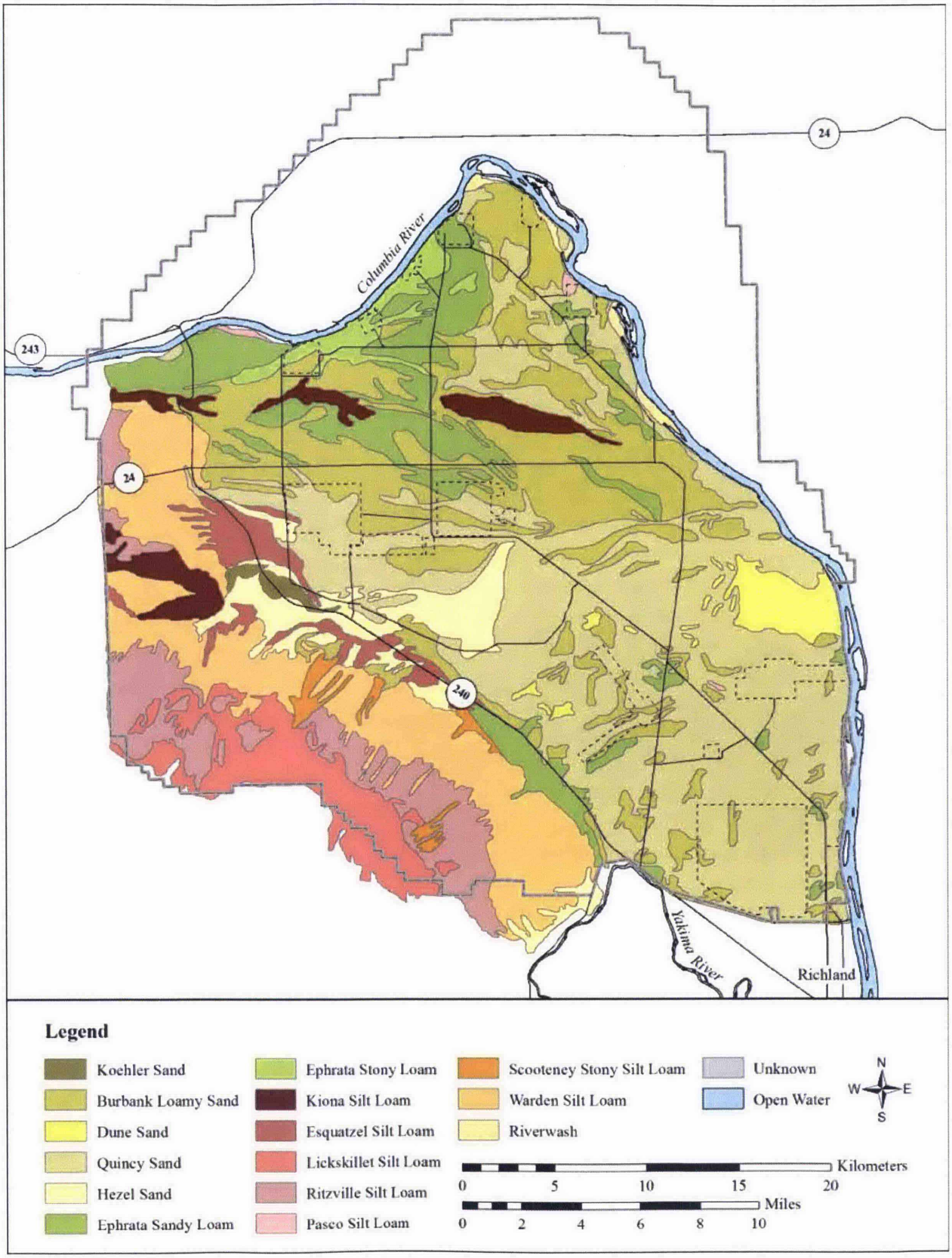

Figure 4.2 Soils of Central Hanford and the Fitzner/Eberhardt Arid Lands Ecology Reserve

4.1.1 Hanford Site History and Past Land Use

The steppe and shrub-steppe communities of the Columbia Basin have undergone substantial loss or degradation in the post-European era that can be attributed primarily to human-induced change (Dobler 1992; Noss et al. 1995). Within Washington alone, more than half of the shrub-steppe habitat historically present has been lost (Dobler 1992; Jacobsen and Snyder 2000), primarily as a result of agriculture. Much of the remaining habitat is degraded and fragmented or threatened by development and agricultural expansion.

Ungrazed sagebrush-steppe in the Intermountain West is a critically endangered ecosystem that has experienced more than a 98% decline since European settlement (Noss et al. 1995). Figures 4.3 and 4.4 show the historic and current distribution and extent of land-cover classes within the Columbia Basin Ecoregion (based on Interior Columbia Basin Ecosystem Management Project data, http://www.icbemp.gov/html/icbhome.html).

Before 1943, the land-use history of the Hanford Site related principally to livestock ranching, farm homesteads, and small supply and grain shipment towns (Gerber 1992). The consequences of some of these land uses are still apparent today. For example, the abandoned town sites and old fields along the Columbia River are still composed mostly of non-native plant species. Other areas that were grazed retain a mix of native and non-native plant species or, if not intensively grazed, still closely resemble the original native plant communities. Even ALE experienced historic land uses from 1880 to 1940, including homesteading, winter/spring sheep grazing, natural gas well drilling, and road building (Hinds and Rogers 1991). These historical non-DOE land uses also must be considered in understanding the ecological context of the Hanford Site.

The Hanford Site was created in 1943 in response to the nation's World War II defense needs. Over its first 50 years of operation, Hanford's mission was a combination of energy-related research and military-related material production, the apportionment of which depended on the nation's changing defense needs (Becker 1990). The last 25 years have been dedicated to environmental restoration and waste management. Use of Hanford lands for the production of defense nuclear materials protected much of the Hanford Site from industrial development, agriculture, and livestock grazing (Gray and Becker 1993; Gray and Rickard 1989). Because of this, the Hanford Site retains large blocks of shrub-steppe (Smith 1994) that have been relatively undisturbed for the last 70 years.

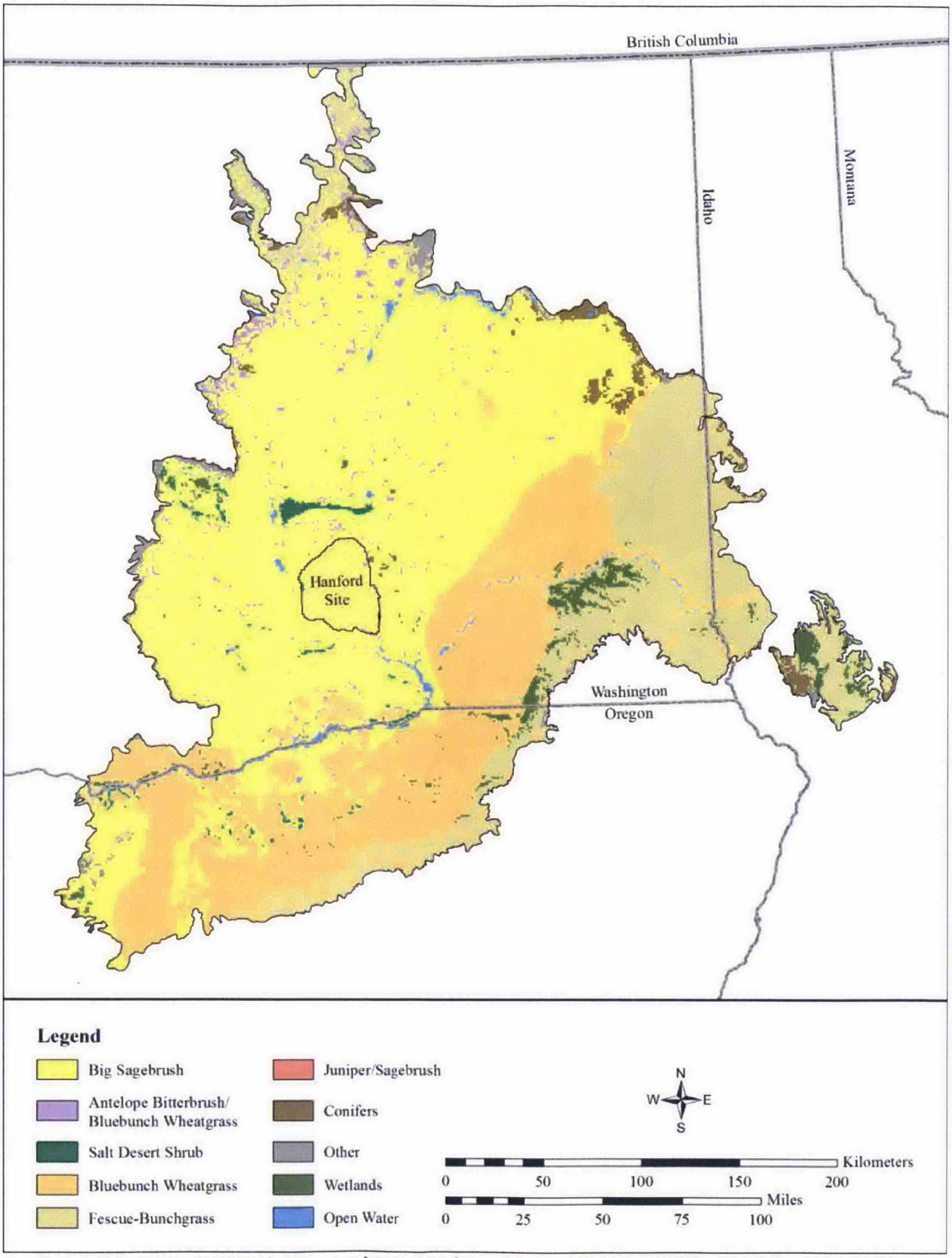

Figure 4.3 Historic Distribution and Extent of Land Cover Classes within the Columbia Plateau Ecoregion

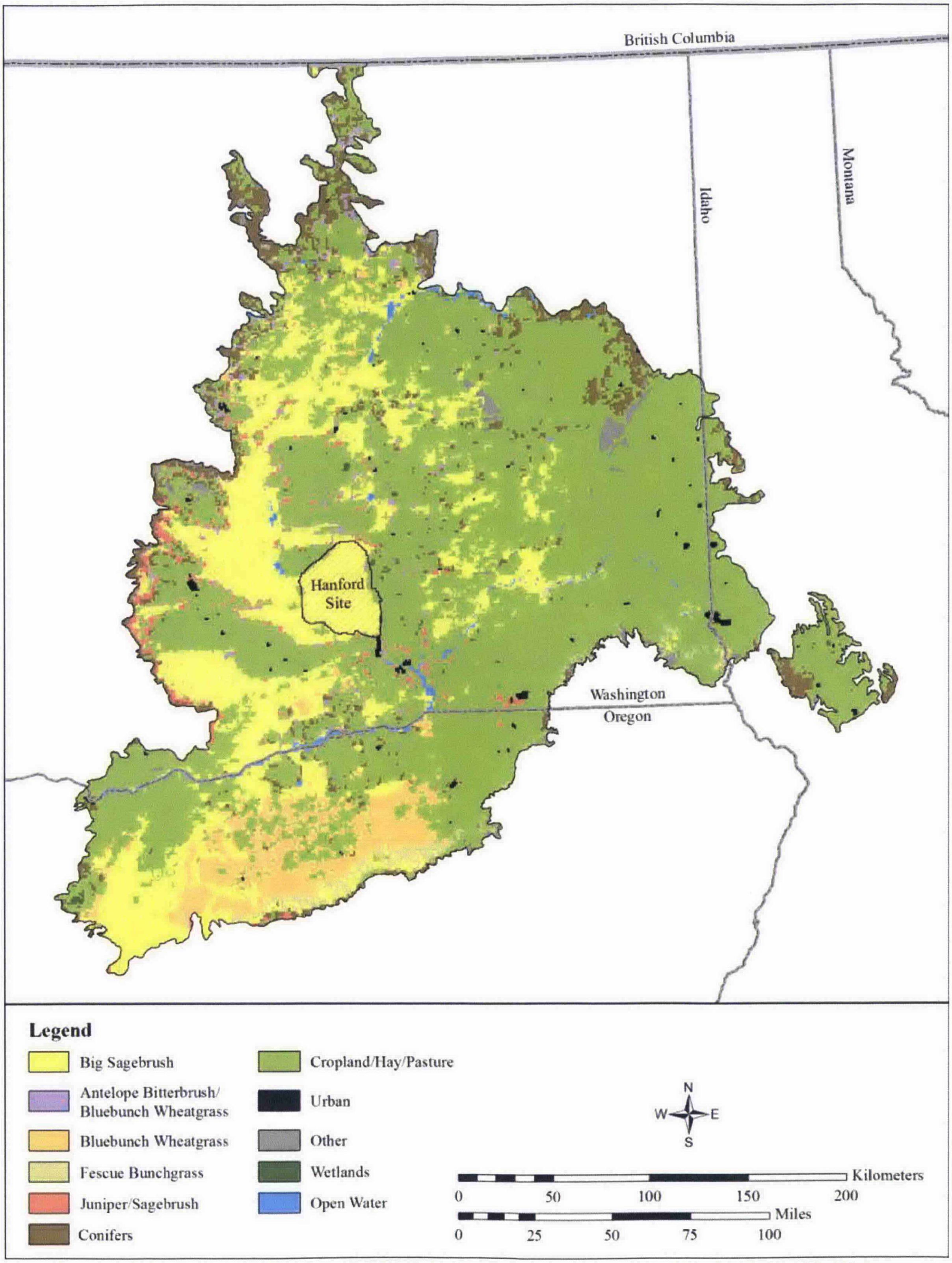

Figure 4.4 Current Distribution and Extent of Land Cover Classes within the Columbia Plateau Ecoregion

4.1.2 Fire History

Over the last several decades, the Hanford Site has been subject to large wildfires that have burned thousands of acres (Figure 4.5). Wildfire in the shrub-steppe historically occurred at intervals of 32 to 70 years in sagebrush vegetation types (Wright et al. 1979), allowing sufficient intervals for the native shrubs to re-establish from seed after a wildfire. Some areas within the shrub-steppe ecoregion now experience fire-return intervals of less than 10 years (Pellant 1990; Whisenant 1990), effectively resulting in the loss of sagebrush and other key plant and wildlife species over large areas (Knick 1999).

The introduction and spread of the alien annual cheatgrass (*Bromus tectorum*) is believed to contribute to increased wildfire frequency in shrub-steppe habitats because the annual grass can create a continuous fine-fuel layer that may increase the rate of fire spread. As cheatgrass has become more prevalent in shrub-steppe communities, and human disturbance and development pressure have increased, the frequency and severity of fires in this ecoregion have increased. The recovery of shrub-steppe habitats after wildfire varies depending on factors, including the composition of the pre-fire plant community, time of the wildfire, and severity of the burn.

4.2 Biological Resources

The Hanford Site lies within the interior, low elevation, Columbia River Basin, which is within the shrub-steppe zone (Daubenmire 1970). The diversity of physical features across the Hanford Site contributes to a corresponding diversity of biological communities (TNC 1995, 1996, 1998, and 1999). Although the majority of the Hanford Site consists of shrub-steppe habitats, valuable riparian, wetland, and aquatic habitats are associated with the Hanford Reach. The Hanford Site also contains a diversity of other rare terrestrial habitats such as riverine islands, bluffs/cliffs, basalt outcrops, and sand dunes (Downs et al. 1993; Hallock et al. 2007). Both shrub-steppe and riparian habitats are considered "priority habitats" by the Washington Department of Fish and Wildlife (WDFW). In addition, the Washington Natural Heritage Program (WNHP) has mapped and classified portions of the native plant communities found on Hanford as priority ecosystems. The location of priority habitats on Hanford provides opportunities for creating habitat and landscape connectivity with other large adjacent areas of shrub-steppe habitat within the ecoregion, such as with the Yakima Training Center to the west and north and Columbia National Wildlife Refuge to the north and east.

This section describes those habitats and the wildlife found on the Hanford lands currently managed by RL—including central Hanford and the McGee-Riverland area. Descriptions of habitats occurring on HRNM lands currently managed by USFWS can be found in the HRNM-CCP (USFWS 2008).

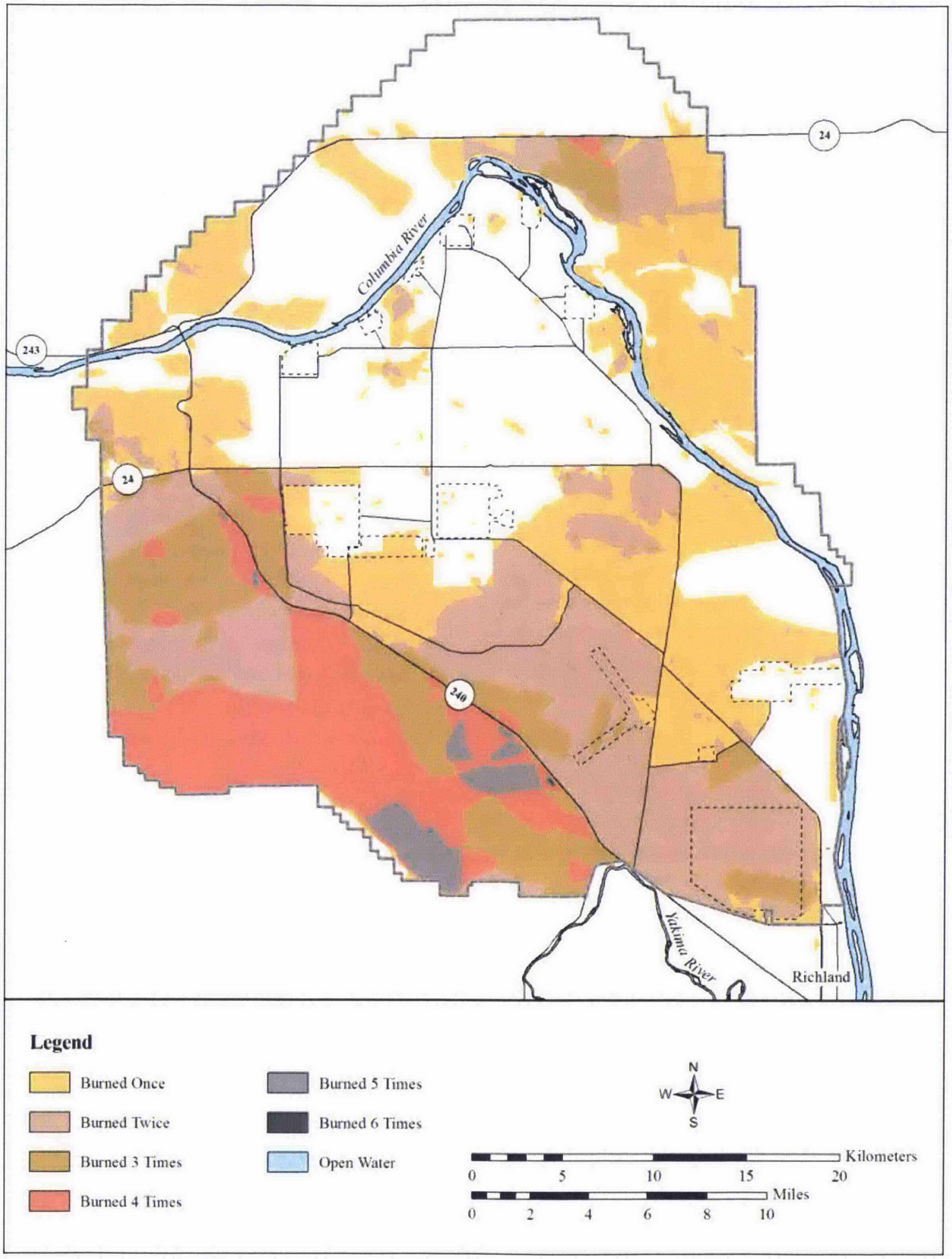

Figure 4.5 Hanford Fire Boundaries from 1978 to 2011

4.2.1 Shrub-Steppe Habitats

The designation "shrub-steppe" refers to habitats dominated by shrubs and steppe grasses. In describing the vegetation zones and plant associations of the eastern Washington steppe, Daubenmire (1970) originally included all the Hanford Site in a zone he called the *Artemisia tridentata/Agropyron spicatum* or big sagebrush/bluebunch wheatgrass zone. (*A. spicatum* has since been reclassified as *Pseudoroegneria spicata* (Pursh) A. Löve). This large zone covers the most arid interior of eastern Washington extending west to the Cascade Mountains, north into the Okanogan Valley, and south into portions of north central Oregon. Within the big sagebrush/bluebunch wheatgrass zone, a number of different shrub-steppe plant community types exist according to climatic conditions, topographic conditions, soil type and depth, and disturbance history.

Shrub-steppe plant communities on Hanford are typically characterized by shrub overstories consisting of species of sagebrush (*Artemisia* spp.), bitterbrush (*Purshia tridentata*), or rabbitbrush (*Ericameria* or *Chrysothamnus spp.*) with perennial bunchgrass understories often dominated by bluebunch wheatgrass, Sandberg's bluegrass (*Poa secunda*), Indian ricegrass (*Achnatherum hymenoides*), or needle-and-thread grass (*Hesperostipa comata*). The extent and distribution of current vegetation and land cover types are shown in Figure 4.6. More detailed descriptions of vegetation associations found on the Hanford Site are described in *Vascular Plants of the Hanford Site* (Sackschewsky and Downs 2001).

The ecological status and composition of the plant community changes in response to natural and human-induced disturbance and continues to change over time. This process of change, called succession, is used to describe the dynamics of plant community recovery. The introduction of invasive annual plants, such as cheatgrass, can alter the sequence of plant community recovery or prevent recovery of perennial native vegetation. Successional plant communities may consist of primarily perennial native bunchgrasses and forbs with or without early successional shrubs such as green and gray rabbitbrush. The succession process may take decades after disturbance before the community recovers to support stands of big sagebrush or other late-successional-stage shrubs; however, these interim plant communities are considered part of the shrub-steppe ecosystem and are an important resource for a variety of wildlife and plant species of concern.

In areas that have been recently or repeatedly burned, the shrub overstory may be sparse, small in stature, or absent. As stated in Section 4.1.2, the potential for habitats to recover after a wildfire depends on a number of factors. Where the pre-fire habitats were dominated by native perennial species, the herbaceous perennials generally re-grow from roots the following growing season. Sagebrush does not re-grow from roots after fire and must re-establish from seed. If viable seeds remain in the soil seed bank, re-establishment of sagebrush as a dominant overstory species may occur within a decade. If no viable seed source is readily available—such as in areas that have burned repeatedly within a 5- to 10-year period—then re-establishment of sagebrush and other shrubs may take significantly longer, and the vegetation association will be dominated by herbaceous grasses and forbs following the fire. Where pre-fire habitats were dominated by alien annual species or where alien annual species are prevalent, these species often increase after fire.

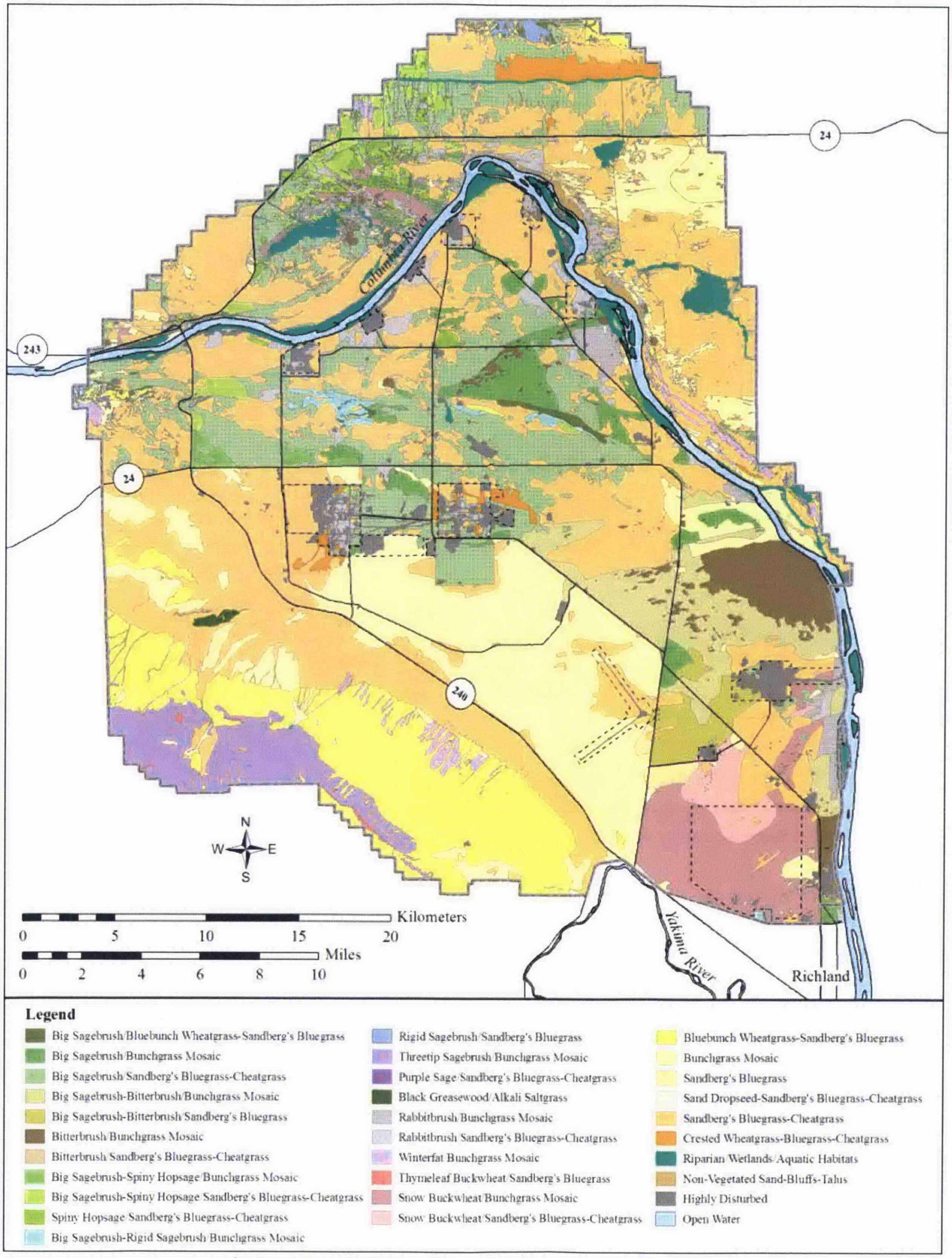

Figure 4.6 Vegetation Cover Types on the Hanford Site

4.2.2 Wetlands and Riparian Habitats

In addition to shrub-steppe, the Hanford Site contains riparian, wetland, and aquatic habitats. Riparian and wetland areas are important because of the increased habitat diversity they provide. Riparian environments also provide critical linkages and transition zones between the upland and aquatic environments. These zones provide a variety of ecosystem functions, such as wildlife habitat, contribution to fish habitat, unique plant species habitat, flood control improvement, and sediment trapping. Riparian vegetation along the Hanford Reach usually consists of a vegetation band along the river shoreline that is influenced by the flow of the river and the increased availability of water for plant growth at the river edge. This type of vegetation is characterized by plants that can persist in wetted soils or that require higher levels of soil moisture than can be found in the more arid uplands.

The Hanford Reach contains native riparian habitat, free-flowing riffles, gravel bars, oxbow ponds, and backwater sloughs that are otherwise limited in occurrence elsewhere along the Columbia River (USFWS 1980; NPS 1994; 65 FR 37253). Riparian vegetation is limited in extent, with narrow bands or buffers near the water consisting of a number of forbs, grasses, sedges, reeds, rushes, cattails, and deciduous trees and shrubs. Much of the riparian zone along the Columbia River has been successfully invaded by exotic plant species that can act to displace native species. Along the Hanford Reach, mulberry (*Morus alba*) and Russian olive (*Elaeagnus angustifolia*) trees are more frequent than the native black cottonwood (*Populus balsamifera* ssp. *trichocarpa*). In places along the Columbia River shoreline, the native cattails (*Typha latifolia*), sedges (*Carex* sp.), and rushes (*Juncus* sp.) may be displaced by reed canary grass (*Phalaris arundinacea*).

Where the banks of the river are steep, the riparian vegetation forms a band that roughly extends from the surface elevation corresponding to average low flows along the river to a few meters above the shoreline elevation corresponding to average high flows. Thus, this band of vegetation can be as narrow as 5 to 10 m (15 to 30 ft) where river banks are steep; but, in areas where the river bank slopes are mild and areas of slower backwater flows (sloughs), the extent of the band of riparian vegetation can be much greater—up to 700 to 800 m (2300 to 2600 ft) in width in some areas. Riparian vegetation types along the Columbia River bordering the Hanford Site are shown in Figure 4.7.

Riparian and wetland areas not directly associated with the Columbia River are widely scattered across the Hanford Site. These areas include a mix of small, naturally occurring springs and streams, artificial wetlands created by irrigation runoff (north of the Columbia River), and a variety of temporary water bodies attributed to waste-water discharges (Neitzel 2000; Downs et al. 1993). The springs and streams and their associated vegetation are especially important for providing water, forage, cover, and breeding sites for wildlife within the dry-land portions of the Hanford Site (Downs et al. 1993). Most of these features are found on Hanford lands currently managed by the USFWS and are described in the HRNM-CCP (USFWS 2008). Springs and water bodies found on central Hanford and McGee-Riverland are shown in Figure 4.8.

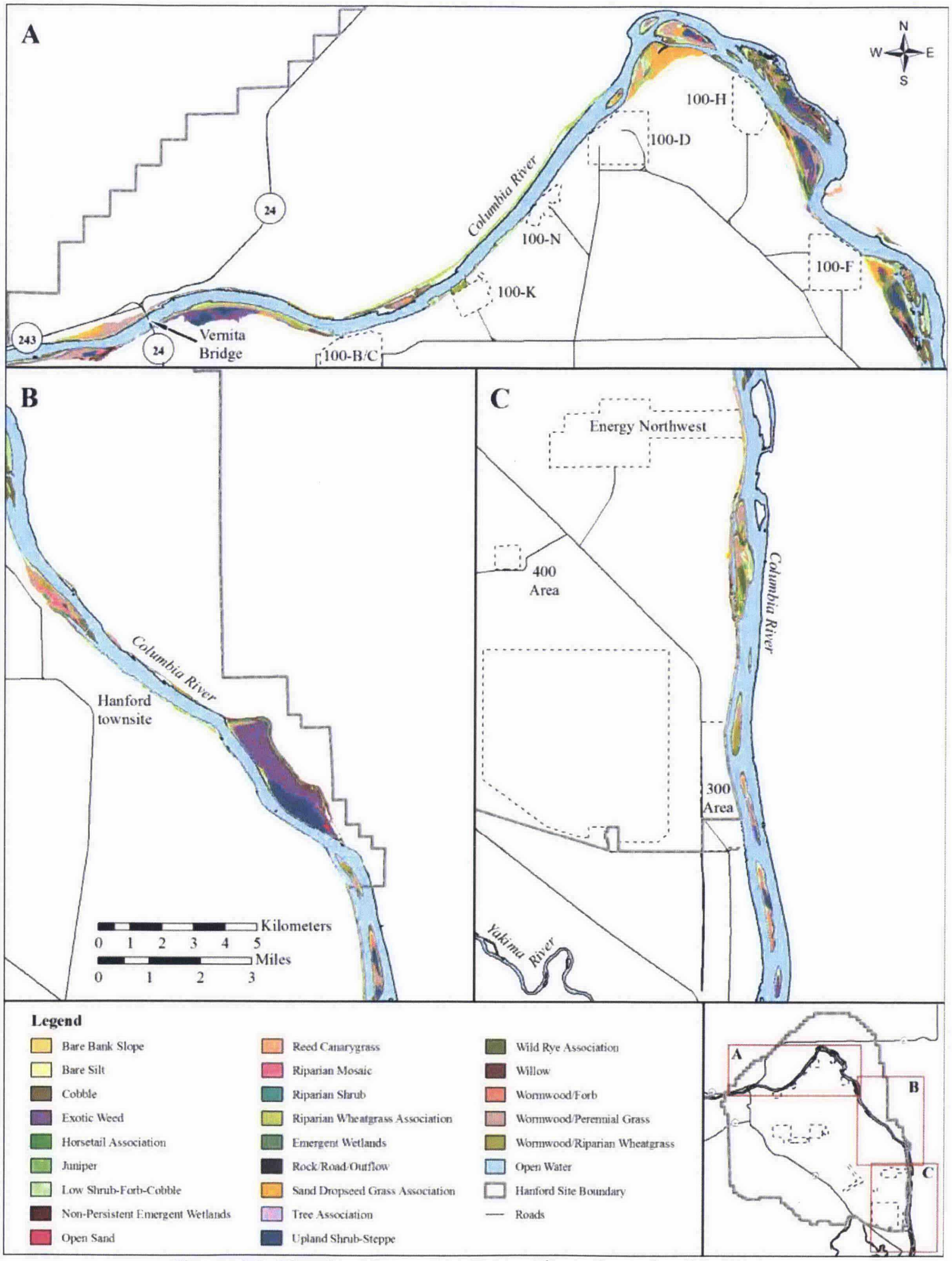

Figure 4.7 Riparian Vegetation Types Along the Columbia River

4.2.3 Significant or Rare Habitats

Within the Hanford Site boundaries, a number of physical features create unique habitat for plants and wildlife (Figure 4.8). In the areas currently managed by RL, these habitats include the following:

- Basalt outcrops, cliffs, and talus slopes—which support rare plants, rare plant communities, and specialized wildlife
- Upland springs—which support rare wildlife species and high wildlife use
- Desert streams – which also support rare wildlife species and high wildlife use
- Vernal pools – which provide rare plant habitat and support wildlife use
- Columbia River sloughs—which support high fish and wildlife use (provide important habitat diversity within the Hanford Reach) and associated rare plant species and communities
- Columbia River islands—which provide unique wildlife habitat through isolation and support rare plants
- Sand dunes—which are considered a priority ecosystem and support rare plant species and communities.

More detailed information about each of these habitats and their associated plants and wildlife can be found in *Habitat Types on the Hanford Site: Wildlife and Plant Species of Concern* (Downs et al. 1993).

4.2.4 Washington State Element Occurrences

The Hanford Site also contains relatively large areas of native plant communities that have been mapped and identified as "element occurrences" by the WNHP and are currently classified as priority ecosystems within the state (Figure 4.9). An element is a basic unit of Washington's biologic and geologic environment identified as a needed component of a system of natural areas. An element can be an entire ecological system, such as a plant community or a wetland ecosystem that includes the native plants and animals common to that system. Occurrences of priority species or ecosystems are assessed by WNHP regarding their overall condition and viability.

4.2.5 Wildlife

Wildlife use habitats on the Hanford Site according to species-specific requirements, and use of shrub-steppe, riparian, and aquatic habitats may vary during different portions of their life cycle or during different seasons. Wildlife at Hanford may be resident or migratory and include recreationally and commercially important species. Hanford provides habitat for a variety of mammals, reptiles, amphibians, birds, fish, and invertebrates. They are discussed briefly in this subsection. Comprehensive lists of the wildlife species observed on Hanford Site are provided in Duncan et al. (2007).

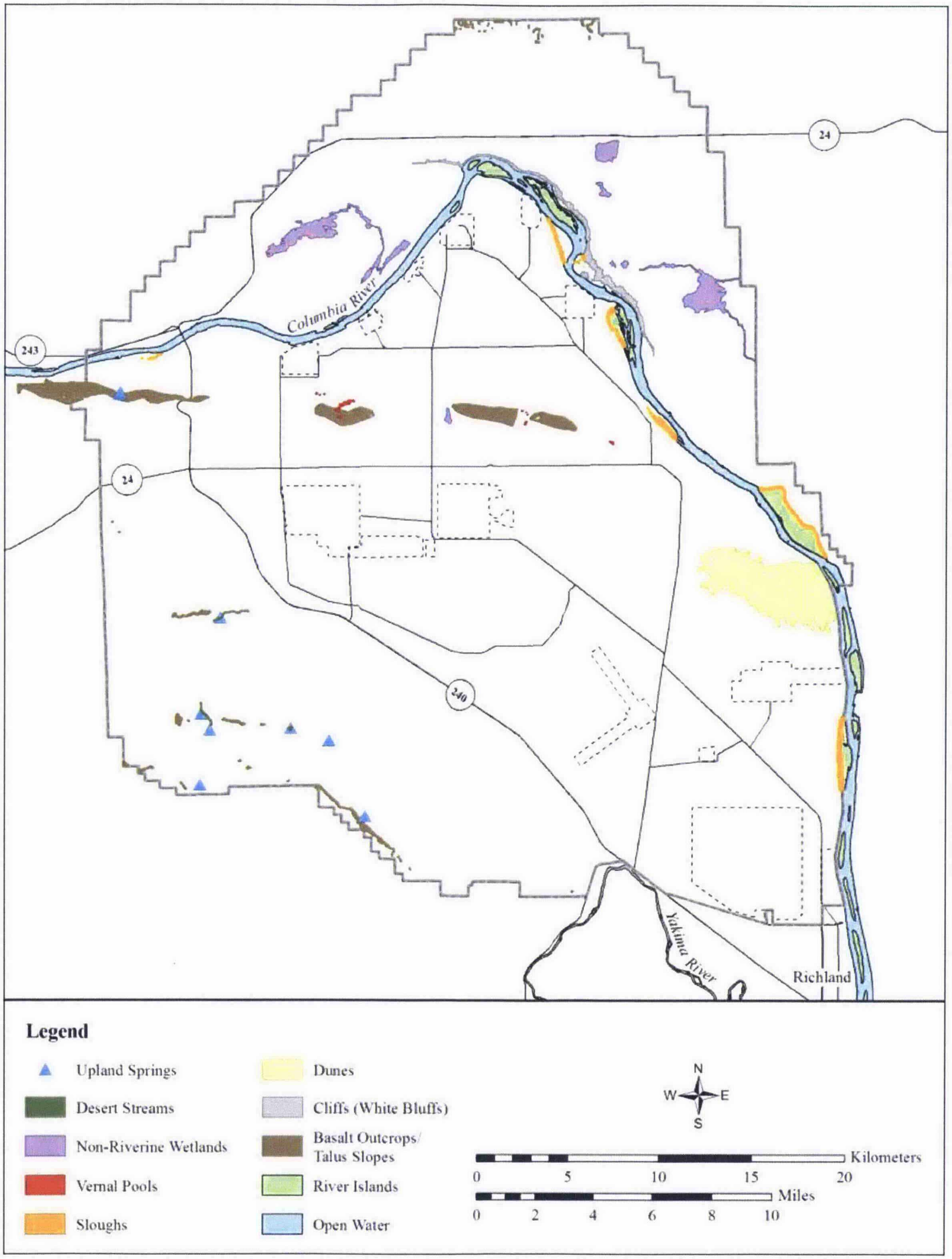

Figure 4.8 Significant or Rare Habitats, including Springs and Water Bodies on Central Hanford

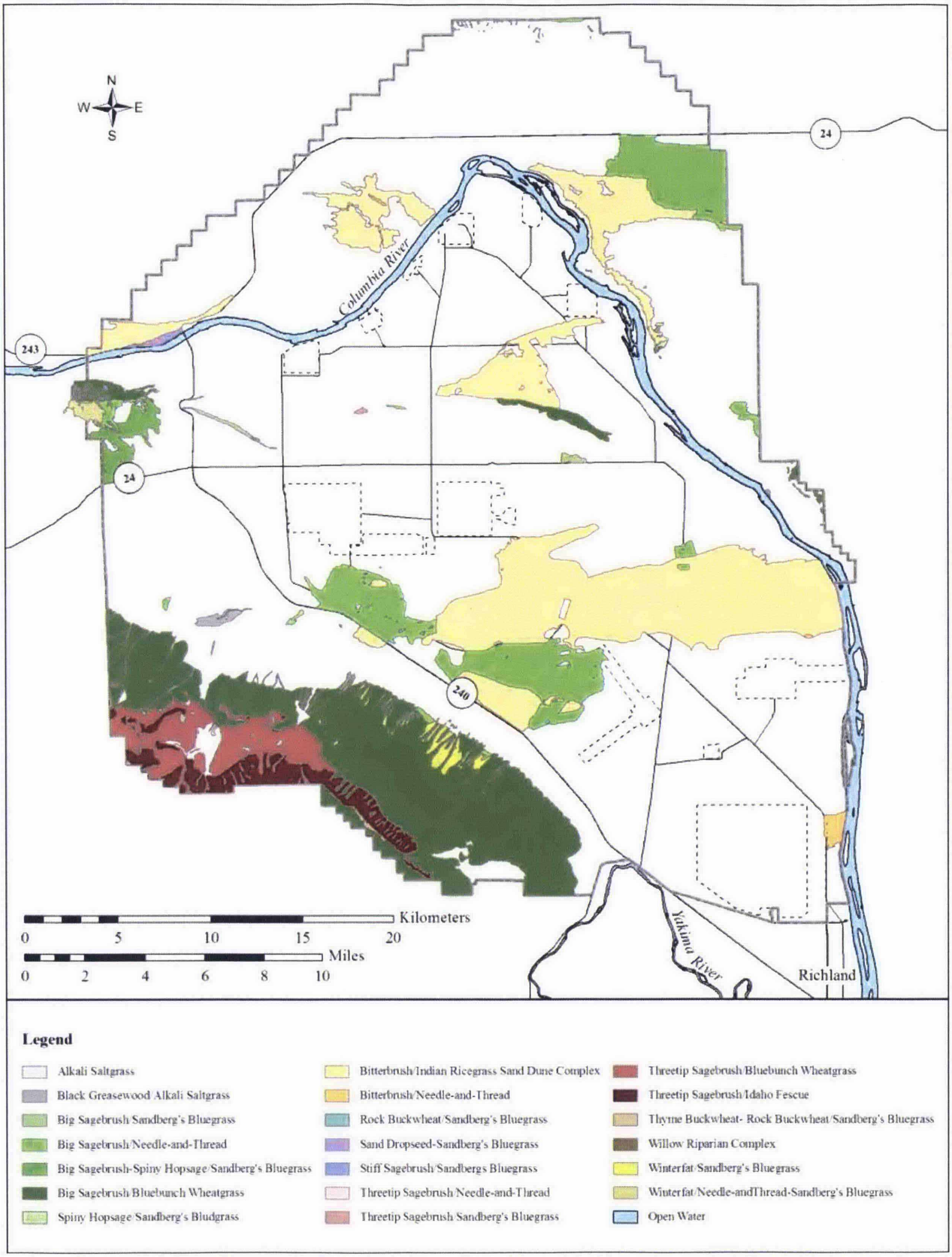

Figure 4.9 Washington State Plant Community Element Occurrences on the Hanford Site

4.2.5.1 Mammals

The approximately 46 mammalian species present on the site are representative of those found in shrub-steppe, riparian, and aquatic habitats of the region (Duncan et al. 2007). Many of the smaller and less mobile mammal species, such as mice, rabbits, and shrews, are resident, and individuals spend their entire lives within the boundary of the site. Individuals of more mobile species, such as bats, or occasional transients like the mountain lion (*Puma concolor*), may only be present seasonally.

Because most of the site is dominated by shrub-steppe, the Hanford mammal community is representative of upland species that occur in shrub-steppe habitats. Habitat generalists, such as the ubiquitous coyote (*Canis latrans*), mule deer (*Odocoileus hemionus*), deer mouse (*Peromyscus maniculatis*), and Great Basin pocket mouse (*P. parvus*) can be found in many different habitats. Black-tailed and white-tailed jackrabbits (*Lepus californicus and L. townsendii*), and ground squirrels (*Urocitellus* spp.) are only found in shrub-steppe habitats. The porcupine (*Erithozon dorsatum*), striped skunk (*Mephitis mephitis*), vagrant shrew (*Sorex vagrans*), and white-tailed deer (*O. virgianus*) are mainly found in riparian areas along the Columbia River. Beaver (*Castor canadensis*), muskrat (*Ondatra zibethicus*), mink (*Mustela vison*), and river otter (*Lontra canadensis*) occur in both riparian and aquatic habitats.

Other Hanford mammal species only occur in very specific habitats. The least chipmunk (*Tamias minimus*), Merriam's shrew (*S. merriami*), and sagebrush vole (*Lemmiscus curtatus*) are only found at higher elevations on Hanford. Bats on the Hanford Site are less common and restricted to very specific habitats such as rock outcrops, abandoned buildings, and large trees. Common bat species found on the Hanford Site are the Yuma myotis (*Myotis yumanensis*), silver-haired bat (*Lasionycteris noctivagans*), and pallid bat (*Antrozous pallidus*).

4.2.5.2 Reptiles and Amphibians

There are approximately 10 reptile species known to occur on the Hanford Site. Of the three lizard species, the common side-blotched lizard (*Uta stansburiana*) is the most frequently observed and occurs in most native upland habitats. Sagebrush lizards (*Sceloporus graciosus*) are also found on Hanford and generally occupy habitats where some shrub cover is available. The pygmy horned lizard (*Phrynosoma douglasii*) is relatively uncommon on the Hanford Site.

Six snake species are known to occur on Hanford. Most of the snakes commonly occur in upland habitats only, including the western yellow-bellied racer (*Coluber constrictor*) and the Great Basin gopher snake (*Pituophis melanoleucus*). The western rattlesnake (*Crotalus viridis*) is often found in or near basalt outcrops on Hanford or along the Columbia River, while the striped whipsnake (*Masticophis taeniatus*) and desert nightsnake (*Hypsiglena torquata*) also occur in uplands, but have rarely been encountered on the site. The western garter snake (*Thamnophis sirtalis*) prefers riparian habitats. The painted turtle (*Chrysemys picta*) is the only turtle known to occur on the Hanford Site.

Amphibians are somewhat limited in abundance and distribution on the site because of the limited abundance and distribution of water and moist habitats. Only five amphibian species are known to occur on the site. The Great Basin spadefoot toad (*Spea intermontana*) and Woodhouse's toad (*Bufo woodhousii*) are the only two toads, and the

American bullfrog (*Rana catesbeiana*) and Pacific tree frog (*Pseudacris regilla*) are the only frogs. The tiger salamander (*Ambystoma tigrinum*) is the remaining amphibian species known to occur on Hanford.

4.2.5.3 Birds

Birds are conspicuous, widespread, and abundant on the Hanford Site. They are diverse in life history and habitat requirements. Estimates of the number of different bird species observed on the Hanford Site range from 187 (Fitzner and Gray 1991) to 238 (Landeen et al. 1992). Many bird species are uniquely adapted to thrive in the shrub-steppe and spend the breeding season nesting and raising young on the site, including the sage sparrow (*Amphispiza belli*), Brewer's sparrow (*Spizella breweri*), long-billed curlew (*Numenius americanus*), and the ferruginous hawk (*Buteo regalis*). Other species, including the common loon (*Gavia immer*), pied-billed grebe (*Podilymbus podiceps*), and many of the ducks can only be found in open water. The rock wren (*Salpinctes obsoletus*) prefers basalt scree and other rocky habitats; the yellow-breasted chat (*Icteria virens*) stays within riparian shrubs; the short-eared owl (*Asio flammeu*) only occurs in a landscape of grassy habitats, and the bank swallow (*Riparia riparia*) depends on bare sand bluffs to nest. Habitat generalists, such as the Eurasian starling (*Sturnus vulgaris*), mourning dove (*Zenaida macroura*), and Canada goose (*Branta canadensis moffitti*) exploit many different habitats.

Varying life histories also allow some species to exploit seasonally available resources and dictate when they may be present on Hanford. Individuals of resident species, such as the California quail (*Callipepla californica*), chukar (*Alectoris chukar*), and ring-necked pheasant (*Phasianus colchicus*), may spend their entire lives within the confines of Hanford, while individuals of other resident species, such as the house finch (*Carpodacus mexicanus*), killdeer (*Charadrius vociferous*), and American robin (*Turdus migratorius*), may be replaced by other individuals as the species seasonally shifts its geographical range.

Migratory species from as small as the tree swallow (*Tachycineta bicolor*) to as large as the sandhill crane (*Grus canadensis*) are only found on the site during spring and autumn. Many songbird species, such as the ruby-crowned kinglet (*Regulus calendula*) and western bluebird (*Sialia mexicana*), stop over during spring or fall migration and breed elsewhere.. Still others, such as the white-crowned sparrow (*Zonotrichia leucophrys*), northern rough-legged hawk (*Buteo lagopus*), and the common goldeneye (*Bucephala clangula*), arrive to spend winter on the site.

Prior to the 1990s greater sage grouse (*Centrocercus urophasianus*) were once routinely observed above 250 m (800 feet) on the Hanford Site (Downs et al. 1993). These birds require sagebrush as a habitat component, and the local populations were apparently lost after wildfires removed sagebrush from large areas of the site. Other factors, such as installation of many tall transmission line towers, also may have contributed to the decline. There are rare sightings of individual birds, but greater sage grouse no longer appear to be a resident population on the Hanford Site.

4.2.5.4 Fishes

The Columbia River provides habitat for both warm- and coldwater fishes. Forty-six species are known to reside in or migrate through the Hanford Reach. Of these species, Chinook salmon (*Oncorhynchus tshawytscha*), sockeye salmon (*O. nerka*), Coho salmon (*O. kisutch*), and steelhead trout (*O. mykiss*) use the river as a migration route to and from upstream spawning areas and are of the greatest economic importance. Adult and juvenile Pacific lamprey (*Entosphenus tridentatus*) also migrate through the Hanford Reach. The Hanford Reach is the most productive spawning area for fall Chinook salmon in the Pacific Northwest. The fall Chinook salmon that spawn in the Hanford Reach are part of the Upper Columbia River Fall-run Evolutionarily Significant Unit, which is not listed under any ESA protection category. The annual escapement of adult Chinook salmon to the Hanford Reach averaged 50,000 over the last 10 years, and the major spawning regions included Vernita Bar, the island complexes between the 100-D and 100-F Areas, and the Ringold Area (Wagner et al. 2013).

In addition to the fall Chinook salmon, other species of fish are culturally and recreationally important, such as white sturgeon (*Acipenser transmontanus*), small-mouth bass (*Micropterus dolomieu*), walleye (*Sander vitreus*), and mountain whitefish (*Prosopium williamsoni*).

4.2.5.5 Terrestrial and Aquatic Invertebrates

Insect diversity on the Hanford Site is high, with more than 1000 taxa identified, which is probably less than 10% of the total present (TNC 1996). Hanford's insect diversity is directly related to the extent and diversity of native habitat. Insects and other related arthropod groups (mites and spiders) are ubiquitous within terrestrial habitats at the site. However, they are not uniformly distributed across all habitats. Darkling beetles (*Tenebrionidae*) and ground beetles (*Carabidae*) are the most common beetles present. Ants (*Formicidae*) are the most common hymenoptera present, and moths are the most common lepidopterans.

Benthic invertebrates are found either attached to or closely associated with the substratum in the Columbia River. All major freshwater benthic taxa are represented in the river. Although studied sparingly over the last 10 to 20 years, the macroinvertebate communities primarily consist of caddisfly (*Trichoptera*) and dipterans (*Chironomidae*) with low overall diversity and species richness. Dipterans make up the majority of spring populations and caddisfly larvae are more prevalent in the fall period. Other orders present but rare in the Hanford Reach include *Plecoptera, Odonata, Hemiptera*, and *Coleoptera*. Species density is generally greatest in the fall and early winter, which corresponds to the time when most insect eggs hatch. In addition to insects, mollusks, sponges, and crayfish are found in riverine environments.

Pacific Northwest National Laboratory (PNNL) conducted mussel surveys along the Hanford Reach shoreline in 2004 (Mueller et al. 2011). Three mussel species belonging to the *Anodonta* genus were found in a number of shallow areas. The California floater (*A. californiensis*) was found in areas with high substrate embeddedness and very low river water velocities. The western floater (*A. kennerlyi*) and Oregon floater (*A. oregonensis*) were encountered in a number of locations where the riverbed was at least partially embedded. Of the four species of native mussels found in the Hanford Reach, the western and Oregon floaters were the most abundant across sampling areas. The western pearlshell mussel (*Margaritafera falcata*) was almost completely absent during surveys conducted in 2004 (a dead shell, thought to have been alive within the last 10 years, was found) (Mueller et al. 2011).

4.2.6 Federal and State Species of Concern

The Hanford Site is home to a number of species of state and federal concern including species listed as endangered and threatened under the ESA (maintained by the USFWS in 50 CFR 17.11 and 50 CFR 17.12) and species listed in Washington State as endangered, threatened, sensitive, candidate, watch, review, or monitor by the WNHP (2012a) and WDFW (2012).

Two fish species (Upper Columbia spring-run Chinook salmon and Upper Columbia steelhead) known to occur in the Hanford Reach are on the federal list of endangered and threatened species. They are known to regularly occur within this portion of the Columbia River. The bull trout (*Salvelinus confluentus*), a threatened species, also has been recorded in the Hanford Reach. The Reach is designated as bull trout critical habitat and considered foraging, overwintering, and migratory habitat as part of the mainstem Upper Columbia River critical habitat unit (75 FR 63898).

In April 2013, the USFWS listed two plant species, the Umtanum desert buckwheat (*Eriogonum codium*), and White Bluffs bladderpod (*Physaria tuplashensis)*, as threatened, with critical habitat, under the ESA (78 FR 23984 and 78 FR 24008). This listing was subsequently delayed until at least November 2013 while additional comments are received (78 FR 30772 and 78 FR 30839). No other plants or animals known to occur on the Hanford Site are currently on the federal list of endangered and threatened species, but one bird (greater sage grouse) is currently a candidate for listing under ESA. The USFWS also maintains a list of species of concern in the Columbia Basin Ecoregion (USFWS 2012) that includes species being monitored that may be considered for federal candidate status in the future. Fifteen species that occur on the Hanford Site are included on the USFWS list. A complete inventory of species listed by state or federal resource agencies is provided in Appendix A.

Plant populations monitored on the Hanford Site include taxa listed by Washington State as endangered, threatened, or sensitive and those species listed as Review Group 1, which includes taxa in need of additional field work before status can be determined (WNHP 2012b). More than 100 plant populations of 53 different taxa listed by WNHP as endangered, threatened, sensitive, review, or watch list are found at the Hanford Site (Figure 4.10) (Sackschewsky and Downs 2001; TNC 1995, 1996, 1998, 1999).

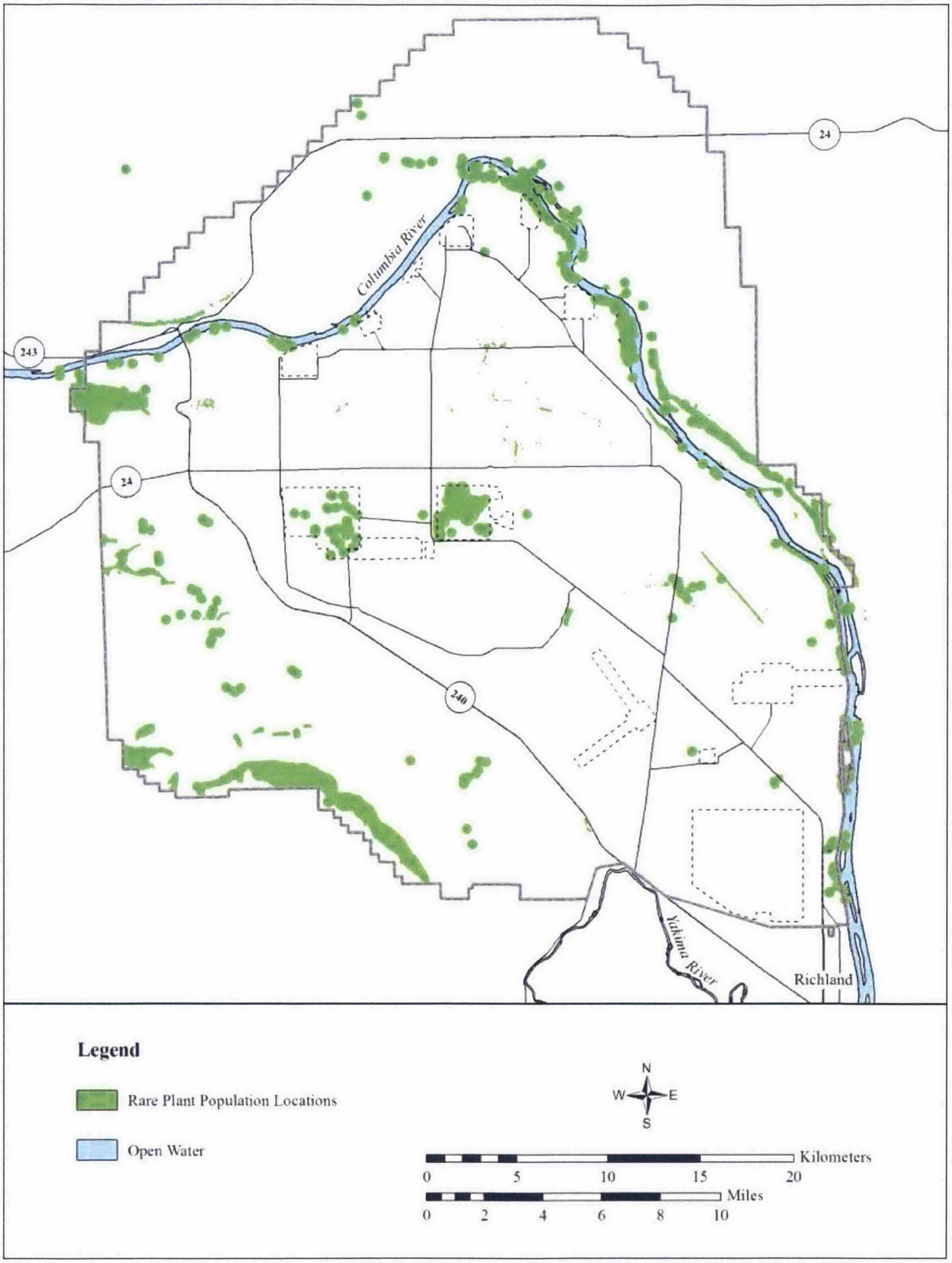

Figure 4.10 Rare Plant Populations on the Hanford Site

5.0 Resource Management Approach and Implementation

As a federal land manager, RL is responsible for conserving fish, wildlife, and plant populations and their habitats on the Hanford Site. The primary goals in managing Hanford's species, habitats, and ecosystem resources include increasing population levels of terrestrial and aquatic resident native species, and maintaining or increasing the quantity and quality of functioning native systems across the Hanford Site. The primary objective of this management plan is to provide the strategies and management actions necessary to sustain Hanford's biological resources.

This chapter describes DOE's management objectives, strategies, and general directives for the Hanford Site. Essential aspects of Hanford biological resource management include resource monitoring, impact assessment, mitigation, and restoration. DOE's resource management strategies address habitat and population monitoring and the role of monitoring in implementing adaptive management strategies that are flexible in application and responsive to emerging issues and changing conditions. The process and actions necessary to assess potential impacts to resources and to effectively mitigate for those impacts through avoidance, minimization, and restoration are described in Chapters 6 and 7.

The DOE process for managing Hanford biological resources is based on a landscape-level ecosystem management approach, which is aimed at protecting, maintaining, restoring, and enhancing essential ecosystem components, processes, and functions. Ecosystem management recognizes the complex links between all biotic and abiotic components, functions they provide, and processes acting on these resources. Because ecosystems are so complex, management is conducted at the resource level and at various scales within the landscape where realistic goals, thresholds, and monitoring strategies can be achieved and measured.

5.1 Resource Management Strategies

Ecosystem-based conservation is a broad approach to natural resource management that involves identifying, protecting, and restoring complete ecosystems, including the structural components and processes, while fully incorporating social, economic, and other human concerns into planning. For RL, a key objective of this approach is to achieve conservation and protection goals by eliminating or minimizing potential adverse impacts of site operations and ongoing projects without affecting the Hanford Site's ongoing mission, goals, and objectives. Resource management objectives for Hanford are to:

- Protect species and habitats of state and federal concern
- Maintain and protect native biological diversity
- Reduce the spread of invasive species and provide integrated control of noxious weeds
- Where and when feasible, improve degraded habitats in a strategic manner to increase landscape connectivity and native diversity
- Reduce and minimize fragmentation of habitats
- Maintain landscapes that provide regional connectivity to habitats surrounding Hanford.

Although RL generally does not directly manage individual species or manage for individual species, it does manage actions and processes that affect multiple species, habitats, and ecosystems. Part of RL's strategy to protect the biological resources on the Hanford Site includes general directives to avoid and minimize impacts to native habitats and species. The directives that all DOE, contractor, and subcontractor personnel are expected to follow are provided below. Also provided are summaries of RL's policies regarding two of the most significant and far-reaching threats to the sites biological resources: fire and noxious weeds.

5.1.1 General Directives and Practices

The following general directives apply to all actions occurring within portions of the Hanford Site managed by RL (i.e. central Hanford), including portions of the HRNM under RL management:

- All actions and activities that potentially affect biological resources require an ecological compliance review (ECR) and determination of potential impacts before proceeding. This directive not only applies to ground-breaking disturbances and excavation, but to any treatments or actions that alter the current natural state of the environment, habitat, or a species population such as mowing, prescribed burning, herbicide application in native vegetation, excessive noise, etc. The ecological compliance assessment process described in Chapter 6 should be a component of early project planning.
- If an ECR determines adverse impacts to biological resources—such as habitat alterations or disturbances that could affect the reproductive success of a species of concern—specific mitigation actions will be identified (see Chapters 6 and 7), and mitigation actions will be implemented by the responsible contractor.
- All entities conducting work on the Hanford Site will conduct activities and work in accordance with access restrictions and administrative designations related to resource protection areas including the following:
    - Areas containing rare plant communities (element occurrences)
    - Mitigation/restoration areas
    - Collection/propagation areas for native plant materials
    - Lands used under permit and leased properties
    - Administrative control areas for species of concern, which include bald eagle buffer zones, fall Chinook salmon spawning locations, ferruginous hawk and burrowing owl buffer zones, and known populations/occurrences of plant species of concern
- Activities that increase habitat fragmentation and degrade existing native habitats should be avoided. If new facilities or new road/railroad/ utility corridors are required, they should be built, as much as possible, within previously disturbed areas or co-located with existing roads or corridors to minimize habitat fragmentation.
- No vehicles are permitted off established roads on the Hanford Site unless specifically approved by the SSD and the Hanford Fire Department (HFD) for conducting work activities, or if required by an emergency situation.
- Consistent with the CLUP and the Presidential Proclamation, domestic livestock grazing is not allowed on Hanford lands except where previous

limited agreements allow access across RL lands to private grazing lands. Although limited grazing occurred in the past, the Presidential Proclamation (7319, June 9, 2000) establishing the HRNM restricts grazing and off-road vehicle use.

- Actions that remove or significantly degrade native vegetation will require revegetation or restoration of areas not needed for future operations following the practices outlined in the *Hanford Site Revegetation Manual* (DOE 2012a). Plant material used for habitat improvements or habitat restoration should be native to the Hanford Site and preferably should be of locally derived genetic stock.
- No hunting, fishing, or trapping is allowed on Hanford Site lands managed by RL. Hunting, fishing, and trapping below the ordinary high water mark of the Columbia River are subject to the laws and regulations of Washington State. The USFWS may allow hunting, fishing, or trapping on portions of the HRNM consistent with its HRNM-CCP (USFWS 2008) and the laws and regulations of Washington State.
- Consistent with the CLUP, no agriculture will be allowed on lands managed by DOE-RL. Several small leases have previously been in place on the Wahluke Unit, and agriculture is not specifically excluded by the HRNM proclamation. Agricultural leases on monument lands managed by USFWS would be at the discretion of USFWS consistent with its HRNM-CCP (USFWS 2008).

5.1.2 Interface with the Hanford Reach National Monument

The following guidelines describe how the BRMP and the HRNM-CCP (USFWS 2008) will interact for actions on the HRNM.

- USFWS actions on HRNM lands managed by USFWS will be guided by the HRNM-CCP
- DOE actions on HRNM lands managed by DOE will be guided by the BRMP
- DOE actions on HRNM lands managed by USFWS will generally follow BRMP, but DOE will coordinate with USFWS on major actions to ensure its activities are not contrary to the goals and objectives of the HRNM-CCP. RL will normally conduct its own biological and cultural resource reviews for its own projects, and will mitigate impacts according to BRMP, regardless of location.

5.1.3 Fire Management

Many plant communities on Hanford and their associated wildlife species have evolved in the presence of natural fires. However, past and present land-use practices and the presence of non-native plant species, especially cheatgrass, have altered the frequency and severity of fires. More frequent and severe fires have reduced the availability of late-successional shrub-steppe habitat for species that are dependent on this habitat type for at least part of their life cycle. Also, in addition to fire itself, many plant communities on Hanford are sensitive to, and slow to recover from, the impacts of certain fire-fighting activities such as the creation of firebreaks.

Large fires are one of the greatest threats to Hanford Site native habitats and biological diversity. The HFD has an annually updated a Fire Management Plan that is implemented as a subcomponent of BRMP, as described in the HCP-EIS supplemental analysis (DOE 2008a). The HFD prepares annual maintenance and burn plans for firebreak maintenance and fuels reduction. The DOE's overall wildfire management policy for the Hanford Site is to minimize the potential for human-caused fires and to aggressively fight wildfires. The following sections briefly describe RL's fire management policy.

5.1.3.1 Wildfire Control

To the extent possible during a wildfire, fire suppression and control actions will be conducted to protect existing stands of late-successional shrub-steppe, and to avoid direct surface disturbance within late-successional shrub-steppe areas, plant community element occurrences, and other rare or sensitive habitat areas. To the extent practical during a firefighting effort, the Fire Department incident commander should coordinate or consult with site natural resource subject matter experts.

Temporary firebreaks constructed during fire-fighting should be re-contoured and reseeded with an appropriate mix of locally derived native plant species as described in the Hanford Site Revegetation Manual (DOE 2012a).

Burned area replanting will be considered on a case-by-case basis. Determining if replanting is needed depends on the site, pre-existing plant community, characteristics of the wildfire, level of damage sustained by native vegetation, and likelihood the burned area will further degrade if restoration actions are not performed. If performed, replanting will use locally derived native species.

5.1.3.2 Prescribed Fires and Fuel Management

Prescribed burning for the purposes of habitat management or hazardous fuels reduction has not been a regular element of the Hanford Site biological resources management strategy, but was considered within the *Environmental Assessment: Integrated Vegetation Management on the Hanford Site, Richland, Washington* (DOE 2012b). Proposals to use prescribed burning for habitat improvement or hazardous fuels reduction, other than burning of tumbleweed accumulations along fence lines, fire breaks, linear transportation, or utility corridors, will be considered on a case-by-case basis, will require review by SSD and HFD approval and cooperation. The ecological effects of fire in semi-arid shrub-steppe habitats are often unpredictable, and restoration of burned areas requires careful consideration of site-specific conditions and the final desired habitat. Prescribed burn plans, other than for burning of tumbleweed accumulations along fence lines and firebreaks, will include detailed restoration, revegetation, and long-term monitoring plans.

Preventative fire control includes installation and maintenance of a system of permanent firebreaks that will use existing roads, rail lines, and utility corridors. Installation and maintenance of these firebreaks will be conducted in a manner that minimizes adverse impacts to biological resources.

Controlled burning of accumulations of dry plant material, particularly along roadways, is conducted to remove large potential sources of fuel that, if accidentally ignited, could provide a mechanism for rapidly accelerating uncontrolled burns.

5.1.4 Noxious Weed Management

A noxious weed is defined as "a plant that when established is highly destructive, competitive, or difficult to control by cultural or chemical practices" (RCW 17.10.010). The Washington State Noxious Weed Control Board determines which species are considered noxious weeds in the state, and what level of control is required for each species. Noxious weeds are controlled on the Hanford Site for regulatory compliance, to prevent adverse impacts to neighboring agricultural operators, and keep deep-rooted vegetation from invading Hanford waste sites.

Noxious weed management is implemented as part of the site-wide *Integrated Biological Control Plan* (MSA 2010) as a subcomponent of BRMP and is described in the HCP-EIS supplemental analysis (DOE 2008a). The goal of noxious weed management on the Hanford Site is to eliminate existing populations of noxious weeds and prevent new populations from becoming established.

The environmental impacts of noxious weed control on the Hanford Site were evaluated in the *Environmental Assessment: Integrated Vegetation Management on the Hanford Site, Richland, Washington* (DOE 2012b). In this assessment, DOE determined that an integrated vegetation management/adaptive management approach that includes chemical, physical, biological, cultural, and prescribed burning methods was preferable to using any one method by itself or a no-action alternative. Noxious weed management, especially in relatively less disturbed areas, must meet other biological resource management requirements described in BRMP, such as evaluations for the presence of rare species and unique habitats, avoidance and minimization of impacts whenever practical and possible, and habitat mitigation as applicable. The need for active reestablishment of desirable vegetation is recognized as a critical component of successful long-term control of noxious weeds and other undesirable vegetation on the Hanford Site.

5.2 Biological Resource Values and Priorities

Although all ecological resources and habitats may be considered important, RL recognizes that some resources will require greater management attention than others. This management plan applies a hierarchical approach to prioritize biological resources and associate different levels of management actions—protection, monitoring, impact assessment, mitigation, and restoration—based on the type and relative ecological value of the resources (Figure 5.1). Applying this framework allows management strategies to account for differences in resource "value," meaning that some resources require greater management attention and protection than others. For example, a relatively intact biological community that is rare in the ecoregion would warrant greater management protection than would a degraded habitat area dominated by non-native plants such as cheatgrass.

5.2.1 Assigning Resource Value and Resource Priority Levels

The strategy for assessing resource values and management priorities considers the relative value of both species and habitats. To address differences in resource "value," and ensure limited fiscal and staff resources focus on those resources that require specific protection and management attention, the biological resources on the Hanford Site are categorized into six priority levels-zero through five (Figure 5.1). Species are assigned a resource value by considering attributes such as legal or listing status, recreational, commercial, cultural, and ecological value (Table 5.1). Known locations of federal and state threatened or endangered plants and animals are included in the landscape-scale resource level determination. Distributions of species that are more common or have a lower priority listing status are often unknown and are not accounted for in the spatial representations provided in this section.

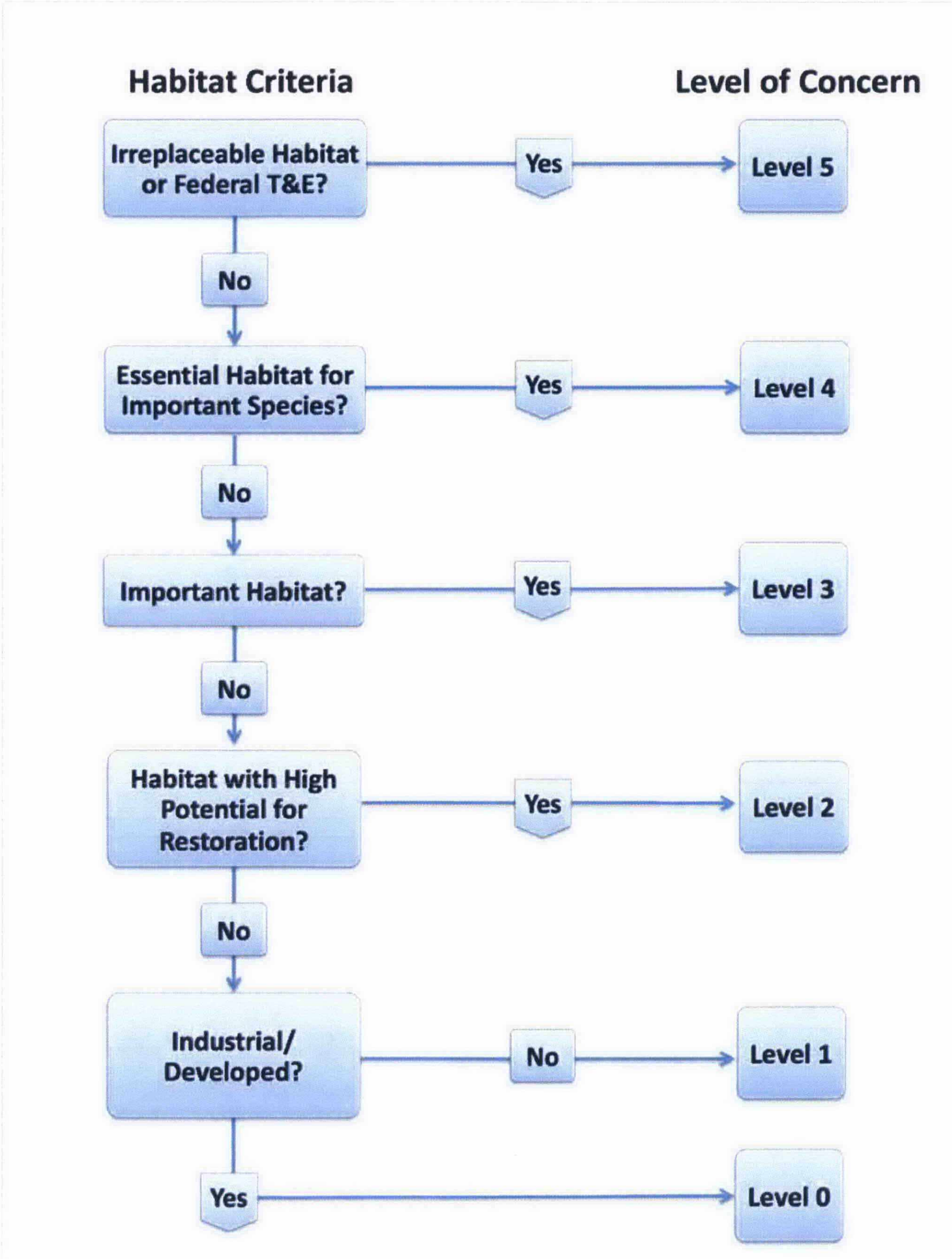

Figure 5.1 General Hierarchical Prioritization of Habitat Resources on the Hanford Site.

Table 5.1. Criteria Used to Classify Hanford Biological Resources into Resource Levels of Concern

Resource Level of Concern	Species	Habitat	Administrative Boundaries
Level 5	• Federal threatened or endangered • Proposed federal threatened or endangered (see Appendix A)	• Rare habitats, including cliffs, lithosols, dune fields, ephemeral streams, and vernal pools as well as fall Chinook salmon and steelhead spawning areas	• Critical habitat for federal threatened or endangered species • Plant community element occurrences
Level 4	• State threatened or endangered • Federal candidate	• Upland stands with a native climax shrub overstory and a native grass understory • Wetlands and riparian habitats	• Bald eagle nest and roost site buffers • Ferruginous hawk nest sites and buffers • Mitigation and restoration areas
Level 3	• State sensitive or review plants • State sensitive or candidate wildlife • Federal species of concern (see Table 4.3) • WDFW priority • Culturally important	• Shrub-steppe with a native climax shrub overstory that have cheatgrass co-dominant in the understory along with native grasses • Shrub-steppe stands with a successional shrub overstory and a predominately native understory • Native stands of steppe vegetation • Snake hibernacula • Bat colonial roost sites • Wading bird rookeries	• Floodplains • Conservation corridors • Burrowing owl nest site buffers • WDFW priority habitats not included in Level 4 or 5
Level 2	• Migratory birds • State Watch list plants • State Monitor wildlife • Recreationally and Commercially important species	• Upland stands with a sparse climax or successional shrub overstory and non-native understory • Steppe stands with native plants co-dominant with non-native plants	

Table 5.1 (continued). Criteria Used to Classify Hanford Biological Resources into Resource Level of Concern

Resource Level of Concern	Species	Habitats	Administrative Boundaries
Level 1	• Common native fish, wildlife, invertebrate, plant, and nonvascular species not otherwise included in higher BRMP levels	• Upland stands of non-native plants. • Abandoned agricultural fields • Very small, isolated patches of shrub-steppe surrounded by industrial areas or other Level 0 habitats	
Level 0	• Non-native plants and animals not already categorized as Level 1-5 resources	• Non-vegetated areas • Industrial sites such as paved and compacted gravel areas	

Habitats are assigned a resource value by considering several attributes, including whether habitats are critical or essential for species of concern, Washington State priority habitats and element occurrences, attributes of the vegetation cover types found on the Hanford Site, landscape-level attributes such as connectivity and/or fragmentation, or administratively designated resource areas. Each level reflects different management priorities, and each has a specific set of associated management actions and requirements. At increasing levels of priority, the number of applicable management actions may increase and become more restrictive to preserve the resource (Table 5.2).

Table 5.2 Management Goals and Actions for Each Resource Level of Concern

Resource Level of Concern	Management Goal	Management Action	Status Monitoring Effort	Compensatory Habitat Mitigation Action
Level 5	Preservation	Avoidance	High	Compensation determined on case-by-case basis
Level 4	Preservation	Avoidance/ minimization preferred	High	Habitat replacement at 5:1
Level 3	Conservation	Avoidance/ minimization preferred	Moderate	Habitat replacement at 3:1 or as per other legal requirements (i.e., wetland mitigation)
Level 2	Conservation	Primarily Avoid/minimize	Low Level	Habitat replacement possible at 1:1 Such areas may be preferred sites to perform mitigation actions
Level 1	Mission support	Avoid/minimize as practicable Regulatory compliance (i.e., MBTA)	None	Habitat replacement is not required, but site could be suitable for use as a restoration or mitigation area
Level 0	Mission support	Regulatory compliance	None	None

The following sections describe each resource level. Figures 5-2 to 5-7 show the distribution of resources within each level after applying the criteria described. The specific attributes used for each resource-level map are provided in Appendix B. Note that the maps showing the distribution of different resource levels are intended for planning purposes only. The presence or absence of any resource can only be confirmed through field surveys at appropriate times of the year. The determination of resource values in the landscape depends on evaluation of all resource characteristics and administrative designations. The resources at a particular location and particular time are managed for the highest applicable resource value as described in Section 5.2.2.

5.2.1.1 Irreplaceable Resources (Level 5)

Resources classified as Level 5 are the rarest and most sensitive habitats and species and are considered irreplaceable or at risk of extirpation or extinction. These species include those listed or formally proposed to be listed as threatened or endangered under the ESA. Habitats include areas that are designated critical habitats for federal threatened or endangered species or are essential for these species to persist on the site. Other irreplaceable habitats are plant community element occurrences and rare habitats, including cliffs, lithosols, dune fields, ephemeral streams, and vernal pools as well as fall Chinook salmon and steelhead spawning areas. The distribution of Level 5 resources is depicted in Figure 5.2.

The primary management goal for Level 5 resources is preservation because any loss of these resources would represent a significant impact to those populations, the site's biological diversity, and biodiversity and ecological integrity of the shrub-steppe and riparian habitats of the Columbia Basin Ecoregion. There is no practical way to replace or restore a Level 5 habitat resource if it is lost. Therefore, avoidance is the preferred mitigation measure for these species and habitats. If any Level 5 resources are lost due to Hanford Site actions, compensation will be determined on a case-by-case basis.

Actions that could affect federal threatened or endangered species or affect critical habitat for such species require interagency consultation under Section 7 of the ESA with the USFWS, NMFS, or both. These agencies have the regulatory authority to allow for some impacts to listed species and would likely require specific mitigation measures to prevent or reduce the magnitude of such impacts. It is RL's policy to avoid impacts to these species and their habitats whenever possible.

Regular inventory and monitoring is a critical component of RL's strategy to effectively manage Level 5 resources. Monitoring provides the information needed to determine population trends, distribution of the species or habitat, and whether habitat quality is declining in these areas. This information can then be used to determine if management actions are effective or if additional access restrictions or other protective measures are required.

5.2.1.2 Essential Resources (Level 4)

Species and habitats classified as Level 4 are considered essential to the biological diversity of the site and the Columbia Basin Ecoregion. These include species listed by the WDFW or WNHP as endangered or threatened, and those listed as candidate species for ESA protection by the USFWS or NMFS. Level 4 habitats include those habitats and vegetation cover types essential to sustain populations of state endangered or threatened species and federal candidate species, such as ferruginous hawk nest sites. Also included are riparian habitats, wetlands, and high-quality (but non-element occurrence) high-quality mature sagebrush steppe (Figure 5.3). Although the bald eagle is no longer listed under the ESA, it is protected under the *Bald and Golden Eagle Protection Act*, and habitat on Hanford essential to the eagle's continued existence is also considered a Level 4 resource. Areas that have been planted as mitigation or restoration areas also are defined as Level 4 habitat areas.

The primary management goal for Level 4 resources is preservation. Level 4 resources are extremely difficult to replace, and loss of these species or habitats would represent a significant decrease in the biological diversity of the

Hanford Site and surrounding region. Therefore, avoidance is the preferred means of mitigation. For example, a waste site excavation could take place in proximity to an eagle nesting or roosting site if conducted while the eagles are not present, but could have a significant effect during the winter roosting season. Unlike Level 5 resources, there is some leeway allowed for impacts to Level 4 resources. If avoidance is impossible, and the habitat cannot be restored, then compensatory mitigation must be performed to begin the process of replacing the lost habitat. As with Level 5 resources, regular monitoring is critical to the successful management and preservation of Level 4 resources.

5.2.1.3 Important Resources (Level 3)

Level 3 resources include species recognized by Washington State as having conservation concern, including state sensitive and review plant species, state sensitive and candidate animal species, WDFW priority species, and those listed by USFWS as federal species of concern in the Columbia Basin Ecoregion. Culturally important species that are not classified as a higher level resource are considered Level 3 resources. Landscape features recognized as important to sustaining native fish and wildlife populations over time, such as conservation corridors and floodplains, are Level 3 resources. Also included are certain vegetation cover types such as shrub-steppe communities that contain discontinuous canopies of climax shrubs as well as transitional shrub-steppe and steppe communities that are predominately native species. The overall distribution of Level 3 resources is provided in Figure 5.4.

The management goal for Level 3 is to conserve and sustain those species and habitats present and provide avenues for overall enhancement of key habitat components through management and stewardship of the site's biological resources. Any disturbance within Level 3 habitat areas must be replanted using locally derived native species.

5.2.1.4 Lower Priority Species and Mid-Successional Communities (Level 2)

Other plant and animal species of potential conservation concern, including migratory birds, state watch list plants, and state monitor wildlife fall into Level 2. Also included are recreationally or commercially important species. Mid-successional habitats, including shrub-steppe or steppe communities where the herbaceous layer is dominated by non-native species are Level 2 habitats that have a high potential or value as restoration areas (Figure 5.5)

The management goal for Level 2 is to conserve and sustain those native species and habitats present. Management of these resources focuses on avoidance or minimization of impacts when and where possible. Level 2 habitats may be used to minimize impacts to higher level resources. Similar to Level 3 resources, sowing native plant seed where existing vegetation has been removed is required to minimize impacts to Level 2 resources.

5.2.1.5 Common Species and Marginal Habitat Resources (Level 1)

Level 1 resources include relatively common native species as well as fragmented habitats that are too small, too degraded, and/or too isolated to be of conservation value. Examples of these habitats are large expanses of cheatgrass or communities dominated by Russian thistle (*Salsola tragus*) or other invasive, non-native species (Figure 5.6). In general, these areas are not high-priority areas for restoration, although some abandoned agricultural fields may be useful sites for restoration projects.

In general, mitigation for these resources is not required, unless impacts could be minimized or avoided by moving a proposed project into Level 0 habitat. More often, Level 1 resource areas would be disturbed and used in lieu of higher level resources to minimize impacts to higher level habitat areas. Level 1 resources are not normally monitored, except to document overall site-wide biological diversity.

5.2.1.6 Non-Native Species, Industrial Sites, and other Developed Areas (Level 0)

Level 0 consists of non-native species and habitats that are subject to continuing anthropogenic influences, such as industrial areas, landscaped areas, and parking lots. In general, these resources provide little or no ecological value and require no protection or conservation (Figure 5.7).

The primary management goal for Level 0 is mission support; these species and habitats are managed to best support the ongoing environmental restoration, waste treatment, decommissioning, and research missions of the Hanford Site. There are no mitigation requirements associated with these resources beyond regulatory compliance. The primary regulation affecting these resources would be the MBTA, in that migratory birds will nest on industrial buildings, gravel parking lots, and in landscaped areas. In these cases, the birds and nests are considered higher level resources and are protected to comply with the MBTA during the nesting/fledging season, but the "habitat" is not otherwise protected. Other regulations may be applicable in specific circumstances. Monitoring Level 0 resources is not required, except for noxious weeds monitored for the purpose of eventual elimination from the site.

5.2.2 Integration of Multiple Resource Values

Biological resources at a particular location or at a particular time may have characteristics representative of more than one resource level. In these cases, the resources are managed at the highest applicable resource level. The highest resource level takes precedence over a lower level if the resources occur at the same time and location. For example, an area dominated by cheatgrass would be classified as a Level 1 resource based on the dominant vegetation. If this area were located within a designated conservation corridor, it would be considered a Level 3 resource regardless of the dominant vegetation. If this cheatgrass patch were also located within the buffer area of a ferruginous hawk nest site, then it would be considered and managed as a Level 4 resource regardless of the dominant vegetation or the occurrence in a conservation corridor. Integration in this way results in a distribution of resource levels depicted in Figure 5.8. Note: The map provided in Figure 5.8 should be considered useful for general guidance and planning purposes only. The actual resources present, priority level, potential impacts, and mitigation requirements can only be determined by field surveys as part of an ecological impact assessment or compliance review.

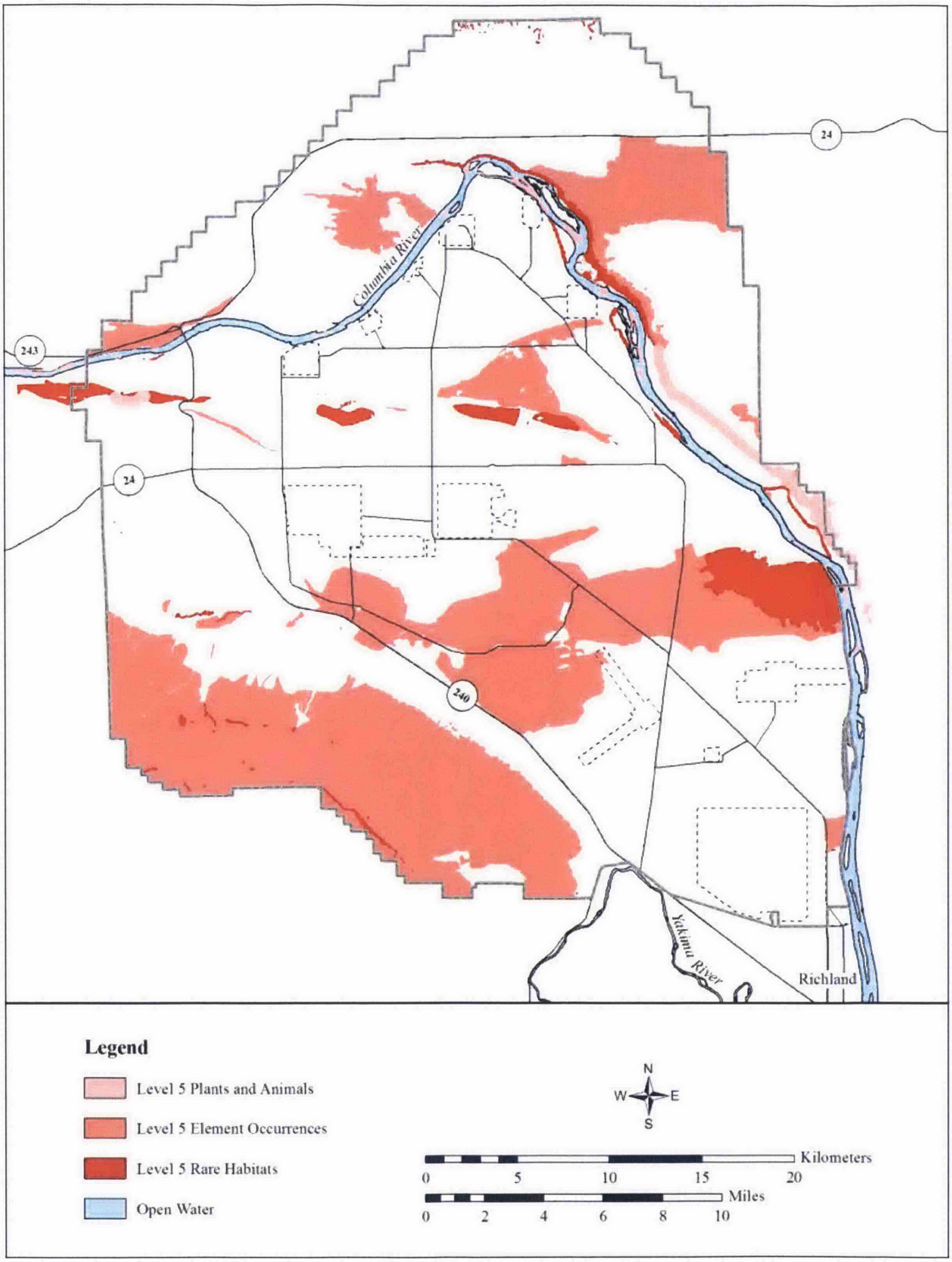

Figure 5.2 Irreplaceable Biological Resources Classified as Level 5

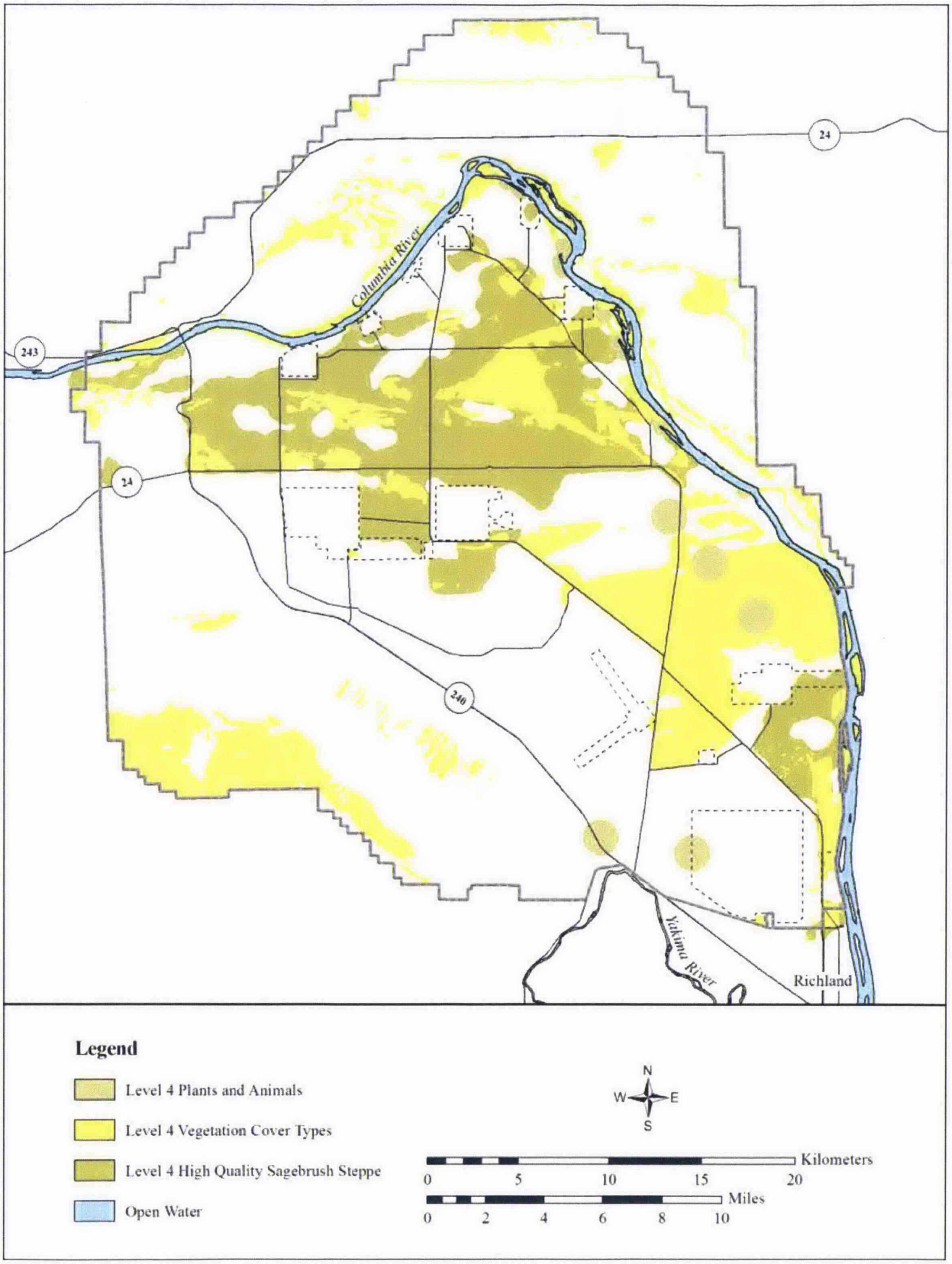

Figure 5.3 Essential Biological Resources Classified as Level 4

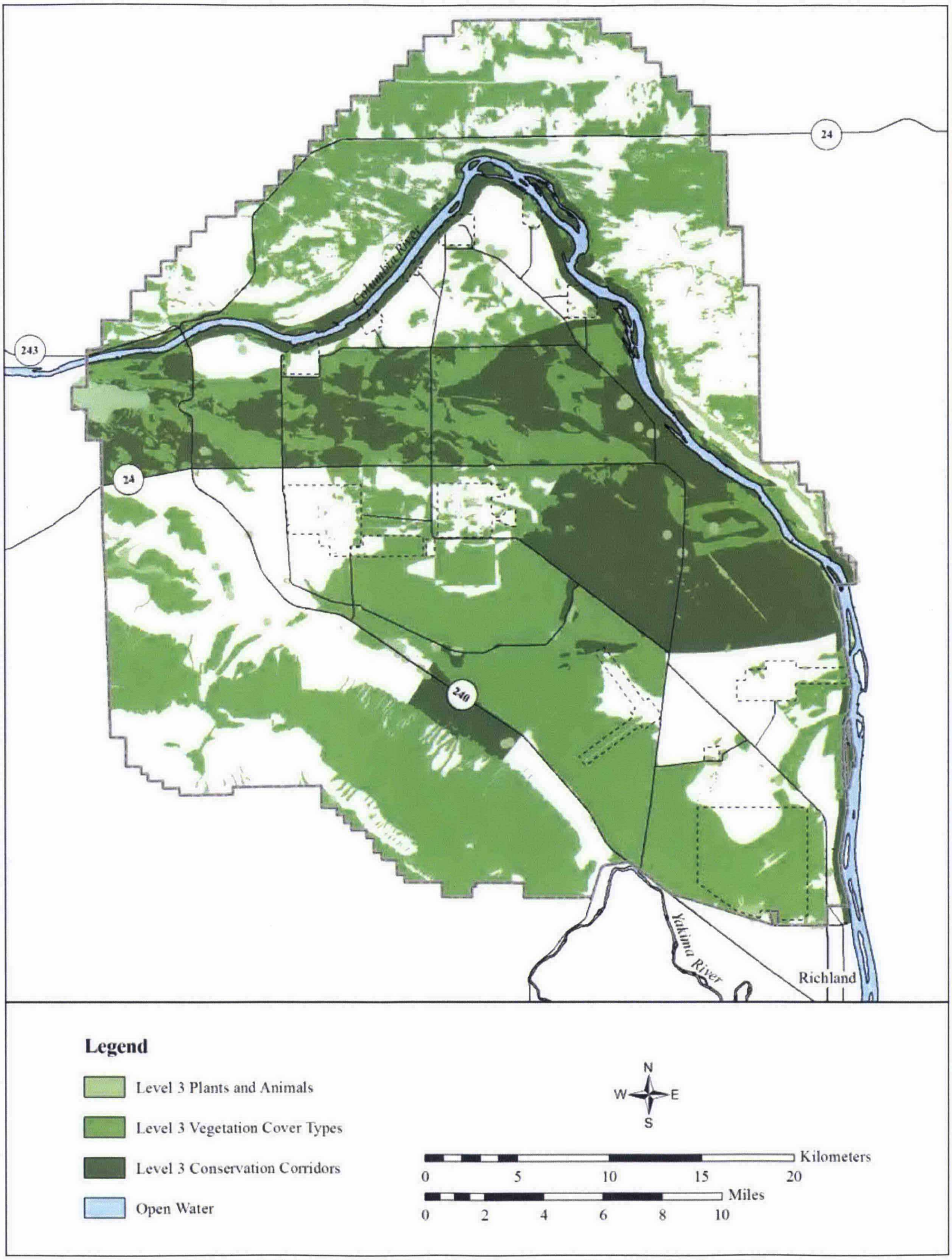

Figure 5.4 Important Biological Resources Classified as Level 3

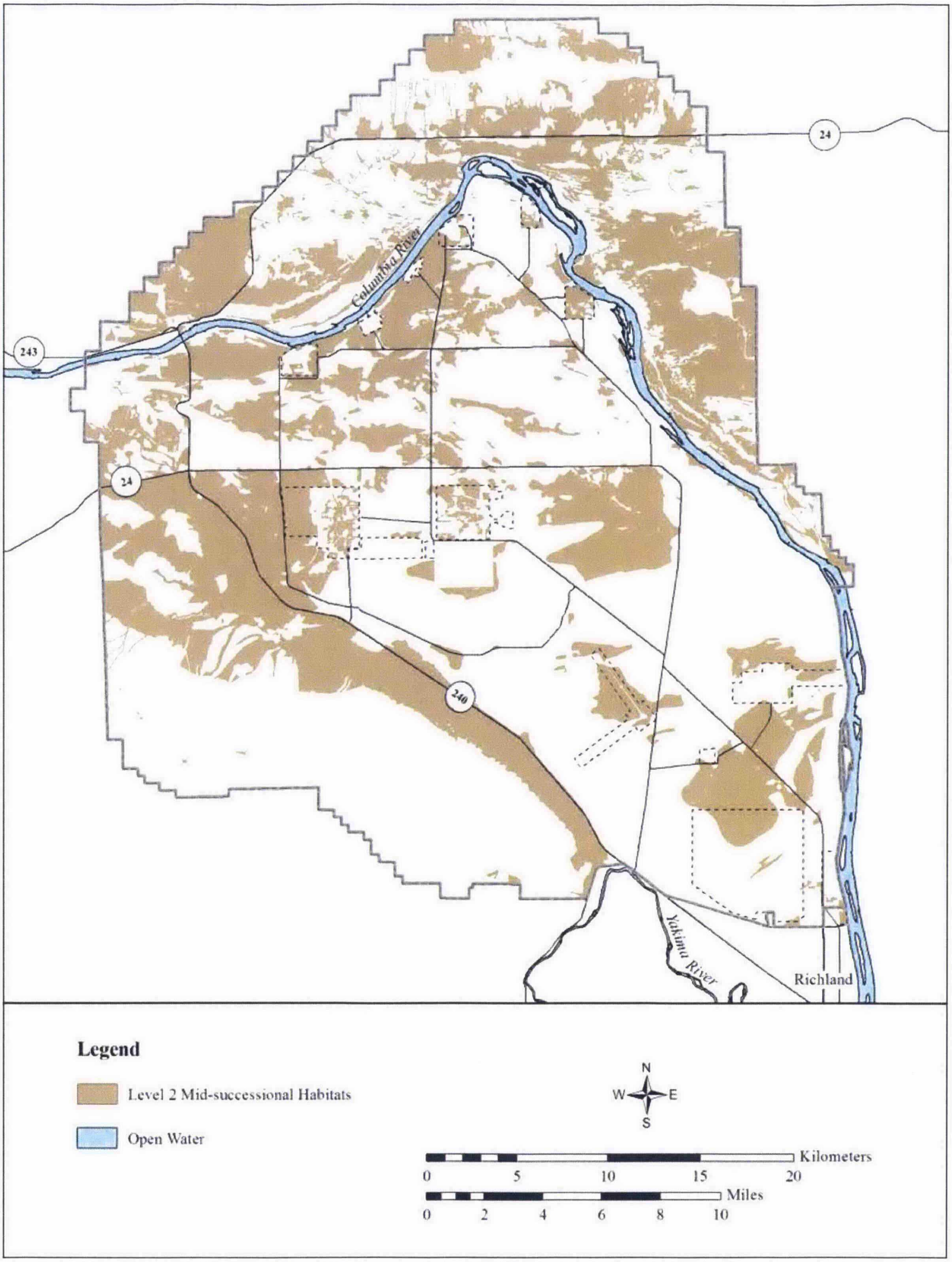

Figure 5.5 Mid-Successional Habitats Classified as Level 2

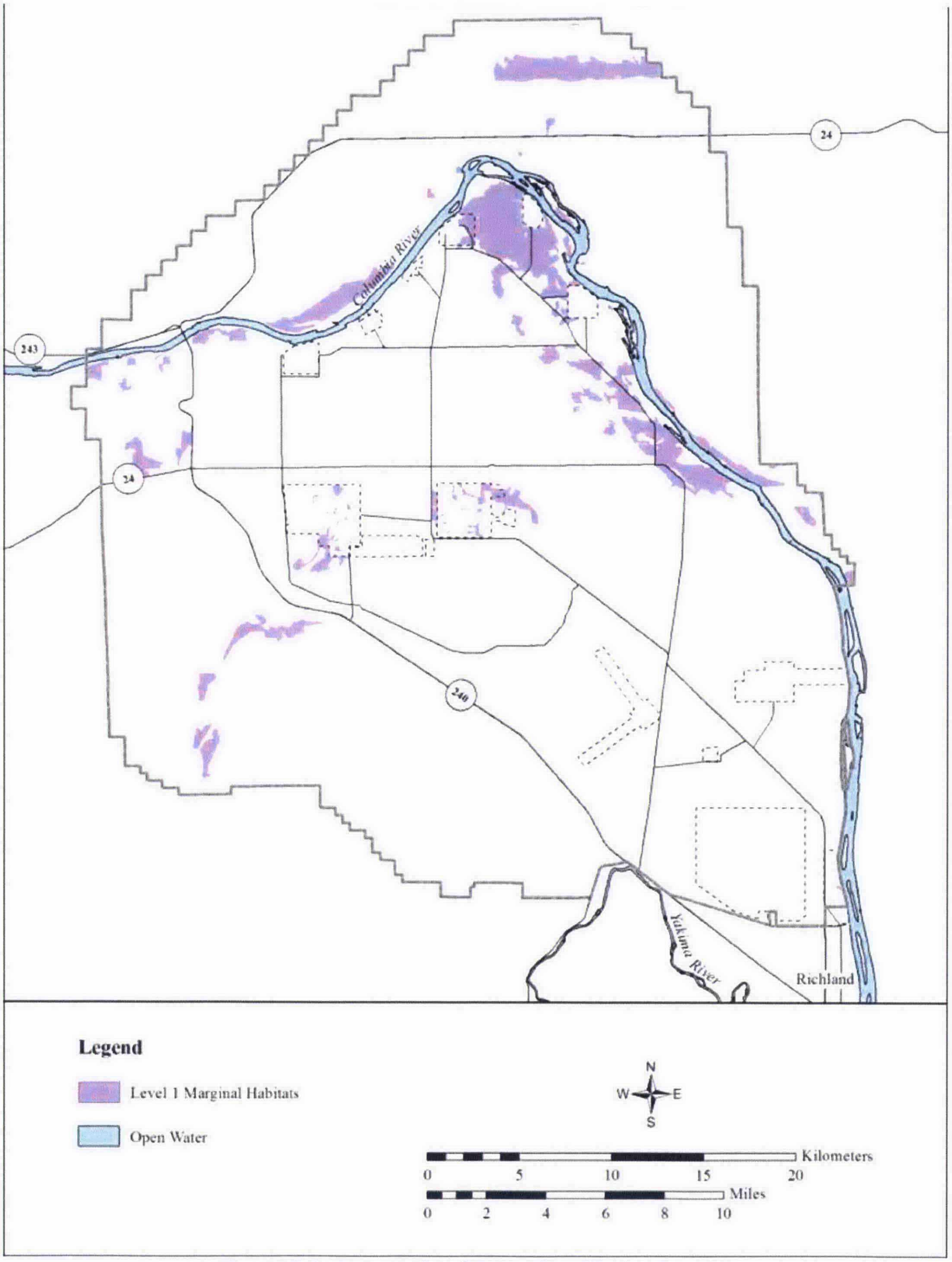

Figure 5.6 Marginal Habitats Classified as Level 1

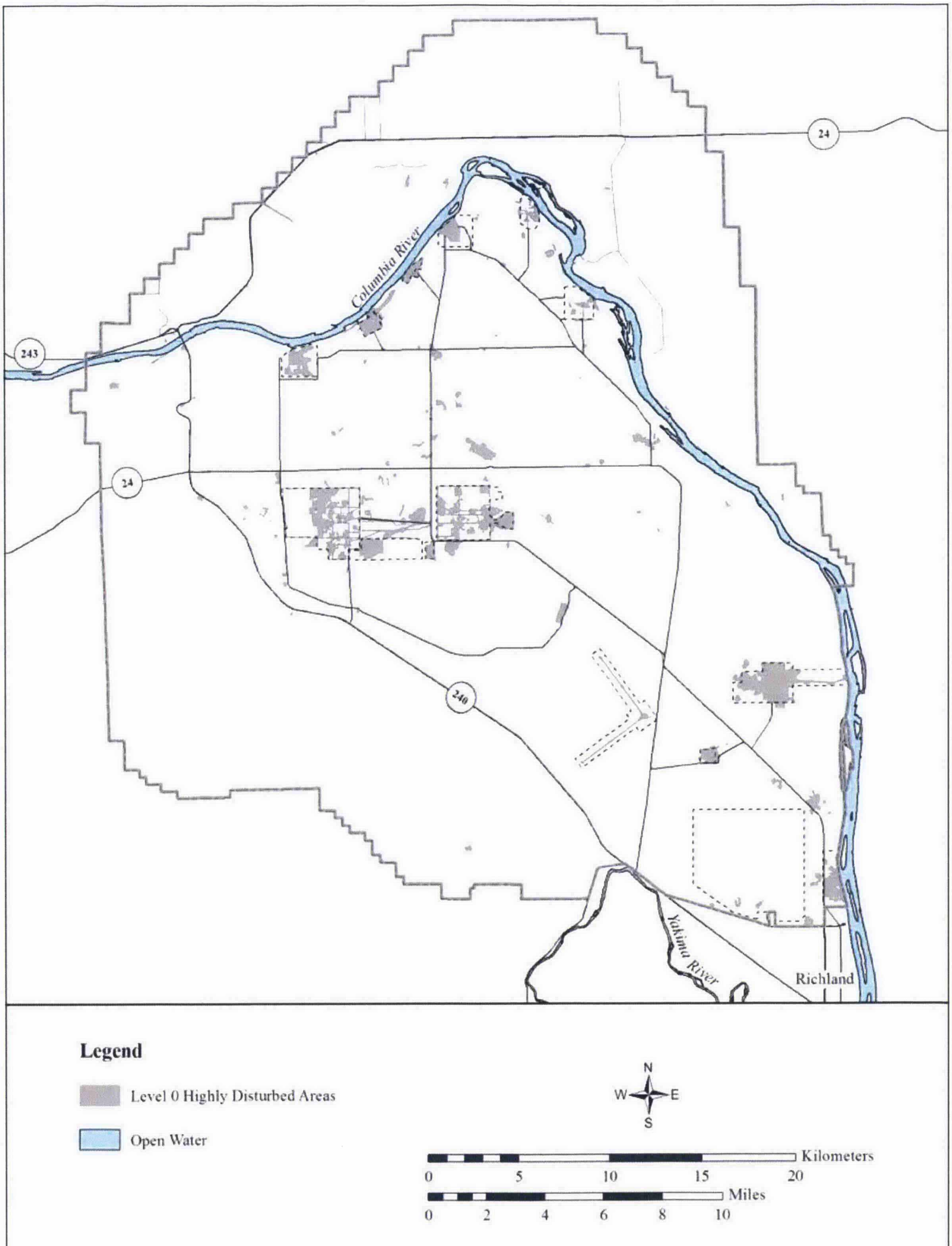

Figure 5.7 Industrial Sites, Highly Developed and Highly Disturbed Areas Classified as Level 0

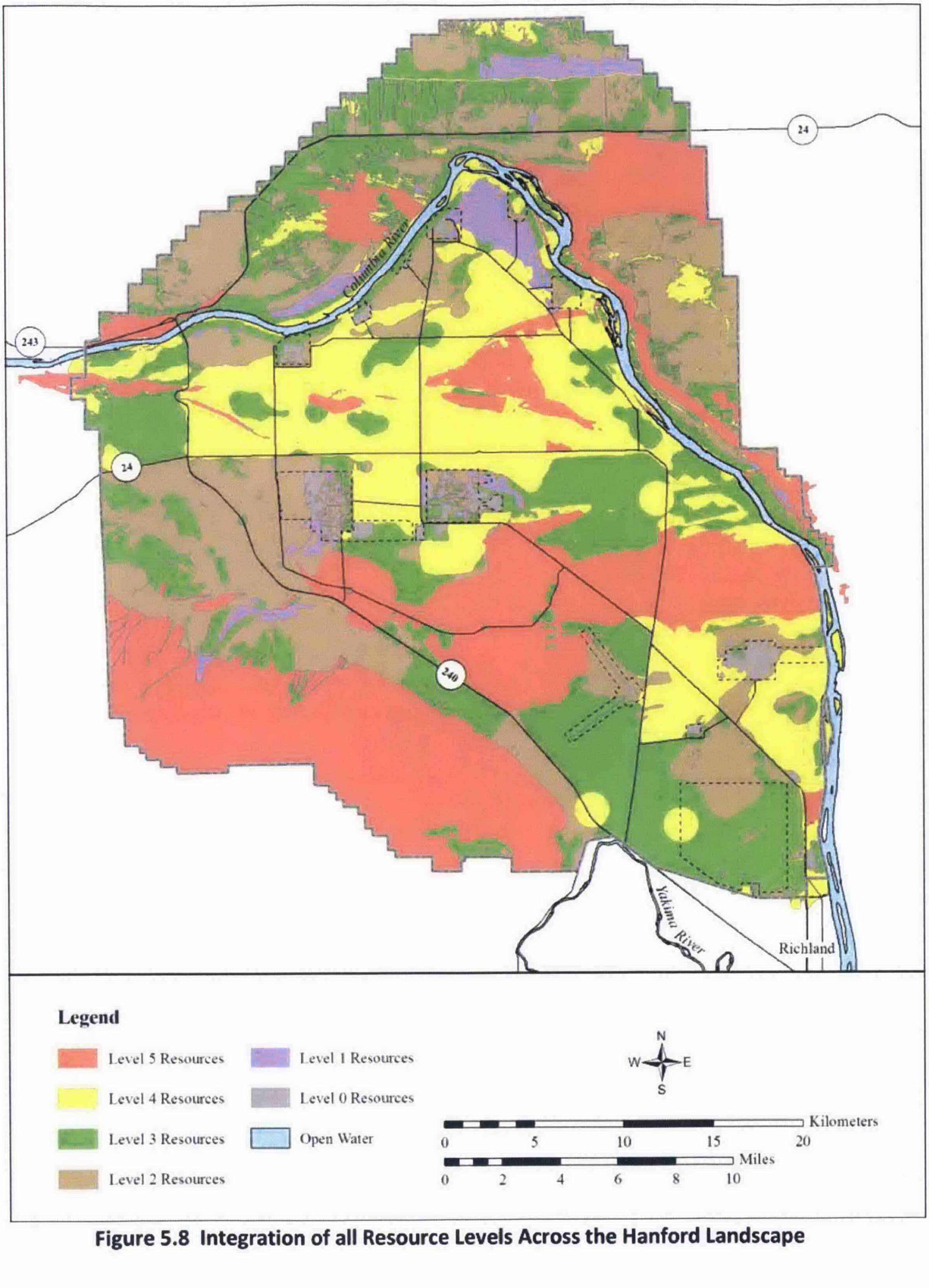

Figure 5.8 Integration of all Resource Levels Across the Hanford Landscape

5.3 Species-Specific Management Goals and Requirements

Management of most species on the Hanford Site is based on the general guidance provided in Section 5.2 for the six resource value levels. For most species, it is RL's belief that protection and management of habitat will provide sufficient protection and management for species that rely on that habitat. However, specific management policies and guidance have been developed for certain species that have additional legal protections, require management actions beyond habitat protection, are unusually sensitive to human disturbance, or are resources of special interest to the public or the Tribes. In some cases, management plans exist that provide the appropriate guidance for these species; in other cases, specific management direction is provided here.

