FILOHA MEADOWS NATURE PRESERVE MANAGEMENT PLAN

August 2008

ADOPTED BY OSTB 9/2/08

Filoha Meadows Management Plan

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1.0 INTRODUCTION

Filoha Meadows Nature Preserve is located in the scenic Crystal River Valley, two miles north of Redstone, Colorado. The spectacular views from the valley floor next to the Crystal River inspired the producers from Disney to film the movie "Tall Tales" on the property. Filoha Meadows Nature Preserve is comprised of three distinct acquisitions; 1.5-acre "Penny Hot Springs" (1991), 140-acre Hot Springs Ranch (2001), and 50-acre Filoha Meadows (2003), which protects over one mile of the Crystal River Valley from development. This management plan encompasses all of the property purchased by Pitkin County Open Space and Trails (OST) from Avalanche Creek to Dorais Way and the combined properties are hereby named Filoha Meadows Nature Preserve (Filoha).

"Filoha" is the Ethiopian word for "hot water" and the property contains unique ecological communities due to the hot springs and geothermal activity underlying the property. The geothermal activity results in snow free meadows, providing critical winter range for bighorn sheep. Elk calve near the Crystal River, beavers create wetlands, and predators like coyotes and foxes use the meadows for their hunting grounds. Filoha exemplifies the program's mission of protecting areas with outstanding scenic, natural, and wildlife habitat value.

The management of Filoha will protect and enhance the meadows and riparian habitat that are so important to wildlife. It will also provide soft surface nature trails and the opportunity for environmental education highlighting the extensive wetland and riparian habitat that exists on Filoha.

This management plan will outline the wildlife and vegetation studies to date and the management implications of those studies. Wildlife and vegetation studies will be continued indefinitely and so far we have found some exciting things on Filoha like the rare helleborine orchid and fireflies! Only a handful of places on the Colorado West Slope have fireflies.

Recreation resources in this plan are determined by the ability of the natural resources to handle a human presence without significant impacts. The recreation plan contained within this document has been developed with consultation with the wildlife and vegetation consultants hired to study the natural resources on Filoha, the Colorado Division of Wildlife, and the Roaring Fork Conservancy which holds a conservation easement on a portion of Filoha.

1.1 Continuing Public Input

The Open Space program regards all management plans as living documents, and will consider comments or proposed changes at any time. Any such comments will be brought to the attention of the Open Space and Trails Board for discussion of an appropriate response, including potential changes to the plan. All potential changes to the plan will go through a public process before adoption.

2.0 RESOURCE MANAGEMENT GOALS

- To study, protect, and enhance the ecological communities with particular emphasis on those that are unique and rare
- Enhance the outstanding wildlife habitat values
- Provide low impact environmental education

- Offer sustainable recreation that will not adversely impact the property's conservation values

3.0 GENERAL DESCRIPTION OF PROPERTIES

3.1 Acquisitions and Legal Status

The County's involvement in the Penny Hot Springs area began in 1991 with the acquisition of a small acreage adjacent Highway 133 replete with riverside hot springs. (Designated herein as the "Visitor Use Area.") The preservation of the meadow proper took a major leap forward in 2001, when Pitkin County purchased the 145-acre Hot Springs Ranch. This had been subdivided into four parcels and slated for development by the prior owner. At the time of this purchase, The Conservation Fund took possession of a small, 8-acre residential parcel on the west side of the river which included the former residence of Kelly Grange. The subsequent resale of the house recovered approximately 30% of the $3,000,000 Hot Springs Ranch purchase price. Finally, a 48-acre fee simple purchase and 2.5-acre conservation easement from Bernarr and Dorothea Johnson added over 50 acres to this scenic wildlife preserve in 2003. The Johnson acquisition was funded in part by Great Outdoors Colorado (GOCO), and resulted in a conservation easement held by the Roaring Fork Conservancy on the 48 acres. The Johnson family retained 2.5-acres on the east side of the river surrounding a small greenhouse, workshop, and waterwheel visible from the highway. This 2.5-acre parcel is subject to a County held conservation easement that restricts residential or other uses. In sum, multiple transactions over a twelve year period protected a contiguous 185-acre meadow and approximately one mile of the Crystal River.

3.2 Physical Characteristics

3.2.1 Location

Filoha is located approximately two miles north of Redstone on the east side of the Crystal River. See Map A for location.

3.2.2 Topography

Filoha contains mostly rolling meadows and the Crystal River. The property does contain some of the steep hillsides along Elephant Mountain and the elevations range from 6,900-feet along the Crystal River to 7,800-feet at the highest point on the hillsides.

3.2.3 Geologic Resources

- Mount Sopris, the dominant mountain just north and east 3.75 miles, consists of an intrusion of igneous rock. The rock, called quartz monzonite, also includes several dark minerals. This large Tertiary intrusion is most likely still cooling deep below the surface. This may help explain the presence of the heated mineral springs in the wet meadows and at the locally famous Penny Hot Springs, river-left on the northwest portion of the property.

- In the wet meadows fed by hot springs, minerals precipitate out into the topsoil causing nutrient and mineral enrichment locally. These conditions are unique and tend to support distinctive and/or rare plants and plant communities.

- Cliff/Talus areas also known as Rocky/ Tall Shrublands (Johnston 2001) on the property support a unique suite of plant species, provide dramatic scenic relief to the landscape and locally are coveted by bighorn. These habitats are intermittent along the Crystal River corridor and relatively small percentage-wise compared to the extent of other typical communities.

- A formal soils report has not been completed on Filoha. In areas where restoration is proposed detailed soil studies will be completed.

- Soil stability is an issue along the steep hillsides in most of the upper Crystal River Valley. On and adjacent to Filoha there have been numerous mud and rock slides. OST will work with the USDA Forest Service (USFS), since most mud and rockslides start on USFS land, to address any soil stability issues that can impact Filoha.

3.2.4 Hydrology and Water Rights

The water resources of interest include:

- The Crystal River is a very significant feature of the property including the fishery and vegetation it supports. Currently, it is important to remember that this perennial river is essentially a free flowing river, one of the few remaining in the state, let alone the western U.S. Upstream in-basin diversions have some impacts, but they are still minimal compared to river systems significantly impacted by dams or more extensive water diversions. The health of the intact riparian communities here reflects this.

- The mineral laden, hot spring waters flow year round, sustaining a good portion of the wetland plant communities. It is also used by the adjacent Johnson residence for heating and hot tubs.

- Beaver enhanced wetlands on the southern portion of the property, river right flanking the Crystal River, provide a critical water storage function. Not only does this dam complex maintain extensive wetlands, but like all streamside active beaver dam sites, the area also helps contribute to base flows during times of diminished instream flows later in the summer and into fall and winter. Springtime overbanking flows are essentially stored in the beaver ponds and recharge groundwater. This water is then slowly discharged later when river flows decrease, ultimately helping maintain instream base flows long after snowmelt season has passed.

When OST purchased all the properties that now comprise Filoha, the primary water right was the Wilke Ditch, which diverts 1.2 cfs from the Crystal River. The management goal for this ditch is to improve the condition and exercise the water rights. The water from the ditch will be used to restore native vegetation on the property and enhance the wetlands. If feasible, this water right could also be dedicated for instream flow protection once the restoration allows. OST has improved the ditch and fully exercised the water rights in 2004-2007.

3.3 Land Use Considerations

3.3.1 Property Perspective

Filoha is one of the most biologically diverse properties in the OST system. The rare and unique plant communities and the wildlife that depend upon them are unparalleled in the Crystal River Valley. At the same time, some areas are degraded by non-native pasture grasses and noxious weeds. Filoha has a diverse human and natural history that makes preservation of the property critical and management decisions difficult. The goals of OST are to protect the natural resources of the property while providing access that allows visitors to learn about the natural values and experience the natural beauty. OST has conducted five years of intensive study of the natural resources to acquire the level of knowledge needed to prepare this management plan. Protection and enhancement goals are outlined while careful allowance is made for visitors of the property to experience one of the most beautiful and biologically diverse places in Colorado.

3.3.2 Adjacent Land Use

South of Filoha is the Wild Rose Subdivision. This low density subdivision borders Filoha and the USFS land. To the north and east of Filoha is extensive USFS land that contains historic mining remains and connects to the Maroon Bells Snowmass Wilderness Area. West of the Crystal River and East of Highway 133 are two residential developments, including that of the former owner who bestowed the name “Filoha” on the area. The former owner retained rights to hot springs located on Filoha to heat their property. There are still wells and piping that provide hot water to the property and was a condition of purchase that these will remain on the property to be used by the former owner. Also to the west of the property, on the west side of the Crystal River is Kelly Grange’s former residence that is currently used as a rental house.

3.3.3 Historical Land Use

It is likely that Filoha’s sunny exposure, hot springs, and gentle river access have always attracted the interest of humans in the Crystal River Valley. Eye witnesses in 1950 could still recall Ute Indian seasonal encampments near the hot springs, during the Ute’s annual migration to hunting lands southwest of Redstone. (See, Some Facts and Conjectures About the Crystal River Valley in Colorado, Alvin Foote, Copyright 1950 by A&T Company, page 33.) By 1885, a county wagon road had been constructed through the meadow, connecting Carbondale to what is now Redstone. (See “Rock Creek Wagon Road” surveyed on 9/17/1885 reception #5 in the Official Records of Pitkin County and “County Road” surveyed on 11/9/1888 reception #6 in the Official Records of Pitkin County). One famous traveler on that early road was Doc Holliday, who traveled from Glenwood Springs to Penny Hot Springs in the summer of 1887 in an effort to find some cure for his consumption. (See, Doc Holliday; A Family Portrait, 1998 by Karen Holliday Tanner, at page 216.) Holliday stayed at a cabin owned by Alexander and Eva Harony there for a few months, before returning to Glenwood Springs where he died that November.

By 1893, the Crystal River Railroad had been completed along the same general route as the wagon road, including the reach through Filoha. (See The Crystal River Pictorial, 1972, by Dell McCoy.) In 1926, the Tomb of the Unknown Soldier rumbled down these tracks. The railroad served Redstone and Marble until 1942 when service was abandoned and the tracks were recycled during World War II. Doug Farris recalls that during the waning days of this rail line, a

Ford Model A was fitted with wheels to haul small freight and mail. This vehicle was affectionately known as "pinkie." (For a photo of track being pulled at Filoha, see Marble, Built on Dreams, Volume 1 at page 62, 1992, by Oscar McCullum) To this day, railroad spikes are still surfacing along the grade, which this plan labels as Travel Corridor A.

Sometime in the late 1880s, a miner named Harry Van Sycle[1] began mining just above the meadow at the north end. A May 1890 map by Frank Monroe depicts Van Sycle's cabin on the east side of the Crystal River across from "Hot Springs" depicted on the west side. These notations correspond with the present day pools which bathers enjoy in the Visitor Use Area and the cabin ruins across the river. His diggings opened up hot caverns, which achieved some fame via an 1899 story in the Denver Times. The Crystal Railroad Company desired to construct a resort there, but apparently was not able to reach an accommodation with Van Sycle. (See, Caves of Colorado (1972) by Lloyd Parris, at page 15; Rocky Mountain Caving Volume 22, number 22.) The mines were apparently reopened for a time during the thirties and early forties, producing lead and iron oxide.

In 1939, the USGS mapped a proposed dam site just below the Visitor Use Area. It is unclear whether planning for this dam went beyond an initial survey. The resulting reservoir would have flooded the entire meadow. (USGS Map on file with Open Space and Trails.)

Joseph Grange acquired the meadow in the forties, and raised cattle and potatoes there. At that time, the Grange holdings included lands above Marble as well as Rock Bottom Ranch and lands near Emma which have remained in the family to the present time. (Both Rock Bottom Ranch and the Emma Ranch have now been protected with conservation easements.) Kelly Grange inherited Filoha while his brother Emil ended up with the Emma property. Kelly, and his cousin Billy, both recall taking their draft horses up the Crystal to plow the potato field near the present beaver pond. When the plowing was done, the horses were released to find their own way back to Rock Bottom Ranch.[2] Billy also recalls that the old railroad grade was commonly used to travel up and down the Crystal Valley, until subdivisions began to claim the larger tracts.

During this same period, the McClean family reopened the mine above the old Van Sycle cabin, extracting ochre for paint pigment. Kelly Grange would later be employed in the Coal Mine above Redstone, and built a house between the highway and the river during the nineteen sixties. In 1978, Kelly subdivided off the southern part of the ranch and sold it to Dr. Bernarr Johnson, who intended to utilize the hot waters for arthritis therapy. Dr. Johnson had practiced in Ethiopia, where "hot water" is called "Filoha"; his wife Dorothy so named their land. The name has since captured the public imagination, as reflected in our decision to formally give this name to the entire meadow. Johnson had tried also to acquire the old Penny Inn, but the parcel lines were set by Grange to retain this. Sometime later, to Johnson's dismay, this structure was removed.

[1] Some sources use the name "Van Dycle"
[2] See, e.g., Crystal Valley Echo and Marble Times, March 2007, p 12-14.

In the early nineties, Grange sold his remaining 140 acres to Gerry Greenwald. Around this time, Disney filmed "Tall Tales" on site, building a faux homestead in the process. Johnson has since integrated materials left behind, including the notable water wheel, into his smaller greenhouse. Greenwald would then subdivide his portion into four parcels, and seek development approvals for an equal number of luxury homes in the meadow. The "Battle of Penny Hot Springs" ensued when Greenwald sought to place a new access bridge over the roadside pools. He eventually abandoned further development plans and listed the property for sale in 2000, thereby allowing Pitkin County to acquire it as permanent open space.

3.3.4 Agriculture

The Grange family used the pastures for grazing and haying for many years and potatoes were grown on a flat near the river on the south end. The Wilke Ditch was the main source for irrigation water and once Kelly Grange sold part of Filoha the agricultural use was sporadic and eventually ceased. The effects of grazing are widespread on the property with non-native pasture grass being introduced and noxious weeds proliferating.

3.3.5 Structures

Along the Railroad Grade, where the road tees down to the Johnson Greenhouse, stands an old barn that dates at least back to the nineteen thirties, and appears in a photograph showing the old Penny Inn and passenger train. Near the barn is a smaller building that Dr. Johnson reports was a bunkhouse.

Near the river, just below the Johnson Bridge, are the remains of a bathhouse, which collapsed during the nineteen nineties. Another bathhouse once stood over the pools at the Visitor Use Area, as featured in historic photos, but has vanished without a trace.

Across the river from the Visitor Use Area lies the remains of a structure that was standing as recently as 1967, when it was photographed by Dell McCoy for his book, The Crystal River Pictorial (see page 45). McCoy states that this structure was a stage stop that was originally built prior to the completion of the railroad in 1892. It is in the approximate location of the Van Sycle cabin identified on the May 1890 Frank Monroe map, which does not otherwise depict any structures in the area; hence we surmise that Van Sycle's cabin and the stage stop were likely one and the same.

More modern structures include a covered viewing platform near the beaver dam that was built by Bernarr Johnson. Some of the materials used here were left over from the Disney movie set. Finally, the Greenhouse 2.5-acre parcel retained by the Johnson family includes a greenhouse/workshop. Adjacent to this is a waterwheel that is a modern relic of the "Tall Tales" movie set.

Potential partnerships with historic preservation organizations will be pursued to develop a plan to protect the historic structures and provide interpretation of the historical resources.

4.0 NATURAL RESOURCES

Vegetation and wildlife on Filoha have been extensively studied by independent consultants procured by OST and both a Wildlife and Vegetation Report have been completed and are included in this plan. OST acknowledges and appreciates the work of Lisa Tasker of E.M. Ecological for the vegetation report and Jonathan Lowsky of Colorado Wildlife Science for the wildlife report.

Fieldwork for both studies began in 2004 and will continue indefinitely to monitor conditions on Filoha. The wildlife report in Appendix B was originally completed in 2005 and has been updated in January 2008 to ensure all findings and management recommendations are still valid. The vegetation report contained in Section 4.1 and Appendix A was completed in 2007.

4.1 Vegetation Resources

From surveys and assessments conducted so far, Filoha has proven to include noteworthy vegetation resources. Visual representation of important attributes is shown in Figure 1 in Appendix A. Much of the property is in good condition, however other areas reflect impacts from past land use activities such as hot spring water channelization, hay production, vegetation manipulation, irrigation, cattle grazing, railroad, a movie set and more current influences including noxious weed invasion and fire suppression.

A portion of the landscape consists of intact, native vegetation communities typical of the surrounding area as well as wetlands and plants that are very atypical and rare both in the watershed, the state, and the entire United States. Notable **vegetation** characteristics include:

- **Shrublands**-the shrublands on the steeper hillsides of the property are in excellent condition.
    - **Oak and sagebrush shrublands** – these communities provide essential forage for deer, elk and area bighorn sheep, berries and nesting sites for songbirds and blue grouse as well as acorns and calories for bears. Winter forage in these areas can be essential for area ungulates and is critical winter range for a herd of bighorn sheep. The diverse vegetation structure provides wildlife cover and much of the upper slopes immediately rising from the Crystal River valley floor consist of these mixed mountain shrublands.
- **Wetland and Riparian Communities** – healthy riparian and wetland communities make up a good part of the western portion of the property. These productive sites provide varied habitats for numerous wildlife species as well as ideal conditions for four species of orchids, two of which are tracked by the Colorado Natural Heritage Program due to rarity. These riparian and wetland areas are also crucial for recharging groundwater that is discharged later in the season helping to maintain Crystal river base flows.
    - **Wet Meadows** – There are both fresh water and hot, mineral spring fed wetlands. A good portion of the calcareous wet meadows consist of beaked spikerush (*Eleocharis rostellata*), a rare species in the state and in most occurrences in the U.S. Approximately 15 acres are currently dominated by beaked spikerush with many more also harboring the species. Other wet meadows consist

predominantly of bulrushes, sedges, willows, and common reedgrass each typically mixed with at least some beaked spikerush present.

- **Riparian habitats**- Healthy stands of cottonwood dominated woodlands with especially diverse vegetation structure, line the majority of the Crystal River banks on the entire southern half of the property. In spring, elk use the right bank areas for calving in the more densely vegetated sections while songbirds nest throughout.

- **Woodlands** – Rocky Mountain juniper intermingle with Gambel oak on three south/southwest-facing, sloped, outwash areas where soils are rockier and less developed. Upper, steep, rocky cliffs and hillsides support pockets of Douglas fir intermixed with Gambel oak and oceanspray.

  - **Juniper Woodlands-** Stands of Rocky Mountain juniper with Gambel oak provide a stark contrast to the open grassy meadows and sagebrush and pasture grass areas that abut them. The contrasts between the vegetation structure of the woodland versus the adjacent more open meadows provides a mosaic of vegetation that may very well be the key elements currently keeping the bighorn sheep so dedicated to this area as winter habitat.

4.1.1 Threats to Vegetation Resources

- **Weed infestations** - The introduction of exotic plant species and noxious weeds displaces native vegetation and wildlife habitat. Some of the troublesome weeds to date are Japanese brome and downy brome or cheat grass, oxeye daisy, Canada thistle, bull thistle, plumeless thistle, tamarisk, hound's tongue, sulfur cinquefoil, common burdock, common tansy, yellow toadflax, chicory, and perennial sowthistle. Many acres within the open meadows and sagebrush sites are covered with Eurasian pasture grasses that can be every bit as aggressive as many noxious weeds and successfully displace native vegetation.

- **Juniper expansion** - The absence of fire will continue to allow the increase in the canopy covers of Rocky Mountain juniper and other shrubs. Denser stands could eventually carry fuel loads so high that if a fire occurs, temperatures may be hot enough to impact the existing native seed bank necessary for revegetation afterwards. Further monitoring should be done to find the rate at which new recruitment and canopy covers are increasing. This information should inform future decisions regarding manipulation of tree cover densities.

- **Water Impoundment** - Additional trapping or **capture** of hot spring waters or increasing **surface water channelization** would all result in loss of wetland vegetation and alteration of existing plant communities.

- Increased Crystal River **water diversion(s)** upstream from the property-resulting in the loss of either high springtime pulses or the loss of base flows. Any new water resource development should be watched closely including proposed hydroelectric dam operations and potential impacts. Seasonal peak flows are essential for the long term viability of riparian vegetation and the recruitment of genetically new cohorts. Sediments and

gravels are moved and redeposited during these events. Cottonwoods and willows, for example, require wet, bare substrates such as these, in order for seeds to germinate and survive.

- **River down-cutting** due to the presence of Highway 133 has resulted in entrenched or channelized river reaches both on the property and upstream. Eventually, riparian communities and streamside wetlands can be left high and dry when the river channel elevation decreases and becomes incised due to the influences of bank armoring or meander straightening. Stream channel downcutting keeps the river from accessing the historical floodplain.

4.1.2 Historic Vegetation

Future land management decisions can be better guided by descriptions of past conditions and trajectories. Several factors should be investigated to piece together an accurate reconstruction of past vegetation conditions. Insights into the past give a point of reference. Conditions that drive the ecological characteristics of the area, such as climate, hydrology, and fire history should be examined. In order to understand the development and succession of the vegetation communities, the basic ecological characteristics of dominant species should be reconstructed within the parameters of the lands historic and physical conditions. Speculation regarding the likely historic distribution of the vegetation communities can then be hypothesized and drives current management strategies.

Since European settlement in the Roaring Fork Valley, much of the vegetation has been altered, especially along the valley floors and on flat mesas where soils were typically deeper and slopes were less steep. Large expanses of the mixed mountain shrub communities and sagebrush shrublands have been cleared and much of Filoha is also altered in this way. Thousands of acres of native vegetation communities in the Roaring Fork watershed were converted for agricultural purposes over a hundred years ago, changing montane shrublands and sagebrush expanses predominantly to hay fields planted with exotic pasture grasses.

The historic plant communities at Filoha were almost certainly similar to what exists today, but most likely without the open, upper, dry meadows on the property and likely with a greater expanse of riparian associated vegetation riverside on some banks. The open, upland meadows are likely an artifact of human intervention. It is impossible to accurately measure how today's vegetation resources differ from the past, but they were likely very comparable in many respects, but likely very different in distribution. In the past, it was common practice to graze cattle on properties year round. **Riparian vegetation** was typically severely impacted and mostly denuded, leaving banks highly susceptible to erosion. Fortunately, few banks on the property reflect this level of impact.

In much of the watershed, large areas of **oak-serviceberry and sagebrush shrublands** were typically cleared to make way for the planting of smooth brome, crested wheatgrass and other Eurasian pasture grasses. Local shrubland systems, especially sagebrush communities, having not evolved with grazers but only with browsers or browsers that may do some grazing, saw extreme changes in understory composition with the introduction of prolonged grazing. Sagebrush seedlings and therefore sagebrush cover would increase with the degradation and elimination of understory forbs and bunch grasses. Less on-the-ground competition and disturbed areas of bare soil were perfect conditions for competition-sensitive sagebrush

seedlings to become artificially successful. Impressive efforts were often used to clear areas of sagebrush and it appears much of the southeast portion of the property was treated to some form of shrub removal. Several of the open meadows on the east-central and northern portions of the property were cleared and plowed and the plant assemblages reflect this level of disturbance. A "wildflower mix" was supposedly planted on several of the upper meadows for the "Tall Tales" movie set in the 1980's and they are now rife with downy brome and Japanese brome. Historically, it would have been very rare to have open, grassy meadows without some shrub component. Typically, these states would have been transitional and not have lasted for many years before a recognizable influx of both shrubs and forb species.

Rocky Mountain juniper is a constant presence within the local mixed mountain shrubland systems in most areas of the Roaring Fork watershed. With prolonged periods without fire, these systems consist of ever-maturing woody species, increasing in height and stem densities. Juniper appears to slowly colonize over time, increasing in numbers in areas of oak and serviceberry shrubland as these habitats are typically very suitable for juniper as well. Historically, with the build-up of flammable woody materials, including both trees and shrubs, these areas were ripe for fire and certainly experienced fires. With the influx of settlers and the increasing numbers of permanent residences, fire has been purposely and successfully suppressed. The difficult question to answer is at what level of fuel build-up will cause this area of the property to become susceptible to fire events with historically unprecedented high temperatures. When is this threshold crossed? And which wildlife species benefit from current conditions and which ones would benefit from a community with more of a mosaic of shrub age classes and thinner densities of juniper?

The hot springs fed wetlands have most likely been **wide-open meadows uncolonized by trees or shrubs** for a long time without any human intervention. This is in all likelihood due to the hot temperatures of the springs and the thick layers of minerals continuously being precipitated out onto soil surfaces. These conditions cannot support the areas typical riparian species, but instead select for more specialized wetland plants. Much of the hot spring water has been captured and channelized by previous property owners. Currently, these channels are set to be managed similarly into the future. Any further hot spring water capture would decrease the extent of the current wetlands. It is likely that wetland acreage was dewatered to a large extent following the initial capture of some of these waters into dugout channels. Over time, a new equilibrium was set and the existing plant assemblages reflect this.

The upper irrigation lateral to the east of the beaked spikerush and other mineral spring-fed meadows, historically provided additional ditch water to these wetland sites and increased the size of the these **wetland communities**. This lateral has not been filled in several years and the wet meadow has adjusted to these drier conditions. Most likely, the upland species are increasing on the eastern edge of the wet meadow and wetland species coverage is shrinking in extent in response to a return to historically drier conditions.

