# Survey for mountain plovers (*Charadrius montanus*) in the Henry's Fork area of the Great Basins Ecoregion

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## *Executive Summary*

The purpose of this study was to conduct surveys for the presence of breeding mountain plovers (*Charadrius montanus*) in the Henry's Fork area of the United States Department of Interior Bureau of Land Management's (BLM's) Rock Springs Field Office (RSFO). A geographic model of mountain plover occurrence previously developed by the Wyoming Natural Diversity Database (WYNDD) was used to aid survey site selection. No mountain plovers were found during the survey periods in mid-May and mid-June. However, the model and subsequent field reconnaissance identified several areas of relatively good habitat. Such areas were generally short sagebrush steppe and often occurred in small, disjunct patches interspersed with areas of marked topography and tall sagebrush cover. Given the marginal nature of this habitat and the fact that it lies on the western periphery of mountain plover breeding range, the Henry's Fork study area likely experiences only infrequent plover use. We should not, however, conclude that mountain plovers are not a concern. Rather, I recommend that follow-up surveys be conducted by the BLM in April and May of 2001, focusing on the areas identified in this report and on large prairie dog towns.

## *Introduction*

Mountain plovers are endemic to short-grass prairie and shrub-steppe of the Great Plains region of North-America. They seem to prefer flat and dry sites with sparse, short (i.e., < 10 cm) vegetation (Knopf, 1996). Habitat frequented by mountain plovers is often grazed by herbivores including prairie dogs (*Cynomys* spp.) , bison (*Bison bison*), pronghorn antelope (*Antilocapra americana*), and domestic cattle. There is evidence that such grazing by wild herbivores and/or domestic livestock actually enhances habitat quality for the plovers (Kantrud and Kologiski, 1982; Knopt, 1996). The core mountain plover breeding range encompasses suitable habitat throughout Eastern Colorado and Wyoming, north into central Montana, and south into New Mexico. Peripheral range also extends into the Oklahoma and Texas pan handles, northeastern Utah, and western Kansas and Nebraska. In the western extent of their range, including the Henry's Fork area, mountain plovers may nest in desert shrubland. In these areas, nesting habitat often contains more bare ground and exhibits stronger associations with herbivores that reduce foliage height, most notably prairie-dogs and cattle (Knopf, 1996).

The mountain plover was proposed for listing as threatened under the U.S. Endangered Species Act on February 16, 1999 (USFWS, 1999a). The BLM has jurisdiction over much plover habitat, in particular much of the

suitable shrub-steppe habitat throughout Wyoming, allowing for a large-scale coordinated recovery effort within the state. In particular much of the suitable shrub-steppe habitat within the mountain plover breeding range is managed by the BLM. This land is less subject to some disturbances, such as agricultural plowing, than shortgrass prairie, but it is open to a variety of other disturbances including oil and gas development, open-range livestock grazing and recreational traffic. Not all of these disturbances negatively impact plovers, but they all must be considered in developing and implementing an effective mountain plover recover plan. The first step in such a plan is to identify areas of plover activity and their associated ecological and economic characteristics.

The purpose of this study was to conduct surveys for the presence of breeding mountain plovers (*Charadrius montanus*) in the Henry's Fork area of the BLM's Rock Springs Field Office. A geographic model of mountain plover occurrence previously developed by the Wyoming Natural Diversity Database was used to aid survey site selection. In the process, avenues to improve the model where considered.

