Upper Clark Fork River Basin
Terrestrial Resource Assessment Final Report

(Photos from upper left: Stucky Ridge Wildlife Management Area, elk on native grasslands in Upper Rock Creek, Dutchman wetland, bighorn ewes on the Blue-eyed Nellie Wildlife Management Area).

by
Ray Vinkey and Kristi DuBois

Montana Fish, Wildlife & Parks

and
Carol Fox and Greg Mullen

Montana Department of Justice
Natural Resource Damage Program

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Abstract

The Montana Fish, Wildlife & Parks, in consultation with the Natural Resource Damage Program, assessed the terrestrial resources of the Upper Clark Fork River Basin from its headwaters downstream to its confluence with the Blackfoot River. Information from this assessment will be used to develop a prioritization document that will identify areas to focus wildlife habitat protection and enhancement efforts in the UCFRB. This terrestrial resource assessment (and upcoming prioritization) is a parallel and complimentary effort to the aquatic resource assessment and prioritization effort.

Existing information, collection of new data, and predictive modeling were used to complete the assessment. Existing wildlife data consisted primarily of big game data from the FWP Crucial Areas Assessment and Planning System (CAPS) and limited nongame observations from Montana Natural Heritage Program (MNHP). New data was collected on aquatic furbearers, small mammals, bats, reptiles, amphibians, songbirds, raptors colonial nesting waterbirds, migrating waterfowl and waterbirds. An improved land-cover map was developed by using remote sensing provided by Re-GAP mapping with subsequent ground-truthing to improve the accuracy of classifications and refine the identification of habitat types in the Basin.

This report summarizes the information gathered during the terrestrial wildlife assessment. Individual reports produced as part of this effort include:

DuBois, K.L. 2010. Upper Clark Fork Wildlife Assessment, Raptor, Colonial Waterbird, and Targeted Species Survey and Monitoring. Montana Fish, Wildlife and Parks, Region 2, Missoula. 18 pp.

Foresman, K.R. 2009. Upper Clark Fork Wildlife Resource Monitoring Assessment—Aquatic Furbearers. University of Montana, Missoula. 25 pp.

Leary, A. 2010. Upper Clark Fork River Basin Small Mammal, Amphibian, and Reptile Surveys. Montana Tech, and Montana Fish, Wildlife and Parks. 29 pp.

Lenard, S. 2009. Summary: Bat Species in Select Vegetation Communities in the Upper Clark Fork Watershed. Montana Natural Heritage Program, Helena, MT. 18 pp.

Ritter, J. 2010. Predicted Distribution Model Analysis Using 2009 UCFRB Field Data. Montana Fish, Wildlife & Parks, Helena, MT. 12 pp.

Smucker, K. and M. Fylling. 2010. Upper Clark Fork River Basin Report on 2009 Bird Surveys. Avian Science Center, University of Montana. 20 pp.

Swant, G. 2009. Fall Shorebird, Waterbird, and Waterfowl Migration Counts at Warm Springs Wildlife Management Area, 2009. GoBird Montana, LLC. *For* Montana Fish, Wildlife and Parks. 32 pp.

Vance, L., and C. Tobalske. 2010. Upper Clark Fork Sage Steppe and Grassland Classification and Mapping. Montana Natural Heritage Program, Helena, MT. 16 pp.

INTRODUCTION

The Montana Fish, Wildlife & Parks (FWP), in consultation with the Natural Resource Damage Program (NRDP), assessed the terrestrial resources of the Upper Clark Fork River Basin (UCFRB)—the portion of the watershed of the Clark Fork River extending from its headwaters, surrounding the City of Butte, downstream to its confluence with the Blackfoot River just upstream of the City of Missoula (Figure 1). Information from this assessment will be used to develop a prioritization document that will identify areas to focus wildlife habitat protection and enhancement efforts in the UCFRB. This terrestrial resource assessment (and upcoming prioritization) is a parallel and complimentary effort to the aquatic resource assessment and prioritization effort.

Background

In 2008, the State of Montana concluded its natural resource damage litigation against ARCO (Montana v. ARCO) for injuries to natural resources in the UCFRB. With the conclusion of this lawsuit, FWP and NRDP began efforts in the spring of 2008 to develop a prioritization process for improving terrestrial resources in the UCFRB, based in part on the distribution and quality of the injured terrestrial resources (wildlife habitat and populations) that were covered under the lawsuit. The first phase of the terrestrial resource prioritization process involves gathering and assessing the information needed to identify and prioritize areas where conservation efforts can be implemented to restore and/or replace these injured terrestrial wildlife resources.

Under the federal Superfund law and according to the NRDP program policy and guidance, settlement funds can only be used to restore or replace injured natural resources and associated lost services. The NRDP's *UCFRB Restoration Plan Procedures and Criteria*[1] summarizes the injured natural resources and lost service that were covered under Montana v. ARCO. Releases of hazardous substances, including arsenic, cadmium, copper, lead, and zinc from mining and mineral processing operations caused a reduction in the fish and benthic macroinvertebrates that constitute the prey base for many aquatic wildlife species. Riparian, grassland, shrubland and forested habitats, were injured from phytotoxic releases, and buried under the footprints of tailings ponds and other industrial facilities.

Injured wildlife species in riparian areas include populations of birds, mammals, and other wildlife that inhabit these areas, and otter, mink and raccoons that rely on fish and mollusks in their diets. Injured wildlife species in grassland and forested habitats include birds of prey, woodpeckers, songbirds, squirrels, porcupine, marten, black bear, elk, and many other species. The services lost or impaired due to injuries to vegetation, wildlife and wildlife habitat include hunting, fishing, bird watching, hiking, wildlife viewing, and other forms of wildlife-related recreation. Specific to terrestrial resources, restoration involves improving wildlife habitat and populations through habitat protection and enhancement activities in the injured terrestrial resource areas and replacement generally involves the same goals and activities, but outside the injured terrestrial resource areas.

[1] UCFRB Restoration Plan, Procedures and Criteria, prepared by NRDP, January 2007.

Scope of Work for the UCFRB Terrestrial Resource Assessment and Prioritization

The scope of work to implement the terrestrial assessment is listed in Appendix A.

In order to prioritize areas for wildlife habitat protection and enhancement, it was necessary to map and characterize the geographic extent and condition of wildlife species and their habitats. This information is required to identify areas of high habitat quality, which support important wildlife resources and can be the focus of protection efforts, areas where habitat quality can be enhanced through cost-effective restoration, and areas where restoration may not be cost-effective. Information necessary to evaluate and prioritize areas includes data on: habitat extent and quality, habitat fragmentation and connectivity, occurrence and distribution of species, overall species diversity within each habitat or land-cover type, and the potential of the area to replace lost services, including access for hunting, bird watching, hiking, wildlife viewing, and other outdoor recreation.

Accurate land-cover maps are essential to make good decisions about habitat conservation and restoration. Existing land-cover maps for the UCFRB contained many inaccuracies, like misclassifying juniper as mountain mahogany, over-mapping sagebrush-steppe habitat and under-mapping some native grasslands. A core priority for this project was to develop a more accurate land-cover map for the UCFRB.

While adequate information on big game species abundance and distribution has been collected, information on nongame wildlife species, especially those inhabiting grasslands and wetlands within the Clark Fork watershed was lacking. Most existing information on nongame species was from forested habitats on public lands and was not applicable to lower-elevation private lands. An important aspect of this project was inventory of nongame species in the UCFRB, focused on lower elevation private lands.

Distribution of these species within the area was initially modeled as part of FWP's Crucial Areas Assessment and Planning System (CAPS) effort (http://www.fwp.mt.gov/wildthings/conservationInAction/crucialAreas.html). These Geographic Information System models predict habitat suitability for a species by using occurrence data and environmental features (e.g. soils, precipitation, land-cover). An initial evaluation of these models indicated that they poorly predicted species distribution in the UCFRB because (other than in forested habitats) few data points existed for most nongame species. Additional species occurrence information within the UCFRB was required to refine the models. More accurate species occurrence models were necessary for FWP to determine where lands with high species diversity or with high habitat values for Species of Concern (SOC) are located.

This assessment is focused on riparian and wetland habitats, grassland and shrub-steppe habitats, and the vertebrate wildlife species that inhabit those habitats. These lands were most impacted by mining activities and are most threatened by development. It is also focused primarily on private lands with those habitat types because wildlife data is generally lacking on private lands. Low elevation habitats provide yearlong habitat for big game, including winter range and birthing habitat, provide recreational opportunities, and support crucial habitat for SOC.

The results from this assessment will help the FWP and NRDP develop a prioritization document that will identify those areas to target for wildlife habitat protection and enhancement in the UCFRB. Data gathered by this assessment will also be used as a baseline to evaluate the effectiveness of restoration efforts.

STUDY AREA

The study area was the Upper Clark Fork River Watershed from just above the confluence with the Blackfoot River to Butte (Figure 1—UCFRB area map). Major tributaries include the Little Blackfoot River, Warm Springs Creek, Silverbow Creek, Rock Creek, and Flint Creek. Fieldwork for the Assessment was completed by FWP and by a variety of partners in coordination with the department. The University of Montana-Avian Science Center, the University of Montana-Wildlife Program, Montana Tech-University of Montana, the Natural Heritage Program, and Montana Audubon all participated in the assessment. Fieldwork was initiated in May 2009 and completed by December 2009 with reporting in early 2010. Most field sampling was completed during June, July, and August.

Figure 1. Upper Clark Fork River Basin.

METHODS

Existing information, collection of new data, and predictive modeling were used to complete the assessment. Existing data consisted primarily of data from FWP and Montana Natural Heritage Program (MNHP). New data was collected by FWP, MNHP, contractors, partners, and volunteers.

Land-cover Mapping and Delineation completed by MNHP was a central part of this assessment. Habitat types were classified and described using remote sensing provided by Re-GAP mapping with subsequent ground-truthing to improve the accuracy of classifications and refine the identification of habitat types in the Basin.

Field data were collected on a variety of wildlife species by directing on-going statewide inventory efforts to the Upper Clark Fork watershed and initiating new studies. These efforts included:

- ***Multiple Species Diversity Monitoring*** which included sampling of small mammals, bats, reptiles, and amphibians by FWP, MNHP, and Montana Tech of the University of Montana-Biological Sciences;
- ***Songbird Point Counts*** conducted by the Avian Science Center (coordinated with the NRDP Smelter Hill songbird inventory), and MNHP;
- ***Colonial Waterbird Surveys*** in conjunction with a statewide effort coordinated by FWP and Montana Audubon;
- ***Raptor Surveys*** completed by FWP to supplement annual bald eagle and peregrine falcon nest monitoring;
- ***Otter/Aquatic Furbearer Surveys*** conducted by University of Montana-Division of Biological Sciences in cooperation with FWP;
- ***Targeted Species Surveys*** by FWP and volunteers to gather information on selected species of interest not adequately covered by the other survey efforts; and
- ***Migration Counts of Waterfowl, Waterbirds and Shorebirds*** at Warm Springs Ponds, by a volunteer to document waterfowl and their use of the area during fall migration.

A description of these projects, including the portions of the scope of work addressed by each project is listed in Appendix B. More detailed descriptions of the protocols can be found in the individual project reports described below, and in the protocols document prepared by FWP (FWP 2009).

Methods—Selection of Sampling Sites for Wildlife Field Surveys

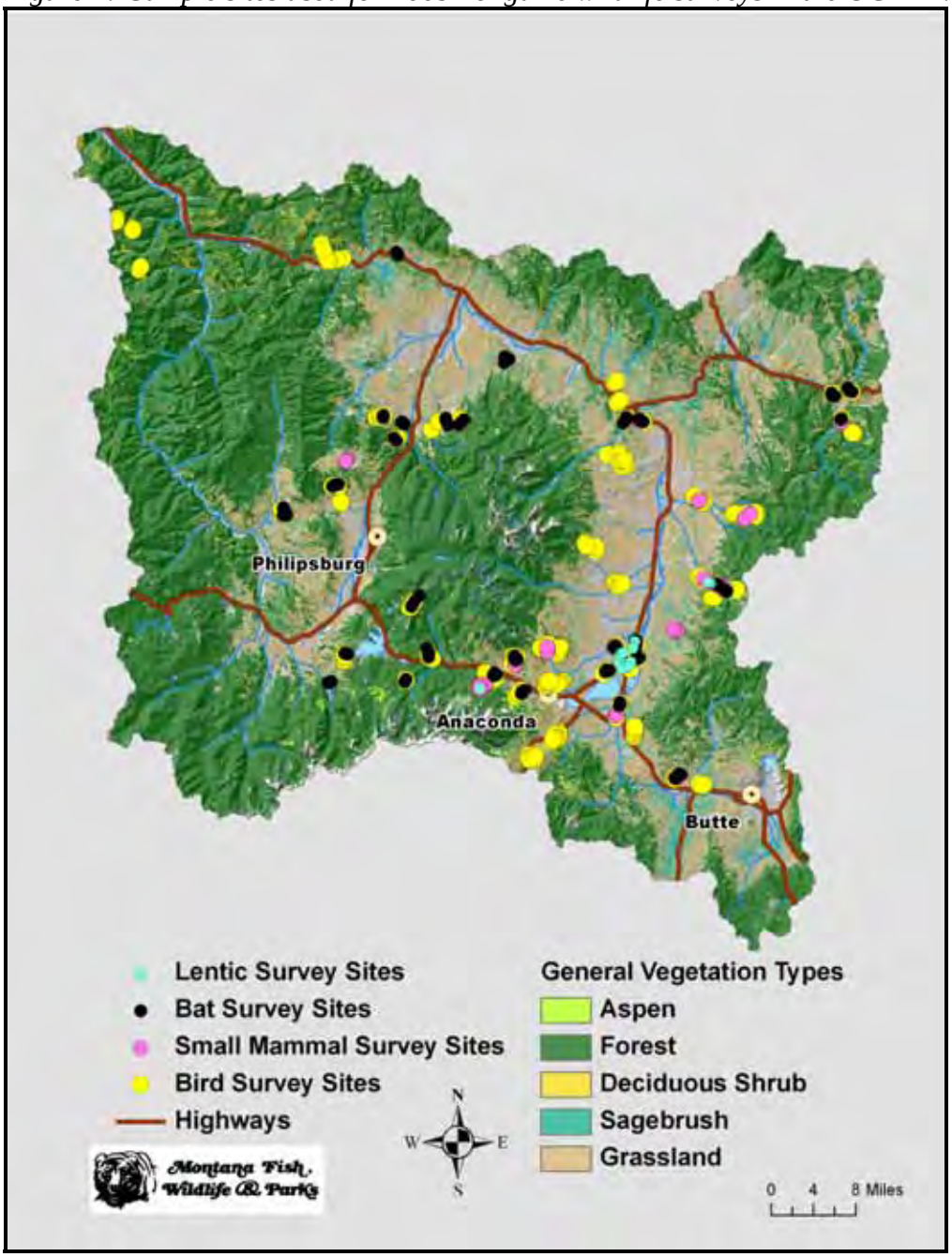
Sampling sites were selected on a landscape and a patch scale to gather data on representative sites in habitats of interest. Sites were selected using the NatureServe and MNHP's Montana land-cover data layer and from wetland maps prepared by MNHP as part of the National Wetlands Inventory Program. Multiple terrestrial ecological systems (habitats) were combined to form five general classes: grassland, steppe, shrubland, deciduous forest (aspen), and mountain mahogany woodlands. These lower elevation cover types had been identified as important to investigate during the assessment. Extensive acreage was misclassified by remote sensing as mountain mahogany in the UCFRB, pointing to a specific need to gather field data to correct classification of these areas.

