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Hanford Site Mule Deer Monitoring Report For Fiscal Year 2016

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

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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 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. This plan 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 mule deer (*Odocoileus hemionus*) is ranked at Level 2 due to being a recreationally and commercially important species. The management goal for Level 2 resources is to conserve and sustain the native species and habitats present.

1.1 Mule Deer Surveys on the Hanford Site

Population characteristics of mule deer (*Odocoileus hemionus*) on the Hanford Site have been monitored since 1994. Roadside surveys have been conducted during the post-hunting period from November to January to assess age and sex ratios, and the frequency of testicular atrophy in males. Because the mule deer have been largely protected from hunting on the Hanford Site for 50 years, the herd has developed unique population characteristics, including a large proportion of older males (Tiller et al. 1997). Although hunting is not permitted on the Hanford Site, wildlife can enter and leave freely. Due to this movement, surveys are conducted after deer hunting season has ended, which runs from September through early December. Additionally, during the winter months following the fall rut, deer tend to herd into tighter groups, greatly easing the monitor efforts.

Prior to 2003, variable numbers of surveys were performed each year. Between FY 2004 and FY 2010, five surveys were conducted during each post-hunt period. In FY 2011 this was reduced to three surveys. No surveys were conducted in FY 2012, 2014, or 2015. During each survey, individual animals were identified according to sex and age class (fawn or adult). For male deer, the presence of misshapen, velvet-covered antlers was used as an indicator of testicular atrophy.

Trends in the ratios of fawns to does over time can be used to monitor changes in mule deer population size and health. Mule deer populations provide a rough indication of overall habitat quality. Additionally, mule deer are a trust resource of interest and importance to wildlife resource agencies and local tribes.

The monitoring route is approximately 37 miles (60 kilometers) long; the northern end of the route is near 100-B/C Area, the southern end is just north of the 300 Area. The route is split into two regions, a northern and southern, with the division located on the north end of the Hanford Townsite. The entire survey area is within DOE managed land. In 2013, the last time data was collected, the fawn-to-doe mean estimate was 41.05 fawns per 100 does for the northern region and 37.2 for the southern region. For both regions, these ratios were higher than the previous 2011 survey results, while the 2013 and 2011 running 10-year averages for both regions remained quite steady. As of 2013, the running 10-year averages remained fairly steady, ranging between 29.3 (in 2004) to 30.36 fawns per 100 does in the southern region, and 34.69 to 32.31 respectively for the northern region. The fairly consistent trend in fawn-to-doe ratios indicates a stable mule deer population (Poston). Hanford Site fawn-to-doe ratios for all survey years (1994 through 2016) are weighted averages, using the total number of fawns and does seen per survey as the weighting factor. This report will address current fawn-to-doe findings for the ten-year average between 2007 and 2016.

In the early 1990s, testicular atrophy and sterility were observed in some male mule deer on the Hanford Site (Tiller et al. 1997). Extensive investigation found no relationships between the presence of testicular atrophy and contaminant levels, diet, disease, or natural conditions such as aging or genetics (Tiller et al. 1997). Testicular atrophy in male mule deer is associated with abnormal antler growth manifested as misshapen, velvet-covered antlers, which can be observed in field surveys. The observed frequency of misshapen antlers in mule deer has ranged from a high of 17% in the southern region in 1998 to a low of 0% in both regions in 2003. In FY 2011, observations of affected male deer were low;

the observed frequency of antler abnormality was 3.9% in the northern region and no bucks with abnormal antlers were seen in the southern region. Interestingly, in FY 2013, there were no affected bucks observed along the northern route while the southern route frequency increased from a previous 0% up to 4.8%. These frequencies need to be interpreted with caution because the small sample sizes may not fully reflect population conditions. In general, recent data indicate the health of the male mule deer on the Hanford Site has not changed substantially over the last decade.

Rocky Mountain Elk (*Cervus elaphus*) data was collected while deer surveys were conducted, recording locations, gender, and herd counts. It was not until 1972 when elk were first documented on the Hanford Site, and in recent years the population has grown drastically. These surveys provide a valuable opportunity to document where land is regularly being occupied and the status of population. In general, the technique of roadside surveys is biased for any type of wildlife population monitoring, and does not represent a consistent and dependable long-term survey methodology. However, these observations may be sufficient to maintain an ongoing record of the relative abundance of elk on central Hanford.

2.0 METHODS

The FY 2016 driving routes were each surveyed four times during the post-hunting period in December 2015 and January 2016. Survey dates were December 16, 29 and 30 of 2015, and January 12 and 26 of 2016. Due to staffing limitations, the two regions were surveyed on separate days on December 29th and 30th.

Surveys were conducted from a vehicle along a specified route (Figure 1). Surveys began within an hour (+ or -) of dawn, and were driven alternatively from north to south and south to north. The route is approximately 37 miles (60 kilometers) long; the northern end of the route is near 100-B/C Area, the southern end is just north of the 300 Area (Figure 1). The survey route is divided into a northern half and a southern half, with the break occurring at the north end of the Hanford Townsite. Tiller and Poston found little overlap in the home ranges of deer occupying these two regions (Tiller 1999). Over the five sample dates, surveys were conducted such that each route was travelled in both directions equally, as described in Table 1. For example, when the northern route was surveyed with the starting point of the Hanford Townsite and stopped at the routes 100-B/C Area endpoint, the paired southern route survey started at the 300 Area end and stopped at the Hanford Townsite. To the extent possible, this should have reduced bias that may occur due to time of day and movement from one day to the next.