## *Methods*

### Study Area

This study was specifically targeted to the Henry's Fork area of the BLM's RSFO (Figure 1). This area was defined in the Assistance Agreement for this project as the public lands north of the Utah state line, west of the Flaming George reservoir, south of interstate 80 and west to the RSFO boundary (USDI, 2000). Topography throughout the Henry's Fork area is quite varied, consisting of rolling hills frequently broken by buttes and ravines. The vast majority of this area is broken shrubland dominated by Wyoming big sagebrush or greasewood. There are also areas with a large proportion of bare soil and rock that contain only scattered shrubs and bunch grasses (e.g., Appendix A). There are numerous streams in the area, but many of them are ephemeral, thus restricting riparian vegetation to the larger streams and rivers, including the west shore of Flaming Gorge reservoir. Most of the land is under management of the BLM, with a small proportion of private land dedicated to agriculture (crops and cattle). Free-range cattle are commonly encountered on the lowlands of this study area.

### Predictive Model

This survey employed a predictive model developed by Beauvais and Smith (1999) to prioritize areas to survey within the Henry's Fork study area. In brief, it is a logistic model based on topography (i.e., slope derived from a digital elevation model based on satellite imagery obtained from the University of Wyoming's Spatial Data

and Visualization Center) and vegetation type (Merrill et al., 1996). The output of this model was a raster grid (cell size approximately 30m X 30m) of the Henry's Fork area where each cell contained the estimated probability of finding a mountain plover within the cell (Figure 2). This grid was digitally overlaid on a map of the Henry's Fork area and areas of high priority, defined a-priori as having greater than an 80 percent chance of finding mountain plovers, were targeted for survey.

### Field Surveys

Surveys were conducted on May 21 – 24 and June 18 – 21, 2000 using a field crew of four trained wildlife biologists in two vehicles. Using the model output mentioned above to guide efforts, vehicle-based reconnaissance was conducted from roads in much of the area and intensive surveys were conducted in areas identified as relatively good mountain plover habitat based on this field reconnaissance (Figure 3). Potentially good sites were visited at least twice during the two survey periods. To identify survey sites potentially missed by the model, cursory habitat surveys were performed in areas not identified by the model when environmental factors were not clearly preclusive of mountain plovers.

Intensive surveys on promising sites were conducted early in the morning or in the evening, to optimize lighting conditions for spotting plovers. All surveys were vehicle-based where possible, but included foot searches in areas inaccessible by roads. Survey areas were scanned using 10X42 binoculars and positive identification of animals was confirmed (when necessary) using a 60X spotting scope. Surveys were suspended in inclement weather.

## *Results and Discussion*

### Model Application and Validation

The areas identified by the model as likely to contain mountain plovers were few, relatively small, and patchily distributed. In fact, there were so few areas that met our a-prior defined criteria of greater than 80% probability of containing mountain plovers, that we expanded the target areas to include land with greater than or equal to a 60 percent probability of containing plovers (Figure 2). The mean size of these patches identified by the model was 3.2 ha (95%CI: 2.4 ha, 3.9 ha) with a maximum patch size of 22.7 ha. Single patches of this size surrounded by inhospitable habitat are not likely viable for support of breeding mountain plovers, since each pair of breeding plovers requires an area on the order of 50 ha (Knopf and Rupert, 1996). However, it is likely that

collections of patches that exceed 50 ha of useable habitat might support plovers if the useable habitat was of reasonably high quality and clumped fairly tightly. Thus, although individual patches were too small to support mountain plovers and were surrounded by habitat deemed unsuitable due to land cover (e.g., tall sagebrush vegetation) or topography (e.g. a slop greater than about 10%), we identified areas where patches tended to clump as priority locations to conduct mountain plover surveys.

