

Sage-grouse Fence Marking Project 2009

INTERNAL BLM REPORT



Photo: Dry Creek 4 Lek fence after marking

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INTRODUCTION:

The greater sage-grouse (*Centrocercus urophasianus*) is currently indentified as a candidate species under the Endangered Species Act. Although many of the threats for this species is due to habitat loss and fragmentation, even in regions where large areas of intact habitat still exist, such as southwest Wyoming, there remain other threats to the species. One threat is mortalities and injuries associated with rangeland fence collisions. While there have historically been anecdotal reports of sage-grouse fence collisions, little published research has been done to quantify or attempt to address speculation.

The purpose of this study was to attempt to reduce mortalities of sage-grouse and other bird species caused by rangeland fence collisions by increasing the visibility of fence wires. In particular, fences were targeted in areas of high sage-grouse population and areas of high concern such as spring lek sites. The other purpose of this study was to perform a baseline analysis to quantify the occurrence of such fence strikes and attempt to narrow what type of fences present the greatest threat to the species.

METHODOLOGY

Data was collected within the Rock Springs Field Office (RSFO) from July 2009 - November 2009. Fences to be marked were originally selected because of their proximity to active sage-grouse leks. Using ArcGIS and layer files of rangeland fences and active leks known within the RSFO, fences of primary concern were determined to be any that fell within a 6/10 mile buffer around each lek. Over the course of the study period, however, this method was expanded to include other fences that were determined to be of concern by RSFO Wildlife Biologists. These included areas within suspected movement corridors; and high density nesting, brood-rearing, and winter habitats.

Fences were marked in accordance with the methods developed by the Sutton Avian Research Center in Oklahoma using "undersill" strips of vinyl house siding cut into 3-4 inch pieces (Wolfe *et al.* 2009). These were then clipped over the top wire of the fence approximately every 4 feet between fence posts (2-3 per section depending on construction of particular fence) (Figure 1). Each stretch of fence was surveyed on foot so that strike data could be collected simultaneously with the marking of the wires. The location of each strike was collected using a Trimble GeoExplorer3 GPS unit for each independent strike as determined by the observer (Figure 2). GPS data was also collected for the start and stop point of each marked fence section so that an accurate GIS map could be created of the marked section of fence.

All collected strike data was imported into ArcGIS for analysis. Strikes were categorized by species and by simple strike or fence induced mortality. Any collection of feathers or hair found on or immediately surrounding the fence was considered a strike. For a strike to be counted as a mortality there had to be bones identifiable as those of the species present. For the purposes of this study, the majority of analysis focuses on sage-grouse collisions, however data was also collected for other animal species where collisions were identifiable. Information about the location of each fence in relation to known sage-grouse habitat, the physical construction of the fence, and animal strike data was combined to investigate reasons for fences to have such a great variance in number of sage-grouse strikes.



Figure 1. Example of marked fence at Lander Creek Lek showing placement of markers and typical habitat type.



Figure 2. Inspector collecting GPS data on big game fence collision at Hilltop Lek fence.

RESULTS

Over the course of the study period a total of 175,706 ft (33.28 mi) of fence within the RSFO was monitored for bird strikes. The majority of this length was marked with white plastic markers, the only exception being a section of electric fence (17,927 ft (3.40 mi)) that was monitored for strikes but not marked with clips. The total cost of fence marking materials (clips) for this project was approximately \$1600, or \$48 per mile of fence marked not including transportation or labor. In total there were twenty-five monitored fence locations, five of which were exclosures. They varied in fence length from the shortest at 2,300 ft to the longest at 21,250 ft (Table 1). A fence location was determined to be a single continuous (or semi-continuous in the case of fences that intersected historic trails) section of

Table 1. Summarized field data collected for each section of fence in the study, includes all strikes and mortalities documented and information regarding fence construction.

Fence Name	Sage-grouse Strikes (Mortalities)	Big Game Collisions (Mortalities)	Other Bird Species Strikes (Mortalities)	Distance of Fence Marked (feet)	Sage-grouse Strikes per Mile	Average Height of Top Wire (inches)	Number of Wires in Fence	Type of Wires in Fence
Mitchell Slough Exclosure	21 (18)	1 (1)	0	4,212	26.3	49	3 + Net	Barb + Net
Poston Reservoir Lek	6 (3)	0	0	2,281	14.0	40	4	Barb + Smooth
Little Mitchell Slough Exclosure	11 (3)	2 (2)	3 (3)	4,333	13.4	47	3 + Net	Barb + Net
Oregon Trial Marker Lek	23 (10)	2 (0)	0	13,689	8.9	40	4	Barb + Smooth
Sharps Meadows Creek Lek	6 (0)	0	1 (1)	3,653	8.7	41	3	Barb + Smooth
Waterhole Draw Lek	33 (10)	2 (0)	2 (2)	21,174	8.2	46	4	Barb
Little Sandy/Reservoir Boundary Fence	17 (8)	1 (0)	0	11,852	7.6	41.5	4	Barb + Smooth
Little Sandy Creek Exclosure	7 (1)	2 (2)	1 (0)	5,499	6.7	51	3 + Net	Barb + Net
Big Sandy River Exclosure (south)	4 (2)	0	0	4,425	4.8	48.5	3 + Net	Barb + Net
Dickie Springs Creek Lek	5 (0)	0	0	6,874	3.8	40	2 + Net	Barb + Net
Lander Creek Lek	4 (2)	1 (0)	0	8,963	2.4	38.5	4	Barb + Smooth
Pacific Creek Playa Lek	4 (1)	0	0	9,878	2.1	41	2 + Net	Barb + Net
Rifes Rim West Lek	1 (0)	0	0	6,150	0.9	36	3	Barb + Smooth
Electric Fence East of Big Sandy	1 (0)	0	3 (2)	17,924*	0.3	30	2	Electric
Greenhough Flat 1 Lek	0	0	1 (1)	2,447	0	38	4	Barb + Smooth
North Vermillion Lek	0	1 (0)	0	4,262	0	40	3	Barb + Smooth
Hilltop Lek	0	1 (0)	0	11,550	0	>42	6/ 2 + Net	Barb + Net
Big Sandy River Exclosure (north)	0	0	0	5,026	0	49	3 + Net	Barb + Net
Little Basin Lek	0	0	0	7,886	0	38	7	Barb
FMC Granger Lek	0	0	0	3,266	0	n/a	1 + Net	Barb + Net
Salt Sage Draw	0	0	0	3,641	0	41.5	2 + Net	Barb + Smooth
Upper Dry Wash 1 Lek	0	0	0	4,802	0	36	5	Barb
Antelope Wash East Lek	0	0	0	4,674	0	42	2 + Net	Barb + Net
Dry Creek 4 Lek	0	0	0	2,586	0	42	4	Barb
Unnamed Lek NE of Dry Creek 4	0	0	0	4,656	0	42	4	Barb

* Distance of fence monitored but not marked

marked fence line. Sometimes these were single lines of fence, but other times they contained off-shoots of other fences that also fell within the limits of the lek buffer or other determined area of concern.

Fourteen of the twenty-five fences, a distance of 120,907 ft (22.90 mi), had recorded sage-grouse strikes, while the other eleven, a distance of 54,796 ft (10.38 mi), had zero sage-grouse strikes. In all, there were a total of 147 sage-grouse strikes across all 33 miles of fence, 64 of which were confirmed mortalities. This equates to an average of 4.4 sage-grouse strikes per mile and 1.9 sage-grouse mortalities per mile. A complete breakdown of species and number of strikes recorded can be found in the table below (Table 2). It is important to note that the mortality rate is a minimum value that could likely be higher to account for the presence of scavengers removing mortality evidence from the fence side. For the purpose of this project and because it was often difficult to identify hair and bones to species in the field, pronghorn antelope and mule deer collisions have been combined into a category of big game species. Within the eleven birds in the other bird category, seven were sage-dwelling passerines, one a *Sialia* spp. (possibly Mountain Bluebird), one an *Anas* spp. (possibly Green-Winged Teal), and two others were unknown species too large for a passerine.

Table 2. Total fence strikes found and mortality rates by species or category.