5.3.1 Upper Columbia River Spring Chinook Salmon, Steelhead, and Bull Trout

Upper Columbia River spring Chinook salmon, Upper Columbia River steelhead, and bull trout are all listed as threatened or endangered under the ESA, and all have critical habitat designated within and along the Columbia River through the Hanford Site. The bull trout is not a normal resident of the Hanford Reach, but was collected within the reach at least once in the late 1970s and has been observed in the lower Yakima River and at Priest Rapids Dam (USFWS 2007b). The Hanford Reach is included in the species' designated critical habitat because it may provide foraging, migratory, and overwintering habitat.

These species are managed under RL's *Hanford Site Threatened and Endangered Species Management Plan: Salmon, Steelhead, and Bull Trout* (DOE 2013a), which serves as a partial ESA Section 7 biological assessment. The plan provides guidance to DOE programs as to what activities may have an impact on these species and explains certain commitments DOE has made to avoid impacts and help preserve these species in the Hanford Reach. The plan defines when further consultation with NMFS or USFWS is required.

5.3.2 Fall Chinook Salmon

Fall Chinook salmon are not listed under the federal ESA or as a WDFW species of concern. However, they are of high cultural value to local Tribes, high recreational value, and because of the large numbers of fall Chinook that spawn in the Hanford Reach, high ecological value. For instance, fall Chinook represent a major food source for wintering bald eagles.

RL's primary management actions regarding fall Chinook salmon are monitoring and avoidance. Fall Chinook redds are counted and mapped each fall. RL uses this information to support decisions about actions that may affect the river environment. Actions that may disturb the river substrate are steered away from known redd concentrations or are delayed to occur after the eggs have hatched and the fry have left the redds. The redd distribution (Figure 5.9) is also useful when evaluating potential impacts at other areas of the river. For instance juvenile concentrations of fry may be higher near or just downstream of important spawning areas.

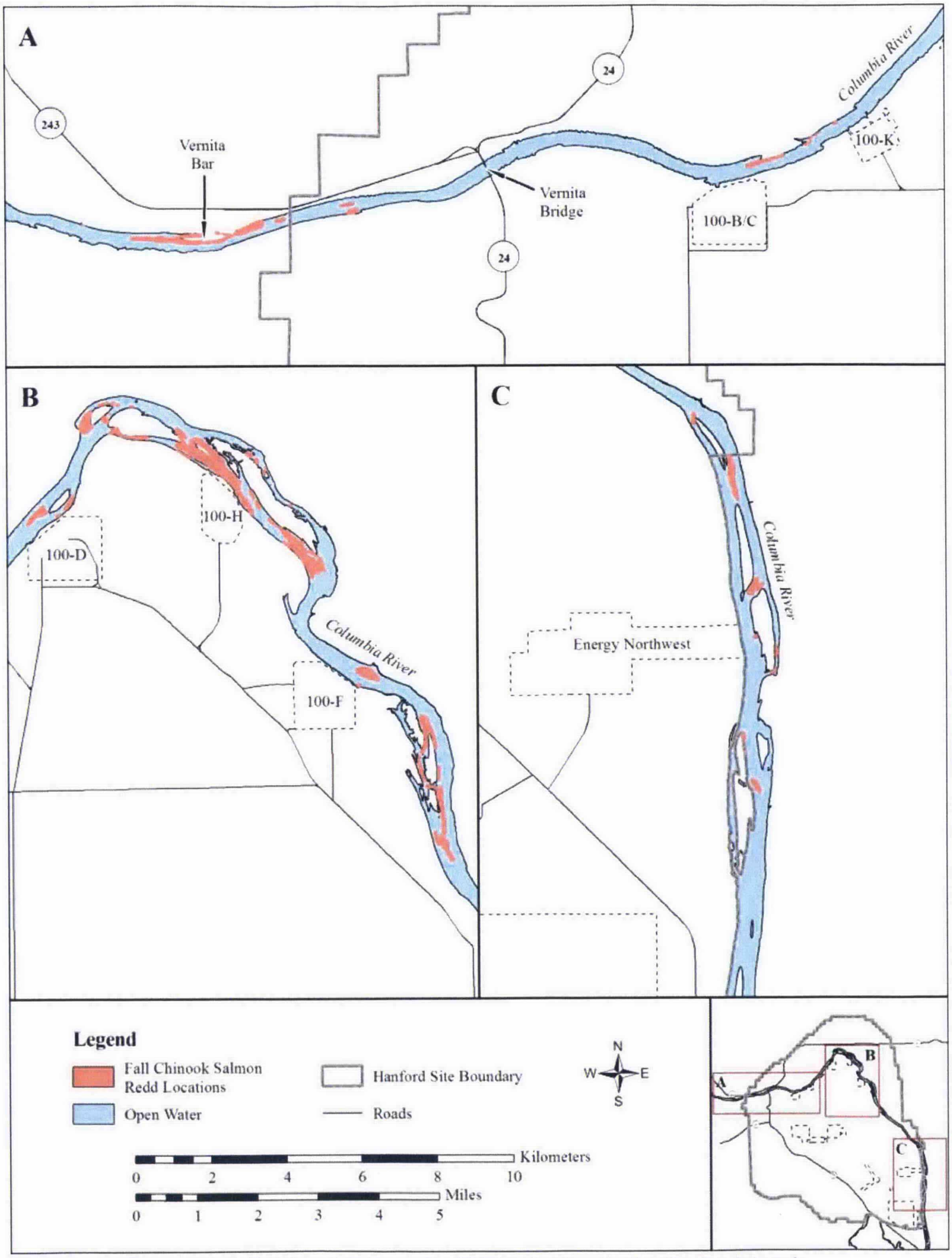

Figure 5.9 Fall Chinook Salmon Redd Distribution in the Hanford Reach

5.3.3 Bald Eagle

The bald eagle was removed from the federal threatened or endangered species list in 2007 (72 FR 37346) and downgraded from threatened to sensitive by the WDFW in 2008 (Washington State Register (WSR) 08-03-068). However, they are still protected under the *Bald and Golden Eagle Protection Act*, are of high cultural value to local Tribes, and important to the public. The DOE *Bald Eagle Management Plan for the Hanford Site, South-Central Washington* (DOE 2013b) describes RL's management policies. In most cases, bald eagle roost and nest sites are protected with 400-m (0.25 mi) buffers. Work-related, routine access within night-roost buffer areas is allowed between the hours of 10 a.m. and 2 p.m. Although several eagle pairs have attempted to nest on the Hanford Site, the first successful nesting on the Hanford Site was documented in 2013. All active nest sites are protected with a 400-m buffer (0.25 mi), and no activities are allowed within that buffer area without a permit issued by the USFWS.

Figure 5.10 shows the location of the primary communal night roosts and buffer areas. Nest and potential nest sites have been monitored at the White Bluffs Slough, White Bluffs boat launch, south of the 100-F Area, the Hanford townsite, upstream of the 100-H Area, and near Wooded Island. DOE will continue to monitor roost usage by wintering bald eagles to determine which sites require roost buffers and will monitor potential nest sites to determine when nest area buffers need to be enforced. Because known roost or nest areas are considered Level 4 resources, damage or removal of trees within these areas is not allowed, even when eagles are not present.

5.3.4 Ferruginous Hawk

The ferruginous hawk is listed as threatened by Washington State, and is a USFWS species of concern for the Columbia Basin. Ferruginous hawks are obligate grassland or desert shrubland nesters (WDFW 2004). Home ranges have been measured at between 10 and 80 km^2/pair (4 and 31 mi^2/pair) and require at least 50% of the area to be non-cultivated (WDFW 1996). Natural nests are on cliffs, large trees, and occasionally on the ground, but on the Hanford Site the ferruginous hawks most frequently nest on 230-kV transmission line towers. Known nesting locations on the Hanford Site are shown in Figure 5.11. From the late 1980s to the present between 2 and 12 active nests have been observed on the Hanford Site, with a peak in the late 1990s. At times nearly 20% of the Washington State breeding pairs have been on the Hanford Site (including central Hanford, ALE, and the Wahluke Slope).

Ferruginous hawks are much more sensitive to human disturbance and intrusion into nesting areas than other *Buteo* species (WDFW 2004). WDFW guidelines (WDFW 2004) recommend buffers of at least 250 m (0.16 mi) for all human disturbance between March 1 and May 31, and 1000 m (0.6 mi) for prolonged (>0.5 h) activities during the entire nesting and fledging season. Surveys are performed annually across the Hanford Site to determine the location of active ferruginous hawk nests and establish and post disturbance buffers. RL will follow these guidelines for active nests, and will consider the buffer areas to be Level 4 resources; thus, development, even during the non-nesting season, should be avoided in these areas.

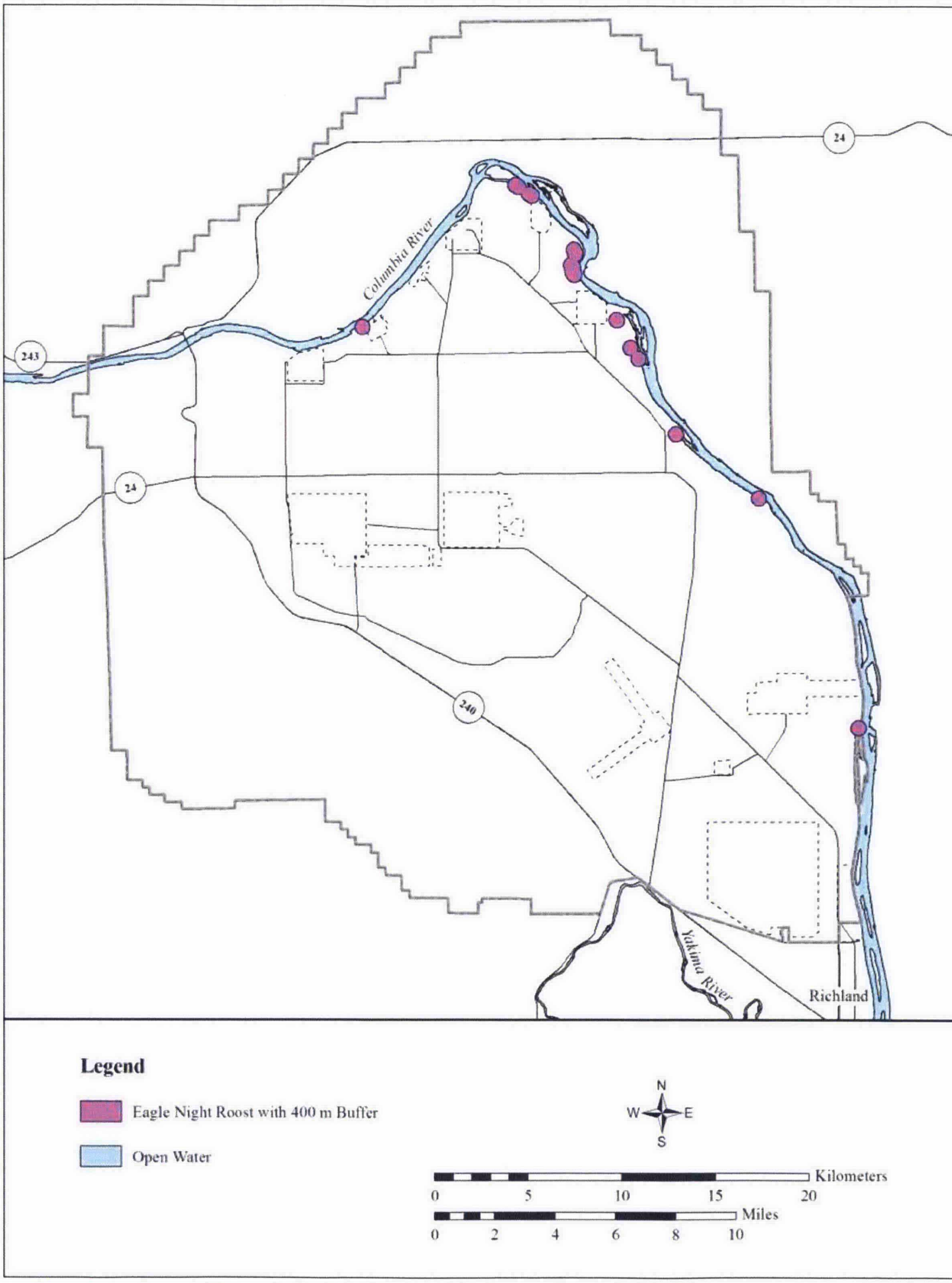

Figure 5.10 Bald Eagle Night Roost Sites with Buffers.

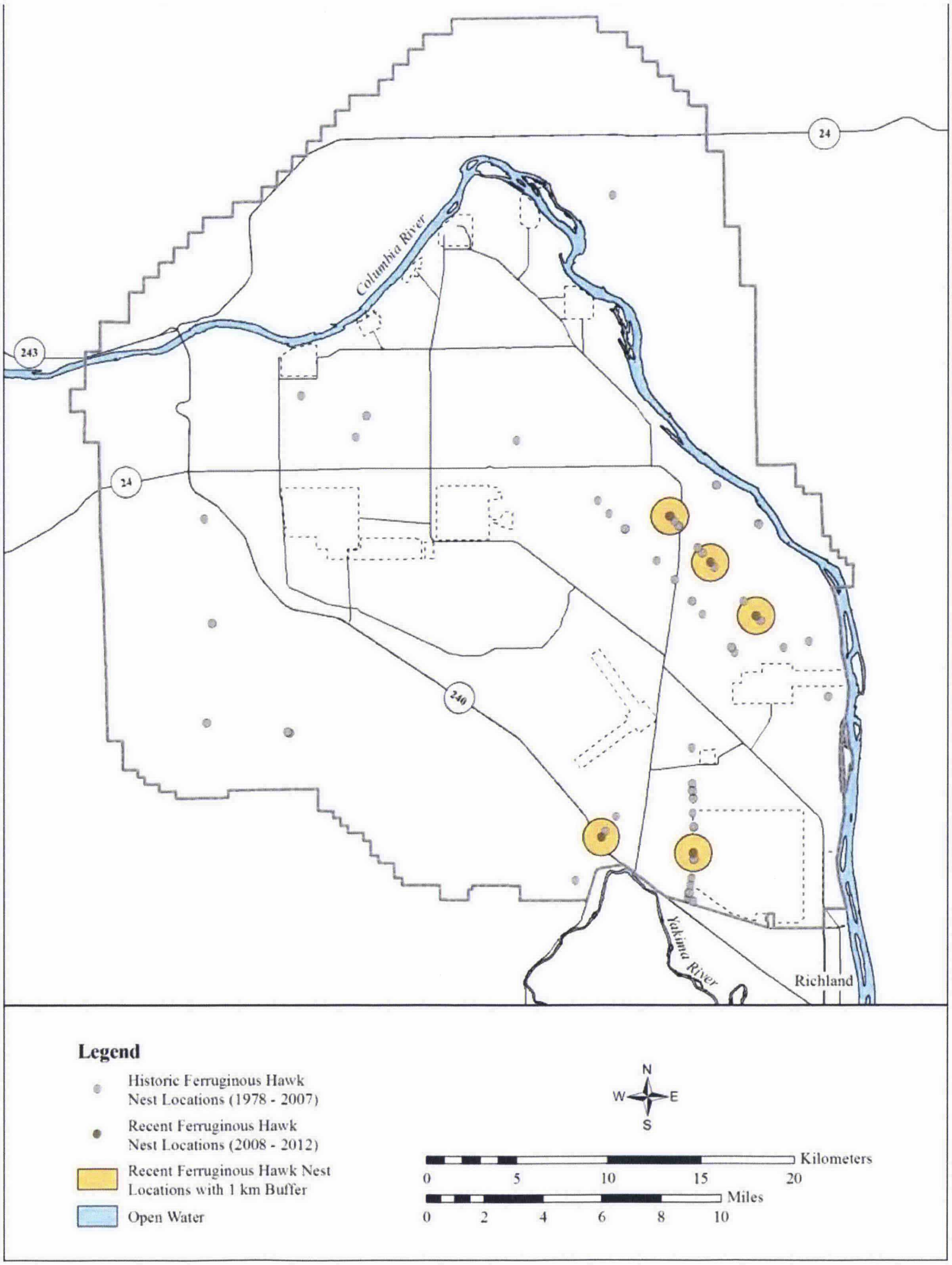

Figure 5.11 Historic and Recent Ferruginous Hawk Nest Locations Sites with Protective Buffers

5.3.5 Burrowing Owl

The burrowing owl is a Washington State candidate species and federal species of concern in the Columbia Basin. The species nests underground in open grasslands and shrub-steppe, usually relying on the presence of burrows created by ground squirrels, badgers, or coyotes. Nesting burrowing owls have been observed throughout the Hanford Site (Figure 5.12) using both natural burrows and man-made structures such as culverts and pipes. Artificial burrows have been installed at several locations as mitigation for project impacts (Figure 5.12). The artificial burrows around the Emergency Vehicle Operations Course (EVOC) at the south end of the site were used after installation (Alexander et al. 2005) and continue to be used, but no burrowing owl use has been observed at the artificial burrows along Army Loop Road.

Although many burrowing owls appear to be relatively tolerant of human activity, all projects occurring within 250 m (800 ft) of a burrowing owl nest will be evaluated for impacts, and avoidance and minimization of impacts will be required to the greatest extent possible. Installation of artificial burrows will be considered only if impacts cannot be reasonably avoided. Artificial burrows may also be considered as a component of other mitigation actions, even if a project is not directly affecting burrowing owls.

5.3.6 Greater Sage Grouse

Greater sage grouse is a Washington State threatened species and a candidate for protection under the federal ESA. This species was historically known to occur throughout the Columbia Basin, including on the Hanford Site, but the distribution has been greatly reduced due to conversion of land to agriculture and the degradation and fragmentation of remaining habitat. There have been sporadic sightings of sage grouse on the Hanford Site, especially on ALE, but no known breeding populations currently exist on the site. However, the species occurs on the Yakima Training Center, and populations could move into suitable sagebrush-dominated habitats on the Hanford Site. If a breeding population is identified or suspected, RL will consult with the USFWS and WDFW to determine appropriate protective measures including administrative buffers around the breeding grounds or "leks." If the greater sage grouse does become listed as threatened or endangered, portions of the Hanford Site might be considered an important part of the species recovery plans. If it is listed, DOE will work closely with USFWS to determine what management actions might be implemented to contribute to the recovery effort.

5.3.7 Peregrine Falcon

Peregrine falcons (*Falco peregrinus*) are present on the Hanford Site primarily during the winter months, but are not known to nest on the site. However, suitable nesting habitat exists along the cliff faces of Gable Mountain, Gable Butte, and Umtanum Ridge, and peregrine falcons are known to nest on structures such as bridges and taller buildings. If peregrine falcon nesting is discovered, RL will evaluate the conditions around the site and identify an appropriate buffer around the nest if needed. The WDFW (2004) recommends restricting access within 800 m (0.5 mi) buffers of cliff rims and 400 m (0.25 mi) of cliff faces.

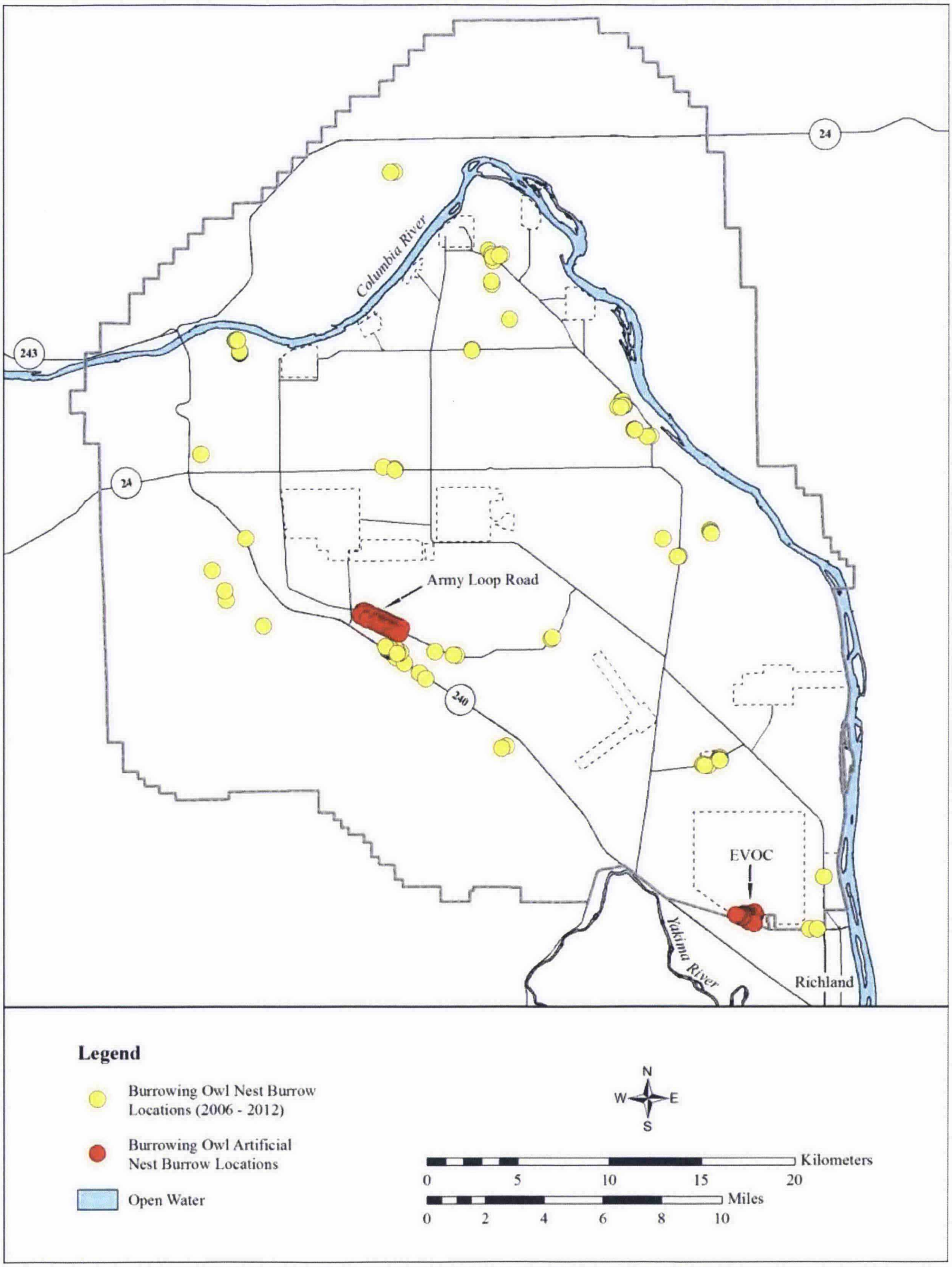

Figure 5.12 Known Burrowing Owl Nest Locations and Artificial Burrows

5.3.8 American White Pelican

The American white pelican (*Pelicanus erythrorhynchos*) is listed as endangered by Washington State. Although the white pelican is a resident along the Columbia River year-round, no nesting sites have been observed on the Hanford Reach, and the only known nesting colony in Washington is on Badger Island, approximately 39 km (24 mi) southeast of the Hanford Site. If nesting were to occur, it would likely be on islands in the Columbia River. The WDFW (2004) recommends that nest islands be closed to prevent human access, and that boating be limited within 400 to 800 m (0.25 to 0.5 mi) of breeding areas. If nesting is identified, DOE will work with USFWS and WDFW to evaluate the setting and potential threats and determine what, if any, specific protections or administrative controls it can implement to protect the nesting site.

5.3.9 Rookeries

Great blue herons (*Ardea herodias)* and other wading birds such as egrets (*Ardea alba*), black-crowned night herons (*Nycticorax nycticorax*), and cormorants (*Phalacrocorax auritus*) are colonial breeders, forming groups of nests called rookeries in tall trees near the Columbia River shoreline. Suitable rookery habitat is limited to isolated groves of trees on the site. Rookeries are considered priority habitats by the WDFW (WDFW 2008), and the primary threat to rookeries is tree removal. All rookeries will be identified so that impacts to those areas can be avoided or mitigated. Great blue herons can also be very sensitive to disturbance, leading to possible colony abandonment. Each rookery will be managed on a case-by-case basis, considering existing levels of disturbance. The standard disturbance buffer for great blue heron rookeries will be 300 m (1000 ft) (WDFW 2004) from mid-February through July. Any proposed actions within 300 m (1000 ft) of a rookery will receive additional assessment of potential impacts.

5.3.10 Ground Squirrels

The Washington ground squirrel (*Urocitellus washingtoni*) and Townsend's ground squirrel (*U. townsendii*) are both listed as state candidate species by WDFW (2012), and the Washington ground squirrel is a candidate for federal protection under the ESA. These species play an important role in the Hanford ecosystem. The squirrels are a food source for many raptor species found on the site, as well as for some mammals, including badgers. Abandoned ground squirrel burrows can become burrowing owl burrows, supplying additional habitat for this candidate raptor species. As colonies are identified, DOE will evaluate the setting and potential threats to each colony and will determine what, if any, specific protections or administrative controls can be implemented. The USFWS has successfully trapped and relocated Washington ground squirrel colonies (Heidi Newsome, personal communication). Although not a preferred option, RL will consider relocating colonies that otherwise would be destroyed by site activities. The locations of known Townsend's ground squirrel colonies on the Hanford Site are shown in Figure 5.13. Washington ground squirrel colonies are known from the Saddle Mountains (Finger et al. 2007).

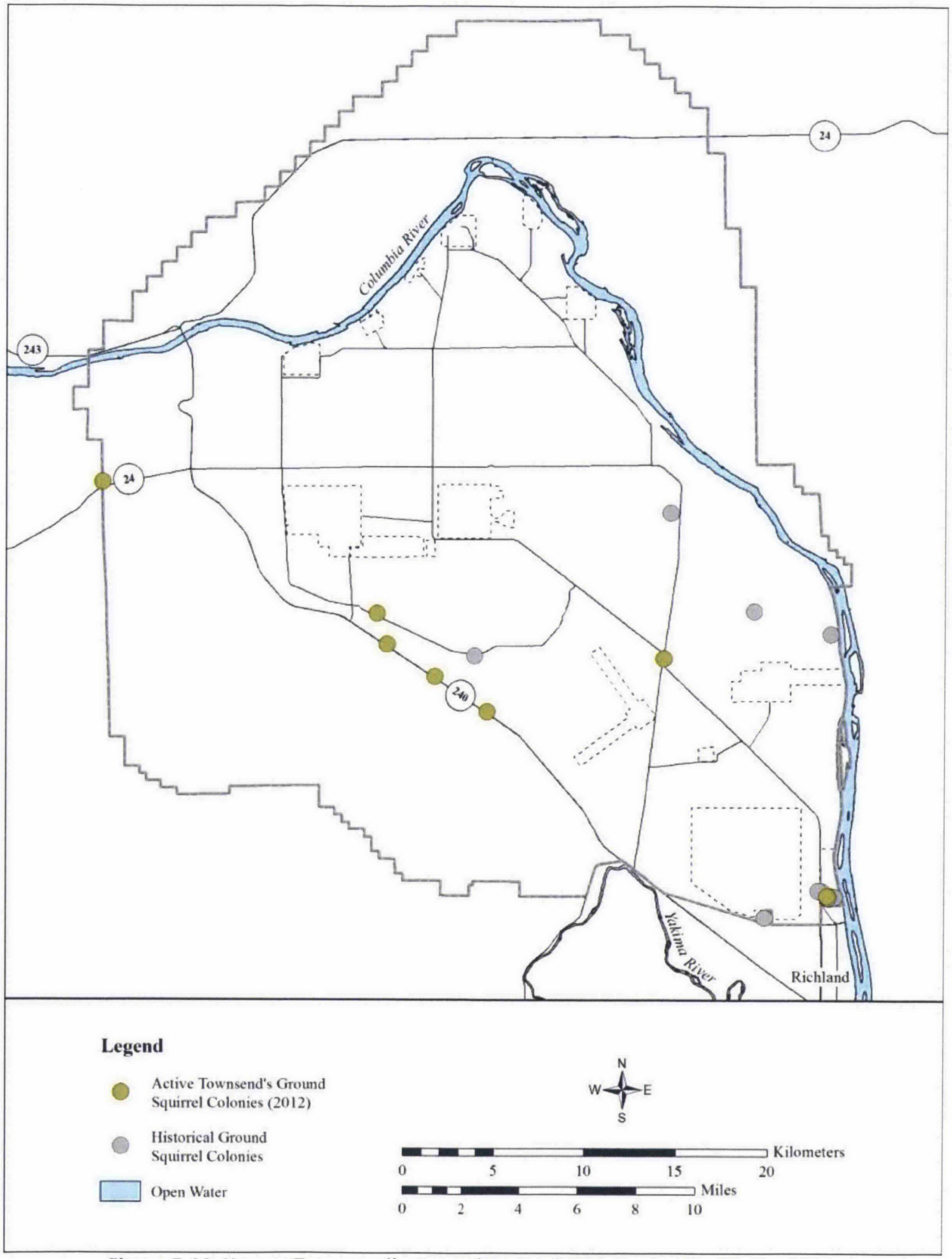

Figure 5.13 Known Townsend's Ground Squirrel Colonies on the Hanford Site

5.3.11 Bat Roosts

Approximately 10 species of bats may occur on the Hanford Site. Of these, pallid bats, canyon bats (*Parastrellus hesperus*), and spotted bats (*Euderma maculatum*) are classified as state monitor species while the Townsend's big-eared bat (*Corynorhinus townsendii*) is classified as a state candidate and federal species of concern (WDFW 2012). In addition, roosting congregations of big-brown bats (*Eptesicus fuscus*), myotis bats (*Myotis* spp.), and pallid bats are considered priority habitats by the WDFW (WDFW 2008). Maternity colonies of yuma myotis and pallid bats have been identified in the 100-F and 100-D Areas.

Maternity roosts, night roosts, and winter roosts for many of these species potentially occur on the Hanford Site. These roost locations are essential to the life cycle of these species, and individuals return to the locations to form colonies year-after-year. Thus, protection from disturbance and destruction is necessary. All known and newly identified bat roosts on the Hanford Site will be mapped in a database. If bat roosts are identified in project areas, evaluations must be made by a qualified biologist to determine impacts and mitigation. If an important roost site is identified in a non-contaminated facility that is scheduled for demolition, RL will evaluate whether the facility can be left in place as bat habitat, as has been determined at the 183-F and 100-D drywells. Bat boxes or alternative roosting structures may be provided to help mitigate the loss of roost sites that may occur from facility demolition.

5.3.12 Snake Hibernacula

Hibernacula provide habitat essential to the life cycle of snake species on the Hanford Site. Snakes are dependent on hibernacula for survival during the winter, and these locations are also important for reproduction. Snakes fill an important role in the ecosystems they occupy, eating a variety of prey and providing a source of food for other predators. Destruction of hibernacula can result in significant losses to local populations of snakes, including sensitive species such as the striped whipsnake, night snake, and yellow-bellied racer. All identified snake hibernacula will be mapped in a database. When a hibernaculum is identified, DOE will make reasonable efforts to protect it from disturbance and maintain natural habitat areas in the vicinity. Construction of potential new hibernacula sites will be included in site restoration efforts whenever feasible.

5.3.13 Rare Plants

More than 50 plant species potentially exist on the Hanford Site that have been listed at various levels of concern by federal (under 50 CFR Part 17) and state (WNHP 2012a) resource agencies. Populations of these species are found throughout the Hanford Site (Figure 4.10), and many eventually may be impacted by Hanford Site activities. Project activities should not result in net losses of any plant species of concern classified at Level 3 or higher. DOE will continue to monitor known populations of rare plants on the Hanford Site and use the impact assessment process described in Chapter 6 to determine if site actions will have an adverse impact to rare plants, and, if so, provide means to mitigate such impacts following the guidelines provided in Section 7.4.8.

5.4 Resource Status and Trends Evaluation

Inventorying and monitoring biological resources at Hanford are critical management actions that allow RL to show its activities are not resulting in significant adverse cumulative impacts to the biological resources present on the Hanford Site. Biological resources inventory and monitoring also provide the technical basis for resource management via an ecosystem management approach.

Much of the inventory work on Hanford's biological resources (identity, location, population size, or community distribution) has been completed through various DOE ecological and biological surveys, the site ecosystem monitoring program, and The Nature Conservancy surveys. However, ongoing inventory work is needed for a number of specific areas, habitat classes, species distributions, and other biological components. Completion of the Hanford Site biological inventory is vital because it is the first step in determining what the important biological resources are, where they are, and how they can most efficiently and effectively be protected.

Monitoring is a repetitive process through which the status and condition of a resource is followed over time. Monitoring may be directed at multiple levels, including the population or species level, habitat or plant community level, or ecosystem level. Most monitoring on the Hanford Site has been directed at identifying trends in populations to determine impacts from site activities, the status of certain species of concern to meet legally mandated protection requirements, or radioactive contaminant levels in selected organisms in various locations. Additional efforts have been initiated to monitor ecosystem integrity and the success of mitigation actions.

These monitoring efforts provide the technical basis for biological resources management policies and identify needed changes to those policies. Monitoring population, habitat, and ecosystem integrity will enable RL to determine what activities are most impacting resources of concern, which resources are being most affected, and which should be reclassified into lower or higher levels of concern. Monitoring areas used for replacement mitigation will ensure that mitigation efforts are successful and that they meet commitments made in project- or program-specific Records of Decision or Mitigation Action Plans.

6.0 Ecological Compliance Assessment

This chapter identifies and describes the organization, requirements, and procedures used to implement the ecological compliance assessment process on the Hanford Site, which includes impact assessment and impact management. Impact assessment is accomplished by evaluating potential impacts before they occur, and impact management is accomplished by mitigating adverse impacts.

Mitigation is a series of prioritized actions that, taken together, reduce or eliminate adverse project impacts to biological resources. Mitigation actions that rely on changes to project timing or location to avoid or minimize impacts are considered part the ecological compliance assessment process and described in this chapter. Mitigation actions that rely on replacement or improvements to habitat are part of the broader strategy for biological resources mitigation and are discussed in Chapter 7. For any specific project, the need for mitigation actions of any type is determined via the ecological compliance review (ECR), which is described in this chapter.

Information provided in this chapter previously was published as the *Hanford Site Ecological Compliance Assessment Management Plan* (ECAMP) (DOE 2006). This revision of BRMP fully incorporates that document into this chapter. Thus, the plan will cease to exist as a stand-alone document.

6.1 Background

Analyses of the ecological effects of major federal actions have a long history at the Hanford Site, particularly as implemented through compliance with NEPA. In 1993, to further ensure that such analyses were applied uniformly, RL issued direction to all Hanford Site contractors requiring all actions with the potential to impact the biological environment to obtain an evaluation of potential effects on ecological resources before initiating such action.[1] The scope of projects requiring such evaluations includes those being considered for functional equivalence under CERCLA and/or RCRA and projects covered under NEPA categorical exclusions, as well as those for which a full NEPA evaluation is required.

Since 1994, the responsibility for conducting ECRs has been assigned to RL's Public Safety and Resource Protection (PSRP) Program, currently managed by MSA, for all Hanford Site activities[2] except those conducted by the River Corridor Contractor (RCC)[3]. Data and information sharing between the PSRP and the RCC natural resources staff is a two-way flow to ensure natural resources information is shared among contractors. The PSRP or RCC staffs, as appropriate, perform ECRs for all RL- and ORP-related activities that take place within the central portion of the Hanford Site and for RL or ORP activities within the HRNM, including those areas currently managed by the USFWS. The USFWS evaluates and manages impacts resulting from its own activities on the HRNM.

[1] Letter from JD Wagoner, Manager, RL, to all Hanford contractors, dated April 9, 1993.

[2] Letter from JD Wagoner, Manager, RL, to TM Anderson, Westinghouse Hanford Company, dated August 18, 1993, and letter from RD Larson, RL, to President, Westinghouse Hanford Company, dated December 3, 1993.

[3] Letter from RD Freeberg, Director, Environmental Programs Division, to President, Westinghouse Hanford Company, dated April 5, 1994.

Non-RL/ORP federal agencies, such as the Bonneville Power Administration or the DOE Office of Science, and non-federal entities performing non-RL/ORP funded work on the Hanford Site must comply with the resource protection aspects of BRMP. However, these agencies have latitude in selecting a contractor to perform the ECR or comparable ecological analysis, such as collecting field data in support of an environmental impact statement (EIS).

6.2 Ecological Compliance Reviews

Ecological compliance reviews are performed before projects are implemented to identify any impacts that may occur and identify opportunities to avoid or minimize those impacts. The review process helps ensure Hanford Site programmatic objectives are met while also ensuring protection of the site's resources and compliance with applicable laws, regulations, Executive Orders, and DOE Orders.

Impacts to ecological resources are evaluated through a trackable ECR process that relies on field and desktop assessments of the presence of species and/or habitats of concern within a project region. The objectives of an ECR are to:

- Assess the potential for proposed Hanford activities to adversely affect biological resources of concern.
- Ensure compliance with relevant laws such as the ESA, MBTA, and other regulations, orders, and guidelines.
- Provide timely information to project managers to support planning decisions.
- Identify mitigation requirements and options.
- Document the results of the assessment for the proposed project and RL.

The ECR process ensures RL that actual and potential impacts of Hanford Site operations on biological resources of concern are identified and evaluated, and impacts to protected species are evaluated and documented in the manner required by NEPA, the ESA, and other applicable laws, regulations, and orders. In addition, the ECRs provide RL with the information it needs to interact productively with federal, state, and Tribal agencies on ecological resource issues. The ECR process also provides RL with the information needed to evaluate the cumulative impacts of all Hanford projects on the ecological resources of the site.

Projects requiring ECRs are those that have the potential to adversely affect biological resources of concern on the Hanford Site. Resources of concern include those categories of species or their habitats that are identified under DOE's NEPA implementing procedures, as well as state candidate, sensitive, and monitor species. Additionally, migratory birds, floodplains, wetlands, and other unique habitats are considered resources of concern on the Hanford Site. Chapter 5 categorizes all species and habitats on the Hanford Site by levels representing the continuum of resource value. Each level has specific management and mitigation requirements.

6.2.1 Actions Requiring an Ecological Compliance Review

Any site action with the potential to adversely affect ecological resources of concern requires an ECR. This includes actions that are covered under NEPA categorical exclusions. Project planners may use the decision flowchart shown in Figure 6.1, or use Site Form A-6006-139, *Criteria for Determining the Need for*

Ecological and Cultural Resources Reviews and Clearance, to determine if an ECR is needed for a specific action. If the answer at any level on the decision flowchart is "yes" or "maybe" the project should either submit a review request or informally contact the ecological compliance contact provided on Site Form A-6006-139 to discuss if a formal ECR is needed. Not all "yes" answers will definitively lead to the need for an ECR. If there is any question, the project planner should contact the ecological compliance contact.

Examples of activities that require an ECR include those that:

- Require an excavation permit
- Remove or modify dead or living vegetative cover
- Would be conducted on the outside of buildings and facilities
- Would be conducted within abandoned buildings and facilities
- Would result in chemical or radiological releases requiring changes to existing permits
- Have the potential to alter or affect the living environment, such as landscape-scale applications of fertilizers, herbicides, prescribed fire, or fire recovery efforts.

6.2.2 Biological Resources of Concern

Resources considered during the ECR process include all of those described as Level 1 or greater in Chapter 5. The higher the value level, the greater emphasis that resource receives during the compliance review process. Of particular interest are the following species and habitats:

- Federal endangered, threatened, proposed, or candidate species
- Washington State endangered, threatened, candidate, sensitive, monitor, review, or watch list species
- Bird species listed under the MBTA
- Rare or sensitive habitats, including terrestrial vegetation associations identified by Washington State as element occurrences, wetlands, floodplains, riparian communities, dunes, basalt outcrops, cliffs, and mid- and late-successional sagebrush steppe
- Anadromous fish spawning areas
- Bald eagle night roost and active nest locations
- Ferruginous hawk and burrowing owl nest locations
- Landscape features related to specific habitats, communities, or species.

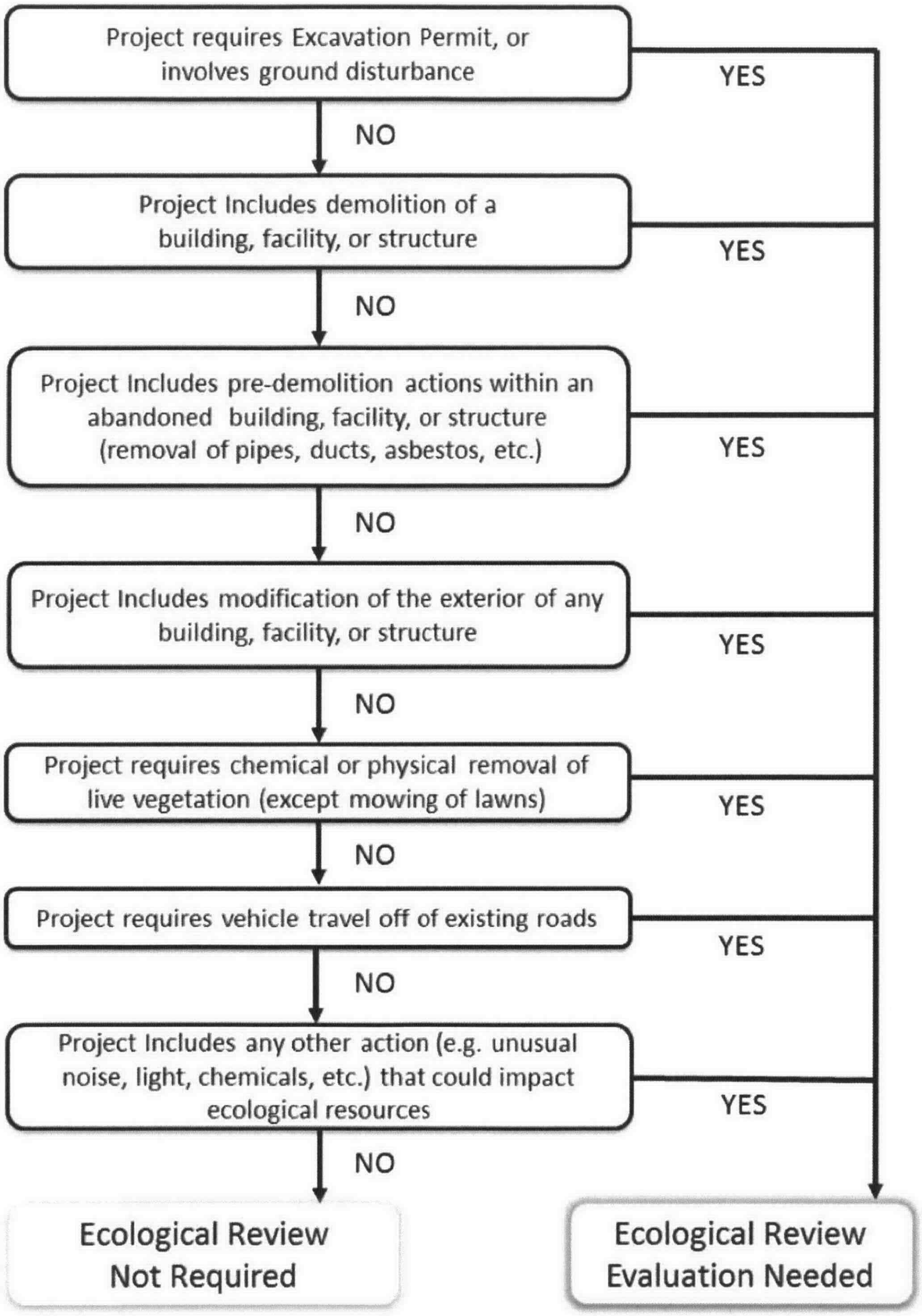

Figure 6.1 Flowchart to Determine Need for Ecological Compliance Review

Impact assessments consider direct and simple indirect effects to biological resources of concern. Direct effects include mortality, disturbance of sensitive wildlife during reproduction, and habitat alteration or destruction. Simple indirect effects include factors such as habitat fragmentation, increased edge effects, and the introduction of potential competitors or predators. Indirect effects will often be considered qualitatively, but as quantitative tools are developed, such as habitat suitability models, they may be incorporated quantitatively into the effects evaluation. Impacts to species of concern are assumed to arise primarily from direct mortality, habitat loss (reproductive, cover/roosting, foraging habitat), nest or den destruction, or disturbance, such as visual or noise impacts causing loss of productivity. Table 6.1 shows the sources considered in determining impacts.

Determination of impact is based on whether a species of concern may be present and whether the proposed action could result in any of the impacts described in Table 6.1. Presence of a species of concern can be determined by direct observation or inferred based on habitat because many species of concern have very specific habitat requirements, which are described in the scientific literature. When suitable habitat is present within a project area, impacts to species of concern that may use those habitats should be evaluated.

Table 6.1 Evaluation of Impacts to Biological Resources of Concern

Source of Impact	Likelihood of Impact
Direct mortality	Potential is defined as high for plants in the areas to be disturbed; low for mobile species
Habitat loss	Potential is evaluated on basis of species/habitat associations, foraging/home range size, and project scope
Nest/den destruction	Potential is defined as high for nests/dens found in the area depending on project scope
Disturbance during sensitive periods	Potential is defined as high within one home range radius, or as defined by management plans/biological assessments depending on project scope

6.3 Ecological Compliance Review Methodology

The ECR methodology relies on field data specific to the site where the proposed action is to occur. To be most useful, field data must be obtained at the biologically appropriate times of year, the period when species of concern can be expected to be present and identifiable. For example, most rare plant species can be accurately identified only during the spring flowering period. Other species, such as the bald eagle, may be found on the Hanford Site only during the fall and winter months. Consequently, no single time period will be sufficient to assess all species occurrences at all surveyed sites. However, impacts to seasonally occurring resources, such as bald eagles, would not need to be considered for projects scheduled to occur during periods, such as summer, when resources would not be affected.

Requests for ECRs for most Hanford Site activities are made via the Intranet Service Catalog Request System (http://msc.rl.gov/ServiceCatalog/index.cfm). The ECR service catalog request is combined with the cultural resources catalog request; therefore, one service catalog request will trigger both reviews.

A hardcopy form, "Ecological and Cultural Resources Request," also is available from the PSRP and RCC ecological compliance staff for requestors without access to the Hanford local area network (HLAN) service catalog request system. Once the ECR request is logged into the database, it is given a unique identification number and evaluated to determine if the proposed activity has the potential to affect biological resources and therefore requires an ECR. If the potential impacts are clearly minimal and/or the project does not meet the requirements listed in Section 6.2.1, the requestor may be notified by email that no ecological review is required. There are cases in which a project may require a cultural review but not an ecological review and vice-versa.

A determination is then made regarding the sufficiency of information provided in the request. If the information is insufficient to support a field survey or analyze project impacts, the requestor is contacted for additional information. For instance, the requestor may be asked to provide better maps of the project area or better describe the type and scale of disturbance. After sufficient information is available, a desktop review is then conducted to gather any information that may pertain to proposed action, and a field survey is conducted if needed. The ecological compliance staff will use information gathered during the desktop evaluation and/or field survey to evaluate the potential impacts of the proposed project on species or habitats of concern.

During the desktop evaluation, staff queries the ecological compliance database to determine whether a field survey has been performed at or near the proposed project site within the last biological year. When such data exist and are adequate, the ECR may be based on this information, as well as pertinent information from other available data sources or databases. When previously collected data are used, additional site inspections may be required prior to conducting the proposed activity to ensure nesting migratory birds are not impacted because conditions may have changed (e.g. birds began nesting) since the previous survey was conducted.

The desktop review may also include photographic evidence provided by the requestor, which can partially substitute for an onsite inspection by the ecological compliance review staff if the photographs clearly indicate the location of the proposed project and specific area, such as a paved or graveled parking lot, that will be disturbed contain no biological resources. If adequate existing data are not available, site-specific field surveys will be completed as appropriate.

Site-specific field surveys include a walk down of the proposed project area by a qualified biologist, who records the presence, distribution, and abundance of all plants and animals observed. Spatial data and digital photography may also become part of the survey record. These data are then entered into the appropriate databases for storage and query. As previously mentioned, detection of some species, such as spring flowers and wintering eagles, is temporally limited, and the biologist will take this into account when scheduling or performing surveys.

6.4 Ecological Compliance Review Reporting and Documentation

Compliance review reporting consists of a letter report to the requestor documenting the ECR and its findings. Contents of ECR reports vary according to the type of action under review, but all reports contain the action title and description, assigned review number, objectives of the review, and findings. Table 6.2 shows specific contents for actions that would cause minor disturbance in paved or graveled areas, those that will not result in loss of mitigable habitat—defined in Chapter 5—and those that will result in loss of mitigable habitat.

ECR letter reports for projects that will not result in loss of mitigable habitat include the following information: 1) a reference to the physical field survey performed as the basis for the review; 2) a description of the affected habitat, the primary plant and animal species that could be affected by the action, and any species of concern or migratory birds that are present that could be affected; and 3) any mitigation requirements associated with the siting or timing of proposed actions or other actions that may avoid or minimize impacts.

Table 6.2 Contents of Ecological Compliance Review Letter Reports

Type of Action	Contents
Minor disturbance in paved, graveled, or other non-vegetated areas	Email alternative citing a previous review Action title Action description ECR Action Number Reference to physical survey(s) – if performed Date and personnel on survey(s) – if performed Findings of the review
Will disturb habitat that does not require compensatory mitigation	Above plus: Habitat description Species of concern in action area Migratory bird species observed Mitigation requirements (i.e., action timing restrictions or footprint minimization)
Will disturb habitat that does require compensatory mitigation	Above plus: Habitat quantification Recommendations for mitigation via habitat improvement If disturbance is above the defined threshold for compensatory mitigation, a mitigation action plan may be required

ECR reports for proposed actions that would result in loss of habitat that would require mitigation, such as mature shrub-steppe, wetlands, or other habitats defined as mitigable require additional information. This includes quantitative descriptions of the habitat, including plant cover by species, and recommendations for mitigation via rectification at the site of the proposed action and/or compensatory mitigation elsewhere.

The final ECR letter report is sent to the requestor, and copies are available from RL upon request. Copies of the letters, request forms, field data, and all supporting documents are retained in the PSRP or RCC project files. ECR reviews will normally be valid for one year, unless otherwise noted in the ECR.

6.5 Blanket Ecological Compliance Reviews

Specific areas on the Hanford Site may qualify for blanket ecological compliance reviews. These blanket reviews are normally issued on an annual basis and allow a prescribed scope of work, such as routine operations and maintenance activities, to proceed without ECRs for each individual action. These blanket reviews save paperwork and time for both the ecological compliance assessment staff and the requesting organization. Except for staff-determined special-case situations, to qualify for a blanket review, an area must meet the following criteria:

- Already highly disturbed habitat or little to no value for flora or fauna (typically Level 0).
- Clearly defined boundaries
- Low probability of adverse ecological impacts
- Considerable project activity that would require numerous individual reviews per year.

Areas that have qualified for blanket ecological compliance reviews in the past include the 100-K Area, the tank farms in the 200 Areas, the Plutonium Finishing Plant, and active portions of the solid waste burial grounds in the 200 Areas. Blanket ecological compliance reviews contain recommendations to reduce impacts to ecological resources that may be specific to the area and require that any nesting birds be reported to ecological compliance staff to determine if they are a protected species, such as a migratory species.

Blanket reviews will usually provide complete coverage during the non-nesting season, generally late July to early March, and non-migratory bird coverage during the nesting season. The potential for impacts to nesting migratory birds must be considered on a project-by-project basis during nesting season. Blanket reviews need to be periodically re-examined and re-issued to allow ecological compliance staff to ensure blanket area environmental compliance officers and project staff are aware of any management changes that they need to be aware of, for instance, changes in bald eagle night roost exclusion areas or ferruginous hawk buffers.

Because ecological and cultural resource reviews are conducted in tandem, a blanket ecological review is normally most useful for areas where a similar review exemption exists for cultural resources.

6.6 Cumulative Impact Reporting

As funding permits, the ecological compliance assessment staff will prepare an annual summary of projects reviewed. At a minimum, this summary will be included as part of the annual *Hanford Site Environmental Report* (e.g. DOE 2012c). The summary will detail potentially significant activities during the year, and may include the following information:

- Number of review requests received and processed, by type of action and action contractor
- Breakdown of review requests by area of the site, affected habitat, and affected species
- Acreage of habitats converted to other uses
- Summary of actions affecting federal- or state-listed species
- Summary of interactions with projects that limit impacts to species of concern and habitats, such as implementation of measures to avoid or minimize impacts
- Summary of mitigation recommendations involving necessary habitat improvement onsite or offsite
- Summary of interactions with the USFWS, NMFS, or WDFW regarding action impacts to Hanford Site plants, fish, and wildlife
- Assessment of cumulative impact, such as habitat fragmentation changes from previous environmental baseline.
- Assessment of the effectiveness of previously implemented mitigation projects.

6.7 Impact Management Recommendations

Although RL recognizes that adverse impacts to biological resources cannot always be eliminated, the potential for impacts must be considered during the early phases of project development, and their consequences incorporated in decision making. Means to accomplish impact avoidance or minimization are identified through the ECR and project site selection processes before project implementation. The ECR may include recommendations to avoid or minimize adverse impacts to ecological resources by:

- Implementing alternatives that would result in fewer adverse impacts
- Locating projects at a less ecologically sensitive site
- Reducing or modifying the project footprint
- Scheduling project activities so that disruption of key species and functions is minimized

In unusual cases when significant impacts cannot be reasonably avoided or minimized, the ECR will provide recommendations for compensatory mitigation based on the characteristics of the habitat that will be disturbed. Implementation of such mitigation will be in accordance with the requirements and procedures defined in Chapter 7. If mitigation beyond avoidance and minimization is likely, ecological compliance assessment staff will meet with the requestor staff (both DOE and contractor) to:

- Provide information on potentially significant biological issues pertinent to a specific project.

- Help identify alternatives to the proposed action that could reduce adverse impacts.
- Provide information on the location of important biological resources to assist, as necessary, in the Hanford Site selection process for individual projects.
- Present information on Hanford policy with regard to mitigation.
- Develop a common schedule for conducting an ECR that would minimize impacts to the schedule of the proposed project.

These meetings will be scheduled as needed. Ecological compliance assessment staff will attempt to initiate interactions in a proactive manner when informed of upcoming major actions. These efforts and resulting recommendations will be reported to RL via regular reporting processes.

7.0 Biological Resource Mitigation Strategy

This chapter identifies and describes the biological resource mitigation strategy on the Hanford Site. It focuses primarily on mitigation actions that rely on habitat improvement, rectification, and compensation. Habitat improvement may be necessary for projects that eliminate or degrade habitat. However, mitigation actions based on avoidance or minimization of adverse impacts, such as changes to project timing or location, are the most important components of the overall mitigation strategy. These mitigation actions are implemented via the interactive impact assessment and management process described in Chapter 6. Mitigation of impacts to species listed under the ESA will be determined under the consultation requirements in Section 7 of the ESA.

This chapter also provides guidance on accounting for habitat protection or improvement as part of the project planning process. In addition, it provides guidance and a reference for the preparation of project-specific mitigation action plans (MAPs) under the DOE NEPA implementation procedures (10 CFR 1021). Section 7.9 provides a brief overview of suggested contents for project-specific MAPs.

The information provided in this chapter previously was published as the *Hanford Biological Resources Mitigation Strategy* (BRMiS) (DOE 2003). This revision of BRMP fully incorporates that document into this chapter. Thus, that guidance will cease to exist as a stand-alone document.

7.1 Mitigation Strategy Overview

Mitigation is a series of prioritized actions intended to reduce or eliminate adverse impacts to biological resources. These actions include avoidance, minimization, onsite rectification, and compensation (Table 7.1). The basis of this strategy is that a project begins mitigation at the avoidance level of the hierarchy and only moves to the next level if reasonable options at the previous level are exhausted.

To facilitate a balance between Hanford Site mission elements and stewardship obligations, the BRMP mitigation strategy is intended to:

- Divert impacts away from higher priority toward lower priority resources.
- Ensure consistent and effective implementation of mitigation recommendations and requirements
- Ensure biological resource mitigation measures meet the responsibilities committed to by DOE within a NEPA or CERCLA ROD or a NEPA finding of no significant impact (FONSI)
- Enable Hanford Site projects to anticipate and plan for mitigation needs via early identification of mitigation requirements
- Provide guidance for implementing cost-effective mitigation actions
- Conserve Hanford's biological resources while facilitating balanced development and cleanup activities.

Table 7.1 Types of Mitigation for Biological Resource Impacts

Mitigation	Utilization Preference	Mitigation Means	Example
Avoidance	1st	Eliminate all or part of a project or alter the timing, location, or implementation to avoid injury to biological resources of concern	Relocate a proposed excavation from an area with protected plant species to an area without resources of concern
Minimization	2nd	Alter proposed project timing, location, or implementation to minimize injury to biological resources of concern	Perform habitat removal at a time when the nesting activities of migratory birds will not be disturbed
Rectification	3rd	Replace the biological resources on the site to be disturbed	Return pre-existing plant community to excavation site
Compensation	4th	Replace project-induced biological resource losses away from the site to be disturbed	Replant mature sagebrush in a degraded area on Hanford

The mitigation process on the Hanford Site includes several steps and decision points. Most projects will require only the first three steps: ecological compliance review, avoidance, and minimization. But, any project that disturbs native vegetation is expected to revegetate the disturbed area with native species to the extent practical. Larger projects, or those that must be located in more ecologically significant areas, may require the latter stages of the mitigation process: rectification and compensation.

The mitigation process starts with an ECR as outlined in Chapter 6. Historically, the majority of reviewed projects have had no adverse impacts to any biological resources of concern. Thus, many projects proceed after the ecological compliance review without additional mitigation actions. Of those remaining, most projects can proceed with only minor adjustments, such as moving the site a short distance or performing the action during a time that would not impact nesting migratory birds.

If significant impacts remain after avoidance and minimization, then rectification or compensation will be determined using procedures described in Section 7.4. Onsite rectification may include actions ranging from the replacement of lost resources to preventing habitat degradation, such as erosion prevention or control of invasive weeds subsequent to land disturbance. Compensation may be needed in addition to rectification if the impact is significant. For example, an area covered by a new facility that cannot be rectified onsite may need compensation to mitigate for habitat loss. The long-term goal of this mitigation strategy is that most compensatory mitigation will be accomplished via participation in a mitigation bank (Section 7.5).

7.2 Requirements for Mitigation

Many of the laws and regulations discussed in Chapter 3 include expectations for mitigation of a resource loss. This mitigation strategy is intended to ensure that RL meets the spirit and intent as well as the letter of those laws and regulations. Additionally, state and federal resource management agencies have published policies and guidelines for biological resource mitigation that form much of the basis for RL's mitigation strategy. These policies and guidelines are summarized in Table 7.2.

Table 7.2 Federal and State Policies and Guidelines for Mitigation

Agency	Summary
U.S. Fish and Wildlife Service Mitigation Policy (46 FR 7644-7663)	• Provides mitigation recommendations based on habitat value; acre-for-acre replacement not necessarily recommended. • Establishes four "Resource Categories" to identify areas of high and low habitat values for important species. • Follows the CEQ guidelines for mitigation: avoid the impact, minimize the impact, rectify the impact, reduce the impact over time, and finally, compensate for the impact.
Washington Department of Fish and Wildlife Mitigation Policy (POL-M5002; January 1999)	• Follows CEQ guidelines for mitigation. • States that mitigation should ensure no net loss of habitat or populations. • Provides direction for use of in-kind/out-of-kind, onsite/offsite mitigation. Onsite, in-kind is highest priority. All out-of-kind mitigation must be approved case by case. • States that priority habitats and species, defined by WDFW's Priority Habitats and Species Program, receive additional consideration; in some cases, preservation of priority habitats can be considered mitigation. • Includes guidance for documenting terms of mitigation.

7.3 Triggers for Mitigation and Threshold Levels

Virtually all areas of the Hanford Site, including industrial areas, constitute habitat for some plants and wildlife. However, it is not practical, possible, or even desirable to mitigate for any and all changes to the current habitat base. This mitigation strategy is designed to direct adverse impacts away from higher value habitat areas and into lower value habitat areas, or preferably, into areas that are already disturbed and contain little or no habitat value. Two obvious benefits from avoiding adverse impacts are reduced costs to projects and preservation of highly valued biological resources and habitats.

It is the policy of RL to determine mitigation requirements based on resource value, as described in Chapter 5, rather than strictly on the size of the impacted area. Impacts to higher value resources will result in greater mitigation commitments than impacts to lower value resources. This policy encourages projects to be located in areas with low extant habitat value because the mitigation requirements associated with these areas will be less than the requirements associated with the disturbance of the same acreage of higher quality habitat.

Impact thresholds will depend on the point in the mitigation hierarchy the project is at, as well as the particular resource(s) that may be impacted. In the first two steps of the mitigation process, avoidance and minimization, no set threshold level exists if managed resources are present. All projects are expected to avoid and minimize adverse impacts to the greatest extent possible, and should weigh these considerations equally with other project siting criteria. Likewise, all projects are expected to rectify impacts at the project site to the extent practicable, including replanting disturbed areas with native species.

Some resources have specific regulatory requirements that may affect mitigation considerations such as threshold level. For instance, jurisdictional wetlands have no mitigation threshold level, and any impact would likely require mitigation as part of the CWA Section 404 permit from the USACE.

For Level 2, 3, or 4 habitat resources, such as steppe, shrub-steppe, and other habitats, compensatory mitigation may be triggered if the impact, after avoidance, minimization, and onsite rectification, is greater than 0.5 ha (1.2 ac), regardless of the project's location.

7.4 Implementation

Implementation follows the order of mitigation priorities presented in Table 7.1. Impacts should be avoided or minimized if possible, and rectified or compensated only if avoidance and minimization do not satisfy all project mitigation needs and the residual impacts are above the mitigation threshold identified in Section 7.3. Avoidance and minimization actions are likely to be less costly, have less potential to adversely impact project schedules, and cause less injury to biological resources than actions that rely on habitat improvement. If compensatory mitigation is required away from the project site, mitigation requirements should be met through participation in a mitigation bank, if available, as described in Sections 7.4.3 and 7.5.

7.4.1 Identifying Mitigation Needs

Mitigation should be identified and implemented as early in the project as possible. Preferably, mitigation needs are identified during the ecological compliance assessment process. Impact management should occur during the site-selection process to address the avoidance and minimization steps of the mitigation process, thereby reducing the need for rectification and/or compensation. Additional mitigation needs may be identified later in the project via the ecological compliance review as described in Chapter 6.

7.4.2 Mitigation at a Project Site

Mitigation at the project site includes avoiding, minimizing, or rectifying project impacts (See Table 7.1). Project impacts can be avoided or minimized by taking actions such as the following:

- Implementing non-disturbing alternatives
- Locating a project at a less ecologically sensitive site
- Reducing project land-use requirements
- Scheduling project activities to minimize disturbance to biological resources of concern

7.4.3 Mitigation Away from a Project Site

Projects that are unable to reduce the impacts below mitigation thresholds via avoidance and/or minimization, and are unable to fully rectify the loss on the project site, will perform mitigation away from the project site. In most cases, this mitigation will consist of habitat improvements at a selected mitigation area; although, in some cases other methods, such as acquisition of high-quality, at-risk lands may be an option.

The siting of mitigation areas should be performed within the context of the CLUP and Hanford Site biological resource management goals, and should consider landscape-scale factors to best enhance or complement existing resources. The following factors should be considered in selecting sites to perform compensatory mitigation actions. The mitigation areas include lands that will allow for in-kind replacement of habitat value lost at project sites and should be:

- Contained either wholly within DOE-administered or managed lands or on the HRNM.
- Placed in regions designated within the CLUP as conservation or preservation areas.
- Located near, within, and/or surrounding lands that possess significant habitat value.
- Adjacent to areas that are already protected or to areas with complementary habitat if management objectives include preserving a mosaic of habitat types.
- Capable of serving as a core area of wildlife usage as well as a wildlife travel corridor either within the Hanford Site or between the site to adjacent non-DOE lands.
- Able to balance the effects of large-scale disturbance and habitat fragmentation.
- Viewed in the context of the surrounding landscape, including lands adjacent to Hanford.
- Capable of achieving in-kind habitat value replacement via habitat improvement. Therefore, the habitat potential of the mitigation area and the project impact area must be similar.
- Located in a non-radiological control area or non-hazardous materials management area.

7.4.4 Mitigation Levels and Ratios

Mitigation levels range from impact avoidance to compensation (Table 7.1). A mitigation replacement ratio is the ratio of the quantity of habitat units created at a compensation site to the quantity lost at the site of adverse impacts. Sometimes this may translate as the area over which mitigation measures are applied to the area receiving adverse impacts, assuming equivalent habitat value at each site. Alternatively, it can be the ratio of the improved habitat value at the mitigation area to the habitat value at an impacted site, assuming the same land area for each site (Figure 7.1). A combination of area and quality considerations can also be used.

Replacement ratios for impacts to riparian or wetland habitats will comply with Washington Department of Ecology (WDOE) requirements for wetland mitigation [2:1 on an area basis with equivalent plant species density (Castelle et al. 1992a)] or as otherwise defined in any CWA Section 404 permit issued by the USACE.

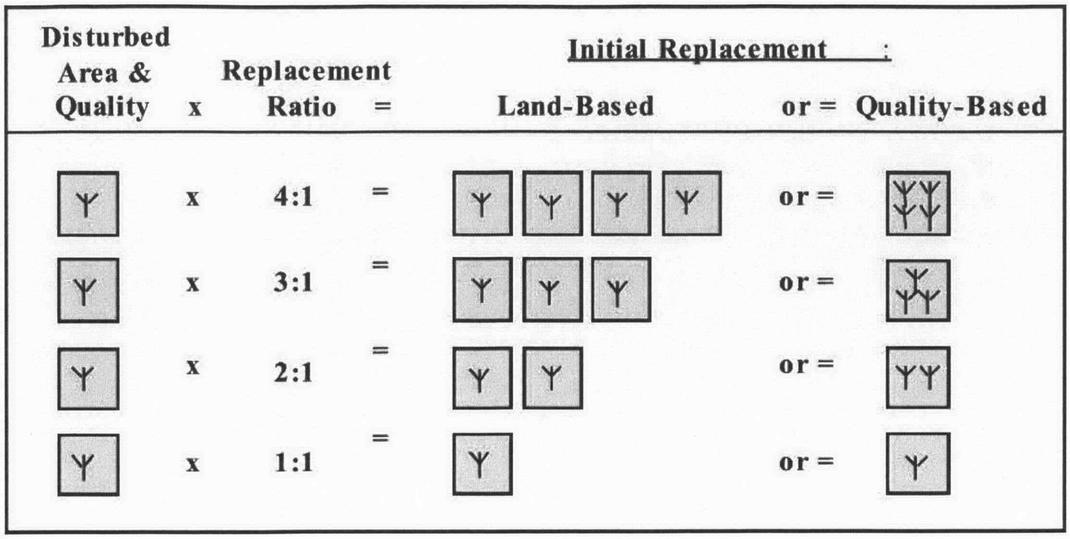

Figure 7.1 Comparison of Spatial- or Quality-Based Replacement Ratios

The replacement ratio should account for both the potential planting failure rate and the loss of services over time. In arid terrestrial systems, there will usually be a time lag, perhaps measured in decades, between when the mitigation actions are performed and when the mitigation area becomes fully usable habitat. Therefore, the replacement ratio should be set at a point that will allow the *habitat value* to be replaced in a reasonable period of time, even if it may ultimately result in a larger number of habitat units decades later. To account for both the failure rate and the replacement time lag the replacement ratio should be set higher than a simple consideration of transplant survival rates would suggest.

For compensatory mitigation of shrub-steppe habitats, the ratio will range from 1:1 to 5:1 based on the area and the resource level or value of the habitat lost. Therefore, Level 4 habitat areas will be replaced at a higher ratio than Level 3 or 2 habitat areas. Rectification at the site of impact should be used for a portion of the mitigation action, when feasible, and may satisfy all the mitigation requirements for Level 2 habitat areas.

Mitigation ratios are specifically designed to compensate for losses of vegetative habitat. However, other resources, such as snake hibernacula, bat roosts, ground squirrel colonies, burrowing owl burrows, eagle roosting areas, heron rookeries and others, could be impacted and may also require mitigation. For these types of impacts, it is not feasible to follow the same ratios as outlined for losses of vegetative habitat. Therefore, a qualified biologist must determine the appropriate type and amount of mitigation actions needed to offset the impact. The type and amount of mitigation must take into account the resource level of the species being impacted, the severity of the impact, and the likelihood of mitigation success.

7.4.5 Habitat Mitigation Replacement Units

Successful planning and budgeting for mitigation commitments require that the level of effort, number of transplanted shrubs or tubelings, and quantity and type of seed needed to achieve the mitigation goals be quantified in the early stages of project planning. Ideally, the level of effort is determined based on the habitat value at the project site and the level of improvement possible through rectification or through compensation at a mitigation area. Quantitative habitat value models are required for these calculations. Because such models are not available, projects that disturb late-successional sagebrush steppe will plan for replacement mitigation using standard replacement units. Replacement units for other habitats will be developed as needed.

Therefore, a project replacing habitat via rectification at a ratio of 1:1 should plan for 1 replacement unit/ha disturbed habitat. A project replacing habitat via compensatory mitigation at a ratio of 3:1 should plan for three replacement units/ha disturbed habitat.

A replacement unit for late-successional sagebrush steppe will consist of:

- 1500 shrubs/ha (600/ac)
- 1500 forbs / ha (600/ac)
- Native, perennial bunchgrass understory – either already present or planted according to the *Hanford Site Revegetation Manual* (DOE 2012a).

This replacement unit is based on the assumption that the tubelings or bareroot seedlings will provide the bulk of the shrub density and canopy coverage replacement, and the final community at maturity will have at least 10% sagebrush cover, forb diversity similar to native stands, and a native perennial grass understory.

The replacement unit may be modified based on the actual site that is to be disturbed. For instance, a site with unusual forb or shrub diversity may necessitate the inclusion of forbs or a broader range of shrub transplants to the project MAP. Deviation from the standard replacement unit would be determined as part of the ECR for the project.

Habitat replacement at the point of impact or at more degraded mitigation areas may require that the native understory be recreated following the guidelines provided in the *Hanford Site Revegetation Manual* (DOE 2012a). If a selected mitigation area already has suitable cover of native perennial grasses, additional understory manipulations may not be required.

Alternatives to any of these requirements may be developed on a case-by-case basis, as long as the functional aspects of the requirements are preserved and the alternative is approved by SSD.

7.4.6 Mitigation/Restoration Methods

Methods used for habitat improvement will vary according to specific site conditions and mitigation goals. Methods to be considered include salvaging plant material and topsoil, preparing the site, amending the soil, and selecting plant species and planting methods. *The Hanford Site Revegetation Manual* (DOE 2012a) provides guidance for planning revegetation actions that may be performed for restoration, mitigation, or habitat enhancement purposes.

7.4.7 Native Plant Nursery and Grass Farm

Mitigation actions that involve habitat amendment, reclamation, or creation will require plant material that is both native and locally adapted. To meet these needs, RL supports the concept of native plant nurseries and/or farms to provide locally derived plant material for revegetation and restoration purposes. This includes any cost-effective means to produce these plant materials, including farms and/or nurseries located onsite or offsite, and operated by DOE, another federal or state agency, private contractor, or Tribal vendors. All contractors or vendors would be expected to follow standards set by the Association of Official Seed Certifying Agencies for source-identified seed (AOSCA 2003).

7.4.8 Rare Plant Mitigation

Mitigation for plant species of concern should follow the hierarchy described in Section 7.1 with the following additional considerations.

Avoidance and Minimization: Selecting an alternate project site is the preferred approach for rare species conservation. It is the one approach that precludes the need for additional mitigation measures. However, this approach could be impractical because of project limitations, or because a new population may colonize an area at any time, even after several years of site use and development. If avoidance is not possible, minimization may be accomplished by redesigning to avoid most of a population, thereby limiting the overall impact. If appropriate, this should include placement of a clearly delineated administratively controlled zone around the protected population. To prevent inadvertent entry by pedestrians or vehicles, site workers should be informed of the site's nature and importance.

Population Replacement: If impacts to a rare plant population cannot be adequately avoided or minimized, the next two mitigation options are, in order of preference, replacement of the population on the project site and replacement at an area away from the project site. Such efforts may include transplanting mature plants, sowing seed at the original or new site, or collecting seed or mature plants for establishment in a greenhouse or garden for eventual planting in the field. Because the probability of successful replacement or relocation is usually low, these options should be considered as a last resort, to be used only when the avoidance and minimization options are infeasible. A revegetation specialist should be engaged to help determine how and where to best replace a rare plant population.

7.5 Mitigation Banking

Mitigation banking is the establishment of habitat for managed resources, or the resources themselves, in areas other than at the impact site to compensate for unavoidable habitat value losses expected to result from future project development. Use of a centralized bank for compensatory mitigation simplifies the mitigation process for small projects because the goals, methodologies, and locations for compensatory mitigation will be pre-defined. A small project would not be required to design, implement, and monitor its own mitigation actions, but would simply pay into the established system or bank.

A bank enables the mitigation requirements for numerous projects be coordinated and conducted in a manner that creates the greatest overall improvement in habitat value while reducing costs because of the economy of scale. Mitigation banking is not currently used on the Hanford Site, but RL recognizes the advantages of mitigation banking, and will continue to explore the means to move to a banking system as described in the following paragraphs.

The degree to which compensatory mitigation is coordinated site wide could range from essentially none—the current, project-by-project approach—to complete coordination with pre-emptive habitat replacement. The following four basic levels of coordination have been identified:

1. Each project (or program) identifies its compensatory mitigation areas, plans and implements its own habitat improvements, and is responsible for maintaining and monitoring the mitigation areas. There is no coordination among different projects or mitigation actions. This is the current Hanford Site approach to mitigation planning.

2. One or more common mitigation areas are identified, but each project continues to plan and implement habitat improvements within that area and is responsible for the continued monitoring and maintenance of its portion of the mitigation area.

3. A pseudo-mitigation bank is created with one or more common mitigation areas. Habitat improvements are coordinated by the bank managers, using standardized implementing procedures. Maintenance and monitoring of the mitigation areas are performed under the guidance of the bank managers. Under a pseudo-bank, credits are created through habitat improvement as a response to project needs, and usually such credits are created concurrently with losses or after the losses already have occurred.

4. A true mitigation bank is created. This is essentially the same as a pseudo-bank, except that credits are created in anticipation of future project needs and before the project-induced losses occur. As impacts occur, the responsible project would purchase some of the existing bank credits; the purchase money would be used to create more credits.

Use of a common mitigation area saves time and money because siting decisions only need to be made once. Use of a banking system would save additional money because projects would not be required to engineer the habitat improvements, set up individual subcontracts to perform the improvements, or coordinate long-term monitoring efforts. Under a bank system, each project would pay into a common pool overseen by the bank managers who would oversee selection of mitigation sites and coordinate the habitat improvements, monitoring, and maintenance for all projects.

Use of a true mitigation bank would ultimately be the most cost-effective because investments made in habitat improvements "gain interest" in the form of plant growth and increased ecological function; therefore, the same monetary investment would purchase more ecological credit. However, a true mitigation bank would require that non-project specific "seed money" be identified and appropriated to create the initial bank credits before they are needed by projects.

Advantages of mitigation banking include the following:

- Overall coordination of site mitigation
- Elimination of the project-by-project learning curve
- Time required for preparation of NEPA documents is reduced
- Mitigation practices are consistent
- Better landscape-scale considerations in planning
- Potential reduction in site-wide loss of ecological services
- Extended project durations required for mitigation are eliminated
- Projects can adequately plan and budget for mitigation
- Mitigation actions are performed by experienced personnel
- Impacts of a similar nature are treated in a similar but comprehensive manner.

Mitigation banking provides a means both to minimize the risk to resource health and survival posed by future projects and to perform habitat improvement and monitoring in a cost-efficient manner. Mitigation banking has been developed for addressing wetland impacts (Castelle et al. 1992a, 1992b), but has been less well defined for impacts in other areas. It is recognized as a potential component of mitigation by both the USFWS (46 FR 7644, USFWS 1988) and the WDFW (1999).

7.5.1 Mitigation Bank Operations

Mitigation banking requires the following components to be identified and established:

- Bank objectives and currency
- Bank site(s), including necessary site protection and controls
- Policy for bank operation, including payments, construction, use of credits and debits, and bank management responsibilities
- Funds and schedule for monitoring, corrective actions, and reporting on bank operations.

7.5.1.1 Bank Objectives

The objectives for mitigation bank(s) on the Hanford Site would be to:

- Consolidate numerous small mitigation projects into one or a few sites that can meet broader management objectives requiring a landscape-level approach
- Provide compensation for habitat loss resulting from Hanford site activities
- Ensure that lost habitat value is adequately compensated
- Maintain mitigable resources within limits of abundance and temporal stability conducive to survival and health of the resources
- Preserve the bank's mitigated resources through long-term monitoring and management.

7.5.1.2 Bank Site Protection, and Control

Banks sites would be administratively protected. The mitigation bank site(s) would be designated as Level 4 resources under BRMP and would be clearly designated on site-planning and land-use maps. Functionally, this should prevent disturbance of the site(s) for as long as RL maintains administrative control of the area. If deed restrictions are instituted, site protection could continue long after RL's mission is completed. Protecting bank site(s) in this way should not incur significant costs. At a minimum, bank site(s) must be protected for the life of the participating projects or until all the habitat value lost as a result of participating projects is replaced, whichever is longer.

Bank credits would normally be given only for improvements on lands under the direct control of RL. However, lands managed by or released to other federal agencies may be eligible for use as bank sites, if the receiving party agrees that the bank site would be managed for its resource values. Bank withdrawals should consider habitat value replacement, not simply acreage or cost for habitat improvement, land purchase, or management.

7.5.1.3 Bank Operation Policy

Projects could pay into the bank at any time, but the preferred method of bank operation is to initiate habitat improvements before use of the credits. This would help ensure that levels of the affected biological resources do not decline between the time of project impact and the time when suitable improved habitat is available to support the resources. Project budgets should be developed to allow credits to be purchased early in the project life: the first year of the project for projects of three years or less.

The bank would be overseen by RL through an oversight committee, as described in Section 7.5.2, with short- and long-term direct management led by SSD. Short-term management responsibilities include developing guidance for operation and habitat improvements within the banking site(s), coordinating habitat improvements within the bank, monitoring the improvements and evaluating improvement methods, and managing credits and debits. Long-term management responsibilities include monitoring, maintenance, reporting, and determining necessary corrective actions. SSD also would ensure mitigation bank sites are clearly identified on Hanford Site land-use planning maps.

Bank maintenance could include:

- Controlling weeds
- Minimizing depredation of transplants
- Irrigating
- Preventing and controlling fires
- Modifying banking guidance, as necessary, to respond to changes in management needs and habitat improvement methodologies.

Bank corrective actions may include:

- Replanting if mortality causes habitat values to fall below target levels
- Designing and implementing new habitat improvement methodologies.

Monitoring and reporting are necessary to ensure the bank meets its resource maintenance and improvement goals, can respond to contingent needs and events, and functions in a cost-efficient manner. Specific monitoring needs may include factors such as shrub survival and growth, plant species composition, abundance, and spatial pattern, wildlife usage, and sources of plant mortality.

Reporting should occur regularly and provide information summaries that:

- Track the progress of the banking program against its goals
- Track the status of the bank with regard to credits and debits
- Provide a means for resource agencies, natural resource trustees, and other outside groups to assess the relative success of the program
- Provide information necessary to allow RL to alter its operational guidance for the bank to better meet its objectives
- Provide information to assist outside agencies in developing their own banking programs.

7.5.2 Mitigation Bank Oversight

The mitigation bank should have an oversight committee that functions as a board of directors made up of representatives from a variety of offices within RL and ORP, such as the site NEPA officer, and offices within SSD responsible for long-term stewardship, land management, and site infrastructure. This oversight committee would be responsible for:

- Determining operating policies
- Approving locations for mitigation banks
- Determining if an appropriate level of mitigation has been assigned to projects
- Determining mitigation "fees" or "taxes"
- Identifying mitigation opportunities
- Overseeing, at a high level, mitigation implementation
- Ensuring appropriate mitigation area monitoring is performed and reported.

The committee itself would not prepare or implement detailed MAPs, but committee approval will be required for all contractor-developed MAPs. Contractors, as part of the project costs, would pay for initial mitigation actions and also pay a fee to an account overseen by the committee. This account would be used to ensure long-term monitoring and maintenance of the mitigation area, and contingency plans would be implemented if mitigation goals are not met.

The committee could choose to take over the overall implementation of mitigation actions to further ensure all actions are coordinated, take advantage of economies of scale, and are implemented in a consistent manner. If the committee chooses this option, each project responsible for an impact that requires compensatory mitigation would be assessed a fee based on the type and size of the impact. The committee could then 1) direct an onsite contractor to use the money collected from all subject projects to implement a single large mitigation action, 2) direct the money to an offsite mitigation action, probably in coordination with another federal or a state agency—such as to purchase high-quality but at-risk habitat, or 3) use the money to implement other approaches to mitigation.

Such a committee also could provide oversight and guidance for other BRMP-related issues that cross organizational boundaries, including oversight of landscape-scale management actions, resource and trend monitoring, coordinating with parallel restoration or management actions by other agencies, and mediating issues when other Hanford Site goals or objectives may conflict with those of BRMP.

7.6 Mitigation Monitoring, Reporting, and Contingencies

Mitigation actions, especially if they include habitat improvements, must be monitored to determine if the mitigation requirements for a project have been satisfied. Monitoring mitigation performance is necessary to:

- Ensure mitigation actions, including a mitigation bank, meet resource maintenance and improvement goals
- Evaluate mitigation and habitat improvement methods
- Provide information to respond to contingent needs and events
- Ensure mitigation functions in a cost-effective manner.

A monitoring program requires defining the specific performance measures to be evaluated, procedures to be followed, and reporting procedures for distributing the monitoring results.

Project-specific mitigation monitoring is funded by the instigating project or contractor and conducted and reported by that contractor or a designee. As more mitigation is conducted cooperatively through a mitigation bank, monitoring and reporting would be led by the oversight committee.

7.6.1 Mitigation Performance Measures and Monitoring

Performance measures for a mitigation site should be based on the specific mitigation goals for that site. The selection of specific site-performance measures may depend on factors such as size and location of the mitigation site, types of mitigation actions performed, and mitigation goals. Performance monitoring should occur at least annually, until the mitigation goals of a site or project have been met. Monitoring procedures used will depend on the specific performance measures and goals for a mitigation site. Performance measures may include:

- Native plant cover
- Shrub survival and growth
- Diversity of native plants
- Wildlife usage
- Alien plant intrusion
- Structural composition of the community
- Spatial pattern of vegetative components
- Physical and geochemical processes such as erosion and soil microbial activity
- Recruitment of planted species.

7.6.2 Performance Reporting

Results of the monitoring efforts should be reported annually. The SSD will review these reports for completeness, adequacy, and consistency. Reporting should provide information to:

- Track the progress of mitigation actions against goals
- Provide means for resource agencies, natural resource trustees, and other interested parties to assess the relative success of the mitigation program
- Provide the information needed by RL to identify additional actions that may be required to meet mitigation goals
- Provide information needed by planners to develop efficient and cost-effective mitigation actions.

7.6.3 Contingencies

All individual project MAPs should include a contingency plan and predefined minimum performance levels that can be used to compare with mitigation monitoring results. If the performance monitoring indicates that one or more of the performance measures are below satisfactory levels, such as transplant shrub survival is below predetermined action levels—more than 50% mortality—the mitigation bank manager, project manager, or appropriate RL responsible office should consider and identify ways and means to redress the deficiencies.

In the event that all or part of a mitigation area is lost due to actions or events under the control of RL, the mitigation bank manager, project manager, or appropriate responsible office within RL should plan and provide for replacement or repair of the mitigation area. In the event that all or part of a mitigation area is lost due to actions or events that are beyond RL control, such as wildfire, RL will not be responsible for replacement or repair of the mitigation areas.

7.7 Project-Specific Mitigation Action Plans

Unless a mitigation bank system is instituted that would relieve small projects of the planning requirements for mitigation implementation, individual projects must prepare project-specific MAPs that describe how the mitigation commitments for that project will be met. Even with an active mitigation bank, some larger projects and those with more comprehensive NEPA coverage, such as an EIS or mitigated environmental assessment (EA), may still require project specific MAPs. A project-specific MAP would not preclude cooperation with or participation in a mitigation bank.

It is not within the scope of BRMP to define specific commitments applicable to any project-specific MAP. Each project will be unique in the types and amounts of resources that need to be mitigated as well as physical and other constraints. Therefore, the project-specific MAP will state the particular mitigation commitments that DOE will make regarding that project. Although they can be issued for other reasons, project MAPS are usually prepared as part of the ROD for an EIS, a FONSI for an EA, or a CERCLA ROD.

MAPs are usually prepared to describe how a project's impacts will be mitigated and primarily discuss compensatory mitigation actions. However, in some cases, a project-specific MAP may function as a road map describing how project or programmatic impacts will be avoided or minimized. An example of this type is the MAP prepared for of the remedial action projects in the 100- and 600-Area Operable Units (DOE 2001b).

MAPS should provide information in the following areas:

- Summary of project
- Summary of impacts to be mitigated
- Specific mitigation goals and objectives
- Description of mitigation site(s)
- Description of mitigation actions
- Monitoring plan
- Performance standards and success criteria
- Site protection measures
- Maintenance activities
- Contingency actions if mitigation goals are not met
- Responsibilities
- Other mitigation needs, such as cultural resources or dust.

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9.0 Glossary

ABIOTIC: The non-living material components of the environment such as air, rocks, soil particles, and inorganic compounds.

ADAPTIVE MANAGEMENT: An approach to monitoring impacts and managing resources that involves three steps: 1) monitoring, 2) using the information gathered from monitoring to better understand the resources, and 3) modifying management practices based on the information gathered.

AQUATIC: Of or related to water.

AVOIDANCE: Mitigation actions that rely on elimination of all or part of a project, or changes to project timing, location, or structural modifications to completely avoid adverse impacts to biological resources. Avoidance is the first step in the mitigation hierarchy.

BANK CREDIT: Increased habitat value derived from habitat improvements on a mitigation banking site. Habitat improvements identified as mitigation banking credits are typically implemented before project impacts take place. Pre-existing habitat value does not count as credit.

BIOLOGICAL DIVERSITY (BIODIVERSITY): The variety of life and its processes, including the variety in genes, species, ecosystems, and the ecological processes that connect everything in ecosystems. As used in the BRMP, this definition specifically excludes artificial diversity (i.e., those biotic elements added through direct manipulation by humans).

BIOLOGICAL RESOURCE: A biological species, population, species assemblage, habitat, community, or ecosystem.

BIOTIC: Pertaining to any aspect of living components.

CANDIDATE SPECIES (FEDERAL): A species for which there is sufficient information on biological vulnerability and threat(s) to support issuance of a proposed rule to list it as endangered or threatened but issuance of the proposed rule is precluded (i.e., by other listing activity or lack of funding). (STATE): Wildlife species that are under review by the Washington Department of Fish and Wildlife for possible listing as endangered, threatened, or sensitive.

CATEGORICAL EXCLUSION: A category of actions as defined in DOE's NEPA implementing procedures (10 CFR 1021) for which neither an environmental assessment nor an environmental impact statement is normally required.

CENTRAL HANFORD: The Hanford Site excluding the Fitzner/Eberhardt Arid Lands Ecology Reserve and the areas north and east of the Columbia River.

COMPENSATORY MITIGATION: Amelioration of project impacts by replacing lost habitat value away from a project site. Can be accomplished by either habitat improvement or by acquisition and protection of substitute, high-quality resources. Compensation is the last step in the mitigation hierarchy.

CONSERVATION (LAND USE): An area reserved for the management and protection of archeological, cultural, ecological, and natural resources. Limited resource extraction or consumptive use is allowed.

CONSERVATION (RESOURCE MANAGEMENT GOAL): The protection and management of ecologically significant resources so as to maintain essential qualities, such as population size and viability for species, and block size, native species diversity, and habitat quality for landscape features. Maintenance of these essential qualities requires active management, but limited disturbance or consumptive use of these resources can occur without a significant degradation of the resource, provided that commensurate mitigating actions are performed.

CORRECTIVE ACTION (MITIGATION): Actions taken following the unsuccessful implementation of mitigation measures that ensure that project-specific mitigation objectives are met.

CULTURALLY SIGNIFICANT RESOURCE: A plant or animal of importance to local Native American tribes because of its use as food, medicine, fiber, or dye, or because of its spiritual significance.

ECOLOGICAL COMPLIANCE REVIEW: An assessment performed to determine the potential for a proposed project to adversely impact biological resources.

ECOREGION: A continuous geographic area in which the environmental complex, produced by climate, topography, and soil, is sufficiently uniform to develop characteristic potential major vegetative communities.

ECOSYSTEM: A complete interacting system of organisms and their environment <u>or</u> a naturally occurring, self-maintaining system of biotic and abiotic interacting parts that are self-organized into biophysical and social components and are linked to each other by exchanges of energy, matter, and information.

ECOSYSTEM MANAGEMENT: A process that integrates scientific knowledge of ecological relationships within a complex sociopolitical and values framework toward the general goal of protecting native ecosystem integrity over the long term.

ELEMENT: The basic unit of Washington's biologic and geologic environment identified as a needed component of a system of natural areas and defined in the (Washington Department of Natural Resources) Natural Heritage Plan. Elements can be plant communities, special species, wetlands, aquatic systems or geologic features. (The equivalent term "cells" is used by the federal Research Natural Area Program.)

ELEMENT OCCURRENCE: The actual on-the-ground example of an element. (Information about each occurrence is stored in the information system of the Natural Heritage Program.)

ENDANGERED SPECIES: Any species that is in danger of extinction throughout all or a significant portion of its range.

ENHANCEMENT: An improvement in the value of an existing habitat. Under U.S. Fish and Wildlife Service policy enhancement specifically refers to habitat improvements that are independent of mitigation commitments or waste site restoration actions.

FLOODPLAIN: The nearly level alluvial plain that borders a stream or river and is subject to inundation under flood-stage conditions unless protected artificially. It is usually a constructional landform built of sediment deposited during overflow and lateral migration of streams and rivers. As defined in Executive Order 11988, Floodplain Management, the floodplain of concern is the 100-yr floodplain.

GOAL: Desired condition to be achieved at some unspecified time in the future.

HABITAT: The combination of biotic and abiotic components that provides the ecological support system for plant or animal populations.

HABITAT AMENDMENT: Increasing habitat value by supplementing an area that already contains some of the desired habitat components with missing habitat components.

HABITAT IMPROVEMENT: An increase in habitat value through amendment, reclamation, or creation.

HABITAT SUITABILITY INDEX: An estimate, ranging from 0 to 1 of the utility of the habitat in a specific area to support an evaluation species. A value of 1 indicates optimal habitat, a value of 0 indicates that the area is unusable by the evaluation species.

HABITAT UNIT: The unit of currency in habitat evaluation procedures, which takes into account both the quality and quantity of habitat. Habitat Units = Quality (HSI value) x Quantity (area).

HABITAT VALUE: The suitability of an area to support selected animal and/or plant evaluation species.

HOME RANGE: The land area required for an animal species to survive and/or successfully reproduce.

IN-KIND MITIGATION: Replacement of lost habitat value with substitute resources that closely approximate that lost, so that populations of species associated with that habitat may remain relatively stable in the area over time.

INVENTORY: The process of collecting initial information concerning the occurrence and status of particular biological resources.

LANDSCAPE: A heterogeneous land area composed of a cluster of interacting ecosystems that are repeated in similar form throughout. Landscapes are the spatial matrix in which organisms, populations, communities, habitats, ecosystems, and the like are set.

LANDSCAPE SCALE: A scale of ecological evaluation that includes multiple habitats, ecosystems, and land uses.

LATE-SUCCESSIONAL SHRUB-STEPPE: Habitat characterized by a relatively constant plant species composition and by large shrubs (usually big sagebrush) whose canopy cover is relatively stable in the absence of a disturbance.

LEVELS OF CONCERN: A management approach used in BRMP that classifies Hanford's biological resources into six different levels (0 to 5) of management concern. Each level corresponds to a different set of management actions that are required to be taken in regard to the biological resources included for consideration at that level. At higher levels of concern (e.g., Level 5), the associated biological resources are considered of higher "value"; thus, the number of applicable management actions are greater and more restrictive.

