HNF-59398
Revision 0

Hanford Site Black-tailed Jackrabbit Monitoring Report for Fiscal Year 2015

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

Contractor for the U.S. Department of Energy
under Contract DE-AC06-09RL14728

P.O. Box 650
Richland, Washington 99352

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The cover photo was taken with a motion-activated trail camera.

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Mission Support Alliance

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1.0 Introduction

The U.S. Department of Energy, Richland Operations Office (DOE-RL) conducts ecological monitoring on the Hanford Site to collect and track data needed to ensure compliance with an array of environmental laws, regulations, and policies governing DOE activities. Ecological monitoring data provide baseline information about the plants, animals, and habitats under DOE-RL stewardship at Hanford required for decision-making under the National Environmental Policy Act (NEPA) and *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA). The *Hanford Site Comprehensive Land Use Plan* (CLUP, USDOE 1999), which is the Environmental Impact Statement that evaluates the potential environmental impacts associated with implementing a comprehensive land-use plan for the Hanford Site for at least the next 50 years, ensures that DOE-RL, its contractors, and other entities conduct activities on the Hanford Site in compliance with NEPA.

The vision for the DOE-RL managed portion of the Hanford Site focuses not only on the clean-up of nuclear facilities and waste sites, but on the protection of groundwater and the Columbia River and the restoration of Hanford lands for access and use. To reach these goals Hanford is working closely with partners, such as the U. S. Fish and Wildlife Service (USFWS) and National Park Service (NPS), to enable use of the Hanford land consistent with the CLUP. As the Hanford Site moves toward accomplishing this vision, understanding of the ecological resources present and the need for conservation and/or protection of those resources will be critical for making informed decisions for responsible site stewardship.

The *Hanford Site Biological Resources Management Plan* (BRMP, USDOE 2013) is identified by the CLUP as the primary implementation document for managing and protecting natural resources on the Hanford Site.

> The BRMP provides a mechanism for ensuring compliance with laws protecting biological resources; provides a framework for ensuring that appropriate biological resource goals, objectives, and tools are in place to make DOE an effective steward of the Hanford biological resources; and implements an ecosystem management approach for biological resources on the Site. The BRMP provides a comprehensive direction that specifies DOE biological resource policies, goals, and objectives.

DOE-RL places priority on monitoring those plant and animal species or habitats with specific regulatory protections or requirements; or that are rare and/or declining (federally or state listed endangered, threatened, or sensitive species); or are of significant interest to federal, state, or tribal governments or the public. The BRMP ranks wildlife species and habitats (Levels 0–5) based on the level of concern for each resource. The black-tailed jackrabbit (*Lepus californicus*) is ranked at Level 3. The management goal for Level 3 resources is conservation with a moderate degree of status monitoring.

Evidence suggests that both black- and white-tailed jackrabbits (*L. townsendii*) were historically abundant in Washington (Ferguson and Atamian 2012). Jackrabbit populations are declining across Washington State

due to the loss and fragmentation of native shrub-steppe habitat. The Washington State Department of Fish and Wildlife (WDFW) currently lists both the black- and white-tailed jackrabbit as candidates for listing as threatened or endangered (WDFW 2016). In recent years, jackrabbits have been infrequently observed on the Hanford Site, potentially indicating population declines, though other factors such as natural population cycles may be contributing. To understand the extent and causes of this possible decline and to implement means to protect the species, it is imperative to collect population status and distribution data on the Hanford Site.

Black-tailed jackrabbits play an important role in the ecosystem, serving as a food source for large mammalian and avian predators, including the coyote (*Canis latrans*), Golden Eagle (*Aquila chrysaetos*), and the state-listed threatened Ferruginous Hawk (*Buteo regalis*). Increasing the understanding of jackrabbits on the Hanford Site could benefit both common and sensitive predator species. Jackrabbits do not migrate long distances or go into a hibernation or estivation period. They also rarely use underground burrows or dens (Best 1996); thus, the highly localized and active nature of jackrabbits provides surveying opportunities throughout the year.

Black-tailed jackrabbits prefer sagebrush-dominated habitats in Washington (Downs et al. 1993) but will also use rabbitbrush (*Ericameria nauseosa* and *Chrysothamnus viscidiflorus*) and antelope bitterbrush (*Purshia tridentata*) communities. Although they prefer grass-dominated habitats typically found at higher elevations in Eastern Washington, white-tailed jackrabbits have been observed on the Arid Lands Ecology (ALE) Reserve, the DOE-RL managed portion of the Hanford Site consists of habitat more commonly associated with black-tailed jackrabbits. A combination of daytime walking transects and nighttime driving transects were conducted on the Hanford Site during FY2012 (Wilde et al. 2012). Other recent surveys on central Hanford consisted of driving surveys (TNC 1999). Although jackrabbits were detected using these methods, the data did not provide the information necessary to address distribution and abundance of jackrabbits across the DOE-RL managed portion of the Hanford Site. Monitoring for FY2013–FY2015 focused on the black-tailed jackrabbit on the DOE-RL managed portion of the Hanford Site using motion-activated trail cameras (Lindsey et al. 2014 and this report).