Some constraints were imposed to facilitate access, simplify logistics, and increase the chance of correct ecological system classification on the ground. In order to be considered, a *patch* had to be able to accommodate at least one point count station with a 100-meter radius. The patches also had to be within one kilometer of a road. Several *targeted sites* were added to the patches to be sampled, as these sites were of interest to local biologists. The final sampling frame contained 1405 distinct patches (approximately 44,000 hectares). The land-cover classes described above were combined with a field codes for individual properties and all other suitable patches to form a final field: *landcover-owner*.

The second tier of sampling, the selection of survey locations, occurred within each patch. Technicians were provided with a GPS coordinate for each patch and were instructed to set up 1 to 4 points (i.e. point count stations) on their first visit to each site. Points were spaced approximately 250 meters apart, and when possible, 100 meters from the patch edge, roads, and permanent structures.

Sampling patches and points formed the basis for sample site selection for songbird point counts, small mammal trapping, bat acoustic surveys, amphibian surveys, reptile surveys, and a significant portion of the vegetation sampling points used to verify and correct land-cover layers. The final selected sample sites used for small mammals, bats, amphibians, and reptiles are shown in Figure 2 below.

Figure 2. Sample sites used for 2009 nongame wildlife surveys in the UCFRB.



Methods—Land-cover Mapping & Delineation

Montana Fish, Wildlife & Parks subcontracted with Montana Natural Heritage Program to complete land-cover mapping and habitat classification in the UCFRB. This effort was focused on riparian, shrubland, and grassland systems since these habitats are the most important habitats in the UCFRB.

During the summer and fall of 2009, MNHP ecology staff collected field data in the UCFRB. Field staff searched for areas where specific ecological systems were large and contiguous, using the original ReGAP maps for guidance. (Terrestrial cover type *patches* had to be at least 5 ha in area). When these areas were found, staff delineated the size of the patch on an aerial image. A GPS point was recorded inside the habitat patch, and five photos were taken, four facing the cardinal directions, and one facing west towards the GPS point. The ecological system and the dominant plant associations were noted. Over a hundred polygons were mapped during this phase of the data collection. Additional field data on land-cover was provided by crews from the Avian Science Center and by diversity monitoring crews. MNHP staff evaluated all additional data.

Because examination of the data suggested that there were too few sagebrush steppe points, and that rabbit-brush might be being misclassified as sagebrush in the ReGAP, MNHP ecologists collected more field data in January 2010; focusing on spots where sage was dense, or where there appeared to be steppe vegetation with no sage component. Montana Natural Heritage Program reclassified the original ReGAP imagery and transformations with the new field data.

Methods—Multiple Species Diversity Monitoring

The diversity monitoring methodology was designed to collect information on animal distribution and estimate occupancy for species. Species groups sampled under the diversity monitoring protocols included small mammals (squirrels, mice, voles, shrews), and bats. Some lentic and upland sample sites were also searched for reptiles and amphibians. Sample sites were selected using a stratified random sample of points within targeted vegetation cover classes (Grasslands, Deciduous Shrublands, Riparian, Forests) as described above. Extra sites were chosen to replace sites where access was not obtained. When practical, diversity monitoring sampling was done at the same sample points used for songbird point counts, but fewer points were sampled because of the longer time needed to complete small mammal trapping. Coordinates were collected for each location and vegetation sampling was centered on these locations. Survey methods vary by species group, as described below.

Small mammals—Traplines were set in the targeted cover type. Traplines were 100 meters in length with stations every ten meters. Each station included a combination of Sherman live traps, standard mouse snap traps, and museum special snap traps. Some stations also included pitfall traps and rat-sized snap traps. MNHP and FWP biologists identified small mammals to species, based on tooth patterns, skull measurements, pelage and other characteristics. Small mammal species that were difficult to identify were given preliminary identification, then submitted to the University of Montana, Philip L. Wright Zoological Museum for preparation into study skins and skull cleaning, and final identification.

Bats—Acoustic detectors were set out at or near the sample points in locations most likely to attract bats. Water sources (streams, wetlands, ponds, stock tanks), roost habitat (rocky outcrops, cliffs, abandoned buildings, trees) and potential flyways were targeted when available to maximize the likelihood of detecting all the bat species using the area. Bat calls were

downloaded using Sonobat software, and identified by biologists experienced with bat call analysis.

Reptiles—Southeast facing aspects with some topographic relief were searched using area searches and examination of likely refugia. Few reptile surveys were completed due to time constraints required for running the small mammal traplines and lack of suitable sites in the vicinity of sample sites. Most sample sites were in wetland or riparian habitats more suitable for painted turtles and garter snakes.

Amphibians—multiple observers using dipnets searched lentic sites within small mammal sample sites for amphibians. Also, a summer intern completed more intensive surveys of wetlands in the Warm Springs WMA, to follow up on rumors of leopard frog observations in that area. Some of these wetlands were not associated with the random sample sites.

Incidental observations of other species—diversity-monitoring crews recorded incidental observations of species of interest.

Habitat Information—general habitat information was collected at small mammal traplines, acoustic sites, and lentic sites. As much as possible, diversity monitoring sites were placed with vegetative sampling sites used for the land-cover and wetland mapping efforts improve species distribution-modeling.

Timing and Logistics— due to the wide range of species seasonal activity periods diversity monitoring surveys are normally completed from early May through late August. Most small mammal, bat, reptile, and amphibian surveys were done during July and August, after the songbird point counts had been completed.

Methods—Songbird Point Counts

FWP contracted the Avian Science Center (ASC) and MNHP to conduct bird surveys in the Upper Clark Fork River Basin. Sampling sites were selected using the methods described above. Bird sampling habitat patches were selected to accommodate at least three point count stations spaced 250 meters apart and at least 250 meters from the nearest edge.

Technicians conducted 10-minute songbird point counts at three to ten points per site, and each site was visited twice. At each point they recorded distance to all birds seen or heard, the number of individuals detected, whether each detection was audio or visual, and the general habitat type at the point.

Technicians recorded vegetation measurements and habitat classifications at all point count stations in order to help verify land-cover classifications and to provide more detailed habitat information. Technicians estimated shrub and ground cover within four 11.3 meter-radius plots.

Methods—Colonial Waterbird Surveys

Waterbirds were surveyed in conjunction with the Montana Colonial Nesting Waterbird Inventory coordinated by FWP. The Montana program was part of a region-wide nesting inventory coordinated by the United States Fish and Wildlife Service (USFWS).

Volunteer birders, Montana Audubon employees, and Montana FWP biologists completed most surveys. Volunteer birders and Audubon employees surveyed wetlands by observing suitable wetland areas from shore, and by boat when possible, to locate colonies for focal species. They counted active nests in colonies, recorded active nests of other species, and recorded observations of adult birds that might indicate nesting in the area. Survey protocols followed Jones 2008, to minimize disturbing nesting birds.

Montana FWP biologists surveyed cottonwood riparian habitats along the Clark Fork River and several tributaries using fixed wing aircraft and helicopter to map colony locations for great blue herons. Heron rookeries were recorded as being active or not, with the number of active nests or pairs estimated. Aerial surveys provided more accurate mapping and access over private lands, but provided less accurate estimates of the number of active nests within a colony, than ground or boat surveys.

Methods—Waterfowl, Waterbird, and Shorebird Migration Counts

Weekly counts of waterfowl, waterbirds, and shorebirds were done from August through December to document migratory bird use of the Warm Springs Ponds and adjacent wetlands on the Warm Springs Wildlife Management Area. These counts, conducted by a volunteer birder, were done from observation points on land using a spotting scope or binoculars.

Methods—Raptor Surveys

Riparian habitats along the Clark Fork River and major tributaries were surveyed by fixed-wing aircraft, helicopter, and ground during May and June to locate and map nest sites for bald eagle, osprey, and other raptor species. Additional ground and aerial surveys were done during July to obtain production information from osprey nests. Peregrine falcon nests were surveyed during 2009 as part of the USFWS post-delisting monitoring effort by the Montana Peregrine Institute. These were surveyed from the ground once or twice during the nesting season to determine occupancy, and to obtain production information if possible. Some suitable grassland habitats in the Clark Fork Valley were surveyed by air to determine if ferruginous hawks nested in the area. Production was recorded from as many raptor nests as possible. Incidental observations of other raptor nests were recorded.

Methods—Otter and Aquatic Furbearers

Surveys were conducted by the University of Montana in cooperation with FWP to document the distribution and abundance of otter and other aquatic furbearers in the UCFRB. A field crew floated the Upper Clark Fork River from Warm Springs to Turah and looked for aquatic furbearers and their sign. Hair snares were placed at latrine sites and feeding areas to collect genetic material. Subsequent analysis of nuclear DNA from hairs will be used to identify individuals and to determine a minimum number of otters in the UCFRB. Incidental observations of other aquatic furbearers (beaver lodges, muskrat houses, mink observations, scat, willow cuttings) were recorded.

Methods—Targeted Species Surveys

Several species-specific surveys were planned to gather observations for the American bittern, which is secretive and rare, and long-billed curlew, which had few observations west of the Divide. Additionally, there were plans to conduct intensive fall surveys in specific areas if needed, to follow up on any rumored observations of Columbian sharp-tailed grouse.

A volunteer conducted acoustic surveys for American bittern in suitable wetlands in the Warm Springs area. Surveys were done either late in the evening or early in the morning, by playing recorded bittern calls, then listening for a response.

During late April and May, curlews are setting up nesting territories and are easily detected as they perform flight displays and emit loud, distinctive calls. Curlew surveys are most effective when done at this time. However, the late starting date of this project and other demands delayed curlew surveys until summer. Several grassland areas were surveyed for long-billed curlews by driving public roads and watching for curlews. Curlews were also recorded during songbird point counts.

Sharp-tailed grouse were to be surveyed in areas with reports of suspected observations by landowners, volunteers, or field crews with site-specific surveys during late summer and early fall. No observations were reported, so no site-specific surveys were done. Recent genetics work comparing samples from western Montana study skins collected in the 1800's with current Columbian and plains sharp-tailed grouse populations indicate that western Montana grouse were likely all plains sharp-tailed grouse (Wood et al. 2010).

Methods—Big Game

For the Assessment, FWP used existing survey data gathered under standard techniques to re-map the distribution of antelope, mule deer, elk, moose, bighorn sheep, mountain goats, and white-tailed deer.

Methods—Crucial Areas and Connectivity

The Crucial Area Assessment and Planning System (CAPS) is a FWP initiative, endorsed by the Western Governors' Association, which seeks to identify 'crucial habitat' and 'important wildlife corridors' at a regional scale. This initiative provided much of the spatial information for our UCRFB effort. A spatial analysis using GIS and existing wildlife occurrence data was used to model species distribution. Species location information gathered in the UCFRB was used to verify the accuracy of the existing models and allowed for refinement of some species predicted distribution. Detailed comparisons were made with three species to evaluate the influence of additional point observations and the improved land cover map on modeled distributions. We also developed a new species richness map using the improved land cover layer. Ritter et al. 2010 provides a detailed description of the modeling process used.