Areas identified by the model as having at least a 60 percent probability of mountain plover occurrence were generally classified by the Wyoming Gap Analysis Project (WYGAP) as basin exposed rock and soil (Merrill et al., 1996). Field reconnaissance of these areas often revealed coverage of sagebrush interspersed with bare ground (Table 1). Further, cursory surveys revealed some locations that seemed suitable to mountain plovers despite not being identified by the model. These areas often consisted of short shrubs (primarily big sagebrush and greaswood less than 15 cm tall). They were therefore classified by WYGAP as sagebrush or desert shrub and given correspondingly low habitat suitability scores (see Beauvais and Smith, 1999). It therefore seems that, with respect to the Henry's Fork area, primary cover of sagebrush could be given a higher habitat suitability score. However, the majority of land in the Henry's Fork area falls in this category and contains unsuitably tall shrubs, so this may cause the model to err in the opposite direction of suggesting too much suitable habitat. In order to identify suitable shrubland, it seems a more precise vegetation classification that incorporates vegetation height would be needed. Such data is extremely hard to come by for areas as large as that encompassed by this study and it is unclear that such a modification would result in more useful output, since the short shrubland that would be reclassified as suitable seems to be fairly marginal habitat anyway. Moreover, the fact that we did not find any mountain plovers in the Henry's Fork area agrees with the extremely limited distribution of suitable habitat identified by the model.

Surveys revealed opportunities to improve the model. Some sites identified as having a high probability of mountain plover occurrence (e.g., sites WB1 and WB3 near Flaming Gorge Reservoir) were adjacent to open water or riparian vegetation and thus not likely to support mountain plovers. Similarly, areas proximate to marked topographic features (e.g., sites near the foot of a butte) are unlikely to attract mountain plovers, which seem to prefer expanses of flat land that have no nearby area of higher elevation. Adding a condition that screens for proximity to waterbodies and areas of steep topography could enhance the model by eliminating areas of poor habitat that the model missed.

## Field Surveys

No mountain plovers were found in any portion of the study area. The most promising areas identified by the model and field reconnaissance were mapped for potential follow-up surveys (Figure 3 and Appendix B). Managers should note that in addition to areas surveyed in this effort, the lowland west of Highway 1 and south of Road 4315 may contain small patches of useable habitat, although initial observations suggest that it is mostly sagebrush and/or greasewood shrubland. Careful (and time-consuming) searches of this area were forgone to focus on the more promising areas mentioned above.

The lack of mountain plover sightings fits with model predictions that identified minimal habitat suitable for mountain plovers. The best habitats were generally small patches of stunted sagebrush and bare soil interspersed with taller sagebrush stands. These areas often occurred on active white-tailed prairie dog colonies. Short sagebrush is marginal plover habitat, particularly when it occurs in small, unevenly distributed patches that are individually insufficient to support breeding plovers.

WYNDD has no records (current or historic) of breeding mountain plover occurrences within the Henry's Fork Study area. Three sightings (not necessarily confirmed as breeding) have been reported just north of the study area, but these are temporally disparate and questionable sightings of single individuals recorded in the Wyoming Wildlife Observation System (WOS). The only one with sufficient credibility to be retained in WYNDD's database occurred on Highway 1, about 4 to 5 miles south of McKinnon Junction, which just outside the boundary of the study area. We surveyed this area repeatedly during our visits, but found no evidence of mountain plovers.

# *Recommendations*

## Future Survey Effort

TIMING: Surveys should be conducted in spring or early summer, as suggested by the current survey guidelines (USFWS, 1999b). Ideally, surveys should be conducted during early courtship and territorial establishment, because that is when males perform courtship displays and are most visible. When considering the whole of mountain plover breeding habitat this begins in the middle of April and continues until early July. If the objective of a study primarily determining presence\absense, it is valuable to conduct surveys in the earlier part of this period (probably by mid-June), as this is when courtship is most likely to occur. The exact time of courtship

varies depending on the locality in question, so surveys will optimally consist of multiple visits during this period, with at least one visit occurring in late April or early May.

PRAIRIE DOGS: It is likely that mountain plovers in the substantially shrub dominated habitat in the Henry's Fork area, and to a lesser extent in the RSFO as a whole, are strongly associated with large prairie dog towns and heavily grazed range (see numerous references in Knopf, 1996). Therefore, these features should be used to guide surveys. Prairie dog colonies also provide high-quality habitat for other sensitive species, including ferruginous hawks (*Buteo regalis*) and burrowings owls (*Athene cunicularia*). Thus, an effort to map prairie dog towns in the Henry's Fork area will simultaneously identify prime habitat for the associated species and surveys for those species could effectively be conducted in conjunction with such mapping efforts.