4.1.3 Vegetation Descriptions and Map

All detailed vegetation descriptions and Map are located in Appendix A.

4.2 Wildlife

The Wildlife Resources report is attached in Appendix B.

5.0 VISITOR SERVICES

5.1 Recreation Potential

Prior to adoption of this Plan the property has been closed to the public except for environmental education programs and the Penny Hot Springs located on the east side of the Crystal River along Highway 133. This closure of the main property has allowed OST to study the property without any additional human impacts. This closure has been successful with very few violations witnessed by OST staff, the Colorado Division of Wildlife (CDOW), and local citizens. All reported violations have been prosecuted.

From the vegetation and wildlife studies conducted on the property, two travel management corridors and one Visitor Use Area have been established to limit human disturbance on the property and provide access for the public. The travel management corridors and Visitor Use Area are depicted on Map B. The entire property on the east side of the Crystal River including both travel management corridors has a **seasonal closure** to protect critical bighorn sheep and Rocky Mountain elk habitat from **October 1 – June 30**. This closure will be strictly enforced similar to our prior closure. There is zero tolerance for violations of the closure and all violations will be prosecuted. Only OST personnel or their assignees and special uses permitted in Section 5.4.2 will be allowed access to the property on the east side of the Crystal River during the closure. The Visitor Use Area will not have a seasonal closure due to it's proximity to Highway 133 and history of year round use. OST also has an access easement from Highway 133 through a private parcel that includes the Greenhouse on the east side of the Crystal River, where the waterwheel is located. Use of this easement is reserved for guided education programs with prior landowner notice and maintenance access.

5.2 Recreation Resources

5.2.1 Trails

<u>Travel Management Corridors and Visitor Use Area</u>

Travel Corridor A – As discussed above, the historic Crystal River Railroad traversed the property and the rail bed still exists on the property. This rail bed defines Travel Corridor A (See Photo 1). The rail bed will be maintained at no more than its current width of approximately 6-8 feet as a soft surface trail with no imported materials such as crusherfines or gravel. Since most wildlife use of the property is nocturnal during the time when Travel Corridor A is open there will be a night closure of the property from ½ hour before sunset to ½ hour after sunrise. A portion of Travel Corridor A traverses USFS land and OST recognizes that, although this is a remnant of the Crystal Wagon Road and Rail Grade, it is not an official USFS trail. OST will continue to work with the USFS on management issues and will encourage the USFS to manage adjacent sections of the railroad grade in accordance with this plan, including seasonal closures and limits on types of recreation.

Photo 1-Former Rail Bed

To minimize potential recreation management problems as the public is introduced to this area; neither equestrians nor bicycles will be allowed. Equestrian use is known to introduce non-native seeds from horse manure and feed. Even certified horse feed contains non-native grass seeds that are not compatible with the goal of OST to return Filoha to native vegetation.

Travel Corridor B and Viewing Blind – From the south end of Filoha by the Wild Rose Subdivision, there is an old road that leaves the rail bed (Travel Corridor A) and traverses downhill towards a viewing blind (see Photo 2) created by the former owner. This old road is Travel Corridor B (see Map B). The road will be allowed to revegetate and reduce in width to 4 feet. The surface will remain dirt and will allow visitors to access and view the beaver ponds. This viewing blind, named Beaver View will remain and be used to limit human encroachment into the beaver enhanced wetlands. There are outstanding bird and other wildlife watching opportunities at Beaver View. Beaver View is an excellent place to perform environmental education programs and will be used extensively during the summer to provide programs to the public. To protect the fragile wetlands, public access to Travel Corridor B will be limited to groups guided by staff or trained volunteers.

Visitor Use Area – Penny Hot Springs is locally famous for the hot springs right next to the Crystal River. [3] Every year after the spring runoff, people rebuild the pools that provide hundreds of locals and travelers along Highway 133 a place to soak in a spectacular setting. Even though located next to Highway 133, the sound of the Crystal River drowns out the cars and allows a great view of Filoha. OST will allow the current use of the hot springs year round.

Photo 2-Viewing Blind

With the hot springs being located on the Highway 133 side of the Crystal River, this area will be the only place for parking motor vehicles to view Filoha and access the Crystal River. OST will work with the Colorado Department of Transportation and the Scenic Byway Committee to consider trailhead signage and potentially a kiosk with natural history and resource information and a spotting scope. OST will also work to maintain a safe, sustainable trail to the hot springs.

5.2.2 Trailheads and Access

Trailhead kiosks will be installed at the entrance to Filoha from Redstone through the Wild Rose Subdivision and potentially at Penny Hot Springs (the Visitor Use Area) along Highway 133. These are envisioned to be small one or two panel kiosks that provide user information similar to what OST installed on Smuggler Mountain and James H Smith North Star Open Space. OST will work with the Colorado Department of Transportation (CDOT) and the Scenic Byway Committee to determine the type of kiosk to develop along Highway 133. As mentioned in section 5.2.1, the Visitor Use Area is the only place cars are allowed to park and OST will work with CDOT on any modifications to the pull-off where parking is occurring.

[3] Technically speaking, the hot springs adjacent Highway 133 were named “Granite Hot Springs” in the water rights adjudication, whereas “Penny Hot Spring” was the adjudicated name of a hot well that lies in the meadow on the east side of the river. However, the name “Penny Hot Springs” is commonly understood to refer to the road side pools, and this Plan adopts that nomenclature.

Currently, the only access point for Travel Corridor A and B for the public is from Redstone on bike or foot, along Redstone Boulevard to the North Entrance of Redstone onto Dorais Way, which starts as USFS property. All parking for Filoha will be at Redstone or Elk Park. A trail easement between the Redstone Campground, along the old RR grade, to the south end of the onsite travel management corridors, was created by the Wild Rose Ranch Subdivision Plat (see Book 14, page 55 of the Official Records of Pitkin County). All visitors on bicycles will need to leave their bicycles at the entrance to Filoha on bike racks at the entrance. OST will work with the homeowners in the Wild Rose Subdivision and the USFS on management of visitor access along the public trail easement and federal lands through signage and other means.

OST will also work with the USFS on their plans for the lands along the Crystal River south of the north entrance to Redstone. Currently, the lands have roads that allow vehicles onto the beaches along the Crystal River. The USFS is in the beginning phase to plan for the restoration of the area and create a parking area. OST will work with the USFS on any plans for creating a parking area since it would also be a potential trailhead for visitors accessing Filoha. There is also potential to work with CDOT on the pullout near the north entrance to Redstone to create additional trailhead parking. All of these options will be explored. OST will provide signage and work with the Pitkin County Sheriff's Department to prevent any illegal parking along Redstone Boulevard.

5.2.3 Angling and Boating

All fishing and boating access will only be allowed to occur from the Visitor Use Area. Anglers and boaters will be allowed on the Crystal River through Filoha, but must respect the closure to access on the east side of the Crystal River and private property on the west side of the river. CDOW manages the Crystal River through Filoha Meadows as a put and take fishery, which allows species to be caught and taken from the river. OST will work with adjoining neighbors to determine if it is desirable to designate this stretch as catch and release and have OST provide the enforcement of that designation.

5.3 Dogs and Other Domestic Pets/Livestock

Dogs and all types of domestic pets/livestock are prohibited on the entire property to protect wildlife on the east side of the Crystal River and to protect the health and visitor enjoyment of the Visitor Use Area on the east side of the Crystal River. This restriction will be strictly enforced with a zero tolerance policy.

5.4 Commercial and Special Use

Commercial use of Filoha will not be allowed.

5.4.1 Special Use Permits

Special Use Permits will be required for any use that is not listed in this plan. This includes any organized use of the property. Some special uses have been occurring on the property and they have been limited to environmental education and scientific research.

The types of Special Use that will require a permit and potentially be allowed on the property are:

- Environmental Education beyond what is provided by OST
- Group visitation higher than 10 people
- Scientific research not initiated by OST

5.4.2 Special Use Permits during Seasonal Closure

Except for OST personnel or their assignees, only school groups will be allowed access to Filoha on the east side of the Crystal River during the October 1 – June 30 seasonal closure. Limitations on school group access will be restricted to the area illustrated in Map C, prior notice to adjacent landowner since this access is on an easement through private property, a group size of no more than 20 people, and to the months of May, June and October.

5.5 Education

One of the main goals for the management of Filoha is to provide environmental education to visitors of Filoha. OST sponsors programs by the Roaring Fork Conservancy to educate visitors on the unique natural resources on the property. To date, two programs have been held each year, one to show off the orchids and fireflies (see Photo 3) and the other to hear the elk bugle.

OST will work with the Roaring Fork Conservancy and/or other educational organizations to develop additional education programs on the property. A regular schedule of environmental education programs will provide the many visitors to the Crystal River Valley and Pitkin County residents a chance to learn about the unique natural resources of Filoha and develop a connection to the property to help OST manage Filoha. Our goal is to develop a volunteer stewards program to strengthen our oversight of the area. This will enhance our enforcement of the seasonal closure and allow the public to take ownership of the property that their tax dollars purchased. Education programs sponsored by OST are exempt from special use permits and can access the entire property at all times during the July 1 – September 30 open season.

Photo 3-Firefly Walk

Interpretive signage will be developed and displayed at the south entrance to the property where both Travel Corridor A and B originate. This will help explain the significant natural resources of Filoha and illustrate why recreation is limited. Interpretive signage will also be created at the Beaver View since wetlands are a main focus of the environmental education on the property. OST will work with interested parties, including CDOW, Roaring Fork Conservancy, USFS, and Redstone Historical Society to create interpretive signage that gives visitors a comprehensive overview of the natural and human history of Filoha.

5.6 Hunting

Hunting on Filoha will not be allowed and discharge of firearms is prohibited as per OST Title 12 regulations.

5.6.1 Hunting Exception

Both the vegetation and wildlife surveys suggest that resources are being impacted by excessive ungulate browsing. Hunting is a management tool to limit these impacts and allow the natural vegetation to recover. OST is working with CDOW to monitor herd density in the area around Filoha. Hunting is allowed on the adjacent USFS lands and in coordination with CDOW limited access to those lands from Filoha could be granted by the OSTB if CDOW demonstrates evidence that the elk, deer, or bighorn sheep populations need to be managed by reducing populations and/or reducing the refuge effect.

5.7 Fencing

OST has been removing fence since the first property was purchased. In 2005, OST, the Roaring Fork Conservancy, and volunteers removed the main fence bisecting the property. This fence has been reused on Smuggler Mountain Open Space. The only remaining fence is located along the property boundaries. To protect wildlife and allow uninhibited movement, no new fence will be built on the property. Boundary fences may be maintained to identify the property for management purposes.

5.8 Facilities

OST does not predict high visitor usage that would necessitate the installation of restroom or other facilities. Public guided and unguided use will be monitored to track levels of use and OST will develop thresholds, with the help of Pitkin County Community Development, to determine levels that will require restroom or other facilities.

The Beaver View viewing blind will be maintained in its current condition and only necessary improvements to improve safety will be performed.

6.0 SPECIFIC MANAGEMENT ACTIONS

6.1 Vegetation Resources

6.1.1 Non-native Species and Native Species Restoration

From the vegetation resources plan there is a substantially diverse biodiversity of vegetation species at Filoha. Protection of the unique wetland plant communities is paramount for the management of Filoha. Both travel management corridors and the Visitor Use Area keep human activity away from the sensitive species and completely out of the wetland plant communities. Only guided environmental education programs will be allowed to visit these areas. The orchids and other wetland vegetation are fragile and any impacts will be avoided. Specifically OST will:

- Continue noxious weed treatments and drill seed native grasses and wildflowers as identified in the vegetation resources plan to provide competition.

- Concentrate on the eradication of the annual grasses Japanese brome and downy brome commonly referred to as cheatgrass. This was identified in the Wildlife and Vegetation Resources Plan as one of the greatest threats to wildlife and native vegetation species on Filoha.
- Monitor habitat and stream health of the Crystal River through Filoha.
- Continue stream orchid pollinator study.
- Re-monitor transects every 3 years to watch stream orchid population numbers, determine plant community health, changes in vegetation, and to determine the need for selective thinning or other management techniques on the property and specifically in the Gambel oak communities.

Weed treatments began in 2004 using selective herbicides and mechanical removal. Noxious weed removal is the priority management action that will occur on the property. As the weed problems are being contained, OST is restoring the abandoned agricultural meadows back to native grasses and shrubs. In some areas this is already naturally occurring and those areas will be allowed to expand.

6.1.2 Riverbank Restoration

Photo 4

Some riverbanks along the Crystal River have been identified as eroded and downcut. Photo 4 illustrates one location across from the Visitor Use Area that is in need of restoration. The presence of Highway 133 along the Crystal River has influenced both river channel elevations and river banks on many river reaches up and down the Crystal River Valley. Past land management practices have also denuded at least one bank of the River on Filoha. Bank vegetation transformed or missing due to these influences will be identified for restoration of riparian vegetation where it can be supported under current conditions. A restoration plan will then be developed.

6.1.3 Tamarisk

Tamarisk, one of the most invasive noxious weeds along rivers in Colorado and the southwest United States, was found on Filoha in 2002. Photo 5 shows the size and location of the tamarisk infestation. The most likely sources of seed or branches are from boaters inadvertently bringing the species to the Crystal River upstream. All tamarisk seedlings and individual plants are mechanically removed when discovered during annual riverbank monitoring. The goal is to continue to keep tamarisk completely eradicated from the property.

Photo 5

6.2 Wildlife Habitat Management

6.2.1 Adaptive Management

Adaptive management is used on most OST properties since it allows staff to monitor conditions and adjust management as conditions warrant. OST uses Management Indicator Species to track the critical wildlife that occurs on each property and obtain data to make management

decisions. OST has been collecting bird monitoring data since 2004 and CDOW began population studies on bighorn sheep in 2006. The data obtained from these studies will be used to make future management decisions to improve wildlife habitat on Filoha.

Management Indicator Species

As detailed in section 1.5.3 and 1.5.4 of the Wildlife Resources Plan, the selected Management Indicator Species (MIS) for birds are the American dipper, cordilleran flycatcher, green-tailed towhee, and Virginia's warbler and for mammals are bighorn sheep and elk. Bird populations will continue to be tracked and thresholds developed to determine levels when management actions will be required to improve habitat. These thresholds will be developed before the property is open to guided tours in 2009. Elk are the only MIS for which population studies have not formally started, but vegetation use and impacts information has been collected and continual vegetation monitoring will be used to determine if elk populations on Filoha are sustainable. OST will work with CDOW to determine health of bighorn sheep and elk populations and develop thresholds that will require management actions. This will include track surveys and a vegetation assessment to determine areas of ungulate use and level of browsing.

Seasonal Closures

Following the recommendations in the Wildlife Resources Plan a **seasonal closure** will be placed on the entire east side of Filoha and on the public access easement along Dorais Way from Mountain Lion Drive to Filoha from **October 1 through June 30**. This will limit human disturbance during the critical fall, winter, and spring when bighorn sheep and elk are on Filoha and the surrounding undeveloped property. This closure will be enforced through OST rangers and CDOW. All violations will be prosecuted and clear signage will be posted at all potential entrances to Filoha. See Section 5.4.2 for special use permits required for any access during the seasonal closure. OST personnel or their assignees may access the property during the closure to perform necessary maintenance, research, and/or enforcement.

6.2.2 Fire

One of the most effective and controversial management tools is prescribed fire. From both the vegetation and wildlife studies on Filoha, fire is a management tool that has to be considered in the long-term management of the property. The majority of the plant communities on Filoha have evolved with fire and OST will work with the USFS to plan for the use of prescribed burns on Filoha and the surrounding national forest. Using prescribed fire on Filoha without incorporating the surrounding USFS land would not be beneficial to Filoha since vegetation communities transcend property boundaries, fire is hard to control, and larger prescribed burns are more beneficial and economically feasible. It will be critical to work on a large scale management plan with USFS to realize the potential gains fire can have on the associated habitats on Filoha and the surrounding national forest.

6.2.3 Mechanical Treatments

To mimic fire or provide other management goals, OST, with consultation from CDOW will determine if mechanical removal of vegetation should be conducted on Filoha. Mechanical treatments would provide fire-like effects to open areas and stimulate Gambel oak to regenerate and lower the densities of juniper. Once again, OST will have to work in close cooperation with

USFS since the vegetation communities transcend property boundaries; however, mechanical treatments can be used on a smaller scale and have been used by other land management agencies to provide small scale benefits.

6.3 Recreational Resource Management

Both travel management corridors have been selected to provide as little to no disturbance on vegetation and wildlife resources. These corridors follow established roads/paths and are situated away from critical vegetation resources or provide a structure like the blind at Beaver View, to mitigate any disturbance. The use of these corridors will be monitored and with the data from the MIS studies any changes to location or time of use will be adjusted to provide protection for wildlife. Trail use will be monitored using trail counters, feedback from volunteer stewards, guided trip counts, and tracking the number of violations. Trail use data will be reported annually to the OSTB.

OST will work to create a full-time seasonal ranger position, subject to budget approval , to regularly patrol OST property in the Crystal Valley. This position will help monitor Travel Corridor A and will provide enforcement on all OST owned lands, trails, and easements. OST will also continue working with neighbors of Filoha and residents of the Crystal Valley to develop a network of volunteer stewards to monitor visitor use and provide environmental education to visitors. The combination of a full-time seasonal ranger and neighborhood volunteer stewards will provide the best protection for Filoha, will limit visitor impacts, and create new stewards of the environment. The following are actions that will be implemented to educate visitors and limit any recreation impacts:

- Phase in public access by allowing guided only access in 2009 along Travel Corridor A and B.
- Develop a Volunteer Steward Program in 2009.
- Develop a signage plan to manage public use and interpretation in 2009. OST will work with the USFS, Dorais Way landowners, and other agencies to develop appropriate signage.
- Work with the Colorado Department of Transportation, Roaring Fork Conservancy, CDOW, Redstone Historical Society, and USFS to provide an informational Kiosk at the Visitor Use Area.
- Monitor guided access use in 2009 and report back to the OSTB in the fall of 2009 before opening Travel Corridor A to unguided public use in 2010.

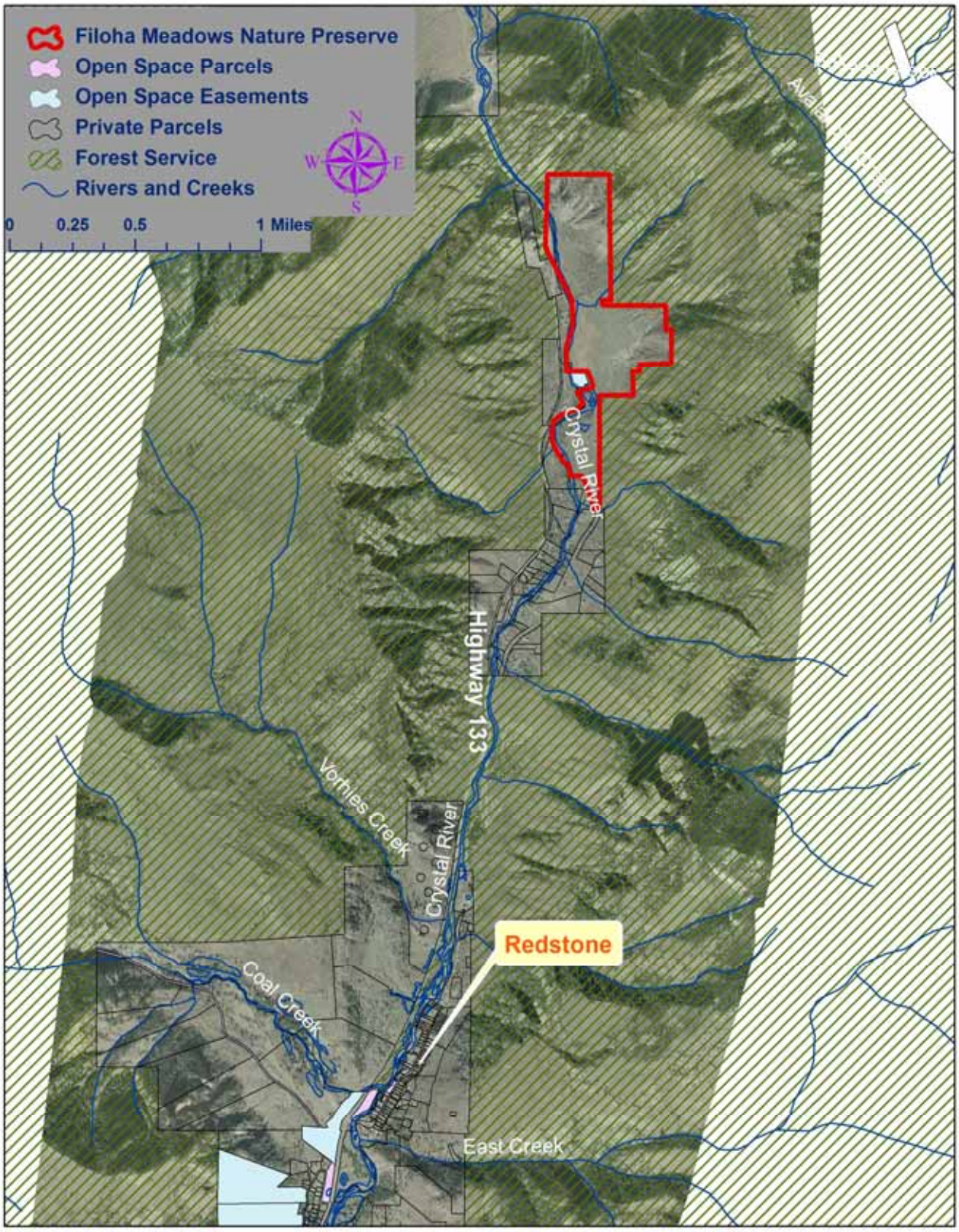
6.4 Education

OST will work to create the following to expand the educational opportunities on Filoha:

- Train the volunteer stewards to lead guided tours of Filoha.
- Develop interpretive displays for Filoha.
- Expand our partnership with the Roaring Fork Conservancy and potentially include CDOW, Redstone Historical Society, and USFS to provide more interpretation and environmental education programs on Filoha.