RESULTS

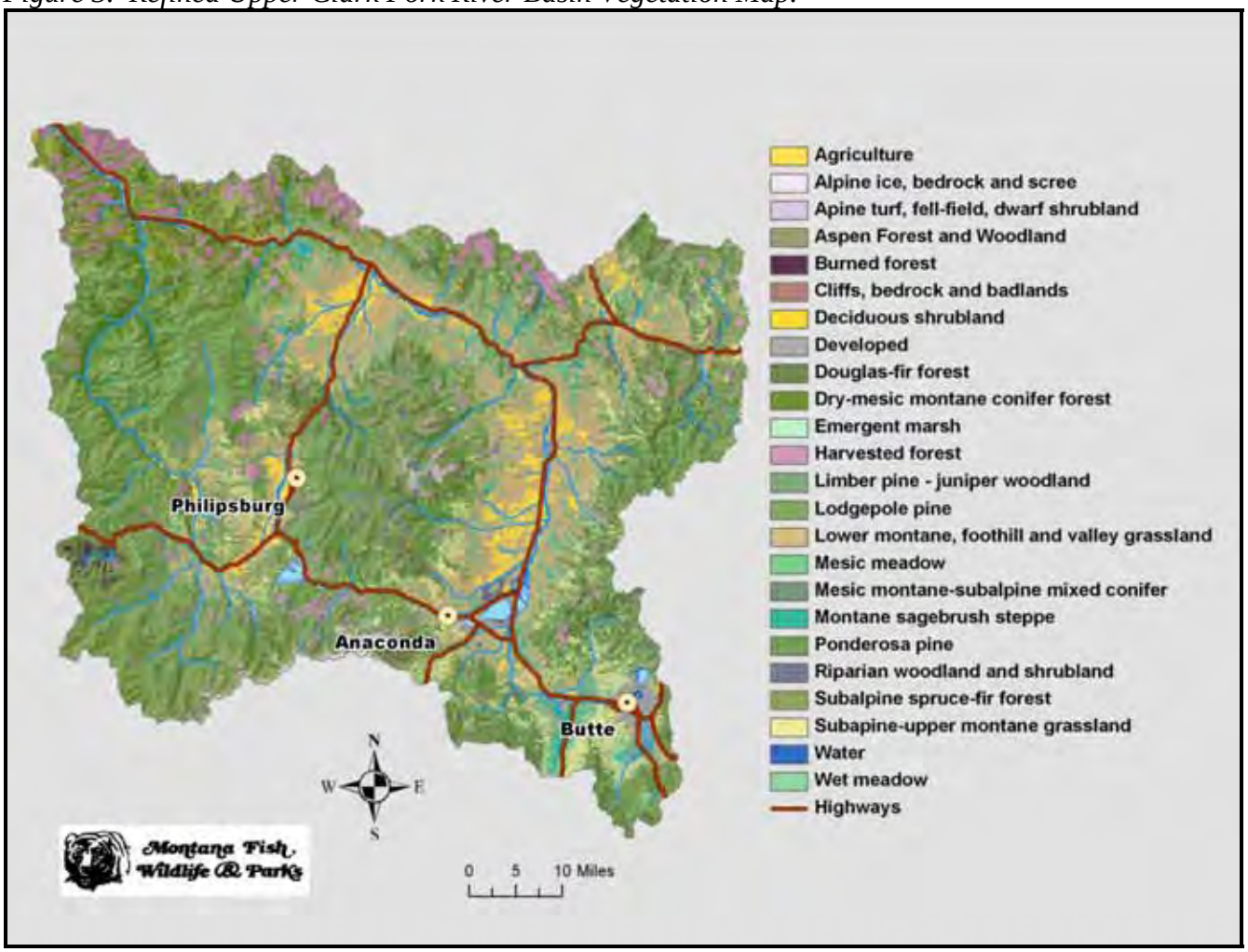
Information gathered as part of the assessment is presented in detail in individual reports prepared by FWP's subcontractors and shown in relevant maps in Appendix C—Table of Maps produced by FWP for the UCFRB Assessment. Also electronic databases and GIS files that were produced for this effort are available. We provide a brief summary of findings by topic below.

Results—Land-cover Mapping and Delineation

Vance, L. and C. Tobalske. 2010. Upper Clark Fork Sage Steppe and Grassland Classification and Mapping. Montana Natural Heritage Program, Helena, MT. 16 pp.

The original ReGAP layer mapped a total of 404,892 acres (163,854 hectares) as sage steppe (17.1% of study area) and 312,723 acres (126,556 hectares) as grassland (13.3%). In contrast, the reclassified maps show 137,640 acres (55,701 hectares) of the area as sage steppe (5.8%) and 581,120 acres (235,171 hectares) of the area as grassland (24.6%). The original model over mapped sage steppe while the reclassification under mapped it. Grasslands are much more prevalent in the basin than originally represented. Overall accuracy in the refined land-cover map improved dramatically for sage-steppe and grassland systems (Vance et al. 2010). A more accurate agriculture layer obtained from Department of Revenue was incorporated into the refined UCFRB land cover map. More accurate riparian and wetland layers were obtained from detailed mapping already completed in the UCFRB. The Refined Upper Clark Fork River Basin Vegetation Map (Figure 3) is now the most accurate map available showing the extent and distribution of 24 habitat types in UCFRB.

Figure 3. Refined Upper Clark Fork River Basin Vegetation Map.



Results—Multiple Species Diversity

Leary, A. 2010. Upper Clark Fork River Basin Small Mammal, Amphibian, and Reptile Surveys. Montana Tech, and Montana Fish, Wildlife and Parks. 29 pp.

Lenard, S. 2009. Summary: Bat Species in Select Vegetation Communities in the Upper Clark Fork Watershed. Montana Natural Heritage Program, Helena, MT. 18 pp.

Bats: Eight species of bats were detected by acoustic surveys in the UCFRB (Lenard 2009). The hoary bat, little brown bat, and silver-haired bat were detected at the most sites. High detection rates of hoary and silver-haired bats may indicate the presence of a migration corridor for these species through the UCFRB. Further surveys would be needed to verify this. No Townsend's big-eared bats were detected during acoustic surveys in 2009. However, this species is very difficult to survey using acoustic methods because their echolocation calls are very quiet and difficult to detect. This SOC has been found in the Silver King and New Seattle Mines in Granite County. Mine entrances were not surveyed during 2009.

The weather in 2009 was characterized by a relatively dry July followed by a cool, wet August. Bat activity is lower on cool, wet nights than on warm, dry nights and the weather may have resulted in lower bat detections during August, especially for the smaller *Myotis* species that tend to be less active in cooler temperatures. Hoary and silver-haired bats are migratory species, and some bat surveys were done during their migration period, which generally occurs during August and September in Montana. Riparian and wetland habitats had the highest bat species diversity. However, fewer surveys were done in grasslands and shrub-steppe habitats than in riparian and wetland habitats.

Small Mammals: Seventeen small mammal species were captured on traplines (Leary 2010), including 5 shrew and 12 rodent species. Riparian habitats had the highest species diversity (14 species) and grasslands had the lowest (3 species). Sagebrush and deciduous shrub habitats supported 9 species each. The number of small mammal species captured on each trapline ranged from 1 to 7 species, with most having 2-3 species per site. None of the small mammal species captured were Species of Concern. Deer mice dominated dryer sites and wetter sites supported voles and shrews in addition to deer mice. Hard rains, hail, and cold temperatures negatively impacted trapping success on some traplines. The crews noted poor trapping success in areas with heavy cattle grazing.

Reptiles and Amphibians: Three amphibian and one reptile species were documented during diversity monitoring for lentic and reptile searches (Leary 2010). Few areas were surveyed for reptiles due to time constraints. Cold, wet weather probably reduced reptile activity, making them more difficult to detect. Tailed frogs have been documented by fisheries crews in the UCFRB (Linstrom, Jason, Pers. Comm.). Only one reptile, the common garter snake, was documented during 2009 surveys. Past surveys documented terrestrial garter snakes in the UCFRB (Carson et al. 2006).

Breeding sites were documented for Columbia spotted frogs, western toads, tailed frogs and long-toed salamanders. All reptile and amphibian observations from diversity monitoring and fisheries crews will be entered into the MNHP/FWP Tracker database. Intensive surveys during 2009 found Columbia spotted frogs, but no northern leopard frogs. These two species look similar in coloration and can easily be confused, especially if not captured and examined closely. Leopard frogs have not been documented in the UCFRB, either recently or historically. These surveys indicate that leopard frogs are probably absent from the Warm Springs WMA area.

Results—Songbird Point Counts

Smucker, K. and M. Fylling. 2010. Upper Clark Fork River Basin Report on 2009 Bird Surveys. Avian Science Center, University of Montana. 20 pp.

Songbird point counts detected 139 bird species in the UCFRB (Smucker and Fylling 2010). Riparian habitats had the highest bird species richness, followed by grasslands, ponds and wet meadows, and deciduous shrub. Grassland habitats supported the highest numbers of bird SOC (7 species) of any habitat. While riparian dependent species were the largest group, each habitat type surveyed contained habitat specialists (Smucker and Fylling 2010). Warbling vireos and red-naped sapsuckers were encountered at the highest densities in aspen. Conifer woodlands supported the highest densities of rock wren, mountain bluebird, and green-tailed towhee. Lazuli bunting and clay-colored sparrows were most frequently encountered in deciduous shrub. Both the grassland and sagebrush habitat types supported many of the species that typify these habitat types. Grasslands supported the only long-billed curlew detection, as well as the highest densities of vesper sparrow, bobolink, western meadowlark, and horned lark. Sagebrush yielded the only detection of a sage thrasher, as well as the highest densities of Brewer's sparrow (Smucker and Fylling 2010).

Results—Colonial Waterbird Surveys

DuBois, K.L. 2010. Upper Clark Fork Wildlife Assessment, Raptor, Colonial Waterbird, and Targeted Species Survey and Monitoring. Montana Fish, Wildlife and Parks, Region 2, Missoula.18 pp.

Ten species of colonial waterbirds were documented in the UCFRB during 2009, including great blue heron, double-crested cormorant, three grebe, two tern, and 1 gull species (DuBois 2010). American white pelicans were observed on the Clark Fork River during migration periods, but no nesting colonies for this species are in the UCFRB. The great blue heron was the most widespread and abundant nesting colonial waterbird in the UCFRB. Warm Springs was one of only 8 sites statewide where over 200 colonial waterbirds were recorded (Wightman and Tilly 2009). The Warm Springs Ponds along with nearby wetlands clearly provide a significant nesting area for colonial waterbirds in western Montana. Nesting was documented for the great blue heron, double-crested cormorant, red-necked grebe, and ring-billed gull in 2009 (DuBois 2010). Other species may nest in the UCFRB, but further work would be needed to confirm nesting. Snow and cold rain during May and June may have deterred some species from nesting in 2009.

Results—Waterfowl, Waterbird, and Shorebird Migration Counts

Swant, G. 2009. Fall Shorebird, Waterbird, and Waterfowl Migration Counts at Warm Springs Wildlife Management Area, 2009. GoBird Montana, LLC. For Montana Fish, Wildlife and Parks. 32 pp.

Sixty bird species were documented during fall migration counts at Warm Springs Ponds and Warm Springs WMA (Swant 2009). These included 27 waterfowl, 5 grebe, and 20 shorebird species, along with pelicans, cormorants, coots, gulls, and terns. Over 87,000 birds were counted during these surveys. From 5,000 to 7,000 birds were usually present during individual surveys. American coots were the most abundant species, totaling 52% of the total number of birds, followed in abundance by waterfowl, grebes, and shorebirds. The Warm Springs Ponds hosted significant numbers of birds during fall migration.

Results—Raptor Surveys

DuBois, K.L. 2010. Upper Clark Fork Wildlife Assessment, Raptor, Colonial Waterbird, and Targeted Species Survey and Monitoring. Montana Fish, Wildlife and Parks, Region 2, Missoula.18 pp.

Seven raptor species were documented in the UCFRB during aerial and ground surveys and along the raptor survey routes, including bald eagle, golden eagle, osprey, turkey vulture, red-tailed hawk, Swainson's hawk, and American kestrel (DuBois 2010). Additionally, a northern harrier was observed during long-billed curlew surveys. Species observed in past years, but not during the 2009 TRA included the prairie falcon, northern goshawk, and rough-legged hawk.

Twenty-six bald eagle territories were monitored in the UCFRB during 2009. Twenty nests successfully fledged young, for a territory success rate of 77% in the UCFRB. Forty-four eaglets were fledged for a production rate of 1.7 fledged/territory or 2.2 fledged per successful nest. Twenty-two bald eagle pairs (84.6%) nested in cottonwood trees and only four pairs nested in conifer trees. Eight golden eagle nests were monitored. Three nests successfully fledged 5 young, 4 nests were vacant and 1 nest was gone. The area around the missing nest was rendered unsuitable for golden eagle nesting by road and summer cabin development. It was not determined whether the vacant nests represented alternate nest sites for those pairs of eagles.

Twenty-nine osprey nests were monitored. Eighteen nests were active (eggs laid), 1-2 adults with no eggs laid occupied 6 nests, and 5 nests were vacant. Some of the vacant nests may have been alternate nests for adjacent nesting pairs. We estimated production in 2009 at approximately 30 chicks, but we did not follow all of the nests to confirm fledging.

Three peregrine falcon territories were monitored, as part of statewide post-delisting peregrine falcon monitoring (Rogers et al. 2009). One nest fledged 2 young and production was not confirmed at the other 2 sites.

Results—Otter and Aquatic Furbearers

Foresman, K.R. 2009. Upper Clark Fork Wildlife Resource Monitoring Assessment—Aquatic Furbearers. University of Montana, Missoula. 25 pp.

A field crew from the University of Montana spent 27 days floating the main-stem of the Upper Clark Fork and surveying it for aquatic furbearers, especially otter. Thirteen latrines and 6 possible den sites were found. They collected 49 otter scats for DNA analysis to confirm species identity and determine the total number of individuals sampled. Sign and observations of beaver, muskrat, and mink were noted. Beaver activity along the river was more abundant than had been expected with 58 lodges and 8 dams recorded. This aquatic furbearer survey provided initial data for a graduate research study of otter that has been initiated by UMT and funded by NRDP. This research will be focused on estimating otter population size in comparison with how many otter the river could support.

Results—Targeted Species Surveys

American bitterns had been observed in the Warm Springs and Deer Lodge areas in 1996. No American bitterns were detected during acoustic surveys in 2009 (DuBois 2010). Habitat in the Warm

Springs area looks suitable for this species, which prefers thick stands of emergent vegetation such as cattails, or thick willow bottoms interspersed with wetlands and the area appears to support a suitable prey base (small fish and amphibians). This area may be too isolated from other bittern habitat or too small in extent to support a self-sustaining population.