2.0 Methods

2.1 Camera Traps

Trail cameras were first deployed to survey jackrabbits February 2, 2013 (FY2013), and were variably deployed through July 13, 2015. This report consists of all the data collected during the project, including the data discussed in the FY2013 report (Lindsey et al. 2014). Traditional traps are labor intensive and intrusive to the animals, but trail cameras can be used as “camera-traps.” The cameras capture photos of jackrabbits, confirming occupancy in the area without interfering with the animal’s normal behavior. The trail cameras can be placed in the field and left for several days without having to revisit the site, as

opposed to traditional traps, which have to be checked every 12 hours. This approach vastly reduces the level of effort per survey location.

The cameras used for this project were Reconyx™ PC900 HyperFire™ professional trail units that take color photos during the day and use an invisible infrared flash for non-intrusive photographing at night. The camera is triggered when an object with a temperature different than the ambient moves through the camera frame. Cameras were generally set on "high" trigger sensitivity, taking three photos per trigger 24 hours per day. No interval was used between photos ("Rapidfire" setting), and no quiet period was selected between trigger events. Each photo was time and date stamped.

The entire central Hanford Site was divided into a mesh of hexagonal survey areas measuring 1 km^2 (0.39 mi^2) using a geographic information system (Figure 1). Hexagonal sample area size was based on the approximate size of a jackrabbit home range. Black-tailed jackrabbit home range size has been reported between 0.02 km2 and 1 km^2 (0.01 to 0.39 mi^2) and was > 0.5 km^2 (> 0.19 mi^2) on the Hanford Site (Major 1993). The upper limit of the home range size was selected for this project, so that a rabbit observed in one transect is assumed not to be present, and therefore not detectible, in any adjacent hexagon. This process provides not only a more coarse scale map of jackrabbit distribution but also allows for a larger portion of the Hanford Site to be surveyed per-unit-effort. Trail cameras were used to document the presence of jackrabbits definitively within each hexagonal survey area.