MINIMIZATION: Mitigation actions that rely on changes to project timing, location, or structural modifications that minimize adverse impacts to biological resources. There may still be some residual adverse impacts to mitigable resources following minimization. Minimization is the second step in the mitigation hierarchy.

MITIGATION: A series of prioritized actions that when achieved in full ensures project impacts will result in no net loss of habitat value or wildlife populations. The sequence of mitigation actions proceeds from the highest to lowest priority as follows: (1) avoid the impact altogether, (2) minimize the impact, (3) rectify the impact by restoring the affected environment, and (4) compensate for the impact by replacing or providing substitute resources or environments. Mitigation actions are applicable for potential impacts to biological resources of concern as a result of proposed Hanford Site activities. The degree to which mitigation actions are conducted is commensurate with the value of the resource and the amount of impact to that resource.

MITIGATION ACTION PLAN (MAP): Document associated with a record of decision for an environmental impact statement or a finding of no significant impact for an environmental assessment for proposed actions that require mitigation that explains how mitigation commitments will be planned and implemented [see DOE's NEPA implementing procedures (10 CFR 1021.104 and 10 CFR 1021.331)].

MITIGATION AREA: Any area on site (mitigation via rectification) or offsite (mitigation via compensation) within which habitat improvements occur as part of a mitigation commitment. The offsite mitigation area must include locations where the habitat improvements occur and adjacent native habitat areas. The latter provides the relevant ecological context that enables the habitat improvements to effectively replace lost habitat value. An offsite mitigation area may include lands that are dedicated to a mitigation bank and post-impact compensation areas.

MITIGATION BANKING: Habitat improvement actions taken for the specific purpose of compensating for unavoidable losses before the impacts occur. Allows for a mitigation credit/debit system, and allows for compensatory actions for multiple projects to be coordinated.

MITIGATION (REPLACEMENT) RATIO: The ratio of the area over which mitigation measures are applied to the area receiving adverse impacts. The calculation of an appropriate ratio (and any adjustments made to the ratio because of time delays in accomplishing mitigation, etc.) ensures that the lost habitat value, and not simply the lost acreage, is replaced.

MITIGATION THRESHOLD LEVEL: The amount of habitat value reduction or potential species population impact that will trigger the requirements for rectification and/or compensatory mitigation.

MONITORING: The process of collecting information to evaluate if the objectives of a management plan are being realized, or if implementation is proceeding as planned. Specifically for mitigation: the collection of specific types of data to determine if the goals and objectives of project-specific mitigation or the mitigation bank are met.

MONITOR SPECIES (STATE): Washington Department of Fish and Wildlife term for animal taxa that are of potential concern but are not listed as sensitive, candidate, threatened, or endangered. Monitor species are not actively tracked by WDFW.

NATIVE: A species, plant community type, or habitat whose presence in an area is due to natural processes and not as a result of direct human manipulation. Native biotic elements and natural processes contribute to biological diversity.

NON-NATIVE: A species, plant community type, or habitat that has been introduced or modified as a result of human actions. Non-native biotic elements or human-dependent processes contribute to artificial diversity. Non-native species also may be referred to as introduced or exotic species.

OBJECTIVE: Measurable result to be achieved within a specified time period.

OFFSITE: Away from the project site and, unless otherwise specified, still within the Hanford Site boundary.

ONSITE: The location where project impacts to biological resources occur on the Hanford Site.

OUT-OF-KIND MITIGATION: Replacement of lost habitat value with substitute resources that are physically or biologically different from those lost.

PLANT COMMUNITY: All the plant populations occurring in a shared habitat or environment.

PRESERVATION (LAND USE): An area managed for the preservation of archeological, cultural, ecological, and natural resources. No new consumptive uses are allowed.

PRESERVATION (RESOURCE MANAGEMENT GOAL): The protection and management of ecologically significant resources so as to protect essential qualities such as population size and viability for species, and the block size, native species diversity, and habitat quality for landscape features. Any loss of these resources, even with mitigation, will result in a long-term degradation of the resource and will reduce the overall biological integrity of the Hanford Site.

PRIORITY HABITAT: A habitat designated by the Washington Department of Fish and Wildlife as having unique or significant value to many wildlife species. A priority habitat may be described by a unique vegetation type, dominant plant species of primary importance to fish and wildlife, successional stage, or specific habitat element (e.g., talus slopes) that is of key value to fish and wildlife.

PRIORITY SPECIES: Wildlife species designated by the Washington Department of Fish and Wildlife that require protective measures and/or management guidelines to ensure their perpetuation. Criteria for designating a species as priority are: (1) listed and candidate species, (2) vulnerable aggregations, and (3) species of recreational, commercial, and/or tribal importance.

PRODUCTIVITY: The amount of energy or biomass accumulated by an individual, population, or community during a specific time period.

PROPOSED SPECIES (FEDERAL): A species that is the subject of a formal rule, published in the Federal Register, proposing that listing the species as threatened or endangered under the Endangered Species Act is warranted.

RECORD OF DECISION (ROD): Decision document for a NEPA or CERCLA action that describes an agency's proposed action and identifies any mitigation (and/or restoration) actions that the agency is committing to conduct.

RECTIFICATION: Amelioration of project impacts by replacing lost habitat value at the project site. Rectification is the third step in the mitigation hierarchy.

REMEDIATION (WASTE SITE): Actions taken at a past-practice waste site to remove or isolate physical, chemical, or radiological hazards.

REPLACEMENT UNIT: The amount of habitat improvement, per resource type and per unit area, that is necessary to achieve the mitigation goal.

RESTORATION (INDIVIDUAL SITE): Actions taken to create habitat value at a past-practice waste site subsequent to the completion of remediation or at a non-contaminated, but human-impacted site (e.g., industrial area, road, etc.), subsequent to decommissioning or end of use. The degree to which habitat values are restored depends on the future land use of the site and the restoration goal.

RESTORATION (SITE-WIDE): Actions taken to replace habitat value and ecological function within the context of a broad geographic area to account for past losses of value and function attributable to human-induced impacts.

RIPARIAN: Generally relating to the transition zone between aquatic (specifically flowing water) and terrestrial ecosystems within which plants are dependent on a perpetual source of water.

SENSITIVE SPECIES (STATE): A species native to the state of Washington that is vulnerable or declining and likely to become endangered or threatened without active management or the removal of threats.

SHRUB-STEPPE: Plant communities consisting of one or more layers of perennial grass with a conspicuous but discontinuous overstory layer of shrubs. Communities with dominant shrubs such as bitterbrush (*Purshia tridentata*), big sagebrush (*Artemisia tridentata*), and threetip sagebrush (*A. tripartita*) illustrate shrub-steppe physiognomy in Washington.

SPECIES OF CONCERN: Narrowly defined—A species of concern is a species that a federal or state agency has identified via law, regulation, or policy as deserving management attention; that is, any federal endangered, threatened, proposed, or candidate species, any species covered under the Migratory Bird Treaty Act, any additional species identified as endangered, threatened, sensitive, or monitor in Washington State, plus any additional species identified by the Washington Department of Fish and Wildlife as a Priority Species. Broadly defined—A species of concern is any species identified in the BRMP that is assigned to a specific resource level of concern.

STEPPE: In contrast to a desert, has moisture relations adequate to support an appreciable cover of perennial grasses on zonal soils (i.e., deep loams on gentle upland slopes), yet not enough to support arborescent vegetation (i.e., trees).

THREATENED SPECIES: Any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

TERRESTRIAL: pertaining to the land.

WETLANDS: Areas that under normal circumstances have hydrophytic vegetation, hydric soils, and wetland hydrology.

APPENDIX A

Federal and State Listed Species

Table A.1. Federal and Washington State Listed Endangered, Threatened, Sensitive, and Candidate Species Occurring or Potentially Occurring on the Hanford Site

Common Name	Scientific Name	Federal Status[a]	State Status[a]
Plants			
awned halfchaff sedge	*Lipocarpha (= Hemicarpha) aristulata*		Threatened
beaked spike-rush	*Eleocharis rostellata*		Sensitive
Canadian St. John's wort	*Hypericum majus*		Sensitive
chaffweed	*Anagallis (= Centunculus) minima*		Sensitive
Columbia milkvetch	*Astragalus columbianus*	Species of concern	Sensitive
Columbia yellowcress	*Rorippa columbiae*	Species of concern	Endangered
coyote tobacco	*Nicotiana attenuata*		Sensitive
desert cryptantha	*Cryptantha scoparia*		Sensitive
desert dodder	*Cuscuta denticulata*		Threatened
desert evening-primrose	*Oenothera caespitosa*		Sensitive
dwarf evening primrose	*Camissonia (= Oenothera) pygmaea*		Sensitive
fuzzytongue penstemon	*Penstemon eriantherus whitedii*		Sensitive
Geyer's milkvetch	*Astragalus geyeri*		Threatened
grand redstem	*Ammannia robusta*		Threatened
gray cryptantha	*Cryptantha leucophaea*	Species of concern	Sensitive
Great Basin gilia	*Aliciella (= Gilia) leptomeria*		Threatened
hedgehog cactus	*Pediocactus nigrispinus (=P. simpsonii var. robustior)*		Sensitive
Hoover's desert parsley	*Lomatium tuberosum*	Species of concern	Sensitive
loeflingia	*Loeflingia squarrosa var. squarrosa*		Threatened
lowland toothcup	*Rotala ramosior*		Threatened
Piper's daisy	*Erigeron piperianus*		Sensitive
rosy pussypaws	*Cistanthe (= Calyptridium) rosea*		Threatened
small-flowered evening-primrose	*Camissonia (= Oenothera) minor*		Sensitive
Snake River cryptantha	*Cryptantha spiculifera (= C. interrupta)*		Sensitive
Suksdorf's monkey flower	*Mimulus suksdorfii*		Sensitive
Umtanum desert buckwheat	*Eriogonum codium*	Proposed Threatened	Endangered
White Bluffs bladderpod	*Physaria (= Lesquerella) tuplashensis*	Proposed Threatened	Threatened
white eatonella	*Eatonella nivea*		Threatened
Mollusks			
California floater	*Anodonta californiensis*	Species of concern	Candidate
great Columbia River spire snail	*Fluminicola columbiana*	Species of concern	Candidate
shortfaced lanx	*Fisherola nuttalli*		Candidate
Insects			
Columbia River tiger beetle[b]	*Cicindela columbica*		Candidate
silver-bordered fritillary	*Boloria selene atrocostalis*		Candidate
Fish			
bull trout[c]	*Salvelinus confluentus*	Threatened	Candidate
leopard dace[c]	*Rhinichthys falcatus*		Candidate
mountain sucker[c]	*Catastomus platyrhynchus*		Candidate
river lamprey[c]	*Lampetra ayresi*	Species of concern	Candidate
spring-run Chinook salmon	*Oncorhynchus tshawytscha*	Endangered	Candidate
steelhead	*Oncorhynchus mykiss*	Threatened	Candidate
Amphibians and Reptiles			
sagebrush lizard	*Sceloporus graciosus*	Species of concern	Candidate
striped whipsnake	*Masticophis taeniatus*		Candidate
western toad	*Anaxyrus boreas*	Species of concern	Candidate

Table A.1 (Continued). Federal and Washington State Listed Endangered, Threatened, Sensitive, and Candidate Species Occurring or Potentially Occurring on the Hanford Site

Common Name	Scientific Name	Federal Status[a]	State Status[a]
Birds			
American white pelican	*Pelecanus erythrorhynchos*		Endangered
bald eagle	*Haliaeetus leucocephalus*	Species of concern	Sensitive
burrowing owl	*Athene cunicularia*	Species of concern	Candidate
Clark's grebe	*Aechmophorus clarkii*		Candidate
common loon	*Gavia immer*		Sensitive
ferruginous hawk	*Buteo regalis*	Species of concern	Threatened
flammulated owl[c]	*Otus flammeolus*		Candidate
golden eagle	*Aquila chrysaetos*		Candidate
greater sage grouse	*Centrocercus urophasianus*	Candidate	Threatened
Lewis's woodpecker[c]	*Melanerpes lewis*		Candidate
loggerhead shrike	*Lanius ludovicianus*	Species of concern	Candidate
northern goshawk[c]	*Accipter gentilis*	Species of concern	Candidate
olive-sided flycatcher	*Contopus cooperi*	Species of concern	
peregrine falcon	*Falco peregrinus*	Species of concern	Sensitive
sage sparrow	*Amphispiza belli*		Candidate
sage thrasher	*Oreoscoptes montanus*		Candidate
sandhill crane	*Grus canadensis*		Endangered
western grebe	*Aechmophorus occidentalis*		Candidate
Mammals			
black-tailed jackrabbit	*Lepus californicus*		Candidate
Merriam's shrew	*Sorex merriami*		Candidate
Townsend's ground squirrel	*Urocitellus townsendii*	Species of concern	Candidate
Washington ground squirrel[c]	*Urocitellus washingtoni*	Candidate	Candidate
white-tailed jackrabbit	*Lepus townsendii*		Candidate

(a) Endangered - Species in danger of extinction within all or a significant portion of its range.

Threatened - Species likely to become endangered in the foreseeable future.

Candidate - Species that are believed to qualify for threatened or endangered species status, but for which listing proposals have not been prepared.

Sensitive - Taxa that are vulnerable or declining and could become endangered or threatened without active management or removal of threats.

Species of concern - Species that are not currently listed or candidates under the *Endangered Species Act of 1973*, but are of conservation concern within specific U.S. Fish and Wildlife Service regions.

(b) Probable, but not observed, on the Hanford Site.

(c) Reported, but seldom observed, on the Hanford Site.

Table A.2. Washington State Monitored Wildlife Species Occurring or Potentially Occurring on Hanford

Common Name	Scientific Name	Common Name	Scientific Name
Birds		**Fish**	
Arctic tern[a]	*Sterna paradisaea*	Pacific lamprey[b]	*Lampetra tridentata*
ash-throated flycatcher[a]	*Myiarchus cinerascens*	piute sculpin	*Cottus beldingi*
black tern[a]	*Chlidonias niger*	reticulate sculpin	*Cottus perplexus*
black-crowned night-heron	*Nycticorax nycticorax*	sand roller	*Percopsis transmontana*
black-necked stilt	*Himantopus mexicanus*		
bobolink[a]	*Dolichonyx oryzivorus*	**Amphibians and Reptiles**	
Caspian tern	*Sterna caspia*	night snake	*Hypsiglena torquata*
Forster's tern	*Sterna forsteri*	racer	*Coluber constrictor*
grasshopper sparrow	*Ammodramus savannarum*	short-horned lizard	*Phrynosoma douglasii*
gray flycatcher	*Empidonax wrightii*	Tiger salamander	*Ambystoma tigrinum*
great blue heron	*Ardea herodias*	Woodhouse's toad	*Anaxyrus woodhousii*
great egret	*Ardea alba*		
gyrfalcon[a]	*Falco rusticolus*		
horned grebe	*Podiceps auritus*	**Mollusks**	
lesser goldfinch	*Spinus psaltria*	Oregon floater	*Anodonta oregonensis*
long-billed curlew	*Numenius americanus*	western floater	*Anodonta kennerlyi*
osprey	*Pandion haliaetus*	western pearlshell	*Margaritifera falcata*
prairie falcon	*Falco mexicanus*		
red-necked grebe[a]	*Podiceps grisegena*		
snowy owl	*Nyctea scandiaca*	**Mammals**	
Swainson's hawk	*Buteo swainsoni*	badger	*Taxidea taxus*
turkey vulture[a]	*Cathartes aura*	long-legged myotis[b]	*Myotis volans*
western bluebird	*Sialia mexicana*	northern grasshopper mouse	*Onychomys leucogaster*
Insects		pallid bat	*Antrozous pallidus*
Bonneville skipper	*Ochlodes sylvanoides bonnevilla*	sagebrush vole	*Lemmiscus curtatus*
juba skipper	*Hesperia juba*	small-footed myotis[b]	*Myotis ciliolabrum*
Nevada skipper	*Hesperia nevada*	western pipistrelle	*Parastrellus hesperus*
Pasco pearl	*Phyciodes tharos pascoensis*		
Persius' duskywing	*Erynnis persius*		
purplish copper	*Lycaena helloides*		
ruddy copper	*Lycaena rubida perkinsorum*		
viceroy	*Limenitis archippus lahontani*		

(a) Reported, but seldom observed on the Hanford Site.
(b) Federal species of concern.

Table A.3. Washington State Review and Watch List Plant Species Potentially Found on the Hanford Site

Common Name	Scientific Name	State Listing[a]
annual paintbrush	*Castilleja exilis*	Watch list
annual sandwort	*Minuartia pusilla var. pusilla*	Review Group 1
basalt milkvetch	*Astragalus conjunctus var. rickardii*	Watch list
bristly combseed	*Pectocarya setosa*	Watch list
Columbia River mugwort	*Artemisia lindleyana*	Watch list
crouching milkvetch	*Astragalus succumbens*	Watch list
false pimpernel	*Lindernia dubia var. anagallidea*	Watch list
giant helleborine	*Epipactis gigantea*	Watch list
Kittitas larkspur	*Delphinium multiplex*	Watch list
medic milkvetch	*Astragalus speirocarpus*	Watch list
pigmy-weed	*Crassula aquatica*	Watch list
porcupine sedge	*Carex hystericina*	Watch list
Robinson's onion	*Allium robinsonii*	Watch list
rosy balsamroot	*Balsamorhiza rosea*	Watch list
scilla onion	*Allium scilloides*	Watch list
shining flatsedge	*Cyperus bipartitus (=C. rivularis)*	Watch list
Shy gily-flower	*Gilia inconspicua*	Review Group 1
small-flowered nama	*Nama densum var. parviflorum*	Watch list
smooth cliffbrake	*Pellaea glabella simplex*	Watch list
Smooth willowherb	*Epilobium pymaeum*	Review Group 1
southern mudwort	*Limosella acaulis*	Watch list
stalked-pod milkvetch	*Astragalus sclerocarpus*	Watch list
vanilla grass	*Hierchloe odorata (= Anthoxanthum hirtum)*	Review Group 1
winged combseed	*Pectocarya penicillata*	Watch list

(a) Review Group 1 - Taxa for which currently there are insufficient data available to support listing as threatened, endangered, or sensitive.
Watch list - Taxa that are more abundant and/or less threatened than previously assumed.

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APPENDIX B

Attributes Used to Create Level of Concern Maps

Attributes Used to Create Resource Level Maps

The resource level maps provided in Figures 5.2 through 5.8 were constructed using data and information provided elsewhere in the document in the text or in resource-specific maps. The following resources are included in the resource level maps.

Level 5 Resources (Figure 5.2)

A) Level 5 Plants and Animals
    a. Fall Chinook spawning areas (Figure 5.9)
    b. Umtanum Desert Buckwheat and White Bluffs Bladderpod populations and critical habitat (From Figure 4.10)

B) Plant Community Element Occurrences (Figure 4.9)

C) Rare Habitats (Figure 4.8 except non-riverine wetlands)

Level 4 Resources (Figure 5.3)

A) Level 4 Plants and Animals
    a. State Threatened or endangered plants (from Figure 4.10)
    b. Bald Eagle roost buffers (Figure 5.10)
    c. Ferruginous hawk nest buffers (Figure 5.11)

B) High quality, mature shrub steppe as determined by application of a sage sparrow habitat quality model (Duberstein et al 2008) to be high quality sage sparrow habitat.

C) Vegetation Cover Types from Figure 4.6:
    a. Big Sagebrush - Bitterbrush/Bunchgrass Mosaic
    b. Big Sagebrush - Bitterbrush/Sandberg's Bluegrass
    c. Big Sagebrush - Rigid Sagebrush/Bunchgrass Mosaic
    d. Big Sagebrush - Spiny Hopsage/Bunchgrass Mosaic
    e. Big Sagebrush/Bluebunch Wheatgrass - Sandberg's Bluegrass
    f. Big Sagebrush/Bunchgrass Mosaic
    g. Bitterbrush/Bunchgrass Mosaic
    h. Black Greasewood/Alkali Saltgrass
    i. Non-Vegetated Sand - Bluffs - Talus
    j. Rigid Sagebrush/Sandberg's Bluegrass
    k. Riparian/Wetland/Aquatic Habitats

l. Threetip Sagebrush/Bunchgrass Mosaic

m. Thymeleaf Buckwheat/Sandberg's Bluegrass

n. Winterfat/Bunchgrass Mosaic

Level 3 Resources (Figure 5.4)

A) Level 3 Plants and Animals

  a. State Sensitive Plant Species (from Figure 4.10)

  b. Burrowing owl nest buffers(Figure 5.12)

B) Conservation corridors

  a. 1/4 mile buffer of Columbia River

  b. A Sagebrush Steppe corridor running generally from McGee Riverland east through Gable Butte and Gable Mountain to the Columbia River, then south through the Hanford Dunes, then south-west to Highway 240.

C) Vegetation Cover Types from Figure 4.6

  a. Big Sagebrush - Spiny Hopsage/Sandberg's Bluegrass - Cheatgrass

  b. Big Sagebrush/Sandberg's Bluegrass - Cheatgrass

  c. Bitterbrush/Sandberg's Bluegrass - Cheatgrass

  d. Bluebunch Wheatgrass - Sandberg's Bluegrass

  e. Bunchgrass Mosaic

  f. Purple Sage/Sandberg's Bluegrass - Cheatgrass

  g. Rabbitbrush/Bunchgrass Mosaic

  h. Sand Dropseed - Sandberg's Bluegrass - Cheatgrass

  i. Sandberg's Bluegrass

  j. Snow Buckwheat/Bunchgrass Mosaic

  k. Spiny Hopsage/Sandberg's Bluegrass - Cheatgrass

Level 2 Resources (Figure 5.5)

A) Vegetation Cover Types from Figure 4.6

  a. Sandberg's bluegrass – Cheatgrass (except abandoned agricultural fields)

  b. Snow buckwheat / Sandberg's bluegrass-Cheatgrass

  c. Rabbitbrush / Sandberg's bluegrass - Cheatgrass

Level 1 Resources (Figure 5.6)

A) Abandoned agricultural fields (part of Sandberg's bluegrass – Cheatgrass in Figure 4.6)

B) Active agriculture (part of highly disturbed in Figure 4.6)

C) Crested wheatgrass – Sandberg's bluegrass – Cheatgrass stands (Figure 4.6)

D) Exotic weed stands (part of highly disturbed in Figure 4.6)

Level 0 Resources (Figure 5.7)

A) Highly disturbed areas (gravel, industrial, non-vegetated) (Figure 4.6 Highly disturbed except vegetation types listed in Level 1 above)

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Revision 2

Hanford Site Biological Resources Management Plan

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

U.S. DEPARTMENT OF ENERGY | Richland Operations Office

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Executive Summary

Resource stewardship is an integral part of U.S. Department of Energy (DOE) responsibilities at the Hanford Site. Appropriate management strategies and actions, based on the best scientific information available, are important components of stewardship and land-use planning at the site. The *Hanford Site Biological Resources Management Plan* (BRMP) is DOE's primary implementation plan for managing natural resources under the *Hanford Comprehensive Land-Use Plan* (CLUP).

The CLUP, which is described in the *Final Hanford Comprehensive Land-Use Plan Environmental Impact Statement* (HCP-EIS; DOE 1999) and defined in the Record of Decision (ROD; 64 FR 61615), consists of a land-use map, land-use designations, land-use policies, and a set of procedures for plan implementation. The CLUP land-use policies that direct land-use actions and help ensure individual land-use actions collectively advance the CLUP's goals and objectives over time. BRMP is one of several implementation plans under the framework of the CLUP. Each addresses unique resources and key activities that, together, provide a comprehensive approach for managing land and facilities at the Hanford Site.

S.1. Introduction

The Hanford BRMP establishes DOE's management objectives, strategies, actions, and general directives for managing biological resources on the Hanford Site. The purpose of BRMP is to provide the Richland Operations Office (RL), the Office of River Protection (ORP), Hanford contractors, and other organizations conducting work on the Hanford Site with a consistent approach to protect and manage biological resources on the site. Essential aspects of Hanford biological resource management include resource monitoring, impact assessment, mitigation, and restoration. The BRMP's overarching goals are to:

- Foster preservation of important biological resources.
- Minimize adverse impacts to biological resources from site development and other management activities.
- Balance the site cleanup mission with resource stewardship obligations.

This document applies to all actions that occur on Hanford Site lands managed by DOE, including central Hanford and the portions of the Hanford Reach National Monument (HRNM) currently managed by RL.

S.2. Roles and Responsibilities

RL is responsible for administering and implementing BRMP for the Hanford Site. The RL and ORP site managers are ultimately responsible for the site's natural resources, but each program manager and assistant manager within RL and ORP is responsible for adhering to the resource management policies described in this document. The RL Site Stewardship Division (SSD) is responsible for defining Hanford's approach to biological resource management and will assist other RL and ORP programs, contractors, and other organizations conducting work on the Hanford Site with interpretation of these guidelines. The SSD oversees monitoring and impact assessment support and tracks performance of mitigation actions.

Portions of the Hanford Site were declared part of the HRNM in 2000 by Presidential Proclamation 7319, "Establishment of the Hanford Reach National Monument," for their ecological, cultural, and geological values. The U.S. Fish and Wildlife Service (USFWS) manages portions of the HRNM and islands in the Hanford Reach as part of the Mid-Columbia River National Wildlife Refuge Complex through the *Hanford Reach National Monument Comprehensive Conservation Plan and Environmental Impact Statement* (HRNM-CCP).

Under existing DOE permits, the USFWS is responsible for protecting and managing HRNM resources and access to HRNM lands under its control. Because DOE is currently the underlying landholder, it retains approval authority over certain management aspects of the monument that could affect DOE operations such as safety or security buffers, access to and operation of research sites, or seismic, meteorological, or environmental monitoring sites.

All contractors and subcontractors, and any other entity performing work on Hanford lands managed by DOE, will conduct work in accordance with this management plan, as established by the CLUP implementing procedures. Each contractor is responsible for incorporating biological resource protection measures into project planning, requesting ecological compliance reviews for its activities, and implementing mitigation actions for any project for which it is responsible. Unless otherwise controlled by legal or contractual requirements, BRMP also applies to lands under lease, permit, or easement.

S.3. Regulatory Basis

The Hanford BRMP was developed to support DOE compliance with applicable federal laws, regulations, Executive Orders, and DOE Orders. Key federal acts and Executive Orders that are relevant to biological resource management include the following:

- Endangered Species Act of 1973 (ESA)
- National Environmental Policy Act of 1969 (NEPA)
- Migratory Bird Treaty Act of 1918 (MBTA)
- Bald and Golden Eagle Protection Act
- Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA)
- Resource Conservation and Recovery Act of 1976 (RCRA)
- Clean Water Act of 1977 (CWA)
- Sikes Act
- Magnuson-Stevens Fishery Conservation and Management Act of 1976
- Executive Order 13112, "Invasive Species"
- Executive Order 11990, "Protection of Wetlands"
- Executive Order 11988, "Floodplain Management"
- Presidential Memorandum of June 20, 2014, "Creating a Federal Strategy to Promote the Health of Honey Bees and Other Pollinators"
- Presidential Proclamation 7319, "Establishment of the Hanford Reach National Monument"
- DOE Order 430.1C "Real Property Asset Management" (August 19, 2016).

BRMP also considers applicable Washington State regulations, especially those regarding fish and wildlife management and noxious weed control.

S.4. Hanford's Biological Resources

The Hanford Site lies within the interior, low elevation, Columbia River Basin, which is within the shrub-steppe zone. The diversity of physical features across the Hanford Site contributes to a corresponding diversity of biological communities. The majority of the Hanford Site consists of shrub-steppe habitats, but valuable riparian, wetland, and aquatic habitats are associated with the Hanford Reach of the Columbia River.

The Hanford Site also contains a diversity of other rare terrestrial habitats such as riverine islands, bluffs/cliffs, basalt outcrops, swales, and sand dunes. Both shrub-steppe and riparian habitats are considered "priority habitats" by the Washington Department of Fish and Wildlife (WDFW). In addition, Washington's Natural Heritage Program (WNHP) has mapped and classified portions of the native plant communities found on Hanford as priority ecosystems.

The Hanford Site is home to at least 46 species of mammals, 10 species of reptiles, 5 species of amphibians, over 200 species of birds, well over 1000 species of insects and invertebrates, and approximately 700 species of plants. There have been 46 fish species identified in the Hanford Reach, as well as numerous insects, crayfish, and mollusks. Many of these species are considered to be rare or of special concern to federal or state resource management agencies.

The Columbia River is designated as critical habitat for three federal endangered or threatened fish species (Upper Columbia River spring Chinook, Upper Columbia River steelhead, and bull trout), and two federal threatened terrestrial plant species (Umtanum desert buckwheat and White Bluffs bladderpod) are found on the Hanford Site. In addition to these species, the WNHP lists approximately 25 plant species as endangered, threatened, or sensitive. The WDFW lists 29 wildlife species as threatened, endangered, sensitive, or candidate. Also, approximately 23 plant species and 51 species of wildlife are listed as state monitor, review, or watch list.

S.5. Resource Management Approach and Implementation

The primary goals in managing Hanford's species, habitats, and ecosystem resources are to maintain sustainable population levels of terrestrial and aquatic resident species and maintain or increase the quantity and quality of functioning native systems across the Hanford Site.

The overarching objective of BRMP is to provide strategies and management actions necessary to sustain Hanford's biological resources. Specific DOE resource management objectives for Hanford are to:

- Protect species and habitats of state and federal concern
- Maintain and preserve native biological diversity
- Reduce the spread of invasive species and provide integrated control of noxious weeds
- Where and when feasible, improve degraded habitats in a strategic manner

to increase landscape connectivity and native diversity

- Reduce and minimize fragmentation of habitats
- Maintain landscapes that provide regional connectivity to habitats surrounding Hanford.

To meet these objectives, BRMP provides a set of general directives for Hanford Site operations; places all site biological resources into six resource priority levels, with accompanying management guidance; and for certain species or resources, provides specific management guidance based on federal and/or state recommendations.

S.5.1. General Directives and Practices

DOE developed the following general directives and practices for biological resource management at the Hanford Site. They apply to all actions occurring within portions of the site managed by DOE, including the areas of the HRNM that DOE manages.

- All actions and activities that potentially affect biological resources require an ecological compliance review and determination of potential impacts before proceeding. This directive not only applies to ground-breaking disturbances and excavation, but also to any treatments or actions that alter the current natural state of the environment, habitat, or a species population, including mowing, prescribed burning, herbicide application in native vegetation, and creating excessive noise. The ecological review process is a component of early project planning.
- If an ecological compliance review determines adverse impacts to biological resources—such as habitat alterations or disturbances that could affect the reproductive success of a species of concern—specific mitigation actions will be identified, and the mitigation actions—avoidance, minimization, or compensation—will be implemented by the responsible contractor.
- All entities conducting work on the Hanford Site will conduct activities and work in accordance with access restrictions and administrative designations related to resource protection areas, including the following:
  - Areas containing rare plant communities (element occurrences)
  - Mitigation/restoration areas
  - Collection/propagation areas for native plant materials
  - Lands used under permit and leased properties
  - Administrative control areas for species of concern which include bald eagle buffer zones, fall Chinook salmon spawning locations, ferruginous hawk and burrowing owl buffer zones, and known populations/ occurrences of plant species of concern.
- Activities that increase habitat fragmentation and degrade existing native habitats will be avoided as practical. New facilities should be located within previously disturbed areas; new linear infrastructure development should be co-located with

existing roads or corridors to minimize habitat fragmentation.

- No vehicles are permitted off established roads on the Hanford Site unless specifically approved by RL's SSD and the Hanford Fire Department, unless required by an emergency situation.
- Actions that remove or significantly degrade native vegetation will require replanting with native species in areas not needed for on-going operations following the practices outlined in DOE/RL-2011-116, *Hanford Site Revegetation Manual.*
- Plant material used for habitat improvements or habitat restoration should be native to the Hanford Site and preferably should be of locally derived genetic stock.
- Domestic livestock grazing is not allowed on Hanford lands.
- No recreational hunting, fishing, or trapping is allowed on Hanford Site lands managed by DOE.
- No agriculture is allowed on lands managed by DOE.

This guidance must be followed unless its application is waived for a certain circumstance by the appropriate site manager for either RL or ORP.

S.5.2. Fire Management

The overall wildfire management policy for the Hanford Site is to minimize the potential for human-caused fires and to aggressively fight wildfires. The following paragraphs describe specific elements of this policy.

To the greatest extent possible during a wildfire, fire suppression and control actions will be conducted to protect existing stands of late successional shrub-steppe, and to avoid direct surface disturbance within late successional shrub-steppe areas, plant community element occurrence areas, and other rare or sensitive habitat areas. To the extent practical during a firefighting effort, the Fire Department incident commander should coordinate or consult with the site natural resource subject matter experts.

Any temporary firebreaks constructed during fire fighting should be re-contoured and reseeded with locally derived native plant species as described in the *Hanford Site Revegetation Manual* (DOE 2013a).

Replanting of areas burned by wildfire will be considered on a case-by-case basis depending on the site, pre-existing plant community, characteristics of the wildfire, level of damage sustained by native vegetation, and likelihood that the burned area will further degrade if restoration actions are not performed. If performed, locally derived native species should be planted.

Preventative fire control will include installation and maintenance of a system of permanent fire breaks. These will use existing roads, rail lines, and utility corridors to the extent practicable. Installation and maintenance of these fire breaks will be conducted in a manner that minimizes adverse impacts to biological resources.

Controlled burning of accumulations of dry plant material, particularly along roadways, is conducted to remove sources of fuel that could provide a mechanism for rapidly accelerating uncontrolled burns.

S.5.3. Noxious Weed Management

Noxious weeds are controlled on the Hanford Site for regulatory compliance with the *Federal Noxious Weed Act of 1974* as amended in 1990 and by the Washington Administrative Code (WAC) 16-750, *Washington State Noxious Weed List and Schedule of Monetary Penalties,* to prevent adverse impacts to neighboring agricultural operators, keep deep-rooted vegetation from invading Hanford waste sites, and protect native communities from further degradation. The goal of noxious weed management on the Hanford Site is to eliminate existing populations of noxious weeds and prevent new populations from becoming established.

Implementation of noxious weed management, especially in less disturbed areas, must meet other biological resource management requirements, such as evaluating the presence of rare species and unique habitats, avoiding and minimizing impacts, and mitigating habitats as applicable. The need for active reestablishment of desirable vegetation is recognized as a critical component of successful long-term control of noxious weeds and other undesirable vegetation.

S.5.4. Resource Priority Levels

To help facilitate and standardize management of resources, all species and habitats on the Hanford Site have been assigned resource priority levels that range from Level 5 (highest priority) to Level 0 (lowest priority). This hierarchical approach allows biological resources to be prioritized and appropriate actions—protection, monitoring, impact assessment, mitigation, and restoration—taken based on the type and relative ecological value of the resource. The following paragraphs describe the priority levels:

- Level 5 resources include species that are listed or proposed-to-be listed under the ESA and their critical habitat, as well as rare and irreplaceable habitats. The management goal for this level is preservation, and a high level of status monitoring is appropriate. Impacts to Level 5 resources should be avoided, and compensatory mitigation will be determined on a case-by-case basis.
- Level 4 resources include federal candidate species; Washington State threatened or endangered species; habitat or exclusion buffers for federal candidates and Washington State threatened or endangered species; high-quality mature shrub-steppe; wetlands, swales, and riparian areas; and buffer areas for bald eagles and ferruginous hawks. The management goal for this level is preservation, with a high level of status monitoring. Avoidance and minimization of impacts is expected, but if required, habitat compensation will be at an area ratio of 5:1.
- Level 3 resources include Washington State sensitive, candidate, and review species; WDFW priority species; lower quality mature shrub-steppe—such as shrub stands that are less mature, have lower shrub density or canopy cover, and/or a greater proportion of cheatgrass in the understory than stands that qualify for Level 4. Level 3 also includes high-quality grasslands, conservation corridors, snake hibernacula, bat roosts, rookeries, burrowing owl buffer areas, and areas

with significant quantities of culturally important species. The management goal for Level 3 is conservation, with a moderate level of status monitoring. Impacts should be avoided or minimized if practical and, if needed, compensatory mitigation will be at a ratio of 3:1.

- Level 2 resources include migratory birds, state watch list plants and monitor list animals, recreationally and commercially important species, and lower quality steppe and shrub-steppe. The management goal is conservation, with a low level of status monitoring. Impacts should be avoided if possible, and compensation may be at a ratio of 1:1. However, Level 2 habitat areas may often be good areas to perform actions to mitigate for impacts to higher-level habitat resources.
- Level 1 resources include individual common native plant and wildlife species, upland stands of non-native plants, and abandoned agricultural fields. Impacts should be avoided or minimized if possible, but there are no compensation requirements for impacts to Level 1 resources.
- Level 0 resources consist of non-native plants and animals (unless otherwise listed at a higher level), non-vegetated areas, and industrial areas. Management goals and actions are limited to those needed for regulatory compliance, such as the MBTA.

S.5.5. Species-Specific Management Guidance

Management of most species on the Hanford Site will be based on the general guidance provided above for the six resource priority levels. However, specific management policies and guidance have been developed for certain species that have additional legal protections, require management actions beyond habitat protection, are unusually sensitive to human disturbance, or are resources of special interest to the public or the local Tribes.

Specific management guidance, based on federal or state resource management agency recommendations, is provided for federally listed spring Chinook salmon, steelhead, and bull trout. Specific guidance also is provided for fall Chinook salmon, bald eagles, ferruginous hawks, burrowing owls, greater sage grouse, peregrine falcons, American white pelicans, ground squirrels, bat roosts, rookeries, snake hibernacula, and federal- or state-listed rare plants.

S.6. Ecological Compliance Assessment

The Hanford Site ecological compliance assessment process incorporates evaluating potential impacts to biological resources before they occur and mitigating adverse impacts if they do occur. This process provides an essential link between DOE's responsibility to protect biological resources and its site missions, including remediation and waste management.

As noted, all actions with the potential to affect biological resources require an ecological compliance review (ECR). This includes actions previously considered under CERCLA, RCRA, and/or NEPA. Specific examples of proposed actions that require an ECR include those that:

- Require an excavation permit

- Remove or modify dead or living vegetative cover
- Will be conducted on the outside of buildings and facilities
- Will be conducted within abandoned buildings and facilities
- Have the potential to alter or affect the living environment, including landscape-scale practices such as applications of fertilizers, herbicides, prescribed fire, or fire recovery efforts.

An ECR is conducted to ensure the proposed action will not affect rare plants or animals, or adversely affect habitats of concern. The review will normally require a site-specific field survey by a qualified biologist, and also may draw on records from previous surveys, maps, photos, and the scientific literature.

If the proposed action will adversely affect rare species or habitats, the ECR will include provisions for mitigation of the impacts, commensurate with the resource priority level of the species or habitat. All projects and programs are expected to comply with the requirements identified in the ECR. This may include recommendations to avoid and/or minimize adverse impacts to ecological resources by taking the following actions:

- Implementing alternatives that would result in fewer adverse impacts
- Locating projects at a less ecologically sensitive site
- Reducing or modifying the project footprint
- Scheduling project activities so disruption of key species and functions is minimized.

In unusual cases when significant impacts cannot be reasonably avoided or minimized, the ECR will provide recommendations for compensatory mitigation based on the floral and faunal characteristics of the habitat that will be disturbed.

S.7. Biological Resource Mitigation

Mitigation is a series of prioritized actions that reduce or eliminate adverse impacts to biological resources, including avoidance, minimization, onsite rectification, and compensation. Avoidance and minimization are always preferable to rectification and compensation, and should always be considered and implemented first. To facilitate a balance between Hanford Site mission elements and stewardship obligations, the BRMP mitigation strategy is intended to:

- Divert impacts away from higher priority resources and toward lower priority resources.
- Ensure consistent and effective implementation of mitigation recommendations and requirements.
- Ensure that mitigation measures for biological resources meet the responsibilities committed to by DOE within a NEPA, CERCLA, or RCRA decision.
- Enable Hanford Site development and cleanup projects to anticipate and plan for mitigation needs via early identification of mitigation requirements.
- Provide guidance for implementing cost-effective and timely mitigation actions.

- Conserve Hanford's biological resources while facilitating balanced development and cleanup activities.

If compensatory mitigation is needed for a project, the specific requirements will depend on the priority level of the resource. For Level 2, 3, or 4 habitat resources, such as steppe, shrub-steppe, and other habitats, compensatory mitigation may be triggered if the impact (after avoidance, minimization, and onsite rectification) is greater than 0.5 ha (1.25 ac), regardless of the project's location on the Hanford Site.

The compensation ratio will vary depending on the priority level of the affected habitat. Level 4 resources will be replaced at a ratio of 5:1, Level 3 at 3:1, and Level 2 at a ratio of 1:1. In all cases, disturbed portions of a project site that are not needed for continued operations should be replanted using native species in accordance with the *Hanford Site Revegetation Manual*.

Habitat replacement should include all the principal vegetation community components (i.e., native grasses, forbs, and shrubs). Projects that disturb late-successional sagebrush steppe will plan for replacement mitigation using standard replacement units. A project that is replacing habitat via rectification at a ratio of 1:1 should plan for one replacement unit/ha habitat disturbed, whereas a project that is replacing habitat via compensatory mitigation at a ratio of 3:1 should plan for three replacement units/ha habitat disturbed.

For planning purposes, a replacement unit for late-successional sagebrush steppe is defined as:

- 1500 shrubs/ha (600/ac)
- 1500 forbs/ha (600/ac)
- A native, perennial bunchgrass understory, either already present or planted according to the *Hanford Site Revegetation Manual.*

Although projects plan and implement their own mitigation actions via a mitigation action plan (MAP), it is DOE's goal to coordinate all compensatory mitigation via some form of mitigation bank. A coordinated mitigation bank would allow all actions to be implemented consistently, reduce project-by-project learning curves, take advantage of economies of scale, allow for better planning and budgeting for mitigation actions, and allow mitigation actions from multiple projects to contribute toward broader scale resource management goals.

Mitigation areas must be monitored for at least 5 years after planting to ensure the planted vegetation is developing to meet the goals of the project MAP. If performance monitoring indicates that one or more of the performance measures is below satisfactory levels, such as transplant shrub survival below predetermined action levels, the mitigation bank manager, project manager, or appropriate responsible office within DOE should identify means to redress the deficiencies, including replanting shrubs, grasses, and/or forbs as necessary.

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Acronyms and Abbreviations

ALE Reserve	Fitzner/Eberhardt Arid Lands Ecology Reserve
BRMP	Biological Resources Management Plan
CCP	Comprehensive Conservation Plan
CEQ	Council on Environmental Quality
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
CFR	Code of Federal Regulations
CLUP	Comprehensive Land Use Plan
CWA	*Clean Water Act of 1977*
DOE	U.S. Department of Energy
ECR	Ecological Compliance Review
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
ESA	*Endangered Species Act of 1973*
FONSI	Finding of No Significant Impact
FR	Federal Register
HCP-EIS	Hanford Comprehensive Land-Use Plan Environmental Impact Statement
HFD	Hanford Fire Department
HMS	Hanford Meteorological Station
HNRTC	Hanford Natural Resource Trustee Council
HRNM	Hanford Reach National Monument
MAP	Mitigation Action Plan
MBTA	*Migratory Bird Treaty Act of 1918*
MOU	Memorandum of Understanding
MSA	Mission Support Alliance
NEPA	*National Environmental Policy Act of 1969*
NMFS	National Marine Fisheries Service
NPS	National Park Service
NRDA	Natural Resource Damage Assessment
ORP	Office of River Protection
PL	Public Law

PNNL	Pacific Northwest National Laboratory (pre-1995 abbreviated name was PNL, Pacific Northwest Laboratory)
PNSO	Pacific Northwest Site Office
PSRP	Public Safety and Resource Protection (MSA)
RCRA	*Resource Conservation and Recovery Act of 1976*
RCW	Revised Code of Washington
RL	U.S. Department of Energy Richland Operations Office
ROD	Record of Decision
SSD	Site Stewardship Division
TNC	The Nature Conservancy
USACE	U.S. Army Corps of Engineers
USC	United States Code
USFWS	U.S. Fish and Wildlife Service
WAC	Washington Administrative Code
WDFW	Washington Department of Fish and Wildlife
WDNR	Washington Department of Natural Resources
WNHP	Washington Natural Heritage Program
WSR	Washington State Register

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1.0 Introduction

Biological resource stewardship is an integral part of U.S. Department of Energy (DOE) responsibilities at the Hanford Site. An appropriate management strategy, based on the best scientific information available, is an important component of responsible stewardship and land-use planning. As such, DOE developed this document as its primary implementation plan for managing biological resources under the *Hanford Comprehensive Land-Use Plan* (CLUP).

The CLUP, which is described in the *Final Hanford Comprehensive Land-Use Plan Environmental Impact Statement* (HCP-EIS; DOE 1999) and defined in the Record of Decision (ROD; 64 FR 61615), consists of a land-use map, land-use designations, land-use policies, and a set of procedures for plan implementation. The CLUP land-use policies that direct land-use actions and help ensure individual land-use actions collectively advance the CLUP's goals and objectives over time. The *Biological Resources Management Plan* (BRMP) is one of several management plans described in the CLUP, each of which addresses unique resources and key activities that, together, provide a comprehensive approach for managing Hanford Site lands and facilities.

The policies and guidance provided in BRMP apply to all actions that occur on Hanford lands managed by DOE. This includes central Hanford and portions of the Hanford Reach National Monument (HRNM) managed by DOE (Figure 1.1). Policies described in the plan apply to all Richland Operations Office (RL) and Office of River Protection (ORP) contractors as well as permit and lease holders if included in the permit or lease documents. Existing contracts, permits, and leases may be modified, as necessary, to meet the management objectives of this plan. The BRMP does not create any right, benefit, or trust responsibility, substantive or procedural, enforceable against the United States, its agencies, officers, or any person.

1.1 Purpose and Scope

The purpose of BRMP is to provide RL, ORP, Hanford contractors, and other organizations conducting work on the Hanford Site with a consistent approach to protect and manage biological resources on the site. This approach includes monitoring, assessing, and mitigating impacts to biological resources from Hanford operations, environmental cleanup, and restoration activities.

The BRMP's overarching goals are to:

- Foster preservation of important biological resources
- Allow for site development with minimal adverse impacts to those resources
- Balance the site cleanup mission with resource stewardship obligations.

The BRMP formalizes a means to meet these goals and implement the primary Hanford Site missions of waste management, environmental restoration, and technology development. To achieve these goals, DOE has committed to the following actions:

- Inventory and monitor key ecological resources on the Hanford Site within the context of surrounding land-use and resource patterns.

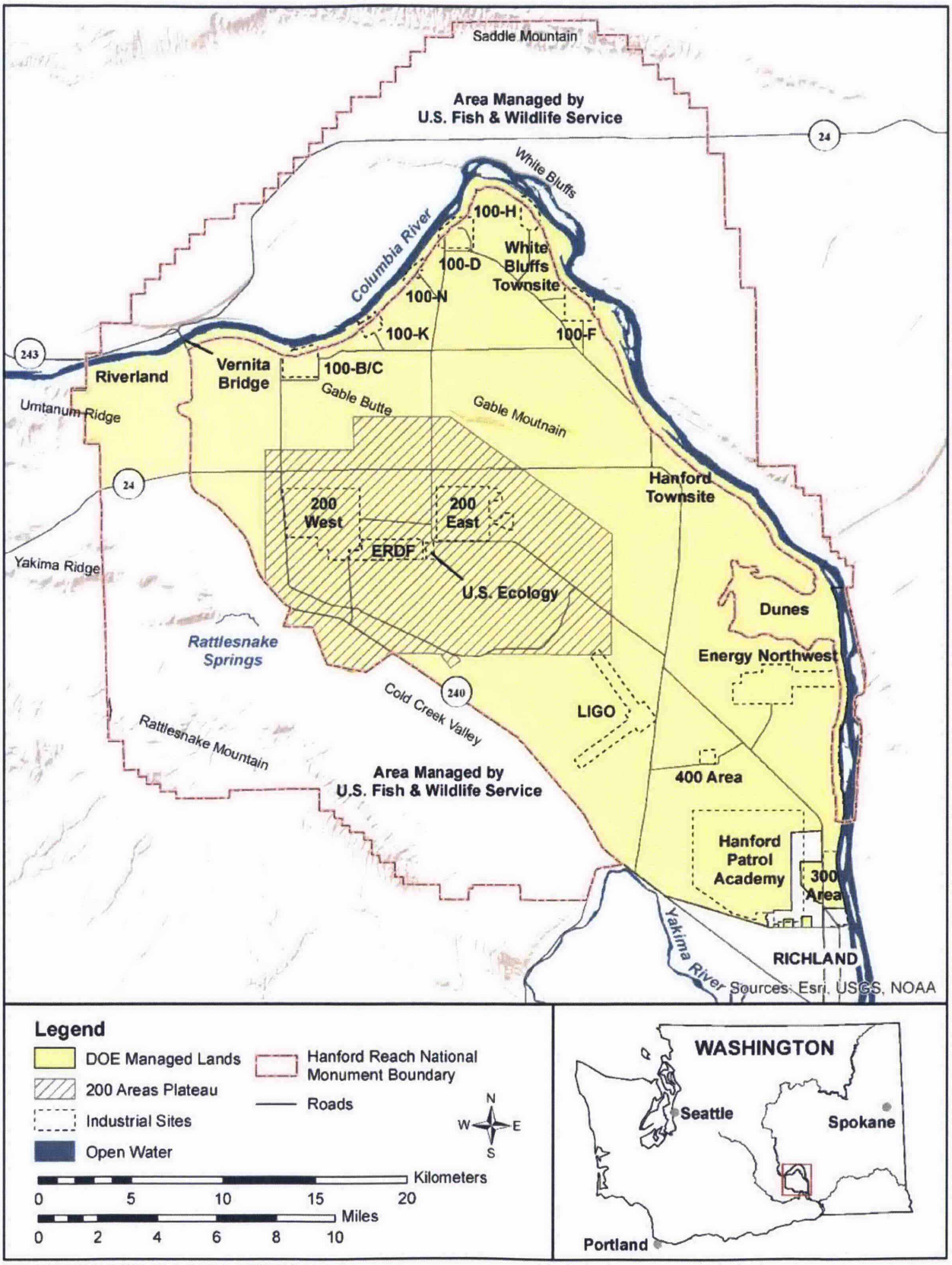

Figure 1.1 Map and General Features of the Hanford Site

- Protect and conserve significant biological resources under DOE stewardship consistent with the HCP-EIS, and as required by applicable statutes, regulations, and orders.
- Control project costs and minimize mission delays by incorporating biological resource considerations during early stages of project planning and design to minimize environmental impacts and focus scarce resources on effective mitigation when projects affect key resources.
- Facilitate project planning by incorporating biological resource requirements into land-use planning.
- Facilitate project execution by streamlining the compliance process.

Although BRMP provides overall biological resource management policies, objectives, and goals, specific management activities for particular species and habitats of concern are included in the following documents:

- Integrated Biological Control Program (Mission Support Alliance [MSA] 2014)
- Threatened and Endangered Species Management Plan: Salmon, Steelhead, and Bull Trout, Revision 2 (DOE 2015a)
- Bald Eagle Management Plan for the Hanford Site, South-Central Washington, Rev. 2 (DOE 2013b).

Additionally, the *Hanford Site Revegetation Manual* (DOE 2013a) provides guidance for planning and performing revegetation and restoration actions on the Hanford Site. It supports overall BRMP goals, especially in the areas of mitigation and restoration. It also provides for consistency among revegetation actions performed for various purposes, including *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) restoration actions, Natural Resource Damage Assessment (NRDA) restoration credits, mitigation plantings, fire recovery, and other purposes.

1.2 Relationship to the Hanford Comprehensive Land-Use Plan

The Hanford Site has diverse missions associated with environmental restoration, waste management, and science and technology. The CLUP provides a comprehensive, long-term approach to planning and directing Hanford activities consistent with overall land-use objectives.

The BRMP is one implementation procedure and control of the CLUP, which is listed in Chapter 6 of the HCP-EIS (DOE 1999). The policies outlined in the HCP-EIS were originally developed to implement and address DOE's *Land- and Facility-Use Policy*, which was subsequently cancelled and replaced by DOE Order 430.1C, *Real Property Asset Management*. These policies protect and sustain native species and their habitats on the site and maintain the capabilities to support site-specific missions and objectives.

The CLUP fulfills DOE's responsibilities under the *Atomic Energy Act of 1954* and Congress's direction in the *National Defense Authorization Act for Fiscal Year 1997*. DOE issued the HCP-EIS in September 1999 and a Record of Decision (64 FR 61615) in November 1999, which established the CLUP.

The following elements of the CLUP address land-use activities and protect and manage unique resources of the site:

- A land-use map depicts designated land uses for areas of the Hanford Site and supports full implementation of the DOE mission elements assigned to the site (HCP-EIS Section 3.2.5, Figure 3-3).
- Land-use designations define the purpose, intent, and principal uses of each geographic area shown by the final CLUP map.
- Land-use policies direct land-use actions and help ensure individual land-use actions collectively advance CLUP's goals and objectives over time.
- Land-use plan implementation procedures and controls and administrative procedures are used to review and approve proposed land-use requests. In addition, these procedures are used to make recommendations on actions to be taken under the land-use plan to align and coordinate Hanford Site area and resource management plans such as the *Hanford Cultural Resource Management Plan* (DOE 2001a) and *Hanford Long-Term Stewardship Program Plan* (DOE 2012a). These types of plans are used by DOE as implementing procedures and controls to ensure consistency in land-use activities on the Hanford Site. They include consideration and management of the land; facilities; infrastructure; and unique biological and cultural resources on the Hanford Site.

The BRMP provides an integral part of implementing the CLUP to address management of biological resources during active and post-cleanup activities, mission support operations, and other land-management activities on the Hanford Site. When evaluating land-use requests through the established CLUP implementing procedures and controls, the BRMP provides important information to ensure appropriate protectiveness of biological resources and habitats. Like BRMP, each management plan described in the CLUP addresses unique resources and key activities. Together, these plans provide DOE with a comprehensive approach for managing Hanford lands and facilities.

1.2.1 Land-Use Designations

Decisions regarding both project planning and biological resource management at any specific location on the Hanford Site must take into account the underlying land-use designation. The CLUP includes seven land-use designations that apply to specific portions of the Hanford Site (Figure 1.2), which are defined in the 2008 HCP-EIS supplemental analysis (DOE 2008) as follows:

- *Industrial-Exclusive*: An area suitable and desirable for treatment, storage, and disposal of hazardous, dangerous, radioactive, and nonradioactive wastes. Includes related activities consistent with Industrial-Exclusive uses.
- *Industrial*: An area suitable and desirable for activities such as reactor operations, rail, barge transport facilities, mining, manufacturing, food processing, assembly, warehouse, and distribution operations. Includes related activities consistent with Industrial uses.
- *Research and Development*: An area designated for conducting basic or applied research that requires the use of a large-scale or isolated facility or

smaller scale time-limited research conducted in the field or in facilities that consume limited resources. Includes scientific, engineering, technology development, technology transfer, and technology deployment activities to meet regional and national needs. Includes related activities consistent with Research and Development.

- *High-Intensity Recreation*: An area allocated for high-intensity visitor-serving activities and facilities (commercial and governmental), such as golf courses, recreational vehicle parks, boat launching facilities, Tribal fishing facilities, destination resorts, cultural centers, and museums. Includes related activities consistent with High-Intensity Recreation.

- *Low-Intensity Recreation*: An area allocated for low-intensity visitor-serving activities and facilities, such as improved recreational trails, primitive boat launching facilities, and permitted campgrounds. Includes related activities consistent with Low-Intensity Recreation.

- *Conservation (Mining)*: An area reserved for the management and protection of archaeological, cultural, ecological, and natural resources. Limited and managed mining (e.g., quarrying for sand, gravel, basalt, and topsoil for governmental purposes only) could occur as a special use (i.e., a permit would be required) within appropriate areas. Limited public access would be consistent with resource conservation. Includes activities related to Conservation (Mining), consistent with the protection of archeological, cultural, ecological, and natural resources.

- *Preservation*: An area managed for the preservation of archeological, cultural, ecological, and natural resources. No new consumptive uses (i.e., mining or extraction of non-renewable resources) would be allowed within this area. Limited public access would be consistent with resource preservation. Includes activities related to Preservation uses.

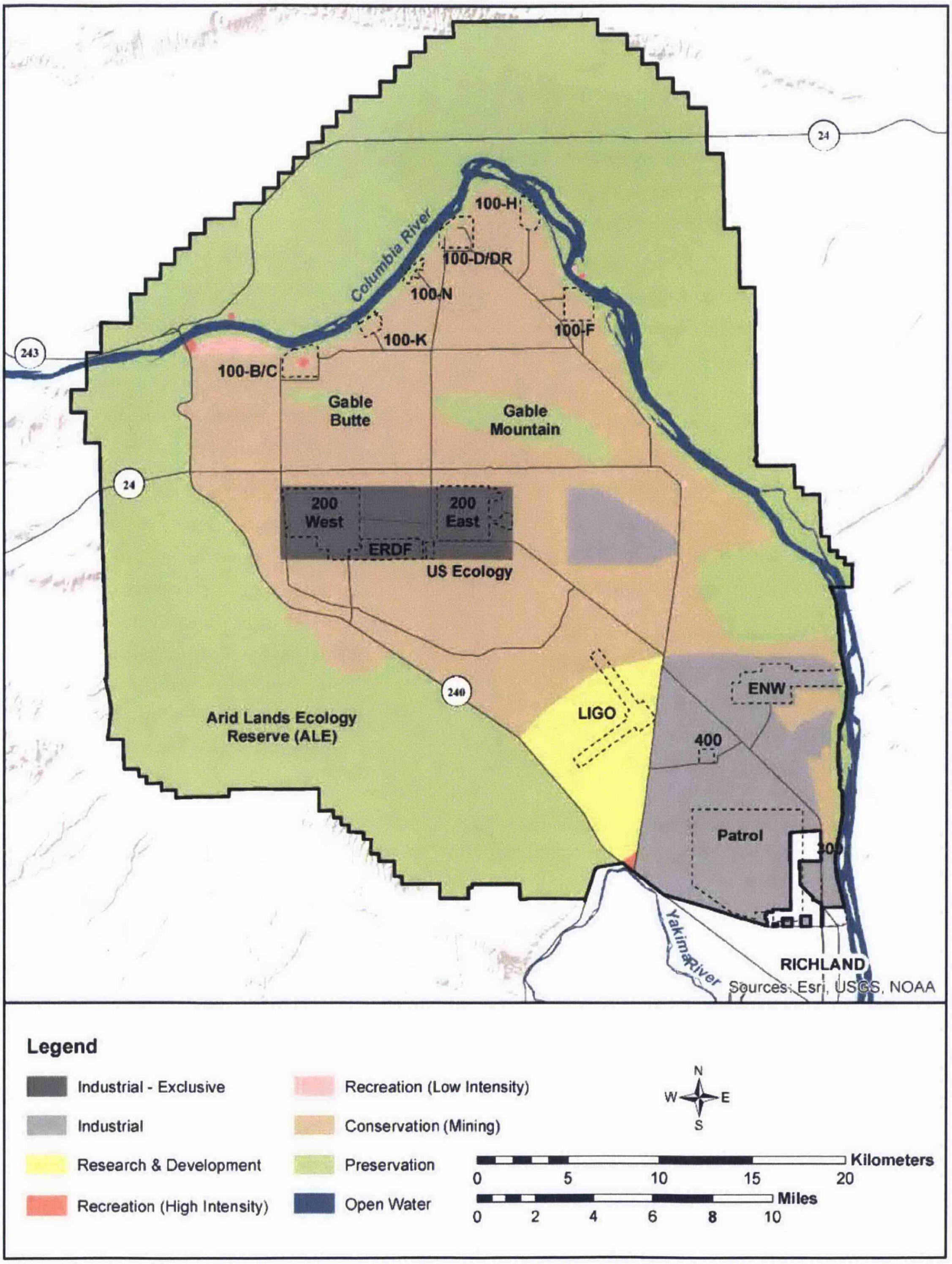

Figure 1.2 Hanford Site Comprehensive Land-Use Plan Land Use Designations (Based on DOE 2008)

1.2.2 Hanford Comprehensive Land-Use Plan Policies

The CLUP sets forth the policies that direct land-use actions. The policies help ensure that individual land-use actions are consistent over time. These policies are set forth to

- Establish land-use mitigation procedures.
- Establish hierarchies, priorities, and standards relating to land use, resource use, and values.
- Integrate competing land and resource goals and objectives.
- Provide reference points for addressing unanticipated circumstances and amending the CLUP when necessary.
- Identify which resource and area management plans are part of the CLUP implementation.

The overall CLUP policy was developed to accomplish the following:

- Protect the Columbia River and associated natural and cultural resources and water quality.
- Wherever possible, locate new development, including cleanup and remediation-related projects, in previously disturbed areas.
- Protect and preserve the natural and cultural resources of the Site for the enjoyment, education, study, and use of future generations.
- Honor treaties with American Indian Tribes as they relate to land uses and resource uses.
- Reduce exclusive use areas to maximize the amount of land available for alternate uses while still protecting the public from inherently hazardous operations.
- Allow access for other uses (e.g., recreation) outside of active waste management areas, consistent with the land-use designation.
- Ensure that a public involvement process is used for amending the CLUP and land-use designation to respond to changing conditions.
- As feasible and practical, remove pre-existing, non-conforming uses.
- Facilitate cleanup and waste management.

For more information, see the HCP-EIS, ROD, supplemental analysis, and amended ROD on DOE's EIS web site at http://www.hanford.gov/page.cfm/EnvironmentalImpactStatements.

1.3 Management Requirements and Policies

The BRMP specifies DOE policies, goals, and objectives relative to different biological resource management concerns and prescribes how such goals and objectives will be met. The BRMP applies to all RL and ORP programs at all locations within RL's and ORP's administrative control. DOE uses the HCP-EIS (DOE 1999; DOE 2008; DOE 2015b) ecosystem-based strategy to manage and control development of Hanford lands and facilities.

DOE has established a broad biological resources protection policy (DOE 1997) that states:

> It is the policy of the U.S. Department of Energy, Richland Operations Office to act as a responsible steward of the environment. This stewardship will be based on the principles of ecosystem management and sustainable development.

As part of this broader policy, DOE has developed specific stewardship policies, including the following:

- Act to preserve and enhance the biological resources under DOE stewardship as valuable national resources.
- Ensure that biological resource values are considered by all programs in all actions conducted on DOE's behalf consistent with applicable treaties, laws, regulations, and obligations as a natural resource trustee.
- Endeavor to enhance an awareness of and appreciation for biological resource values and their preservation, restoration, and enhancement throughout the Hanford Site.
- Integrate biological resource management goals and administrative procedures into relevant program- and project-level activities to ensure that potential adverse impacts to biological resources are avoided or minimized.
- Integrate biological resource information into site land- and facility-use plans to ensure that broad-scale land-use planning and specific site-selection decisions consider biological resource values, apply ecosystem management principles, and minimize cumulative impacts to biological resources.
- Incorporate ecosystem management principles and tools into the program (project) planning process to facilitate meeting biological resource management goals and objectives while minimizing impacts to program (project) budgets and schedules.
- Adopt the recommendations of the Council on Environmental Quality (CEQ) to incorporate biodiversity considerations into *National Environmental Policy Act of 1969*, as amended (NEPA) environmental impact analyses (CEQ 1993).
- Mitigate, as necessary, adverse impacts to biological resources that may result from present and future Hanford activities in a manner commensurate with the value of the resource and the severity of the impact. DOE will adhere to a hierarchy of mitigation actions in the following preferred order: avoid, minimize, rectify, and/or compensate.
- As the Lead Response Agency at Hanford under the National Contingency Plan (40 CFR 300), conduct response activities, such as removal or remedial actions, in a cost-effective manner that avoids or minimizes adverse impacts to biological resources.
- Cooperate with federal and state resource agencies to ensure a cost-effective information baseline on resource status is maintained for Hanford's biological resources within a bioregional context.
- Coordinate with other governmental agencies and stakeholders, as

applicable, on biological resource management issues in an open and cooperative manner.

- Manage the DOE-administered portions of the HRNM in a manner consistent with the rest of the monument.

1.4 Management Plan Organization

The BRMP is designed to assist Hanford Site program and project managers and resource professionals, local Tribes, resource agencies, and other stakeholders who have an interest or a role in the management of Hanford's biological resources. Chapter 2.0 of this plan describes the roles and responsibilities of DOE and its contractors with respect to biological resource management. Chapter 3.0 provides a brief description of the primary legal drivers for biological resource management and the relationship of BRMP to federal and state laws, Executive Orders, and DOE Orders.

An overview of the biological resources and past land-use history of the Hanford Site is presented in Chapter 4.0. Chapter 5.0 outlines DOE's approach to biological resource management and describes implementing actions and policies. Chapter 6.0 defines the process for ecological compliance reviews for projects and work taking place on Hanford lands. Chapter 7.0 discusses mitigation and restoration strategies and policies. Chapter 8.0 provides references cited in the text, and Chapter 9.0 provides a glossary of terms.

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2.0 Roles and Responsibilities

It is DOE policy to steward Hanford Site natural resources through responsible ecosystem management. This chapter outlines DOE management responsibilities and identifies the federal agencies and other entities responsible for managing biological resources on specific portions of the site.

The RL and ORP managers are ultimately responsible for the site's natural resources. The RL Assistant Manager for Mission Support is charged with development and oversight of land and resource management policies. The BRMP is an important part of implementing such policies. It is designed to provide a consistent approach in managing the site's natural resources within the context of its primary missions of environmental remediation and waste management.

2.1 Department of Energy

To ensure BRMP is applied consistently throughout the portions of the Hanford Site managed by DOE, each program manager and assistant manager within RL and ORP is responsible for adhering to the resource management guidance and policies described in this document. The RL's Site Stewardship Division (SSD) is responsible for defining Hanford's approach to biological resource management and will assist other RL and ORP programs, contractors, and other organizations conducting work on the Hanford Site with interpreting this document. The SSD oversees monitoring and impact assessment support and tracks performance of mitigation actions.

Close coordination between SSD and program and project managers within RL, ORP, and DOE's Pacific Northwest Site Office (PNSO) (when PNSO-sponsored work occurs on the Hanford Site) is required in early phases of Hanford Site project development. This is an important part of identifying areas where resource protection is a prime consideration, alternatives should be considered, or mitigation may be necessary. PNSO-sponsored work that occurs on the Hanford Site is subject to BRMP, and PNSO activities that occur on land managed by PNSO is subject to the management plan developed for the PNSO site (DOE 2015c).

The SSD also has responsibility to act as DOE's primary point of contact for forming ecosystem management partnerships with outside organizations. The division coordinates with the U.S. Fish and Wildlife Service (USFWS) to confirm USFWS's management of DOE-owned property within the HRNM is consistent with DOE's biological resource management policies.

2.2 Contractors and Other Entities Performing Work on the Hanford Site

All contractors and subcontractors, or any other entity performing work on Hanford lands managed by RL or ORP, will conduct work in accordance with the policies and guidance provided in this management plan, as established by the CLUP implementing procedures.

Implementation of much of this management plan is assigned to the Public Safety and Resource Protection (PSRP) Program, currently managed by Mission Support Alliance (MSA). MSA's implementation responsibilities include, among other actions, ecological monitoring, compliance reviews, reporting, implementing some protective measures or administrative controls, and determining mitigation requirements.

Each contractor is responsible for incorporating biological resource protection measures into project planning. Each contractor also is responsible for requesting an ecological compliance review (ECR) for its activities and implementing mitigation actions, if needed, for any project for which it is responsible.

2.3 U.S. Fish and Wildlife Service

Portions of the Hanford Site were designated as the HRNM in 2000 by Presidential Proclamation7319 (65 FR 37253-37257, "Establishment of the Hanford Reach National Monument") under provisions of the *Antiquities Act of 1906* as amended (16 USC 431-433). These areas were selected for their ecological, cultural, and geological values. The USFWS manages several portions of the 789 km^2 (195,000-ac) monument, including the north bank of the Columbia River Corridor, Saddle Mountain Unit, Rattlesnake Unit (which includes the Fitzner/Eberhardt Arid Lands Ecology (ALE) Reserve, a federal research natural area), Wahluke Unit (west and east), and Ringold Unit (Figure 2.1). The USFWS manages these areas and various islands in the Hanford Reach as part of the Mid-Columbia River National Wildlife Refuge Complex.

Under existing permits from DOE, the USFWS is responsible for protecting and managing HRNM resources and access to HRNM lands under its control. This is accomplished through Presidential Proclamation 7319 and the *Hanford Reach National Monument Comprehensive Conservation Plan and Environmental Impact Statement* (HRNM-CCP; USFWS 2008). Because DOE is currently the underlying landholder, it retains approval authority over certain management aspects on the HRNM that could affect DOE operations such as safety or security buffers, access to and operation of research sites, or seismic, meteorological, or environmental monitoring sites.

Collaboration between the DOE and the Department of the Interior, including USFWS, related to the long-term protection of important and ecologically sensitive lands on the Hanford Site is defined in an interagency Memorandum of Understanding (DOE and USFWS 2014). The scope of this MOU includes those areas of the Hanford Site outside the current boundaries of the HRNM.

2.4 National Park Service

In December 2014, President Obama signed the *National Defense Authorization Act of 2015* (PL 113-291), which included provisions authorizing the Manhattan Project National Historic Park to be located at three sites: Oak Ridge, Tennessee; Hanford, Washington; and Los Alamos, New Mexico. Facilities and areas on the Hanford Site included in the park include the B Reactor National Historic Landmark, Hanford High School in the town of Hanford and the Hanford Camp Historic District; the White Bluffs bank building in the White Bluffs Historic District; the warehouse at Bruggeman's Agricultural Complex; the Hanford Irrigation District Pump House; and the T Plant (221-T) Process Building).

A Memorandum of Agreement between DOE and the NPS that defines their respective roles and responsibilities in creating and managing the park was signed in 2015. The agreement included provisions for enhanced public access, management, interpretation, and historic preservation (DOE and NPS 2015).

2.5 Other Lease, Permit, or Easement Holders

Several entities use land on Hanford under permits, leases, or easements. These are managed by SSD, which oversees the protection of Hanford Site resources through the appropriate implementation plans contained in the CLUP. Unless otherwise controlled by legal or contractual requirements, the BRMP applies to lands under lease, permit, or easement.

2.6 Hanford Tribal Involvement

As a result of the *Nuclear Waste Policy Act of 1982* and the DOE American Indian Tribal Government Interactions Policy (DOE Order 141.1), the Nez Perce Tribe, Confederated Tribes of the Umatilla Indian Reservation, and Yakama Nation all actively participate in cleanup issues at Hanford. All three Tribes are members of the Hanford Natural Resource Trustee Council (HNRTC) and have cooperative agreements with DOE to provide advice and guidance on CERCLA response and NRDA issues. These Tribes work on issues related to mitigation and restoration of natural resources at Hanford. The Wanapum people, a non-federally recognized Tribe, also participate in cleanup issues at Hanford

2.7 Ecological Resources Working Group

An Ecological Resources Working Group is established to assist and advise SSD on Hanford Site biological resource-related issues as needed. The working group generally comprises representatives from the local Tribes, HNRTC, resource management agencies, resource professionals from site contractors, and SSD staff. The working group meets as needed to address any significant problems with BRMP implementation and new resource management issues. Staff from other DOE programs or their contractor representatives may be invited to the meetings to discuss specific resource issues, policies, or concerns.

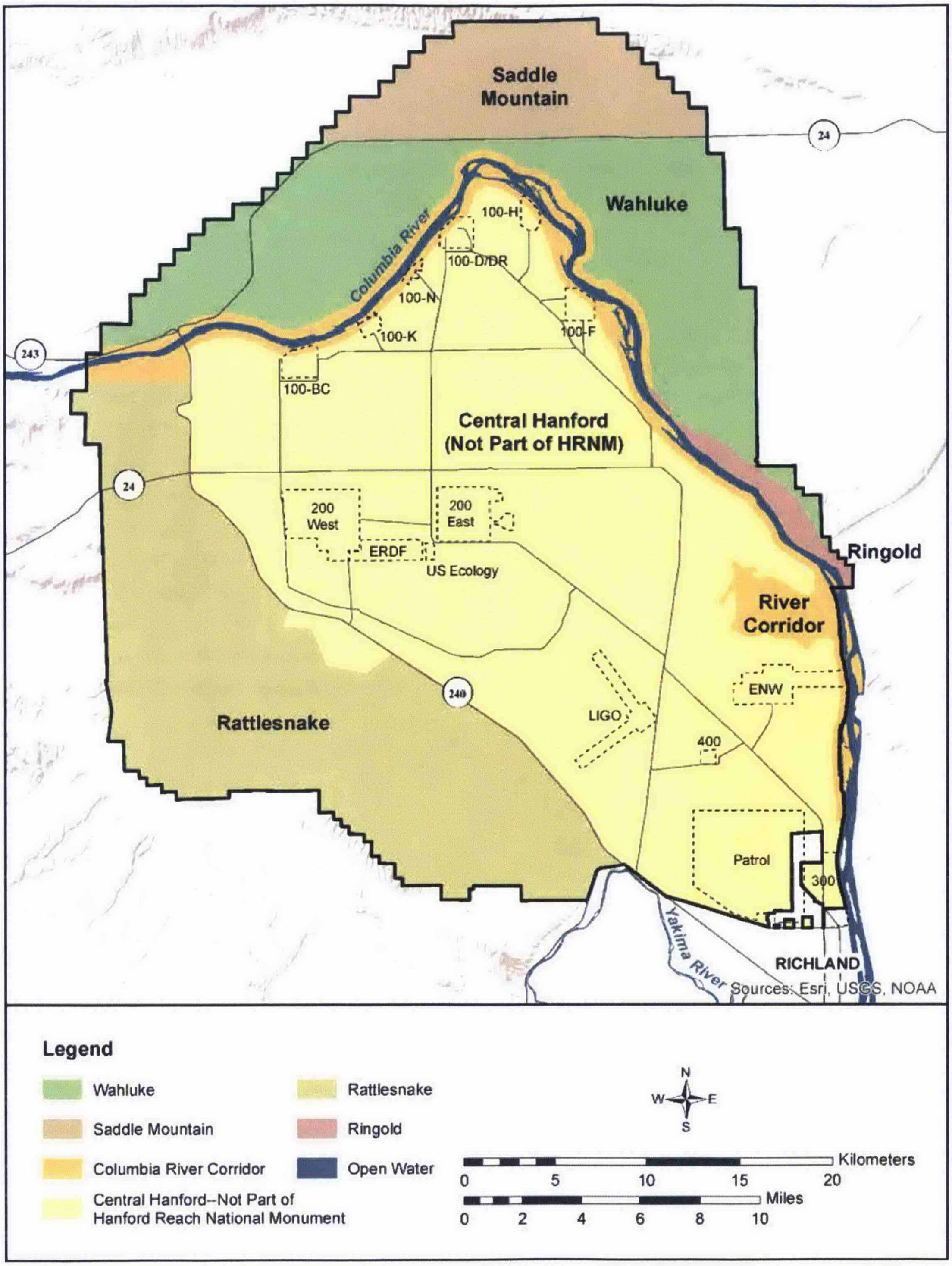

Figure 2.1 Management Units of the Hanford Reach National Monument (USFWS 2008)

3.0 Applicable Guidance and Requirements

This chapter outlines the primary federal laws, Executive Orders, DOE Orders, and state laws considered in developing BRMP as an implementing document of the CLUP. It also discusses key factors of these laws as they apply to biological resource management and how BRMP assists DOE in implementing the requirements.

BRMP was developed to support DOE compliance with the following federal acts:

- *Endangered Species Act of 1973 (ESA)*
- *National Environmental Policy Act of 1969 (NEPA)*
- *Migratory Bird Treaty Act of 1918 (MBTA)*
- *Bald and Golden Eagle Protection Act of 1972*
- *Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA)*
- *Resource Conservation and Recovery Act of 1976 (RCRA)*
- *Clean Water Act of 1977 (CWA)*
- *Sikes Act*
- *Magnuson-Stevens Fishery Conservation and Management Act of 1976.*

Regulatory agencies responsible for enforcing these acts also promulgate pertinent regulations to implement the laws. Agencies also can develop additional guidelines specific to their organizations. For example, in addition to requirements provided in NEPA (42 USC 4321, et seq.), DOE developed guidelines defining its own responsibilities under the act (10 CFR 1021).

In addition to federal laws, BRMP also helps DOE implement various Executive Orders, Proclamations, and Memoranda as well as DOE Orders, including the following:

- Executive Order 13112, "Invasive Species"
- Executive Order 11990, "Protection of Wetlands"
- Executive Order 11988, "Floodplain Management"
- Presidential Memorandum of June 20, 2014, "Creating a Federal Strategy to Promote the Health of Honey Bees and Other Pollinators"
- Presidential Proclamation 7319, "Establishment of the Hanford Reach National Monument"
- DOE Order 430.1C "Real Property Asset Management" (August 19, 2016).

BRMP was developed with consideration of Washington State laws and regulations that may apply to Hanford Site activities and biological resource management practices. Particularly applicable are rules regulating fish and wildlife described in Chapter 77 of the Revised Code of Washington (RCW), Title 232 of the Washington Administrative Code (WAC), and rules regarding noxious weed control described in RCW Chapter 17 and WAC Chapter 16-750.

3.1 Endangered Species Act

The ESA provides for the designation and protection of wildlife, fish, and plant species that are endangered or threatened with extinction because of natural or human-made factors, and the conservation of the ecosystems upon which they depend. The ESA makes it illegal to kill, harm, harass, or otherwise take a listed species or adversely modify designated critical habitat.

Under Section 7 of the ESA, federal agencies are required to evaluate actions they perform, fund, or permit to determine whether any species listed as endangered or threatened at 50 CFR 17.11 and 50 CFR 17.12 may be affected by the proposed action. Authorizations called "Incidental Take Permits" are required under Section 10 of the ESA for non-federal activities that may result in a "take" of threatened or endangered species. The USFWS and National Marine Fisheries Service (NMFS) share responsibility for implementing the ESA. Consultation with one or both of the agencies is required if a proposed action may affect listed species or designated critical habitat.

BRMP implements the ESA by providing a process to 1) identify whether ESA-protected species or critical habitats may be affected by DOE activities, and 2) confirm DOE compliance with ESA requirements. In addition to the ESA, management of threatened and endangered salmonids on the Hanford Site is addressed in the *Threatened and Endangered Species Management Plan, Salmon, Steelhead and Bull Trout* (DOE 2015a). This management plan was developed to assist in the consultation process with the NMFS (salmon and steelhead) and USFWS (bull trout) required by Section 7 of the ESA.

3.2 National Environmental Policy Act

As stated in the NEPA implementing regulations, "The NEPA process is intended to help public officials make decisions that are based on an understanding of environmental consequences, and take actions that protect, restore, and enhance the environment" (40 CFR 1500.1c).

Executive Order 11514, "Protection and Enhancement of Environmental Quality," and Executive Order 11991, "Relating to Protection and Enhancement of Environmental Quality," further define the role of federal agencies in implementing NEPA. Executive Order 11514 states that federal agencies shall "monitor, evaluate, and control on a continuing basis their agencies' activities so as to protect and enhance the quality of the environment. Such activities shall include those directed to controlling pollution and enhancing the environment and those designed to accomplish other program objectives which may affect the quality of the environment." Executive Order 11991 requires federal agencies to "comply with the (NEPA) regulations issued by the Council (on Environmental Quality) except where such compliance would be inconsistent with statutory requirements."

Proper application of the NEPA process requires a thorough understanding of the biological resources present, potential impacts of a proposed action on those resources, and the ultimate consequences of those actions. BRMP directly supports the NEPA decision-making process by providing the basic biological information and assessment methodology needed to determine whether adverse impacts to biological resources may occur on the Hanford Site. It also provides the resource context and management guidelines needed to determine the magnitude of potential impacts to biological resources and appropriate mitigation actions as needed. The BRMP and the *Hanford Site NEPA Characterization* (Duncan et al. 2007) provide ecological information and guidance for the preparation of NEPA documents.

3.3 Migratory Bird Treaty Act

The MBTA makes it illegal for anyone without a waiver to take, capture, or kill any migratory bird or to take any part, nest, or egg of any such bird, included in the terms of the conventions or treaties between the United States, and Great Britain (for Canada), Mexico, Japan, and Russia (covered species are listed at 50 CFR 17.13). In addition, Executive Order 13186, "Responsibility of Federal Agencies to Protect Migratory Birds," further clarifies federal agency responsibilities under the MBTA and other regulations. It requires, among other things, that agencies "identify where unintentional take reasonably attributable to agency actions is having, or is likely to have, a measurable negative effect on migratory bird populations, focusing first on species of concern, priority habitats, and key risk factors."

In 2006, DOE signed an MOU with the USFWS regarding implementation of Executive Order 13186 (DOE and USFWS 2006). In 2013, when the order was modified and the MOU was re-signed (DOE and USFWS 2013), DOE committed to, among other items and within statutory and budgetary limits, the following actions:

- Implement management practices that avoid or minimize adverse effects on migratory bird populations and their nesting, foraging, migration, staging, or wintering habitats.
- When designing new projects, ensure that they avoid important migratory bird habitats and otherwise avoid or minimize direct and indirect effects of new projects on migratory birds and their habitats, and when practicable and appropriate, restore and enhance bird habitat.
- Institute management practices for controlling non-native plants and animals to protect migratory birds and their habitats.
- Construct or utilize engineered constraint systems to prevent migratory birds from nesting or roosting in areas of recognized hazard.
- Promote monitoring, research, and information exchange related to migratory bird conservation and program actions that may affect migratory birds, including collaborating on studies on migratory bird species that may be affected by agency actions, infrastructure, or facilities; and to identify habitat conditions essential to sustain migratory bird populations.
- Develop partnerships with other agencies and non-federal entities to further bird conservation, as practicable.
- Identify training opportunities for DOE and contractor employees in methods and techniques to inventory and monitor migratory birds, assess population status of migratory birds, assess bird use within project areas, evaluate effects of projects on migratory birds, and develop management practices that avoid or minimize adverse effects and promote

beneficial approaches to migratory bird conservation.

- Engage the USFWS for coordination regarding proposed actions that may have direct and indirect adverse effects on migratory birds or their habitats.
- Engage the USFWS on development and implementation of strategies to improve the conservation of migratory birds and their habitats in the conduct of environmental cleanup activities at DOE sites.
- Engage the USFWS on development and implementation of strategies to improve or enhance the conservation of migratory birds and their habitats at the Hanford Site.
- Support efforts to promote the ecological, economic, and recreational values of migratory birds by supporting outreach and educational activities and materials, as appropriate.

In addition to the actions above, DOE maintains a federal fish and wildlife permit for migratory birds. This special purpose permit authorizes limited takes of migratory birds on the Hanford Site and adjacent lands with land owner approval for the purposes of ecological monitoring and protecting human health and safety. The migratory bird permit is administered through the SSD and its named sub-permittees.

BRMP and the actions described in this section assist DOE to determine whether protected migratory birds on the site may be affected by proposed actions. The plan also assists in determining if intentional or unintentional take is likely and the potential effects of such take. In addition, BRMP provides the overall context to identify opportunities to enhance migratory bird habitat and populations.

3.4 Bald and Golden Eagle Protection Act

The *Bald and Golden Eagle Protection Act of 1972* makes it illegal to take (pursue, wound, kill, molest, or disturb), as applicable, any bald or golden eagle, or any part, nest, or egg of these eagles. The National Bald Eagle Management Guidelines issued by the USFWS define "disturb" as any activity that may cause injury or decrease productivity (USFWS 2007a). The BRMP and the Hanford Site Bald Eagle Site Management Plan (DOE 2013b) provide DOE and its contractors with guidance to ensure compliance with the *Bald and Golden Eagle Protection Act*.

3.5 Comprehensive Environmental Response, Compensation, and Liability Act

The primary purpose of CERCLA is to provide for timely compensation, cleanup, and emergency response for hazardous substances released into the environment, as well as the cleanup of inactive hazardous waste disposal sites. The CERCLA planning process requires evaluation of natural resources, including biological resources, on the Hanford Site in an area potentially affected by the release. DOE, through its contractors, has primary responsibility for these evaluations when planning and performing CERCLA cleanup actions.

BRMP is the means by which DOE defines which resources that may be affected by a cleanup action are important, and provides the framework for determining impacts and appropriate mitigation measures. The CERCLA planning and evaluation process can be used in place of a NEPA evaluation; in those cases, BRMP supports the CERCLA process in the same way it would support a NEPA review.

Section 107(f) of CERCLA identifies and defines natural resource trustees, who are authorized to act in the public interest with regard to natural resources. For the Hanford Site, seven trust entities organized under an MOU to form the Hanford Natural Resource Trustee Council (HNRTC 1996). The trustees are DOE, U.S. Department of the Interior (represented by the USFWS), states of Washington and Oregon, Yakama Nation, Confederated Tribes of the Umatilla Indian Reservation, and Nez Perce Tribe. These natural resource trustees are authorized to evaluate the impacts to resources resulting from the release of hazardous substances to the environment through a process called a Natural Resource Damage Assessment, and to use the results of that assessment to direct restoration activities aimed at replacing the resources and services lost due to a hazardous substance release.

Although the trustees may make their own determinations about what resources could be damaged and how or where they should be restored, the determinations should be consistent with overall site-wide resource management goals, including BRMP and CLUP. This ensures that NRDA restoration and DOE non-CERCLA actions are synergistic and mutually beneficial. With this in mind, DOE may plan and perform "early restoration" or "enhanced mitigation" that could potentially be used as credit to offset some or all impacts resulting from contaminant release. Such actions should consider the procedures and guidance provided in Chapter 7.0 of this document and in the *Hanford Site Revegetation Manual* (DOE 2013a).

3.6 Resource Conservation and Recovery Act

The primary purpose of RCRA is to ensure the safe and environmentally acceptable management of solid wastes. RCRA outlines the framework of national programs to achieve environmentally sound management of both hazardous and non-hazardous wastes. Waste site operation activities and RCRA compliance activities may have significant adverse impacts to biota. RCRA activities must comply with other federal statutes that do not deal directly with control and abatement of solid waste or hazardous waste disposal—for example, NEPA and ESA. BRMP provides data in direct support of RCRA permits and helps ensure RCRA activities are not adversely affecting biota, and activities are in compliance with other applicable laws.

3.7 Clean Water Act

Section 404 of the *Clean Water Act* (CWA) authorizes the U.S. Army Corps of Engineers (USACE) to issue permits for the discharge into or dredging of wetlands (33 CFR 320 et seq.). The U.S. Environmental Protection Agency guidelines (40 CFR 230) require that potential impacts to physical, chemical, and biological characteristics of the aquatic systems be considered in the permit process. BRMP provides the baseline data and resource management structure for DOE to determine whether any wetlands may be affected by a proposed action.

3.8 Sikes Act

The *Sikes Act* (16 USC 670) originally provided for cooperation by the U.S. Department of the Interior and the U.S. Department of Defense with state agencies in "planning, development, maintenance and coordination of wildlife, fish and game conservation and rehabilitation" on military reservations throughout the United States. A 1974 amendment to the Act (PL 93-452) authorized conservation and rehabilitation programs on lands managed by DOE and several other federal departments and agencies. These programs are carried out in cooperation with the states by the Secretary of the Interior. BRMP provides the basis for coordination and interaction with stakeholders and resource professionals from state and tribal agencies.

3.9 Magnuson-Stevens Fishery Conservation and Management Act

Federal agencies are obligated, under Section 305(b)(2) of the *Magnuson-Stevens Fishery Conservation and Management Act*, and its implementing regulations (50 CFR 600, Subpart K), to consult with the NMFS about actions that are authorized, funded, or undertaken by those agencies that may adversely affect Essential Fish Habitat (EFH), which is defined by the Act as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." The purpose of the procedure is to promote protection of EFH via the review of federal and state actions that may adversely affect these habitats. Activities in or near the Columbia River may affect defined EFH for salmonids. Management of EFH in the Columbia River is coordinated through BRMP and the *Threatened and Endangered Species Management Plan: Salmon, Steelhead, and Bull Trout* (DOE 2015a).

3.10 Executive Order 13112

Executive Order 13112, "Invasive Species," requires all executive agencies to identify actions that may affect the status of invasive species; prevent the introduction of such species; detect, monitor, and control populations of invasive species; restore native species and habitats that have been invaded; and conduct research on the prevention and control of invasive species. In addition, executive agencies are prohibited from authorizing or funding activities that are likely to cause or promote the introduction or spread of invasive species, unless the benefit of such an action clearly outweighs the potential harm from the invasive species.

BRMP provides the overall guidance and philosophy for invasive species management on the Hanford Site. BRMP also provides direction for prioritization of species and coordination of invasive species control activities with other site resource management priorities. However, detailed implementation may be deferred to an integrated pest management plan (MSA 2014).

3.11 Executive Orders 11988 and 11990

Executive Order 11990, "Protection of Wetlands," and Executive Order 11988, "Floodplain Management," require federal agencies to minimize the loss or degradation of wetlands on federal lands and account for floodplain management when developing water- and land-use plans, respectively. DOE implements the requirements of these two Executive Orders via 10 CFR 1022, "Compliance with Floodplain and Wetlands Environmental Review Requirements." It is DOE policy to 1) restore and preserve natural and beneficial values served by floodplains; 2) minimize the destruction, loss, or degradation of wetlands; and 3) preserve and enhance the natural and beneficial value of wetlands. As with the wetland provisions of the *Clean Water Act*, the identification, management, protection, and when necessary, mitigation of wetlands and floodplains on the Hanford Site are coordinated through BRMP.

3.12 Presidential Memorandum of June 20, 2014

The Presidential Memorandum of June 20, 2014 (79 FR 35903-35907), addressed "Creating a Federal Strategy to Promote the Health of Honey Bees and Other Pollinators." This memorandum called for establishment of a multi-agency Pollinator Health Task Force, which included DOE as a member. This task force was charged with developing a national pollinator health strategy and implementing plans for Increasing and improving pollinator habitat.

One of the primary goals addressed in the resulting *Pollinator Research Action Plan* (Pollinator Health Task Force 2015) is to "Restore or enhance 7 million acres of land for pollinators over the next 5 years through federal actions and public/private partnerships." Appendix E to this action plan is the DOE-specific *Pollinator Protection Plan*, which focuses on DOE adoption of best management practices to enlarge the land area and protect pollinator health. The BRMP describes best management practices used at the Hanford Site, and include the removal of invasive species, maintenance of riparian areas, and restoration, rehabilitation, and/or revegetation of native plant communities.

3.13 Presidential Proclamation 7319

Presidential Proclamation 7319 (65 FR 37253-37257) under the *Antiquities Act of 1906* established the HRNM within portions of the Hanford Site. The USFWS manages portions of the HRNM under agreements with DOE, and DOE manages other portions of the HRNM.

The USFWS prepared a CCP (USFWS 2008), and currently is developing implementing procedures that will guide its management activities to meet the policies and objectives developed in the CCP. The BRMP provides the comparable guidance for DOE's management of biological resources, and it functions as the primary interface for biological resource management between the USFWS and DOE.

In addition to Proclamation 7319, President Clinton, in an accompanying Memorandum of Understanding (White House 2000), provided the following direction to the Secretary of Energy:

> The area being designated as the Hanford Reach National Monument forms an arc surrounding much of what is known as the central Hanford area. While a portion of the central area is needed for Department of Energy missions, much of the area contains the same shrub-steppe habitat and other objects of scientific and historic interest that I am today permanently protecting in the monument. Therefore, I am directing you to manage the central area to protect these important values where practical. I further direct you to consult with the Secretary of the Interior on how best to permanently protect these objects, including the possibility of adding lands to the monument as they are remediated.

The biological aspects of this directive are implemented through BRMP as part of the CLUP.

3.14 DOE Order 430.1C – Real Property Asset Management

The objective of DOE Order 430.1C is to "establish a data-driven, risk-informed, performance-based approach to the life cycle management of real property assets that aligns the real property portfolio with DOE mission needs; acquire, manage, positively account for, and dispose of real property assets in a safe, secure, cost-effective, and sustainable manner; and ensure the property portfolio is appropriately sized, aligned, and in the proper condition to support efficient mission execution."

This order establishes land-use planning requirements for DOE sites, and states that "real property planning must ensure applicable requirements related and not limited to climate change resilience and adaptation, and sustainability; environment, health, safety, and security; earthquake risks; cultural and natural resource preservation; and historic preservation are addressed." BRMP directly supports implementation of this order by identifying important resources on the Hanford Site and providing guidance for the management of those resources consistent with the HCP-EIS.

3.15 Noxious Weed Control

The need for control of undesirable species such as noxious weeds is established by several federal and state regulations, orders, and agreements, as described in the following subsections.

3.15.1 Federal Regulations

The *Federal Noxious Weed Act of 1974,* as amended by *Section 15 - Management of Undesirable Plants on Federal Lands, 1990,* authorizes the Secretary of Agriculture "to cooperate with other federal and state agencies, and others in carrying out operations or measures to eradicate, suppress, control, prevent, or retard the spread of any noxious weed. Each federal agency must 1) designate an office or person adequately trained to develop and coordinate an undesirable plants management program for control of undesirable plants on federal lands under the agency's jurisdiction, 2) establish and adequately fund an undesirable plants management program through the agency's budgetary process, 3) complete and implement cooperative agreements with State agencies regarding the management of undesirable plant species on federal lands, and 4) establish integrated management systems to control or contain undesirable plant species targeted under cooperative agreements."

A Memorandum of Understanding for the Establishment of a Federal Interagency Committee for the Management of Noxious and Exotic Weeds, 1994, identified a government interagency united effort to control exotic and noxious weeds on government properties. The federal agencies include the U.S. Departments of the Interior, Agriculture, Defense, Transportation, and Energy.

3.15.2 Washington State Regulations

The Revised Code of Washington *Chapter 17.10 -Noxious Weed - Control Boards* provides the regulatory authority for control of noxious weeds in Washington. It also establishes county and regional noxious weed control boards and the structure for establishing county noxious weed lists. WAC 16-750, *Washington State Noxious Weed List and Schedule of Monetary Penalties,* provides the list of species categorized in Washington as noxious weeds and defines monetary penalties for failure to control their spread.

DOE established an agreement with neighboring counties' noxious weed control boards via the Memorandum of Understanding between the Washington State Department of Agriculture, Adams County Noxious Weed Control Board, Benton County Noxious Weed Control Board, Franklin County Noxious Weed Control Board, Grant County Noxious Weed Control Board, and US. Department of Energy Richland Field Office for Management of Noxious Weeds and Undesirable Plants, 1997, for ongoing control of noxious weeds on the Hanford Site.

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4.0 Overview of Hanford Biological Resources

This chapter describes the current extent and distribution of biological resources found on the Hanford Site. It also provides a brief description of the climate, soils, and topography and characterizes how these physical features influence the vegetation and wildlife of the Hanford Site. A brief history of past land use and a fire history are also included to provide context for understanding how historic land use and wildfire have influenced the habitats and wildlife that occupy the site. Additional detailed information characterizing the geology, climate, and surface waters of the Hanford Site can be found in the *Hanford Site NEPA Characterization* (Duncan et al. 2007).

The Hanford Site is located within the Columbia Basin Ecoregion, an area that historically included over 6 million ha (14.8 million ac) of steppe and shrub-steppe vegetation across most of central and southeastern Washington State (Franklin and Dyrness 1973) as well as portions of north-central Oregon. The current Hanford Site occupies about 1516 km^2 (586 mi^2) at the approximate center of the ecoregion (Figure 4.1). The Hanford Site represents one of the largest tracts of native shrub-steppe habitat remaining in Washington State.

A wide variety of habitat types and associated plant communities can be found on the Hanford Site, ranging from habitats on talus slopes, unstabilized sand dunes, and high-elevation basalt outcrops to vast expanses of sagebrush/bunchgrass communities. In addition to shrub-steppe habitats, Hanford also includes valuable swale, riparian, wetland, and aquatic resources. A free-flowing stretch of the Columbia River, the Hanford Reach, bisects the Hanford Site, and a couple of perennial streams flow within the site boundaries.

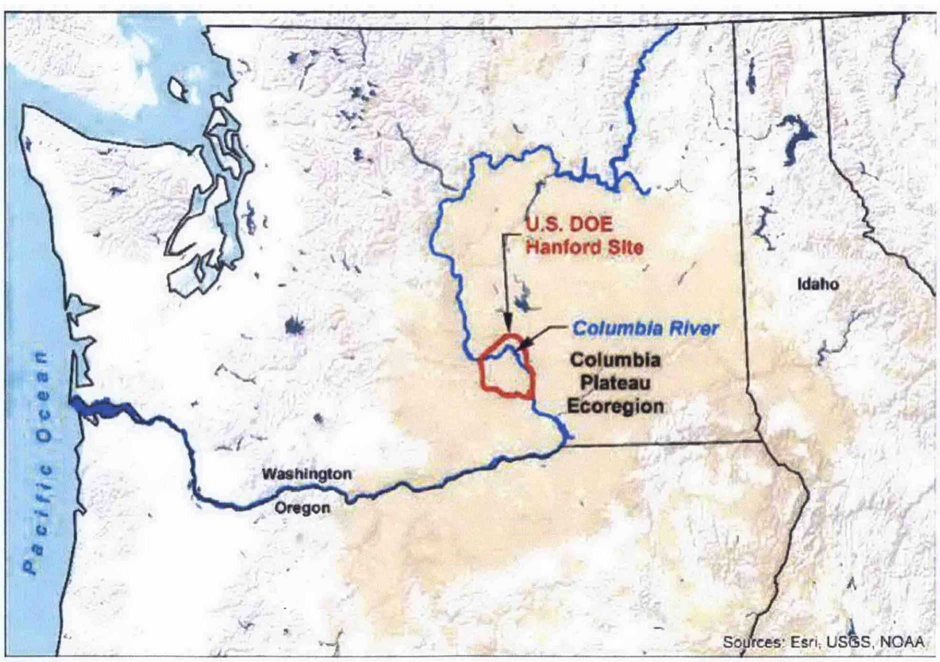

Figure 4.1 The Hanford Site within the Columbia Plateau Ecoregion

The Hanford Site's biological resources have been recognized for their state, regional, and national significance. In addition to the Presidential Proclamation designating portions of the Hanford Site as the HRNM (65 FR 37253), DOE designated the entire site designated a National Environmental Research Park in 1994. This designation reflected Hanford's importance in providing a protected area for research demonstrations and education in ecology. Also, the ALE Reserve is designated a federal Research Natural Area (Franklin et al. 1972). This federal designation is based on the site's ability to provide opportunities for researchers, students, and educators to study and observe a relatively large and undisturbed ecosystem in which natural processes are retained (PNL 1993). The research natural area designation also furthers the purposes of *Washington's Natural Heritage Plan* (WDNR 2011) by providing protection for rare plant communities.

4.1 Environmental Setting

The climate at Hanford is semi-arid with hot, dry summers and cold, wet winters. Based on data collected from 1945 through 2015 (http://www.hanford.gov/hms), the average monthly temperatures at the Hanford Meteorological Station (HMS) ranged from a low of -0.4°C (31.3°F) in January to a high of 24.9°C (76.9°F) in July. Average annual precipitation at the HMS during this period was 17 cm (6.8 in.). Most precipitation is received between October and April, and precipitation increases with elevation (Thorp and Hinds 1977). The highest elevation on the Hanford Site is 1150 m (3500 ft) at the crest of Rattlesnake Mountain. Protected areas along the ridgeline may receive 28 to 30 cm (11 to 12 in.) of precipitation annually—severe winds and freezing weather make it difficult to measure precipitation on the crest accurately. The upper slopes of this northeast-facing anticlinal ridge fall steeply to about 490 m (1600 ft) elevation, where slopes become more moderate, but continue to descend to approximately 152 m (500 ft) in the Cold Creek Valley and eastward to the Columbia River where annual average precipitation is approximately 12 cm (6 to 7 in.) (Hoitink et al. 2005).

The 200-Area plateau rises a few hundred feet above the rest of the central portion of the Hanford Site, with Gable Butte and Gable Mountain rising fairly steeply to 236 m (773 ft) and 331 m (1085 ft), respectively (Figure 1.1). Soils range from silt loams and stony silt loams on the slopes of Rattlesnake Mountain, Gable Mountain, Gable Butte, and Umtanum Ridge, to sandy loams, loamy sands, and dune sands on the Columbia River Plain Plain (Rickard et al. 1988; Hajek 1966). See Figure 4.2. There are also areas of talus and basalt scree on all major ridges. Variation in soils, elevation, and precipitation from the river to the top of Rattlesnake Mountain allow a variety of shrub-steppe plant species and habitats to exist across the site.

Although the Hanford Site's biological resources are characteristic of the Columbia Plateau Ecoregion, the site is unique in that it is located within the driest and hottest portion of the ecoregion (Franklin and Dyrness 1973). These climatic conditions result in somewhat unusual species assemblages relative to the rest of the ecoregion. These same conditions also may result in Hanford shrub-steppe communities being less resilient to disturbance, making restoration and rehabilitation after large-scale disturbance more difficult than other areas that are cooler and receive more precipitation.