Several areas were surveyed for long-billed curlews during June and July (DuBois 2010). The late initiation of the study and time demands for other portions of the study precluded surveys during April and May, when they would be most effective. However, some curlews were located. A newly fledged curlew was located in an extensive grassland area near Drummond. Sixteen new locations for curlews were used to refine the curlew distribution model.

Results—Big game

Montana Fish, Wildlife & Parks updated our big game maps in the Basin for the Assessment (see Appendix C for map list and descriptions). The improved maps include point data to 2008 and are overlaid on the general vegetation type map. The generalized range of species as well as point locations from survey data are shown for antelope, mule deer, elk, moose, bighorn sheep, and mountain goat. Since no surveys are conducted for white-tailed deer, which are relatively uncommon, only a range map is presented. Overall these maps reaffirm the importance of the large, intact grassland complexes that characterize the UCFRB and make the area some of the best big game habitat in western Montana.

Results—Crucial Areas and Connectivity

Ritter, J. 2010. Predicted Distribution Model Analysis Using 2009 UCFRB Field Data. Montana Fish, Wildlife & Parks, Helena, MT. 12 pp.

Predicted distributions for the Brewer's sparrow, willow flycatcher, and Clark's nutcracker changed as a result of corrections in the land cover map. Brewer's sparrow predicted distribution showed an overall reduction in extent, due to land cover classifications that changed from sagebrush cover types to grassland cover types. Willow flycatcher distribution was more widespread with the new land cover map due to refinements in riparian cover types. Corrections to cover types are expected to improve modeled species distributions for other sagebrush, grassland, and riparian species.

The new species richness map developed with the improved land cover layer was similar to the former species richness map, but with subtle changes in some areas. This information will be used to prioritize areas for restoration in the UCFRB, and also to refine statewide models developed for the Crucial Areas Assessment and Planning System that will be finalized in spring 2010.

DISCUSSION

The UCFRB Terrestrial Assessment yielded valuable information on natural resources. The accuracy of the land cover layer improved dramatically for riparian and grassland habitats. The corrected land cover layer provides a foundation for future prioritization and allowed FWP to produce more accurate distribution models for some species. Observations collected in 2009 enhanced models for some nongame species, including some SOC species. Information gathered from the assessment will

provide critical information necessary to prioritize conservation efforts in the UCFRB. Although not yet finalized, the Crucial Areas Assessment spatial analyses were essential to the effort.

Important big game distribution and occurrence data came primarily from existing FWP surveys. This extensive data set was incorporated into the assessment and provides a comprehensive view of winter range. Because this data set existed, terrestrial assessment activities were focused on species where information needs were much greater.

As the first pilot area for the Crucial Areas Assessment, this project successfully showed the advantages and shortcomings of the survey and modeling methods used. In combination the diversity monitoring and songbird point counts detected a high percentage of the species found in the basin, at a relatively low cost. Some of these species had sufficient point observations for accurate distribution modeling prior to the assessment, but others did not. Information gathered in the UCFRB will enhance eco-region and statewide species distribution information.

The terrestrial resource assessment effectively detected common species, but fell short for less common or difficult to detect species. Two SOC provide good examples of how well the surveys provided information for improving distribution models. Prior to the assessment, few observations of Brewer's sparrow existed in the UCFRB. Point counts detected sufficient observations of this species to greatly improve the distribution model for this species. In contrast, point counts and incidental observations gathered during the late May through August sample period detected only 16 additional long-billed curlew observations in the UCFRB, much fewer than we expected based on anecdotal reports of their occurrence there. Since targeted survey efforts for this species were not completed during the best time of year the distribution model for curlews still predicts too wide a distribution. Earlier surveys would have been much more efficient in detecting this species and would have provided adequate information to generate a more accurate distribution model.

Targeted survey efforts were more successful for other species, such as northern leopard frog. For this species, intensive survey efforts in an area of rumored occurrence did not detect any individuals, confirming its likely absence in the area. For this example, survey methods used for diversity monitoring were appropriate for detecting the species, but the survey area was targeted, rather than selected at random.

Species richness, both overall and for SOC species are factors considered in the statewide Crucial Areas effort. Inaccurate distribution models can result in over-valuing some areas for species diversity and under valuing other areas. Targeted survey efforts will be important to fill data gaps for species that are not observed during standard diversity monitoring surveys.

Habitat condition was a more difficult parameter to measure or model, than other factors. Available GIS layers such as roads, power lines, and abandoned mines provide some information, but do not provide information on habitat integrity. For example, an extensive grassland area that has a history of overgrazing can be infested with weeds to the point that habitat for big game winter range or grassland birds is severely compromised. GIS-based weed information varied greatly from county to county, so we could not generate a comprehensive layer for weeds in the UCFRB.

In contrast, several large grassland areas in the UCFRB that were somewhat fragmented by power lines or roads provided valuable big game winter range and supported long-billed curlew populations because past and current grazing management fostered good grassland condition. This clearly demonstrates that GIS-based rankings generated by the Crucial Areas effort will not eliminate the need

for field evaluation of potential projects. Rankings provide a useful guide for targeting restoration and replacement efforts at the landscape level, but projects still need to be evaluated on their individual merit. GIS models are most useful for directing where conservation efforts should be directed at the landscape level and can help cluster projects together in high priority areas.

Finally, FWP considers monitoring and evaluation to be critical for successful wildlife restoration. Tools used to accomplish restoration or replacement of wildlife resources typically include habitat enhancement through modification of management activities, in-perpetuity protection of areas supporting high-quality wildlife populations through acquisition and/or conservation easements, or more commonly, a combination of enhancement and protection actions. Modifying the habitat or protecting the land alone does not guarantee that targeted wildlife resources will prosper. Long-term monitoring and evaluation is needed so that management strategies can be changed if wildlife restoration goals are not being achieved. Information gathered during the assessment will provide a good baseline for future monitoring of restoration and replacement projects to ensure success.

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Appendix A. Scope of work to implement FWP's Terrestrial Resource Assessment.

1. Compile available information, data, and maps for ownerships, infrastructure, wildlife populations, ecological sites, wildlife linkage zones, habitat types, vegetation, and similar information.

- ✓ ***Addressed through the Crucial Areas and Connectivity Assessment, scheduled for completion in 2009. Species distribution models may be fine-tuned for greater accuracy in the UCFRB based on field data collected during the 2009 field season.***

2. Classify and describe native forest, grass, and shrub ecosystems for the area in terms of their compositions, structures, and processes.

- ✓ ***Addressed through the ReGAP land-cover mapping efforts and wetland delineations by Montana Natural Heritage Program***.

3. Conduct field sampling to determine the quantity, quality, and condition of existing grass and shrub lands and where necessary ground-truth data on forested habitats.

- ✓ ***Field data will be gathered by MNHP to assess plant composition and general conditions in important Tier 1 vegetation communities to include low to mid-elevation grasslands, riparian and wetland areas, and shrub-steppe communities.***

4. Integrate available data on riparian and wetland ecosystems and, where necessary, conduct fieldwork to collect additional information on these systems.

- ✓ ***On-going through MNHP contract to complete delineations of wetland and riparian habitats. Existing and proposed wetland mapping will be overlaid on habitat maps to be prepared in 2009. Wildlife information will be collected in riparian and wetland systems to clarify habitat relationships***.

5. Quantify existing ecosystem types and distributions based on available data.

- ✓ ***Related land-cover types will be grouped together into broader ecological units to delineate and quantify ecosystems (habitat blocks) important for wildlife, as part of mapping efforts by MNHP and FWP.***

6. Link wildlife habitat needs with ecosystem classifications.

- ✓ ***Predicted species distributions from CACA will be assessed with field monitoring efforts within important land-cover vegetation communities***.

7. Review information with agency personnel.

- ✓ ***All species distribution maps, habitat maps, and ecosystem classifications will be reviewed by biologists and other experts familiar with the UCFRB to ensure the best possible accuracy of each layer.***

8. Estimate impacts that have resulted from development and human activities, to the extent feasible.

- ✓ ***GIS data layers that reflect anthropogenic impact, including roads, mapped weed infestations, industrial sites, and predicted growth models will be developed as part of a risk assessment through CACA.***

9. Identify areas of greatest ecological value and risk.

- ✓ ***Delineate areas that have high potential for conservation, restoration or replacement of wildlife resources versus areas with low potential.***

10. Present all information in a report with supporting maps.

- ✓ ***All information used to create maps will also be available as GIS layers and databases.***

Appendix B. Methods and cooperators used to address the Terrestrial Resource Assessment scope of work.

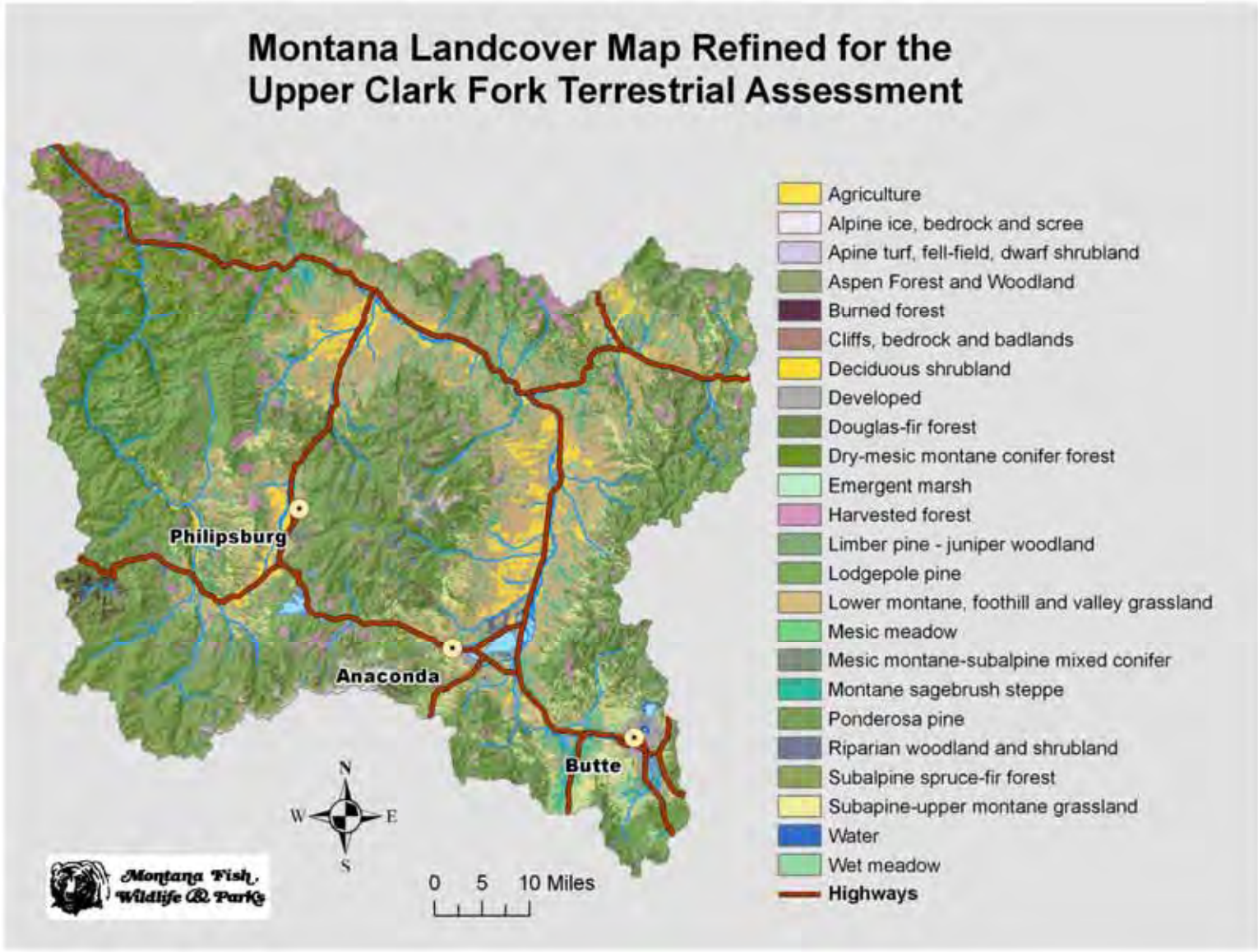
Method and Cooperator	**Description**	**Portions of Scope of Work Addressed**
Crucial Areas and Connectivity Assessment – FWP	Compile existing wildlife information, create species distribution models, and compile GIS layers on human and natural features that impact wildlife	1, 6, 7, 8, 9
Land-cover classification and mapping, wetland delineation – MNHP	Update landcover types using "ReGAP" to identify important vegetation communities within the UCFRB. Complete wetland riparian mapping efforts. Collect site-specific vegetation information (species composition and general condition) in important landcover types targeting Tier 1 vegetation community types.	2, 3, 4, 5
Multiple Species Diversity Monitoring – FWP, MNHP, Montana Tech	Gather data needed to complete more accurate species distribution maps, focused on grassland, shrubland, and riparian/wetland habitats. Species groups include small mammals, bats, amphibians, and reptiles.	1, 4, 6, 9
Songbird Point Counts – Avian Science Center & MNHP	Songbird point counts in grassland, riparian and shrub-steppe habitats. This data is needed to complete more accurate species distribution maps for birds.	1, 4, 6, 9
Colonial Waterbird Surveys – FWP and Montana Audubon	Aerial and ground surveys, to locate nesting colonies. This will help identify important areas for restoration and provide information to improve accuracy of species distribution maps.	1, 4, 6, 9
Raptor Surveys – FWP	Aerial and ground surveys to map raptor nests, in conjunction with bald eagle and waterbird surveys.	1, 4, 6, 9
Otter/Aquatic Furbearer Surveys – University of Montana	Targeted surveys for otter and collection of incidental observations of other aquatic furbearers	1, 4, 6, 9
Targeted Species Surveys – FWP	Targeted surveys for long-billed curlew, American bittern, and Columbian sharp-tailed grouse.	1, 4, 6, 9

Appendix C. Table of Maps produced by FWP for the UCFRB Assessment.