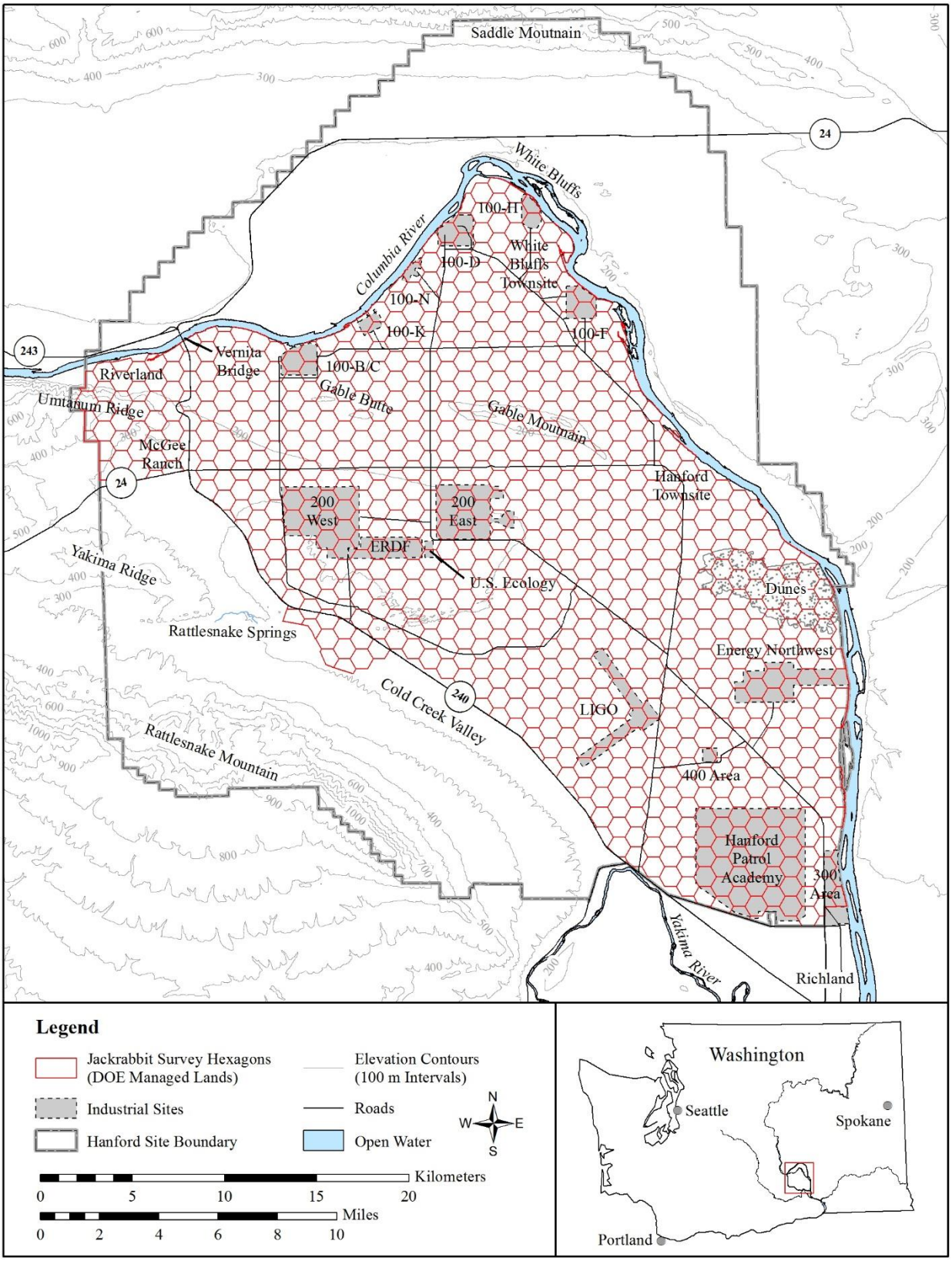

Figure 1. Survey Grid Developed for Camera Trap Surveys

A total of 820, 1 km^2 (0.39 mi^2) hexagons were identified across the DOE-RL managed portion of the Hanford Site (Figure 1). Surveying every hexagon would have been prohibitively time consuming, so initial camera setup locations were determined based on the presence of a black-tailed jackrabbit activity center, termed a "core area." These core areas are defined as locations with high levels of visibly detectible jackrabbit activity such as active trails and fresh scat. Jackrabbits were confirmed at core areas using the cameras, and then all adjacent hexagons were monitored using the camera setup. If any of the hexagons adjacent to the original core areas were found to contain jackrabbits based on camera-trap observations, then the search area was expanded to include all hexagons adjacent to the newly discovered active hexagon. Cameras were not placed adjacent to hexagons where jackrabbits were not detected unless a new core area was identified. In this way, personnel avoided monitoring locations in which jackrabbits were unlikely to be present and focused on expanding the areas of known jackrabbit activity.

Cameras were placed as near to the centroid of a hexagon as possible, with a maximum distance of 100 m (328 feet) from the center. Keeping the cameras at a distance from the edges further minimized the chance of encountering the same individual in two adjacent hexagons. Field personnel surveyed the area around the centroid and identified the location where jackrabbit detection was most likely. These locations typically contained an active trail, scat, and trampled vegetation. When possible, the cameras were placed at the intersection of two or more active trails to maximize the potential for capturing photos of jackrabbits. If no active trails were present, natural funnels or other local environmental features were used to increase the potential for jackrabbit detection.

The cameras were placed on a tripod ~50 cm (~19.6 inches) high, and 1–3 m (~3.2-9.8 ft) from the focal point, with a slight downward tilt (Figure 2). Cameras were secured to available structures or shrubs using a cable lock. A Trimble™ global positioning system (GPS) capable of sub-meter accuracy was used to acquire coordinates at the actual location of the camera setup, and data were recorded on a pre-made field data sheet that included hexagon number, distance from centroid, distance from trail, camera direction, camera number, start time, and the vegetation type surrounding the camera. Cameras were left on-location for a minimum of three trap-nights, but deployments were typically 1 week long. Cameras were then recovered, and the photos were downloaded to the field GPS unit or transferred to a computer. Photos were reviewed to determine if jackrabbits were present in the hexagon. The same field data sheet used during deployment of the cameras was used during retrieval, and data collected included end time, total number of images, and whether jackrabbit presence was confirmed.

Figure 2. Trail Camera Deployed Along a Game Trail on the Hanford Site

2.2 Incidental Observations

All locations where jackrabbits were observed by MSA Ecological Monitoring and Compliance staff on the Hanford Site while setting trail cameras, driving, or performing other surveys were recorded. These occurrences included flushed individuals and road kill observations. Locations were recorded using a GPS, or the approximate location was marked on a map by the observer. All locations were stored using a GIS.

3.0 Results

3.1 Camera Traps

Monitoring with trail cameras began February 2, 2013, and the last FY2015 camera trap was retrieved on July 13, 2015. The data in this report are a comprehensive catalogue for all data gathered from the study's first camera deployment through July 13, 2015. During this time, 4334 jackrabbit images were captured on the remote cameras, with a total of 257 hexagons successfully surveyed. Jackrabbits were detected within 72 of the hexagons surveyed (Figure 3).