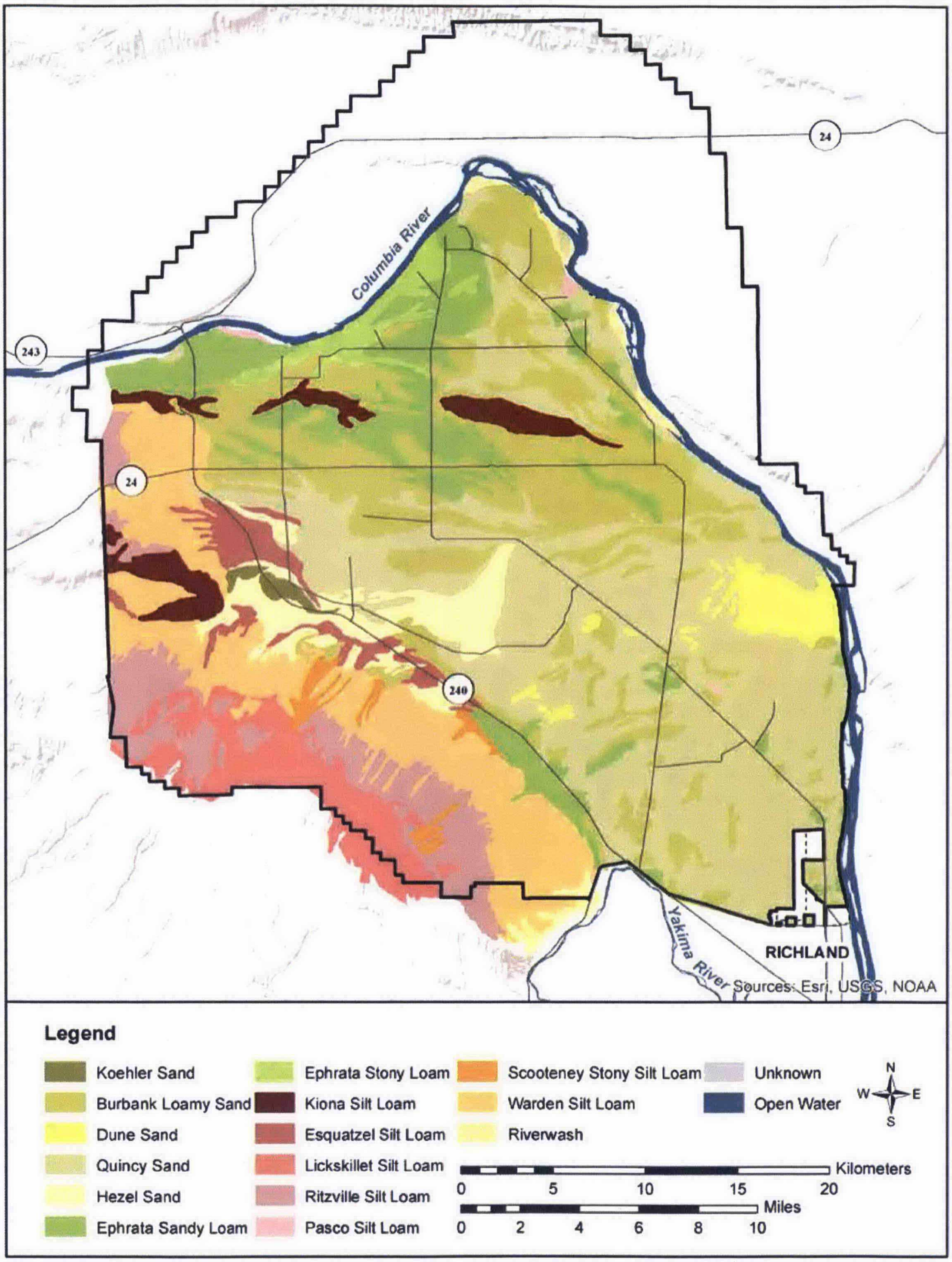

Figure 4.2 Soils of Central Hanford and the Fitzner/Eberhardt Arid Lands Ecology Reserve

4.1.1 Hanford Site History and Past Land Use

The steppe and shrub-steppe communities of the Columbia Basin have undergone substantial loss or degradation in the post-European era that can be attributed primarily to human-induced change (Dobler 1992; Noss et al. 1995). Within Washington alone, more than half of the shrub-steppe habitat historically present has been lost (Dobler 1992; Jacobsen and Snyder 2000), primarily as a result of agriculture. Much of the remaining habitat is degraded and fragmented or threatened by development and agricultural expansion.

Ungrazed sagebrush-steppe in the Intermountain West is a critically endangered ecosystem that has experienced more than a 98% decline since European settlement (Noss et al. 1995). Figures 4.3 and 4.4 show the historic and current distribution and extent of land-cover classes within the Columbia Basin Ecoregion (based on Interior Columbia Basin Ecosystem Management Project data, http://www.icbemp.gov/html/icbhome.html).

Before 1943, the land-use history of the Hanford Site related principally to livestock ranching, farm homesteads, and small supply and grain shipment towns (Gerber 1992). The consequences of some of these land uses are still apparent today. For example, the abandoned town sites and old fields along the Columbia River are still composed mostly of non-native plant species. Other areas that were grazed retain a mix of native and non-native plant species or, if not intensively grazed, still closely resemble the original native plant communities. Even the current Fitzner/Eberhardt Arid Lands Ecology Reserve experienced historic land uses from 1880 to 1940, including homesteading, winter/spring sheep grazing, natural gas well drilling, and road building (Hinds and Rogers 1991). These historical non-DOE land uses also must be considered in understanding the ecological context of the Hanford Site.

The Hanford Site was created in 1943 in response to the nation's World War II defense needs. Over its first approximately 50 years of operation, Hanford's mission was a combination of energy-related research and military-related material production, the apportionment of which depended on the nation's changing defense needs (Becker 1990). The most recent 25 years or so have been dedicated to environmental restoration and waste management. Use of Hanford lands for the production of defense nuclear materials protected much of the Hanford Site from industrial development, agriculture, and livestock grazing (Gray and Becker 1993; Gray and Rickard 1989). Because of this, the Hanford Site retains large blocks of shrub-steppe (Smith 1994) that have been relatively undisturbed for over 70 years.

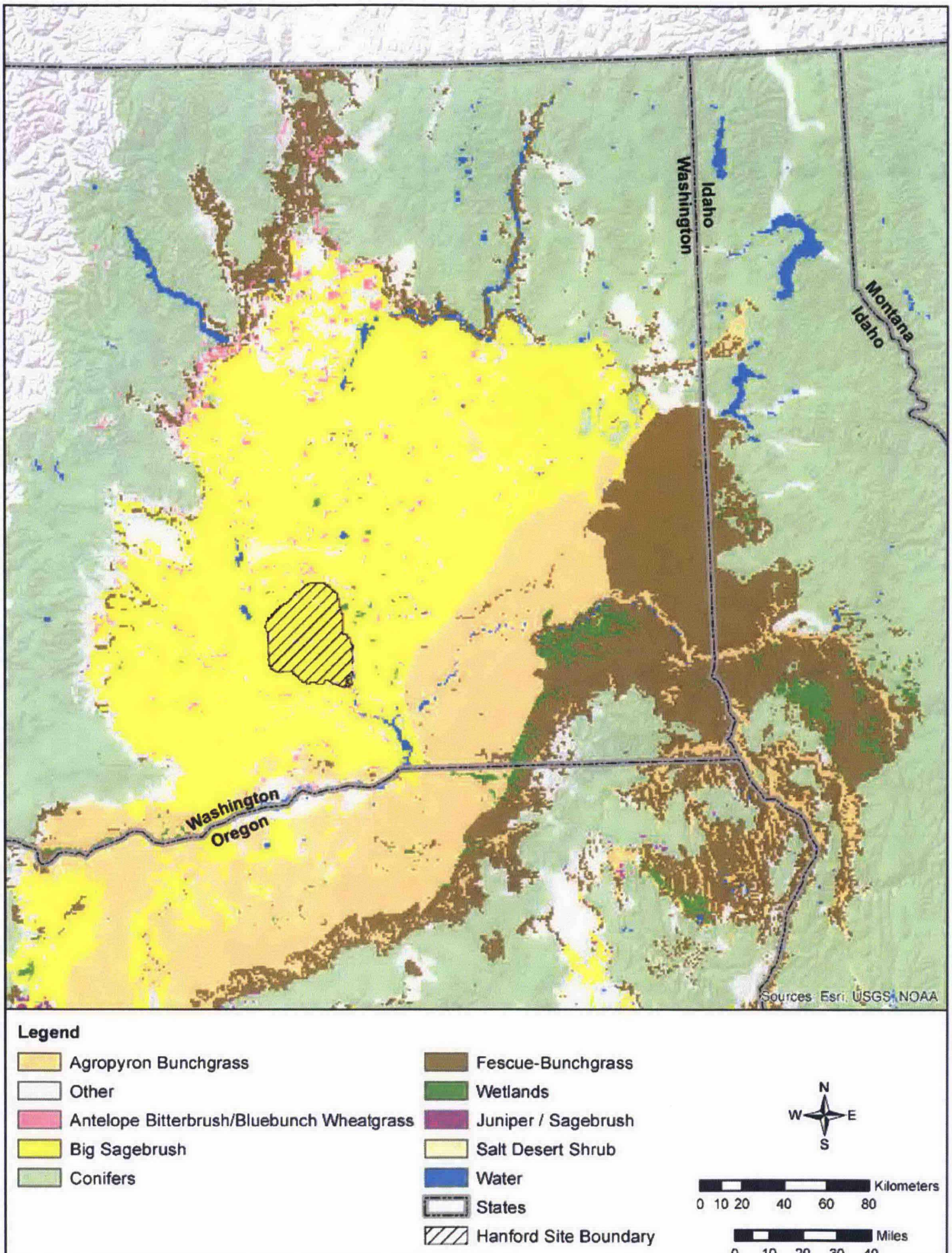

Figure 4.3 Historic Distribution and Extent of Land Cover Classes within the Columbia Plateau Ecoregion

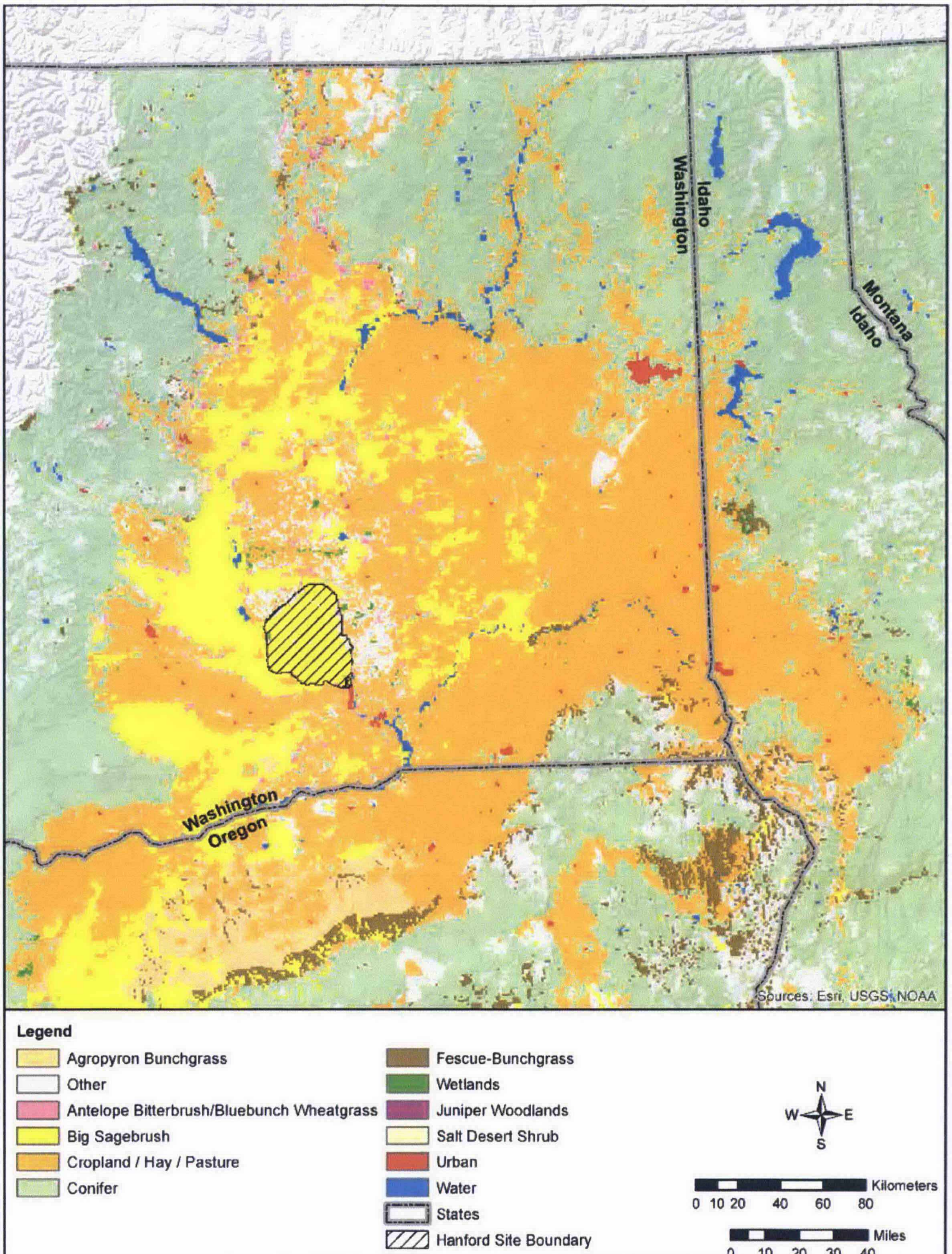

Figure 4.4 Current Distribution and Extent of Land Cover Classes within the Columbia Plateau Ecoregion

4.1.2 Fire History

Over the last several decades, the Hanford Site has been subject to large wildfires that have burned thousands of acres (Figure 4.5). Wildfire in the shrub-steppe historically occurred at intervals of 32 to 70 years in sagebrush vegetation types (Wright et al. 1979), allowing sufficient intervals for the native shrubs to re-establish from seed after a wildfire. Some areas within the shrub-steppe ecosystem now experience fire-return intervals of less than 10 years (Pellant 1990; Whisenant 1990), effectively resulting in the loss of sagebrush and other key plant and wildlife species over large areas (Knick 1999).

The introduction and spread of the alien annual cheatgrass (*Bromus tectorum*) in the arid western United States has been linked to increased wildfire frequency in shrub-steppe habitats. During the 1990s, cheatgrass-dominated areas were found to burn nearly four times more often than any native vegetation type. Cheatgrass was also disproportionately represented in the largest fires (Balch et al. 2012).

As cheatgrass has become more prevalent in shrub-steppe communities, and human disturbance and development pressure have increased, the frequency and severity of fires in this ecoregion have increased. The recovery of shrub-steppe habitats after wildfire varies depending on factors, including the composition of the pre-fire plant community, time of the wildfire, and severity of the burn.

4.2 Biological Resources

The Hanford Site lies within the interior, low elevation, Columbia River Basin, which is within the shrub-steppe zone (Daubenmire 1970). The diversity of physical features across the Hanford Site contributes to a corresponding diversity of biological communities (TNC 1995, 1996, 1998, and 1999). Although the majority of the Hanford Site consists of shrub-steppe habitats, valuable riparian, wetland, and aquatic habitats are associated with the Hanford Reach. The Hanford Site also contains a diversity of other rare terrestrial habitats such as riverine islands, bluffs/cliffs, basalt outcrops, and sand dunes (Downs et al. 1993; Hallock et al. 2007). Both shrub-steppe and riparian habitats are considered "priority habitats" by the Washington Department of Fish and Wildlife (WDFW). In addition, the Washington Natural Heritage Program (WNHP) has mapped and classified portions of the native plant communities found on Hanford as priority ecosystems. The location of priority habitats on Hanford provides opportunities for creating habitat and landscape connectivity with other large adjacent areas of shrub-steppe habitat within the ecoregion, such as with the Yakima Training Center to the west and north and Columbia National Wildlife Refuge to the north and east.

This section describes those habitats and the wildlife found on the Hanford lands currently managed by DOE, including central Hanford and the McGee Ranch/Riverlands area. Descriptions of habitats occurring on HRNM lands currently managed by USFWS can be found in the HRNM-CCP (USFWS 2008).

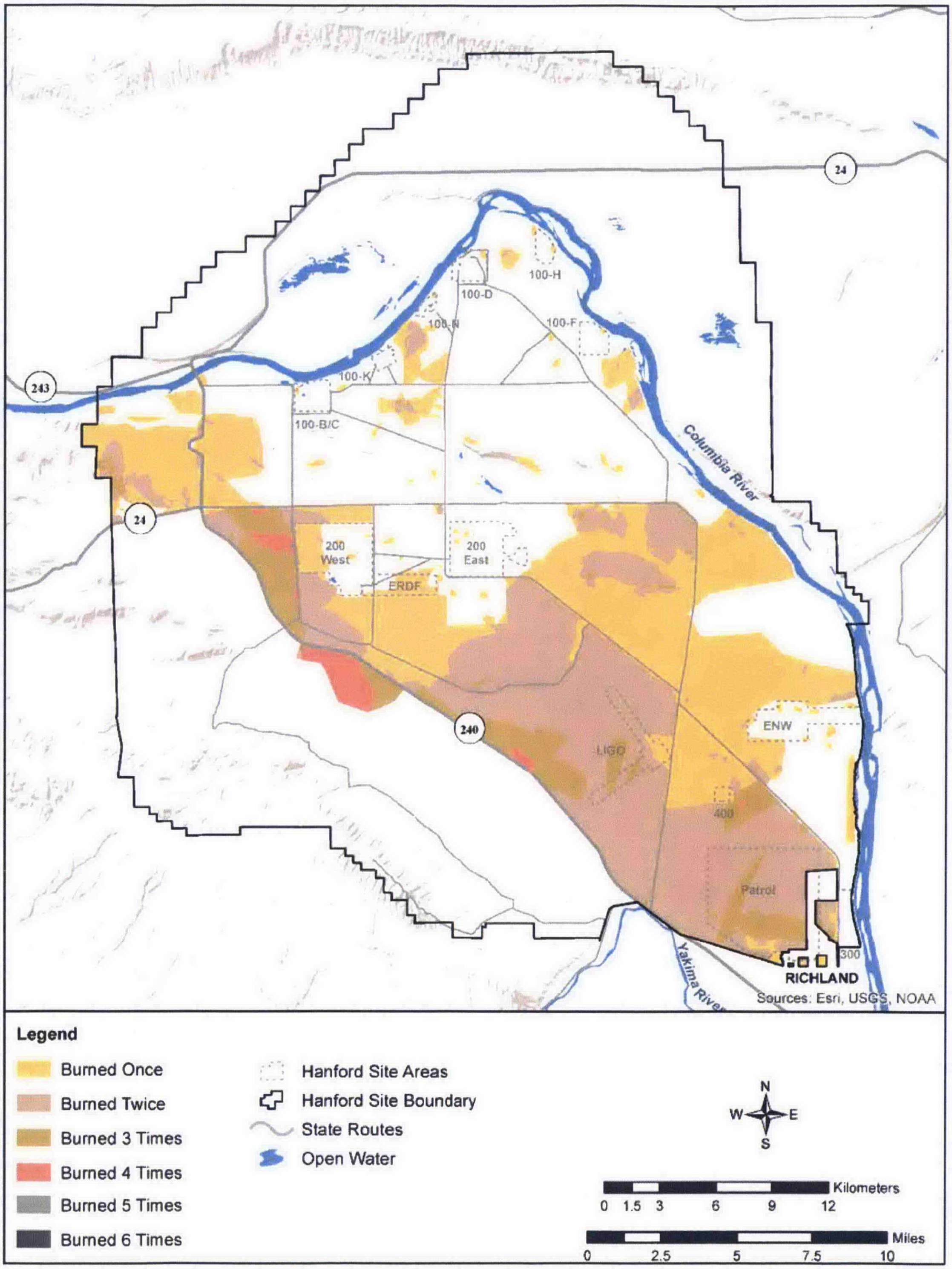

Figure 4.5 Hanford Site Fire Boundaries from 1978 to 2016

4.2.1 Shrub-Steppe Habitats

The designation "shrub-steppe" refers to habitats dominated by shrubs and steppe grasses. In describing the vegetation zones and plant associations of the eastern Washington steppe, Daubenmire (1970) originally included all the Hanford Site in a zone called the *Artemisia tridentata/Agropyron spicatum* or big sagebrush/bluebunch wheatgrass zone. (*A. spicatum* has since been reclassified as *Pseudoroegneria spicata* (Pursh) A. Löve). This large zone covers the most arid interior of eastern Washington extending west to the Cascade Mountains, north into the Okanogan Valley, and south into portions of north central Oregon. Within the big sagebrush/bluebunch wheatgrass zone, a number of different shrub-steppe plant community types exist according to climatic conditions, topographic conditions, soil type and depth, and disturbance history.

Shrub-steppe plant communities on Hanford are characterized by shrub overstories consisting of species of sagebrush (*Artemisia* spp.), bitterbrush (*Purshia tridentata*), or rabbitbrush (*Ericameria* or *Chrysothamnus* spp.) with perennial bunchgrass understories often dominated by bluebunch wheatgrass, Sandberg's bluegrass (*Poa secunda*), Indian ricegrass (*Achnatherum hymenoides*), or needle-and-thread grass (*Hesperostipa comata*). The extent and distribution of current vegetation and land cover types, based on a vegetation survey done for the central Hanford Site in 2015 and 2016 are shown in Figure 4.6. More detailed descriptions of vegetation associations found on the Hanford Site are described in *Vascular Plants of the Hanford Site* (Sackschewsky and Downs 2001).

The ecological status and composition of the plant community changes in response to natural and human-induced disturbance and continues to change over time. This process of change, called succession, is used to describe the dynamics of plant community recovery. The introduction of invasive annual plants, such as cheatgrass, can alter the sequence of plant community recovery or prevent recovery of perennial native vegetation. Successional plant communities may consist of primarily perennial native bunchgrasses and forbs with or without early successional shrubs such as green and gray rabbitbrush. The succession process may take decades after disturbance before the community recovers to support stands of big sagebrush or other late-successional-stage shrubs; however, these interim plant communities are considered part of the shrub-steppe ecosystem and are an important resource for a variety of wildlife and plant species of concern.

In areas that have been recently or repeatedly burned, the shrub overstory may be sparse, small in stature, or absent. As stated in Section 4.1.2, the potential for habitats to recover after a wildfire depends on a number of factors. Where the pre-fire habitats were dominated by native perennial species, the herbaceous perennials generally re-grow from roots the following growing season. Sagebrush does not re-grow from roots after fire and must re-establish from seed. If viable seeds remain in the soil seed bank, re-establishment of sagebrush as a dominant overstory species may occur within a decade. If no viable seed source is readily available—such as in areas that have burned repeatedly within a 5- to 10-year period—then re-establishment of sagebrush and other shrubs may take significantly longer, and the vegetation association will be dominated by herbaceous grasses and forbs following the fire. Where pre-fire habitats were dominated by alien annual species or where alien annual species are prevalent, these species often increase after fire.

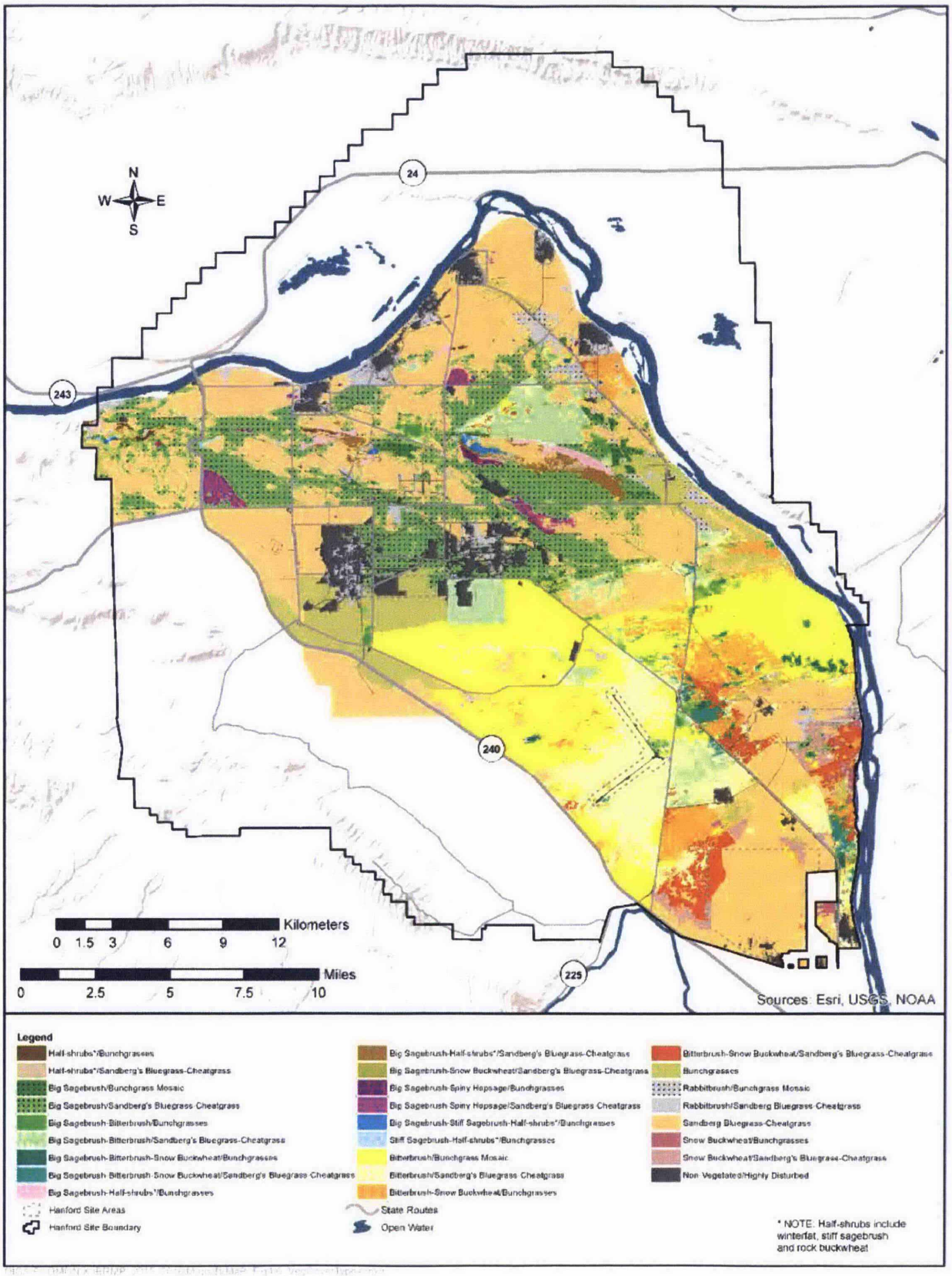

Figure 4.6 Vegetation Cover Types on the Hanford Site

4.2.2 Wetlands and Riparian Habitats

In addition to shrub-steppe, the Hanford Site contains riparian, wetland, and aquatic habitats. Riparian and wetland areas are important because of the increased habitat diversity they provide. Riparian environments also provide critical linkages and transition zones between the upland and aquatic environments. These zones provide a variety of ecosystem functions, such as wildlife habitat, contribution to fish habitat, unique plant species habitat, flood control improvement, and sediment trapping. Riparian vegetation along the Hanford Reach usually consists of a vegetation band along the river shoreline that is influenced by the flow of the river and the increased availability of water for plant growth at the river edge. This type of vegetation is characterized by plants that can persist in wetted soils or that require higher levels of soil moisture than can be found in the more arid uplands.

The Hanford Reach contains native riparian habitat, free-flowing riffles, gravel bars, oxbow ponds, and backwater sloughs that are otherwise limited in occurrence elsewhere along the Columbia River (USFWS 1980; NPS 1994; 65 FR 37253). Riparian vegetation is limited in extent, with narrow bands or buffers near the water consisting of a number of forbs, grasses, sedges, reeds, rushes, cattails, and deciduous trees and shrubs. Much of the riparian zone along the Columbia River has been colonized by invasive plant species that can act to displace native species. Along the Hanford Reach, mulberry (*Morus alba*) and Russian olive (*Elaeagnus angustifolia*) trees are more frequent than the native black cottonwood (*Populus balsamifera* ssp. *trichocarpa*). In places along the Columbia River shoreline, the native cattails (*Typha latifolia*), sedges (*Carex* sp.), and rushes (*Juncus* sp.) may be displaced by reed canary grass (*Phalaris arundinacea*).

Where the banks of the river are steep, the riparian vegetation forms a band that roughly extends from the surface elevation corresponding to average low flows along the river to a few meters above the shoreline elevation corresponding to average high flows. Thus, this band of vegetation can be as narrow as 5 to 10 m (15 to 30 ft) where river banks are steep; but, in areas where the river bank slopes are mild and areas of slower backwater flows (sloughs), the extent of the band of riparian vegetation can be much greater—up to 700 to 800 m (2300 to 2600 ft) in width in some areas. Riparian vegetation types along the Columbia River bordering the Hanford Site are shown in Figure 4.7.

Riparian and wetland areas not directly associated with the Columbia River are widely scattered across the Hanford Site. These areas include a mix of small, naturally occurring springs and streams, artificial wetlands created by irrigation runoff (north of the Columbia River), and a few temporary water bodies attributed to past waste-water discharges (Neitzel 2000; Downs et al. 1993). The springs and streams and their associated vegetation are especially important for providing water, forage, cover, and breeding sites for wildlife within the dry-land portions of the Hanford Site (Downs et al. 1993). Most of these features are found on Hanford lands currently managed by the USFWS and are described in the HRNM-CCP (USFWS 2008). Springs and water bodies found on central Hanford and McGee Ranch/Riverlands are shown in Figure 4.8.

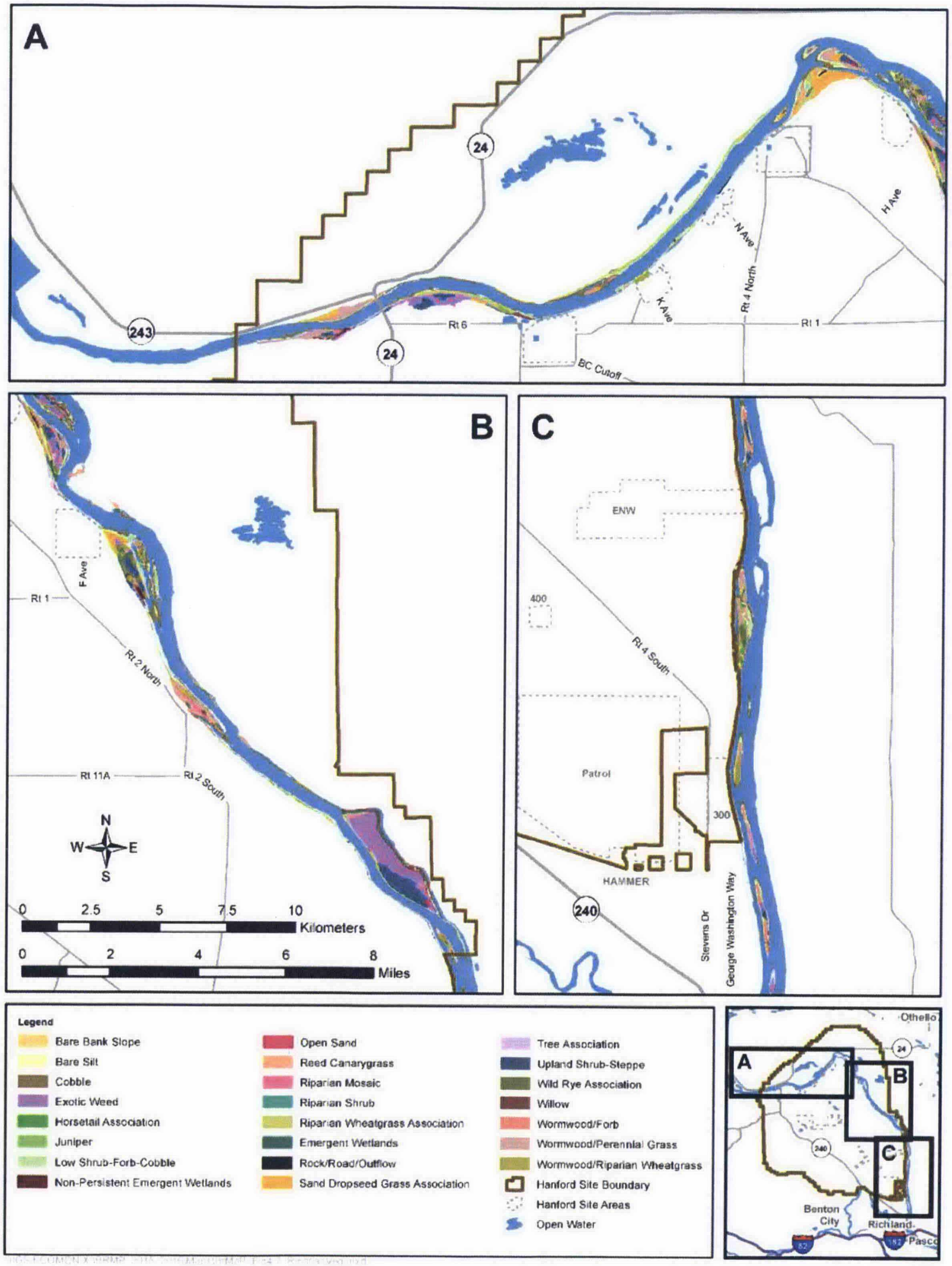

Figure 4.7 Riparian Vegetation Types Along the Columbia River

4.2.3 Significant or Rare Habitats

Within the Hanford Site boundaries, a number of physical features create unique habitat for plants and wildlife (Figure 4.8). In the areas currently managed by DOE, these habitats include the following:

- Basalt outcrops, cliffs, and talus slopes—which support rare plants, rare plant communities, and specialized wildlife
- Upland springs—which support rare wildlife species and high wildlife use
- Desert streams – which also support rare wildlife species and high wildlife use
- Vernal pools – which provide rare plant habitat and support wildlife use
- Columbia River sloughs—which support high fish and wildlife use (provide important habitat diversity within the Hanford Reach) and associated rare plant species and communities
- Columbia River islands—which provide unique wildlife habitat through isolation and support rare plants
- Sand dunes—which are considered a priority ecosystem and support rare plant species and communities
- Swales—which contain unique vegetation assemblages that support heavy use by pollinators.

More detailed information about each of these habitats and their associated plants and wildlife can be found in *Habitat Types on the Hanford Site: Wildlife and Plant Species of Concern* (Downs et al. 1993).

4.2.4 Washington State Element Occurrences

The Hanford Site also contains relatively large areas of native plant communities that have been mapped and identified as "element occurrences" by the WNHP and are currently classified as priority ecosystems within the state (Figure 4.9). An element is a basic unit of Washington's biologic and geologic environment identified as a needed component of a system of natural areas. An element can be an entire ecological system, such as a plant community or a wetland ecosystem that includes the native plants and animals common to that system. Occurrences of priority species or ecosystems are assessed by WNHP regarding their overall condition and viability.

4.2.5 Wildlife

Wildlife use habitats on the Hanford Site according to species-specific requirements. Their use of shrub-steppe, riparian, and aquatic habitats may vary during different portions of their life cycle or different seasons. Wildlife at Hanford may be resident or migratory and include recreationally and commercially important species. Hanford provides habitat for a variety of mammals, reptiles, amphibians, birds, fish, and invertebrates. They are discussed briefly in this subsection. Comprehensive lists of the wildlife species observed on Hanford Site are provided in Duncan et al. (2007).

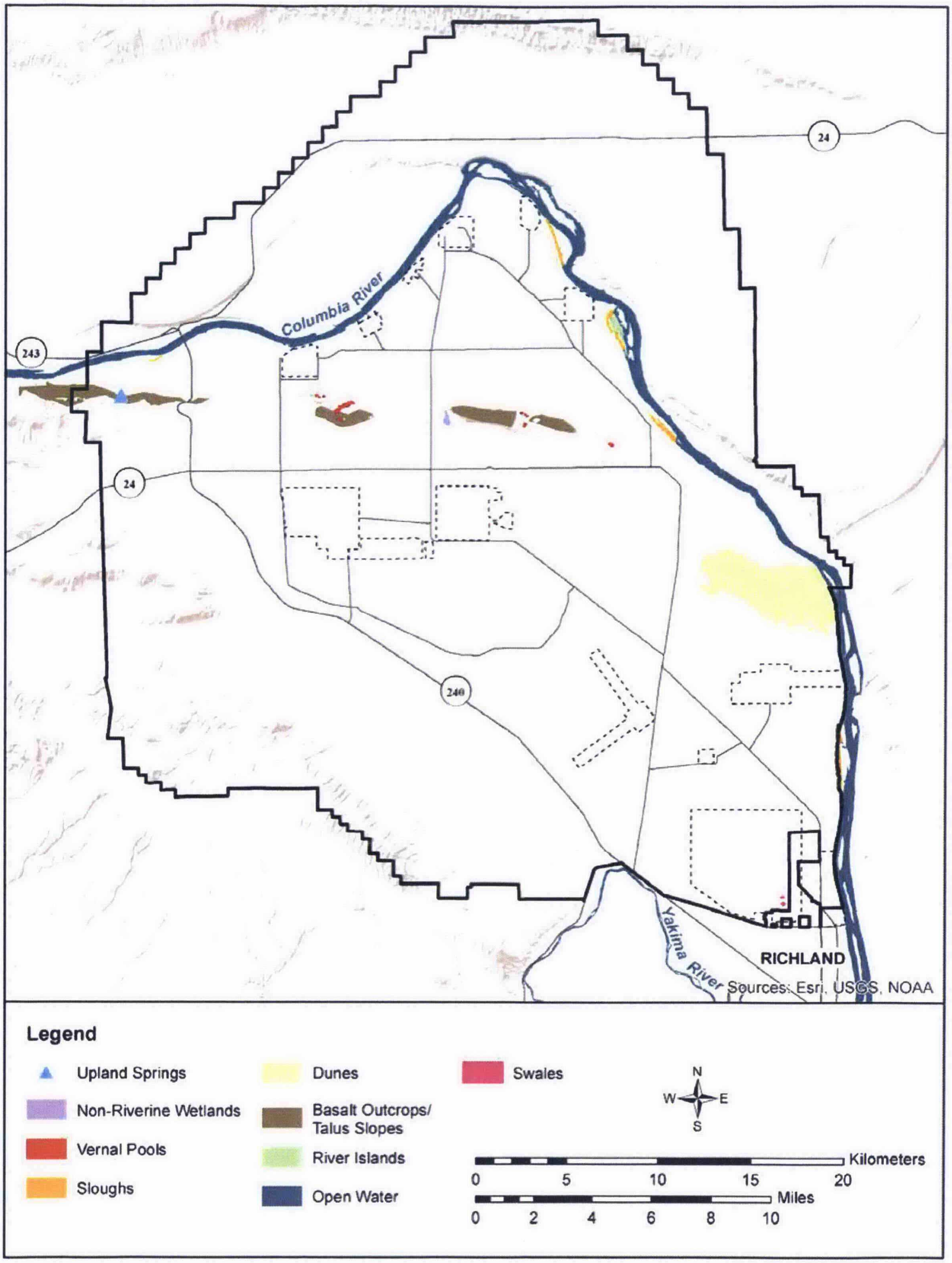

Figure 4.8 Significant or Rare Habitats, including Swales, Springs, and Water Bodies

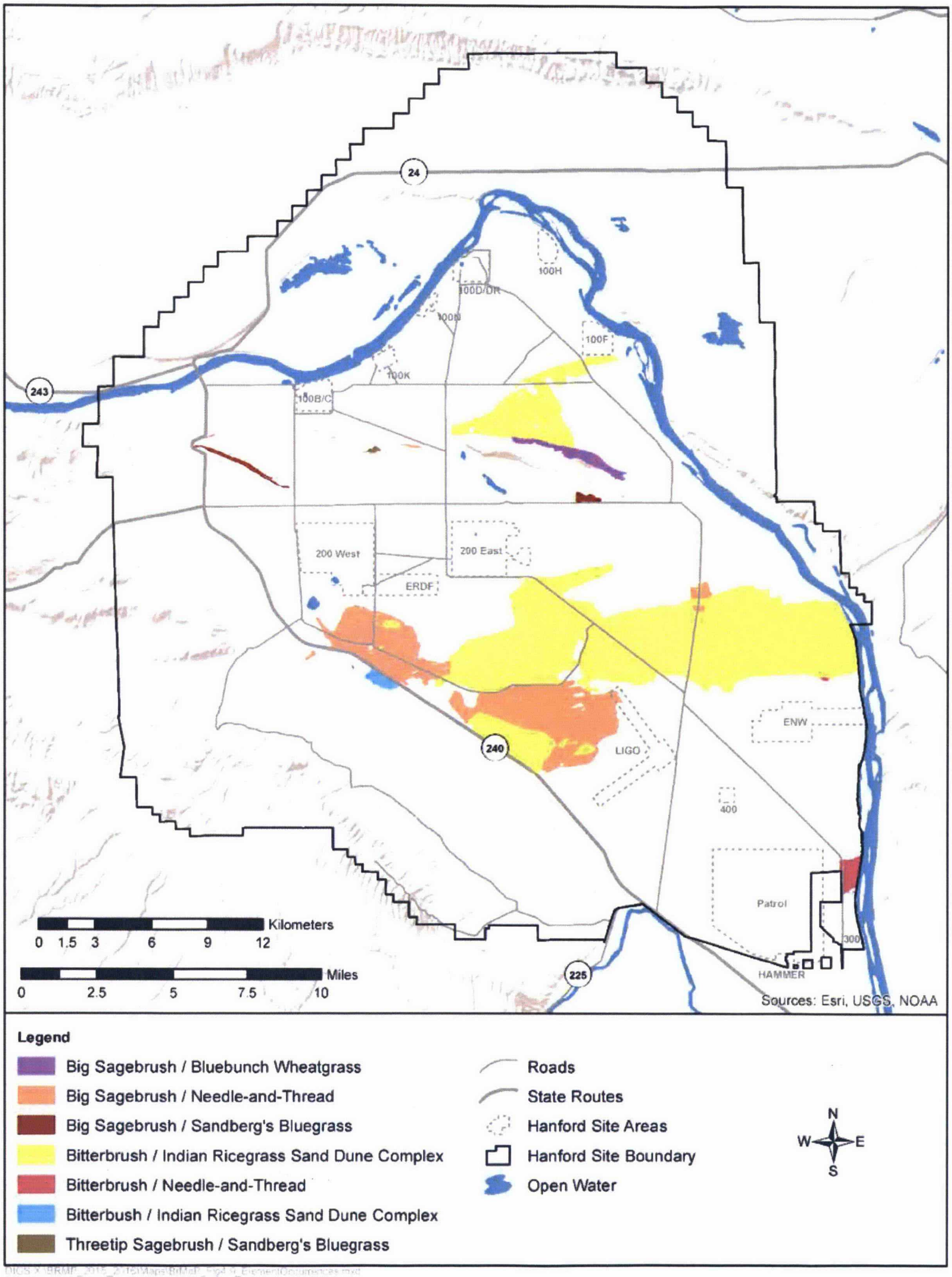

Figure 4.9 Washington State Plant Community Element Occurrences on the Hanford Site

4.2.5.1 Mammals

The approximately 46 mammalian species present on the site are representative of those found in shrub-steppe, riparian, and aquatic habitats of the region (Duncan et al. 2007). Many of the smaller and less mobile mammal species, such as mice, rabbits, and shrews, are resident, and individuals spend their entire lives within the boundary of the site. Individuals of more mobile species, such as bats, or occasional transients like the mountain lion (*Puma concolor*), may only be present seasonally.

Because most of the site is dominated by shrub-steppe, the Hanford mammal community is representative of upland species that occur in shrub-steppe habitats. Habitat generalists, such as the ubiquitous coyote (*Canis latrans*), mule deer (*Odocoileus hemionus*), Rocky Mountain elk (*Cervus elaphus nelsoni*), American badger (*Taxidea taxus*), deer mouse (*Peromyscus maniculatis*), and Great Basin pocket mouse (*P. parvus*) can be found in many different habitats. Black-tailed and white-tailed jackrabbits (*Lepus californicus* and *L. townsendii*), and ground squirrels (*Urocitellus* spp.) are only found in shrub-steppe habitats. The porcupine (*Erithozon dorsatum*), striped skunk (*Mephitis mephitis*), vagrant shrew (*Sorex vagrans*), and white-tailed deer (*Odocoileus virgianus*) are mainly found in riparian areas along the Columbia River. Beaver (*Castor canadensis*), muskrat (*Ondatra zibethicus*), mink (*Mustela vison*), and river otter (*Lontra canadensis*) occur in both riparian and aquatic habitats.

Other Hanford mammal species only occur in very specific habitats. The least chipmunk (*Tamias minimus*), Merriam's shrew (*S. merriami*), and sagebrush vole (*Lemmiscus curtatus*) are only found at higher elevations on Hanford. Bats on the Hanford Site are less common and restricted to very specific habitats such as rock outcrops, abandoned buildings, and large trees. Common bat species found on the Hanford Site are the Yuma myotis (*Myotis yumanensis*), silver-haired bat (*Lasionycteris noctivagans*), and pallid bat (*Antrozous pallidus*).

4.2.5.2 Reptiles and Amphibians

There are approximately 10 reptile species known to occur on the Hanford Site. Of the three lizard species, the common side-blotched lizard (*Uta stansburiana*) is the most frequently observed and occurs in most native upland habitats. Sagebrush lizards (*Sceloporus graciosus*) are also found on Hanford and generally occupy habitats where some shrub cover is available. The pygmy short-horned lizard (*Phrynosoma douglasii*) is relatively uncommon on the Hanford Site.

Six snake species are known to occur on Hanford. Most of the snakes commonly occur in upland habitats only, including the western yellow-bellied racer (*Coluber constrictor*) and the Great Basin gopher snake (*Pituophis catenifer*). The western rattlesnake (*Crotalus viridis*) is often found in or near basalt outcrops on Hanford or along the Columbia River, while the striped whipsnake (*Masticophis taeniatus*) and desert nightsnake (*Hypsiglena chlorophaea*) also occur in uplands, but have rarely been encountered on the site. The western garter snake (*Thamnophis elegans*) prefers riparian habitats. The painted turtle (*Chrysemys picta*) is the only turtle known to occur on the Hanford Site.

Amphibians are somewhat limited in abundance and distribution on the site because of the limited abundance and distribution of water and moist habitats. Only five amphibian species are known to occur on the site. The Great Basin spadefoot toad (*Spea intermontana*) and Woodhouse's toad (*Anaxyrus woodhousii*) are the only two toads, and the American bullfrog (*Rana catesbeiana*) and Pacific tree frog (*Pseudacris regilla*) are the only frogs. The tiger salamander (*Ambystoma tigrinum*) is the remaining amphibian species known to occur on Hanford.

4.2.5.3 Birds

Varying life histories also allow some species to exploit seasonally available resources and dictate when they may be present on Hanford. Individuals of resident species, such as the California quail (*Callipepla californica*), chukar (*Alectoris chukar*), and ring-necked pheasant (*Phasianus colchicus*), may spend their entire lives within the confines of Hanford, while individuals of other resident species, such as the house finch (*Haemorhous mexicanus*), killdeer (*Charadrius vociferus*), and American robin (*Turdus migratorius*), may be replaced by other individuals as the species seasonally shifts its geographical range.

Migratory species from as small as the tree swallow (*Tachycineta bicolor*) to as large as the sandhill crane (*Grus canadensis*) are only found on the site during spring and autumn. Many songbird species, such as the ruby-crowned kinglet (*Regulus calendula*) and western bluebird (*Sialia mexicana*), stop over during spring or fall migration and breed elsewhere. Still others, such as the white-crowned sparrow (*Zonotrichia leucophrys*), northern rough-legged hawk (*Buteo lagopus*), and the common goldeneye (*Bucephala clangula*), arrive to spend winter on the site.

Prior to the 1990s greater sage grouse (*Centrocercus urophasianus*) were once routinely observed above 250 m (800 ft) on the Hanford Site (Downs et al. 1993). These birds require sagebrush as a habitat component, and the local populations were apparently lost after wildfires removed sagebrush from large areas of the site. Other factors, such as installation of many tall transmission line towers, also may have contributed to the decline. Despite rare sightings, greater sage grouse no longer appear to be a resident population on the Hanford Site.

4.2.5.4 Fishes

The Columbia River provides habitat for both warm- and coldwater fishes. Forty-six species are known to reside in or migrate through the Hanford Reach. Of these species, Chinook salmon (*Oncorhynchus tshawytscha*), sockeye salmon (*O. nerka*), Coho salmon (*O. kisutch*), and steelhead trout (*O. mykiss*) use the river as a migration route to and from upstream spawning areas and are of the greatest economic importance. Adult and juvenile Pacific lamprey (*Entosphenus tridentatus*) also migrate through the Hanford Reach. The Hanford Reach is the most productive spawning area for fall Chinook salmon in the Pacific Northwest. The fall Chinook salmon that spawn in the Hanford Reach are part of the Upper Columbia River Fall-Run Evolutionarily Significant Unit, which is not listed under any ESA protection category. The annual escapement of adult Chinook salmon to the Hanford Reach averaged 50,000 from 2003 to 2013 (Wagner et al. 2013). In 2015, the Hanford Reach fall Chinook spawning escapement was a record 233,000 adult fish (WDFW and ODFW 2016). The major spawning regions included Vernita Bar and island complexes between the 100 Areas and Ringold.

In addition to fall Chinook salmon, other species of fish are culturally and recreationally important, such as white sturgeon (*Acipenser transmontanus*), small-mouth bass (*Micropterus* *dolomieu*), walleye (*Sander vitreus*), and mountain whitefish (*Prosopium williamsoni*).

4.2.5.5 Terrestrial and Aquatic Invertebrates

Insect diversity on the Hanford Site is high, with more than 1000 taxa identified, which is probably less than 10% of the total present (TNC 1996). Hanford's insect diversity is directly related to the extent and diversity of native habitat. Insects and other related arthropod groups (mites and spiders) are ubiquitous within terrestrial habitats at the site. However, they are not uniformly distributed across all habitats. Darkling beetles (*Tenebrionidae*) and ground beetles (*Carabidae*) are the most common beetles present. Ants (*Formicidae*) are the most common hymenoptera present, and moths are the most common lepidopterans.

Benthic invertebrates are found either attached to or closely associated with the substratum in the Columbia River. All major freshwater benthic taxa are represented in the river. Although studied sparingly over the last 10 to 20 years, the macroinvertebate communities primarily consist of caddisfly (*Trichoptera*) and dipterans (*Chironomidae*) with low overall diversity and species richness. Dipterans make up the majority of spring populations and caddisfly larvae are more prevalent in the fall period. Other orders present but rare in the Hanford Reach include *Plecoptera, Odonata, Hemiptera*, and *Coleoptera*. Species density is generally greatest in the fall and early winter, which corresponds to the time when most insect eggs hatch. In addition to insects, mollusks, sponges, and crayfish are found in riverine environments.

Pacific Northwest National Laboratory conducted mussel surveys along the Hanford Reach shoreline in 2004 (Mueller et al. 2011). Three mussel species belonging to the *Anodonta* genus were found in a number of shallow areas. The California floater (*A. californiensis*) was found in areas with high substrate embeddedness and very low river water velocities. The western floater (*A. kennerlyi*) and Oregon floater (*A. oregonensis*) were encountered in a number of locations where the riverbed was at least partially embedded. Of the four species of native mussels found in the Hanford Reach, the western and Oregon floaters were the most abundant across sampling areas. The western pearlshell mussel (*Margaritafera falcata*) was almost completely absent during surveys conducted in 2004 (a dead shell, thought to have been alive within the last 10 years, was found; Mueller et al. 2011).

4.2.5.6 Federal and State Species of Concern

The Hanford Site is home to a number of species of state and federal concern including species listed as endangered and threatened under the ESA (maintained by the USFWS in 50 CFR 17.11 and 50 CFR 17.12) and species listed in Washington State as endangered, threatened, sensitive, candidate, watch, review, or monitor by the WNHP (2016) and WDFW (2016).

Two fish species (Upper Columbia spring-run Chinook salmon and Upper Columbia steelhead) known to occur in the Hanford Reach of the Columbia River are on the federal list of endangered and threatened species, respectively. The bull trout (*Salvelinus confluentus*), a threatened species, also has been recorded in the Hanford Reach. The Reach is designated as bull trout critical habitat and considered foraging, overwintering, and migratory habitat as part of the mainstem

Upper Columbia River critical habitat unit (75 FR 63898-64069).

In April 2013, the USFWS listed two plant species, the Umtanum desert buckwheat (*Eriogonum codium*) and White Bluffs bladderpod (*Physaria tuplashensis)*, as threatened, with critical habitat, under the ESA (78 FR 23984 and 78 FR 24008). Following an extended public comment period, USFWS affirmed their decision to list these species as threatened, and in December 2013, the final revised rule took effect (78 FR 76995-77005).

No other plants or animals known to occur on the Hanford Site are currently on the federal list of endangered and threatened species. The USFWS also maintains a list of species of concern in Washington State (USFWS 2013) that includes species being monitored that may be considered for federal candidate status in the future. Thirteen species that occur on the Hanford Site are included on the USFWS list. A complete inventory of species listed by state or federal resource agencies is provided in Appendix A.

Plant populations monitored on the Hanford Site include taxa listed by Washington State as endangered, threatened, or sensitive and those species listed as Review Group 1, which includes taxa in need of additional field work before status can be determined (WNHP 2016). More than 100 plant populations of 53 different taxa listed by WNHP as endangered, threatened, sensitive, review, or watch list have been found at the Hanford Site (Figure 4.10) (Sackschewsky and Downs 2001; TNC 1995, 1996, 1998, 1999).

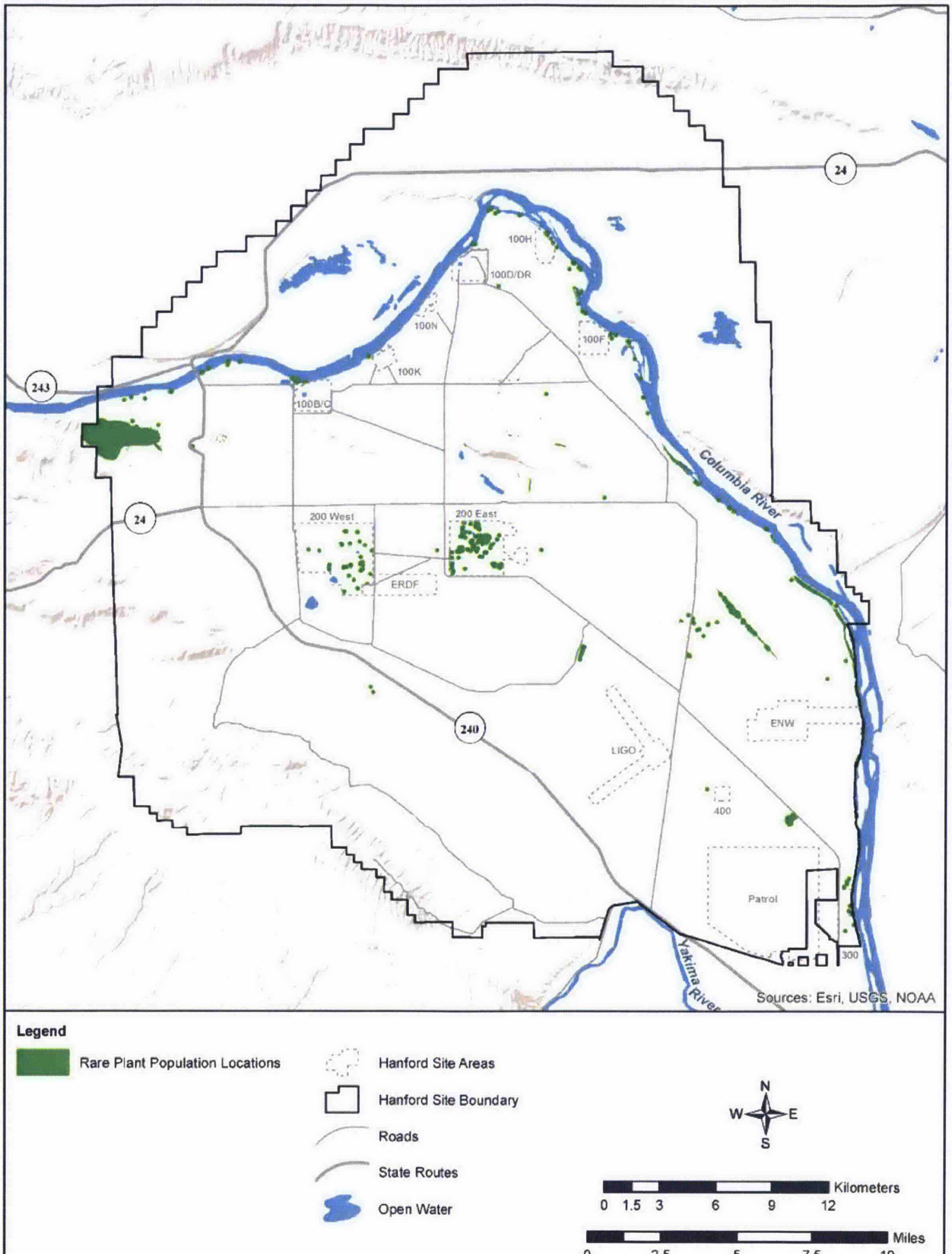

Figure 4.10 Plant Populations of Conservation Concern on the Hanford Site

5.0 Resource Management Approach and Implementation

As a federal land manager, DOE is responsible for conserving plant and animal populations and their habitats on the Hanford Site. The primary goals in managing Hanford's species, habitats, and ecosystem resources include maintaining sustainable population levels of terrestrial and aquatic resident native species, and maintaining or increasing the quantity and quality of functioning native systems across the Hanford Site. The primary objective of this management plan is to provide the strategies and management actions necessary to sustain Hanford's biological resources.

This chapter describes DOE's management objectives, strategies, and general directives for the Hanford Site. Essential aspects of Hanford biological resource management include resource monitoring, impact assessment, mitigation, and restoration. DOE's resource management strategies address habitat and population monitoring and the role of monitoring in implementing adaptive management strategies that are flexible in application and responsive to emerging issues and changing conditions. The process and actions necessary to assess potential impacts to resources and to effectively mitigate for those impacts through avoidance, minimization, and restoration are described in Chapters 6.0 and 7.0.

The DOE process for managing Hanford biological resources is based on a landscape-level ecosystem management approach, which is aimed at protecting, maintaining, restoring, and enhancing essential ecosystem components, processes, and functions. Ecosystem management recognizes the complex links between all biotic and abiotic components, functions they provide, and processes acting on these resources. Because ecosystems are so complex, management is conducted at the resource level and at various scales within the landscape where realistic goals, thresholds, and monitoring strategies can be achieved and measured.

5.1 Resource Management Strategies

Ecosystem-based conservation is a broad approach to natural resource management that involves identifying, protecting, and restoring complete ecosystems, including the structural components and processes, while fully incorporating social, economic, and other human concerns into planning. For DOE, a key objective of this approach is to achieve conservation and protection goals by eliminating or minimizing potential adverse impacts of site operations and ongoing projects without affecting the Hanford Site's ongoing mission, goals, and objectives. Resource management objectives for Hanford are to:

- Protect species and habitats of state and federal concern
- Maintain and protect native biological diversity
- Reduce the spread of invasive species and provide integrated control of noxious weeds
- Where and when feasible, improve degraded habitats in a strategic manner to increase landscape connectivity and native diversity
- Reduce and minimize fragmentation of habitats

- Maintain landscapes that provide regional connectivity to habitats surrounding Hanford.

Although DOE generally does not directly manage individual species or manage for individual species, it does manage actions and processes that affect multiple species, habitats, and ecosystems. Part of DOE's strategy to protect the biological resources on the Hanford Site includes general directives to avoid and minimize impacts to native habitats and species. The directives that all DOE, contractor, and subcontractor personnel are expected to follow are provided below. Also provided are summaries of DOE's policies regarding two of the most significant and far-reaching threats to the sites biological resources: fire and noxious weeds.

5.1.1 General Directives and Practices

The following general directives apply to all actions occurring within portions of the Hanford Site managed by DOE, including portions of the HRNM under DOE management (central Hanford and McGee Ranch/Riverlands).

- All actions and activities that potentially affect biological resources require an ECR and determination of potential impacts before proceeding. This directive not only applies to ground-breaking disturbances and excavation, but to any treatments or actions that alter the current natural state of the environment, habitat, or a species population such as mowing, prescribed burning, herbicide application in native vegetation, and excessive noise. The ecological compliance assessment process described in Chapter 6.0 is a component of early project planning.
- If an ECR determines adverse impacts to biological resources—such as habitat alterations or disturbances that could affect a species listed under the ESA or the reproductive success of a species of concern—specific mitigation actions will be identified (see Chapters 6.0 and 7.0), and mitigation actions will be implemented by the responsible contractor.
- All entities conducting work on the Hanford Site will conduct activities and work in accordance with access restrictions and administrative designations related to resource protection areas including the following:
    - Areas containing rare plant communities (element occurrences)
    - Mitigation/restoration areas
    - Collection/propagation areas for native plant materials
    - Lands used under permit and leased properties
    - Administrative control areas for species of concern, which include bald eagle buffer zones, fall Chinook salmon spawning locations, ferruginous hawk and burrowing owl buffer zones, and known populations/occurrences of plant species of concern.
- Activities that increase habitat fragmentation and degrade existing native habitats should be avoided. If new facilities or new road/railroad/ utility corridors are required, they should be built, as much as possible, within previously disturbed areas or co-

located with existing roads or corridors to minimize habitat fragmentation.

- No vehicles are permitted off established roads on the Hanford Site unless specifically approved by the SSD and the Hanford Fire Department (HFD) for conducting work activities, or if required by an emergency situation.
- Consistent with the CLUP and the Presidential Proclamation, domestic livestock grazing is not allowed on Hanford lands except where previous limited agreements allow access across DOE lands to private grazing lands. Although limited grazing occurred in the past, Presidential Proclamation 7319 (June 9, 2000) establishing the HRNM restricts grazing and off-road vehicle use.
- Actions that remove or significantly degrade native vegetation will require revegetation or restoration of areas not needed for future operations following the practices outlined in the *Hanford Site Revegetation Manual* (DOE 2013a). Plant material used for habitat improvements or habitat restoration should be native to the Hanford Site and preferably should be of locally derived genetic stock.
- No hunting, fishing, or trapping is allowed on Hanford Site lands managed by DOE. Hunting, fishing, and trapping below the ordinary high water mark of the Columbia River are subject to the laws and regulations of Washington State. The USFWS may allow hunting, fishing, or trapping on portions of the HRNM consistent with its HRNM-CCP (USFWS 2008) and the laws and regulations of Washington State.
- Consistent with the CLUP, no agriculture will be allowed on lands managed by DOE. Several small leases have previously been in place on the Wahluke Unit, and agriculture is not specifically excluded by the HRNM proclamation. Agricultural leases on monument lands managed by USFWS would be at the discretion of USFWS consistent with its HRNM-CCP (USFWS 2008).

The guidance above must be followed unless its application is waived for a certain circumstance by the appropriate site manager for either RL or ORP.

5.1.2 Interface with the Hanford Reach National Monument

The following guidelines describe how the BRMP and the HRNM-CCP (USFWS 2008) will interact for actions on the HRNM.

- USFWS actions on HRNM lands managed by USFWS will be guided by the HRNM-CCP.
- DOE actions on HRNM lands managed by DOE will be guided by the BRMP.
- DOE actions on HRNM lands managed by USFWS will generally follow BRMP, but DOE will coordinate with USFWS on major actions to ensure its activities are not contrary to the goals and objectives of the HRNM-CCP. DOE will normally conduct its own biological and cultural resource reviews for its own projects, and will mitigate impacts according to BRMP, regardless of location.

5.1.3 Fire Management

Many plant communities on Hanford and their associated wildlife species have evolved in the presence of natural fires. However, past and present land-use practices and the presence of non-native plant species, especially cheatgrass, have altered the frequency and severity of fires. More frequent and severe fires have reduced the availability of late-successional shrub-steppe habitat for species that are dependent on this habitat type for at least part of their life cycle. Also, in addition to fire itself, many plant communities on Hanford are sensitive to, and slow to recover from, the impacts of certain fire-fighting activities such as the creation of firebreaks.

Large fires are one of the greatest threats to Hanford Site native habitats and biological diversity. The HFD has an annually updated a Fire Management Plan that is implemented as a subcomponent of BRMP, as described in the HCP-EIS supplemental analyses (DOE 2008). The HFD prepares annual maintenance and burn plans for firebreak maintenance and fuels reduction. The DOE's overall wildfire management policy for the Hanford Site is to minimize the potential for human-caused fires and to fight wildfires aggressively. The following sections briefly describe DOE's fire management policy regarding biological resources as defined in the Fire Management Plan.

5.1.3.1 Wildfire Control

To the extent possible during a wildfire, fire suppression and control actions will be conducted to protect existing stands of late-successional shrub-steppe, and to avoid direct surface disturbance within late-successional shrub-steppe areas, plant community element occurrences, and other rare or sensitive habitat areas. To the extent practical during a firefighting effort, the Fire Department incident commander should coordinate or consult with site natural resource subject matter experts.

Temporary firebreaks constructed during fire-fighting should be re-contoured and reseeded with an appropriate mix of locally derived native plant species as described in the *Hanford Site Revegetation Manual* (DOE 2013a).

Burned area replanting will be considered on a case-by-case basis. Determining if replanting is needed depends on the site, pre-existing plant community, characteristics of the wildfire, level of damage sustained by native vegetation, and likelihood the burned area will further degrade if restoration actions are not performed. If performed, replanting will use locally derived native species.

5.1.3.2 Prescribed Fires and Fuel Management

Prescribed burning for the purposes of habitat management or hazardous fuels reduction has not been a regular element of the Hanford Site biological resources management strategy, but was considered within the *Environmental Assessment: Integrated Vegetation Management on the Hanford Site, Richland, Washington* (DOE 2012b). Proposals to use prescribed burning for habitat improvement or hazardous fuels reduction, other than burning of tumbleweed accumulations along fence lines, fire breaks, linear transportation, or utility corridors, will be considered on a case-by-case basis, and will require review by SSD and Hanford Fire Department approval and cooperation. The ecological effects of fire in semi-arid shrub-steppe habitats are often unpredictable, and restoration of burned areas requires careful consideration of site-specific conditions and the final desired habitat. Prescribed burn plans, other than for burning of tumbleweed accumulations along fence lines and firebreaks, will include detailed restoration, revegetation, and long-term monitoring plans.

Preventative fire control includes installation and maintenance of a system of permanent firebreaks that will use existing roads, rail lines, and utility corridors. Installation and maintenance of these firebreaks will be conducted in a manner that minimizes adverse impacts to biological resources.

Controlled burning of accumulations of dry plant material, particularly along roadways, is conducted to remove large potential sources of fuel that, if accidentally ignited, could provide a mechanism for rapidly accelerating uncontrolled burns.

5.1.4 Noxious Weed Management

A noxious weed is defined as "a plant that when established is highly destructive, competitive, or difficult to control by cultural or chemical practices" (RCW 17.10.010). The Washington State Noxious Weed Control Board determines which species are considered noxious weeds in the state, and what level of control is required for each species. Noxious weeds are controlled on the Hanford Site for regulatory compliance with the *Federal Noxious Weed Act* of 1974 as amended in 1990 and by WAC 16-750, *Washington State Noxious Weed List and Schedule of Monetary Penalties*, to prevent adverse impacts to neighboring agricultural operators, and keep deep-rooted vegetation from invading Hanford waste sites.

Noxious weed management is implemented as part of the site-wide *Integrated Biological Control Plan* (MSA 2014) as a subcomponent of BRMP and is described in the 2008 HCP-EIS supplemental analysis (DOE 2008). The goal of noxious weed management on the Hanford Site is to eliminate existing populations of noxious weeds and prevent new populations from becoming established.

The environmental impacts of noxious weed control on the Hanford Site were evaluated in the *Environmental Assessment: Integrated Vegetation Management on the Hanford Site, Richland, Washington* (DOE 2012b). Noxious weeds are to be treated as soon as appropriate after they are identified to minimize seed production, and in this assessment, DOE determined that an integrated vegetation management/adaptive management approach that includes chemical, physical, biological, cultural, and prescribed burning methods was preferable to using any one method by itself or a no-action alternative. Noxious weed management, especially in relatively less disturbed areas, must meet other biological resource management requirements described in BRMP, such as evaluations for the presence of rare species and unique habitats, avoidance and minimization of impacts whenever practical and possible, and habitat mitigation as applicable. The need for active reestablishment of desirable vegetation is recognized as a critical component of successful long-term control of noxious weeds and other undesirable vegetation on the Hanford Site.

5.2 Biological Resource Values and Priorities

Although all ecological resources and habitats may be considered important, DOE recognizes that some resources will require greater management attention than others. This management plan applies a hierarchical approach to prioritize biological resources and associate different levels of management actions—protection, monitoring, impact assessment, mitigation, and restoration—based on the type and relative ecological value of the resources (Figure 5.1). Applying this framework allows management strategies to account for differences in resource "value," meaning that some resources require greater management attention and protection than others. For example, a relatively intact biological community that is rare in the ecoregion would warrant greater management protection than would a degraded habitat area dominated by non-native plants such as cheatgrass.

5.2.1 Assigning Resource Value and Resource Priority Levels

The strategy for assessing resource values and management priorities considers the relative value of both species and habitats. To address differences in resource "value," and ensure limited fiscal and staff resources focus on those resources that require specific protection and management attention, the biological resources on the Hanford Site are categorized into six priority levels, 0 through 5 (Figure 5.1). Species are assigned a resource value by considering attributes such as legal or listing status, recreational, commercial, cultural, and ecological value (Table 5.1). Known locations of federal and state threatened or endangered plants and animals are included in the landscape-scale resource level determination. Distributions of species that are more common or have a lower priority listing status are often unknown and are not accounted for in the spatial representations provided in this section.

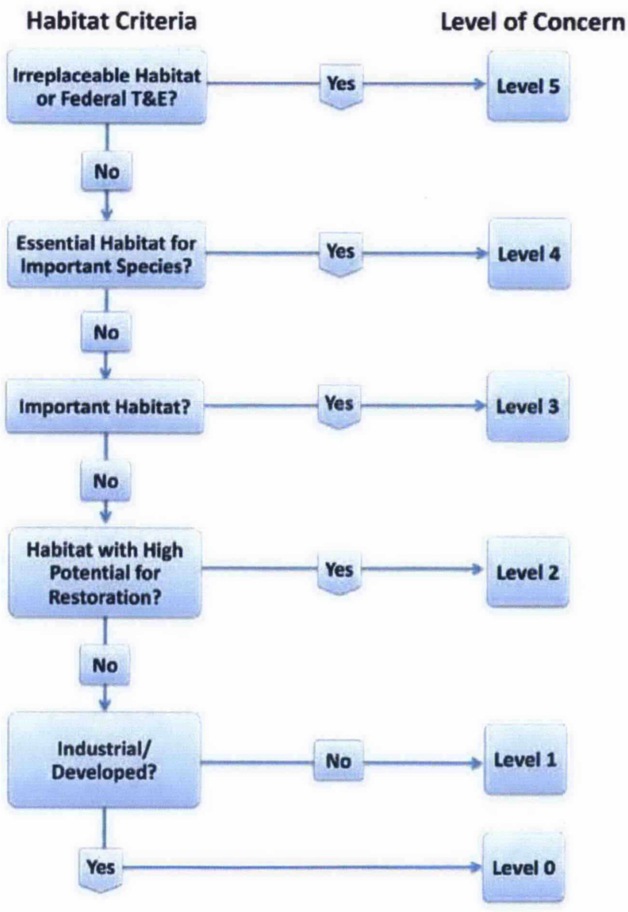

Figure 5.1 General Hierarchical Prioritization of Habitat Resources on the Hanford Site

Table 5.1 Criteria Used to Classify Hanford Biological Resources into Resource Levels of Concern

Resource Level of Concern	Species	Habitat	Administrative Boundaries
Level 5 Irreplaceable Resources	• Federal threatened or endangered • Proposed federal threatened or endangered (see Appendix A)	• Rare habitats, including cliffs, lithosols, dune fields, ephemeral streams, and vernal pools • Fall Chinook salmon and steelhead spawning areas	• Critical habitat for federal threatened or endangered species • Plant community element occurrences
Level 4 Essential Resources	• State threatened or endangered • Federal candidate	• Upland stands with a native climax shrub overstory and a native grass understory • Wetlands, swales, and riparian habitats	• Bald eagle nest and roost site buffers • Ferruginous hawk and burrowing owl nest sites and buffers • Mitigation and restoration areas
Level 3 Important Resources	• State sensitive or review plants • State sensitive or candidate wildlife • Federal species of concern (see Table A.1) • WDFW priority • Culturally important	• Shrub-steppe habitats with a native climax shrub overstory and cheatgrass co-dominant in the understory along with native grasses • Shrub-steppe stands with a successional shrub overstory and predominantly native understory • Native stands of bunchgrass-dominated vegetation • Snake hibernacula • Bat colonial roost sites • Wading bird rookeries	• Floodplains • Conservation corridors • Burrowing owl nest site buffers • WDFW priority habitats not included in Level 4 or 5
Level 2 Mid-Successional Communities	• Migratory birds • State Watch List plants • State monitor wildlife • Recreationally and commercially important species	• Upland stands with a sparse climax or successional shrub overstory and non-native understory • Steppe stands with native plants co-dominant with non-native plants	•
Level 1 Marginal Habitats	• Common plant and animal species not otherwise included in higher BRMP levels	• Upland stands of non-native plants • Abandoned agricultural fields • Very small, isolated patches of shrub-steppe surrounded by industrial areas or other Level 0 habitats	•
Level 0 Industrial Areas	• Non-native plants and animals not already categorized as Level 1-5 resources	• Non-vegetated areas • Industrial sites such as paved and compacted gravel areas	•

Habitats are assigned a resource value by considering several attributes, including whether habitats are critical or essential for species of concern, Washington State priority habitats and element occurrences, attributes of the vegetation cover types found on the Hanford Site, landscape-level attributes such as connectivity and/or fragmentation, or administratively designated resource areas. Each level reflects different management priorities, and each has a specific set of associated management actions and requirements. At increasing levels of priority, the number of applicable management actions may increase and become more restrictive to preserve the resource (Table 5.2).

Table 5.2 Management Goals and Actions for Each Resource Level of Concern

Resource Level of Concern	Management Goal	Management Action	Status Monitoring Effort	Compensatory Habitat Mitigation Action
Level 5	Preservation	Avoidance	High	Compensation determined on case-by-case basis
Level 4	Preservation	Avoidance/ minimization preferred	High	Habitat replacement at 5:1
Level 3	Conservation	Avoidance/ minimization preferred	Moderate	Habitat replacement at 3:1 or as per other legal requirements (wetland mitigation)
Level 2	Conservation	Primarily Avoid/minimize	Low Level	Habitat replacement possible at 1:1. Such areas may be preferred sites to perform mitigation actions
Level 1	Mission support	Avoid/minimize as practicable regulatory compliance (MBTA)	None	Habitat replacement is not required, but site could be suitable for use as a restoration or mitigation area
Level 0	Mission support	Regulatory compliance	None	None

The following sections describe each resource level. Figures 5.2 to 5.7 show the distribution of resources within each level after applying the criteria described. The specific attributes used for each resource-level map are provided in Appendix B. Note that the maps showing the distribution of different resource levels are intended for planning purposes only. The presence or absence of any resource can only be confirmed through field surveys at appropriate times of the year. The determination of resource values in the landscape depends on evaluation of all resource characteristics and administrative designations. The resources at a particular location and particular time are managed for the highest applicable resource value as described in Section 5.2.2.

5.2.1.1 Irreplaceable Resources (Level 5)

Resources classified as Level 5 are the rarest and most sensitive habitats and species and are considered irreplaceable or at risk of extirpation or extinction. These species include those listed or formally proposed to be listed as threatened or endangered under the ESA. Habitats include areas that are designated critical habitats for federal threatened or endangered species or are essential for those species to persist on the site. Other irreplaceable habitats are plant community element occurrences and rare habitats, including cliffs, lithosols, dune fields, ephemeral streams, and vernal pools as well as fall Chinook salmon and steelhead spawning areas. The distribution of Level 5 resources is depicted in Figure 5.2.

The primary management goal for Level 5 resources is preservation because any loss of these resources would represent a significant impact to threatened or endangered populations, the site's biological diversity, and biodiversity and ecological integrity of the shrub-steppe and riparian habitats of the Columbia Basin Ecoregion. There is no practical way to replace or restore a Level 5 habitat resource if it is lost. Therefore, avoidance is the preferred mitigation measure for these species and habitats. If any Level 5 resources are lost due to Hanford Site actions, compensation will be determined on a case-by-case basis.

Actions that could affect federal threatened or endangered species or affect critical habitat for such species require interagency consultation under Section 7 of the ESA with the USFWS, NMFS, or both. These agencies have the regulatory authority to allow for some impacts to listed species and would likely require specific mitigation measures to prevent or reduce the magnitude of such impacts. It is DOE's policy to avoid impacts to these species and their habitats whenever possible.

Regular inventory and monitoring is a critical component of DOE's strategy to effectively manage Level 5 resources. Monitoring provides the information needed to determine population trends, distribution of the species or habitat, and whether habitat quality is declining in these areas. This information can then be used to determine if management actions are effective or if additional access restrictions or other protective measures are required.

5.2.1.2 Essential Resources (Level 4)

Species and habitats classified as Level 4 are considered essential to the biological diversity of the site and the Columbia Basin Ecoregion. These include species listed by the WDFW or WNHP as endangered or threatened, and those listed as candidate species for ESA protection by the USFWS or NMFS. Level 4 habitats include those habitats and vegetation cover types essential to sustain populations of state endangered or threatened species and federal candidate species, such as ferruginous hawk and burrowing owl nest sites. Also included are riparian habitats, wetlands, swales, and high-quality (but non-element occurrence) high-quality mature sagebrush steppe (Figure 5.3). Although the bald eagle is no longer listed under the ESA, it is protected under the *Bald and Golden Eagle Protection Act*, and habitat on Hanford essential to the eagle's continued existence is also considered a Level 4 resource. Areas that have been planted as mitigation or restoration areas also are defined as Level 4 habitat areas.

The primary management goal for Level 4 resources is preservation. Level 4 resources are extremely difficult to replace, and loss of these species or habitats would represent a significant decrease in the biological diversity of the Hanford Site and surrounding region. Therefore, avoidance is the preferred means of mitigation. For example, a waste site excavation could take place in proximity to an eagle nesting or roosting site if conducted while the eagles are not present, but could have a significant effect during the winter roosting season. Unlike Level 5 resources, there is some leeway allowed for impacts to Level 4 resources. If avoidance is impossible, and the habitat cannot be restored, then compensatory mitigation must be performed to begin the process of replacing the lost habitat. As with Level 5 resources, regular monitoring is critical to the successful management and preservation of Level 4 resources.

5.2.1.3 Important Resources (Level 3)

Level 3 resources include species recognized by Washington State as having conservation concern, including state sensitive and review plant species, state sensitive and candidate animal species, WDFW priority species, and those listed by USFWS as federal species of concern in the Columbia Basin Ecoregion. Culturally important species that are not classified as a higher level resource are considered Level 3 resources. Landscape features recognized as important to sustaining native fish and wildlife populations over time, such as conservation corridors and floodplains, are Level 3 resources. Also included are certain vegetation cover types such as shrub-steppe communities that contain discontinuous canopies of climax shrubs as well as transitional shrub-steppe and steppe communities that are predominantly native species. The overall distribution of Level 3 resources is provided in Figure 5.4.

The management goal for Level 3 is to conserve and sustain those species and habitats present and provide avenues for overall enhancement of key habitat components through management and stewardship of the site's biological resources. Any disturbance within Level 3 habitat areas must be replanted using locally derived native species.

5.2.1.4 Lower Priority Species and Mid-Successional Communities (Level 2)

Other plant and animal species of potential conservation concern, including migratory birds, state watch list plants, and state monitor wildlife, fall into Level 2. Also included are recreationally or commercially important species. Mid-successional habitats, including shrub-steppe or steppe communities where the herbaceous layer is dominated by non-native species are Level 2 habitats that have a high potential or value as restoration areas (Figure 5.5)

The management goal for Level 2 is to conserve and sustain those native species and habitats present. Management of these resources focuses on avoidance or minimization of impacts when and where possible. Level 2 habitats may be used to minimize impacts to higher level resources. Similar to Level 3 resources, sowing native plant seed where existing vegetation has been removed is required to minimize impacts to Level 2 resources.

5.2.1.5 Common Species and Marginal Habitat Resources (Level 1)

Level 1 resources include relatively common native species as well as fragmented habitats that are too small, too degraded, and/or too isolated to be of conservation value. Examples of these habitats are large expanses of cheatgrass or communities dominated by Russian thistle (*Salsola tragus*) or other invasive, non-native species (Figure 5.6). In general, these areas are not high-priority areas for restoration, although some abandoned agricultural fields may be useful sites for restoration projects.

In general, mitigation for these resources is not required, unless impacts could be minimized or avoided by moving a proposed project into Level 0 habitat. More often, Level 1 resource areas would be disturbed and used in lieu of higher level resources to minimize impacts to higher level habitat areas. Level 1 resources are not normally monitored, except to document overall site-wide biological diversity.

5.2.1.6 Non-Native Species, Industrial Sites, and Other Developed Areas (Level 0)

Level 0 consists of non-native species and habitats that are subject to continuing anthropogenic influences, such as industrial areas, landscaped areas, and parking lots. In general, these resources provide little or no ecological value and require no protection or conservation (Figure 5.7).

The primary management goal for Level 0 is mission support; these species and habitats are managed to best support the ongoing waste management, environmental restoration, and technology development missions of the Hanford Site. There are no mitigation requirements associated with these resources beyond regulatory compliance. The primary regulation affecting these resources would be the MBTA, in that migratory birds will nest on industrial buildings, gravel parking lots, and in landscaped areas. In these cases, the birds and nests are considered higher level resources and are protected to comply with the MBTA during the nesting/fledging season, but the "habitat" is not otherwise protected. Other regulations may be applicable in specific circumstances. Monitoring Level 0 resources is not required, except for noxious weeds monitored for the purpose of eventual elimination from the site.

5.2.2 Integration of Multiple Resource Values

Biological resources at a particular location or at a particular time may have characteristics representative of more than one resource level. In these cases, the resources are managed at the highest applicable resource level. The highest resource level takes precedence over a lower level if the resources occur at the same time and location. For example, an area dominated by cheatgrass would be classified as a Level 1 resource based on the dominant vegetation. However, if this area were located within a designated conservation corridor, it would be considered a Level 3 resource regardless of the dominant vegetation. If this cheatgrass patch were also located within the buffer area of a ferruginous hawk nest site, then it would be considered and managed as a Level 4 resource regardless of dominant vegetation or its occurrence in a conservation corridor.

Integration in this way results in a distribution of resource levels depicted in Figure 5.8. Note that the map provided in Figure 5.8 should be considered useful for general guidance and planning purposes only. The actual resources present, priority level, potential impacts, and mitigation requirements can only be determined by field surveys as part of an ecological impact assessment or compliance review.

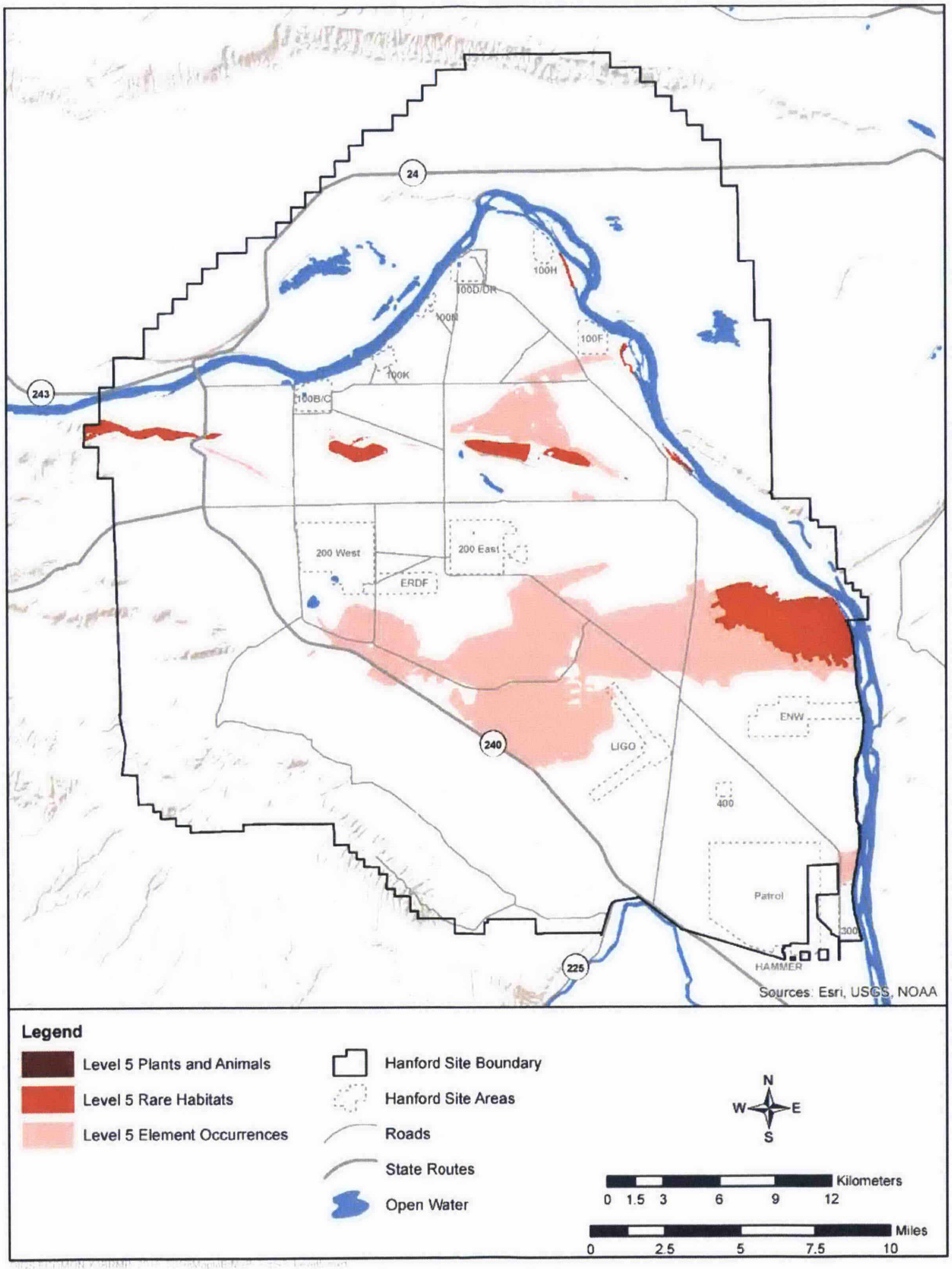

Figure 5.2 Irreplaceable Biological Resources Classified as Level 5

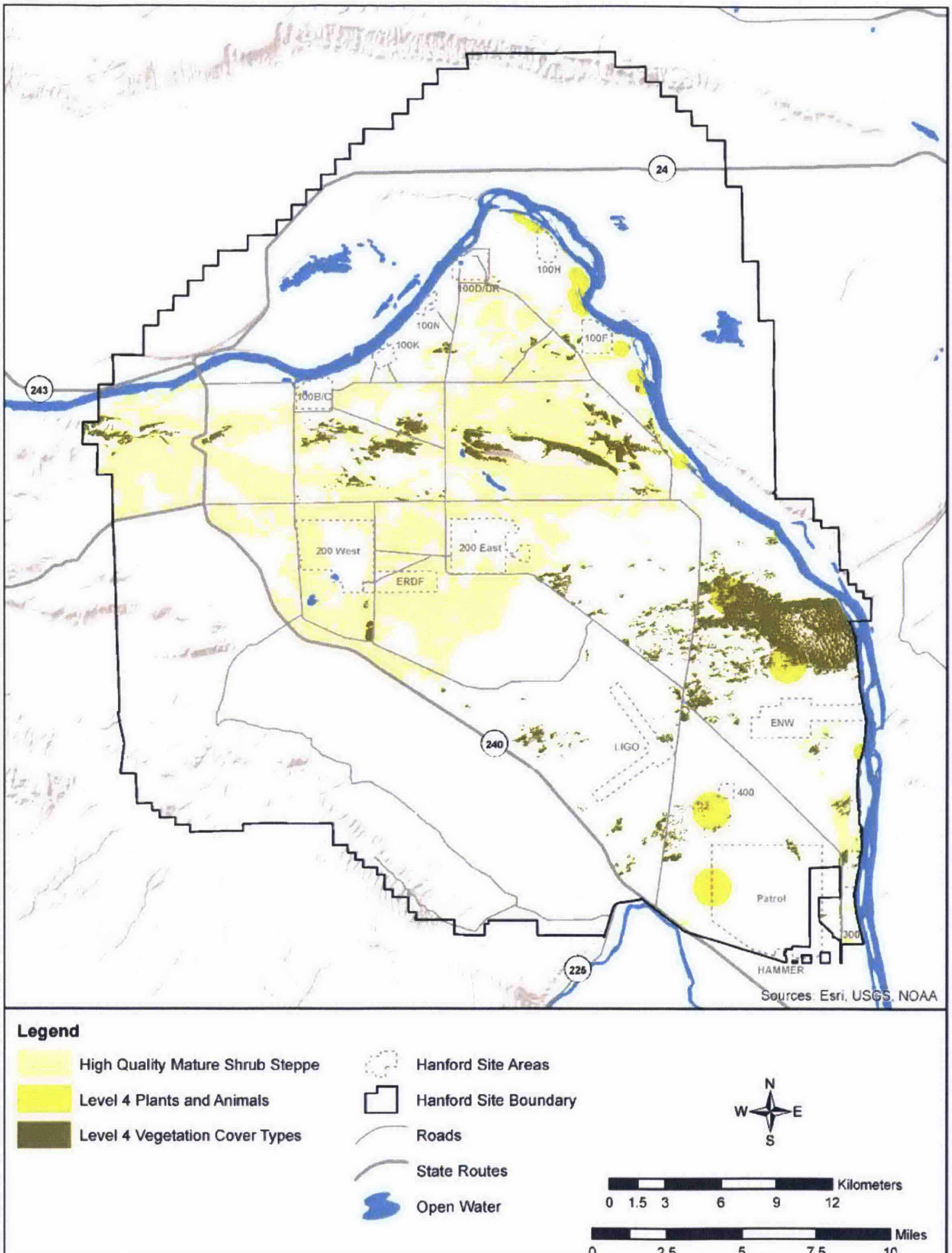

Figure 5.3 Essential Biological Resources Classified as Level 4

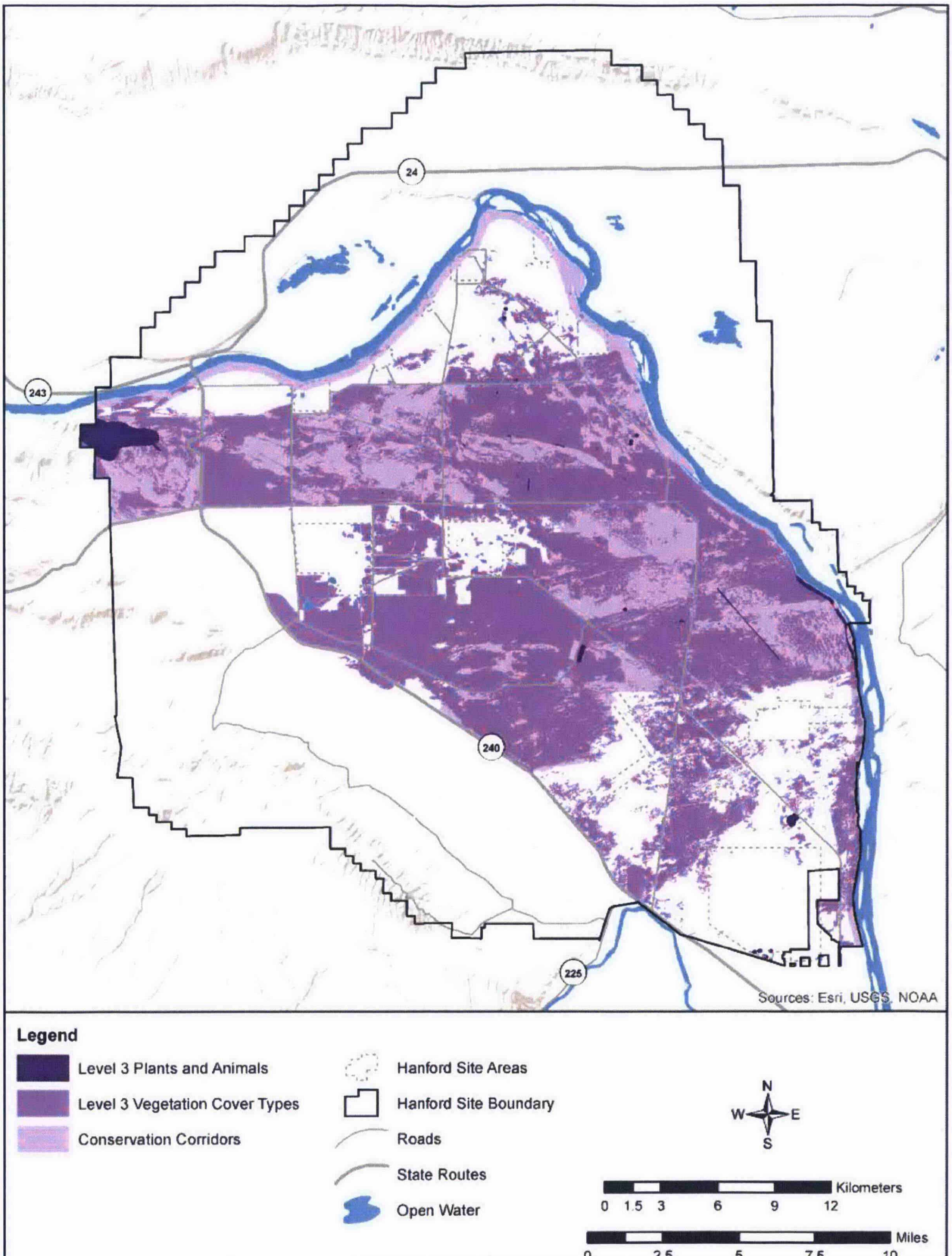

Figure 5.4 Important Biological Resources Classified as Level 3

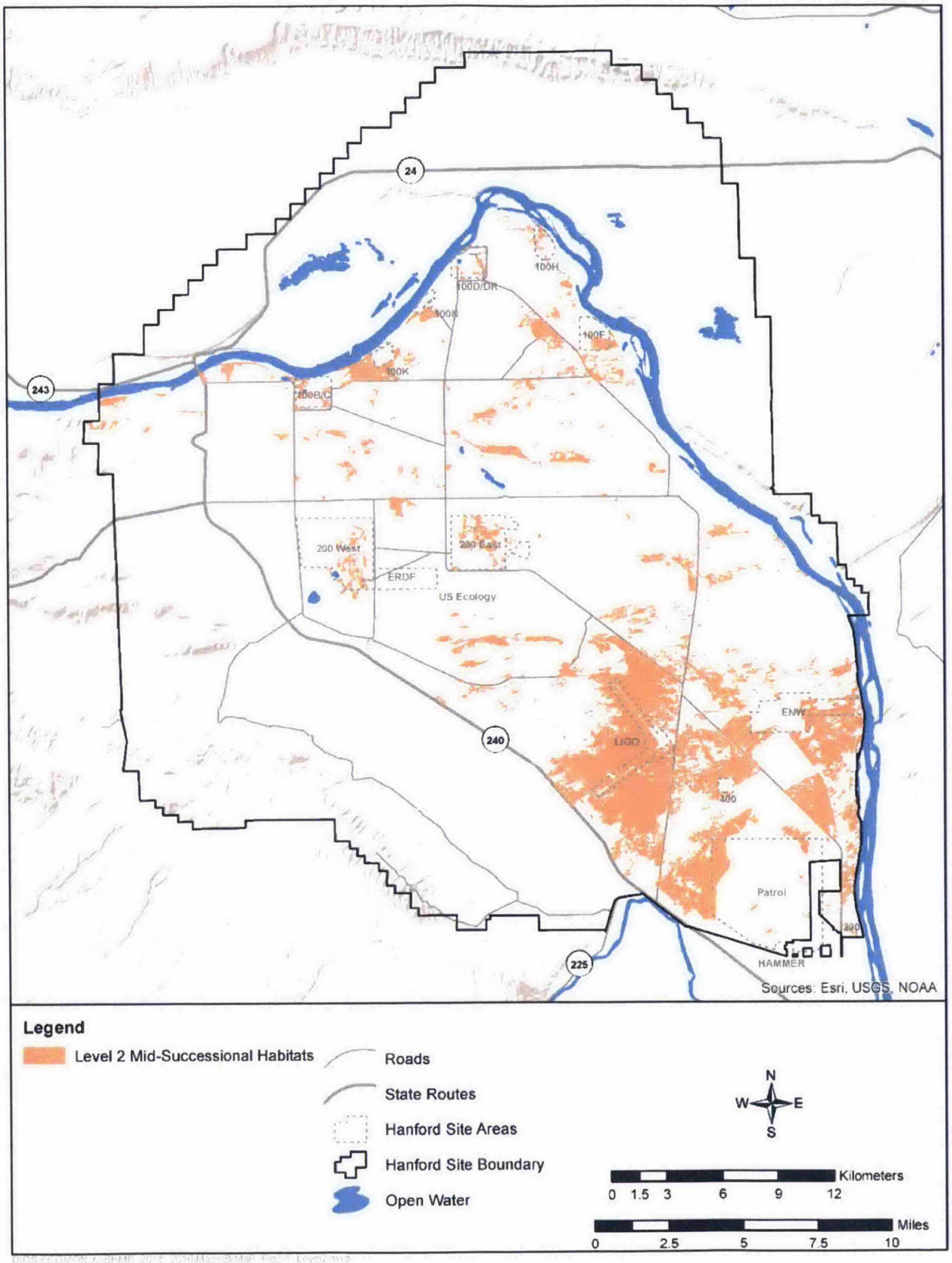

Figure 5.5 Mid-Successional Habitats Classified as Level 2

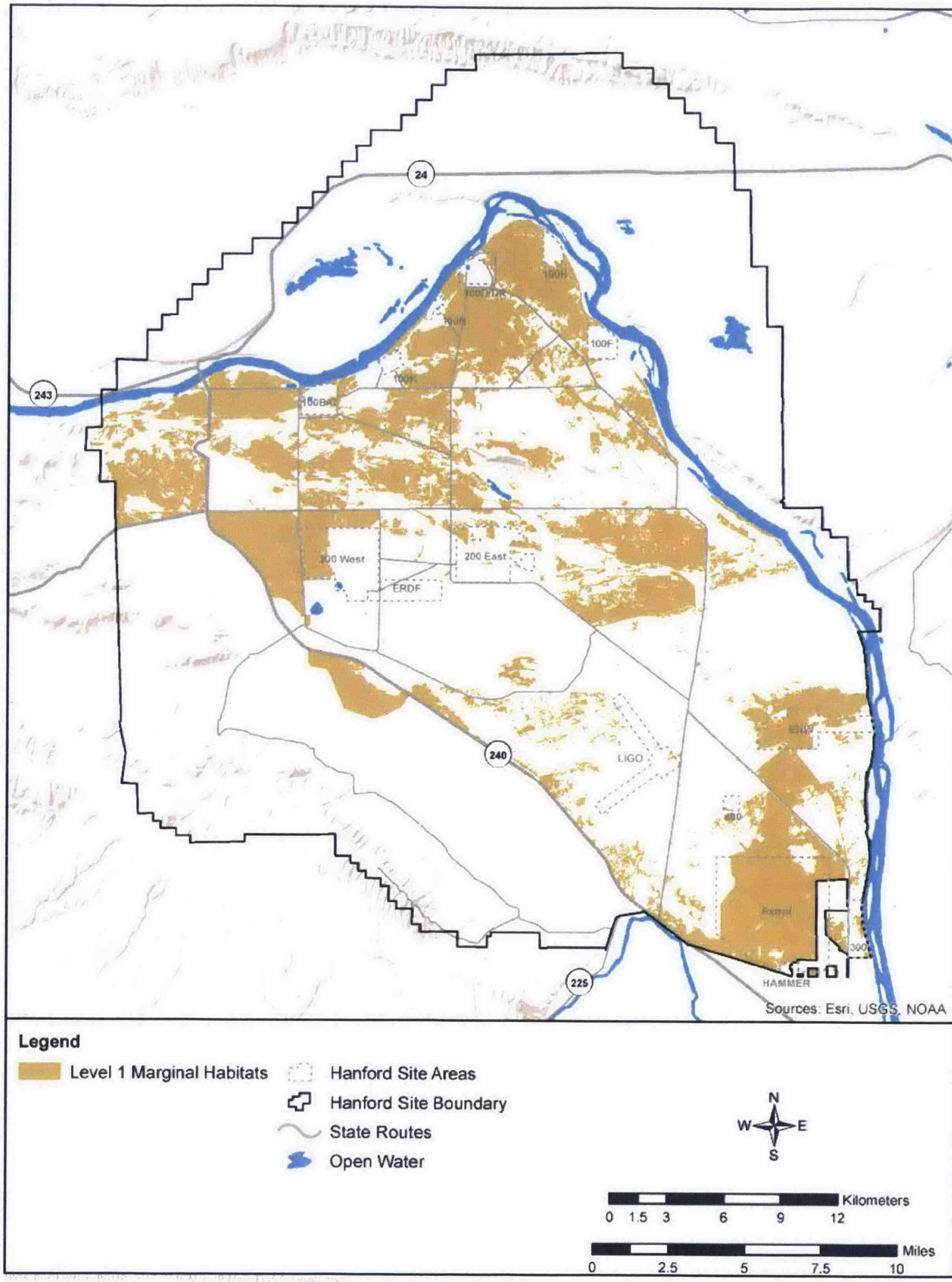

Figure 5.6 Marginal Habitats Classified as Level 1

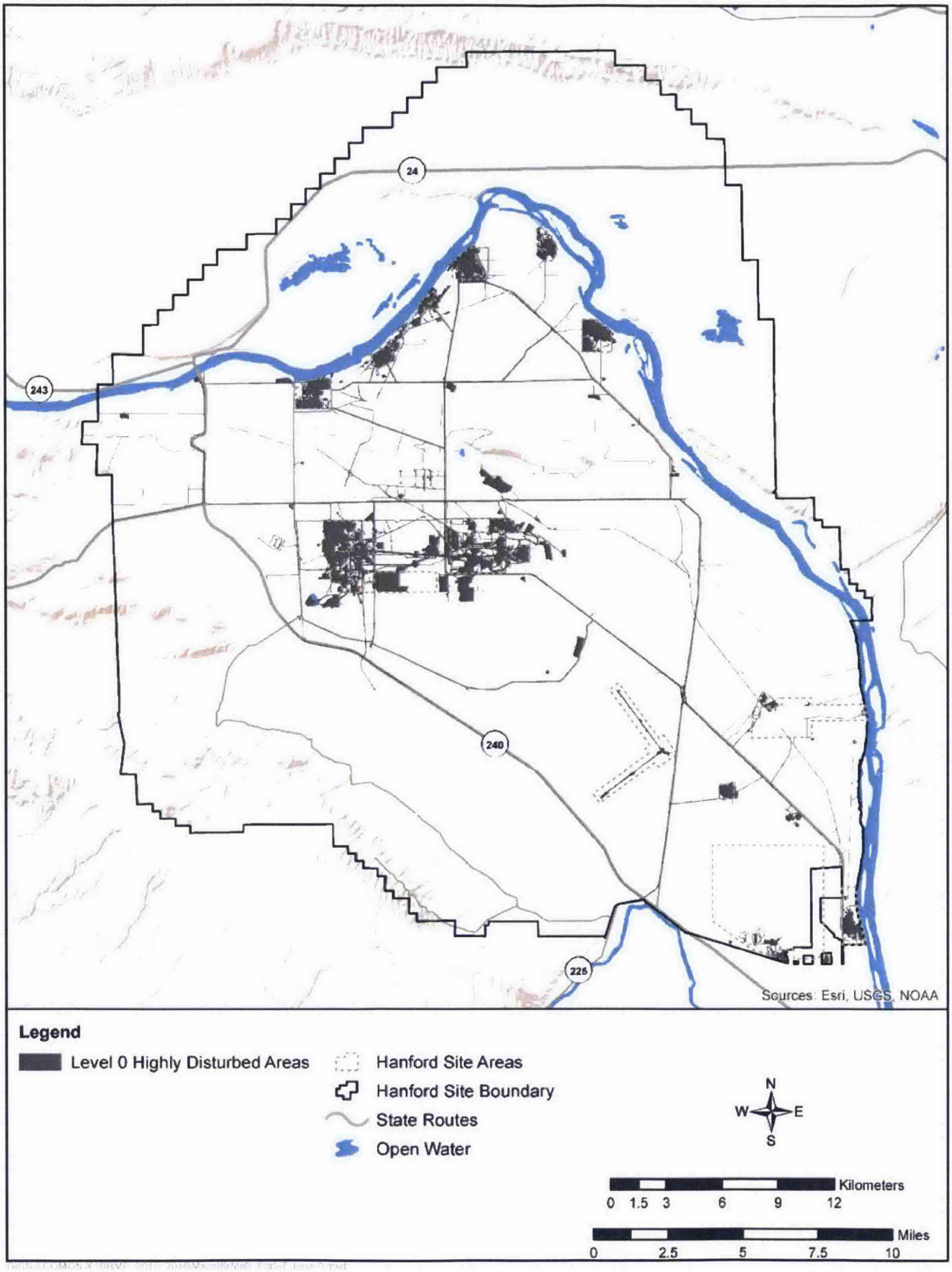

Figure 5.7 Industrial Sites, Highly Developed and Highly Disturbed Areas Classified as Level 0

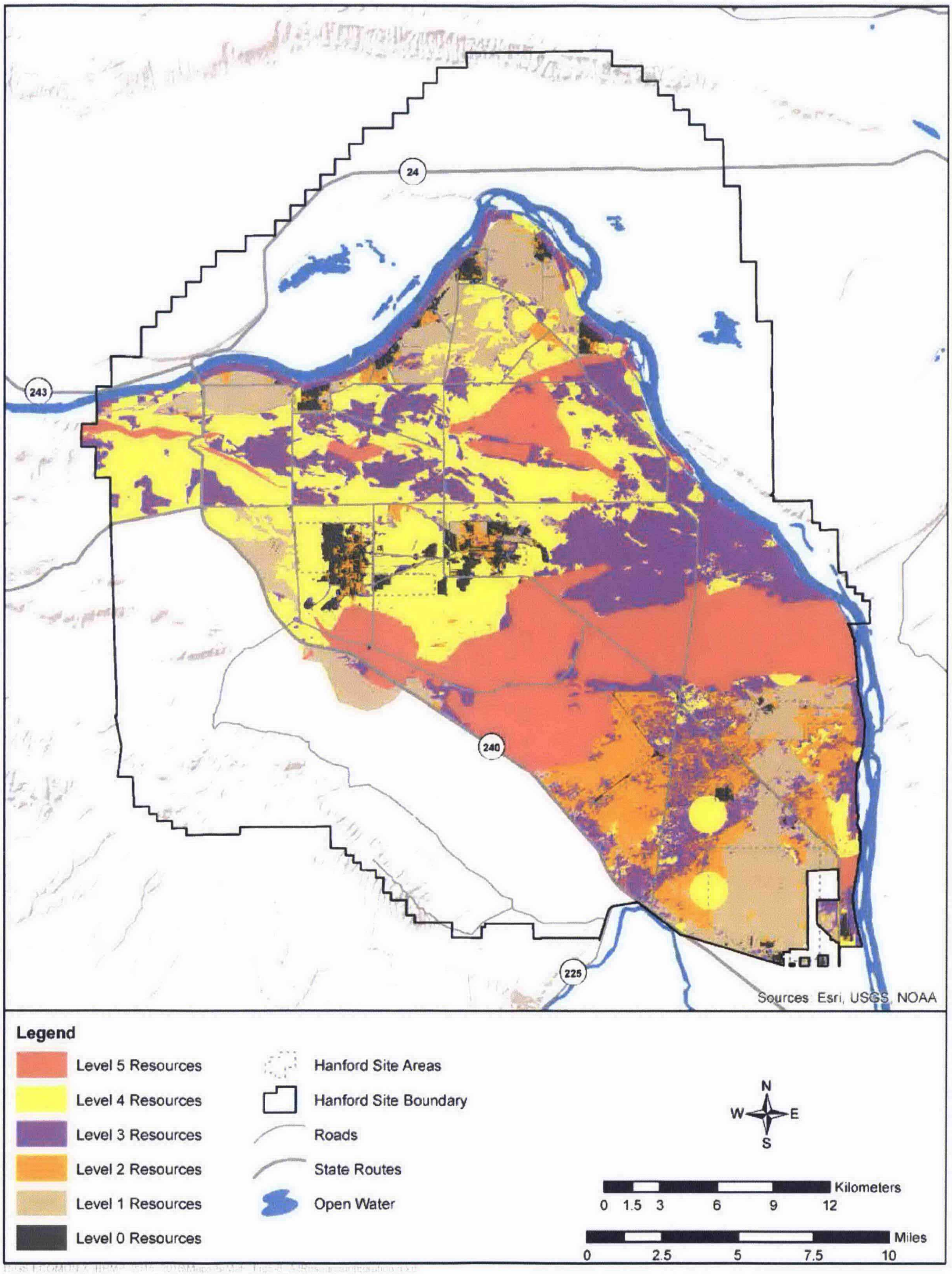

Figure 5.8 Integration of all Resource Levels Across the Hanford Landscape

5.3 Species-Specific Management Goals and Requirements

Management of most species on the Hanford Site is based on the general guidance provided in Section 5.2 for the six resource value levels. For most species, it is DOE's belief that protection and management of habitat will provide sufficient protection and management for species that rely on that habitat. However, specific management policies and guidance have been developed for certain species that have additional legal protections, require management actions beyond habitat protection, are unusually sensitive to human disturbance, or are resources of special interest to the public or local Tribes. In some cases, management plans provide the appropriate guidance for these species; in other cases, specific management direction is provided here.