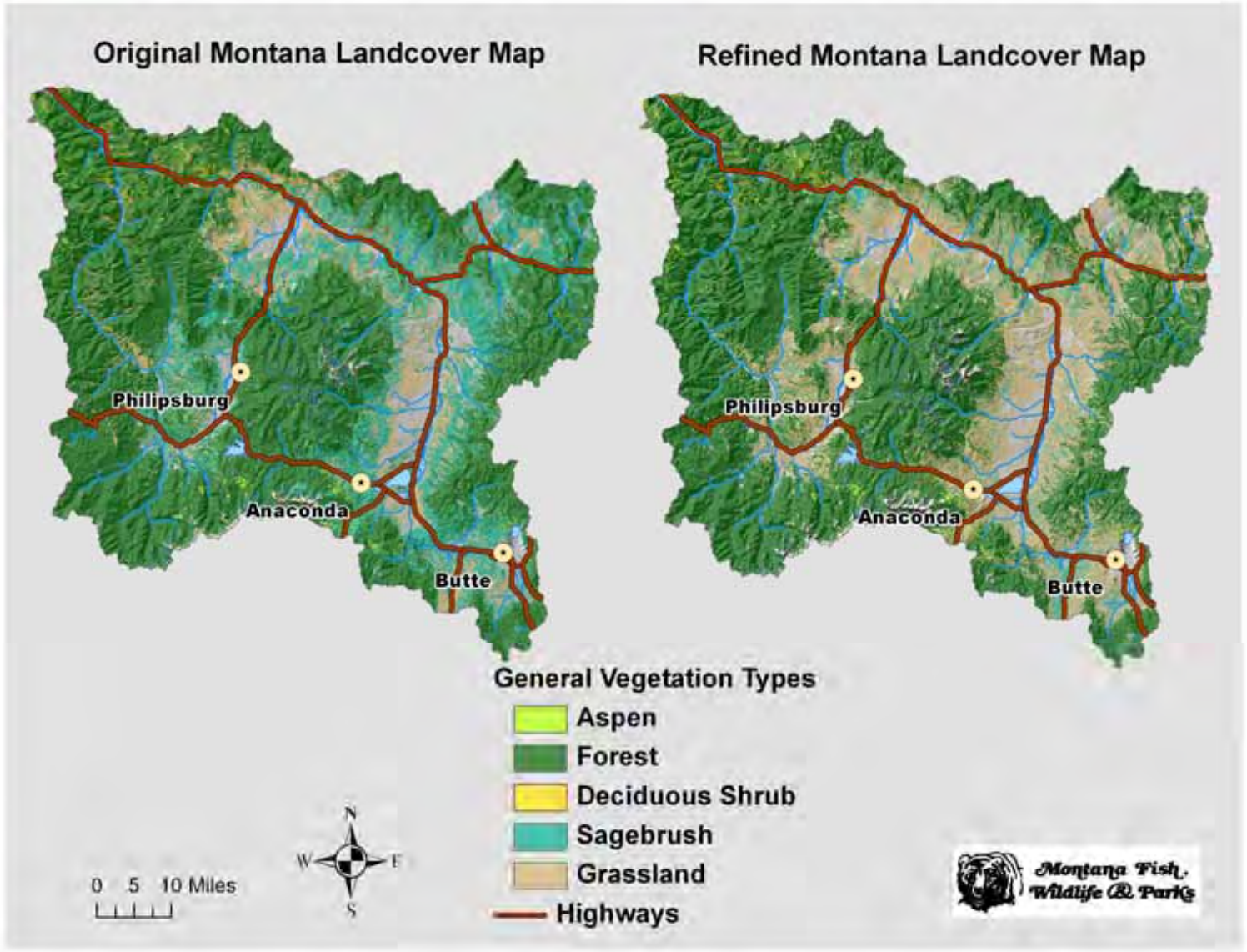
Map Title	File Name	Description
Montana Landcover Map Refined for the Upper Clark Fork Terrestrial Assessment	Veg42Class	This map shows the Montana Landcover map refined for the Upper Clark Fork and reduced from 44 to 24 ecological systems/landcover classes.
Original Montana Landcover Map/Refined Montana Landcover Map	VegCompare	This map shows the original Montana landcover map next to the refined Montana landcover map for the UCFRB. Ecological systems/landcover classes have been generalized from 44 to 5 for visualization purposes.
Riparian Areas and Wetlands in the Upper Clark Fork River Basin	WetRiparian	This map is a combination of the riparian and wetland classes from the refined MT Landcover, plus the Riparian and Wetland maps made for the Crucial Areas Assessment.
Surveys Conducted During the 2009 Field Season in the Upper Clark Fork River Basin	AllSurveySites	This map shows the sampling locations for all of the animal sites from surveys conducted in 2009. This does not include sites that were surveyed for vegetation only.
Pronghorn Antelope Locations and Overall Distribution in the Upper Clark Fork River Basin	AntLocsDist	This map shows antelope locations from surveys conducted primarily during the months of July and August between 1999 and 2008 on the left. The right side of the map shows general and winter distribution as delineated by FWP biologists.
Mule Deer Locations and Overall Distribution in the Upper Clark Fork River Basin	MdeerLocsDist	This map shows mule deer locations from surveys conducted during the winter months (Jan – April) between 2003 and 2008 on the left. The right side of the map shows the general and winter distribution as delineated by FWP biologists.
Elk Locations and Overall Distribution in the Upper Clark Fork River Basin	ElkLocsDist	This map shows elk locations from surveys conducted during the winter months (Jan – April) between 1984 and 2008 on the left. The right side of the map shows the general and winter distribution as delineated by FWP biologists.
Moose Locations and Overall Distribution in the Upper Clark Fork River Basin	MooseLocsDist	This map shows moose from surveys conducted during the winter months (Jan – April) between 1990 and 2008 on the left. The right side of the map shows the general and winter distribution as delineated by FWP biologists.
Bighorn Sheep Locations and Overall Distribution in the Upper Clark Fork River Basin	BighornLocsDist	This map shows bighorn sheep locations from surveys conducted throughout the year between 1990 and 2008 on the left. The right side of the map shows the general and winter distribution as delineated by FWP biologists.

Mountain Goat Locations and Overall Distribution in the Upper Clark Fork River Basin	MtnGoatLocsDist	This map shows mountain goat locations from surveys conducted throughout the year between 1990 and 2008 on the left. The right side of the map shows the general and winter distribution as delineated by FWP biologists.
White-tailed Deer Overall Distribution in the Upper Clark Fork River Basin	WTdeerDist	This map shows the general and winter distribution of white-tailed deer as delineated by FWP biologists
Bat Species Richness at Survey Sites in the Upper Clark Fork River Basin	BatRich	This map show the number of different bat species detected using bat call recorders at sites surveyed in 2009.
Bird Species Richness at Survey Sites in the Upper Clark Fork River Basin	BirdRich	This map shows the number of different bird species that were observed at sites surveyed in 2009.
Small Mammal Species Richness at Survey Sites in the Upper Clark Fork River Basin	MammalRich	This map shows the number of different small mammal species that were trapped at sites surveyed in 2009.
Overall Species Richness in the Upper Clark Fork River Basin	RichAll	This map shows species richness of all regularly occurring native species in Montana, including: amphibians, reptiles, birds, and mammals. Richness scores were divided into four classes such that; low = 0-86 species, moderate = 87-123 species, high = 124-145 species, high = 146-227 species. This layer was created by using high or medium suitability habitat associations assigned to each species by the Montana Natural Heritage Program with the Refined Montana Landcover Map. This information was used to make a deductive habitat model for every vertebrate species in Montana. The resulting layers were then summed for each 90 meter pixel in the Montana Landcover Map.

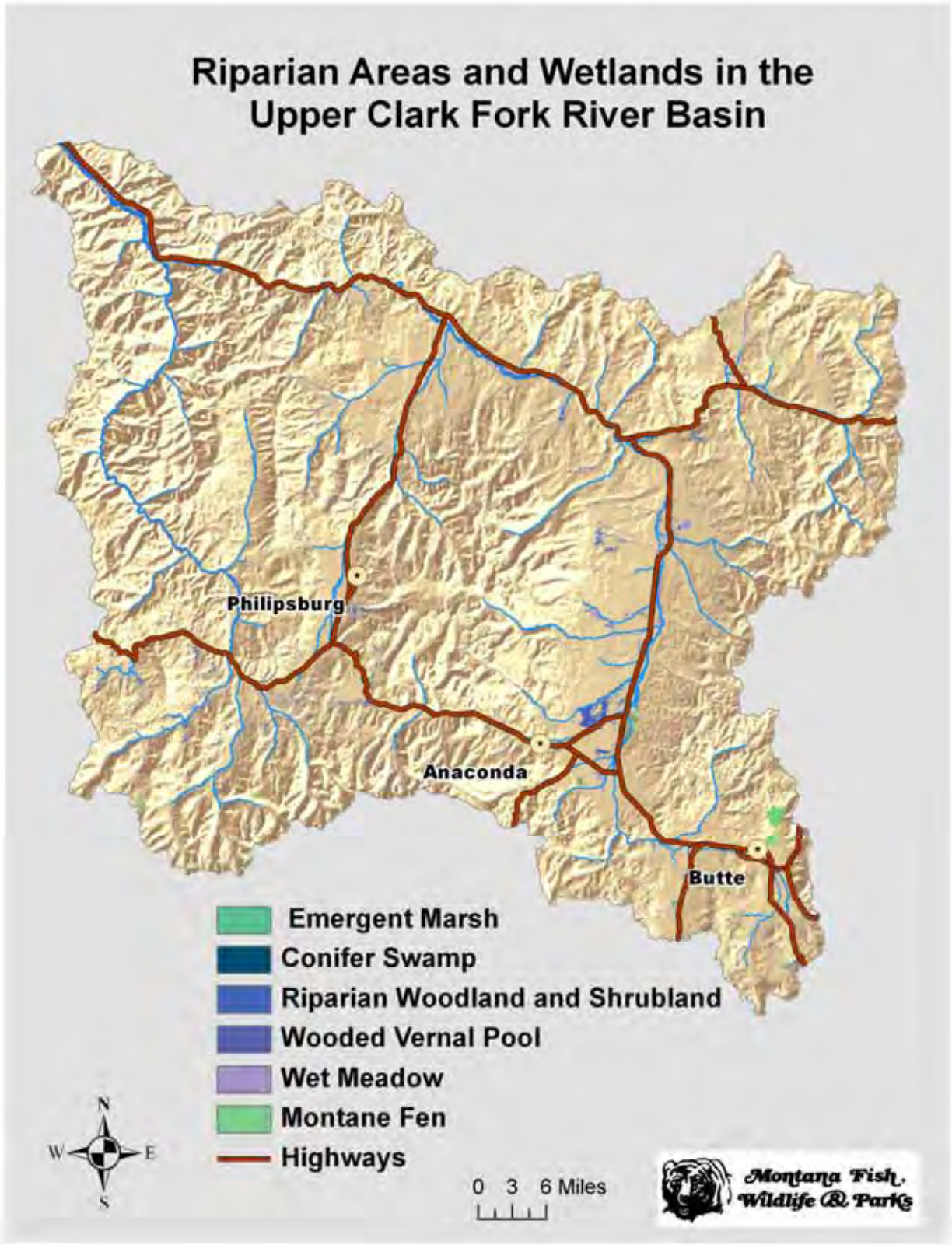
Appendix Figure 4. Refined Upper Clark Fork River Basin Vegetation Map.