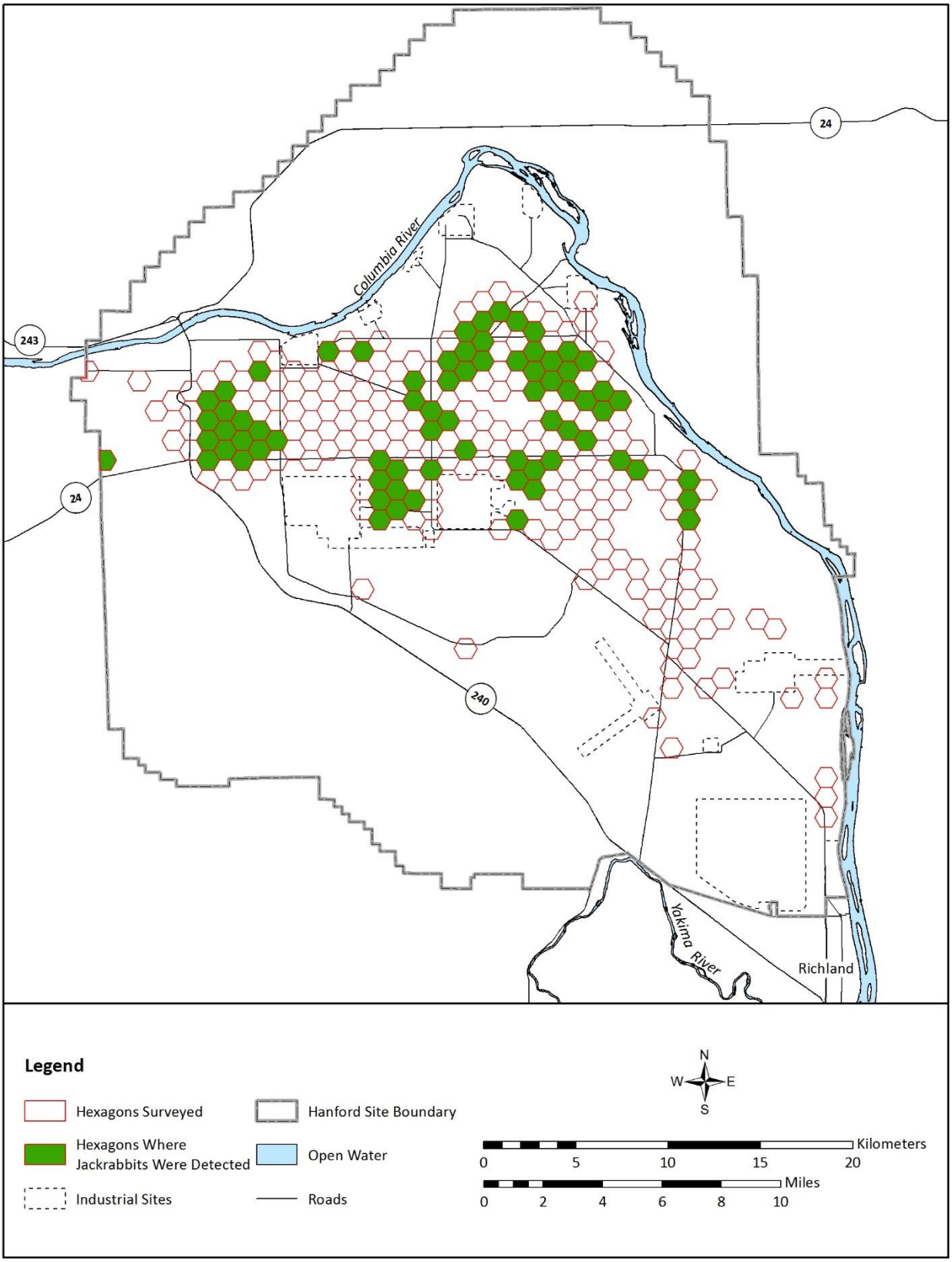

Figure 3. Hexagons Surveyed for Black-tailed Jackrabbits

Between three and five cameras were deployed for the majority of the survey period, with a total of 2348 camera trap-nights recorded. Being a nocturnal/crepuscular animal, only a handful of jackrabbits were captured in photos during the day (Figure 4, Figure 5). The majority of detections were made during twilight hours and after dark (Figure 5). Jackrabbits were readily identifiable in photos taken at night (Figure 6).