Two people conducted each survey - the driver and a second observer. Survey speed was 5 to 35 miles per hour (56 kilometers per hour) with higher speeds on the Hanford primary roads, and slower speeds on the secondary and dirt roads. When deer were spotted, the driver stopped and/or pulled off the road. The odometer reading was recorded, a global positioning system (GPS) position was collected, and the distance and direction from the observation point were collected with a laser range finder and compass. Specific data collected about the herd included the number of deer, their sex and age class, and

the presence of misshapen antlers on any of the bucks. Care was taken to avoid duplicate counts of the same deer. Similar data were collected for all herds of elk observed along the driving transects.

Deer are most active during early morning and late evening periods. Therefore, to attain maximum sample sizes and help attain representative estimates for these population characteristics, surveys were performed when deer and elk were most likely to be active, i.e. within four hours of twilight.

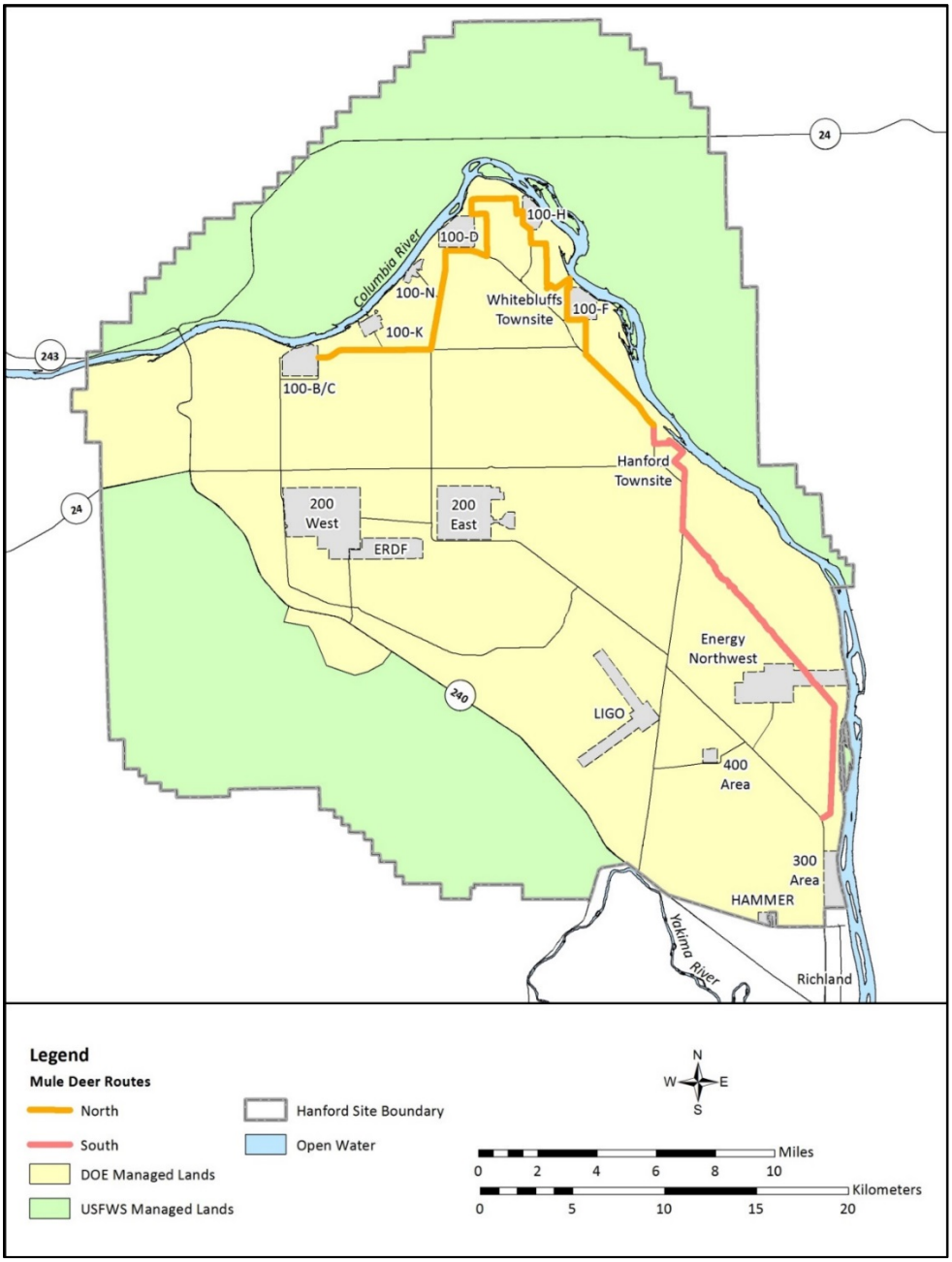

Figure 1. Northern and Southern Region Driving Routes connecting at the Hanford Townsite during the 2016 Mule Deer Survey

Table 1. Matrix of Survey Times and Travel Directions by Route and Survey Date

Date	Region	Survey Period	Survey Direction
December 16, 2015	South	Morning	South to North
December 16, 2015	North	Morning	South to North
December 29, 2015	South	Morning	North to South
December 30, 2015	North	Morning	North to South
January 12, 2016	North	Morning	South to North
January 12, 2016	South	Morning	South to North
January 26, 2016	North	Morning	North to South
January 26, 2016	South	Morning	North to South

3.0 RESULTS

3.1 Mule Deer

A total of 330 mule deer were observed over the five survey dates (Table 2). Two-thirds of the total observations occurred in the northern region, and one-third in the southern region. Bucks represented 18% of the northern population and 22% of the southern population. Undoubtedly, these numbers include repeated observations of at least some of the same animals on multiple survey dates.

