A Natural Heritage Assessment

of Wetlands and Riparian Areas in

Routt County, Colorado

Report Submitted to:
the Colorado Department of Natural Resources

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REPORT ORGANIZATION

This report is divided into 3 sections. Each section contains a table of contents, list of tables, and list of figures (when necessary). The first section (red tabs) presents the executive summary, recommendations, and sites of biodiversity significance. The second section (blue tabs) presents the project's background, wetland definitions and regulations, methods, major impacts, Colorado Natural Heritage Program description, wetland functions and values, and the hydrogeomorphic approach. The third section (green tabs) contains characterization abstracts of the wetland/riparian communities, plants, amphibians, birds, and invertebrates associated with Routt County wetlands. The literature cited and field form examples are located at the end of the report. It is hoped that this organization will be helpful to all who will use this report.

ACKNOWLEDGMENTS

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Finally, we thank the many landowners (too numerous to name here) for their cooperation in allowing us access to their land to conduct the inventory.

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EXECUTIVE SUMMARY

Routt County contains a diverse array of wetlands which support a wide variety plants, animals, and plant communities. At least 5 plants, 8 birds, 2 fish, 3 amphibians, 4 invertebrates, and 47 major plant communities from the Colorado Natural Heritage Program's (CNHP's) list of rare and imperiled elements are known (or expected) to occur in Routt County wetlands. In addition to their biological significance, these wetlands perform many functions that provide value to the residents of the county, as well as communities down river. Routt County wetlands help control flooding, maintain water quality, provide wildlife habitat, provide recreational opportunities, and add to the aesthetic quality of the county.

In 1995, CNHP received funding to inventory wetland areas under Routt County jurisdiction (excluding federal and state lands). The lands included in the survey are privately owned or under the purview of the Routt County government, with special emphasis on the South Steamboat Springs area. The funding for this project was provided by the U.S. Environmental Protection Agency to the Colorado Department of Natural Resources, which selects projects and administers funding. The purpose of the funding is to provide local planners, resource managers, and citizens with information on the status and value of their riparian and wetland areas.

This report presents the results of a comprehensive wetland survey designed to better understand the types of wetlands which occur in Routt County, along with their distribution and their natural heritage value. Eighteen wetland and riparian sites (general locations only) are profiled in this report. These sites represent the best examples of twenty four wetland and riparian communities including a few from the South Steamboat Springs area that merit protection. CNHP believes these sites include wetlands that most merit conservation efforts, while recognizing that protecting only these sites in no way adequately protects all the values associated with Routt County wetlands. By studying aerial photos, maps, and existing inventory data, CHNP initially identified 95 wetlands which merited inventory. A low-altitude flight over the county and roadside assessments greatly reduced the number of sites that required actual on-site inventory. Wetlands heavily impacted by roads, buildings, weeds, agriculture, or grazing were eliminated from the inventory.

In addition to providing important information for Routt County, this inventory will advance efforts to evaluate and manage wetlands on state and regional levels. Wetland plant community information gathered during this project is being assimilated into *A Preliminary Vegetation Classification of the Western United States* (Bourgeron and Engelking 1994) which is being compiled and updated by The Nature Conservancy and the Colorado Natural Heritage Program. Policy makers, land use planners, and resource managers can use information in the classification to make informed decisions governing the use and conservation of natural heritage resources.

Information on threats to all Routt County wetlands is presented as well as recommendations for a comprehensive approach to wetland conservation in the county. Rapid growth throughout much of the county continues to pose a threat to wetlands through encroachment, fragmentation,

altered hydrology, and weed introduction. Even without alteration, invasive plant species such as crack willow, tamarisk, leafy spurge, Canada thistle, and several other noxious plants could cause major negative impacts on Routt County's wetlands. Historically, one of the most profound impacts on Colorado's wetlands have been changes in hydrology imposed by reservoirs, diversion, irrigation ditches, canals, and ground water pumping. As water becomes an increasingly valuable commodity in northwestern Colorado, more changes of this type are anticipated.

Information from this effort will also be used to enhance the development of a program for hydrogeomorphic (HGM) wetland function assessment. This report can be used to help identify wetland subclasses in the area, and to better characterize the range of variation within a subclass. Several of the sites profiled in this report have the potential for use as reference sites, or to be part of the reference standard (see Section 2 for HGM definitions).

RECOMMENDATIONS

1. **Support the efforts of The Nature Conservancy, the Yampa Valley Land Trust, and other conservation programs to protect the county's wetlands and riparian areas in a non-regulatory and non-confrontational manner.**

2. **Develop and implement a plan for protecting the sites profiled in this report**. Strong consideration should be given to Biodiversity Rank (B1=highest priority, B5=lowest priority). These sites provide Routt County with the basic framework to implement a wetland conservation program. Adopt a goal of protection not only for wetlands with the highest natural heritage significance, but also good examples of all the wetland types in the study area.

3. **Treat all the sites included in this report as "red flags" when considering proposals for commercial and residential land use changes**. Wetlands with significant natural heritage elements generally require a buffer from development of at least 300 feet, extending up to one-quarter mile (in the case of heron rookeries and bald eagle winter roosts).

4. **Consider the effects on wetlands, especially the significant wetlands identified in this report, when evaluating proposals for water diversions, extensive development within a watershed, ground water development, and other activities potentially affecting wetlands**. Hydrology defines wetlands, and wetlands can often be affected by changes in hydrology far from their boundaries. Changes in water quality and quantify must be considered in planning for protection of significant wetlands of Routt County.

5. **Develop and implement a county-wide wetland conservation program**. Use the U.S. Fish and Wildlife Service definition of wetlands and the National Wetland Inventory maps to guide this program. Develop a system of buffers, while recognizing that some wetlands, such as those with natural heritage significance, require buffers larger than most.

6. **Prohibit the introduction, sale, and planting of plants that are known to negatively and profoundly affect wetlands and riparian areas**. These include, but are not limited to, crack willow, purple loosestrife, Russian olive, and tamarisk (salt cedar). Encourage land managers and others to remove these plants from their properties.

7. **Encourage and support statewide wetland protection efforts**. County government is encourage to support research efforts on wetlands. County-wide education of the importance of wetlands could be implemented through the county extension service or other local agencies. Cultivate communication and cooperation with landowners regarding protection of wetlands in Routt County.

SITES OF BIODIVERSITY SIGNIFICANCE

Conservation resources should be directed to the following sites first, in order of their biodiversity rank. The 18 most important wetland sites in Routt County are profiled in this section, alphabetically. These sites include the wetlands with the highest biodiversity significance as well as the best examples of all wetland types present in Routt County.

Table 1 lists all 18 sites in order of their significance. All of these sites merit protection, but any available resources should be directed first toward the B2 sites, then the B3, and finally the B4 and B5 sites. These sites alone do not represent a complete wetland conservation program; they only represent the rare and imperiled elements. Figure 1 references each site by number and B-rank.

Table 1. Sites of Biodiversity Significance sites in Routt County, arranged by Biodiversity Rank (B-rank).

Site Name	Biodiversity Rank
Elk River	B2 (Very high significance)
Pleasant Valley	B2 (Very high significance)
Steamboat Lake (Willow and Beaver Creek)	B2 (Very high significance)
Yampa River at Hayden and Morgan Bottoms	B2 (Very high significance)
Bear River	B3 (High significance)
Independence Creek	B3 (High significance)
Phillips Creek	B3 (High significance)
Mill Creek	B3 (Very high significance)
Soda Creek	B3 (High significance)
Yampa River at Elk River	B4 (Moderate significance)
California Park	B4 (Moderate significance)
East Fork William Fork	B4 (Moderate significance)
Little Snake River	B4 (Moderate significance)
Morrison Creek	B4 (Moderate significance)
Slater Park	B4 (Moderate significance)
Windemere Lake	B4 (Moderate significance)
Sunnyside Creek	B5 (General biodiversity significance)
Yampa River South of Steamboat Springs	B5 (General biodiversity significance)

The site is described in a standard site report which reflects data fields in CNHP's Biological and Conservation Data System (BCD), used to track rare and imperiled elements. The sections of this report and the contents are outlined and explained below.

SIZE: The approximate acreage included within the preliminary conservation planning boundary for the conservation site.

BIODIVERSITY RANK: The overall significance of the conservation site in terms of imperilment of the natural heritage resources and the quality (health, abundance, etc.) of their occurrences. As discussed in Section 2, these ranks range from B1 (Outstanding Significance) to B5 (General Biodiversity Significance).

PROTECTION URGENCY RANK: The time frame in which conservation protection must occur. In most cases, this rank refers to the need for a major change of protective status (e.g., agency special area designations or ownership). The ranks range from P1 (immediate urgency; within a one year time frame) to P5 (no known urgency) (see Section 2).

MANAGEMENT URGENCY RANK: The time frame in which a change in management of the element or site must occur. Using best scientific estimates, this rank refers to the need for management in contrast to protection (e.g., increased fire frequency, decreased herbivory, weed control, etc.). The ranks range from M1 (immediate urgency, within one year) to M5 (no known urgency) (see Section 2).

GENERAL DESCRIPTION: A brief narrative picture of the topography, general location, vegetation, and current use of the site. Common names are used along with the scientific names.

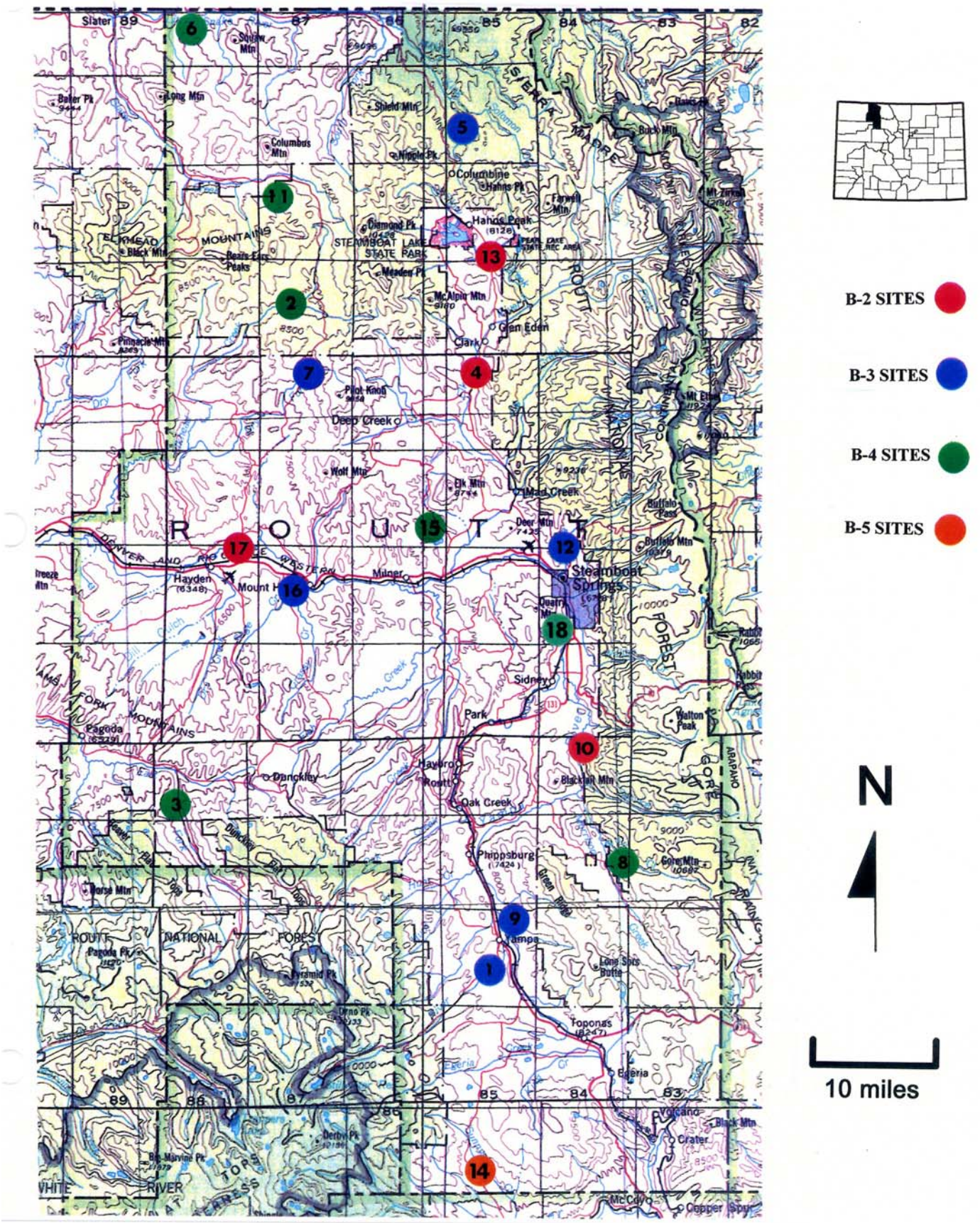
NATURAL HERITAGE RESOURCE SIGNIFICANCE: A synopsis of the rare species and significant natural communities that occur on the site. See Table 1 (Section 2) for explanations of ranks.

CURRENT STATUS: A summary of the ownership, degree of protection currently afforded the conservation site, and threats to the site or natural heritage resources as determined to date.

PROTECTION AND MANAGEMENT CONSIDERATIONS: A summary of the major issues and factors that are known or likely to affect the protection and management of the conservation site.

WETLAND FUNCTIONAL EVALUATION. A summary of the functions and values and the confidence with which each was ranked that are occurring on each conservation site (see Section 2). Also included is a general soils description.

Figure 1. General site locations and B-ranks of site of biodiversity significance.



(1) Bear River

Size: ca. 50 acres

Biodiversity Rank: B3 (High Significance)--The Bear River site supports a good quality concentration of a likely common montane riparian shrubland. This site is the best representation of this wetland community observed on private lands in Routt County.

Protection Urgency Rank: P3-definable threat by residential expansion, but not in the next 5 years.

Management Urgency Rank: M3-new management will be needed within 5 years to maintain current quality of the element occurrence.

General Description: The Bear River is one of three rivers that forms the beginning of the Yampa River in southern Routt County. Its headwaters are to the southwest in the Flat Tops Wilderness Area. It flows north to its confluence with Phillips and Wheeler Creek at the town of Yampa. It enters the broad floodplain just southwest of Yampa. The site support an extensive intact willow carr which is relatively undisturbed by agricultural and grazing activities. There is evidence of active beaver along the river.

The Bear River site contains approximately 0.8 km (0.5 mi) long area of wetland habitat, ranging in elevation from 2400 to 2425 m to (8000 to 8080 ft). It is located approximately 0.6 km (1 mi) south of the town of Yampa.

Natural Heritage Significance: This site encompasses a good occurrence of *Salix boothii-Salix geyeriana-Salix lasiandra*, a GU/SU community (Table 2). The site is important for it is the highest quality occurrence of this community on private lands in Routt County.

Table 2. Natural Heritage elements at the Bear River site.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sens.	EO* Rank
Salix boothii-Salix geyeriana-Salix lasiandra	Montane riparian shrubland	GU	SU				B

*EO=Element Occurrence

Protection and Management Considerations: This area is privately owned. The floodplain is fragmented by agricultural activities. The site is not large (ca. 50 acres), but supports a good example of a montane riparian shrubland. In context with other sites, this site's hydrology is relatively intact. There is evidence of beaver, sapling growth, and point bar establishment. Improvement to the site could be accomplished by fencing off sections of the riparian area to promote woody vegetation and native grasses and forbs.

Wetland Functional Evaluation for the Bear River Site: This wetland is important for flood abatement and providing wildlife habitat (e.g., beaver, mule deer, riparian shrub birds). It may

be important for removing nutrients from agricultural runoff, but more research would be necessary to confirm this. It also contributes to the aesthetic quality of this portion of Routt County (Table 3).

Table 3. Wetland functional evaluation for the Bear River site.

Function	Ratings	Confidence in Rating	Comments
Hydrological Functions			
Groundwater Recharge	high	high	Sandy soils, densely vegetated, meandering river
Groundwater Discharge	low	medium	Spring located to the east of river
Flood Storage	very high	medium	Debris and sand bars evident, river travels along a low gradient, dense vegetation, overflow channels and depressions filled with flood waters
Shoreline Anchoring	high	medium	Woody vegetation along streambank; little bank destabilization observed
Biogeochemical Functions			
Sediment Trapping	high	high	Meandering river, dense vegetation, deposits of sand and organic matter along streambank
Long Term Nutrient Retention	high	low	No peaty soils; dense vegetation
Short Term Nutrient Retention	high	low	Moderate accumulation of organic matter
Biological Functions			
Downstream Food chain Support	very high	high	Seasonally flooded, dense vegetation
Within Food chain Support	high	high	Irregular shaped wetland; no stagnant water
Fish Habitat	very high	high	Observed fish; clear water; overhanging vegetation
Wildlife Habitat	very high	high	Deer sign; beaver; raccoon; various birds
Passive Recreation	high	high	Utilized for fishing and rafting
Heritage Value	high	high	Highly significant

General Soil Description

Texture	Sandy soils with some clay
Color	Dark red 10YR 2/1
Cobble Size	Medium to large
Percent Mottling	15% at 12 cm

(2) California Park Site

Size: ca. 2,560 acres

Biodiversity Rank: B4 (Moderate significance)--The California Park Site supports an excellent occurrence of nesting sandhill cranes, a fair example of a globally rare montane riparian shrubland, and an historical occurrence of the Colorado River cutthroat trout.

Protection Urgency Rank: P2-threat expected within 5 years by proposed residential expansion.

Management Urgency Rank: M2-new management action will be needed within 5 years to prevent the loss of element occurrences.

General Description: California Park encompasses a 3.2 km (2 mi) long area of wetland habitat dominated by seasonally flooded willow shrublands. Elkhead Creek drains the site flowing southwest to its confluence with the Yampa River, east of Craig. There are several first and second order creeks that flow through the site: First, Second, Armstrong, Jokodowski, and Stuckey. California Park is located west of the Elkhead Mountains within an elevational range of 2350 to 2275 m (7840 to 7910 ft). It lies in a narrow to moderately wide floodplain at the base of several 3000 m (10000 ft) peaks, including Meaden Peak, Quaker Mountain, and Sugarloaf Mountain.

The site is moderately to heavily grazed during mid to late summer by sheep and cows. It appears that some parts of California Park were once hayed, as evidenced by the uniform rows of timothy (*Phleum pratense*). Access to California Park is restricted from Nov. 1 to July 1 to protect the nesting habitat of sandhill cranes. The beaver activity is sparse; only a few dams were observed.

Natural Heritage Significance: This site encompasses a fair occurrence of the *Salix boothii*/mesic graminoid (G3/S3?) community, an excellent occurrence for *Grus canadensis tabida*, sandhill crane (G5T4/S2B,S4N), and a historical record for *Oncorhynchus clarki pleuriticus*, Colorado River cutthroat trout (G5T2T3/S2) (Table 4). The sandhill crane is listed as federally sensitive by the U.S. Forest Service and is a Colorado threatened species. The Colorado River cutthroat trout was a candidate species (C2) with the federal government. It is presently listed as U.S.F.S. sensitive species and a Colorado species of special concern. This site is significant because of the high quality occurrence for sandhill crane nesting habitat.

Table 4. Natural Heritage elements at the California Park site.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sens.	EO* Rank
Salix boothii/Mesic Graminoid	Montane riparian shrubland	G3	S3?				C
Grus canadensis tabida	Greater sandhill crane	G5T4	S2B S4N		T	FS	A
Oncorhynchus clarki pleuriticus	Colorado River cutthroat trout	G5T2T3	S2	(C2)	SC	FS	Historical (1981)

*EO=Element Occurrence

Protection and Management Considerations: The majority of the site is privately owned, but there are parcels which are managed by Routt National Forest. Presently, there is no significant threat from development of summer homes, but there is a proposed hunting resort in the southern portion of the site. Development, road improvement, and increased recreational use could lead to habitat fragmentation and disturbance of nesting sandhill crane. The site is not accessible during the spring, but it is heavily used by livestock during July and August. The willow community is viable but heavily impacted from intensive livestock use. Improvement of this site could be accomplished by a quicker rotation of cattle and sheep.

Wetland Functional Evaluation for California Park Site: This wetland provides good wildlife and fish habitat. The wetland supports an extensive willow carr that contributes to the aesthetic quality of the northern portion of Routt County (Table 5).

Table 5. Wetland functional evaluation for the California Park site.

Function	Ratings	Confidence in Rating	Comments
Hydrological Functions			
Groundwater Recharge	medium	medium	Clayey soils, moderately vegetated
Groundwater Discharge	very low	medium	No obvious source of discharge
Flood Storage	medium	high	Debris evident, low gradient wetland
Shoreline Anchoring	medium	high	Moderately vegetated, bank destabilization high at areas where livestock access creek
Biogeochemical Functions			
Sediment Trapping:	medium	high	Few sediment and sand bars evident
Long Term Nutrient Retention:	medium	low	No peaty soils, but moderated levels of sediment trapping
Short Term Nutrient Retention	medium	low	Moderate accumulation of organic matter
Biological Functions			
Downstream Food Chain Support	medium	medium	Seasonally flooded
Within Food Chain Support	medium	medium	Low productive vegetation, irregular shape wetland
Fish Habitat	medium	medium	Shallow narrow creek, no fish observed

Table 5. Wetland functional evaluation for the California Park site (continued).

Wildlife Habitat	high	high	Moderately sized wetland with good edge ration; mule deer and cranes observed
Passive Recreation	medium	high	Area is aesthetic, far from population centers, but heavily impacted by grazing operations
Heritage Value	medium	high	Moderately significant

General Soil Description

Texture	Clayey soils
Color	Medium dark gray 2.5Y 3/1
Cobble Size	Small size
Percent Mottling	10% at 20 cm with few oxidized root channels

Figure 2. Bear River site in southern Routt County.

Figure 3. California Park site in northern Routt County.

(3) East Fork Williams Fork Site

Size: ca. 1,300 acres

Biodiversity Rank: B4 (Moderate significance)--The East Fork Williams Fork Site supports a fair example of a globally rare mixed deciduous-evergreen montane riparian forest. This community is the best representation of the wetlands in this portion of Routt County.

Protection Urgency Rank: P2-threat by residential expansion and on-going agricultural activities expected within 5 years.

Management Urgency Rank: M2-new management action needed within 5 years to prevent loss of element occurrence.

General Description: The East Fork Williams Fork site supports several willow carrs at the base of steep slopes. There are several small streams and kettle ponds that drain the slopes above the riparian forest. The site is moderately to heavily impacted by grazing and agriculture. There are several ranches and farms along this portion of the river.

The East Fork Williams Fork contains approximately 9.6 km (6 mi) stretch of a forested wetland. The site is a narrow to moderately wide floodplain ranging in elevations from 2077 to 2268 m (6924 to 7560 ft). The Beaver Flat Tops are to the east and the Williams Fork Mountains are to the north. County Road 55 bisects the site.

Natural Heritage Significance: This site encompasses a fair occurrence of a G3/S3 *Populus angustifolia-Picea pungens/Alnus incana* community (Table 6). Although it is impacted by human activities, it is the highest quality occurrence of a mixed deciduous-evergreen montane riparian forest observed in Routt County.

Table 6. Natural Heritage elements at the East Fork Williams Fork site.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sens.	EO* Rank
Populus angustifolia-Picea pungens/Alnus incana	Mixed deciduous-evergreen montane riparian forest	G3	S3				C

*EO=Element Occurrence

Protection and Management Considerations: All of this site is privately owned. It is hayed and moderately to heavily grazed. The wetland is fragmented by houses, hay meadows, and ditching. The understory is dominated by European hay grasses such as *Bromus inermis*, (smooth brome), *Phleum pratense* (timothy), and *Poa pratensis* (Kentucky blue grass). The majority of this site is unrecoverable, but there are a few areas where the element remains intact. Management of this area would entail cooperation from several landowners to fence off the riparian area in order to restore the woody vegetation and encourage cottonwood and willow regeneration.

Wetland Functional Evaluation for the East Fork of the Williams Fork Site: This wetland is important for flood abatement and providing wildlife habitat. It may be important for groundwater recharge and removing nutrients from agricultural runoff, but more research would be necessary to confirm this (Table 7).

Table 7. Wetland functional evaluation for the East Fork Williams Fork site.

Function	Ratings	Confidence in Rating	Comments
Hydrological Functions			
Groundwater Recharge	medium	medium	Sandy soils; lightly to moderately vegetated
Groundwater Discharge	medium	medium	Possible discharge from upslope
Flood Storage	medium	high	Debris and sediment accumulation evident; relative narrow area
Shoreline Anchoring	medium	high	Moderately vegetated with woody shrubs
Biogeochemical Functions			
Sediment Trapping	high	high	Sediment accretion along point bars
Long Term Nutrient Retention	medium	low	No peaty soils; moderate vegetation
Short Term Nutrient Retention	medium	low	Area receives pulses of flooding
Biological Functions			
Downstream Food Chain Support	medium	high	Seasonally flooded, moderately vegetated
Within Food Chain Support	medium	high	No sign of beaver activity or fish
Fish Habitat	medium	medium	No fish observed
Wildlife Habitat	medium	high	Evidence of deer, but no beaver
Passive Recreation	high	high	Aesthetically pleasing
Heritage Value	medium	high	Moderately significant

General Soil Description

Texture	Sandy
Color	not available
Cobble Size	medium to large
Percent Mottling	not available

(4) Elk River

Size: ca. 10,500 acres

Biodiversity Rank: B2 (Very High Significance)--The Elk River site supports several good to fair occurrences of globally rare narrowleaf cottonwood riparian forest and willow carr occurrences.

Protection Urgency Rank: P2-threat expected within 5 years by residential expansion.

Management Urgency Rank: M2-new management action will be needed within 5 years to prevent loss of element occurrences.

General Description: The Elk River site contains approximately 8 km (5 mi) stretch of wetland/riparian habitat. The site ranges in elevation from 2150 to 2170 m (7166 to 7234 ft). County Road 129 forms the eastern boundary and County Roads 56 and 58 bisect the site. The Campbell and Keller ditches divert water in the southern portion of site. There is a subdivision located on the eastern bank of the Elk River as well as several ranches with hay fields along the stream corridor. There is a small boggy area located just south of the Moon Hill bridge on the north end of the subdivision. The town of Clark is located at the northern boundary of site. The area is heavily manipulated by development and agricultural activities.

Natural Heritage Significance: This site encompasses one good quality occurrence of a G2/S2 community, *Salix drummondiana/Calamagrostis canadensis*, two good occurrences of G3 communities, *Salix bebbiana* and *Populus angustifolia/Cornus sericea*; one good quality occurrence of a G?/S? community, *Alnus incana-Cornus sericea*; and two fair occurrences of G3 community elements, *Populus angustifolia/ Salix exigua* and *Salix boothii/*mesic graminoid. There is also a degraded occurrence of *Grus canadensis tabida* (sandhill crane) (Table 8). This site is considered as part of The Nature Conservancy's Yampa River Site Conservation Plan (1996).

Table 8. Natural Heritage elements at Elk River site.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sens.	EO* Rank
Alnus incana-Cornus sericea	Thin-leaf alder-red-osier dogwood	G?	S?				B
Populus angustifolia/ Cornus sericea	Narrowleaf cottonwood /red-osier dogwood	G3	S2?				B
Populus angustifolia/ Salix exigua	Narrowleaf cottonwood /coyote willow	G4G5	S4S5				C
Salix boothii/Mesic graminoid	Booth's willow/ mesic grasses	G3	S3?				C
Salix bebbiana	Bebb's willow	G3	SU				B

Table 8. Natural Heritage elements at Elk River site (continued).

Salix drummondiana /Calamagrostis canadensis	Drummond's willow/ Canada reedgrass	G2	S2				B
Grus canadensis tabida	Greater sandhill crane	G5T4	S2B, S4N		T	FS	D

*EO=Element Occurrence

Protection and Management Considerations: This site consists of privately owned ranches and houses. It is hayed and grazed extensively on the western bank of the Elk River. There is habitat fragmentation throughout the site due to the residential development and roads. The area that is the least disturbed is the boggy area between the Elk River and Keller ditch. However, this boggy area is likely the result of the human-made ditches and water diversions that bisect the site. This site is unique due to the boggy area, only one other privately owned site supports *Salix bebbiana* (Bebb's willow). Protection considerations should concentrate on the boggy area. The majority of this site is unrecoverable, but there are a few areas where the element remains intact. Management of this area would entail fencing off the riparian area in order to restore the woody vegetation and encourage cottonwood and willow regeneration. Protection and restoration in this site will take the cooperation of many landowners.

Wetland Functional Evaluation for Elk River Site: This wetland is very important for flood abatement, flood water storage, groundwater recharge, and possible nutrient removal. The peaty soils within the bog provide excellent long term nutrient retention and filters of toxicants from agriculture runoff upstream (Table 9).

Table 9. Wetland functional evaluation for Elk River site.

Function	Ratings	Confidence in Ratings	Comments
Hydrological Functions			
Groundwater Recharge	high	high	Sandy soils, dense vegetation
Groundwater Discharge	very high	medium	Boggy areas and meadow provide recharge with flood water retention
Flood Storage	very high	high	Dense vegetation and porous substrate.
Shoreline Anchoring	medium	high	Supports moderately dense vegetation; areas exhibit bank destabilization.
Biogeochemical Functions			
Sediment Trapping	high	high	Vegetation along stream bank is woody and dense
Long Term Nutrient Retention	high	low	Low-lying areas such as the bog and wet meadows contain peaty soils with high organic matter
Short Term Nutrient Retention	medium	low	Area next to river exhibits evidence of short term nutrient retention
Biological Functions			
Downstream Food Chain Support	high	high	Seasonally flooded; exhibits good flushing flows

Table 9. Wetland functional evaluation for the Elk Creek site (continued).

Within Food Chain Support	high	high	Evidence of raccoon, deer, sandhill cranes, various waterfowl
Fish Habitat	very high	high	Observed fish in the river
Wildlife Habitat	very high	high	Observed deer, sandhill cranes
Passive Recreation	medium	high	Near highway and agricultural practices
Heritage Value	very high	high	Very highly significant

General Soil Description

Texture	River: Sandy soils Bog/Meadow: Peaty soils, high organic matter ,
Color	River: Medium brown-2.5 Y 3/1 Bog/Meadow: Light brown-red 7.5YR 4/1
Cobble Size	River: Small to Medium Size
Percent Mottling	River: 7% at 10 cm with oxidized root channels Bog/Meadow: 1% mottling

Figure 4. East Fork Williams Fork site in southwestern Routt County.

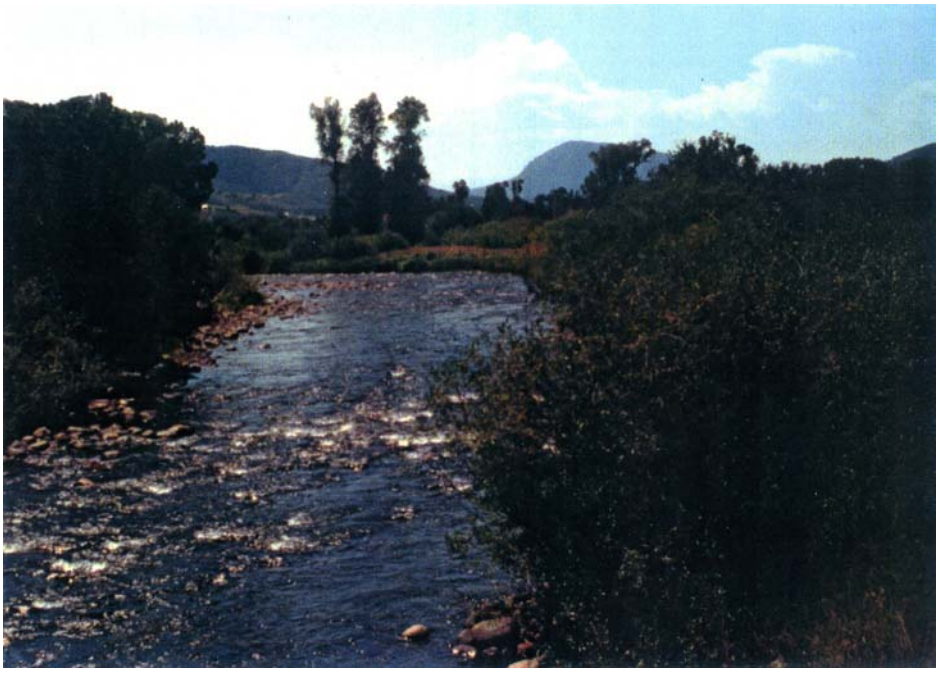


Figure 5. Elk River site in northeastern Routt Count.

(5) Independence Creek Site

Size: ca. 2,550 acres

Biodiversity Rank: B3 (High Significance)--The Independence Creek site supports an excellent and a good quality occurrence of likely common willow communities. There is also a fair occurrence of nesting sandhill cranes and an historical occurrence of a boreal toad. This site is one of the best examples of a montane willow community observed on private lands in Routt County.

Protection Urgency Rank: P3-definable threat but not in the next 5 years by residential expansion.

Management Urgency Rank: M4-although not currently threatened, management may be needed in the future to maintain quality of element occurrences.

General Description: This site is located in a moderately broad valley which supports many small ponds and large willow carrs. The site is an 8 km (5 mi) riparian habitat that includes the following creeks: Summit, Independence, Smith, Box, King Solomon, Dudley, and Tennessee. These creeks eventually feed into the Middle Fork of the Little Snake River. County Road 129 bisects the site. This site ranges in elevation from 2316 to 2413 m (7720 to 8043 ft). There are narrow canyons that define the northern and southern boundaries. Homes and ranches are located within the site, but no subdivisions. Light to moderate grazing activities and light agriculture are evident. The extensive willow carrs extend up into the narrow reaches of small canyons. There is ample evidence of extensive beaver activity.

Natural Heritage Significance: This site encompasses an excellent occurrence of a GU/SU riparian shrubland community, *Salix boothii-Salix drummondiana* and a good occurrence of a G?/S? riparian shrubland community, *Salix boothii/*mesic graminoid. There is a fair occurrence of *Grus canadensis* tabida (greater sandhill crane) which is a Colorado threatened species and a U.S.F.S. sensitive species. A historical occurrence of *Bufo boreas boreas* (boreal toad) is within the site. The boreal toad is a candidate for federal listing by the U.S. Forest Service. It is currently listed as federally sensitive and a Colorado endangered species (Table 10). This is one of the best examples of a willow carr on private lands observed and provides excellent breeding habitat for sandhill cranes. There are areas where the understory consists of sedges and native grasses.

Table 10. Natural Heritage elements at the Independence Creek site.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sens.	EO* Rank
Salix boothii/ Mesic Graminoid	Booth's willow/mesic grasses	G?	S?				B
Salix boothii-Salix drummondiana	Booth's willow/ Drummond's willow	GU	SU				A
Grus canadensis tabida	Greater sandhill crane	G5T4	S2B, S4N		T	FS	C
Bufo boreas boreas	Boreal toad	G5T2Q	S1	C	E	FS	Historical (1962)

*EO=Element Occurrence

Protection and Management Considerations: The majority of this site is privately owned, however Routt National Forest does manage several parcels and the surrounding upslope areas. The elements remain viable, and relatively undisturbed by present grazing and agriculture activities. The main threat to the site is from residential development pressure and road improvements. This could lead to habitat fragmentation, removal of beaver, increased recreational use and hydrology alteration. The site is relatively pristine in context with other privately owned wetlands. To maintain site viability the county should consider concentrated areas of development and fewer roads to prevent further habitat fragmentation.