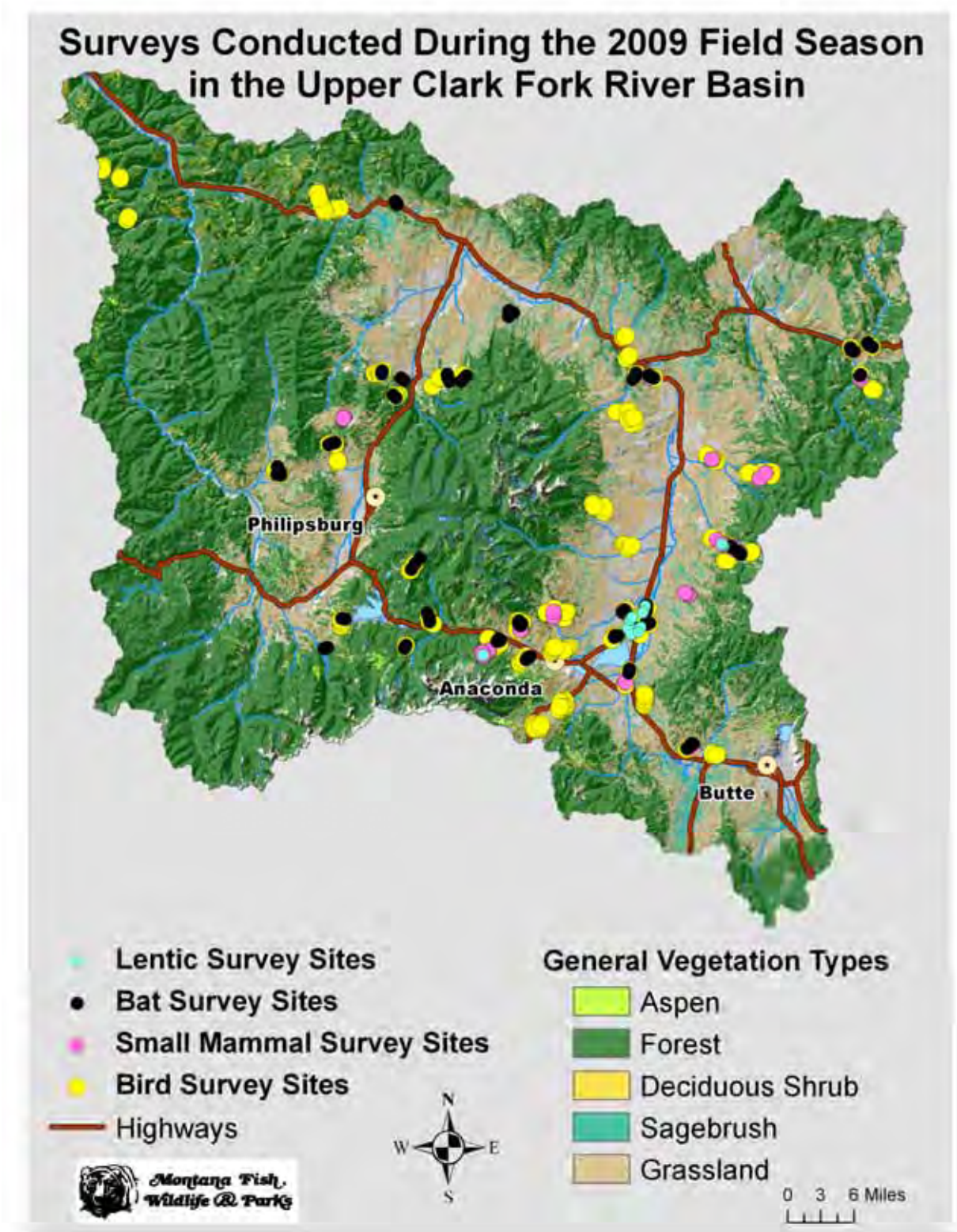
Appendix Figure 5. Comparison of original and refined Upper Clark Fork River Basin Vegetation Maps.



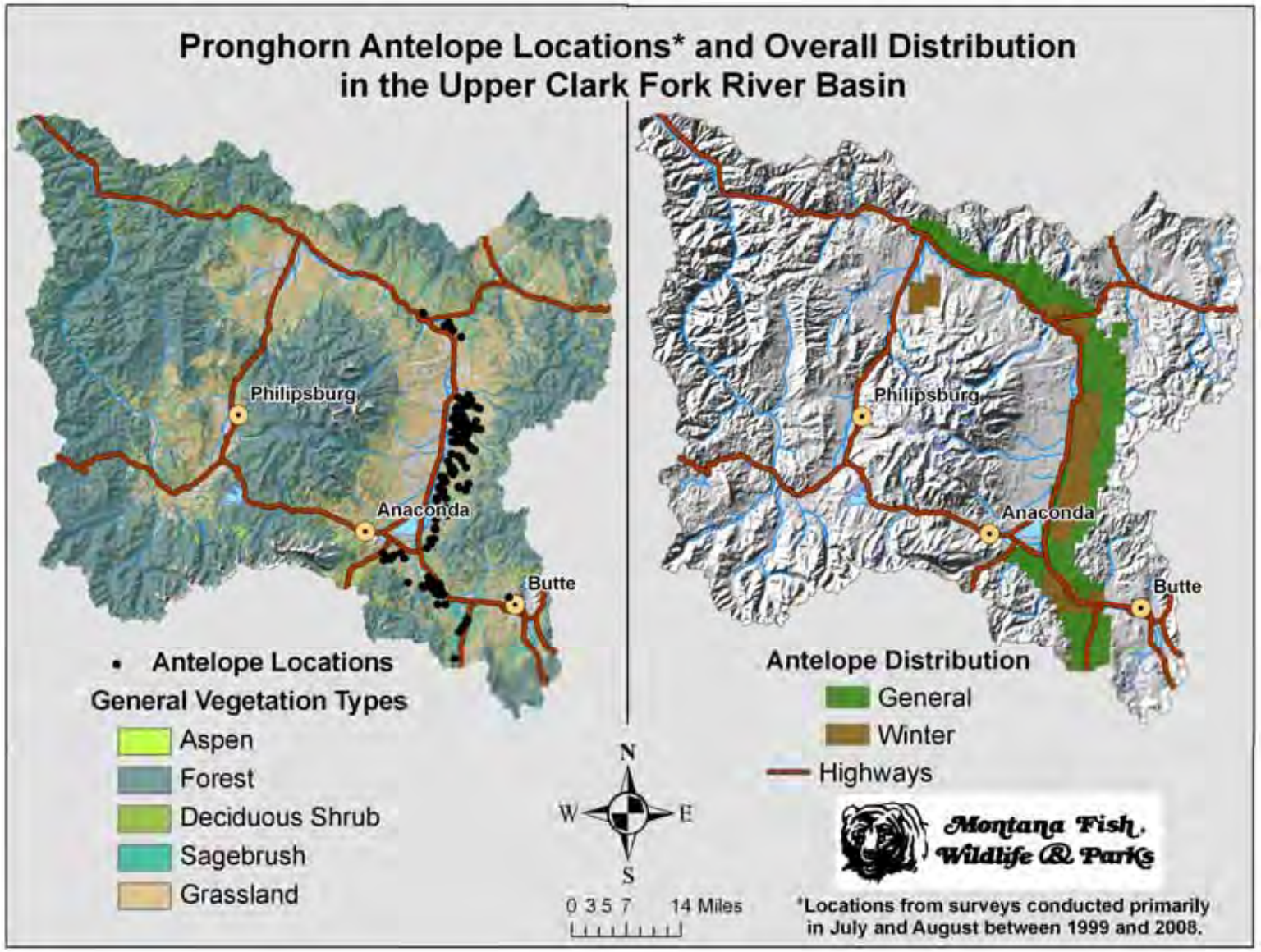
Appendix Figure 6. Riparian and wetland vegetation in the Upper Clark Fork River Basin.



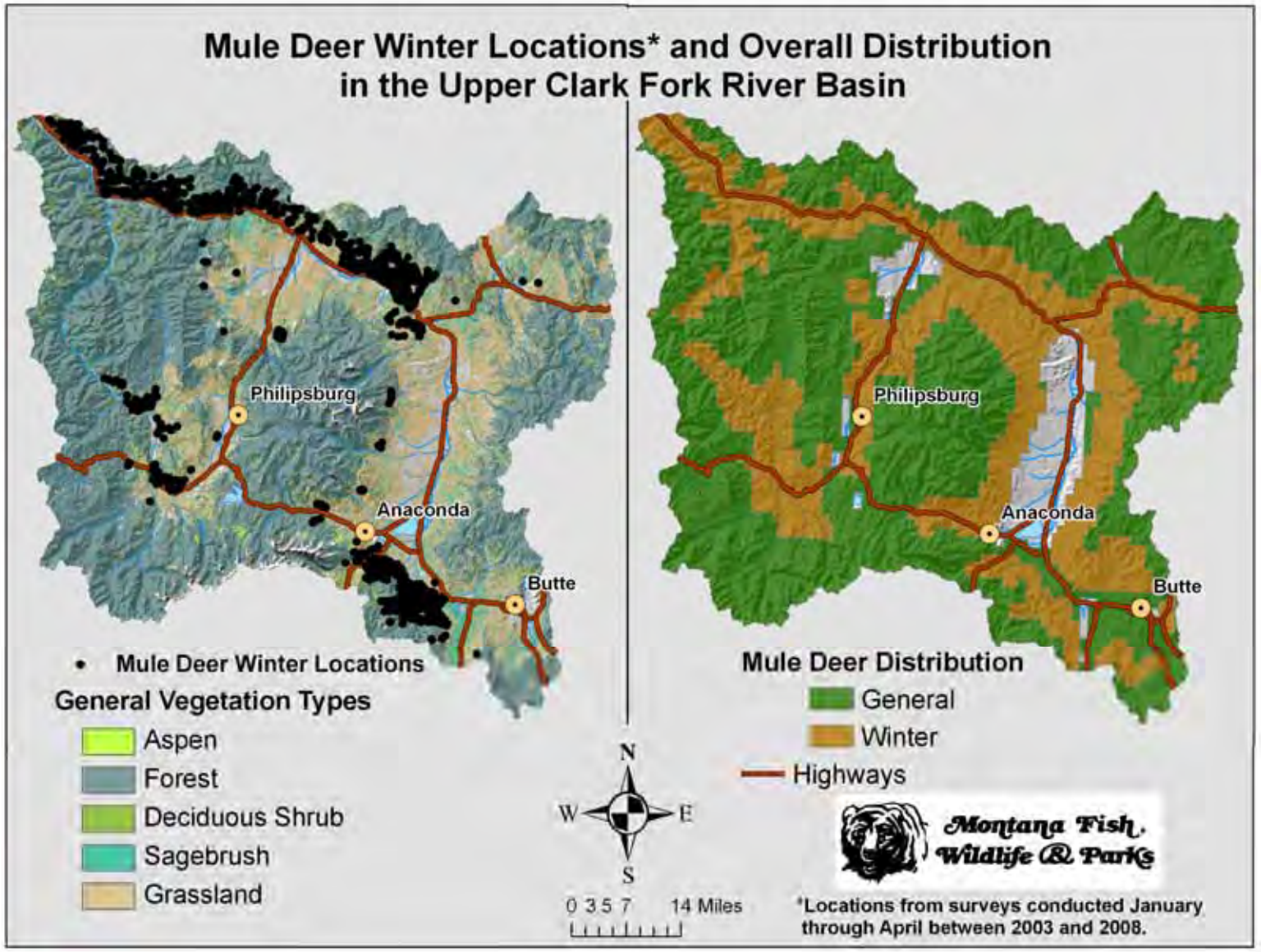
Appendix Figure 7. Survey sites for the Upper Clark Fork River Basin Terrestrial Resource Assessment.



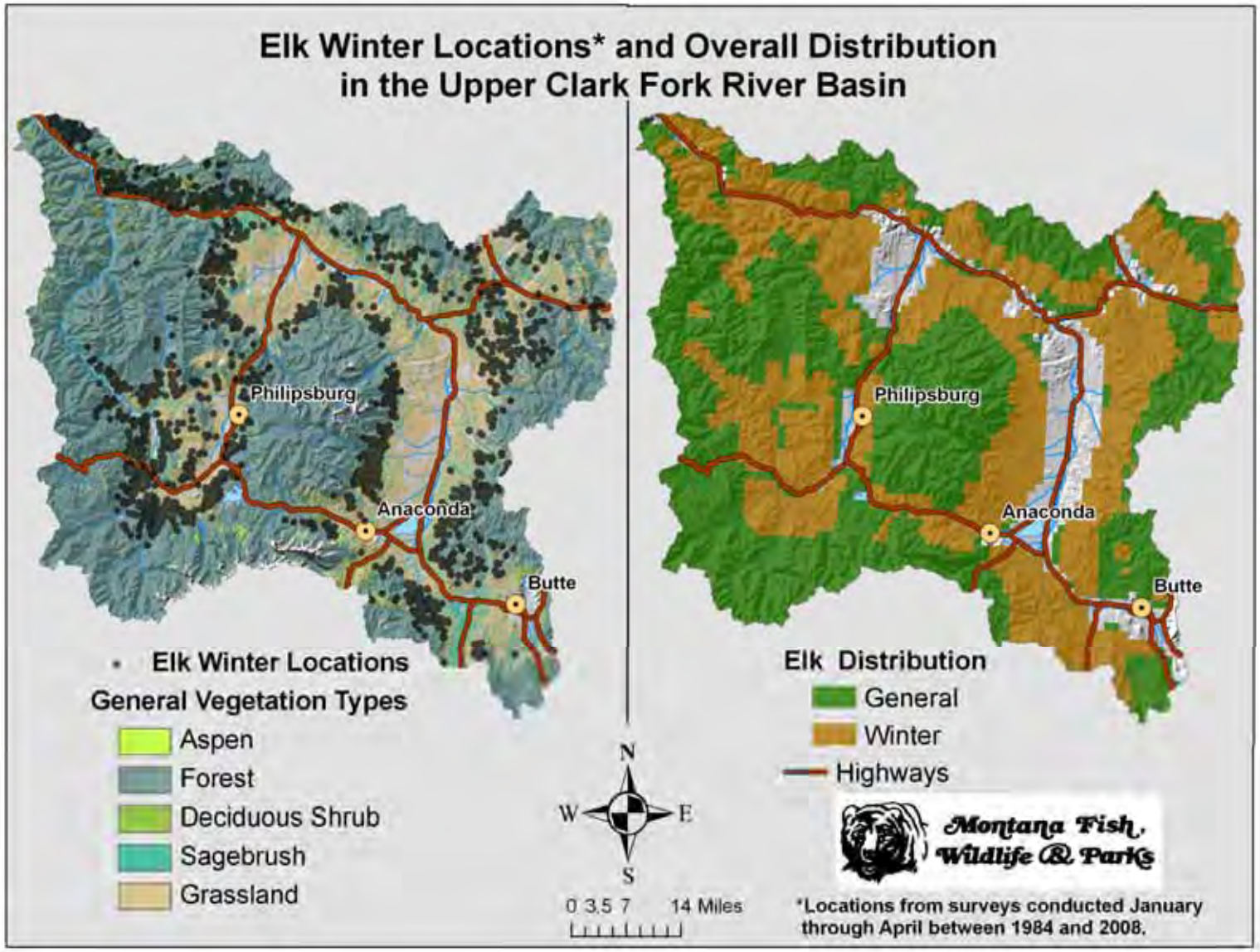
Appendix Figure 8. Pronghorn antelope locations and distribution in the Upper Clark Fork River Basin.