	Total Strikes	Number of Confirmed Mortalities	Minimum Mortality Rate
Sage-grouse	147	64	44%
Big Game	15	5	33%
Other Bird Species	11	9	82%

Considering only sage-grouse fence strikes, there were nine fences whose strike per mile value was above the study average of 4.4 strikes per mile. These nine fences were determined to be the most problematic to sage-grouse out of those studied. All problematic fences appear in red in Table 3.

Five characteristics of the fence and its surrounding habitat were considered to be possible reasons for high number of sage-grouse strikes based on established sage-grouse habitat and life history data. These characteristics include: fences located within 6/10 of a mile from an active lek, within a sage-grouse core area as determined by the Wyoming Game and Fish Department, less than 2 miles from a known sage-grouse winter location, close proximity to a continuous water supply (possible brood-rearing area), and height of top fence wire being above BLM range fence standards (38 inches maximum height for combination of cattle, deer and antelope). Of the nine most problematic fences, two of them fit all five of these characteristics, three fences fit four of five, and all the rest fit three of five. The lesser problematic fences (< 4.4 strikes/mile), had much greater variation in the number of characteristics they displayed. These ranged from one characteristic out of five, to four characteristics out of five (Table 3). Although, at least in the case of the height of top fence wire, there was considerable difference between the extents above BLM standards when comparing problematic fences to non-problematic. For the nine problematic fences, all were greater than 38 inches in height with the tallest being an average of 51 inches above ground. In contrast, of the sixteen non-problematic fences, only 10 were greater than 38 inches (Table 3).

For big game collisions and mortalities it was predicted that the presence of net wire on the fence increased the mortality rate. While not all fences with net wire showed mortalities, all fences with mortalities did contain net wire (Table 1).

Table 3. Sage-grouse strikes per mile and the five problematic characteristics that could lead to increased sage-grouse strike occurrence.

Fence Name	Sage-grouse Strikes per Mile	Within 6/10 of a Mile from Active Lek	Within Sage-grouse Core Area	Under 2 Miles from Sage-grouse Known Winter Ground	Water Crossing or Parallel to Fence	Top Wire Height > 38in (BLM Standard)	Number of Problematic Characteristics Found (0-5)
Mitchell Slough Exclosure	26.3	X	X	X	X	X	5
Poston Reservoir Lek	14.0	X	X	X		X	4
Little Mitchell Slough Exclosure	13.4		X		X	X	3
Oregon Trial Marker Lek	8.9	X	X	X		X	4
Sharps Meadows Creek Lek	8.7	X	X		X	X	4
Waterhole Draw Lek	8.2	X	X	X	X	X	5
Little Sandy/Reservoir Boundary Fence	7.6		X	X		X	3
Little Sandy Creek Exclosure	6.7		X		X	X	3
Big Sandy River Exclosure (south)	4.8		X		X	X	3
Dickie Springs Creek Lek	3.8	X	X			X	3
Lander Creek Lek	2.4	X	X			X	3
Pacific Creek Playa Lek	2.1	X	X			X	3
Rifes Rim West Lek	0.9	X	X	X			3
Electric Fence East of Big Sandy	0.3		X		X		2
Greenhough Flat 1 Lek	0	X					1
North Vermillion Lek	0	X	X	X		X	4
Hilltop Lek	0	X				X	2
Big Sandy River Exclosure (north)	0		X		X	X	3
Little Basin Lek	0	X	X	X	X		4
FMC Granger Lek	0	X	X			n/a	2
Salt Sage Draw	0	X				X	2
Upper Dry Wash 1 Lek	0	X					1
Antelope Wash East Lek	0	X				X	2
Dry Creek 4 Lek	0	X	X			X	3
Unnamed Lek NE of Dry Creek 4	0	X	X			X	3

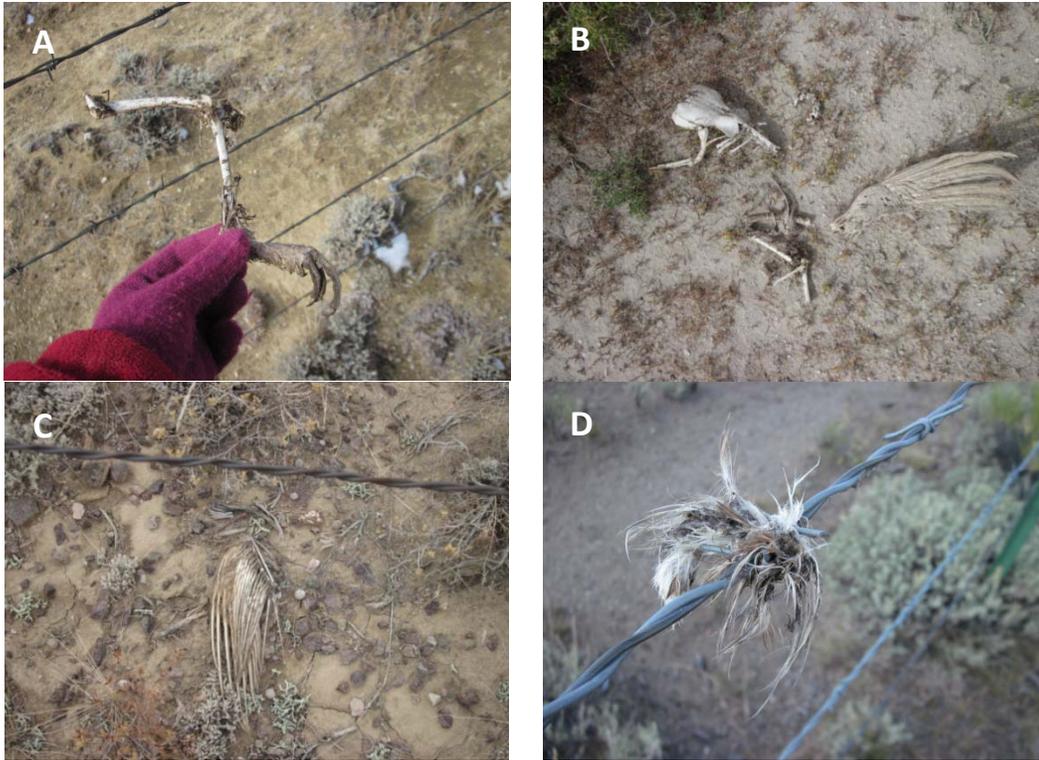


Figure 3. Examples of sage-grouse mortalities and strikes found in the field. (A) Oregon Trail Marker Lek, mortality. (B) Mitchell Slough Enclosure, mortality. (C) Little Sandy/Reservoir Boundary Fence, mortality. (D) Sharps Meadows Creek Lek, strike.



Figure 4. Examples of other species mortalities. (A) Big game mortality, Little Sandy Creek Enclosure. (B) Passerine bird mortality, Greenhough Lek.

CONCLUSION

It is believed that the five characteristics identified in this study as possible reasons for increased sage-grouse strikes in some areas (Table 3) are accurate predictions for beginning to identify this problem. However, as illustrated by those fences where little-to-no sage-grouse strikes were found but many of the characteristics were still met, other factors exist that were not considered for this study. It is possible that some of these confounding factors include differences in fence construction and/or

maintenance, the placement of fences in relationship to the terrain of the land, and differences in surrounding sagebrush habitats. It should also be mentioned that the timing of fence monitoring varied greatly over the course of the study. Most of the fences were monitored during the summer season, but several were not reached until later into the fall after the first snow storm. Some were even monitored with snow still on the ground which could have affected the strike data collected.

The twenty-five fences monitored during this study are just a fraction of the miles of fence that exist within the RSFO boundaries. There is an estimate of 2,130 total miles of fence line within the field office, only 33 of which were monitored and marked. This amounts to only 2% of the total fence length used in this study. While it is important to point out that the fences chosen for this project were chosen for their proximity to sage-grouse habitat and do not likely act as a good representation of all fences in the area, the result that an average of 4.4 sage-grouse strikes/mile found is indicates good reason for this project to be continued in the future. More fences from other parts of the field office should be considered, including some control fences that do not meet the criteria for possible high sage-grouse strike probability. Other suggested means for improving this study would be including collecting additional data in the field on specific habitat type, a description of strike location (i.e. terrain, hillside, lowland, etc.), estimating the age of the strike found, and distance from closest raptor perch. These are all things that could either increase the ability to make accurate predictions as to the types of areas with greater sage-grouse strikes, or else give useful information that would assist in not making assumptions that could be otherwise explained by predator habits or timing of strikes. It is also believed that beginning this study, or any future studies, earlier in the summer closer to the end of breeding season would be a benefit in collecting accurate strike data, at least in areas where strikes are thought to be induced by the proximity to sage-grouse leks.