5.3.1 Upper Columbia River Spring Chinook Salmon, Steelhead, and Bull Trout

Upper Columbia River spring Chinook salmon, Upper Columbia River steelhead, and bull trout are all listed as threatened or endangered under the ESA, and all have critical habitat designated within and along the Columbia River through the Hanford Site. Bull trout are not likely to reside or spawn in the Hanford Reach, but this species has been occasionally observed in this section of the Columbia River (USFWS 2007b; Poston 2010). The Hanford Reach is included in the species' designated critical habitat because it may provide foraging, migratory, and overwintering habitat.

These species are managed under DOE's Hanford Site Threatened and Endangered Species Management Plan: Salmon, Steelhead, and Bull Trout (DOE 2015a), which serves as a partial ESA Section 7 biological assessment. This plan provides guidance to DOE programs as to what activities may impact these species and DOE's commitments to avoid impacts and help preserve these species in the Hanford Reach. The plan defines when consultation with NMFS or USFWS is required.

5.3.2 Fall Chinook Salmon

Fall Chinook salmon are not listed under the federal ESA and are not a WDFW species of concern; however, they have high cultural value to local Tribes, high recreational value, and because of the large numbers of fall Chinook that spawn in the Hanford Reach, high ecological value. Fall Chinook represent a major food source for wintering bald eagles. Under 305(b)(2) of the *Magnuson-Stevens Act*, DOE must consult NMFS regarding actions that may adversely affect EFH for salmonids. Best management practices to minimize impacts to EFH for fall Chinook can be found in DOE's *Hanford Site Threatened and Endangered Species Management Plan: Salmon, Steelhead, and Bull Trout* (DOE 2015a).

DOE's primary management actions regarding fall Chinook salmon are monitoring and avoidance. Fall Chinook redds are counted and mapped each fall to support decisions about actions that may affect the river environment. Actions that may disturb the river substrate are steered away from known redd concentrations or are delayed to occur after the eggs have hatched and the fry have left the redds. Redd distribution (Figure 5.9) is also used to evaluate potential impacts at other areas of the river. For instance, juvenile concentrations of fry may be higher near spawning areas.

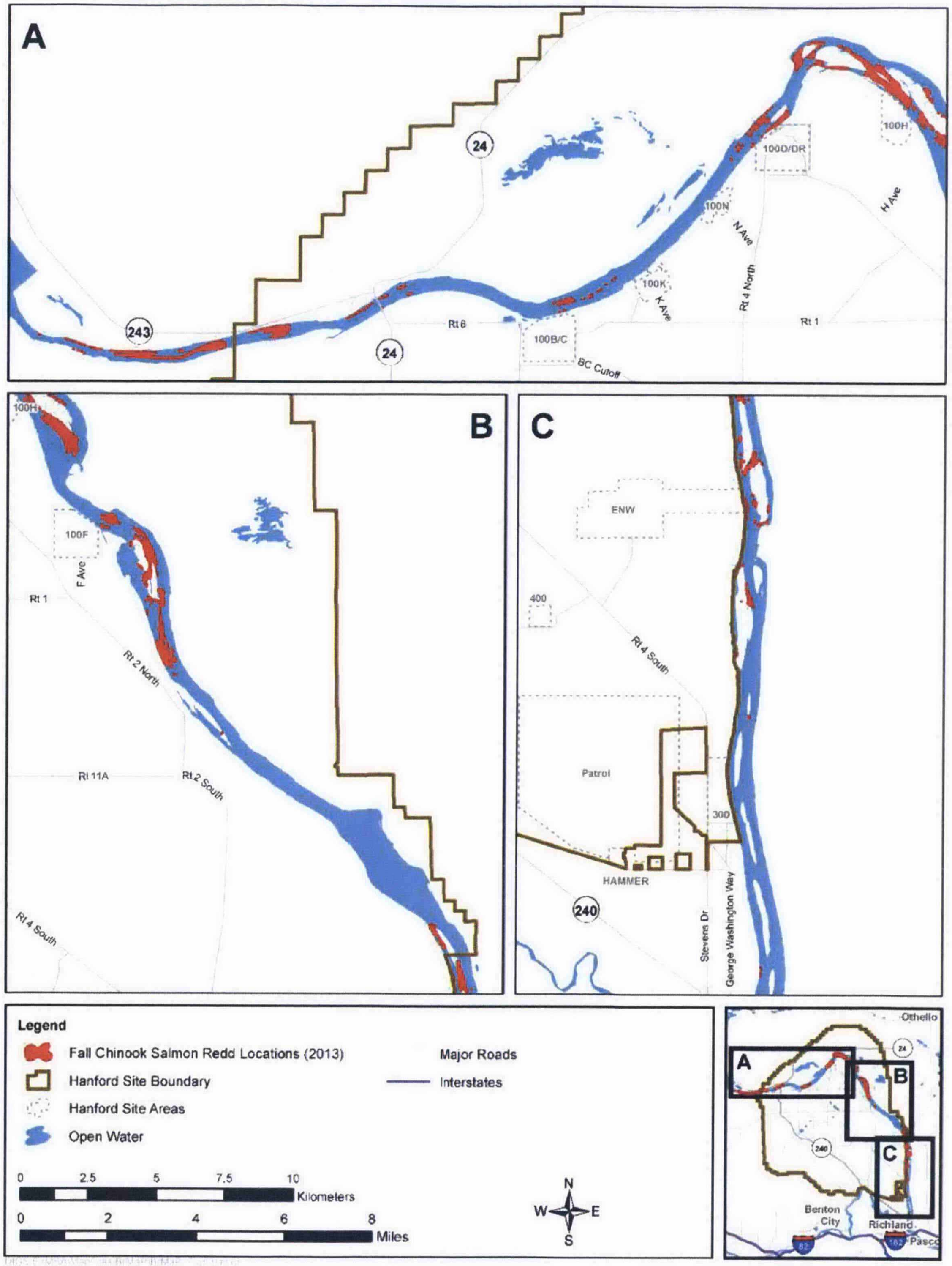

Figure 5.9 Fall Chinook Salmon Redd Distribution in the Hanford Reach

5.3.3 Bald Eagle

The bald eagle was removed from the federal threatened or endangered species list in 2007 (72 FR 37346-37372) and downgraded from threatened to sensitive by the WDFW in 2008 (Washington State Register [WSR] 08-03-068). The bald eagle has continued its recovery in the Northwest, and the recent *Draft Periodic Status Review for the Bald Eagle in Washington* (Kalasz and Buchanan 2016), recommends that this species be removed from Washington's list of endangered species. However, this species is still protected under the *Bald and Golden Eagle Protection Act*, is of high cultural value to local Tribes, and is important to the public.

The DOE *Bald Eagle Management Plan for the Hanford Site, South-Central Washington* (DOE 2013b) describes DOE's management policies. In most cases, bald eagle roost and active nest sites are protected with 400-m (0.25- mi) buffers. Work-related, routine access within night-roost buffer areas is allowed between the hours of 10 a.m. and 2 p.m.; however, no activities are allowed within nest buffer areas without a permit issued by the USFWS. Several eagle pairs have attempted to nest on the Hanford Site, and one pair has had a successful nest each year since 2013.

Figure 5.10 shows the location of the primary communal night roosts and buffer areas. DOE will continue to monitor roost usage by wintering bald eagles to determine which sites require roost buffers and will monitor potential nest sites to determine when nest area buffers need to be enforced. Because known roost or nest areas are considered Level 4 resources, damage or removal of trees within these areas is not allowed, even when eagles are not present.

5.3.4 Ferruginous Hawk

The ferruginous hawk is listed as threatened by Washington State, and is a USFWS species of concern for the Columbia Basin. Ferruginous hawks are obligate grassland or desert shrubland nesters (WDFW 2004). Home ranges have been measured at between 10 and 80 km^2/pair (4 and 31 mi^2/pair) and require at least 50% of the area to be non-cultivated (WDFW 1996). Natural nests are on cliffs, large trees, and occasionally on the ground, but on the Hanford Site, ferruginous hawks most frequently nest on 230-kV transmission line towers. Known nesting locations on the Hanford Site are shown in Figure 5.11. From the late 1980s to the present between 2 and 12 active nests have been observed on the Hanford Site, with a peak in the late 1990s. At times nearly 20% of Washington State breeding pairs have been on the Hanford Site (including central Hanford, ALE Reserve, and the Wahluke Slope).

Ferruginous hawks are much more sensitive to human disturbance and intrusion into nesting areas than other *Buteo* species (WDFW 2004). The Hanford Site complies with WDFW guidelines (WDFW 2004) that recommend buffers of at least 250 m (0.16 mi) for all human disturbance between March 1 and May 31, and 1000 m (0.6 mi) for prolonged (>0.5 h) activities during the entire nesting and fledging season. Surveys are performed annually across the Hanford Site to determine the location of active ferruginous hawk nests and establish and post disturbance buffers. DOE follows these guidelines for active nests, and considers the buffer areas to be Level 4 resources; thus, development, even during the non-nesting season, should be avoided in these areas.

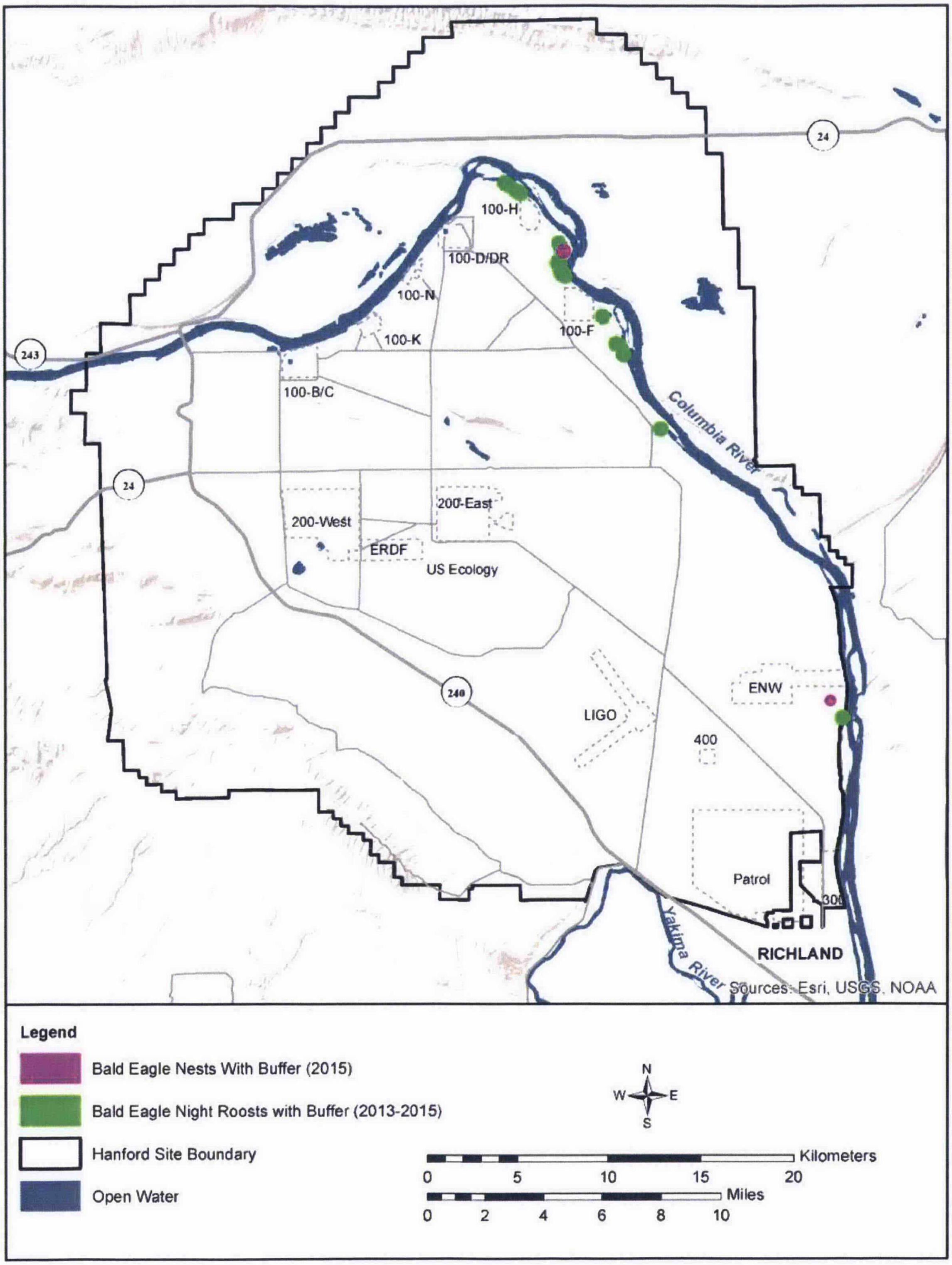

Figure 5.10 Bald Eagle Nests and Night Roost Sites with Buffers

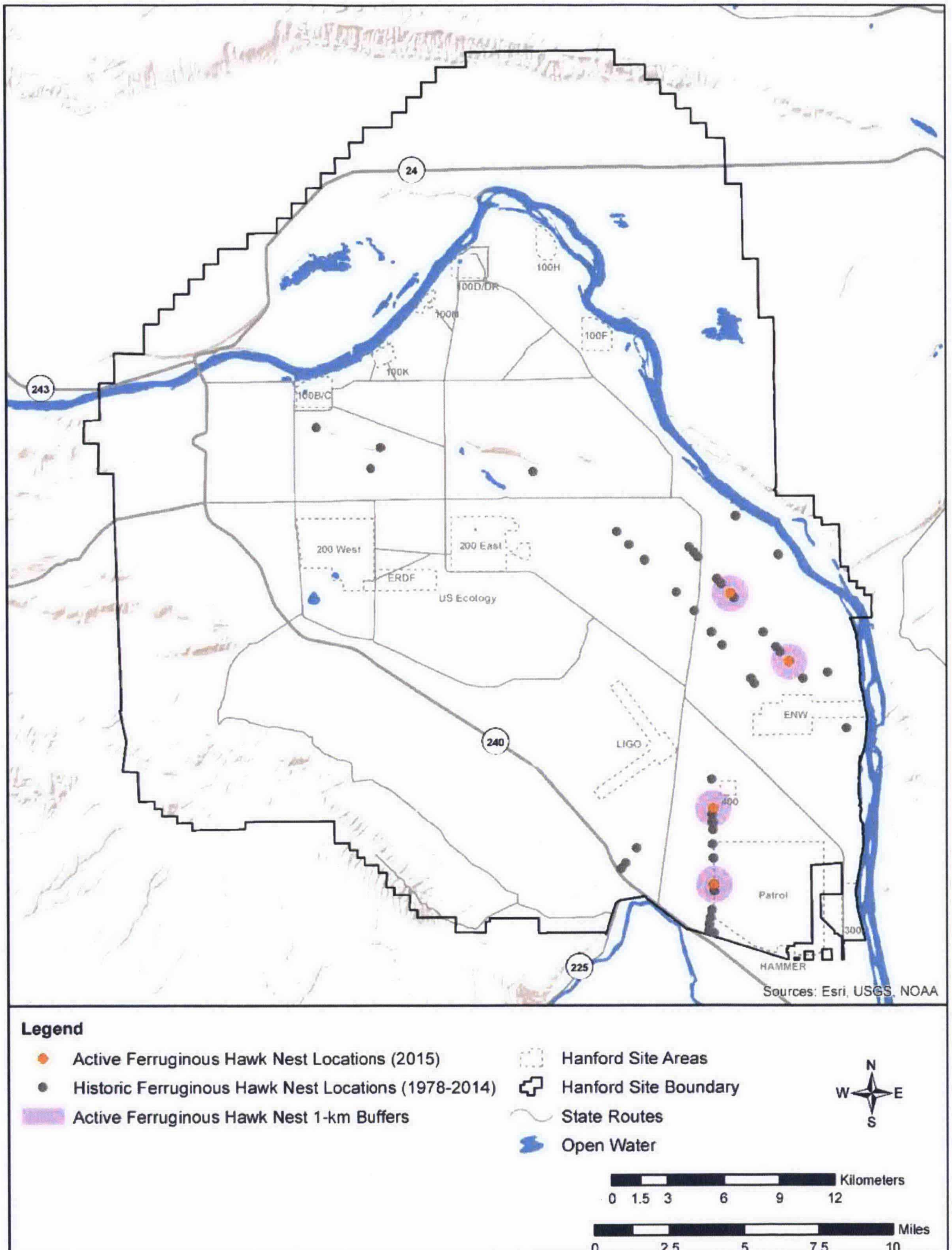

Figure 5.11 Historic and Recent Ferruginous Hawk Nest Locations Sites with Protective Buffers

5.3.5 Burrowing Owl

The burrowing owl is a Washington State candidate species that will be reviewed for possible listing as state endangered, threatened, or sensitive (WDFW 2016). The species nests underground in open grasslands and shrub-steppe, usually relying on the presence of burrows created by ground squirrels, badgers, or coyotes. Nesting burrowing owls have been observed throughout the Hanford Site (Figure 5.12) using both natural burrows and man-made structures such as culverts and pipes. Artificial burrows have been installed at several locations as mitigation for project impacts (Figure 5.12). The artificial burrows around the Emergency Vehicle Operations Course at the south end of the site were used after installation (Alexander et al. 2005) and continue to be used, but no burrowing owl use has been observed at the artificial burrows along Army Loop Road.

Although many burrowing owls appear to be relatively tolerant of human activity, all projects occurring within 250 m (800 ft) of a burrowing owl nest will be evaluated for impacts, and avoidance and minimization of impacts will be required to the greatest extent possible. Installation of artificial burrows will be considered only if impacts cannot be reasonably avoided. Artificial burrows may also be considered as a component of other mitigation actions, even if a project is not directly affecting burrowing owls.

5.3.6 Greater Sage Grouse

Greater sage grouse is a Washington State threatened species, which was formerly considered for protection under the federal ESA USFWS (DOI 2015). This species was historically known to occur throughout the Columbia Basin, including on the Hanford Site, but the distribution has been greatly reduced due to conversion of land to agriculture and the degradation and fragmentation of remaining habitat. There have been sporadic sightings of sage grouse on the Hanford Site, especially on the ALE Reserve, but no known breeding populations currently exist on the site. However, the species does occur on the Yakima Training Center, and populations could move into suitable sagebrush-dominated habitats on the Hanford Site. If a breeding population is identified or suspected, DOE will consult with the USFWS and WDFW to determine appropriate protective measures including administrative buffers around the breeding grounds or "leks."

5.3.7 Peregrine Falcon

A Washington State-sensitive species, peregrine falcons (*Falco peregrinus*) are present on the Hanford Site primarily during the winter months, but are not known to nest on the site. However, suitable nesting habitat exists along the cliff faces of Gable Mountain, Gable Butte, and Umtanum Ridge, and peregrine falcons are known to nest on structures such as bridges and taller buildings. If peregrine falcon nesting is discovered, DOE will evaluate the conditions around the site and identify an appropriate buffer around the nest if needed. Although this species has been recommended for delisting in Washington (Vekasy 2016), the WDFW (2004) recommends restricting access within 800 m (0.5 mi) buffers of cliff rims and 400 m (0.25 mi) of cliff faces.

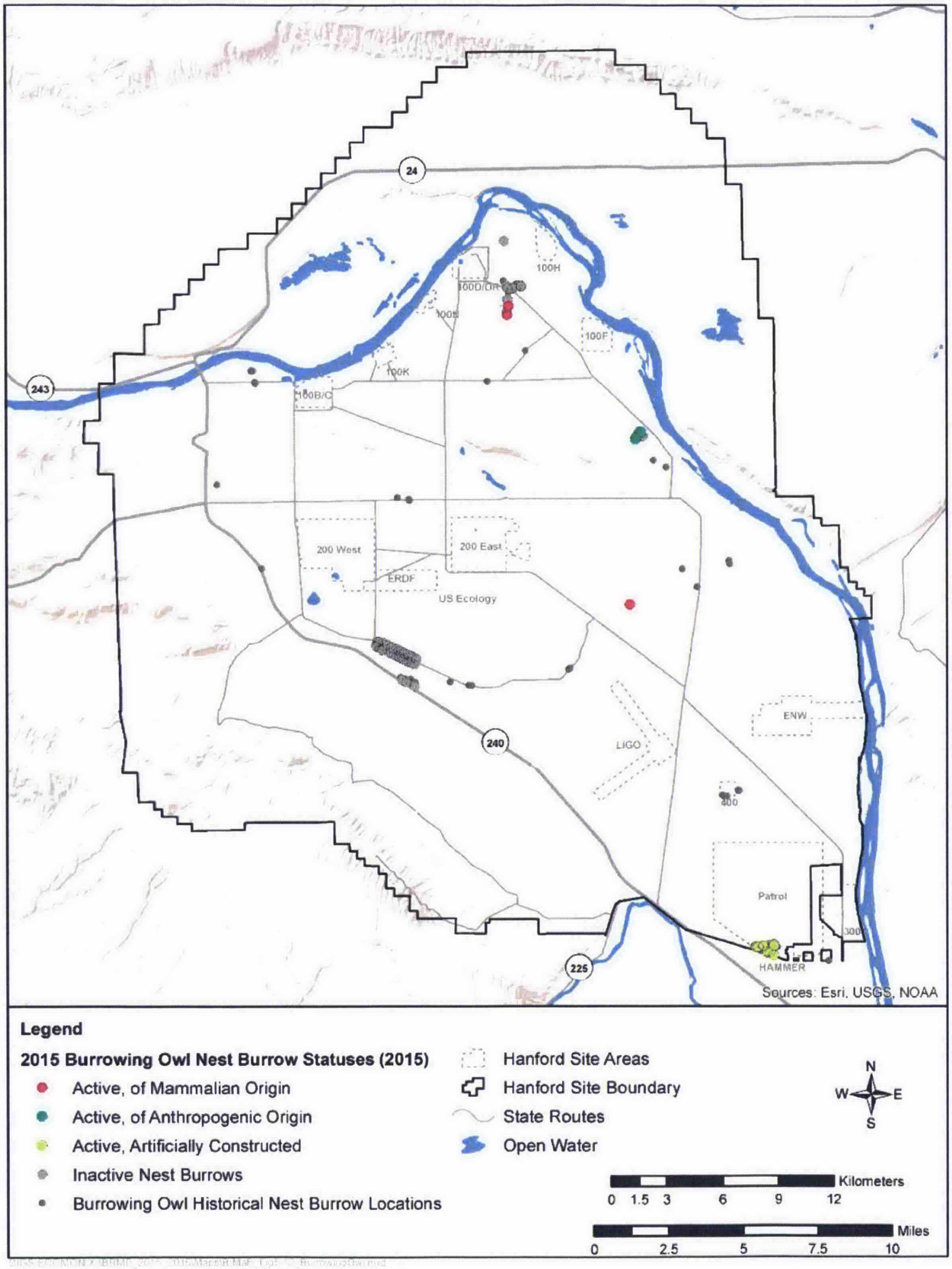

Figure 5.12 Burrowing Owl Nest Locations and Artificial Burrows (2015)

5.3.8 American White Pelican

The American white pelican (*Pelicanus erythrorhynchos*) is currently listed as endangered by Washington State; however, the number of this species has increased in recent years and the WDFW has recommended that it be down-graded to state-threatened (Stinson 2016). Although the white pelican is a resident along the Columbia River year-round, no nesting sites have been observed on the Hanford Reach, and the only known nesting colony in Washington is on Badger Island, approximately 39 km (24 mi) southeast of the Hanford Site. If nesting were to occur, it would likely be on islands in the Columbia River. The WDFW (2004) recommends that nest islands be closed to prevent human access, and that boating be limited within 400 to 800 m (0.25 to 0.5 mi) of breeding areas. If nesting is identified, DOE will work with USFWS and WDFW to evaluate the setting and potential threats and determine what, if any, specific protections or administrative controls it can implement to protect the nesting site.

5.3.9 Rookeries

Great blue herons (Ardea herodias) and other wading birds such as egrets (Ardea alba), black-crowned night herons (Nycticorax nycticorax), and cormorants (Phalacrocorax auritus) are colonial breeders, forming groups of nests called rookeries in tall trees near the Columbia River shoreline. Suitable rookery habitat is limited to isolated groves of trees on the site. Rookeries are considered priority habitats by the WDFW (WDFW 2008), and the primary threat to rookeries is tree removal. All rookeries will be identified so that impacts to those areas can be avoided or mitigated. Great blue herons can also be very sensitive to disturbance, leading to possible colony abandonment. Each rookery will be managed on a case-by-case basis, considering existing levels of disturbance. The standard buffer for great blue heron rookeries is 300 m (1000 ft; WDFW 2004) from mid-February through July. Any proposed actions within 300 m (1000 ft) of a rookery will be assessed for impacts.

5.3.10 Raptors

The Hanford Site is home to a variety of raptors, including the American kestrel (*Falco sparverius*), great horned owl (*Bubo virginianus*), long-eared owl (*Asio otus*), osprey (*Pandion haliaetus*), prairie falcon (*Falco mexicanus*), red-tailed hawk (*Buteo jamaicensis*), and Swainson's hawk (*Buteo swainsoni*). Raptor species observations on the Hanford Site in 2015 are shown in Figure 5.13. Most of these species reside along the Columbia River corridor, where both aquatic and terrestrial resources can be exploited, rather than the more arid Central Plateau. Bald eagles, burrowing owls, and ferruginous hawks are excluded from this section, as they are addressed elsewhere in this management plan.

Raptor species have likely benefitted from the restrictions of public access on the Hanford site, as well as the landscapes created by pre-Hanford agricultural settlement and the Manhattan/Cold-War Era built-environment. These cultural occupations of the Hanford site provided anthropogenic structures (e.g., transmission line towers and buildings) as well as domestic vegetation resources (e.g., locust and orchard trees) for raptor species nests and roosts (Nugent et al. 2016). Surveys are performed bi-annually to monitor the presence of raptor species and to understand their relationships to changes in jackrabbit and other prey populations.

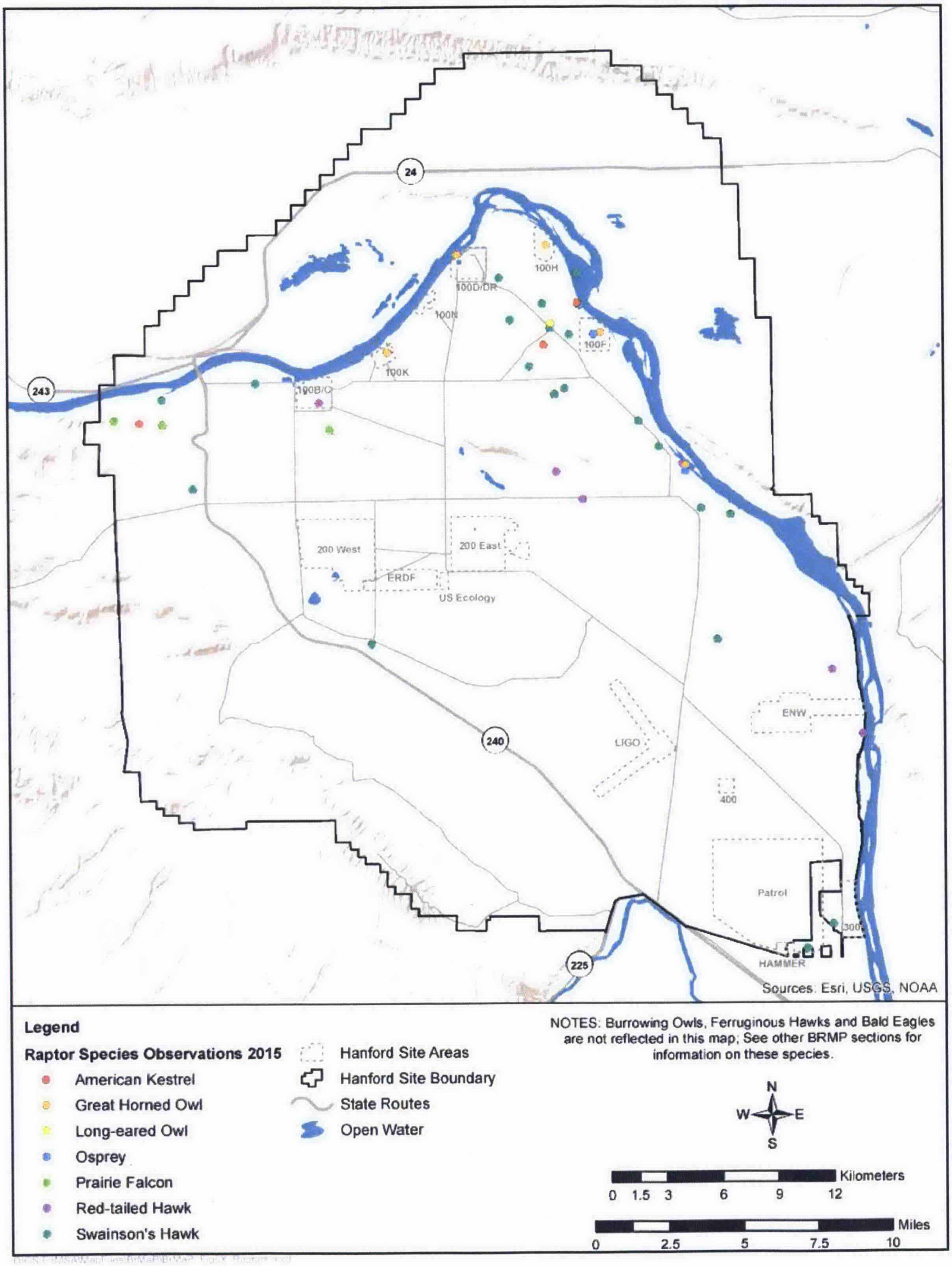

Figure 5.13 Raptors on the Hanford Site

5.3.11 Ground Squirrels

The Washington ground squirrel (*Urocitellus washingtoni*) and Townsend's ground squirrel (*U. townsendii*) are both listed as state candidate species by WDFW (2016), and the Washington ground squirrel is a candidate for federal protection under the ESA. These species play an important role in the Hanford ecosystem. Squirrels are a food source for many raptor species found on the site, as well as for some mammals, including badgers. Abandoned ground squirrel burrows can become burrowing owl burrows, supplying additional habitat for this candidate raptor species.

As colonies are identified, DOE will evaluate the setting and potential threats to each colony and will determine what, if any, specific protections or administrative controls can be implemented. The USFWS has successfully trapped and relocated Washington ground squirrel colonies in the area (Heidi Newsome, personal communication). Although not a preferred option, DOE will consider relocating colonies that otherwise would be destroyed by site activities. The locations of known Townsend's ground squirrel colonies on the Hanford Site are shown in Figure 5.14. Washington ground squirrel colonies are known to occupy areas in the Saddle Mountains (Finger et al. 2007).

5.3.12 Bat Roosts

Approximately 10 species of bats may occur on the Hanford Site. Of these, pallid bats (*Antrozous pallidus*), canyon bats (*Parastrellus hesperus*), and spotted bats (*Euderma maculatum*) are classified as state monitor species while the Townsend's big-eared bat (*Corynorhinus townsendii*) is classified as a state candidate and federal species of concern (WDFW 2016). In addition, roosting congregations of big-brown bats (*Eptesicus fuscus*), myotis bats (*Myotis* spp.), and pallid bats are considered priority habitats by the WDFW (WDFW 2008). Maternity colonies of Yuma myotis (*M. yumanensis*) and pallid bats have been identified in the 100-F and 100-D Areas.

Maternity roosts, night roosts, and winter roosts for many of these species potentially occur on the Hanford Site. These roost locations are essential to the life cycle of these species, and individuals return to the locations to form colonies year-after-year. Thus, protection from disturbance and destruction is necessary. All known and newly identified bat roosts on the Hanford Site are mapped in a database. If bat roosts are identified in project areas, evaluations must be made by a qualified biologist to determine impacts and mitigation. If an important roost site is identified in a non-contaminated facility that is scheduled for demolition, DOE will evaluate whether the facility can be left in place as bat habitat, as has been determined at the 183-F and 100-D drywells. Bat boxes or alternative roosting structures may be provided to help mitigate the loss of roost sites that may occur from facility demolition.

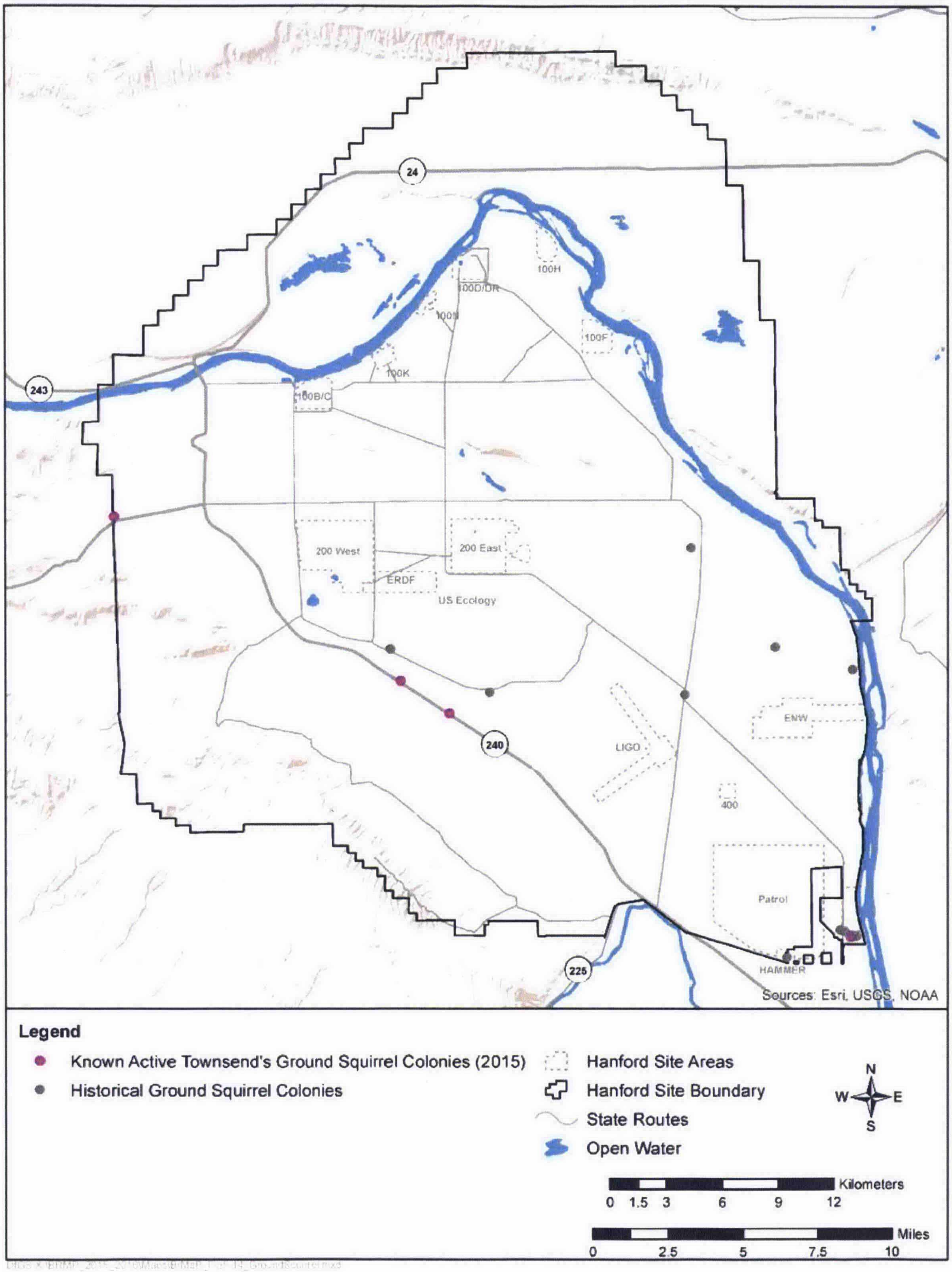

Figure 5.14 Known Townsend's Ground Squirrel Colonies on the Hanford Site

5.3.13 Elk

Elk (*Cervus elaphus*) were first documented on the Hanford Site in the early 1970s (Lindsey et al. 2013a). With few natural predators, the elk population quickly grew, and the USFWS estimated elk herd size on the Hanford Site in the winter of 2014/15 to be more than 1100 individuals (USFWS 2015). This group of elk is referred to as the Rattlesnake Hills elk herd, which is a subset of the Yakima herd as defined by WDFW.

Smaller groups of the Rattlesnake Hills elk herd can be found on the DOE-managed portion of central Hanford, particularly during the winter months. Figure 5.15 shows the locations of elk sightings on DOE-managed lands in winter 2015-16. The largest group of elk seen during this period contained 77 individuals; in comparison, the largest herd counted on central Hanford in 2012 consisted of 37 individuals (Lindsey et al. 2013a).

Besides their importance to wildlife resource agencies and local Tribes, both as an indicator of overall habitat quality and as a game species, elk migrating across highways and major roadways pose potential hazards and conflicts with automobile traffic. DOE will continue to monitor elk populations and migration patterns on the DOE-managed lands of the Hanford Site and will work with USFWS to address population size issues as needed.

5.3.14 Black-Tailed Jackrabbit

The black-tailed jackrabbit (*Lepus californicus*) is a sagebrush-obligate species that also exploits areas of rabbitbrush (*Chrysothamnus spp*) and antelope bitterbrush (*Purshia tridentata*). Jackrabbits are currently candidates for listing on Washington's threatened or endangered species list (WDFW 2016). Jackrabbit presence on the Hanford Site seems to be decreasing compared to historical levels (Grzyb et al. 2016). Sightings of black-tailed jackrabbit on the Hanford Site from 2013 to 2015 are reflected in Figure 5.16.

To-date, monitoring efforts have focused on verifying black-tailed jackrabbit populations in areas known to contain preferred habitat through the use of trail cameras, incidental sightings, and snow surveys. DOE will continue to monitor, map, and study the black-tailed jackrabbit population bi-annually to establish a complete picture of populations across all DOE-managed lands. Information gathered from these activities assist DOE in better understanding the implications fluctuating populations levels of black-tailed jackrabbit may have on other predatory species.

5.3.15 Snake Hibernacula

Hibernacula provide habitat essential to the life cycle of snake species on the Hanford Site. Snakes depend on hibernacula for survival during the winter, as well as for reproduction. Snakes fill an important role in the ecosystems they occupy: eating a variety of prey and providing a source of food for other predators. Destruction of hibernacula can result in significant losses to local snake populations, including sensitive species such as the striped whipsnake (*Masticophis taeniatus*), night snake (*Hypsiglena torquata*), and yellow-bellied racer (*Coluber constrictor)* (Lindsey et al. 2013b).

All identified snake hibernacula are mapped and included in a long-term database. When a hibernaculum is identified, DOE will make reasonable efforts to protect it from disturbance and maintain natural habitat areas in the vicinity. Construction of potential new hibernacula sites will be included in site restoration efforts whenever feasible.

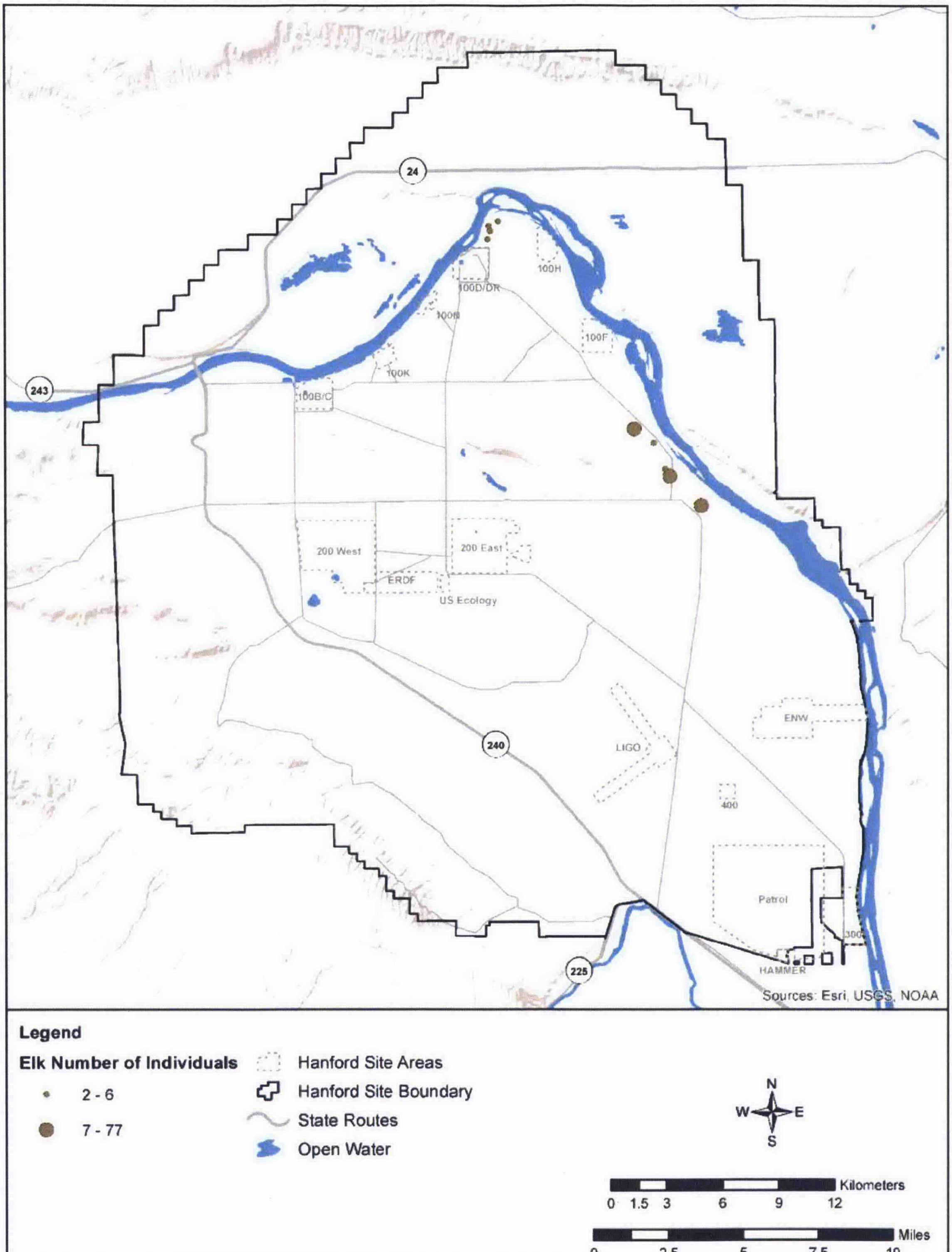

Figure 5.15 Elk Sightings on the Central Hanford Site (Winter 2015-16)

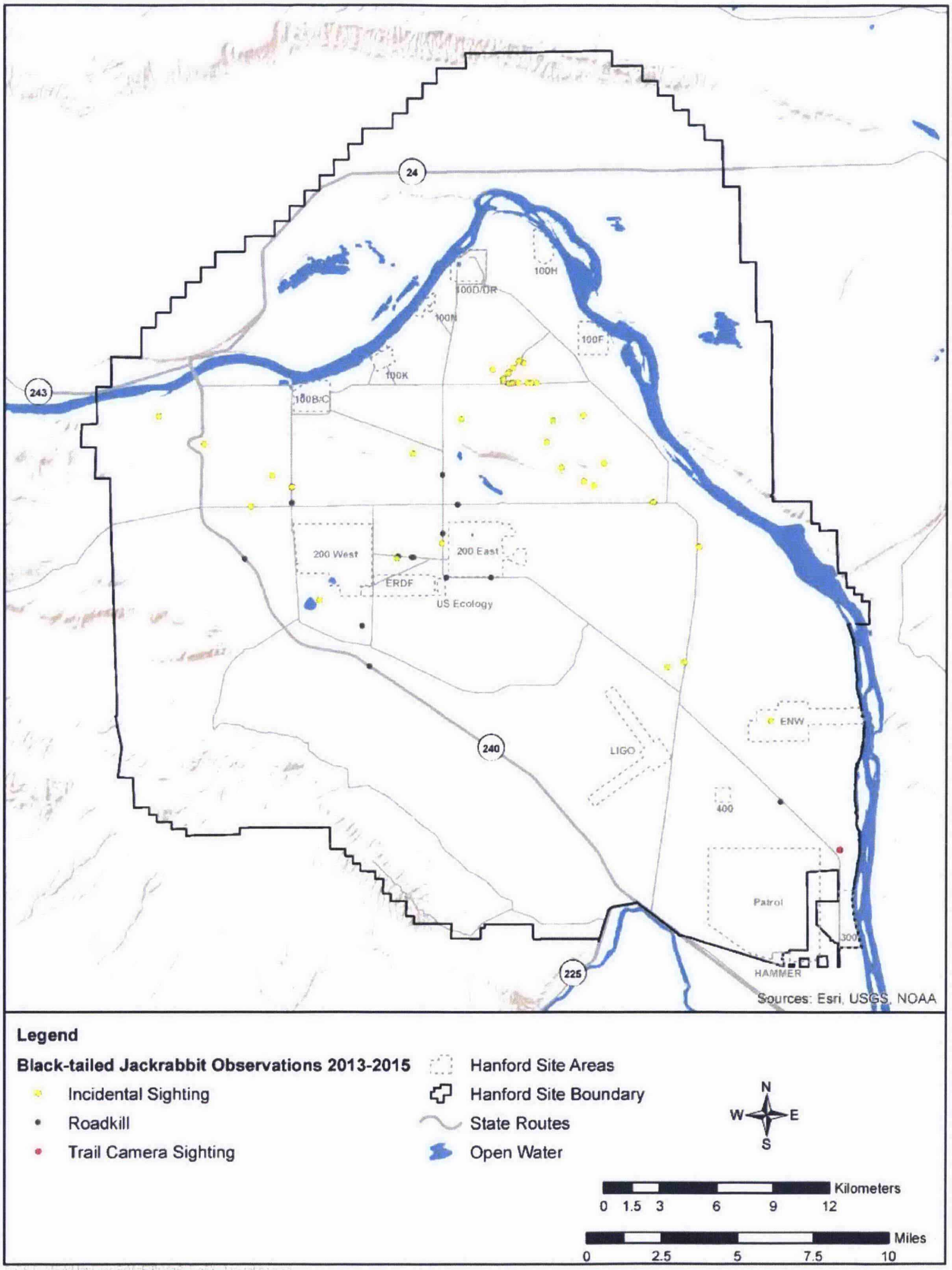

Figure 5.16 Black-Tailed Jackrabbit Observations on the Hanford Site

5.3.16 Rare Plants

More than 50 plant species potentially exist on the Hanford Site that have been listed at various levels of concern by federal (ESA, 50 CFR 17) and state (WNHP 2015) resource agencies. Populations of these species are found throughout the Hanford Site (Figure 4.10) and could be impacted by site activities. DOE will continue to monitor known populations of rare plants on the Hanford Site and use the impact assessment process described in Chapter 6.0 to determine if site actions will adversely affect rare plants, and, if so, provide means to mitigate such impacts following the guidelines provided in Section 7.4.8. Project activities should not result in net losses of any plant species of concern classified at Level 3 or higher.

5.4 Resource Status and Trends Evaluation

Inventorying and monitoring biological resources at Hanford are critical management actions that allow DOE to show its activities are not resulting in significant adverse cumulative impacts to the biological resources present on the Hanford Site. Biological resources inventory and monitoring also provide the technical basis for resource management via an ecosystem management approach.

Much of the inventory work on Hanford's biological resources (identity, location, population size, or community distribution) has been completed through various DOE ecological and biological surveys, the site ecosystem monitoring program, and The Nature Conservancy surveys. However, ongoing inventory work is needed for a number of specific areas, habitat classes, species distributions, and other biological components. Completion of the Hanford Site biological inventory is vital because it is the first step in determining what the important biological resources are, where they are, and how they can most efficiently and effectively be protected.

Monitoring is a repetitive process through which the status and condition of a resource is followed over time. Monitoring may be directed at multiple levels, including the population or species level, habitat or plant community level, or ecosystem level. Most monitoring on the Hanford Site has been directed at identifying trends in populations to determine impacts from site activities, the status of certain species of concern to meet legally mandated protection requirements, or radioactive contaminant levels in selected organisms in various locations. Additional efforts have been initiated to monitor ecosystem integrity and the success of mitigation actions.

These monitoring efforts provide the technical basis for biological resources management policies and identify needed changes to those policies. Monitoring population, habitat, and ecosystem integrity will enable DOE to determine what activities are most impacting resources of concern, which resources are being most affected, and which should be reclassified into lower or higher levels of concern. Monitoring areas used for replacement mitigation will ensure that mitigation efforts are successful and that they meet commitments made in project- or program-specific Records of Decision or Mitigation Action Plans.

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6.0 Ecological Compliance Assessment

This chapter identifies and describes the organization, requirements, and procedures used to implement the ecological compliance assessment process on the Hanford Site, which includes impact assessment and impact management. Impact assessment is accomplished by evaluating potential impacts before they occur, and impact management is accomplished by avoiding or mitigating adverse impacts.

Mitigation is a series of prioritized actions that, taken together, reduce or eliminate adverse project impacts to biological resources. Mitigation actions that rely on changes to project timing or location to avoid or minimize impacts are considered part the ecological compliance assessment process and are described in this chapter. Mitigation actions that rely on replacement or improvements to habitat are part of the broader strategy for biological resources mitigation and are discussed in Chapter 7.0. For any specific project, the need for mitigation actions of any type is determined via the ECR, which is described in this chapter.

6.1 Background

Analyses of the ecological effects of major federal actions have a long history at the Hanford Site, particularly as implemented through compliance with NEPA. In 1993, to further ensure such analyses were applied uniformly, DOE issued directions requiring all Hanford Site contractors to obtain an ECR for all actions with the potential to impact ecological resources before initiating such action (DOE 1993a). The scope of projects requiring such evaluations includes those 1) being considered for functional equivalence under CERCLA and/or RCRA, 2) projects covered under NEPA categorical exclusions, and 3) those for which a full NEPA evaluation is required.

Since 1994, the responsibility for conducting ECRs has been assigned to RL's PSRP Program, currently managed by MSA, for all Hanford Site activities (DOE 1993b; DOE 1993c). The PSRP performs ECRs for all DOE-related activities that take place within the Hanford Site and for DOE-activities within the HRNM, including those areas currently managed by the USFWS. The USFWS evaluates and manages impacts resulting from its own activities on the HRNM.

Non-RL/ORP federal agencies, such as the Bonneville Power Administration or the DOE Office of Science, and non-federal entities performing non-RL/ORP funded work on the Hanford Site must comply with the resource protection aspects of BRMP. However, these agencies have latitude in selecting a contractor to perform the ECR or comparable ecological analyses, such as collecting field data in support of an EIS.

6.2 Ecological Compliance Reviews

Ecological compliance reviews are performed before projects are implemented to identify and assess any impacts that may occur and identify opportunities to avoid or minimize those impacts. The review process helps ensure Hanford Site programmatic objectives are met. It also ensures protection of the site's resources and compliance with applicable laws, regulations, Executive Orders, and DOE Orders.

Impacts to ecological resources are evaluated through a trackable ECR process that relies on field and desktop assessments of the presence of species and/or habitats of concern and any previous assessments done within a project region. The objectives of an ECR are to:

- Assess the potential for proposed Hanford activities to adversely affect biological resources of concern.
- Ensure compliance with relevant laws such as the ESA, MBTA, and other regulations, orders, and guidelines.
- Provide timely information to project managers to support planning decisions.
- Identify mitigation requirements and options.
- Document the results of the assessment for the proposed project and DOE.

The ECR process ensures that actual and potential impacts of Hanford Site operations on biological resources of concern are identified and evaluated, and impacts to protected species are evaluated and documented in compliance with the ESA, NEPA, and other applicable laws, regulations, and orders. In addition, the ECRs provide DOE with the information it needs to interact productively with federal, state, and tribal agencies on ecological resource issues. The ECR process also provides the information needed to evaluate the cumulative impacts of all Hanford projects on the ecological resources of the site.

Projects requiring ECRs are those that have the potential to adversely affect biological resources of concern on the Hanford Site. Resources of concern include those categories of species or their habitats that are identified under DOE's NEPA implementing procedures, as well as state candidate, sensitive, and monitor species. Additionally, migratory birds, floodplains, wetlands, and other unique habitats are considered resources of concern on the Hanford Site. Chapter 5.0 categorizes all species and habitats on the Hanford Site by levels representing the continuum of resource value. Each level has specific management and mitigation requirements.

6.2.1 Actions Requiring an Ecological Compliance Review

Any site action with the potential to affect ecological resources of concern adversely requires an ECR. This includes actions that are covered under NEPA categorical exclusions. Project planners may use the decision flowchart shown in Figure 6.1, or use Site Form A-6006-139, *Criteria for Determining the Need for Ecological and Cultural Resources Reviews and Clearance*, to determine if an ECR is needed for a specific action. If the answer at any level on the decision flowchart is "yes" or "maybe," the project should either submit a review request or informally contact the ecological compliance contact provided on Site Form A-6006-139 to discuss if a formal ECR is needed. Not all "yes" answers will definitively lead to the need for an ECR. If there is any question, the project planner should contact the ecological compliance contact.

Examples of activities that generally require an ECR include those that:

- Require an excavation permit
- Remove or modify dead or living vegetative cover
- Would be conducted on the outside of buildings and facilities
- Would be conducted within abandoned buildings and facilities

- Would result in chemical or radiological releases requiring changes to existing permits
- Have the potential to alter or affect the living environment, such as landscape-scale applications of fertilizers, herbicides, prescribed fire, or fire recovery efforts.

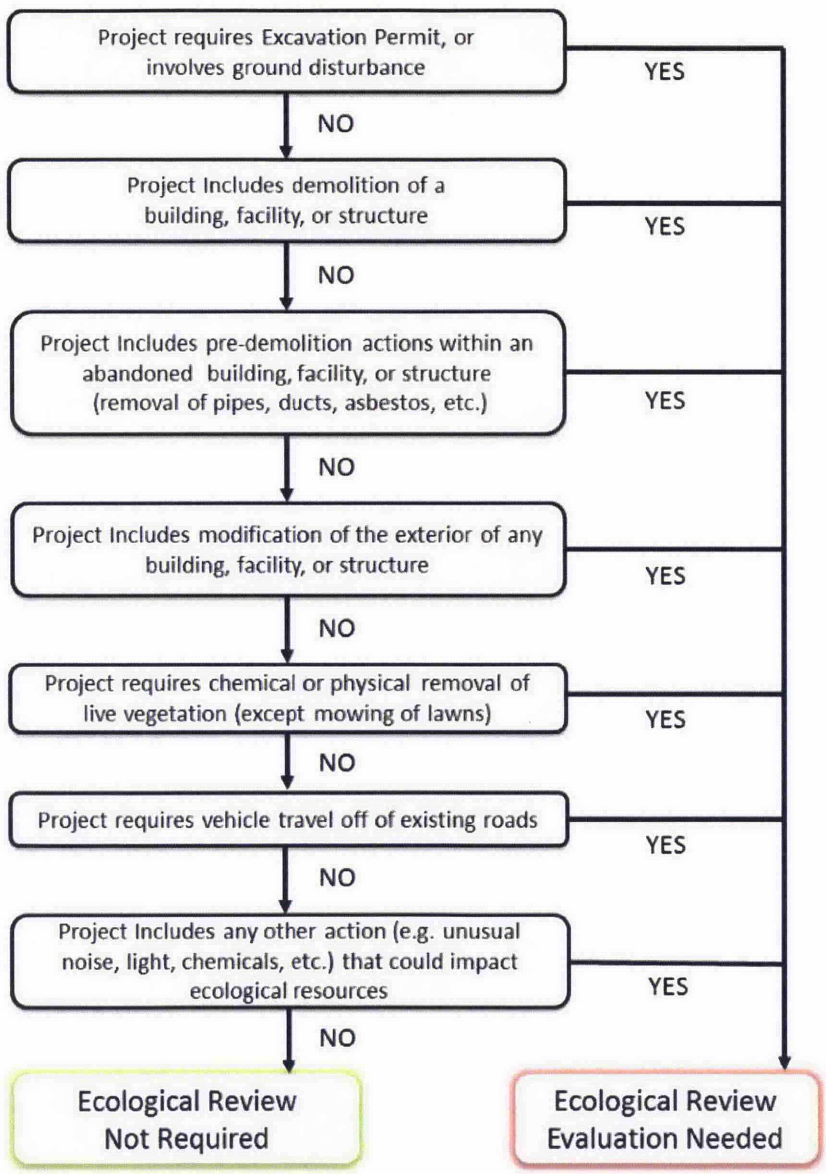

Figure 6.1 Flowchart to Determine Need for Ecological Compliance Review

6.2.2 Biological Resources of Concern

Resources considered during the ECR process include all those described as Levels 5 through 1. The higher the value level, the greater emphasis the resource receives during the ECR process. Particular species and habitats include the following:

- Federal endangered, threatened, proposed, or candidate species
- Washington State endangered, threatened, candidate, sensitive, monitor, review, or watch list species
- Bird species listed under the MBTA
- Rare or sensitive habitats, including terrestrial vegetation associations identified by Washington State as element occurrences, wetlands, floodplains, riparian communities, swales, dunes, basalt outcrops, cliffs, and mid- and late-successional sagebrush steppe
- Anadromous fish spawning areas
- Bald eagle night roost and active nest locations
- Ferruginous hawk and burrowing owl nest locations
- Landscape features related to specific habitats, communities, or species.

Impact assessments consider direct and simple indirect effects to biological resources of concern. Direct effects include mortality, habitat loss (reproductive, cover/roosting, foraging habitat), nest or den destruction, or disturbance, such as visual or noise impacts causing loss of productivity. Simple indirect effects include habitat fragmentation, increased edge effects, and introduction of potential competitors or predators. Indirect effects will often be considered qualitatively, but as quantitative tools are developed, such as habitat suitability models, they may be incorporated quantitatively into the effects evaluation. Table 6.1 shows the sources considered in determining impacts.

Determination of impact is based on whether a species of concern may be present and whether the proposed action could result in any of the impacts described in Table 6.1. Presence of a species of concern can be determined by direct observation or inferred based on habitat because many species of concern have very specific habitat requirements, which are described in the scientific literature. When suitable habitat is present within a project area, impacts to species of concern that may use those habitats should be evaluated.

Table 6.1 Evaluation of Impacts to Biological Resources of Concern

Source of Impact	Likelihood of Impact
Direct mortality	Potential is defined as high for plants in the areas to be disturbed, low for mobile species
Habitat loss	Potential is evaluated on basis of species/habitat associations, foraging/home range size, and project scope
Nest/den destruction	Potential is defined as high for nests/dens found in the area depending on project scope
Disturbance during sensitive periods	Potential is defined as high within one home range radius, or as defined by management plans/biological assessments depending on project scope

6.3 Ecological Compliance Review Methodology

The ECR methodology relies on field data specific to the site where the proposed action is to occur. To be most useful, field data must be obtained at the biologically appropriate time of year, the period when species of concern can be expected to be present and identifiable. For example, many rare plant species can be accurately identified only during the spring flowering period. Other species, such as the bald eagle, may be found on the Hanford Site only during the fall and winter months. Consequently, no single time period will be sufficient to assess all species occurrences at all surveyed sites. However, impacts to seasonally occurring resources, such as bald eagles, would not need to be considered for projects scheduled to occur during periods, such as summer, when resources would not be affected.

Requests for ECRs for most Hanford Site activities are made via the Intranet Service Catalog Request System http://msc.ms.rl.gov/ServiceCatalog/index.cfm. The ECR service catalog request is combined with the cultural resources catalog request; therefore, one service catalog request will trigger both reviews.

Once the ECR request is logged into the database, it is given a unique identification number and evaluated to determine if the proposed activity has the potential to affect biological resources and therefore requires an ECR. If the potential impacts are clearly minimal and/or the project does not meet the requirements listed in Section 6.2.1, the requestor may be notified by email that no ecological review is required. There are cases in which a project may require a cultural review but not an ecological review and vice-versa.

A determination is then made regarding the sufficiency of information provided in the request. If the information is insufficient to support a field survey or analyze project impacts, the requestor is contacted for additional information. For instance, the requestor may be asked to provide better maps of the project area or better describe the type and scale of disturbance. After sufficient information is available, a desktop review is then conducted to gather any information that may pertain to proposed action, and a field survey is conducted if needed. The ecological compliance staff will use information gathered during the desktop evaluation and/or field survey to evaluate the potential impacts of the proposed project on species or habitats of concern.

For efficiency purposes and cost considerations during the desktop evaluation, staff query the ecological compliance database to determine whether a field survey has been performed at or near the proposed project site within the last year. When such data exist and are adequate, the ECR may be based on this information, as well as pertinent information from other available data sources or databases. When previously collected data are used, additional site inspections may be required prior to conducting the proposed activity to ensure nesting migratory birds are not impacted because conditions may have changed (e.g., birds began nesting) since the previous survey was conducted.

The desktop review may also include photographic evidence provided by the requestor, which can partially substitute for an onsite inspection by the ecological compliance review staff if the photographs clearly indicate the location of the proposed project and specific area, such as a paved or graveled parking lot, that will be disturbed contain no biological resources. If adequate existing data are not available, site-specific field surveys will be completed as appropriate.

Site-specific field surveys include a walk down of the proposed project area by a qualified biologist, who records the presence, distribution, and abundance of all plants and animals observed. Spatial data and digital photography may also become part of the survey record. These data are then entered into the appropriate databases for storage and query. As previously mentioned, detection of some species, such as spring flowers and wintering eagles, is temporally limited, and the biologist will take this into account when scheduling or performing surveys.

6.4 Ecological Compliance Review Reporting and Documentation

Compliance review reporting consists of a letter report to the requestor documenting the ECR and its findings. Contents of ECR reports vary according to the type of action under review, but all reports contain the action title and description, assigned review number, objectives of the review, and findings. Table 6.2 shows specific contents for actions that would cause minor disturbance in paved or graveled areas, those that will not result in loss of mitigable habitat and those that will. Mitigable habitats include the following:

- Habitats necessary for plant and animal species of concern
- Rare or unusual plant assemblages as defined in the Washington Natural Heritage Plan (WDNR 2011)
- Habitats with high native plant or animal diversity
- Habitats lacking significant anthropogenic disturbance
- Habitats specifically protected under state or federal regulation such as jurisdictional wetlands.

ECR letter reports for projects that will not result in loss of mitigable habitat include the following information: 1) a reference to the physical field survey performed as the basis for the review; 2) a description of the affected habitat, the primary plant and animal species that could be affected by the action, and any species of concern or migratory birds that are present that could be affected; and 3) any mitigation requirements associated with the siting or timing of proposed actions or other actions that may avoid or minimize impacts.

ECR reports for proposed actions that will result in loss of habitat and would require mitigation, such as mature shrub-steppe, wetlands, or other mitigable habitats require additional information. This includes quantitative descriptions of the habitat, including plant cover by species, and recommendations for mitigation via rectification at the site of the proposed action and/or compensatory mitigation elsewhere.

The final ECR letter report is sent to the requestor, and copies are available upon request. Copies of the letters, request forms, field data, and all supporting documents are retained in the PSRP project files. ECR reviews will normally be valid for 1 year, unless otherwise noted in the ECR.

Table 6.2 Contents of Ecological Compliance Review Letter Reports

Type of Action	Contents
Minor disturbance in paved, graveled, or other non-vegetated areas	Action title Action description ECR Action Number Reference to physical survey(s) – if performed Findings of the review
Will disturb habitat that does not require compensatory mitigation	Above plus: Habitat description Species of concern in action area Migratory bird species observed Mitigation requirements (i.e., action timing restrictions or footprint minimization)
Will disturb habitat that does require compensatory mitigation	Above plus: Habitat quantification, as appropriate Recommendations for mitigation via habitat improvement, as applicable If disturbance is above the defined threshold for compensatory mitigation, a mitigation action plan may be required

6.5 Blanket Ecological Compliance Reviews

Specific areas on the Hanford Site may qualify for blanket ecological compliance reviews. These blanket reviews are issued on an annual basis and allow a specific prescribed scope of work, such as routine operations and maintenance activities, to proceed without

ECRs for each individual action. These blanket reviews save paperwork and time for both the ecological compliance assessment staff and the requesting organization. Except for staff-determined special-case situations, to qualify for a blanket review, an area must meet the following criteria:

- Already highly disturbed habitat or little to no value for flora or fauna (typically Level 0)
- Clearly defined boundaries
- Low probability of adverse ecological impacts
- Considerable project activity that would require numerous individual reviews per year.

Areas that have qualified for blanket ecological compliance reviews in the past include the 100-K Area, the 200 Areas tank, the Plutonium Finishing Plant, and active portions of the solid waste burial grounds in the 200 Areas. Blanket ecological compliance reviews contain recommendations to reduce impacts to ecological resources that may be specific to the area and require that any nesting birds be reported to ecological compliance staff to determine if they are a protected species, such as a migratory species.

Blanket reviews will usually provide complete coverage during the non-nesting season, generally late July to early March, and non-migratory bird coverage during the nesting season. The potential for impacts to nesting migratory birds must be considered on a project-by-project basis during nesting season. Blanket reviews need to be periodically re-examined and re-issued to allow ecological compliance staff to ensure blanket area environmental compliance officers and project staff are aware of any management changes they need to be aware of, for instance, changes in bald eagle night roost exclusion areas or ferruginous hawk buffers. In addition, any unexpected change in conditions or changes to project scope will require re-evaluation of the blanket review to ensure its adequacy.

Because ecological and cultural resource reviews are conducted in tandem, a blanket ecological review is normally most useful for areas where a similar review exemption exists for cultural resources.

6.6 Cumulative Impact Reporting

As funding permits, the ecological compliance assessment staff will prepare an annual summary of projects reviewed. At a minimum, this summary will be included as part of the annual *Hanford Site Environmental Report* (DOE 2015d). The summary will detail potentially significant activities during the year, and may include the following information:

- Number of review requests received and processed, by type of action and action contractor
- Breakdown of review requests by area of the site, affected habitat, and affected species
- Acreage of habitats converted to other uses
- Summary of actions affecting federal- or state-listed species
- Summary of interactions with projects that limit impacts to species of concern and habitats, such as implementation of measures to avoid or minimize impacts
- Summary of mitigation recommendations involving necessary habitat improvement onsite or offsite
- Summary of interactions with the USFWS, NMFS, or WDFW regarding action impacts to Hanford Site plants, fish, and wildlife

- Assessment of cumulative impact, such as habitat fragmentation changes from previous environmental baseline
- Assessment of the effectiveness of previously implemented mitigation projects.

6.7 Impact Management Recommendations

Although DOE recognizes that adverse impacts to biological resources cannot always be eliminated, the potential for impacts must be considered during the early phases of project development and their consequences incorporated in decision making. Means to accomplish impact avoidance or minimization are identified through the ECR and project site selection processes before project implementation. The ECR may include recommendations to avoid or minimize adverse impacts to ecological resources by:

- Implementing alternatives that would result in fewer adverse impacts
- Locating projects at a less ecologically sensitive site
- Reducing or modifying the project footprint
- Scheduling project activities so that disruption of key species and functions is minimized.

In unusual cases when significant impacts cannot be reasonably avoided or minimized, the ECR will provide recommendations for compensatory mitigation based on the characteristics of the habitat that will be disturbed. Implementation of such mitigation will be in accordance with the requirements and procedures defined in Chapter 7.0. If mitigation beyond avoidance and minimization is likely, ecological compliance assessment staff will meet with the project staff (both DOE and contractor) to:

- Provide information on potentially significant biological issues pertinent to a specific project.
- Help identify alternatives to the proposed action that could reduce adverse impacts.
- Provide information on the location of important biological resources to assist, as necessary, in the Hanford Site selection process for individual projects.
- Present information on Hanford policy with regard to mitigation.
- Develop a common schedule for conducting an ECR that would minimize impacts to the schedule of the proposed project.

These meetings will be schedule as needed. Ecological compliance staff will attempt to initiate interactions in a proactive manner when informed of upcoming major actions. These efforts and resulting recommendations will be reported to DOE via regular reporting processes.

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7.0 Biological Resource Mitigation Strategy

This chapter identifies and describes the biological resource mitigation strategy on the Hanford Site. It focuses primarily on mitigation actions that rely on habitat improvement, rectification, and compensation. Habitat improvement may be necessary for projects that eliminate or degrade habitat. However, mitigation actions based on avoidance or minimization of adverse impacts, such as changes to project timing or location, are the most important components of the overall mitigation strategy. These mitigation actions are implemented via the interactive impact assessment and management process described in Chapter 6.0. Mitigation of impacts to species listed under the ESA will be determined under the consultation requirements in Section 7 of the ESA.

This chapter also provides guidance on accounting for habitat protection or improvement as part of the project planning process. In addition, it provides guidance and a reference for preparation of project-specific MAPs under the DOE NEPA implementation procedures (10 CFR 1021). This includes a brief overview of suggested contents for project-specific MAPs.

7.1 Mitigation Strategy Overview

Mitigation is a series of prioritized actions intended to reduce or eliminate adverse impacts to biological resources. These actions include avoidance, minimization, onsite rectification, and compensation (Table 7.1). The basis of this strategy is that a project begins mitigation at the avoidance level of the hierarchy and only moves to the next level if reasonable options at the previous level are exhausted.

To facilitate a balance between Hanford Site mission elements and stewardship obligations, the BRMP mitigation strategy is intended to:

- Divert impacts away from higher priority toward lower priority resources
- Ensure consistent and effective implementation of mitigation recommendations and requirements
- Ensure biological resource mitigation measures meet the responsibilities committed to by DOE within a NEPA or CERCLA ROD or a NEPA finding of no significant impact
- Enable Hanford Site projects to anticipate and plan for mitigation needs via early identification of mitigation requirements
- Provide guidance for implementing cost-effective mitigation actions
- Conserve Hanford's biological resources while facilitating balanced development and cleanup activities.

Table 7.1 Types of Mitigation for Biological Resource Impacts

Mitigation	Utilization Preference	Mitigation Means	Example
Avoidance	1st	Eliminate all or part of a project or alter the timing, location, or implementation to avoid injury to biological resources of concern	Relocate a proposed excavation from an area with protected plant species to an area without resources of concern
Minimization	2nd	Alter proposed project timing, location, or implementation to minimize injury to biological resources of concern	Perform habitat removal at a time when the nesting activities of migratory birds will not be disturbed
Rectification	3rd	Replace the biological resources on the site to be disturbed	Return pre-existing plant community to excavation site
Compensation	4th	Replace project-induced biological resource losses away from the site to be disturbed	Replant mature sagebrush in a degraded area on Hanford

The mitigation process on the Hanford Site includes several steps and decision points. Most projects will require only the first three steps: ECR, avoidance, and minimization. But, any project that disturbs native vegetation is expected to revegetate the disturbed area with native species to the extent practical. Larger projects, or those that must be located in more ecologically significant areas, may require the latter stages of the mitigation process: rectification and compensation.

The mitigation process starts with an ECR as outlined in Chapter 6.0. Historically, the majority of reviewed projects have had no adverse impacts to any biological resources of concern. Thus, many projects proceed after the ECR without additional mitigation actions. Of those remaining, most projects can proceed with only minor adjustments, such as moving the site a short distance or performing the action during a time that would not impact nesting migratory birds.

If significant impacts remain after avoidance and minimization, then rectification or compensation will be determined using procedures described in Section 7.4. Onsite rectification may include actions ranging from the replacement of lost resources to preventing habitat degradation, such as erosion or control of invasive weeds subsequent to land disturbance. Compensation may be needed in addition to rectification if the impact is significant. For example, an area covered by a new facility that cannot be rectified onsite may need compensation to mitigate for habitat loss. The long-term goal of this mitigation strategy is that most compensatory mitigation will be accomplished via participation in a mitigation bank (Section 7.5).

7.2 Requirements for Mitigation

Many of the laws and regulations discussed in Chapter 3.0 include expectations for mitigation of a resource loss. This mitigation strategy is intended to ensure that DOE meets the spirit and intent as well as the letter of those laws and regulations. Additionally, state and federal resource management agencies have published policies and guidelines for biological resource mitigation that form much of the basis for DOE's mitigation strategy. These policies and guidelines are summarized in Table 7.2.

Table 7.2 Federal and State Policies and Guidelines for Mitigation

Agency	Summary
USFWS Mitigation Policy (81 FR 61031, September 2016)	• Takes landscape-level approach to compensatory mitigation • Categorizes mitigation elements into three general types that form a sequence: Avoidance, minimization, and compensatory mitigation for remaining unavoidable (also known as residual) impacts. • Follows the CEQ guidelines for mitigation: Avoid the impact altogether by not taking a certain action or parts of an action; minimize impacts by limiting the degree or magnitude of the action and its implementation; rectify the impact by repairing, rehabilitating, or restoring the affected environment; reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; and compensating for the impact by replacing or providing substitute resources or environments.
WDFW Mitigation Policy (POL-M5002; January 1999)	• Follows CEQ guidelines for mitigation • States that mitigation should ensure no net loss of habitat or populations • Provides direction for use of in-kind/out-of-kind, onsite/offsite mitigation. Onsite, in-kind is highest priority. All out-of-kind mitigation must be approved case by case. • States that priority habitats and species, defined by WDFW's Priority Habitats and Species Program, receive additional consideration; in some cases, preservation of priority habitats can be considered mitigation. • Includes guidance for documenting terms of mitigation.

7.3 Triggers for Mitigation and Threshold Levels

Virtually all areas of the Hanford Site, including industrial areas, constitute habitat for some plants and wildlife. However, it is not practical, possible, or even desirable to mitigate for any and all changes to the current habitat base. The DOE mitigation strategy is designed to direct adverse impacts away from higher value habitat areas and into lower value habitat areas, or preferably, into areas that are already disturbed and contain little or no habitat value. Two obvious benefits from avoiding adverse impacts are reduced costs to projects and preservation of highly valued biological resources and habitats.

It is the policy of DOE to determine mitigation requirements based on resource value, as described in Chapter 5.0, rather than strictly on the size of the impacted area. Impacts to higher value resources will result in greater mitigation commitments than impacts to lower value resources. This policy encourages projects to be located in areas with low extant habitat value because the mitigation requirements associated with these areas will be less than the requirements associated with the disturbance of the same acreage of higher quality habitat.

Impact thresholds will depend on the point in the mitigation hierarchy the project is at, as well as the particular resource(s) that may be impacted. In the first two steps of the mitigation process, avoidance and minimization, no set threshold level exists if managed resources are present. All projects are expected to avoid and minimize adverse impacts to the greatest extent possible, and should weigh these considerations equally with other project siting criteria. Likewise, all projects are expected to rectify impacts at the project site to the extent practicable, including replanting disturbed areas with native species.

Some resources have specific regulatory requirements that may affect mitigation considerations such as threshold level. For instance, jurisdictional wetlands have no mitigation threshold level, and any impact would likely require mitigation as part of the *Clean Water Act* Section 404 permit from the USACE.

For Level 2, 3, or 4 habitat resources, such as steppe, shrub-steppe, and other habitats, compensatory mitigation may be triggered if the impact, after avoidance, minimization, and onsite rectification, is greater than 0.5 ha (1.2 ac), regardless of the project's location.

7.4 Implementation

Implementation follows the order of mitigation priorities presented in Table 7.1. Impacts should be avoided or minimized if possible, and rectified or compensated only if avoidance and minimization do not satisfy all project mitigation needs and the residual impacts are above the mitigation threshold identified in Section 7.3. Avoidance and minimization actions are likely to be less costly, have less potential to adversely impact project schedules, and cause less injury to biological resources than actions that rely on habitat improvement. If compensatory mitigation is required away from the project site, mitigation requirements should be met through participation in a mitigation bank, if available, as described in Sections 7.4.3 and 7.5.

7.4.1 Identifying Mitigation Needs

Mitigation should be identified and implemented as early in the project as possible. If not determined earlier, mitigation needs are identified during the ecological compliance assessment process. Impact management should occur during the site-selection process to address the avoidance and minimization steps of the mitigation process, thereby reducing the need for rectification and/or compensation. Additional mitigation needs may be identified later in the project via the ecological compliance review as described in Chapter 6.0.

7.4.2 Mitigation at a Project Site

Mitigation at the project site includes avoiding, minimizing, or rectifying project impacts (Table 7.1). Project impacts can be avoided or minimized by taking actions such as the following:

- Implementing non-disturbing alternatives
- Locating a project at a less ecologically sensitive site
- Reducing project land-use requirements
- Scheduling project activities to minimize disturbance to biological resources of concern.

7.4.3 Mitigation Away from a Project Site

Projects that are unable to reduce the impacts below mitigation thresholds via avoidance and/or minimization, and are unable to rectify the loss on the project site fully, will perform mitigation away from the project site. In most cases, this mitigation will consist of habitat improvements at a selected mitigation area; although, in some cases, other methods, such as acquisition of high-quality, at-risk lands may be an option.

The siting of mitigation areas should be performed within the context of the CLUP and Hanford Site biological resource management goals, and should consider landscape-scale factors to best enhance or complement existing resources. Mitigation areas include lands that will allow for in-kind replacement of habitat value lost at project sites and should be:

- Contained either wholly within DOE-administered or managed lands or on the HRNM.
- Placed in regions designated within the CLUP as conservation or preservation areas.
- Located near, within, and/or surrounding lands that possess significant habitat value.
- Adjacent to areas that are already protected or to areas with complementary habitat if management objectives include preserving a mosaic of habitat types.
- Capable of serving as a core area of wildlife usage as well as a wildlife travel corridor either within the Hanford Site or between the site and adjacent non-DOE lands.
- Able to balance the effects of large-scale disturbance and habitat fragmentation.
- Viewed in the context of the surrounding landscape, including lands adjacent to Hanford.
- Capable of achieving in-kind habitat value replacement via habitat improvement. The habitat potential of the mitigation area and project impact area must be similar.
- Located in a non-radiological control area or non-hazardous materials management area.

7.4.4 Mitigation Levels and Ratios

Mitigation levels range from impact avoidance to compensation (Table 7.1). A mitigation replacement ratio is the ratio of the quantity of habitat units created at a compensation site to the quantity lost at the site of adverse impacts. Sometimes this may translate as the area over which mitigation measures are applied to the area receiving adverse impacts, assuming equivalent habitat value at each site. Alternatively, it can be the ratio of the improved habitat value or "quality" at the mitigation area to the habitat value at an impacted site, assuming the same land area for each site (Figure 7.1). Figure 7.1 depicts area based replacement as a number of boxes with new plantings and habitat quality as additional branches on a representative plant. This figure also shows how a combination of area and quality considerations can also be used to determine compensatory mitigation actions.

Replacement ratios for impacts to riparian or wetland habitats will be consistent with Washington Department of Ecology requirements for wetland mitigation (2:1 on an area basis with equivalent plant species density; Castelle et al. 1992a) or as otherwise defined in any CWA Section 404 permit issued by the USACE.

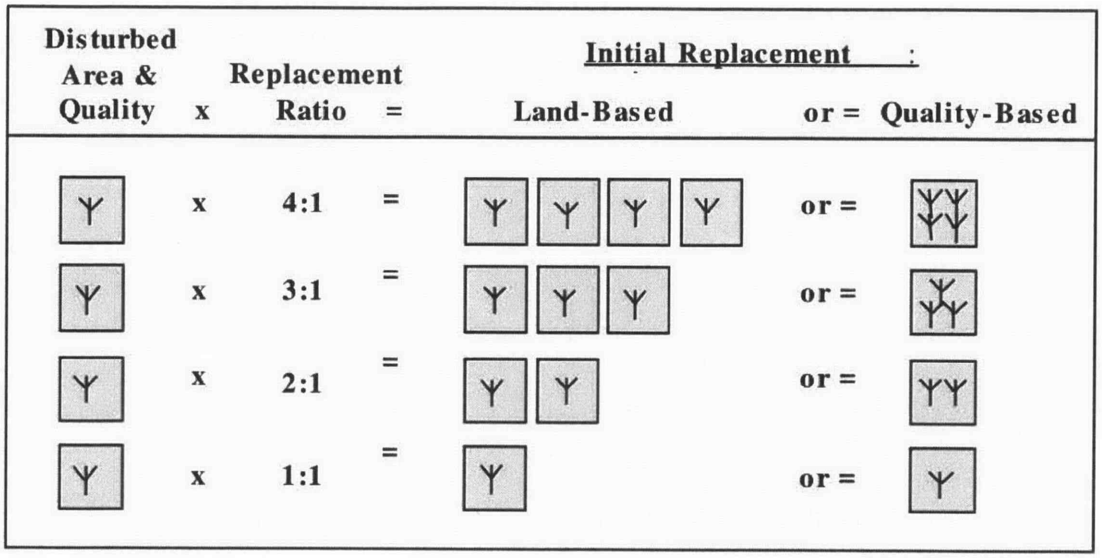

Figure 7.1 Comparison of Spatial- or Quality-Based Replacement Ratios

The replacement ratio should account for both the potential planting failure rate and the loss of services over time. In semi-arid terrestrial systems, there will usually be a time lag, perhaps measured in decades, between when the mitigation actions are performed and when the mitigation area becomes fully usable habitat. Therefore, the replacement ratio should be set at a point that will allow the *habitat value* to be replaced in a reasonable period of time, even if it may ultimately result in a larger number of habitat units decades later. To account for both the failure rate and the replacement time lag the replacement ratio should be set higher than a simple consideration of transplant survival rates would suggest. This consideration is a key element in the early planning for revegetation/restoration activities as laid out in the *Hanford Site Revegetation Manual* (DOE 2013a).

For compensatory mitigation of shrub-steppe habitats, the ratio will range from 1:1 to 5:1 based on the area and the resource level or value of the habitat lost. Therefore, Level 4 habitat areas will be replaced at a higher ratio than Level 3 or 2 habitat areas. Rectification at the site of impact should be used for a portion of the mitigation action, when feasible, and may satisfy all the mitigation requirements for Level 2 habitat areas.

Mitigation ratios are specifically designed to compensate for losses of vegetative habitat. However, other resources, such as snake hibernacula, bat roosts, ground squirrel colonies, burrowing owl burrows, eagle roosting areas, heron rookeries, and others could be impacted and may also require mitigation. For these types of impacts, it is not feasible to follow the same ratios as outlined for losses of vegetative habitat. Therefore, a qualified biologist must determine the appropriate type and amount of mitigation actions needed to offset the impact. The type and amount of mitigation must take into account the resource level of the species being impacted, the severity of the impact, and the likelihood of success.

7.4.5 Habitat Mitigation Replacement Units

Successful planning and budgeting for mitigation commitments require that the level of effort, number of transplanted shrubs or tublings, and quantity and type of seed needed to achieve the mitigation goals be quantified in the early stages of project planning. Ideally, the level of effort is determined based on the habitat value at the project site and the level of improvement possible through rectification or through compensation at a mitigation area. Quantitative habitat value models are required for these calculations. Because such models are not available, projects that disturb late-successional sagebrush steppe will plan for replacement mitigation using standard replacement units. Replacement units for other habitats will be developed as needed.

As an example, a project replacing habitat via rectification at a ratio of 1:1 should plan for 1 replacement unit/ha disturbed habitat. A project replacing habitat via compensatory mitigation at a ratio of 3:1 should plan for three replacement units/ha disturbed habitat.

A replacement unit for late-successional sagebrush steppe will consist of:

- 1500 shrubs/ha (600/ac)
- 1500 forbs/ha (600/ac)
- Native, perennial bunchgrass understory either already present or planted according to the *Hanford Site Revegetation Manual* (DOE 2013a).

This replacement unit is based on the assumption that tublings or bareroot seedlings will provide the bulk of the shrub density and canopy coverage replacement, and the final community at maturity will have at least 10% sagebrush cover, forb diversity similar to native stands, and a native perennial grass understory.

The replacement unit may be modified based on the actual site that is to be disturbed. For instance, a site with unusual forb or shrub diversity may necessitate the inclusion of forbs or a broader range of shrub transplants to the project MAP. Deviation from the standard replacement unit would be determined as part of the ECR for the project.

Habitat replacement at the point of impact or at more degraded mitigation areas may require that the native understory be recreated following the guidelines provided in the *Hanford Site Revegetation Manual* (DOE 2013a). If a selected mitigation area already has suitable cover of native perennial grasses, additional understory manipulations may not be required.

Alternatives to any of these requirements may be developed on a case-by-case basis, as long as the functional aspects of the requirements are preserved and the alternative is approved by SSD.

7.4.6 Mitigation/Restoration Methods

Methods used for habitat improvement will vary according to specific site conditions and mitigation goals. Methods to be considered include salvaging plant material and topsoil, preparing the site, amending the soil, and selecting plant species and planting methods. The *Hanford Site Revegetation Manual* (DOE 2013a) provides guidance for planning revegetation actions that may be performed for restoration, mitigation, or habitat enhancement purposes.

7.4.7 Native Plant Nursery and Grass Farm

Mitigation actions that involve habitat amendment, reclamation, or creation will require plant material that is both native and locally adapted. To meet these needs, DOE supports the concept of native plant nurseries and/or farms to provide locally derived plant material for revegetation and restoration purposes. This includes any cost-effective means to produce these plant materials, including farms and/or nurseries located onsite or offsite, and operated by DOE, another federal or state agency, private contractor, or tribal vendors. All contractors or vendors would be expected to follow standards set by the Association of Official Seed Certifying Agencies for source-identified seed (AOSCA 2003).

7.4.8 Rare Plant Mitigation

Mitigation for plant species of concern should follow the hierarchy described in Section 7.1 with the following additional considerations.

Avoidance and Minimization: Selecting an alternate project site is the preferred approach for rare species conservation. It is the one approach that precludes the need for additional mitigation measures. However, this approach could be impractical because of project limitations, or because a new population may colonize an area at any time, even after several years of site use and development. If avoidance is not possible, minimization may be accomplished by redesigning the project to avoid most of a population, thereby limiting the overall impact. If appropriate, this should include placement of a clearly delineated administratively controlled zone around the protected population. To prevent inadvertent entry by pedestrians or vehicles, site workers should be informed of the site's nature and importance.

Population Replacement: If impacts to a rare plant population cannot be adequately avoided or minimized, the next two mitigation options are, in order of preference, replacement of the population on the project site and replacement at an area away from the project site. Such efforts may include transplanting mature plants, sowing seed at the original or new site, or collecting seed or mature plants for establishment in a greenhouse or garden for eventual planting in the field. Because the probability of successful replacement or relocation is usually low, these options should be considered as a last resort, to be used only when the avoidance and minimization options are infeasible. A revegetation specialist should be engaged to help determine how and where to best replace a rare plant population.

7.5 Mitigation Banking

The following section describes the concept of mitigation banking that could be established for the Hanford Site. Mitigation banking is the establishment of habitat for managed resources, or the resources themselves, in areas other than the impact site to compensate for unavoidable habitat value losses expected to result from future project development. Use of a centralized bank for compensatory mitigation simplifies the mitigation process for small projects because the goals, methodologies, and locations for compensatory mitigation will be pre-defined. A small project would not be required to design, implement, and monitor its own mitigation actions, but would simply pay into the established system or bank.

A bank enables the mitigation requirements for numerous projects be coordinated and conducted in a manner that creates the greatest overall improvement in habitat value while reducing costs because of the economy of scale. Mitigation banking is not currently used on the Hanford Site, but DOE recognizes the advantages of mitigation banking, and will continue to explore the means to move to a banking system as described in the following paragraphs.

The degree to which compensatory mitigation is coordinated site wide could range from essentially none—the current, project-by-project approach—to complete coordination with pre-emptive habitat replacement. The following four basic levels of coordination have been identified:

1. Each project (or program) identifies its compensatory mitigation areas, plans and implements its own habitat improvements, and is responsible for maintaining and monitoring the mitigation areas. There is no coordination among different projects or mitigation actions. This is the current Hanford Site approach to mitigation planning.
2. One or more common mitigation areas are identified, but each project continues to plan and implement habitat improvements within that area and is responsible for the continued monitoring and maintenance of its portion of the mitigation area.
3. A pseudo-mitigation bank is created with one or more common mitigation area(s). Habitat improvements are coordinated by the bank managers, using standardized implementing procedures. Maintenance and monitoring of the mitigation areas are performed under the guidance of the bank managers. Under a pseudo-bank, credits are created through habitat improvement as a response to project needs, and usually such credits are created concurrently with losses or after the losses already have occurred.
4. A true mitigation bank is created. This is essentially the same as a pseudo-bank, except that credits are created in anticipation of future project needs and before the project-induced losses occur. As impacts occur, the responsible project would purchase some of the existing bank credits; the purchase money would be used to create more credits.

Use of a common mitigation area saves time and money because siting decisions only need to be made once. Use of a banking system would save additional money because projects would not be required to engineer the habitat improvements, set up individual subcontracts to perform the improvements, or coordinate long-term monitoring efforts. Under a bank system, each project would pay into a common pool overseen by the bank managers who would oversee selection of mitigation sites and coordinate the habitat improvements, monitoring, and maintenance for all projects.

Use of a true mitigation bank would ultimately be the most cost-effective because investments made in habitat improvements "gain interest" in the form of plant growth and increased ecological function; therefore, the same monetary investment would purchase more ecological credit. However, a true mitigation bank would require that non-project specific "seed money" be identified and appropriated to create the initial bank credits before they are needed by projects.

Advantages of mitigation banking include the following:

- Overall coordination of site mitigation
- Elimination of the project-by-project learning curve
- Reduced time and resources required to conduct the appropriate NEPA analyses
- Consistent mitigation practices
- Better landscape-scale considerations in planning
- Potential reduction in site-wide loss of ecological services
- Elimination of extended project durations required for mitigation
- More adequate project planning and budgeting for mitigation
- Experienced personnel perform mitigation actions
- Impacts of a similar nature are treated in a similar but comprehensive manner.

Mitigation banking provides a means to minimize the risk to resource health and survival posed by future projects and to perform habitat improvement and monitoring in a cost-efficient manner. Mitigation banking has been developed for addressing wetland impacts (Castelle et al. 1992a, 1992b), but has been less well defined for impacts in other areas. It is recognized as a potential component of mitigation by both the USFWS (81 FR 61031, 2016) and the WDFW (1999).

7.5.1 Mitigation Bank Operations

Mitigation banking requires the following components to be identified and established:

- Bank objectives and currency
- Bank site(s), including necessary site protection and controls
- Policy for bank operation, including payments, construction, use of credits and debits, and bank management responsibilities
- Funds and schedule for monitoring, corrective actions, and reporting on bank operations
- Funds available to mitigate for unforeseen events such as a site fire.

7.5.1.1 Bank Objectives

The objectives for mitigation bank(s) on the Hanford Site would be to:

- Consolidate numerous small mitigation projects into one or a few sites that can meet broader management objectives requiring a landscape-level and holistic site-wide approach.

- Provide compensation for habitat loss resulting from Hanford site activities.
- Ensure that lost habitat value is adequately compensated.
- Maintain mitigable resources within limits of abundance and temporal stability conducive to survival and health of the resources.
- Preserve the bank's mitigated resources through long-term monitoring and management.
- Ensure that mitigation projects complement and enhance each other.

7.5.1.2 Bank Site Protection and Control

Banks sites would be administratively protected. The mitigation bank site(s) would be designated as Level 4 resource(s) and would be clearly designated on site-planning and land-use maps. Functionally, this should prevent disturbance of the site(s) for as long as DOE maintains administrative control of the area. If deed restrictions are instituted, site protection could continue long after DOE's mission is completed. Protecting bank site(s) in this way should not incur significant costs. At a minimum, bank site(s) must be protected for the life of the participating projects or until all the habitat value lost as a result of participating projects is replaced, whichever is longer.

Bank credits would normally be given only for improvements on lands under the direct control of DOE. However, lands managed by or released to other federal agencies may be eligible for use as bank sites, if the receiving party agrees that the bank site would be managed for its resource values. Bank withdrawals should consider habitat value replacement, not simply acreage or cost for habitat improvement, land purchase, or management.

7.5.1.3 Bank Operation Policy

Projects could pay into the bank at any time, but the preferred method of bank operation is to initiate habitat improvements before use of the credits. This would help ensure that levels of the affected biological resources did not decline between the time of project impact and the time when suitable improved habitat was available to support the resources. Project budgets should be developed to allow credits to be purchased early in the project life: the first year of the project for projects of three years or less.

The bank would be overseen by DOE through an oversight committee, as described in Section 7.5.2, with short- and long-term direct management led by SSD. Short-term management responsibilities include developing guidance for operation and habitat improvements within the banking site(s), coordinating habitat improvements within the bank, monitoring the improvements and evaluating improvement methods, and managing credits and debits. Long-term management responsibilities include monitoring, maintenance, reporting, and determining necessary corrective actions. SSD also would ensure mitigation bank sites are clearly identified on Hanford Site land-use planning maps.

Bank maintenance could include:

- Controlling weeds
- Minimizing depredation of transplants
- Irrigating
- Preventing and controlling fires

- Modifying banking guidance, as necessary, to respond to changes in management needs and habitat improvement methodologies.

Bank corrective actions may include:

- Replanting if mortality causes habitat values to fall below target levels
- Designing and implementing new habitat improvement methodologies.

Monitoring and reporting are necessary to ensure the bank meets its resource maintenance and improvement goals, can respond to contingent needs and events, and functions in a cost-efficient manner. Specific monitoring needs may include factors such as shrub survival and growth, plant species composition, abundance, and spatial pattern, wildlife usage, and sources of plant mortality.

Reporting should occur regularly and provide information summaries that:

- Track the progress of the banking program against its goals
- Ensure mitigation actions are documented
- Track the status of the bank with regard to credits and debits
- Provide a means for resource agencies, natural resource trustees, and other outside groups to assess the relative success of the program
- Provide information necessary to allow DOE to alter its operational guidance for the bank to better meet its objectives
- Provide information to assist outside agencies in developing their own banking programs.

7.5.2 Mitigation Bank Oversight

Mitigation banks generally have an oversight group. Functions that this oversight group could be responsible for include:

- Determining operating policies
- Approving locations for mitigation banks
- Determining if an appropriate level of mitigation has been assigned to projects
- Determining mitigation "fees" or "taxes"
- Identifying mitigation opportunities
- Overseeing, at a high level, mitigation implementation
- Ensuring appropriate mitigation area monitoring is performed and reported.

Such a group also could provide oversight and guidance for other BRMP-related issues that cross organizational boundaries, including oversight of landscape-scale management actions, resource and trend monitoring, coordinating with parallel restoration or management actions by other agencies, and mediating issues when other Hanford Site goals or objectives may conflict with those of BRMP.

7.6 Mitigation Monitoring, Reporting, and Contingencies

Mitigation actions, especially if they include habitat improvements, must be monitored to determine if the mitigation requirements for a project have been satisfied. Monitoring mitigation performance is necessary to:

- Ensure mitigation actions, including a mitigation bank, meet resource maintenance and improvement goals
- Evaluate mitigation and habitat improvement methods
- Provide information to respond to contingent needs and events
- Ensure mitigation functions in a cost-effective manner.

A monitoring program requires defining the specific performance measures to be evaluated, procedures to be followed, and reporting procedures for distributing the monitoring results.

Project-specific mitigation monitoring is funded by the instigating project or contractor and conducted and reported by that contractor or a designee. As more mitigation is conducted cooperatively through a mitigation bank, monitoring and reporting would be led by the oversight committee.

7.6.1 Mitigation Performance Measures and Monitoring

Performance measures for a mitigation site should be based on the specific mitigation goals for that site. The selection of specific site-performance measures may depend on factors such as size and location of the mitigation site, types of mitigation actions performed, and mitigation goals. Performance monitoring should occur at least annually, until the mitigation goals of a site or project have been met. Monitoring procedures used will depend on the specific performance measures and goals for a mitigation site. Performance measures may include:

- Native plant cover
- Shrub survival and growth
- Diversity of native plants
- Wildlife usage
- Alien plant intrusion
- Structural composition of the community
- Spatial pattern of vegetative components
- Physical and geochemical processes such as erosion and soil microbial activity
- Recruitment of planted species.