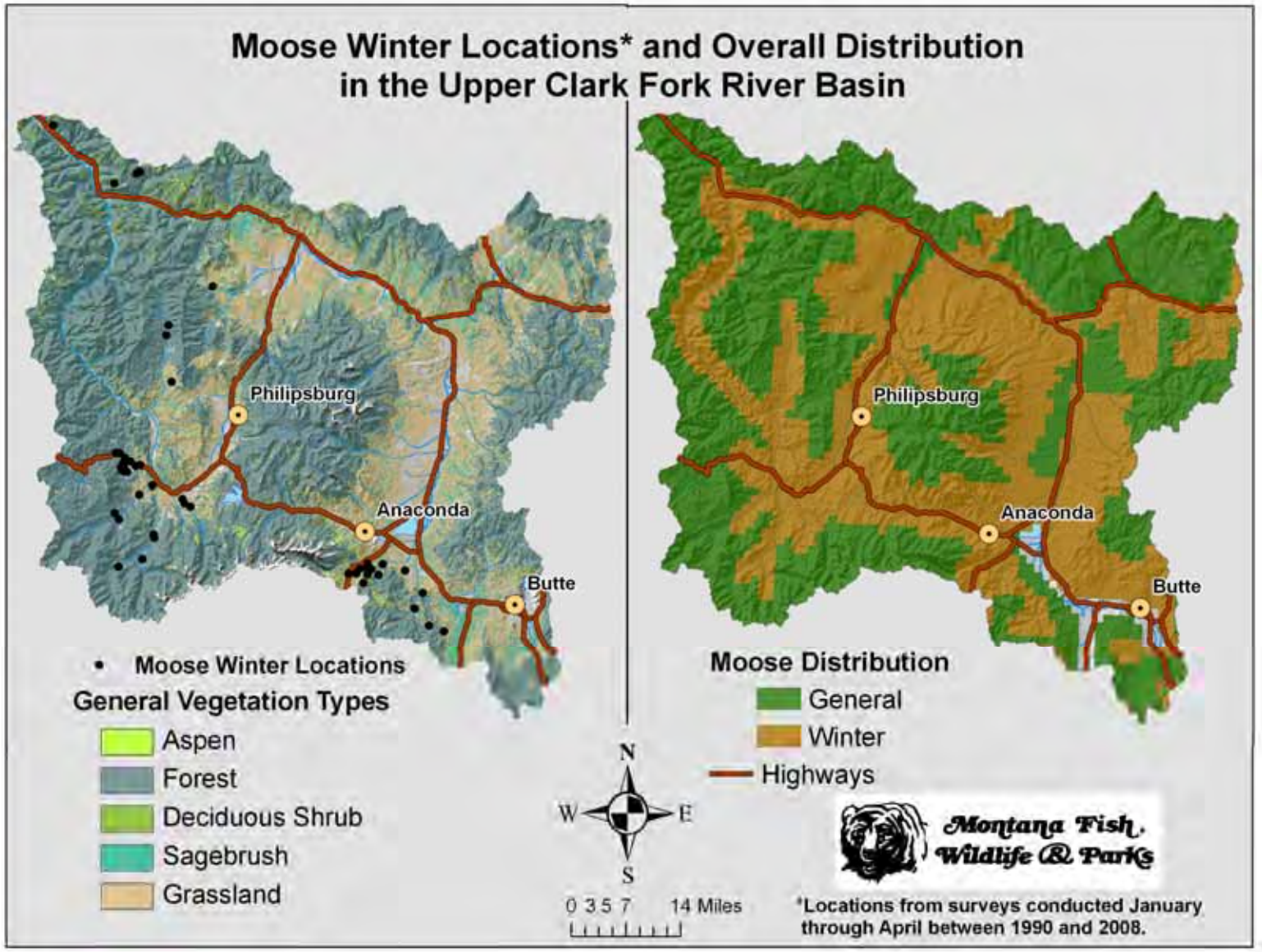
Appendix Figure 9. Mule deer winter locations and overall distribution in the Upper Clark Fork River Basin.



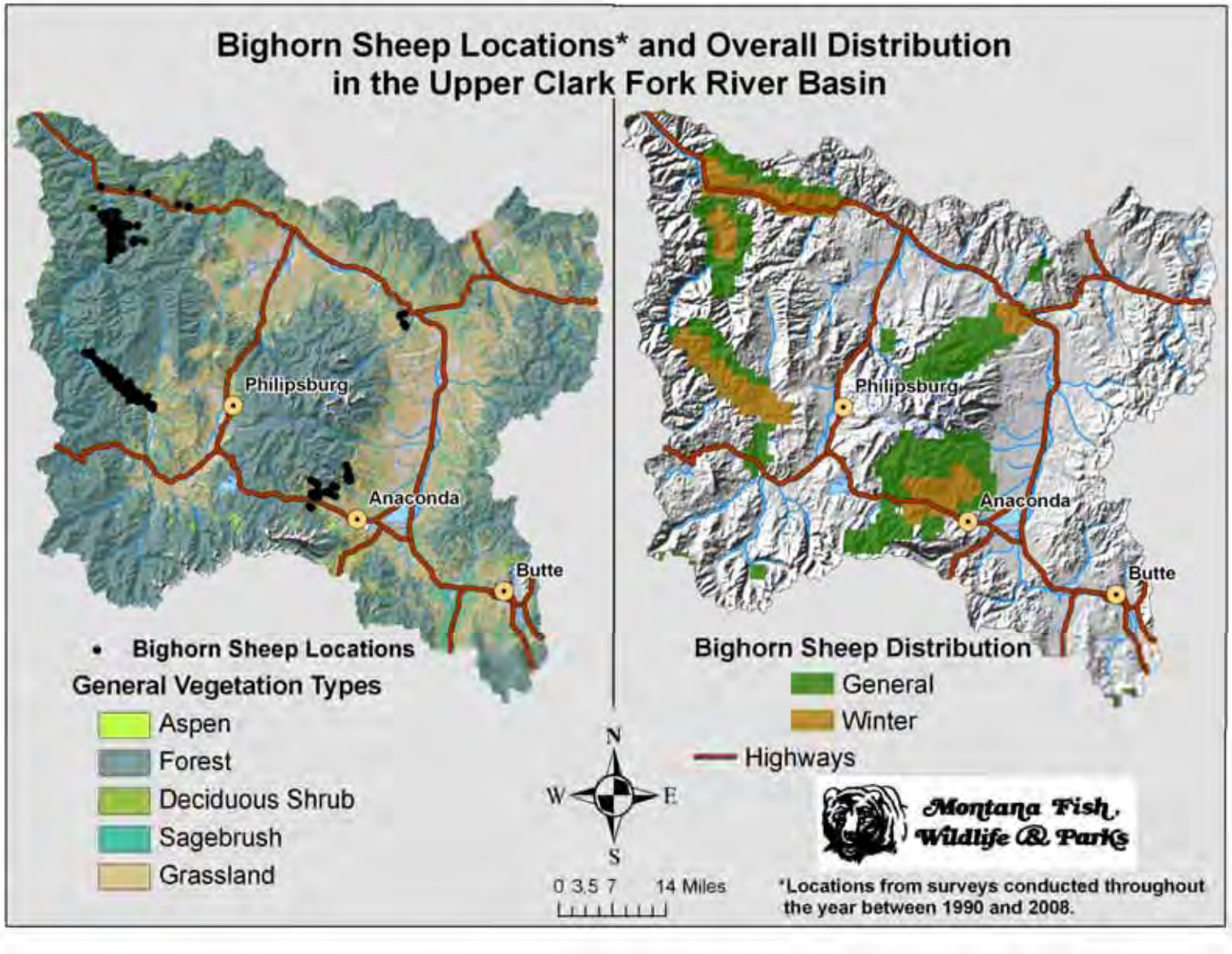
Appendix Figure 10. Elk winter locations and overall distribution in the Upper Clark Fork River Basin.



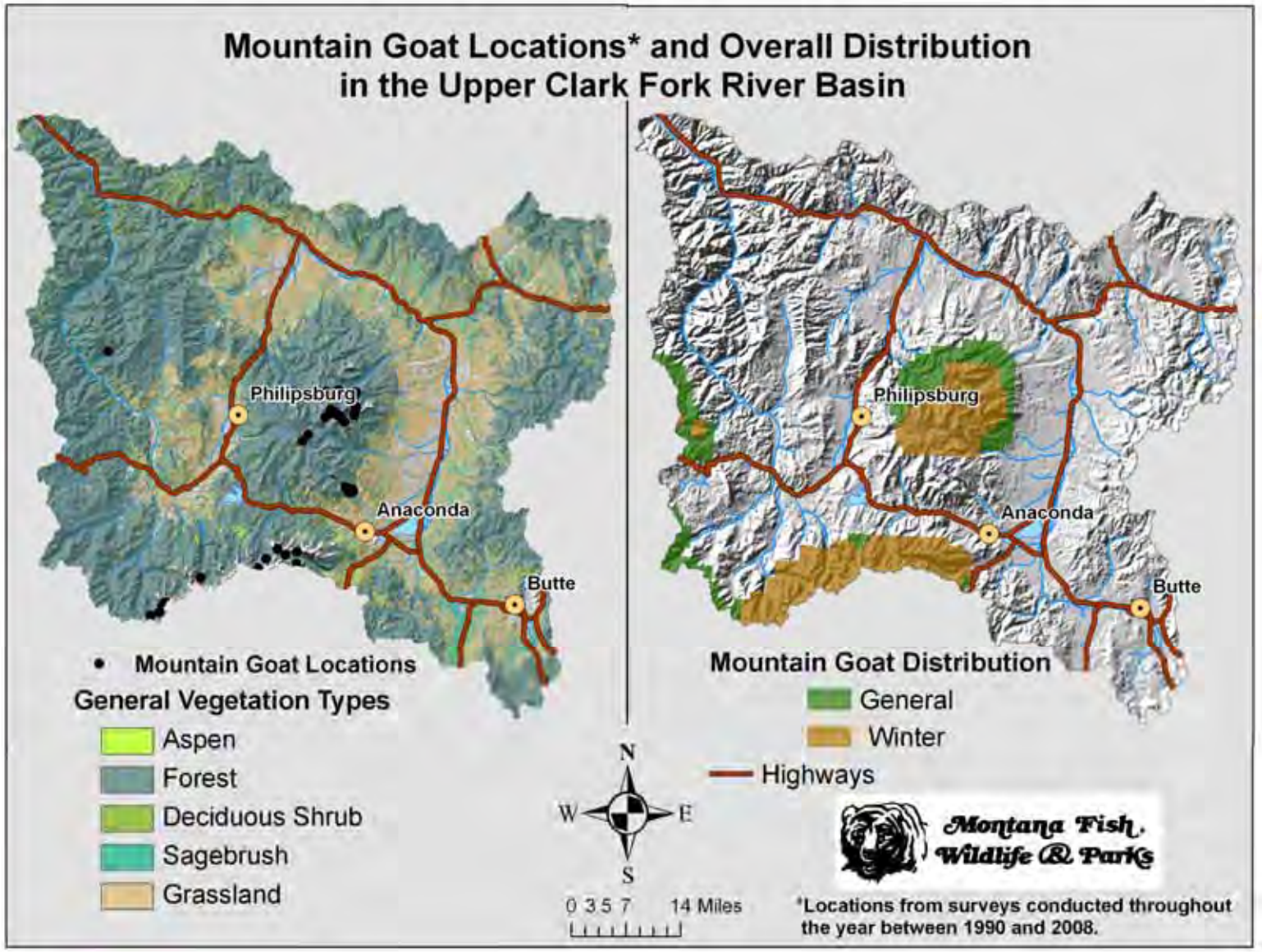
Appendix Figure 11. Moose winter locations and overall distribution in the Upper Clark Fork River Basin.



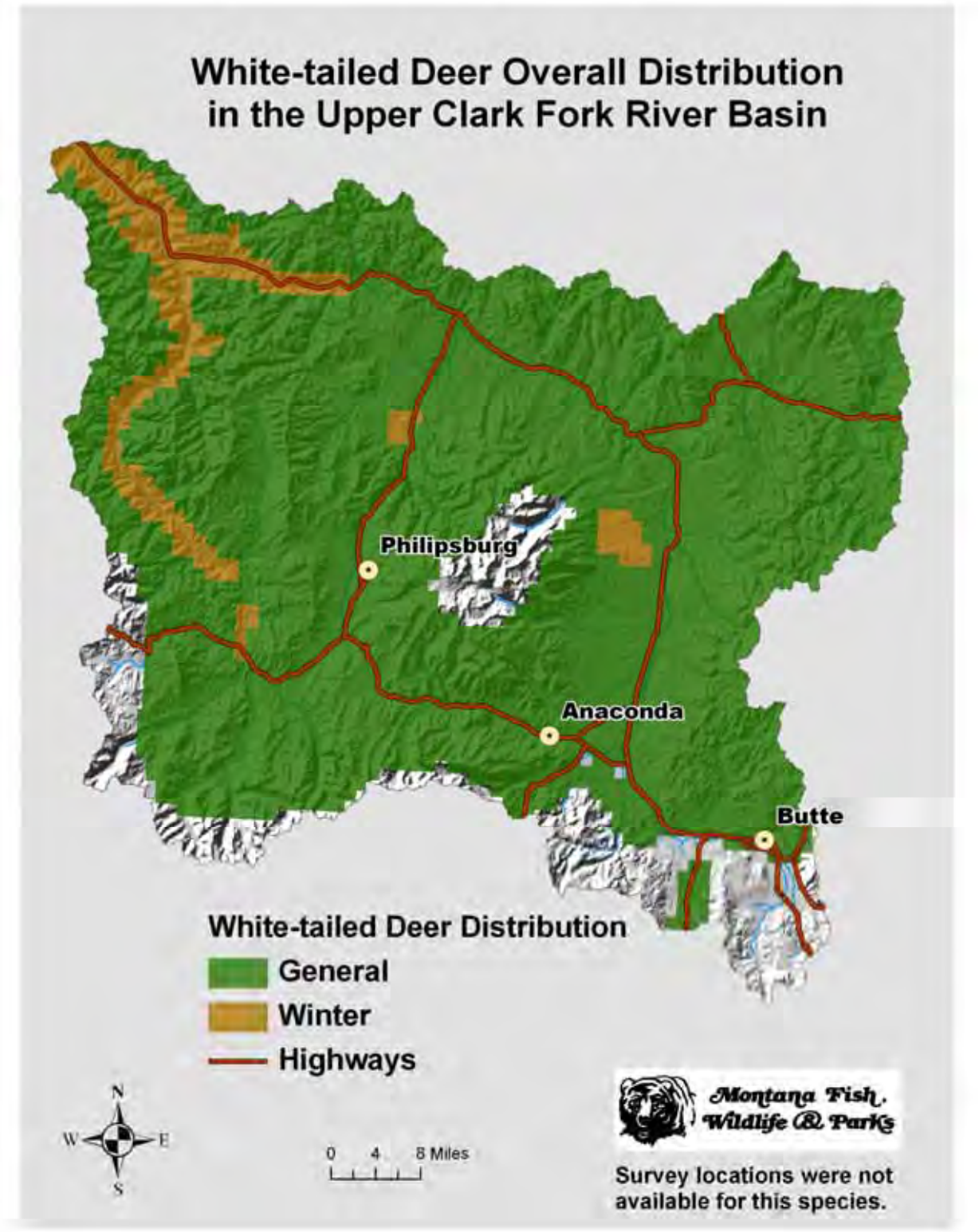
Appendix Figure 12. Bighorn sheep locations and overall distribution in the Upper Clark Fork River Basin.