As this was only a single season study, no data has yet been collected in this area to support the relative success rate of marked fences in reducing the occurrence of sage-grouse strikes. It is suggested that all problematic fences identified in this study be further monitored and if the markers are determined to not significantly reduce the number of strikes, then the fence(s) should be considered for redesign or removal. It should be noted, however, that markers were observed to have great variability in visibility depending on lighting conditions and ground cover. Some studies, including a recent study put forth by the Wyoming Game and Fish Department, suggest the addition of high quality reflective tape to increase visibility in low lighting and snow cover, but it has not been definitively determined yet whether this is a cost-effective method (Christiansen 2009).

The results of this study highlight the possible dangers sage-grouse, as well as other bird and big game species face when coming into contact with rangeland fences. This is not to say that every fence that exists in these types of habitats is a problem. Because the data suggests that most problematic fences tended to be those with the highest number of sage-grouse habitat characteristics, future actions should be explored regarding fence design and specifications and fence construction locations as they relate to proximity to known sage grouse corridors and habitats. An important lesson to be taken from this study is how much more research needs to be done on fence strikes and their association to sage grouse habitats.

ACKNOWLEDGEMENTS

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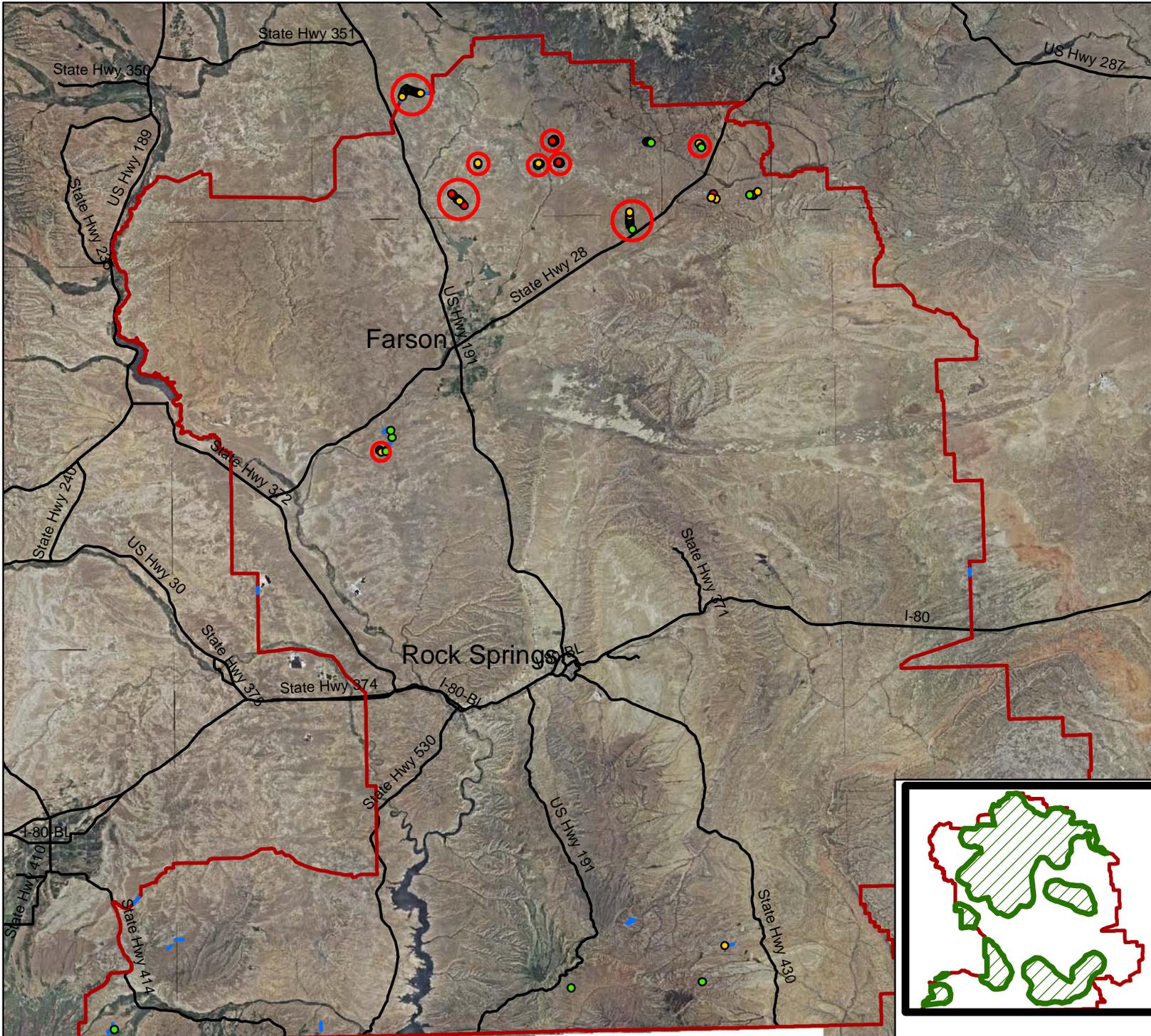
Land Management Internship Program, and Tom Christiansen and the Wyoming Game and Fish Department.

REFERENCES

Christiansen, T. 2009. Fence marking to reduce greater sage-grouse (*Centrocercus urophasianus*) collisions and mortality near Farson, Wyoming – Summary of interim results. Wyoming Game and Fish Department.

Wolfe, D.H., M.A. Patten, and S.K. Sherrod. 2009. Reducing grouse collision mortality by marking fences (Oklahoma). *Ecological Restoration*. **27:2**:141-143.

2009 Sage-Grouse Fence Marking Project



Legend

Strikes_Collisions

- all other collisions

species, type

- sage-grouse, feathers
- sage-grouse, mortality

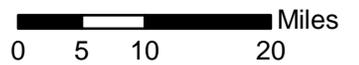
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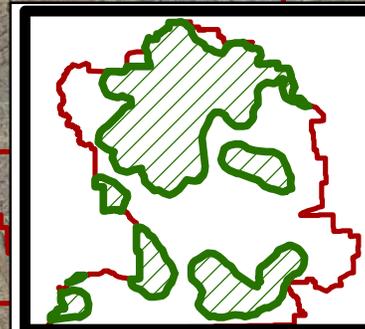
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— Highways