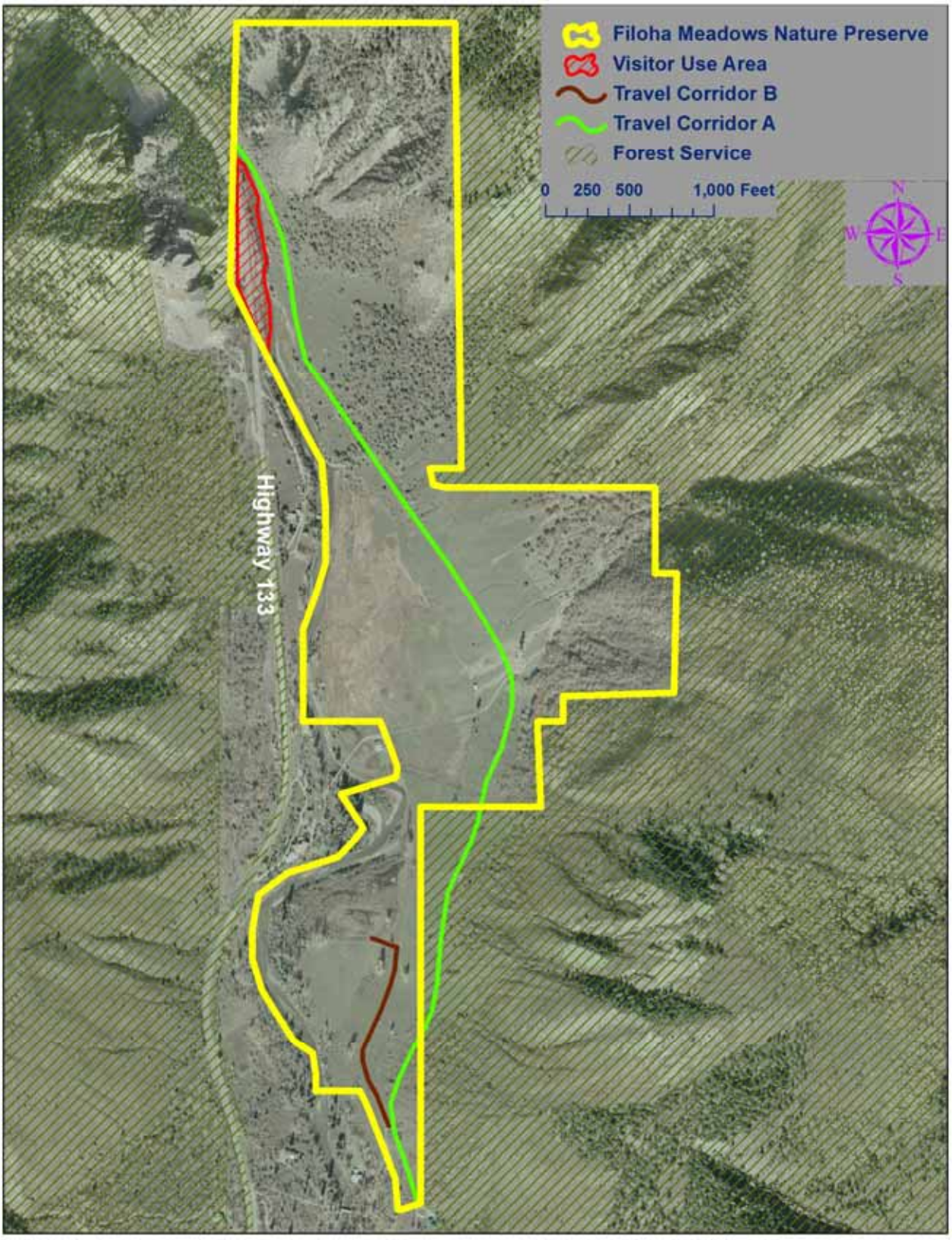
Map A

Location



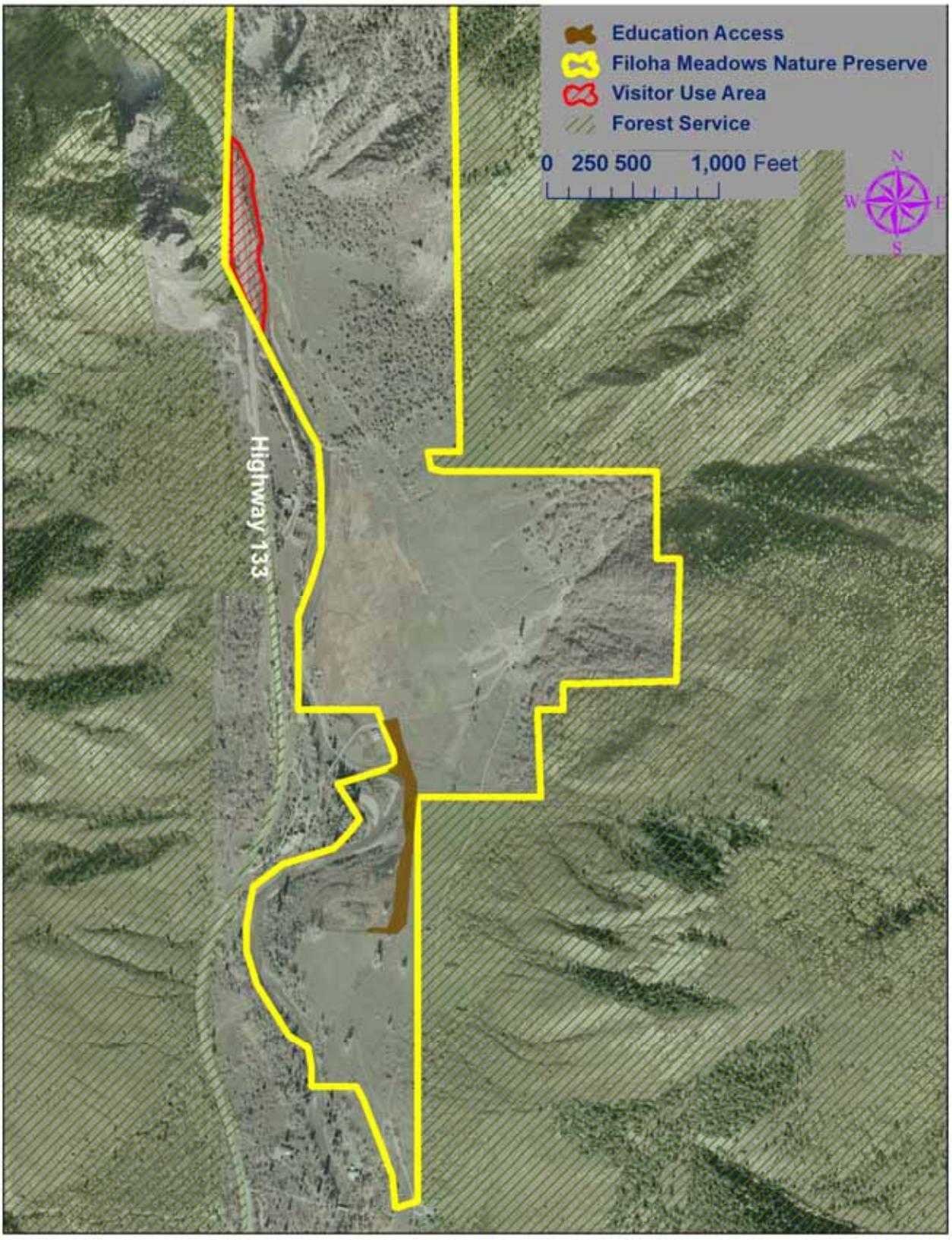
Map B

Recreation Resources



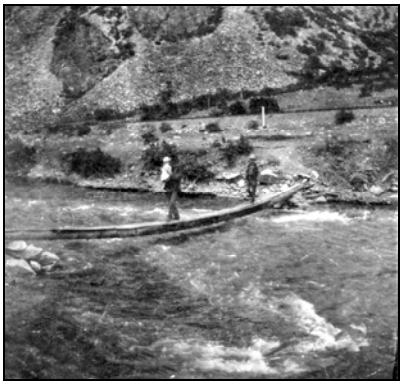
Map C

Special Use - Education Programs Access



Historic Photos

"Original Bathhouse at Penny Hot Springs"



"Penny Hot Springs Bridge"

"Hell's Gate"

Above Photos Courtesy of Sharon Bouchard

"Penny Hot Springs" Robert Richardson Collection, 1935.

APPENDIX A

Vegetation and Rare Plants-Resource Element Description

Summary Table:

Significant Elements

✓ **Wet meadows –** Support at least 3 species of orchids, two of which are tracked.

Stream orchid or giant helleborine
Epipactis gigantea CNHP ranked **S2/G3**
USFS "sensitive"species list

Canyon bog orchid or Few flowered rein orchid
Platanthera tescamnis CNHP ranked **S3/G4G5T3?**
(syn. *Platanthera sparsiflora var. sparsiflora*)

Also: Hooded ladies' tresses (***Spiranthes romanzoffiana***)
Northern green bog orchid (***Platanthera huronensis)***

Hot spring fed meadows also support at least 15 acres of a rare spikerush community:
Beaked spikerush herbaceous vegetation
Eleocharis rostellata CNHP ranked **S2/G3**
(CNHP Ranks, see Table)

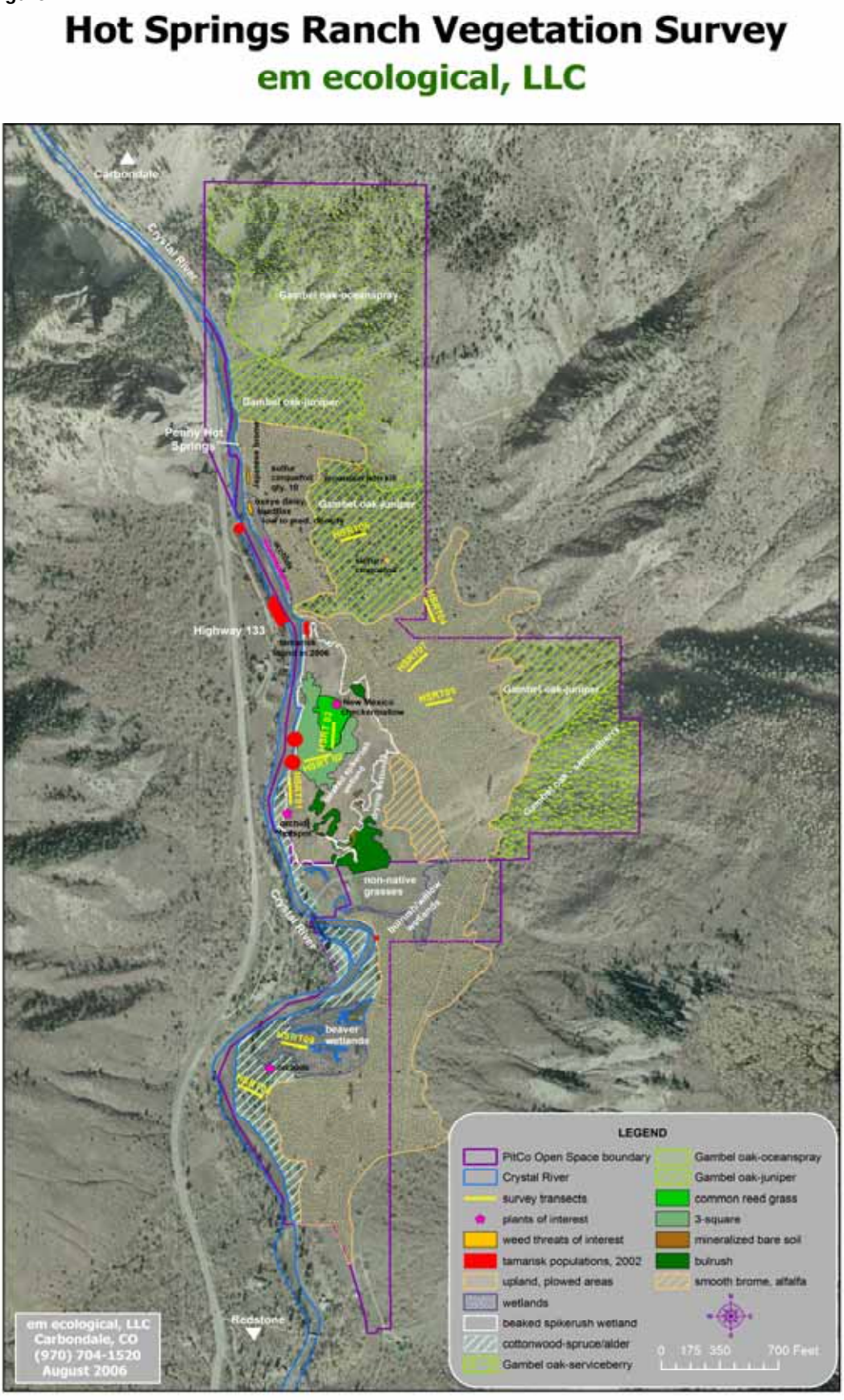
In the wet meadows, with high bulrush cover values especially, these areas support fireflies, an uncommon occurrence in the typically dry state of Colorado.

✓ **Wetland beaver complex –** this wetland provides important groundwater recharge to both area riparian and wetland vegetation soils and to the Crystal River when high spring pulses have long subsided.

✓ **Intact riparian woodlands –** the historic hydrologic regime at this section of the river is relatively unaltered compared to many other streams of this class size in the Roaring Fork Watershed. Retaining a close resemblance to historical flows in size, timing and duration in the river system is critical to the survival and persistence of these healthy, structurally diverse and species diverse, ecologically intact plant communities.

✓ **Mixed mountain shrublands -** have very few weed species at relatively low infestation levels on the upper slopes. These Gambel oak dominated shrublands, while locally abundant, are much less common when considered on a larger landscape scale context. They make up only 3% of the Southern Rocky Mountain Ecosystem, an area covering most of the U. S. Rocky Mountain States (Rondeau 2001). In contemporary ecology, any plant communities with minimal weed infestations are now considered exemplary and therefore significant. These shrublands are one of the most productive habitats for wildlife in the west, let alone the Crystal River Valley.

Figure 1.


Hot Springs Ranch Vegetation Survey
em ecological, LLC
Carbondale
Crystal River
Gambel oak-oceanspray
Gambel oak-juniper
Penny Hot Springs
Gambel oak-juniper
Highway 133
Gambel oak-juniper
non-native grasses
beaver wetlands
Redstone
em ecological, LLC
Carbondale, CO
(970) 704-1520
August 2006
LEGEND
PitCo Open Space boundary
Crystal River
survey transects
plants of interest
weed threats of interest
tamarisk populations, 2002
upland, plowed areas
wetlands
beaked spikerush wetland
cottonwood-spruce/alder
Gambel oak-serviceberry
Gambel oak-oceanspray
Gambel oak-juniper
common reed grass
3-square
mineralized bare soil
bulrush
smooth brome, alfalfa
0 175 350 700 Feet

Summary Table (cont.):

Significant Elements (cont.)

✓ **Rocky/ Tall shrublands –** the major value of these sites is habitat for bighorn sheep. Ocean-spray is the main plant in this vegetation community that figures to a large extent in bighorn diets (Johnston 2001). Numerous droppings, trails and beds suggest this is a high use area for the local bighorn herd, with the majority of this community on adjacent forest service property to the east and north.

Threats to Significant Elements

✓ The presence of **noxious weeds** on the property is a management concern due to their relative abundance both in the upland meadows and in the vicinity of the rare plants. Concerns about noxious weeds include the replacement of native vegetation, decreasing biodiversity, creating increased understory fuel loads and ultimately degrading wildlife habitat.

✓ **Juniper expansion** and **fire suppression** are creating higher fuel loads. The juniper component of the Gambel oak/ Rocky Mountain juniper sites will most likely continue to increase. Increases in juniper densities will potentially provide extensive fuels, in addition to the Gambel oak. Subsequently if a fire was to occur, these burgeoning fuel loads could potentially create fire intensities and temperatures ultimately problematic to post-fire native species regeneration.

✓ **Changes in the Crystal River hydrograph**, alterations in the **flow and extent of the mineral hot and cold spring waters**, and **increase in the water diversions up river** are all threats to the wetland and riparian plant communities and the bird and wildlife species that rely upon them. Changes to nutrient loading in the system would also cause alterations.

Vegetation Descriptions

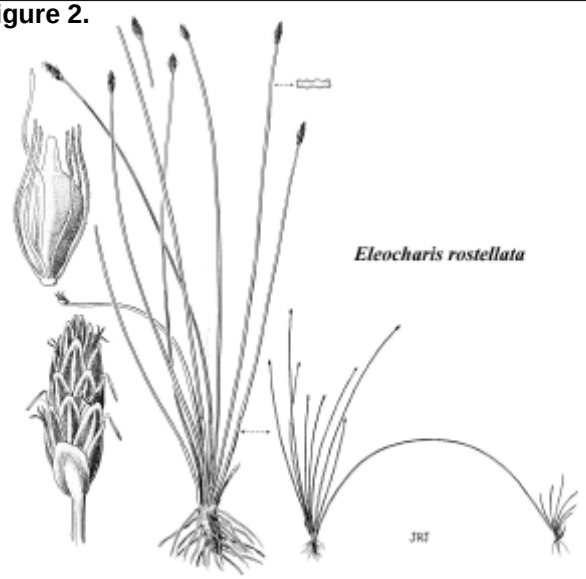
The narrow Crystal River Valley is a dramatically scenic landscape with steep slopes rising up on either side of the river throughout most of the watershed. There are plant communities of both xeric and mesic origins all influenced by abiotic factors such as elevation, aspect, physiography, and geology. Not only do these natural features influence and define the establishment of the vegetation communities, but so do past land management practices. Activities such as grazing, farming, irrigating and infrastructure like the roads, railroad corridor and buildings all affect vegetation. Average annual precipitation records for Redstone, just upstream, show from 1979-1994 the average annual accumulation is 27.7 inches. As elevation increases while traveling up the hillsides flanking both sides of the Crystal River, so do precipitation values. The changes in plant species composition reflect these increases in available moisture.

Riparian and wetland communities inhabit areas directly adjacent to the river or near springs and seeps. Oak or mixed mountain shrublands dominate the lower slopes just as they rise up from the flatter valley floor. Interspersed occasionally are sagebrush shrublands, often early seral to the mixed mountain shrublands in this area and typically highly impacted. Rocky Mountain juniper can be seen interspersed within much of these shrublands at the lower elevations. Douglas fir can be found typically on steeper rocky hillsides and Aspen forests enter above the mixed mountain shrublands at higher elevations on more mesic sites. Ocean-spray or rockspirea is a common shrub also found on rock talus hillsides typically with Gambel oak and an occasional Douglas fir patch (Natureserve. 2007). Ponderosa pine, in numbers far fewer than prior to settlement, can be seen occasionally streamside and inadvertently throughout the valleys and mid-elevations.

Wet Meadows

Mineral Spring-fed Wet Meadows – A prominent feature of the property is the expansive herbaceous wet meadow devoid of typical woody, riparian vegetation all the way to the rivers edge. This large, mineral-rich, spring-fed wetland is directly adjacent to the Crystal River just upstream and across the river from the Penny Hot Springs Visitor Use Area. Most notable is the presence of **beaked spikerush** (***Eleocharis rostellat****a*) which occurs throughout the meadow and dominates plant cover on over 13 acres. This uncommon wetland association is typically associated with mineral springs and calcareous or alkaline sites and on Filoha, this occurrence is no exception. Analyses of the hot spring waters done in 1976 and 1980 reveal very high levels of calcium carbonates, iron, sulfates, sodium and other minerals. As these flow out onto the soil surfaces, precipitates fall out of solution and can form odoriferous soil crusts locally and typically support specialized vegetation.

Figure 2.



Beaked spikerush (*Eleocharis rostellata*) is known from Vancouver Island to Nova Scotia, Canada south to northern New Mexico and the Greater Antilles, and in the South American Andes (USDA-plants. 2007). Although seemingly widespread, it occurs only in highly scattered, very disjunct populations. This accounts for it's presence on numerous state lists of sensitive, threatened, and endangered plants. Populations are very rare on the broader landscape and very few and far between (only 2 other recorded occurrences in Colorado, CNHP 2003) most likely due to the very specific substrates it colonizes. Therefore finding it at Filoha is very significant and constitutes a new record for the state.

Other notable attributes of *Eleocharis rostellata* include its designation as an obligate wetland species within Region 8 meaning it occurs within wetlands with an estimated probability of 99%. The species is also most likely important in the maintenance of natural wetland functions. Additionally, waterfowl eat the achenes (fruits), stems and roots (National Plants Database). Broad zones of this spikerush along streams and rivers, like the occurrence on FILOHA adjacent to the Crystal River, provide valuable feeding and nesting sites. Larger occurrences like at Filoha are considered a valuable source of food and cover for the waterfowl of this area (P. Hansen, et al, 1995). Palatability is known to be very low for livestock and trampling damage occurs readily with livestock use. (National Plants Database, 2007).

Figure 3.

Beaked spikerush sending out runners that will root at the ends. Photo L. Tasker

The beaked spikerush habitat typically occurs on sites prone to yearly flooding. It is considered an early colonizer, but is only able to persist under continued wet conditions (National Plants Database. 2007) which currently must be the case on Filoha due to its present dominance.

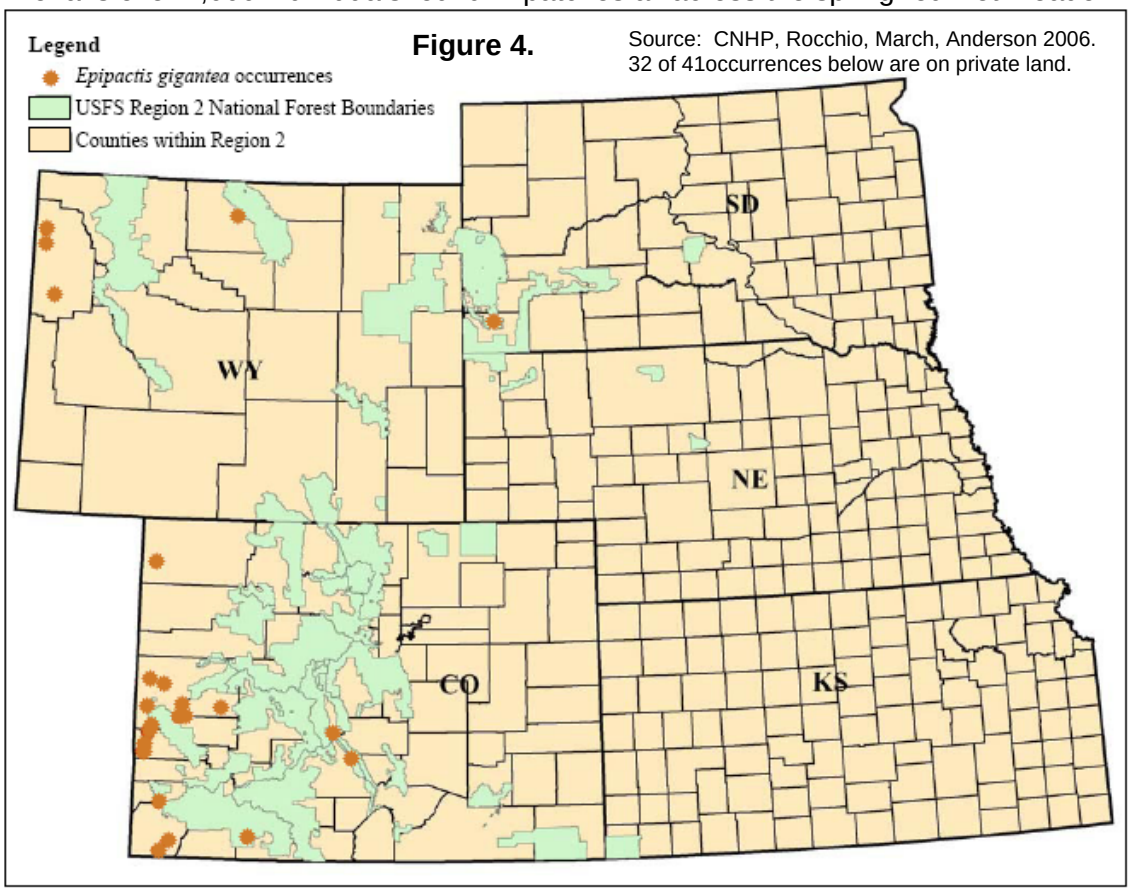
Disturbance and a drop in water table levels can dramatically increase the amount of invader species and out-compete the beaked spikerush. Beaked spikerush reproduces vegetatively and by seed. Regeneration vegetatively is by sprouting and layering from short shallow rhizomes (see **Figure 2** and **Figure 3**). Elongated layering stems arch to the ground and root in moist soil from an apical bulbil. It does not have long creeping rhizomes so is not as colonial as *Eleocharis palustris* or common spikerush, also on the property. On nutrient poor sites, more biomass is allocated to reproduction than on more fertile sites. The geothermal activity associated with the hot springs keeps the beaked spikerush dominated meadow mostly bare of snow in winter with steam visibly rising over active hot springs. This may play a role in the wet meadows attraction for area ungulates during winter months.

Orchids – Both the beaver wetlands and the calcareous wet meadows support at least three orchids. Two are tracked by the Colorado Natural Heritage Program (CNHP). **Stream orchid** or **giant helleborine** (*Epipactis gigantea*) has the highest rarity ranking with CNHP, of the three being ranked, and is listed as sensitive by the U.S. Forest Service. In Colorado it is listed as an S2 or vulnerable to extinction throughout its range due to the small number of documented occurrences or other extenuating factors (see Table 3 for CNHP Ranking System).

The range of the stream orchid is relatively wide, similar to beaked spikerush, but populations are quite disjunct and isolated (often by hundreds of miles) making it a very uncommon find. The species can be quite abundant when found, yet dense patches can represent a single genetic individual (a genet) with many hundreds of individual flowering stems (ramets) (Natureserve 2007). The less genetic diversity represented typically means the more vulnerable a species is. Populations of stream orchid are generally small but occasionally some populations are very large like the one at Filoha. The population estimate for Filoha is over 1,000 individuals found in patches all across the spring-fed wet meadow.

Figure 4.

Source: CNHP, Rocchio, March, Anderson 2006.
32 of 41occurrences below are on private land.



Stream orchid is found only in the western part of the country and is most abundant in the state of California. Eleven western states and British Columbia list it from (S1) critically imperiled to (S3) vulnerable. This rarity is most likely due to its very specific habitat requirements. Most importantly the

stream orchid needs surface water at the roots and any activity that lowers the water table will most likely extirpate it. Other described habitats, besides seeps and springs like at Filoha, have a common theme of having a constant, permanent source of water. These include lake margins and streambanks and like Filoha thermal waters are especially suitable habitats (Natureserve 2007). In Wyoming, stream orchid has only been reported to occur near hot springs (Rocchio, March, Anderson 2006).

Table 1. From NatureServe 2007 and Rocchio, March and Anderson 2006.

Nation	State/Province/District	S Rank
Canada	British Columbia	S2S3
USA	Arizona	SR
USA	California	SR
USA	**Colorado**	**S2**
USA	Idaho	S3
USA	**Kansas**	**No Rank**
USA	Montana	S2
USA	Nevada	SR
USA	**Nebraska**	**SU**
USA	New Mexico	S2?
USA	Oklahoma	S1S2
USA	Oregon	SR
USA	**South Dakota**	**S1**
USA	Texas	S3
USA	Utah	S2S3
USA	Washington	S3
USA	**Wyoming**	**S1**
Mexico		?

Known distribution of *Epipactis gigantea*.

Figure 5. Stream orchid on Filoha. L. Tasker photo.

Figure 6. Stream Orchid close-up. L. Tasker photo.