Wetland Functional Evaluation for Independence Creek Site: This wetland is important for providing wildlife habitat, flood water storage, and groundwater recharge. It supports an extensive willow carr that contributes to the aesthetic quality of this portion of Routt County (Table 11).

Table 11. Wetland functional evaluation for the Independence Creek site.

Function	Ratings	Confidence in Rating	Comments
Hydrological Functions			
Groundwater Recharge	medium	medium	Densely vegetated; irregular-shaped wetland
Groundwater Discharge	very low	medium	No obvious signs of discharge
Flood Storage:	medium	high	Debris in vegetation, low gradient, many ponds to store flood waters
Shoreline Anchoring:	very high	high	High vegetation density, woody vegetation, sedges in understory
Biogeochemical Functions			
Sediment Trapping:	medium	high	Sediment accretion along point bars
Long Term Nutrient Retention:	high	low	Peaty soils, high organic matter accumulation, beaver dams constricting creek flow
Short Term Nutrient Retention	medium	low	Densely vegetated, seasonally saturated soils

Table 11. Wetland functional evaluation for the Independence Creek site (continued).

Biological Functions			
Downstream Food Chain Support	high	medium	Presence of an outlet, seasonally flooded, peaty soils
Within Food Chain Support	very high	high	Evidence of fish, beaver, deer
Fish Habitat	very high	high	Observed several small fish
Wildlife Habitat	very high	high	Beaver dams and lodges, mule deer
Passive Recreation	high	high	No major roads or developments
Heritage Value	high	high	Highly significant

General Soil Description

Texture	Peaty soils with high organic matter
Color	Very dark brown, 2.5Y 2.5/1
Cobble Size	Small
Percent Mottling	3% at 15 cm with some oxidized roots

(6) Little Snake River

Size: 550 acres

Biodiversity Rank: B4 (Moderate Significance)--The Little Snake River site supports fair examples of globally imperiled forest communities. It is representative of the wetlands located in this portion of Routt County.

Protection Urgency Rank: P1-immediately threatened by on-going agricultural activities.

Management Urgency Rank: M1-management required immediately or element occurrences could be lost or irretrievably degraded within one year.

General Description: The Little Snake River site is located in northern Routt County along the Wyoming border. The Little Snake River flows west through a 7.2 km (4.5 mi) forested riparian habitat. The site ranges in elevation from 2033 to 2004 m (6775 to 6680 ft) and is bordered to the north by County Road 129 and to the south by Flattop Mountain. The site supports pockets of riparian forests, but is extensively fragmented by agricultural activities. Irrigated hay meadows and grazing pastures dominate the floodplain adjacent to the riparian communities.

Natural Heritage Significance: This site encompasses fair occurrences of G3/S2? and G2?/S1? communities, *Populus angustifolia/Cornus sericea* and *Populus angustifolia/Prunus virginiana*, respectively (Table 12). The status of the plant association, *Populus angustifolia/Prunus virginiana* as a globally rare or even a viable community is questionable until further research and inventories can be performed (G. Kittel pers. comm.). It is presented here because the level of threats is high and it is the best representation of the wetland areas in this portion of Routt County.

Table 12. Natural Heritage elements at the Little Snake River site.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sens.	EO* Rank
Populus angustifolia/ Cornus sericea	Narrowleaf cottonwood riparian forest	G3	S2?				C
Populus angustifolia /Prunus virginiana	Cottonwood riparian forest	G2?	S1?				C

*EO=Element Occurrence

Protection and Management Considerations: This site is entirely privately owned. The elements are presently affected by anthropogenic activities (i.e., agriculture, grazing). The riparian area is impacted with moderate to high levels of stream channelization, mainly from the lack of native woody vegetation along the streambank. The communities are fragmented as a result of the agricultural activities within the site. There are ditches and pump stations along the river which have altered the hydrology. There was no evidence of beaver activity. Many of the alterations to the floodplain are irreversible, however if the riparian area was managed for improved riparian conditions, this could promote establishment of woody, native vegetation.

Such management could include restricted access to riparian habitats by livestock. Successful management and protection of the site will require the cooperation of many landowners.

Wetland Functional Evaluation for Little Snake River site: This wetland is important for flood abatement and possibly removing nutrients from agriculture runoff (Table 13).

Table 13. Wetland functional evaluation for the Little Snake River site.

Function	Ratings	Confidence in Rating	Comments
Hydrological Functions			
Groundwater Recharge	low	medium	Moderately vegetated
Groundwater Discharge	very low	medium	No obvious springs or discharge sources
Flood Storage	medium	high	Low gradient; sediment and debris accretion
Shoreline Anchoring	low	high	Moderately vegetated by woody vegetation with non-native grasses in understory
Biogeochemical Functions			
Sediment Trapping	medium	high	Sediment accumulation evident
Long Term Nutrient Retention	low	low	Moderate vegetation
Short Term Nutrient Retention	low	low	
Biological Functions			
Downstream Food Chain Support	medium	medium	Moderate amounts of vegetation overhanging creek;
Within Food Chain Support	medium	medium	Irregular-shaped wetland
Fish Habitat	medium	medium	Overhanging vegetation; clear water
Wildlife Habitat	low	high	Gentle gradient, good edge ratio, irregular shape
Passive Recreation	medium	high	Site is impacted from agriculture, but is away from large population centers
Heritage Value	medium	high	Moderately significant

General Soil Description

Texture	Not available
Color	
Cobble Size	

Figure 6. Independence Creek site in northeastern Routt County.

Figure 7. Little Snake River site in northern Routt County.

(7) Mill Creek Site

Size: ca. 600 acres

Biodiversity Rank: B3 (High Significance)--The Mill Creek Site supports excellent examples of two likely common willow communities.

Protection Urgency Rank: P2-threat expected within 5 years by residential expansion and adjacent intensive livestock activities.

Management Urgency Rank: M2-new management action will be needed within 5 years to prevent the loss of element occurrences.

General Description: The Mill Creek site encompasses a 1.6 km (1 mi) long willow carr ranging in elevations from 2453 to 2520 m (8177 to 8400 ft). The site is bordered to the north by Routt National Forest and to the south where County Road 80 fords Mill Creek. Mill Creek flows through a narrow valley located between Quaker Mountain and Pilot Knob. The site is relatively undisturbed, with only light grazing by sheep during the middle of the summer. Beaver activity is evidenced by dams and lodges. The beaver have created several boggy areas along the creek in the wider areas.

Natural Heritage Significance: This site encompasses two excellent occurrences of GU/SU and G?/S? community occurrences, *Salix boothii-Salix drummondiana* and *Salix boothii*-mesic forbs, respectively (Table 14). Although these communities are in all likelihood common communities, this site contains the highest quality occurrence of the elements observed on private lands in Routt County. The understory consists of native forbs and sedges, with relatively few exotics. This site is relatively small, but one of the least disturbed private areas observed during the field season. The area downstream of the site is heavily impacted by intensive livestock use.

Table 14. Natural Heritage elements at the Mill Creek site.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sens.	EO* Rank
Salix boothii-Salix drummondiana	Montane willow carr	GU	SU				A
Salix boothii-Mesic Forbs	Booth's willow-mesic forbs	G?	S?				A

*EO=Element Occurrence

Protection and Management Considerations: The entire site is privately owned by a civic improvement foundation which might account for the pristine condition. However, there are no fences to delineate the site and protect it from the negative adjacent livestock use. It may be a matter of time before the Mill Creek site will be negatively impacted. Additionally, there is a summer home development occurring to the west, Quaker Mountain Ranch. Presently, road improvement and ditching activities are occurring. The largest threat would be from the housing

development which could affect the hydrology of site through water diversion and beaver removal.

Wetland Functional Evaluation for the Mill Creek Site: This wetland is very important for wildlife and fish habitat. It also provides flood abatement, ground water recharge, and long term nutrients retention (Table 15).

Table 15. Wetland functional evaluation for the Mill Creek site.

Function	Ratings	Confidence in Rating	Comments
Hydrological Functions			
Groundwater Recharge	medium	medium	Clayey soils, densely vegetated
Groundwater Discharge	very high	medium	Permanently saturated soils in areas near beaver dams; suspect several springs along foothills that discharge into boggy area
Flood Storage	high	high	Low gradient with several beaver dams; sediment and debris accretion
Shoreline Anchoring	high	high	Densely vegetated by woody vegetation with sedge understory
Biogeochemical Functions			
Sediment Trapping	high	high	Sediment accumulation evident
Long Term Nutrient Retention	high	low	Clayey soils common with peat and organic matter occurring in several areas
Short Term Nutrient Retention	medium	low	Moderate accumulation of organic matter
Biological Functions			
Downstream Food Chain Support	high	medium	Dense vegetation overhanging creek; clayey soils
Within Food Chain Support	high	medium	Irregular-shaped wetland
Fish Habitat	medium	medium	Beaver dams impede movement; some stagnant water in ponds
Wildlife Habitat	very high	high	Gentle gradient, good edge ratio, irregular shape
Passive Recreation	very high	high	Away from population areas; excellent birding and animal viewing
Heritage Value	very high	high	Very highly significant

General Soil Description

Texture	Clayey, formed a 10 cm ribbon
Color	Medium gray 2.5Y 4/1
Cobble Size	No cobbles
Percent Mottling	10% mottling at 5 cm with Fe and Mn deposits and oxidized root channels

(8) Morrison Creek

Size: ca. 600 acres

Biodiversity Rank: B4 (Moderate Significance)--The Morrison Creek site supports a good example of an apparently common willow/sedge community. It also supports two fair occurrences of likely common willow communities. This site is representative of the wetlands in this portion of Routt County.

Protection Urgency Rank: P2-threats expected in the next five years. This site is fragmented by subdivisions and proposed subdivisions.

Management Urgency Rank: M2-management needed within 5 years to prevent the loss of element occurrences.

General Description: The Morrison Creek site is located approximately 32 km (20 mi) south of Steamboat Springs. Morrison Creek flows north from Lynx Pass 2700 m (9000 ft) through a high elevation valley, 2400 m (8000 feet) valley to its confluence with the Yampa River just south of Pleasant Valley. The site is 4.8 km (3 mi) long. It is bordered to the west by Green Ridge and to the east by the Gore Range. Several creeks feed Morrison Creek within the site: Muddy, Clear, Beaver, and Bushy. County Road 16 bisects the site. This site supports an extensive willow carr which is fragmented by subdivisions and proposed subdivisions. Irrigated hay meadows and grazing pastures dominate the floodplain adjacent to the riparian communities.

Natural Heritage Significance: This site encompasses a good quality occurrence of a G5/S2 community, *Salix geyeriana/ Carex utriculata* and fair occurrences of, *Salix boothii/ Calamagrostis canadensis* (G4/S2S3) and *Alnus incana/ Salix geyeriana* (G?/S?) (Table 16). It is presented because the level of threats is very high and it is representative of the wetland areas in this portion of Routt County. The site is presently heavily grazed, however even more importantly are threats from development.

Table 16. Natural Heritage elements at the Morrison Creek site.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sens.	EO* Rank
Salix geyeriana/ Carex utriculata	Geyer's willow/ beaked sedge	G5	S2				B
Alnus incana/ Salix geyeriana	Thinleaf alder/ Geyer's willow	G?	S?				C
Salix boothii/ Calamagrostis canadensis	Booth's willow/ Canada reedgrass	G4	S2S3				C

*EO=Element Occurrence

Protection and Management Considerations: The majority of this area is privately owned, except for the extreme southern end which is managed by Routt National Forest and a parcel which is part of the State Land Trust. The elements remain viable, but are presently affected by intensive livestock use. The riparian area is impacted with moderate to high levels of bank destabilization and trampling of saplings. The willows exhibit browse and rub lines. Cow trails

exist on both sides of the stream. This area is also being subdivided and large tracts of land are for sale. The valley is only a short distance (approx. 32 km/20 mi) from Steamboat Springs and an even shorter distance (8 km/5 mi) from the rapidly expanding Stagecoach Reservoir community. This area is highly threatened by habitat fragmentation, intensive livestock use, and demands on the water table from development. Improvement of the sites could be accomplished by fencing off sections of the riparian area to promote woody vegetation and native grasses and forbs. Management of the site should consider concentrated areas of development with fewer roads to prevent further habitat fragmentation.

Wetland Functional Evaluation for Morrison Creek Site: This wetland is important for flood abatement and groundwater recharge (Table 17). The viability and defensibility of this site are compromised because of current and proposed land uses.

Table 17. Wetland functional evaluation for the Morrison Creek site.

Function	Ratings	Confidence in Rating	Comments
Hydrological Functions			
Groundwater Recharge	very high	medium	Sandy soils; irregular-shaped wetland
Groundwater Discharge	low	medium	Spring located in the southern end of site
Flood Storage	very high	high	Evidence of flooding, debris in vegetation, establishment of gravel and sand bars
Shoreline Anchoring	medium	high	Streambank moderately destabilized, areas of dense willows
Biogeochemical Functions			
Sediment Trapping	high	high	Sediment and sand bars present
Long Term Nutrient Retention	medium	low	No peaty soils; moderate vegetation
Short Term Nutrient Retention	medium	low	Moderate accumulation of organic matter
Biological Functions			
Downstream Food Chain Support	medium	medium	Seasonally flooded; outlet present
Within Food Chain Support	medium	medium	No stagnant water; some areas contain highly productive vegetation
Fish Habitat	medium	medium	No fish observed; clear water with some overhanging vegetation
Wildlife Habitat	high	high	Signs of beaver, deer
Passive Recreation	medium	high	Impacted by grazing, but is away from population centers
Heritage Value	medium	high	Moderately significant

General Soil Description

Texture	Fine textured sand
Color	Dark 2.5Y 3/1
Cobble Size	Small to medium
Percent Mottling	10% at 7 cm, with moderate amounts of oxidized root channel

Figure 8. Mill Creek site in northern Routt County.

Figure 9. Morrison Creek site in southeastern Routt County.

(9) Phillips Creek

Size: ca. 320 acres

Biodiversity Rank: B3 (High Significance)--The Phillips Creek site contains a good quality occurrence of a state rare willow, three good to fair examples of apparently common wet meadow and willow communities, and one historical occurrence of a great blue heron. This site is unique for it supports one of the few slope wetlands observed on private lands in Routt County.

Protection Urgency Rank: P3-threatened by residental expansion but not in the next 5 years.

Management Urgency Rank: M4-although not currently threatened, management may be needed in the future to maintain current quality of element occurrences.

General Description: Phillips Creek is one of three rivers that feed the headwaters of the Yampa River. Phillips Creek begins in the foothills just south of the town of Yampa. The site encompasses 6.4 km (4 mi) of riparian habitat ranging from 2293 to 2382 m (7642 to 7940 ft). The confluence of Phillips Creek with the Bear River and Wheeler Creek is extremely boggy and supports a dense willow carr and sedge community. Haying and grazing activities currently occur on the drier slopes but not within the boggy area. The remainder of the site, north of the boggy area, extends for 6.4 km (4 mi) encompassing an extensive willow carr at the base of the foothills. Irrigated hay meadows and grazing pastures dominate the floodplain adjacent to the willow communities throughout the site.

Natural Heritage Significance: This site encompasses good quality occurrences of *Salix serissima* (G4/S1), *Salix bebbiana* (G3/SU) riparian shrubland, and *Carex nebrascensis* wet meadow (G4/S4). It also encompasses fair occurrences of *Populus angustifolia/Salix exigua* (G3/S3) and *Carex utriculata* (G5/S3) (Table 18). All the elements, except *Ardea herodias* (great blue heron) were located, are viable and intact. This area is unique not only with respect to community structure, but it encompasses both a slope and riverine wetland. The hydrology appears intact and minimally impacted by agricultural activities.

Table 18. Natural Heritage elements at the Phillips Creek site.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sens.	EO* Rank
Populus angustifolia/ Salix exigua	Narrowleaf cottonwood riparian forest	G4G5	S4S5				C
Carex nebrascensis wetland	Great Plains wet meadow	G4	S4				B
Carex utriculata wetland	Montane wet meadow	G5	S3				BC
Salix serissima	Autumn willow	G4	S1			FS	B
Salix bebbiana	Bebb's willow	G3	SU				B
Ardea herodias	Great blue heron	G5	S3B, SZN				Historical (1981)

*EO=Element Occurrence

Protection and Management Considerations: The majority of the Phillips Creek site is privately owned except for a 1 mile stretch owned by the town of Yampa. The elements remain viable, but are threatened by the agricultural activities on adjacent floodplain. The understory in the drier areas consists mainly of European hay grasses. The streambank is impacted by intensive livestock use in some areas. The boggy area within the site is unique, there was only one other such area observed on private lands in Routt County. The boggy area is not as impacted by cattle as the drier areas, but it could be fenced off from the pastures to ensure long term viability.

Wetland Functional Evaluation for Phillips Creek: This wetland supports both a slope and riverine wetland. It is important for flood abatement, groundwater recharge, and possible removal of agricultural runoff. It is part of the extensive Yampa River riparian corridor that is one of the last relatively intact riverine systems in the west (Table 19).

Table 19. Wetland functional evaluation for the Phillips Creek site.

Function	Ratings	Confidence in Rating	Comments
Groundwater Recharge	high	medium	Clayey soils, densely vegetated, meandering stream
Groundwater Discharge	very high	medium	Located at base of bluffs, likely many springs that discharge into Phillips Creek
Flood Storage	high	high	Low gradient stream, debris and sand/gravel bars present
Shoreline Anchoring	high	high	Woody vegetation
Biogeochemical Functions			
Sediment Trapping	high	high	Meandering stream, deposits of organic matter
Long Term Nutrient Retention	high	low	Organic matter accumulation, boggy soils
Short Term Nutrient Retention	medium	low	Seasonally flooded, dense vegetation

Table 19. Wetland functional evaluation for the Phillips Creek site (continued).

Biological Functions			
Downstream Food Chain Support	medium	medium	Dense and diverse vegetation, seasonally flooded
Within Food Chain Support	medium	medium	Irregular-shaped wetland
Fish Habitat	very high	high	Fish observed in Phillips Creek and Yampa River
Wildlife Habitat	very high	high	Evidence of beaver, birds, deer
Passive Recreation	high	high	Not located near high population center
Heritage Value	high	high	Highly significant

General Soil Description

Texture	Peaty in bog area, clayey with some sand along stream
Color	Dark reddish 10YR 2/1
Cobble Size	Small
Percent Mottling	7% at 10 cm, with moderate amounts of oxidized root channels

(10) Pleasant Valley

Size: ca. 600 acres

Biodiversity Rank: B2 (Very High Significance)--The Pleasant Valley site encompasses good quality occurrences of a globally imperiled mixed deciduous-evergreen montane riparian forest and a globally rare alder/red-osier dogwood riparian forest. The site also supports fair examples of a globally rare narrowleaf cottonwood forest and an apparently common willow community.

Protection Urgency Rank: P2-threat expected within 5 years from proposed ski area and expansion of residential areas.

Management Urgency Rank: M2-new management action will be needed within 5 years to prevent the loss of the element occurrences.

General Description: Pleasant Valley is a broad valley located south of Steamboat Springs. The Yampa River meanders across a wide floodplain encompassing a 4.8 km floodplain (3 mi) ranging from 2075 to 2115 m (6915 to 7050 ft). The Stagecoach Reservoir is located to the south and Lake Catamount is located to the north. Sarvis (Service) and Green Creeks enter the Yampa River in Pleasant Valley from the Gore Range. Irrigated hay meadows and grazing pastures dominate the floodplain adjacent to the riparian communities. Cottonwood saplings are establishing along the point bars. Irrigated hay fields and grazing pastures dominate the adjacent flood plain.

Natural Heritage Significance: This site encompasses good quality occurrences of a G2/S2 community, (*Picea pungens-Populus angustifolia/ Alnus incana-Lonicera involucrata*), and of a G3/S1 community (*Alnus incana-Cornus sericea*). There are fair occurrences of a G3/S2? community (*Populus angustifolia/Cornus sericea)*and a GU/SU community (*Salix monticola-Salix geyeriana*/mesic forbs). The occurrence for *Ardea herodias* (great blue heron) was not located, the rookery was last observed in 1994. The great blue heron has no legal federal or state status (Table 20).

Table 20. Natural Heritage elements at the Pleasant Valley site.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sens.	EO* Rank
Salix monticola-Salix geyeriana /Mesic Forbs	Rocky Mountain willow-Geyer's willow/mesic forbs	GU	SU				C
Picea pungens-Populus angustifolia /Alnus incana/Lonicera involucrata	Mixed deciduous-evergreen montane riparian forest	G3	S3				B

Table 20. Natural Heritage elements at the Pleasant Valley site (continued).

Populus angustifolia /Cornus sericea	Narrowleaf cottonwood /red osier dogwood	G3	S2?				C
Alnus incana-Cornus sericea	Thinleaf alder-red-osier dogwood	G3	S1				B
Ardea herodias	Great blue heron	G5	S3B, SZN				No rank available

*EO=Element Occurrence

Protection and Management Considerations: Most of this site is privately owned, except for the extreme southern end which is managed by the Bureau of Land Management. The entire site is threatened from the proposed development of a ski area. The elements remain viable, but are small, narrow bands within the wettest areas. The understory consists entirely of adventive, weedy species. The Yampa River and its associated hydrology is relatively intact. The streambank is impacted by intensive livestock use in some areas. No evidence of beaver activity was observed in the site. Restoration of the beaver would help reestablish the natural processes and effectiveness of this site as a wetland. Improvement of the streambank could be done by fencing off sections so that woody, native vegetation could establish to prevent further channelization. Protection of the site would require the cooperation of several landowners.

Wetland Functional Evaluation for Pleasant Valley: This wetland is important for flood abatement, groundwater recharge, and possible nutrient removal from agricultural runoff. It is part of the extensive Yampa River riparian corridor that is one of the last remaining intact riverine systems in the west (Table 21).

Table 21. Wetland functional evaluation for the Pleasant Valley site.

Function	Ratings	Confidence in Rating	Comments
Hydrological Functions			
Groundwater Recharge	high	high	Sandy soils, dense vegetation in many areas
Groundwater Discharge	medium	medium	Located at the base Service Mountain, probable seeps
Flood Storage	very high	high	Water and debris marks on streamside vegetation
Shoreline Anchoring	medium	high	Moderate bank destabilization
Biogeochemical Functions			
Sediment Trapping	high	high	Debris and sand bars present
Long Term Nutrient Retention	medium	low	No peaty soils;moderate vegetation
Short Term Nutrient Retention	high	low	Moderate accumulation of organic matter

Table 21. Wetland functional evaluation for the Pleasant Valley site (continued).

Biological Functions			
Downstream Food Chain Support	high	high	Seasonally flooded with some vegetation overhanging water
Within Food Chain Support	low	high	Low production of vegetation
Fish Habitat	very high	high	Observed fish , clear water, some vegetation overhang
Wildlife Habitat	medium	high	Observed mule deer and raccoon; low level of plant diversity; close proximity to reservoirs
Passive Recreation	medium	high	Close proximity to reservoirs
Heritage Value	very high	high	Very high significance

General Soil Description

Texture	Very sandy soils
Color	Dark, reddish soils 10YR 3/2
Cobble Size	Small to medium
Percent Mottling	5% at 15 cm, with oxidized root channels

Figure 10. Phillips Creek site in southern Routt County.

Figure 11. Pleasant Valley site south of Steamboat Springs, Routt County.

(11) Slater Park Site

Size: ca. 1,200 acres

Biodiversity Rank: B4 (Moderately Significant)--The Slater Park site supports a fair occurrence of a globally imperiled riparian willow carr , an apparently common montane wet meadow, and a good quality occurrence of nesting sandhill cranes.

Protection Urgency Rank: P3-definable threat on-going agricultural and livestock activities but not in the next 5 years.

Management Urgency Rank: M4-although not currently threatened, management may be needed in the future to maintain the current quality of element occurrences.

General Description: Slater Park site encompasses a 9.6 km (6 mi) long area of wetland habitat located north of the Elkhead Mountains within an elevational range of 2400 to 2475 m (8000 to 8250 ft). The site is located in a narrow to moderately wide floodplain at the base of several 2700-3000 m (9000-10000 ft) peaks such as: Columbus Mountain, Brush Mountain, Middle Mountain, and Sawtooth Mountain. Slater Creek drains the site flowing west to its confluence with the Little Snake River. There are several first and second order creeks which flow through the site: Adams, Crawford, Chicken, Douglas, Grizzly, and Green. Moderate beaver activity is evident

The site is moderately to heavily grazed during mid to late summer by sheep and cows. Several ranches are located within the site. A few irrigated hay meadows and grazing pastures are located adjacent to ranches. Presently, because of the isolated location, there is no apparent proposed development.

Natural Heritage Significance: This site encompasses fair occurrences of *Salix boothii*/Mesic graminoids(G3/S3?) and *Carex aquatilis* wetland (G5/S3S4) and a good quality occurrence of *Grus canadensis tabida* (G5T4/S2B,S4N) (Table 22). The sandhill crane is a federal sensitive species and a Colorado threatened species. This site is significant because of the good quality occurrence of nesting sandhill cranes.

Table 22. Natural Heritage elements at the Slater Park site.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sens.	EO* Rank
Salix boothii/Mesic graminoids	Riparian willow carr	G3	S3?				C
Carex aquatilis wetland	Montane wet meadow	G5	S3S4				BC
Grus canadensis tabida	Greater sandhill crane	G5T4	S2B, S4N		T	FS	B

*EO=Element Occurrence

Protection and Management Considerations: The majority of the site is privately owned, but some parcels are managed by Routt National Forest. Presently, no significant threats from

development of summer homes exist, but there are several properties for sale within the site. Development (e.g., road improvement, increased recreational use) could lead to habitat fragmentation impacting nesting sandhill cranes. Management should consider minimized disturbance to nesting cranes.

Wetland Functional Evaluation for the Slater Park Site: This wetland is important for wildlife habitat and contributing to the aesthetic quality of northern Routt County (Table 23).

Table 23. Wetland functional evaluation for the Slater Park site.

Function	Ratings	Confidence in Rating	Comments
Hydrological Functions			
Groundwater Recharge	medium	medium	Sandy soil, moderately vegetated
Groundwater Discharge	very low	medium	No obvious springs or groundwater discharge
Flood Storage	high	high	Debris evident, low gradient wetland
Shoreline Anchoring	medium	high	Moderately vegetated by willows; understory dominated by European hay grasses
Biogeochemical Functions			
Sediment Trapping	high	high	Sediment and sand bars evident
Long Term Nutrient Retention	medium	low	No peaty soils; moderate vegetation
Short Term Nutrient Retention	medium	low	Low to moderate accumulation of organic matter
Biological Functions			
Downstream Food Chain Support	medium	medium	Seasonally flooding with good flushing flows
Within Food Chain Support	medium	medium	Irregular-shaped wetland, moderately productive vegetation
Fish Habitat	medium	high	Shallow water; several beaver dams; low level of overhanging vegetation
Wildlife Habitat	medium	high	Gentle gradient, good edge ratio, low plant diversity
Passive Recreation	medium	high	Moderately aesthetic, far from population center
Heritage Value	medium	high	Moderately significant

General Soil Description

Texture	Sandy soils
Color	Dark reddish color 10R 2.5/1
Cobble Size	Few, small to medium size
Percent Mottling	10% with oxidized root channels

(12) Soda Creek

Size: ca. 350 acres

Biodiversity Rank: B3 (High Significance)--The Soda Creek site supports a good example of a globally imperiled mixed deciduous-evergreen riparian forest and a fair example of an apparently common willow community.

Protection Urgency Rank: P1-immediately threatened by fragmentation from residential housing expansion.

Management Urgency Rank: M1-management action required immediately or element occurrences could be lost or irretrievably degraded within one year.

General Description: Soda Creek originates from Soda Mountain in the Park Range. It emerges from a steep sided canyon running into a moderately wide floodplain, Strawberry Park. The site is approximately 3.2 km (2 mi) long with elevations ranging from 2040 to 2125 m (6800 to 7082 ft). The willow community is located at lower elevations along the edge of Strawberry Springs subdivision. The floodplain is subdivided, thus the willow carrs on individual properties are fragmented, but intact. Some haying and grazing is evident. The spruce community is located at upper portion of Soda Creek at the outlet of the narrow canyon.

Natural Heritage Significance: This site supports a good occurrence of a G3/S3 community, (*Picea pungens-Populus angustifolia /Alnus incana-Lonicera involucrata*) and a fair occurrence of *Salix monticola-Salix geyeriana/*Mesic Forb (GU/SU) (Table 24).

Table 24. Natural Heritage elements at the Soda Creek site.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sens.	EO* Rank
Picea pungens-Populus angustifolia /Alnus incana-Lonicera involucrata	Mixed deciduous-evergreen montane riparian forest	G3	S3				B
*Salix monticola-Salix geyeriana /*Mesic Forb	Rocky Mountain willow -Geyer's willow/mesic forb	GU	SU				C

*EO=Element Occurrence

Protection and Management Consideration: The site consists of privately owned tracts within the Strawberry Park subdivision. The elements remain viable as isolated willow carrs, but are fragmented due to development. The natural processes and hydrology have been altered by removal of beaver, ditching, and irrigation. The site is threatened by increase development of large tracts of lands and continued subdivisions of smaller tracts. The floodplain is irreversibly altered. Improvements to the site could be accomplished by no further subdividing of land parcels and concentrating areas of development. A local community-based effort will be necessary to protect and successfully manage this site.

Wetland Functional Evaluation for Soda Creek Site: This wetland provides flood abatement, wildlife and fish habitat and groundwater recharge (Table 25).

Table 25. Wetland functional evaluation for the Soda Creek site.

Function	Ratings	Confidence in Rating	Comments
Hydrological Functions			
Groundwater Recharge	very high	high	Sandy soils, dense vegetation in many areas
Groundwater Discharge	medium	medium	Probable seeps located at the base Cooper Ridge
Flood Storage	high	high	Water and debris marks on streamside vegetation
Shoreline Anchoring	medium	high	Moderate bank destabilization
Biogeochemical Functions			
Sediment Trapping	high	high	Debris and sand bars present
Long Term Nutrient Retention	medium	low	No peaty soils; moderately vegetated
Short Term Nutrient Retention	high	low	Moderate accumulation of organic matter
Biological Functions			
Downstream Food Chain Support	high	high	Seasonally flooded with some vegetation overhanging water
Within Food Chain Support	low	high	Low production of vegetation
Fish Habitat	high	high	Observed fish; clear water, some vegetation overhang
Wildlife Habitat	medium	high	Observed mule deer and raccoon; low level of plant diversity; close proximity to reservoirs
Passive Recreation	medium	high	Close proximity to subdivision
Heritage Value	high	high	High significance

General Soil Description

Texture	Very sandy soils
Color	Dark, reddish soils 10YR 3/2
Cobble Size	Small to medium
Percent Mottling	5%, with oxidized root channels

Figure 12. Slater Park site in northern Routt County.

Figure 13. Soda Creek site north of Steamboat Springs, Routt County.

(13) Steamboat Lake Site (Willow and Beaver Creeks)

Size: ca. 1,200 acres

Biodiversity Rank: B2 (Very High Significance)--The Steamboat Lake site encompasses a good quality example of a globally imperiled montane willow community, two good examples of willow communities, and a good quality occurrence of nesting sandhill cranes. This site supports one of the best examples of a wetland observed on private lands in Routt County.

Protection Urgency Rank: P2-threat expected within 5 years from residential expansion.

Management Urgency Rank: M2-new management action will be needed within 5 years to prevent the loss of element occurrences.

General Description: The Steamboat Lake site encompasses approximately 8.8 km (5.5 mi) of wetland habitat ranging from 2376 to 2448 m (7920 to 8160 ft). The site is located in a broad valley south of Steamboat Lake and west of Pearl Lake. Willow, Beaver, and Larson Creeks meander through the site. The willow carr on Willow and Larson Creeks is one of the best examples observed on private lands for Routt County. The willow carr on Beaver Creek is small, and located between two forks of Beaver Creek. It is separated from the Willow Creek carr by housing development. Both carrs are located downslope from reservoirs and are moderately to heavily impacted by grazing and subdivisions.

Natural Heritage Significance: This site encompasses a good quality occurrence of a G2/S2 community of *Salix boothii-Salix geyeriana* and fair occurrences of G?/S3 community (*Salix wolfii*/mesic forb) and a G3/S3? community (*Salix boothii/*mesic graminoid). There is a good occurrence of *Grus canadensis tabida* (greater sandhill crane) within the site (Table 26). The sandhill crane is a federally sensitive and a Colorado threatened species. The site contains one of the most extensive and highest quality occurrence of a willow carr observed along the Elk River and within Routt County.

Table 26. Natural Heritage elements at the Steamboat Lake site.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sens.	EO* Rank
Salix boothii/Mesic graminoid	Booth's willow/ mesic grasses	G3	S3?				BC
Salix wolfii/Mesic forb	Subalpine riparian willow carr	G?	S3				BC
Grus canadensis tabida	Greater sandhill crane	G5T4	S2B, S4N		T	FS	B
Salix boothii-Salix geyeriana	Montane willow carr	G2	S2				B

*EO=Element Occurrence

Protection and Management Considerations: The majority of the site is privately owned, the BLM does manage a portion of the site along Willow Creek. The site is not hayed, but is moderately grazed. The highest threat originates from subdividing for future housing

expansions. Much of the site is currently used for summer second homes and there are many for sale signs on the large ranches. Future development could further alter the hydrology leading to an increase in the already considerable habitat fragmentation. This site needs an immediate development plan to ensure that the aesthetic quality and natural values are not destroyed.

Wetland Functional Evaluation Steamboat Lake Site: This wetland is important for flood abatement, groundwater recharge, wildlife and fish habitat, and contributes to the aesthetic quality of this portion of Routt County (Table 27).

Table 27. Wetland functional evaluation for the Steamboat Lake site.

Function	Ratings	Confidence in Ratings	Comments
Hydrological Functions			
Groundwater Recharge	very high	high	Sandy soils, dense vegetation, stream meanders through site
Groundwater Discharge	medium	high	Willow carrs located downslope of reservoirs
Flood Storage	high	high	Debris in vegetation, low gradient
Shoreline Anchoring	high	high	Densely vegetated with woody plants
Biogeochemical Functions			
Sediment Trapping	medium	high	Evidence of sediment accretion along streambank; beaver activity
Long Term Nutrient Retention	low	low	No peaty soils
Short Term Nutrient Retention	medium	low	Dense vegetation and seasonally saturated soils
Biological Functions			
Downstream Food Chain Support	medium	medium	Seasonally flooded, vegetation is dense and overhangs water
Within Food Chain Support	high	high	Beaver active, observed small fish
Fish Habitat	very high	high	Observed several small fish
Wildlife Habitat	high	high	Habitat is fragmented, but did see evidence of deer and beaver
Passive Recreation	medium	high	Heavily impacted by subdivisions and roads
Heritage Value	very high	high	Very highly significant

General Soil Description

Texture	Sandy soils, with some clay
Color	Medium dark 10YR 3/4
Cobble Size	Fine
Percent Mottling	15% mottling, at 20 cm, manganese deposits, extensive oxidized root channels

(14) Sunnyside Creek

Size: ca. 640 acres

Biodiversity Rank: B5 (General Biodiversity Interest)--The Sunnyside Creek site supports a fair example of a likely common montane willow carr. This site is representative of the riparian willow carrs on private lands in this portion of Routt County.