## Model Improvement

Future applications of WYNDD's mountain plover model (Beauvais and Smith, 1999) may be enhanced by inclusion of additional variables, some of which are specific to the Henry's Fork area. Some examples that were highlighted by this survey effort include:

1. Distance to nearest water: Plovers are unlikely to be near water, due to the associated effects on vegetation and the presence of other species, such as killdeer (Knopf, 1996; USFWS, 1999b). Further, the current form of the model classified some unsuitable riparian areas as being highly likely to contain plover. Therefore, setting a minimum distance from water for a given parcel of land to be considered could be a useful model parameter.
2. Distance from topographic features: Not only do plovers nest on flat land, but they seem to avoid nesting near prominent topographic features, such as buttes or rock outcrops (Beauvais and Smith, 1999). To correct for this fact in the model, we could code flat areas that are farther away from such features as being more suitable than those close to such features.
3. Prairie dog colonies: Due to the association of mountain plovers with prairie dog towns, factors influencing the location of prairie dog towns could be used to increase the accuracy of the model. For example, prairie dogs seem to favor well-drained, loamy soils (Trevino et al., 1997; Reading and Matchett, 1997), so surface soil type could be used as a factor in a mountain plover model.
4. Patch size: As suggested above, mountain plovers require a fairly large block of habitat to establish successful broods (Knopf and Rupert, 1996). Therefore, a model weighting habitat patches by size might be more effective at identifying high probability areas of mountain plover occurrence.

## *Acknowledgements*

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### *Tables and Figures*

Table 1: Vegetation types of locations identified by the mountain plover model and their actual vegetation based on field reconnaissance.

| Site | Model Classification | Primary GAP Landcover | Adjacent Primary GAP Landcover | Field-Observed Landcover |
|---|---|---|---|---|
| BF1 (#1) | > 80% | mixed-grass prairie (60%)<br>dry land crop (40) | Irrigated crops (90%) | 90% groundcover, mostly hay meadows and big sagebrush |
| BF2 | > 60% | bare rock and soil (70%)<br>big sagebrush (30%) | irrigated crops (90%) | 90% groundcover, mostly of big sagebrush |
| BF3 (#1) | > 60% | bare rock and soil (70%)<br>big sagebrush (30%) | irrigated crops (90%) | 80% groundcover, mostly of big sagebrush |
| BF4 (#1) | > 60% | bare rock and soil (70%)<br>big sagebrush (30%) | big sagebrush (80%)<br>irrigated crop (90%)<br>aspen forest (60%)<br>juniper wood (60%) | 60%-80% ground cover of sagebrush |
| DP1 | > 60% | bare rock and soil (80%)<br>juniper wood (20%) | big sagebrush (60%) | Not quantified |
| FC1 (#1) | > 60% | bare rock and soil (60%)<br>big sagebrush (40%) | big sagebrush (80%) | Not quantified (see photo in Appendix A) |
| WB1 (#1) | > 80% | bare rock and soil (90%)<br>desert shrub (10%) | wyoming big sagebrush (80-90%)<br>shrub dominated riparian (70%)<br>open water (100%) | about 30% ground cover of tall (> 12”) riparian grasses and sagebrush. |
| WB4 & 5 | >60% | bare rock and soil (60)<br>desert shrub (20)<br>big sagebrush (20) | shrub dominated riparian (90) | Not quantified |