Figure 4. Black-tailed Jackrabbit Captured by Trail Camera during Day

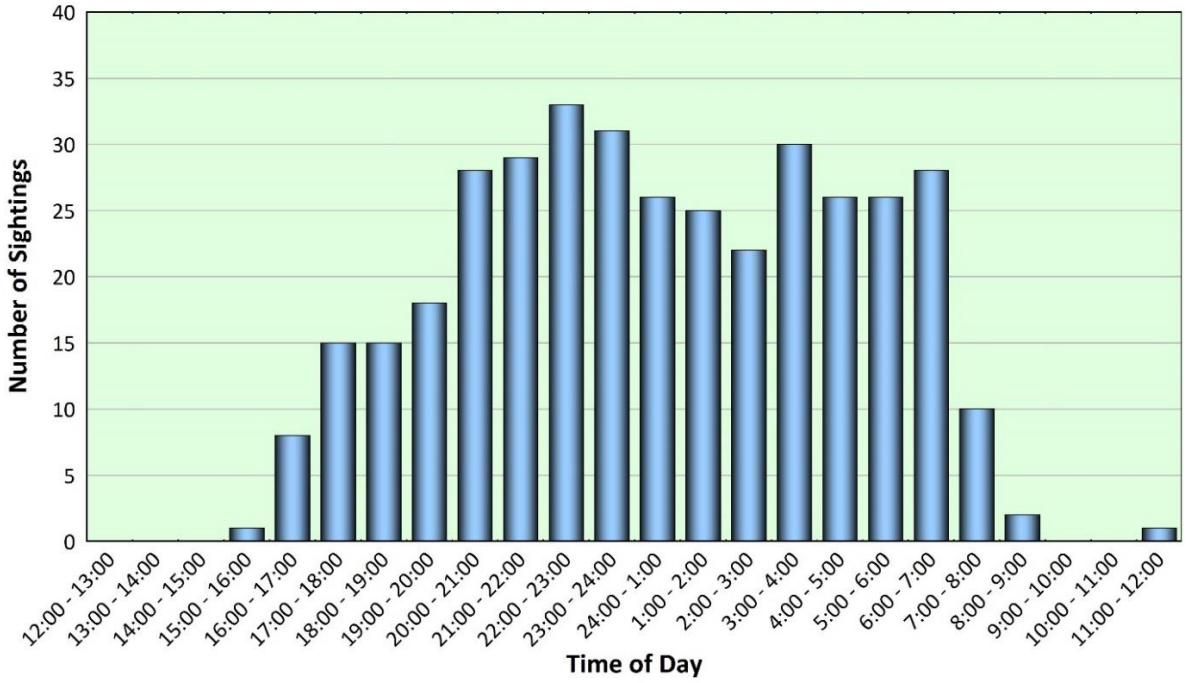

Figure 5. Number of Jackrabbit Observations by Time of Day Detected by All Trail Cameras

Figure 6. Black-tailed Jackrabbit Captured by a Trail Camera after Dark

Trail cameras recorded the time of each photo taken, capturing the moment during which a black-tailed jackrabbit was first spotted in a given hexagon as well as subsequent detections. Using the trail camera data collection technique described above, project staff were able to monitor the success rate of jackrabbit detection and also to document the time it took from camera deployment to the first detection of a jackrabbit (Figure 7). The data demonstrate a regression of first detections, most detections occurring within the first day of deployment, with a linear pattern of depleting frequency for subsequent days.

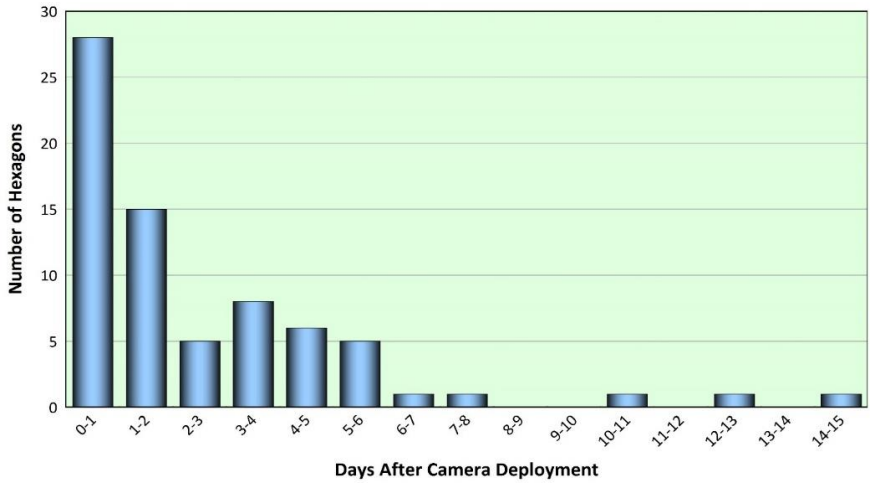

Figure 7. Day of First Jackrabbit Detection in Each Hexagon

3.2 Incidental Observations

Ecological staff recorded incidental observations of black-tailed jackrabbits, including flushed individuals and road kills, during the reporting period of December 2012 through July 2015. Personnel observed jackrabbits 44 times and recorded 21 jackrabbit road kills (Figure 8).