Protection Urgency Rank: P2-threat expected from on-going intensive livestock activities within 5 years.

Management Urgency Rank: M1-management action required immediately or element occurrences could be lost or irretrievably degraded within one year.

General Description: This site is located in the extreme southeastern portion of Routt County. Sunnyside Creek originates at Sunnyside Lake in the White River National Forest. The elevation range within the site is from 2400 to 2553 m (8000 to 8510 ft). It enters the moderately narrow floodplain and flows southward to its confluence with the Colorado River. The site is a 3.2 km (2 mi) stretch along Sunnyside Creek that supports a narrow band of willow. There is moderate to heavy grazing that occurs throughout the site evidenced by the browse/rub lines on the willows and numerous cow trails on each side of the creek.

Natural Heritage Significance: This site encompasses a fair occurrence of *Salix boothii-Salix geyeriana-Salix lasiandra caudata,* a GU/SU community (Table 28). The Sunnyside Creek site represents the composition and state of many willow communities in the southeastern portion of Routt County. It is the best example of this wetland community, which is dominate in this portion of Routt County.

Table 28. Natural Heritage elements at the Sunnyside Creek site.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sens.	EO* Rank
Salix boothii-Salix geyeriana-Salix lasiandra caudata	Montane willow carr	GU	SU				C

*EO=Element Occurrence

Protection and Management Considerations: This site is owned privately. The site is heavily degraded, the element is restricted to a narrow occurrence along the creek. The understory is weedy with adventive species. The streambank is affected by the grazing with evidence of bank destabilization and trampling of willow saplings. Improvement of this site could begin by fencing off portions of the streambank to encourage growth of native grasses and forbs and preventing further stream channelization. This site would make an excellent demonstration project for riparian improvement.

Wetland Functional Evaluation of Sunnyside Creek Site: This wetland is important for flood storage and groundwater recharge (Table 29).

Table 29. Wetland functional evaluation of Sunnyside Creek site.

Function	Ratings	Confidence in Ratings	Comments
Hydrological Functions			
Groundwater Recharge	medium	medium	Clayey soils; moderately vegetated streambank
Groundwater Discharge	medium	medium	Spring located at the south end of the site
Flood Storage	medium	medium	Some debris in vegetation; no sand or gravel bars
Shoreline Anchoring	medium	high	Moderately vegetated by woody species
Biogeochemical Functions			
Sediment Trapping	low	high	No sand or gravel bars observed
Long Term Nutrient Retention	low	low	No peaty soils, no excessive accumulation of organic matter
Short Term Nutrient Retention	medium	low	Periodically flooded
Biological Functions			
Downstream Food Chain Support	medium	medium	Clayey soils; pulses of flooding evident
Within Food Chain Support	low	medium	Moderately productive vegetation, low plant diversity
Fish Habitat	very low	medium	None observed
Wildlife Habitat	medium	high	Sign of deer and raccoon
Passive Recreation	very low	high	Heavily impacted by grazing
Heritage Value	low	high	General biodiversity interest

General Soil Description

Texture	Clayey with some sand
Color	Dark reddish 10YR 3/1
Cobble Size	Small
Percent Mottling	5% at 20 cm with few oxidized root channels

Figure 14. Steamboat Lake site (Willow and Beaver Creek) in northeastern Routt County.

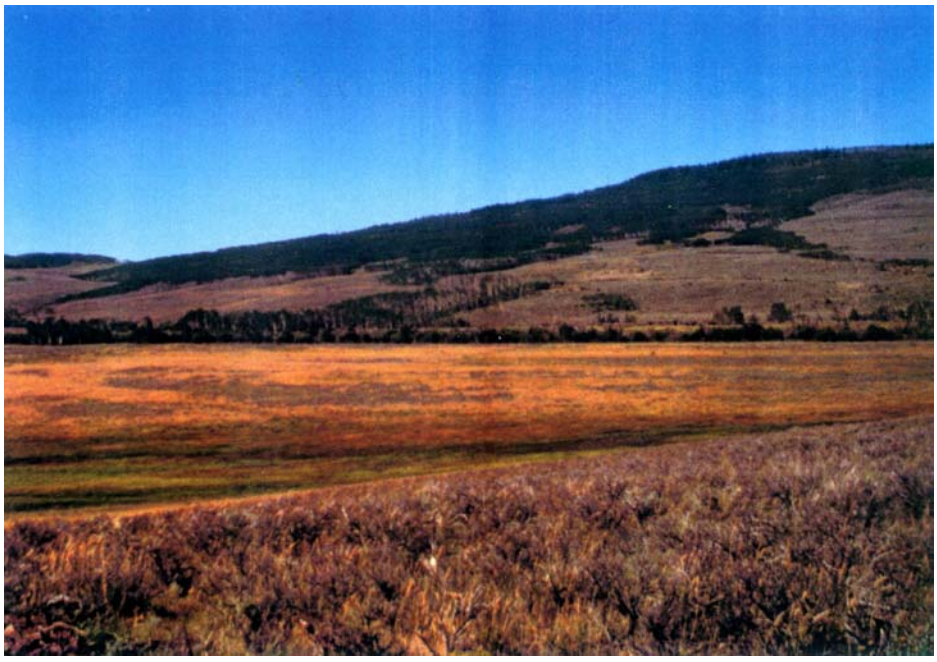


Figure 15. Sunnyside Creek site in southwestern Routt County.

(15) Windemere Lake

Size: ca. 90 acres

Biodiversity Rank: B4 (Moderate Significance)--The Windemere Lake site supports a good to fair example of state imperiled Western slope marsh and a fair occurrence of the Northern leopard frog, a state rare amphibian. It is the only depressional wetland observed on private lands in Routt County.

Protection Urgency Rank: P1-immediately threatened from further manipulation of water level.

Management Urgency Rank: M1-management action required immediately or element occurrences could be lost or irretrievably degraded within one year.

General Description: Windemere Lake is a result of the diversion of Fawn Creek since 1892. The lake is 1.6 m (1 mi) long by 0.8 m (0.5 mi) wide. Windemere Lake is dominated by *Scirpus tabernaemontani* (bulrush) community. The site was probably a natural wet meadow before enhancement with water diverted from Fawn Creek. The alkaline soils indicate that the area has been permanently flooded for approximately 80-100 years. It supports a variety of waterfowl, song birds, red and yellow-winged blackbirds, and shore birds. The drier uplands nearby support adventive grasses. The area is presently lightly grazed by horses.

Natural Heritage Significance: This site supports a fair occurrences of *Scirpus tabernaemontani* wetland and a fair occurrence of *Rana pipiens* (Table 30). The northern leopard frog is a U.S.F.S. sensitive species and Colorado special concern species. The site contains a human-made lake, however, it is unique for it is the only known occurrence of *Scirpus tabernaemontani* wetland in Routt County's private lands. Additional research needs to be performed regarding birds' use of the lake as a spring and fall stopover, as well as nesting habitat. Also, research by boat is necessary to document the aquatic plants and amphibians in the middle of the lake and around the 'islands' of vegetation.

Table 30. Natural Heritage elements at the Windemere Lake site.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sens.	EO* Rank
Scirpus tabernaemontani wetland	Western slope marsh	G5	S2				C
Rana pipiens	Northern leopard frog	G5T5	S3		SC	FS	C

*EO=Element Occurrence

Protection and Management Considerations: Windemere Lake is owned privately, the water rights for the lake are held by two private parties. Currently, there is a proposal to raise the level of the lake. This site is unique with respect to its plant community and important habitat for birds and amphibians. Maintaining the current water levels and hydrologic regime in the lake is the best way to assure that the natural heritage values of the lake are retained. Additional

research of at least one full summer should be performed to document the birds and their use of this site and to assess vegetation responses before the lake is further manipulated.

Wetland Functional Evaluation for Windemere Lake Site: This wetland is the only significant depressional wetland observed on private lands. It is important for groundwater discharge/recharge and wildlife habitat (Table 31).

Table 31. Wetland function evaluation for the Windemere Lake site.

Function	Ratings	Confidence in Rating	Comments
Hydrological Functions			
Groundwater Recharge	medium	medium	Soils are clayey; constricted outlet
Groundwater Discharge	medium	medium	Constricted outlet
Flood Storage	low	high	No mottling of soils to indicate frequent flooding; indication of mottling 5 meters upslope
Shoreline Anchoring	medium	medium	No woody vegetation, but grasses and sedges present
Biogeochemical Functions			
Sediment Trapping	medium	medium	Constricted outlet, but not much organic matter accumulation; (not sure how much of Fawn Creek is allowed to flood in the spring)
Long Term Nutrient Retention	high	low	Flooded permanently; denitrification likely; . emergent and submerged vegetation present
Short Term Nutrient Retention	medium	low	Moderate accumulation of organic matter
Biological Functions			
Downstream Food Chain Support	very low	high	Outlet is manipulated and area is permanently flooded
Within Food Chain Support	medium	medium	Productive vegetation, but somewhat stagnant water, further surveys required
Fish Habitat	very low	medium	No fish observed
Wildlife Habitat	very high	high	Observed deer, raccoon, waterfowl, songbirds, blackbirds, and sandhill cranes
Passive Recreation	very high	high	Excellent birding
Heritage Value	medium	high	Moderately significant

General Soil Description

Texture	Clayey
Color	Gleyed with sulfur smell 7/10G
Cobble Size	None
Percent Mottling	0 mottling at shoreline, 3-5% mottling at 12 cm 5 meters upslope

(16) Yampa River at Elk River

Size: ca. 700 acres

Biodiversity Rank: B3 (High significance)--The Yampa River at Elk River site encompasses a good and fair examples of two globally imperiled communities; a montane riparian forest and a narrowleaf cottonwood riparian forest.

Protection Urgency Rank: P1-immediately threatened by severely destructive forces (i.e., residential expansion), within 1 year.

Management Urgency Rank: M1-management action required immediately or element occurrences could be lost or irretrievably degraded within one year.

General Description: This Yampa River at Elk River site contains a 4.8 km (3 mi) stretch of the Yampa River, including its confluence with the Elk River. The elevational range within the site is 1954 to 1968 m (6512 to 6560 ft). Highway 40 and the railroad tracks border the site to the north and Saddle Mountain forms the border to the southwest. Hay meadows are adjacent on both sides of the river, except where the Saddle Mountain cliffs extends outward. The site is bisected by a county road and several private access roads. The western end of the site is platted for the Two River subdivision.

Natural Heritage Significance: This site encompasses a fair occurrence of G3/S2? community (*Populus angustifolia/ Cornus sericea*) and a good occurrence of a G3/S2? community (*Populus angustifolia/ Picea pungens/Alnus incana-Cornus sericea*). A historical occurrence of *Ardea herodias* (great blue heron) was not located during the field season, nor the *Haliaeetus leucocephalus* (bald eagle) occurrence (Table 32). This site is part of The Nature Conservancy's Yampa River Site Conservation Plan (1996).

Table 32. Natural Heritage elements at the Yampa River at Elk River site.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sens.	EO* Rank
Populus angustifolia /Cornus sericea	Narrowleaf cottonwood riparian forest	G3	S2?				C
Populus angustifolia /Picea pungens/ Alnus incana-Cornus sericea	Montane riparian forest	G3	S3				B
Ardea herodias	Great blue heron	G5	S3B, SZN				Historical (1982)
Haliaeetus leucocephalus	Bald eagle	G4	S1B, SZN	LT	T		Unranked

*EO=Element Occurrence

Protection and Management Considerations: The entire site is privately owned and is either platted for houses or is in agricultural use. Presently, the narrow riparian area, is relatively undisturbed. The elements are currently viable, but their future viability and defensibility are in

question. The understory is dominated by weedy, adventive species. The majority of this site is unrecoverable, but there are a few areas where the elements remain intact. Management of this area would entail fencing off the riparian area in order to restore the woody vegetation and encourage cottonwood and willow regeneration. Development areas should be concentrated to prevent further fragmentation by roads. Protection of this site would require cooperation from several landowners.

Wetland Functional Evaluation for the Yampa River at Elk River Site: This wetland is important for flood abatement, groundwater recharge, and possible nutrient removal from agricultural runoff. It is part of the extensive Yampa River riparian corridor that is one of the last relatively intact riverine systems in the west (Table 33).

Table 33. Wetland functional evaluation for the Yampa River at Elk River site.

Function	Ratings	Confidence in rating	Comments
Hydrological Functions			
Groundwater Recharge	very high	high	Sandy soils in a wide floodplain; steep slopes on the south side of Yampa River.
Groundwater Discharge	very low	high	No obvious source of discharge
Flood Storage	very high	high	Profuse debris from seasonal floods; located in a wide floodplain with low gradient
Shoreline Anchoring	high	high	Established woody vegetation on bank.
Biogeochemical Functions			
Sediment Trapping	high	high	Dominated by woody vegetation located next to stream
Long Term Nutrient Retention	medium	low	No peaty soils; moderate vegetation
Short Term Nutrient Retention	medium	low	Seasonally flooded; supports moderately dense vegetation
Biological Functions			
Downstream Food Chain Support	very high	high	Seasonally flooded; dense and diverse vegetation
Within Food Chain Support	medium	high	Vegetation moderately diverse
Fish Habitat	high	high	Good edge ratio; clear water
Wildlife Habitat	high	high	Observed 6 mule deer, gentle gradient
Passive Recreation	high	high	Utilized for fishing and floating
Heritage Value	high	high	High significant

General Soil Description

Texture	Very sandy soils
Color	Yellow brown color 2.5Y 3/3
Cobble Size	Medium to fine cobbles
Percent Mottling	7 %

Figure 16. Windemere Lake site, Routt County.

Figure 17. Yampa River at Elk River site, Routt County.

(17) Yampa River at Hayden and Morgan Bottoms

Size: ca. 5,120 acres

Biodiversity Rank: B2 (Very High Significance)--The Yampa River at Hayden and Morgan Bottoms site supports several occurrences of a globally imperiled narrowleaf cottonwood riparian forest, ranging from excellent to fair condition. This site supports the best examples of a riparian forest observed on private lands in Routt County.

Protection Urgency Rank: P1-immediately threatened by altered hydrology and residential expansion.

Management Urgency Rank: M1-management action required immediately or element occurrences could be lost or irretrievably degraded within one year.

General Description: Hayden and Morgan Bottoms encompasses approximately 25.6 km (16 mi) of wetlands/riparian bottom lands along the Yampa River. The Yampa River meanders across a wide floodplain ranging in elevation from approximately 1896 to 1920 m (6320 to 6400 ft). Morgan and Hayden Bottoms contain a number of relative high quality stands of the *Acer negundo-Populus angustifolia /Cornus sericea* (box elder-narrowleaf cottonwood/red-osier dogwood) riparian forests. Associated shrubs include: *Alnus tenuifolia* (thinleaf alder), *Salix lasiandra* ssp. *caudata* (Pacific willow), and *Crataegus rivularis* (hawthorn). Cobble bars inside meander bends support several regenerating stands of *Populus angustifolia* (narrowleaf cottonwood) and *Salix exigua* (coyote willow).

Irrigated hay meadows and grazing pastures dominate the floodplain adjacent to the riparian communities. Several creeks confluence with the Yampa within the site: Wolf, Goose, Morgan, Dry, and Sage, as well as the following gulches: Stokes, Coal Bank, and Smuin. Several ditches which divert water from the Yampa also exist within the site, they include: Gibralter, Walker, and Brock Adair. Highway 40 and the Denver/Rio Grande railroad tracks bisect the site. Sewage disposal ponds are located west of Hayden at Stokes Gulch.

Natural Heritage Significance: The Yampa River at Morgan and Hayden Bottoms is one of the best sites within the Yampa River system. The site supports broad areas of high quality, globally imperiled deciduous riparian forests as well as large areas with restoration potential (The Nature Conservancy 1996). The site supports, on the average, good occurrences of *Acer negundo-Populus angustifolia /Cornus sericea,* a G2/S2 community. There are 3 degraded occurrences of *Grus canadensis tabida* (greater sandhill crane) within the site. Sandhill cranes are listed as U.S.F.S. sensitive and Colorado threatened species. An unranked occurrence for *Haliaeetus leucocephalus* (bald eagle) is also documented for the site. The bald eagle is a federal and state listed threatened species. A historical occurrence of *Ardea herodias* (great blue heron) located in the eastern portion of the site was not located during the field season (Table 34). Much of the site has been altered by agriculture and livestock uses, therefore increasing the importance of this site for sources of propagules for cottonwood and willow regeneration. Morgan Bottoms is used by sandhill cranes as a staging area in the fall and breeding in the spring. The Yampa River is

also used by bald eagles as breeding and wintering grounds. The site is part of The Nature Conservancy's Yampa River Site Conservation Plan (1996).

Table 34. Natural Heritage elements at the Yampa River at Morgan and Hayden Bottoms site.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sens.	EO* Rank
Acer negundo-Populus angustifolia /Cornus sericea	Narrowleaf cottonwood riparian forest	G2	S2				BC; B; CD; AB; C+; AB; BC; AB; AB
Grus canadensis tabida	Greater sandhill crane	G5T4	S2B, S4N				D; D; D; D
Ardea herodias	Great blue heron	G5	S3B, SZN				Historical (1981)
Haliaeetus leucocephalus	Bald eagle	G4	S1B, SZN	LT	T		Unranked

*EO=Element Occurrence

Protection and Management Considerations: The majority of this site is privately owned, except for a small portion on the western edge which is managed by the Colorado Division of Wildlife. Several threats to the riparian forest and the bottom lands exist including: urban expansion and/or conversion of bottom lands to agriculture, alteration of hydrology (dam expansion or diversions), reduced channel migration and meander cut off by riprap and other bank stabilization methods, irrigation ditches, spread of noxious weeds (e.g., tamarisk, leafy spurge). Alteration of the natural flood regime reduces the regeneration processes for cottonwoods and willows, affecting the viability of riparian forests. Trapping of beaver interferes with the river's natural processes and effectiveness as a wetland. The majority of this site has been converted to agriculture, but there are a few areas where the elements remain intact. Management of this area would entail fencing off the riparian area in order to restore the woody vegetation and encourage cottonwood and willow regeneration. Development areas should be concentrated to prevent further fragmentation. Protection of this site will require cooperation from several landowners.

Wetland Functional Evaluation for Yampa River at Hayden and Morgan Bottoms Site: This wetland is important for flood abatement, groundwater recharge, wildlife habitat, and possible removal of nutrients from agricultural runoff. It contributes to the aesthetic quality of the Yampa River valley. It is part of the extensive Yampa River riparian corridor that is one of the last relatively intact riverine systems in the west (Table 35).

Table 35. Wetland functional evaluation for the Yampa River at Hayden and Morgan Bottoms site.

Function	Ratings	Confidence in Rating	Comments
Hydrological Functions			
Groundwater Recharge	very high	medium	Sandy soil, moderately vegetated
Groundwater Discharge	very low	medium	No obvious source of discharge
Flood Storage:	high	high	Debris evident, sediment accretion, low gradient; overflow channels present
Shoreline Anchoring:	medium	high	Moderately vegetated by woody vegetation, understory consists of European hay grasses with fibrous root systems
Biogeochemical Functions			
Sediment Trapping:	high	high	Sediment and sand bars evident
Long Term Nutrient Retention:	medium	low	No peaty soils; moderate vegetation
Short Term Nutrient Retention	medium	low	Moderate accumulation of organic matter
Biological Functions			
Downstream Food Chain Support	medium	medium	Seasonally flooded with good flushing flows
Within Food Chain Support	very high	medium	Observed mule deer, cranes, elk
Fish Habitat	high	medium	clear water; overhanging vegetation
Wildlife Habitat	high	medium	Observed mule deer, no beaver
Passive Recreation	high	high	Utilized for rafting, fishing
Heritage Value	very high	high	Very high significance

General Soil Description

Texture	Sandy soils
Color	Dark yellow color 2.5Y 3/2
Cobble Size	Few, small cobbles
Percent Mottling	7% at 12 cm with moderate level of oxidized root channels

(18) Yampa River South of Steamboat

Size: ca. 3,200 acres

Biodiversity Rank: B4 (Moderate Significance)--The Yampa River, South of Steamboat site encompasses fair examples of a globally imperiled narrowleaf cottonwood/willow community, and several state rare willow communities. There is a fair example of nesting great blue herons. This site is representative of private lands in this portion of Routt County's wetlands.

Protection Urgency Rank: P1-immediately threatened by severely destructive forces, namely residential and commercial expansion, within one year.

Management Urgency Rank: M1-management action required immediately or element occurrences could be lost or irretrievably degraded within one year.

General Description: The Yampa River meanders through a broad riparian valley, south of Steamboat Springs for approximately 5.6 km (3.5 mi) ranging in elevations from 2040 to 2049 m (6800 to 6830 ft). The confluences of Oak, Agate, and Walton Creeks are contained within the site. Walton Creek and several first order streams emerge from the Park Range into the floodplain. The site is hayed extensively in drier areas and later moderately grazed. There are several housing subdivisions located to the west. A golf course is currently under construction to the east. There is a large gravel extraction operation located in the middle of the site. Highway 131 is located to the east and County Road 14 and railroad tracks are located to the west. The wetter areas still support willow and cottonwood while *Scirpus microcarpus* (bulrush) and *Carex utriculata* (beaked sedge) occur in the understory along with copious amounts of adventive species. The heron rookery was active this year. This site contains the Williams Preserve, which is managed by the City of Steamboat Springs as open space.

Natural Heritage Significance: This site encompasses fair occurrences of a G4G5/S4S5 community (*Populus angustifolia/ Salix exigua),* a G5/S2 communities (*Salix geyeriana-Carex utriculata*) and a G3/S3 community (*Populus angustifolia/Alnus incana*). There is a degraded occurrence for *Grus canadensis tabida* (greater sandhill crane) and a fair quality occurrence for *Ardea herodias* (great blue heron) (Table 36). The sandhill crane is federal listed sensitive and state listed threatened species. The great blue heron has no federal or state listing. This site is unique in that there is high probability of groundwater discharge from the Park Range along the eastern portion of the site. It is presented because the level of threats are high and the close proximity to Steamboat Springs.

Table 36. Natural Heritage elements at the Yampa River South of Steamboat site.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sens.	EO* Rank
Salix geyeriana-Carex utriculata	Geyer's willow-beaked sedge	G5	S2				C,C
Populus angustifolia/ Alnus incana	Narrowleaf cottonwood /thinleaf alder	G3	S3				C
Populus angustifolia/ Salix exigua	Narrowleaf cottonwood/coyote willow	G4G5	S4S5				C
Grus canadensis tabida	Greater sandhill crane	G5T4	S2B, S4N		T	FS	D
Ardea herodias	Great blue heron	G5	S3B, SZN				C

*EO=Element Occurrence

Protection and Management Consideration: Most of this site is privately owned, except for the northern end which is owned by the City of Steamboat Springs. The site is heavily impacted by agricultural practices and grazing. The elements have been severely affected by human activities and are limited to small fragments of willow located on the wettest areas. The hydrology has been irretrievably degraded by activities associated with residential and commercial developments. The most significant threat for this site is habitat fragmentation and draining of the wetlands for further developments. Management needs to consider a comprehensive conservation plan to protect the remaining wetlands from further degradation and fragmentation. Maintenance and protection of this site will require community-based conservation plan and local cooperation of many landowners.

Wetland Functional Evaluation for Yampa River South of Steamboat Site: This wetland is important for flood abatement, groundwater recharge, active and passive recreation, and it contributes to the aesthetic quality of the area. It is part of the extensive Yampa River riparian corridor that is one of the last relatively intact riverine systems in the west (Table 37).

Table 37. Wetland functional evaluation for Yampa River South of Steamboat site.

Function	Ratings	Confidence in Rating	Comments
Hydrological Functions			
Groundwater Recharge	very high	high	Flooding evident, low gradient basin, stream meanders; sandy soils, depressions present. Slough areas traps water
Groundwater Discharge	high	medium	Slough retains and releases water gradually back into Yampa, discharge from the first and second order streams along the east side of site
Flood Storage	very high	high	Water and debris marks evident
Shoreline Anchoring	medium	high	Moderate vegetation along streambank

Table 37. Wetland functional evaluation for Yampa River South of Steamboat site (continued).

Biogeochemical Functions			
Sediment Trapping	high	high	Sand and sediment accumulation
Long Term Nutrient Retention	medium	low	No peaty soils;moderate vegetation
Short Term Nutrient Retention	high	low	Slough constricts water flow; moderate accumulation of organic matter
Biological Functions			
Downstream Food Chain Support	medium	medium	Seasonally flooded
Within Food Chain Support	very high	medium	Fish, blue heron, waterfowl, and amphibians observed, clear water
Fish Habitat	very high	high	Not oligotrophic, well-mixed water
Wildlife Habitat	medium	high	Observed 2 mule deer, heavily used for recreation
Passive Recreation	very high	high	Part of site is used as open space for tubing, kayaking, bicycling
Heritage Value	low	high	General biodiversity significance

General Soil Description

Texture	Sandy soils, some clay present
Color	Dark reddish 10YR 3/1
Cobble Size	Small to medium
Percent Mottling	10% at 15 cm. with oxidized root channels

Figure 18. Yampa River at Hayden and Morgan Bottoms site, Routt County.

Figure 19. Yampa River South of Steamboat Springs site, Routt County.

ADDITIONAL INFORMATION

For additional information on the natural heritage values of Routt County's wetlands, contact:

Colorado Natural Heritage Program
Colorado State University
254 General Services Building
Fort Collins, CO 80525
tel. 970-491-1309
fax 970-491-3349
e-mail: heritage@lamar.colostate.edu

For information on U.S. Army Corps of Engineers wetland regulations, contact:

U.S. Army Corps of Engineers--Omaha District
Tri-Lakes Project Office
9307 Colorado State Hwy. #121
Littleton, CO 80123-6901
tel. 303-979-4120
fax. 303-979-0602

For information on the U.S. Fish and Wildlife Service's National Wetlands Inventory (source of wetland maps of Routt County), contact:

National Wetlands Inventory Office
U.S. Fish and Wildlife Service
134 Union Blvd.
Lakewood, CO 80228
tel. 303-236-4625

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PROJECT BACKGROUND AND PURPOSE

Wetlands are places where soils are inundated or saturated with water long enough and frequently enouth to significantly affect the plants and animals that live and grow there. Until recently, most people viewed wetlands as a hindrance to productive land use. As a result, many wetlands across North America were purposefully and unintentionally destroyed. Kelly *et al.* (1993) state that wetlands in the United States were still being lost at a rate of 260,000 acres/year (105,218 ha/year). In Colorado an estimated 1 million acres of wetlands (50% of the total for the state) were lost prior to 1980 (Dahl 1990).

Although the rate of wetland loss in Routt County is difficult to quantify, it is clear that many of the county's wetlands, especially around Steamboat Springs and along the Yampa River, have been destroyed or profoundly altered from their pre-settlement state. Agriculture, grazing, development and water diversions have had tremendous impacts on wetlands throughout the county. Fertile soils and available water for irrigation attract agriculture to floodplains. Since the nineteenth century hydrological diversions developed for irrigation, recreation, and drinking water supplies, have removed water from some wetlands, and created other wetlands very different from those present prior to European settlement. For example, in the area south of Steamboat Springs, residential and commercial development has profoundly affected the large willow community associated with the Yampa River. It is clear that with the current rate of land use conversion in the county and the lack of comprehensive wetland protection programs, wetlands will continue to be lost or dramatically altered.

Routt County wetlands have been the focus of several studies. Baker (1984) first classified the plant communities of Routt and Garfield Counties. Reid (1991) conducted the Yampa River Basin Riparian Survey. Kittel and Lederer (1993) conducted a field survey of the riparian vegetation of the Yampa and San Miguel/Dolores River basins which resulted in a preliminary classification of the riparian areas. Lastly, Kettler and McMullen (1996) conducted a riparian vegetation classification of Routt National Forest.

Increasingly, local Colorado governments, particularly in rapidly growing parts of the state, are expressing a desire to better understand their natural heritage resources, including wetlands. The Colorado Natural Heritage Program (CNHP) (program description on page 27) approached this project with the intent of addressing this desire, in order to learn more about Routt County's wetlands.

The primary goal of this project was to identify the types of wetlands within Routt County (excluding state and federal lands), and to describe their values and functions. The South Steamboat Springs area was emphasized in consideration of current and projected development pressures. This report does not contain specific location information, but rather discusses general locations. The second goal of this project was to facilitate better understanding of the wetlands that occur in Routt County, and thus, extend overall knowledge of Colorado wetlands.

Study Area

Routt County is located in the northwestern portion of Colorado and lies within the Northern Parks and Ranges section (Bailey *et al*. 1994). Routt County is bordered to the northeast by the Sierra Madre Mountains and to the southeast by the Gore Range. The Elkhead Mountains are to the northwest, and to the southwest lie the Williams Fork Mountains. The Yampa River and its major tributaries (Elk, Elkhead, Bear, East Fork Williams Fork, Little Snake River, and Oak Creek) drain the majority of Routt County. Three major reservoirs (Stagecoach, Lake Catamount, and Steamboat Lake) influence the Yampa River and its associated wetlands.

The climate is generally characterized by long, cold, moist winters, and short, cool, drier summers. Steamboat Springs, where climate data are recorded, receives approximately 23.0 in (58.4 cm) of precipitation each year. Average minimum and maximum temperatures are, respectively, -0.3^0 F (-20.9^0 C)and 26.7^0 F (-3.4^0 C) in January and 41.6^0 F (5.4^0 C)and 81.8^0 F (27.9^0 C) in July (Owenby and Ezell 1992).

The geology of Routt County is complex, as evidenced by the Geological Map of Colorado (Tweto 1979). The most noticeable geological features are several hotsprings that rise along a fault zone in the Dakota Sandstone (Chronic 1980). The valley west of Steamboat Springs is underlain by Mancos Shale dipping westward off the west flank of the Park Range. Further west the valley consists of a sandstone-shale complex represented by the Mesaverde Group. The Hayden power plant burns coal strip-mined from the Mesaverde Group (Chronic 1980). Elk Mountain and other prominent peaks are tertiary volcanic pipes that rise from the valley. The Park Range consists of Precambrian igneous and metamorphic strata. The Elkhead Mountains consist of sandstone and siltstone, dotted with igneous intrusive rocks e.g., Bears Ears Peaks. The Williams Fork Mountains contain sandstone, shale, and major coal beds. The Gore Range consists of granitic rocks with several faults. The valley bottoms of the Yampa, Little Snake and Elk Rivers are composed of alluvial deposits (Tweto 1979).

Typical Southern Rocky Mountain flora is prevalent in Routt County. Elevations up to approximately 2,300 m (7,500 ft) are dominated by *Quercus gambelii* (Gambel's oak), *Amelanchier alnifolia* (service berry), *Artemesia tridentata* ssp. *vaseyana* (mountain sagebrush) and *Symphoricarpos rotundifolius* (snowberry). At these elevations, wetlands occur in riparian areas on floodplains, on oxbow lakes, and in beaver ponds. These wetlands are dominated by *Salix* spp. (willows), *Populus angustifolia* (narrowleaf cottonwood), *Alnus incana* (thinleaf alder), and *Acer negundo* (box elder).

Above 2,300 m (7,670 ft), *Populus tremuloides* (quaking aspen) dominates. In the elevational zone between 2,500 m to 2,900 m (8,000 to 9,500 ft) *Picea pungens* (Colorado blue spruce), *Picea engelmanii* (Engelmann's spruce), and *Abies lasiocarpa* (subalpine fir) occur.

WETLAND DEFINITIONS AND REGULATIONS

Wetland Definitions

Wetlands are places where soils are inundated or saturated with water often and long enough, to significantly affect the plants and animals that live and grow there. This type of general definition suffices for most ecologists, but wetland regulators and the judicial system require a more precise definition.

The U.S. Army Corps of Engineers (the Corps) has primary responsibility for regulating activities in wetlands. According to the Corps, wetlands are "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstance do support, a prevalence of vegetation typically adapted for life in saturated soil condition." For Corps' programs, the wetlands' boundary must be determined according to the mandatory technical criteria described in the Corps of Engineers Wetlands Delineation Manual (Environmental Laboratory 1987). In order for an area to be classified as a jurisdictional wetlands (i.e., a wetland subject to federal regulations), it must have *all* three of the following:

(1) wetland plants (plants that tolerate flooded soils);
(2) wetland hydrology (flooded or saturated soils for a significant part of the growing season); and
(3) hydric soils (soils that show evidence of regular or sustained saturation).

The U.S. Fish and Wildlife Service defines wetlands from an ecological point of view. In *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin *et al.* 1979) the definition states that "wetlands are lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water". Wetlands must have *one or more* of the following three attributes:

(1) at least periodically, the land supports predominantly hydrophytes (wetland plants);
(2) the substrate is predominantly undrained hydric soil; and
(3) the substrate is nonsoil and is saturated with water or covered by shallow water at some time during the growing season of each year.

This definition only requires that an area meet one of the three criteria (vegetation, soils, and hydrology) in order to be classified as a wetland.

The Colorado Natural Heritage Program prefers the wetland definition used by the U.S. Fish and Wildlife Service, because it recognizes that some areas display many of the attributes of wetlands without exhibiting all three characteristics required to fulfill the Corps' criteria. Additionally, riparian areas, while often technically not wetlands, should be included in a wetland conservation program. Riparian areas perform many of the same functions as do wetlands, including maintenance of water quality, storage of floodwaters, and enhancement of biodiversity, especially in the western United States (National Research Council 1995).

Wetland Function and Values

Many physical and biological functions and values associated with wetlands provide benefit to society. CNHP is most interested in the contribution of wetlands in maintenance of Colorado's natural diversity. The Southern Rocky Mountain population of the boreal toad (*Bufo boreas boreas*), for example, is known from only 12-15 breeding populations in the state (M. Sherman pers. comm.). The Colorado Division of Wildlife lists the boreal toad as an endangered species, while the U.S. Fish and Wildlife Service has designated it as a candidate for listing under the Endangered Species Act. CNHP ranks natural communities, plants, animals according to their relative degree of imperilment within a global and state context (page 13).

Wetlands perform many functions beyond simply providing habitat for plants and animals. It is commonly known that wetlands act as natural filters, helping to protect water quality, but it is less well known that wetlands perform other important functions. Adamus *et al.* (1991) list the following functions performed by wetlands (detailed definitions for each function are located on page 28):

- Ground water recharge--the replenishing of below-ground aquifers.
- Ground water discharge--the movement of ground water to the surface e.g., springs.
- Floodflow alteration--the temporary storage of potential flood waters.
- Sediment stabilization--the protection of stream banks and lake shores from erosion.
- Sediment/toxicant retention--the removal of suspended soil particles from the water, along with toxic substances that may be attached to these particles.
- Nutrient removal/transformation--the removal of excess nutrients from the water, in particular nitrogen and phosphorous.
- Production export--supply organic material (dead leaves, etc.) to the base of the food chain.
- Aquatic diversity/abundance--wetlands support fisheries.
- Wildlife diversity/abundance--wetlands provide habitat for wildlife.

Adamus and Stockwell (1983) include two items they call "values" which also provide benefits to society:

- Recreation--wetlands provide areas for fishing, birdwatching, etc.
- Uniqueness/heritage--wetlands support rare and unique plants, animals, and plant communities.