The maximum number observed in the northern region (64 deer) occurred on December 16, 2015. The maximum number observed in the southern region (43 deer) occurred on January 26, 2016. The highest combined count was 93 deer on December 29 and 30, 2015 (Table 2).

The largest concentrations of mule deer were observed in the vicinity of the Hanford Townsite and the region between 100-F and 100-D/DR Areas (Figure 3). No deer were observed along the northern route from the western end to 100 D/DR reactor road, and very few were observed during the 4 surveys between Energy Northwest and the south end of the Hanford Townsite. There were no discernible shifts in population locations through the season.

Table 2. Mule Deer Survey Results for FY 2016

Region / Date	Bucks	Does	Fawns	Antlerless*	Total
Northern Region:					
December 16, 2015	6	35	17	6	64
December 30, 2015	8	29	15	6	58
January 12, 2016	1	27	4	0	32
January 26, 2016	7	24	15	0	46
Total - North	22	115	51	12	200
Southern Region:					
December 16, 2015	4	13	5	0	22
December 30, 2015	7	12	11	5	35
January 12, 2016	8	22	0	0	30
January 26, 2016	8	34	1	0	43
Total - South	27	81	17	5	130
Combined:					
December 16, 2015	10	48	22	6	86
December 29 and 30, 2015	15	41	26	11	93
January 12, 2016	9	49	4	0	62
January 26, 2016	15	58	16	0	89
Total Combined	49	196	68	17	330

*Antlerless are either fawns or does, but age could not be accurately determined.