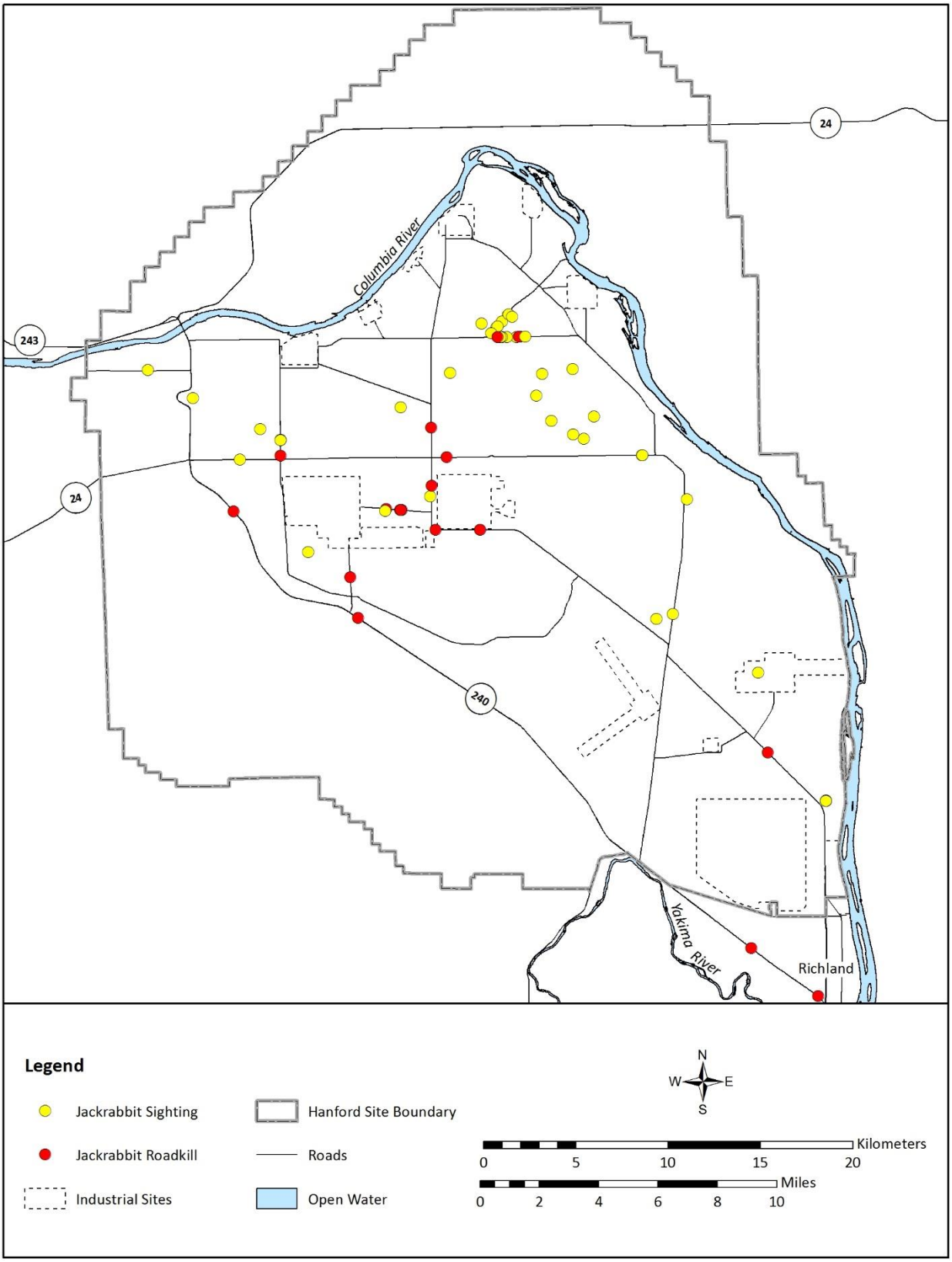

Figure 8. Black-tailed Jackrabbit Sightings and Roadkills on the Hanford Site

4.0 Discussion

The status of the black-tailed jackrabbit population on the Hanford Site was largely unknown at the start of this project. Until official documented surveys commenced, jackrabbit data consisted of occasional, isolated sightings. The data generated by this project show the status and estimated distribution of black-tailed jackrabbits across the DOE-RL managed portion of the Hanford Site.

Snowfall track surveys were not conducted in 2014 or 2015 because surveyors were restricted by limited snowfall events and quickly melting snow. The weather dependency of this survey type and the 24-hour timeframe after a snowfall to complete surveys severely limited the number and extent of surveys that were conducted. The method was not useful for documenting jackrabbits across the Hanford Site, given the size of the area and unpredictability of snowfall in the region. However, this method is useful in identifying core areas for future camera trap deployments, perhaps especially for habitat types in which jackrabbit trails are not readily visible (e.g., heavy cryptogamic crust) or in areas where jackrabbits are present but in low numbers. In fact, initial deployments of the trail cameras to test effectiveness were conducted in areas where high levels of jackrabbits were detected during snowfall track surveys, and jackrabbits were detected on the cameras during these tests.

The data illustrated in Figure 7 suggest that 7–8 days is an appropriate time to deploy a camera at each point; if resident jackrabbits inhabit the area, they will most likely be captured within this timeframe. This information can serve as a general habitat use indicator on the Hanford Site. For instance, the hexagons that did not detect a jackrabbit until the 10^{th} and 15^{th} day of deployment indicate areas with low habitat use, whereas the hexagons that detected jackrabbits within the first 7 days and continuously throughout deployment indicate higher habitat use.

Other than occasionally tipping over due to high winds or curious animals, trail cameras functioned well using the deployment techniques described. Camera settings were adjusted seasonally to minimize false triggering. In the summer, high winds combined with tall cheatgrass (*Bromus tectorum*), and uneven heating often triggered the camera several thousand times during a single deployment. Other than the encumbrance of sorting through the large number of pictures, this occurrence did not affect the usability of the data unless the camera cards were completely filled. Sensitivity settings on cameras were reduced slightly during these times to minimize the number of false triggers.