"Values" are subject to societal perceptions, whereas "functions" are all biological and physical processes and manifestations of processes which occur in wetlands, regardless of the value placed on them by society (National Research Council 1995). The actual value attached to any given function or value listed above depends on the needs and perceptions of society.

It is important to recognize that not all wetlands provide all functions. For instance, many subalpine willow carrs, especially small ones, do not have significant amounts of open water. They are supported by seeps and springs on the mountain sides and thus cannot provide habitat

for fish (the aquatic diversity/abundance function). The lack of certain functions at a wetland does not necessarily decrease the importance of that wetland.

Wetland Regulation in Routt County and throughout Colorado

Wetlands in Routt County are currently regulated under the authority of the federal Clean Water Act. A permit issued by the Corps is required before placing fill in a wetland (e,g., building up a site before constructing home), and before dredging, ditching, or channelizing a wetland. The Clean Water Act exempts certain filling activities, such as normal agricultural activities.

The 404(b)(1) guidelines, prepared by the Environmental Protection Agency in consultation with the Corps, are the federal environmental regulations for evaluating projects that will impact wetlands. Under these guidelines, the Corps is required to determine if alternatives exist for minimizing or eliminating impacts to wetlands. When unavoidable impacts occur, the Corps requires mitigation of the impacts. Mitigation may involve creation or restoration of similar wetlands in order to achieve an overall goal of no net loss of wetland area.

It is important to understand that the Corps wetlands program is not a wetlands *protection* program, even though in fact many wetlands are protected through implementation of these regulations (B. Clairain, pers. comm.). Rather, the Corps wetlands permit review process is a means to insure that the societal value of wetlands (i.e., the value of flood control, water quality maintenance, etc.) is considered whenever wetlands will be impacted by development activities. Under the Corps program, most wetland permit applications are approved, after impacts have been minimized or mitigated, nonetheless the wetlands are impacted.

The U.S. Fish and Wildlife Service has conducted inventories of the extent and types of our nation's wetlands. The Cowardin *et al.* (1979) classification system provides the basic mapping units for the U.S. National Wetlands Inventory (NWI). The NWI drew their maps for Routt County based on 1:58,000 scale color infrared aerial photography taken in September 1983. Photointerpretation and field reconnaissance were used to refine wetland boundaries according to the wetland classification system. The information is summarized on 1:24,000 and 1:100,000 maps.

Currently, Routt County NWI maps are in draft form and near the final stage of printing and will be completed as soon as funds become available (C. Elliot pers. comm.). These maps should prove to be a valuable asset for land use planning for Routt County. The NWI maps provide important and accurate information regarding the location of wetlands. They can be used to gain an understanding of the general types of wetlands in the county and their distribution. The NWI maps cannot be used for federal regulatory programs that govern wetlands for two reasons. First, the U.S. Fish and Wildlife Service uses a definition of wetland that differs slightly from Corps, the agency responsible for executing federal wetland regulations. Secondly, there is a limit to the resolution of the 1:24,000 scale maps. For example, at this scale, the width of a fine line on a map represents about 5 m (17 ft) on the ground (Mitsch and Gosselink 1993). For this reason, precise wetland boundaries must be determined on a project by project basis.

Colorado's state government has developed no guidelines or regulations concerning the management, conservation, and protection of wetlands, but a few county and municipal governments have, including the City of Boulder, Boulder County, and San Miguel County.

METHODS

Survey Site Selection

Site selection was executed based on the goal of visiting every wetland type occurring in Routt County, excluding public lands. Within the full spectrum of wetland types, the highest quality occurrence of each type was targeted during the field season. CNHP classifies wetland and riparian plant associations or communities, not wetlands. Plant communities reflect the broader nature of the wetlands in the study area (i.e., willow carr, sedge meadow, etc.), while also mirroring the local nature of the wetlands in Routt County. Most other classifications applied to wetlands in Colorado and across the nation (including the U.S.F.W.S. classification used for mapping purposes in Routt County) classify wetlands based mainly on the physiognomy (structure) of the vegetation. Unfortunately, these structural classes can be applied across virtually all wetlands, and they generally do not reflect the importance or singularity of Routt County's wetlands.

Potential wetlands or target inventory areas (TIAs) were initially identified using color infrared aerial photographs, 7.5 minute topographic quadrangles, in conjunction with a review of CNHP's Biological Conservation Datasystem (BCD) for known occurrences. A low-altitude flight over the county, by the non-profit organization Project Lighthawk, provided an opportunity to view the county as a whole, to exclude inferior sites included during the photo interpretation, and to include high quality sites that were missed. The TIAs were prioritized for surveying in such a manner that each type of wetland in Routt County would be visited.

The majority of these sites are on private lands, so field personnel requested permission to access the TIAs. Each land owner was contacted in person at their residence. For various reasons permission to access some TIAs was not obtained.

Site Assessment

Site assessments included assessments of the natural heritage elements at the site and a wetland function evaluation. Site visits and assessments were conducted on the following three levels:

1) **Roadside or adjacent land assessments.** Many of the sites could be viewed at a distance from a public road or from adjacent public land. While on the ground the field scientist can see, even from a distance, many features not apparent on maps and aerial photos. The majority of the sites selected during the TIA analysis were rejected during this phase from consideration as potential conservation sites. The road assessments determined the extent of human and livestock impacts on the TIA, which included ditching, adventive plant species, indicator plant species of intensive livestock use, stream bank destabilization, establishment of saplings on point bars, major hydrologic alterations, excessive weed cover (especially noxious weeds), or new construction. Sites with these characteristics were immediately rejected as potential high significance conservation sites. No extensive data were gathered at these sites.

2) **On-site assessments**. On-site assessment was the preferred method, as it was the only assessment technique that can yield high-confidence statements concerning the known or potential presence of rare and imperiled elements or excellent examples of common communities. On-site assessments are also the most resource intensive because of the required landowner contact and comprehensive field efforts. In several cases where on-site assessments were desired, they could not be conducted either because the field crews were denied access to the property by the landowner, or CNHP was unable to contact the landowner in the available time.

3) **Off-site assessments**. Off-site assessment was the least preferred method because of the low confidence in the results. In cases where access to a property was not possible, off-site assessments are made when there are indications that the site contains a good example of a natural community or a rare or imperiled species. Off-site assessments generally included intensive analysis of aerial photos, surveys of the property from the nearest publicly accessible point, flyovers, survey of similar sites on nearby public land, and assessment of existing data in BCD.

For the sites that were visited, the following general information was noted (Example of field forms are located at the end of the report):

- Sketch of the site layout, with distribution of community types indicated (this was generally done on the 7.5' USGS topographic map, but occasionally for clarity a separate map was drawn on the site survey form)
- elevation (from 7.5 min. USGS topographic maps)
- current and historic land use (e,g., grazing, logging, recreational use) when apparent
- notes on geology and geomorphology
- reference photos of the site
- signs of disturbance such as logging, grazing, flooding, etc.
- a list of elements known or expected from the site, and notes on their status

A description of the various wetland elements present in Routt County and the wetland function assessment are described in Section 3.

Plant Communities

Plant communities are very useful integrators of site conditions, therefore, our TIA analysis attempted to identify potential sites for the full range of plant communities present in the study area. A moderate amount of information about riparian and wetland communities associated with streams and rivers was already present in BCD, but little information was available about wetlands not associated with riparian areas.

The following information about plant communities was gathered when visiting a site. For every site where an element occurrence (see Table 1) was located, the following information was entered into BCD:

- List of all plant associations in the wetland complex, including the amount of wetland area covered by that community. In almost all cases, plant associations were immediately placed in existing classifications. However, on rare occasion a plant association was encountered which could not be easily classified based on stands sampled previously.
- Vegetation data for each major plant association in the wetland were collected using rough ocular estimates of species cover in a representative portion of the plant association.
- Hydrologic information, including water source and hydroperiod (i.e., perennially flooded, seasonally saturated, etc.).
- Soil descriptions based on a shallow pit or an augered sample within each plot. Thickness, texture (via hand-texturing), color, mottling/gleying, structure, matrix color, coarse fragments, and parent material when possible were noted for each soil horizon.
- Notes on unusual features, alkali deposits, unusual microtopography, beaver activity, etc.

Function and Value Assessment

Function and value assessment was based on Cooper (1988), which employs a modified methodology developed by Adamus and Stockwell (1983). Cooper's methodology was modified slightly to place it more in line with Adamus' modified methodology, known as the Wetland Evaluation Technique (W.E.T.) (Adamus *et al*. 1991).

The technique developed by Adamus *et al.* (1991) has not been adequately regionalized to local conditions in the western United States, but the method does provide an accurate framework for evaluating wetland functions. The ratings, however, are based on the "Best Professional Judgment" of CNHP's wetland ecologists.

The ratings for each function are not based on quantitative data, and only a limited amount of data on these functions are available. Some of the functions (e.g., groundwater recharge and nutrient retention) are very difficult to assess accurately in a rapid manner. Also, the scientific understanding of many of these functions as performed in the Rocky Mountains is based on sparse and disparate data from many sources, often for eastern or Pacific Coast wetlands. CNHP was aware of these limitations, but CNHP is confident that the function and value assessments, as presented, provide a solid foundation on which to base wetland protection efforts.

Absolute assessments of the functions of Routt County wetlands can be known only after extensive (generally multi-year) data have been collected at a site. County government is encouraged to support such research efforts. Such research will generate potential reference sites for the hydrogeomorphic (HGM) approach to wetland function assessment (page 31).

Colorado Natural Heritage Program Ranks

Each of the species and plant communities tracked by CNHP is an element of natural diversity. Each element is assigned a rank which indicates its relative degree of imperilment on a five-point scale (1 = critically imperiled; 5 = abundant; Table 1). Federal and state ranks are explained in Table 2.

The primary criterion for ranking elements is the number of occurrences, or in other words, the number of known distinct localities or populations. The number of individuals at each locality or, for highly mobile organisms, the total number of individuals is also of great importance. Other considerations include the condition of the occurrences, the number of protected occurrences, and threats. The ranks are assigned both in terms of the element's imperilment within Colorado (State or S-rank) and the element's imperilment over its entire range (Global or G-rank). Taken together, these two ranks give an instant picture of the conservation status of the element. Although most species protected under state or federal endangered species laws are imperiled, not all rare or imperiled species are listed as endangered or threatened. **Natural Heritage ranks should not be interpreted as legal designations.**

Two other Natural Heritage Program ranks apply to the location where an element is found. Element occurrence ranks indicate the quality, condition, defensibility, and viability of any one location of a particular element. The definitions are as follows:

> quality: size, connectedness to surrounding natural ecosystems, productivity, vigor, regeneration relative to other examples of the same element.
>
> condition: abundance of non-native plant species, degree of soil compaction, degree of degradation, ability to recover.
>
> viability: whether intrinsic and extrinsic biological factors are in place for the long-term persistence of the element.
>
> defensibility: likelihood of long-term survival of the element based on social/political/ biophysical factors, vulnerability.

Biodiversity ranks (B-ranks) indicate the relative natural heritage significance of a site occurrence. B-ranks are a function of both rarity ranks and element occurrence ranks. Explanations of Natural Heritage Program ranks are given in Table 1.

Table 1. Colorado Natural Heritage Program Ranks.

Global rarity ranks are similar, but refer to a species' rarity throughout it range. State and Global ranks are denoted, respectively, with an "S" or a "G" followed by a character. Note that GA and GN are not used and GX means extinct. These ranks should not be interpreted as legal designations.

Rarity Ranks (applied to an element only)

G/S1 Critically imperiled; usually 5 or fewer occurrences in the state; or may be a few remaining individuals; often especially vulnerable to extirpation.

G/S2 Imperiled; usually between 5 and 20 occurrences; or with many individuals in fewer occurrences; often susceptible to becoming endangered.

G/S3 Vulnerable; usually between 20 and 100 occurrences; may have fewer occurrences, but with a large number of individuals in some populations; may be susceptible to large-scale disturbances.

G/S4 Common; usually > 100 occurrences, but may be fewer with many large populations; may be restricted to only a portion of the state; usually not susceptible to immediate threats.

G/S5 Very common; demonstrably secure under present conditions.

G/SU Status uncertain; often because of low search effort or cryptic nature of the element.

T Trinomial; specifies the rank of that species and sub species.

S#B Refers to the breeding season imperilment of elements that are not permanent residents.

S#N Refers to the non-breeding season imperilment of elements that are not permanent residents. Where no consistent location can be discerned for migrants or non-breeding populations, a rank of ZN is used

SZ Migrant whose occurrences are too irregular, transitory, and/or dispersed to be reliable identified, mapped, and protected.

Notes: When a question mark follows a numerical rank (e.g., S2?), it indicates uncertainty about the accuracy of this rank. When two numbers appear in a state or global rank (e.g., S2S3), the actual rank of the elements falls between the two numbers. When a 'Q' follows a rank, it indicates uncertainty about the taxonomic status of the element.

Element Occurrence ranks (applies to the site where an element(s) occurs)

A The occurrence is relatively large, pristine, defensible, and viable.

B The occurrence is small but in good condition, or large but removed from its natural condition and/or not viable and defensible.

C The occurrence is small, in poor condition, and possibly of questionable viability.

D The occurrence does not merit conservation efforts because it is too degraded or not viable.

Biodiversity ranks (applies to the site where an element(s) occurs).

B1 Outstanding Significance: only site known for an element or an excellent occurrence of a G1 species.

B2 Very High Significance: one of the best examples of a community type, good occurrence of a G1 species, or excellent occurrence of a G2 or G3 species.

B3 High Significance: excellent example of any community type, good occurrence of a G3 species, or a large concentration of good occurrences of state rare species.

B4 Moderate Significance: good example of a community type, excellent or good occurrence of state-rare species.

B5 General Biodiversity Significance: good or marginal occurrence of a community type, S1, or S2 species.

Table 2. Federal and State Agency Designations.

Federal Status:

U.S. Fish and Wildlife Service (58 Federal Register 51147, 1993)

LE	Endangered; taxa formally listed as endangered.
LT	Threatened; taxa formally listed as threatened.
P	Proposed E or T; taxa formally proposed for listing as endangered or threatened.
C1	Notice of Review, Category 1: taxa for which substantial biological information exists on file to support proposing to list as endangered or threatened.

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:
a.	Significant current or predicted downward trends in population numbers or density.
b.	Significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution.

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 C1 and C2 candidate species.

State Status:

Colorado Division of Wildlife

E	Endangered
T	Threatened
SC	Special Concern

Protection urgency ranks (P-ranks) refer to the time frame in which conservation protection must occur. In most cases, this rank refers to the need for a major change of protective status (e.g., agency special area designations or ownership). The ranks range from P1 (immediate urgency; within a one year time frame) to P5 (no known urgency). The urgency for protection rating reflects the need to take legal, political, or other administrative measures to alleviate threats that are related to land ownership or designation. The following codes are used to indicate the rating which best describes the urgency to protect the area:

P1 --Immediately threatened by severely destructive forces within 1 year of rank date.
P2 --Threat expected within 5 years.
P3 --Definable threat but not in the next 5 years.
P4 --No threat known for foreseeable future.
P5 --Land protection complete or adequate reasons exist not to protect the site; do not act on this site.

A protection action involves increasing the current level of legal protection accorded one or more tracts at a potential conservation area. It may also include activities such as educational or public relations campaigns or collaborative planning efforts with public or private entities to minimize adverse impacts to element occurrences at a site. It does not include management

actions, i.e., any action requiring stewardship intervention. Threats that may require a protection action are as follows:

1) Anthropogenic forces that threaten the existence of one or more element occurrences at a site; e.g., development that would destroy, degrade or seriously compromise the long-term viability of an element occurrence and timber, range, recreational, or hydrologic management that is incompatible with an element occurrence's existence;
2) The inability to undertake a management action in the absence of a protection action; e.g., obtaining a management agreement
3) In extraordinary circumstances, a prospective change in ownership management that will make future protection actions more difficult.

Management urgency ranks (M-ranks) indicate the time frame in which a change in management of the element or site must occur. Using best scientific estimates, this rank refers to the need for management in contrast to protection (e.g., increased fire frequency, decreased herbivory, weed control, etc.). The ranks range from M1 (immediate urgency, within one year) to M5 (no known urgency). The urgency for management rating focuses on land use management or land stewardship action required to maintain element occurrences at the potential conservation area. The following codes are used to indicate the action needed to be taken at the area:

M1 --Management action required immediately or element occurrences could be lost or irretrievably degraded within one year; or ongoing annual management action must continue or element occurrences could be lost or irretrievably degraded within one year.
M2 --New management action will be needed within 5 years to prevent the loss of element occurrences; or ongoing, recurring management action must continue within 5 years to prevent loss of element occurrences.
M3 --New management action will be needed within 5 years to maintain current quality of element occurrences; or ongoing, recurrent management action must continue within 5 years to maintain current quality of element occurrences.
M4 --Although not currently threatened, management may be needed in the future to maintain the current quality of element occurrences.
M5 --No serious management needs known or anticipated at the site.

A management action may include biological management (prescribed burning, removal of exotics, mowing, etc.) or people and site management (building barriers, rerouting trails, patrolling for collectors, hunters, or trespassers, etc). Management action does not include legal, political, or administrative measures taken to protect a potential conservation area.

MAJOR IMPACTS TO BIODIVERSITY IN ROUTT COUNTY

In the course of the study, it was found that some threats to biological diversity are pervasive in Routt County and should be addressed on a scale larger than individual conservation sites. While these threats are obviously interrelated, and certain actions may be placed in more than one category, generalized categories can be defined.

Human alteration of the landscape

Human alteration and development of the landscape has taken many forms in Routt County. As an agriculture-dominated county, past development generally took the form of sparse buildings and roads, plowed fields, fences, and water diversion and impoundment. These developments significantly altered the landscape, but retained large areas of open spaces that still supported many of the native plant and animals. Today, agricultural activities still dominate, but residential and commercial development are escalating in Routt County and present new challenges to the protection of biological diversity.

Agriculture and Livestock Production

Agriculture, has been a traditional land use in Routt County since European settlement. Many crops were planted when settlers first arrived. Most agriculture in Routt County has been, and continues to be, livestock production and irrigated or dryland farming. The ecological effects of agricultural land uses are varied and controversial. In recent years, however, conservation biologists have paid special attention to this problem and have come closer to understanding the detrimental as well as desirable effects of agricultural practices.

Native plant communities can be displaced by monotypic stands of crop species (e.g., hay grasses). This not only completely alters the grassland habitat within the field, but also has the effect of fragmenting formerly continuous natural plant communities in the area. The extent of native grasslands throughout North America has been seriously reduced since European settlement, as have many individual species that use the grasslands as habitat (Sampson and Knopf 1994). Conversion to agricultural land, overgrazing, and urban development have probably had the most significant impacts. Since cropland is so heavily altered and slow to recover, its current ecological value is relatively low.

Livestock production in Routt County is one of the most prevalent land uses and has a significant effect on the natural ecosystems. Fleischner (1994) concludes that livestock grazing has affected all major attributes of ecosystems. Native plant diversity and densities are typically decreased by heavy grazing, and indirect effects can have profound impacts on animal populations, including birds, small mammals, reptiles, and fish. The result is an alteration of native species community composition. Fundamental ecosystem functions such as plant succession can also be disrupted by preventing seedling establishment of certain species. The physical structure of environments is often changed by livestock grazing; altering habitats for the native species that occur there.

Clearing cottonwood forests for agriculture has resulted in streambank deforestation. The clearing of vegetation has led to destabilization of stream banks resulting in progressive straightening of the stream channel. The Yampa River is currently crossing a geomorphic threshold from a meandering to a braided stream channel (The Nature Conservancy 1996). Some landowners in an effort to prevent streambank erosion have been encouraged by county and Natural Resources Conservation Service to artificially stabilize the river banks with rip-rap and other materials, resulting in continued stream channelizing.

Beaver have been trapped historically for pelts and recently because they are considered a nuisance for damming and filling ditches. Where forest regeneration is not occurring to provide food for beaver, they are cutting the larger cottonwood trees. However, beaver dams play an essential role in regulating water table fluctuations, diminishing flood peaks and trapping sediments in the upper reaches of the Yampa and its tributaries.

The effects of livestock production in arid or semi-arid climates such as Colorado are most severe in riparian areas (Fleischner 1994 and references therein). The ecological importance of riparian areas for various wildlife including many species that are rare or imperiled has been broadly demonstrated (Johnson *et al*. 1977, Brode and Bury 1984; Laymon 1984; Johnson 1989).

Residential and commercial development.

Direct effects of residential and commercial development are typically total alteration of the natural habitat where construction of buildings, roads, parking lots, and other infrastructure are appearing. While affecting a relatively small percentage of the landscape, these effects may have devastating consequences such as south of Steamboat Springs. Wetlands and riparian areas are habitats that are typically limited in extent, but other habitats may also be reduced by widespread alterations. The habitats and sites that support rare or imperiled species are by their nature limited in extent and need to be protected from such wholesale alteration. Protection from total alteration may not be an adequate long-term strategy. Exceeding direct habitat destruction are a also variety of indirect effects. These indirect effects result from the increase in human density and in development of structures including buildings, roads, and fences (Knight *et al*. 1995 and references therein). Human disturbances often affect natural interactions between species and between individuals, resulting in the alteration of animal communities and changes in the numbers and types of species present (Knight and Gutzwiller 1995). The effects of these disturbances, including noise, human presence, and security lights, can be particularly acute when they occur in or near critical or sensitive habitats.

The effects of exotic plant and animal species are well known and discussed at greater length below. Since native species are rarely used in landscaping and erosion control, and because many exotic species are favored by soil disturbance, developments can act as epicenters for exotic species dispersal to adjacent areas (Harty 1986; Primack 1993; Soule 1990).

Habitat fragmentation, also presented separately in this report, is a major effect of rural development. Roads and fences can create significant barriers for large animals such as elk and

smaller ones such as rodents. Even butterflies are affected by the impact of habitat fragmentation. Furthermore, these same barriers may also act as corridors for dispersal of other species including exotic plants and animals (Schonewald-Cox and Buechner 1993 and references therein). Increased mortality from roads also affects certain species, e.g. migrating mammals and birds.

Increased rural development is likely to restrict landscape level processes such as fire, disease, predation, and movement of animals, which are integral to the maintenance of the entire spectrum of biological diversity (Knight *et al*. 1995). This impact is the least studied, but may have pervasive long-term impacts on the natural diversity and ecosystem health of Routt County.

Chemical and organic pollution of rivers and streams is one of the most visible threats to the health and survival of intact ecosystems. While it is unlikely that any riverine species has been driven extinct by pollution alone, it has been estimated that pollution has played a role in 38% of the known extinctions in North America (Miller *et al.* 1989). For rare or imperiled river-dwelling species, the effects of chemical and organic pollution may present a serious problem (Allan and Flecker 1993).

Likely sources of chemical pollution in Routt County include industrial and sewage plants. Also non-point sources such as fertilizer and pesticide runoff from suburban lawns and golf courses, spilled oil and gas, mud and silt, and lead from automobile emissions are pervasive. Excessive use of an area by livestock can also result in enrichment and eutrophication of water sources, as well as increased siltation. All of these can have negative effects on aquatic habitats (Woodling 1985).

Exotic Species

The problem of invasive exotic plants and animals is one of the greatest threats facing native habitats and the conservation of biological diversity (Soule 1990). Such invasive aliens can have a number of impacts on natural systems (Bratton 1982; DeLoach 1991; Harty 1986; Hester 1991). Exotic organisms that become established in natural areas often displace native plants and animals, thereby altering the composition of native communities (Bock and Bock 1988), and affecting any other organisms that may have relied on these native communities. In some cases, the species being displaced are rare or imperiled plants and animals (Moore and Keddy 1988).

Since most invasive exotic organisms are adapted to habitats that have been disturbed in some way, the greatest impacts tend to occur in areas that have experienced the greatest landscape modification (White *et al*.1993). This disturbance can take the form of soil removal, intensive livestock use, changes in the regime of water fluctuations, adjacent forest clearance, fire suppression, and many others.

The origins of exotic plants and animals in Routt County are varied. Many plants have been brought to this continent for use as garden and landscaping ornamentals, but have since "escaped" and established themselves in the wild. In fact, many exotic plants are recommended to gardeners on the basis of their "hardiness" or their ready adaptability to our local

environments. Recent trends in "xeriscaping" are certainly needed and well intentioned, but many of the plants used in such plans are in fact such hardy exotic plants, some of which establish wild populations. The hardiness of such species may also make their control or eradication very difficult.

The control of excess erosion is essential to preventing the loss of topsoil and the maintenance of good water quality. Unfortunately, the control of erosion is often at the expense of native species. Typically, areas such as ditches and roadcuts are reseeded with a seed mix recommended for Colorado's climate and soils. Unfortunately, these mixes rarely contain seeds of the locally native vegetation, but instead contain "hardy" exotic species chosen for their ability to thrive in this area. This has been the fate of many reseeded areas in the county, which are now dominated by various exotic grasses. Furthermore, these areas serve as a source for the subsequent invasion of adjacent areas.

Exotic animals are also found in many wetlands in Routt County. Perhaps of greatest concern is the potential for introduced fish species to alter the native fish communities of Routt County's streams, potentially impacting many rare or imperiled species. A number of non-native fish have been stocked, such as rainbow, brown and brook trout, northern pike, Snake River cutthroat trout, walleye, redside shiner and creek chub. Several of the native suckers are declining, largely due to the introduction of white and longnose suckers, Eastern Slope species, which replace and hybridize with native suckers (Haskins 1996; Woodling 1985). Their presence in some of the most ecologically important habitats in Routt County is reason for concern.

There is also concern regarding the fox squirrel (*Sciurus niger*), an introduced species from the east, which is now common in the Steamboat Springs. This species is known to be a significant nest predator on songbird eggs and nestlings (Armstrong 1996).

Some species are native but are extremely adventive. Baltic rush (*Juncus balticus*) and Nebraska sedge (*Carex nebrascensis*) are two species that dominate meadows after other native species are eliminated by heavy grazing. Cattail (*Typha latifolia)*) is a species that often dominates wetlands where soil has been exposed through construction disturbance and the wetland is then flooded. While cattails occur in the county naturally, wetlands dominated by this species are spreading at the expense of other wetland types (e.g., bulrushes). Cattail marshes should not be an acceptable replacement for other wetland types in the area.

Exotic Plant Species in Wetlands

Exotic plant species have the potential to radically alter the nature of riparian and wetland areas. Some noxious weeds that cause problems in wetlands and riparian areas are: Canada thistle (*Cirsium arvense*), white top (*Cardaria chalepensis*), dalmation toadflax (*Linaria dalmatica)*, butter and eggs (*Linaria vulgaris*), wild oats (*Avena fatua*), houndstongue (*Cynoglossum officinale),* common mallow (*Malva neglecta*), and Russian knapweed (*Acroptilon repens*). Many are so well established that there is little that can be done except in small, targeted areas. Species such as these demonstrate that preventing widespread establishment of a noxious species is usually the best way to avoid costly, deleterious consequences in the future. Three seriously

harmful wetland and riparian plant species require immediate control in Routt County. These species are:

Crack willow (*Salix fragilis)*--Crack willow is an Eurasian large tree that has been cultivated as a shade and windbreak tree. It is persistent, escaping along irrigation and natural waterways and lake margins. In Routt County, populations are concentrated around homes and urban areas. It appears to dominate the slightly drier riparian and wetland areas, outcompeting the native willows (e.g., *Salix geyeriana*). However research needs to be performed to confirm these observations.

Tamarisk, Salt cedar (*Tamarix ramossisima*)--This small tree is established locally only along theYampa River on CDOW lands, west of Hayden. It is believed that the ability of tamarisk to dominate riparian areas in northwest Colorado is limited by the temperatures in this area, but this idea has not been proven. In southwest Colorado and elsewhere this species has become a serious problem, completely displacing native or even more desirable non-native plant communities. Tamarisk can tolerate salty soils and has an the ability to concentrate salts in the soils around it. This change in soil chemistry excludes the native species. Tamarisk should be exterminated wherever found.

Leafy Spurge (*Euphorbia esula*)--Leafy spurge is native to Eurasia and was brought to the United States as a seed impurity about 1827. It has infested the bottomland west of Hayden; the greatest number of acres with leafy spurge are along the Yampa River and the Southern Pacific Railroad right-of-way (Mucklow 1996). It has been reported to cause severe irritation of the mouth and digestive tract in cattle which may result in death. Capsules explode when dry, often projecting seeds as far as 15 feet. Seeds may be viable in the soil for at least 8 years. An extensive root system containing large nutrient reserves makes leafy spurge extremely difficult to control (Whitson *et al.* 1992).

Fragmentation

Human beings gradually create patches of natural habitats within human-dominated landscapes by using natural resources, building towns and cities and their suburbs, and creating new agricultural land. Conservation biologists term this breaking up of natural habitats "fragmentation." Many scientists consider fragmentation one of the greatest threats to biological diversity (Noss and Cooperrider 1994). Wilcove *et al*. (1986) described fragmentation as: decrease of a habitat type, and breaking up of remaining habitat into smaller, more isolated pieces.

Currently, the greatest causes of increased fragmentation in Routt County are rural and suburban housing development, concurrent road and highway development, and commercial developments (especially, golf courses). In the past, agricultural field and pasture development further fragmented the Routt County landscape. Rural and suburban housing developments divide the landscape with roads, fences, new homes, and artificial landscaping. Similarly, in aquatic systems the development of even small impoundments may effectively fragment what is otherwise continuous habitat.

In riparian forest environments, fragmentation often allows more light into the forest interior, changing the plant species capable of surviving there. Animal species that prefer open habitats will often be able to invade, displacing those species adapted to the forest interior. While these changes might be less obvious in a grassland or shrubland, the same processes occur. Exotic species are able to invade and displace the natives, often reducing the total number of species able to survive. Animal species associated with native grasslands, wetlands, and shrublands may not be able to survive in an area with only exotic, weedy vegetation.

Roads that accompany residential expansion often act as impenetrable barriers to animals, especially small animals, and may encourage the spread of weedy plant species along their edges. There may also be significant mortality on roads, especially when animals formerly used the area where the road now exists. Fences may also act as barriers to animals, especially to species like pronghorn antelope that in most cases, do not jump over them.

Fragmentation is a process which occurs through many means, and its effects often occur over several months, years, or decades. The fragmentation process may not result in immediate loss of plants, animals, and natural communities from an area, but an area may experience gradual turnover of plant and animal species able to survive. In some cases the results of fragmentation are not seen for several years as species gradually leave or die off within a fragment. The fragment size and surrounding landscape greatly influence the impacts on living things within the fragment.

Small patches of natural habitat, such as those created by large scale suburban expansion or large scale conversion of land to agriculture, cannot support wide-ranging animals (e.g., elk, deer, antelope) and will be unable to support plants and animals dependent on large areas of continuous habitat. These small fragments may also experience a change in species composition, supporting more weedy plant and animal species. While the number of species may remain the same, small habitat fragments surrounded by suburban or agricultural development will likely experience species turnover and end up with more common and/or pest plants and animals. Large habitat fragments are less vulnerable to complete change in species composition. However, even a large habitat area can experience loss of native, habitat-specific plants and animals, especially along its edges. Intensive urban and suburban expansion at the edges of even a large natural area may cause changes in the species able to survive within a natural area.

Fragmentation threatens the significant natural features of Routt County. The negative effects of fragmentation can be reduced by: concentrating housing and road development, leaving some areas relatively free from such pressures, planting native species in lawns and gardens, leaving large buffers of open space around nature preserves, and discouraging the building of roads within these buffers; planning for large fragments as opposed to small ones, and educating local residents about impacts of fragmentation on the natural world.

Hydrologic Modifications

Natural areas and their constituent plant and animal species often depend on an intact hydrologic regime to persist. Many of the rare and imperiled species and significant natural communities in Routt County depend upon a natural hydrologic regime. Changes in hydrology and related changes in water quantity, quality, and periodicity threatens many natural areas across the United States, including high quality natural areas in Routt County. Human induced modification of the hydrologic regimes often change the quantity, place, and timing of natural water flow. Activities at one place can impact areas many miles downstream. Modifications to hydrology are caused by: water diversions or removal, groundwater depletion, vegetation removal and subsequent stream channelization, impoundment development, and housing and road construction.

Water diversion and water removal from natural water courses affects water flow downstream. These activities often cause formerly perennial streams to run intermittently. Many fish species that depend on having water throughout the year are not able to survive these hydrologic modifications even if they take place many miles upstream. A reduction in water flow often causes the entire drainage to dry up. Plants and animals that depend on year round moisture usually disappear from these drainages.

Wells usually do not remove water directly from a naturally wet area, but may lower the water table sufficiently to cause the elimination of ephemeral aquatic habitats. Lowering the water table eventually has the same effect as direct water removal. Perennial streams may run intermittently, and the plant and animal species associated with them will not be able to survive. Vegetation removal from riparian areas due to grazing, agriculture, or residential and commercial real estate development will probably change the natural water flow. Vegetation removal enables water to flow much more quickly across the surface causing greater erosion rates. An increase rate of runoff also causes shorter and higher peak flood flows. This in turn changes habitats dependent on water. Wetlands associated with streams often disappear as groundwater levels decrease, and subsequently species that depend on them also disappear. Urban environments are designed to move water off more quickly, causing greater erosion and decreased replenishment of ground water. When water eventually reaches streams or wetlands it often carries eroded materials that cloud the water, and potentially harm native plants and animals dependent upon the water.
Water quality alterations are related to hydrologic modifications. Chemicals that leach from agricultural fields and lawns into streams and wetlands may poison plant and animal species living in aquatic environments. Excess nutrients in natural waters may cause rapid growth of certain algae species, depleting oxygen levels and eventually killing water dependent animals, especially fish. Changes in water quality and quantity must be considered in planning for protection of significant wetlands of Routt County. Conservation of these features will often include consideration of the hydrologic modifications far away from the actual conservation site, as well as in the immediate vicinity. Potential long term impacts of certain types of development to hydrology and water quality must be addressed. New developments should not be placed next to streams and rivers. New water diversions upstream of significant natural areas should be avoided. Well drilling and use must be considered with respect to the maintenance of the water table. Run off from fields and cattle lots should be carefully monitored to ensure the runoff is not negatively impacting conservation areas.

Mineral Developments

Gravel mining is prevalent along the Yampa River and its tributaries. There are gravel pits south and west of Steamboat Springs, near Clark along the Elk River, and north of Hayden. With the high demand for gravel for roads and construction, there is definitely potential for mining to increase in the future (Fox 1996). Mining in riparian areas results in complete destruction and alteration of native wetland and riparian plant communities.

The Yampa Coalfield includes much of the Yampa area from the town of Milner west. There are two active coal mines between Milner and Mt. Harris south of the Yampa: the Seneca Strip and Foidel Creek. Seneca employs 98 miners and sends coal to the Hayden Power Station, while Foidel Creek employs 296 miners and sends coal to Public Service in Denver. This is a period of high production for several large coal companies, although the price of coal is down (The Nature Conservancy 1996).

There are a number of independently operated and active oil wells in the floodplain between Milner and Mt. Harris (Toe Creek Field). There have been problems with oil spillage into the river when old pipelines leak. Prices of oil and gas are currently low, but if the price goes up, there might be increased exploration in this area (The Nature Conservancy 1996).

General Observations from the 1996 field season

From CNHP field observations, several general conclusions can be made regarding the overall status of private lands in Routt County.

- Over 100 years of human habitation and accompanying land uses such as livestock production, agriculture, timbering, and mining have left an indelible mark. Nearly all of Routt County's landscapes are altered to some degree.