7.6.2 Performance Reporting

Results of the monitoring efforts should be reported annually. The SSD will review these reports for completeness, adequacy, and consistency. Reporting should provide information to:

- Track the progress of mitigation actions against goals
- Provide means for resource agencies, natural resource trustees, and other interested parties to assess the relative success of the mitigation program
- Provide the information needed by DOE to identify additional actions that may be required to meet mitigation goals
- Provide information needed by planners to develop efficient and cost-effective mitigation actions.

7.6.3 Contingencies

All individual project MAPs should include a contingency plan and predefined minimum performance levels that can be used to compare with mitigation monitoring results. If the performance monitoring indicates that one or more of the performance measures are below satisfactory levels, such as transplant shrub survival is below predetermined action levels—more than 50% mortality—the mitigation bank manager, project manager, or appropriate DOE responsible office should consider and identify ways and means to redress the deficiencies.

In the event that all or part of a mitigation area is lost due to actions or events under the control of DOE, the mitigation bank manager, project manager, or appropriate responsible office within DOE should plan and provide for replacement or repair of the mitigation area. In the event that all or part of a mitigation area is lost due to actions or events that are beyond DOE control, such as wildfire, DOE will not be responsible for replacement or repair of the mitigation areas.

7.7 Project-Specific Mitigation Action Plans

Unless a mitigation bank system is instituted that would relieve small projects of the planning requirements for mitigation implementation, individual projects must prepare project-specific MAPs that describe how the mitigation commitments for that project will be met. Even with an active mitigation bank, some larger projects and those with more comprehensive NEPA coverage, such as an EIS or mitigated environmental assessment, may still require project-specific MAPs. A project-specific MAP would not preclude cooperation with or participation in a mitigation bank.

It is not within the scope of BRMP to define specific commitments applicable to any project-specific MAP. Each project will be unique in the types and amounts of resources that need to be mitigated as well as physical and other constraints. Therefore, the project-specific MAP will state the particular mitigation commitments that DOE will make regarding that project. Although project MAPS can be issued for other reasons, they are usually prepared as part of the ROD for an EIS, a FONSI for an EA, or a CERCLA ROD.

MAPs are usually prepared to describe how a project's impacts will be mitigated and primarily discuss compensatory mitigation actions. However, in some cases, a project-specific MAP may function as a road map describing how project or programmatic impacts will be avoided or minimized. An example of this type is the MAP prepared for the remedial action projects in the 100- and 600-Area Operable Units (DOE 2001b).

MAPS should provide information in the following areas:

- Summary of project
- Summary of impacts to be mitigated
- Specific mitigation goals and objectives
- Description of mitigation site(s)
- Description of mitigation actions
- Monitoring plan
- Performance standards and success criteria
- Site protection measures
- Maintenance activities
- Contingency actions if mitigation goals are not met
- Responsibilities
- Other mitigation needs, such as consideration of cultural resources, dust control.

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9.0 Glossary

ABIOTIC: The non-living material components of the environment such as air, rocks, soil particles, and inorganic compounds.

ADAPTIVE MANAGEMENT: An approach to monitoring impacts and managing resources that involves three steps: 1) monitoring, 2) using the information gathered from monitoring to better understand the resources, and 3) modifying management practices based on the information gathered.

AQUATIC: Of or related to water.

AVOIDANCE: Mitigation actions that rely on elimination of all or part of a project, or changes to project timing, location, or structural modifications to completely avoid adverse impacts to biological resources. Avoidance is the first step in the mitigation hierarchy.

BANK CREDIT: Increased habitat value derived from habitat improvements on a mitigation banking site. Habitat improvements identified as mitigation banking credits are typically implemented before project impacts take place. Pre-existing habitat value does not count as credit.

BIOLOGICAL DIVERSITY (BIODIVERSITY): The variety of life and its processes, including the variety in genes, species, ecosystems, and the ecological processes that connect everything in ecosystems. As used in the BRMP, this definition specifically excludes artificial diversity (i.e., those biotic elements added through direct manipulation by humans).

BIOLOGICAL RESOURCE: A biological species, population, species assemblage, habitat, community, or ecosystem.

BIOTIC: Pertaining to any aspect of living components.

CANDIDATE SPECIES (FEDERAL): A species for which there is sufficient information on biological vulnerability and threat(s) to support issuance of a proposed rule to list it as endangered or threatened but issuance of the proposed rule is precluded (i.e., by other listing activity or lack of funding). (STATE): Wildlife species that are under review by the Washington Department of Fish and Wildlife for possible listing as endangered, threatened, or sensitive.

CATEGORICAL EXCLUSION: A category of actions as defined in DOE's NEPA implementing procedures (10 CFR 1021) for which neither an environmental assessment nor an environmental impact statement is normally required.

CENTRAL HANFORD: The Hanford Site excluding the Fitzner/Eberhardt Arid Lands Ecology Reserve and the areas north and east of the Columbia River.

COMPENSATORY MITIGATION: Amelioration of project impacts by replacing lost habitat value away from a project site. Can be accomplished by either habitat improvement or by acquisition and protection of substitute, high-quality resources. Compensation is the last step in the mitigation hierarchy.

CONSERVATION (LAND USE): An area reserved for the management and protection of natural and cultural resources. Limited resource extraction or consumptive use is allowed.

CONSERVATION (RESOURCE MANAGEMENT GOAL): The protection and management of ecologically significant resources so as to maintain essential qualities, such as population size and viability for species, and the block size, native species diversity, and habitat quality for landscape features. Maintenance of these essential qualities requires active management, but limited disturbance or consumptive use of these resources can occur without a significant degradation of the resource, provided that commensurate mitigating actions are performed.

CORRECTIVE ACTION (MITIGATION): Actions taken following the unsuccessful implementation of mitigation measures that ensure that project-specific mitigation objectives are met.

CULTURALLY SIGNIFICANT RESOURCE: A plant or animal of importance to local Native American Tribes because of its use as food, medicine, fiber, or dye, or because of its spiritual significance.

ECOLOGICAL COMPLIANCE REVIEW: An assessment performed to determine the potential for a proposed project to adversely impact biological resources.

ECOREGION: A continuous geographic area in which the environmental complex, produced by climate, topography, and soil, is sufficiently uniform to develop characteristic potential major vegetative communities.

ECOSYSTEM: A complete interacting system of organisms and their environment or a naturally occurring, self-maintaining system of biotic and abiotic interacting parts that are self-organized into biophysical and social components and are linked to each other by exchanges of energy, matter, and information.

ECOSYSTEM MANAGEMENT: A process that integrates scientific knowledge of ecological relationships within a complex sociopolitical and values framework toward the general goal of protecting native ecosystem integrity over the long term.

ELEMENT: The basic unit of Washington's biologic and geologic environment identified as a needed component of a system of natural areas and defined in the (Washington Department of Natural Resources) *Natural Heritage Plan*. Elements can be plant communities, special species, wetlands, aquatic systems or geologic features. (The equivalent term "cells" is used by the federal Research Natural Area Program.)

ELEMENT OCCURRENCE: The actual on-the-ground example of an element. (Information about each occurrence is stored in the information system of the Natural Heritage Program.)

ENDANGERED SPECIES: Any species that is in danger of extinction throughout all or a significant portion of its range.

ENHANCEMENT: An improvement in the value of an existing habitat. Under U.S. Fish and Wildlife Service policy, enhancement specifically refers to habitat improvements that are independent of mitigation commitments or waste site restoration actions.

FLOODPLAIN: The nearly level alluvial plain that borders a stream or river and is subject to inundation under flood-stage conditions unless protected artificially. It is usually a constructional landform built of sediment deposited during overflow and lateral migration of streams and rivers. As defined in Executive Order 11988, "Floodplain Management," the floodplain of concern is the 100-yr floodplain;

however, because the U.S. Federal Emergency Management Agency has never mapped the floodplains at the Hanford Site, no 100-yr floodplain has been designated for the site.

GOAL: Desired condition to be achieved at some unspecified time in the future.

HABITAT: The combination of biotic and abiotic components that provides the ecological support system for plant or animal populations.

HABITAT AMENDMENT: Increasing habitat value by supplementing an area that already contains some of the desired habitat components with missing habitat components.

HABITAT IMPROVEMENT: An increase in habitat value through amendment, reclamation, or creation.

HABITAT SUITABILITY INDEX: An estimate, ranging from 0 to 1 of the utility of the habitat in a specific area to support an evaluation species. A value of 1 indicates optimal habitat, a value of 0 indicates that the area is unusable by the evaluation species.

HABITAT UNIT: The unit of currency in habitat evaluation procedures that takes into account the quality and quantity of habitat. Habitat Units = Quality (HSI value) x Quantity (area).

HABITAT VALUE: The suitability of an area to support selected animal and/or plant evaluation species.

HOME RANGE: The land area required for an animal species to survive and/or successfully reproduce.

IN-KIND MITIGATION: Replacement of lost habitat value with substitute resources that closely approximate that lost, so that populations of species associated with that habitat may remain relatively stable in the area over time.

INVENTORY: The process of collecting initial information concerning the occurrence and status of particular biological resources.

LANDSCAPE: A heterogeneous land area composed of a cluster of interacting ecosystems that are repeated in similar form throughout. Landscapes are the spatial matrix in which organisms, populations, communities, habitats, ecosystems, and the like are set.

LANDSCAPE SCALE: A scale of ecological evaluation that includes multiple habitats, ecosystems, and land uses.

LATE-SUCCESSIONAL SHRUB-STEPPE: Habitat characterized by a relatively constant plant species composition and by large shrubs (usually big sagebrush) whose canopy cover is relatively stable in the absence of a disturbance.

LEVELS OF CONCERN: A management approach used in BRMP that classifies Hanford's biological resources into six different levels (0 to 5) of management concern. Each level corresponds to a different set of management actions required for biological resources included at that level. At higher levels of concern, such as Level 5, the associated biological resources are considered of higher "value," and require greater and more restrictive management actions.

MINIMIZATION: Mitigation actions that rely on changes to project timing, location, or structural modifications that minimize adverse impacts to biological resources. There may still be some residual adverse impacts to mitigable resources following minimization. Minimization is the second step in the mitigation hierarchy.

MITIGATION: A series of prioritized actions that when achieved in full ensure project impacts will result in no net loss of habitat value or wildlife populations. The sequence of mitigation actions proceeds from the highest to lowest priority as follows: 1) avoid the impact altogether, 2) minimize the impact, 3) rectify the impact by restoring the affected environment, and 4) compensate for the impact by replacing or providing substitute resources or environments. Mitigation actions are applicable for potential impacts to biological resources of concern as a result of proposed Hanford Site activities. The degree to which mitigation actions are conducted is commensurate with the value of the resource and the amount of impact to that resource.

MITIGATION ACTION PLAN (MAP): Document associated with a Record of Decision for an environmental impact statement or a finding of no significant impact for an environmental assessment for proposed actions that require mitigation that explains how mitigation commitments will be planned and implemented [see DOE's NEPA implementing procedures (10 CFR 1021.104 and 10 CFR 1021.331)].

MITIGATION AREA: Any area on site (mitigation via rectification) or offsite (mitigation via compensation) within which habitat improvements occur as part of a mitigation commitment. The offsite mitigation area must include locations where the habitat improvements occur and adjacent native habitat areas. The latter provides the relevant ecological context that enables the habitat improvements to effectively replace lost habitat value. An offsite mitigation area may include lands that are dedicated to a mitigation bank and post-impact compensation areas.

MITIGATION BANKING: Habitat improvement actions taken for the specific purpose of compensating for unavoidable losses before the impacts occur. Allows for a mitigation credit/debit system and for compensatory actions for multiple projects to be coordinated.

MITIGATION (REPLACEMENT) RATIO: The ratio of the area over which mitigation measures are applied to the area receiving adverse impacts. The calculation of an appropriate ratio (and any adjustments made to the ratio because of time delays in accomplishing mitigation, etc.) ensures that the lost habitat value, and not simply the lost acreage, is replaced.

MITIGATION THRESHOLD LEVEL: The amount of habitat value reduction or potential species population impact that will trigger the requirements for rectification and/or compensatory mitigation.

MONITORING: The process of collecting information to evaluate if the objectives of a management plan are being realized, or if implementation is proceeding as planned. Specifically for mitigation: the collection of specific types of data to determine if the goals and objectives of project-specific mitigation or the mitigation bank are met.

MONITOR SPECIES (STATE): Washington Department of Fish and Wildlife term for animal taxa that are of potential concern but are not listed as sensitive, candidate, threatened, or endangered. Monitor species are not actively tracked by WDFW.

NATIVE: A species, plant community type, or habitat whose presence in an area is due to natural processes and not as a result of direct human manipulation. Native biotic elements and natural processes contribute to biological diversity.

NON-NATIVE: A species, plant community type, or habitat that has been introduced or modified as a result of human actions. Non-native biotic elements or human-dependent processes contribute to artificial diversity. Non-native species also may be referred to as introduced or exotic species.

OBJECTIVE: Measurable result to be achieved within a specified time period.

OFFSITE: Away from the project site and, unless otherwise specified, still within the Hanford Site boundary.

ONSITE: The location where project impacts to biological resources occur on the Hanford Site.

OUT-OF-KIND MITIGATION: Replacement of lost habitat value with substitute resources that are physically or biologically different from those lost.

PLANT COMMUNITY: All the plant populations occurring in a shared habitat or environment.

PRESERVATION (LAND USE): An area managed for the preservation of natural and cultural resources. No new consumptive uses are allowed.

PRESERVATION (RESOURCE MANAGEMENT GOAL): The protection and management of ecologically significant resources so as to protect essential qualities such as population size and viability for species, and the block size, native species diversity, and habitat quality for landscape features. Any loss of these resources, even with mitigation, will result in a long-term degradation of the resource and will reduce the overall biological integrity of the Hanford Site.

PRIORITY HABITAT: A habitat designated by the Washington Department of Fish and Wildlife as having unique or significant value to many wildlife species. A priority habitat may be described by a unique vegetation type, dominant plant species of primary importance to fish and wildlife, successional stage, or specific habitat element (e.g., talus slopes) that is of key value to fish and wildlife.

PRIORITY SPECIES: Wildlife species designated by the Washington Department of Fish and Wildlife that require protective measures and/or management guidelines to ensure their perpetuation. Criteria for designating a species as priority are: 1) listed and candidate species, 2) vulnerable aggregations, and 3) species of recreational, commercial, and/or tribal importance.

PRODUCTIVITY: The amount of energy or biomass accumulated by an individual, population or community during a specific time period.

PROPOSED SPECIES (FEDERAL): A species that is the subject of a formal rule, published in the *Federal Register*, proposing that listing the species as threatened or endangered under the Endangered Species Act is warranted.

RECORD OF DECISION (ROD): Decision document for a NEPA or CERCLA action. A NEPA ROD is a concise public document that 1) states the decision made, 2) identifies all alternatives considered by the agency in reaching its decision, 3) specifies the alternative or alternatives that were considered to be environmentally preferable, 4) identifies and discusses all factors used by the agency in making its decision, and 5) states whether all practicable means to avoid or minimize environmental harm from the alternative selected have been adopted, and, if not, why they were not (40 CFR 1505.2). A CERCLA ROD is the decision document describing the remedial action based on the remedial investigation/feasibility study process for application to the specific area listed on the National Priorities List.

RECTIFICATION: Amelioration of project impacts by replacing lost habitat value at the project site. Rectification is the third step in the mitigation hierarchy.

REMEDIATION (WASTE SITE): Actions taken at a past-practice waste site to remove or isolate physical, chemical, or radiological hazards.

REPLACEMENT UNIT: The amount of habitat improvement, per resource type and unit area, that is necessary to achieve the mitigation goal.

RESTORATION (INDIVIDUAL SITE): Actions taken to create habitat value at a past-practice waste site subsequent to the completion of remediation or at a non-contaminated, but human-impacted site (e.g., industrial area, road), subsequent to decommissioning or end of use. The degree to which habitat values are restored depends on the future land use of the site and the restoration goal.

RESTORATION (SITE-WIDE): Actions taken to replace habitat value and ecological function within the context of a broad geographic area to account for past losses of value and function attributable to human-induced impacts.

RIPARIAN: Generally relating to the transition zone between aquatic (specifically flowing water) and terrestrial ecosystems within which plants are dependent on a perpetual source of water.

SENSITIVE SPECIES (STATE): A species native to the state of Washington that is vulnerable or declining and likely to become endangered or threatened without active management or the removal of threats.

SHRUB-STEPPE: Plant communities consisting of one or more layers of perennial grass with a conspicuous but discontinuous overstory layer of shrubs. Communities with dominant shrubs such as bitterbrush (*Purshia tridentata*), big sagebrush (*Artemisia tridentata*), and threetip sagebrush (*A. tripartita*) illustrate shrub-steppe physiognomy in Washington.

SPECIES OF CONCERN: Narrowly defined—A species of concern is a species that a federal or state agency has identified via law, regulation, or policy as deserving management attention; that is, any federal endangered, threatened, proposed, or candidate species, any species covered under the Migratory Bird Treaty Act, any additional species identified as endangered, threatened, sensitive, or monitor in Washington State, plus any additional species identified by the Washington Department of Fish and Wildlife as a Priority Species. Broadly defined—A species of concern is any species identified in the BRMP that is assigned a specific resource level of concern.

STEPPE: In contrast to a desert, has moisture relations adequate to support an appreciable cover of perennial grasses on zonal soils (deep loams on gentle upland slopes), yet not enough to support trees.

THREATENED SPECIES: Any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

TERRESTRIAL: Pertaining to the land.

WETLANDS: Areas that under normal circumstances have hydrophytic vegetation, hydric soils, and wetland hydrology.

APPENDIX A

Federal and State Listed Species

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Table A.1. Federal and Washington State Listed Endangered, Threatened, Sensitive, and Candidate Species[1] Occurring or Potentially Occurring on the Hanford Site

Species	Status* Federal	State
Plants		
Annual sandwort (*Minuartia pusilla* var. *pusilla*)		Sensitive
Awned halfchaff sedge (*Lipocarpha aristulata*)		Threatened
Beaked spike-rush (*Eleocharis rostellata*)		Sensitive
Canadian St. John's-wort (*Hypericum majus*)		Sensitive
Columbia milkvetch (*Astragalus columbianus*)	Species of concern	Sensitive
Columbia yellowcress (*Rorippa columbiae*)	Species of concern	Threatened
Coyote tobacco (*Nicotiana attenuata*)		Sensitive
Desert dodder (*Cuscuta denticulata*)		Threatened
Dwarf evening primrose (*Eremothera pygmaea*)		Sensitive
Geyer's milkvetch (*Astragalus geyeri* var. *geyeri*)		Threatened
Grand redstem (*Ammannia robusta*)		Threatened
Gray cryptantha (*Cryptantha leucophaea*)	Species of concern	Sensitive
Great Basin gilia (*Aliciella leptomeria*)		Threatened
Hairy bugseed (*Corispermum villosum*)		Sensitive
Hoover's desert parsley (*Lomatium tuberosum*)	Species of concern	Sensitive
Loeflingia (*Loeflingia squarrosa*)		Threatened
Lowland toothcup (*Rotala ramosior*)		Threatened
Miner's candle (*Cryptantha scoparia*)		Sensitive
Piper's daisy (*Erigeron piperianus*)		Sensitive
Rosy pussypaws (*Cistanthe rosea*)		Threatened
Small-flower evening-primrose (*Eremothera minor*)		Sensitive
Snake River cryptantha (*Cryptantha spiculifera*)		Sensitive
Snowball cactus (*Pediocactus nigrispinus*)		Sensitive
Suksdorf's monkey flower (*Erythranthe suksdorfii*)		Sensitive
Thompson's sandwort (*Eremogone franklinii* var. *thompsonii*)		Sensitive
Tufted evening-primrose (*Oenothera cespitosa* ssp. *cespitosa*)		Sensitive
Umtanum desert buckwheat (*Eriogonum codium*)	Threatened	Endangered
White Bluffs bladderpod (*Physaria douglasii* ssp. *tuplashensis*)	Threatened	Threatened
White eatonella (*Eatonella nivea*)		Threatened
Mollusks		
California floater (*Anodonta californiensis*)		Candidate
Columbia pebblesnail (*Fluminicola columbiana*)		Candidate
Shortface lanx (*Fisherola nuttalli*)		Candidate
Insects		
Columbia clubtail (dragonfly; *Gomphus lynnae*)		Candidate
Columbia River tiger beetle (*Cicindela columbica*)†		Candidate
Silver-bordered fritillary (*Boloria selene atrocostalis*)		Candidate
Fish		
Bull trout (*Salvelinus confluentus*)‡	Threatened	Candidate
Chinook salmon (upper Columbia spring-run; *Oncorhynchus tshawytscha*)	Endangered	Candidate
Leopard dace (*Rhinichthys falcatus*)‡		Candidate
Mountain sucker (*Catostomus platyrhynchus*)‡		Candidate
River lamprey (*Lampetra ayresi*)‡	Species of concern	Candidate
Steelhead (upper Columbia; *Oncorhynchus mykiss*)	Threatened	Candidate
Birds		
American white pelican (*Pelecanus erythrorhynchos*)		Endangered
Bald eagle (*Haliaeetus leucocephalus*)	Species of concern	Sensitive
Burrowing owl (*Athene cunicularia*)		Candidate
Clark's grebe (*Aechmophorus clarkii*)		Candidate
Common loon (*Gavia immer*)		Sensitive
Ferruginous hawk (*Buteo regalis*)		Threatened

Table A.1. Federal and Washington State Listed Endangered, Threatened, Sensitive, and Candidate Species[1] Occurring or Potentially Occurring on the Hanford Site

Flammulated owl (*Otus flammeolus*)‡		Candidate
Golden eagle (*Aquila chrysaetos*)		Candidate
Greater sage grouse (*Centrocercus urophasianus*)		Threatened
Lewis's woodpecker‡ (*Melanerpes lewis*)‡		Candidate
Loggerhead shrike (*Lanius ludovicianus*)		Candidate
Northern goshawk‡ (*Accipiter gentilis*)‡		Candidate
Peregrine falcon (*Falco peregrinus*)	Species of concern	Sensitive
Sagebrush sparrow (*Artemisiospiza nevadensis*)		Candidate
Sage thrasher (*Oreoscoptes montanus*)		Candidate
Sandhill crane (*Grus canadensis*)		Endangered
Western grebe (*Aechmophorus occidentalis*)		Candidate
Amphibians and Reptiles		
Sagebrush lizard (*Sceloporus graciosus*)		Candidate
Striped whipsnake (*Masticophis taeniatus*)		Candidate
Western toad (*Bufo boreas*)		Candidate
Mammals		
Black-tailed jackrabbit (*Lepus californicus*)		Candidate
Merriam's shrew (*Sorex merriami*)		Candidate
Townsend's ground squirrel (*Urocitellus townsendii*)		Candidate
Washington ground squirrel (*Urocitellus washingtoni*)‡	Candidate	Candidate
White-tailed jackrabbit (*Lepus townsendii*)		Candidate

[1]Current Status for plants per the Washington State Natural Heritage Program http://www1.dnr.wa.gov/nhp/refdesk/lists/stat_rank.html and for animal species per the Washington Department of Fish and Wildlife http://wdfw.wa.gov/conservation/endangered/

*Endangered=Species in danger of extinction within all or a significant portion of its range; Threatened=Species likely to become endangered in the near future; Candidate=Species believed to qualify for threatened or endangered species status but for which listing proposals have not been prepared; Sensitive=Taxa that are vulnerable or declining and could become endangered or threatened without active management or removal of threats; Species of concern=Not currently listed or candidates under the Endangered Species Act of 1973 but of conservation concern within specific USFWS regions.

†Probable but not observed on the Hanford Site.

‡Reported but seldom observed on the Hanford Site.

Table A.2. Washington State Monitored Wildlife Species1 Occurring or Potentially Occurring on the Hanford Site

Species	Species
Birds	**Insects**
Arctic tern (*Sterna paradisaea*)*	Juba skipper (*Hesperia juba*)
Ash-throated flycatcher (*Myiarchus cinerascens*)*	Nevada skipper (*Hesperia nevada*)
Black tern (*Chlidonias niger*)*	Pasco pearl crescent (*Phyciodes tharos pascoensis*)
Black-crowned night-heron (*Nycticorax nycticorax*)	Persius duskywing (*Erynnis persius*)
Black-necked stilt (*Himantopus mexicanus*)	Purplish copper (*Lycaena helloides*)
Bobolink (*Dolichonyx oryzivorus*)*	Ruddy copper (*Lycaena rubida perkinsorum*)
Caspian tern (*Sterna caspia*)	Viceroy (*Limenitis archippus lahontani*)
Forster's tern (*Sterna forsteri*)	**Amphibians and Reptiles**
Grasshopper sparrow (*Ammodramus savannarum*)	Night snake (*Hypsiglena torquata*)
Gray flycatcher (*Empidonax wrightii*)	Racer (*Coluber constrictor*)
Great blue heron (*Ardea herodias*)	Short-horned lizard (*Phrynosoma douglasii*)
Great egret (*Ardea alba*)	Tiger salamander (*Ambystoma tigrinum*)
Gyrfalcon (*Falco rusticolus*)*	Woodhouse's toad (*Anaxyrus woodhousii*)
Horned grebe (*Podiceps auritus*)	**Mollusks**
Lesser goldfinch (*Spinus psaltria*)	Oregon floater (*Anodonta oregonensis*)
Long-billed curlew (*Numenius americanus*)	Western floater (*Anodonta kennerlyi*)
Osprey (*Pandion haliaetus*)	Western pearlshell (*Margaritifera falcata*)
Prairie falcon (*Falco mexicanus*)	Winged floater (*Anodonta nuttalliana*)
Red-necked grebe (*Podiceps grisegena*)*	**Mammals**
Snowy owl (*Nyctea scandiaca*)	American badger (*Taxidea taxus*)
Swainson's hawk (*Buteo swainsoni*)	Canyon bat (*Parastrellus hesperus*)
Turkey vulture (*Cathartes aura*)*	Long-legged myotis (*Myotis volans*)†
Western bluebird (*Sialia mexicana*)	Northern grasshopper mouse (*Onychomys leucogaster*)
Fish	Pallid bat (*Antrozous pallidus*)
Pacific lamprey (*Lampetra tridentata*)†	Sagebrush vole (*Lemmiscus curtatus*)
Paiute sculpin (*Cottus beldingi*)	Western small-footed myotis (*Myotis ciliolabrum*)†
Reticulate sculpin (*Cottus perplexus*)	
Sand roller (*Percopsis transmontana*)	

[1] Current Status for plants per the Washington Department of Fish and Wildlife http://wdfw.wa.gov/conservation/endangered/

*Reported but seldom observed on the Hanford Site; †Federal species of concern.

Table A.3. Washington State Review and Watch List Plant Species Potentially Found on the Hanford Site

Species	State Listing*
Annual paintbrush (*Castilleja exilis*)	Watch List
Basalt milkvetch (*Astragalus conjunctus* var. *rickardii*)	Watch List
Bristly combseed (*Pectocarya setosa*)	Watch List
Chaffweed (*Anagallis minima*)	Watch List
Columbia River mugwort (*Artemisia lindleyana*)	Watch List
Crouching milkvetch (*Astragalus succumbens*)	Watch List
False pimpernel (*Lindernia dubia* var. *anagallidea*)	Watch List
Giant helleborine (*Epipactis gigantea*)	Watch List
Kittitas larkspur (*Delphinium multiplex*)	Watch List
Medic milkvetch (*Astragalus speirocarpus*)	Watch List
Pigmy-weed (*Crassula aquatica*)	Watch List
Porcupine sedge (*Carex hystericina*)	Watch List
Robinson's onion (*Allium robinsonii*)	Watch List
Rosy balsamroot (*Balsamorhiza rosea*)	Watch List
Scilla onion (*Allium scilloides*)	Watch List
Shining flatsedge (*Cyperus bipartitus*)	Watch List
Shy gilly-flower (*Gilia inconspicua*)	Review Group 1
Small-flowered nama (*Nama densum* var. *parviflorum*)	Watch List
Smooth cliffbrake (*Pellaea glabella* var. *simplex*)	Watch List
Smooth willowherb (*Epilobium campestre*)	Review Group 1
Southern mudwort (*Limosella acaulis*)	Watch List
Stalked-pod milkvetch (*Astragalus sclerocarpus*)	Watch List
Vanilla grass (*Anthoxanthum hirtum*)	Review Group 1
Winged combseed (*Pectocarya penicillata*)	Watch List

[1] Current Status for plants per the Washington State Natural Heritage Program http://www1.dnr.wa.gov/nhp/refdesk/lists/stat_rank.html

*Watch List: Taxa of conservation concern but more abundant and/or less threatened than previously assumed.
Review Group 1: Taxa for which currently there are insufficient data available to support listing as threatened, endangered, or sensitive.

APPENDIX B

Attributes Used to Create Level of Concern Maps

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Attributes Used to Create Resource Level Maps

The resource level maps provided in Figures 5.2 through 5.8 were constructed using data and information provided elsewhere in the text and/or in resource-specific maps. The following resources are included in the resource level maps.

Level 5 Resources (Figure 5.2)

A) Level 5 Plants and Animals
   a. Fall Chinook Spawning Areas (Figure 5.9)
   b. Umtanum Desert Buckwheat and White Bluffs Bladderpod populations and critical habitat (Figure 4.10)

B) Washington State Plant Community Element Occurrences (Figure 4.9)

C) Significant or Rare Habitats (Figure 4.8, except non-riverine wetlands)

Level 4 Resources (Figure 5.3)

A) Level 4 Plants and Animals
   a. Plant Populations of Conservation Concern (from Figure 4.10)
   b. Bald Eagle Nest and Night Roost Buffers (Figure 5.10)
   c. Ferruginous Hawk Nest Locations with Buffers (Figure 5.11)

B) High quality, mature shrub-steppe as determined by application of a sage sparrow habitat quality model (Duberstein et al. 2008) to be high-quality sage sparrow habitat.

C) Vegetation Cover Types[1] (from Figure 4.6):
   a. [Stiff Sagebrush](Half-Shrubs)/Bunchgrasses
   b. Big Sagebrush(Bitterbrush)/Bunchgrasses
   c. Big Sagebrush(Bitterbrush)[Snow Buckwheat]/Bunchgrasses
   d. Big Sagebrush(Half Shrubs)/Bunchgrasses
   e. Big Sagebrush[Spiny Hopsage]/Bunchgrasses
   f. Big Sagebrush[Stiff Sagebrush](Half-Shrubs)/Bunchgrasses
   g. Big Sagebrush-Bitterbrush[Snow Buckwheat]/Bunchgrasses
   h. Bitterbrush/Bunchgrass Mosaic

---

[1] Low cover - present to approximately 3% is shown with parentheses, (..); Irregular or patchy distribution is shown with brackets. [..]; and moderate to dense cover and a relatively even distribution is shown with no modifier.

Level 3 Resources (Figure 5.4)

A) Level 3 Plants and Animals

  a. Plant Populations of Conservation Concern (Figure 4.10)

  b. Burrowing Owl Nest Buffers (Figure 5.12)

B) Conservation Corridors

  a. ¼-mi buffer of Columbia River

  b. A sagebrush steppe corridor running generally from McGee Ranch/Riverlands east through Gable Butte and Gable Mountain to the Columbia River, south through the Hanford Dunes, then southwest to Highway 240

C) Vegetation Cover Types (from Figure 4.6)

  a. (Bitterbrush)/Bunchgrass Mosaic

  b. (Bitterbrush)[Snow Buckwheat/Bunchgrasses

  c. Half-Shrubs/Bunchgrasses

  d. [Snow Buckwheat]/Bunchgrasses

  e. Big Sagebrush(Bitterbrush)/Sandberg's Bluegrass-Cheatgrass

  f. Big Sagebrush(Half-Shrubs)/Sandberg's Bluegrass-Cheatgrass

  g. Big Sagebrush/Sandberg's Bluegrass-Cheatgrass

  h. Big Sagebrush[Snow Buckwheat]/Sandberg's Bluegrass-Cheatgrass

  i. Big Sagebrush[Spiny Hopsage]/Sandberg's Bluegrass-Cheatgrass

  j. Big Sagebrush-Bitterbrush/Sandberg's Bluegrass-Cheatgrass

  k. Big Sagebrush-Bitterbrush[Snow Buckwheat]/ Sandberg's Bluegrass-Cheatgrass

  l. Bitterbrush/Sandberg's Bluegrass-Cheatgrass

  m. Bunchgrasses

  n. Rabbitbrush/Bunchgrasses

Level 2 Resources (Figure 5.5)

A) Vegetation Cover Types (from Figure 4.6)

  a. (Bitterbrush)/Sandberg's Bluegrass-Cheatgrass

  b. (Bitterbrush)[Snow Buckwheat]/Sandberg's Bluegrass-Cheatgrass

  c. (Half-Shrubs)/Sandberg's Bluegrass-Cheatgrass

  d. [Snow Buckwheat]/ Sandberg's Bluegrass-Cheatgrass

  e. Rabbitbrush/Sandberg's Bluegrass-Cheatgrass

Level 1 Resources (Figure 5.6)

A) Abandoned Agricultural Fields (part of Sandberg's Bluegrass – Cheatgrass in Figure 4.6)

B) Active Agriculture (part of highly disturbed in Figure 4.6)

C) Crested Wheatgrass – Sandberg's Bluegrass – Cheatgrass stands (Figure 4.6)

D) Exotic Weed Stands (part of highly disturbed in Figure 4.6)

Level 0 Resources (Figure 5.7)

A) Highly disturbed areas (gravel, industrial, non-vegetated) (Figure 4.6; highly disturbed except vegetation types listed in Level 1 above)

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DOE/RL-2000-27
Revision 2

Threatened and Endangered Species Management Plan: Salmon, Steelhead, and Bull Trout

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

U.S. DEPARTMENT OF ENERGY | Richland Operations Office

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DOE/RL-2000-27
Revision 2

Threatened and Endangered Species Management Plan: Salmon, Steelhead, and Bull Trout

Date Published
September 2015

Prepared for the U.S. Department of Energy Assistant Secretary for Environmental Management

U.S. DEPARTMENT OF ENERGY Richland Operations Office
P.O. Box 550
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Executive Summary

This *Threatened and Endangered Species Management Plan for Salmon, Steelhead, and Bull Trout* defines the U.S. Department of Energy-Richland Operations Office (RL) commitment to protecting the stocks of Upper Columbia River spring Chinook salmon (*Oncorhynchus tschawytscha*), Upper Columbia River steelhead (*Oncorhynchus mykiss*), and bull trout (*Salvelinus confluentus*) within the Hanford Reach of the Columbia River. The National Marine Fisheries Service (NMFS) is responsible for administering the Endangered Species Act (ESA) with regard to listed steelhead and Chinook salmon while the U.S. Fish and Wildlife Service (USFWS) is responsible for administering the ESA with regard to listed bull trout. In addition, federal agencies are required, under 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) and its implementing regulations, to consult with NMFS regarding actions that agency authorizes, funds, or undertakes that may adversely affect Essential Fish Habitat (EFH). As partial fulfillment of RL's responsibilities under the ESA and Magnuson-Stevens Act, this plan constitutes a partial consultation between the RL, NMFS, and USFWS. In addition to this management plan, RL has agreed to request project-specific consultation under Section 7 of ESA for remediation projects occurring below the wetted edge of the Columbia River.

Specific objectives of this management plan are to:

- Identify the types of RL actions and facilities at the Hanford Site that could impact listed steelhead, spring Chinook salmon, bull trout, or their critical habitat within the Hanford Reach.
- Identify means to avoid or minimize the potential adverse impacts of RL actions and facilities on listed species.
- Identify which actions will have:
    - *No effect* on listed species – RL usually will proceed with these actions without additional interactions with NMFS or USFWS.
    - *May affect, but are not likely to adversely affect* listed species or their critical habitat - RL will provide NMFS and USFWS with information for concurrence with this finding on a project-by-project basis prior to project implementation.
    - Undetermined impacts – these actions will require specific formal or informal consultation under the ESA because of the potential to impact listed species or their critical habitat. Actions or activities not considered within this plan will fall into this category.

Hanford Site activities that have the potential for impacting salmonids include waste site remediation, construction, water withdrawals, permitted wastewater discharges, groundwater monitoring near the shoreline, groundwater treatment activities conducted near the shoreline,

ecological and cultural research and monitoring programs, and pesticide applications. Potential effects include impingement and entrainment from water withdrawals, toxicity of wastewater discharges, shoreline and riverbed modifications that affect habitat, siltation from surface runoff, toxic modifications of groundwater plumes, harassment from boat traffic on RL Projects, noise, and incidental capture during biological monitoring activities. Given the present status of permits and the design and mitigation qualifications defined in this plan for these activities, none of the planned actions or potential effects is likely to adversely affect the listed salmonids within the Hanford Reach or modify critical habitat.

To ensure protective management of these listed species, RL will ensure that Hanford Site contractors conduct all activities so as to preserve, protect, and perpetuate steelhead spawning and rearing habitat and the migration corridor for spring Chinook adults and juveniles as well as bull trout. Protection measures include the following best management practices and designing and implementing projects to meet the following criteria:

- Adverse impacts due to water withdrawal will be avoided by reducing the magnitude of water withdrawn from existing intakes, when possible, and ensuring all water diversions meet state of Washington and NMFS screening criteria or appropriate administrative controls, such as the timing of withdrawal.

- Heavy equipment use below the ordinary high water mark (OHWM) will be minimized. When heavy equipment below the OHWM is required, strict best management practices will be followed to prevent spills, sedimentation, and other potential impacts.

- No blasting or other loud percussive noises will occur below the OHWM without additional consultation with NMFS and/or USFWS.

- Removal of native riparian or emergent vegetation will be minimized. Whenever possible, projects in riparian areas will be located where vegetation is already disturbed; vegetation will be mowed when complete removal is not needed. Damaged vegetation will be replaced with native species for erosion protection. Whenever possible, hand-tools will be used for in-water work.

- Whenever possible, construction projects will not simplify the shoreline structure[1]. Modifications will be limited to shoreline areas that have been previously disturbed, or will maintain as much of the natural shoreline configuration as possible, and will incorporate mitigation measures into project design to replace the shoreline configuration.

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[1] Shoreline simplification refers to any method that reduces the variation of the physical or biological environment along the waterway.

- When possible, riverbank protection, where required for a given project, will use bioengineering rather than hard armor[2]. Projects will use accepted Washington Department of Fish and Wildlife (WDFW) guidelines when designing streambank protection measures, and RL will consult with NMFS and USFWS when armoring projects are required.

- All fill material used below the OHWM will be in-kind to native shoreline materials (i.e., ancestral Columbia River cobble from local borrow sources). These materials are relatively free of fines and are relatively stable under current river conditions; they should therefore result in minimal releases of sediment following completion of the shoreline projects and subsequent inundation by higher river levels. Fill will be placed and contoured so as to minimize the potential for stranding of juvenile fish. Materials will be "placed" on the banks rather than "dumped" to minimize river turbidity.

- Silt-loaded surface runoff from near-shore areas disturbed by RL Project activities will be minimized by avoiding impacts to shoreline vegetation and using accepted best management practices to control runoff and erosion. Adherence to stormwater management plans will reduce potential impacts from runoff to salmonid habitat.

- When working below the ordinary high water mark (OHWM), but above the wetted perimeter, RL Project activities will minimize adverse impacts to listed salmonids by conducting disruptive activities at locations and during time periods when fish are absent or present in low numbers.

- No activities that could result in capture or harm to steelhead or spring Chinook salmon will be conducted without undergoing consultation with NMFS. No activities that would adversely modify critical habitats (the Columbia River and its riparian zone) or essential fish habitat as defined in the Magnuson-Stevens Act will be conducted without specific consultation with NMFS.

- No activities that could result in capture or harm to bull trout will be conducted without undergoing consultation with USFWS. No activities that would adversely modify critical habitat (the Columbia River and its riparian zone) will be conducted without specific consultation with USFWS.

If Hanford Site activities are carried out in accordance with this plan, they are not likely to significantly affect steelhead, spring Chinook salmon, or bull trout or modify their critical habitat. Activities conducted in accordance with this plan that include the best management practices described will most likely not require formal or informal consultation with NMFS or USFWS. However, RL will coordinate with these agencies before

[2] Hard armor refers to structures placed on the shoreline to reduce erosion and consists of hard materials such as stone, rock, boulders, concrete, sheet pile, gabions (stone-filled wire baskets), rock rip-rap etc.

project implementation and will provide sufficient information for them to determine this plan and best management practices are being implemented, and the general determinations of *no effect* or *not likely to adversely affect* (depending on the action) are applicable to the specific action. Some potential actions described in this plan, and any activities performed not in accordance with or described in this plan, will require formal or informal (whichever is appropriate) consultation with the NMFS and/or USFWS as required by the ESA.

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Acronyms and Abbreviations

BA	Biological Assessment
BMP	Best Management Practices
BRMP	Hanford Site Biological Resources Management Plan
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
EFH	Essential Fish Habitat
EPA	U. S. Environmental Protection Agency
ESA	Endangered Species Act
ESU	Evolutionary Significant Unit
FMO	Foraging, Migration, and Overwintering
HRNM	Hanford Reach National Monument
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NPDES	National Pollution Discharge Elimination System
OHWM	Ordinary High Water Mark
OLWM	Ordinary Low Water Mark
RK	River Kilometer
RL	U. S. Department of Energy, Richland Operations Office
RM	River Mile
SWPPP	Stormwater Pollution Prevention Plan
USFWS	U. S. Fish and Wildlife Service
WDFW	Washington Department of Fish and Wildlife
WSAHGP	Washington State Aquatic Habitat Guidelines Program

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1.0 INTRODUCTION

Spring Chinook salmon (*Oncorhynchus tschawytscha*), steelhead (*Oncorhynchus mykiss*), and bull trout (*Salvelinus confluentus*) within the Hanford Reach of the Columbia River are listed for protection under the Endangered Species Act (ESA). This management plan documents the U.S. Department of Energy-Richland Operations Office (RL) commitment and approach to protect stocks of these species within the Hanford Reach. This plan also constitutes a partial consultation between RL and the National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS) as required under the ESA[3]. Specific objectives of this plan are to:

- identify the types of RL actions and facilities at the Hanford Site that could impact listed steelhead, spring Chinook salmon, bull trout, or their critical habitat within the Hanford Reach.
- identify means to avoid or minimize the potential adverse impacts of RL actions and facilities on listed species.
- identify which actions will have:
    - *No effect* on listed species – RL usually will proceed with these actions without additional interactions with NMFS or USFWS.
    - *May affect, not likely to adversely affect* listed species or their critical habitat - RL will provide NMFS and USFWS with information for concurrence with this finding on a project-by-project basis prior to project implementation.
    - Undetermined impacts – these actions will require specific formal or informal consultation under the ESA because of the potential to impact listed species or their critical habitat. Actions or activities not considered within this plan will fall into this category.

Federal agencies are obligated, under Section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) and its implementing regulations (50 CFR 600), to consult with NMFS regarding actions that are authorized, funded, or undertaken that may adversely affect Essential Fish Habitat (EFH). The Magnuson-Stevens Act defines EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." This plan represents a partial consultation with regard to the Magnuson Stevens Act. RL actions, if carried out in accordance with this plan, are not likely to adversely impact EFH.

[3] In addition to this document, RL has agreed to request project-specific consultation under Section 7 for remediation projects occurring below the wetted edge of the river.

1.1 HANFORD SITE BACKGROUND

The Hanford Site occupies most of the Columbia River shoreline between Priest Rapids Dam and the city of Richland (Figure 1). This stretch of the river comprises the last free-flowing portion of the Columbia River within the United States above Bonneville Dam.

Since the late 1980s, RL's mission at the Hanford Site has been to clean up and stabilize facilities, wastes, and contaminated areas associated with Hanford's former role in nuclear weapons production from 1943 to the late 1980s. Currently, the primary mission at Hanford focuses on environmental restoration, which includes remediation of contaminated areas, decontamination and decommissioning of site facilities, waste management, and related scientific and environmental research and development of waste management technologies. Completion of this mission requires a variety of activities that will occur within the Columbia River and on its shoreline or could alter groundwater flows and/or composition entering the river.

The Hanford Site was developed during the World War II Manhattan Project as a site to produce plutonium for nuclear weapons. The first plutonium-production reactors at the Hanford Site used single-pass cooling systems that discharged cooling water directly to the Columbia River, relying on dilution to minimize impacts. Improvements in technology and operations protocols reduced the amount of contaminants discharged to the river by redirecting effluents to various land-based storage systems. The Clean Water Act of 1977, as amended, applies to discharges to surface waters in the United States. At the Hanford Site, regulations are applied through the EPA Administered Permit Programs: The National Pollutant Discharge Elimination System (NPDES, 40 CFR 122). DOE does not currently have any discharges to the Columbia River requiring permits.

The Hanford Site comprises 1,517 km^2 (586 mi^2), subdivided into various DOE-administered operational areas with specific functions. Of these, the six 100 Areas and the 300 Area are closest to the Columbia River and have the most potential for affecting listed salmonids. The Hanford Site includes a 789 km^2 (305 mi^2) area that was designated as the Hanford Reach National Monument in 2000. RL is the landowner of the entire Hanford Site, although portions of the Monument are managed by USFWS.

Steelhead are present in the Hanford Reach all year. Most adults move into the Hanford Reach from August to November, where they may reside for 6 to 8 months near shorelines at depths less than 3 m (10 ft). Juveniles usually spend 1 to 3 years in freshwater before migrating downstream to the ocean. Outmigration through the Hanford Reach usually occurs between April and June. Limited spawning may occur within the Hanford Reach between February and early June, with peak spawning in mid-May. Fry emerge from the nest 2 to 3 weeks after hatching and school near the margins of the river and over shallow water gravel bars. Streamside vegetation and submerged cover provide protection from predators, moderate temperatures, and colonization sites for steelhead food sources. As fry grow larger they feed primarily on food found along the bottom of the river, including midges, mayflies, stoneflies, and beetle larvae.

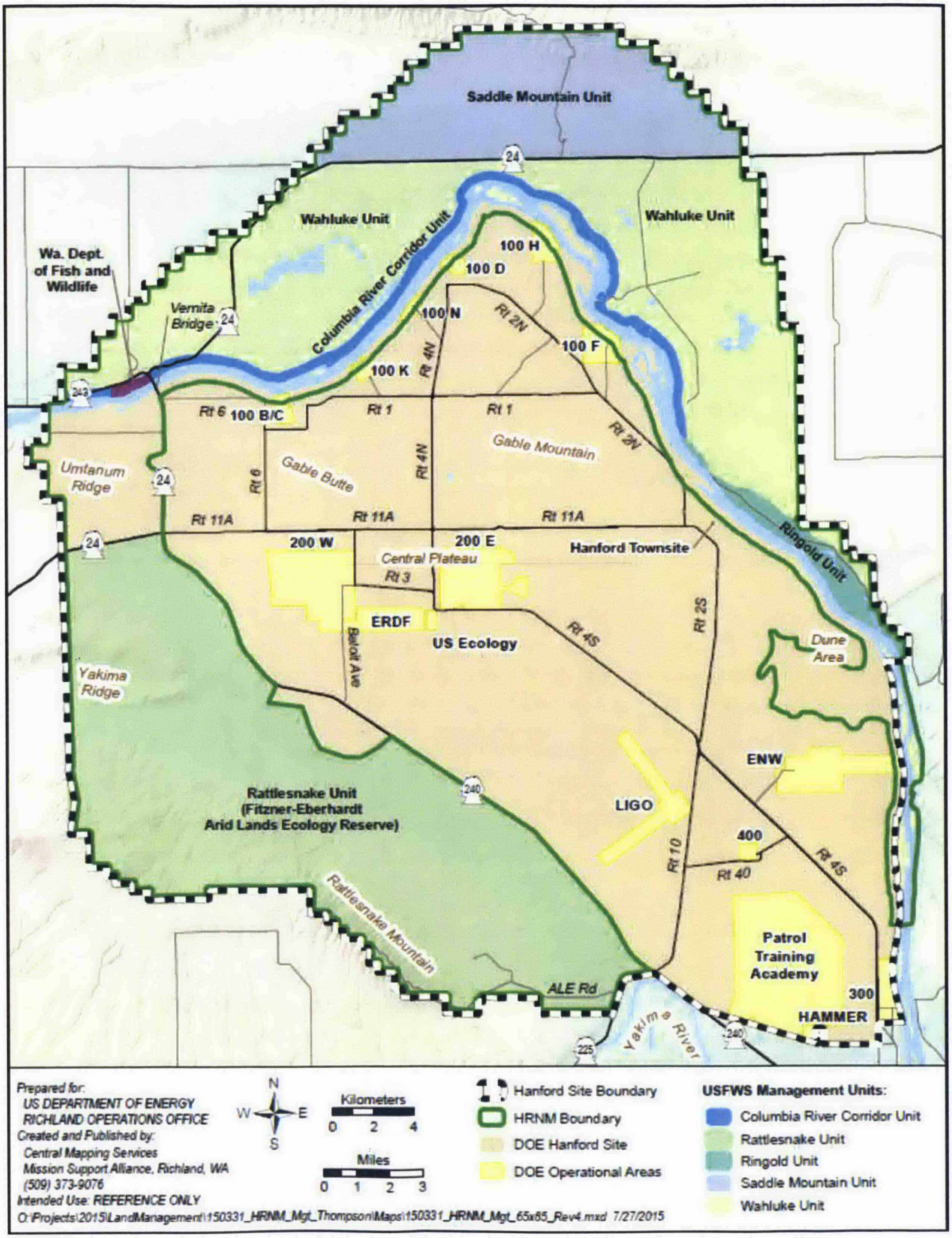

Figure 1. Principal Features of the Hanford Site

Spring Chinook salmon do not spawn within the Hanford Reach; however, the Hanford Reach is used by in-migrating adult salmon as a passage corridor and by out-migrating juvenile salmon as a migration corridor and interim feeding. Individual juveniles do not spend more than 1 week in the Hanford Reach, although the outmigration period extends from April to the end of August.

Bull trout require colder water than all other Columbia River Basin salmonids, and they generally reside and spawn in smaller streams at higher elevations. Therefore, their presence in the Hanford Reach is most likely limited by relatively warm summer water temperatures. However, there is limited evidence confirming occasional bull trout presence in the Hanford Reach, which is designated critical habitat for this species based primarily on its functionality as a migration corridor. It is believed migratory bull trout also use the Hanford Reach for foraging and overwintering. The mainstem upper Columbia River Critical Habitat Unit, which includes the Hanford Reach, is essential for maintaining bull trout distribution within the Mid-Columbia region and conserving the fluvial migratory life history exhibited by many populations from adjacent core areas.

1.2 HANFORD SITE LAND USE

The Hanford Site comprises approximately 1,517 km^2 (586 mi^2) within the lower Columbia Basin, and is subdivided into operational areas (Figure 1), each with specific functions, as described below:

- The six 100 Areas along the south and west banks of the Columbia River are the locations of the nine former plutonium-production reactors that were shut down between the mid-1960s and the mid-1980s. Most waste sites associated with these reactors have been remediated, and most reactor buildings have been stabilized and are awaiting final disposition.
- The 200 Areas (East and West), located on a plateau about 10 km (6 mi) from the Columbia River, were dedicated to processing nuclear fuel and for waste management and disposal activities.
- The 300 Area, located just north of the city of Richland, was used for fuel assembly and test reactor experiments. Most buildings have been removed, but it still contains several research facilities and various laboratories.
- The 400 Area, about 8 km (5 mi) north of the 300 Area, is the location of the retired experimental reactor known as the Fast Flux Test Facility.
- The 600 Area is the core of the Hanford Site not designated as an operations area, although it does contain some waste disposal sites. This area is further subdivided as follows:
    - 0.4 km^2 (100 ac) is leased by Washington State and contains a commercial low-level radioactive waste disposal facility known as the US Ecology Low-Level Radioactive Waste site.
    - Energy Northwest leases 4.4 km^2 (1.7 mi^2) along the Columbia River north of the 300 Area for operation of the Columbia Generating Station for nuclear power production.
    - The Hanford Reach National Monument (HRNM), which is mostly managed by the USFWS. The USFWS-managed portions of the HRNM include:

- The Rattlesnake Unit (Fitzner-Eberhardt Arid Lands Ecology Reserve), which occupies 310 km^2 (121 mi^2) in the southwest quadrant of the Hanford Site.
- The Wahluke (East and West), Saddle Mountain, and Ringold Units, which comprise a
- 355-km^2 (139-mi^2) area on the north and east banks of the Columbia River.

Although the USFWS manages portions of the Site, RL is the landowner of the entire Hanford Site. This plan does not cover actions taken by the USFWS within the HRNM. Recreational or other non-RL uses of the Hanford Reach within Site the boundaries are outside the scope of this plan. The long-term vision for land use within the Hanford Site has been evaluated and set forth in the *Final Hanford Comprehensive Land-Use Plan Environmental Impact Statement* (DOE 1999a) and its implementing documents, including the *Hanford Site Biological Resources Management Plan* (DOE 2013b).

The 100 and 300 Areas are closest to the Columbia River, and operations in these areas have the greatest potential for affecting listed salmonids. Areas remote from the Columbia River, such as 200 East and 200 West, are sources of contaminated groundwater that has reached the river in some cases.

1.3 CONSULTATION HISTORY

The original Hanford Site *Threatened and Endangered Species Management Plan for Salmon and Steelhead* (DOE/RL-2000-27) was prepared during the late 1990s in response to the listing of Upper Columbia River spring Chinook salmon and Upper Columbia River steelhead as endangered species under the ESA. This management plan was initially published in April 2000, but NMFS did not concur with all provisions of that plan. In 2006, RL prepared an addendum to the plan to specifically address waste site remediation projects that were required along the Columbia River (DOE 2006). In its response letter (NMFS 2007) NMFS concurred with the conclusions of *may affect, not likely to adversely affect* for remediation actions that occurred above the wetted perimeter of the river, given certain stipulations and limitations. NMFS did not concur with a similar determination for actions below the wetted perimeter of the river. RL currently requests project-specific consultation under Section 7 of ESA for remediation projects occurring below the wetted edge of the river.

Although RL can make determinations of *no effect* without consultation with the respective agencies, RL routinely contacts NMFS and USFWS to address potential impacts associated with projects occurring in the nearshore areas. RL has also conducted several informal consultations for projects that *may affect, but not likely adversely affect* listed species or their habitat.

In 2008, RL requested consultation to support various sampling activities associated with the Columbia River Corridor Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Remedial Investigation (DOE 2008). NMFS determined that the proposed sampling efforts may affect, but were not likely to adversely affect listed spring-run Chinook, steelhead, or their critical habitat, and that the proposed conservation measures would be adequate to protect essential fish habitat for fall-run Chinook and coho (*Oncorhynchus kisutch*) salmon (NMFS 2008). This determination was reaffirmed and extended indefinitely in July 2013 (NMFS 2013a).

In fall 2010, RL prepared two separate biological assessments (BA) for the removal and remediation of river intake structures: one for the demolition/disposition of the 181-KE and 181-KW river intake structures (CHPRC 2010a) and one for the demolition of 181-N and 181-NE intake structures and the 1908-NE discharge structure (DOE 2010). Both BAs evaluated potential impacts to Upper Columbia River spring Chinook salmon, Upper Columbia River steelhead, and bull trout. The USFWS concurred with the *may affect, not likely to adversely affect* determination for bull trout for the 181-KE /181-KW project on January 18, 2011 (USFWS 2011a), and for the 100-N Area project on July 14, 2011 (USFWS 2011b). NMFS provided comments on the BA for the 100-K Area project, but did not provide a formal concurrence with the *may affect, not likely to adversely affect* determination for steelhead and spring Chinook salmon. RL determined that it had met the substantive requirements of the ESA, and chose to proceed under provisions of CERCLA and completed the project in 2011. NMFS provided a Biological Opinion on August 1, 2011, for the 100-N Area work, which determined that the proposed work at 100-N would *adversely affect* listed species, but would not jeopardize the species or result in the destruction or adverse modification of designated critical habitat (NMFS 2011a). An incidental take statement was provided with the Biological Opinion for 100-N.

In July 2011, RL submitted a BA that assessed potential impacts on bull trout from electrofishing and hook-and-line fishing for collection of environmental monitoring samples (DOE 2011). The USFWS concurred with the *may affect, not likely to adversely affect* determination regarding these activities on July 25, 2011 (USFWS 2011c). Other environmental sampling activities have been performed for RL under consultations or Section 10 of the ESA permits obtained by DOE subcontractors.

In March 2013, RL prepared a BA for the installation of a series of piezometers along the shoreline of the Columbia River near the 300 Area (DOE 2013a), concluding that the piezometer installation *may affect but not likely to adversely affect* listed spring-run Chinook and steelhead or their critical habitat; NMFS concurred, and also concluded that the proposed action would not adversely affect essential fish habitat (NMFS 2013b). This consultation was extended to include the installation of aquifer tubes near the 100-B/C Area in July 2013 (NMFS 2013c).

In May 2014, RL prepared a BA examining the potential effects of the emplacement of an apatite barrier in the saturated zone sediments and vadose zone soils on ESA-listed fish in the Hanford Reach. The 762-m (2,500-ft) long permeable reactive barrier was designed to reduce the concentrations of strontium-90 in the groundwater being released to the Columbia River by approximately 90%. The BA concluded that the installation and operation of the apatite barrier in the 100-N Area *may affect, but was not likely to adversely affect* spring-run Chinook, steelhead, bull trout, or their critical habitat. Concurrence with this determination was received from USFWS for bull trout (USFWS 2014), and from NMFS (NMFS 2014) for spring-run Chinook salmon and steelhead.

In April 2015, RL submitted a BA in support of its request for informal consultation with NMFS and USFWS regarding the installation and operation of a groundwater treatment system designed to reduce the mobility of uranium that is a primary source of groundwater contamination in the Hanford Site 300 Area (DOE 2015a, 2015b). In May 2015, USFWS concurred with RL's determination that the Uranium Sequestration Groundwater Treatment Project *may affect, but not likely to adversely affect* bull trout and its designated critical habitat (USFWS 2015). In June 2015, NMFS reached a similar conclusion for spring-run Chinook salmon and steelhead and their designated critical habitats (NMFS 2015).

A draft version of this management plan was submitted to USFWS and NMFS in October 2012. USFWS concurred with the proposed determinations regarding bull trout, with a few stipulations (USFWS 2012). NMFS provided comments, but determined it required more information and had concerns with some proposed determinations. The document was revised to incorporate NMFS comments. In August 2013, RL and NMFS reached an agreement on the applicability and limitations of the proposed determinations and the procedures, as described in this document, for using this plan as the basis for future consultations. NMFS provided an approval letter in December 2013 (NMFS 2013d).

2.0 STATUS OF LISTED SPECIES

2.1 STEELHEAD

Historically, steelhead occurred in most streams from the northern Baja Peninsula to Alaska. During the present century, at least 23 indigenous stocks are thought to have been extirpated. The current range of the species in the contiguous United States extends from the U.S.-Canada border to the Los Angeles Basin (61 FR 56138).

Declines of steelhead stocks within the region have been attributed to a number of human and natural causes (62 FR 43937); human causes include:

- habitat loss, modification, or curtailment of use, especially from hydropower operations
- excess commercial or recreational harvest
- increased predation through introduction of non-native species and habitat modifications.

Steelhead within the Hanford Reach are part of the Upper Columbia River Evolutionarily Significant Unit (ESU) as defined by NMFS (61 FR 56138, 70 FR 52630 – see Figure 2). The Middle Columbia River and Snake River ESUs border the Upper Columbia River ESU to the south. The Middle Columbia River ESU includes the Yakima River drainage and the Columbia River downstream from its confluence with the Yakima River, while the Snake River ESU includes the Snake River drainage. A portion of the Hanford Site lies within the Middle Columbia River ESU, although there are no water discharges, water withdrawals, or perennial runoff from the Site within this ESU. Because of the lack of potential impact to this ESU, protection measures are not addressed in this plan.

On August 18, 1997, Upper Columbia Summer-Run Steelhead were listed as endangered under the ESA, with an effective date of October 17, 1997 (62 FR 43937). This status was upgraded to threatened on January 5, 2006; reinstated to endangered per a U.S. District Court decision in June 2007; and upgraded to threatened per a U.S. District Court order in June 2009. NMFS issued results of a 5-year review on August 15, 2011, and concluded that this species should remain listed as threatened (76 FR 50447) and subject to section 4(d) protective regulations under the ESA (71 FR 5177) as amended in June 2005 (70 FR 37160).

In the case of threatened species, ESA section 4(d) allows NMFS or USFWS to determine whether and to what extent conservation measures may be appropriate, and directs the agency to issue regulations it considers necessary and advisable for the conservation of the species. The agencies have flexibility under section 4(d) to tailor protective regulations based on the contributions of available conservation measures. The 4(d) protective regulations may prohibit, with respect to threatened species, some or all of the acts which section 9(a) of the ESA prohibits with respect to endangered species (70 FR 37160).

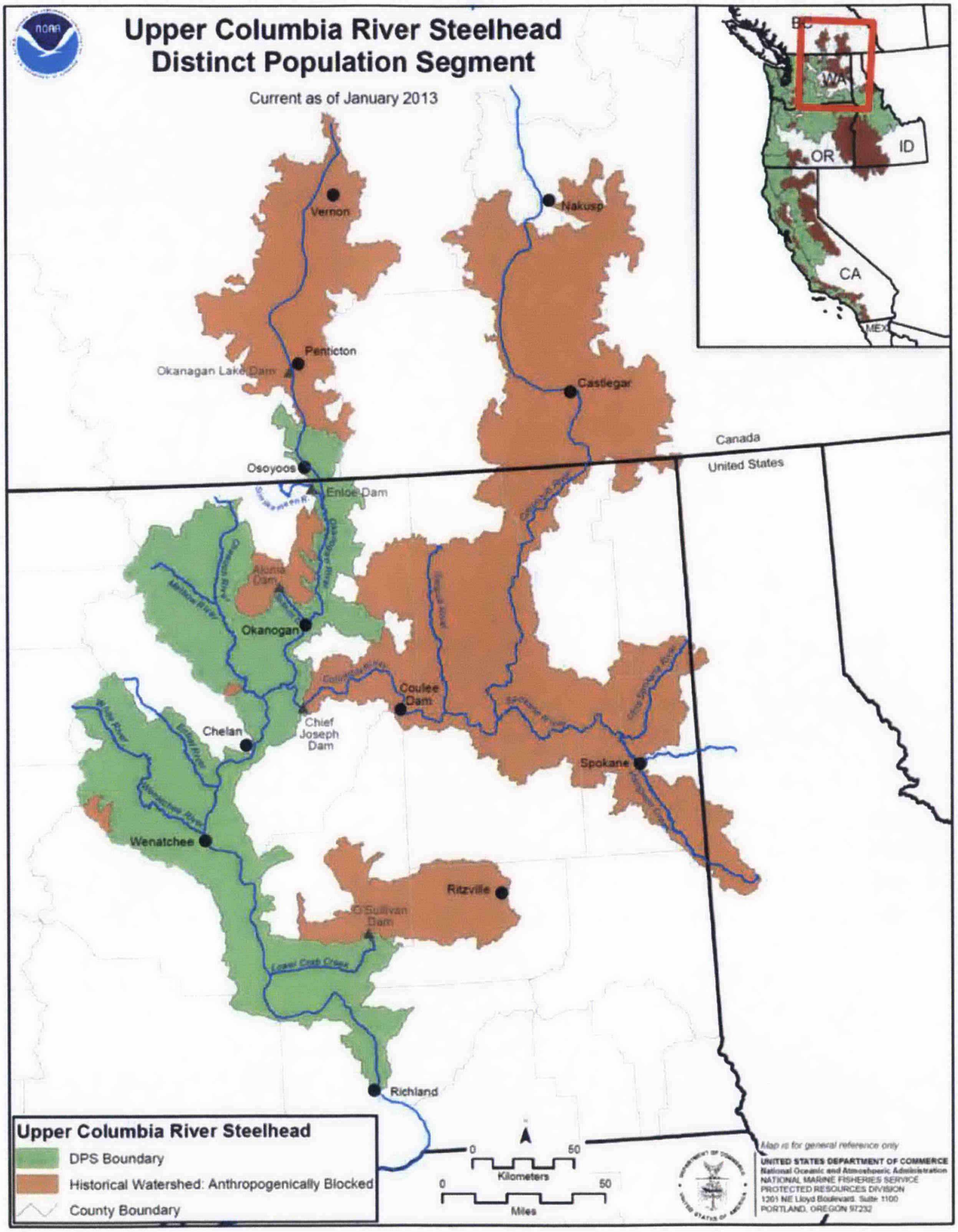

Figure 2. Upper Columbia River Steelhead Distinct Population Segment

Section 4(d) protections apply to natural and hatchery fish with an intact adipose fin, but not to listed hatchery fish that have had their adipose fin removed prior to release into the wild (71 FR 5177).

Steelhead covered under this listing include all naturally spawned anadromous steelhead populations and their progeny below natural and man-made impassable barriers in streams in the Columbia River Basin upstream of the Yakima River, Washington, to the U.S.-Canada border, as well six artificial propagation programs: the Wenatchee River, Wells Hatchery (in the Methow and Okanogan Rivers), Winthrop National Fish Hatchery, Omak Creek, and Ringold steelhead hatchery programs. Steelhead within the Middle Columbia River ESU and the Snake River ESU are also listed as threatened.

Critical habitat is defined in section 3 of the ESA as--(i) the specific area within the geographical area occupied by a species, at the time it is listed in accordance with the Act, on which are found those biological features essential to the conservation of the species and that may require special management considerations or protection and; (ii) specific areas outside the geographical area occupied by a species at the time it is listed, upon a determination that such areas are essential for the conservation of the species. ``Conservation'' means the use of all methods and procedures needed to bring the species to the point at which listing under the ESA is no longer necessary.

Critical habitat for this ESU within the Hanford Site includes the entire Hanford Reach (65 FR 7764, 70 FR 52630– see Figure 3). Functions of this habitat within the Hanford Reach include juvenile rearing areas, juvenile migration corridors, areas for growth and development to adulthood, adult migration corridors, and spawning areas. To prevent impacts to this critical habitat, RL must ensure that its activities do not adversely affect substrate, water quality, water quantity, water temperature, water velocity, cover/shade provided by bank vegetation, food supplies, riparian vegetation, the space occupied by the river, or other conditions that limit safe passage of juveniles or adults (65 FR 7764).

Section 7(a)(1) of the ESA requires federal agencies to "utilize their authorities in furtherance of the purposes of [the ESA] by carrying out programs for the conservation of threatened and endangered species." Section 7(a)(2) of the ESA requires that each federal agency shall, in consultation with, and assistance of USFWS and/or NMFS, ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of the species or result in the destruction or adverse modification of critical habitat.

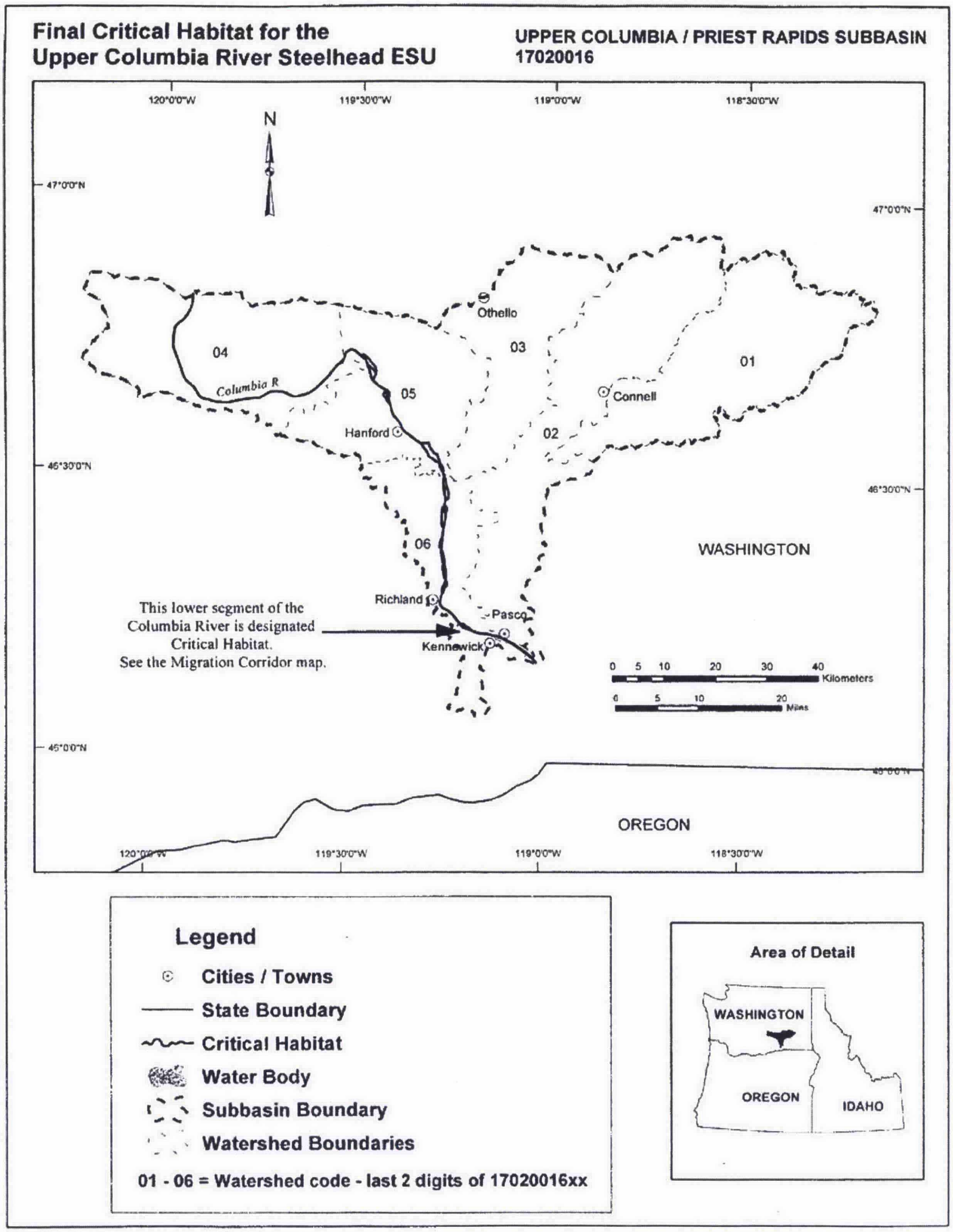

Figure 3. Upper Columbia River Steelhead Critical Habitat (source: 70 FR 52630)

2.2 SPRING RUN CHINOOK SALMON

On March 9, 1998, NMFS determined that ESA listing was not warranted for the Middle Columbia River Spring-Run Chinook ESU (63 FR 11482), which comprises all naturally spawned populations of spring-run Chinook salmon in Columbia River tributaries from the Klickitat River upstream, including the Yakima River but excluding the Snake River Basin. Major river basins containing spawning and rearing habitat for this ESU comprise approximately 69,000 km^2 (43,000 mi) in Oregon and Washington. The Middle Columbia ESU does not include fish within the Hanford Reach, but does include fish that migrate through the Yakima River to spawning grounds in that drainage basin. RL Project activities are not expected to have any impacts on this ESU, and there will be no effect from Hanford Site operations on this ESU.

The Upper Columbia River Spring-Run ESU of Chinook salmon was listed by NMFS as an endangered species on March 24, 1999 (64 FR 14308 – see Figure 4). The endangered status was reaffirmed on June 28, 2005 (70 FR 37160). NMFS issued results of a 5-year review on August 15, 2011, and concluded this species should remain listed as endangered (76 FR 50447). This ESU includes all naturally spawned populations of Chinook salmon in all river reaches accessible to spring Chinook salmon in Columbia River tributaries upstream of the Rock Island Dam and downstream of Chief Joseph Dam in Washington, as well as six artificial propagation programs: the Twisp River, Chewuch River, Methow Composite, Winthrop National Fish Hatchery, Chiwawa River, and White River spring-run Chinook hatchery programs. ESA section 9(a) take prohibitions apply to all species listed as endangered. Hatchery stocks determined to be part of endangered ESUs are afforded the full protections of the ESA (70 FR 37160).

These salmon do not spawn within the Hanford Reach, but it serves as a migration corridor for adults and juveniles, and juveniles may use the shallows of the Hanford Reach as rearing areas. A final designation of critical habitat was published on September 2, 2005, with an effective date of January 2, 2006. Critical habitat for this ESU within the Hanford Site includes the entire Hanford Reach, which functions as juvenile rearing habitat and a juvenile and adult migration corridor (70 FR 52630 – see Figure 5). To prevent impacts to this critical habitat, RL must ensure that Project activities do not adversely affect substrate, water quality, water quantity, water temperature, water velocity, cover/shade provided by bank vegetation, food supplies, riparian vegetation, the space occupied by the river, or other conditions that limit safe passage of juveniles or adults (65 FR 7764).

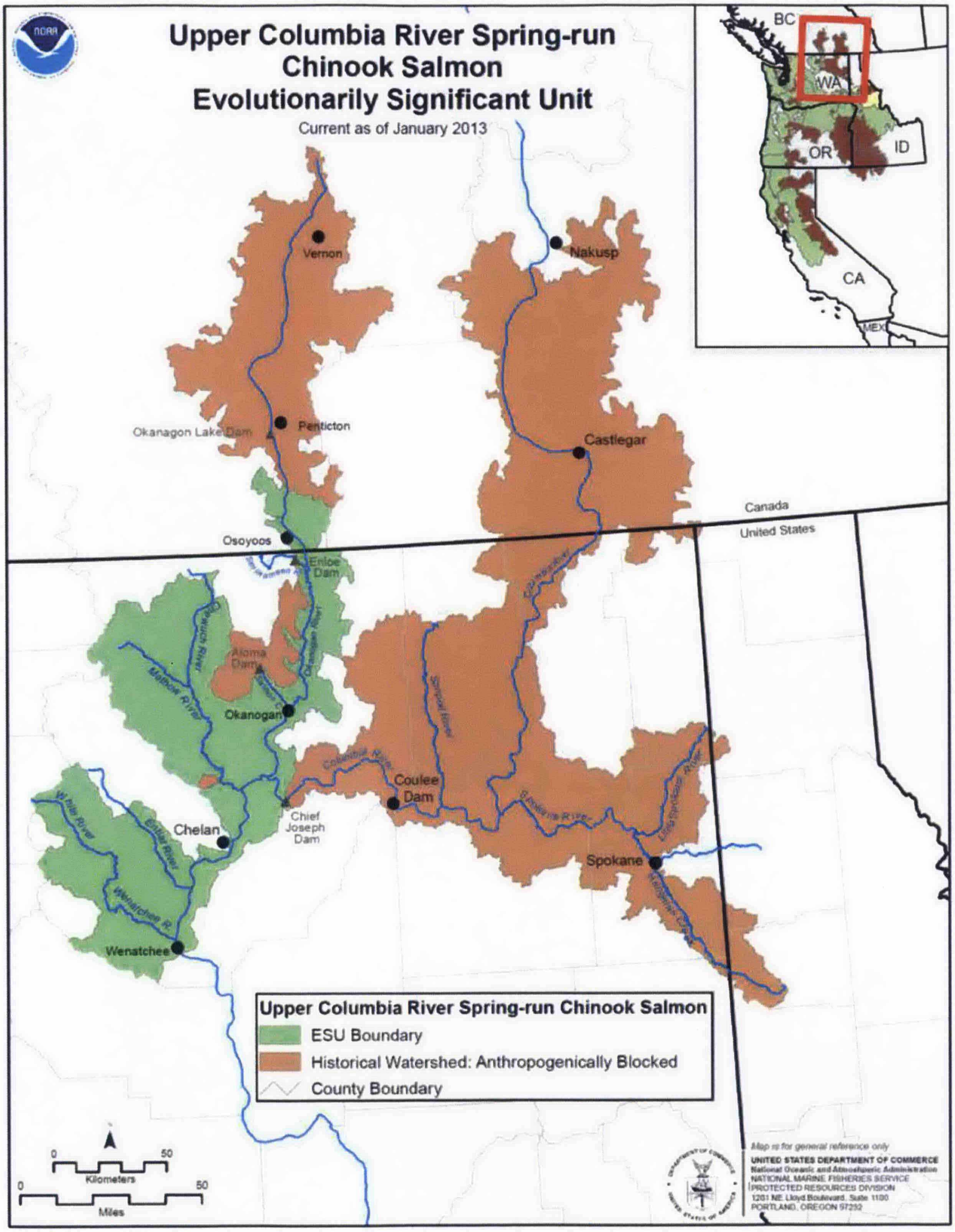

Figure 4. Upper Columbia River Spring-Run Chinook Salmon ESU

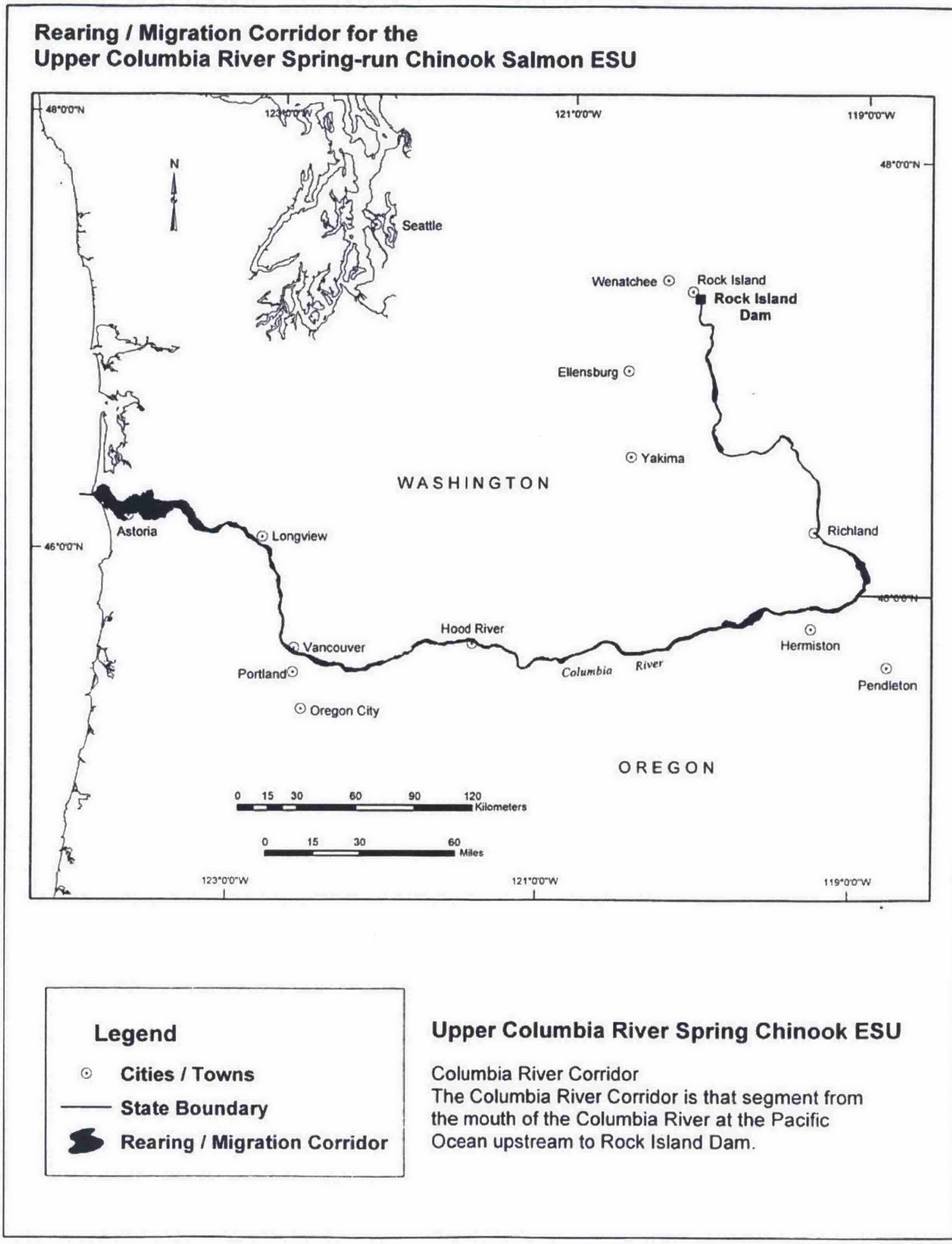

Figure 5. Upper Columbia River Spring-Run Chinook Salmon Critical Habitat (source: 70 FR 52630)

2.3 COLUMBIA RIVER BULL TROUT

On June 10, 1998, the USFWS listed the Klamath River and the Columbia River bull trout distinct population segments as threatened under the ESA (63 FR 31647). On November 1, 1999, the USFWS listed all bull trout in the coterminous United States as threatened (64 FR 58910). The USFWS completed a 5-year status review in 2008 that determined that no change in listing status was warranted (USFWS 2008). The Columbia River population segment is represented by relatively widespread subpopulations that have declined in overall range and numbers of fish. A majority of Columbia River bull trout occur in isolated, fragmented habitats that support low numbers of fish and are inaccessible to migratory bull trout. The few remaining bull trout "strongholds" in the Columbia River Basin tend to be found in large areas of contiguous habitats in the Snake River Basin of the central Idaho mountains, upper Clark Fork and Flathead Rivers in Montana, and several streams in the Blue Mountains in Washington and Oregon.

The USFWS published a final rule designating critical habitat for the Klamath River and Columbia River populations of bull trout on October 6, 2004 (69 FR 59996), and then again for the Klamath River, Columbia River, Jarbidge River, Coastal-Puget Sound, and Saint Mary-Belly River populations on September 26, 2005 (70 FR 56212). The USFWS published revisions to the critical habitat designations in October, 2010 (75 FR 63898). The Mainstem Upper Columbia River Critical Habitat Unit 22 (Figure 6) includes the Columbia River from John Day Dam upstream 520.1 km (323.2 mi) to Chief Joseph Dam (75 FR 63898) and includes the Hanford Reach (Figure 7).

To be included as critical habitat, an area must provide one or more of the following three functions: (1) spawning, rearing, foraging, or overwintering habitat to support existing bull trout local populations; (2) movement corridors necessary for maintaining migratory life-history forms; and/or (3) suitable and historically occupied habitat that is essential for recovering existing local populations that have declined, or that is needed to re-establish local populations required for recovery (69 FR 59996). In its revised designation of critical habitat (75 FR 63898), the USFWS defined nine primary constituent elements necessary to sustain the essential bull trout life-history functions.

Segments of large rivers such as the Columbia and Snake Rivers are important to the conservation of bull trout because they are interconnected with tributaries that support bull trout and they provide important foraging, migrating, and overwintering (FMO) habitat. The mainstem Columbia River appears to provide essential FMO habitat for bull trout because of a combination of water depth, lower velocities, comparatively warmer water, and availability of food (69 FR 59996). Bull trout use of the Columbia River has been documented by radio-tagging studies conducted by the USFWS (69 FR 59996) and the Chelan, Douglas, and Grant County Public Utility Districts (Kreiter 2001, 2002; BioAnalysts, Inc. 2002 as cited in 69 FR 59996). Recoveries of tagged bull trout in the Bonneville Pool that originated from the Hood River have shown that bull trout are using the mainstem of the lower Columbia River as well (Wachtel 2000 as cited in 69 FR 59996). Radio-telemetry studies by the Oregon Department of Fish and Wildlife (Hemmingsen et al. 2001a, b) and Idaho Power Company (Chandler and Richter 2000 as cited in 69 FR 59996) have verified movements of bull trout between tributary streams and the mainstem Snake River. Current bull trout presence in the mainstem Columbia River reflects the strength of the local populations within tributaries and its value as a migration corridor (69 FR 59996). Adult migratory bull trout have been documented in the Columbia River primarily between October and May. Overwintering habitat is often only used seasonally, especially if an area has warm summer water temperatures that may cause bull trout to migrate to cooler areas (69 FR 59996).

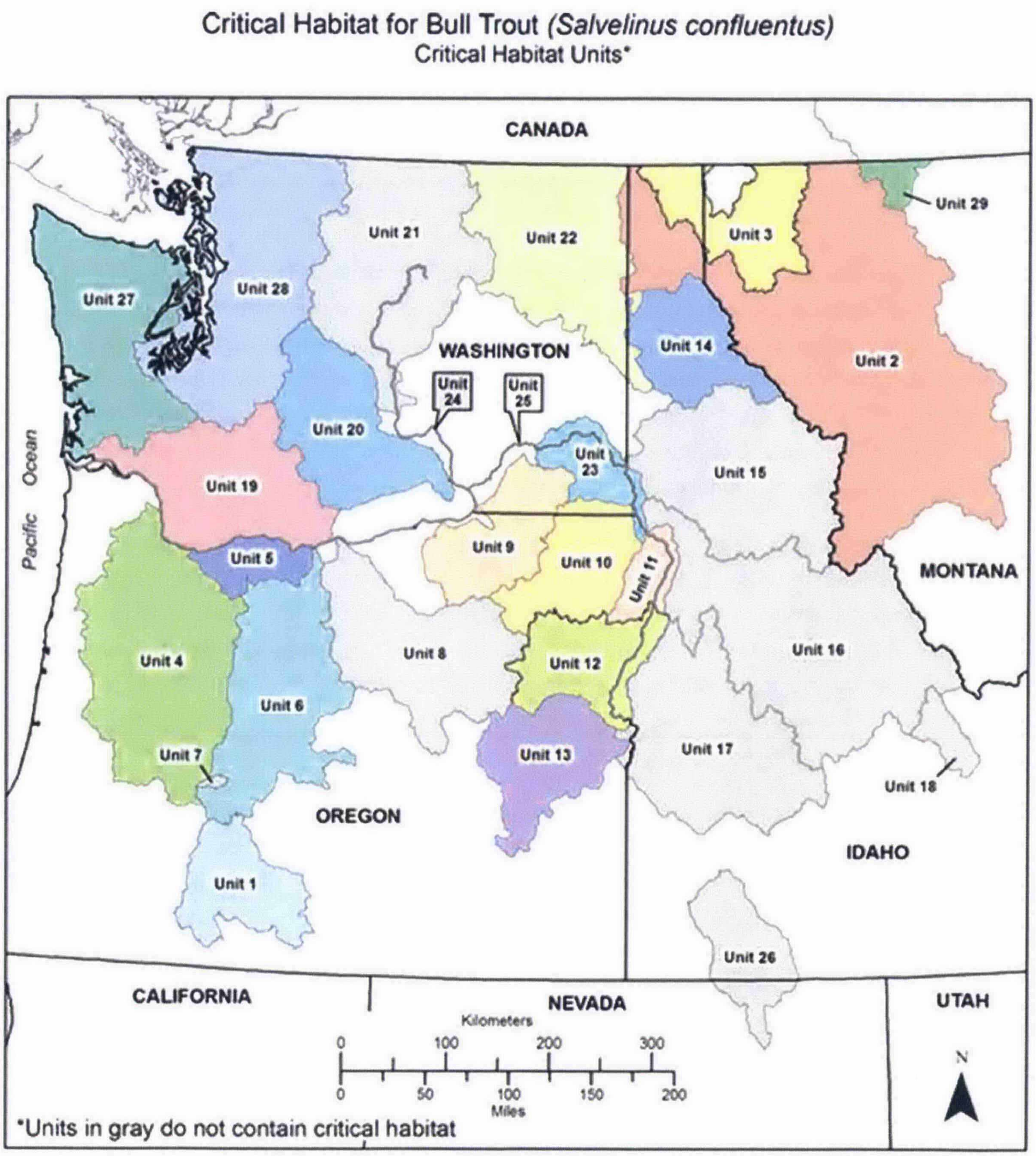

Figure 6. Bull Trout Critical Habitat Units (Source: 75 FR 63898)

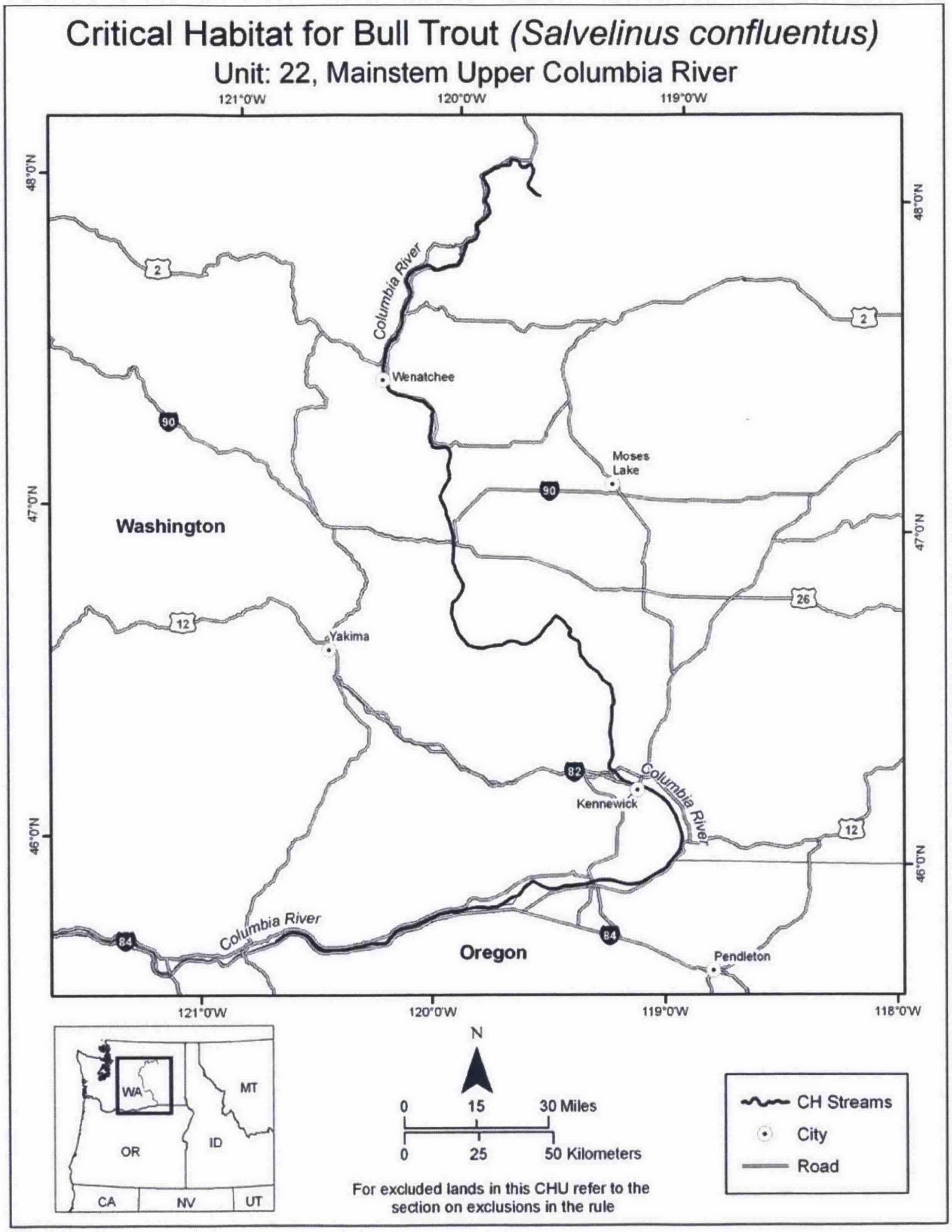

Figure 7. Mainstem Upper Columbia River Bull Trout Critical Habitat (Source: 75 FR 63898)

3.0 BIOLOGY OF LISTED SPECIES IN THE HANFORD REACH

3.1 UPPER COLUMBIA RIVER STEELHEAD EVOLUTIONARY SIGNIFICANT UNIT (ESU)

Steelhead are anadromous, meaning they live in the ocean but return to freshwater streams and rivers as adults to spawn. Most steelhead reside in the ocean 2 or 3 years and return to their natal stream/river as 4 or 5 year olds. Based on the timing of their entry as adults into the Columbia River, they are classified either as winter or summer run. Winter-run steelhead enter the Columbia River from November through April and spawn in tributaries below Bonneville Dam. Winter-run steelhead have not been found in the Columbia River system upstream of the Deschutes River (Peven 1990). Summer-run fish enter the Columbia River from May through October and spawn in areas above Bonneville Dam, including the Hanford Reach.

The proportions of hatchery and wild steelhead that return to the Hanford Reach are unknown. Ringold Hatchery (river km 570.5), operated by the Washington Department of Fish and Wildlife (WDFW), has been raising and releasing steelhead smolts into the Hanford Reach since 1962. From 1998 through 2011, these releases averaged 169,582 smolts (Hoffarth 2011). The annual adult sport catches in the Ringold area from 2001 through 2011 averaged 2,792 fish (Hoffarth 2011). With the exception of an 8-year time period (1981 through 1988), most fish reared and released into the Hanford Reach have been Skamania (coastal) steelhead, not the Wells stock that were listed under the ESA. Beginning in 1998, WDFW eliminated the release of the Skamania stock and switched to the Wells stock. This action was primarily in response to the listing of Wells stock steelhead under the ESA.

Unlike Chinook salmon, steelhead trout are iteroparous and can spawn more than once. However, the repeat spawning rate in the state of Washington is low (4 to 15% [Wydoski and Whitney 1979]), and adults encounter four mainstem dams on their way to and from the Hanford Reach. Repeat spawning in the Hanford Reach by a significant number of steelhead is unlikely.

<u>MIGRATION</u>

Steelhead are present in the Hanford Reach all year; however, most adults move into the Hanford Reach from August to November, peaking in September (Watson 1973; Becker 1985). Most steelhead that enter the Hanford Reach hold in the immediate vicinity for 6 to 8 months. A limited tagging study in 1967 found adults migrated near shorelines at depths less than 3 m (10 ft) (Coutant 1973).

Juvenile steelhead usually spend 1 to 3 years in freshwater before migrating downstream to the ocean (Shapovalov and Taft 1954; Chapman 1958; Maher and Larkin 1959; Peven 1990). Outmigration through the Hanford Reach usually occurs between April and June (Becker 1985). In addition to any fish produced within the Hanford Reach, this area also serves as an important holding and rearing area for yearling juvenile steelhead produced farther upstream. Fickeisen et al. (1980) estimated that between 2 and 2.2 million steelhead smolts may pass through the Hanford Reach each year. Yearling steelhead smolts (predominantly upstream hatchery stocks) have been collected mainly from the bottom, mid-channel zone of the river (Dauble et al. 1989). No juvenile steelhead were collected in shoreline fyke nets, but they were obtained in shoreline areas with electroshocking gear.

STEELHEAD SPAWNING WITHIN THE HANFORD REACH

Steelhead create redds (nests) in the gravel and cobble substrate of the river bottom. In Idaho's Clearwater and Salmon Rivers, the preferred gravel size for nesting has been reported as 1.3 to 10.2 cm (0.5 to 4 in.), water depth 0.2 to 1.5 m (0.66 to 4.9 ft), and water velocity 0.70 to 0.76 m/s (2.3 to 2.5 ft/s) (Orcutt et al. 1968); these habitat conditions also exist within the Hanford Reach.

Any spawning within the Hanford Reach most likely would occur between February and early June, with peak spawning in mid-May (Eldred 1970; Watson 1973; Becker 1985). Little is known about the quality and quantity of steelhead trout spawning, rearing, and adult holding habitat in the Hanford Reach. Watson (1973) estimated that from 1962 to 1971 an average of 35,000 steelhead trout that annually passed McNary Dam did not pass Priest Rapids Dam on the Columbia River or Ice Harbor Dam on the Snake River. He estimated that 10,000 of these fish were potential spawners in the Hanford Reach, after taking into account reductions due to migration into the Yakima and Walla Walla Rivers, sport catch, and natural mortality. Counts from 1977 to 1996 indicated an average of 20,000 steelhead trout that annually passed McNary Dam did not pass Ice Harbor or Priest Dams, and approximately 9,000 of these could potentially spawn in the Hanford Reach (Pacific Northwest National Laboratory, unpublished data). Gray and Dauble (1976) provide other evidence of steelhead spawning. They collected gravid and ripe females in late April and early May and collected spent males in August within the Hanford Reach.

The quantity and location of steelhead spawning in the Hanford Reach is often unclear because aerial surveys of steelhead spawning are difficult, due to high, turbid spring runoff that obscures visibility.

- Historical information on steelhead spawning in the Hanford Reach is available from the late 1960s and early 1970s during unusually low flow conditions (1,100 to 2,200 m^3/s [39,000 to 78,000 ft^3/s]– normal average flow is ~3,400 m^3/s [120,000 ft^3/s]). Key spawning areas reported from aerial surveys conducted in 1968 and 1970 included Vernita Bar, Coyote Rapids, Locke Island, 100-F islands, and Ringold (Tony Eldred, personal communication with D.R. Geist 9-28-89, see Figure 8). A total of 220 redds were counted in 1968 and 95 in 1970; total steelhead spawning was estimated by Eldred to be approximately 2,200 to 25,000 in 1968 and 950 to 7,800 in 1970. Fickeisen et al. (1980) indicated steelhead trout likely spawned at Vernita Bar, Coyote Rapids, Locke Island, and Ringold. An aerial survey conducted on April 30, 1998, identified up to 75 redds in the Hanford Reach, with the area from Wooded Island to Ringold having 14 redds and the 100-F islands having 61 (Dauble 1998). Much of the area at Locke Island where redds were counted in the 1970s has since been silted over due to slumping of the White Bluffs from agricultural water seepage.

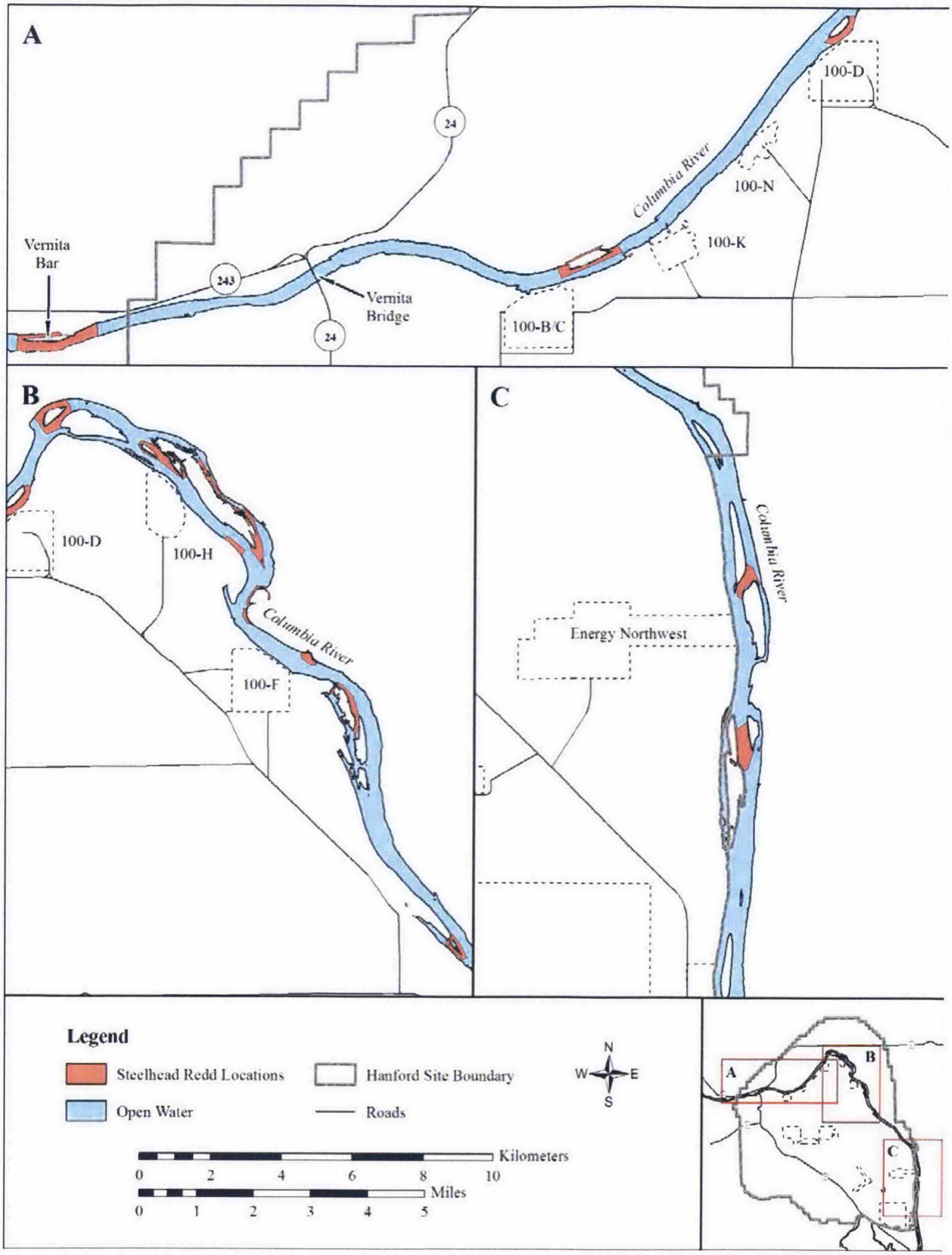

Figure 8. Locations of Steelhead Redds Observed During Aerial Surveys in 1968 and 1970 in the Upper Portion of the Hanford Reach (T. Eldred, personal communication September 28, 1989)

- More recent aerial surveys of steelhead have been performed in the springs of 1999 through 2002, 2004 through 2010, and 2012 through 2015 (MSA 2012, 2014). A comprehensive study also was conducted in spring 1999 to survey likely spawning areas near Locke Island, but no steelhead redds were found (Mueller and Geist 1999). Finally, the 100-N Area shoreline was investigated by aerial and boat surveys during spring 2005 to search for spawning areas (Poston 2010).

  Results of surveys conducted prior to 2015 show only limited spawning near the Ringold Hatchery Creek (near river mile 355) in certain years. One verified steelhead redd was also found near the 300 Area in spring 2003. The 2005 spring surveys identified a single location where steelhead redds occurred downstream of Ringold at Island 15 (Poston 2010). Aerial steelhead redd count survey data for years 2007 through 2009 resulted in the observation of only a single redd in 2008, which was located near the upper portion of Locke Island.

  During 2015, three aerial redd count surveys were performed during April and May. Using the maximum redd count seen at a particular location on either day, a total of 43 redds were identified in the Hanford Reach (MSA 2015). The higher number of redds is most likely due to the lower and more steady river flows experienced in 2015. Figure 9 shows the locations and numbers of steelhead redds observed in the Hanford Reach during the 2015 aerial surveys.