At this point, the majority of suitable habitat has been surveyed using remote cameras, with a few outlier pockets of suitable habitat left unsurveyed. For the purpose of our scope, this project is considered complete and we feel that all of the core jackrabbit areas on the Hanford Site have been identified.

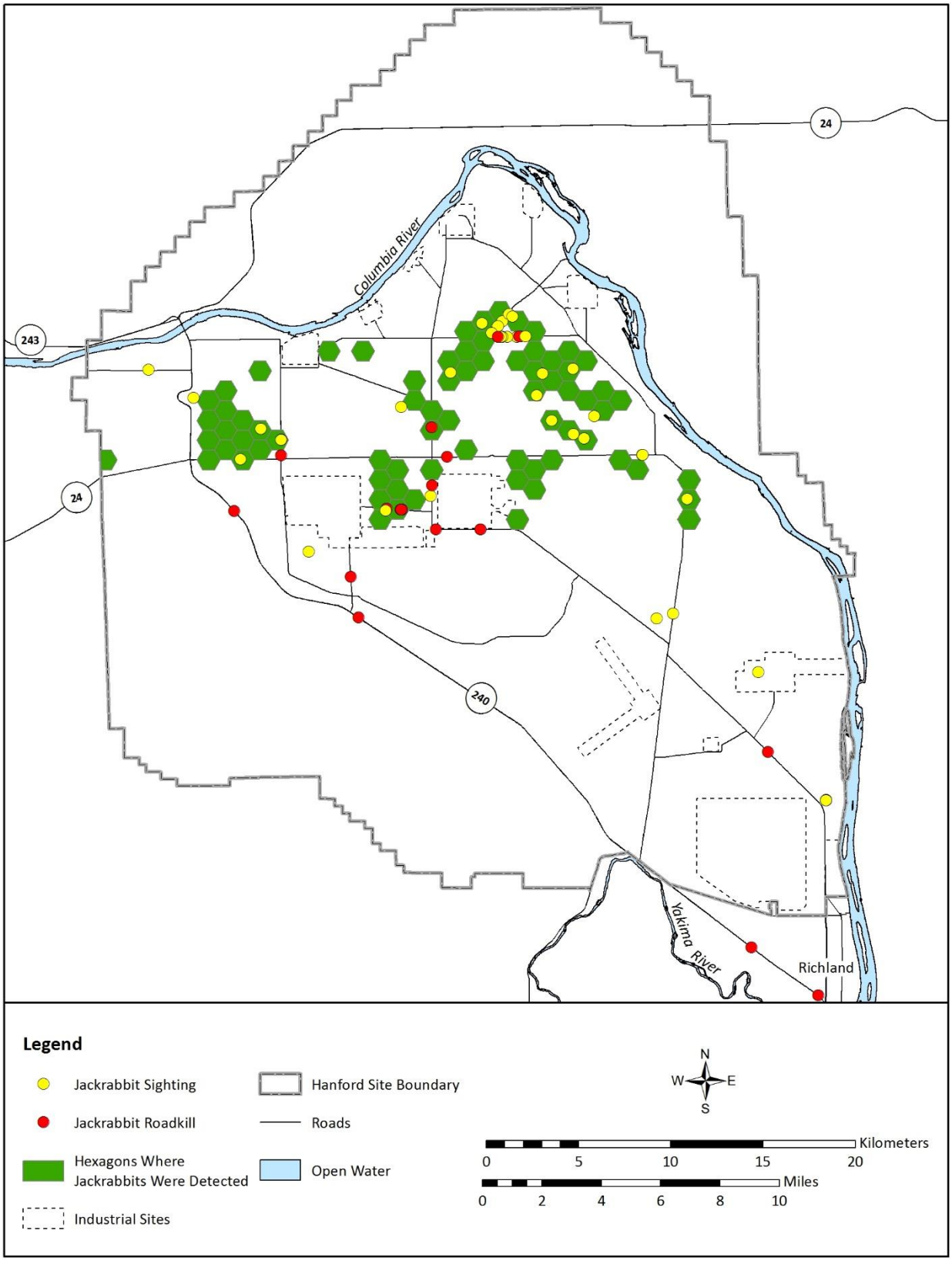

Figure 9. Distribution Map of Black-tailed Jackrabbits on the Hanford Site

Figure 9 above is the complete distribution map of all data collected, and is useful for determining the habitat characteristics selected by jackrabbits and the level of connectivity between areas occupied by jackrabbits. Currently, connecting corridors appear to be represented on the map between areas of high observations. The map also shows disconnected jackrabbit populations and areas where opportunities exist to restore connectivity for jackrabbits and other sagebrush obligate species. The habitat characteristics selected by jackrabbits could help guide in restoration efforts. The data collected thus far demonstrates that the areas on the Hanford Site which contain vast, dense sagebrush habitat are consistent with jackrabbit observations, while little to no observations occurred in other habitat types. Between these vast areas, jackrabbit observations occurred in stretches of sagebrush that potentially provide crucial migration and population corridors and should be considered during future land development projects.