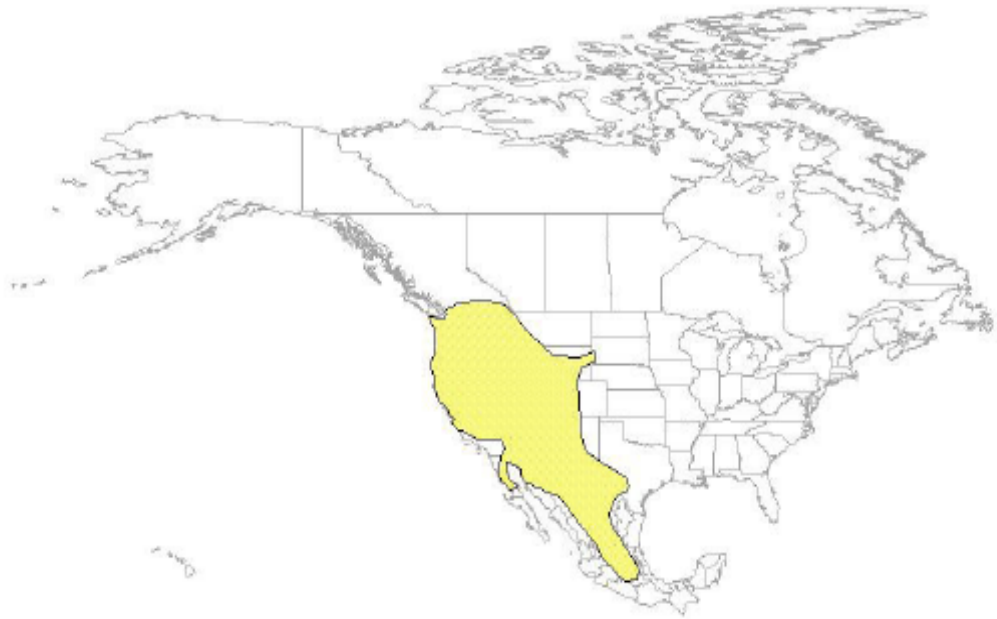
Figure 7. This area of the wetland (see Figure 1 for transect placement on the property) is where 413 stream orchids and 20 canyon bog orchids were recorded on ten 1X1 Meter square samples. Notice the noxious weed oxeye daisy is visibly prolific.

Figure 8. Lliterally hundreds, if not thousands, of stream orchids are present in large patches in the hot spring-fed meadows. This photo was taken July 1st in 2005.

The **canyon bog orchid** (Platanthera tescamnis, syn P. sparsiflora var. sparsiflora, syn Limnorchis ensifolia) , green bog orchid (Plantanthera huronensis), and **hooded ladies' tresses orchid** (*Spiranthes romanzoffiana*) were found in the same vicinity as the southern most section of the stream bog orchid occurrences within the mineral spring-fed wetlands (Jennings pers. comm.). A permanent monitoring transect (HSRT01) was subjectively placed within what appeared to be a dense area of stream orchids. The canyon bog orchid or few flowered rein orchid has have also been reported downstream 6.1 miles from Filoha or less than 2 miles upstream of where Thompson Creek enters the Crystal River. Other species present along this transect included beaked spikerush (*Eleocharis rostellata*), Arctic rush (*Juncus arcticus*, syn J*uncus balticus*), Rocky mountain gentian (*Gentiana affinis*), Nuttall's sunflower (*helianthus nuttallii*), smooth aster (*Aster laevis*), and blue-eyed grass (*Sisyrinchium montanum*).

Along a **50 meter linear transect** at HSRT01 (see Figure 7), a total of ten square meters were sampled for orchids. There were 413 stream orchids and 20 bog orchids along the transect. This gives some perspective on just how many orchids are potentially present in the area. The samples represent only a quarter of 1% of an acre or about 108 square feet. The hooded ladies' tresses were found just outside of the transect, approximately 8 individuals. Weedy species present and of concern were Canada thistle, oxeye daisy, yellow sweet clover (unlisted weed) and chicory.

Figure 9.



The North American distribution of the stream orchid *(Epipactis gigantea)*. Rocchio, March and Anderson 2006 and Luer 1975.

Figure 10. *Spiranthes romanzoffiana*, L. Tasker photo.

Figure11. *Platanthera tescamnis*. L. Tasker photo.

Beginning in the summer of 2007, a master's degree student began looking at the **pollinators** for the stream orchid on Filoha. In the literature, orchids are notorious for often having specialized pollinators. The stream orchid is said to potentially attract generalized pollinators, but the literature reports the plants may have a specialized relationship with syrphid flies. A recent, unpublished paper has reported that yellow jackets may be key pollinators in at least one area (Denise Wilson, personal communication 2007). Other wasps have also been suggested. Rocchio, March and Anderson (2006) report that self-pollination may also play a role, but further study is needed to assess its importance to reproduction. They also report that plants can reproduce vegetatively by means of short, fibrous rhizomes and this is a common means of increasing numbers. Very little is known about the stream orchid's seed longevity, dormant stages or seed bank dynamics.

The demonstrable competitive strategies of the stream orchid suggest it does have several competitive advantages even though other habitat requirements, like the need for water at the root zone, are restrictive. Vegetative **reproduction** is obviously one advantage. Yet stream orchids also produce numerous small seeds allowing for long distance dispersal by wind or water allowing for colonization of suitable habitat downwind or downstream. Seeds do require mycorrhizae in order to germinate but no detailed data exists in the literature on specificity of species of mycorrhizae (Rocchio, March and Anderson 2006).

Mineral Spring-fed Wet Meadows-other dominant species with beaked spikerush (Eleocharis rostellata):

There are approximately 1.9 acres of **hardstem bulrush** (*Schoenplectus acutus* var. *acutus*, syn. *Scirpus acutus*, Figure 12) and much of it is interspersed with the beaked spikerush. Again, maintaining the hydrology of these sites is the key to these wetland species persisting. Seeds and rhizomes of hardstem bulrush are eaten by waterfowl and stems are used for nesting. Like with many of the grass-like wetland plants, including the beaked spikerush, water velocities through hardstem bulrush are minimized and sediment movement is moderated.

Figure 12. L. Tasker photo

Figure 13. Hardstem bulrush is the taller, darker green species in areas with standing water. The beaked spikerush is usually still the dominant species, just residing in the understory of the bulrush. Photo L. Tasker

Common threesquare (*Schoenplectus pungens*, syn. *Scirpus pungens*) co-dominant with the beaked spikerush covers approximately 2.8 acres (Figure 14). Most notable are the stream orchids which are dispersed throughout all of wetland microsites where there is adequate moisture, regardless of what other dominant wetland species reside there. See Figure 1 for the extent of noticeably dominant common threesquare. Areas with the common threesquare co-dominant with the beaked spikerush are noticeably devoid of species diversity. Apparently these two species have a very good competitive advantage in these areas. Standing water was quite common on the transect on this site.

Figure 14. Common threesquare co-dominant with beaked spikerush. L. Tasker photo.

Common reed (*Phragmites australis*) is a species that is native to the United States and also native to Europe (Figure 16 and 17). It has been discovered that the European strains are actually different both genetically and subtly in morphological characteristics. Additionally, the non-native version has proven to be very aggressive and weedy. Fortunately, at Filoha the U.S. native is the species in the large mineral spring-fed wetland. It does not occupy much acreage, but is noticeable due to its height which can range around 6 feet or taller. It is spread across less than two acres (Figure 1.) The stream orchid is also fairly extensive in this area of the wetland. New Mexico checkermallow, (*Sidalcea neomexicana*) a relatively common and attractive pink forb, a wetland indicator species, is also found on this site (Figure 15).

Figure 15. New Mexico checkermallow. L. Tasker photo.

Figure 16. Common reed is the tall grass, much taller than any other species in the wet meadows. There are still standing dead stems from the previous season. Much of the understory consists of beaked spikerush. L. Tasker

Figure 17. Stream orchids in the understory of the common reed near a channelized outlet for hot spring water.

Riparian Woodlands

Table 2. The numeric values below are in linear meters. The method used follows CNHP's methods used for their "Field Guide to the Wetland and Riparian Plant Associations of Colorado".

HSRT08: 50 meter line transect-Narrow leaf Cottonwood-Blue Spruce/ Thinleaf Alder Woodland on Filoha										
8/21/2005										
Species:										
Alninc	Betocc	Padvir	Picpun	Popang	Salmon	Corsto	Roswoo	Acegla	Amealn	Crariv
thinleaf alder	river birch	choke-cherry	blue spruce	narrowleaf cottonwood	mountain willow	red osier dogwood	Wood's rose	Rocky Mountain maple	service-berry	river haw-thorn
3.9	**2.5**	0.3	1.7	10.5	0.1	0.15	0.2	**0.1**	**0.05**	**0.1**
1.2		0.4	2.45	17.5	2	0.4	0.15			
2.15		0.2	0.2	4.5	1.3	0.25	0.4			
4.8		**0.9**	0.9	**32.5**	**3.4**	0.55	0.05			
2.1			2.6			0.05	0.3			
7			2.05			0.25	0.3			
10.4			2.3			0.05	0.15			
0.65			5.9			0.15	0.3			
2.5			5.6			0.15	0.1			
34.7			2.5			1.45	0.1			
			1.6			0.4	0.4			
			27.8			**3.85**	0.25			
							0.1			
							2.8			
% Cover Totals:										
34.7	**2.5**	**0.9**	**27.8**	**32.5**	**3.4**	**3.85**	**2.8**	**0.1**	**0.05**	**0.1**
% of 50 M tape covered:										
69.4			55.6	65		7.7				
denotes dominant species										

The three dominant riparian species from the above line transect data denote **narrowleaf cottonwood** (*Populus deltoides*), **blue spruce** (*Picea pungens*) and **thinleaf alder** (*Alnus incana ssp. tenuifolia*) as the dominant species. This community is widespread in these middle and middle-upper reaches of the Crystal River. Although several other shrubs are present, they are not in big enough cover values to be considered as dominants. The Narrowleaf cottonwood-Blue spruce / Thinleaf alder Woodland is tracked by CNHP and ranked S4/G4, down from a previous rank of S3/G3 with the exploration of new occurrences in the state. Part of the criteria for a suite of species to be formally designated as an occurrence of a plant association is determined by size. An occurrence should be found on at least a mile or two of stream with the same species dominating over the majority of that entire reach (Renee Rondeau, personal communication 2004).

Blue spruce occurs in multiple age classes. At least two on the southern portion of the property west of the beaver ponds are over 80 centimeters in diameter. Young trees and several age classes between the 80 centimeter size can be seen throughout the riparian forest. Further monitoring of the cottonwoods to assess if recruitment of new trees is occurring should be a future goal.

The above transect HSRT08 (Figure 1) had very little to no understory forbs and grasses. This was because of the large size and maturity of most of the species along the transect. At the 19 meter mark on the tape, there were four very large narrowleaf cottonwoods just out of the plot to the north about ten feet. They each had diameters at breast height of approximately 85 centimeters. As with most riparian areas in Colorado and the west, the understory did contain some aggressive non-native species. Reed

canary grass (*Phalaris arundinacea*), smooth brome (*Bromus inermis*), orchard grass (*Dactylis glomerata*), red clover (*Trifolium pratense*), and Canada bluegrass (*Poa pratensis*) have a strong presence. However, there is still a fairly impressive native component. A few species include star Solomonplume (*Maianthemum stellatum*), pink pyrola (*Pyrola rotundifolia* subsp *asarifolia*), valerian (*Valerian edulis*), mountain lover (*Paxistima myrsinites*), Richardson's geranium (*Geranium richardsonii*), Mare's tail (*Hippuris vulgaris*), wild liquorice (*Glycyrrhiza lepidota*), and Fendler's meadowrue (*Thalictrum fendleri).*

Figure 18. Different age classes of the narrowleaf cottonwoods near transect HSRT08.

Figure 19. Riparian woodland transect, river right west of the beaver pond wetlands. L. Tasker photos.

Gambel Oak Communities

There are three areas of **Gambel oak mixed with Rocky Mountain juniper** that are fairly sizable on the property. Each is adjacent to open meadows that are dominated by non-native grasses and forbs which provide a stark contrast to the shrubs and trees on the oak-juniper dominated areas. The understory and overstory were sampled in this community. Within a 625 square meter area (25meter X 25 meter plot):

12 trees	taller than breast height
8 trees	2 feet tall up to breast height
60 saplings	less than 2 feet tall
15 seedlings	2-3" in height
95 trees	Total

The understory consisted primarily of Gambel oak (*Quercus gambelii*), golden aster (*Heterotheca villosa*), elk sedge, snowberry, Agassi's bluegrass (*Poa agassizensis*), and Oregon grape holly (*Mahonia repens*). Many other species were present in very low cover values.

This plot should be revisited every 2-3 years to see if young tree numbers continue to increase and to see if the numerous small trees are surviving (Figure 1). Both Gambel oak and Rocky Mountain juniper are considered highly flammable species and as the canopy closes, these areas will become highly susceptible to very hot crown fires. After analyzing monitoring data trends, eventually selective thinning will most likely be the management action of choice.

Figure 20. Gamble oak-Rocky mountain juniper. L. Tasker photo.

The understory consisted primarily of big sagebrush (*Artemisia tridentata* var. *pauciflora*, syn. *Artemisia tridentata* subsp. *vaseyana*), golden aster (*Heterotheca villosa*), needle-and-thread grass (*Hesperostipa comata*) and Agassi's bluegrass (*Poa agassizensis*) with many other species with very low cover values.

The **Gambel oak dominated sites with serviceberry** (*Amelanchier utahensis*) as the next dominant cover value, cover a northwest facing section of the property on the eastern portion as it goes up the hillsides. These are typical examples of this community type and the understory is in excellent condition as very few weeds exist moving up the slopes.

Of interest, because of the **oceanspray** or rockspirea (*Holodiscus dumosus*) component, are the talus covered hillsides to the north and off the property to the northeast. These areas have been described in the literature as Rocky/Tall Shrublands (Johnston 2001). On the sites at Filoha, **Gambel oak is dominant** with areas of oceanspray, three-leaf sumac (*Rhus aromatica* subsp. *trilobata*), Douglas fir (*Pseudotsuga menziesii*) pockets and even an occasional box elder (*Acer negundo*). These sites are easily accessible by agile bighorn sheep and are used extensively according to the number of droppings in the area. Oceanspray is the main plant in this community that figures into the bighorn diet (Johnston, 2001).

Figure 21. Gambel oak-oceanspray shrublands on the north and northeast sides of the property.

There are open meadows in the middle portions of the property that are dominated by **Japanese brome**. These sites were disturbed during the establishment of a movie set on the property in the 1980's and then supposedly planted with "wildflowers". Below this area is the eastern edge of the spring-fed wet meadow, an area that has been plowed and planted in alfalfa and **Eurasian pasture grasses** (Figure 1). Several upland meadows on the property have experienced severe clearing of native shrubs and vegetation or have actually been plowed and planted in exotic grasses (see plowed or cleared areas, Figure 1). These sites are some of the more problematic as they have been heavily disturbed and are areas ripe for continual weed invasions. Diligent efforts are needed to keep them from being colonized by noxious weed species. They are also prime areas for restoration efforts.

Figure 22. Areas dominated by Japanese brome and downy brome

Figure 23. Japanese brome (Bromus japonicus). Photos L. Tasker

Table 3 – Colorado Natural Heritage Program Conservation Ranking System

The Colorado Natural Heritage Program (CNHP) is member of the international Natural Heritage Network governed by NatureServe (www. natureserve.org). These entities manage information which is critical for targeting conservation efforts. CNHP is the state's primary comprehensive biological diversity data center. They use a conservation status ranking system based on a one to five scale with the assumption that an element found in one place is more imperiled than an element found in many places. An element is a species or community and may be assessed at three distinct geographic scales-global (G), national (N), and state/province (S) based on the best available information. All available information is factored in such as threats, distribution, population, abundance, and trends. Each element of natural diversity is assigned a rank that indicates its relative degree of imperilment:

1 = critically imperiled
2 = imperiled
3 = vulnerable to extirpation or extinction
4 = apparently secure
5 = demonstrably widespread, abundant, and secure.

Element imperilment ranks are assigned both in terms of the element's degree of imperilment within Colorado (S-rank) and the element's imperilment over its entire range or Global rank (G-rank). Using the lynx as an example, which is thought to be secure in northern North America, but only known from less than five locations in Colorado, is ranked G5S1 or globally secure, but critically imperiled in Colorado. The global rank sets the highest priorities. For example a G3S2 will theoretically receive more priority than a rank of G5S1 due to global rank.

CNHP actively collects specific occurrence information for animal and plant species considered extremely imperiled to vulnerable in the state (S1-S3). Elements with a ranking of S3S4 are known as "watchlisted" and occurrence data is periodically analyzed to determine if more active assessments are warranted. Any element more common than a "watchlisted" element, with an S4 or S5 rank, is not closely monitored. Subspecies are included on the CNHP list, but typically receive less priority than equivalently ranked species.

Natural Heritage rarity ranks are not legal designations and should not be interpreted as such. To date, the creation of and understanding of the species imperilment ranks can help establish priorities on a voluntary basis for the protection of the most sensitive or imperiled sites. Legal status is designated by either the U.S. Fish & Wildlife Service under the Endangered Species Act or by the Colorado Division of Wildlife under Colorado Statutes 33-2-105 Article 2. Not all rare species receive legal protection although most species protected under state or federal laws are extremely rare. Rarity designations are available to contribute to effective, proactive land planning.

NatureServe Global Conservation Status Ranks	
Rank	**Definition**
GX	Presumed Extinct (species)— Not located despite intensive searches and virtually no likelihood of rediscovery. Eliminated (ecological communities)—Eliminated throughout its range, with no restoration potential due to extinction of dominant or characteristic species.
GH	Possibly Extinct (species)— Missing; known from only historical occurrences but still some hope of rediscovery. Presumed Eliminated— (Historic, ecological communities)-Presumed eliminated throughout its range, with no or virtually no likelihood that it will be rediscovered, but with the potential for restoration, for example, American Chestnut Forest.
G1	Critically Imperiled—At very high risk of extinction due to extreme rarity (often 5 or fewer populations), very steep declines, or other factors.
G2	Imperiled—At high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors.
G3	Vulnerable—At moderate risk of extinction due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors.
G4	Apparently Secure—Uncommon but not rare; some cause for long-term concern due to declines or other factors.
G5	Secure—Common; widespread and abundant.

Variant Ranks

Rank	Definition
G#G#	Range Rank—A numeric range rank (e.g., G2G3) is used to indicate the range of uncertainty in the status of a species or community. Ranges cannot skip more than one rank (e.g., GU should be used rather than G1G4).
GU	Unrankable—-Currently unrankable due to lack of information or due to substantially conflicting information about status or trends. Whenever possible, the most likely rank is assigned and the question mark qualifier is added (e.g., G2?) to express uncertainty, or a range rank (e.g., G2G3) is used to delineate the limits (range) of uncertainty.
GNR	Unranked—Global rank not yet assessed.
GNA	Not Applicable—A conservation status rank is not applicable because the species is not a suitable target for conservation activities.

Rank Qualifiers	
Rank	**Definition**
?	Inexact Numeric Rank—Denotes inexact numeric rank (e.g., G2?)
Q	Questionable taxonomy—Taxonomic distinctiveness of this entity at the current level is questionable; resolution of this uncertainty may result in change from a species to a subspecies or hybrid, or the inclusion of this taxon in another taxon, with the resulting taxon having a lower-priority conservation priority.

C	Captive or Cultivated Only—At present extant only in captivity or cultivation, or as a reintroduced population not yet established.

Infraspecific Taxon Conservation Status Ranks Infraspecific taxa refer to subspecies, varieties and other designations below the level of the species. Infraspecific taxon status ranks (T-ranks) apply to plants and animal species only; these T-ranks do not apply to ecological communities.

Rank	Definition
T#	Infraspecific Taxon (trinomial)—The status of infraspecific taxa (subspecies or varieties) are indicated by a "T-rank" following the species' global rank. Rules for assigning T-ranks follow the same principles outlined above for global conservation status ranks. For example, the global rank of a critically imperiled subspecies of an otherwise widespread and common species would be G5T1. A T-rank cannot imply the subspecies or variety is more abundant than the species as a whole-for example, a G1T2 cannot occur. A vertebrate animal population, such as those listed as distinct population segments under the U.S. Endangered Species Act, may be considered an infraspecific taxon and assigned a T-rank; in such cases a Q is used after the T-rank to denote the taxon's informal taxonomic status. At this time, the T rank is not used for ecological communities.

National and Subnational Conservation Status Definitions Listed below are definitions for interpreting CNHP and NatureServe conservation status ranks at the national (N-rank) and subnational (S-rank) levels. The term "subnational" refers to state or province-level jurisdictions (e.g., Colorado, Ontario). Assigning national and subnational conservation status ranks for species and ecological communities follows the same general principles as used in assigning global status ranks. A subnational rank, however, cannot imply that the species or community is more secure at the state/province level than it is nationally or globally (i.e., a rank of G1S3 cannot occur), and similarly, a national rank cannot exceed the global rank. Subnational ranks are assigned and maintained by CNHP. National (N) and Subnational (S) Conservation Status Ranks

Status	Definition
NX SX	Presumed Extirpated—Species or community is believed to be extirpated from the nation or state/province. Not located despite intensive searches of historical sites and other appropriate habitat, and virtually no likelihood that it will be rediscovered.
NH SH	Possibly Extirpated (Historical)—Species or community occurred historically in the nation or state/province, and there is some possibility that it may be rediscovered. Its presence may not have been verified in the past 20-40 years. A species or community could become NH or SH without such a 20-40 year delay if the only known occurrences in a nation or state/province were destroyed or if it had been extensively and unsuccessfully looked for. The NH or SH rank is reserved for species or communities for which some effort has been made to relocate occurrences, rather than simply using this status for all elements not known from verified extant occurrences.
N1 S1	Critically Imperiled—Critically imperiled in the nation or state/province because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the state/province.

N2 S2	Imperiled—Imperiled in the nation or state/province because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the nation or state/province.
N3 S3	Vulnerable—Vulnerable in the nation or state/province due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.
N4 S4	Apparently Secure—Uncommon but not rare; some cause for long-term concern due to declines or other factors.
N5 S5	Secure—Common, widespread, and abundant in the nation or state/province.
NNR SNR	Unranked—Nation or state/province conservation status not yet assessed.
NU SU	Unrankable—Currently unrankable due to lack of information or due to substantially conflicting information about status or trends.
NNA SNA	Not Applicable —A conservation status rank is not applicable because the species is not a suitable target for conservation activities.
N#N# S#S#	Range Rank —A numeric range rank (e.g., S2S3) is used to indicate any range of uncertainty about the status of the species or community. Ranges cannot skip more than one rank (e.g., SU is used rather than S1S4).
Not Provided	Species is known to occur in this nation or state/province. Contact the relevant natural heritage program for assigned conservation status.

Breeding Status Qualifiers

Qualifier	Definition
B	Breeding—Conservation status refers to the breeding population of the species in the nation or state/province.
N	Nonbreeding—Conservation status refers to the non-breeding population of the species in the nation or state/province.
M	Migrant—Migrant species occurring regularly on migration at particular staging areas or concentration spots where the species might warrant conservation attention. Conservation status refers to the aggregating transient population of the species in the nation or state/province.

Note: A breeding status is only used for species that have distinct breeding and/or non-breeding populations in the nation or state/province. A breeding-status S-rank can be coupled with its complementary non-breeding-status S-rank if the species also winters in the nation or state/province, and/or a migrant-status S-rank if the species occurs regularly on migration at particular staging areas or concentration spots where the species might warrant conservation attention. The two (or rarely, three) status ranks are separated by a comma (e.g., "S2B ,S3N" or "SHN, S4B, S1M").

Other Qualifiers

Rank	Definition

?	Inexact or Uncertain—Denotes inexact or uncertain numeric rank. (The **?** qualifies the character immediately preceding it in the S-rank.)