- High priority conservation areas identified in this report support rare or imperiled species or significant examples of natural communities. This suggests that some sensitive species and communities have escaped negative effects or are resistant to such impacts.

- Floodplains have been especially impacted through years of agricultural use. Land management such as pasture seeding, irrigation, and excessive grazing have left very little of the grasslands in the county unaltered. Natural grassland types persist in a few small remnants and are important as reference areas and educational tools.

- The majority of wetlands in Routt County have been drastically altered by past land uses. Most wetlands in Routt County are associated with rivers and streams in old oxbows, or creek confluences where water spreads out over a larger area, and remains throughout the year to support wetland vegetation. Most wetlands on private lands in the county have been modified by grazing, water diversions, or conversion to hay meadows. Those remaining natural wetlands tend to be small and contain a high percentage of weedy plant species. Still, a few of the wetlands remain relatively intact and provide important functions such as hydrological processes (e.g., flooding, seasonal flow variation), water quality, wildlife habitat and flood abatement. This indicates that the processes which create and support these habitats are still relatively intact, even though the vegetation composition of the riparian communities is altered throughout.

COLORADO NATURAL HERITAGE PROGRAM

The Colorado Natural Heritage Program is building on a solid base of biodiversity information. In 1992, after 14 years of operation with the Division of Parks and Outdoor Recreation, CNHP was relocated in the University of Colorado Museum. Quickly outgrowing available space, CNHP transferred its offices to Colorado State University's College of Natural Resources in September 1994. CNHP has established itself as a statewide repository for information on rare or imperiled species and significant natural communities in Colorado. The multi-disciplinary team of scientists gather information and information managers continually incorporate these data into CNHP databases. CNHP is part of an international network of conservation data centers that use the Biological and Conservation Datasystem (BCD, developed by The Nature Conservancy). Concentrating on site-specific data for each element of natural diversity, the accurate status of each element is known. Maps of the data contained in BCD illustrate sites that are important to the conservation of Colorado's natural heritage. By using the element ranks and the quality of each occurrence, priorities can be established for the protection of the most sensitive sites. This updated locational database and priority-setting system provides CNHP with effective, proactive land-planning tools.

WETLAND FUNCTIONS AND VALUES

The Wetland Evaluation Technique (WET) (Adamus *et al.* 1991) was developed by the U.S. Army Corps of Engineers for the Federal Highway Administration. WET is a broad-brush approach to wetland evaluation, and is based on information derived from predictors of wetland functions which can be gathered relatively quickly. WET can be used to compare ratings of a wetland for future uses in management and planning. This technique was developed to assist planners, regulators, and others to assess the probability that a particular wetland performs specific functions, and to provide insight as to the local, regional, and national significance of those functions. The main reason WET was utilized for the Routt County wetland survey is because it was the best method available.

Ground Water Recharge and Discharge

Ground water recharge occurs when the water level in a wetland is higher than the water table of its surroundings resulting in the movement (usually downward) of surface water (e.g., flood water retention). Ground water discharge results when the groundwater level of a wetland is lower than the water table of its surroundings, resulting in the movement (usually laterally or upward) of surface water (e.g., springs, seeps). Neither of these functions is exclusionary for a wetland can perform both functions simultaneously. Ground water movement can greatly influence some wetlands, whereas in others it may have minimal effect (Carter and Novitzki 1988). There are three processes that directly affect ground water movement:

1) ground water flow rates and storage capacity;
2) direction and location (within the wetland) of ground water movement; and
3) evapotranspiration

Both groundwater discharge and recharge are difficult to estimate without intensive data collection. Wetland characteristics that may indicate groundwater recharge are: porous underlying strata, irregularly shaped wetland, dense vegetation, and presence of a constricted outlet. Indicators of groundwater discharge are: a dam upstream and wet slopes with no obvious source.

Flood Storage

Wetlands are excellent in their ability to store or delay flood waters that occur from peak flow, gradually recharging the adjacent groundwater table. This function and the evidence of flood storage was observed frequently in Routt County, especially along the major rivers. Indictors of flood storage include: debri along streambank and in vegetation, low gradient, formation of sand and gravel bars, high density of small and large depressions, and dense vegetation.

Shoreline Anchoring

Shoreline anchoring is the stabilization of soil at the water's edge by roots and other plant parts. The vegetation dissipates the energy caused by fluctuations of water and prevents streambank erosion. The presence of woody vegetation and sedges in the understory are the best indicator of good shoreline anchoring.

Sediment Trapping

Sediment and toxicant trapping is the process by which suspended solids and chemical contaminants are retained and deposited within the wetland. Deposition of sediments can ultimately lead to removal of toxicants through burial, chemical break down, or temporary assimilation into plant tissues (Boto and Patrick 1979). Most vegetated wetlands are excellent sediment traps, at least in the short term. Riverine wetlands tend to have relatively short retention times, because of the typical seasonal flooding that occurs. Wetland characteristics indicating this function include: dense vegetation, deposits of mud or organic matter, gentle sloping gradient, and location next to beaver dams or human-made detention ponds/lakes.

Long and Short Term Nutrient Removal

Nutrient retention is the storing of nutrients within the sediment or vegetation. Inorganic nutrients are transformed into the organic form, resulting in the transformation and subsequent removal of one nutrient (e.g., nitrogen) as a gas. Nutrient removal/transformation involves trapping of nutrients before they reach deep water, are carried downstream, or are transported to underlying aquifers. Particular attention is focused on processes involving nitrogen and phosphorus, as these nutrients are usually of greatest importance to wetland systems (Kadlec and Kadlec 1979). Nutrient storage in wetlands may be for long-term (greater than 5 years) for example peatlands or short-term (30 days to 5 years) as in riverine wetlands. A densely vegetated cattail or bulrush community would be an example of a wetland that performs this function for the short-term. A wetland that would not perform this function would be sparsely vegetated and located on a steep slope.

Processes involving nitrogen removal and conversion to gas are pertinent to wetlands. Denitrification is frequently a critical process because it results in nutrient removal rather than retention. Denitrificaiton is the microbial conversion of nitrate to gaseous nitrogen, resulting in a permanent loss of nitrogen from a wetland. This process must occur under anaerobic or near anaerobic conditions. There are two sources of nitrate for denitrification: diffusion from water and nitrification. Nitrification, the microbial conversion of ammonia to nitrate, occurs only under aerobic conditions.

Nitrogen fixation is the opposite process of nitrificaiton in that gaseous nitrogen is converted or fixed, usually into organic forms of nitrogen, by bacteria and blue-green algae. Also, several wetland vascular plant genera (e.g., *Lemna* and *Juncus*) host nitrogen-fixing bacteria. In most wetlands, denitrification exceeds nitrogen fixation (Seitzinger 1988), which results in a net loss of nitrogen. However, reviews of mass balance studies show that wetlands do generally act as sinks for nitrogen and phosphorus both under nutrient-enriched and natural conditions (Nichols 1983; Nixon and Lee 1986). Some indicators of nutrient retention include: high sediment trapping, organic matter accumulation, presence of free-floating, emergent, and submerged vegetation, and permanently or semi-permanently flooded areas.

Production Export (Downstream and Within Food Chain Support)

Production export refers to the flushing of relatively large amounts of organic material (carbon) from the wetland downstream. Production export emphasizes the production of organic foods within the wetland and the utilization of the exported production by fish and aquatic invertebrates. Food chain support is the direct or indirect use of nutrients, in any form, of animals inhabiting aquatic environments. Indicators of wetlands that perform downstream food chain support are: an outlet, seasonally flooded, overhanging vegetation, and dense and diverse vegetation. Wetlands that perform within food chain support do not have stagnant water and contain productive vegetation.

Habitat

Habitat includes those physical and chemical factors which affect the metabolism, attachment, and predator avoidance of the adult or larval forms of fish, and the food and cover needs of wildlife in the place where they reside. Wetland characteristics indicating good fish habitat include: deep, open, non-acidic water, no barriers to migration, well-mixed (high oxygen content) water, and highly vegetated Wetland characteristics indicating good wildlife habitat are: good edge ratio, islands, high plant diversity, and a sinuous and irregular basin.

Recreation (Active and Passive)

Active recreation refers to recreational activities which are water-dependent. This includes the following activities: swimming, boating, canoeing, and kayaking. Passive recreation refers to the use of wetlands for aesthetic enjoyment, nature study, picnicking, open space, or research.

Natural Heritage Value

Heritage value refers to the biological diversity of the wetland. This function is based on the ranking of imperiled plant, animal, and natural communities according to CNHP.

HYDROGEOMORPHIC (HGM) APPROACH TO WETLAND FUNCTION ASSESSMENT

Few people argue about the value of wetlands for water quality maintenance, flood regulation, and wildlife habitat, but when wetlands occur on private land their regulation for public good provokes controversy. In an effort to provide a more consistent and logical basis for regulatory decisions about wetlands, a new approach to assessing wetland functions--the *hydrogeomorphic* approach is rapidly being developed. In Colorado, the hydrogeomorphic, or HGM, approach to wetland function assessment is being developed by the Colorado Geological Survey, with help from the U.S. Army Corps of Engineers, other government agencies, academic institutions, the Colorado Natural Heritage Program, and representatives from private consulting firms.

This approach is based on a classification of wetlands according to their hydrology (water source and direction of flow) and geomorphology (landscape position and shape of the wetland) called "hydrogeomorphic" classification (Brinson 1993). There are four hydrogeomorphic classes present in Routt County: riverine, slope, depression, and lacustrine (Table 3). Within a geographic region, HGM wetland classes are further subdivided into subclasses. A subclass includes all those wetlands that have essentially the same characteristics and perform the same functions. CNHP tentatively proposes eight subclasses for Routt County, based on field experience. Their descriptions and characterizations may have to change as the definition of each subclass is extended to the entire area.

Using the HGM method, wetlands functions are evaluated only with respect to other wetlands in the same subclass, because different subclasses often perform very different functions. For example, a montane kettle pond may provide habitat for rare plant communities never found on a large river, but it has little flood control value. While on the other hand, the wetlands along the Yampa River perform important flood control functions.

One of the fundamental goals of the HGM approach is to create a system whereby every wetland is evaluated according to the same standard. In the past wetland function assessments typically were on a site by site basis, with little ability to compare functions or assessments between sites. The HGM approach allows for consistency first through the use of a widely applicable classification, then through the use of *reference wetlands*. Reference wetlands are chosen to encompass the known variation of a subclass of wetlands. A subset of the reference wetlands are *reference standards*, wetlands that correspond to the highest level of functioning of the ecosystem across a suite of functions (Brinson and Rheinhardt 1996).

The hydrogeomorphic approach to wetland function assessment assumes that highest, sustainable functional capacity is achieved in wetland ecosystems and landscapes that have not been subject to long-term anthropogenic disturbance. Under these conditions, the structural components and physical, chemical, and biological processes in the wetland and surrounding landscape reach the dynamic equilibrium necessary to achieve highest, sustainable functional capacity (Smith *et al*. 1995). In general reference standards, against which all other wetlands in a subclass will be compared, meet this condition. The need to find reference standards overlaps with CNHP's

efforts to identify those wetlands with the highest biological significance, in that the least disturbed wetlands will often be those with the highest significance. Several of the wetland sites profiled in this report can probably serve as reference wetlands.

Table 3. Hydrogeomorphic wetland classes in Routt County.

Class	Geomorphic setting	Water Source	Water Movement	SUBCLASS	EXAMPLES
Riverine	In riparian areas along rivers and streams	Overbank flow from channel	One-directional and horizontal (downstream)	1. High-order, meandering river, broad flood plain; forested wetlands 2. Low-order stream, willow carr wetlands	Cottonwood forests wetland along the Yampa River; Willow shrublands along Mill Creek
Slope	At the base of slopes, e.g., along the base of the foothills; also, places where a porous bedrock overlying a non-porous bedrock intercepts the ground surface.	Groundwater	One-directional, horizontal (to the surface from groundwater)	3. Low-elevation, often alkaline, springs on sedimentary rock 4. Montane and subalpine fens	Phillips Creek wetlands at Yampa River Montane and subalpine sedge meadows
Depressional	In depressions cause by glacial action (in the mountains) and wind erosion or buffalo wallowing (on the plains); depressions caused by human activity (e.g., gravel pits in floodplains).	Shallow ground water	Generally two-directional, vertical: flowing into and out of the wetland in the bottom and sides of the depression	5. Low-elevation wet meadows, oxbow ponds 6. Montane and subalpine kettle ponds	Windemere Lake
Lacustrine	Along the edges of reservoirs	Flow between deep water and shallow water areas	Two-directional, horizontal: flowing into/out of shallow water wetlands as reservoirs rise/fall	7. Seasonally saturated forested wetlands 8. Permanently flooded marshes	Willow carrs along reservoirs Sedge meadows on edges of reservoirs

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Significant Known and Potential Wetland Elements in Routt County

The Colorado Natural Heritage Program has records of the following wetland and riparian elements for the wetlands in Routt County. This list *does not* necessarily represent *all* rare or imperiled plants, animals, and plant communities, but it is a complete list of known occurrences.

Wetland and Riparian Plant Associations in Routt County

Existing studies on plant communities (Kettler and McMullen 1996; Kittel *et al.* 1995; Kittel *et al.* 1994; Kittel and Lederer 1993) as well as information in BCD (CNHP 1996) were used to develop a preliminary list of wetland plant communities in Routt County. This list was further developed with information gathered during the field efforts from this study. Since this study was intended to identify the wetland sites of highest conservation value, and did not encompass wetland classification, CNHP does not presume the following list of plant communities to be a complete list of Routt County plant communities. Nonetheless, CNHP believes the list to be a good representation of the wetland and riparian plant communities present in the county.

There are 47 plant communities that have been documented in Routt County from previous studies (Table 1). The plant communities are presented, in the context of both The Nature Conservancy hierarchical classification (Bourgeron and Engelking 1994) and the U.S. Fish and Wildlife Service's wetland classification (Cowardin *et al.* 1979). The Fish and Wildlife Service classification units (palustrine system and forested, scrub-shrub, emergent, and aquatic bed classes) will be useful for anyone familiar with the National Wetlands Inventory maps that use this classification. The assessment of Routt County wetlands documented 24 of those communities on private lands. Detailed description for each of these communities is presented on page 10.

Table 1. Riparian and Wetland Plant Communities in Routt County.

Sceintific Name	Common Name	Global Rank	State Rank
Evergreen Forested Riparian Community			
Abies lasiocarpa/Senecio triangularis	Montane riparian forest	G2G3	S2S3
Abies lasiocarpa/Alnus incana-Salix drummondiana	Montane riparian forest	G3	S3?
Picea pungens/Alnus incana	Montane riparian forest	G3	S3
Picea pungens-Populus angustifolia/Alnus incana-Lonicera involucrata	Mixed deciduous-evergreen montane riparian forest	G3	S3
Picea engelmannii/Heracleum lanatum	Montane riparian forest	G3?	S2
Broad-leaved Deciduous Riparian Plant Communities			
Acer negundo-Populus angustifolia/Cornus sericea	Narrowleaf cottonwood riparian forest	G2	S2
Populus angustifolia/Salix exigua	Narrowleaf cottonwood riparian forest	G4G5	S4S5

Table 1. Riparian and Wetland Plant Communities in Routt County (continued).

Populus angustifolia /Amelanchier alnifolia/Smilacina stellatum phase *Crataegus rivularis-Cornus sericea*	Narrowleaf cottonwood riparian forest	G3	S3
Populus angustifolia/Picea pungens/Alnus incana	Narrowleaf cottonwood riparian forest	G3	S3
Populus angustifolia/Cornus sericea	Cottonwood riparian forest	G3	S2?
Populus angustifolia/Alnus incana		G3	S3
Populus angustifolia-(Picea pungens)/Alnus incana-Cornus sericea	Montane riparian forest	G3	S3
Palustrine Scrub-Shrub Communities			
Broad-leaved Deciduous			
*Betula glandulosa/*mesic forb-mesic graminoids		GU	SU
Alnus incana/Salix geyeriana	Thinleaf alder/Geyer willow	G?	S?
Alnus incana/ mesic forb	Thinleaf alder/mesic forb	G3	S?
Alnus incana-Cornus sericea	Thinleaf alder-red-osier dogwood	G?	S?
Salix bebbiana	Montane willow carr	G3	SU
Salix boothii/mesic graminoid	Riparian willow carr	G3	S3?
*Salix boothii/*mesic forb	Riparian willow carr	G?	S?
Salix boothii/Salix drummondiana	Montane willow carr	GU	SU
Salix boothii/Salix geyeriana	Riparian willow carr	G2	S2
Salix boothii/Carex utriculata	Riparian willow carr	G3?	S1
Salix boothii/Calamagrositis canadensis	Riparian willow carr	G4	S2S3
Salix drummondiana /Calamagrostis canadensis	Lower montane willow carr	G2	S2
Salix drummondiana/Carex utriculata	Montane willow carr	GU	SU
Salix exigua/barren soil	Coyote willow/barren soil	G5	S5
Salix exigua/mesic graminoid	Coyote willow/mesic graminoid	GU	SU
Salix geyeriana/Carex utriculata	Geyer's willow/beaked sedge	G5	S2
*Salix monticola-Salix geyeriana/*mesic forb	Montane willow carr	GU	SU
Salix planifolia/Carex aquatilis	Montane willow carr	G4G5	S4S5
Salix planifolia/mesic graminoid		GU	SU
Salix wolfii/mesic forb	Subalpine riparian willow carr	G?	S3
Salix boothii-Salix geyeriana-Salix lasiandra caudata	Montane willow carr	GU	SU
Salix boothii-Salix drummondiana	Montane willow carr	GU	SU
Salix exigua-Salix lasiandra caudata-Salix lutea	Foothills riparian shrubland	G3G4	S2
Palustrine Scrub-Shrub Deciduous Communities			
Artemisia tridentata/Elymus cinerus phase *Symphoricarpos oreophilus*	Sagebrush bottomland shrublands	GU	S?

Table 1. Riparian and Wetland Plant Communities in Routt County (continued).

Palustrine Emergent Communities			
Carex aquatilis wetland	Montane wet meadow	G5	S3S4
Carex aquatilis-*Carex utriculata* wetland	Montane wet meadow	G?	S3S4
Carex utriculata wetland	Montane wet meadow	G5	S3
Carex nebrascensis	Great plains wet meadow	G4	S?
Carex saxatilis		G3	SU
Calamagrostis stricta	Slimstem reedgrass	GU	SU
Scirpus tabernaemontani	Bulrush wetland	G?	S2
Eleocharis quinqueflora alpine wetland	Alpine wetland	G4	S?

Rare or Imperiled Wetland Plants in Routt County Wetlands

Wetlands in Routt County provide habitat for five known rare or imperiled plants (Table 2). Detailed descriptions of each plant can be found in the characterization abstracts at the end of this section. The characterization abstracts include a discussion on taxonomy, habitat, distribution, range, ecology, and threats. There are a total of 20 occurrences of rare or imperiled plants in Routt County's wetlands (CNHP 1996). The majority of the occurrences are on federal lands, only 2 are located on private land. *Salix serissima* (autumn willow) is are listed with the U.S. Forest Service as sensitive because of a significant current or predicted downward trend in population, density, or habitat capability.

Table 2. Rare or imperiled wetland plants associated with Routt County.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status
Pyrola picta	Pictureleaf wintergreen	G4G5	S2	
Salix serissima	Autumn willow	G4	S1	USFS Sensitive
Trillium ovatum	Western wake-robin	G4?	S2	
Listera convallarioides	Broad-leaved twayblade	G5	S2	
Platanthera sparsiflora var. *ensifolia*	Canyon bog orchid	G4G5T3	S2	

Rare or Imperiled Amphibians Associated with Routt County Wetlands

Three amphibians of concern are found in Routt County (Table 3). There are a total of 19 occurrences for amphibians in the county (16-*Bufo boreas boreas*; 2-*Rana pipiens*; 1-*Rana sylvatica*). Most known occurrences of these species are on federal land (CNHP 1996). The boreal toad (*Bufo boreas boreas*) is listed endangered in Colorado by the Division of Wildlife and is a candidate for listing under the federal Endangered Species Act. The wood frog (*Rana sylvatica*) is listed threatened and the northern leopard frog (*Rana pipiens*) is listed a species of special concern by the Colorado Division of Wildlife.

These listings by the Division of Wildlife indicate that capturing or handling this species requires a special permit, but they have no implications for land management.

A new occurrence of the northern leopard frog was documented on private lands during the field survery. Statewide, some amphibian populations have been in decline, however, the cause of these population declines is not yet known. The best current method of protecting these species is to protect breeding habitat, especially high quality wetlands within their range, and adjacent non-breeding habitat. Detailed descriptions of each amphibian can be found in the characterization abstracts at the end of this section.

Table 3. Rare or imperiled amphibians associated with Routt County wetlands.

Scientific Name	Common Name	Global Rank	State Rank	State Status	Federal Status
Bufo boreas boreas	Boreal toad (southern Rocky Mountain pop.)	G5T2Q	S1	Endangered	USFS Sensitive
Rana sylvatica	Wood frog	G5	S3	Threatened	USFS Sensitive
Rana pipiens	Northern leopard frog	G5	S3	Special Concern	USFS Sensitive

Rare or Imperiled Fish Associated with Routt County Wetlands

Two rare or imperiled fish are known from Routt County (Table 4). There are a total of 12 occurrences for these fish in Routt County (CNHP 1996). The Colorado River cutthroat trout (*Oncorhynchus clarki pleuriticus)* is globally rare. It is listed threatened under the federal Endangered Species Act and listed as threatened in Colorado by the Division of Wildlife. The largest threats stem from the introduction of non-native trout and alteration of habitat. In Routt County, it is known only from public lands. There is only one occurrence documented in Routt County for the roundtail chub (*Gila robusta)*. This fish is a species of special concern by the Division of Wildlife.

The wetlands in the floodplain of the Yampa and Elk Rivers play an important role in sustaining the populations of these fish. Wetlands provide organic input as food, shelter from heat and predators, temperature regulation, and breeding habitat for some species. The presence of these fish is one reason that wetlands along the length of both of these major rivers and their larger tributaries should not be destroyed. Detailed descriptions of each fish can be found in the characterization abstracts at the end of this section.

Table 4. Rare or imperiled fish associated with Routt County wetlands.

Scientific Name	Common Name	Global Rank	State Rank	State Status	Federal Status
Oncorhynchus clarki pleuriticus	Colorado River cutthroat trout	G5T2T3	S2	Threatened	Threatened
Gila robusta	Roundtail chub	G3	S2	Special Concern	

Rare or imperiled Birds Associated with Routt County Wetlands

Nine rare or imperiled birds are known or strongly suspected to breed in Routt County wetlands (Table 5). The majority of the birds utilize wetlands for foraging and nesting, however the following species nest and forage in the drier lands adjacent to wetlands: American peregrine falcon, Columbian shrap-tailed grouse, and boreal owl. Detailed descriptions of each bird can be found in the characterization abstracts at the end of this section. There is only one occurrence in Routt County documented for the American peregrine falcon (CHNP 1996). The American peregrine falcon (*Falco peregrinus anatum)* is listed endangered under the federal Endangered Species Act and threatened in Colorado by the Division of Wildlife. The bald eagle (*Haliaeetus leucocephalus)* (4 occurrences in Routt County) is listed threatened under the Endangered Species Act and as threatened in Colorado. In addition, the riparian reaches of the Yampa River are important to wintering populations of bald eagles. The remaining species are listed with the U.S. Forest Service as sensitive because of a significant current or predicted downward trend in population, density, or habitat capability.

Note that for most migratory birds, CNHP documents only breeding locations; migratory birds are otherwise too unpredictable in their locations. However, the Natural Heritage Program does track predictable locations of migratory birds such as winter roosts of bald eagles and staging areas for greater sandhill cranes. Despite the focus on predictable locations, it should be clearly recognized that many bird species depend heavily on wetlands if only for nourishment and rest during their long migrations.

Table 5. Rare or imperiled birds associated with Routt County wetlands.

Scientific Name	Common Name	Global Rank	State Rank	State Status	Federal Status
Ardea herodias	Great blue heron	G5	S3B,SZN		
Pandion haliatus	Osprey	G5	S1B,SZN		
Haliaeetus leucocephalus	Bald eagle	G4	S1B,S3N	Threatened	Threatened
Falco peregrinus anatum	American perigrine falcon	G4T4	S2B,SZN	Threatened	Endangered
Tympanuchus phasianellus columbianus	Columbian sharp-tailed grouse	G5T3	S2		USFS Sensitive
Grus canadensis tabida	Greater sandhill crane	G5T4	S2B,S4N	Threatened	USFS Sensitive
Aegolius funereus	Boreal owl	G5	S2		USFS Sensitive
Progne subis	Purple martin	G5	S3B		USFS Sensitive
Accipiter gentilis	Northern goshawk	G5	S3B,S4N		USFS Sensitive

Rare or imperiled Wetland and Aquatic Invertebrates Associated with Routt County Wetlands

Four rare or imperiled invertebrates associated with wetlands are known to occur in Routt County (Table 6). This group includes butterflies and moths (order Lepidoptera) and freshwater snails (order Mesogastropoda). There are a total of 5 occurrences, all were documented prior to 1969 (CNHP 1996). Detailed descriptions of each invertebrate is located at the end of this section.

As with the native fish, the distribution and precise requirements for their survival are poorly known. The best way to insure their continued survival in the county is to maintain natural wetland ecosystems wherever possible, strive to maintian high levels of water quality in county surface waters, and limit the spread of invasive wetland plant species.

Table 6. Rare or imperiled wetland and aquatic invertebrates associated with Routt County wetlands.

Scientific Name	Common Name	Global Rank	State Rank
Lycaena editha	Edith's copper	G5	S2S3
Speyeria hydaspe	Hydaspe fritillary	G5	S2
Speyeria egleis	Egleis fritillary	G5	S2
Valvata sincera	Mossy valvata	G?	S3

WETLAND PLANT ASSOCIATIONS

Plant communities, as detailed indicators of the various wetland types present in Routt County, were the main focus of this survey. A plant community is a collection of plants that often grow together in response to complex environmental factors. Plant communities are useful indicators of wetland attributes which may be difficult to measure or are poorly understood. Plant community level conservation promotes conservation efforts beyond the individual species, to include processes as well as little known or poorly understood biotic elements (e.g., invertebrate species).

The plant association descriptions provide a thorough picture of the wetland areas in Routt County. The field survey results indicate that virtually every wetland area on private lands within Routt County has been influenced to some notable degree by present and historic post-settlement activities. The majority of the sites visited have been profoundly influenced by introduced European hay grasses, weed infestations, domestic livestock use, hydrological alterations, etc. Only one shallow aquatic community (*Scirpus tabernaemontani*) is presented as all of the potential shallow water types visited were heavily degraded from anthropogenic influences.

For each plant association, a description is provided of its distribution in the state and region, vegetation composition, soils, wetland description, and environmental conditions where it is found (i.e., geomorphologic setting, hydrology, etc.). Plant association descriptions also include notes on successional status and management as well as a list of other wetland plant species with which it may be found.

There are 24 plant associations presented based on dominant species, species composition, and community structure. The plant associations are placed in the context of The Nature Conservancy's Preliminary Vegetation Classification of the Western United States (Bourgeron and Engelking 1994), which is based on the UNESCO Physiognomic-Ecological Classification of Plant Formations of the Earth (1973) as revised by Driscoll *et al.* (1984). The majority of these descriptions are based on Kittel and Lederer (1993).

MIXED-DECIDUOUS EVERGREEN FORESTS

Narrowleaf cottonwood-Colorado blue spruce/thinleaf alder-red osier dogwood (*Populus angustifolia-Picea pungens/Alnus incana-Cornus sericea*) plant association

Colorado Natural Heritage Ranks: G3/S3

Synonyms: *Populus angustifolia-(Picea pungens)/Alnus incana-Cornus sericea* (Baker 1989).

Distribution: Baker (1989) reports that this type occurs from eastern Idaho to western Wyoming and in Utah, citing Youngblood *et al*. (1985) and Padgett and Youngblood (1986). While it is likely that this type does occur in these areas, Padgett and Youngblood do not describe a mixed evergreen-decidous forest type, nor does Baker specify which type(s) match his association. In Colorado, this plant association is known from the San Juan Mountains on the San Miguel River, Eagle and Pitkin Counties on the Eagle River and its tributaries, and north to Grand County.

In Routt County this type occurs in Routt County between 2100 and 2260 m (6880-7410 ft) elevation, in narrow valleys on immediate stream banks and rocky, low terraces.

Soil: Shallow sandy to silty loams over approximately 0.5 meter thick sands, often stratified with finer textures from sedimentary events. Signs of mottling were evident.

Wetland description: Riverine wetland with a seasonal hydroperiod and occasional flooding.

Vegetation: *Populus angustifolia* dominated the canopy, and *Picea pungens* ranged from present (<5%) to codominant (20%). A dense shrub understory of *Cornus sericea* characterized undisturbed occurrences. The undergrowth was usually dominated by mesic forbs such as *Rudbeckia laciniata, Smilacina stellata*, and *Actaea rubra*.

Adjacent riparian vegetation: Alder/mesic forb, Pacific willow/mesic graminoid shrublands.

Adjacent upland vegetation: Gambel's oak, serviceberry shrublands, aspen woodlands, subalpine fir-Engelmann spruce, Douglas-fir forests.

Succession/management: The narrowleaf cottonwood-Colorado blue spruce/red-osier dogwood plant association is a continuation of the narrowleaf cottonwood/red-osier dogwood type as elevation increases, and/or where canyons and valleys become narrower, and/ or where cool air drainage, topographic shading, and cooler mean summer temperatures create more favorable conditions for Colorado blue spruce. These two important plant associations may grade into each other, and a few areas may be considered transitional.

Colorado blue spruce-narrowleaf cottonwood/thinleaf alder-black twinberry (*Picea pungens-Populus angustifolia/Alnus incana-Lonicera involucrata*) plant association

Colorado Natural Heritage Ranks: G3/S3

Synonyms: *Picea pungens-Populus angustifolia/Alnus incana-Lonicera involucrata* (Baker 1989).

Distribution: Not reported outside of Colorado. Known only from west-central and southwestern Colorado (Baker 1989).

In Routt County, this type occurred on narrow terraces and benches adjacent to the channel in narrow to moderately wide valleys, usually 1-2 meters above the high water line. In Routt County, this plant association occurs at elevation between 2075 and 2115 m (6915-7050 ft) south of Steamboat Springs.

Soils: Highly stratified solids due to depositional events. Shallow loamy sand and silt over 0.5 meters of loam or sandy clay with alternating dark and light bands. Gravel and cobble alluvial parent material was within one meter of the surface. Depth to water table averaged approximately 45 cm, varying from 0 to greater than 77 cm.

Wetland description: Riverine wetland with a seasonal hydroperiod and occasional flooding.

Vegetation: This mixed deciduous-evergreen plant association is distinguished from the narrowleaf cottonwood-Colorado blue spruce/thinleaf alder-red-osier dogwood plant association by lack of *Cornus sericea* and higher abundance of *Picea pungens*. *Populus angustifolia* and *Picea pungens* co-dominate the overstory. *Alnus incana* was abundant, usually lining the river banks, while *Lonicera involucrata* was present as constant understory shrub component within the floodplain forest. Other tree species present in minor amounts included: *Populus tremuloides* and *Pseudotsuga menziesii*. Other shrub species present were *Salix ligulifolia, Salix drummondiana, Salix monticola, Rosa woodsii* and *Symphoricarpos rotundifolius*. The herbaceous layer was dominated by forbs including *Smilacina stellata, Equisetum arvense, Equisetum hyemale, Heracleum lanatum, Geranium richardsonii,* and *Rudbeckia laciniata*. Graminoid cover was sparse, and included *Poa pratensis* and *Bromus ciliatus*.

Adjacent riparian vegetation: Coyote willow, Rocky Mountain willow-Geyer's willow shrublands.

Adjacent upland vegetation: Engelmann spruce-subalpine fir and Douglas-fir forests; aspen, and juniper woodlands; Gambel's oak scrub on south-facing slopes.

Succession/management: More information is needed about the successional status of these mixed deciduous-evergreen riparian forests. They may be a late-seral plant association subject to frequent flooding and deposition.

DECIDUOUS FORESTS

Box elder-Narrowleaf cottonwood/red osier dogwood (*Acer negundo-Populus angustifolia/Cornus sericea*) plant association

Colorado Natural Heritage Ranks: G2/S2

Synonyms: *Acer negundo-Populus angustifolia/Cornus sericea* (Baker 1984; Peterson *et al*. 1984). May be similar to Padgett *et al*. (1989) *Populus angustifolia/Cornus sericea* type, as he states that "*Acer negundo* may rarely co-dominate".

Distribution: Not reported to occur outside of Colorado. In Colorado, it is known to occur only along the Yampa, Williams Fork, Colorado, and White Rivers in Moffat, Rio Blanco, and Routt counties (CNHP 1996).

In Routt County it was found only along the mainstream of the Yampa River between 1910 and 1960 m (6260 and 6430 ft) elevation, on terraces approximately 1.3 m above the high water level, and from 1-30 meters distant from the channel. This plant association is expected to occur as far west as the town of Craig.

Wetland description: Riverine wetland with a seasonal hydroperiod with occasional flooding.

Soil: deep unstratified sandy loam and silty clay loams well over 2 meters. Mottling was evident at about 50-60 (90) cm.

Vegetation: *Populus angustifolia* and *Acer negundo* dominated this deciduous riparian woodland. *Cornus sericea* often created an impenetrable shrub layer. *Salix ligulifolia*, *Crataegus rivularis* and *Ribes montigenum* were also sometimes present. Herbaceous cover was generally dominated by forbs and ranged from sparse to moderate, including *Smilacina stellata, Rudbeckia laciniata, Solidago serotinoides*, and *Mentha arvensis*. Grasses usually were introduced hay species, including *Phleum pratense, Poa pratensis, Agrostis gigantea,* and *Dactylis glomerata*.

Adjacent riparian vegetation: Coyote willow shrublands.

Adjacent upland vegetation: Gambel's oak, big sagebrush shrublands.

Succession/management: This plant association appears to be late-seral, mature cottonwood forests. Eroding banks on the outside bend of meanders had mature tree roots exposed, and occasionally large logs were observed lying in the river. Dense stands of *Cornus sericea* occurred within the closed forest canopy between 1 and 2 meters above the high water mark, indicating undisturbed, late-seral forests. Channel migration and meander movement cut into these forests on the outside of meander bends, leaving the mature stands immediately adjacent to, yet several meters above, the channel. Young, early-seral stands of regenerating cottonwoods were found on inside bends, on point bars and low terraces with surfaces much lower than those of the more mature stands.

Narrowleaf cottonwood/Colorado blue spruce/thinleaf alder (*Populus angustifolia/Picea pungens/Alnus incana***) plant association**

Colorado Natural Heritage Ranks: G3/S3

Synonyms: *Populus angustifolai* (*Picea pungens*) *Alnus incana-Cornus sericea* (Baker 1989).

Distribution: This plant association is found from eastern Idaho and western Wyoming to southern Utah (Baker 1989). Within Colorado it is reported from the White River Plateau, the Gunnison and Uncompahgre National Forests, and the San Miguel River Basin (Hess and Wasser 1982; DeVelice *et al.* 1985; and Komarkova 1986, as cited by Baker 1989, Kittel and Lederer 1993). In the White River Basin several high quality occurrences occur only on the western slope of the Flat Tops, along the South Fork of the White River (Kittel *et al.* 1994).