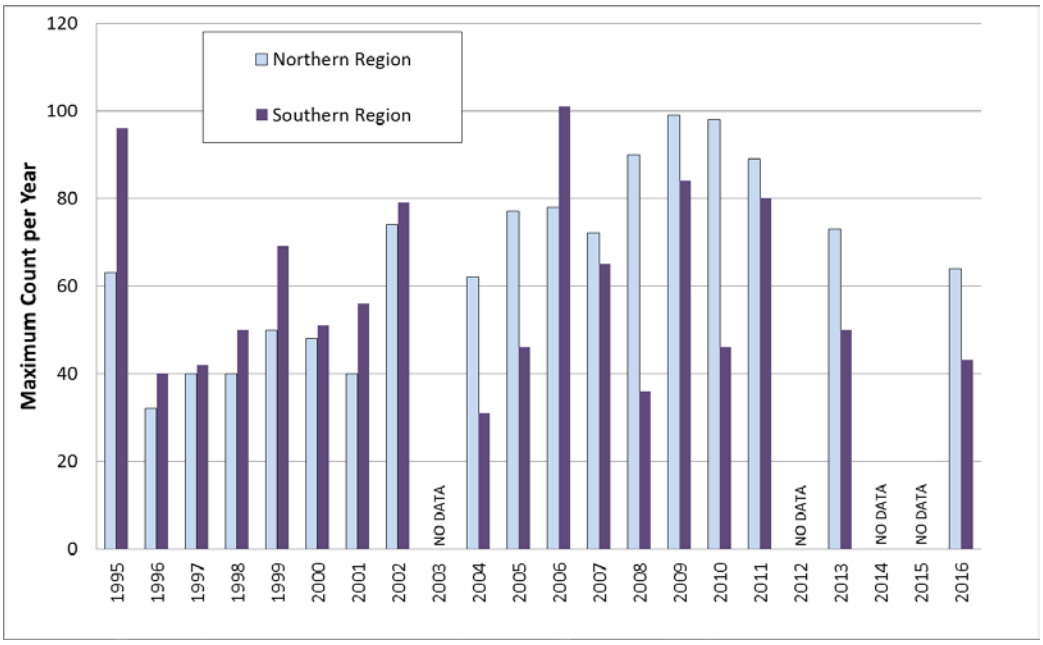

Figure 2. Maximum Number of Deer Observed in each Region FY 1995 to FY 2016

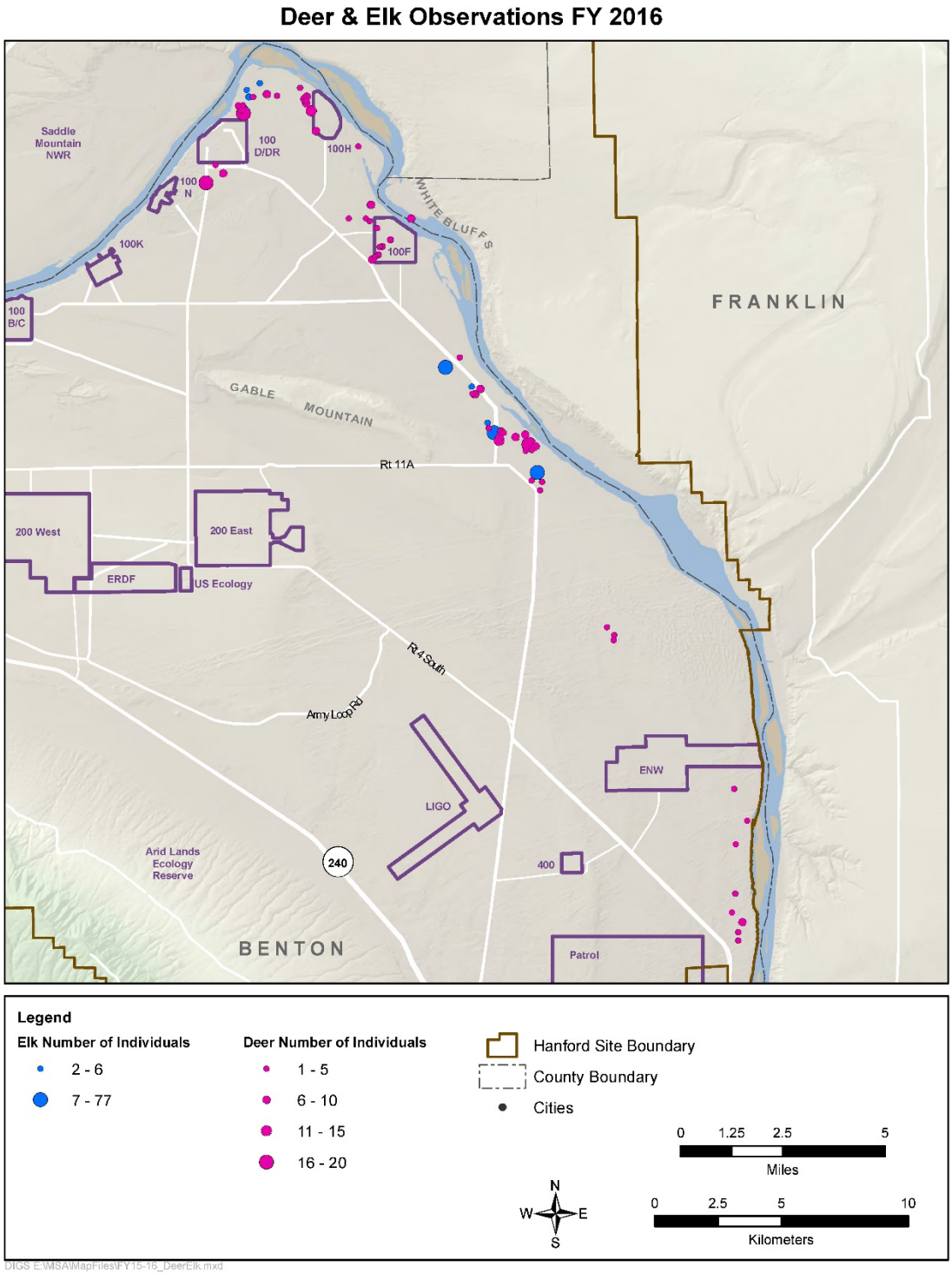

Figure 3 Distribution of Observed Mule Deer and incidental Elk Herds during FY 2016

The number of fawns per 100 does in FY 2016 was estimated to be 44.35 in the northern region and 28.81 in the southern region. Overall, the running 10-year average of fawns per 100 does remains pretty consistent without any major variation (figure 4).

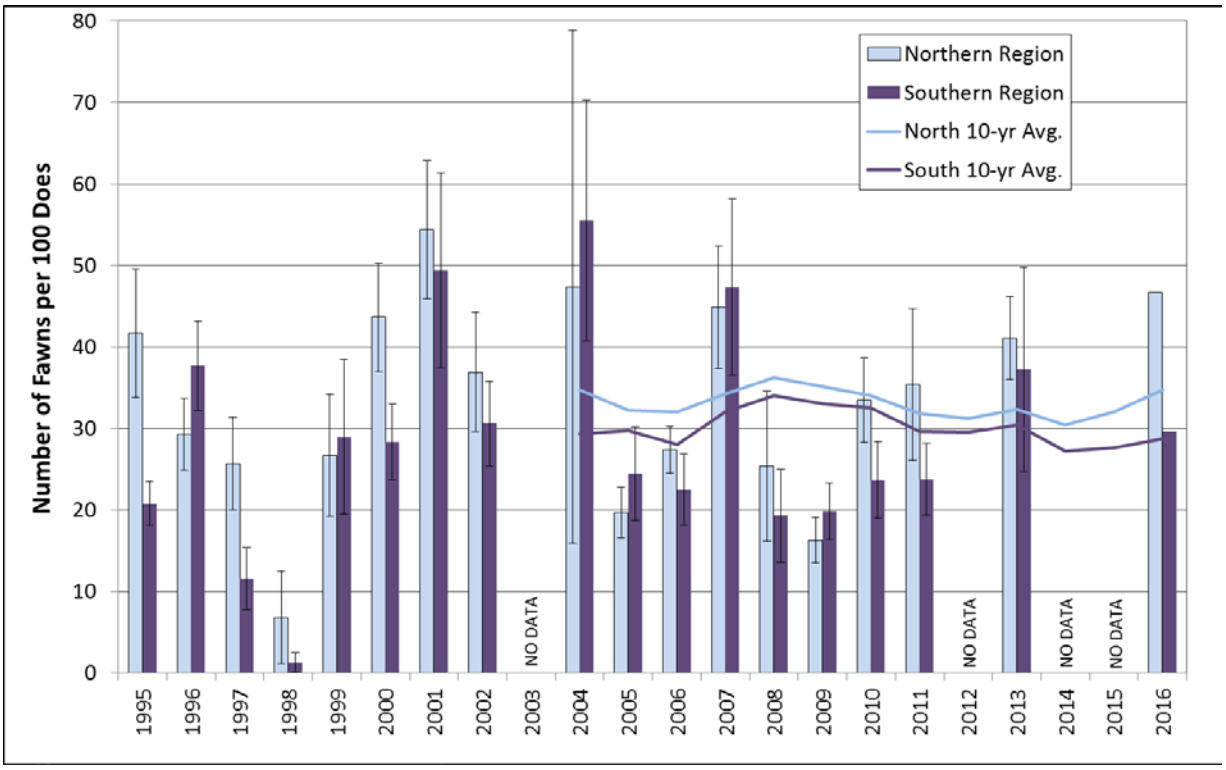

Figure 4. Ratio of Fawns to Does, FY 1995 through FY 2016

One buck and one bull with abnormal antler growth was observed in the northern region in FY 2016, and one affected buck was observed in the southern region – representing 4.5% of the observed bucks in the northern and 3.7% in the southern region. These values are well below the maximum affected rates seen in 1999, although it is an increase from 0% in 2013 for the northern region (Figure 5).