Reference

The information on this page is a slightly modified version of the NatureServe Conservation Status page found on the NatureServe Explorer website at:
http://www.natureserve.org/explorer/ranking.htm
and from the Colorado Natural Heritage Program website:
http://www.cnhp.colostate.edu/ftp_meta/Understanding%20Conservation%20Status%207-28-2005.pdf

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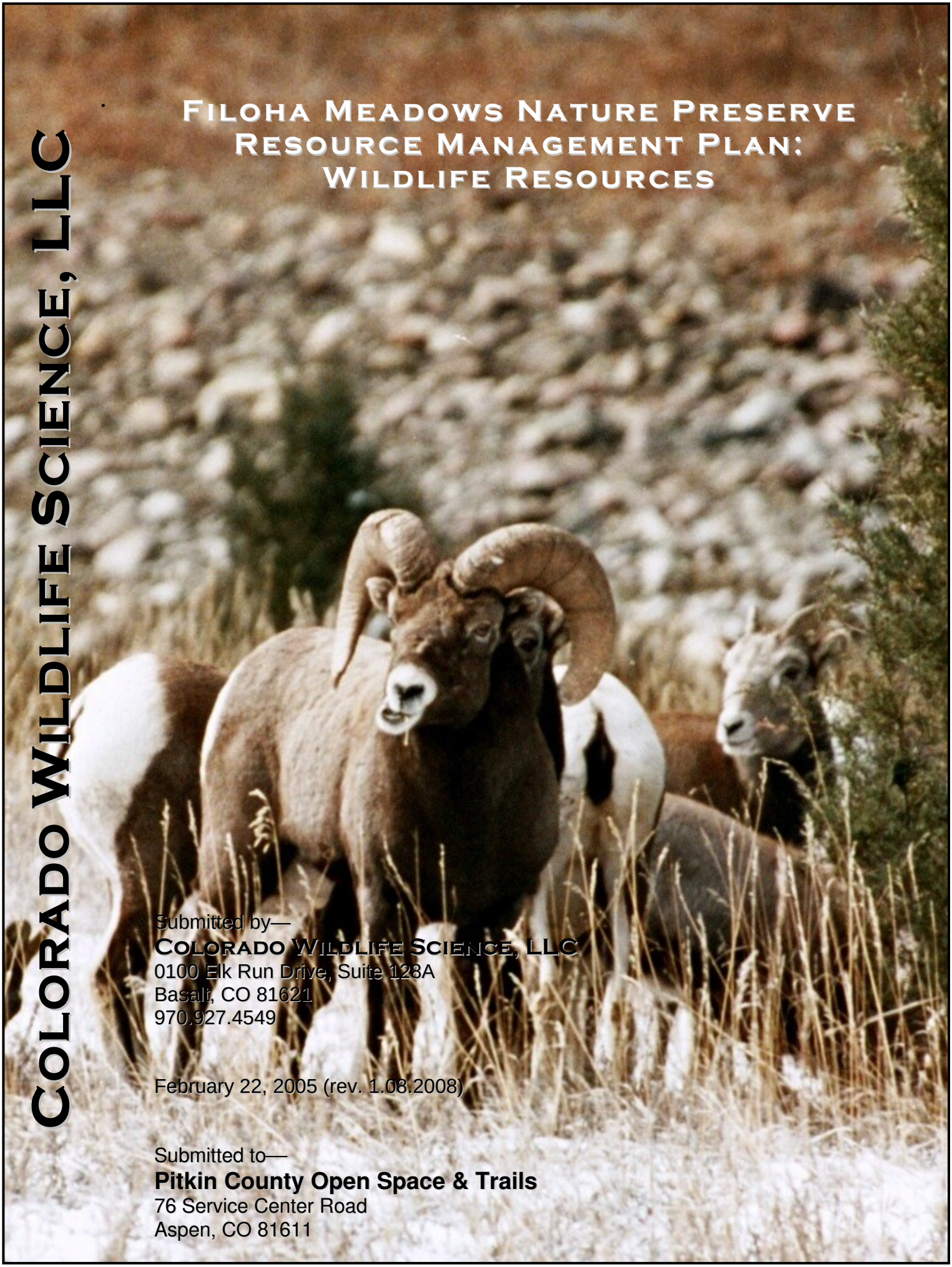
APPENDIX B – Attached Separately

Filoha Meadows Nature Preserve Resource Management Plan: Wildlife Resources



Colorado Wildlife Science, LLC

Submitted by—
Colorado Wildlife Science, LLC
0100 Elk Run Drive, Suite 128A
Basalt, CO 81621
970.927.4549

February 22, 2005 (rev. 1.08.2008)

Submitted to—
Pitkin County Open Space & Trails
76 Service Center Road
Aspen, CO 81611

TABLE OF CONTENTS

FIGURES

1.0 INTRODUCTION

The importance of FMNP to wildlife results from a combination of factors. One of the most significant is the landscape of undeveloped White River National Forest lands in which it is embedded. FMNP is situated such that it provides an important ungulate migration link between summer and winter ranges on WRNF and BLM lands. In addition, the variety of habitats at Filoha Meadows Nature Preserve (FMNP) and the adjacent public lands supports a diverse array of wildlife. Containing varied habitats, this open space provides important life history requisites for animals such as Rocky Mountain bighorn sheep, Rocky Mountain elk, peregrine falcons, beaver, and numerous resident and migratory songbirds.

Non-native pasture grass dominated hay fields are the most common habitat type on the property. These fields, however, are not actively maintained and are slowly being reoccupied by native woody plant dominated communities (Figure 1). The interspersion of the property's plant communities − aspen, cliffs, Gambel oak-serviceberry dominated montane shrublands, alkaline hot spring marsh, montane riparian forest, piñon-juniper woodlands, sedge wetlands, upper perennial riverine (Figure 2) (1995), and talus − results in a relatively intact wildlife community that is unique to this part of the southern Rocky Mountains.

2.0 HISTORIC ECOLOGY

Vegetation in the Crystal River Valley has been significantly altered since the area was originally settled by miners. This has resulted in changes in species composition, behavior, and demographics that is difficult to characterize or quantify. As described in the Plant Ecology section of this plan, the plant communities on FMNP have been altered at varying times for various purposes. The potential natural communities at FMNP likely supported a wildlife community that was similar to that of today yet different in distribution, composition, and density.

The conversion of the montane and mountain sage shrublands, riparian forest, and assorted wetlands for the railroad station and hay production at different times, benefited some wildlife species while harming others. Habitat obligates that only breed in a certain habitat type such as Virginia's warblers and cordilleran flycatchers, edge-sensitive species that suffer reductions in their survival and natality in fragmented habitats dominated by ecological edges such as green-tailed towhees or southern red-backed voles are particularly susceptible to the effects of anthropogenic habitat alteration. Alternatively, grazers such as bighorn sheep and montane voles and species that prefer ecological edges such as elk have prospered from the conversion of shrublands to grassland.

As agricultural use of the property no longer occurs, the piñon-juniper woodlands and montane shrublands will likely continue to reoccupy the hay fields in a process often referred to as old field succession. The long-term result will be the loss of grassland habitat on FMNP and a shift of back to a wildlife community that may resemble pre-settlement conditions.

3.0 RESOURCE INVENTORIES/CURRENT CONDITIONS

Wildlife species composition on FMNP is currently being studied via various methods. Birds were first surveyed according to the Pitkin County Open Space Bird Inventory and Monitoring Protocol in 2003 and again in 2004. Bighorn sheep have been sporadically monitored by CDOW over the last 25 years. Small mammals and herpetofauna have not been

surveyed at this time. Open Space staff have also conducted informal track and browse surveys and spent many hours observing bighorn sheep and elk use of the property.

Gambel oak, the dominant shrub species on the westerly facing slopes on and above FMNP, is arguably the most important shrub for wildlife in the Crystal Valley. It provides both vertical and horizontal heterogeneity, potentially increasing species diversity by increasing the number of available habitats (Pearson et al. 1996). For example, oaks increase species composition and diversity of bird communities by providing additional nesting and foraging substrates and cavities (Rosenstock 1998). In addition to enhancing habitat for many small birds, Gambel oak dominated shrublands provide valuable food and cover for deer, elk, rabbits, turkeys, grouse, and squirrels (Pendleton et al. 1992). Wildlife browse on twigs, foliage, and mast such as acorns, and utilize the dense shrubby nature of the oak for cover.

Gambel oak and serviceberry on FMNP and adjacent WRNF land are moderately to heavily browsed on the southwesterly facing montane shrubland dominated slopes (Figure 3). The aspen on the property show the scars of moderate elk barking that usually occurs at FMNP in the transition between summer and winter ranges. Game trails are plentiful on slopes of all aspects.

Riparian habitat varies from very good condition on the southern half of the property to virtually non-existent on the northern end. Consequently, stream bank integrity is in fair to good condition where the streamside vegetation is largely intact on the south end but where the riparian vegetation has been eliminated, there is significant lateral migration and streambank erosion (Figure 4).

One of the greatest threats to wildlife at Filoha Meadows Nature Preserve is cheatgrass (also known as downy brome). This Eurasian grass was unintentionally introduced into North America in the mid-1800s and has spread rapidly over much of the continent except the far north. It is common on roadsides and disturbed areas, sometimes lining roads for long distances. The plants, sometimes with a purplish or reddish hue, eventually turn brown. At maturity the spikelets break apart; the sharp-pointed, bristly sections can injure grazing animals, working into the nose, ears, mouth, or eyes (Clements et al. 2003). It adapts well to many climates and takes advantage of areas disturbed by grazing, development, and other activities. It replaces native plants, decreases biodiversity, decreases nitrogen availability, and increases fire frequency in many systems. Because cheatgrass normally out-competes native grasses, owing to its rapid seed dispersal, late winter germination capability, and the maintenance of an accelerated fire regime; cheatgrass can become a monotypic grassland community with little or no wildlife values (Clements et al. 2003).

4.0 MAMMALS[1]

The vegetation types on FMNP provide habitat for many mammal species. The combination of structural diversity and fruit-bearing shrubs provides an abundance of food, cover, and denning sites. At least 39 mammal species are known or suspected to occur on the property. Bighorn sheep, black bear, coyotes, mountain lions, montane voles, pocket gophers, and two species of weasel are known to use FMNP for some aspect of their life history.

[1] See Appendix A for list of species known or suspected to occur on Filoha Meadows Nature Preserve (including Latin names).

4.1 SMALL MAMMALS

Small mammals are an important component of many ecological communities, occupying an intermediate trophic position. They are prey for many reptilian, avian, and mammalian carnivores, including several sensitive species. Small mammals consume vegetation, seeds, fungi, and insects. Grazing by small mammals can stimulate plant production and substantially alter species composition of plant communities. Small mammals impact plants through seed consumption, which often destroys seeds, and seed caching, which disperses seeds. Also, small mammals are important consumers of hypogeous fungi (i.e., truffles), which are dependent on animals for spore dispersal. Small mammals have not been sampled at FMNP. Appendix A includes the small mammal species that have been identified on the property via visual observation of individuals of a given species or their sign.

FMNP supports a small colony of Wyoming ground squirrels. It is likely that as the grassland habitat on the property is succeeded by shrubland this colony will decline. Montane voles, mountain cottontails, and yellow-bellied marmots are regularly seen on the property and rock squirrel are common in the piñon-juniper and bare rock dominated southerly facing slopes.

It is likely that FMNP contains relatively high insectivore species diversity. The presence of moist meadows, blue spruce-narrowleaf cottonwood riparian forest, mesic and xeric shrublands, piñon-juniper, and talus between 6,980 and 7,120 in elevation provides suitable habitat for dwarf, masked, montane, and water shrews (Fitzgerald et al. 1994).

4.2 AMERICAN BEAVER

Habitat alteration by American beaver is quite apparent to the casual observer at Filoha Meadows Nature Preserve. There are numerous dams, cuttings, and trails in the riparian wetland complex on the southwest end of the property. There is one active lodge and two inactive lodges in varying states of disrepair. The willow-sedge dominated marsh in this area is actively managed by a resident beaver colony. Although the presence of this marsh is largely due to the meandering action of the Crystal River, beavers have had a tremendous impact on its present condition. Modification of water flow in and out of this marsh has resulted in what is likely the most biologically diverse habitat on the property with numerous small mammal, songbird, wading bird, and waterfowl depending on the beaver's actions to provide them with important habitat. In recent years, however, it has become apparent that the beaver ponds in this area have begun to eutrophicate. It is currently suspected that one cause of this change is the deterioration of the condition of the irrigation ditch that diverts water from the Crystal River across the hayfields above the marsh. This, however, does not completely explain the change. Another explanation is that that the beavers had temporarily abandoned the area and have only recently recolonized. Because beavers are important to this system and provide habitat for so many other species, beavers should be periodically monitored and the hydrologic state of the marsh should be investigated.

4.3 MAMMALIAN CARNIVORES AND BATS

Carnivore or predator species are critical to maintaining the integrity of native ecological communities. Mammalian carnivores (or their sign) such as black bear, coyote, ermine, mountain lion, red fox, and long-tailed weasel were sighted and recorded on FMNP during field inventories or via tracks, scat, or other sign (Appendix A). Two of the most important carnivores to the ecosystem in which FMNP occurs are now extinct in Colorado. Both gray

wolves (*Canis lupus*) and grizzly bears (*Ursus arctos horribilis*) were systematically eliminated form the area by the first half of the 20th century. Similarly, wolverines (*Gulo gulo*) are believed to have once occurred in the area but are now extinct. River otters have been reintroduced in Colorado and have been periodically sited in the Crystal River near the confluence with the Roaring Fork.

Estimates of animal abundance are among the most important information needs of managers and researchers. Unfortunately, secretive habits of most carnivore species and the low density of most carnivore populations preclude accurate, precise, and inexpensive estimation of population size. Thus, indices of relative abundance often substitute (Harrison 1992). No formal track transects or photo station surveys have been conducted on FMNP. Initiation of such carnivore sampling would provide Open Space with more accurate information regarding the carnivore community at FMNP.

Mountain lions are known to occur in the area and individuals and tracks have been observed on the property by Dr. Johnson (Johnson 2003). Coyotes are active on the property. In 2004, Justin Martens, former CDOW District Wildlife Manager, observed 4 coyotes chase a small group of bighorn ewes down the railroad grade north to Avalanche Creek (Martens 2004). Since acquiring the property in 2001, no dens have been found by staff.

Black bears are common on the property in summer and fall. Bears are most often observed in the Engelmann spruce-narrowleaf cottonwood riparian forest in summer and in the montane shrublands in the fall where mast is most plentiful. There have been some human-bear conflicts at residences adjacent to FMNP.

Although bats have not been surveyed at FMNP, it is important to note that a healthy bat community is critical to nearly every ecosystem. There are 7 bat species that may occur on FMNP (Appendix B) based upon habitat affinity and geographic distribution (Fitzgerald et al. 1994).

4.4 UNGULATES[2]

Bighorn sheep, mule deer, and Rocky Mountain elk are all common on FMNP. In fact, especially in late fall, all three species can be observed foraging on the property. The continuing loss of winter and migration habitat is the most serious problem for bighorn sheep, mule deer and elk in the Roaring Fork Valley and the western U.S. Although the property does not encompass the entire home range of any of these species, it does provide critical habitat for all three at different times of year.

4.4.1 ROCKY MOUNTAIN BIGHORN SHEEP

It has been estimated that 20,000 to 30,000 bighorn sheep roamed Colorado in the 1870s (Wolfe 1990). These numbers declined rapidly as the mountainous areas of the state were increasingly settled. The largest decline on a statewide basis coincided with the advent of domestic livestock, particularly domestic sheep, spreading into the habitat of wild bighorn sheep (Wolfe 1990). Considerable research over the past two decades has shown that healthy domestic sheep carry strains of respiratory tract bacteria that almost always cause fatal pneumonia in bighorn sheep if contact between the two occurs. Entire herds of bighorn have died out following contact with domestic sheep. These facts alone explain much of the

[2] See Appendix B for CDOW definitions of bighorn sheep, elk, and mule deer seasonal habitats.

historic decline of bighorn sheep in the west since Europeans appeared and began grazing domestic sheep in the mid 1800s. But numbers have improved. In 1970 Colorado had an estimated 2,200 sheep. Now there are about 7,465 sheep statewide (Ellenberger 2005).

Two adaptations of bighorn sheep substantially define basic habitat requirements. First is their agility on precipitous slopes, which is their primary means of escaping predators. Second is their keen eyesight, which is their primary sense for detecting predators (Geist 1971; Etchberger 1989). Relatively short legs and a stocky build allow agility on rocks, but preclude fleetness necessary to outrun coursing predators in less rocky terrain (Geist 1971). Consequently, bighorn sheep select open habitats that allow them to detect predators at distances sufficient to provide adequate lead time to reach the safety of precipitous terrain (Geist 1971; Etchberger 1989). In short, optimal bighorn habitat is visually open and contains steep and generally rocky slopes (Figure 5).

Bighorn sheep are much more susceptible to stress caused by disturbances than most other ungulates (MacArthur et al. 1982). Elevated stress levels in sheep have been linked to depressed immune response, loss of condition, reduced lamb survival, and elevated mortality rates(MacArthur et al. 1982). In addition, Bighorn sheep are highly susceptible to infection with lungworms (*Protostrongylus* spp.) (Miller 2000). Grazing bighorn sheep accidentally ingest snails, which are hosts for lungworm larvae. The larvae penetrate the intestinal wall and travel to the lungs where they become adults. Lungworms lay eggs in the lungs, which hatch and the young larvae enter the air passages where they are coughed up and swallowed. The lungworm larvae are excreted in fecal pellets and seek the host snail. Larvae can remain viable in fecal material for up to 14 months. Large concentrations of the parasite cause respiratory stress and can create lesions in the lungs and bronchial passages and predispose the host sheep to pneumonia bacteria invasion (Miller 2000). Similar species of lungworm infect both domestic sheep and goats and their wild counterparts. The transmission of the parasite from domestic to wild sheep, or vice versa, has not been well documented but is often blamed for infections in bighorn sheep.

Bighorn sheep on the east side of the Crystal River watershed range from the slopes of Mount Sopris to the north, Schofield Pass and Elko Park to the southeast and Big Kline Creek and the Crystal River to the west. The CDOW has not conducted any population studies of the Crystal River herds since the 1970s (Wright 2005). Unfortunately, those figures are currently unavailable. Consequently, it is difficult to say whether these sheep comprise one greater herd made up of separate bands that interact seasonally in more restricted habitats such as winter range or if this population consists of separate herds that only interact by chance.

FMNP contains important winter range that provides forage year-round due to the warming action of the numerous hot springs on the property (Figure 1). The property also contains a portion of an important winter concentration area (Figure 5a). It is centered on the bare soil and piñon-juniper dominated southwest running intermittent draw on the northeast end of the ranch (Figure 6). In addition, the hot springs adjacent to the river have been identified as an area that provides minerals important to bighorn sheep for meeting basic nutritional needs (Figure 8) (CDOW 2005a).

The sheep that winter in the vicinity of FMNP migrate to their lambing habitat and summer range via the Avalanche Creek, East Creek, Gift Creek, and Hawk Creek drainages (Wright 2005). There is also a movement corridor between the Penny Hot Springs area and Avalanche Creek along the old railroad grade and the cliff band above it (Figure 6). The protection of

FMNP also maintains the connectedness of this herd's northern and southern home range.

The minimum limiting factors for bighorn sheep in the Crystal River drainage are production areas and winter range. Summer range for these sheep is extensive. Bighorn sheep have slow population growth rates and have a restricted lambing season in late spring and early summer. This results in a susceptibility to population declines and slow recoveries (Goodson 1991a). Recruitment within Crystal bighorn herds over the past 5 years or so has been poor and the CDOW is just beginning to investigate the causes (Martens 2004). The current belief is that while lamb production is adequate for positive population growth rates, there has been high lamb mortality in the first year (Wright 2005).

The use of the drug fenbendazole has been effectively used on both bighorn sheep and domestic sheep to reduce lungworm parasite loads (Miller 2000). The CDOW began using FMNP as a medicating station to treat bighorn sheep for lungworm in 2003 (Figure 9). They combine the fenbendazole with apple mash and distribute it on the ground with hay.

Bighorn avoid forest and thick brush to the maximum extent possible, and fire can play an important role in creating bighorn habitat as well as making existing patches safer relative to predators (Goodson 1991b). Large areas that lack precipitous escape terrain represent substantial barriers to movement. Even within mountain ranges like the Elks, bighorn sheep habitat (is frequently patchy and the population structure is one of natural fragmentation (Wakelyn 1987). This structure can include multiple independent female subpopulations within what are commonly designated single populations (Bleich 1997), and male sheep travel to, from, and between these subpopulations.

Bighorn sheep are primarily grazers, but also eat sedges and other non-grasses as they build up body fat in the summer months (Figure 10). In winter, when plants are dormant, they rely on browsing willows, shrubs, forbs, sage, bearberry, rose, and other woody plants (Rominger 1988). Bighorn should be selected as a Management Indicator Species (MIS) for FMNP for their esthetic and educational value as well for their importance as key components to the local ecology.

4.4.2 ROCKY MOUNTAIN ELK

An accelerating threat to elk in the Crystal River watershed is the loss or deterioration of winter range. The disruption of migration routes, loss of seasonal habitat, and the reduction in habitat security on summer and fall range from residential development, roads, and recreation are all serious problems for this elk herd.

FMNP provides important winter resources for elk (Figure 11). As many as 100 elk have been seen on the ranch in the height of winter. Elk move back and forth from the slopes with southerly and westerly exposures above and northeast of the property to the nutritious winter forage and shallow snow resulting from the geothermal energy of the hot springs on the property. The CDOW has accurately identified the lower southwest facing slopes, the hot spring marshes, and the old hay fields on the property as an important winter concentration area (Figure 12) (CDOW 2005b). CDOW defines a winter concentration area as:

"…that part of the winter range of elk where densities are at least 200% greater than the surrounding winter range density during the average five winters out of ten from the first heavy snowfall to spring green-up, or during a site specific period of winter as defined for each Data Analysis Unit (CDOW 2005c)."

Accordingly, this habitat on FMNP is quite important to the persistence of elk in the area.

Dr. Bernarr Johnson, who has lived across the river from FMNP for over 20 years, has reported observing very young spotted calves on the property in mid-June (Johnson 2003). In 2003 and 2004, OST staff confirmed that a few elk cows probably dropped their calves in the riparian forest on the southern half of the property. Three very young spotted calves were observed on 10 June 2003 and two were observed on 8 June 2004. Although the CDOW species distribution maps do not indicate this area as elk calving habitat (or "production area"), these observations combined with Dr. Johnson's many sightings over the years probably warrant this designation.

Although elk can occasionally be observed on FMNP after calving season, most animals that winter on and around the property migrate to summer range on WRNF land in the western Elk Range to the east and the Huntsman Ridge area to the west. As the days shorten and snow begins to accumulate in the late summer and early fall, elk begin migrating back to lower elevations and eventually back to their winter range on and around FMNP.

As noted above, FMNP is surrounded by public lands of the White River National Forest. The beginning of the first elk hunting season in Game Management Unit 43 begins around the third week of October. As hunters spread out across the public land surrounding FMNP migrating elk often congregate on private land where they are not disturbed. This results in abnormally high densities of elk due to what is known as the "refuge effect." The refuge effect is the tendency for animals to congregate on land (e.g., private property, National Parks) due to the "no trespassing" and "no firearms" policies of the property owner or managing agency, which removes hunting and harassment pressures from big game. The refuge effect has 2 negative consequences:

- Concentrating a large number of large native herbivores like elk can adversely affect the habitat to the detriment of the vegetation and other animals. The net result is a reduced carrying capacity for all wildlife, large and small.
- Hunting is a critical tool the CDOW uses to achieve its population management objectives. As the acreage of large private land holdings prohibiting hunting or firearms increases, the number of elk seeking refuge on these lands increases thus reducing the numbers of animals available to hunters.

Although FMNP is heavily used by elk in the winter, it has not been determined whether a refuge effect is in fact occurring.

4.4.3 MULE DEER

Mule deer occupy a variety of cover types in the Crystal River watershed. Consequently, habitat requirements vary with vegetational and landscape components contained within each herd range. Forested habitats provide mule deer with forage as well as snow intercept, thermal, and escape cover. Mule deer occupying montane habitats such as those at FMNP, move within a broad range of elevations, climates, and topography which includes a wide range of vegetation. Mule deer also occupy agricultural areas that were converted from shrublands. In addition, mule deer diets are as varied as the landscapes they inhabit. Kufeld et al. (1973) identified 788 plant species that have been eaten by mule deer; this list includes 202 trees and shrubs, 484 forbs, and 84 grasses, rushes, and sedges.

Currently, wildlife managers are in disagreement as to the conservation status of mule deer in Colorado. While some believe that they are in decline, others think that populations are on the rise. Nevertheless, to counter the impacts of residential development, rangeland conversion,

road and highway construction, and recreation, it is important to conserve critical areas, especially winter ranges, to maintain the various habitats required by mule deer. In addition, much of the winter range is currently vegetated by middle-age vegetation--young trees and over-mature shrubs. This particular seral stage does not produce much forage for deer. The effects of reduced mule deer winter range can be mitigated by improving the quality of cover and forage on lands that remain undeveloped. Habitat management programs include limiting livestock grazing in important winter range and the alteration of vegetational communities towards early seral stages.

For mule deer, the optimal successional stages are subclimax plant communities that are most easily perpetuated anthropogenically (Wallmo 1981). Land managers have had great success using mechanical treatments (e.g., hydro-ax, brush hogs) to set back the Gambel oak shrublands and piñon-juniper to an early seral stage. Mule deer numbers have improved after just two or three years following such treatments (e.g., Basalt State Wildlife Area) (Clark 2004).

Mule deer are common on and around FMNP from late spring though early fall (Figure 13). Seasonal movements involving migrations from higher elevations (summer ranges) to lower winter ranges are associated, in part, with decreasing temperatures, severe snowstorms, and snow depths that reduce mobility and food supply. Deep snows ultimately limit useable range to a fraction of the total. Unlike elk, mule deer do not use FMNP as part of their winter range. Rather, most of the deer that summer in the vicinity of FMNP migrate down (north) to the piñon-juniper, Gambel oak, mountain mahogany, and antelope bitterbrush dominated shrublands in the Assignation Ridge-Thompson Creek area north of Perham Creek. Although some does likely fawn on the property, this is unconfirmed.