In Routt County, this community occurs in deep canyons and valleys with moderately wide floodplains to allow which *Populus angustifolia* regeneration between 2077 to 2268 m (6924 to 7560 ft).

Soil: The associated soils are shallow sandy to silty loams over cobbles and boulders.

Wetland description: Riverine wetland with a seasonal hydroperiod and occasional flooding.

Vegetation: *Populus angustifolia* dominates the tree layer with *Picea pungens* ranging from 1% to 20% cover. Other trees present may be *Pseudotsuga menziesii* and *Juniperus scopulorum*. The dense shrub layer consists of *Cornus sericea*, *Acer glabrum,* and *Amelanchier alnifolia*. *Actaea rubra, Osmorhiza depauperata,* and *Maianthemum stellatum* are common and abundant forbs (Kittel *et al.* 1994).

Adjacent riparian vegetation: Coyote willow on the point bars.

Adjacent upland vegetation: Gambel's oak and aspen woodlands.

Succession/management: This mixed deciduous-evergreen community type represents a mid-seral stage that is maintained by flooding, channel migration, sediment deposition, and scouring. *Picea* ssp. may become the climax tree layer on higher terraces that are no longer flooded (Kittel *et al.* 1994).

Narrowleaf cottonwood/thinleaf alder (*Populus angustifolia/Alnus incana*) plant association

Colorado Natural Heritage Program Ranks: G3/S3

Synonyms: May be similar to *Populus angustifolia/Alnus incana-Cornus sericea* (Johnston 1987. May also be similar to *Alnus incana/*mesic forb (Padgett *et al*. 1989).

Distribution: Similar types (listed above) may occur in central and eastern Utah (Padgett *et al*. 1989), western Wyoming, and southcentral Colorado in Gunnison National Forest (Johnston 1987).

In Routt County it occurred in the northwestern portion of the watershed in Routt County between 2090 and 2220 m (6850-7280 ft) elevation. This type occurred on immediate stream banks and in swales on the active floodplain.

Soils: The associated soils are shallow sandy to silty loams over cobbles and boulders. Moderate levels of mottling occurring at 10 cm.

Wetland description: Riverine wetland with a seasonal hydroperiod and occasional flooding.

Vegetation: The narrowleaf cottonwood/thinleaf alder type was distinguished by the lush band of *Alnus incana* overhanging the banks, with an open canopy of *Populus angustifolia* overhead. Other shrubs present included *Salix lanata* ssp. *caudata, Salix ligulifolia*, and *Salix drummondiana*.

Adjacent riparian vegetation: Narrowleaf cottonwood/red-osier dogwood forests, beaked sedge meadows.

Adjacent upland vegetation: Gambel's oak scrub, Douglas-fir forests, aspen woodlands.

Succession/management: More information is needed about the successional status of this type. Alder appears to withstand periodic flooding and requires more aerated ground water (Padgett *et al*. 1989). Also, the root structure can hold coarse-textured subsurface soils in place, stabilizing the stream bank, and can act as a coarse filter for upland soil and water movement (Padgett *et al.* 1989).

Narrowleaf cottonwood/red-osier dogwood (*Populus angustifolia/Cornus sericea*) plant association

Colorado Natural Heritage Program: G3/S2?

Synonyms: Very similar to Padgett *et al*. (1989) *Populus angustifolia/Cornus sericea* type; Also appears similar to *Populus angustifolia/Amelanchier alnifolia/Smilacina stellata (Crataegus rivularis-Cornus sericea* phase) described by Hess and Wasser (1982).

Distribution: Similar types (listed above) occur in central and eastern Utah and central Idaho (Padgett *et al*. 1989). In Colorado, similar types have been described from Arapaho-Roosevelt and White River National Forests in north-central and central Colorado (Hess 1981; Hess and Wasser 1982).

In Routt County this type was found mostly in Routt County between 2060 and 2300 m (6750-7540 ft) elevation. Usually located on immediate stream banks and active floodplains; occasionally found on terraces of narrow channels in narrow valleys (<0.8 km wide).

Soil: Stratified layers of loam, silty clay, sand, and cobbles with alternating light and dark color, indicating that depositional events have created this substrate, rather than in-place soil development. Overall depth up to 1 meter.

Wetland description: Riverine wetland with a seasonal hydroperiod and occasional flooding.

Vegetation: *Populus angustifolia* formed a tall canopy along with a dense population of *Cornus sericea* and several tall willow species, such as *Salix lasiandra* var. *caudata* and *Salix boothii* in the understory. High cover of *Cornus sericea* distinguished this plant association from the narrowleaf cottonwood/thinleaf alder plant association *Rudbeckia laciniata, Smilacina stellata*, and *Solidago gigantea* were common abundant forbs.

Adjacent riparian vegetation: Booth's willow-Geyer's willow shrublands, thinleaf alder-Geyer's willow shrublands.

Adjacent upland vegetation: Aspen woodlands, Gambel's oak scrub, big sagebrush shrublands.

Succession/management: More information is needed about the succession of this plant association. *Cornus sericea* appears to be able to withstand periodic flooding and high water tables, and provides stream bank stability because of its strongly rhizomatous rooting structure (Padget *et al*. 1989). Padgett *et al.* (1989) proposes that his similar type may be considered early to mid-seral due to its proximity to the channel. If the channel remains in place, it may be replaced by a Conifer/*Cornus sericea* type, and if the channel moves it may be replaced by another *Populus angustifolia* dominated type, with a less mesophic undergrowth.

Narrowleaf cottonwood/coyote willow (*Populus angustifolia/Salix exigua*) plant association

Colorado Natural Heritage Program Rank: G4G5/S4S5

Synonyms: *Populus angustifolia/Salix scouleriana* (Baker 1984); *Populus angustifolia/Salix exigua-Betula fontinalis* (Johnston 1987; Komarkova 1986); *Populus angustifolia/Salix exigua* (Hess 1981).

Distribution: This common type occurs from eastern Idaho, northern Wyoming, central Utah (Johnston 1987). In Colorado, it occurs from Arapaho-Roosevelt, Medicine Bow, and Gunnison National Forests (Johnston 1987). It has also been reported from Moffat, Conejos, Archuleta, and Hinsdale Counties of northwestern and southwestern Colorado (CNHP 1996).

In Routt County this plant association is a very common in riparian areas. between approximately 2000-2300 m (6560-7540 ft) elevation. It represents a very early successional stage and is very susceptible to flooding and scouring, as it usually lies well below the annual average high water mark.

Soils: Very sandy soils with small to medium cobbles. This plant association usually located on point bars along the stream.

Wetland description: Riverine wetland with a seasonal hydroperiod and occasional flooding.

Vegetation: Dense 1-2 meter high thickets of *Populus angustifolia* seedlings and saplings intermixed with equally tall *Salix exigua* characterized this plant association. Other willows commonly present included *Salix lanata* ssp. *caudata* and *Salix ligulifolia*. Forb cover was as much as 25%, although no one species comprised more than 1%.

Adjacent riparian vegetation: Narrowleaf cottonwood/red-osier dogwood forests, narrowleaf cottonwood/serviceberry forests, coyote willow shrublands.

Adjacent upland vegetation: Big sagebrush shrublands, Gambel's oak scrub.

Succession/management: The narrowleaf cottonwood/coyote willow plant association represents an early seral stage of other, more diverse narrowleaf cottonwood plant associations. This plant association develops on freshly deposited alluvium and is the first stage in cottonwood riparian forest development. Continued flooding and sedimentation coupled with lateral channel migration allows the physical setting of sites to become more stable and less likely to be scoured and eroded away by more severe floods. Hess (1981) describes this plant association as a climax type; however, we found that *Salix exigua* rarely occurs as a dominant shrub understory in stands of narrowleaf cottonwood older than the sapling or pole stage.

TALL-WILLOW SHRUBLANDS

Booth's willow/mesic forb (*Salix boothii*/mesic forb**) plant association**

Colorado Natural Heritage Program: G?/S?

Synonyms: *Salix boothii-Salix geyeriana-Salix lasiandra* var. *caudata* (CNHP 1996). Very similar to Padgett *et al*. (1989) *Salix boothii*/mesic forb and Youngblood *et al*. (1985) *Salix boothii/Smilacina stellata* types.

Distribution: Similar types (listed above) occur in eastern Idaho and Western Wyoming. This type has been previously reported in Colorado from Routt County, in the upper Yampa valley (CNHP 1996).

In Routt County, the Booth's willow/mesic forb type is a major type occurring throughout the eastern quarter of the basin between 2260 and 2720 m (7410-8920 ft) elevation in the Park Range, the Elkhead Mountains, and in the Flat Tops. This type occurred on well drained flat and gently sloping floodplains in narrow to very broad valleys, usually within half a meter of the water table, but occasionally on low terraces.

Soil: Loams and fine sandy loams over silty clay loams over cobbles about 3/4 of a meter deep. Mottling evident at about 50 cm with some gleying.

Wetland description: Riverine or depressional wetlands, associated with beaver ponds with seasonal to permanent hydroperiods and occasional flooding.

Vegetation: *Salix boothii* formed large continuous shrublands ranging from 40% to over 80% canopy cover. Other willows included *Salix geyeriana* and *Salix lasiandra* var. *caudata. Salix wolfii* was sometimes present as a low shrub layer. The undergrowth was characterized by a sparse to lush layer of forbs, including *Achillea millefolium*, *Fragaria virginiana*, *Galium boreale*, *Geranium richardsonii*, *Smilacina stellata*, and *Geum macrophyllum*. The understory name "mesic forbs" was chosen to emphasize that no one species dominated that layer.

Adjacent riparian vegetation: Thinleaf alder shrublands, sedge meadows.

Adjacent upland vegetation: Mixed conifer-aspen forests, aspen forests, big sagebrush scrub.

Succession/management: *Salix boothii* appears to grow on mesic sites that are neither saturated nor dry throughout the growing season (Padgett *et al.* 1989). With excessive grazing of this type may be replaced with a *Salix boothii/Poa pratensis* type, which often has remnant forbs indicative of the *Salix boothi*i/mesic forb type growing at the shrub bases (Padgett *et al*. 1989)

Booth's willow/Geyer's willow (*Salix boothii/Salix geyeriana*) plant association

Colorado Natural Heritage Program Ranks: G2/S2

Synonyms: *Salix boothii-Salix geyeriana-Salix lemmonii/Carex aquatilis* (Kovalchik 1987).

Distribution: This plant association is found on active floodplains and overflow channels. It occurs on low gradient floodplains at low to moderate elevations ranging from 2010 to 2100 m (6700 to 7000 ft). It was found on the adjacent drier areas of the floodplain. In Routt County, it was found on the floodplain between irrigated hay fields and the streambank. This type is also found in Oregon on the Ochoco Mountains and Basin and Range Physiographic Areas (Kovalchik 1987).

Soil: Moderately sandy soils with some clay; 15% mottling occurred at 20 cm with extensive oxidized root channeling and manganese deposits.

Wetland description: Riverine wetland with a seasonal hydroperiod and occasional flooding.

Vegetation: *Salix boothi*i and *Salix geyeriana* are co-dominant in the overstory of this plant association. *Alnus incana* and *Ribes aureum* were commonly present. The understory was characterized by a dense layer of introduced grasses, including *Poa pratensis, Phleum pratense,* and *Agrostis gigantea*.

Adjacent riparian vegetation:: Narrowleaf cottonwood woodlands.

Adjacent upland vegetation: Aspen woodlands and Gambel's oak.

Succession/management: Booth's willow/Geyer's willow often succeeds Booth's willow/beaked sedge type as the site becomes drier. This plant association often occurred in the disturbed area between hay fields/grazing pastures and the streambank. If disturbance continues this plant association may transition to a sagebrush/bluegrass type (Kovalchik 1987).

Booth's willow/Geyer's willow/Pacific willow(*Salix boothii/Salix geyeriana/Salix lasiandra* var. *caudata***) plant association**

Colorado Natural Heritage Program: GU/SU

Synonyms: *Salix boothii-Salix geyeriana-Salix lucida* ssp. *caudata* (Kettler and McMullen 1996).

Distribution: This plant association is found on active floodplains and overflow channels. It occurs on low gradient floodplains at low to moderate elevations ranging from 2010 to 2100 m (6700 to 7000 ft). In Routt County, this association inhabits certain portions of old abandoned stream channels. It appears to establish on areas where bare alluvium has been deposited and left exposed during the process of channel abandonment. *Salix lasiandra* var. *caudata* will establish in areas that hold standing water when the water table is high in the spring, and they may still conduct water from the main channel during high stream flows (The Nature Conservancy 1996) or directly within the stream channel. *Salix boothii* and *Salix geyeriana* occur next to wetter areas on slightly drier ground.

Soils: Sandy soils with some clay; 15% mottling occurred at 12 cm with oxidized root channels evident.

Wetland description: Riverine wetland with a seasonal hydroperiod and occasional flooding.

Vegetation: *Salix boothii*, *Salix lasiandra* and *caudata, Salix geyeriana* are co-dominant in the overstory of this plant association. *Alnus incana* and *Populus tremuloides* were commonly present. The understory was characterized by a dense layer of introduced grasses, including *Poa pratensis, Phleum pratense,* and *Agrostis gigantea*.

Adjacent riparian vegetation:: Narrowleaf cottonwood forests.

Adjacent upland vegetation: Aspen woodlands and Gambel's oak.

Succession/management: This association seems to be tolerant of agricultural and grazing activities in that it usually occurred next to heavily manipulated areas. Within some stands, individuals of the Pacific willows attained trunks of one decimeter or more in diameter (The Nature Conservancy 1996). However, this plant association cannot withstand a drastic change in hydrology. A hydrologic change would result in fragmentation.

Booth's willow/Drummond's willow (*Salix boothii/Salix drummondiana*) plant association

Colorado Natural Heritage Program Rank: GU/SU

Synonyms: None known.

Distribution: This plant association has not been reported outside of Colorado. It is newly described and is known only from northwestern Colorado in Routt, Garfield, and Grand Counties.

In Routt County there are six occurrences documented at elevations ranging from 2340 to 2565 m (7800 to 8550 ft) (CNHP 1996). It occurs on immediate stream banks and adjacent floodplains and is associated with active beaver ponds.

Soils: Clayey soils with 10% mottling occurring at 5 cm with Fe Mn deposits and oxidized root channels evident.

Wetland description: Riverine wetland with boggy area which experience seasonal to permanent hydroperiod with occasional flooding.

Vegetation: *Salix boothii* and *Salix drummondiana* co-dominate with *Alnus incana* in the overstory. The understory was characterized by *Carex aquatilis, Carex utriculata*, and *Heracleum sphondylium* ssp. *montanum*.

Adjacent riparian vegetation: beaked sedge, aspen woodlands.

Adjacent upland vegetation: Engelmann spruce-subalpine fir, Douglas-fir and Colorado blue spruce forests, aspen woodlands, Gambel's oak shrublands.

Succession/management: Often associated with beaver ponds, this type appears to colonize silted areas and will eventually be replaced by drier site willows.

Booth's willow/beaked sedge (*Salix boothii/Carex utriculata*) plant association

Colorado Natural Heritage Program Rank: G3?/S1

Synonyms: *Salix boothii/Carex rostrata* (Padgett *et al*. 1989; Youngblood *et al*. 1985).

Distribution: From central and eastern Idaho, western Wyoming and the central plateau regions of Utah. Not previously described from Colorado.

In Routt County, one large occurrence was found on Phillips Creek near the town of Yampa, at 2400 m (7870 ft) elevation. The plant association occurred on a gently sloping floodplain with saturated soils due to irrigation runoff and hillside seepage.

Soil: peat approximately a meter thick with some minerals (clays, fine sands) and gleying throughout the profile in one plot. Some mottling evident at 20 cm over a gleyed layer. After 60 cm, peat/clay became very dense and more anoxic.

Wetland description: Riverine and depressional wetlands with seasonal to permanent hydroperiod and occasional flooding.

Vegetation: The saturated soils supported a dense layer of *Carex rostrata* under a mosaic of *Salix boothii*, *Salix geyeriana* and *Salix planifolia* ssp. *planifolia* var. *planifolia. Salix serissima*, a rare Colorado willow, also occurred at this site. Other shrubs present included *Lonicera involucrata, Rosa woodsii*, and *Ribes inerme*. Other graminoids present were *Calamagrostis canadensis, C. stricta* and *Carex aquatilis*. Forb cover was sparse but included *Smilacina stellata, Fragaria virginiana*, and *Ligusticum porteri.*

Adjacent riparian vegetation: Narrowleaf cottonwood/red-osier dogwood forests, thinleaf alder forests.

Adjacent upland vegetation: Big sagebrush scrub, aspen woodlands.

Succession/management: Padgett *et al*. (1989) suggests that the *Salix boothii/Carex rostrata* type becomes established when beaver ponds have raised the water table. Saturated soils of this type make it susceptible to soil compaction from livestock or heavy machinery (Padgett *et al*. 1989).

Booth's willow/Canada reedgrass (*Salix boothii/Calamagrositis canadensis*) plant association

Colorado Natural Heritage Program Rank: G4/S2S3

Synonyms: None known

Distribution: *Salix boothii* is a common widespread species in northwestern Colorado. It occurs in the Wasatch and Bear River Ranges of Utah and Idaho (Padgett *et al.* 1989), in eastern Idaho and western Wyoming (Youngblood *et al.* 1985), Centennial Mountains in southeastern Idaho/southwestern Montana (Mutz and Queiroz 1983), and central Idaho (Tuhy and Jensen 1982).

In Routt County it occurs in the western portion of Routt County along Morrison Creek with *Alnus incana* between elevations of 2370 to 2400 m (7900 to 8000 ft).

Vegetation: This plant association forms extensive carrs with *Salix geyeriana*. The understory was characterized by introduced grasses, including *Phleum pratense* and *Poa pratensis*.

Soils: Sandy, fine textured soils; 10% mottling occurring at 7 cm with moderate levels of oxidized root channels.

Wetland description: Riverine wetland with a seasonal hydroperiod and occasional flooding.

Adjacent riparian vegetation: Geyer's willow/beaked sedge.

Adjacent upland vegetation: Gambel's oak and aspen.

Succession/management: Booth's willow often succeeds beaked sedge as sites become drier. Booth's willow is often associated with Geyer's willow, planeleaf willow, beaked sedge and aquatic sedge in undisturbed sites (Girard *et al.* 1995).

Drummond's willow/Canada reedgrass (*Salix drummondiana/Calamagrostis canadensis*) plant association

Colorado Natural Heritage Program Rank: G2/S2

Synonyms: *Salix drummondiana-Salix monticola/Calamagrostis canadensis-Carex rostrata* (Baker 1989); *Salix drummondiana*/mesic forb (Kittel and Lederer 1993).

Distribution: This plant association occurs in Idaho and Utah (Baker 1989; Padgett *et al.* 1989). In Colorado it is reported from the Front Range (Cooper and Cottrell 1990), and in the Gunnison and Uncompahgre National Forests (Komarkova 1986). In Routt County this plant association occurs along the Elk River near Clark.

Soils: Sand, fine textured soils with 7% mottling at 10cm; moderate levels of oxidized root channels evident.

Wetland description: Riverine wetland with a seasonal hydroperiod and occasional flooding.

Vegetation: Dense stands of *Salix drummondiana* with an understory of sedges and native grasses.

Adjacent riparian vegetation: Rocky mountain willow shrubland.

Adjacent upland vegetation: Gambel's oak and aspen woodlands.

Succession/management: This narrows shrub association appears to tolerate flooding, and is early-seral, colonizing the boulder strewn steep first order streams.

Rocky Montain willow-Geyer's willow/mesic forb (*Salix monticola-Salix geyeriana*/mesic forb**) plant association**

Colorado Natural Heritage Program Rank: GU/SU

Synonyms: Similar to *Salix geyeriana-Salix* ssp./*Calamagrostis canadensis* (Johnson 1987); *Salix monticola/Calamagrostis canadensis* (Cooper and Cottrell 1990); *Salix drummondiana-Salix monticola/Calamagrostis canadensis-Carex rostrata* (Baker 1989).

Distribution: Similar types (listed above) occur from eastern Idaho, northwestern and north-central Wyoming (Johnston 1987) into Utah. In Colorado, similar types have been reported from the Colorado Front Range (Cooper and Cottrell 1990), the Routt, Arapaho, Gunnison and Medicine Bow National Forests.

In the Yampa River drainage it occurs primarily south of Steamboat Springs on river banks and floodplains of broader valley reaches such as Pleasant Valley, 2075 to 2115 m (6915 to 7050 ft) in elevation.

Soil: Shallow silt and silty clay loams (less than 0.5 m deep) over gravels and cobbles. Some stands occurred on deeper clay loams of filled in beaver ponds.

Wetland description: Riverine wetland with a seasonal hydroperiod and occasional flooding.

Vegetation: *Salix monticola* and *Salix geyeriana* were codominant in this dense willow carr plant association Understory consisted mainly of: *Bromus inermis, Poa pratensis*, *Carex aquatilis, Juncus balticus,* and *Equisetum arvense*.

Adjacent riparian vegetation: Beaked sedge meadow, Colorado blue spruce-narrowleaf cottonwood/thinleaf alder-black twinberry woodland.

Adjacent upland vegetation: Engelmann spruce-subalpine fir, Douglas-fir and Colorado blue spruce forests, aspen woodlands, Gambel's oak shrubland.

Succession/management: *Salix geyeriana* willow carrs seem to require a water table no deeper than about 1 meter (Padgett *et al.* 1989). These willow carrs are commonly, but not always, associated with beaver ponds, which can maintain a higher water table than would be present otherwise. Where they occur on first and second orders streams they may be fairly stable late-seral associations. Along lower order streams subject to flooding and channel adjustments, or where associated with beaver ponds, this plant association may be subject to a shorter successional cycle. More research is needed to understand the succesional sequence of willow carrs dependent on beaver-maintained high water tables.

Geyer's willow/beaked sedge (*Salix geyeriana/Carex utriculata*) plant association

Colorado Natural Heritage Program Rank: G5/S2

Synonyms: *Salix geyeriana/Carex rostrata* (Padgett *et al*. 1989; Youngblood *et al*. 1985).

Distribution: Known from central and eastern Idaho and northern Utah (Padgett *et al*. 1989). In Colorado, Johnston (1987) lists this type as *Salix geyeriana-Salix* ssp*./Carex utriculata* where it occurs in the Roosevelt and Routt National Forests.

In Routt County, this type only occurred in Routt County, in the far eastern portion of the study area. This tall willow plant association occurred adjacent to large and moderately large stream channels, in swales and overflow channels of active floodplains in wide to moderately wide valley bottoms at 2070-2450 m (6790-8030 ft) elevation.

Soil: Silty clay loam with coarse sand fragments. Gleying evident at about 30 cm.

Wetland description: Riverine wetland with a seasonal hydroperiod and occasional flooding.

Vegetation: *Salix geyeriana* dominated the tall willow layer. Other shrubs present were *Alnus incana* and *Lonicera involucrata* with less than 10% cover. The understory was characterized by a dense layer of *Carex rostrata, Carex nebrascensis, C. praegracilis, C. aquatilis*, and *Calamagrostis canadensis* were also present in varying amounts. Forb cover was very low.

Adjacent riparian vegetation: Thinleaf alder shrublands, beaked sedge meadows, Colorado blue spruce/alder forests.

Adjacent upland vegetation: Lodgepole forests, big sagebrush scrub.

Succession/management: This type requires a high water table and saturated soils for much of the growing season, and is susceptible to soil compaction by livestock. *Carex rostrata* (rather than *Carex aquatilis* apparently becomes established) when soils are saturated (Padgett *et al*. 1989).

Bebb's willow (*Salix bebbiana*) plant association

Colorado Natural Heritage Program Rank: G3/SU

Synonyms: *Salix bebbiana* var. *depilis*, *Salix bebbiana* var. *capreifolia*, *Salix bebbiana* var. *lixurians*, *Salix bebbiana* var. *perrostrata*, *Salix bebbiana* var.*projecta*. *Salix depressa* var. *rostrata* (Kartesz 1994).

Distribution: *Salix bebbiana* is a minor plant association found at low to mid elevation throughout the mountains, foothills, and mountain valleys of Montana (Hansen *et al.* 1995), northcentral Wyoming (Girad *et al.* 1995), and northwestern Colorado.

In Routt County this tall willow plant association occurred along both the Yampa and Elk Rivers in boggy, saturated areas at elevations ranging from 2100 to 2340 m (7000 to 7800 ft).

Soils: Peaty soils with moderate to high levels of organic matter.

Wetland description: Depressional wetlands with a permanent hydroperiod and occasional flooding.

Vegetation: The overstory is dominated by *Salix bebbiana*. *Salix drummondiana*, *Salix geyeriana,* and *Salix serissima* (in one stand) were present. The understory consisted of *Carex utriculata*, *Carex aquatilis*, and *Calamagrostis canadensis*.

Adjacent riparian vegetation: Coyote willow shrublands.

Adjacent upland vegetation: Gambel's oak.

Succession/management: Bebb's willow seems to be a highly palatable willow, however, wildlife consumption does not negatively affect it (Hansen *et al.* 1995). This tolerance to repeated browsing allows Bebb's willow to increase at the expense of less browsing-tolerant willow species such as Geyer willow, Booth willow, yellow willow, and Drummond willow. Bebb willow is not a common species for Routt County. It is found at lower elevation (below 2340 m). This type is found in easily accessible areas where livestock and wildlife congregate. With disturbance, it dries out and species composition changes to drier, more disturbance related species. This plant association will shift toward herbaceous dominance by Kentucky blue grass and common timothy with an associated increase in non-riparian forbs with disturbance (Girad *et al.* 1995).

LOW-WILLOW SHRUBLANDS

Wolf's willow/mesic forb (*Salix wolfii/*mesic forb**) plant association**

Colorado Natural Heritage Program Rank: G?/S3

Synonyms: *Salix wolfii*/mesic forb (Padgett *et al*. 1989; Youngblood *et al*. 1985); *Salix wolfii/Fragaria virginiana* (Johnston 1987).

Distribution: This type occurs from central and eastern Idaho, western Wyoming (Padgett *et al.* 1989). In Colorado it has been reported from the western slope (Baker 1989).

In Routt County this type occurred in the eastern half of the county in the upper reaches of the Park Range, the Flat Tops, and the Elkhead Mountains, from 2400-2790 m (7870-9150 ft) elevation. Wolf's willow/mesic forb plant association was commonly found in broad glaciated or unglaciated high mountain valleys on well drained slopes and hummocks, usually approximately one meter above the water table.

Soil: Shallow heavy silty clays over gravels and rocks.

Wetland description: Riverine wetlands with a seasonal hydroperiod and occasional flooding.

Vegetation: *Salix wolfii* formed a low, patchy canopy ranging from 20 to 80% cover. *Salix boothii* and *Salix geyeriana* were often present in small amounts. Graminoid cover averaged approximately 25% cover with highly variable species composition, including *Carex aquatilis, C. hoodii, C. lanuginosa, C. microptera,* and *Calamagrostis canadensis*. Sparse forb cover included *Fragaria virginiana, Galium boreale, Geum macrophyllum, and Heracleum lanatum*.

Adjacent riparian vegetation: Booth's willow/mesic forb shrublands, beaked sedge meadows, thinleaf alder shrublands.

Adjacent upland vegetation: Subalpine fir and engelmann spruce forests and aspen forests on steep sided valleys, big sagebrush scrub in broad valleys.

Succession/management: appears to be a stable climax plant association.

NON-WILLOW-DOMINATED SHRUBLANDS

Thinleaf alder-red-osier dogwood (*Alnus incana-Cornus sericea*) plant association

Colorado Natural Heritage Program Rank: G?/S?

Synonyms: *Alnus incana-Cornus sericea* (Komarkova 1986; Johnston 1987; Padgett *et al*. 1989); similar to *Alnus incana/Ribes hudsonianum* and *Cornus sericea/Galium triflorum* types described by Youngblood *et al*. (1985).

Distribution: This plant association occurred on smaller creeks and upper reaches of the Yampa River in Routt County between 2075 and 2300 m (6800-7540 ft) elevation. It occurred on narrow, rocky banks and benches of small channels and narrow constricted reaches of larger rivers.

Soil: Sandy loam to sandy clay loam, mottling evident at about 30 cm, gravel or cobbles layers appear at 70-100 cm.

Wetland description: Riverine wetland with a seasonal hydroperiod and occasional flooding.

Vegetation: *Alnus incana* and *Cornus sericea* dominated a dense tall shrub overstory. Other shrubs commonly present included *Lonicera involucrata, Rubus idaeus, Amelanchier alnifolia,* and *Salix* ssp. in minor amounts, although in one stand *Salix bebbiana* was quite abundant. Tree species, if present, were scattered. *Heracleum lanatum, Geum macrophyllum, Rudbeckia laciniata,* and *Aster foliaceus* characterized the rich forb undergrowth. Graminoid cover was usually low.

Adjacent riparian vegetation: Narrowleaf cottonwood-Colorado blue spruce mixed forests, narrowleaf cottonwood/red-osier dogwood forests.

Adjacent upland vegetation: Gambel's oak and serviceberry shrublands, aspen woodlands, engelmann spruce-subalpine fir forests.

Succession/management: *Alnus incana-Cornus sericea* is tolerant of flooding. *Alnus incana* requires highly aerated ground water that flows through the coarse-textured subsurface soils with which they are commonly associate (Padgett *et al.* 1989). In Colorado this type is often found on rock benches, the surface of which may be not periodically flooded, but where rhizomatous roots may reach well aerated ground water near the stream. This community also occurs on small, shady, high gradient streams. This community is more common on stream border than floodplains (Kittel *et al.* 1994).

Thinleaf alder-Geyer willow (*Alnus incana-Salix geyeriana*) plant association

Colorado Natural Heritage Program Rank: G?/S?

Synonyms: Not previously described; however, this type appears to be very similar to the *Alnus incana/Equisetum arvense* type described by Padgett *et al*. (1989); Komarkova (1986); and Hess (1981).

Distribution: This plant association occurred on cobble point bars and islands in moderately wide to wide river valleys between 2300 and 2450 m (7540-8030 ft) elevation in the eastern part of Routt County watershed.

Soils: Well drained sandy loam over coarser sands, with alternating mottled layers.

Wetland description: Riverine wetland with a seasonal hydroperiod and occasional flooding.

Vegetation: *Alnus incana* and *Salix geyeriana* dominated the tall shrub overstory along with *Salix ligulifolia,* and *Salix lanata* ssp. *caudata*. Herbaceous undergrowth was sparse to abundant, dominated by the introduced grasses *Poa pratensis, Phleum pratense*, and *Agrostis gigantea* due to grazing and flooding disturbance. Forb cover was sparse.

Adjacent riparian vegetation: Coyote willow shrublands, creeping spikerush marshes.

Adjacent upland vegetation: Gambel's oak shrublands, ponderosa pine forests.

Succession/management: The thinleaf alder-Geyer willow plant association appears to be unstable, occurring in frequently flooded environments. This type may indicate that the hydrological processes have been altered, and the channel is undergoing adjustment. This plant association was associated with abandoned or breached beaver dams, and may succeed to a more stable, drier riparian plant association, such as the *Salix geyeriana* plant association, as the water table lowers.

HERBACEOUS DOMINATED RIPARIAN WETLANDS

Water sedge (*Carex aquatilis*) wetland plant association

Colorado Natural Heritage Program Rank: G5/S3S4

Synonyms: *Carex aquatilis* (Baker 1984; Padgett *et al*. 1989; Youngblood *et al*. 1985); *Carex aquatilis-Pedicularis groenlandica* (Komarkova 1986); *Carex aquatilis/Carex utriculata (Carex aquatilis* phase) (Johnston 1987). Broader plant associations that encompass our type are the *Carex aquatilis-Carex rostrata* types described by Hess (1981) and Hess and Wasser (1982).

Distribution: This is a commonly occurring plant association in the subalpine zone throughout northern Colorado, between 2400 and 3350 m (7850 and 11,000 ft) elevation. This plant association commonly occurred on meadows and seeps associated with broad valley bottoms. Slopes ranged from 0 to 10 percent on even or concave surface topography.

Soil: Soils were usually deep organic peats, but sometimes were mineral soils, fine silts and deep peats.

Wetland description: Riverine wetland with boggy areas with a seasonal to permanent hydroperiod and occasional flooding.

Vegetation: *Carex aquatilis* dominated a typically dense graminoid layer. Other graminoids included *Carex vesicaria, Calamagrostis stricta,* and *Calamagrostis canadensis*. Forb cover was typically sparse, but common associates included *Caltha leptosepala, Pedicularis groenlandica, Fragaria virginiana*, and *Gentianella amarella*.

Adjacent riparian vegetation: Planeleaf willow, Wolf's willow, and barren-ground willow shrublands.

Adjacent upland vegetation: Engelmann spruce-subalpine fir forests.

Succession/management: *Carex aquatilis* type occurs on soils that are typically wet throughout the growing season, and livestock grazing can often cause hummocking and pitting of the soil (Padgett *et al.* 1989). *Carex aquatilis* and *Carex utriculata* seem to be very similar in regard to moisture regimes and elevations, but *Carex utriculata* appears to be capable of occupying sites that are more inundated that *Carex aquatilis* (Padgett *et al.* 1989).

Beaked sedge (*Carex utriculata*) wetland plant association

Colorado Natural Heritage Program Rank: G5/S3

Synonyms: *Carex rostrata* (Padgett *et al*. 1989; Youngblood *et al*. 1985). A broader type, *Carex rostrata-Carex aquatilis* wetland plant association has been described for north-central Colorado that includes our *Carex rostrata* and *Carex aquatilis* types (Hess and Wasser 1982, Komarkova 1986, Johnston 1987, Hess 1981). See also *Carex aquatilis* plant association description above.

Distribution: The *Carex rostrata* plant association had a wide elevation range of 2020-2720 m (6620-8920 ft), and occurred in all counties within the study area. It occurred in floodplain swales and abandoned channels, as well as silty stream margins. This is one of the wettest riparian plant association found in Routt County, as it sometimes has saturated soils all season long, and often is associated with standing water.

Soil: Shallow (0.5 meter) accumulations of clays and silts over cobbles and alluvium.

Wetland description: Depressional or riverine wetland with a permanent hydroperiod.

Vegetation: *Carex rostrata* dominated a dense, continuous graminoid layer. Pure stands occurred occasionally, but *Carex aquatilis* and *Juncus saximontanus* were often present in patches. Forb cover was very low.

Adjacent riparian vegetation: Beaked sedge can occur in conjunction with many different willow and other herbaceous riparian plant associations due to its broad elevational range. Some of the more common associates were Booth's willow/beaked sedge and coyote willow/mesic graminoid shrublands.

Adjacent upland vegetation: Big sagebrush and Gambel's oak shrublands, subalpine fir-engelmann spruce forests.

Succession/management: *Carex rostrata* appears to occupy the wettest sites, while *Carex aquatilis* occurs in slightly better drained areas. These two species intermix at intermediate habitats, and thus create confusion in the literature as to whether there are one or two plant associations. CNHP chose to follow Padgett *et al*. (1989) and Youngblood *et al*. (1985) lead in distinguishing between plant associations which often have different environmental characteristics as well as different species composition. These may be lumped at a higher level.

Nebraska sedge (*Carex nebrascensis*) wetland plant association

Colorado Natural Heritage Program Rank: G4/S?