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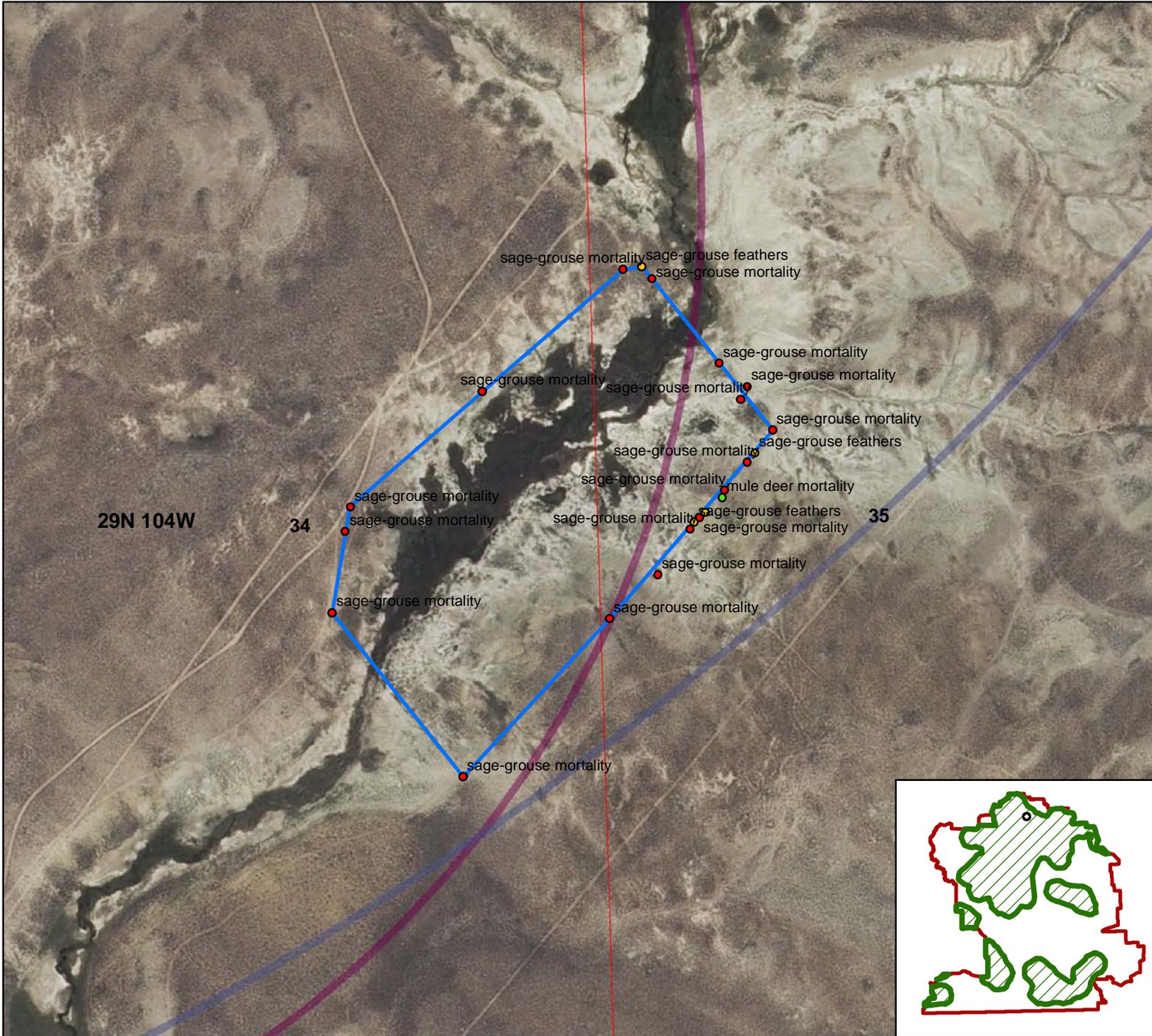


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Mitchell Slough Exclosure



Legend

Strikes_Collisions

- all other collisions

species, type

- sage-grouse, feathers
- sage-grouse, mortality

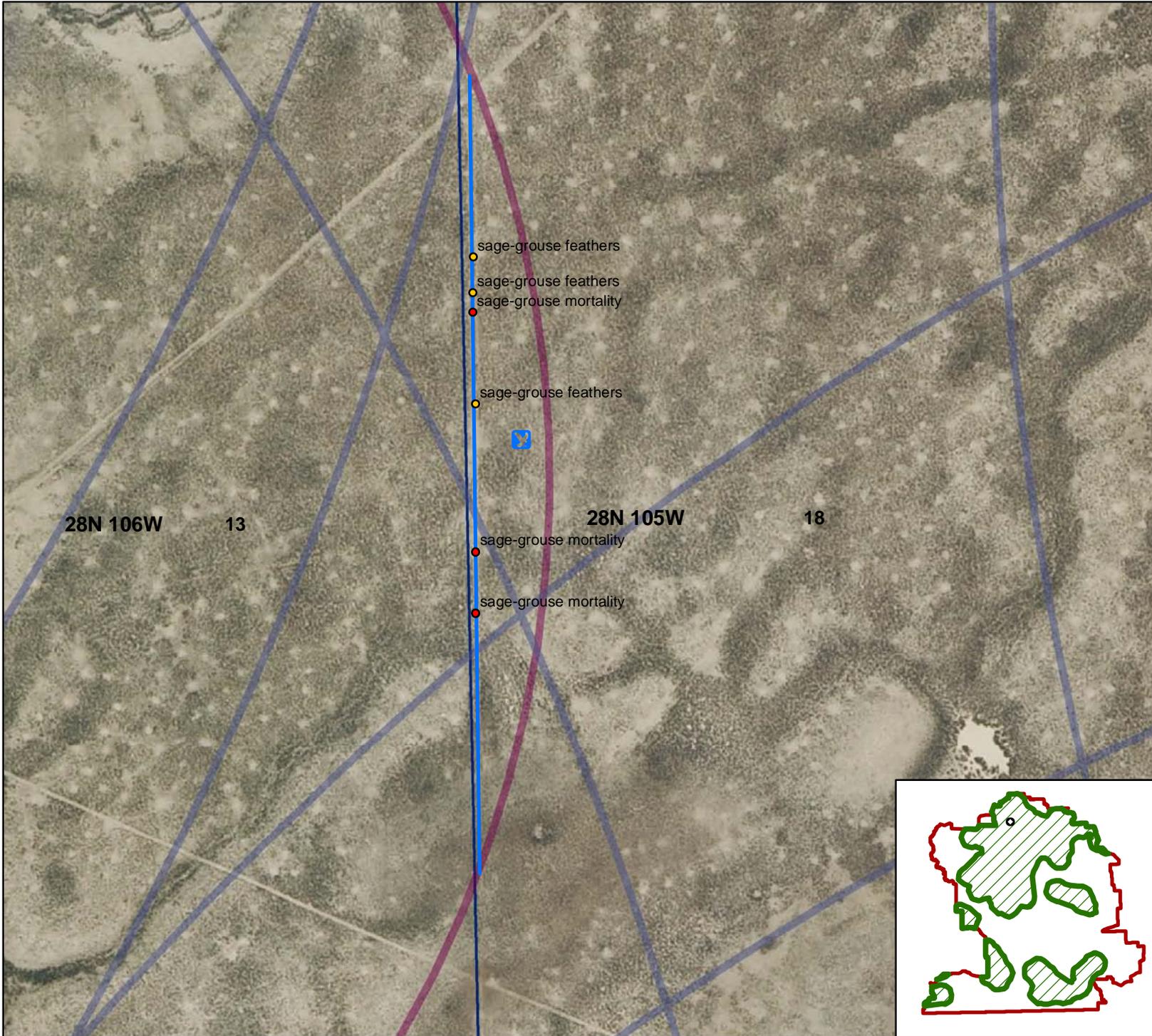
- Marked Fences
- New Sage-grouse Leks
- Sage-grouse Leks
- ✈ Sage-grouse Winter Locations
- 2 Mile Buffer Sage-grouse Winter Locations
- 6/10 Mile Buffer of Sage-grouse Leks
- RSFO Boundary
- RSFO_Township_Range
- RSFO_Sections
- ▨ WYGF Sage-grouse Core Areas



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Poston Reservoir Lek



Legend

Strikes_Collisions

- all other collisions

species, type

- sage-grouse, feathers
- sage-grouse, mortality

— Marked Fences

● New Sage-grouse Leks

● Sage-grouse Leks

☐ Sage-grouse Winter Locations

▭ 2 Mile Buffer Sage-grouse Winter Locations

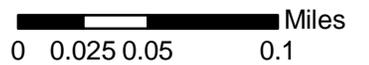
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▭ RSFO Boundary