**Figure 1:** Location of the Henry's Fork study area in southwestern Wyoming

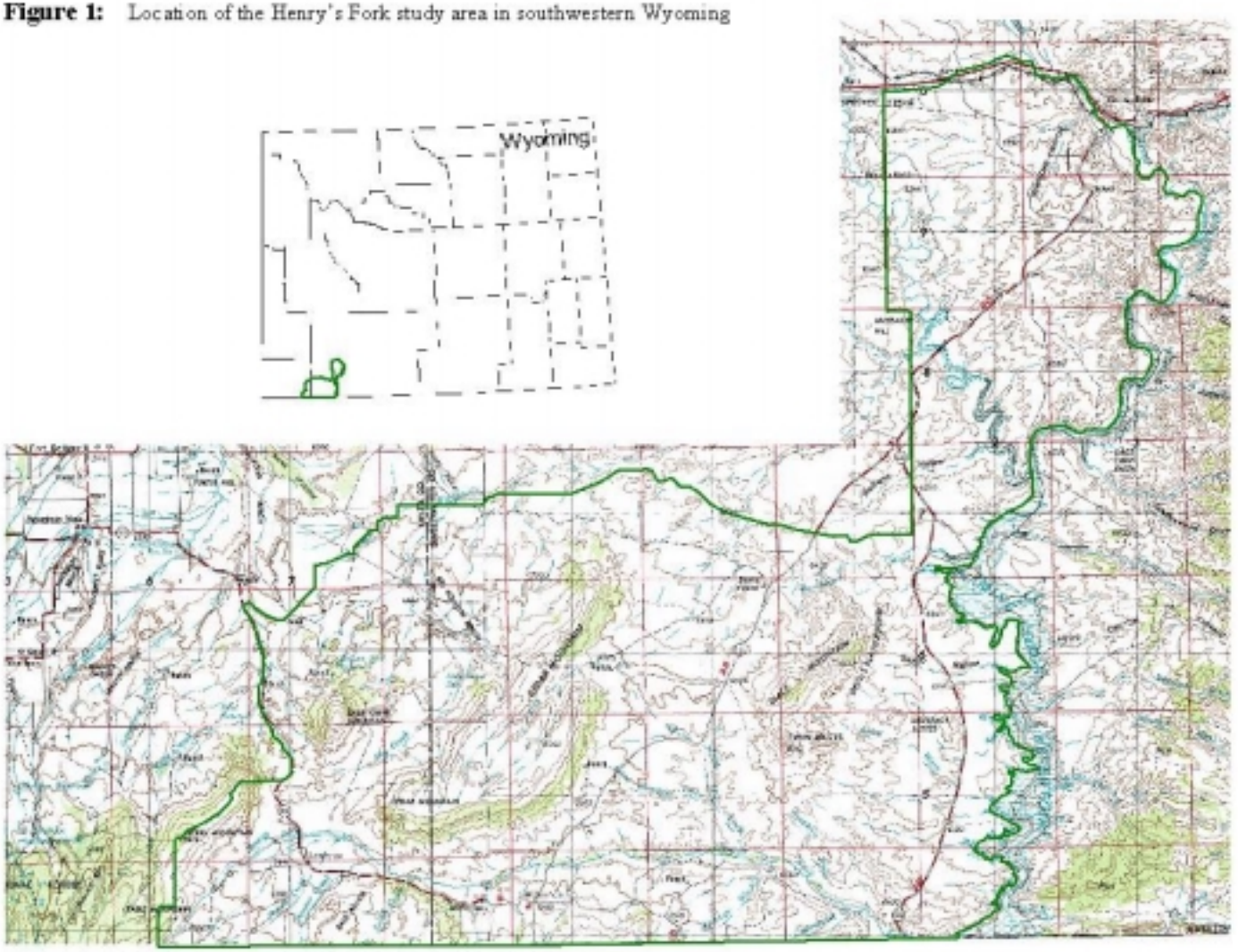

Figure 2: Probability of finding mountain plovers in the Henry's Fork area of southwestern Wyoming based on a habitat model developed by the Wyoming Natural Diversity Database (Beauvais and Smith, 1999).