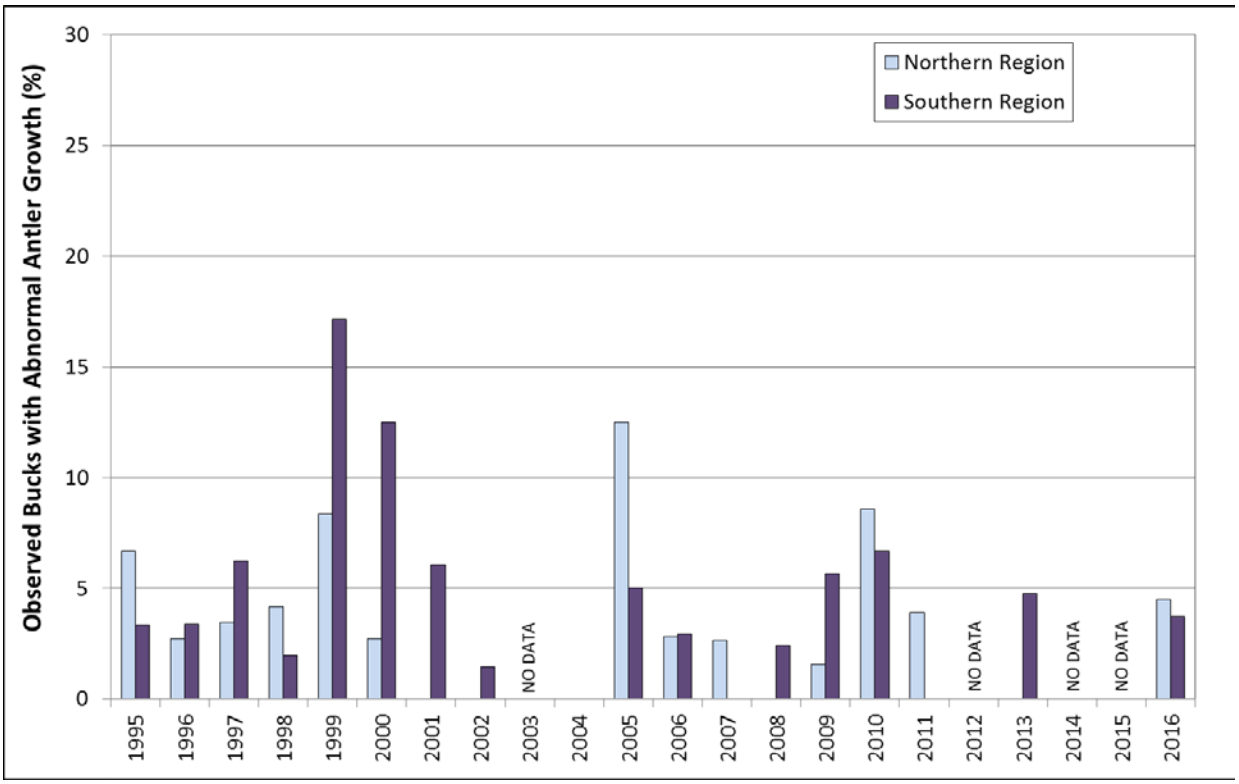

Figure 5. Percentage of Bucks with Abnormal Antler Growth, FY 1995 through FY 2016

3.2 Incidental Elk Observations

Elk were observed during all four of the surveys along the northern route and during the December 16, 2015 and January 12, 2016 surveys along the southern route. A group of bull elk, known as the "Bachelor's", were observed during all four northern route surveys, consisting of 4-6 individuals. Each time, they were spotted just north of 100 D/DR Area. A large herd of elk, consisting of approximately 77 individuals were observed in the vicinity of the Hanford Townsite during the December 16, 2015 and January 12, 2016 southern route surveys and just north of the Hanford Townsite between Gable Mountain and Rt. 2 South during the January 26, 2016 northern route survey. This elk population has had substantial population growth in recent years, in respect to elk first being observed on the Hanford Site in the late 1970s, and a herd of around 22 regularly observed in central Hanford just 6 years ago in 2010 (Lindsey et al. 2013) . With a current herd of 77 known elk and a rapid growth trend, carrying capacity for elk and deer on the Hanford could possibly exceed its threshold. Due to the similarities in preferred habitat between mule deer and elk, a drop in deer population may be an indicator for elk outcompeting mule deer for resources. It will be wise to compare population trends between the two species during future monitoring efforts. Currently the carrying capacity for the site is unknown.

The State of Washington has initiated an in-depth study into the spreading epidemic of treponeme bacteria associated hoof disease in elk. Currently, the epicenter of this epidemic is located in southwest Washington, but in 2015, multiple cases were discovered closer to the Hanford Site near Ellensburg and

Walla Walla, putting the site right in between (WDFWS). This bacteria causes crippling hoof deformities to hooved animals. The Washington Department of Fish & Wildlife has conducted, and continues to conduct multiple studies into this disease. Affected animals are initially identified by displaying an obvious limp. The advanced stages of the bacterial infection are easily identifiable due to the crippling and eventual death of the animal. As deer and elk monitoring continues on the Hanford Site, these signs and symptoms will be incorporated into the monitoring agenda.

Further monitoring information on the Hanford Site elk herd is located in Mission Support Alliance's *Elk Monitoring Report for Calendar Year 2012* (Lindsey et al. 2013).