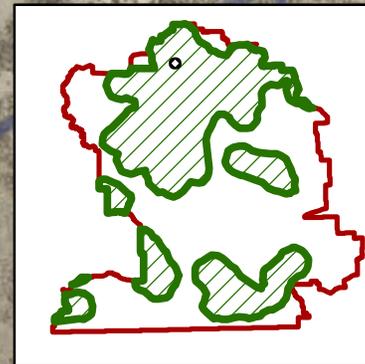
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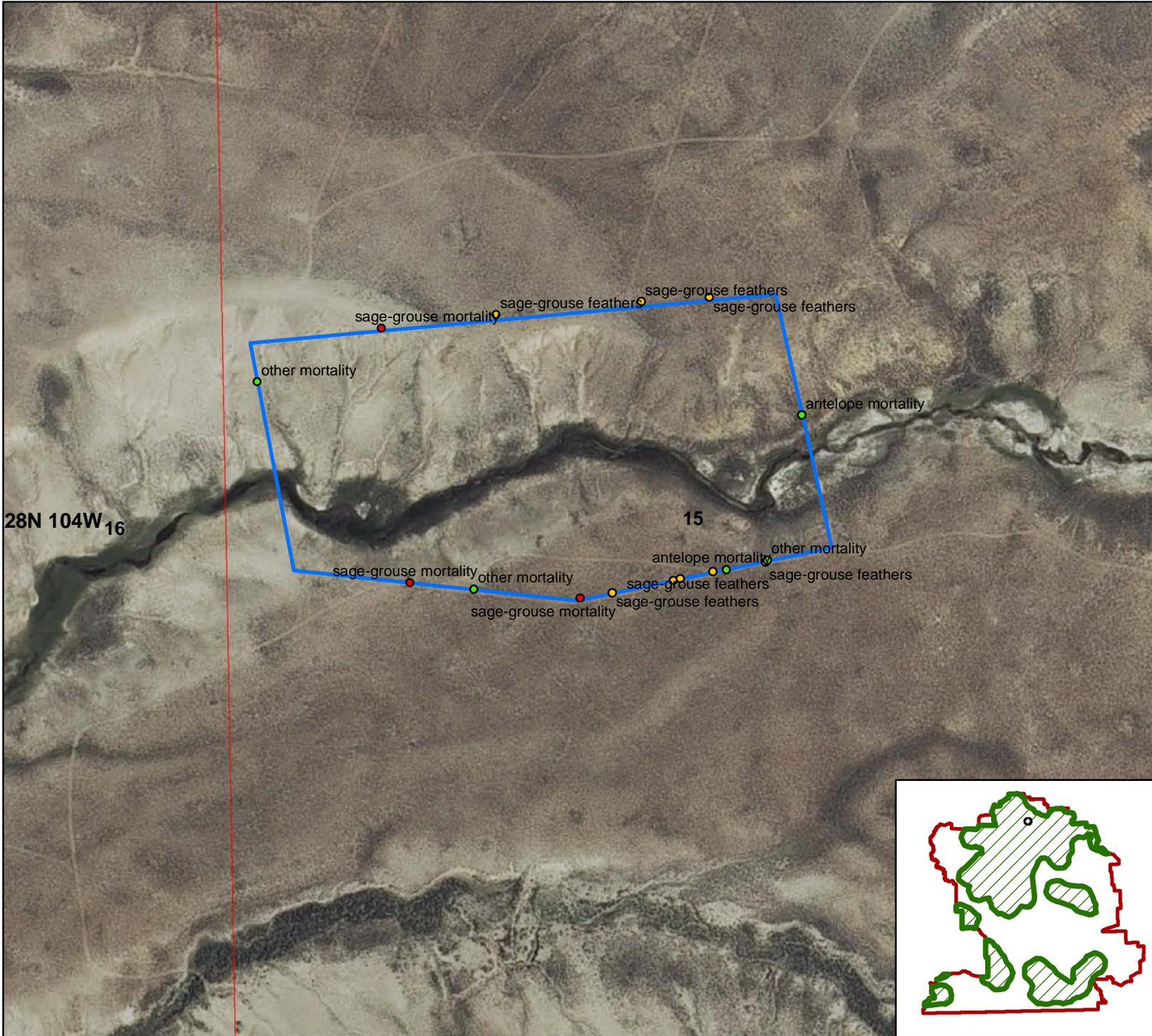


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Little Mitchell Slough Exclosure



Legend

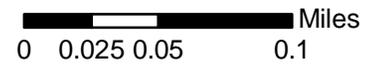
Strikes_Collisions

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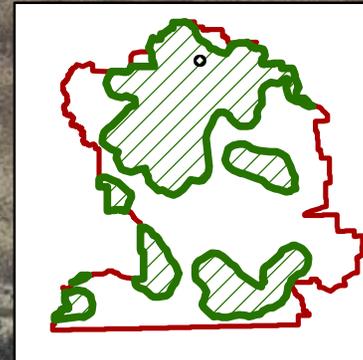
species, type

- sage-grouse, feathers
- sage-grouse, mortality

- Marked Fences
- New Sage-grouse Leks
- Sage-grouse Leks
- 📍 Sage-grouse Winter Locations
- ▭ 2 Mile Buffer Sage-grouse Winter Locations
- ▭ 6/10 Mile Buffer of Sage-grouse Leks
- ▭ RSFO Boundary
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- ▭ RSFO_Sections
- ▭ WYGF Sage-grouse Core Areas