Synonyms: Similar to the *Carex nebrascensis* type described by Padgett *et al*. (1989), Youngblood *et al*. (1985), and Johnston (1987). Stands in Routt County occurred at somewhat lower elevations, and therefore had different associated species. Notably, ours were lacking the *Deschampsia cespitosa* component, and usually *Salix exigua* was adjacent.

Distribution: 1750-2410 m (5740-7900 ft) elevation in Routt County, along low gradient swales and smaller channels within flat floodplains.

Soils: Shallow clayey soils with some mottling.

Wetland description: Depressional wetland with a seasonal hydroperiod.

Vegetation: *Carex nebrascensis* dominated a dense herbaceous layer. Few shrubs were present. Other graminoids occasionally present included *Juncus balticus* and *Agrostis gigantea*.

Adjacent riparian vegetation: Narrowleaf cottonwood/skunkbrush forests; coyote willow, Pacific willow, and Booth's willow shrublands; beaked sedge and cattail wetlands.

Adjacent upland vegetation: Piñon-juniper woodlands, Gambel's oak, greasewood, and big sagebrush shrublands.

Succession/management: The *Carex nebrascensis* plant association is a grazing disclimax typically representing an early to mid-seral secondary successional type (Hansen *et al.* 1995). *C. nebrascensis* is strongly rhizomatous with high underground biomass that while being highly palatable to livestock, appears to withstand moderate to heavy grazing pressures and thus acts as an increaser and/or invader (Hansen *et al.* 1995). Under continued season long grazing, *C. nebrascensis* acts as an increaser, replacing former climax dominants (Youngblood *et al.* 1985; Kovalchik 1986; 1987).

Softstem bulrush (*Scirpus tabernaemontani*) plant association

Colorado Natural Heritage Program Rank: G?/S2

Synonyms: *Scirpus validus* (Kartesz 1994); *Schoenoplectus lacustris* var. *validus* Weber and Wittmann (1992); *Scirpus acutus* (Hansen *et al.* 1995).

Distribution: The *Scirpus tabernaemontani* plant association occurs in marshes, along the margins of lakes and ponds, and in backwater areas of rivers with water up to one meter deep. Generally, it occupies sites similar to those of the *Typha* l*atifolia* plant association and some authors have on occasion lumped *Scirpus* and *Typha* together (e.g., Cooper 1988). These associations rarely intergrade significantly, however, and when they occur adjacent to each other, the transition from one association to another is usually abrupt and distinct (Hansen *et al.* 1988). Hansen *et al.*(1988) describe a *Scirpus tabernaemontani* dominance type as a minor dominance type at lower elevations throughout Montana. Johnson (1941) reported "dense growth of bulrush [*Scirpus validus*, a synonym for *S. tabernaemontani*] . . . on the south side of the lake [Lake John]" in northern Colorado.

The *Scirpus tabernaemontani* plant association does appear to be widespread throughout the Rocky Mountains and adjacent regions, mainly at low elevations. It was documented only once in Routt County at an elevation of 2035 m (6678 ft).

Soils: Permanently saturated, clayey, gleying occurs at 3 cm, little to no mottling

Wetland description: Depressional wetland with a permanent hydroperiod.

Vegetation: This plant association is characterized by dense cover of *Scirpus tabernaemontani*. Depending on growing conditions, stands may include limited amounts of emergent wetland species such as *Sagittaria* sp., *Alisma trivale*, and *Potamogeton* sp.

Adjacent riparian vegetation: Beaked sedge.

Adjacent upland vegetation: Sagebrush, common timothy, Kentucky bluegrass.

Succession/management: As with *Typha latifolia, Scirpus tabernaemontani* can quickly colonize bare, muddy ground (which it requires for germination) (Sanderson and Kettler 1996). Once established, however, it can persist as a stable stand as long as the water regime remains constant (Hansen *et al.* 1988). It can also persist through several years of low-water conditions. This plant association can easily become established in unnatural wetlands (e.g., restored gravel mines) (Sanderson and Kettler 1996). *Scirpus tabernaemontani* plant association is an important source of cover, nesting habitat, and food for wildlife, including waterfowl, other birds, muskrats, and deer.

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PLANT CHARACTERIZATION ABSTRACT

Plant Characterization Abstract for Colorado

LISTERA CONVALLARIOIDES
BROAD-LEAVED TWAYBLADE

Taxonomy:

TAXCLASS:	MONOCOTYLEDONEAE	ORDER:	ORCHIDALES
FAMILY:	ORCHIDACEAE	GENUS:	LISTERA

Status:

GLOBAL RANK: G5 STATE RANK: S2
FED. STATUS: AGENCY STATUS:

Habitat:

MINIMUM ELEV: 7000 feet
MAXIMUM ELEV: 10,500 feet

HABITAT COMMENTS:
Moist places in leaf mold, in shaded areas or in wet places along small streams high in the mountains (Cronquist et al. 1977).

State Distribution:

COUNTY NAME:
Routt
Boulder
Larimer

RANGE: This species may be naturally rare and/or peripheral in Colorado. It is known from Routt, Larimer, and Boulder counties.

Phenology:

JAN1:	MAR1:	MAY1:	JUL1: Flower	SEP1:	NOV1:
JAN2:	MAR2:	MAY2:	JUL2: Flower	SEP2:	NOV2:
FEB1:	APR1:	JUN1: Flower	AUG1:	OCT1:	DEC1:
FEB2:	APR2:	JUN2: Flower	AUG2:	OCT2:	DEC2:

PHENOLOGY COMMENTS:
Flowers from June to July (Cronquist and K 1977).

Look Alikes:

Similar to L. cordata which has broader fruits than L. convallaroides (Cronquist et al. 1977).

Management:

MANAGEMENT COMMENTS:
Unknown.

Global Distribution:

Alaska to Newfoundland south to California, Utah, Arizona, Michigan, New York and Colorado. Also occurs in Asia.

References:

ABBREVIATED CITATION:	FULL CITATION:
Cronquist and K 1977	Cronquist, A., A. H. Holmgren, N. H. Holmgren, J. L. Reveal and P. K. Holmgren. 1977. Intermountain Flora Vascular Plants of the Intermountain West, USA: vol. 6. New York Botanical Garden, Bronx, NY.
Harrington 1954	Harrington, H. D. 1954. Manual of the Plants of Colorado. Sage Books, Denver, CO.
Welsh 1974	Welsh, S. L. 1974. Anderson's Flora of Alaska and Adjacent Canada. Brigham Young University Press, Provo, UT.

Plant Characterization Abstract for Colorado

PLATANTHERA SPARSIFLORA VAR ENSIFOLIA
CANYON BOG-ORCHID

Taxonomy:

TAXCLASS:	MONOCOTYLEDONEAE	ORDER:	ORCHIDALES
FAMILY:	ORCHIDACEAE	GENUS:	PLATANTHERA

TAXONOMIC COMMENTS:

Taxonomically, the bog orchids are very difficult. The most conservative botanists include the bog orchids in genus Habenaria, middle of the roaders use Platanthera; while the most liberal botanists use Limnorchis. Dr. Stanley Welsh and other Utah botanists use Habenaria for the Utah bog orchids; as does Cronquist et al., in the Intermountain Flora; the Great Plains Flora for the bog orchids of Great Plains; and the most recent floras for Wyoming, New Mexico and Arizona. Dr. William Weber of the University of Colorado uses Limnorchis in his floras (Anonymous 1990).

Status:

GLOBAL RANK: G4G5T3 STATE RANK: S2
FED. STATUS: AGENCY STATUS:

Habitat:

MINIMUM ELEV: 6000 feet
MAXIMUM ELEV: 11000 feet

HABITAT COMMENTS:

Platanthera sparsiflora var ensifolia occurs in moist or wet soil in mountain meadows, marshes, swamps, bogs, open or dense forests, on stream banks and open seepage and frequently about springs (unknown source). Usually in black, organic-rich mud, and often associated with Betula fontinalis (Anonymous 1990).

State Distribution:

COUNTY NAME:
Conejos
Eagle
Gunnison
Mesa
Montrose
Ouray
Pitkin
Routt
Saguache
Garfield
Archuleta
San Miguel

RANGE: This species range has consistently been reported from western and southern Colorado (Harrington 1954).

Phenology:

JAN1:	MAR1:	MAY1:	JUL1:	SEP1:	NOV1:
			Flower		

JAN2:	MAR2:	MAY2:	JUL2: Flower Fruiting	SEP2:	NOV2:
FEB1:	APR1:	JUN1:	AUG1: Fruiting	OCT1:	DEC1:
FEB2:	APR2:	JUN2: Flower	AUG2:	OCT2:	DEC2:

PHENOLOGY COMMENTS:
Phenology taken from various herbarium specimens.

Look Alikes:
There are several species which Platanthera sparsiflora var ensifolia may be confused with including: P. zothecina, P. hyperborea and P. stricta (Anonymous 1990).

Management:
MANAGEMENT COMMENTS:
This species occurs in areas currently used for grazing, camping and hiking. The orchids survival depends upon a reliable year-round supply of moisture. The combination of grazing and trampling by domestic livestock in the mucky areas where the orchid grows will ordinarily eradicate the orchid (Anonymous 1990).

Global Distribution:
The known range of this species is Oregon and California, eastward through Nevada, Utah, and Arizona, north of the Sonoran Desert to western Colorado and western New Mexico (U90ANO01COUS).

References:

ABBREVIATED CITATION:	FULL CITATION:
Anonymous 1990	Anonymous. 1990. Status Report on Platanthera sparsiflora var ensifolia.
Higgins 1970	Higgins, L. 1970. Plants collected in 1970 by L. Higgins deposited at Brigham Young University Herbarium, Provo, Utah.
Rydberg 1901	Rydberg, P. A. 1901 a. Bulletin from Torrey Club 28:630-631.
Vanderhorst 1991	Vanderhorst, J. 1991. Plants collected in 1991 by J. Vanderhorst deposited at the University of Colorado Herbarium.

Plant Characterization Abstract for Colorado

PYROLA PICTA
PICTURELEAF WINTERGREEN

Taxonomy:

TAXCLASS:	DICOTYLEDONEAE	ORDER:	ERICALES
FAMILY:	PYROLACEAE	GENUS:	PYROLA

TAXONOMIC COMMENTS:
No known taxonomic problems.

Status:

GLOBAL RANK:	G4G5	STATE RANK:	S2
FED. STATUS:		AGENCY STATUS:	

Habitat:

MINIMUM ELEV:	6000	feet
MAXIMUM ELEV:	9800	feet

HABITAT COMMENTS:
Pyrola picta is found on moist mossy and shaded conifer woods and stream banks to dry open sunny clearings and slopes, and from deep soils rich in humus and leaf litter to gravelly, sandy and rocky substrates and outcrops that include granite, quartz, diorite, and peridotite (Haber 1987).

State Distribution:

COUNTY NAME:
Boulder
El Paso
Garfield
Jackson
Mineral
Routt
La Plata
Conejos
Douglas

RANGE: No published state range information. Only known from Boulder, Conejos, Douglas, El Paso, Garfield, Jackson, La Plata, Mineral, Ouray and Routt Counties.

Phenology:

JAN1:	MAR1:	MAY1:	JUL1: Flower Fruiting	SEP1:	NOV1:
JAN2:	MAR2:	MAY2:	JUL2: Flower Fruiting	SEP2:	NOV2:
FEB1:	APR1:	JUN1: Flower	AUG1: Flower Fruiting	OCT1:	DEC1:
FEB2:	APR2:	JUN2: Flower	AUG2: Fruiting	OCT2:	DEC2:

PHENOLOGY COMMENTS:

This species flowers from June through early August, fruiting July through August (Kettler, et al., 1993).

Look Alikes:

Pyrola picta is the only Pyrola with white- or gray-mottled veins (Kettler and Lederer 1993). It superficially resembles the rattlesnake plantain (Goodyera oblongifolia/repens) in vegetative form, but the flowers are obviously distinct (pers. comm. Coles 1994).

Management:

MANAGEMENT COMMENTS:

Ski area development may threaten one population. Other threats are not currently known although major disruptions to known populations should be avoided.

Global Distribution:

Pyrola picta is known from British Columbia to South Dakota, south to Arizona, California and Colorado (U93KET01COUS).

References:

ABBREVIATED CITATION:	FULL CITATION:
Coles 1994	Coles, J. 1994. Personal communication about Rare Plant Guide Species.
Great Plains Flora Association 1986	Great Plains Flora Association. 1986. Flora of the Great Plains. University Press of Kansas, Lawrence, KS.
Haber 1987	Haber, E. 1987. Variability, Distribution, and Systematics of Pyrola picta (Ericaceae) in Western North America. Systematic Botany 12(2):324-335.
Jennings 1994	Jennings, W. 1994. Personal communication between Bill Jennings and Susan Spackman.
Kettler, et al., 1993	Kettler, S. M., N. D. Lederer, D. Bacher, and S. Spackman. 1993. Pike and San Isabel National Forests and Comanche and Cimarron National Grasslands Plants of Special Concern. Colorado Natural Heritage Program.

Plant Characterization Abstract for Colorado

SALIX SERISSIMA
AUTUMN WILLOW

Taxonomy:

TAXCLASS:	DICOTYLEDONEAE	ORDER:	SALICALES
FAMILY:	SALICACEAE	GENUS:	SALIX

Status:

GLOBAL RANK: G4	STATE RANK: S1
FED. STATUS:	AGENCY STATUS: FS

Habitat:

MINIMUM ELEV:	7800	feet
MAXIMUM ELEV:	9000	feet

HABITAT COMMENTS:
Willow carrs at mid elevations associated with other Salix spp. and Carex sp.

State Distribution:
COUNTY NAME:
Larimer
Park
Routt

RANGE: Larimer, Park, and Routt counties.

Phenology:

JAN1:	MAR1:	MAY1:	JUL1:	SEP1:	NOV1:
JAN2:	MAR2:	MAY2:	JUL2:	SEP2:	NOV2:
FEB1:	APR1:	JUN1:	AUG1:	OCT1:	DEC1:
FEB2:	APR2:	JUN2:	AUG2:	OCT2:	DEC2:

PHENOLOGY COMMENTS:
Catkins mature from late July through early September, later than most other willows.

Look Alikes:

Similar mid-elevation tall willows with glabrous capsules and light colored scales are S. lucida ssp. caudata, and S. lucida ssp. lasiandra. Both of these have shining, long acuminate leaves and shorter capsules (less than 7mm long compared to 7-10mm long in S. serissima). Also catkins of these species mature earlier in the summer than S. serissima. S. serissima is distinguished by its large capsules, leaves with toothed margins, and late flowering period (pers. comm. Kittel 1995).

Management:

MANAGEMENT COMMENTS:

Season long grazing may threaten this species and should be avoided, along with any hydrological modifications to habitat.

Global Distribution:

Eastern Canada to Alberta, Massachusetts, New Jersey, Indiana, Montana and Colorado

References:

ABBREVIATED CITATION:	FULL CITATION:
Little 1979	Little, E.L., Jr. 1979. Checklist of United States trees. Agriculture Handbook no. 541. U.S. Dept. of Agriculture, Forest Service. 375 pp.

Plant Characterization Abstract for Colorado

TRILLIUM OVATUM
WESTERN WAKE-ROBIN

Taxonomy:

TAXCLASS:	MONOCOTYLEDONEAE	ORDER:	LILIALES
FAMILY:	LILIACEAE	GENUS:	TRILLIUM

Status:

GLOBAL RANK: G4? STATE RANK: S2
FED. STATUS: AGENCY STATUS:

Habitat:

MINIMUM ELEV: 8600 feet
MAXIMUM ELEV: 9900 feet

HABITAT COMMENTS:
Occurs along streams and in moister shaded forests (BCD-EOR's, Mesler & Lu 1983).

State Distribution:

COUNTY NAME:
Jackson
Routt

RANGE: Known from Routt and Jackson counties in Colorado (BCD-EOR's).

Phenology:

JAN1:	MAR1:	MAY1: F	JUL1: Fruiting	SEP1:	NOV1:
JAN2:	MAR2:	MAY2: Flower	JUL2: Fruiting	SEP2:	NOV2:
FEB1:	APR1:	JUN1: Fruiting	AUG1:	OCT1:	DEC1:
FEB2:	APR2: F	JUN2: Fruiting	AUG2:	OCT2:	DEC2:

PHENOLOGY COMMENTS:
This plant flowers in spring, shortly after it emerges. It retains fruits through July (Mesler and Lu 1983).

Look Alikes:

Management:

MANAGEMENT COMMENTS:
Weber (1987) states that this species is threatened from over collection for gardens. CNHP currently has 14 records for this species - one mentions that proximity to trails subject that population to collection pressure, and another states that logging and sheep grazing potentially threaten the specific population (BCD-EOR's).

Global Distribution:

A western North American species occurring from British Columbia south to Oregon and California, west to Montana, Wyoming and just into Colorado

References:

ABBREVIATED CITATION:	FULL CITATION:
Mesler and Lu 1983	Mesler, M.R. and K.L. LU. 1983. Seed dispersal of Trillium ovatum (Liliaceae) in second growth redwood forests. American Journal of Botany. 70(10):1460-1467.
Weber 1987	Weber, W. A. 1987. Colorado Flora: Western Slope. Colorado Associated University Press, Boulder, CO.

AMPHIBIAN CHARACTERIZATION ABSTRACTS

Vertebrate Characterization Abstract for Colorado

BUFO BOREAS POP 1
BOREAL TOAD (SOUTHERN ROCKY MOUNTAIN POPULATION)

Taxonomy:

TAXCLASS: AMPHIBIA ORDER: ANURA
FAMILY: BUFONIDAE GENUS: BUFO

Status:

GLOBAL RANK: G5T2Q STATE RANK: S1
FED. LEGAL STATUS: C STATE LEGAL STATUS: E
FED. AGENCY STATUS: FS

GLOBAL STATUS COMMENTS:

In July 1994, USFWS determined that listing as endangered may be warranted; a status review was initiated (Federal Register, 22 July 1994); in March 1995, USFWS determined that listing is warranted but precluded by actions of higher priority (Federal Register, 23 March 1995).

Habitat:

MINIMUM ELEV: 7000
MAXIMUM ELEV: 11860

HABITAT COMMENTS:

Lives near springs, streams, ponds, and lakes in foothill woodlands, mountain meadows, and moist subalpine forest up to 11,860 ft. (source unknown). Breed in any body of water lacking a strong current and with gradual descending banks. Beaver ponds and glacial kettle ponds are typical breeding habitat. Tadpoles have been found in both large lakes and in small puddles (Hammerson 1982). Most individuals are found in marshy areas around complexes of beaver ponds or ponds formed by snow melt (Carey 1993). Within the Colorado Front Range the boreal toad occupies a wide variety of habitats with the largest populations occurring between 8500-11,000 ft. (Campbell 1970).

REPRODUCTIVE HABITAT COMMENTS:

Tadpoles have been observed resting on the bottom in 2 to 6 inches of water (Burger and N 1946). Breeding begins late in spring as winter snowpack begins to melt. Breeding males emit a soft chirping call to attract females. Strings of eggs usually are deposited in shallow pools or along lake margins in late May or early June. Tadpoles metamorphose during their first summer at elevations below 9000 ft. At higher elevations, metamorphosis does not occur until the second summer; tadpoles overwinter beneath the ice. Toads do not breed successfully every year at elevations above 11,000 ft. (Hammerson 1982). Reproductive maturity occurs at 4 to 6 years (Carey 1993).

GLOBAL REPRODUCTIVE HABITAT COMMENTS:

In Boulder County, Colorado, egg laying occurs usually in late May or early June. Larvae metamorphose usually in first summer, possibly may overwinter once at highest elevations.

In Colorado, metamorphosis occurs usually in August, sometimes in late July.

Distribution:

GLOBAL RANGE:

STATE RANGE: Apparently absent from Sangre de Cristo range, Wet Mountains, and Pikes Peak region. These toads are most common between 8500-11,000 feet. Rarely found as low as 7000 feet (Hammerson 1982).

COUNTY NAME:	REFERENCE:
Boulder	Hammerson 1982
Moffat	Hammerson 1982
Routt	Hammerson 1982
Jackson	Hammerson 1982
Rio Blanco	Hammerson 1982
Grand	Hammerson 1982
Larimer	Hammerson 1982
Gilpin	Hammerson 1982
Clear Creek	Hammerson 1982
Park	Hammerson 1982
Summit	Hammerson 1982
Lake	Hammerson 1982
Chaffee	Hammerson 1982
Gunnison	Hammerson 1982
Pitkin	Hammerson 1982
Mesa	Hammerson 1982
Delta	Hammerson 1982
Garfield	Hammerson 1982
Eagle	Hammerson 1982
Archuleta	Hammerson 1982
Conejos	Hammerson 1982
Hinsdale	Hammerson 1982

Phenology:

JANA: P	APRA: P	JULA: A	OCTA: P
JANB: P	APRB: P	JULB: A	OCTB: P
FEBA: P	MAYA: A	AUGA: A	NOVA: P
FEBB: P	MAYB: R	AUGB: A	NOVB: P
MARA: P	JUNA: R	SEPA: A	DECA: P
MARB: P	JUNB: R	SEPB: P	DECB: P

"P" = Present (resident populations or regular migrants).
"A" = Present and active (eg. not hibernating).
"R" = Present, active and reproducing.
"Reproducing" is defined as follows:
Fish = spawning; Amphibians = breeding through egg hatching;
Reptiles = mating and egg laying through hatching;
Birds = earliest nest building/egg laying through fledging
Mammals = breeding, and birth through independence from a nest/den site or from lactation, whichever comes first

PHENOLOGY COMMENTS:

Toads spent winter in a natural, rock-bounded chamber that opened next to a creek in a small opening in subalpine forest in Boulder County. Toads emerged from snow-covered

chamber during May and began to move back to hibernaculum during late August and early September. By October, most toads had entered hibernation (Hammerson 1982). During the day, it buries itself in loose soil or in gopher or squirrel burrows near water; but at night, it ranges away from water for feeding (source unknown).

GLOBAL PHENOLOGY COMMENTS:
Active day or night in summer, depending on conditions; probably mainly diurnal. Inactive in colder months; in Colorado, most end activity by October.

SREPROCOM: Tadpoles have been observed resting on the bottom in 2 to 6 inches of water (Burger and N 1946). Breeding begins late in spring as winter snowpack begins to melt. Breeding males emit a soft chirping call to attract females. Strings of eggs usually are deposited in shallow pools or along lake margins in late May or early June. Tadpoles metamorphose during their first summer at elevations below 9000 ft. At higher elevations, metamorphosis does not occur until the second summer; tadpoles overwinter beneath the ice. Toads do not breed successfully every year at elevations above 11,000 ft. (Hammerson 1982). Reproductive maturity occurs at 4 to 6 years (Carey 1993).

Management:
MANAGEMENT COMMENTS:
Potential threats include disturbance, degradation, and loss of wetland habitats; conversion of small ponds into larger reservoirs by damming; and trout introduction and predation on toad larvae. In addition, impacts by livestock, timber management practices, human recreation, and water pollution may potentially jeapordize toad populations (source unknown). Pollution, pesticides, acid precipitation, habitat destruction, increase in UV radiation, and introduction of predators or competitors into breeding areas have all been proposed as possible causes of decline. It has been suggested that some environmental factors or synergistic effects of more than one factor can lead to sublethal "stress". This stress directly causes suppression of the immune system, or indirectly cause immunosuppression by effecting elevated secretion of adrenal cortical hormones. Immunosuppression, coupled with the apparent effect of cold body temperatures on the ability of the immune system of ectothermic animals to fight disease leads to infection by aeromonas or other infectious agents, and to subsequent death of individuals and extinction of populations (Carey 1993).

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DATA PROVIDED BY THE COLORADO NATURAL HERITAGE PROGRAM;
CURRENT TO DEC 1995

Vertebrate Characterization Abstract for Colorado

RANA PIPIENS
NORTHERN LEOPARD FROG

Taxonomy:

TAXCLASS:	AMPHIBIA	ORDER:	ANURA
FAMILY:	RANIDAE	GENUS:	RANA

GLOBAL TAXONOMIC COMMENTS:

Relationships and taxonomic status of leopard frogs have not yet been fully resolved. Much published information on "RANA PIPIENS" actually pertains to other species that have been described or recognized since the early 1970s.

TAXONOMIC COMMENTS:

Large dark spots on back; dorsalateral folds not inset toward midline on rump; webbed hind toes; max snout-vent length about 4 3/8 inches (Hammerson 1982).

Status:

GLOBAL RANK: G5 STATE RANK: S3
FED. LEGAL STATUS: STATE LEGAL STATUS: SC
FED. AGENCY STATUS: FS

Habitat:

MINIMUM ELEV:
MAXIMUM ELEV: 11500

HABITAT COMMENTS:

Inhabits the banks and shallow portions of ponds, streams, marshes, lakes, reservoirs, beaver ponds and other bodies of permament water especially those that have rooted vegetation. Also irrigation ditches and wet meadows. Most frequently observed at the edge of the water but sometimes roam far from water on rainy nights. In the plains region, they typically emerge from their winter retreats in the bottoms of ponds. Have been found in February and January in pools formed by warm artesian wells (Hammerson 1982).

REPRODUCTIVE HABITAT COMMENTS:

Breeds in shallow, non-flowing portions of permanent bodies of water and in seasonally flooded areas adjacent to or contiguous with permanent pools. Breeding pools typically contain vegetation, mats of algae, and fairly clear water. Frogs do not begin breeding before their second spring. At elevations below 5500 ft, males begin calling on warm, sunny days in March or April (plains of Boulder County). Calling usually wanes in April but some lowland frogs can call in may or early June (Pueblo County). Females begin laying eggs a few days after calling begins and hatching 4-15 days after being laid. Metamorphosis occurs several weeks after hatching, probably in July or August. At elevations at 6680-7760 ft. in Larimer County, eggs were laid in late May and in early June, metamorphosis occurred from late mid-July through mid-September after a larval period of 58-105 days.

In the San Luis Valley metamorphosed leopard frogs have been observed on July 24. Information from higher altitudes is lacking, but leopard frogs in the Elk Mountains at 9500 ft. did not metamorphose before August 12. In North Park at 9000 ft. tadpoles were observed on August 23. In southern Colorado metamorphosing leopard frogs were seen at 10,500 ft. on August 2 (Hammerson 1982 and references therein).

GLOBAL REPRODUCTIVE HABITAT COMMENTS:

The time of egg deposition varies with latitude and elevation. Egg deposition occurs typically in April in southern Quebec, New York, and the Great Lakes region, late April to late May farther north in Manitoba and Nova Scotia (see Gilbert et al. 1994). In Colorado, eggs are laid mainly in early spring at low elevations, in late spring in the mountains (Hammerson 1982). Breeding often peaks when water temperatures reach about 10 C. At a particular site, egg deposition generally occurs within a span of about 10 days. Egg masses include several hundred to several thousand ova. Aquatic larvae usually metamorphose in summer, may overwinter in some areas. Females are sexually mature usually in two years in most areas, three years in high elevation populations. Density of egg masses often reaches a few hundred per ha in favorable habitat, sometimes >1000/ha.

Distribution:

GLOBAL RANGE:

STATE RANGE: Occurs throughout Colorado except in Republican River drainage area and southeastern Colorado south of the Arkansas River. Ranges to above 11,000 in southern Colorado (Hammerson 1982).

COUNTY NAME:	REFERENCE:
Moffat	Hammerson 1982
Rio Blanco	
Garfield	
Mesa	
Delta	
Montrose	
Montezuma	
San Miguel	
Dolores	
La Plata	
San Juan	
Ouray	
Routt	
Eagle	
Pitkin	
Gunnison	
Archuleta	
Jackson	
Grand	
Eagle	
Summit	
Chaffee	

Saguache
Rio Grande
Conejos
Larimer
Boulder
Gilpin
Jefferson
Clear Creek
Park
Teller
Fremont
Custer
Alamosa
Costilla
Weld
Adams
Morgan
Denver
Arapahoe
Elbert
Douglas
El Paso
Pueblo
Las Animas
Lincoln
Washington
Logan
Sedgwick
Phillips
Kit Carson
Cheyenne
Kiowa
Huerfano

Phenology:

JANA: P	APRA: R	JULA: A	OCTA: A
JANB: P	APRB: R	JULB: A	OCTB: A
FEBA: P	MAYA: R	AUGA: A	NOVA: A
FEBB: P	MAYB: R	AUGB: A	NOVB: P
MARA: R	JUNA: R	SEPA: A	DECA: P
MARB: R	JUNB: A	SEPB: A	DECB: P

"P" = Present (resident populations or regular migrants).
"A" = Present and active (eg. not hibernating).
"R" = Present, active and reproducing.
"Reproducing" is defined as follows:
Fish = spawning; Amphibians = breeding through egg hatching;
Reptiles = mating and egg laying through hatching;
Birds = earliest nest building/egg laying through fledging
Mammals = breeding, and birth through independence from a nest/den site or from lactation, whichever comes first

PHENOLOGY COMMENTS:
In the plains, R. pipiens typically emerge from the bottoms of ponds in March, and usually remain active until October or November when cold weather forces them into dormancy (except in unusual situations at warm springs where they have been found to be active even in January and February). Leopard frogs may be active day or night (Hammerson 1982).

GLOBAL PHENOLOGY COMMENTS:
Inactive in cold weather in winter.

SREPROCOM: Breeds in shallow, non-flowing portions of permanent bodies of water and in seasonally flooded areas adjacent to or contiguous with permanent pools. Breeding pools typically contain vegetation, mats of algae, and fairly clear water. Frogs do not begin breeding before their second spring. At elevations below 5500 ft, males begin calling on warm, sunny days in March or April (plains of Boulder County). Calling usually wanes in April but some lowland frogs can call in may or early June (Pueblo County). Females begin laying eggs a few days after calling begins and hatching 4-15 days after being laid. Metamorphosis occurs several weeks after hatching, probably in July or August. At elevations at 6680-7760 ft. in Larimer County, eggs were laid in late May and in early June, metamorphosis occurred from late mid-July through mid-September after a larval period of 58-105 days. In the San Luis Valley metamorphosed leopard frogs have been observed on July 24. Information from higher altitudes is lacking, but leopard frogs in the Elk Mountains at 9500 ft. did not metamorphose before August 12. In North Park at 9000 ft. tadpoles were observed on August 23. In southern Colorado metamorphosing leopard frogs were seen at 10,500 ft. on August 2 (Hammerson 1982 and references therein).

Management:
MANAGEMENT COMMENTS:
The formerly abundant leopard frog has become scarce in many areas of Colorado. Part of the decline seems to be due to predation by the increasingly abundant bullfrog (Rana catesbiana), but the leopard frog is also becoming uncommon in areas where bullfrogs are absent. The exact cause of the declines is unknown and needs further investigation (Hammerson 1982).

References:

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Vertebrate Characterization Abstract for Colorado

RANA SYLVATICA
WOOD FROG

Taxonomy:

TAXCLASS:	AMPHIBIA	ORDER:	ANURA
FAMILY:	RANIDAE	GENUS:	RANA

GLOBAL TAXONOMIC COMMENTS:
Collins (1990) listed Colorado-Wyoming populations as a separate species, "RANA MASLINI" (not recognized by most herpetologists familiar with wood frogs) (see A69POR01NA, A76BAG01NA). See Zeyl (1993) for information on allozyme variation and divergence among some populations in the central part of the range.

TAXONOMIC COMMENTS:
Distinct species in large genus in large family. Disjunct population in Rocky Mountains. Was at some point considered to be a distinct species, R. maslini.

TAXONOMIC COMMENTS:
Dark mask across eyes; light stripe along the middle of the back; webbed hind toes; dorsolateral folds on back; max snout-vent length about 3 and 1/4 inches (Hammerson 1982).

Status:

GLOBAL RANK: G5	STATE RANK: S3
FED. LEGAL STATUS:	STATE LEGAL STATUS: T
FED. AGENCY STATUS: FS	

Habitat:

MINIMUM ELEV:	8300
MAXIMUM ELEV:	9800

HABITAT COMMENTS:
Wood frogs inhabit marshes bogs, pothole ponds, beaver ponds, lakes, stream borders, wet meadows, willow thickets and subalpine forests bordering these mesic habitats. Willow thickets and forest stream courses are inhabited primarily after frogs have dispersed from the breeding ponds. Likely winter retreat habitat consists of the underside of logs or rocks in the forest. (Hammerson 1982).

REPRODUCTIVE HABITAT COMMENTS:
Adults usually go to breeding ponds in June. Within a few days, eggs are laid in spherical masses attached to vegetation or free floating in the water. Areas selected by water temperature, depth and cloud cover. Breed in small natural ponds that lack a permanent inlet and outlet. Inactive beavor ponds and man-made ponds sometimes are used. Breeding ponds typically have a shallow, sunny, north edge with an extensive growth of sedges in the water. Frogs usually do not breed successfully in ponds inhabited by trout. Males begin calling in May (Hammerson 1982).

GLOBAL REPRODUCTIVE HABITAT COMMENTS:

Explosive breeder, with all egg laying in a given pond generally occurring within a brief period of several days. Eggs laid in winter in the Ozarks and southern Appalachians, late February in Maryland, February-March in Missouri, mainly March in southern New England, mostly late May-early June in Colorado; mean date of breeding increases 5.2 days per degree of latitude (Guttman et al. 1991). Eggs hatch in about 1-2 weeks. Larvae metamorphose within a few months, in spring or summer, depending on locality. Period from fertilization to emigration from pond averages about 11 weeks in Michigan, 13 weeks in Maryland, 15-16 weeks in Virginia (Riha and Berven 1991). In Maryland, 20,262 juveniles emerged from a single pond in one year (Berven 1988). Sexually mature in 2-3 years (in Maryland, females mainly in 2 years, rarely in 1 year; Berven 1988).

Distribution:

GLOBAL RANGE:

STATE RANGE: North-central Colorado in Grand, Jackson and Larimer Counties. Around the margins of North Park, along the upper tributaries of the Colorado River and the upper Laramie River drainage (Hammerson 1982).

COUNTY NAME:	REFERENCE:
Jackson	Hammerson 1982
Grand	
Larimer	

Phenology:

JANA: P	APRA: P	JULA: R	OCTA: P
JANB: P	APRB: P	JULB: R	OCTB: P
FEBA: P	MAYA: R	AUGA: A	NOVA: P
FEBB: P	MAYB: R	AUGB: A	NOVB: P
MARA: P	JUNA: R	SEPA: A	DECA: P
MARB: P	JUNB: R	SEPB: P	DECB: P

"P" = Present (resident populations or regular migrants).
"A" = Present and active (eg. not hibernating).
"R" = Present, active and reproducing.
"Reproducing" is defined as follows:
Fish = spawning; Amphibians = breeding through egg hatching;
Reptiles = mating and egg laying through hatching;
Birds = earliest nest building/egg laying through fledging
Mammals = breeding, and birth through independence from a nest/den site or from lactation, whichever comes first

PHENOLOGY COMMENTS:

Are diurnal in spring and may be active day and night during warmer summer nights. Larvae metamorphose from mid-July to late August. Larvae overwinter in ponds. Newly metamorphosed frogs migrate at night to willow thickets and meadows where they spend the rest of the summer (Hammerson 1982).

GLOBAL PHENOLOGY COMMENTS:

Inactive during cold season in north and at high elevations.

Primarily diurnal in northwest and in spring at high elevations, though breeding activities may occur at night as well. Most active in summer in damp conditions.