Figure 6. The "Bachelor Herd" grazing north of the 105-D/DR reactors

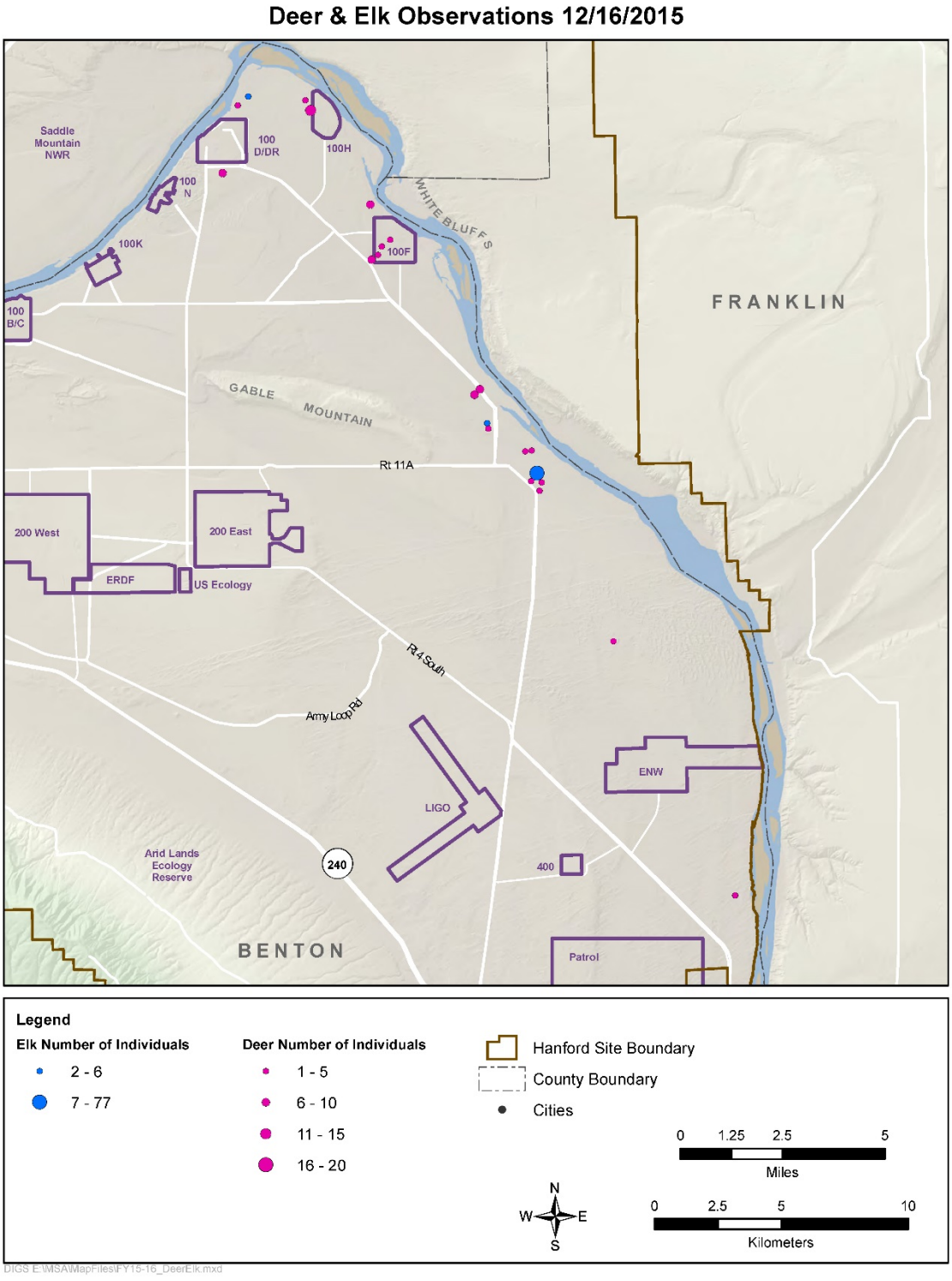

Figure 7. Deer and Incidental Elk Observations during the December 16, 2015 Survey