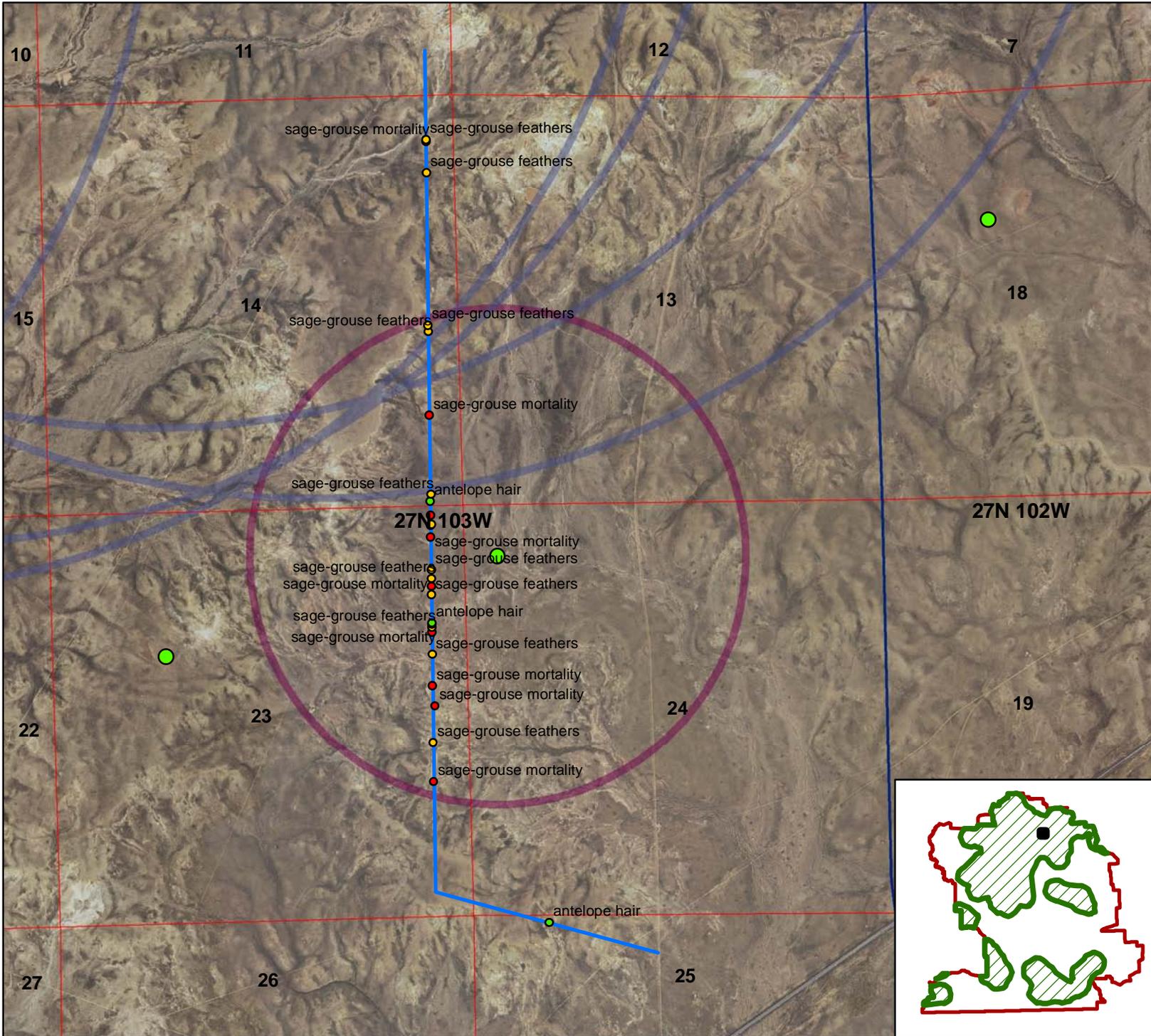


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Oregon Trail Marker Lek



Legend

Strikes_Collisions

- all other collisions

species, type

- sage-grouse, feathers
- sage-grouse, mortality

— Marked Fences

● New Sage-grouse Leaks

● Sage-grouse Leaks

✈ Sage-grouse Winter Locations

— 2 Mile Buffer Sage-grouse Winter Locations

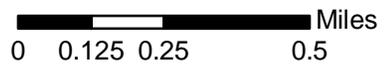
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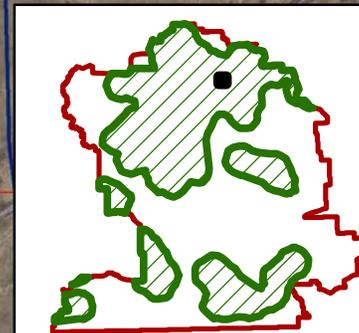
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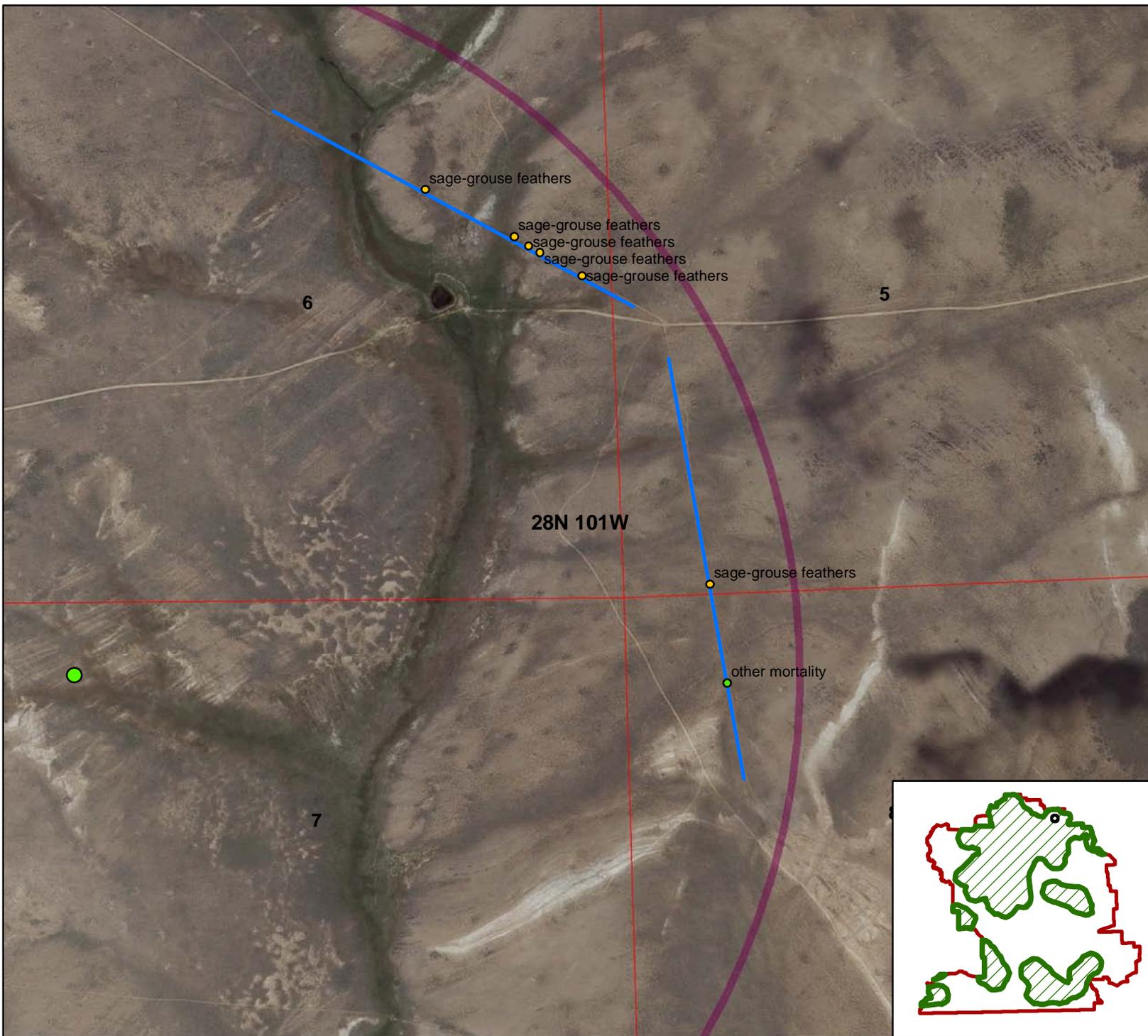


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Sharps Meadows Creek Lek



Legend

Strikes_Collisions

- all other collisions

species, type

- sage-grouse, feathers
- sage-grouse, mortality

— Marked Fences

● New Sage-grouse Leks

● Sage-grouse Leks

✈ Sage-grouse Winter Locations

▭ 2 Mile Buffer Sage-grouse Winter Locations

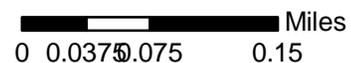
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▭ RSFO Boundary

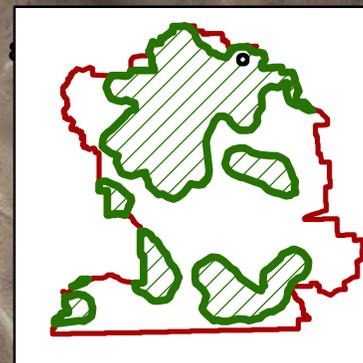
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▭ RSFO_Sections