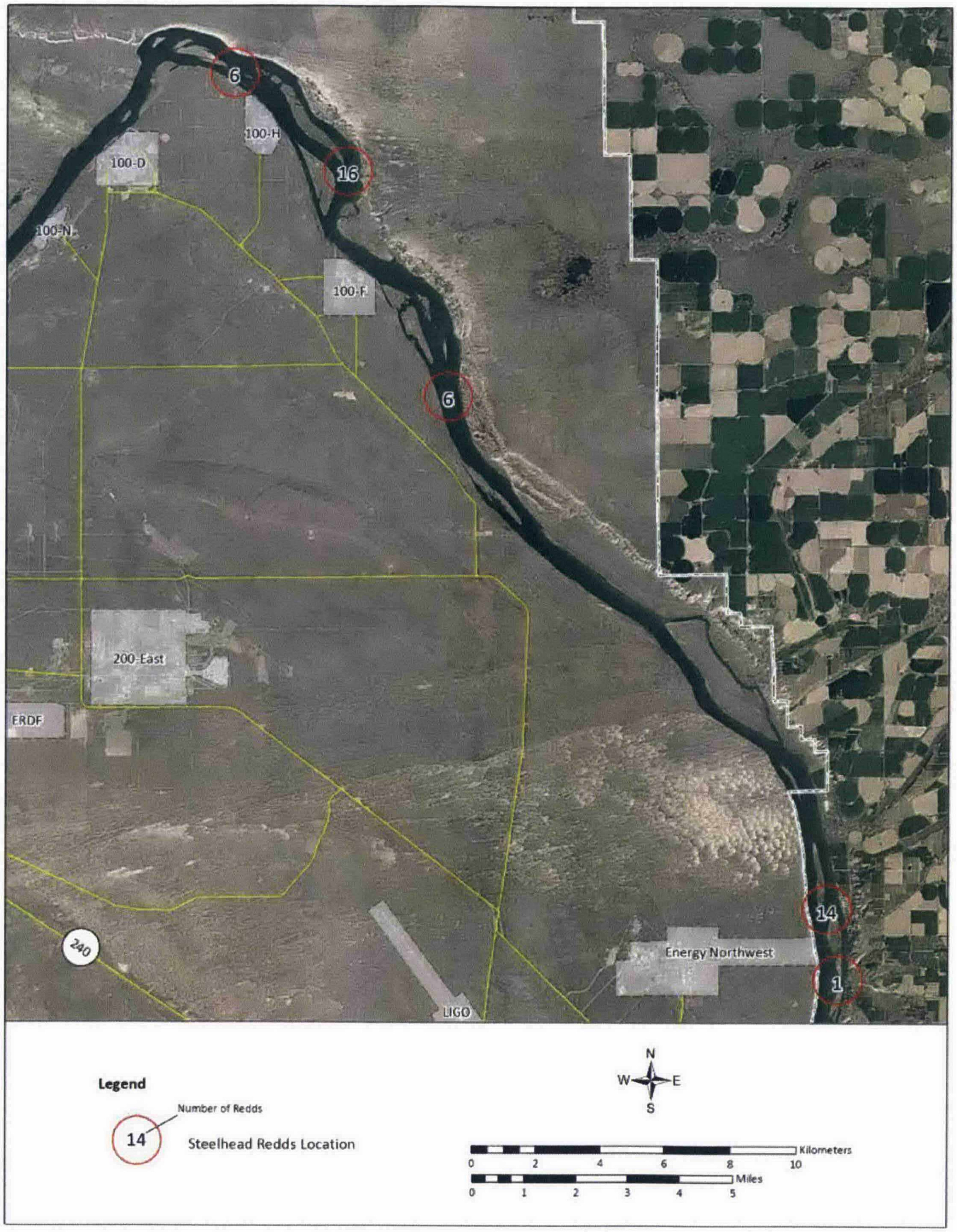

Figure 9. Steelhead Redds Observed in the Hanford Reach During the 2015 Aerial Surveys

HATCHING AND REARING

Steelhead eggs hatch in about 50 days when water temperatures are 10°C (50°F) (Wydoski and Whitney 1979). Fry emerge from the nest 2 to 3 weeks after hatching (Peven 1990). They school near the margins of the river and over shallow water gravel bars. Streamside vegetation and submerged cover are important habitat features for early life history stages because they provide protection from predators, moderate temperature, and colonization sites for steelhead food sources (Shapovalov and Taft 1954; Bustard and Narver 1975; Peven 1990). As fry grow larger they feed primarily on benthic organisms, including midges, mayflies, stoneflies, and beetle larvae (Wydoski and Whitney 1979). Macroscopic analysis of steelhead smolts collected in the Hanford Reach in 1974 and 1975 showed that fish were consuming adult caddisflies (53%), larval caddisflies (35%), and midgefly larvae (15%) (Gray and Dauble 1977).

If significant steelhead spawning does occur in the Hanford Reach, one would expect to find sub-yearling and pre-smolt juveniles (young-of-the-year). Gray and Dauble (1976) reported that young-of-the-year steelhead were not collected by small mesh beach seines in areas and at the time of the year when steelhead juveniles should have been present. Other studies have failed to collect young-of-the-year steelhead (Dauble et al. 1989; Wagner et al. 1997; Hoffarth et al. 1998; Nugent et al. 1999, 2000). In June 2001, four wild steelhead fry were collected from an entrapment pool near Wooded Island for the first time during the fifth year of an ongoing fry stranding study (Nugent et al. 2002). The absence of young-of-the-year steelhead noted in these studies may be due to low hatching success of steelhead eggs, low spawning abundance, or low catch per effort due to gear bias or sampling at the improper time or location. With few exceptions (Gray and Dauble 1976), many of the studies that reported a lack of young-of-the-year steelhead were not specifically fishing for them, but were targeting fall Chinook salmon instead. Steelhead eggs hatch later than those of fall Chinook salmon; thus, fry may not have emerged from the gravel at the time most fall Chinook salmon studies were conducted. Newly emergent steelhead fry are often found within submerged vegetation, which is not necessarily preferred habitat for juvenile fall Chinook salmon. Large beach seines used for fall Chinook salmon would not be effective in catching fish within vegetation. A summary of steelhead usage of the Columbia River within the Hanford Site is presented in Table 1.

Table 1. Life History Data for Upper Columbia River Steelhead within the Hanford Reach

	Life Stage						
	Return Migration	Adult holdover in Reach	Spawning	Egg Stage	Intragravel development	Rearing	Outmigration
Dates in Hanford Reach	Year round	1 September to 1 March	1 February to 1 June	1 February to 1 July	1 May to 15 July	Year round	1 April to 1 July
Food	None	Caddis larvae, midge larvae, zooplankton, adult insects, fish	None	Yolk Sac	Yolk Sac	Caddis larvae, midge larvae, zooplankton	Caddis larvae, midge larvae, zooplankton
Habitat	Pelagic - throughout water column	Pelagic - throughout water column	Gravels in mapped areas	Gravels in mapped areas	Gravels in mapped areas	Intermediate water (not main channel and not near shore)	Main Channel at night, nearshore feeding during day

3.2 UPPER COLUMBIA RIVER SPRING-RUN CHINOOK SALMON EVOLUTIONARY SIGNIFICANT UNIT (ESU)

The life history of Chinook salmon is complex and may vary depending on age at seaward migration; variation in length of freshwater, estuarine, and oceanic residence; ocean distribution and migratory patterns; and age and season of spawning migration (Healey 1991). Chinook salmon are similar to steelhead in that they too are anadromous and classified into runs based on when the adults return to their natal river to spawn. All three runs (spring, summer, fall) of Columbia River Chinook salmon ascend McNary Dam and return to and/or pass through the Hanford Reach (Becker 1985). Upper Columbia River Spring-Run ESU Chinook salmon are classified as a "stream-type" life history because the juveniles spend 1 or more years in freshwater before migrating to sea and return to their natal river several months prior to spawning (Healey 1991). Upper Columbia River Spring-Run ESU Chinook salmon are not known to spawn in the Hanford Reach. They do, however, pass through the Hanford Reach between April and mid-June on their way to spawning areas upstream (Table 2), traveling near the shoreline (Becker 1985; Peven 1990; Coutant 1973). Unlike steelhead, Chinook salmon, like most other Pacific salmon, are semelparous and die after spawning once (Healey 1991).

Table 2. Use of the Hanford Reach by Upper Columbia River Spring-Run ESU Chinook Salmon

	Life Stage				
	Return Migration	Spawning	Intragravel development	Rearing	Outmigration
Dates in Hanford Reach	1 April to 15 June	Above Reach	Above Reach	Above Reach	1 April to 1 September
Food	None	-	-	-	Caddis adults, midge adults
Habitat	Near shore	-	-	-	Main Channel at night, nearshore feeding during day

Juvenile spring-run Chinook salmon are released from hatcheries into the Hanford Reach. In 1982, 196,000 age-1 spring Chinook salmon from Leavenworth Hatchery were released below Priest Rapids Dam in the upper Hanford Reach. This was the only release of spring Chinook salmon directly into the Hanford Reach from stock originating upstream of the Hanford Reach in the last 30 years. From 1980 to 1998, the Ringold Fish Rearing Facility released an average of approximately 515,000 spring Chinook salmon per year (range 0 – 1,200,000) into the Hanford Reach. These releases comprised various stocks including Cowlitz (during the early 1980s), Klickitat, Carson, Yakima, and mixed stock returning to the Ringold hatchery. Although spring-run Chinook salmon are not known to spawn within the Hanford Reach, it is possible that a few hatchery fish have spawned in the river in the past. If this has occurred, these fish would not be classified as Upper Columbia River Spring-Run ESU Chinook salmon since the Hanford Reach is downstream of Rock Island Dam, the lower boundary of this ESU (63 FR 11482 and 64 FR 14308). At present, spring Chinook salmon are no longer released from Ringold Hatchery (Paul Hoffarth [WDFW], personal communication with Paul Wagner [Environmental Assessment Services] March 1, 2012).

Juvenile Upper Columbia River Spring-Run ESU Chinook salmon migrate downstream as smolts from April to September during their second year (Horner and Bjornn 1981; Becker 1985). Most migration takes place at night (Healey 1991; Mains and Smith 1955). Migrating smolts do not use nearshore habitat as do summer and fall Chinook salmon migrants, but instead, similar to outmigrating juvenile steelhead, exhibit a strong preference for the bottom of the mid-channel river zone (Becker 1985, Dauble et al. 1984, 1989). This results in their outmigration rates being more flow-dependent in relation to the other Chinook salmon runs. Period of travel from Priest Rapids Dam through the Hanford Reach to McNary Dam is estimated to be 3 days or less for active migrant spring Chinook salmon smolts (Table 2; Weitkamp and McEntee 1982). Backwater sloughs and shoreline indentations in the Hanford Reach may provide temporary foraging sites for outmigrating salmon (Becker 1973).

Adults reside in saltwater for 1 to 4 years and return to their natal stream/river as 4 or 5 year olds (Becker 1985; Mullan 1987; Peven 1990; Chapman et al. 1994).

3.3 COLUMBIA RIVER DISTINCT POPULATION SEGMENT BULL TROUT

Bull trout were once abundant throughout the Northwest and found in about 60% of the Columbia River Basin. Today, they occur in less than half of their historic range, with scattered populations in portions of Oregon, Washington, Nevada, Idaho, and Montana. Bull trout occur in 21% of their historic range in the Klamath River Basin, and no longer exist in California.

Bull trout are typically associated with the colder streams in a river system, although fish can occur throughout larger river systems (Fraley and Shepard 1989; Rieman and McIntyre 1993, 1995; Buchanan and Gregory 1997; Rieman et al. 1997 as cited in 64 FR 58910). For example, water temperature above 15° C (59° F) is believed to negatively influence bull trout distribution, which partially explains the generally patchy distribution within a watershed (Fraley and Shepard 1989; Rieman and McIntyre 1995 as cited in 64 FR 58910). Overwintering habitat, such as the mainstem Columbia River, often is only used seasonally until the water warms, and bull trout are forced to migrate out (69 FR 59996). Bull trout year-round use of the Hanford Reach is most likely precluded by summer water temperatures that typically range above 15° C (59° F) from late June through early October (Water Quality Monitoring Data, downstream from Priest Rapids Dam, 10-year average 2002 through 2011, [University of Washington 2012]).

Bull trout and Dolly Varden (*Salvelinus malma*) were previously considered a single species (Cavender 1978; Bond 1992 as cited in 64 FR 58910). Cavender (1978) presented morphometric (measurement), meristic (counts), osteological (bone structure), and distributional evidence to document specific distinctions between Dolly Varden and bull trout. Bull trout and Dolly Varden were formally recognized as separate species by the American Fisheries Society in 1980 (Robins et al. 1980 as cited in 64 FR 58910).

HABITAT

Bull trout are vulnerable to many of the same threats that have reduced salmon populations, but they have more specific habitat requirements than most other salmonids (Rieman and McIntyre 1993 as cited in 64 FR 58910). For example, the optimal temperatures for bull trout appear to be substantially lower than those for other salmonids (75 FR 63898). Besides very cold water (5° to 9° C [41° to 48° F]), bull trout require stable stream channels, clean spawning gravel, complex and diverse cover, and unblocked migration routes (Oliver 1979; Pratt 1984, 1992; Fraley and Shepard 1989; Goetz 1989; Hoelscher and Bjornn 1989; Sedell and Everest 1991; Howell and Buchanan 1992; Rieman and McIntyre 1995 as cited in 75 FR 63898). In addition, large patches of these components are necessary to support robust populations. Further threats to bull trout include hybridization and competition with non-native brook trout (*Salvelinus fontinalis*), brown trout (*Salmo trutta*), and lake trout (*Salvelinus namaycush*); overfishing; poaching; and man-made structures that block migration.

The decline of bull trout is primarily due to habitat degradation and fragmentation, blockage of migratory corridors, poor water quality, past fisheries management practices, impoundments, dams, water diversions, and the introduction of nonnative species (63 FR 31647 and 64 FR 17110). Climate change may exacerbate some of these impacts (75 FR 63898).

Bull trout spawning areas are often associated with cold-water springs, groundwater infiltration, and the coldest streams in a given watershed (Pratt 1992; Rieman and McIntyre 1993; Rieman et al. 1997 as cited in 64 FR 58910). Watson and Hillman (1997) concluded that watersheds must have specific physical characteristics to provide the necessary habitat requirements for bull trout spawning and rearing, and that the characteristics are not necessarily ubiquitous throughout watersheds in which bull trout occur. Because bull trout exhibit a patchy distribution, even in undisturbed habitats (Rieman and McIntyre 1993), fish would not likely occupy all available habitats simultaneously (Rieman et al. 1997 as cited in 64 FR 58910). Preferred spawning habitat generally consists of low gradient stream reaches often found in high gradient streams that have loose, clean gravel (Fraley and Shepard 1989 as cited in 64 FR 58910) and water temperatures of 5° to 9° C (41° to 48° F) in late summer to early fall (Goetz 1989 as cited in 64 FR 58910).

LIFE HISTORY

Bull trout exhibit both resident and migratory life-history strategies through much of their current range (Rieman and McIntyre 1993 as cited in 64 FR 58910). Resident bull trout complete their life cycles in the tributary streams in which they spawn and rear. Migratory bull trout spawn in tributary streams, and juvenile fish rear from 1 to 4 years before migrating to either a lake (adfluvial), river (fluvial), or in certain coastal areas, saltwater (anadromous) to mature (Fraley and Shepard 1989; Goetz 1989 as cited in 64 FR 58910). Anadromy is the least studied life-history type in bull trout, and some biologists believe the existence of true anadromy in bull trout is still uncertain (McPhail and Baxter 1996 as cited in 64 FR 58910). However, historical accounts, collection records, and recent evidence suggest an anadromous life-history form for bull trout (Suckley and Cooper 1860; Cavender 1978; McPhail and Baxter 1996; as cited in 64 FR 58910).

Spawning typically occurs in August to November when water temperatures drop below 9° C (48° F), in streams with abundant cold, unpolluted water, clean gravel and cobble substrate, and gentle stream slopes. Like steelhead, bull trout are iteroparous and may spawn more than once. Bull trout eggs require a long incubation period compared to other salmon and trout, hatching in late winter or early spring. Fry may remain in the stream gravels for up to 3 weeks before emerging.

Bull trout are opportunistic feeders, with food habits primarily a function of size and life-history strategy. Resident and juvenile bull trout prey on terrestrial and aquatic insects, macro-zooplankton, amphipods, mysids, crayfish, and small fish (Wyman 1975; Rieman and Lukens 1979 in Rieman and McIntyre 1993; Boag 1987; Goetz 1989; Donald and Alger 1993 as cited in 64 FR 58910). Adult migratory bull trout are primarily piscivorous, known to feed on various trout and salmon species (*Oncorhynchus* spp.), whitefish (*Prosopium* spp.), yellow perch (*Perca flavescens*), and sculpin (*Cottus* spp.) (Fraley and Shepard 1989; Donald and Alger 1993 as cited in 64 FR 58910). In the Willamette Basin, Chinook salmon are an important food source for bull trout. Adult bull trout are usually small, but can grow to 91 cm (36 in.) in length and weigh up to 14.5 kg (32 lb). Bull trout reach sexual maturity at between 4 and 7 years of age and are known to live as long as 12 years.

Migratory corridors link seasonal habitats for all bull trout life-history forms. The ability to migrate is important to the persistence of local bull trout subpopulations (Rieman and McIntyre 1993; Rieman and Clayton 1997; Rieman et al. 1997 as cited in 64 FR 58910). Migrations facilitate gene flow among local subpopulations if individuals from different subpopulations interbreed when some return to non-natal streams. Migratory fish may also re-establish extirpated local subpopulations.

PRESENCE WITHIN THE HANFORD REACH

The Columbia River population segment of bull trout includes 141 subpopulations, and the USFWS considers four geographic areas of the Columbia River Basin: (1) lower Columbia River (downstream of the Snake River confluence), (2) mid-Columbia River (Snake River confluence to Chief Joseph Dam), (3) upper Columbia River (upstream from Chief Joseph Dam), and (4) Snake River and its tributaries (including the Lost River drainage). The Mid-Columbia geographic area includes the Hanford Reach. Within this area, the USFWS has identified 16 bull trout sub-populations in the four watersheds (number of subpopulations in each watershed): Yakima River (8), Wenatchee River (3), Entiat River (1), and Methow River (4). Historically, populations of bull trout occurred in larger areas of the four tributaries and in the mainstem Columbia River. However, bull trout are thought to have been extirpated in 10 streams within this area, including the Hanford Reach. The USFWS also identified 3 subpopulations of bull trout within the Walla Walla River (Lower Columbia River geographic area) (63 FR 31647).

Bull trout have been documented both in the Rocky Reach, Rock Island, Wells, Wanapum, and Priest Rapids reservoirs (Bioanalysts Inc. 2004). Current information also suggests the occasional presence of bull trout in the Hanford Reach (Gray and Dauble 1977; Pfeifer et al. 2001). A bull trout radio-telemetry study conducted by Grant County Public Utility District in 2001 through 2003 found that *"only one of the 79 tagged bull trout migrated downstream past Wanapum Dam. This trout ultimately moved downstream through Priest Rapids Dam. This observation indicates that few bull trout migrate through projects owned by Grant County PUD"* (Stevenson et al. 2003).

Additional documentation indicates limited use of the unobstructed portion of the Columbia River between McNary and Priest Rapids dams. During the study years 2001 through 2004, Mahoney et al. (2006) did not observe migrating radio-tagged bull trout between the upper Walla Walla drainage and the Columbia River. However, one tagged bull trout was detected on January 31, 2007, moving downstream toward the Columbia River, which represents the first empirical evidence of Walla Walla Basin bull trout using the Columbia River (Anglin et al. 2009).

Bull trout are not likely to reside or spawn in the Hanford Reach, and those observations in the Hanford Reach are likely either displaced fish or migrating fish passing through the reach (Poston 2010). Fish passage data from hydroelectric projects immediately above (Priest Rapids Dam) and below (McNary Dam) the Hanford Reach support this. For example, from 2006 through 2011, only a single bull trout was observed (on July 17, 2007) migrating upstream from the Hanford Reach at the Priest Rapids Dam adult counting stations. Similarly, from 2001 through 2011, only 1 bull trout was observed (on December 21, 2004) passing upstream at the McNary Dam adult counting stations. Fish Passage Center data from 1998 through 2011 (Fish Passage Center website) indicate that bull trout were not sampled passing downstream through the juvenile collection system at McNary Dam, supporting the premise that juvenile bull trout hatch and remain to rear in cold headwater tributaries such as the Yakima and Walla Walla basins and likely do not use the mainstem Columbia River between McNary and Priest Rapids Dams for rearing.

Although the Hanford Reach may not have habitat suitable to support a subpopulation of bull trout year-round, mainstem portions of the Columbia River such as the Hanford Reach are known to provide essential FMO habitat where a combination of water depth, lower velocities, comparatively warmer water, and availability of food provide suitable habitat for at least a portion of the year (69 FR 59996). The Hanford Reach is critical habitat for bull trout based on its functionality as a migration corridor (Poston 2010). The mainstem Upper Columbia River Critical Habitat Unit is essential for maintaining bull trout distribution within the geographic region of the Mid-Columbia and conserving the fluvial migratory life history exhibited by many of the populations from adjacent core areas (75 FR 63898).

4.0 HANFORD ACTIVITIES POTENTIALLY AFFECTING LISTED SALMONIDS IN THE HANFORD REACH

This section describes the types of RL actions and facilities at the Hanford Site that could impact listed steelhead, spring Chinook salmon, bull trout, or their critical habitat within the Hanford Reach. It also notes which actions will have *no effect* on listed species or actions that *may affect, but not likely adversely affect* listed species or their habitats.

Threatened or endangered fish species in the Columbia River may be affected by Hanford operations in several ways. General categories of activities include:

- waste site remediation and facility demolition activities that occur near or within the river
- construction of new facilities near or within the river
- water withdrawals to support Hanford operations
- industrial or storm water discharges to the Columbia River
- groundwater remediation actions that may affect groundwater entering the river
- groundwater monitoring near or within the river
- other monitoring and research activities that may affect biota, water, or sediments
- pesticide applications near the river.

Each activity is described in greater detail below, and determinations regarding the potential effects of these actions on listed steelhead, spring-run Chinook salmon, bull trout, and their critical habitats are provided. When evaluating potential effects on bull trout critical habitat, RL considered each of the nine primary constituent elements defined in 75 FR 63898. The potential significance of many of these effects may depend on the particular setting where the action takes place. Therefore, RL has considered determinations based on whether the action takes place above the OHWM, on the shoreline between the OHWM and the edge of the river (wetted perimeter), or within the water. A summary of these effect determinations is provided in Table 3.

Table 3. RL Hanford Site Project Activities that Potentially Could Affect Listed Salmonids or their Critical Habitat

Activity Type	Effect Determination for Activities by Setting		
	Upland to OHWM	OHWM to Wetted Perimeter	In Water
Waste Site Remediation and Demolition	No Effect	May Affect, Not Likely to Adversely Affect	Further Consultation Required
Construction	No Effect	Further Consultation Required	Further Consultation Required
Water Withdrawals	N/A	N/A	May Affect, Not Likely to Adversely Affect
Permitted Waste Water Discharges	No Effect	No Effect	May Affect, Not Likely to Adversely Affect
Groundwater Monitoring	No Effect	May Affect, Not Likely to Adversely Affect	N/A
Groundwater Treatment	No Effect	May Affect, Not Likely to Adversely Affect	N/A
Environmental Research	No Effect	No Effect	May Affect, Not Likely to Adversely Affect
Pesticide Applications	No Effect	May Affect, Not Likely to Adversely Affect	Further Consultation Required

This section identifies various ongoing projects as well as planned or potential projects for the Hanford Site that could affect steelhead, Upper Columbia River Spring-Run ESU Chinook salmon, bull trout, or their critical habitats within the Hanford Reach. Activities are described at a level of detail necessary to determine the severity of potential impacts on these species. For planned or potential actions, information is provided to the level of detail possible at this time, which in many cases is at a relatively generic level. Each summary lists the potential impacts that need to be considered along with actions to mitigate those impacts. For all actions that fall within a generic *may affect, not likely to adversely affect* determination, RL will notify NMFS and/or USFWS prior to project implementation and RL will provide sufficient project description and analysis to allow the agencies to concur with the generic determination for that specific action.

Future projects with the potential to affect these species that are significantly different from the types of work defined here or fall outside the protection requirements described below will be coordinated with NMFS and/or USFWS, and RL will enter into formal or informal consultation, if needed, prior to taking actions that could affect these listed species or their critical habitats.

4.1 WASTE SITE REMEDIATION AND DEMOLITION

Waste site remediation on the Hanford Site generally consists of sampling and characterization, excavation and removal of soil, debris, concrete, followed by close-out sampling and backfill. Originally, many waste sites on the Hanford Site were near the river. These sites were associated with the reactor areas and the fuel production activities in the 300 Area and included both liquid and solid waste. RL prioritized remediation of sites along the Columbia River to minimize releases to groundwater and the river, so most of these sites have been remediated, interim closed-out, and are awaiting final records of decision under CERCLA. The majority of the waste sites remaining on the Hanford Site are located in the upland areas, well away from the Columbia River. Remediation at these sites, with approved storm water plans, is unlikely to cause any effects on listed salmonids or their habitats.

Several waste sites exist between the top of the floodplain and the OHWM. Although these projects occur outside of designated critical habitat, surface runoff could be considered an adverse risk to Upper Columbia River Spring-Run ESU Chinook salmon, steelhead, bull trout, or their critical habitat if runoff material results in the state water quality standards being exceeded or in siltation of, or the introduction of harmful contaminants to, a potential or known steelhead spawning area. Each project occurring along the shoreline with the potential for creating impermeable surfaces or destabilizing slopes will have an approved Stormwater Pollution Prevention Plan (SWPPP) in place to prevent potential impacts.

There also are a few identified waste sites remaining that extend beyond the OHWM of the Columbia River (Table 4), while others could be identified or reclassified at any time. Although final decisions have not been made for each identified location, some sites may be remediated while others may be left in place. Remediation designs are not available for these projects at this time, but designs will be thoroughly evaluated as part of the Ecological Compliance Review that is performed prior to the start of any project. Remediating these waste sites will remove the sources of contamination, if present, and thus prevent further movement of contaminants toward the river by groundwater.

The majority of these remaining sites consist of small segments of pipelines or spillways that extend from the upland area beyond the OHWM. Remediation of this type is expected to disturb less than 500 m^2 (5,382 ft^2) below the OHWM at a given site. However, some identified waste sites are associated with unplanned releases and dumping sites that extend over larger areas. For example, the current boundary of the 100-F-59 waste site is 6,000 m^2 (65,000 ft^2), all occurring below the OHWM but above the ordinary low water mark (OLWM). Remediation in these areas would be performed during seasonal low flows (August 1 through February), and would be conducted outside of the wetted perimeter of the river. RL will provide project-specific details to NMFS and USFWS as they are developed for concurrence. Any excavation that would impact the wetted perimeter of the river will require further coordination and/or ESA consultation with the respective agencies.

Table 4. Waste Sites that Extend Beyond the OHWM of the Columbia River and Their Current Status

Site Number	Site Name	Status
300-257	309 Process Sewer to River	Final - Closed Out
300 RLWS	300 Area Radioactive Liquid Waste Sewer, 300 Area RLWS	Inactive
300-15	300 Area Process Sewer System	Inactive
300-257	309 Process Sewer to River	Final - Closed Out
600-334	CMX Building	Final - Closed out
100-B-15	100BC River Effluent Pipelines, 100BC River Lines	Inactive
100-D-60	100D River Lines, 100D/DR River Effluent Pipelines	Inactive
100-D-65	116-D-5 Outfall Spillway, 1904D Spillway, 100-D-60:1 Flume	Interim – Closed Out
100-D-66	116-DR-5 Outfall, 1904-DR Spillway, 100-D-60:1 Flume	Interim – Closed Out
100-D-67	D Island, D Island Contamination	Interim – No Action
100-D-8	105-DR Process Sewer Outfall Site, 1907-DR, Undocumented Liquid Waste Site	Interim – No Action
100-D-50	100-DR Water Treatment Facilities Underground Pipelines	Inactive
100-F-39	100F River Effluent Pipelines, 100F River Lines	Inactive
100-F-59	Riparian Area Contamination Originating from 128-F-2	Inactive
100-H-34	100H River Effluent Pipelines, 100H River Lines	Interim – Closed Out
100-H-36	116-H-5 Spillway, 1904-H Spillway, 100-H-34:1 Flume (Spillway)	Interim – No Action
100-H-54	GPERS 100-H Shoreline Survey Unplanned Release	Interim – No Action
100-K-111	Effluent Seepage Area from 116-K-2	Inactive
100-K-113	100KW Columbia River Effluent Pipeline	Inactive
100-K-114	100KE Columbia River Effluent Pipeline	Inactive
100-K-80	100KW River Effluent Pipeline, 100KW River Line	Inactive
100-K-96	100KE River Effluent Pipeline, 100KE River Line	Inactive
100-N-104	Raw Water Overflow Spillway	Interim – Closed Out
100-N-77	River Line from 1908-N Outfall, 100N River Effluent Pipeline	Inactive
100-N-79	1908 N Outfall Structure, 1908-N Spillway, 100-N-77:1 Flume	Interim – Closed Out
100-N-80	River Line from 1908-NE Outfall	Inactive
100-N-84	100-N 100-N Miscellaneous Pipelines	Interim – Closed Out
100-N-102	100-N Potentially Contaminated French Drains	Interim – Closed Out
100-N-103	100-N Steam Condensate French Drains	Interim – No Action
100-N-61	100-N Water Treatment and Storage Facilities Underground Pipelines	Interim – Closed Out
100-N-62	100-N 105-N, 109-N, 163-N, 182-N, 183-N and 184-N Underground Pipelines	Interim – Closed Out
100-N-63	100-N Reactor (1314-N. 116-N-1 and 116-N-3) TSD Underground Pipelines	Interim – Closed Out
100-N-64	100-N Reactor 105/109-N Cooling Water Effluent Underground Pipelines	Interim – Closed Out
100-N-84	100-N 100-N Miscellaneous Pipelines	Interim – Closed Out
100-N-87	116-N Ventilation Stack Piping and French Drain	Interim – Closed Out
100-N-95	Hanford Generating Plant (185-N) Septic Tank	Interim – Closed Out
120-N-3	163-N Neutralization Pit and French Drain	Interim – Closed Out

Water flows in the Hanford Reach are controlled by upriver dams, thus the water levels can change rapidly due to dam operations. Therefore, it is possible during the course of a shoreline remediation project that river fluctuations could cause an excavation to become inundated, even if the project is performed completely during seasonal low flows. Because these activities will usually occur at a time when juvenile outmigrating salmonids are not expected to be present, the excavations are not likely to pose a stranding risk. Any excavation that extends beyond the OHWM must be left in a condition that prevents any potential stranding between mid-February and late-July (the period when stranding-prone juvenile salmon and steelhead may be present in the river).

Removal of native riparian vegetation will be minimized, and whenever possible, projects will be located in areas where vegetation is already disturbed. Damaged vegetation will be replaced with native plants for erosion protection and restoration. In all cases, the use of heavy equipment below the OHWM will be minimized. Wherever possible, such as in support or access areas, vegetation will be cut or mowed rather than grubbed or completely removed.

All fill material used below the OHWM will be in-kind to native shoreline materials (ancestral Columbia River cobble from local borrow sources). These materials are relatively free of fines and are relatively stable under current river conditions, and should result in minimal releases of sediment following completion of the shoreline projects and subsequent inundation by higher river levels. Any project that installs non-native substrate (such as basalt rip-rap), or installs permanent structures (such as retaining walls) below the OHWM, will require additional consultation with the respective agencies. Complex shorelines and riverbed features provide refuge for many life stages of salmonids, including emergent fry, yearlings, and adults. Project designs will maintain as much of the natural shoreline configuration as possible, and/or will incorporate mitigation measures into project design. Riverbank protection, when required for a given project, will use bioengineering rather than hard armor whenever possible. Projects will use accepted guidelines, such as Washington State Aquatic Habitat Guidelines Program, when designing streambank protection measures (WSAHGP 2002).

Waste site remediation actions that occur completely above the OHWM are expected to have *no effect* on listed species, assuming that best management practices (BMPs) are followed that prevent any run-off or impacts to the river or shoreline. Waste site remediation and supporting activities that are conducted below the OHWM, but outside the wetted perimeter of the river, will likely have a *may affect but not likely to adversely affect* determination regarding threatened or endangered species or their critical habitats. RL will notify NMFS and USFWS of these activities prior to implementation, and will supply sufficient project-specific information for the agencies to provide a concurrence with the generic determination. Any remediation activities that occur within water below the wetted perimeter of the river, or cannot be designed to meet all of the protective measures for shoreline protection, will require additional consultation with NMFS and USFWS to establish appropriate mitigation actions.

Demolition projects in upland areas occur frequently on the Hanford Site. When these activities are conducted with approved SWPPPs, *no effect* is expected to listed salmonids or their critical habitat. Any demolition activity that occurs below the OHWM, but outside of the wetted perimeter of the Columbia River, has the potential for impacting critical habitat. However, these projects will be conducted with approved SWPPPs, will follow BMPs, and will be followed by restoration using native materials. These projects will occur during low water periods, typically August 1 through February. Demolition projects performed below the OHWM but outside of the wetted perimeter *may affect but are not likely to adversely affect* listed salmonids and their critical habitats when conducted in this manner.

There are several structures remaining along the shorelines of the Columbia River, such as water intake buildings, that are expected to be removed in the future. Any demolition activities extending into the water will require further ESA consultation with the respective agencies.

4.2 NEW AND ONGOING CONSTRUCTION ACTIVITIES

Various construction activities on the Hanford Site could occur in the nearshore areas of the Columbia River, but above the OHWM. These may include, but not be limited to, infrastructure installation and maintenance activities that support the Hanford Site missions. Any new construction activities or ongoing activities will be conducted using BMPs and a SWPPP, which will ensure state water quality standards are not exceeded, and runoff does not occur near or affect a known or potential steelhead spawning area. These projects will also undergo an Ecological Compliance Review that will ensure that species or habitat impacts are avoided or mitigated; if the review determines that adverse impacts may occur, NMFS and USFWS will be contacted for further consultation. Construction activities performed in this manner are expected to cause *no effect* on listed salmonids or their critical habitat. No permanent structures will be installed along the shoreline below the OHWM without further ESA consultation with the respective agencies.

4.3 WATER WITHDRAWALS

Currently there are three permanent water pumping stations at RL facilities along the Columbia River with potential to impact juvenile fish. These are located at 100-B/C, 100-D, and 300 Areas.

181-B/C and 181-D Pumping Stations. These stations supply raw water from the Columbia River to the 200 East and West Areas and the other 100 Areas. Each of these pump stations contains several functional pumps, each capable of pumping approximately 631 L/s (10,000 gal/min). Current Hanford Site water use averages about 3,800 m^3/day (1,000,000 gal/day). To support this level of water use, two pumps at one of the facilities are activated for 3 to 4 hours every 2 to 3 days to maintain the water level in the raw water reservoirs located near each pump station. The screens at these pumping stations were installed in 1996, and have no moving parts, openings no greater than 1.75 mm (0.7 in), and an air backwash system to keep them free of debris. Water velocity through the screens is less than 0.1 m/s (0.3 ft/s). These screening systems meet the NMFS criteria for active screen systems (NMFS 2011b). Steel plates cover the pumphouse inlet channels to seal off openings between the pump house and the river.

300 Area Pumping Station. Fish screens at the 300 Area Pumping Station, which provides small amounts of raw Columbia River water to the 331 Aquatic Laboratory fish tanks, were evaluated and modified for compliance with WDFW requirements in 1995. Screen mesh size and approach velocity standards in 1995 (NMFS 1995) were similar to modern standards (NMFS 2011b).

In the past, divers were used periodically to clean intake screens, but this has not occurred in at least 10 years. If this were to occur in the future the process could create some disturbance to the riverbed. However, appropriate approvals or permits would be obtained prior to any in-water cleaning actions.

There are no new permanent water withdrawal systems planned for the Hanford Site. If a new system is proposed for installation, it will need to be reviewed, approved, and permitted by appropriate agencies such as WDFW, Washington Department of Ecology, and the U.S. Army Corps of Engineers. Native American Tribes may also be consulted before final designs are developed. The design of any new water withdrawal system would have to meet all the regulatory requirements and mitigation strategies for this type of activity. Any new water withdrawal systems will also include consultation with NMFS and USFWS under Section 7 of the ESA as part of the review process.

Minor withdrawals: Small-scale, temporary water withdrawals may be required to support specific projects. These withdrawals could be in the range of ten to several hundred gal/min, and would consist of a pipe placed in the river where needed. If such withdrawals are required, the pipe will have a screen that meets the current NMFS criteria for juvenile fish protection regarding pore size, approach velocity, and open area, and will be sized to account for the anticipated pumping rates. The site ecological compliance staff will work with these projects to identify locations for the withdrawal pipe and seasons when pumping can be accomplished with minimal impact to migrating or rearing juvenile salmon. The staff will work closely with NMFS and/or USFWS when needed to ensure adverse impacts are avoided. For instance, ecological compliance staff worked with NMFS to develop a means to safely withdraw water to support the Apatite Barrier project near the 100-N Area without harming juvenile salmon or steelhead (CHPRC 2010b). If any future minor withdrawals are needed, similar BMPs will be employed, and NMFS and USFWS will be notified prior to initiation of the withdrawal.

All existing water intake structures on the Hanford Site meet the NMFS criteria for protection of juvenile fish. The intake screens at the Site's primary intake structures have an active, air backwash cleaning system. None of the intake structures are located in steelhead spawning areas (Figure 8). Because all water intakes meet the current standards for the protection of juvenile fish and none are located near potential spawning areas, continued water withdrawal to support Hanford Site operations *may affect, but are not likely to adversely affect* listed salmonids. Although no new permanent withdrawals are planned, any new structures would require Section 7 consultation with the NMFS/USFWS.

4.4 PERMITTED WATER DISCHARGES

The EPA permits wastewater discharges to surface waters of the Columbia River under the National Pollution Discharge Elimination System (NPDES – 40 CFR 122). RL does not currently have any discharges to the Columbia River requiring an NPDES permit under the federal program. However, four

Washington Department of Ecology state waste discharge permits currently are in effect at the Hanford Site that allow releases of liquid wastes to the ground. The permits are for the 200 Area Effluent Treatment Facility (ST-4500), the 200 Area Treated Effluent Disposal Facility (ST-4502), Miscellaneous Streams (ST-4511), and the 200 West Area Evaporative Sewage Lagoon (ST-0045514). DOE is the holder of all state waste discharge permits.

Two Department of Ecology general permits for sand and gravel also are in effect: Concrete Batch Plant (WAG-50-5150) and Pit 30 Quarry (WAG-50-5181). These general state permits provide coverage for discharges of process water, storm water, and mine dewatering activities associated with sand and gravel operations and rock quarries.

Additional information about the Waste Water Discharge and Sand and Gravel permits can be found on the Washington State Department of Ecology website at http://www.ecy.wa.gov/programs/nwp/permitting/WWD/.

Any future permitted groundwater discharges on the Hanford Site would be expected to have *no effect* on listed salmonids or their critical habitats. Although expected to have minimal effect, permitted discharges to the Columbia River may affect the river environment, and would be assigned a *may affect, not likely to adversely affect* determination regarding listed salmon, steelhead, and bull trout.

RL does not currently anticipate the need for an NPDES permit. If such a need were to arise, RL would consult with NMFS and USFWS as part of the permit application and approval process.

4.5 GROUNDWATER MONITORING

Legacy wastes released to the soil have migrated through the vadose (unsaturated) zone and have reached the groundwater. Some contaminants have moved laterally with the groundwater as plumes to reach the Columbia River. The sources of these plumes are now-inactive waste or process ponds, ditches, cribs (similar to a sanitary septic tank), trenches, French drains, and various types of injection wells (also known as "reverse wells"). RL has taken steps to protect the Columbia River and groundwater by terminating all unpermitted discharges in the central Hanford Site, remediating the former liquid waste sites in the 100 and 300 Areas, containing groundwater plumes, and reducing the mass of primary contaminates through remedial actions such as pump-and-treat systems (DOE 2014).

Thousands of wells have been constructed on the Hanford Site since the early half of the 20th century beginning with early settlers drilling and hand digging wells for drinking water, to the drilling of wells to support the Site's nuclear weapons production (starting in the 1940s), to the installation of wells for the Site's environmental cleanup mission (starting in the 1990s). All known wells on the Hanford Site are tracked in the Well Information and Document Lookup database. Recognized well types include aquifer tubes, borings, groundwater wells, hosted piezometers, independent piezometers, piezometer hosts, soil tubes, lysimeters, and vadose wells (Table 5). Each well receives a unique Hanford identification number. A total of 12,030 wells have been assigned unique identification numbers as of the end of 2013, with 4,059 wells still in use. Wells currently in use include 2,960 groundwater and vadose wells, 122 piezometers within host wells, 79 lysimeters, 511 aquifer tubes, and

387 soil tubes. Of the 12,030 wells drilled, 7971 wells are candidates for decommissioning or have been decommissioned. All construction, maintenance, and decommissioning of wells on the Hanford Site are in accordance with Washington State provisions of WAC 173-160 (DOE 2014).

Table 5. Hanford Site Well Types (source: DOE 2014)

Well Category	Description
Aquifer Tube	A groundwater monitoring site installed along the river shoreline. Generally consists of a small diameter tube (less than one inch) and screen installed using push technology near the water table.
Boring	A borehole or direct push that was decommissioned immediately after drilling. Decommissioning generally would have been performed before the drill rig was removed from the site.
Groundwater Well	A well that is constructed with the open interval extending below the water table. This is the general case and should not be used if the site could be otherwise classified as an aquifer tube, piezometer, or piezometer host.
Hosted Piezometer	A groundwater monitoring well that is constructed inside of a host well. In most cases, hosted piezometers are one and one-half inch in diameter with the open interval extending below the water table.
Independent Piezometer	Small diameter, independent, groundwater monitoring well not constructed inside of a host well. In most cases, the independent piezometers are one and one-half inch in diameter.
Lysimeter	Generally an in-situ open bottom cylindrical core where the top is coincident with the ground surface, and with walls that prevent horizontal movement of moisture. A lysimeter is used to measure moisture or contaminant changes through time over a specific depth interval.
Piezometer Host	A well with one or more piezometers constructed inside it.
Soil Tube	Vadose zone monitoring site. A small diameter tube (less than two inches in diameter) and possibly a screen are left in place after the drilling is completed for sampling.
Vadose Well	A vadose zone monitoring site where casing (greater than two inches in diameter) is left in place after drilling activities are completed. May have a screen, open bottom, or may be closed.

In 2014, 977 wells and 324 aquifer tubes were sampled; many were sampled more than once for a total of 4,654 sampling events (DOE 2015c). Well monitoring follows a standard procedure. Before a sample is taken, wells are purged of a volume of water equal to three water columns. In accordance with Hanford Facility Dangerous Waste Permit, Revision 8C, Permit Number WA7 89000 8967, if contaminated (higher than permit criteria) purge water is generated, it is contained in tanker trucks and sent for disposal. Non-contaminated purge water may be discharged to the surrounding ground surface. No contaminated water is discharged on the ground, and no water is discharged directly to the river.

In addition to routine sampling, occasional hydrologic testing is performed to characterize the aquifer. This involves pumping water from the well continuously for several days. This is only done a few times per year and rarely on the wells near the river. Strict procedures and BMPs are followed to prevent erosion and all discharges are performed in accordance with the Hanford Site Miscellaneous Streams Discharge Permit (ST-4511). Except as authorized by a wastewater discharge permit, no discharge or runoff of wastewater is allowed to any surface waters, including the Columbia River. Well installation and decommissioning are routine activities that will continue to occur at Hanford for the foreseeable future. During 2014 RL completed 30 new wells and aquifer tubes for monitoring, remediation, and characterization and decommissioned 4 wells that were no longer needed (DOE 2015c). Some of these activities may occur within the 100-year floodplain. Permanent wells will not be installed below the OHWM, but boreholes or other temporary wells may be constructed for aquifer or substrate characterization. The physical impact to the environment from these activities is generally minor because of the small area affected.

Drilling a new well often involves clearing and/or leveling an area large enough for the drill rig and support equipment (typically 600 m^2 [6,500 ft^2]). The size of the area can vary, depending on the type of drilling equipment used. The quality and sensitivity of the habitat in the area also influences the size of the drill pad. Where high quality or sensitive habitat, including riparian or sagebrush steppe is present, all efforts are made to keep the area of disturbance as small as possible. RL evaluates each proposed project and identifies requirements that will minimize disturbance to high quality or sensitive habitats or to protected species (DOE 2013b).

Well decommissioning consists of bringing in equipment either to pull the well casing or perforate it, fill it with grout to the surface, and then restore the pad with native vegetation. Decommissioning wells generally disturbs less area than installing them because clearing and leveling the land surface is seldom required. Land disturbance from this activity is often only from vehicle tracks.

Groundwater entering the Columbia River is monitored by installing small-diameter tubing in the shoreline to various depths (aquifer tubes). Access to these sites may be by driving a vehicle to the shoreline, when accessible, but is commonly by boat. The installation typically involves driving a 2.5- to 3.75-cm-(1- to 1-5 in.) diameter steel tube up to 10 m (30 ft) deep, along with an inner plastic sample tube, into the gravels using either a truck-mounted hydraulic ram or a hand-operated air-driven ram. Once the desired depth is reached, the outer casing is removed, leaving the 0.6-cm (0-24 in.) diameter sample tube in place. Sample tube locations are below the 100-year flood plain and generally just above the annual low-water shoreline. Installation usually takes place above the active waterline during the months of lowest river flow (August to November), but may occur in up to several feet of water. The sample tubes typically extend well above the water line, often to above the OHWM. Thus, sampling usually can be conducted with minimal in-water disturbance.

The impacts from aquifer tube monitoring on shoreline habitat are considered to be minimal, consisting of temporary disturbance to vegetation by foot traffic and occasionally by driving a vehicle to the shoreline (only done in areas that are accessible). No excavation is conducted and no permanent damage is done to vegetation.

Most groundwater monitoring activities occur above the OHWM and are expected to cause *no effect* on listed salmonids or their critical habitat. Activities that occur below the OWHW but above the OLWM *may affect but are not likely to adversely affect* listed salmonids or their critical habitat. RL will notify NMFS and USFWS prior to installation of any new groundwater monitoring devices or wells below the OHWM, and will provide sufficient information for the agencies to concur with the generic determination regarding these impacts.

4.6 GROUNDWATER TREATMENT

RL is using several techniques of groundwater treatment to reduce the amount and extent of contaminants reaching the Columbia River. These techniques include pump-and-treat systems, in-situ groundwater treatment, and permeable barriers.

Pump-and-treat systems consist of a set of groundwater wells designed to clean up groundwater contamination. Wells are installed down gradient of a contamination plume to pump the water out of the ground. In the case of systems adjacent to the Columbia River, the groundwater is treated to remove contaminants, and is then re-injected upgradient of the plume. These wells are not within the 100-year floodplain; therefore, shoreline habitats are not affected. Although treated groundwater will eventually reach the Columbia River, the result will be an improvement of water quality entering the river. Currently, there are five pump-and-treat systems operating on the Hanford Site within 2 km (1 mi) of the Columbia River and additional systems in the 200 West Area. There are three pump-and-treat systems (KR-4, KX, and KW) in the 100-K Area with 42 extraction wells and 18 injection wells capable of treating 4.6 million liters (1.2 million gallons) of groundwater per day and two pump-and-treat systems (DX and HX) between the 100-D and 100-H Areas with 68 extraction wells and 29 injection wells capable of treating 7.6 million liters (2 million gallons) of groundwater per day depending on the season.

A permeable reactive barrier (also known as the In-Situ REDOX Manipulation Project) was installed in the 100-D Area for in-situ chemical treatment of hexavalent chromium. The barrier was designed to intersect the portion of the groundwater plume with highest concentration of hexavalent chromium. The treatment area, which is approximately 680 m (2,250 ft) long with 65 wells, was injected with sodium dithionate ($Na_2O_6S_2$), which reacts with the metal in the sediments creating a reducing zone. As groundwater moves through this zone, hexavalent chromium is reduced to trivalent chromium. The trivalent chromium precipitates out and is thus prevented from migrating to the river. The project was implemented to prevent the continual discharge of hexavalent chromium to the river where it may impact aquatic organisms, including salmonid eggs and fry. The treatment makes the groundwater anoxic, but a numerical model predicts 75 to 95% oxygen saturation at the river. Air entrapment caused by water table fluctuations has the most impact on dissolve oxygen concentration (Williams et al 1999). No fall Chinook salmon spawning occurs where groundwater from the treatment area enters the river and less than one percent of the area is suitable spawning habitat (Mueller and Geist 1998). In 1999 RL transmitted a BA that determined that there would not be a significant impact to listed salmon or steelhead (DOE 1999b). In 2010, due to breakthrough of contaminants at the barrier, it was decided that the barrier would no longer be actively maintained and that expansion of the pump-and-treat system (i.e., extraction wells located down gradient of the barrier) would be used to address the breakthrough and provide a protective interim remedy.

A 311-m (1,020-ft) permeable reactive barrier for strontium-90 is located in the 100-N Area. Strontium-90 is sequestered by injecting calcium-citrate phosphate solution into the aquifer. Biodegradation of the citrate results in apatite precipitation as the free calcium and phosphate combine to form apatite. Strontium (and strontium-90 ions) in groundwater substitute for calcium ions through cation exchange and are incorporated in the mineral matrix during apatite crystallization. RL recently expanded this barrier to a length of 762 m (2,500 ft). The potential impacts of the 100-N apatite barrier on salmonids evaluated by Poston (2010) identified increased cation concentrations and dissolution of metals as the primary potential impacts. It was determined that factor was likely to have a detectable effect on migrating juvenile salmon or steelhead.

Most recently, a system designed to sequester uranium present in the soil and groundwater beneath a portion of the 300 Area was constructed. Uranium sequestration involves infiltrating/injecting phosphate solutions to the vadose zone and periodically rewetted zone to sequester, or bind, residual mobile uranium to form insoluble minerals. Uranium sequestration will also be used in the top of the aquifer to reduce the mobility of uranium that may be mobilized during the vadose zone treatment process. Uranium sequestration is anticipated to reduce the mass of soluble uranium entering the groundwater in this area, thereby reducing the restoration time frame for uranium in the groundwater. Uranium in the groundwater will be monitored until cleanup levels are met. The potential impacts of the uranium sequestration project on the three ESA-listed salmonids and their critical habitat were evaluated in support of informal consultations with USFWS and NMFS (DOE 2015b).

In addition, RL has constructed a bioventing system for in-situ bioremediation of deep vadose zone petroleum contamination in the 100-N Area. Bioventing is a process in which oxygen is added by forcing air through vadose zone soils to enhance the population of naturally occurring bacteria to metabolize and remove petroleum contaminants from the vadose zone. Petroleum contamination in the aquifer is being removed using a polymer "smart sponge" that selectively absorbs petroleum products from the groundwater within the wells observed to have a free-floating petroleum product; currently this is performed at only one well. RL is proposing to use biosparging to further address petroleum contamination in the aquifer. Similar to bioventing, biosparging will force air into the aquifer to enhance the population of naturally occurring bacteria in the aquifer to metabolize petroleum contamination in the aquifer.

Operation of groundwater treatment systems will benefit the Columbia River ecosystem by improving the quality of the groundwater entering the river. Groundwater treatment activities occur above the OHWM and are expected to cause *no effect* on listed salmonids or their critical habitat.

4.7 ENVIRONMENTAL RESEARCH

Environmental research is conducted to monitor the distribution of radionuclides and other contaminants in the environment, and to perform research on various biotic, abiotic, and cultural resource concerns. This activity consists of various types of biotic and abiotic sampling along with ecological evaluations and data gathering. Sampling supports contaminant characterization in river sediments or in the porewater below the surface of the riverbed.

Abiotic sampling inside the wetted perimeter of the river includes surface water, sediment, and porewater samples. Samples are obtained with jars or scoops, small pumps, small ponar samplers, seep samplers, aquifer tubes, or substrate probes. Sampling may take place on exposed shorelines when water levels are at a daily or seasonally low point or within submerged portions of the river. Seep samplers are installed by digging shallow (<1-m [3-ft]) holes in exposed shoreline areas to bury tubes, aquifer tubes are placed in the shoreline substrate up to 10 m (30 ft) deep using a hydraulic hammer, while substrate probes are placed into the river bottom using a weighted frame. Care will be taken during all sampling activities to not leave depressions where juvenile salmon or steelhead could become stranded. These sampling activities are not expected to impact habitat integrity because very small sample quantities are collected on an intermittent basis.

Water, sediment, and shoreline sampling/monitoring activities will occur on a sporadic and intermittent basis. These activities include small volumes of water (usually <20 L [5 gal]) and small masses of sediment (<2 kg [4.4 lb]). These activities are not expected to result in significant levels of harassment due to their short term and sporadic occurrences. When these sampling activities are conducted outside of the wetted perimeter of the river, *no effect* on listed salmonids or their habitats are expected. When sampling will occur in the water, fish may be temporarily displaced due to noise disturbance associated with sampling devices. These disturbances are likely to have minimal effect on listed species or their habitats.

Selected fishes are routinely collected, usually by electrofishing or hook-and-line, throughout the Hanford Reach for various research purposes and for contaminant uptake monitoring. Other organisms, such as invertebrates and amphibians, may be surveyed or sampled to support ecological characterization and contaminant monitoring. Electrofishing will be conducted consistent with NMFS Electrofishing Guidelines (NMFS 2000). Hook-and-line sampling will be conducted primarily with artificial lures and in target species habitats. The use of natural bait will be minimized and only used as necessary to collect the desired number of target specimens when other techniques fail. The activities described above will only be conducted in accordance with Section 10 Incidental Take permits and WDFW Scientific Collection permits. Consequently, no unpermitted take/harassment of listed salmonids will occur during fish sampling activities.

Mitigation strategies for water/sediment sample collection will include avoiding critical times of the year and sensitive habitats such as spawning areas. Environmental monitoring activities will not be conducted in known spawning areas for steelhead (Figure 8) during the spawning period, until the point that spawning activity is documented as absent during aerial redd counts. RL performs annual aerial surveys for steelhead redds during May and June. If steelhead redds are located during the course of these surveys, protective measures will be put in place to minimize boat activities and avoid sampling in those areas. No sampling will occur within 10 m (30 ft) of a fall Chinook salmon redd. In addition, the general strategies developed to prevent capture, harassment, or impacts from riverbed modifications will prevent any adverse effect on steelhead, Upper Columbia River Spring-Run ESU Chinook Salmon, or bull trout or their critical habitats from sampling and ecological evaluation activities. Adherence to stipulations included in the required WDFW Scientific Collection Permit, and subcontractors ESA Section 10 Incidental Take Permits, will mitigate for impacts associated with fish collection.

Environmental sampling and monitoring activities are usually small-scale and short-duration actions. These activities are likely to cause noise at an intensity of <150 dB, and therefore are unlikely to cause physical injury to listed salmon, steelhead, or bull trout that can occur from other actions such as pile driving (Hastings 1995; NMFS 2012). The noise from boats used for access to sample and monitoring locations may have small, short-term behavior effects on listed fish species (NMFS 2012), but the amount of boat traffic due to Hanford-related environmental sampling and monitoring is expected to be relatively small compared to the typical daily recreational boat traffic on the Hanford Reach.

Environmental research activities that occur outside of the wetted perimeter of the Columbia River are expected to have *no effect* on listed salmonids or their critical habitat. Environmental research activities that occur within the wetted zone of the river *may affect, but not likely to adversely affect* listed salmonids or their critical habitat. In 2008, NMFS concurred with this determination (NMFS 2008) and reaffirmed the determination in 2013 (NMFS 2013c).

4.8 PESTICIDE APPLICATIONS

Pesticide applications are occasionally used to control noxious weeds on the Hanford Site. All applications are performed by state-licensed applicators following procedures and application requirements defined specifically by EPA for each product. All upland noxious weed control applications will be performed under conditions that will not result in any runoff or drift to the Columbia River environment.

When pesticides are applied above the OHWM, label instructions are followed and appropriate buffer distances are established to ensure that the chemicals do not drift to the river. Therefore, pesticide applications above the OHWM are expected to have *no effect* on listed salmonids.

Historically, pesticides have not been applied in the Columbia River or in adjoining riparian areas. However, products that are EPA-approved specifically for application in aquatic environments potentially could be considered by RL to control noxious weeds in the nearshore environment. Application of EPA-approved pesticides below the OHWM that follow label instructions *may affect, but* *are not likely to adversely affect* listed salmonids. NMFS is currently consulting with EPA concerning a number of pesticides, and RL will monitor these discussions. If pesticide applications within or near the river are pursued, RL will carefully evaluate and select products based on their potential toxicity to salmonids, and will consult with NMFS and/or USFWS prior to application below the OHWM. Any deviations from these requirements will necessitate consultation with NMFS/USFWS prior to application.

5.0 MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT

Federal agencies are directed, under 305(b)(2) of the Magnuson-Stevens Act to consult NMFS regarding actions that are authorized, funded, or undertaken by that agency that may adversely affect EFH, defined as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." The Hanford Reach provides habitat for various life stages of Chinook and coho salmon and steelhead, and hosts the major spawning aggregation of Upper Columbia River bright fall-run Chinook salmon.

Most actions conducted by RL and its contractors occur in the terrestrial environment above the OHWM and are not expected to impact EFH. Mitigation methods that include silt fences, grading to prevent runoff, and project timing for actions close to the OHWM will prevent impacts to EFH. For any actions that occur between the OHWM and the wetted shoreline, RL and its contractors will take additional measures to avoid impacts to EFH, including monitoring the condition of the riparian vegetation and reestablishing native plants as necessary. Rearing juvenile fall Chinook salmon are highly associated with the nearshore environment and are vulnerable to stranding.

Best management practices to minimize impacts to EFH for fall Chinook and other anadromous salmonids include the following:

- All work occurring between the OHWM and the wetted shoreline will be performed during the low flow season (generally August 1 through February), a timeframe that falls outside of the emergence and rearing period for juvenile fall Chinook salmon.
- Any excavation that extends beyond the OHWM must be left in a condition that prevents any potential stranding while juvenile salmonids are present (between March and July).
- Any excavation work will include runoff prevention and restoration to re-establish native vegetation and to prevent soil erosion.
- Any fill material will be in-kind native shoreline materials from local sources.
- No in-water work will be performed by RL and its contractors without further consultation with NMFS.

These mitigation measures will substantially reduce impacts to EFH.

6.0 MANAGEMENT PLAN IMPLEMENTATION

This management plan is implemented primarily through the National Environmental Policy Act (NEPA) review process and the analogous CERCLA Remedial Investigation process. One aspect of these review processes is the Ecological Compliance Review, which evaluates proposed projects against regulatory criteria and RL natural resource management goals. Ecological compliance reviews for all projects with the potential to affect listed species or the Columbia River will include a consideration of these requirements and management procedures. These requirements and procedures pertain to RL and its contractors as they perform work under their operations contracts with RL.

RL's *Hanford Site Biological Resources Management Plan* (BRMP) (DOE 2013b) provides objectives and strategies for biological resource protection, monitoring, assessing impacts, and determining mitigation requirements for Hanford Site activities. BRMP-related monitoring may include annual spawning surveys, habitat evaluation, and contaminant monitoring. RL projects are required to rectify or replace all riparian habitats that are disturbed by RL Projects. Riparian areas and the Columbia River are among the habitats with the highest priority for protection.

RL abides by the belief that protecting habitat is a more cost-effective and prudent approach to resource management than restoring habitat that is lost or damaged. Therefore, every effort will be taken to ensure that RL and its contractors conduct activities in a manner that is protective of salmon, steelhead, and bull trout habitat. This includes following project-specific best management practices and considering the objectives of this plan in land management decision-making.

When possible, activities will be conducted during time periods or at places that avoid contact with steelhead, bull trout, and salmon. Good planning and construction practices will be used to minimize impacts to listed salmonids. For example, properly maintaining equipment to prevent loss of petroleum products, using erosion and sediment control measures, and disposing of construction debris in upland locations will prevent degradation of water quality. Where possible, contractors will incorporate provisions into their project plans that are beneficial for fish and wildlife habitat.

Future projects with the potential to affect these ESA-listed species that are significantly different from the types of work defined in this document will be coordinated with NMFS and/or USFWS, and RL will enter into formal or informal consultation, if needed, prior to taking actions that could affect these listed species or their critical habitats.

7.0 REFERENCES

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Assistant Secretary for Environmental Management

U.S. DEPARTMENT OF ENERGY | Richland Operations Office
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Executive Summary

This *Threatened and Endangered Species Management Plan for Salmon, Steelhead, and Bull Trout* defines the U.S. Department of Energy's (DOE) commitment to protecting the stocks of Upper Columbia River spring-run Chinook salmon (*Oncorhynchus tschawytscha*), Upper Columbia River steelhead (*Oncorhynchus mykiss*), and bull trout (*Salvelinus confluentus*) within the Hanford Reach of the Columbia River. The National Marine Fisheries Service (NMFS) is responsible for administering the *Endangered Species Act* (ESA) with regard to listed steelhead and Chinook salmon while the U.S. Fish and Wildlife Service (USFWS) is responsible for administering the ESA with regard to listed bull trout. In addition, federal agencies are required under the *Magnuson-Stevens Fishery Conservation and Management Act* (Magnuson-Stevens Act) Section 305(b)(2) and its implementing regulations (50 CFR 600) to consult with NMFS regarding actions that are authorized, funded, or undertaken that may adversely affect Essential Fish Habitat (EFH). As partial fulfillment of DOE's responsibilities under the ESA and Magnuson-Stevens Act, this plan constitutes a partial consultation between the DOE, NMFS, and USFWS. In this plan, DOE has agreed to request project-specific consultation under ESA Section 7 for remediation projects occurring below the wetted edge of the Columbia River.

The current revision (Revision 3) updates the plan to reflect the results of the NMFS's five-year review of the status of the Upper Columbia steelhead and Upper Columbia River spring-run Chinook salmon (NMFS 2016a), informal consultations that have occurred since the last revision, and recent changes on the Hanford Site.

Specific objectives of this management plan are to:

- Identify the types of actions and facilities at the Hanford Site that could impact listed steelhead, spring Chinook salmon, bull trout, or their critical habitat within the Hanford Reach.
- Identify means to avoid or minimize the potential adverse impacts of DOE actions and facilities on listed species.
- Identify which actions will have:
  - *No effect on listed species* – DOE usually will proceed with these actions without additional interactions with NMFS or USFWS.
  - *May affect, but are not likely to adversely affect listed species or their critical habitat* – DOE will provide NMFS and USFWS with information for concurrence with this finding on a project-by-project basis prior to project implementation.
  - Undetermined impacts – these actions will require specific formal or informal consultation under the ESA because of the potential to impact listed species or their critical habitat. Actions or activities not considered within this plan will fall into this category.

Hanford Site activities that have the potential for impacting salmonids include waste site remediation, construction, water withdrawals, permitted wastewater discharges, groundwater monitoring near the shoreline, groundwater treatment activities conducted near the shoreline, ecological and cultural research and monitoring programs, and pesticide applications. Potential effects include impingement and entrainment from water withdrawals, toxicity of wastewater discharges, shoreline and riverbed modifications that affect habitat, siltation from surface runoff, toxic modifications of groundwater plumes, harassment from boat traffic on DOE projects, noise, and incidental capture during biological monitoring activities. Given the present status of permits and the design and mitigation qualifications defined in this plan for these activities, none of the planned actions or potential effects is likely to adversely affect the listed salmonids within the Hanford Reach or modify critical habitat.

To ensure protective management of these listed species, DOE will ensure that Hanford Site contractors conduct all activities so as to preserve, protect, and perpetuate steelhead spawning, rearing habitat, and the migration corridor for spring Chinook adults and juveniles, as well as bull trout. Protection measures include the following best management practices (BMPs), as well as designing and implementing projects to meet the following criteria:

- Adverse impacts due to water withdrawal will be avoided by reducing the magnitude of water withdrawn from existing intakes, when possible, and ensuring all water diversions meet state of Washington and NMFS screening criteria or appropriate administrative controls, such as the timing of withdrawal.

- Heavy equipment use below the ordinary high water mark (OHWM) will be minimized. When heavy equipment below the OHWM is required, strict BMPs will be followed to prevent spills, sedimentation, and other potential impacts.

- No blasting or other loud percussive noises will occur below the OHWM without additional consultation with NMFS and/or USFWS.

- Removal of native riparian or emergent vegetation will be minimized. Whenever possible, projects in riparian areas will be located where vegetation is already disturbed; vegetation will be mowed when complete removal is not needed. Damaged vegetation will be replaced with native species for erosion protection. Whenever possible, hand-tools will be used for in-water work.

- Whenever possible, construction projects will not simplify the shoreline structure[1]. Modifications will be limited to shoreline areas that have been previously disturbed or will maintain as much of the natural shoreline configuration as possible, and will incorporate mitigation measures into project design to replace the shoreline configuration.

- When possible, riverbank protection, where required for a given project, will use bioengineering rather than hard armor[2]. Projects will use accepted Washington Department of Fish and Wildlife (WDFW) guidelines when designing streambank protection measures. DOE will consult with NMFS and USFWS when armoring projects are required.

- All fill material used below the OHWM will be in-kind to native shoreline materials (i.e., ancestral Columbia River cobble from local borrow sources). These materials are relatively free

[1] Shoreline simplification refers to any method that reduces the variation of the physical or biological environment along the waterway.
[2] Hard armor refers to structures placed on the shoreline to reduce erosion and consists of hard materials (e.g., stone, rock, boulders, concrete, sheet pile, gabions [stone-filled wire baskets], rock rip-rap).

of fines and are relatively stable under current river conditions; they should, therefore, result in minimal releases of sediment following completion of the shoreline projects and subsequent inundation by higher river levels. Fill will be placed and contoured so as to minimize the potential for stranding of juvenile fish. Materials will be "placed" on the banks rather than "dumped" to minimize river turbidity.

- Silt-loaded surface runoff from near-shore areas disturbed by DOE project activities will be minimized by avoiding impacts to shoreline vegetation and using accepted BMPs to control runoff and erosion. Adherence to stormwater management plans will reduce potential impacts from runoff to salmonid habitat.

- When working below the OHWM, but above the wetted perimeter, DOE project activities will minimize adverse impacts to listed salmonids by conducting disruptive activities at locations and during time periods when fish are absent or present in low numbers.

- No activities that could result in capture or harm to steelhead or spring Chinook salmon will be conducted without undergoing consultation with NMFS. No activities that would adversely modify critical habitats (the Columbia River and its riparian zone) or EFH, as defined in the Magnuson-Stevens Act, will be conducted without specific consultation with NMFS.

- No activities that could result in capture or harm to bull trout will be conducted without undergoing consultation with USFWS. No activities that would adversely modify critical habitat (the Columbia River and its riparian zone) will be conducted without specific consultation with USFWS.

If Hanford Site activities are carried out in accordance with this plan, they are not likely to significantly affect steelhead, spring Chinook salmon, or bull trout or modify their critical habitat. Activities conducted in accordance with this plan that include the BMPs described will most likely not require formal or informal consultation with NMFS or USFWS. However, DOE will coordinate with these agencies before project implementation and will provide sufficient information for them to determine this plan and BMPs being implemented. The general determinations of *no effect* or *not likely to adversely affect* (depending on the action) are applicable to the specific action. Some potential actions described in this plan, and any activities performed not in accordance with or described in this plan, will require formal or informal consultation, as appropriate, with the NMFS and/or USFWS as required by the ESA.

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ACRONYMS AND ABBREVIATIONS

BA	Biological Assessment[3]
BMP	Best Management Practices
BRMP	Hanford Site Biological Resources Management Plan
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DOE	U.S. Department of Energy
DOE-RL	U. S. Department of Energy, Richland Operations Office
DPS	Distinct Population Segment
Ecology	Washington State Department of Ecology
EFH	Essential Fish Habitat
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
OHWM	Ordinary High Water Mark
PNSO	Department of Energy Office of Science, Pacific Northwest Site Office
SWPPP	Stormwater Pollution Prevention Plan
USFWS	U.S. Fish and Wildlife Service
WDFW	Washington Department of Fish and Wildlife

[3] Both formal and informal consultations under ESA Section 7 require a written analysis to be submitted to NMFS or USFWS; this analysis is typically transmitted in a document referred to as a Biological Assessment or Biological Evaluation. The former is defined in regulation and is required under specific circumstances (Biological Assessments are only required for "major construction activities" as referred to in the National Environmental Policy Act of 1969). The latter is a generic term used to document analyses and Section 7 determinations when a Biological Assessment is not required. Both documents are for the same purpose, and hence for this document, only the term Biological Assessment is used.

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1.0 INTRODUCTION

Spring Chinook salmon (*Oncorhynchus tschawytscha*), steelhead (*Oncorhynchus mykiss*), and bull trout (*Salvelinus confluentus*) within the Hanford Reach of the Columbia River are listed for protection under the *Endangered Species Act* (ESA). This management plan documents the U.S. Department of Energy, Richland Operations Office (DOE-RL) commitment and approach to protect stocks of these species within the Hanford Reach. This plan also constitutes a partial consultation between DOE and the National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS) as required under the ESA[4]. Specific objectives of this plan are to:

- Identify the types of actions and facilities at the Hanford Site that could impact listed steelhead, spring Chinook salmon, bull trout, or their critical habitat within the Hanford Reach.
- Identify means to avoid or minimize the potential adverse impacts of DOE actions and facilities on listed species.
- Identify which actions will have:
  - *No effect* on listed species – DOE usually will proceed with these actions without additional interactions with NMFS or USFWS.
  - *May affect, not likely to adversely affect* listed species or their critical habitat – DOE will provide NMFS and USFWS with information for concurrence with this finding on a project-by-project basis prior to project implementation.
  - Undetermined impacts – these actions will require specific formal or informal consultation under the ESA because of the potential to impact listed species or their critical habitat. Actions or activities not considered within this plan will fall into this category.

Federal agencies are obligated under the *Magnuson-Stevens Fishery Conservation and Management Act* (Magnuson-Stevens Act) Section 305(b)(2) and its implementing regulations (50 CFR 600) to consult with NMFS regarding actions that are authorized, funded, or undertaken that may adversely affect Essential Fish Habitat (EFH). The Magnuson-Stevens Act defines EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." This plan represents a partial consultation with regard to the Magnuson-Stevens Act. DOE actions, if carried out in accordance with this plan, are not likely to adversely impact EFH.

[4] DOE has agreed to request project-specific consultation under the *Endangered Species Act* Section 7 for remediation projects occurring below the wetted edge of the river.

1.1 Hanford Site Background

The Hanford Site occupies most of the Columbia River shoreline between Priest Rapids Dam and the City of Richland (Figure 1). This stretch of the river comprises the last free-flowing portion of the Columbia River within the United States above Bonneville Dam.

Since the late 1980s, DOE's mission at the Hanford Site has been to cleanup and stabilize facilities, wastes, and contaminated areas associated with the Hanford Site's former role in nuclear weapons production from 1943 to the late 1980s. Currently, the primary mission at the Hanford Site focuses on environmental restoration, which includes remediation of contaminated areas, decontamination and decommissioning of site facilities, waste management, and related scientific and environmental research and development of waste management technologies. Completion of this mission requires a variety of activities that will occur within the Columbia River and on its shoreline possibly altering groundwater flows and/or composition entering the river.

The Hanford Site was developed during the World War II Manhattan Project as a site to produce plutonium for nuclear weapons. The first plutonium-production reactors at the Hanford Site used single-pass cooling systems that discharged cooling water directly to the Columbia River, relying on dilution to minimize impacts. Improvements in technology and operations protocols reduced the amount of contaminants discharged to the river by redirecting effluents to various land-based storage systems. The *Clean Water Act of 1977*, as amended, applies to discharges to surface waters in the United States. At the Hanford Site, regulations are applied through the U. S. Environmental Protection Agency (EPA) Administered Permit Programs: The National Pollutant Discharge Elimination System (NPDES, 40 CFR 122). DOE does not currently have any discharges to the Columbia River requiring permits.

The Hanford Site comprises 1,517 km^2 (586 mi^2), subdivided into various DOE-administered operational areas with specific functions. Of these, the six 100 Areas and the 300 Area are closest to the Columbia River and have the most potential for affecting listed salmonids. The Hanford Site includes a 789 km^2 (305 mi^2) area that was designated as the Hanford Reach National Monument in 2000. DOE is the landowner of the entire Hanford Site, although portions of the Monument are managed by USFWS.

Steelhead are present in the Hanford Reach all year. Most adults move into the Hanford Reach from August to November where they may reside for 6 to 8 months near shorelines at depths less than 3 m (10 ft). Juveniles usually spend 1 to 3 years in freshwater before migrating downstream to the ocean. Outmigration through the Hanford Reach usually occurs between April and June. Limited spawning may occur within the Hanford Reach between February and early June with peak spawning in mid-May. Fry emerge from the nest 2 to 3 weeks after hatching and school near the margins of the river and over shallow water gravel bars. Streamside vegetation and submerged cover provide protection from predators, moderate temperatures, and colonization sites for steelhead food sources. As fry grow larger they feed primarily on food found along the bottom of the river (e.g., midges, mayflies, stoneflies, beetle larvae).

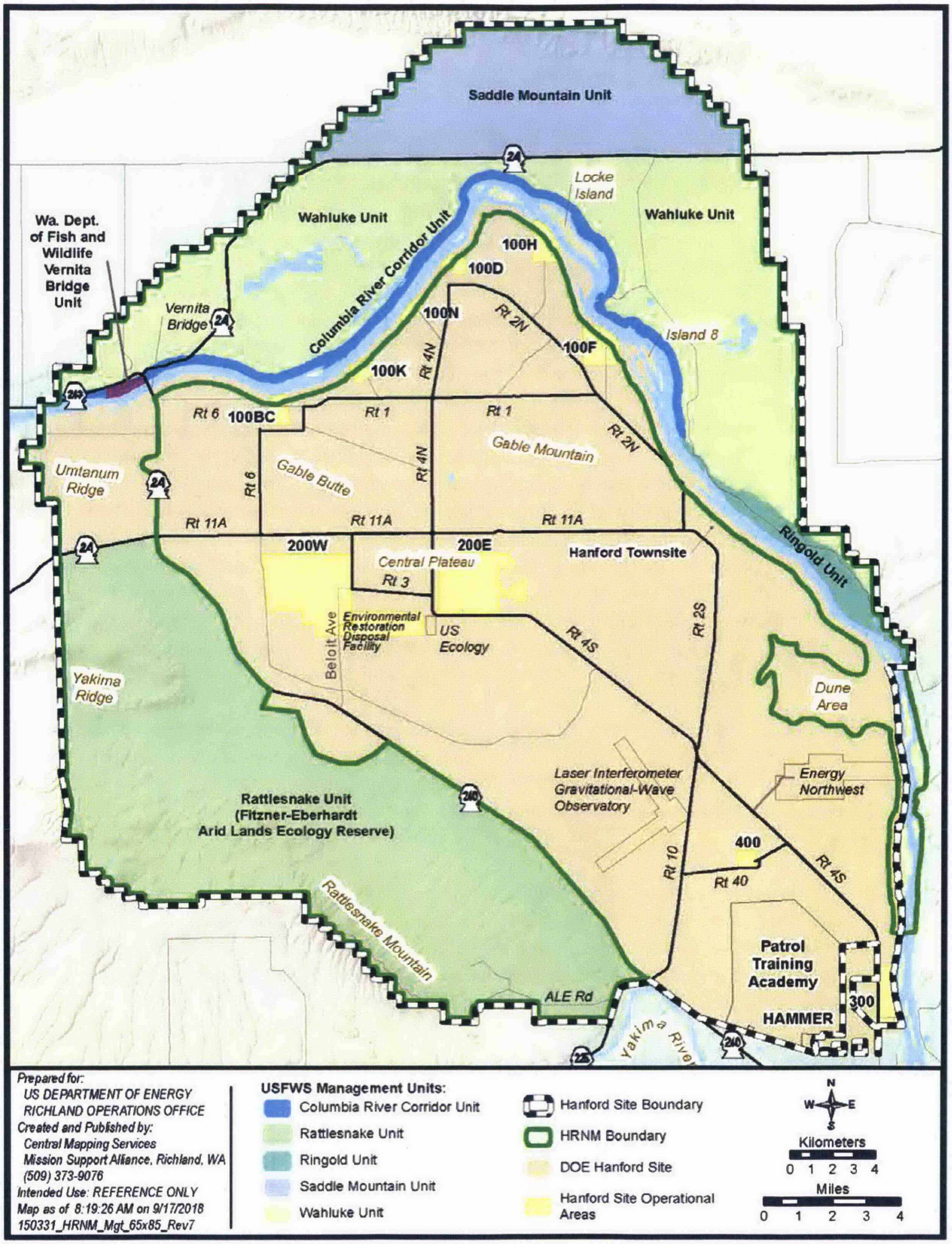


Figure 1. Principal Features of the Hanford Site

Spring Chinook salmon do not spawn within the Hanford Reach; however, the Hanford Reach is used by in-migrating adult salmon as a passage corridor, out-migrating juvenile salmon as a migration corridor, and for interim feeding. Individual juveniles do not spend more than 1 week in the Hanford Reach, although the outmigration period extends from April to the end of August.

Bull trout require colder water than all other Columbia River Basin salmonids; they generally reside and spawn in smaller streams at higher elevations. Therefore, their presence in the Hanford Reach is most likely limited by relatively warm summer water temperatures. However, there is limited evidence confirming occasional bull trout presence in the Hanford Reach, which is designated critical habitat for this species based primarily on its functionality as a migration corridor. It is believed migratory bull trout also use the Hanford Reach for foraging and overwintering. The mainstem upper Columbia River Critical Habitat Unit, which includes the Hanford Reach, is essential for maintaining bull trout distribution within the Mid-Columbia region and conserving the fluvial migratory life history exhibited by many populations from adjacent core areas (see Section 2.3).

1.2 Hanford Site Land Use

The Hanford Site comprises approximately 1,502 km^2 (580 mi^2) within the lower Columbia Basin and is subdivided into operational areas (Figure 1) each with specific functions, as described in the following:

- The six 100 Areas along the south and west banks of the Columbia River are the locations of the nine former plutonium-production reactors that were shut down between the mid-1960s and the mid-1980s. Most waste sites associated with these reactors have been remediated. Reactor buildings have been stabilized and are awaiting final disposition.
- The 200 Areas (East and West), located on a plateau about 10 km (6 mi) from the Columbia River, were dedicated to waste management and disposal activities, as well as processing nuclear fuel.
- The 300 Area, located just north of the City of Richland, was used for fuel assembly and test reactor experiments. Most buildings have been removed; however, it still contains several research facilities and various laboratories.
- The 400 Area, about 8 km (5 mi) north of the 300 Area, is the location of the retired experimental reactor known as the Fast Flux Test Facility.
- The 600 Area is the core of the Hanford Site not designated as an operations area, although it does contain some waste disposal sites. This area is further subdivided as follows:
  - 0.4 km^2 (100 ac) is leased by Washington State and contains a commercial low-level radioactive waste disposal facility operated by US Ecology Washington.
  - Energy Northwest leases 5.8 km^2 (2.2 mi^2) along the Columbia River north of the 300 Area. Approximately 4.4 km^2 (1.7 mi^2) of this area is used for operation of the Columbia

Generating Station for nuclear power production and 1.5 km^2 (0.6 mi^2) supports the Industrial Development Complex, including buildings, warehouses, and office spaces.

- The Laser Interferometer Gravitational-Wave Observatory (LIGO), operated by the California Institute of Technology and the Massachusetts Institute of Technology, is located northwest of the 400 Area and covers an area of 6.1 km^2 (2.4 mi^2).

- The Hanford Reach National Monument is mostly managed by the USFWS. The USFWS-managed portions of the Hanford Reach National Monument include the following:

  - The Rattlesnake Unit (Fitzner-Eberhardt Arid Lands Ecology Reserve), which occupies 310 km^2 (121 mi^2) in the southwest quadrant of the Hanford Site.

  - The Wahluke (East and West), Saddle Mountain, and Ringold Units, which comprise a 355-km^2 (139-mi^2) area on the north and east banks of the Columbia River.

Although the USFWS manages portions of the Hanford Site, DOE is the landowner of the entire Hanford Site. This plan does not cover actions taken by the USFWS within the Hanford Reach National Monument. Recreational or other non-DOE uses of the Hanford Reach within the Hanford Site boundaries are outside the scope of this plan. The long-term vision for land use within the Hanford Site has been evaluated and set forth in the *Final Hanford Comprehensive Land-Use Plan Environmental Impact Statement* (DOE 1999a) and its implementing documents, including the *Hanford Site Biological Resources Management Plan* (BRMP) (DOE 2017a).

The 100 and 300 Areas are closest to the Columbia River; operations in these areas have the greatest potential for affecting listed salmonids. Areas remote from the Columbia River, such as 200-East and 200-West, are sources of contaminated groundwater that has reached the river in some cases.

1.3 Consultation History

The original Hanford Site *Threatened and Endangered Species Management Plan for Salmon and Steelhead* (DOE/RL-2000-27) was prepared during the late 1990s in response to the listing of Upper Columbia River spring Chinook salmon and Upper Columbia River steelhead as endangered species under the ESA. This management plan was initially published in April 2000 but NMFS did not concur with all provisions of that plan. In 2006, DOE prepared an addendum to the plan to specifically address waste site remediation projects that were required along the Columbia River (DOE 2006). In its response letter (NMFS 2007), NMFS concurred with the conclusions of *may affect, not likely to adversely affect* for remediation actions that occurred above the wetted perimeter of the river, given certain stipulations and limitations. NMFS did not concur with a similar determination for actions below the wetted perimeter of the river. DOE currently requests project-specific consultation under ESA Section 7 for remediation projects occurring below the wetted edge of the river.

A draft version of this management plan was submitted to USFWS and NMFS in October 2012. USFWS concurred with the proposed determinations regarding bull trout, with a few stipulations (USFWS 2012). NMFS provided comments but determined it required more information and had concerns with some proposed determinations. The document was revised to incorporate NMFS comments. In August 2013, DOE and NMFS reached an agreement on the applicability and limitations of the proposed determinations and the procedures, as described in this document, for using this plan as the basis for future consultations. NMFS provided an approval letter in December 2013 (NMFS 2013d).

Updates and minor revisions to this plan were made in 2015 (Revision 2), and the plan was sent to USFWS and NMFS. No comments were received from either agency. The current revision (Revision 3) also updates the plan to reflect the results of the NMFS's five-year review of the status of the Upper Columbia steelhead and Upper Columbia River spring-run Chinook salmon (NMFS 2016a), informal consultations that have occurred since the last revision, and recent changes on the Hanford Site.

Although DOE can make determinations of *no effect* without consultation with the respective agencies, DOE routinely contacts NMFS and USFWS to address potential impacts associated with projects occurring in the nearshore areas. DOE has also conducted several informal consultations for projects that *may affect, but not likely adversely affect* listed species or their habitat. The following provides short summaries of these informal consultations.

- In 2008, DOE requested consultation to support various sampling activities associated with the *Columbia River Corridor Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Remedial Investigation* (DOE 2008). NMFS determined that the proposed sampling efforts may affect, but were not likely to adversely affect listed spring-run Chinook, steelhead, or their critical habitat and that the proposed conservation measures would be adequate to protect EFH for fall-run Chinook and coho (*Oncorhynchus kisutch*) salmon (NMFS 2008). This determination was reaffirmed and extended indefinitely in July 2013 (NMFS 2013a).

- In fall 2010, DOE prepared two separate Biological Assessments (BA) for the removal and remediation of river intake structures: one for the demolition/disposition of the 181-KE and 181-KW river intake structures (CHPRC 2010a) and one for the demolition of 181-N and 181-NE intake structures and the 1908-NE discharge structure (DOE 2010). Both BAs evaluated potential impacts to Upper Columbia River spring Chinook salmon, Upper Columbia River steelhead, and bull trout. The USFWS concurred with the *may affect, not likely to adversely affect* determination for bull trout for the 181-KE /181-KW project on January 18, 2011, (USFWS 2011a) and for the 100-N Area project on July 14, 2011 (USFWS 2011b). NMFS provided comments on the BA for the 100-K Area project but did not provide a formal concurrence with the *may affect, not likely to adversely affect* determination for steelhead and spring Chinook salmon. DOE determined that it had met the substantive requirements of the ESA and chose to proceed under provisions of CERCLA. The project was completed in 2011. NMFS provided a Biological Opinion on August 1, 2011, for the 100-N Area work, which determined that the proposed work at 100-N would *adversely affect* listed species but would not jeopardize the species or result in the destruction or adverse modification of designated critical habitat (NMFS 2011a). An incidental take statement was provided with the Biological Opinion for 100-N.

- In July 2011, DOE submitted a BA that assessed potential impacts on bull trout from electrofishing and hook-and-line fishing for collection of environmental monitoring samples (DOE 2011). The USFWS concurred with the *may affect, not likely to adversely affect* determination regarding these activities on July 25, 2011 (USFWS 2011c). Other environmental sampling activities have been performed for DOE under consultations or Section 10 of the ESA permits obtained by DOE subcontractors.

- In May 2014, DOE prepared a BA examining the potential effects of the emplacement of an apatite barrier in the saturated zone sediments and vadose zone soils on ESA-listed fish in the Hanford Reach. The 762-m (2,500-ft)-long permeable reactive barrier was designed to reduce the concentrations of strontium-90 in the groundwater being released to the Columbia River by approximately 90%. The BA concluded that the installation and operation of the apatite barrier in the 100-N Area *may affect, but was not likely to adversely affect* spring-run Chinook, steelhead, bull trout, or their critical habitat. Concurrence with this determination was received from USFWS for bull trout (USFWS 2014) and from NMFS (NMFS 2014) for spring-run Chinook salmon and steelhead.

- In April 2015, DOE submitted a BA in support of its request for informal consultation with NMFS and USFWS regarding the installation and operation of a groundwater treatment system designed to reduce the mobility of uranium that is a primary source of groundwater contamination in the Hanford Site 300 Area (DOE 2015a, 2015b). In May 2015, USFWS concurred with DOE's determination that the Uranium Sequestration Groundwater Treatment Project *may affect, but not likely to adversely affect* bull trout and its designated critical habitat (USFWS 2015a). In June 2015, NMFS reached a similar conclusion for spring-run Chinook salmon and steelhead and their designated critical habitats (NMFS 2015).

In addition to the informal consultations listed above, the DOE Office of Science's Pacific Northwest Site Office (PNSO), which is situated directly adjacent to and sometimes does work on the Hanford Site, has entered into the following consultations with NMFS and USFWS.

- In March 2013, PNSO prepared a BA for the installation of a series of piezometers along the shoreline of the Columbia River near the 300 Area (DOE 2013), concluding that the piezometer installation *may affect, but not likely to adversely affect* listed spring-run Chinook and steelhead or their critical habitat; NMFS concurred and concluded that the proposed action would not adversely affect EFH (NMFS 2013b). This consultation was extended to include the installation of aquifer tubes near the 100-B/C Area in July 2013 (NMFS 2013c).

- In June 2016, PNSO requested an informal consultation for the characterization of sediments using an electrical array towed by a motorized research vessel in the Hanford Reach of the Columbia River with NMFS (DOE 2016a) and USFWS (DOE 2016b). Based on the information provided by PNSO in the BA, the USFWS concurred with DOE's determination of *may affect, but not likely to adversely affect* bull trout or their designated critical habitat (USFWS 2016). Similarly, NMFS concurred that the proposed action *may affect, but is not likely to adversely affect* Upper Columbia River spring-run Chinook salmon and Upper Columbia River steelhead and their designated critical habitats (NMFS 2016b).

- In February 2017, PNSO prepared a BA for tracer injection studies along the shoreline of the Columbia River at the southern end of the Hanford Site and requested informal consultation with USFWS (DOE 2017b) and NMFS (DOE 2017c). The objective of this research was to develop a predictive understanding of biogeochemical transport and microbial processes in the groundwater-surface water interaction zone. USFWS and NMFS concurred with DOE that the proposed activities *may affect, but are not likely to adversely affect* bull trout (USFWS), Upper

Columbia River spring-run Chinook salmon, and Upper Columbia River steelhead (NMFS) or their designated critical habitats (USFWS 2017; NMFS 2017).

- In January 2018, PNSO requested informal consultations with USFWS (DOE 2018a) and NMFS (DOE 2018b) for subsurface research activities designed to further the understanding of hydrological exchange flows on river corridor and watershed biogeochemical functions. Proposed activities for this research included the use of direct push installations such as piezometers and aquifer tubes; sediment sampling; the installation and use of flux chambers, floating platforms, and sensors/other similar instruments; tracer injections; and geophysical investigations including electrical resistivity tomography. Based on the BA and their analysis, NMFS concurred with DOE's determination that the proposed actions *may affect, but not likely to adversely affect* Upper Columbia spring-run Chinook salmon and Upper Columbia River steelhead or their designated critical habitats (NMFS 2018). Similarly, USFWS concurred with DOE's determination of *may affect, but not likely to adversely affect* bull trout and its designated critical habitat (USFWS 2018).

2.0 STATUS OF LISTED SPECIES

2.1 Steelhead

Historically, steelhead occurred in most streams from the northern Baja Peninsula to Alaska. During the 20th century at least 23 indigenous stocks are thought to have been extirpated and many more are thought to be in decline in numerous coastal and inland streams in Washington, Oregon, Idaho, and California. The current range of the species in the contiguous United States extends from the U.S./Canada border to the Los Angeles Basin (62 FR 43937).

Declines of steelhead stocks within the region have been attributed to a number of human and natural causes (62 FR 43937); human causes include:

- Habitat loss, modification, or curtailment of use, especially from hydropower operations
- Excess commercial or recreational harvest
- Increased predation through introduction of non-native species and habitat modifications.

Steelhead within the Hanford Reach are part of the Upper Columbia River Distinct Population Segment (DPS)[5], which consists of naturally spawned anadromous steelhead originating below natural and manmade impassable barriers from the Columbia River and its tributaries upstream of the Yakima River to the U.S./Canada border. It also includes steelhead from artificial propagation programs. This

[5] The term "species" for listing purposes under the ESA includes the following entities: species, subspecies, and for vertebrates only, "distinct population segments (DPSs)." Pacific salmon are listed as "evolutionarily significant units (ESUs)," which are essentially equivalent to DPSs for the purpose of the ESA. For West Coast salmon and steelhead, many of the ESU and DPS descriptions include fish originating from specific artificial propagation programs (e.g., hatcheries) that, along with their naturally-produced counterparts, are included as part of the listed species. (79 FR 20802).

DPS is shown in Figure 2. The areas displayed in this figure are consistent with the regulatory description of the composition of the Upper Columbia River steelhead found at 50 CFR 17.11, 223.102, and 224.102. Actions outside the boundaries shown can affect this DPS; therefore, the boundaries shown do not delimit the entire area that could warrant consideration in recovery planning or determining if an action may affect this DPS for purposes of the ESA (NMFS 2016a).

The Middle Columbia River and Snake River DPSs border the Upper Columbia River DPS to the south. The Middle Columbia River DPS includes the Yakima River drainage and the Columbia River downstream from its confluence with the Yakima River, while the Snake River DPS includes the Snake River drainage. A portion of the Hanford Site lies within the Middle Columbia River DPS, although there are no water discharges, water withdrawals, or perennial runoff from the Site within this DPS. Because of the lack of potential impact to this DPS, protection measures are not addressed in this plan.

On August 18, 1997, Upper Columbia Summer-Run steelhead were listed as endangered under the ESA, with an effective date of October 17, 1997 (62 FR 43937). This status was upgraded to threatened on January 5, 2006, reinstated to endangered per a U.S. District Court decision in June 2007, and upgraded to threatened per a U.S. District Court order in June 2009. NMFS issued results of a five-year review on August 15, 2011, and concluded that this species should remain listed as threatened (76 FR 50447) and subject to Section 4(d) protective regulations under the ESA (71 FR 5177), as amended in June 2005 (70 FR 37160). The decision to keep the Upper Columbia River steelhead listed as threatened was reaffirmed in the most recent five-year review, issued in 2016 (NMFS 2016a; 81 FR 33468).

In the case of threatened species, ESA Section 4(d) allows NMFS or USFWS to determine whether and to what extent conservation measures may be appropriate and directs the agency to issue regulations it considers necessary and advisable for the conservation of the species. The agencies have flexibility under Section 4(d) to tailor protective regulations based on the contributions of available conservation measures. The 4(d) protective regulations may prohibit, with respect to threatened species, some or all of the acts which Section 9(a) of the ESA prohibits with respect to endangered species (70 FR 37160).

Critical habitat is defined in ESA Section 3 (5)(a) as

> *(i) the specific area within the geographical area occupied by a species, at the time it is listed in accordance with the Act, on which are found those biological features essential to the conservation of the species and that may require special management considerations or protection and; (ii) specific areas outside the geographical area occupied by a species at the time it is listed, upon a determination that such areas are essential for the conservation of the species.*

Conservation means the use of all methods and procedures needed to bring the species to the point at which listing under the ESA is no longer necessary.

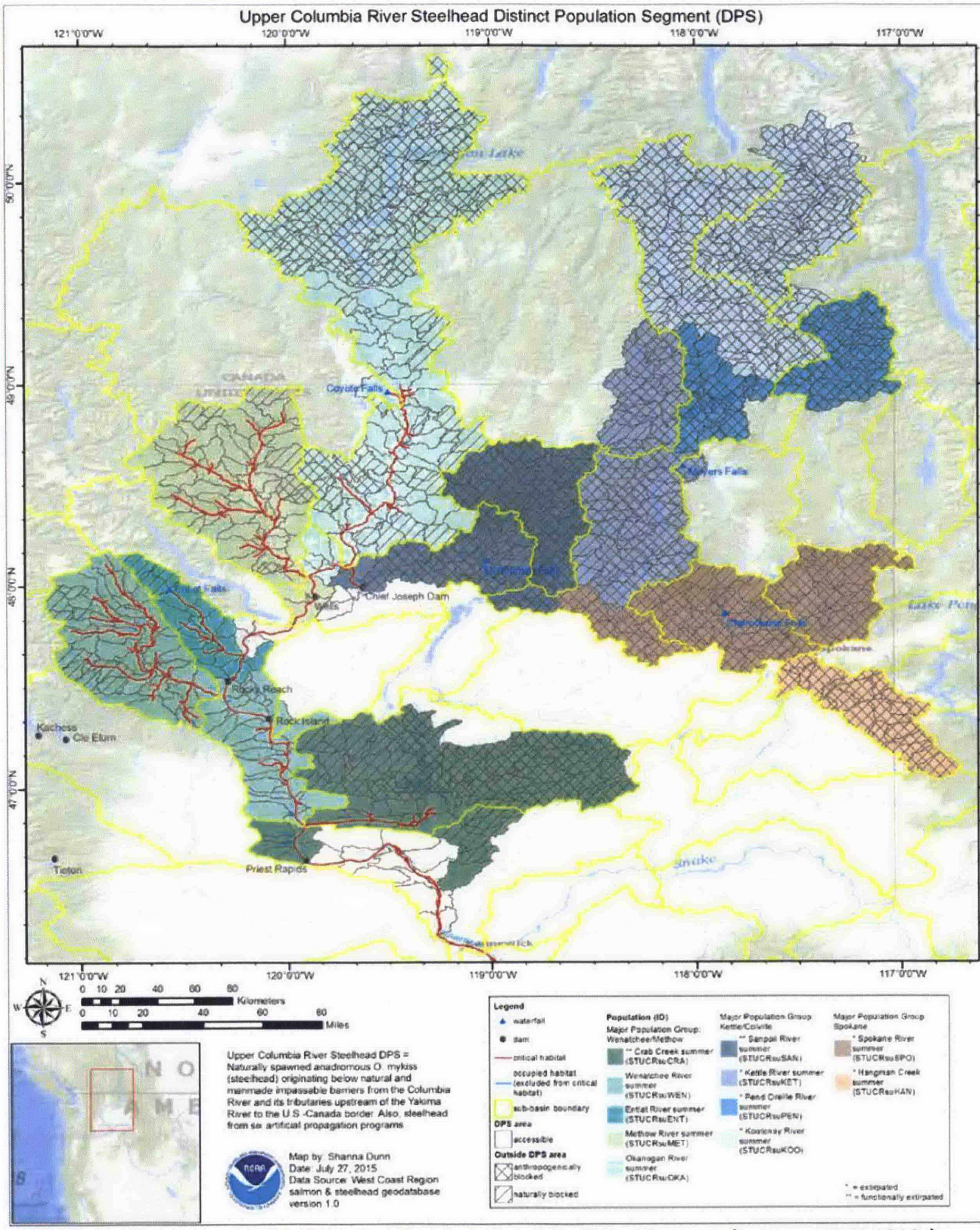


Figure 2. Upper Columbia River Steelhead Distinct Population Segment (source: NMFS 2016a)

Critical habitat for this DPS within the Hanford Site includes the entire Hanford Reach (65 FR 7764, 70 FR 52630– see Figure 3). Functions of this habitat within the Hanford Reach include juvenile rearing areas, juvenile migration corridors, areas for growth and development to adulthood, adult migration corridors, and spawning areas. To prevent impacts to this critical habitat, DOE must ensure that its activities do not adversely affect substrate, water quality, water quantity, water temperature, water velocity, cover/shade provided by bank vegetation, food supplies, riparian vegetation, the space occupied by the river, or other conditions that limit safe passage of juveniles or adults (65 FR 7764).

Section 7(a)(1) of the ESA requires federal agencies to

> *utilize their authorities in furtherance of the purposes of [the ESA] by carrying out programs for the conservation of threatened and endangered species.*

Section 7(a)(2) of the ESA requires that each federal agency shall, in consultation with, and assistance of USFWS and/or NMFS, ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of the species or result in the destruction or adverse modification of critical habitat.

2.2 Spring-Run Chinook Salmon

On March 9, 1998, NMFS determined that ESA listing was not warranted for the Middle Columbia River spring-run Chinook Evolutionarily Significant Unit (ESU), which comprises all naturally spawned populations of spring-run Chinook salmon in Columbia River tributaries from the Klickitat River upstream, including the Yakima River but excluding the Snake River Basin (63 FR 11482). Major river basins containing spawning and rearing habitat for this ESU comprise approximately 69,000 km^2 (43,000 mi^2) in Oregon and Washington. The Middle Columbia ESU does not include fish within the Hanford Reach but does include fish that migrate through the Yakima River to spawning grounds in that drainage basin. DOE project activities are not expected to have any impacts on this ESU.

The Upper Columbia River spring-run ESU Chinook salmon (Figure 4) was listed by NMFS as an endangered species on March 24, 1999 (64 FR 14308); the endangered status was reaffirmed on June 28, 2005 (70 FR 37160). NMFS issued results of five-year reviews in August 2011 and in September 2016 (NMFS 2016a); both reviews concluded that this species should remain listed as endangered (76 FR 50447; 81 FR 33468). This ESU includes all naturally spawned populations of Chinook salmon in all river reaches accessible to spring Chinook salmon in Columbia River tributaries upstream of the Rock Island Dam and downstream of Chief Joseph Dam in Washington (excluding the Okanogan River sub-basin), as well as six artificial propagation programs: The Twisp River, Chewuch River, Methow Composite, Winthrop National Fish Hatchery, Chiwawa River, and White River spring-run Chinook hatchery (NMFS 2016a). ESA Section 9(a) take prohibitions apply to all species listed as endangered (79 FR 20802). Hatchery stocks determined to be part of endangered ESUs are afforded the full protections of the ESA (70 FR 37160).