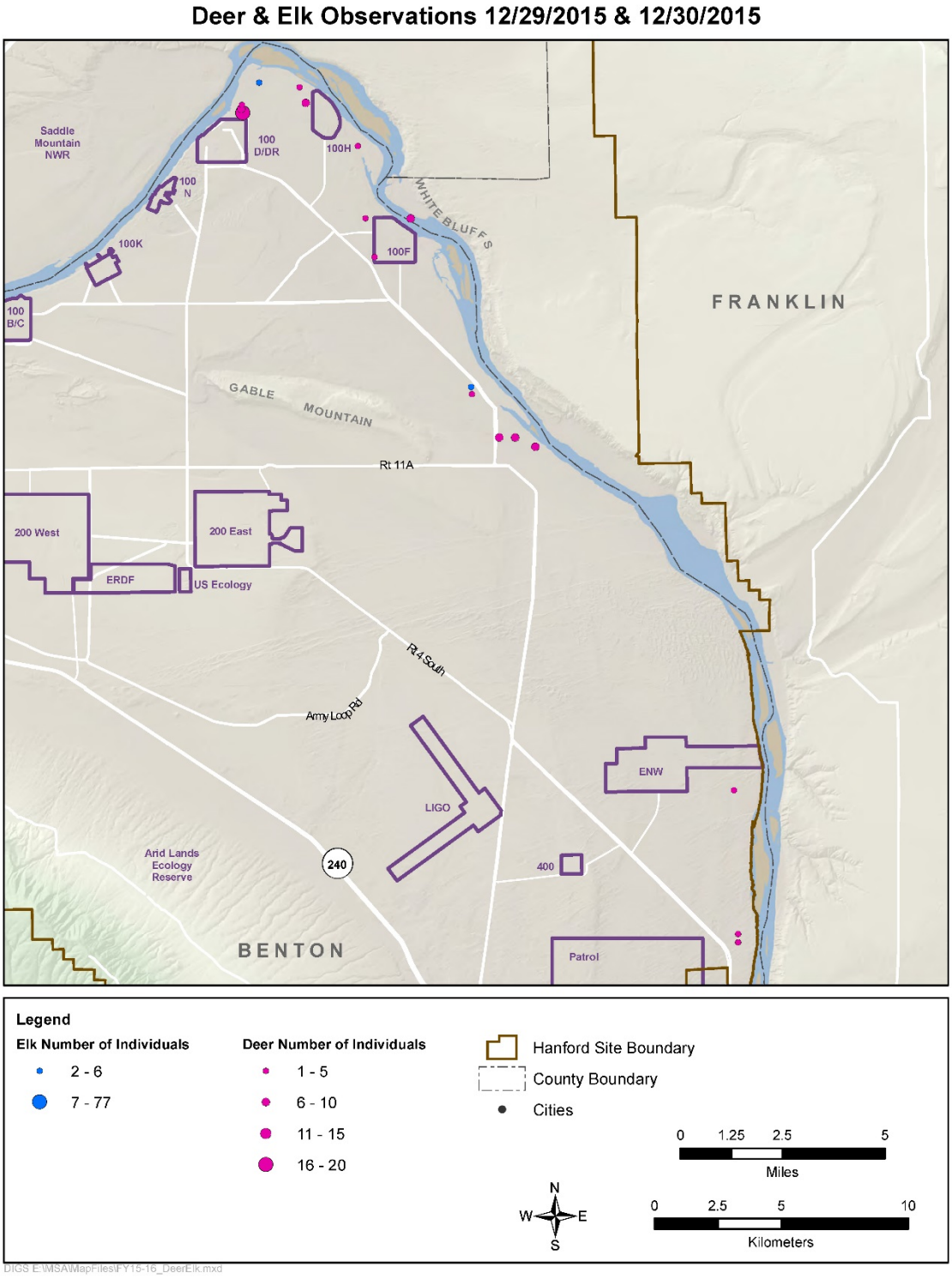

Figure 8. Deer and Incidental Elk Observations during the December 29 and 30, 2015 Surveys

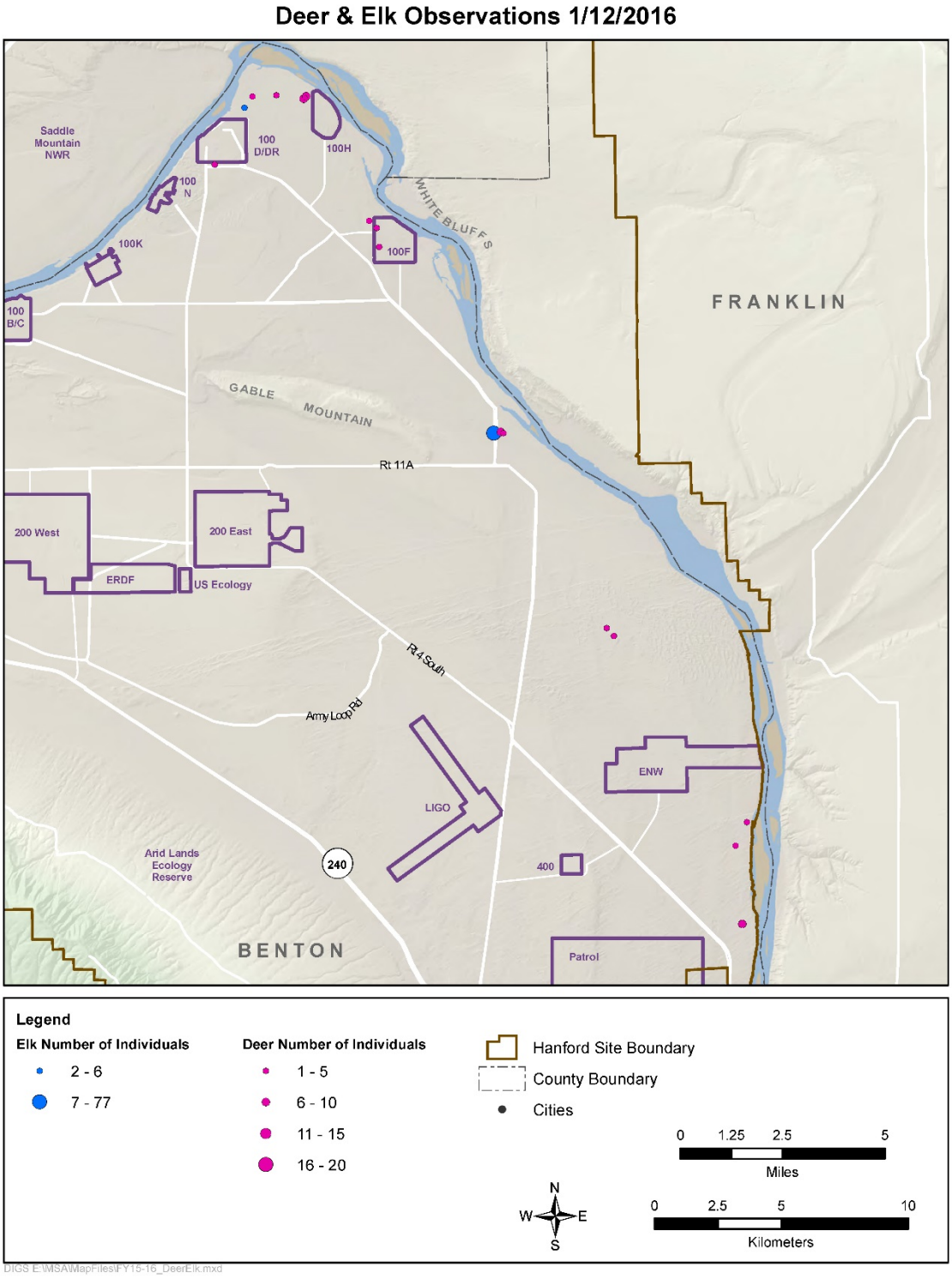

Figure 9. Deer and Incidental Elk Observations during the January 12, 2016 Survey