5.0 BIRDS

Birds are monitored on Pitkin County Open Space with three main objectives: 1) to measure species composition and diversity, 2) to monitor population trends, and 3) to evaluate the effects of specific management actions. Breeding birds were surveyed on Filoha Meadows Nature Preserve for the first time in 2003. Forty-four species have been identified in point transects conducted during the height of the 2003 and 2004 breeding seasons (See Appendix A). The 93 species in Table A1 are known or suspected to either breed on or at least incorporate part of FMNP within their home range for hunting/foraging or some other aspect of their life history.

The major habitats on FMNP from an avian perspective are (1) Aspen; (2) Cliff/Rock; (3) Grassland; (4) Mid-elevation Riparian; (5) Montane Shrubland; (6) Piñon-Juniper Woodland; and (7) Wetlands.

5.1 ASPEN HABITAT

There is a small portion of a larger aspen stand in the extreme southern portion of the property. Healthy aspen stands with diverse understories support some of the highest levels of vertebrate diversity in the Southern Rocky Mountains. Because aspen is seral and is usually mixed with adjacent conifer types, the importance of aspen-dominated woodlands to birds and other wildlife far exceeds the areal extent of the stands themselves (DeByle 1985). Currently, the numerous elk using the property are limiting regeneration of aspen and heavily impacting the development of a robust understory. Consequently, this stand is in poor condition and

does not support the avian density or richness as healthier stands. Birds strongly associated with aspen habitat such as broad-tailed hummingbirds, red-naped sapsuckers, violet- green swallows, and warbling vireos would benefit from management of this stand to limit the effects of elk on regeneration and understory development.

5.2 CLIFF/ROCK HABITAT

Cliff/rock habitats are ecologically typical and exceptionally scenic features of the Crystal River Valley. Although the avifauna of cliff/rock habitat is small compared to other habitats, these species are highly specialized. Birds that use cliffs for nesting may be more susceptible to loss of nesting habitat than many other species because they rely completely on cliffs as nest sites (Kingery 1998). Thus, the number of suitable nest sites is finite and essentially non-renewable. All suitable nest sites in some areas may be used, making any disruption of a nest site by humans result in a direct reduction in the population. Conflicts related to nesting birds that use cliffs, rocky ledges, and small rocky out thrusts include rock climbing, mining, road construction, hiking, bicycle and horseback trails, and housing development (Knight & Cole 1995). All these activities can have a negative impact whether they are conducted at the base or the top of a cliff, rocky ledge, or small rocky out thrust.

There is an historic peregrine falcon nesting area on cliffs within a ½ mile of Filoha Meadows Nature Preserve (Figure 14). There have been active peregrine eyries (nest sites) on nearby cliffs in at least 4 of the last 7 seasons. Some peregrine falcons reside in their territories in Colorado throughout the year, but most winter south of Colorado and arrive on the breeding grounds in March. They immediately begin courtship activities and begin laying eggs in April. Peregrines often choose cliffs that lie within piñon-juniper and ponderosa pine zones such as those southeast of FMNP (Colorado Partners in Flight 2000). A large majority of eyries are within a mile of water. The falcons hunt in adjacent open meadows, forested tree top areas, around lakes and rivers, and montane shrublands (Colorado Partners in Flight 2000). Although the birds nest on WRNF lands, FMNP meets all of the criteria for high quality peregrine hunting habitat. Formerly listed as Endangered, peregrines were delisted from the Federal Threatened and Endangered Species list in 1999. It is now listed only as a State of Colorado Species of Special Concern which is not a statutory listing.

Other bird species strongly associated with cliff/rock recorded on the property include cliff wren, common raven, golden eagle, turkey vulture, and white-throated swift.

5.3 GRASSLAND HABITAT

At present the dominant vegetational community by area is non-native grassland. It is likely that given a normal disturbance regime, grasslands would occupy some proportion of the total cover on the property. This acreage, however, would likely be lower than the current condition. In addition, the dominant species would be native grasses and forbs rather than the introduced pasture grasses that dominate now. Such grasses have low to moderate forage value for wildlife. Monitoring data suggests that this habitat type on FMNP supports the lowest species richness of all of the habitats found on the property. This is due to a combination of factors: (1) As discussed above, the dominant plant species are not native to this region; and (2) There is very low structural diversity for foraging, nesting, and perching (Rotenberry 1980; Wiens & Rotenberry 1981).

Colorado Partners in Flight does not have a Priority Species for this habitat type given that it is an anthropogenically maintained community. One of the species that benefits the presence of this habitat is the mountain bluebird. The current condition of the property is particularly suited to mountain bluebirds given the interspersion of excellent foraging and nesting habitat. Mountain bluebirds are particularly adapted to early successional communities resulting from disturbance adjacent to appropriate nesting habitat (Guinan et al. 2000). Proximity of the old hayfields/pastures and wetlands with piñon-juniper, Gambel oak shrublands, and aspen at FMNP results in excellent mountain bluebird habitat. Winter distribution and abundance is strongly influenced by the availability of fruits (especially juniper)(Guinan et al. 2000).

5.4 MID-ELEVATION RIPARIAN FOREST HABITAT

Although riparian systems occupy no more than 3% of the Colorado landscape (Kingery 1998), 75% of the bird species in the West use riparian areas during some part of their life cycle (Howe 1996). The blue spruce-narrowleaf cottonwood riparian habitat at FMNP is found along the Crystal River south of the Johnson residence (Figure 15). While this mixed deciduous and evergreen forest comprises a small portion of the property, it probably supports the greatest avian richness. Twenty (40.8%) of the species recorded during point transects were identified in the riparian forest. American robin and yellow warbler were the species most frequently detected. Other species detected included broad-tailed hummingbird, cordilleran flycatcher, house wren, mountain chickadee, northern flicker, ruby-crowned kinglet, song sparrow, warbling vireo, western wood-pewee, yellow-rumped warbler, and western tanager.

Riparian ecosystems are also highly important areas for people. They are convenient locations for roads and trails, mining activities, and dams and water diversions. They are also productive areas for domestic livestock grazing. Riparian areas are under constant assault from these and other activities which cause habitat loss and degradation, disturbance, dewatering, and pollution (Melton et al. 1984; Wozniak 1995).

Of the bird species known to breed at FMNP two species are strongly associated with healthy riparian communities: cordilleran flycatcher and American dipper. Both of these species have been found to exhibit detectable population response to changes in the quality of riparian habitat and would be excellent Management Indicator Species (MIS) for this habitat at FMNP.

5.5 MONTANE SHRUBLAND HABITAT

Although Filoha Meadows Nature Preserve is adjacent to hundreds of acres of Gambel oak dominated Montane Shrublands, this habitat type occupies only a small portion of the property on the northerly facing slopes on the eastern boundary (Figure 16). The potential natural community of much of the non-native grasslands on the property is likely Gambel oak or mountain sage dominated montane shrublands. So, absent human intervention it is likely that a significantly higher percentage of FMNP will be covered by shrublands.

In Colorado, most mountain shrubland bird species are meeting their habitat requirements fairly well at this time (Colorado Partners in Flight 2000). Colorado Partners in Flight Priority Species for this habitat type are Virginia's warbler and green-tailed towhee (Colorado Partners in Flight 2000). Both species currently breed on FMNP and are recommended as MIS for the mixed mountain shrubland habitat type.

Virginia's warblers are strongly associated with Gambel oak. They nest in dense shrublands and on scrub-adorned slopes of foothills, open draws, and mountain valleys in semiarid country. They also use scrubby brush, draws covered with Gambel oak, and dense shrublands – especially Gambel oak (Colorado Partners in Flight 2000). Virginia's warblers have a small breeding range, and in places their habitat has been severely altered. They are vulnerable to brown-headed cowbird parasitism and the rate of parasitism on Virginia's warbler may be on the rise (Kingery 1998). Virginia's warblers are endemic to Arizona, Colorado, New Mexico, and Utah. Accordingly, it is important that stewards of Virginia's warbler habitat in Colorado consider their requirements when making management decisions.

Green-tailed towhees are also strongly associated with mixed mountain shrublands in Colorado. They breed in dry shrubby hillsides (Gambel oak, mountain mahogany, serviceberry, sagebrush, snowberry, chokecherry, and antelope bitterbrush), in sagebrush flats (Colorado Partners in Flight 2000). They are most often seen at altitudes between 6,000-9,000 ft (Kingery 1998).

5.6 PIÑON-JUNIPER WOODLAND HABITAT

Piñon-juniper habitat supports one of the largest nesting bird species list of any upland vegetation type in western Colorado. The avian species richness in piñon-juniper ecological communities is due, in part, to the fact that it occurs at such a broad range of elevations (approximately 4,500 – 8,500 feet) (Balda & Masters 1980).

Like montane shrublands described above, many acres of piñon-juniper habitat on WRNF land border FMNP. At the present, however, the areal extent of this habitat type on the property is less than what would naturally occur. Again, this is largely due to past anthropogenic intervention. As time passes since maintenance of the hayfields/pastures ceased, the extent of the piñon-juniper cover type will increase. It is important to note that fire suppression in grasslands adjacent to piñon-juniper woodland has allowed the woodlands to advance by out-competing grasses (Kingery 1998). Also, ips beetles are having a significant impact on piñon pine in the Crystal River watershed.

Of the Priority Species for this habitat type by Colorado Partners in Flight, only one has been identified on FMNP, pinyon jay. The others, such as gray vireo and juniper titmouse occur at lower elevations (Colorado Partners in Flight 2000). Other bird species strongly associated with high elevation piñon-juniper woodlands at FMNP include blue-gray gnatcatchers, canyon wren, chipping sparrow, and mountain bluebird.

5.7 WETLANDS HABITAT

Wetlands are only exceeded in areal extent at FMNP by the non-native grasslands. The two major wetland areas − the bulrush dominated marsh (approximately 26 ac) surrounding the hot springs (Figure 17) and the shrub-scrub riparian wetland south of the Johnson residence with the overlooking viewing blind (Figure 18; approximately 15 ac) − occupy approximately 28% of the property. The bulrush dominated wetland supports a vigorous wetland bird community. Thirty-seven of Colorado's breeding bird species are dependent on wetlands. That means that 14% of the breeding species depend on less than 3% of the state's area. Many of the species are common and are presently of little current conservation concern (e.g., red-winged blackbird) (Colorado Partners in Flight 2000).

As described in the Mammal section, the shrub-scrub wetland is home to a small colony of

beavers that are important to the maintenance of this ecological community. In addition, this wetland contains three ponds that have historically supported a small number of nesting waterfowl. As the process of eutrophication continues, these ponds could be replaced by emergent wetlands resulting in the loss of the waterfowl habitat. The role the beavers and the irrigation ditch play in the maintenance of the open water component of this wetland should be investigated.

The bulrush dominated wetland around the hot springs is a seasonal wetland that supports a number of wetland bird species. Numerous red-winged blackbirds breed here as do a few pairs of killdeer. Harriers have been observed hunting over this wetland on a few occasions but no nest has been located at this time.

Bird species strongly associated with graminoid marshes and shrub-scrub wetlands recorded on the property include killdeer, lazuli bunting, red-winged blackbird, song sparrow, Wilson's snipe, and yellow warbler. In addition, cinnamon teal, gadwall, green-winged teal, mallard, and spotted sandpipers have been observed on or around the ponds. Lazuli buntings have been selected as a Colorado Partners in Flight Priority Species for riparian areas at this elevation (Colorado Partners in Flight 2000). Preferred habitats include Gambel oak, hillside shrublands, and riparian shrubland. In all habitats they require low shrubs. Habitat loss and the conversion of habitat for agriculture and residential development is the greatest threat for the lazuli bunting (Kingery 1998).

6.0 AMPHIBIANS AND REPTILES

Herpetofauna sampling has not been conducted at FMNP. Bullsnakes, tiger salamanders, western chorus frogs, and western terrestrial garter snakes have been observed on the property. FMNP contains appropriate habitat for northern leopard frogs but none have been found at this time (Hammerson 1999).

7.0 FISH

Fish sampling could be conducted in the future.

8.0 INVERTEBRATES

Invertebrate sampling could be conducted in the future. Of particular interest is the occurrence of fireflies at FMNP. According to Whitney Cranshaw, Colorado State University Entomologist, light emitting fireflies (not all adult fireflies produce light) have never been common in the western United States, although they do occur in scattered pockets around Colorado (2008 personal communication). They are almost always found near streams and permanent wetlands that have not been overly damaged by human activity. Fireflies, also known as lightning bugs, are soft-winged beetles, which belong to the Lampyridae family (3 species of the genus *Photuris* and 3 species of the genus *Photinus* may occur at FMNP). They lay eggs in damp soil along ponds, rivers and in wetlands. The larvae live in these moist habitats where they feast on slugs, snails, and other invertebrates. After pupating, they emerge as adults. The Lampyridae at FMNP are comprised of species that flash and the more common species that do not. The flash patterns for different species are unique and some species identifications, such as species in the genus *Photinus*, are based on these flash patterns because the morphology between species is indistinguishable. Some females of the genus *Photuris* use their ability to flash to attract dinner as well as potential dates. *Photuris* females

are known to lure males of genus *Photinus* with the flash pattern of female *Photinus* in order to consume them and obtain defensive chemicals from them (Eisner 2003).

9.0 RARE, IMPERILED, THREATENED, AND ENDANGERED RESOURCES[3]

The following species are designated by one or more state or federal agencies and/or conservation organizations as rare, imperiled, threatened, endangered, or of special concern. Species included below are known or suspected to occur on FMNP or within close proximity.

9.1 MAMMALS

Common Name	BLM/USFS Sensitivity Status	CNHP Global Rank	CNHP State Rank	ESA Designation	CDOW Status	Occurrence
Canada lynx	Sensitive	G5	S1	Threatened	Endangered	Reported in vicinity
Townsend's big-eared bat	Sensitive	G4T4	S2		Species of Concern	Potential Habitat

CDOW maps a small portion of the property as lynx potential habitat. Field surveys revealed that FMNP contains marginal habitat for Canada lynx but is adjacent to higher quality habitat. In addition, Canada lynx are known to have passed through the Crystal River Valley on more than one occasion. Canada lynx were listed in Colorado as endangered in 1973 and as a federally listed threatened species in 2000. Colorado is the southern edge of the range of the lynx. Lynx habitat in Colorado is usually found in the subalpine and upper montane forest zones, typically between 8,000 and 11,500 feet in elevation (Ruediger et al. 2000). Lynx habitat in Colorado tends to be a mosaic within these southern boreal forest landscapes, rather than as simple vegetation types. Spruce-fir, lodgepole pine, aspen, and mesic Douglas fir may all provide foraging and/or denning habitat for lynx. Also potentially important are the high elevation sagebrush and mountain shrub communities found adjacent to or intermixed with forested communities, affording potentially important alternate prey resources (USDA Forest Service 2004). Riparian and wetland shrub communities (e.g.: willow, alder, serviceberry) found in valleys, drainages, wet meadows, and moist timberline locations may also support important prey resources (USDA Forest Service 2004).

9.2 BIRDS

Common Name	BLM/USFS Sensitivity Status	CNHP Global Rank	CNHP State Rank	ESA Designation	CDOW Status	Occurrence
American peregrine falcon	G4T3	S3B, SZN			Sensitive	Known to occur
Bald eagle	G5	S1B,S3N			Sensitive	Winter
Flammulated owl	G4	S4	Declining		Sensitive	Potential habitat
Lewis's woodpecker	G4	S4	Declining		Sensitive	Known to occur

[3] See Appendices C and D for designation definitions.

Common Name	BLM/USFS Sensitivity Status	CNHP Global Rank	CNHP State Rank	ESA Designation	CDOW Status	Occurrence
Virginia's warbler	G5	S5	Declining			Known to occur
White-throated swift	G5	S5B	Declining			Known to occur

3.1 AMPHIBIANS

Common Name	BLM/USFS Sensitivity Status	CNHP Global Rank	CNHP State Rank	ESA Designation	CDOW Status	Occurrence
Northern leopard frog	G5	S3		Sensitive	Species of Concern	Historic occurrence

10.0 WILDLIFE - RECREATION INTERACTIONS

Increasing recreational use of Open Space poses many problems for wildlife. Off-road recreational vehicle use, dogs, skiing, hiking, bicycling, horseback riding, snowmobiling, hunting and road and trail development can all negatively impact wildlife. A recent publication prepared for the Montana Department of Fish, Wildlife and Parks, *Effects of Recreation on Rocky Mountain Wildlife* (Joslin & Youmans 1999) states:

> Wildlife responses to disturbance may be behavioral (e.g., avoidance, habituation, attraction) or physiological (stress). Short-term responses to disturbances are often presumed to be of little consequence to wildlife. But, over time, the stress of repeated disturbance may have detrimental consequences to individual animals by interrupting feeding or breeding behavior, reducing vigor, reducing productivity, and causing death; all have been documented. In the long-term, negative consequences to individual animals may result in lower population levels, changes in the composition of wildlife communities, and conflict between wildlife species.

Furthermore, the following activities can severely impact wildlife (Gabrielsen 1995):

1. **Viewing** – Disturbance as a result of close encounters may alter behavior, cause unnecessary energy expenditure, alter nest placement, and reduce survivorship of young (via abandonment or predation).
2. **Backpacking, hiking, cross-country skiing, /horseback riding** – flight and/or elevated heart rates, displacement.
3. **Rock Climbing** − Disturbance of preferred raptor perching and nesting sites during the breeding season, displacement.
4. **Pets** (dogs) – Provoke more of a predator-alarm response than a person unaccompanied by a dog, harassment/energy expenditure, direct mortality.
5. **Off Road Vehicles** (e.g., motorcycles, ATVs) – May cause disturbance (flight and/or stress) and redistribution.
6. **Hunting** – Alteration of sex and age composition, behavior, reproduction (including date of conception in elk), and distribution.

7. **Snowmobiles** – May cause disturbance (flight and/or stress) and/or redistribution. There can be a release of toxic by-products from combustion into snowpack and water.

Although recreation at Filoha Meadows Nature Preserve is limited at this time, recreational trails can pose challenges for managers of this ecologically important property. That being said there is clearly a need for guidelines to protect FMNP's ecological resources and wildlife from recreational disturbance while allowing uses that foster nature appreciation, education, knowledge, and stewardship. These should be designed for the species needing protection from the type of recreation causing the impact.

11.0 MANAGEMENT ACTIVITIES

Three primary activities will be used to achieve the wildlife objectives of this management plan: vegetation management, species and habitat monitoring, and adaptive management. Vegetation management practices will focus on maintaining and restoring the native vegetational communities as described in the Plant Ecology section. Monitoring of sensitive species and habitats will provide a baseline for establishment of thresholds and information on effects of management practices. Adaptive management will be the link between these components.

11.1 ADAPTIVE MANAGEMENT

Adaptive management will provide the basis for the long-term management of Filoha Meadows Nature Preserve and is considered fundamental to successful implementation of all management actions outlined in this plan. Adaptive management includes four general elements:

1. Monitoring of special status species and their habitats (begun in 2003);
2. Development of baseline data and management thresholds;
3. Application of management activities to maintain sensitive species habitats;
4. Reassessment of management thresholds and activities based on the monitoring results and management goals.

There is a considerable amount of information to be learned about the complex interactions between the various biotic and abiotic elements at work at Filoha Meadows Nature Preserve. The flexibility of an adaptive management approach will allow adjustments to be made throughout implementation of the management plan and ensure that the goals of the plan are met.

The key to adaptive management of the property will be the monitoring program, which will provide quantitative data on the management indicator species, species of cultural and economic importance, sensitive, rare, and/or imperiled species, as well as their habitat. These data will be used to develop and refine the habitat and population based objectives. Evaluation of management activities will involve examining annual monitoring data relative to thresholds while considering long-term habitat and population data trends, as well as the influence of natural environmental changes and anthropogenic influences. The analysis of monitoring data and thresholds will identify where management efforts are successful and

where additional measures need to be implemented to improve success. If continued monitoring shows that the management efforts are unsuccessful, staff will seek advice from various experts to investigate alternative management methods.

11.2 VERTEBRATE MONITORING

Monitoring is a tool to evaluate whether management actions are meeting the objectives set forth by this management plan. The monitoring methods have been developed to collect data that can be analyzed to determine whether management actions are achieving a stated goal related to a species' or suite of species' density, productivity, and or behavior. If they are not, management changes may be warranted. In addition, as more information is gained about the property and the species, changes in the management activities that are not contemplated at present may be implemented (adaptive management). Monitoring activities may include quantitative sampling of all birds during the breeding season at FMNP, year-round use by Rocky Mountain bighorn sheep and periodic winter track and motion-sensitive camera surveys for carnivores, and qualitative reconnaissance of avian, beaver, and ungulate habitat.

Monitoring efforts can closely track Management Indicator Species (MIS) to assess management objectives. In general MIS are selected because they qualify as one of the following:

1. Ecological indicators – usually a habitat obligate or strongly associated with a certain habitat, or those species most sensitive to habitat alteration (e.g., area-sensitive, edge-sensitive, and isolation-sensitive (Temple 1991);
2. Species commonly hunted or of cultural or economic significance; or
3. Endemic, rare, imperiled, threatened or endangered species.

11.3 AVIAN MONITORING

Rocky Mountain Bird Observatory (RMBO) in cooperation with the Colorado Division of Wildlife, U.S. Forest Service, Bureau of Land Management, and other agencies, has developed a program of point-count transects as the main technique in establishing a breeding-bird monitoring project for the state. The point count portion of this project is designed to be statistically rigorous and produce data for analysis of population trends of approximately 159 bird species that breed in Colorado (57.4% of the total breeding avifauna). In 1999 Jonathan Lowsky, Pitkin County Wildlife Biologist, modified that protocol in concert with Tony Leukering, RMBO Monitoring Director, for use on Pitkin County Open Space properties. As discussed above, an avian monitoring effort at FMNP should closely track four species as Management Indicator Species for FMNP: American dipper, cordilleran flycatcher, green-tailed towhee, and Virginia's warbler.

Cordilleran Flycatcher

Selection: Cordilleran Flycatchers breed in montane riparian forests and woodlands near cliffs, in shady canyon bottoms, and near streams(Dobkin 1994; DeGraaf & Rappole 1995). Water and shade are considered factors limiting the range of the cordilleran flycatcher. Edge habitat is important for feeding, specifically trees along shrubs, grass, or water edges(DeGraaf & Rappole 1995).

Conservation Issues: Habitat degradation from timber harvesting, heavy grazing, or development are the most significant threats. Cordilleran flycatchers are somewhat tolerant of human presence around nests, but may be vulnerable to disturbance just prior to fledging (USDA Forest Service 1994).

Management Recommendations:

1. Preserve standing dead trees. The loss of snags reduces nesting sites.
2. Any activity that would remove the dense understory preferred by this species would be detrimental.
3. Use of cut banks and other physical cover features may make them particularly vulnerable to damage to streambanks from over gazing or overuse for recreation.
4. Restore riparian habitat where it has been removed or degraded.

Virginia's Warbler

Selection: This species was selected for monitoring to answer the question, "Does current management maintain populations of species dependent on dense mountain shrub habitat?" Dense shrub components provide important foraging and nesting habitat for this and other species.

Conservation Issues: Virginia's warblers are strongly associated with Gambel oak. They nest on the ground in dense shrublands and on scrub-adorned slopes of mesas, foothills, open ravines, and mountain valleys in semiarid country. They also use scrubby brush, piñon-juniper woodland with a well-developed shrubby understory and Gambel oak component, ravines covered with Gambel oak, and dense shrublands – especially Gambel oak (Colorado Partners in Flight 2000).

Virginia's warblers are considered to be vulnerable due to its narrow geographic distribution on breeding and wintering ranges, and small populations in its breeding range (Colorado Partners in Flight 2000). Population declines occur immediately after fires that remove shrub habitats and brushy understories, but there is evidence that they benefit in the long term from burns that promote regeneration of shrubs and native understory grasses (Paige et al. 1999). Intentional alteration of habitat to enhance livestock grazing disturbs nesting, resting, and foraging habitat. Other species that may benefit from habitat management for this species on FMNP include MacGillivray's warbler, common poorwill, green-tailed towhee, spotted towhee, black-headed grosbeak, and broad-tailed hummingbird.

Management Recommendations:

1. Maintain mountain shrublands where Virginia's warblers occur.
2. Maintain herbaceous vegetation for nesting cover where Virginia's warblers occur.
3. Identify and restore historic mountain shrub habitat.
4. Produce a mosaic of habitat age classes on a landscape scale.
5. Maintain dense stands of mountain shrub habitat of at least 20 acres.
6. Avoid applying herbicides in Gambel oak dominated habitat while young are in the nest (May 15-June 30th).
7. Delay habitat manipulations in Virginia's warbler habitat until after July 20th.

8. Avoid management practices that create or increase the amount of edge between shrubland habitat and converted or highly altered land. These edges support Brown-headed Cowbirds, nest predators, and invasive grasses and forbs.

Recommended Research:

1. Continue to annually monitor Virginia's warbler populations through the PCOST Monitoring Protocol. Annually analyze 5-year trend to determine stability of population.
2. Determine best methods for controlling non-native invasions and reestablishing native habitat (Rotenberry 1998).
3. Investigate use of prescribed burns that promote regeneration of shrubs and native understory grasses.