▭ WYGF Sage-grouse Core Areas

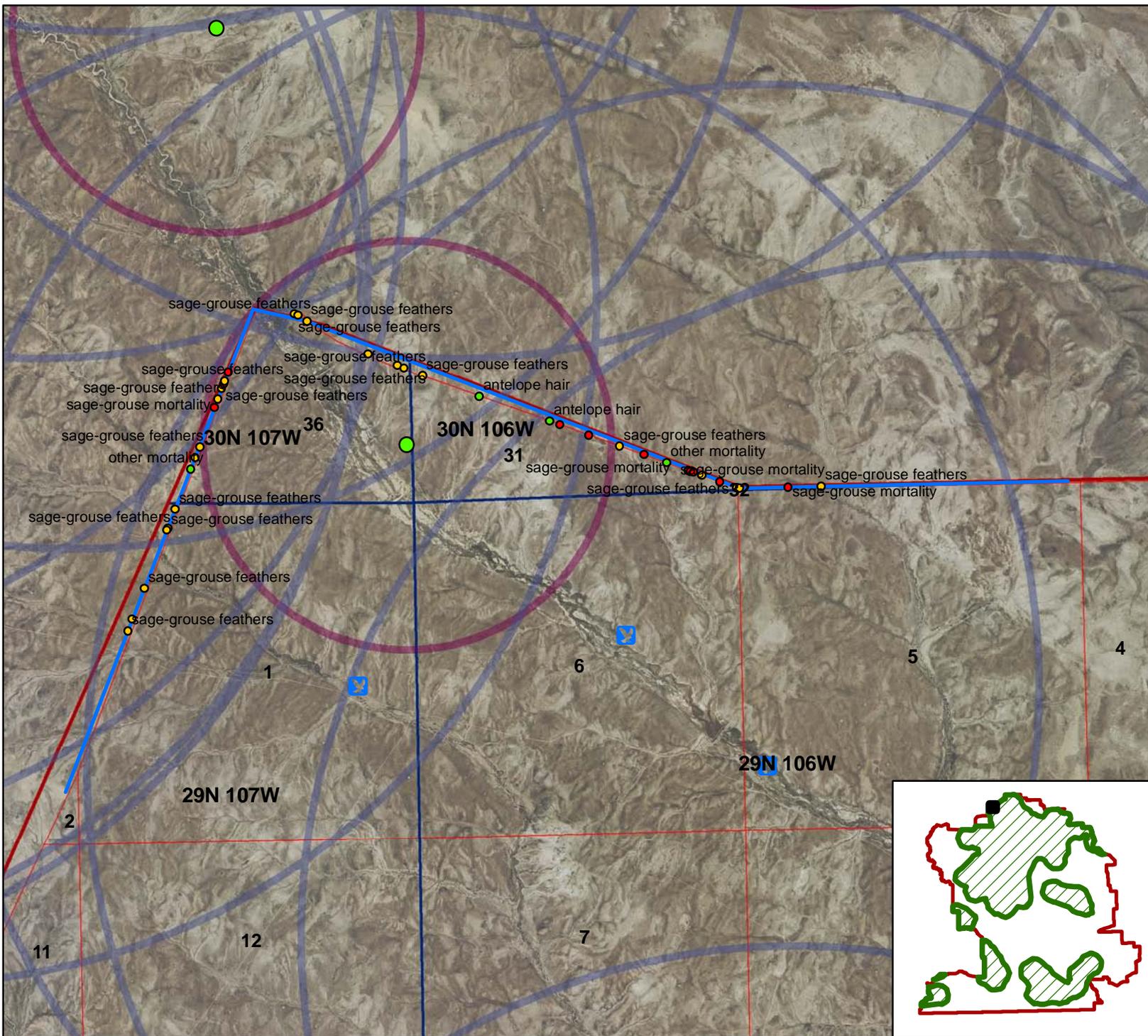


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Waterhole Draw Lek



Legend

Strikes_Collisions

- all other collisions

species, type

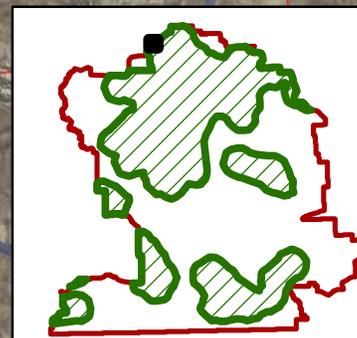
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- sage-grouse, mortality

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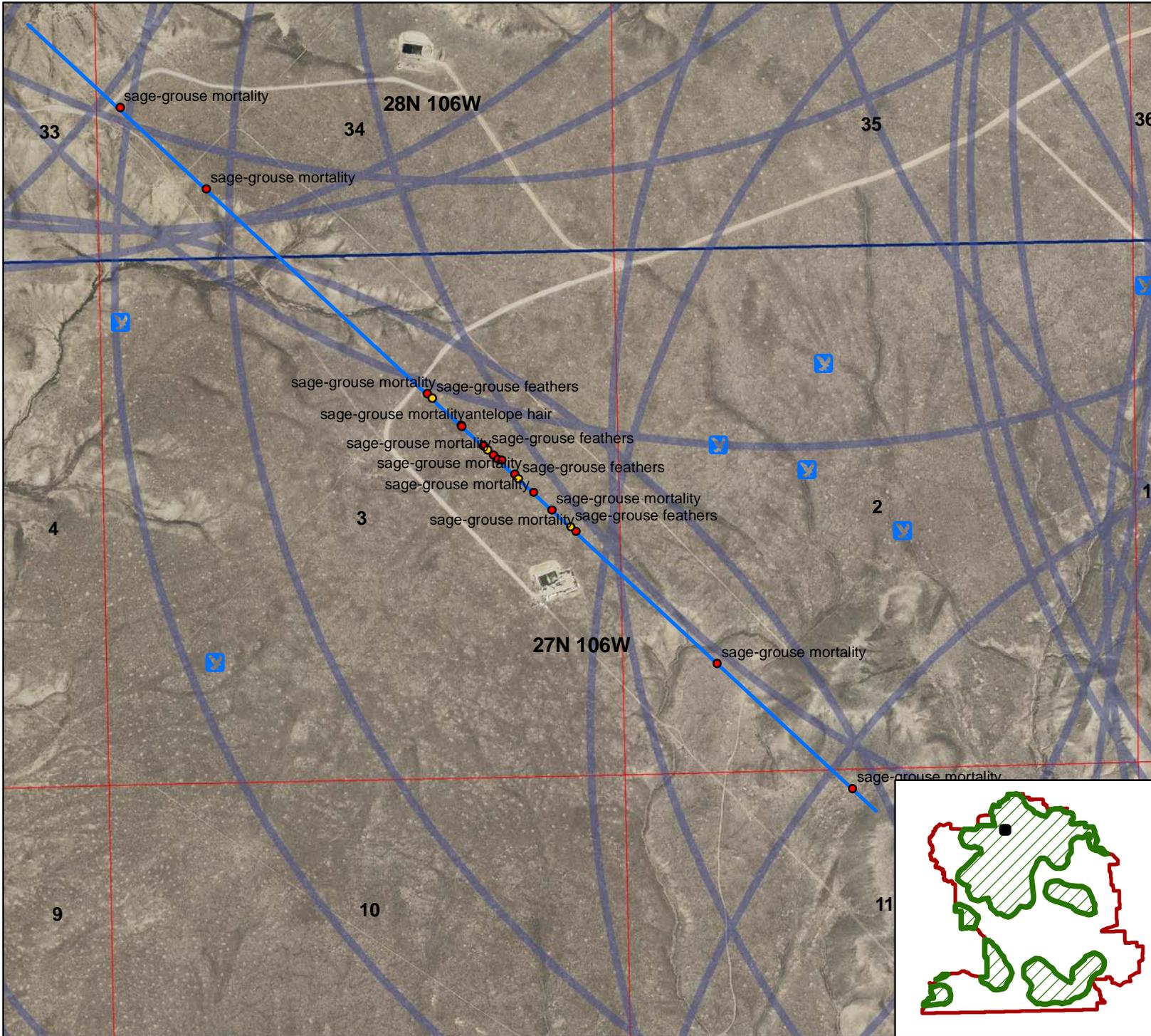


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Little Sandy/ Reservoir Boundary Fence



Legend

Strikes_Collisions

- all other collisions
- sage-grouse, feathers
- sage-grouse, mortality

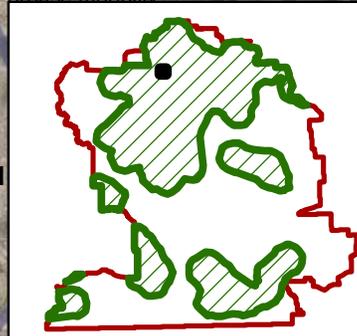
species, type

- Marked Fences
- New Sage-grouse Leaks
- Sage-grouse Leaks
- ✈ Sage-grouse Winter Locations
- 2 Mile Buffer Sage-grouse Winter Locations
- 6/10 Mile Buffer of Sage-grouse Leaks
- RSFO Boundary
- RSFO_Township_Range
- RSFO_Sections
- WYGF Sage-grouse Core Areas