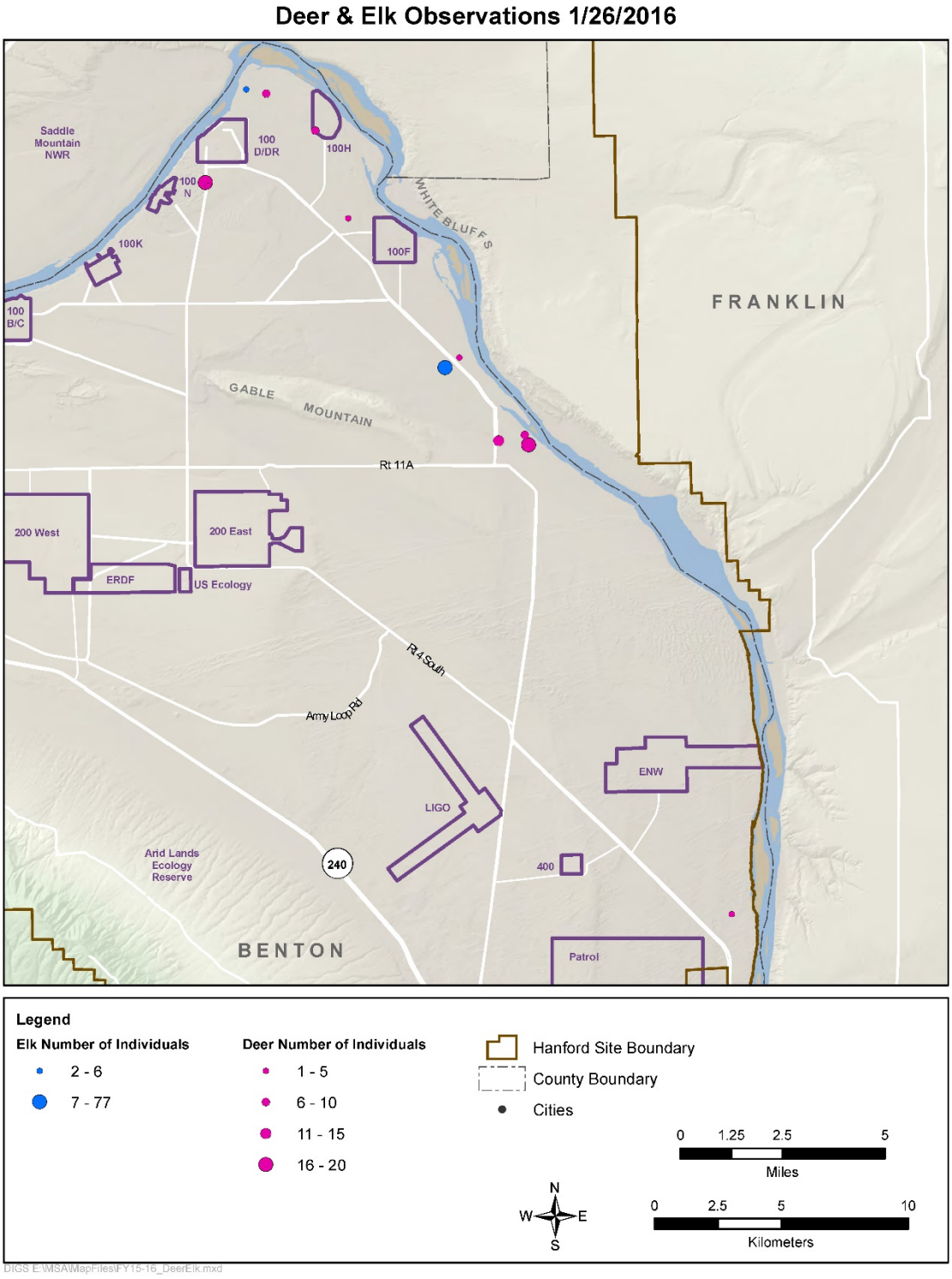

Figure 10. Deer and Incidental Elk Observations during the January 26, 2016 Survey.

4.0 DISCUSSION

The monitoring conducted during the winter of 2015 and 2016 found lower population sizes along both the southern and northern routes compared to the previous surveys conducted in 2013. The rates of gonadal atrophy and the fawn to doe ratio have remained relatively steady over the last 10 years. If the population continues to decline and gonadal atrophy levels remain steady or increase, the population as a whole could ultimately plunge, due to affected deer commonly being sterile. This is a major drive to continue triennial surveys. With a growing elk population competing for the same resources, future monitoring data should be analyzed to track the population trends between the two species. Currently, the deer population is declining, while the elk is growing, which could indicate a shrinking carrying capacity for deer. Both species and much of their utilized habitat have a BRMP Level-2 status with a management goal of conservation. Because the Hanford Site lacks most of the natural predators for both species, and hunting is not permitted on site, overpopulation leading to major habitat destruction is possible. Information from past and future deer surveys may aid in game management decisions down the road. Monitoring will continue in future years to detect changes that may occur in the Hanford population as clean up along the Columbia River corridor is completed and there is less human presence.

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