Green-tailed Towhee

Selection: This species was selected for monitoring to answer the question, "Does current management maintain populations of species dependent on open shrub habitat?" Green-tailed towhees breed in dry shrubby hillsides (Gambel oak, mountain mahogany, serviceberry, sagebrush, snowberry, chokecherry, and antelope bitterbrush), in sagebrush flats, and on slightly moister soils within hillside shrublands around rock outcrops where fruit-bearing shrubs are found.

Conservation Issues: Conflicts related to the nesting, resting, and foraging of green-tailed towhees include mining, road construction, hiking trails, fire, conversion of rural areas to urban subdivisions (ski resorts), and intentional alteration of habitat to enhance livestock grazing. Large scale prescribed fires that eliminate the shrub component would be detrimental to this species.

Colorado contains between 20% and 40% of the entire breeding population of green-tailed towhees (Kingery 1998); therefore, Colorado has high responsibility for the conservation of this species (Colorado Partners in Flight 2000). Colorado Breeding Bird Atlas abundance calculations rank this towhee as the thirteenth most numerous species in Colorado, with almost a million breeding pairs (Kingery 1998). Mountain shrubland habitat in the West Slope is one of the most important breeding habitat types for green-tailed towhees. Other species that may benefit from habitat management for this species on FMNP include the common poorwill, green-tailed towhee, spotted towhee, black-headed grosbeak, and broad-tailed hummingbird.

Management Recommendations:

1. Survey areas for breeding green-tailed towhees before considering altering mountain shrubland by herbicide treatment, mechanical alteration, or burning.
2. Strive to produce landscape-scale mosaics of altered and unaltered habitat, and to prevent invasion of exotic plants such as cheatgrass.
3. Schedule habitat manipulations and/or prescribed burning in early spring before birds arrive and not during the bird's breeding and nesting season.
4. Ensure that habitat manipulations and/or prescribed fires leave adequate amounts of unburned shrubs to provide breeding habitat.

5. Maintain existing larger stands of shrublands and continuity between stands wherever possible.
6. Avoid applying herbicides in Gambel oak dominated habitat when while young are in the nest (May 15-June 30th).
7. Avoid management practices that create or increase the amount of edge between shrubland habitats and converted or highly altered land. These edges support brown-headed cowbirds, nest predators, and invasive grasses and forbs.
8. Management for natural shrubland mosaics interspersed with other shrub species and shrub habitats should favor green-tailed towhees (Braun 1976; Knopf 1990).

Recommended Research:

1. Continue to annually monitor green-tailed towhee populations through the PCOST Monitoring Protocol. Annually analyze 5-year trend to determine stability of population.
2. Research threshold levels below which green-tailed towhees drop in significant breeding numbers to determine where the critical loss of shrub cover occurs.
3. Determine best methods for controlling non-native invasions and reestablishing native habitat (Rotenberry 1998).
4. Investigate use of prescribed burns that promote regeneration of shrubs and native understory grasses.

11.4 MAMMALIAN MONITORING

Rocky Mountain Bighorn Sheep

Conservation Issues: Filoha Meadows Nature Preserve contains critical winter range for a herd of bighorn that have suffered population declines resulting from a variety of factors, not the least of which is loss of winter habitat (See bighorn sheep section above). As the manager of this property, it is incumbent on Pitkin County Open Space and Trails to maintain or improve this property such that it continues to support this population of bighorn sheep through the non-summer months. There are three major threats to the quality of bighorn winter range at FMNP:

1. Cheatgrass: As discussed above, if not treated, cheatgrass has a propensity to out-compete other grasses (both native and introduced pasture grasses) and can eventually form a monotypic community with little to no wildlife value. Cheatgrass poses a special threat to grazers such as bighorn. At maturity, the pointed, barbed fruits can work into the eyes, nostrils and mouths of livestock, causing inflammation and often serious injury. Sometimes the intestines are pierced and death results (Clements et al. 2003).

2. Piñon-juniper and montane shrubland expansion: The advancement of non-palatable woody shrubs and trees such as piñon pine and Rocky Mountain juniper into the region's grasslands has been blamed on two primary anthropogenic influences: (1) Cattle grazing; and (2) Fire suppression. Heavy grazing reduced community diversity and plant competition; as a result there were no fine fuels to carry surface and ground fires which were once common in the area's grasslands. Grazing also reduced

> competition from herbaceous species, allowed rapid growth of piñon, juniper, and other woody plants into adjacent grassland communities. Prior to white settlement, fires likely burned through the Plateau's extensive pinyon-juniper woodlands every 10–30 years (Touchan et al. 1995). Such frequent fires resulted in a shifting steady state mosaic of grasslands and woodlands. Over time, fire suppression has resulted in an expansion of piñon-juniper woodlands and montane shrublands in bighorn sheep winter range with a net loss of the grasslands that provide critical winter forage.

Recreation: Many authors have found that human disturbance can alter habitat use and activity patterns of bighorn sheep (e.g., (Miller & Smith 1985b; Etchberger 1989; Papouchis et al. 2000). Population declines (Etchberger 1989; Harris 1992), shifts in habitat use (Van Dyke et al. 1983), and interruption of seasonal migration routes (Ough & deVos 1984) have been linked to human disturbance. Timing and location of recreation in bighorn habitat, the distance between sheep and humans, and the presence of domestic dogs has a role in the impact of human activities on bighorn sheep.

MacArthur et al. (1982) found that bighorn sheep exhibited elevated heart rates in response to the presence of people, especially when people were approaching with a dog or from over a ridge. Miller and Smith (1985a) found that bighorn had a stronger adverse reaction to 1 or 2 humans on the ground than to parked vehicles or a light airplane circling overhead. Papouchis et al. (2000) found that bighorn sheep had a greater flight response to hikers than to mountain bikers or cars. King and Workman (1986) noted that responses may be more severe in areas where animals have historically been exposed to relatively high levels of human activity. Krausman et al. (2000) postulated that human recreation was a contributing factor in the decline of bighorn sheep in three southwest populations.

Response based on distance between the bighorn and the source of disturbance has been generally documented. Both flight and cardiac responses seem to be stimulated between about 50 and 100 meters (MacArthur et al. 1982; Holl & Bleich 1983; Miller & Smith 1985a). It should be noted, however, that the distance at which sheep become aware of the disturbance can also affect how far they move away from the disturbance (Miller and Smith 1985). Distance alone is a poor predictor of behavioral response to disturbance. Responses are variable and group size and gender compositions are also important factors (Miller and Smith 1985).

Domestic dogs can have a significant impact on bighorn sheep. Bighorn evolved with canine predators and thus react very strongly to domestic dogs (Geist 1971). Disturbance of bighorn by dogs causes heart rate increases and flight response (MacArthur et al. 1979; Purdy & Shaw 1981; MacArthur et al. 1982). Sheep will remain nervous and alert for up to 30 minutes following a dog encounter, responding to subtle stimuli with otherwise evoked no response (MacArthur et al. 1982). Goodson et al. (1999) noted that the elimination of camping and dogs in important sheep habitat resulted in a reduction in the effects of human disturbance to bighorn.

Objectives:

1. Maintain the integrity FMNP as a safe refuge for bighorn sheep.
2. Preserve migration routes to and from the property.
3. Protect, enhance, and restore the bighorn sheep habitat on the property.

Management Recommendations:

1. Improve bighorn winter range via mechanical removal of piñon pine and Rocky mountain juniper at the north end of the property. This will increase acreage of usable grazing habitat and improve sight distances for predator avoidance.
2. Prohibit dogs on the property.
3. Prohibit recreation on the east side of the Crystal River within 100 meters of bighorn winter range from October 1st through May 15th.
4. Preserve the integrity of the movement corridor along the old railroad right-of-way between FMNP and Avalanche Creek.
5. Eradicate all cheatgrass on the property.
6. Fences should be prohibited on the property except where necessary to achieve management goals. Such fences should be built such that they do not impede bighorn movement.

Recommended Research:

1. Annually monitor bighorn sheep use of the property.
2. Collaborate with CDOW, USFS on a larger population assessment.
3. Continue to cooperate with CDOW on lung worm treatment effort.
4. Determine best methods for controlling cheatgrass.

Rocky Mountain Elk

Elk have been chosen for 2 reasons: (1) because they may be over-utilizing the property due to a hunting induced refuge effect; and (2) they are charismatic and provide an excellent watchable wildlife opportunity. In addition, because elk are sensitive to the size and configuration of habitat patches across a landscape, they are indicators of ecological conditions at broad scales and, therefore, are helpful in the process of landscape scale conservation planning. Elk migration and winter use of the property could be monitored via seasonal counts, winter track surveys, and browse assessments.

Conservation Issues: As discussed above, FMNP provides important elk winter range and migration habitat in a valley where exurban development is decreasing the acreage of effective winter habitat. In some places, elk can even live around people, although this is not their normal behavior. But there are certain things elk need – early spring food, safe calving areas, nutritious summer forage, room for rutting – that they don't always find easily if their habitat has been reduced or disturbed. As described above, residential development in the Crystal River watershed has resulted in the direct and indirect loss of important winter range, calving habitat, and blocked historic migration routes.

Recreation can cause problems for elk, also. The disruption of migration routes, loss of seasonal habitat, and the reduction in habitat security on winter range and calving habitat from recreation, roads, livestock grazing, etc., are serious problems for some elk herds. One researcher (Cassirer 1992) has reported even the sight of a relatively quiet backcountry skier in Yellowstone National Park caused wintering female elk to move an average of 1,675 m (usually until a topographical break or tree line shielded their view from the skier). The authors recommended a minimum buffer of 650 m between cross country skiers and non-habituated elk on winter range (Cassirer 1992). Lieb and Mossman (1966) found that human disturbance caused elk with young calves to move to secondary forage areas away from the

central parts of their home ranges. Phillips and Alldredge (2000) were able to show that repeated displacement resulting from hiker disturbance during the calving season resulted in major declines in survival of elk calves. Whenever elk or any wild animal must move unnecessarily, that extra action burns calories the animals cannot afford to lose at this time of year.

Uncontrolled human use of FMNP during the winter presents high risks to elk. If human use becomes excessive in amount and distribution, elk could abandon the FMNP winter range. In the unlikely event that elk remain in the face of increased human use during winter, they will be subject to increased stress and decreased access to critical habitats during the period of the year when they are least able to respond. In either case, the result probably will be decreased survivorship (i.e., fewer calves or healthy calves born, and lowered calf survival through their first winter) and the eventual decline of this elk herd. It is important to note that while this elk herd certainly is adapted to survive limited losses due to periodically severe winter conditions, its long-term persistence may be critically linked with the ability to recover and increase herd numbers and condition during mild winters, with full access to the resources available at FMNP.

Habitat for elk on FMNP can be improved so other species such as bighorn sheep and mule deer will benefit as well. Thinning woody vegetation to increase herbaceous production can improve the forage for elk as well as bighorn sheep. As long as shrubs remain available in critical winter browse areas such treatments will increase production and nutrient content of plants preferred by both browsers and grazers. Thinning dense Gambel oak can greatly improve the forage value for elk, which primarily are grazers, by increasing herbaceous production. Although deer mainly are browsers and are heavily dependent on shrubs throughout much of the year, thinning oak and piñon-juniper also can be beneficial for deer because it stimulates tender young shoots that are more nutritious, palatable, and easily reached. For both deer and elk, however, thinning must be done in relatively small blocks so that adequate densities of tall brush and trees remain nearby for the requisite thermal and hiding cover.

Objectives:

1. Protect, enhance, and restore the transition and winter habitat on the property while minimizing negative impacts on the habitat of other species.
2. Preserve the watchable wildlife opportunity that wintering elk provide at FMNP.

Management Recommendations:

1. Maintain elk populations at a level that the shrub community can support and continue to regenerate.
2. Monitor browsing by wild ungulates in areas where productive stands of berry-producing shrubs are desired.
3. Seasonal recreation restrictions should be implemented on the east side of the Crystal River to provide minimum elk habitat effectiveness (e.g., November 1st through June 30th).
4. Manage shrublands to produce a mosaic of habitat age classes on a landscape scale.
5. Create elk exclosures as controls to evaluate browsing pressure.
6. Thin woody vegetation to increase herbaceous production as described above.
7. Monitor elk use of the property during hunting season to evaluate refuge effect.

8. If the refuge effect is occurring, cooperate with CDOW to develop a program to reduce the refuge effect, and facilitate population management.
9. Fences should be avoided on the property except where necessary to achieve management goals. Fences necessary for recreation management should be wildlife friendly and should have gaps every 50 – 100 feet to facilitate passage of elk calves and mule deer fawns.

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FILOHA MEADOWS NATURE PRESERVE

FIGURES

RESOURCE MANAGEMENT PLAN:
WILDLIFE RESOURCES

Figure 1. Piñon-juniper woodland invading old hayfields/pasture.

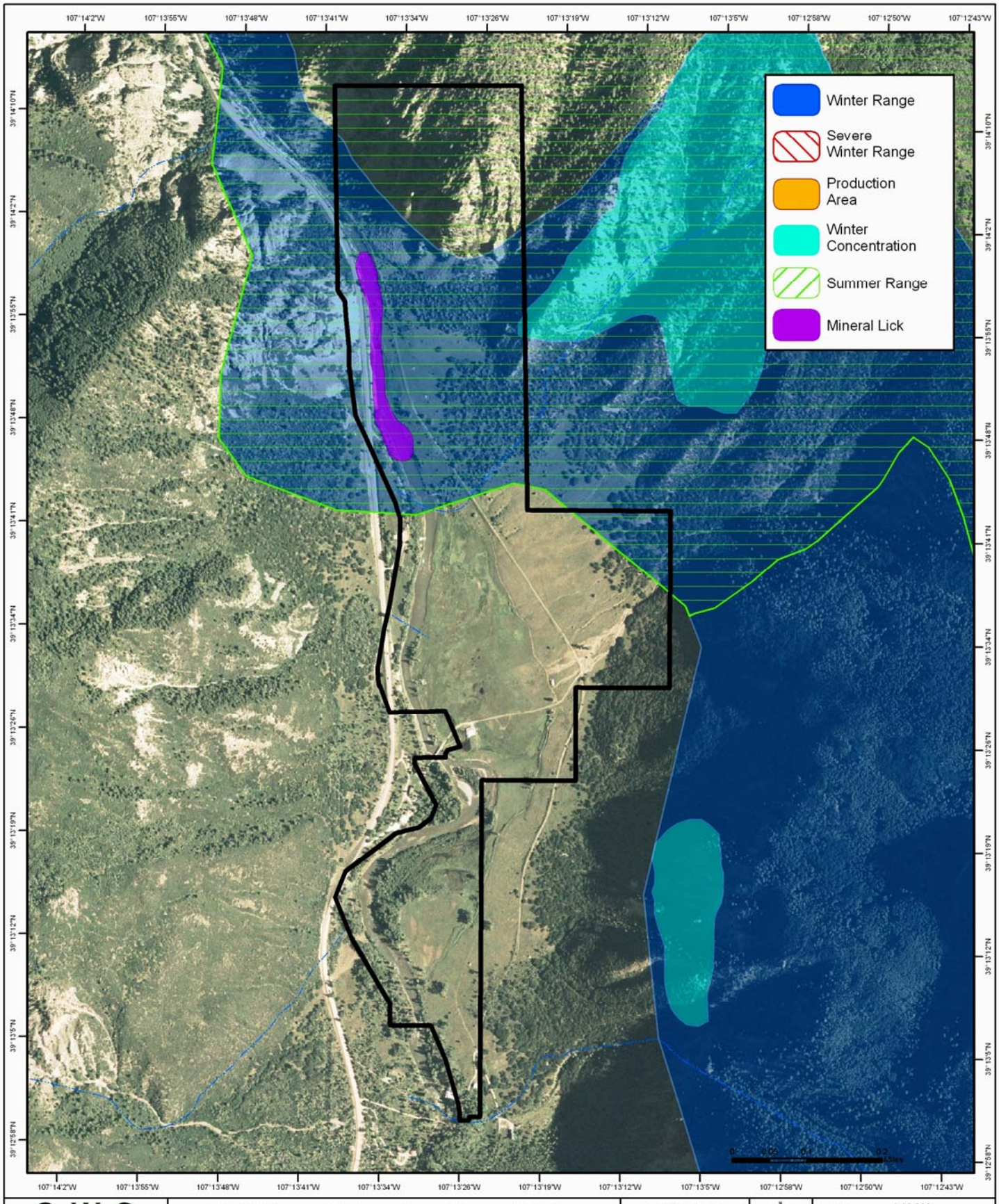
Figure 2. Crystal River and riparian habitat.

Figure 3. Heavily browsed Gambel oak.

Figure 4. Highly eroded river banks.

Figure 5. Excellent bighorn sheep habitat at FMNP.

Figure 5a. Part of the bighorn sheep winter concentration area at FMNP.



C W S
COLORADO WILDLIFE SCIENCE, LLC
0100 Elk Run Dr, Suite 128A
Basalt, CO 81621
970.927.4549
info@coloradowildlifescience.com

CDOW Mapped Bighorn Sheep Seasonal Habitat

Filoha Meadows Nature Preserve

Pitkin County, Colorado

Basemap Source:
USDA-FSA-APFO NAIP
2005 Mosaicked County Image
Pitkin County, CO

NOTE: Boundaries are approximate

Figure 6

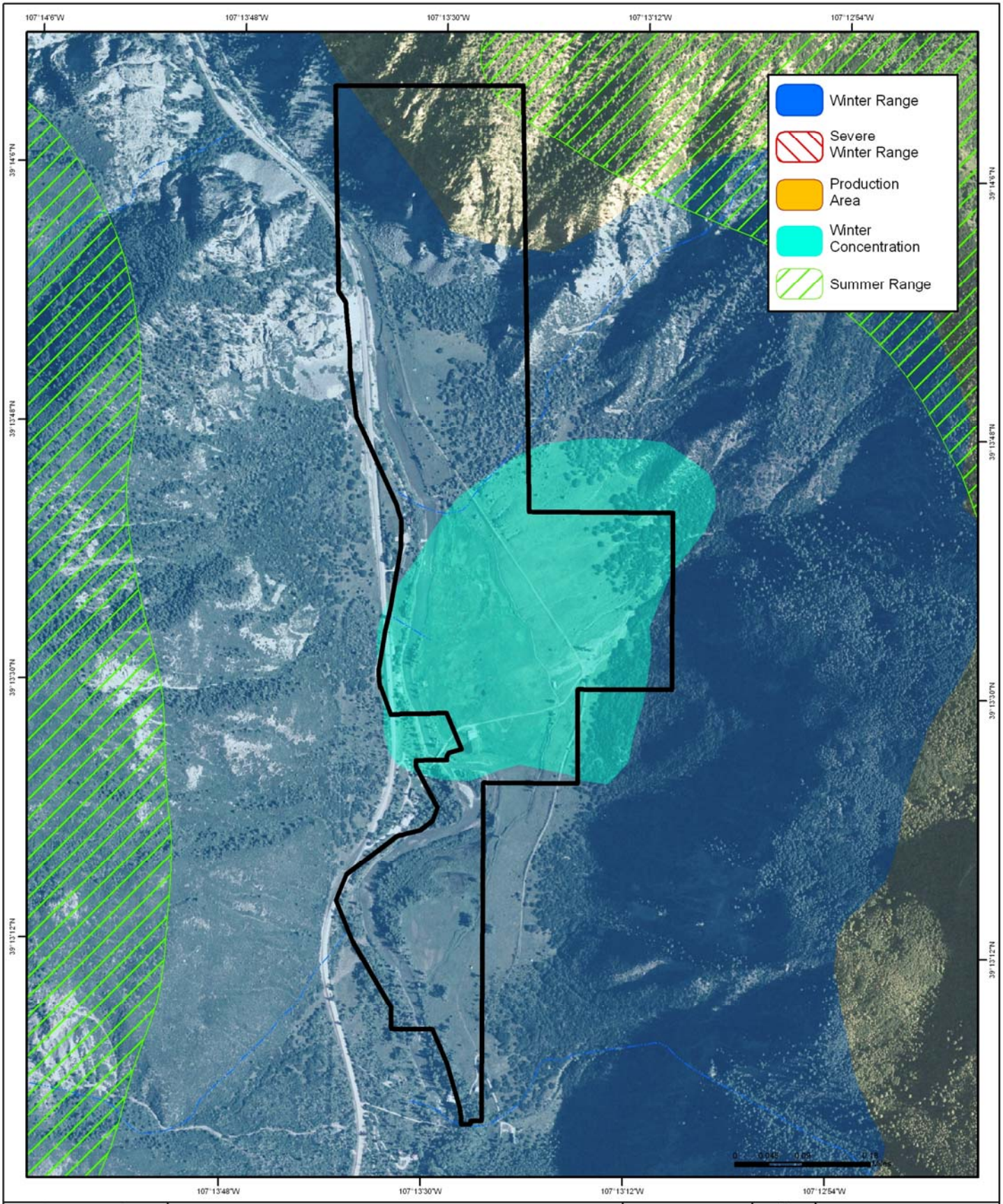
Scale:	1:10,000
Drawn By:	J. Lowsky
Project Name:	2005.PCOST.FMNP
Date:	February 6, 2005

Figure 7. Bighorn ram with ewes in winter concentration area at FMNP.

Figure 8. Crystal River and bighorn mineral lick.

Figure 9. Bighorn ram with ewe and lamb harem at CDOW medication station on FMNP.

Figure 10. Bighorn ram grazing on pasture grasses.



C W S
COLORADO WILDLIFE SCIENCE, LLC
0100 Elk Run Dr. Suite 128A
Basalt, CO 81621
970.927.4549
info@coloradowildlifescience.com

CDOW Mapped Elk Seasonal Habitat

Filoha Meadows Nature Preserve

Pitkin County, Colorado

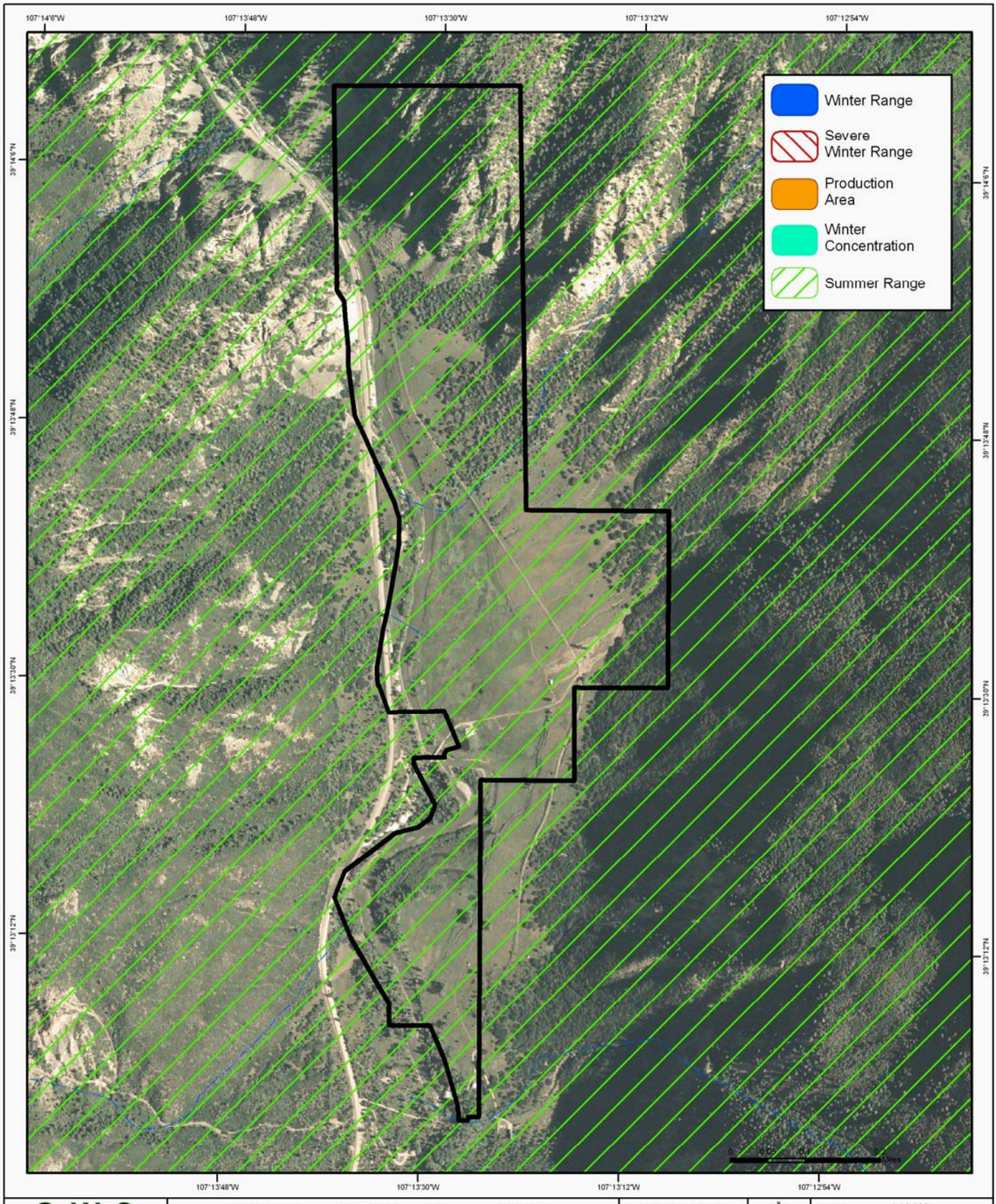
Basemap Source:
USDA-FSA-APFO NAIP
2005 Mosaicked County Image
Pitkin County, CO

NOTE: Boundaries are approximate

Figure 11

Scale:	
Drawn By:	J. Lowsky
Project Name:	2005.PCOST.FMNP
Date:	February 6, 2005

Figure 12. Elk grazing in winter concentration area at FMNP.