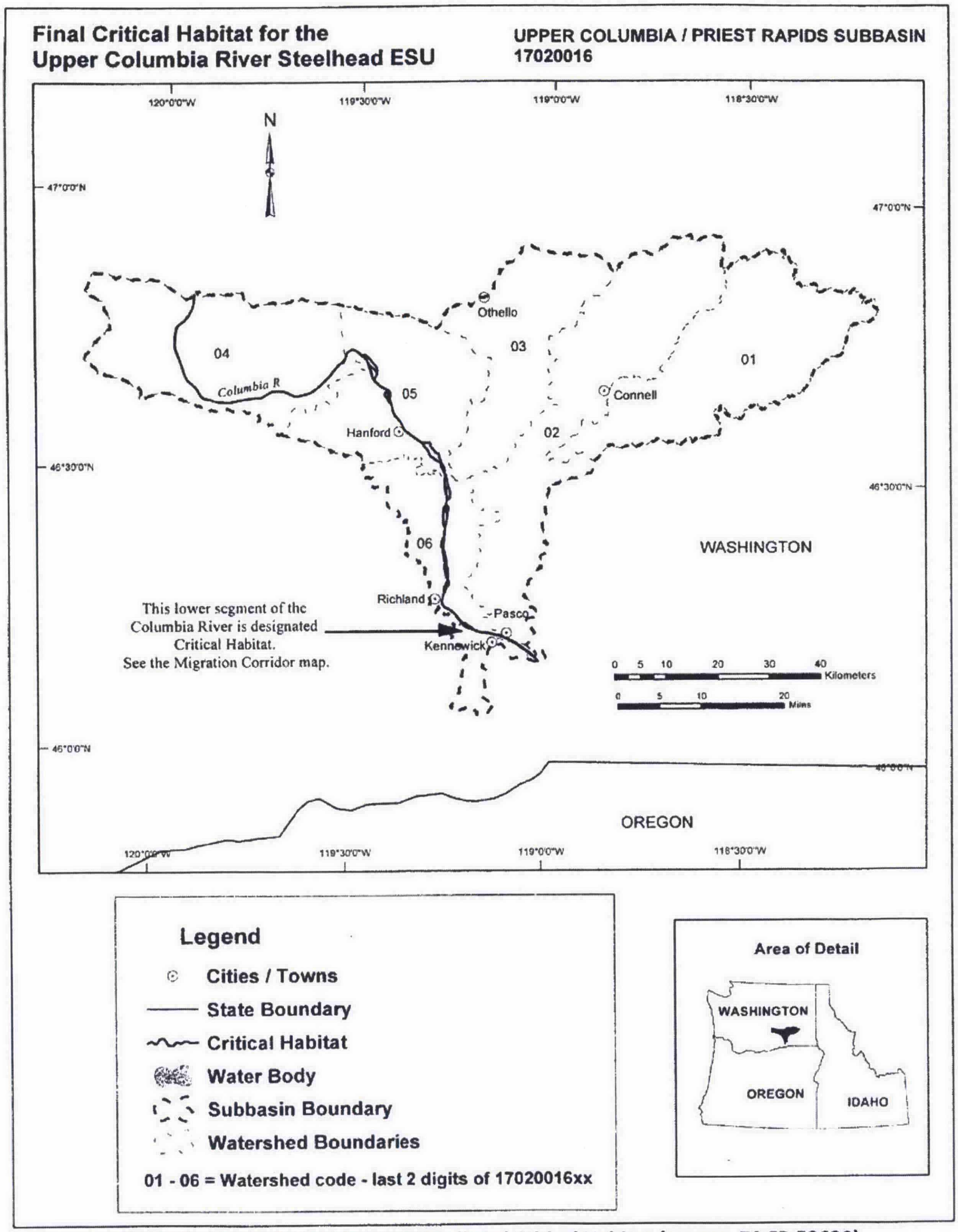


Figure 3. Upper Columbia River Steelhead Critical Habitat (source: 70 FR 52630)

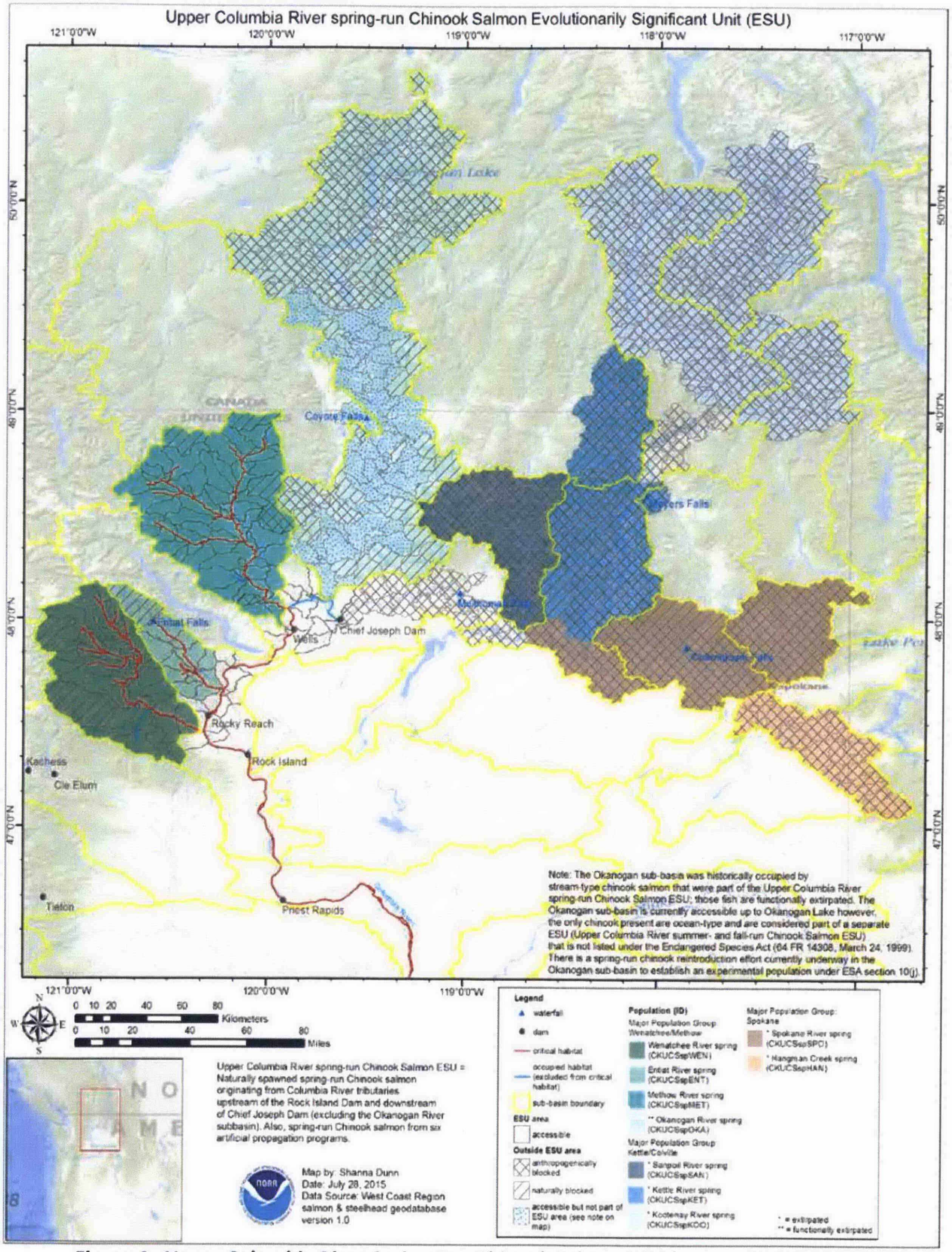


Figure 4. Upper Columbia River Spring-Run Chinook Salmon ESU (source: NMFS 2016a)

These salmon do not spawn within the Hanford Reach, but it serves as a migration corridor for adults and juveniles, and juveniles may use the shallows of the Hanford Reach as rearing areas. A final designation of critical habitat was published on September 2, 2005, with an effective date of January 2, 2006. Critical habitat for this ESU within the Hanford Site includes the entire Hanford Reach, which functions as juvenile rearing habitat and a juvenile and adult migration corridor (70 FR 52630 – see Figure 5). To prevent impacts to this critical habitat, DOE must ensure that project activities do not adversely affect substrate, water quality, water quantity, water temperature, water velocity, cover/shade provided by bank vegetation, food supplies, riparian vegetation, the space occupied by the river, or other conditions that limit safe passage of juveniles or adults (65 FR 7764).

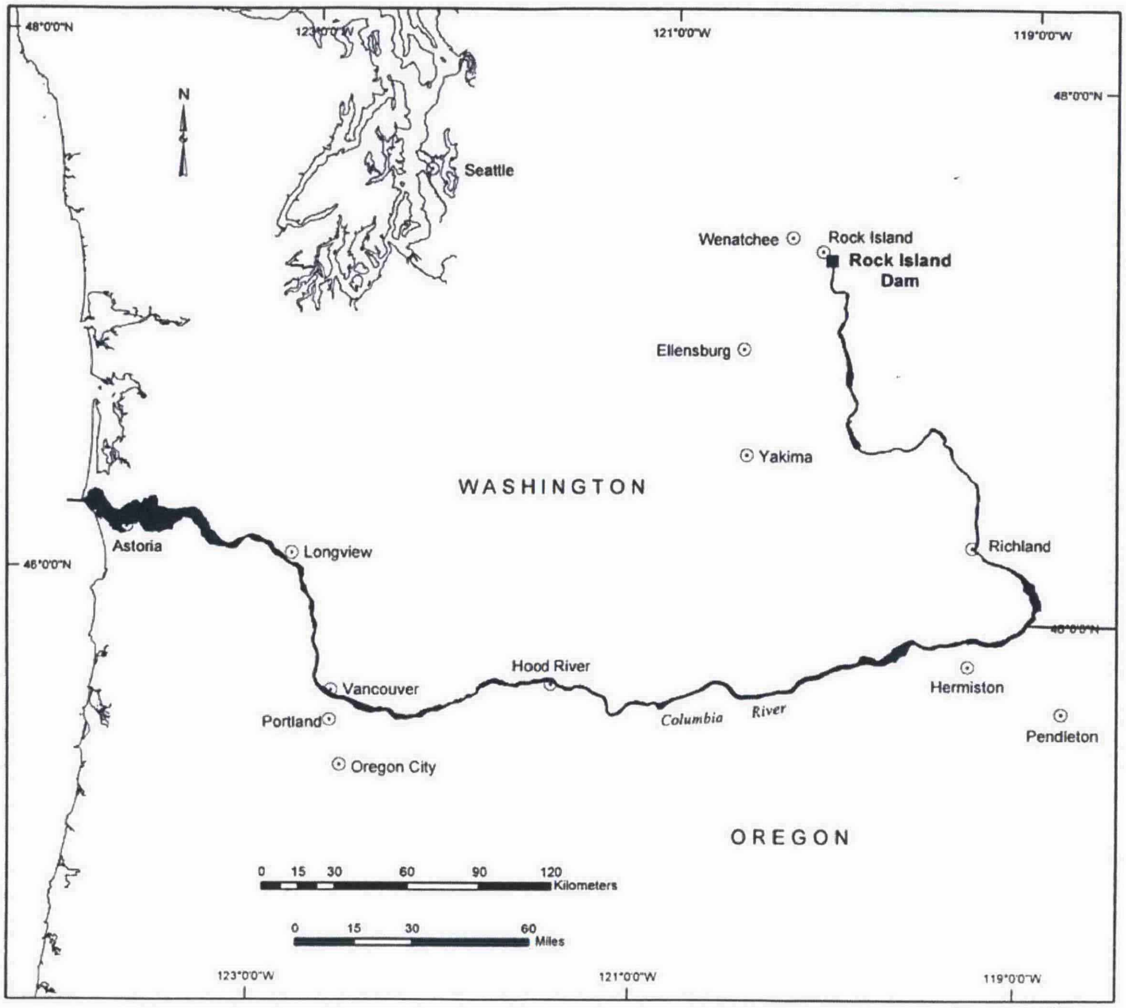
2.3 Columbia River Bull Trout

On June 10, 1998, the USFWS listed the Klamath River and the Columbia River bull trout DPSs as threatened under the ESA (63 FR 31647). On November 1, 1999, the USFWS listed all bull trout in the coterminous United States as threatened (64 FR 58910). The USFWS completed a five-year status review in 2008 that determined that no change in listing status was warranted (USFWS 2008). The Columbia River population segment is represented by relatively widespread subpopulations that have declined in overall range and numbers of fish. A majority of Columbia River bull trout occur in isolated, fragmented habitats that support low numbers of fish and are inaccessible to migratory bull trout. The few remaining bull trout "strongholds" in the Columbia River Basin tend to be found in large areas of contiguous habitats in the Snake River Basin of the central Idaho mountains, upper Clark Fork and Flathead Rivers in Montana, and several streams in the Blue Mountains in Washington and Oregon.

The USFWS published a final rule designating critical habitat for the Klamath River and Columbia River populations of bull trout on October 6, 2004, (69 FR 59996) and then again for the Klamath River, Columbia River, Jarbidge River, Coastal-Puget Sound, and Saint Mary-Belly River populations on September 26, 2005 (70 FR 56212). The USFWS published revisions to the critical habitat designations in October 2010 (75 FR 63898). The Mainstem Upper Columbia River Critical Habitat Unit 22 (Figure 6) includes the Columbia River from John Day Dam upstream 520.1 km (323.2 mi) to Chief Joseph Dam (75 FR 63898) and includes the Hanford Reach (Figure 7).

To be included as critical habitat, an area must provide one or more of the following three functions: (1) spawning, rearing, foraging, or overwintering habitat to support existing bull trout local populations; (2) movement corridors necessary for maintaining migratory life-history forms; and/or (3) suitable and historically occupied habitat that is essential for recovering existing local populations that have declined, or that is needed to re-establish local populations required for recovery (69 FR 59996). In its revised designation of critical habitat (75 FR 63898), the USFWS defined nine primary constituent elements necessary to sustain the essential bull trout life-history functions.

Rearing / Migration Corridor for the Upper Columbia River Spring-run Chinook Salmon ESU



Legend

- Cities / Towns
- State Boundary
- Rearing / Migration Corridor

Upper Columbia River Spring Chinook ESU

Columbia River Corridor
The Columbia River Corridor is that segment from the mouth of the Columbia River at the Pacific Ocean upstream to Rock Island Dam.

Figure 5. Upper Columbia River Spring-Run Chinook Salmon Critical Habitat (source: 70 FR 52630)

Critical Habitat for Bull Trout *(Salvelinus confluentus)*
Critical Habitat Units*

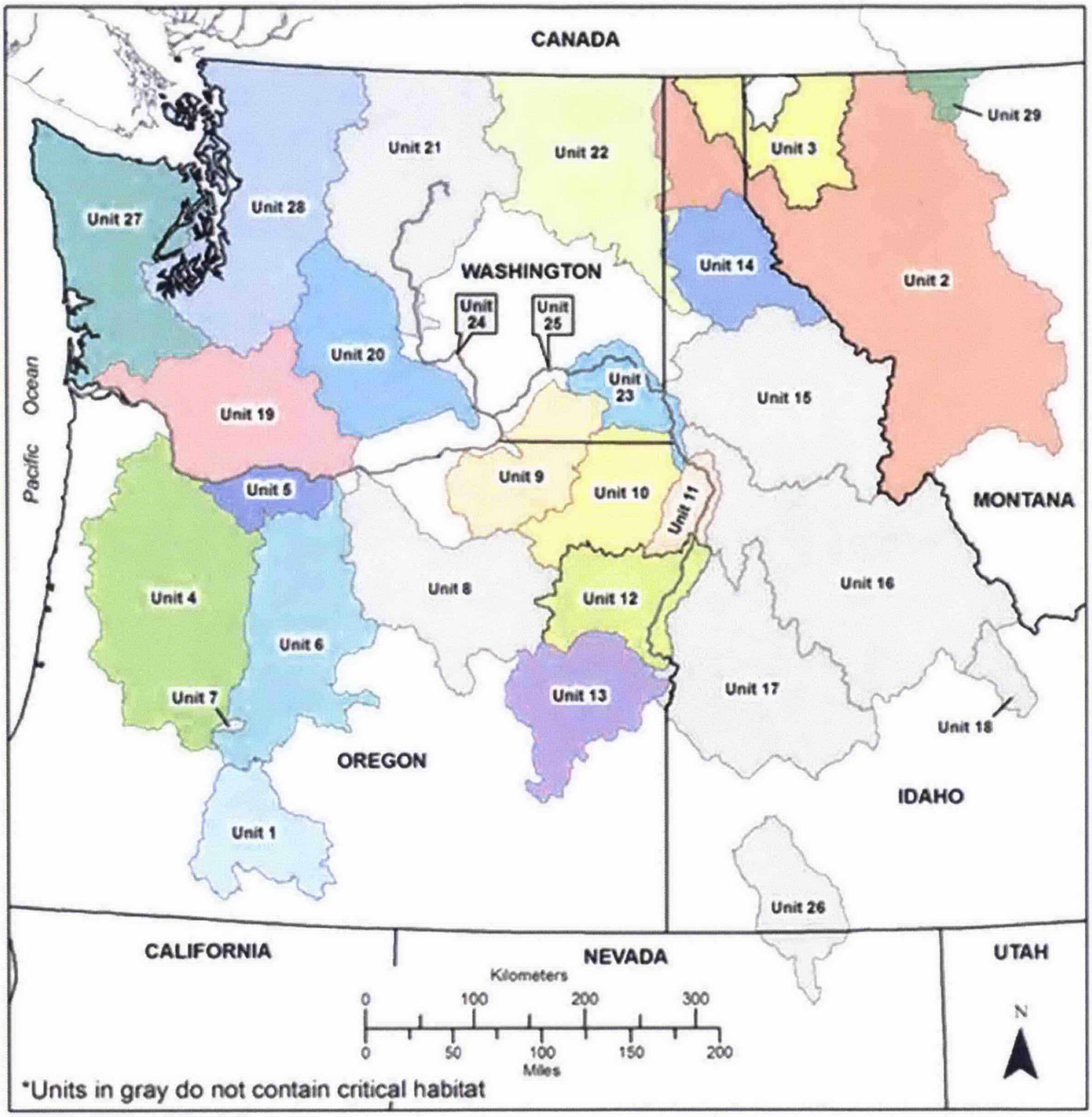


Figure 6. Bull Trout Critical Habitat Units (Source: 75 FR 63898)

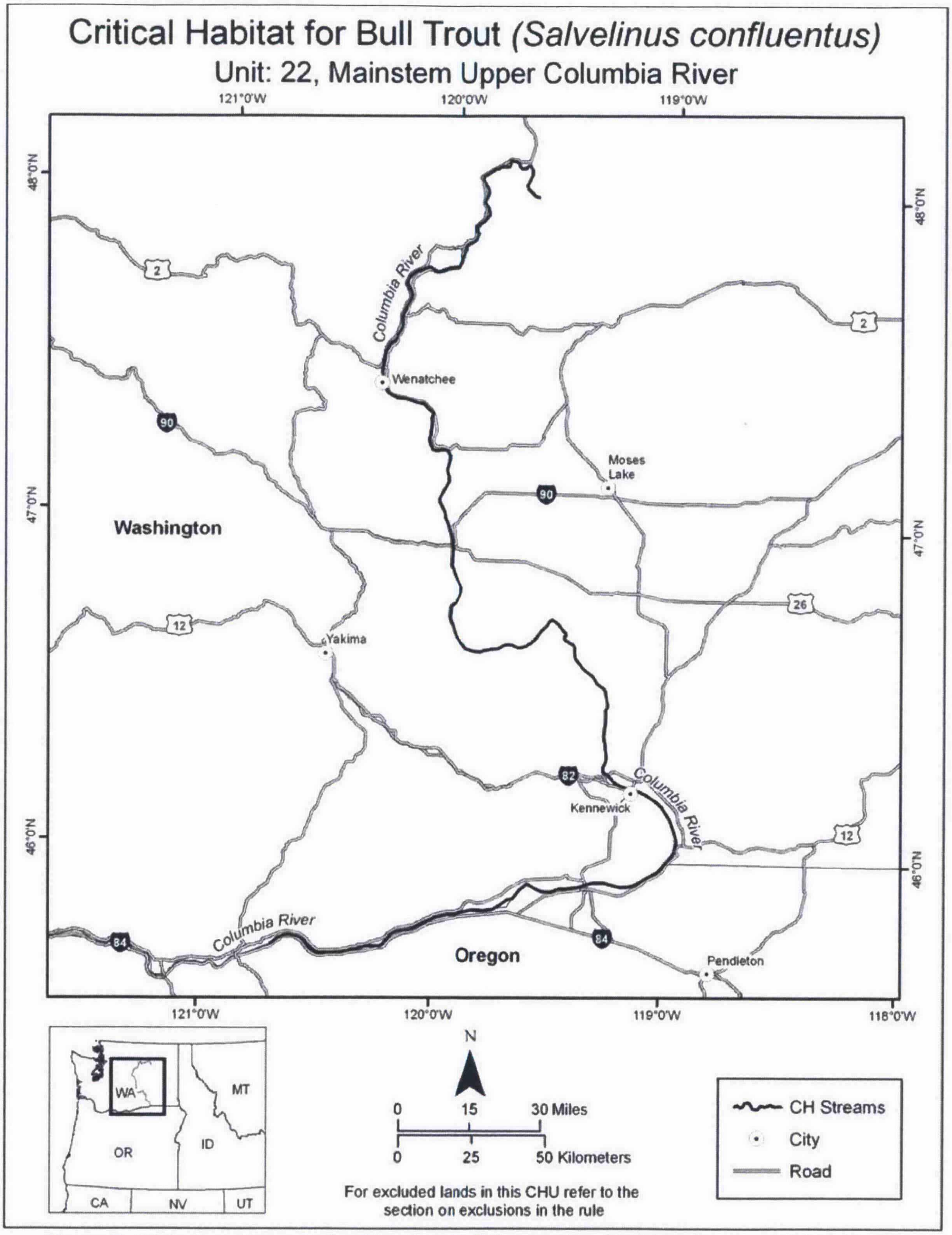


Figure 7. Mainstem Upper Columbia River Bull Trout Critical Habitat (Source: 75 FR 63898)

Segments of large rivers, such as the Columbia and Snake Rivers, are important to the conservation of bull trout because they are interconnected with tributaries that support bull trout and they provide important foraging, migrating, and overwintering habitat. The mainstem Columbia River appears to provide essential foraging, migrating, and overwintering habitat for bull trout because of a combination of water depth, lower velocities, comparatively warmer water, and availability of food (69 FR 59996). Bull trout use of the Columbia River has been documented by radio-tagging studies conducted by the USFWS (69 FR 59996) and the Chelan, Douglas, and Grant County Public Utility Districts (Kreiter 2001, 2002; BioAnalysts, Inc. 2002 as cited in 69 FR 59996). Recoveries of tagged bull trout in the Bonneville Pool that originated from the Hood River have shown that bull trout are using the mainstem of the lower Columbia River as well (Wachtel 2000 as cited in 69 FR 59996). Radio-telemetry studies by the Oregon Department of Fish and Wildlife (Hemmingsen et al. 2001a, b) and Idaho Power Company (Chandler and Richter 2000 as cited in 69 FR 59996) have verified movements of bull trout between tributary streams and the mainstem Snake River. Current bull trout presence in the mainstem Columbia River reflects the strength of the local populations within tributaries and its value as a migration corridor (69 FR 59996). Adult migratory bull trout have been documented in the Columbia River primarily between October and May. Overwintering habitat is often only used seasonally, especially if an area has warm summer water temperatures that may cause bull trout to migrate to cooler areas (69 FR 59996).

In 2015, USFWS issued an implementation plan for the recovery of bull trout within the Mid-Columbia Recovery Unit (USFWS 2015b; 80 FR 58767). The Mid-Columbia Recovery Unit comprises 24 bull trout core areas, as well as two historically occupied areas and one research needs area. This plan describes the threats to bull trout within the Recovery Unit and provides recovery criteria and a strategy for the species, including estimated schedules and costs.

3.0 BIOLOGY OF LISTED SPECIES IN THE HANFORD REACH

3.1 Upper Columbia River Steelhead Distinct Population Segment

Steelhead are anadromous, meaning they live in the ocean but return to freshwater streams and rivers as adults to spawn. Most steelhead reside in the ocean 2 or 3 years and return to their natal stream/river as 4 or 5 year olds. Based on the timing of their entry as adults into the Columbia River, they are classified either as winter or summer run. Winter-run steelhead enter the Columbia River from November through April and spawn in tributaries below Bonneville Dam. Winter-run steelhead have not been found in the Columbia River system upstream of the Deschutes River (Peven 1990). Summer-run fish enter the Columbia River from May through October and spawn in areas above Bonneville Dam, including the Hanford Reach.

The proportions of hatchery and wild steelhead that return to the Hanford Reach are unknown. Ringold Hatchery (river km 570.5), operated by the Washington Department of Fish and Wildlife (WDFW), has been raising and releasing steelhead smolts into the Hanford Reach since 1962. From 1998 through 2018, these releases averaged 170,693 smolts (Hoffarth 2018). The annual adult sport catches in the Ringold area from 2001 through 2018 averaged 1,553 fish (Hoffarth 2018). With the exception of an 8-year time period (1981 through 1988), most fish reared and released into the Hanford Reach have been Skamania (coastal) steelhead, not the Wells stock that were listed under the ESA. Beginning in 1998

WDFW eliminated the release of the Skamania stock and switched to the Wells stock. This action was primarily in response to the listing of Wells stock steelhead under the ESA.

Unlike Chinook salmon, steelhead trout are iteroparous and can spawn more than once. However, the repeat spawning rate in the state of Washington is low (4 to 15% [Wydoski and Whitney 1979]) and adults encounter four mainstem dams on their way to and from the Hanford Reach. Repeat spawning in the Hanford Reach by a significant number of steelhead is unlikely.

3.1.1 Migration

Steelhead are present in the Hanford Reach all year; however, most adults move into the Hanford Reach from August to November, peaking in September (Watson 1973; Becker 1985). Most steelhead that enter the Hanford Reach hold in the immediate vicinity for 6 to 8 months. A limited tagging study in 1967 found adults migrated near shorelines at depths less than 3 m (10 ft) (Coutant 1973).

Juvenile steelhead usually spend 1 to 3 years in freshwater before migrating downstream to the ocean (Shapovalov and Taft 1954; Chapman 1958; Maher and Larkin 1959; Peven 1990). Outmigration through the Hanford Reach usually occurs between April and June (Becker 1985). In addition to any fish produced within the Hanford Reach, this area also serves as an important holding and rearing area for yearling juvenile steelhead produced farther upstream. Fickeisen et al. (1980) estimated that between 2 and 2.2 million steelhead smolts may pass through the Hanford Reach each year. Yearling steelhead smolts (predominantly upstream hatchery stocks) have been collected mainly from the bottom, mid-channel zone of the river (Dauble et al. 1989). No juvenile steelhead were collected in shoreline fyke nets, but they were obtained in shoreline areas with electroshocking gear.

3.1.2 Steelhead Spawning Within the Hanford Reach

Steelhead create redds (nests) in the gravel and cobble substrate of the river bottom. In Idaho's Clearwater and Salmon Rivers, the preferred gravel size for nesting has been reported as 1.3 to 10.2 cm (0.5 to 4 in.), water depth 0.2 to 1.5 m (0.66 to 4.9 ft), and water velocity 0.70 to 0.76 m/s (2.3 to 2.5 ft/s) (Orcutt et al. 1968); these habitat conditions also exist within the Hanford Reach.

Any spawning within the Hanford Reach most likely would occur between February and early June, with peak spawning in mid-May (Eldred 1970; Watson 1973; Becker 1985). Little is known about the quality and quantity of steelhead trout spawning, rearing, and adult holding habitat in the Hanford Reach. Based upon an average of 35,000 steelhead trout that annually passed McNary Dam, but did not pass Priest Rapids Dam on the Columbia River or Ice Harbor Dam on the Snake River from 1962 to 1971, Watson (1973) developed a "steelhead budget." After taking into account reductions due to migration into the Yakima and Walla Walla Rivers, sport catch, and natural mortality, Watson estimated that as many as 13,000 of these fish potentially spawned in the Hanford Reach. In a similar, but unpublished, study covering the period from 1977 to 1996, it was estimated that approximately 9,000 steelhead could have potentially spawned within the Hanford Reach (Mueller and Geist 1999). Gray and Dauble (1976) provide other evidence of steelhead spawning. They collected gravid and ripe females in late April and early May and collected spent males in August within the Hanford Reach.

The quantity and location of steelhead spawning in the Hanford Reach is often unclear because aerial surveys of steelhead spawning are difficult, due to high, turbid spring runoff that obscures visibility.

Historical information on steelhead spawning in the Hanford Reach is available from the late 1960s and early 1970s during unusually low flow conditions (1,100 to 2,200 m^3/s [39,000 to 78,000 ft^3/s]; normal average flow is ~3,400 m^3/s [120,000 ft^3/s]). Key spawning areas reported from aerial surveys conducted in 1968 and 1970 included Vernita Bar, Coyote Rapids, Locke Island, 100-F islands, and Ringold (Tony Eldred, personal communication with D.R. Geist 9-28-89, see Figure 8). A total of 220 and 95 redds were counted in 1968 1970, respectively; total steelhead spawning was estimated by Eldred to be approximately 2,200 to 25,000 in 1968 and 950 to 7,800 in 1970. Fickeisen et al. (1980) indicated steelhead trout likely spawned at Vernita Bar, Coyote Rapids, Locke Island, and Ringold. An aerial survey conducted on April 30, 1998, identified up to 75 redds in the Hanford Reach, with the area from Wooded Island to Ringold having 14 redds and the 100-F islands having 61 (Dauble 1998). Much of the area at Locke Island where redds were counted in the 1970s has since been silted over due to slumping of the White Bluffs from agricultural water seepage.

More recent aerial surveys of steelhead have been performed in the springs of 1999 through 2002, 2004 through 2010, and 2012 through 2015 (MSA 2012, 2014). A comprehensive study also was conducted in spring 1999 to survey likely spawning areas near Locke Island but no steelhead redds were found (Mueller and Geist 1999). Finally, the 100-N Area shoreline was investigated by aerial and boat surveys during spring 2005 to search for spawning areas (Poston 2010).

Results of surveys conducted prior to 2015 show only limited spawning near the Ringold Hatchery Creek (near river mile 355) in certain years. One verified steelhead redd was also found near the 300 Area in spring 2003. The 2005 spring surveys identified a single location where steelhead redds occurred downstream of Ringold at Island 15 (Poston 2010). Aerial steelhead redd count survey data for years 2007 through 2009 resulted in the observation of only a single redd in 2008, which was located near the upper portion of Locke Island.

During 2015, three aerial redd count surveys were performed during April and May. Using the maximum redd count seen at a particular location on either day, a total of 43 redds were identified in the Hanford Reach (MSA 2015). The higher number of redds is most likely due to the lower and more steady river flows experienced in 2015. Figure 9 shows the locations and numbers of steelhead redds observed in the Hanford Reach during the 2015 aerial surveys.

3.1.3 Hatching and Rearing

Steelhead eggs hatch in about 50 days when water temperatures are 10° C (50° F) (Wydoski and Whitney 1979). Fry emerge from the nest 2 to 3 weeks after hatching (Peven 1990). They school near the margins of the river and over shallow water gravel bars. Streamside vegetation and submerged cover are important habitat features for early life history stages because they provide protection from predators, moderate temperature, and colonization sites for steelhead food sources (Shapovalov and Taft 1954; Bustard and Narver 1975; Peven 1990). As fry grow larger they feed primarily on benthic organisms (e.g., midges, mayflies, stoneflies, and beetle larvae) (Wydoski and Whitney 1979). Macroscopic analysis of steelhead smolts collected in the Hanford Reach in 1974 and 1975 showed that fish were consuming adult caddisflies (53%), larval caddisflies (35%), and midgefly larvae (15%) (Gray and Dauble 1977).

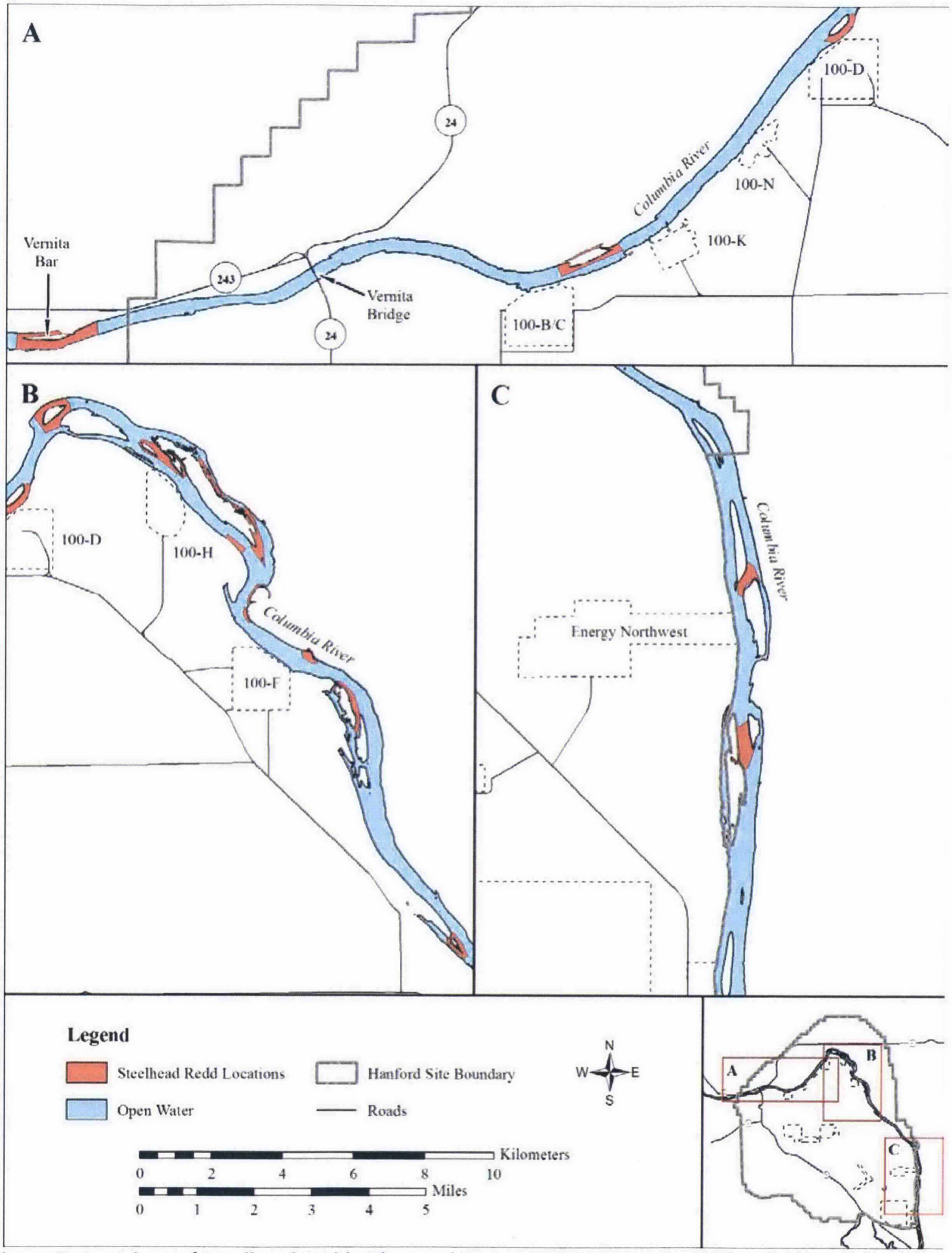


Figure 8. Locations of Steelhead Redds Observed During Aerial Surveys in 1968 and 1970 in the Upper Portion of the Hanford Reach (T. Eldred, personal communication September 28, 1989)

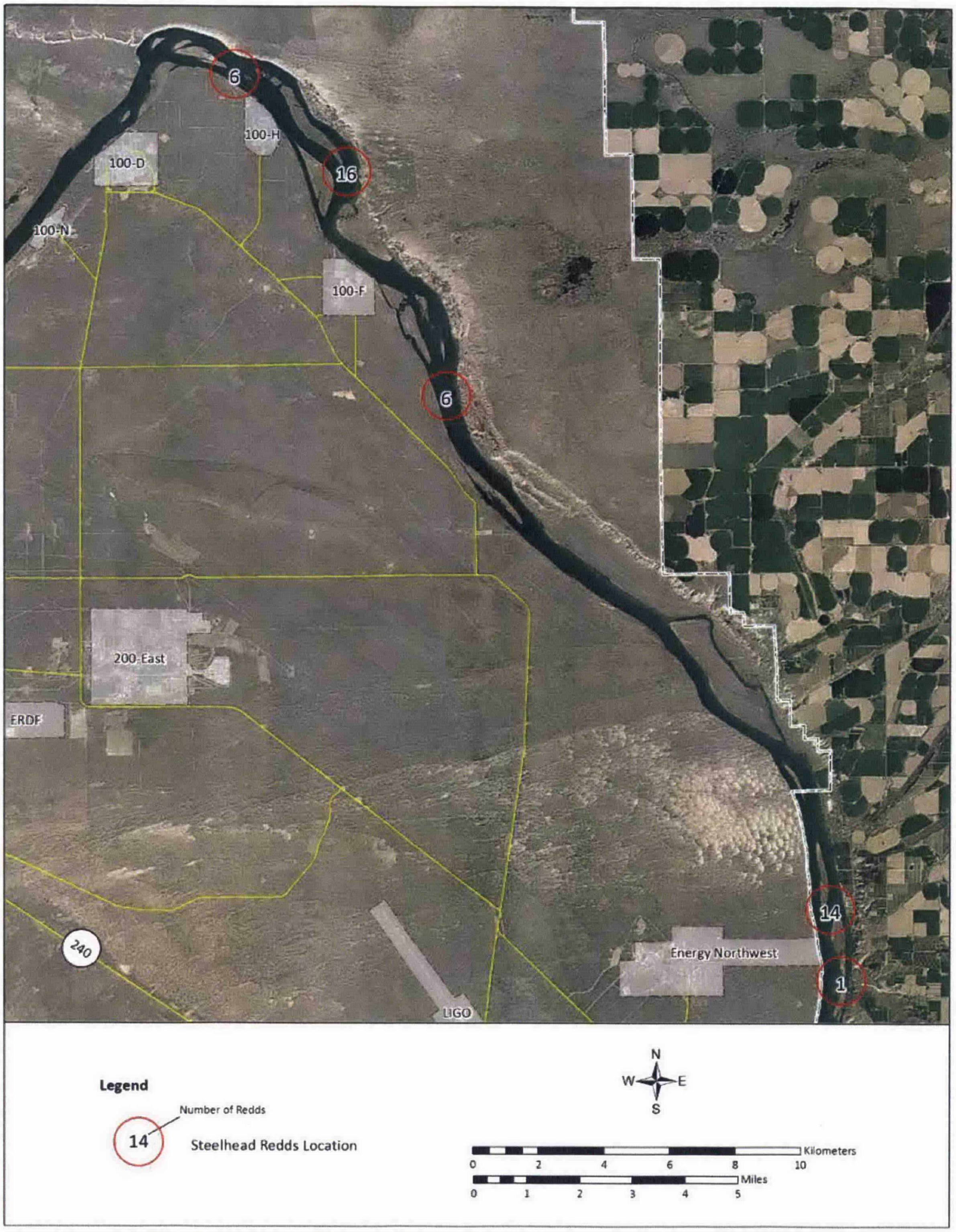


Figure 9. Steelhead Redds Observed in the Hanford Reach During the 2015 Aerial Surveys

If significant steelhead spawning does occur in the Hanford Reach, one would expect to find sub-yearling and pre-smolt juveniles (young-of-the-year). Gray and Dauble (1976) reported that young-of-the-year steelhead were not collected by small mesh beach seines in areas and at the time of the year when steelhead juveniles should have been present. Other studies have failed to collect young-of-the-year steelhead (Dauble et al. 1989; Wagner et al. 1997; Hoffarth et al. 1998; Nugent et al. 1999, 2000). In June 2001, four wild steelhead fry were collected from an entrapment pool near Wooded Island for the first time during the fifth year of an ongoing fry stranding study (Nugent et al. 2002). The absence of young-of-the-year steelhead noted in these studies may be due to low hatching success of steelhead eggs, low spawning abundance, or low catch per effort due to gear bias or sampling at the improper time or location. With few exceptions (Gray and Dauble 1976), many of the studies that reported a lack of young-of-the-year steelhead were not specifically fishing for them but were targeting fall Chinook salmon instead. Steelhead eggs hatch later than those of fall Chinook salmon; thus, fry may not have emerged from the gravel at the time most fall Chinook salmon studies were conducted. Newly emergent steelhead fry are often found within submerged vegetation, which is not necessarily preferred habitat for juvenile fall Chinook salmon. Large beach seines used for fall Chinook salmon would not be effective in catching fish within vegetation. A summary of steelhead usage of the Columbia River within the Hanford Site is presented in Table 1.

Table 1. Life History Data for Upper Columbia River Steelhead within the Hanford Reach.

	Life Stage						
	Return Migration	**Adult Holdover in Reach**	**Spawning**	**Egg Stage**	**Intragravel Development**	**Rearing**	**Outmigration**
Dates in Hanford Reach	Year round	September 1 to March 1	February 1 to June 1	February 1 to July 1	May 1 to July 15	Year round	April 1 to July 1
Food	None	Caddis larvae, midge larvae, zooplankton, adult insects, fish	None	Yolk Sac	Yolk Sac	Caddis larvae, midge larvae, zooplankton	Caddis larvae, midge larvae, zooplankton
Habitat	Pelagic – throughout water column	Pelagic – throughout water column	Gravels in mapped areas	Gravels in mapped areas	Gravels in mapped areas	Intermediate water (not main channel and not near shore)	Main channel at night, near shore feeding during day

3.2 Upper Columbia River Spring-Run Chinook Salmon Evolutionarily Significant Unit

The life history of Chinook salmon is complex and may vary depending on age at seaward migration; variation in length of freshwater, estuarine, and oceanic residence; ocean distribution and migratory patterns; and age and season of spawning migration (Healey 1991). Chinook salmon are similar to steelhead in that they too are anadromous and classified into runs based on when the adults return to their natal river to spawn. All three runs (spring, summer, fall) of Columbia River Chinook salmon ascend McNary Dam and return to and/or pass through the Hanford Reach (Becker 1985). Upper

Columbia River spring-run ESU Chinook salmon are classified as a "stream-type" life history because the juveniles spend 1 or more years in freshwater before migrating to sea and return to their natal river several months prior to spawning (Healey 1991). Upper Columbia River spring-run ESU Chinook salmon are not known to spawn in the Hanford Reach. They do, however, pass through the Hanford Reach between April and mid-June on their way to spawning areas upstream (Table 2), traveling near the shoreline (Becker 1985; Peven 1990; Coutant 1973). Unlike steelhead, Chinook salmon, like most other Pacific salmon, are semelparous and die after spawning once (Healey 1991).

Table 2. Use of the Hanford Reach by Upper Columbia River Spring-Run ESU Chinook Salmon.

	Life Stage				
	Return Migration	**Spawning**	**Intragravel Development**	**Rearing**	**Outmigration**
Dates in Hanford Reach	April 1 to June 15	Above Reach	Above Reach	Above Reach	April 1 to September 1
Food	None	---	---	---	Caddis flies, midge adults
Habitat	Near shore	---	---	---	Main channel at night, nearshore feeding by day

Juvenile spring-run Chinook salmon are released from hatcheries into the Hanford Reach. In 1982, 196,000 age-1 spring Chinook salmon from Leavenworth Hatchery were released below Priest Rapids Dam in the upper Hanford Reach. This was the only release of spring Chinook salmon directly into the Hanford Reach from stock originating upstream of the Hanford Reach in the last 30 years. From 1980 to 1998, the Ringold Fish Rearing Facility released an average of approximately 515,000 spring Chinook salmon per year (range 0 – 1,200,000) into the Hanford Reach. These releases comprised various stocks including Cowlitz (during the early 1980s), Klickitat, Carson, Yakima, and mixed stock returning to the Ringold hatchery. Although spring-run Chinook salmon are not known to spawn within the Hanford Reach, it is possible that a few hatchery fish have spawned in the river in the past. If this has occurred, these fish would not be classified as spring-run Chinook salmon since the Hanford Reach is downstream of Rock Island Dam, the lower boundary of this ESU (63 FR 11482 and 64 FR 14308). Spring Chinook salmon are no longer released from Ringold Hatchery (Hoffarth 2018).

Juvenile spring-run Chinook salmon migrate downstream as smolts from April to September during their second year (Horner and Bjornn 1981; Becker 1985). Most migration takes place at night (Healey 1991; Mains and Smith 1955). Migrating smolts do not use nearshore habitat as do summer and fall Chinook salmon migrants, but instead, similar to outmigrating juvenile steelhead, exhibit a strong preference for the bottom of the mid-channel river zone (Becker 1985; Dauble et al. 1984, 1989). This results in their outmigration rates being more flow-dependent in relation to the other Chinook salmon runs. Period of travel from Priest Rapids Dam through the Hanford Reach to McNary Dam is estimated to be 3 days or less for active migrant spring Chinook salmon smolts (Table 2; Weitkamp and McEntee 1982). Backwater sloughs and shoreline indentations in the Hanford Reach may provide temporary foraging sites for outmigrating salmon (Becker 1973).

Adults reside in saltwater for 1 to 4 years and return to their natal stream/river as 4 or 5 year olds (Becker 1985; Mullan 1987; Peven 1990; Chapman et al. 1994).

3.3 Columbia River Distinct Population Segment Bull Trout

Bull trout were once abundant throughout the Northwest and found in about 60% of the Columbia River Basin. Today they occur in less than half of their historic range with scattered populations in portions of Oregon, Washington, Nevada, Idaho, and Montana. Bull trout occur in only 21% of their historic range in the Klamath River Basin and no longer exist in California.

Bull trout are typically associated with the colder streams in a river system, although fish can occur throughout larger river systems (Fraley and Shepard 1989; Rieman and McIntyre 1993, 1995; Buchanan and Gregory 1997; Rieman et al. 1997 as cited in 64 FR 58910). For example, water temperature above 15° C (59° F) is believed to negatively influence bull trout distribution, which partially explains the generally patchy distribution within a watershed (Fraley and Shepard 1989; Rieman and McIntyre 1995 as cited in 64 FR 58910). Overwintering habitat, such as the mainstem Columbia River, often is only used seasonally until the water warms and bull trout are forced to migrate out (69 FR 59996). Bull trout year-round use of the Hanford Reach is most likely precluded by summer water temperatures that typically range above 15° C (59° F) from late June through early October (Water Quality Monitoring Data, downstream from Priest Rapids Dam, 10-year average 2002 through 2011, [University of Washington 2012]).

Bull trout and Dolly Varden (*Salvelinus malma*) were previously considered a single species (Cavender 1978; Bond 1992 as cited in 64 FR 58910). Cavender (1978) presented morphometric (measurement), meristic (counts), osteological (bone structure), and distributional evidence to document specific distinctions between Dolly Varden and bull trout. Bull trout and Dolly Varden were formally recognized as separate species by the American Fisheries Society in 1980 (Robins et al. 1980 as cited in 64 FR 58910).

3.3.1 Habitat

Bull trout are vulnerable to many of the same threats that have reduced salmon populations but they have more specific habitat requirements than most other salmonids (Rieman and McIntyre 1993 as cited in 64 FR 58910). For example, the optimal temperatures for bull trout appear to be substantially lower than those for other salmonids (75 FR 63898). Besides very cold water (5° to 9° C [41° to 48° F]), bull trout require stable stream channels, clean spawning gravel, complex and diverse cover, and unblocked migration routes (Oliver 1979; Pratt 1984, 1992; Fraley and Shepard 1989; Goetz 1989; Hoelscher and Bjornn 1989; Sedell and Everest 1991; Howell and Buchanan 1992; Rieman and McIntyre 1995 as cited in 75 FR 63898). In addition, large patches of these components are necessary to support robust populations. Further threats to bull trout include hybridization and competition with non-native brook trout (*Salvelinus fontinalis*), brown trout (*Salmo trutta*), and lake trout (*Salvelinus namaycush*); overfishing; poaching; and man-made structures that block migration.

The decline of bull trout is primarily due to habitat degradation and fragmentation, blockage of migratory corridors, poor water quality, past fisheries management practices, impoundments, dams, water diversions, and the introduction of nonnative species (63 FR 31647 and 64 FR 17110). Climate change may exacerbate some of these impacts (75 FR 63898).

Bull trout spawning areas are often associated with cold-water springs, groundwater infiltration, and the coldest streams in a given watershed (Pratt 1992; Rieman and McIntyre 1993; Rieman et al. 1997 as cited in 64 FR 58910). Watson and Hillman (1997) concluded that watersheds must have specific physical characteristics to provide the necessary habitat requirements for bull trout spawning and rearing, and that the characteristics are not necessarily ubiquitous throughout watersheds in which bull trout occur. Because bull trout exhibit a patchy distribution, even in undisturbed habitats (Rieman and McIntyre 1993), fish would not likely occupy all available habitats simultaneously (Rieman et al. 1997 as cited in 64 FR 58910). Preferred spawning habitat generally consists of low gradient stream reaches often found in high gradient streams that have loose, clean gravel (Fraley and Shepard 1989 as cited in 64 FR 58910) and water temperatures of 5° to 9° C (41° to 48° F) in late summer to early fall (Goetz 1989 as cited in 64 FR 58910).

3.3.2 Life History

Bull trout exhibit both resident and migratory life-history strategies through much of their current range (Rieman and McIntyre 1993 as cited in 64 FR 58910). Resident bull trout complete their life cycles in the tributary streams in which they spawn and rear. Migratory bull trout spawn in tributary streams; juvenile fish rear from 1 to 4 years before migrating to either a lake (adfluvial); river (fluvial); or, in certain coastal areas, saltwater (anadromous) to mature (Fraley and Shepard 1989; Goetz 1989 as cited in 64 FR 58910). Anadromy is the least studied life-history type in bull trout, and some biologists believe the existence of true anadromy in bull trout is still uncertain (McPhail and Baxter 1996 as cited in 64 FR 58910). However, historical accounts, collection records, and recent evidence suggest an anadromous life-history form for bull trout (Suckley and Cooper 1860; Cavender 1978; McPhail and Baxter 1996; as cited in 64 FR 58910).

Spawning typically occurs in August to November when water temperatures drop below 9° C (48° F) in streams with abundant cold, unpolluted water, clean gravel and cobble substrate, and gentle stream slopes. Like steelhead, bull trout are iteroparous and may spawn more than once. Bull trout eggs require a long incubation period compared to other salmon and trout, hatching in late winter or early spring. Fry may remain in the stream gravels for up to 3 weeks before emerging.

Bull trout are opportunistic feeders with food habits primarily a function of size and life-history strategy. Resident and juvenile bull trout prey on terrestrial and aquatic insects, macro-zooplankton, amphipods, mysids, crayfish, and small fish (Wyman 1975; Rieman and Lukens 1979 in Rieman and McIntyre 1993; Boag 1987; Goetz 1989; Donald and Alger 1993 as cited in 64 FR 58910). Adult migratory bull trout are primarily piscivorous, known to feed on various trout and salmon species (*Oncorhynchus* spp.), whitefish (*Prosopium* spp.), yellow perch (*Perca flavescens*), and sculpin (*Cottus* spp.) (Fraley and Shepard 1989; Donald and Alger 1993 as cited in 64 FR 58910). In the Willamette Basin, Chinook salmon are an important food source for bull trout. Adult bull trout are usually small but can grow to 91 cm (36 in.) in length and weigh up to 14.5 kg (32 lb). Bull trout reach sexual maturity between 4 and 7 years of age and are known to live as long as 12 years.

Migratory corridors link seasonal habitats for all bull trout life-history forms. The ability to migrate is important to the persistence of local bull trout subpopulations (Rieman and McIntyre 1993; Rieman and Clayton 1997; Rieman et al. 1997 as cited in 64 FR 58910). Migrations facilitate gene flow among local subpopulations if individuals from different subpopulations interbreed when some return to non-natal streams. Migratory fish may also re-establish extirpated local subpopulations.

3.3.3 Presence Within the Hanford Reach

The Columbia River population segment of bull trout includes 141 subpopulations, and the USFWS considers four geographic areas of the Columbia River Basin: (1) lower Columbia River (downstream of the Snake River confluence), (2) mid-Columbia River (Snake River confluence to Chief Joseph Dam), (3) upper Columbia River (upstream from Chief Joseph Dam), and (4) Snake River and its tributaries (including the Lost River drainage). The Mid-Columbia geographic area includes the Hanford Reach. Within this area, the USFWS has identified 16 bull trout sub-populations in the 4 watersheds (number of subpopulations in each watershed): Yakima River (8), Wenatchee River (3), Entiat River (1), and Methow River (4). Historically, populations of bull trout occurred in larger areas of the four tributaries and in the mainstem Columbia River. However, bull trout are thought to have been extirpated in 10 streams within this area, including the Hanford Reach. The USFWS also identified three subpopulations of bull trout within the Walla Walla River (Lower Columbia River geographic area) (63 FR 31647).

Bull trout have been documented both in the Rocky Reach, Rock Island, Wells, Wanapum, and Priest Rapids reservoirs (Bioanalysts, Inc. 2004). Current information also suggests the occasional presence of bull trout in the Hanford Reach (Gray and Dauble 1977; Pfeifer et al. 2001). A bull trout radio-telemetry study conducted by Grant County Public Utility District in 2001 through 2003 found that "only one of the 79 tagged bull trout migrated downstream past Wanapum Dam. This trout ultimately moved downstream through Priest Rapids Dam. This observation indicates that few bull trout migrate through projects owned by Grant County PUD" (Stevenson et al. 2003).

Additional documentation indicates limited use of the unobstructed portion of the Columbia River between McNary and Priest Rapids dams. During the study years 2001 through 2004, Mahoney et al. (2006) did not observe migrating radio-tagged bull trout between the upper Walla Walla drainage and the Columbia River. However, one tagged bull trout was detected on January 31, 2007, moving downstream toward the Columbia River, which represents the first empirical evidence of Walla Walla Basin bull trout using the Columbia River (Anglin et al. 2009).

Bull trout are not likely to reside or spawn in the Hanford Reach, and those observations in the Hanford Reach are likely either displaced fish or migrating fish passing through the Reach (Poston 2010). Fish passage data from hydroelectric projects immediately above (Priest Rapids Dam) and below (McNary Dam) the Hanford Reach support this. In the past 20 plus years, from 1998 through August 2018, a total of only 47 bull trout have been observed at the Priest Rapids Dam adult counting stations. No bull trout were observed prior to 2007. Since 2007, an average of 2.3 trout/per year have been counted, ranging from a high of 11 fish in 2013 to zero fish in 2014 and 2017. Similarly, from 2001 through 2018, only one bull trout was observed (on December 21, 2004) passing upstream at the McNary Dam adult counting stations. Fish Passage Center data from 1998 through August 18, 2018 (Fish Passage Center website) indicate that bull trout were not sampled passing downstream through the juvenile collection system at McNary Dam, supporting the premise that juvenile bull trout hatch and remain to rear in cold headwater tributaries such as the Yakima and Walla Walla basins and likely do not use the mainstem Columbia River between McNary and Priest Rapids Dams for rearing.

Although the Hanford Reach may not have habitat suitable to support a subpopulation of bull trout year-round, mainstem portions of the Columbia River such as the Hanford Reach are known to provide essential foraging, migrating, and overwintering habitat where a combination of water depth, lower velocities, comparatively warmer water, and availability of food provide suitable habitat for at least a portion of the year (69 FR 59996). The Hanford Reach is critical habitat for bull trout based on its functionality as a migration corridor (Poston 2010). The mainstem Upper Columbia River Critical Habitat Unit is essential for maintaining bull trout distribution within the geographic region of the Mid-Columbia and conserving the fluvial migratory life history exhibited by many of the populations from adjacent core areas (75 FR 63898).

4.0 HANFORD ACTIVITIES POTENTIALLY AFFECTING LISTED SALMONIDS IN THE HANFORD REACH

This section describes the types of DOE actions and facilities at the Hanford Site that could impact listed steelhead, spring-run Chinook salmon, bull trout, or their critical habitat within the Hanford Reach. It also notes which actions will have *no effect* on listed species or actions that *may affect, but not likely adversely affect* listed species or their habitats.

Threatened or endangered fish species in the Columbia River may be affected by Hanford Site operations in several ways. General categories of activities include:

- Waste site remediation and facility demolition activities that occur near or within the river
- Construction of new facilities near or within the river
- Water withdrawals to support Hanford Site operations
- Industrial or stormwater discharges to the Columbia River
- Groundwater remediation actions that may affect groundwater entering the river
- Groundwater monitoring near or within the river
- Other monitoring and research activities that may affect biota, water, or sediments
- Pesticide applications near the river.

Each activity is described in greater detail below; determinations regarding the potential effects of these actions on listed steelhead, spring-run Chinook salmon, bull trout, and their critical habitats are provided. When evaluating potential effects on bull trout critical habitat, DOE considered each of the nine primary constituent elements defined in 75 FR 63898. The potential significance of many of these effects may depend on the particular setting where the action takes place. Therefore, DOE has considered determinations based on whether the action takes place above the Ordinary High Water Mark (OHWM), on the shoreline between the OHWM and the edge of the river (wetted perimeter), or within the water. A summary of these effect determinations is provided in Table 3.

Table 3. DOE Hanford Site Project Activities that Potentially Could Affect Listed Salmonids or their Critical Habitat. (2 pages)

Activity Type	Effect Determination for Activities by Setting		
	Upland to OHWM	OHWM to Wetted Perimeter	In Water
Waste Site Remediation and Demolition	No Effect	May Affect, Not Likely to Adversely Affect	Further Consultation Required

Construction	No Effect	Further Consultation Required	Further Consultation Required
Water Withdrawals	N/A	N/A	May Affect, Not Likely to Adversely Affect
Permitted Waste Water Discharges	No Effect	No Effect	May Affect, Not Likely to Adversely Affect
Groundwater Monitoring	No Effect	May Affect, Not Likely to Adversely Affect	N/A
Groundwater Treatment	No Effect	May Affect, Not Likely to Adversely Affect	N/A
Environmental Research	No Effect	No Effect	May Affect, Not Likely to Adversely Affect
Pesticide Applications	No Effect	May Affect, Not Likely to Adversely Affect	Further Consultation Required

This section identifies various ongoing projects as well as planned or potential projects for the Hanford Site that could affect steelhead, spring-run ESU Chinook salmon, bull trout, or their critical habitats within the Hanford Reach. Activities are described at a level of detail necessary to determine the severity of potential impacts on these species. For planned or potential actions, information is provided to the level of detail possible at this time, which in many cases is at a relatively generic level. Each summary lists the potential impacts that need to be considered along with actions to mitigate those impacts. For all actions that fall within a generic *may affect, not likely to adversely affect* determination, DOE will notify NMFS and/or USFWS prior to project implementation and DOE will provide sufficient project description and analysis to allow the agencies to concur with the generic determination for that specific action.

Future projects with the potential to affect these species that are significantly different from the types of work defined here or fall outside the protection requirements described below will be coordinated with NMFS and/or USFWS, and DOE will enter into formal or informal consultation, if needed, prior to taking actions that could affect these listed species or their critical habitats.

4.1 Waste Site Remediation and Demolition

Waste site remediation on the Hanford Site generally consists of sampling and characterization, excavation and removal of soil, debris, concrete, followed by close-out sampling and backfill. Originally, many waste sites on the Hanford Site were near the Columbia River. These sites were associated with the reactor areas and the fuel production activities in the 300 Area and included both liquid and solid waste. DOE prioritized remediation of sites along the Columbia River to minimize releases to groundwater and the river. Most of these sites have been remediated, interim closed-out, and are awaiting final records of decision under CERCLA. The majority of the waste sites remaining on the

Hanford Site are located in the upland areas, well away from the Columbia River. Remediation at these sites, with approved stormwater plans, is unlikely to cause any effects on listed salmonids or their habitats.

Several waste sites exist between the top of the floodplain and the OHWM. Although these projects occur outside of designated critical habitat, surface runoff could be considered an adverse risk to spring-run ESU Chinook salmon, steelhead, bull trout, or their critical habitat if runoff material results in the state water quality standards being exceeded or in siltation of, or the introduction of harmful contaminants to, a potential or known steelhead spawning area. Each project occurring along the shoreline with the potential for creating impermeable surfaces or destabilizing slopes will have an approved Stormwater Pollution Prevention Plan (SWPPP) in place to prevent potential impacts.

There also are a few identified waste sites remaining that extend beyond the OHWM of the Columbia River (Table 4), while others could be identified or reclassified at any time. The sites listed in Table 4 have been classified as "Inactive" or "Interim." Inactive sites are permanent man-made structures that have no current or planned future use and have surfaces contaminated with hazardous substances or have hazardous substances remaining within them. Inactive structures do not include waste disposal facilities such as cribs, ponds, ditches, or burial grounds. Interim Closed Out is a status indicating that, due to actions taken, a waste management unit meets cleanup standards specified in an Interim Record of Decision or Action Memorandum but for which a Final Record of Decision has not been issued. Although final decisions have not been made for each identified location, some sites may be remediated while others may be left in place. All new remediation designs will be thoroughly evaluated as part of the Ecological Compliance Review that is performed prior to the start of any project. Remediating these waste sites will remove the sources of contamination, if present, and thus prevent further movement of contaminants toward the river by groundwater.

The majority of these remaining sites consist of small segments of pipelines or spillways that extend from the upland area beyond the OHWM. Remediation of this type is expected to disturb less than 500 m^2 (5,382 ft^2) below the OHWM at a given site. However, some identified waste sites are associated with unplanned releases and dumping sites that extend over larger areas. Remediation in these areas would be performed during seasonal low flows (August 1 through February) and would be conducted outside of the wetted perimeter of the Columbia River. DOE will provide project-specific details to NMFS and USFWS as they are developed for concurrence. Any excavation that would impact the wetted perimeter of the river will require further coordination and/or ESA consultation with the respective agencies.

Table 4. Waste Sites that Extend Beyond the OHWM of the Columbia River and Their Current Status. (3 Pages)

Site Number	Site Name	Status
300-215	330 Area South Dumping Area	Inactive
300 RLWS	300 Area Radioactive Liquid Waste Sewer	Inactive
300-15	300 Area Process Sewer System	Inactive
300-261	315 Filter Plant Process Sewer to River	Inactive
300-292	315 Water Filter Plant Waste Pipeline	Inactive
600-153	Dumping Area Between River Mile Markers 29 and 30	Inactive
600-210	300 Area TEDF Outfall	Inactive

Table 4. Waste Sites that Extend Beyond the OHWM of the Columbia River and Their Current Status. (3 Pages)

Site Number	Site Name	Status
600-231	RCRA General Inspection – Historic Disposal Site	Inactive
600-250	Metal Debris from RCRA General Inspection	Inactive
600-258	Dumping Area from RCRA General Inspection	Inactive
600-385	Segment 4 Transite, Concrete, and Metal Debris Area	Interim - Closed Out
100-B-15	100BC River Effluent Pipelines, 100BC River Lines	Inactive
100-B-17	Transite on Columbia River Shoreline at 100B	Inactive
100-B-24	116-B-7 Spillway (Flume)	Interim – No Action
100-B-25	132-B-6 Spillway (Flume)	Interim – Closed Out
100-B-26	132-C-2 Spillway (Flume)	Interim – No Action
128-B-3	100-B Dump Site; 128-B Burning Pit Site	Interim – Closed Out
100-D-8	105-DR Process Sewer Outfall Site, 1907-DR, Undocumented Liquid Waste Site	Interim – No Action
100-D-10	Storm Drain Outfall	Inactive
100-D-50	100-DR Water Treatment Facilities Underground Pipelines	Inactive
100-D-60	100D River Lines, 100D/DR River Effluent Pipelines	Inactive
100-D-63	100-D/DR Clean Water Pipelines	Interim - No Action
100-D-65	116-D-5 Outfall Spillway, 1904D Spillway, 100-D-60:1 Flume	Interim – Closed Out
100-D-66	116-DR-5 Outfall, 1904-DR Spillway, 100-D-60:1 Flume	Interim – Closed Out
100-D-67	D Island, D Island Contamination	Interim – No Action
100-D-84	100-D Sanitary Sewer Pipelines	Interim – Closed Out
100-H-28	100-H Water Treatment Facilities Underground Pipelines	Interim - Closed Out
100-H-34	100H River Effluent Pipelines, 100H River Lines	Inactive
100-H-35	100-H Clean Water Pipeline	Interim – No Action
100-H-36	116-H-5 Spillway, 1904-H Spillway, 100-H-34:1 Flume (Spillway)	Inactive
100-H-54	GPERS 100-H Shoreline Survey Unplanned Release	Interim – No Action
100-K-58	100-KE Clean Water Pipelines	Inactive
100-K-59	100-KW Clean Water Pipelines	Inactive
100-K-63	100-KW Flood Plain Contamination Area	Interim - Closed Out
100-K-80	100KW River Effluent Pipeline, 100KW River Line	Inactive
100-K-96	100KE River Effluent Pipeline, 100KE River Line	Inactive
100-K-111	Effluent Seepage Area from 116-K-2	Inactive
100-K-113	100KW Columbia River Effluent Pipeline	Inactive
100-K-114	100KE Columbia River Effluent Pipeline	Inactive
100-N-61	100-N Water Treatment and Storage Facilities Underground Pipelines	Interim – Closed Out
100-N-62	100-N 105-N, 109-N, 163-N, 182-N, 183-N and 184-N Underground Pipelines	Interim – Closed Out
100-N-63	100-N Reactor (1314-N. 116-N-1 and 116-N-3) TSD Underground Pipelines	Interim – Closed Out
100-N-64	105/109-N Cooling Water Effluent Underground Pipelines	Interim – Closed Out
100-N-65	Diesel Oil Interceptor Trench	Inactive
100-N-77	River Line from 1908-N Outfall, 100N River Effluent Pipeline	Inactive
100-N-79	1908 N Outfall Structure, 1908-N Spillway, 100-N-77:1 Flume	Interim – Closed Out
100-N-80	River Line from 1908-NE Outfall	Inactive
100-N-84	100-N Miscellaneous Pipelines	Interim – Closed Out
100-N-87	116-N Ventilation Stack Piping and French Drain	Interim – Closed Out

Table 4. Waste Sites that Extend Beyond the OHWM of the Columbia River and Their Current Status. (3 Pages)

Site Number	Site Name	Status
100-N-95	Hanford Generating Plant (185-N) Septic Tank	Interim – Closed Out
100-N-102	100-N Potentially Contaminated French Drains	Interim – Closed Out
100-N-103	100-N Steam Condensate French Drains	Interim – No Action
100-N-104	Raw Water Overflow Spillway	Interim – Closed Out
100-N-108	100-N Shoreline Site – Unplanned Release	Inactive
120-N-3	163-N Neutralization Pit and French Drain	Interim – Closed Out
1908-NE	1908-NE Building; HGP Outfall	Interim – Closed Out

Water flows in the Hanford Reach are controlled by upriver dams, thus the water levels can change rapidly due to dam operations. Therefore, it is possible during the course of a shoreline remediation project that river fluctuations could cause an excavation to become inundated, even if the project is performed completely during seasonal low flows. Because these activities will usually occur at a time when juvenile out-migrating salmonids are not expected to be present, the excavations are not likely to pose a stranding risk. Any excavation that extends beyond the OHWM must be left in a condition that prevents any potential stranding between mid-February and late July (the period when stranding-prone juvenile salmon and steelhead may be present in the river).

Removal of native riparian vegetation will be minimized and, whenever possible, projects will be located in areas where vegetation is already disturbed. Damaged vegetation will be replaced with native plants for erosion protection and restoration. In all cases the use of heavy equipment below the OHWM will be minimized. Wherever possible, such as in support or access areas, vegetation will be cut or mowed rather than grubbed or completely removed.

All fill material used below the OHWM will be in-kind to native shoreline materials (ancestral Columbia River cobble from local borrow sources). These materials are relatively free of fines and are relatively stable under current river conditions, which should result in minimal releases of sediment following completion of the shoreline projects and subsequent inundation by higher river levels. Any project that installs non-native substrate (such as basalt rip-rap) or permanent structures (such as retaining walls) below the OHWM will require additional consultation with the respective agencies. Complex shorelines and riverbed features provide refuge for many life stages of salmonids, including emergent fry, yearlings, and adults. Project designs will maintain as much of the natural shoreline configuration as possible and/or will incorporate mitigation measures into project design. Riverbank protection, when required for a given project, will use bioengineering rather than hard armor whenever possible. Projects will use accepted guidelines (e.g., Washington State Aquatic Habitat Guidelines Program) when designing streambank protection measures (WSAHGP 2002).

Waste site remediation actions that occur completely above the OHWM are expected to have *no effect* on listed species, assuming that best management practices (BMP) are followed that prevent any run-off or impacts to the river or shoreline. Waste site remediation and supporting activities that are conducted below the OHWM, but outside the wetted perimeter of the river, will likely have a *may affect but not likely to adversely affect* determination regarding threatened or endangered species or their critical habitats. DOE will notify NMFS and USFWS of these activities prior to implementation and will supply sufficient project-specific information for the agencies to provide a concurrence with the generic determination. Any remediation activities that occur within water below the wetted perimeter of the river, or cannot be designed to meet all of the protective measures for shoreline protection, will require additional consultation with NMFS and USFWS to establish appropriate mitigation actions.

Demolition projects in upland areas occur frequently on the Hanford Site. When these activities are conducted with approved SWPPPs, *no effect* is expected to listed salmonids or their critical habitat. Any demolition activity that occurs below the OHWM, but outside of the wetted perimeter of the Columbia River, has the potential for impacting critical habitat. However, these projects will be conducted with approved SWPPPs, will follow BMPs, and will be followed by restoration using native materials. These projects will occur during low water periods, typically August 1 through February. Demolition projects performed below the OHWM but outside of the wetted perimeter *may affect but are not likely to adversely affect* listed salmonids and their critical habitats when conducted in this manner.

There are several structures remaining along the shorelines of the Columbia River, such as water intake buildings, that are expected to be removed in the future. Any demolition activities extending into the water will require further ESA consultation with the respective agencies.

4.2 New and Ongoing Construction Activities

Various construction activities on the Hanford Site could occur in the nearshore areas of the Columbia River but above the OHWM. These may include, but not be limited to, infrastructure installation and maintenance activities that support the Hanford Site missions. Any new construction activities or ongoing activities will be conducted using BMPs and a SWPPP, which will ensure state water quality standards are not exceeded and runoff does not occur near or affect a known or potential steelhead spawning area. These projects will also undergo an Ecological Compliance Review that will ensure that species or habitat impacts are avoided or mitigated; if the review determines that adverse impacts may occur, NMFS and USFWS will be contacted for further consultation. Construction activities performed in this manner are expected to cause *no effect* on listed salmonids or their critical habitat. No permanent structures will be installed along the shoreline below the OHWM without further ESA consultation with the respective agencies.

4.3 Water Withdrawals

Currently, there are three permanent water pumping stations at DOE facilities along the Columbia River with potential to impact juvenile fish. These are located at the 100-B/C, 100-D, and 300 Areas.

4.3.1 181-B/C and 181-D Pumping Stations

These stations supply raw water from the Columbia River to the 200-East and West Areas and the other 100 Areas. Each of these pump stations contains several functional pumps, each capable of pumping approximately 631 L/s (10,000 gal/min). Current Hanford Site water use averages about 3,800 m^3/day (1,000,000 gal/day). To support this level of water use, two pumps at one of the facilities are activated for 3 to 4 hours every 2 to 3 days to maintain the water level in the raw water reservoirs located near each pump station. The screens at these pumping stations were installed in 1996 and have no moving parts, openings no greater than 1.75 mm (0.7 in), and an air backwash system to keep them free of debris. Water velocity through the screens is less than 0.1 m/s (0.3 ft/s). These screening systems meet the NMFS criteria for active screen systems (NMFS 2011b). Steel plates cover the pumphouse inlet channels to seal off openings between the pump house and the river.

4.3.2 300 Area Pumping Station

Fish screens at the 300 Area Pumping Station, which provides small amounts of raw Columbia River water to the 331 Aquatic Laboratory fish tanks, were evaluated and modified for compliance with WDFW requirements in 1995. Screen mesh size and approach velocity standards in 1995 (NMFS 1995) were similar to modern standards (NMFS 2011b).

In the past, divers were used periodically to clean intake screens; however, this has not occurred in over 10 years. If this were to occur in the future, the process could create some disturbance to the riverbed. However, appropriate approvals or permits would be obtained prior to any in-water cleaning actions.

There are no new permanent water withdrawal systems planned for the Hanford Site; however, potential modifications to the systems at 181-B/C and 181-D are currently being studied. If a new or substantially modified system is proposed for installation, it will need to be reviewed, approved, and permitted by appropriate agencies such as WDFW, Washington State Department of Ecology (Ecology), and the U.S. Army Corps of Engineers. Native American Tribes may also be consulted before final designs are developed. The design of any new water withdrawal system would have to meet all the regulatory requirements and mitigation strategies for this type of activity. Any new water withdrawal systems will also include consultation with NMFS and USFWS under ESA Section 7 as part of the review process.

4.3.3 Minor Withdrawals

Small-scale, temporary water withdrawals may be required to support specific projects. These withdrawals could be in the range of 10 to several hundred gal/min, and would consist of a pipe placed in the river where needed. If such withdrawals are required, the pipe will have a screen that meets the current NMFS criteria for juvenile fish protection regarding pore size, approach velocity, and open area will be sized to account for the anticipated pumping rates. The site ecological compliance staff will work with these projects to identify locations for the withdrawal pipe and seasons when pumping can be accomplished with minimal impact to migrating or rearing juvenile salmon. The staff will work closely with NMFS and/or USFWS, when needed, to ensure adverse impacts are avoided. For instance, ecological compliance staff worked with NMFS to develop a means to safely withdraw water to support the Apatite Barrier project near the 100-N Area without harming juvenile salmon or steelhead (CHPRC 2010b). If any future minor withdrawals are needed, similar BMPs will be employed and NMFS and USFWS will be notified prior to initiation of the withdrawal.

All existing water intake structures managed by the DOE on the Hanford Site meet the NMFS criteria for protection of juvenile fish. The intake screens at the Hanford Site's primary intake structures have an active, air backwash cleaning system. None of the intake structures are located in steelhead spawning areas (Figure 8). Because all water intakes meet the current standards for the protection of juvenile fish and none are located near potential spawning areas, continued water withdrawal to support Hanford Site operations *may affect, but are not likely to adversely affect* listed salmonids. Although no new permanent withdrawals are planned, any new structures would require ESA Section 7 consultation with the NMFS/USFWS.

4.4 Permitted Water Discharges

The EPA permits wastewater discharges to surface waters of the Columbia River under the National Pollutant Discharge Elimination System (NPDES – 40 CFR 122). DOE does not currently have any discharges to the Columbia River requiring an NPDES permit under the federal program. However, four Ecology state waste discharge permits currently are in effect at the Hanford Site that allow releases of liquid wastes to the ground. The permits are for the 200 Area Effluent Treatment Facility (ST-4500), the 200 Area Treated Effluent Disposal Facility (ST-4502), Miscellaneous Streams (ST-4511), and the 200-West Area Evaporative Sewage Lagoon (ST-0045514). DOE is the holder of all state waste discharge permits.

Two Ecology general permits for sand and gravel also are in effect: Concrete Batch Plant (WAG-50-5150) and Pit 30 Quarry (WAG-50-5181). These general state permits provide coverage for discharges of process water, stormwater, and mine dewatering activities associated with sand and gravel operations and rock quarries.

Additional information about the Waste Water Discharge and Sand and Gravel permits can be found on the Ecology website.

Any future permitted groundwater discharges on the Hanford Site would be expected to have *no effect* on listed salmonids or their critical habitats. Although expected to have minimal effect, permitted discharges to the Columbia River may affect the river environment and would be assigned a *may affect, not likely to adversely affect* determination regarding listed salmon, steelhead, and bull trout.

DOE does not currently anticipate the need for an NPDES permit. If such a need were to arise, DOE would consult with NMFS and USFWS as part of the permit application and approval process.

4.5 Groundwater Monitoring

Legacy wastes released to the soil have migrated through the vadose (unsaturated) zone and have reached the groundwater. Some contaminants have moved laterally with the groundwater as plumes to reach the Columbia River. The sources of these plumes are now inactive waste or process ponds, ditches, cribs (similar to a sanitary septic tank), trenches, French drains, and various types of injection wells (also known as "reverse wells"). DOE has taken steps to protect the Columbia River and groundwater by terminating all unpermitted discharges in the central Hanford Site, remediating the former liquid waste sites in the 100 and 300 Areas, containing groundwater plumes, and reducing the mass of primary contaminates through remedial actions such as pump-and-treat systems (DOE 2018c).

Thousands of wells have been constructed on the Hanford Site since the early half of the 20th century beginning with early settlers drilling and hand digging wells for drinking water, to the drilling of wells to support the Site's nuclear weapons production (starting in the 1940s), to the installation of wells for the Site's environmental cleanup mission (starting in the 1990s). All known wells on the Hanford Site are tracked in the DOE Environmental Dashboard Application (DOE 2018d). Recognized well types include aquifer tubes, borings, groundwater wells, hosted piezometers, independent piezometers, piezometer hosts, soil tubes, lysimeters, and vadose wells (Table 5). Each well receives a unique Hanford identification number. A total of 12,534 wells have been assigned unique identification numbers as of

August 2018, with 4,184 wells still in use. Wells include 2,633 groundwater and 2,555 vadose wells, 395 piezometers within 99 host wells and 53 independent piezometers, 229 lysimeters within 65 host wells, 603 aquifer tubes, and 549 soil tubes. A total of 6,534 wells have been decommissioned or are candidates for decommissioning. All construction, maintenance, and decommissioning of wells on the Hanford Site are in accordance with Washington State provisions of WAC 173-160 (DOE 2018c).

Table 5. Hanford Site Well Types (DOE 2018c).

Well Category	Description
Aquifer Tube	A groundwater monitoring site installed along the river shoreline. Generally consists of a small diameter tube (less than one inch) and screen installed using push technology near the water table.
Boring	A borehole or direct push that was decommissioned immediately after drilling. Decommissioning generally would have been performed before the drill rig was removed from the site.
Groundwater Well	A well that is constructed with the open interval extending below the water table. This is the general case and should not be used if the site could be otherwise classified as an aquifer tube, piezometer, or piezometer host.
Hosted Piezometer	A groundwater monitoring well that is constructed inside of a host well. In most cases, hosted piezometers are one and one-half inch in diameter with the open interval extending below the water table.
Independent Piezometer	Small diameter, independent, groundwater monitoring well not constructed inside of a host well. In most cases, the independent piezometers are one and one-half inch in diameter.
Lysimeter	Generally an in-situ open bottom cylindrical core where the top is coincident with the ground surface, and with walls that prevent horizontal movement of moisture. A lysimeter is used to measure moisture or contaminant changes through time over a specific depth interval.
Piezometer Host	A well with one or more piezometers constructed inside it.
Soil Tube	Vadose zone monitoring site. A small diameter tube (less than two inches in diameter) and possibly a screen are left in place after the drilling is completed for sampling.
Vadose Well	A vadose zone monitoring site where casing (greater than two inches in diameter) is left in place after drilling activities are completed. May have a screen, open bottom, or may be closed.

In 2017, 1,063 wells and 199 aquifer tubes were sampled; many were sampled more than once for a total of 4,167 sampling events (DOE 2018c). Well monitoring follows a standard procedure. Before a sample is taken wells are purged of a volume of water equal to three water columns. In accordance with Hanford Facility Dangerous Waste Permit, Revision 8C, Permit Number WA7 89000 8967, if contaminated (higher than permit criteria) purge water is generated, it is contained in tanker trucks and sent for disposal. Non-contaminated purge water may be discharged to the surrounding ground surface. No contaminated water is discharged on the ground and no water is discharged directly to the river.

In addition to routine sampling, occasional hydrologic testing is performed to characterize the aquifer. This involves pumping water from the well continuously for several days. This is only done a few times per year and rarely on the wells near the river. Strict procedures and BMPs are followed to prevent erosion and all discharges are performed in accordance with the Hanford Site Miscellaneous Streams Discharge Permit (ST-4511). Except as authorized by a wastewater discharge permit, no discharge or runoff of wastewater is allowed to any surface waters, including the Columbia River. Well installation and decommissioning are routine activities that will continue to occur at Hanford for the foreseeable future. During 2017, DOE drilled 107 new wells and boreholes for monitoring, remediation, and characterization and decommissioned 7 wells that were no longer needed (DOE 2018c). Some of these activities may occur within the 100-year floodplain. Permanent wells will not be installed below the OHWM but boreholes or other temporary wells may be constructed for aquifer or substrate characterization. The physical impact to the environment from these activities is generally minor because of the small area affected.

Drilling a new well often involves clearing and/or leveling an area large enough for the drill rig and support equipment (typically 600 m^2 [6,500 ft^2]). The size of the area can vary depending on the type of drilling equipment used. The quality and sensitivity of the habitat in the area also influences the size of the drill pad. Where high quality or sensitive habitat is present, all efforts are made to keep the area of disturbance as small as possible. DOE evaluates each proposed project and identifies requirements that will minimize disturbance to high quality or sensitive habitats or to protected species (DOE 2017a).

Well decommissioning consists of bringing in equipment either to pull the well casing or perforate it, fill it with grout to the surface, and then restore the pad with native vegetation. Decommissioning wells generally disturbs less area than installing them because clearing and leveling the land surface is seldom required. Land disturbance from this activity is often only from vehicle tracks.

Groundwater entering the Columbia River is monitored by installing small-diameter tubing in the shoreline to various depths (aquifer tubes). Access to these sites may be by driving a vehicle to the shoreline, when accessible, but is commonly by boat. The installation typically involves driving a 2.5- to 3.75-cm-(1- to 1-5 in.) diameter steel tube up to 10 m (30 ft) deep, along with an inner plastic sample tube, into the gravels using either a truck-mounted hydraulic ram or a hand-operated air-driven ram. Once the desired depth is reached, the outer casing is removed leaving the 0.6-cm (0-24 in.) diameter sample tube in place. Sample tube locations are below the 100-year flood plain and generally just above the annual low-water shoreline. Installation usually takes place above the active waterline during the months of lowest river flow (August to November) but may occur in up to several feet of water. The sample tubes typically extend well above the water line, often to above the OHWM. Thus, sampling usually can be conducted with minimal in-water disturbance.

The impacts from aquifer tube monitoring on shoreline habitat are considered to be minimal, consisting of temporary disturbance to vegetation by foot traffic and occasionally by driving a vehicle to the shoreline (only done in areas that are accessible). No excavation is conducted and no permanent damage is done to vegetation.

Most groundwater monitoring activities occur above the OHWM and are expected to cause *no effect* on listed salmonids or their critical habitat. Activities that occur below the OWHW but above the OLWM *may affect but are not likely to adversely affect* listed salmonids or their critical habitat. DOE will notify NMFS and USFWS prior to installation of any new groundwater monitoring devices or wells below the OHWM and will provide sufficient information for the agencies to concur with the generic determination regarding these impacts.

4.6 Groundwater Treatment

DOE-RL is using several techniques of groundwater treatment to reduce the amount and extent of contaminants reaching the Columbia River. These techniques include pump-and-treat systems, in-situ groundwater treatment, and permeable barriers.

Pump-and-treat systems consist of a set of groundwater wells designed to cleanup groundwater contamination. Wells are installed within or downgradient of a contamination plume to pump the water out of the ground. In the case of systems adjacent to the Columbia River, the groundwater is treated to remove contaminants and is then re-injected upgradient of the plume. These wells are not within the 100-year floodplain, therefore, shoreline habitats are not affected. Although treated groundwater will eventually reach the Columbia River, the result will be an improvement of water quality entering the river. Currently, there are five pump-and-treat systems operating on the Hanford Site within 2 km (1 mi) of the Columbia River and additional systems in the 200-West Area. There are 3 pump-and-treat systems (KR-4, KX, and KW) in the 100-K Area with 38 extraction wells and 19 injection wells and 2 pump-and-treat systems (DX and HX) between the 100-D and 100-H Areas with 85 extraction wells and 28 injection wells.

A permeable reactive barrier (also known as the In-Situ REDOX Manipulation Project) was installed in the 100-D Area for in-situ chemical treatment of hexavalent chromium. The barrier was designed to intersect the portion of the groundwater plume with highest concentration of hexavalent chromium. The treatment area (680 m [2,250 ft] long with 65 wells) was injected with sodium dithionate ($Na_2O_6S_2$), which reacts with the metal in the sediments creating a reducing zone. As groundwater moves through this zone, hexavalent chromium is reduced to trivalent chromium. The trivalent chromium precipitates out and is thus prevented from migrating to the river. The project was implemented to prevent the continual discharge of hexavalent chromium to the river where it may impact aquatic organisms, including salmonid eggs and fry. The treatment makes the groundwater anoxic, but a numerical model predicts 75 to 95% oxygen saturation at the river. Air entrapment caused by water table fluctuations has the most impact on dissolve oxygen concentration (Williams et al 1999). No fall Chinook salmon spawning occurs where groundwater from the treatment area enters the river and less than 1% of the area is suitable spawning habitat (Mueller and Geist 1998). In 1999, DOE transmitted a BA that determined that there would not be a significant impact to listed salmon or steelhead (DOE 1999b). In 2010, due to breakthrough of contaminants at the barrier, it was decided that the barrier would no longer be actively maintained and that expansion of the pump-and-treat system (i.e., extraction wells located downgradient of the barrier) would be used to address the breakthrough and provide a protective interim remedy.

A 311-m (1,020-ft) permeable reactive barrier for strontium-90 is located in the 100-N Area. Strontium-90 is sequestered by injecting calcium-citrate phosphate solution into the aquifer. Biodegradation of the citrate results in apatite precipitation as the free calcium and phosphate combine to form apatite. Strontium (and strontium-90 ions) in groundwater substitute for calcium ions through cation exchange and are incorporated in the mineral matrix during apatite crystallization. DOE plans to expand this barrier to a length of 762 m (2,500 ft). The potential impacts of the 100-N apatite barrier on salmonids evaluated by Poston (2010) identified increased cation concentrations and dissolution of metals as the primary potential impacts. It was determined that factor was likely to have a detectable effect on migrating juvenile salmon or steelhead.

Most recently, a system designed to sequester uranium present in the soil and groundwater beneath a portion of the 300 Area was constructed. Uranium sequestration involves infiltrating/injecting phosphate solutions to the vadose zone and periodically rewetted zone to sequester, or bind, residual mobile uranium to form insoluble minerals. Uranium sequestration will also be used in the top of the aquifer to reduce the mobility of uranium that may be mobilized during the vadose zone treatment process. Uranium sequestration is anticipated to reduce the mass of soluble uranium entering the groundwater in this area, thereby reducing the restoration timeframe for uranium in the groundwater. Uranium in the groundwater will be monitored until cleanup levels are met. The potential impacts of the uranium sequestration project on the three ESA-listed salmonids and their critical habitat were evaluated in support of informal consultations with USFWS and NMFS (DOE 2015b).

In addition, DOE has constructed a bioventing system for in-situ bioremediation of deep vadose zone petroleum contamination in the 100-N Area. Bioventing is a process in which oxygen is added by forcing air through vadose zone soils to enhance the population of naturally occurring bacteria to metabolize and remove petroleum contaminants from the vadose zone. Petroleum contamination in the aquifer is being removed using a polymer "smart sponge" that selectively absorbs petroleum products from the groundwater within the wells observed to have a free-floating petroleum product; currently this is performed at only one well. DOE is proposing to use biosparging to further address petroleum contamination in the aquifer. Similar to bioventing, biosparging will force air into the aquifer to enhance the population of naturally occurring bacteria in the aquifer to metabolize petroleum contamination in the aquifer.

Operation of groundwater treatment systems will benefit the Columbia River ecosystem by improving the quality of the groundwater entering the river. Groundwater treatment activities occur above the OHWM and are expected to cause *no effect* on listed salmonids or their critical habitat.

4.7 Environmental Research

Environmental research is conducted to monitor the distribution of radionuclides and other contaminants in the environment, and to perform research on various biotic, abiotic, and cultural resource concerns. This activity consists of various types of biotic and abiotic sampling along with ecological evaluations and data gathering. Sampling supports contaminant characterization in river sediments or in the porewater below the surface of the riverbed.

Abiotic sampling inside the wetted perimeter of the river includes surface water, sediment, and porewater samples. Samples are obtained with jars or scoops, small pumps, small ponar samplers, seep samplers, aquifer tubes, or substrate probes. Sampling may take place on exposed shorelines when water levels are at a daily or seasonally low point or within submerged portions of the river. Seep samplers are installed by digging shallow (<1-m [3-ft]) holes in exposed shoreline areas to bury tubes, aquifer tubes are placed in the shoreline substrate up to 10 m (30 ft) deep using a hydraulic hammer, while substrate probes are placed into the river bottom using a weighted frame. Care will be taken during all sampling activities to not leave depressions where juvenile salmon or steelhead could become stranded. These sampling activities are not expected to impact habitat integrity because very small sample quantities are collected on an intermittent basis.

Water, sediment, and shoreline sampling/monitoring activities will occur on a sporadic and intermittent basis. These activities include small volumes of water (usually <20 L [5 gal]) and small masses of sediment (<2 kg [4.4 lb]). These activities are not expected to result in significant levels of harassment due to their short term and sporadic occurrences. When these sampling activities are conducted outside of the wetted perimeter of the river, *no effect* on listed salmonids or their habitats are expected. When sampling will occur in the water, fish may be temporarily displaced due to noise disturbance associated with sampling devices. These disturbances are likely to have minimal effect on listed species or their habitats.

Selected fishes are routinely collected, usually by electrofishing or hook-and-line, throughout the Hanford Reach for various research purposes and for contaminant uptake monitoring. Other organisms, such as invertebrates and amphibians, may be surveyed or sampled to support ecological characterization and contaminant monitoring. Electrofishing will be conducted consistent with NMFS Electrofishing Guidelines (NMFS 2000). Hook-and-line sampling will be conducted primarily with artificial lures and in target species habitats. The use of natural bait will be minimized and only used as necessary to collect the desired number of target specimens when other techniques fail. The activities described above will only be conducted in accordance with Section 10 Incidental Take permits and WDFW Scientific Collection permits. Consequently, no unpermitted take/harassment of listed salmonids will occur during fish sampling activities.

Mitigation strategies for water/sediment sample collection will include avoiding critical times of the year and sensitive habitats such as spawning areas. Environmental monitoring activities will not be conducted in known spawning areas for steelhead (Figure 8) during the spawning period until the point that spawning activity is documented as absent during aerial redd counts. DOE performs annual aerial surveys for steelhead redds during May and June. If steelhead redds are located during the course of these surveys, protective measures will be put in place to minimize boat activities and avoid sampling in those areas. No sampling will occur within 10 m (30 ft) of a fall Chinook salmon redd. In addition, the general strategies developed to prevent capture, harassment, or impacts from riverbed modifications will prevent any adverse effect on steelhead, spring-run ESU Chinook salmon, or bull trout or their critical habitats from sampling and ecological evaluation activities. Adherence to stipulations included in the required WDFW Scientific Collection Permit, and subcontractors ESA Section 10 Incidental Take Permits, will mitigate for impacts associated with fish collection.

Environmental sampling and monitoring activities are usually small-scale and short-duration actions. These activities are likely to cause noise at an intensity of less than 150 dB, and therefore are unlikely to cause physical injury to listed salmon, steelhead, or bull trout that can occur from other actions such as pile driving (Hastings 1995; NMFS 2012). The noise from boats used for access to sample and monitoring locations may have small, short-term behavior effects on listed fish species (NMFS 2012), but the amount of boat traffic due to Hanford-related environmental sampling and monitoring is expected to be relatively small compared to the typical daily recreational boat traffic on the Hanford Reach.

Environmental research activities that occur outside of the wetted perimeter of the Columbia River are expected to have *no effect* on listed salmonids or their critical habitat. Environmental research activities that occur within the wetted zone of the river *may affect, but not likely to adversely affect* listed salmonids or their critical habitat. In 2008, NMFS concurred with this determination (NMFS 2008) and reaffirmed the determination in 2013 (NMFS 2013c).

4.8 Pesticide Applications

Pesticide applications are occasionally used to control noxious weeds on the Hanford Site. All applications are performed by state-licensed applicators following procedures and application requirements defined specifically by EPA for each product. All upland noxious weed control applications will be performed under conditions that will not result in any runoff or drift to the Columbia River environment.

When pesticides are applied above the OHWM, label instructions are followed and appropriate buffer distances are established to ensure that the chemicals do not drift to the river. Therefore, pesticide applications above the OHWM are expected to have *no effect* on listed salmonids.

Historically, pesticides have not been applied in the Columbia River or in adjoining riparian areas. However, products that are EPA-approved specifically for application in aquatic environments potentially could be considered by DOE to control noxious weeds in the nearshore environment. Application of EPA-approved pesticides below the OHWM that follow label instructions *may affect, but are not likely to adversely affect* listed salmonids. NMFS has consulted with EPA concerning a number of pesticides (summarized in NOAA 2018). If pesticide applications within or near the river are pursued, DOE will carefully evaluate and select products based on their potential toxicity to salmonids, and will consult with NMFS and/or USFWS prior to application below the OHWM. Any deviations from these requirements will necessitate consultation with NMFS/USFWS prior to application.

5.0 MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT

Federal agencies are directed, under Magnuson-Stevens Act 305(b)(2) to consult NMFS regarding actions that are authorized, funded, or undertaken by that agency that may adversely affect EFH, defined as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." The Hanford Reach provides habitat for various life stages of Chinook and coho salmon and steelhead, and hosts the major spawning aggregation of Upper Columbia River bright fall-run Chinook salmon.

Most actions conducted by DOE and its contractors occur in the terrestrial environment above the OHWM and are not expected to impact EFH. Mitigation methods that include silt fences, grading to prevent runoff, and project timing for actions close to the OHWM will prevent impacts to EFH. For any actions that occur between the OHWM and the wetted shoreline, DOE and its contractors will take additional measures to avoid impacts to EFH, including monitoring the condition of the riparian vegetation and reestablishing native plants as necessary. Rearing juvenile fall Chinook salmon are highly associated with the nearshore environment and are vulnerable to stranding.

Best management practices to minimize impacts to EFH for fall Chinook and other anadromous salmonids include the following:

- All work occurring between the OHWM and the wetted shoreline will be performed during the low flow season (generally August 1 through February), a timeframe that falls outside of the emergence and rearing period for juvenile fall Chinook salmon.
- Any excavation that extends beyond the OHWM must be left in a condition that prevents any potential stranding while juvenile salmonids are present (between March and July).
- Any excavation work will include runoff prevention and restoration to re-establish native vegetation and to prevent soil erosion.
- Any fill material will be in-kind native shoreline materials from local sources.
- No in-water work will be performed by DOE and its contractors without further consultation with NMFS.

These mitigation measures will substantially reduce impacts to EFH.

6.0 MANAGEMENT PLAN IMPLEMENTATION

This management plan is implemented primarily through the *National Environmental Policy Act* review process and the analogous CERCLA Remedial Investigation process. One aspect of these review processes is the Ecological Compliance Review, which evaluates proposed projects against regulatory criteria and DOE natural resource management goals. Ecological compliance reviews for all projects with the potential to affect listed species or the Columbia River will include a consideration of these requirements and management procedures. These requirements and procedures pertain to DOE and its contractors as they perform work under their operations contracts with DOE.

DOE's BRMP (DOE 2017a) provides objectives and strategies for biological resource protection, monitoring, assessing impacts, and determining mitigation requirements for Hanford Site activities. BRMP-related monitoring may include annual spawning surveys, habitat evaluation, and contaminant monitoring. DOE projects are required to rectify or replace all riparian habitats that are disturbed by DOE projects. Riparian areas and the Columbia River are among the habitats with the highest priority for protection.

DOE-RL abides by the belief that protecting habitat is a more cost-effective and prudent approach to resource management than restoring habitat that is lost or damaged. Therefore, every effort will be taken to ensure that DOE and its contractors conduct activities in a manner that is protective of salmon, steelhead, and bull trout habitat. This includes following project-specific BMPs and considering the objectives of this plan in land management decision-making.

When possible, activities will be conducted during time periods or at places that avoid contact with steelhead, bull trout, and salmon. Good planning and construction practices will be used to minimize impacts to listed salmonids. For example, properly maintaining equipment to prevent loss of petroleum products, using erosion and sediment control measures, and disposing of construction debris in upland locations will prevent degradation of water quality. Where possible, contractors will incorporate provisions into their project plans that are beneficial for fish and wildlife habitat.

Future projects with the potential to affect these ESA-listed species that are significantly different from the types of work defined in this document will be coordinated with NMFS and/or USFWS, and DOE will enter into formal or informal consultation, if needed, prior to taking actions that could affect these listed species or their critical habitats.

7.0 REFERENCES

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Department of Energy
Richland Operations Office
P.O. Box 550
Richland, Washington 99352

17-SSD-0007

NOV 10 2016

Mr. William K. Johnson, President
Mission Support Alliance, LLC
Richland, Washington 99352

Dear Mr. Johnson:

CONTRACT NO. DE-AC06-09RL14728 – CONTRACT DELIVERABLE CD0067
"HANFORD SITE BIOLOGICAL RESOURCES MANAGEMENT PLAN"
(DOE/RL 2000-27, REV 2)

This letter is in response to your September 26, 2016, letter (MSA- 1604082) requesting approval of the contract deliverable. The Richland Operations Office has reviewed and approves the "Hanford Site Biological Resources Management Plan, (DOE/RL 2000-27, Rev 2)" for publication. If you have any questions, please contact me, or your staff may contact Annabelle L. Rodriguez, Site Stewardship Division, on (509) 372-0277.

Sincerely,

Timothy E. Corbett
Contracting Officer

SSD:ALR

cc: Jennifer A. Jahner, MSA
April L. Johnson, MSA
Judy A. Pottmeyer, MSA
Mary J. Skelton, MSA
Darci D. Teel, MSA
Michael B. Wilson, MSA

Mission Support Alliance
Post Office Box 650
Richland, Washington 99352

September 26, 2016

MSA-1604082
CONTRACT NO. DE-AC06-09RL14728

Mr. Timothy E. Corbett, Contracting Officer
U.S. Department of Energy
Richland Operations Office
Procurement Division
Post Office Box 550
Richland, Washington 99352

Dear Mr. Corbett:

RL APPROVAL - CONTRACT DELIVERABLE CD0067, "HANFORD SITE BIOLOGICAL RESOURCES MANAGEMENT PLAN"

In accordance with MSC Section C.2.1.8.4, "Ecological Monitoring and Compliance," attached is contract deliverable CD0067, "Hanford Site Biological Resources Management Plan." Approval of CD0067 is requested within 45 days of receipt of this letter, in accordance with MSC Section J-11.1.

Overall, Revision 2 of the "Hanford Site Biological Resources Management Plan" does not make substantive changes to the approach or the requirements for the management of biological resources on the DOE-managed portions of the Hanford Site from those contained in the previous revision of the document. Notable changes found in Revision 2 include the following:

- Substantial updates to the Resource Level Maps to incorporate the results of the site-wide vegetation monitoring effort done in 2015.
- Updates to occurrence maps for species of conservation concern based on recent monitoring work.
- A new section on the policies adopted in the Comprehensive Land-Use Plan.
- Inclusion of discussions regarding recent Presidential Proclamations and Memoranda that affect biological resource management at Hanford.
- Updated references and links for cited material.

Technical questions should be directed to M. B. Wilson at 376-1667, and contractual questions should be directed to me at 376-5052.

Sincerely,

Jennifer A. Jahner, Manager
Contracts

ksp:ljm

Attachment

RL – L. D. Beitz
H. B. Hathaway
S. Y. Ki
A. L. Rodriguez
K. L. Snell

Department of Energy
Richland Operations Office
P.O. Box 550
Richland, Washington 99352

19-SSD-0009 NOV 0 8 2018

Mr. Robert E. Wilkinson, President
Mission Support Alliance, LLC
Richland, Washington 99352

Dear Mr. Wilkinson:

CONTRACT NO. DE-AC06-09RL14728 - CONTRACT DELIVERABLE (CD) CD0071, "THREATENED AND ENDANGERED SPECIES MANAGEMENT PLAN: SALMON, STEELHEAD, AND BULL TROUT"

This letter responds to your September 24, 2018, letter (MSA-1803673) requesting approval of the contract deliverable. The Richland Operations Office has reviewed and approves the "Threatened and Endangered Species Management Plan." If you have any questions, please contact me or your staff may contact Annabelle L. Rodriguez, Site Stewardship Division on (509) 372-0277.

Sincerely,

Timothy E. Corbett
Contracting Officer

SSD:ALR

cc: Jennifer A. Jahner, MSA
April L. Johnson, MSA
Mary J. Skelton, MSA
Michael B. Wilson, MSA

Mission Support Alliance
Post Office Box 650
Richland, Washington 99352

September 24, 2018

MSA-1803673
CONTRACT NO. DE-AC06-09RL14728

Mr. Timothy E. Corbett, Contracting Officer
U.S. Department of Energy
Richland Operations Office
Procurement Division
Post Office Box 550
Richland, Washington 99352

Dear Mr. Corbett:

RL APPROVAL - CONTRACT DELIVERABLE CD0071, "THREATENED AND ENDANGERED SPECIES MANAGEMENT PLAN: SALMON, STEELHEAD, AND BULL TROUT"

In accordance with MSC Section C.2.1.8.4, "*Ecological Monitoring and Compliance*," attached is contract deliverable CD0071, "Threatened and Endangered Species Management Plan: Salmon, Steelhead, and Bull Trout." Approval of CD0071 is requested within 45 days of receipt of this letter, in accordance with MSC Section J-11.1.

This document will be used as a key part of future consultations between RL and the U.S. Fish and Wildlife Service, and the National Marine Fisheries Service in partial fulfillment of RL's responsibilities under the Endangered Species Act, and the Magnuson-Stevens Fishery Conservation and Management Act.

Technical questions should be directed to M. B. Wilson at 376-1667, and contractual questions should be directed to me at 376-5052.

Sincerely,

Jennifer A. Jahner, Director
Contracts

alj:ljm

Attachment

RL –	K. C. Barott-Wolff	K. E. Lutz
	L. D. Beitz	A. L. Rodriguez
	S. T. Hargroves	

Department of Energy
Richland Operations Office
P.O. Box 550
Richland, Washington 99352

16-SSD-0064 AUG 08 2016

Mr. William K. Johnson, President
Mission Support Alliance, LLC
Richland, Washington 99352

Dear Mr. Johnson:

CONTRACT NO. DE-AC06-09RL14728 – CONTRACT DELIVERABLE CD0071 - "THREATENED AND ENDANGERED SPECIES MANAGEMENT PLAN," (DOE/RL 2000-27, Rev 2)

This letter responds to your September 23, 2015, letter (MSA-1504041) requesting approval of the contract deliverable. The Richland Operations Office has reviewed and approves the "Threatened and Endangered Species Management Plan". If you have any questions, please contact me, or your staff may contact Annabelle L. Rodriguez, Site Stewardship Division, on (509) 372-0277.

Sincerely,

Timothy E. Corbett
Contracting Officer

SSD:ALR

cc: Michael B. Wilson, MSA
Jennifer A. Jahner, MSA
Mary J. Skelton, MSA
Darci D. Teel, MSA
April L. Johnson, MSA

Mission Support Alliance
Post Office Box 650
Richland, Washington 99352

September 23, 2015

MSA-1504041
CONTRACT NO. DE-AC06-09RL14728

Mr. Timothy E. Corbett, Contracting Officer
U.S. Department of Energy
Richland Operations Office
Procurement Division
Post Office Box 550
Richland, Washington 99352

Dear Mr. Corbett:

RL APPROVAL - CONTRACT DELIVERABLE CD0071, "THREATENED AND ENDANGERED SPECIES MANAGEMENT PLAN: SALMON, STEELHEAD, AND BULL TROUT"

In accordance with MSC Section C.2.1.8.4, "Ecological Monitoring and Compliance," attached is contract deliverable CD0071, "Threatened and Endangered Species Management Plan: Salmon, Steelhead, and Bull Trout" (Attachment). Approval of CD0071 is requested within 45 days of receipt of this letter, in accordance with MSC Section J-11.1.

This document will be used as a key part of future consultations between RL and the U.S. Fish and Wildlife Service and the National Marine Fisheries Service in partial fulfillment of RL's responsibilities under the Endangered Species Act and the Magnuson-Stevens Fishery Conservation and Management Act. A draft of this document was transmitted to the U.S. Fish and Wildlife Service and the National Marine Fisheries Service for their review; no comments were received from either agency.

Technical questions should be directed to M. B. Wilson at 376-1667, and contractual questions should be directed to me at 376-5052.

Sincerely,

Jennifer A. Jahner, Manager
Contracts

ksp:ljm

Attachment

RL –	L. D. Beitz	H. B. Hathaway
	P. K. Call	E. D. MacAlister
	C. E. Clark	K. L. Snell