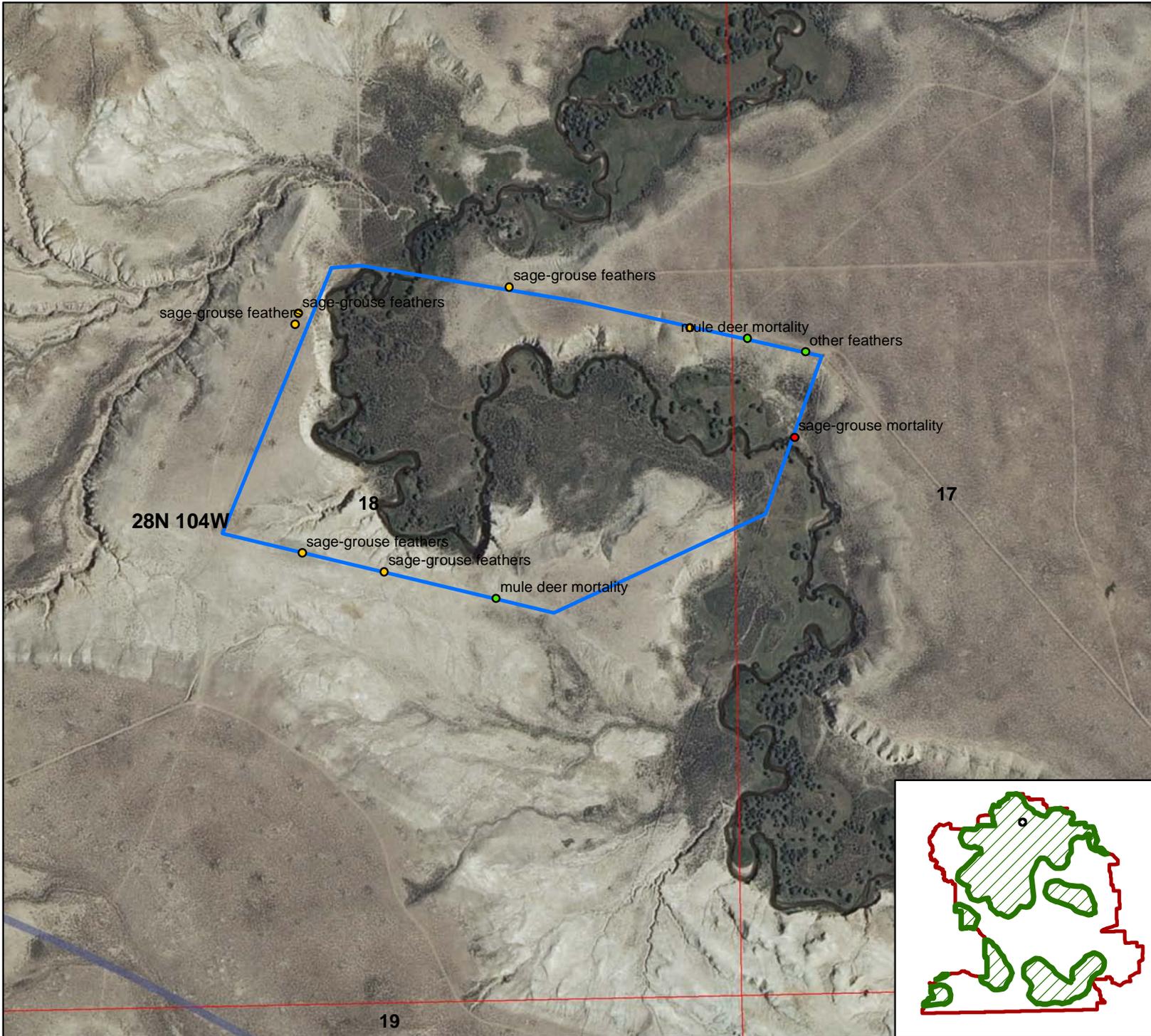


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Little Sandy Creek Exclosure



Legend

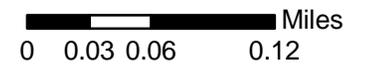
Strikes_Collisions

- all other collisions

species, type

- sage-grouse, feathers
- sage-grouse, mortality

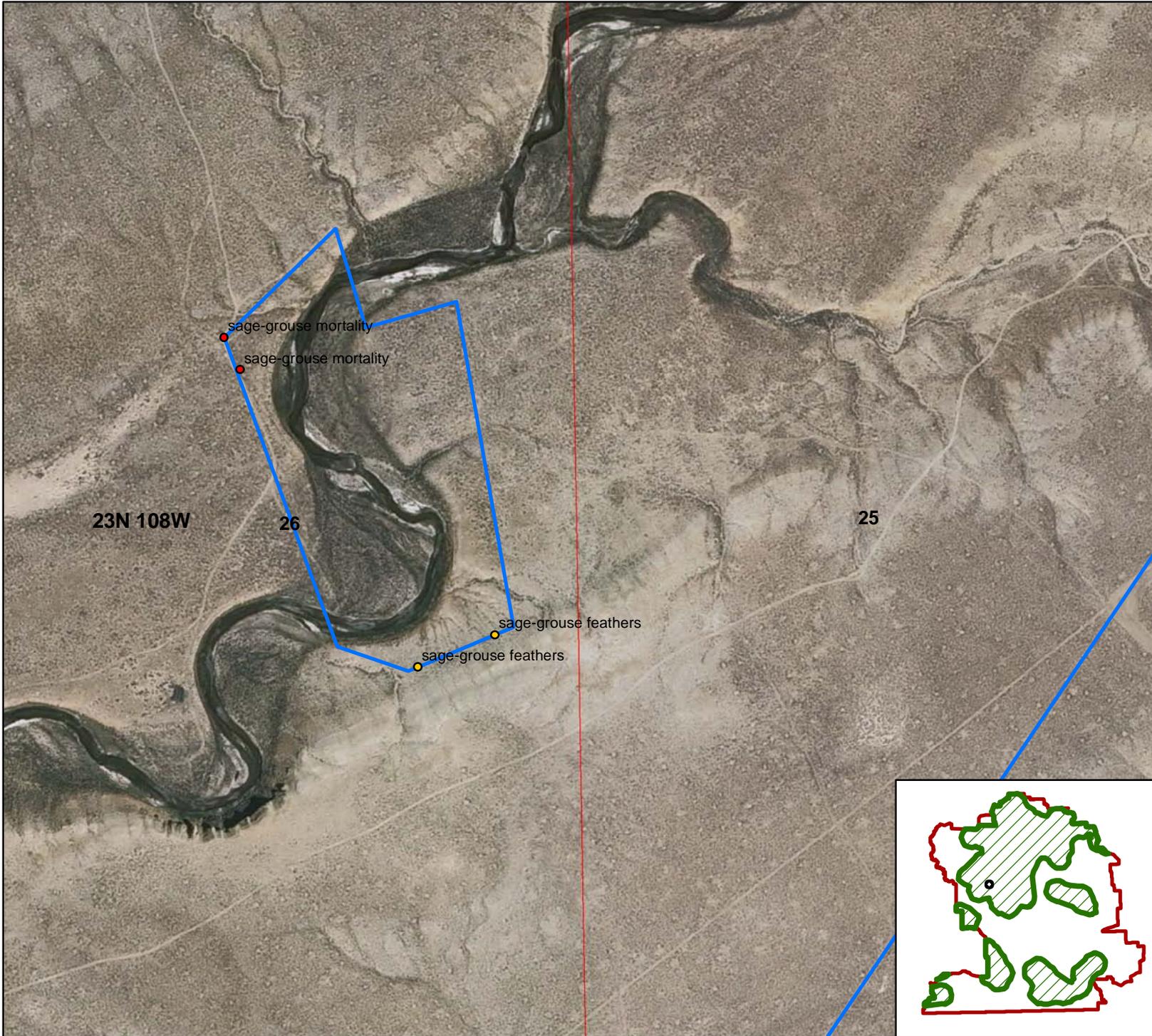
- Marked Fences
- New Sage-grouse Leaks
- Sage-grouse Leaks
- ✈ Sage-grouse Winter Locations
- ▭ 2 Mile Buffer Sage-grouse Winter Locations
- ▭ 6/10 Mile Buffer of Sage-grouse Leaks
- ▭ RSFO Boundary
- ▭ RSFO_Township_Range
- ▭ RSFO_Sections
- ▭ WYGF Sage-grouse Core Areas



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Big Sandy River Exclosure (south)



Legend

Strikes_Collisions

- all other collisions

species, type

- sage-grouse, feathers
- sage-grouse, mortality

Marked Fences

- New Sage-grouse Leks

- Sage-grouse Leks

- 📍 Sage-grouse Winter Locations

- ▭ 2 Mile Buffer Sage-grouse Winter Locations

- ▭ 6/10 Mile Buffer of Sage-grouse Leks

- ▭ RSFO Boundary

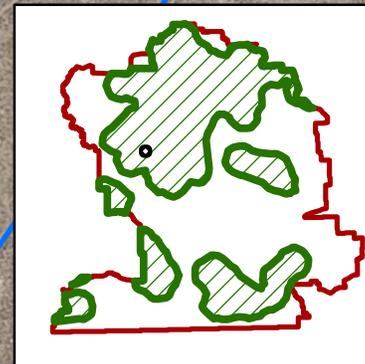
- ▭ RSFO_Township_Range

- ▭ RSFO_Sections

- ▭ WYGF Sage-grouse Core Areas



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