C W S
COLORADO WILDLIFE SCIENCE, LLC
0100 Elk Run Dr, Suite 128A
Basalt, CO 81621
970.927.4549
info@coloradowildlifescience.com

CDOW Mapped Mule Deer Seasonal Habitat

Filoha Meadows Nature Preserve

Pitkin County, Colorado

Basemap Source:
USDA-FSA-APFO NAIP
2005 Mosaicked County Image
Pitkin County, CO

NOTE: Boundaries are approximate

Figure 13

Scale:	1:10,000
Drawn By:	J. Lowsky
Project Name:	2005.PCOST.FMNP
Date:	February 6, 2005

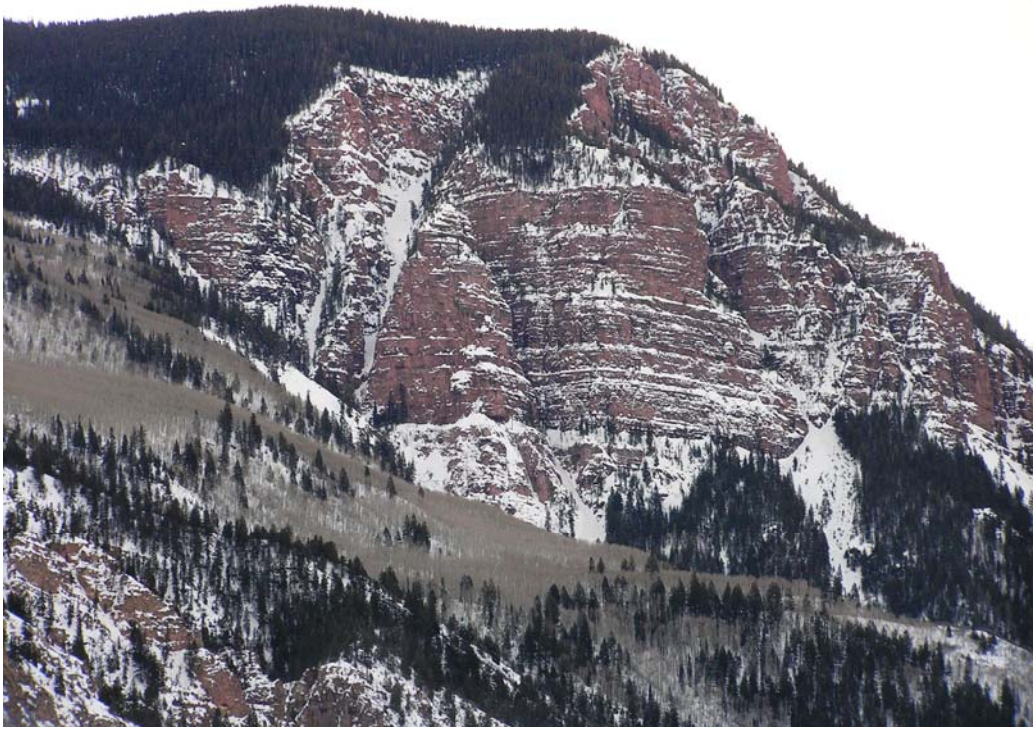


Figure 14. Peregrine falcon nesting habitat above FMNP.

Figure 15. Riparian forest on south end of FMNP.

Figure 16. Elk in Gambel oak dominated montane shrublands.

Figure 17. Bulrush and sedge wetlands around hot springs.

Figure 18. Beaver pond-riparian wetland complex.

Figure 19. Non-native pasture grass dominated grasslands.

Figure 20. American dipper in Crystal River at FMNP.

APPENDIX A. Vertebrates known or suspected to occur on Filoha Meadows Nature Preserve.

The birds are listed in Table A1, the mammals are listed in Table B2, and the amphibians and reptiles are listed in Table A3. An asterisk (*) following a common name indicates that the species has been recently observed on the property or has been identified as occurring on the property via scat, tracks, or other sign.

Table A1: Birds

	Common Name	Latin Name
1	American coot*	*Fulica americana*
2	American dipper*	*Cinclus mexicanus*
3	American kestrel*	*Falco sparverius*
4	American peregrine falcon*	*Falco peregrinus anatum*
5	American robin*	*Turdus migratorius*
6	Bald eagle*	*Haliaeetus leucocephalus*
7	Bank swallow*	*Riparia riparia*
8	Barn swallow*	*Hirundo rustica*
9	Belted kingfisher*	*Ceryle alcyon*
10	Black-billed magpie*	*Pica hudsonia*
11	Black-capped chickadee*	*Poecile atricapillus*
12	Black-headed grosbeak*	*Pheucticus melanocephalus*
13	Blue grouse*	*Dendragapus obscurus*
14	Blue-gray gnatcatcher*	*Polioptila caerulea*
15	Blue-winged teal	*Anas discors*
16	Broad-tailed hummingbird*	*Selasphorus platycercus*
17	Brown creeper	*Certhia americana*
18	Brown-headed cowbird*	*Molothrus ater*
19	Bushtit	*Psaltriparus minimus*
20	Canada goose*	*Branta canadensis*
21	Canyon wren*	*Catherpes mexicanus*
22	Cedar waxwing	*Bombycilla cedrorum*
23	Chipping sparrow*	*Spizella passerina*
24	Cinnamon teal*	*Anas cyanoptera*
25	Common merganser	*Mergus merganser*
26	Common nighthawk*	*Chordeiles minor*
27	Common poorwill	*Phalenoptilus nuttallii*
28	Common raven*	*Corvus corax*
29	Cooper's hawk	*Accipiter cooperii*
30	Cordilleran flycatcher*	*Empidonax occidentalis*
31	Dark-eyed junco*	*Junco hyemalis*
32	Downy woodpecker*	*Picoides pubescens*
33	Dusky flycatcher*	*Empidonax oberholseri*
34	Evening grosbeak	*Coccothraustes vespertinus*
35	Flammulated owl	*Otus flammeolus*
36	Fox sparrow	*Passerella iliaca*
37	Gadwall*	Anas strepera
38	Golden eagle*	*Aquila chrysaetos*
39	Great blue heron*	*Ardea herodias*
40	Great-horned owl	*Bubo virginianus*

Table A1: Birds		
	Common Name	**Latin Name**
41	Green-tailed towhee*	*Pipilo chlorurus*
42	Green-winged teal*	*Anas crecca*
43	Hairy woodpecker*	*Picoides villosus*
44	House finch*	*Carpodacus mexicanus*
45	House wren*	*Troglodytes aedon*
46	Lazuli bunting*	*Passerina amoena*
47	Lewis' woodpecker	*Melanerpes lewis*
48	Lincoln's sparrow	*Melospiza lincolnii*
49	Long-eared owl	*Asio otus*
50	Macgillivray's warbler*	*Oporornis tolmiei*
51	Mallard*	*Anas platyrynchus*
52	Mountain bluebird*	*Sialia currucoides*
53	Mountain chickadee*	*Poecile gambeli*
54	Mourning dove*	*Zenaida macroura*
55	Northern flicker*	*Colaptes auratus*
56	Northern harrier*	*Circus cyaneus*
57	Northern pygmy owl	*Glaucidium gnoma*
58	Northern rough-winged swallow*	*Stelgidopteryx serripennis*
59	Northern saw-whet owl	*Aegolius acadicus*
60	Orange-crowned warbler*	*Vermivora celata*
61	Pinyon jay*	*Gymnorhinus cyanocephalus*
62	Plumbeous vireo*	*Vireo plumbeus*
63	Pygmy nuthatch	*Sitta pygmaea*
64	Red-naped sapsucker*	*Sphyrapicus nuchalis*
65	Red-tailed hawk*	*Buteo jamaicensis*
66	Red-winged blackbird*	*Agelaius phoeniceus*
67	Rock wren	*Salpinctes obsoletus*
68	Ruby-crowned kinglet*	*Regulus calendula*
69	Sharp-shinned hawk	*Accipiter striatus*
70	Song sparrow*	*Melospiza melodia*
71	Sora	*Porzana carolina*
72	Spotted sandpiper*	*Actitus macularis*
73	Spotted towhee*	*Pipilo maculatus*
74	Steller's jay*	*Cyanocitta stelleri*
75	Townsend's solitaire*	*Myadestes townsendi*
76	Tree swallow*	*Tachycineta bicolor*
77	Turkey vulture*	*Cathartes aura*
78	Vesper sparrow*	*Pooecetes gramineus*
79	Violet-green swallow*	*Tachycineta thalassina*
80	Virginia rail	*Rallus limicola*
81	Warbling vireo*	*Vireo gilvus*
82	Western meadowlark*	*Sturnella neglecta*
83	Western screech-owl	*Otus kennicottii*
84	Western scrub jay*	*Aphelocoma californica*
85	Western tanager*	*Piranga ludoviciana*
86	Western wood-pewee*	*Contopus sordidulus*
87	White-breasted nuthatch*	*Sitta carolinensis*
88	White-crowned sparrow	*Zonotrichia leucophrys*
89	White-throated swift*	*Aeronautes saxatalis*

Table A1: Birds		
	Common Name	**Latin Name**
90	Wild turkey*	*Meleagris gallopavo*
91	Wilson's snipe[4]	*Gallinago delicata*
92	Yellow warbler*	*Dendroica petechia*
93	Yellow-rumped warbler*	*Dendroica coronata*

Table A2. Mammals		
	Common Name	**Latin Name**
1	American badger	*Taxidea taxus*
2	American beaver*	*Castor canadensis*
3	Big brown bat	*Eptesicus fuscus*
4	Black bear*	*Ursus americanus*
5	Bobcat	*Lynx rufus*
6	Bushy-tailed woodrat*	*Neotoma cinerea*
7	Common muskrat*	*Ondatra zibethicus*
8	Coyote*	*Canis latrans*
9	Deer mouse*	*Peromyscus maniculatus*
10	Dwarf shrew	*Sorex nanus*
11	Ermine	*Mustela erminea*
12	Fringed myotis	*Myotis thysanodes*
13	Golden-mantled ground squirrel*	*Spermophilus lateralis*
14	Hoary bat	*Lasiurus cinereus*
15	Least chipmunk*	*Tamias minimus*
16	Little brown myotis	*Myotis lucifugus*
17	Long-legged myotis	*Myotis volans*
18	Long-tailed vole	*Microtus longicaudus*
19	Long-tailed weasel*	*Mustela frenata*
20	Masked shrew	*Sorex cinereus*
21	Meadow vole	*Microtus pennsylvanicus*
22	Montane shrew	*Sorex monticolus*
23	Montane vole*	*Microtus montanus*
24	Mountain lion*	*Felis concolor*
25	Mule deer*	*Odocoileus hemionus hemionus*
26	Northern pocket gopher*	*Thomomys talpoides meritus*
27	Mountain cottontail*	*Sylvilagus nuttallii*
28	Red fox*	*Vulpes vulpes*
29	Rock squirrel*	*Spermophilus variegatus*
30	Silver-haired bat	*Lasionycteris noctivagans*
31	Striped skunk*	*Mephitis mephitis*
32	Southern red-backed vole	*Clethrionomys gapperi*
33	Townsend's big-eared bat	*Corynorhinus townsendii pallescens*

[4] The Wilson's snipe was recently recognized as a different species from the common snipe of Eurasia (Banks 2002).

Table A2. Mammals		
	Common Name	**Latin Name**
34	Uinta chipmunk	*Tamias umbrinus*
35	Rocky Mountain bighorn sheep*	*Ovis canadensis canadensis*
36	Rocky Mountain elk*	*Cervus elaphus nelsoni*
37	Water shrew	*Sorex palustris*
38	Wyoming ground squirrel*	*Spermophilus elegans*
39	Yellow-bellied marmot*	*Marmota flaviventris*

Table A3. Amphibians and Reptiles		
	Common Name	**Latin Name**
1	Bullsnake (or Gopher snake)	*Pituophis catenipher*
2	Northern leopard frog	*Rana pipiens*
3	Tiger salamander*	*Ambystoma tigrinum*
4	Western chorus frogs*	*Pseudacris triseriata*
5	Western terrestrial garter snakes*	*Thamnophis elegans*

APPENDIX B: Colorado Division of Wildlife Natural Resource Information System ungulate seasonal activity area definitions

ROCKY MOUNTAIN BIGHORN SHEEP

MIGRATION CORRIDORS: A specific mappable site through which large numbers of animals migrate and loss of which would change migration routes.

MINERAL LICK: Specific natural sites known to be utilized by bighorn sheep for obtaining minerals to meet basic nutritional needs.

OVERALL RANGE: The area which encompasses all known seasonal activity areas within the observed range of a bighorn sheep population.

PRODUCTION AREA: That part of the overall range of bighorn sheep occupied by pregnant females during a specific period of spring. This period is May 1 to June 30 for Rocky Mountain bighorn sheep and February 28 to May 1 for desert bighorn sheep.

SEVERE WINTER: That part of the overall range where 90% of the individuals are located when the annual snowpack is at its maximum and/or temperatures are at a minimum in the two worst winters out of ten.

SUMMER CONCENTRATION: Those areas where bighorn sheep concentrate from mid-June through mid-August. High quality forage, security, and lack of disturbance may be characteristic of these areas to meet the high energy demands of lactation, calf rearing, antler growth, and general preparation for the rigors of fall and winter.

SUMMER RANGE: That part of the overall range where 90% of the individuals are located between spring green-up and the first heavy snowfall. Summer range is not necessarily exclusive of winter range; in some areas winter range and summer range may overlap.

WATER SOURCE: Water sources known to be utilized by bighorn sheep in dry, water scarce areas. Up to a 1.6km radius should be described around a point source, and up to a 1.6km band be drawn along a river or stream.

WINTER CONCENTRATION: That part of the winter range where densities are at least 200% greater than the surrounding winter range density during the same period used to define winter range in the average five winters out of ten.

WINTER RANGE: That part of the overall range where 90 percent of the individuals are located during the average five winters out of ten from the first heavy snowfall to spring green-up, or during a site specific period of winter as defined for each Data Analysis Unit (DAU).

ROCKY MOUNTAIN ELK

HIGHWAY CROSSING: Those areas where elk movements traditionally cross roads, presenting potential conflicts between elk and motorists.

LIMITED USE AREA: An area within the overall range which is occasionally inhabited by elk and/or contains a small scattered population of elk.

MIGRATION CORRIDORS: A specific mappable site through which large numbers of animals migrate and loss of which would change migration routes.

OVERALL RANGE: The area which encompasses all known seasonal activity areas within the observed range of an elk population.

PRODUCTION AREA: That part of the overall range of elk occupied by the females from May 15 to June 15 for calving. (Only known areas are mapped and this does not include all production areas for the DAU).

RESIDENT POPULATION: An area used year-round by a population of elk. Individuals could be found in any part of the area at any time of the year; the area cannot be subdivided into seasonal ranges. It is most likely included within the overall range of the larger population.

SEVERE WINTER: That part of the range of a species where 90 percent of the individuals are located when the annual snowpack is at its maximum and/or temperatures are at a minimum in the two worst winters out of ten. The winter of 1983-84 is a good example of a severe winter.

SUMMER CONCENTRATION: Those areas where elk concentrate from mid-June through mid-August. High quality forage, security, and lack of disturbance are characteristics of these areas to meet the high energy demands of lactation, calf rearing, antler growth, and general preparation for the rigors of fall and winter.

SUMMER RANGE: That part of the range of a species where 90% of the individuals are located between spring green-up and the first heavy snowfall, or during a site specific period of summer as defined for each DAU. Summer range is not necessarily exclusive of winter range; in some areas winter range and summer range may overlap.

WINTER CONCENTRATION: That part of the winter range of a species where densities are at least 200% greater than the surrounding winter range density during the same period used to define winter range in the average five winters out of ten.

WINTER RANGE: That part of the overall range of a species where 90 percent of the individuals are located during the average five winters out of ten from the first heavy snowfall to spring green-up, or during a site specific period of winter as defined for each DAU.

MULE DEER

CONCENTRATION AREA: That part of the overall range where higher quality habitat supports significantly higher densities than surrounding areas. These areas are typically occupied year round and are not necessarily associated with a specific season. Includes rough break country, riparian areas, small drainages, and large areas of irrigated cropland.

HIGHWAY CROSSING: Those areas where mule deer movements traditionally cross roads, presenting potential conflicts between mule deer and motorists.

LIMITEDUSE AREA: An area within the overall range of mule deer that is only occasionally inhabited and/or contains only a small population of scattered mule deer.

MIGRATION CORRIDORS: A specific mappable site through which large numbers of animals migrate and loss of which would change migration routes.

OVERALL RANGE: The area which encompasses all known seasonal activity areas within the observed range of a mule deer population.

RESIDENT POPULATION: An area that provides year-round range for a population of mule deer. The resident mule deer use all of the area all year; it cannot be subdivided into seasonal ranges although it may be included within the overall range of the larger population.

SEVERE WINTER: That part of the overall range where 90% of the individuals are located when the annual snowpack is at its maximum and/or temperatures are at a minimum in the two worst winters out of ten. SUMMER RANGE: That part of the overall range where 90% of the individuals are located between spring green-up and the first heavy snowfall. Summer range is not necessarily exclusive of winter range; in some areas winter range and summer range may overlap.

WINTER CONCENTRATION: That part of the winter range where densities are at least 200% greater than the surrounding winter range density during the same period used to define winter range in the average five winters out of ten.

WINTER RANGE: That part of the overall range where 90 percent of the individuals are located during the average five winters out of ten from the first heavy snowfall to spring green-up, or during a site specific period of winter as defined for each DAU.

Source: (Colorado Division of Wildlife 2004)

APPENDIX C: COLORADO NATURAL HISTORY PROGRAM RANKING ELEMENT RANKINGS

CNHP uses an element ranking system that emphasizes the number of occurrences at distinct localities as an index of biological rarity. This index is based on the assumption that an element found in one place is more imperiled than an element found in many places. The factor of rarity is then modified by information on the size of the geographic range, the total number of individuals, trends in both population and distribution, identifiable threats, fragility, and the number of already protected occurrences. Each element is then assigned a rank that indicates its relative degree of imperilment on a five point scale:

1. Critically imperiled or extremely rare; generally five or fewer occurrences;
2. Imperiled or very rare; usually 6 to 20 occurrences;
3. Very rare or found in a restricted range; 21-100 occurrences;
4. Apparently secure; and
5. Demonstrably secure.

Element ranks are assigned in terms of imperilment within Colorado, the state rank, and the element's imperilment over its entire range, its global rank. The global rank, or G-rank, sets the highest priorities. The state rank, or S-rank, is used in discerning state and regional priorities. For example, an element with a rank of G3S2 will receive higher priority than an element with a rank of G5S1 due to its global rank. Together these two ranks provide an instant picture of an element's degree of imperilment.

Elements that receive a rank of S1, S2, and S3 are used to set species protection priorities. Elements with a ranking of S3S4 are "watchlisted"; occurrence data is collected and periodically analyzed to determine if more active tracking is warranted. Any element more common than a "watchlisted" element, with an S-rank of S4 or S5, is not closely monitored. Accepted subspecies are also included on the CNHP list, but they receive less priority than an equivalently ranked or imperiled species.

This single ranking system identifies all imperiled elements except those that are migratory. When ranking migratory elements, it is necessary to distinguish between breeding, non-breeding, and resident species. Ranking followed by a "B", e.g. S1B, indicates that the rank applies only to the status of breeding occurrences. Ranking followed by an "N", e.g. S1N, refer to the non-breeding status, typically during migration and winter. Elements without this notation are believed to be year-round residents within the state. A complete description of each of the Natural Heritage global and state ranks is provided in Tables 1A and 1B, respectively.

Legal Designations

Natural Heritage rarity ranks should not be interpreted as legal designations. Although most species protected under state or federal endangered species laws are extremely rare, not all rare species receive legal protection. Legal status is designated by either the U.S. Fish and Wildlife Service under the Endangered Species Act or by the Colorado Division of Wildlife under Colorado Statutes 33-2-105 Article 2. In addition, the U.S. Forest Service recognizes some species as "Sensitive," as does the Bureau of Land Management. Table 2 defines the special status assigned by these agencies and provides a key to the abbreviations used by CNHP.

Please note: The U.S. Fish and Wildlife Service has issued a Notice of Review in the February 28 Federal Register for plants and animal species that are "candidates" for listing as endangered or threatened under the Endangered Species Act. The revised candidate list replaces an old system that listed many more species under three categories: Category 1 (C1), Category 2 (C2), and Category 3 (including 3A, 3B, 3C). Beginning with the February 28 notice, the Service will recognize as candidates for listing only species that would have been included in the former Category 1. This includes those species for which the Service has sufficient information on their biological status and threats to propose them as endangered or threatened under the Endangered Species Act.

Candidate species listed in the February 28 Federal Register are indicated with a "C". Former Category 2 and Category 3 codes are noted in this publication in parentheses, (e.g. (C2)). Although obsolete legal status codes will not be provided in future issues, CNHP will continue to maintain them in it's Biological and Conservation Data system for reference.

APPENDIX D: GOVERNMENTAL AGENCY STATUS CODES

Federal Status:

1. U.S. Fish and Wildlife Service (58 Federal Register 51147, 1993) and (61 Federal Register 7598, 1996)

LE	Listed Endangered: defined as a species, subspecies, or variety in danger of extinction throughout all or a significant portion of its range.
E(S/A)	Endangered: treated as endangered due to similarity of appearance with listed species.
LT	Listed Threatened: defined as a species, subspecies, or variety likely to become endangered in the foreseeable future throughout all or a significant portion of its range.
P	Proposed: taxa formally proposed for listing as Endangered or Threatened (a proposal has been published in the Federal Register, but not a final rule).
C	Candidate: taxa for which substantial biological information exists on file to support proposals to list them as endangered or threatened, but no proposal has been published yet in the Federal Register.
*** (LE,C)**	All of the species' infraspecific taxa worldwide are listed as Endangered or as Candidates.
*** (LE,LT)**	All of the species' infraspecific taxa worldwide are listed as Endangered or as Threatened.
*** (LE,XN)**	All of the species' infraspecific taxa worldwide are listed as Endangered; however, a nonessential experimental population exists in Colorado
*** (PS)**	Partial status; infraspecific taxon or population has federal status but the entire species does not (status in only a portion of the species' range)
*** (PS,LE)**	Partial status; infraspecific taxon or population is listed as Endangered in only a portion of the species' range
*** (PS,LT)**	Partial status; infraspecific taxon or population is listed as Threatened in only a portion of the species' range
*** (PS:LT,PDL)**	Partial status; infraspecific taxon or population is listed as Threatened, proposed delisting, in only a portion of the species' range

*** Status Due to Taxonomic Relationship (Values in Parentheses)**

The taxonomic relationships between species and their infraspecific taxa may determine whether a taxon has federal protection. Section 17.11(g) of the Endangered Species Act states, "the listing of a particular taxon includes all lower taxonomic units." Also, if an infraspecific taxon or population has federal status, then by default, some part of the species has federal protection. NatureServe data for some taxa show values indicating U.S. ESA status even though the element may not be specifically named in the Federal Register. Where status is implied due to a taxonomic relationship alone, the status abbreviation appears in parentheses and no date of listing is given (NatureServe 2005).

2. U.S. Forest Service (Forest Service Manual 2670.5) (noted by the Forest Service as "S")

FS	Sensitive: those plant and animal species identified by the Regional Forester for which population viability is a concern as evidenced by: Significant current or predicted downward trends in population numbers or density. Significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution.

3. Bureau of Land Management (BLM Manual 6840.06D) (noted by BLM as "S")

BLM	Sensitive: those species found on public lands, designated by a State Director, that could easily become endangered or extinct in a state. The protection provided for sensitive species is the same as that provided for C (candidate) species.

4. State Status:

The Colorado Division of Wildlife has developed categories of imperilment for nongame species (refer to the Colorado Division of Wildlife's Chapter 10 – Nongame Wildlife of the Wildlife Commission's regulations). The categories being used and the associated CNHP codes are provided below.

E	Endangered: those species or subspecies of native wildlife whose prospects for survival or recruitment within this state are in jeopardy, as determined by the Commission.
T	Threatened: those species or subspecies of native wildlife which, as determined by the Commission, are not in immediate jeopardy of extinction but are vulnerable because they exist in such small numbers, are so extremely restricted in their range, or are experiencing such low recruitment or survival that they may become extinct.
SC	Special Concern: those species or subspecies of native wildlife that have been removed from the state threatened or endangered list within the last five years; are proposed for federal listing (or are a federal listing "candidate species") and are not already state listed; have experienced, based on the best available data, a downward trend in numbers or distribution lasting at least five years that may lead to an endangered or threatened status; or are otherwise determined to be vulnerable in Colorado.