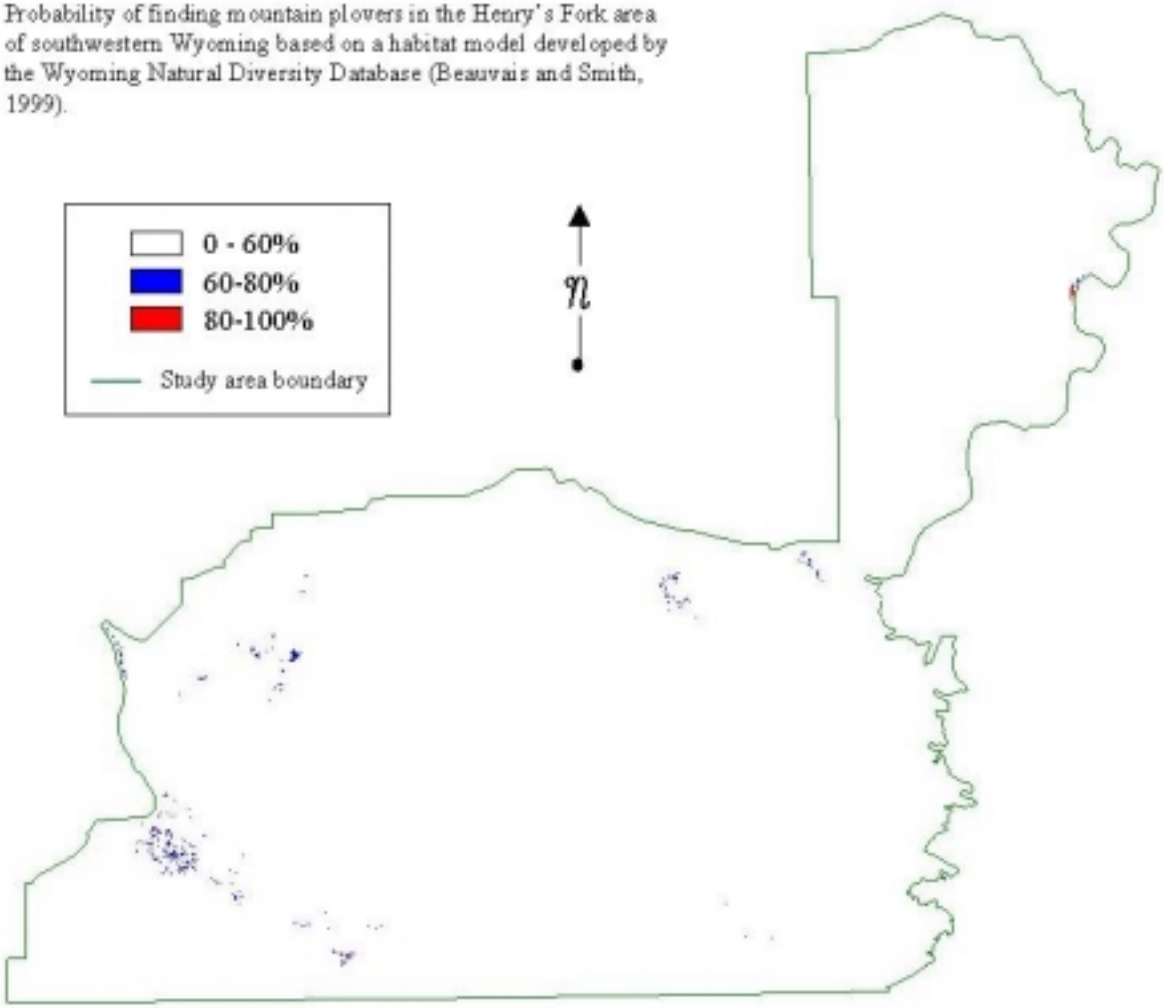

Figure 3: Areas surveyed in May - June, 2000 in the Henrys Fork area of southwestern Wyoming.