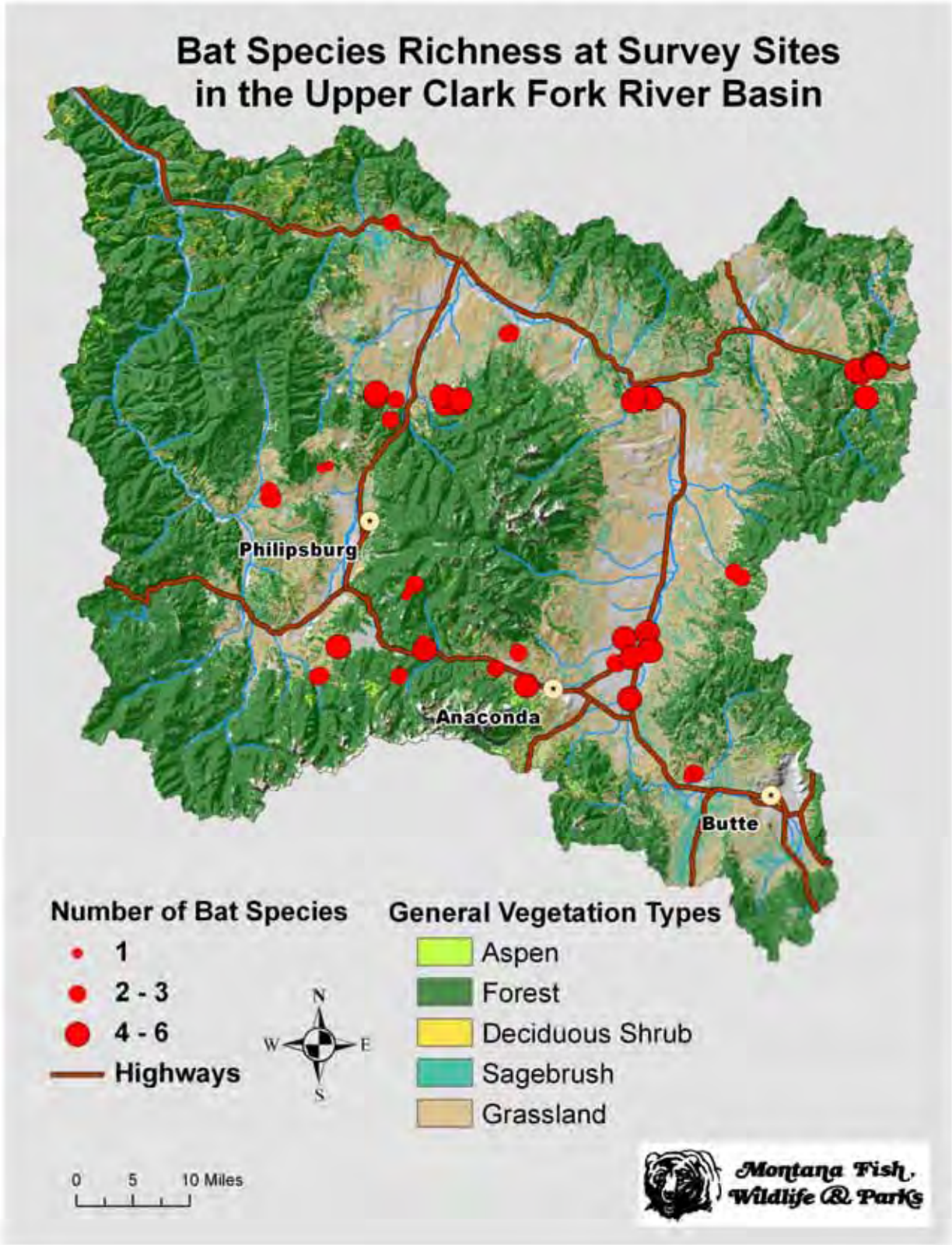
Appendix Figure 13. Mountain goat locations and overall distribution in the Upper Clark Fork River Basin.



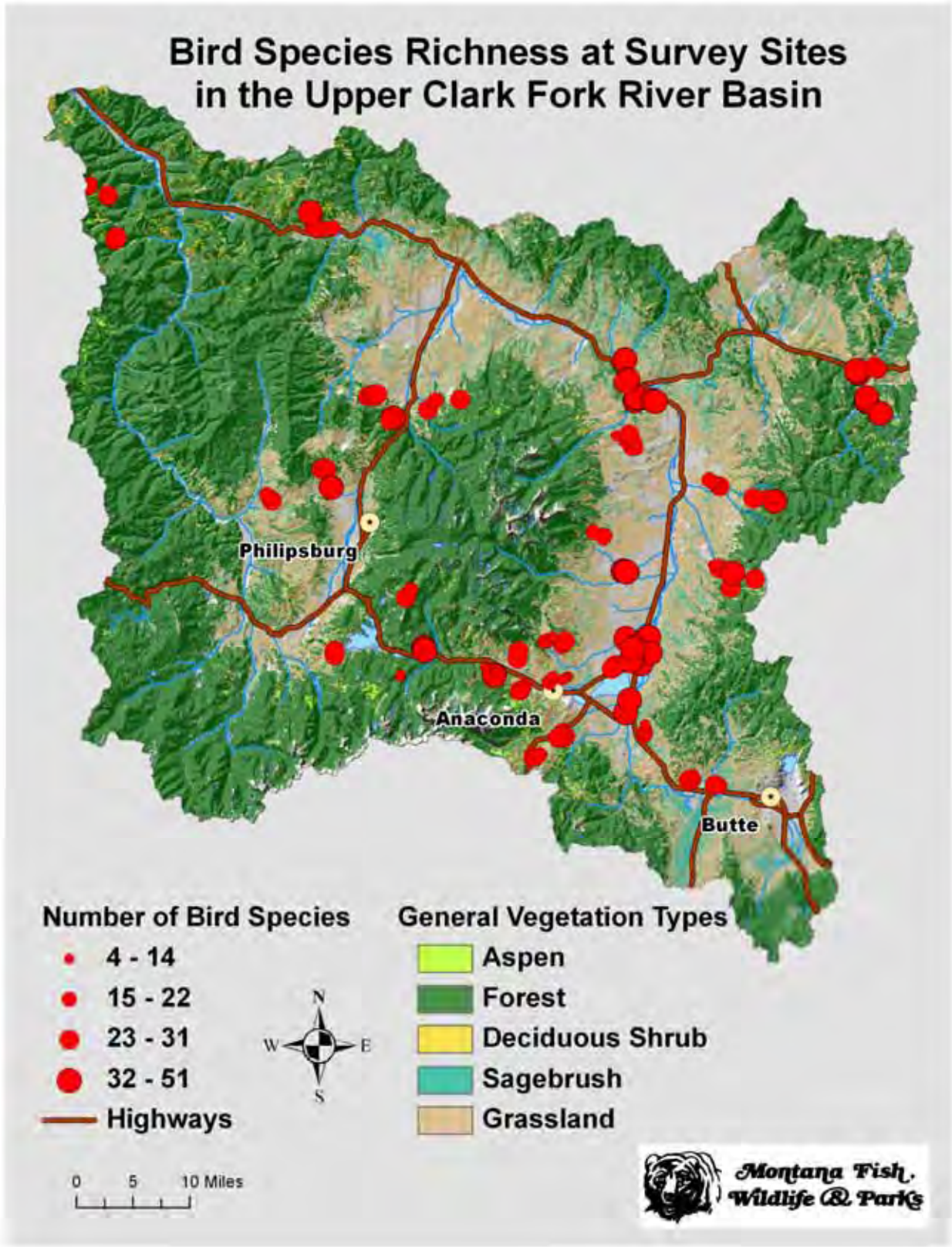
Appendix Figure 14. White-tailed deer overall distribution in the Upper Clark Fork River Basin.



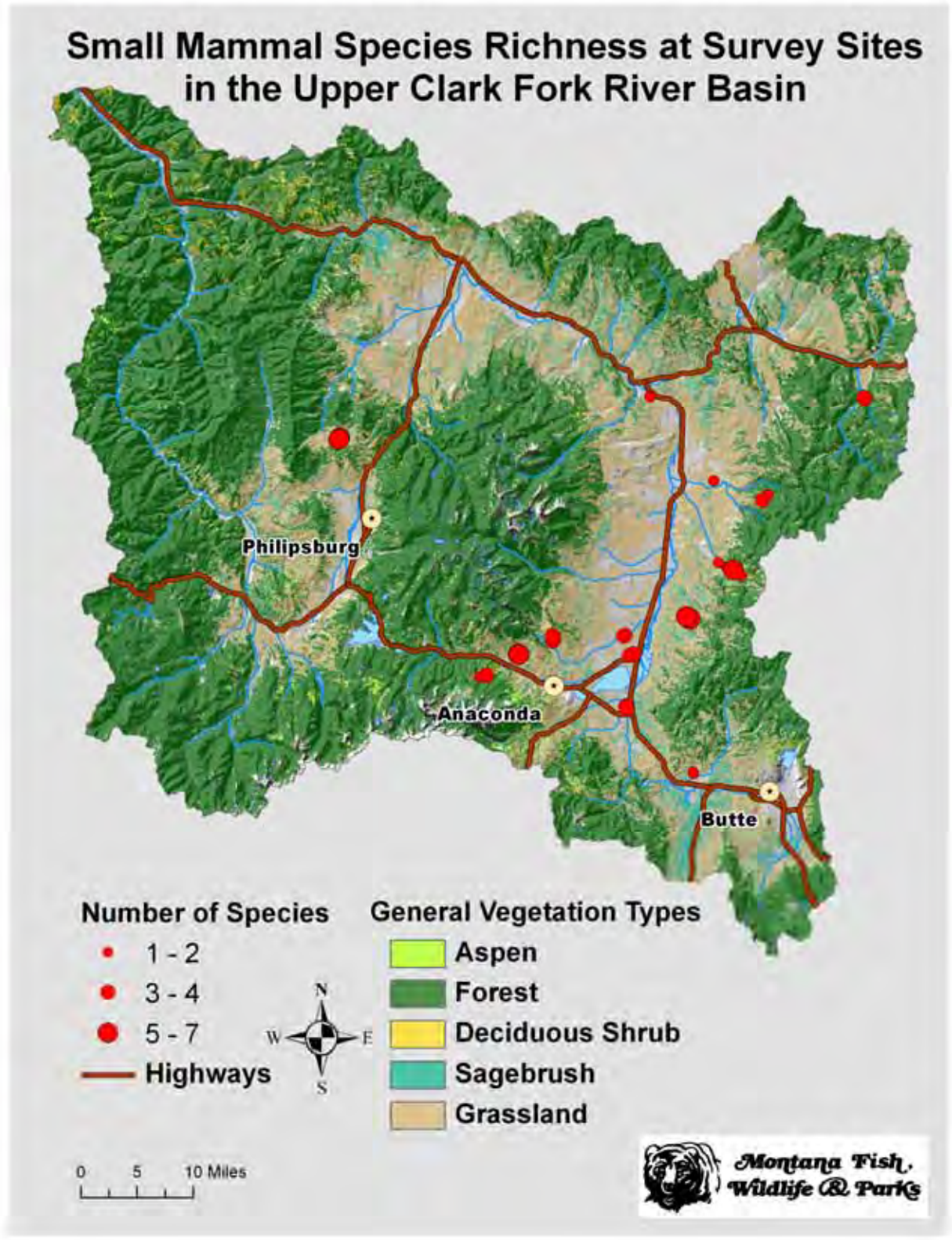
Appendix Figure 15. Bat species richness at survey sites in the Upper Clark Fork River Basin.



Appendix Figure 16. Bird species richness at survey sites in the Upper Clark Fork River Basin.



Appendix Figure 17. Small mammal species richness at survey sites in the Upper Clark Fork River Basin.



Appendix Figure 18. Overall species richness in the Upper Clark Fork River Basin.