Figure 8 was generated from incidental observations to identify potential areas to search for jackrabbit core locations. Different methodologies of jackrabbit detection could produce different distribution maps, therefore, the distribution map in figure 9 is composed of all positive jackrabbit observations. Identification of trails, tracks, and scat was used to document jackrabbit presence, but these signs are all less consistent and more dependent on surveyor effort and ability than the use of camera-traps. The camera-trap distribution map (Figure 3), therefore, shows where jackrabbits are present at a high enough level to be detected by the cameras. Interestingly, comparing the incidental observation with the camera observation maps, the majority of incidental observations occurred in the same general areas that the cameras observed jackrabbits, providing stronger evidence to the preferred habitat type of black-tailed jackrabbits.

The potential exists for jackrabbits to be present but not detected in hexagons (i.e., false negatives). The detectability of jackrabbits using this method is likely to be density dependent. Dense populations are more likely to be detected, while low density populations may be missed (Figure 9). In a case where jackrabbits are suspected in an area based on the presence of sign, cameras may be redeployed to attempt to correct a false negative. Leaving cameras deployed at a location for multiple days increases the likelihood of detection while reducing the potential for recording false negatives.

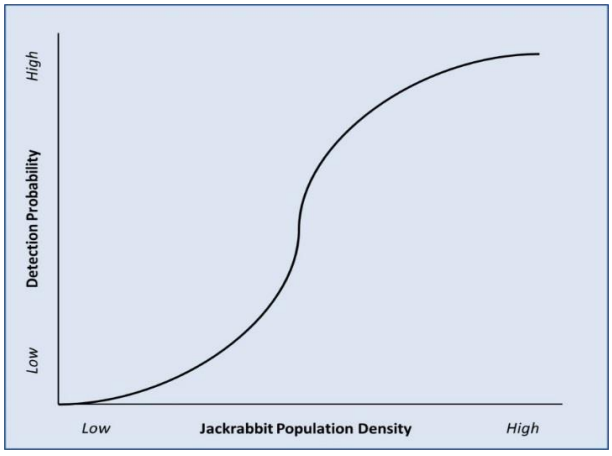

Figure 10. Hypothetical Jackrabbit Detection Probability Curve When Using Trail Cameras

Detection probability can be described by the following equation

$$p_n = 1 - p^n$$

where (p) is the probability of a non-detect on a single night, (n) is the number of monitoring nights, and (p_n) is the overall likelihood of detection. Thus, as the probability of detection during a single night increases, the probability of a non-detect (p) decreases, and as the number of monitoring nights (n) increases, the overall likelihood of detection (p_n) increases. Inversely, as the detection probability and/or number of monitoring nights increases, the likelihood of recording a false negative (jackrabbits present but not detected) decreases.

Other circumstances that may influence the detectability of jackrabbits within a hexagon include variable vegetation types and disturbances such as roadways. It is possible that jackrabbits could use a portion of a given hexagon but not be present near the centroid due to a change in vegetation type or a roadway that bisects a given hexagon may be a barrier between an active and inactive area. For example, if the centroid of a hexagon falls in a mature sagebrush stand just off of a busy four-lane road, while the other side of the road is void of shrubs, it may be inaccurate to represent that jackrabbits exist on both sides of the roadway based on their presence at the centroid. One option for these circumstances includes dividing hexagons into multiple units and monitoring each unit separately in order to represent jackrabbit occupation effectively. This effort would require an increase in the number of surveys and would be used to define more precisely the initial habitat mapping determined by this study.

Trail cameras proved to be an effective method of documenting the presence of jackrabbits. Most likely due to camera placement along trails, jackrabbits were the most photographed animal, although elk (*Cervus elaphus*), mule deer (*Odocoileus hemionus*), coyotes, birds, mice, and even badgers (*Taxidea taxus*) were detected with the cameras (Figures 10, 11, and 12). Because trail cameras maximize observation time while minimizing person-hours and disturbance to animals, they could be useful for a variety of other ecological monitoring projects.

Figure 11. Adult and Juvenile American Badgers Photographed by a Trail Camera

Figure 12. A Curious Morning Coyote Photographed by a Trail Camera

Figure 13. Mule Deer Doe Preening Photographed by a Trail Camera

The FY2013–FY2015 monitoring effort documented the continued presence of the black-tailed jackrabbit on the Hanford Site and established a population distribution map for the Washington State Candidate species, while also documenting the primary habitats used by jackrabbits on the Hanford Site. At this point, the majority of suitable habitat has been surveyed. There are a few small outlier patches that may possibly contain jackrabbit populations as well as a handful of suitable habitat survey locations that may have provided false negatives. The non-surveyed outliers as well as the possible false-negative locations may be surveyed or re-surveyed in the future. This information is useful during site development planning and future access to the site in minimizing potential project-related impacts to black-tailed jackrabbits as well as other sagebrush obligate species. The data is useful in identifying high-value areas for shrub-steppe connectivity restoration and can be provided as reference for project mitigation.

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