SREPROCOM: Adults usually go to breeding ponds in June. Within a few days, eggs are laid in spherical masses attached to vegetation or free floating in the water. Areas selected by water temperature, depth and cloud cover. Breed in small natural ponds that lack a permanent inlet and outlet. Inactive beavor ponds and man-made ponds sometimes are used. Breeding ponds typically have a shallow, sunny, north edge with an extensive growth of sedges in the water. Frogs usually do not breed successfully in ponds inhabited by trout. Males begin calling in May (Hammerson 1982).

Management:

MANAGEMENT COMMENTS:

D.O.W. does have a management plan for Rana sylvatica. It requires tree-bordered ponds, lack of predatory fishes, clean flowing water, size of pond unknown.

References:

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Vogt 1981 — Vogt, R. G. 1981. Natural History of Amphibians and Reptiles of Wisconsin. Milwaukee Public Museum. 205 pp.

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DATA PROVIDED BY THE COLORADO NATURAL HERITAGE PROGRAM;
CURRENT TO DEC 1995

FISH CHARACTERIZATION ABSTRACTS

Vertebrate Characterization Abstract for Colorado

GILA ROBUSTA
ROUNDTAIL CHUB

Taxonomy:

TAXCLASS:	OSTEICHTHYES	ORDER:	CYPRINIFORMES
FAMILY:	CYPRINIDAE	GENUS:	GILA

GLOBAL TAXONOMIC COMMENTS:

Four subspecies in the U.S. (JORDANI, SEMINUDA, GRAHAMI, and ROBUSTA), others in Mexico. See A89DOU01NA for discussion of methods for distinguishing G. CYPHA from G. ROBUSTA. Considerable hybridization may have occurred between G. CYPHA and G. R. ROBUSTA in Upper Colorado River Basin; origin of G. R. SEMINUDA may have included hybridization between G. ELEGANS and G. R. ROBUSTA; see A89ROS02NA for information on biochemical genetics of Colorado River GILA.

Status:

GLOBAL RANK: G3	STATE RANK: S2
FED. LEGAL STATUS:	STATE LEGAL STATUS: SC
FED. AGENCY STATUS:	

GLOBAL STATUS COMMENTS:

Subspecies Jordani and Seminuda are listed by USFWS as Endangered. Decline attributed to introduced species (especially Oriental snail and red shiner), predation, parasitism, competition for food and space, and habitat alteration. In New Mexico, declining in San Juan and Gila drainages, extirpated in Zuni and San Francisco drainages (Sublette, et al. 1990); persists where non-native predators are absent or where natural flow regimes and periodic flooding might act to suppress populations of introduced predators and maintain habitat variability (Bestgen and propst 1989).

Habitat:

MINIMUM ELEV:
MAXIMUM ELEV:

HABITAT COMMENTS:

Occupy slow moving waters adjacent to areas of faster water. Groups of adults concentrate in quiet swirling water adjacent to fast moving water. If younger than 1 year old, they concentrate in river eddies and irrigation ditches. (Woodling 1985)

REPRODUCTIVE HABITAT COMMENTS:

Reproduction takes place over a gravel substrate - fertilized eggs randomly scattered over substrate with no parental care; spawn in early summer in warmer water. (Woodling 1985)

GLOBAL REPRODUCTIVE HABITAT COMMENTS:
Spawns late spring to early summer, though subspecies Jordani spawns February-March (Sigler and Sigler 1987). Eggs hatch in 4-7 days at 19 C.

Distribution:

GLOBAL RANGE: Warm streams and large tributaries of the Colorado River basin (Wyoming, Utah, and Colorado south to Arizona, Nevada, and New Mexico), south through Rio Yaqui basin, to Rio Piaxtla, Sinaloa, Mexico; also Pluvial White River, eastern Nevada. Locally common (Page and Burr 1991). Subspecies Jordani: Pluvial White River, Nevada. Subspecies Seminuda: Virgin River, southwestern Utah, southern Nevada, and northwestern Arizona. Subspecies Grahami: Gila River, New Mexico and Arizona. Subspecies Robusta: remainder of U.S. range.

STATE RANGE: Found in the Colorado River mainstem and larger tributaries. Declining in the Gunnison river where once abundant in late 1970s. Abundant in most others - White, Yampa, Dolores, San Juan. (Woodling 1985)

COUNTY NAME:	REFERENCE:
Moffat	Woodling 1985
Rio Blanco	
Garfield	
Mesa	
Delta	
Gunnison	
Montrose	
San Miguel	
Dolores	
Montezuma	
La Plata	
Archuleta	

Phenology:

JANA: P	APRA: P	JULA: R	OCTA: P
JANB: P	APRB: P	JULB: R	OCTB: P
FEBA: P	MAYA: P	AUGA: P	NOVA: P
FEBB: P	MAYB: R	AUGB: P	NOVB: P
MARA: P	JUNA: R	SEPA: P	DECA: P
MARB: P	JUNB: R	SEPB: P	DECB: P

"P" = Present (resident populations or regular migrants).
"A" = Present and active (eg. not hibernating).
"R" = Present, active and reproducing.
"Reproducing" is defined as follows:
Fish = spawning; Amphibians = breeding through egg hatching;
Reptiles = mating and egg laying through hatching;
Birds = earliest nest building/egg laying through fledging
Mammals = breeding, and birth through independence from a nest/den site or from lactation, whichever comes first

PHENOLOGY COMMENTS:

SREPROCOM: Reproduction takes place over a gravel substrate - fertilized eggs randomly scattered over substrate with no parental care; spawn in early summer in warmer water. (Woodling 1985)

Management:

MANAGEMENT COMMENTS:
Decline due to coldwater releases downstream of curecanti project. (Woodling 1985)

GLOBAL MANAGEMENT COMMENTS:
See Taylor, et al. 1989 for information on impact of cattle presence on fish populations.

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Vertebrate Characterization Abstract for Colorado

ONCORHYNCHUS CLARKI PLEURITICUS
COLORADO RIVER CUTTHROAT

Taxonomy:

TAXCLASS:	OSTEICHTHYES	ORDER:	SALMONIFORMES
FAMILY:	SALMONIDAE	GENUS:	ONCORHYNCHUS

GLOBAL TAXONOMIC COMMENTS:
Due to hybridization with introduced non-native trout, few genetically pure populations remain.

TAXONOMIC COMMENTS:
Evolutionary isolation places Pleuriticus at a competitive disadvantage, rendering it vulnerable to hybridization with rainbow trout and replacement by brook and brown trout. (Sealing 1992)

TAXONOMIC COMMENTS:
A vague to brilliant horizontal red band runs along each brassy yellow side, its intensity varying with the fishes diet. The spotting pattern, although geographically variable, consists of large round black spots concentrated posteriorly and above the lateral line anteriorly (Martinez 1989).

Status:

GLOBAL RANK: G4T2T3 STATE RANK: S2
FED. LEGAL STATUS: STATE LEGAL STATUS: SC
FED. AGENCY STATUS: FS

Habitat:

MINIMUM ELEV: 7000
MAXIMUM ELEV:

HABITAT COMMENTS:
Small streams, beaver ponds, and lakes; cold clear running, well oxygenated water, cobble-boulder, gravel substrate, a good balance of pools to riffles, pH ranging from 6 to 9 and fairly high stream gradients (>4%) (Sealing 1992).

REPRODUCTIVE HABITAT COMMENTS:
The Colorado River cutthroat is an obligatory stream spawner, depositing fertilized ova in redds constructed in gravel substrate. Lake populations migrate to both inlet and outlet streams to spawn (Sealing 1992).

GLOBAL REPRODUCTIVE HABITAT COMMENTS:
Spawns in late spring when temperature reaches about 45 F; spawning begins after flows have peaked in spring or early summer, ends before runoff subsides; emergence of fry tends to occur in mid- to late summer; sexually mature in 2-3 years; in Trappers Lake (Colorado), repeat spawners comprised 16% of the spawning run and most had spawned the previous year, but the incidence of repeat spawning in fluvial or resident populations is poorly known (Spahr et

al. 1991, Young 1995).

Distribution:
GLOBAL RANGE:

STATE RANGE: Historically extended from the headwaters of the Colorado River basin downstream to the Dirty Devil River and the San Juan drainage of the Colorado. Presently, three populations in tributaries to the main Colorado River; Cunningham Creek, Northwater Creek, and the headwater area of the Colorado River in Rocky Mt. National Park (Sealing 1992). The Colorado River cutthroats native range extends southward to the Escalante River on the west and San Juan drainage on the east sides of the upper basin, including the Green River, Yampa River, Gunnison River, Dolores River, San Juan River, and their associated tributaries. Most or all of the remaining Colorado River cutthroat trout are found in small headwater streams or alpine lakes that have resisted colonization of non-native trouts (Proebstel 1994).

COUNTY NAME:	REFERENCE:
Pitkin	Sealing 1992
Garfield	
Grand	
Eagle	
Summit	
Gunnison	
Rio Blanco	
Archuleta	
Conejos	
Jackson	
La Plata	
Mineral	
Moffat	
Routt	

Phenology:

JANA: P	APRA: R	JULA: P	OCTA: P
JANB: P	APRB: R	JULB: P	OCTB: P
FEBA: P	MAYA: R	AUGA: P	NOVA: P
FEBB: P	MAYB: R	AUGB: P	NOVB: P
MARA: P	JUNA: R	SEPA: P	DECA: P
MARB: P	JUNB: R	SEPB: P	DECB: P

"P" = Present (resident populations or regular migrants).
"A" = Present and active (eg. not hibernating).
"R" = Present, active and reproducing.
"Reproducing" is defined as follows:
Fish = spawning; Amphibians = breeding through egg hatching;
Reptiles = mating and egg laying through hatching;
Birds = earliest nest building/egg laying through fledging
Mammals = breeding, and birth through independence from a nest/den site or from lactation, whichever comes first

PHENOLOGY COMMENTS:
Spawn from late spring to early summer when water temp. rises to about 7c. Obligatory stream spawners; spawn 100-200

eggs. Sexual maturity between 2 and 4 yrs (Sealing 1992).

GLOBAL PHENOLOGY COMMENTS:
Activity declines at night, peaks at various times during the day (Young 1995).

SREPROCOM: The Colorado River cutthroat is an obligatory stream spawner, depositing fertilized ova in redds constructed in gravel substrate. Lake populations migrate to both inlet and outlet streams to spawn (Sealing 1992).

Management:

MANAGEMENT COMMENTS:
Reasons for decline include alteration of habitat and introduction of non-native trout species; high susceptibility to angling; managed by CDOW (Sealing 1992) Minimizing risks of fishery enhancement programs is vital. Negative repercussions include a loss of genetic purity and variability (Proebstel 1994). The remaining 20 potential recovery stock populations should be protected from intrusion of non-native trout, and steps should be taken to address potential losses from factors such as disease, over-harvest, land-use practices, and environmental stochasticity. Important factors that will help monitor the ecological status of pure trout such as population parameters of abundance, recruitment, age and size structure, quality and condition of habitat, etc. would help to provide a more complete picture as to the overall stability of this subspecies in Colorado (Proebstel 1994).

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DATA PROVIDED BY THE COLORADO NATURAL HERITAGE PROGRAM;
CURRENT TO DEC 1995

BIRD CHARACTERIZATION ABSTRACTS

Vertebrate Characterization Abstract for Colorado

ACCIPITER GENTILIS
NORTHERN GOSHAWK

Taxonomy:

TAXCLASS: AVES
ORDER: FALCONIFORMES
FAMILY: ACCIPITRIDAE
GENUS: ACCIPITER

GLOBAL TAXONOMIC COMMENTS:
See Whaley and White (1994) for information on geographic variation in North America.

Status:

GLOBAL RANK: G5
STATE RANK: S3B,S4N
FED. LEGAL STATUS:
STATE LEGAL STATUS:
FED. AGENCY STATUS: FS

Habitat:

MINIMUM ELEV: 7500
MAXIMUM ELEV: 11200

HABITAT COMMENTS:
Forests; one study (Shuster 1980) found that nests were placed in mature stands of aspens, ponderosa pine, and lodgepole pine. Sites were gentle slopes with north or east aspects, lacked understory, and were located near clearings and water. All nests were at 7500 ft. and above. Migrants and winter residents are seen in all types of coniferous forest and riparian forest and occasionally in shrublands (Andrews and Righter 1992).

GLOBAL REPRODUCTIVE HABITAT COMMENTS:
Clutch size is 2-4. Incubation lasts 32-34 days per egg, by female (male provides food). Young leave nest at 5-6 weeks, begin hunting at about 50 days, independent at about 70 days. Some first breed as yearlings. Nests usually are 2+ km apart (but close as 0.8 km).

Distribution:

GLOBAL RANGE:

STATE RANGE: Rare to uncommon resident in foothills and mountains. Accidental in summer in western valleys (Andrews & Righer 1992).

COUNTY NAME:	REFERENCE:
Moffat	Andrews and R 1992
Rio Blanco	
Garfield	
Mesa	
Delta	

Montrose
San Miguel
Ouray
Montrose
La Plata
Archuleta
Hinsdale
San Juan
Rio Grande
Conejos
Mineral
Costilla
Las Animas
Huerfano
Custer
Pueblo
El Paso
Fremont
Teller
Saguache
Gunnison
Chaffee
Lake
Pitkin
Eagle
Summit
Clear Creek
Gilpin
Douglas
Jefferson
Park
Boulder
Jackson
Larimer

Phenology:

JANA: P	APRA: R	JULA: R	OCTA: P
JANB: P	APRB: R	JULB: R	OCTB: P
FEBA: P	MAYA: R	AUGA: P	NOVA: P
FEBB: P	MAYB: R	AUGB: P	NOVB: P
MARA: P	JUNA: R	SEPA: P	DECA: P
MARB: P	JUNB: R	SEPB: P	DECB: P

"P" = Present (resident populations or regular migrants).
"A" = Present and active (eg. not hibernating).
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"Reproducing" is defined as follows:
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Reptiles = mating and egg laying through hatching;
Birds = earliest nest building/egg laying through fledging
Mammals = breeding, and birth through independence from a nest/den site or from lactation, whichever comes first

PHENOLOGY COMMENTS:
Breeding dates 1 April - 31 July (Nelson 1993).

SREPROCOM:

Management:
MANAGEMENT COMMENTS:

References:

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DATA PROVIDED BY THE COLORADO NATURAL HERITAGE PROGRAM;
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Vertebrate Characterization Abstract for Colorado

AEGOLIUS FUNEREUS
BOREAL OWL

Taxonomy:

TAXCLASS:	AVES	ORDER:	STRIGIFORMES
FAMILY:	STRIGIDAE	GENUS:	AEGOLIUS

TAXONOMIC COMMENTS:
All North American boreal owls assigned to subspecies A. f. richardsoni.

TAXONOMIC COMMENTS:
Small owl with large head and long wings. Total length of 21-28 cm, wingspan 55-62 cm. Females generally larger. Similar in appearance in our region to the northern saw-whet owl. Numerous small white spots on an umber-brown crown and a buff-white bill distinguish this bird from northern saw-whet owl which has streaking on light-brown crown and black bill. Young boreal owl distinguished from young saw-whet by relatively uniform dark rust-brown breast, compared to the paler two-tone breast and belly of latter (Hayward & Hayward 1993).

Status:

GLOBAL RANK: G5	STATE RANK: S2
FED. LEGAL STATUS:	STATE LEGAL STATUS:
FED. AGENCY STATUS: FS	

Habitat:

MINIMUM ELEV: 9000
MAXIMUM ELEV: 10500

HABITAT COMMENTS:
Mature spruce-fir or spruce-fir/lodgepole pine forest interspersed with meadows (Palmer 1984), (Ryder et al. 1987). Natural nest sites always found in mature or older forests; mature spruce-fir forests important foraging habitat, especially in winter since uncrusted snow conditions allow access to prey; same foraging habitat in summer presumably due to greater access to prey on sparsley covered forest floors; immediately following spring thaw, will shift to openings where densitities of voles are higher than in forest and herbaceous forbs have not yet formed a dense cover (Hayward and Hayward 1993).

GLOBAL REPRODUCTIVE HABITAT COMMENTS:
Female may occupy the nest cavity 1-3 weeks prior to egg laying (Hayward 1989). In Colorado, nests were initiated from mid-April to early June; mid-April to late May in Idaho (Hayward 1989). Clutch size usually is 4-6. Incubation reported as 25-36 days, by female. Young fledge at about 4-5 weeks, independent at 5-6 weeks, sexually mature by 1 year. Mating system variable. See Johnsgard (1988).

Distribution:
GLOBAL RANGE:

STATE RANGE: Year-round resident in higher mountains throughout most of the state. Confirmed breeding at Cameron Pass and Deadman Mountain Lookout, Larimer County and Rocky Mountain Biological Lab, Gunnison County. No records for Pikes Peak, Spanish Peaks, Rampart Range, Culebra, or Sangre de Cristo Mtns. Not confirmed in Wet Mountains (Andrews & Righter 1992).

COUNTY NAME:	REFERENCE:
Larimer	Andrews and R 1992
Gunnison	
Routt	
Jackson	
Grand	
Boulder	
Gilpin	
Clear Creek	
Jefferson	
Summit	
Eagle	
Park	
Pitkin	
Chaffee	
Mesa	
Delta	
Hinsdale	
Mineral	
Conejos	
Huerfano	

Phenology:

JANA: P	APRA: R	JULA: R	OCTA: P
JANB: P	APRB: R	JULB: R	OCTB: P
FEBA: P	MAYA: R	AUGA: R	NOVA: P
FEBB: P	MAYB: R	AUGB: R	NOVB: P
MARA: P	JUNA: R	SEPA: R	DECA: P
MARB: P	JUNB: R	SEPB: R	DECB: P

"P" = Present (resident populations or regular migrants).
"A" = Present and active (eg. not hibernating).
"R" = Present, active and reproducing.
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Fish = spawning; Amphibians = breeding through egg hatching;
Reptiles = mating and egg laying through hatching;
Birds = earliest nest building/egg laying through fledging
Mammals = breeding, and birth through independence from a nest/den site or from lactation, whichever comes first

PHENOLOGY COMMENTS:

GLOBAL PHENOLOGY COMMENTS:
May forage day or night; most hunting occurs at night (Hayward 1989).

SREPROCOM:

Management:
MANAGEMENT COMMENTS:

References:

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DATA PROVIDED BY THE COLORADO NATURAL HERITAGE PROGRAM;
CURRENT TO DEC 1995

Vertebrate Characterization Abstract for Colorado

ARDEA HERODIAS
GREAT BLUE HERON

Taxonomy:

TAXCLASS: AVES ORDER: CICONIIFORMES
FAMILY: ARDEIDAE GENUS: ARDEA

GLOBAL TAXONOMIC COMMENTS:
Includes great white heron, formerly considered a distinct species, A. OCCIDENTALIS. Some authors consider A. HERODIAS, A. CINEREA, and A. COCOI conspecific. (AOU 1983)

TAXONOMIC COMMENTS:
63 species in the family, 15 species in north america. Only species in genus in north america(a. Occidentalis now considered subspecies) at least one other in genus in the old world.

Status:

GLOBAL RANK: G5 STATE RANK: S3B,SZN
FED. LEGAL STATUS: STATE LEGAL STATUS:
FED. AGENCY STATUS:

GLOBAL STATUS COMMENTS:
Populations generally are stable or increasing in most areas. See Spendelow and Patton (1988) for status of coastal U.S. breeding populations.

Habitat:

MINIMUM ELEV:
MAXIMUM ELEV:

HABITAT COMMENTS:
None listed

GLOBAL REPRODUCTIVE HABITAT COMMENTS:
Clutch size 3-7, averages larger in north than in south. Incubation 25-29 days, by both sexes. Both parents tend young, which leave nest in 60-90 days. May breed at 2 years. Nests usually in colonies, a few pairs to 100s; sometimes solitary.

Distribution:

GLOBAL RANGE:BREEDS: southeastern Alaska and southern Canada to southern Mexico, Greater Antilles, Virgin Islands (St. Thomas and Anegada), islands off coastal Venezuela, and on Galapagos. NORTHERN WINTER: southeastern Alaska, central U.S., and southern New England south to northern South America (mainly to northern Colombia, northern Venezuela). In the U.S. in winter, the highest densities occur along the lower Colorado River, around the Great Salt Lake, and near Aransas National Wildlife Refuge on the Texas coast (Root 1988). Wanders

widely outside usual range, a few times to Hawaii. Some subadults may spend summer in nonbreeding range.

STATE RANGE: Colonies scattered throughout the state. Some winter here, most others return mid feb.-march and leave in october.

COUNTY NAME:	REFERENCE:
Adams	
Boulder	
Douglas	
Eagle	
Garfield	
Grand	
Jackson	
Kit Carson	
Larimer	
Logan	
Mesa	
Moffat	
Prowers	
Rio Blanco	
Routt	
Washington	
Weld	
Yuma	

Phenology:

JANA:	APRA: P	JULA:	OCTA:
JANB:	APRB: P	JULB:	OCTB:
FEBA:	MAYA: P	AUGA:	NOVA:
FEBB:	MAYB:	AUGB:	NOVB:
MARA: P	JUNA:	SEPA:	DECA:
MARB: P	JUNB:	SEPB:	DECB:

"P" = Present (resident populations or regular migrants).
"A" = Present and active (eg. not hibernating).
"R" = Present, active and reproducing.
"Reproducing" is defined as follows:
Fish = spawning; Amphibians = breeding through egg hatching;
Reptiles = mating and egg laying through hatching;
Birds = earliest nest building/egg laying through fledging
Mammals = breeding, and birth through independence from a nest/den site or from lactation, whichever comes first

PHENOLOGY COMMENTS:
March -may, lays 3-7 usually pale blue green eggs. Incubated by both sexes 28 days. Turns the eggs every 2 hours. Both parents feed nestlings, regurgitating food into mouths when young, then into nest. Usually leaves nest 2-3 months after hatching(terres). Usually lay eggs at end of april in colorado.(bailey+neidrach).

GLOBAL PHENOLOGY COMMENTS:
Generally tends to be mainly crepuscular but also is active in daytime and at night. In coastal region, activity often is related to the tidal cycle, independent of day-night cycle in some areas (Powell 1987). Nocturnal foraging activity occurs in nontidal situations as well as in tidal

environments (McNeil et al. 1993).

SREPROCOM:

Management:

MANAGEMENT COMMENTS:

Undisturbed cottenwood areas for nesting, adequate food supply and perpetuation of cottenwood areas by maintaining waterflow. Colonies are long established and utilized year after year, as long as there is no disturbance of site. Cutting of cottonwoods, altering water use(therefore changing food supply and perpetuation of cottonwoods) detrimental.

GLOBAL MANAGEMENT COMMENTS:

In Illinois, a public viewing area used once a week by humans 229 m from a rookery did not cause any overt responses from nesting birds (DeMauro 1993). See Vos (1984) for information on response to human disturbance in Colorado.

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Vertebrate Characterization Abstract for Colorado

FALCO PEREGRINUS ANATUM
AMERICAN PEREGRINE FALCON

Taxonomy:

TAXCLASS: AVES ORDER: FALCONIFORMES
FAMILY: FALCONIDAE GENUS: FALCO

TAXONOMIC COMMENTS:
Medium-sized hawk with long, pointed wings and long tail. Rapid, shallow wing beats. Adult is slate gray above, wing and tail feathers and flanks barred with black. Throat white. Below white and reddish buffy, extensively spotted and barred with black. Legs and feet yellow.

Status:

GLOBAL RANK: G4T4 STATE RANK: S2B,SZN
FED. LEGAL STATUS: LE STATE LEGAL STATUS: T
FED. AGENCY STATUS:

GLOBAL STATUS COMMENTS:
USFWS (Federal Register, 30 June 1995) proposed removing this subspecies from the list of endangered and threatened wildlife; also propsoed was the removal of the similarity of appearance provision that currently exists for all free-flying FALCO PEREGRINUS within the coterminous U.S.

Habitat:

MINIMUM ELEV: 3500
MAXIMUM ELEV: 11500

HABITAT COMMENTS:
Nests on cliffs and forages over adjacent coniferous and riparian forests, sometimes other habitats (Andrews and Righter 1992).

GLOBAL REPRODUCTIVE HABITAT COMMENTS:
See files for FALCO PEREGRINUS.

Distribution:

GLOBAL RANGE:

STATE RANGE: Summer resident in foothills and lower mountains; in 1991 there were 58 active nest sites: 42 on Western Slope, 16 on Eastern Slope, and increasing (Andrews and Righter 1992).

COUNTY NAME:	REFERENCE:
Baca	Andrews and R 1992
Otero	
Larimer	
Boulder	
Jefferson	

Douglas
Park
Teller
El Paso
Fremont
Pueblo
Custer
Saguache
Chaffee
Gunnison
Eagle
Grand
Jackson
Routt
Garfield
Moffat
Mesa
Delta
Montrose
San Miguel
Ouray
Hinsdale
Mineral
Rio Grande
Conejos
Archuleta
La Plata
Montezuma
Dolores
San Juan

Phenology:

JANA: P	APRA: P	JULA: R	OCTA: P
JANB: P	APRB: R	JULB: R	OCTB: P
FEBA: P	MAYA: R	AUGA: P	NOVA: P
FEBB: P	MAYB: R	AUGB: P	NOVB: P
MARA: P	JUNA: R	SEPA: P	DECA: P
MARB: P	JUNB: R	SEPB: P	DECB: P

"P" = Present (resident populations or regular migrants).
"A" = Present and active (eg. not hibernating).
"R" = Present, active and reproducing.
"Reproducing" is defined as follows:
Fish = spawning; Amphibians = breeding through egg hatching;
Reptiles = mating and egg laying through hatching;
Birds = earliest nest building/egg laying through fledging
Mammals = breeding, and birth through independence from a nest/den site or from lactation, whichever comes first

PHENOLOGY COMMENTS:
Breeding dates 21 April - 31 July; locally breeding race is nesting before tundrius race has migrated through (Nelson 1993).

GLOBAL PHENOLOGY COMMENTS:
See files for FALCO PEREGRINUS.

SREPROCOM:

Management:
MANAGEMENT COMMENTS:

References:

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Vertebrate Characterization Abstract for Colorado

TYMPANUCHUS PHASIANELLUS COLUMBIANUS
COLUMBIAN SHARP-TAILED GROUSE

Taxonomy:

TAXCLASS:	AVES	ORDER:	GALLIFORMES
FAMILY:	PHASIANIDAE	GENUS:	TYMPANUCHUS

TAXONOMIC COMMENTS:
Both sub-species occur in Colorado.

TAXONOMIC COMMENTS:
In the prairie brushland, [...] a pale grouse with a short, pointed tale. In flight the tail appears white (Peterson 1947).

Status:

GLOBAL RANK: G5T3 STATE RANK: S2
FED. LEGAL STATUS: STATE LEGAL STATUS:
FED. AGENCY STATUS: FS

Habitat:

MINIMUM ELEV: 6000
MAXIMUM ELEV: 9500

HABITAT COMMENTS:
Gambel oak and serviceberry shrublands, often interspersed with sagebrush shrublands, aspen forests, wheatfields, or irrigated meadows and alfalfa fields. Display grounds on knolls and ridges (Andrews and Righter 1992).

REPRODUCTIVE HABITAT COMMENTS:
Nest usually concealed under grass or under shrub; shallow depression lined with grass, leaves, ferns, etc. 10-14 eggs average (5-17 occasionally), promiscuous mating system. Female incubates, incubation takes 21-24 days. Courtship "dancing" occurs April-May. Males occupy lek usually on small knoll; male inflates sacs on sides of neck, with tail erect and wings droped, then rapidly drops head and deflates sacs with a weak "coo". Jumping displays follow ().

Distribution:
GLOBAL RANGE:

STATE RANGE: Uncommon local resident in Routt and eastern Moffat counties with small populations south to Montezuma County (Andrews and 1992). Declined due to habitat changes since the turn of the century; many areas within the historical range are unoccupied or have low densities (Braun, et al., 1991).

COUNTY NAME:	REFERENCE:
Routt	Andrews and R 1992

Moffat
Montezuma
Mesa
San Miguel
Rio Blanco
Garfield
Delta
Montrose
Ouray
Dolores
Archuleta

Phenology:

JANA: P	APRA: R	JULA: R	OCTA: P
JANB: P	APRB: R	JULB: R	OCTB: P
FEBA: P	MAYA: R	AUGA: R	NOVA: P
FEBB: P	MAYB: R	AUGB: R	NOVB: P
MARA: R	JUNA: R	SEPA: P	DECA: P
MARB: R	JUNB: R	SEPB: P	DECB: P

"P" = Present (resident populations or regular migrants).
"A" = Present and active (eg. not hibernating).
"R" = Present, active and reproducing.
"Reproducing" is defined as follows:
Fish = spawning; Amphibians = breeding through egg hatching;
Reptiles = mating and egg laying through hatching;
Birds = earliest nest building/egg laying through fledging
Mammals = breeding, and birth through independence from a nest/den site or from lactation, whichever comes first

PHENOLOGY COMMENTS:
Great concentrations occur at display grounds in spring (Andrews and 1992).

SREPROCOM: Nest usually concealed under grass or under shrub; shallow depression lined with grass, leaves, ferns, etc. 10-14 eggs average (5-17 occasionally), promiscuous mating system. Female incubates, incubation takes 21-24 days. Courtship "dancing" occurs April-May. Males occupy lek usually on small knoll; male inflates sacs on sides of neck, with tail erect and wings droped, then rapidly drops head and deflates sacs with a weak "coo". Jumping displays follow ().

Management:

MANAGEMENT COMMENTS:
Jeopardized by overgrazing and conversion of native grasses to agriculture (Wheye 1992).

GLOBAL MANAGEMENT COMMENTS:
Transplants have been made from Canada to Dancing Prairie, Montana (Spomer 1987).

References:

ABBREVIATED CITATION: FULL CITATION:

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DATA PROVIDED BY THE COLORADO NATURAL HERITAGE PROGRAM;
CURRENT TO DEC 1995

Vertebrate Characterization Abstract for Colorado

GRUS CANADENSIS TABIDA
GREATER SANDHILL CRANE

Taxonomy:

TAXCLASS: AVES ORDER: GRUIFORMES
FAMILY: GRUIDAE GENUS: GRUS

TAXONOMIC COMMENTS:
Subspecies tabida is the only one to breed in Colorado, but it is difficult to distinguish subspecies. Canadensis also occurs in Colorado during migrations.

TAXONOMIC COMMENTS:
Distinguished from Whooping Crane (Grus americana) by smaller size and uniform gray coloration (Tacha, et al. 1992). Grus species do not perch (Tacha, et al. 1992).

Status:

GLOBAL RANK: G5T4 STATE RANK: S2B,S4N
FED. LEGAL STATUS: STATE LEGAL STATUS: T
FED. AGENCY STATUS: FS

Habitat:

MINIMUM ELEV: 7500
MAXIMUM ELEV: 8500

HABITAT COMMENTS:
Breeding birds are found in parks with grassy hummocks and watercourses, beaver ponds, and natural ponds lined with willows or aspens (Ellis and Haskins 1985). Migrants occur on mudflats around reservoirs, in moist meadows and in agricultural areas (Andrews and R 1992).

GLOBAL REPRODUCTIVE HABITAT COMMENTS:
Nests with eggs occur in April in mid-U.S. Clutch size usually 2. Incubation, by both sexes, lasts 28-30 days. Young are tended by both parents, begin flying at about 2 months, remain with parents until following year. Usually renests if clutch is lost or abandoned. Usually only one chick survives to fledging. May pair as early as age 3 years, but more commonly at 5-6 years; in mid-continental North America, most recruitment is by cranes older than 7 years.

Distribution:

GLOBAL RANGE:

STATE RANGE: Rare summer resident in the parks of the Elkhead Mtns. and Park Range in eastern Moffat, northern Routt, and western Jackson Counties, and a few south to NE Rio Blanco and NW Grand Counties. Also nests at Meeker, Rio Blanco County (Andrews and Righter 1992). Nested sparingly throughout the mountains of western Colorado south to La Plata County as

late as 1905 (Bailey and J 1965). Nonbreeders very rarely summer in the San Luis Valley (Ryder 1965).

COUNTY NAME:	REFERENCE:
Moffat	Andrews and R 1992
Routt	
Jackson	
Rio Blanco	
Grand	
Summit	
Mesa	
Gunnison	
Montrose	
Hinsdale	
La Plata	
Rio Grande	

Phenology:

JANA: P	APRA: P	JULA: R	OCTA: P
JANB: P	APRB: P	JULB: R	OCTB: P
FEBA: P	MAYA: R	AUGA: P	NOVA: P
FEBB: P	MAYB: R	AUGB: P	NOVB: P
MARA: P	JUNA: R	SEPA: P	DECA: P
MARB: P	JUNB: R	SEPB: P	DECB: P

"P" = Present (resident populations or regular migrants).
"A" = Present and active (eg. not hibernating).
"R" = Present, active and reproducing.
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Reptiles = mating and egg laying through hatching;
Birds = earliest nest building/egg laying through fledging
Mammals = breeding, and birth through independence from a nest/den site or from lactation, whichever comes first

PHENOLOGY COMMENTS:
Breeding dates from Nelson 1993.

GLOBAL PHENOLOGY COMMENTS:
In the Platte River area, flights from roosts occur primarily shortly after sunrise; often returns to roost site around sunset (Johnsgard 1983).

SREPROCOM:

Management:

MANAGEMENT COMMENTS:

Low annual recruitment rates limit ability of G. canadensis to recover from population declines (Tacha, et al. 1992). Primary conservation need of this species is the maintenance of essential habitats; wetland conservation is especially important in staging areas (Tacha, et al. 1992). Low recruitment rates also emphasize the need for careful management of the mid-continent population that is hunted, mostly by pass shooting, occasionally over decoys (Tacha, et al. 1992).

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Vertebrate Characterization Abstract for Colorado

HALIAEETUS LEUCOCEPHALUS
BALD EAGLE

Taxonomy:

TAXCLASS: AVES ORDER: FALCONIFORMES
FAMILY: ACCIPITRIDAE GENUS: HALIAEETUS

GLOBAL TAXONOMIC COMMENTS:
The two subspecies, H. L. LEUCOCEPHALUS (southern U.S. and Baja California) and H. L. ALASCANUS (northern U.S. and Canada) intergrade broadly in the central and northern U.S. Federal status is categorized by state/region, rather than by subspecies.

TAXONOMIC COMMENTS:
White head and white tail. The immature bird has a dusky head and tail, and usually shows some white in the wings and tail (Peterson 1947).

Status:

GLOBAL RANK: G4 STATE RANK: S1B,S3N
FED. LEGAL STATUS: LT STATE LEGAL STATUS: T
FED. AGENCY STATUS:

GLOBAL STATUS COMMENTS:
Listed as Threatened in the coterminous U.S.; not federally classified as Endangered anywhere as of mid-1995 (USFWS, Federal Register, 12 July 1995).

Habitat:

MINIMUM ELEV: 3500
MAXIMUM ELEV: 8000

HABITAT COMMENTS:
Rivers and reservoirs. In winter, may also occur locally in semideserts and grasslands, especially near prairie dog towns (Andrews and Righter 1992).

REPRODUCTIVE HABITAT COMMENTS:
Nest often in fork of tall tree; of large sticks, vegetation, deeply lined with fine materials. Cliff nests range from minimal sticks to massive structure. Occasionally more than 1 nest. Perennial, known to use nest for longer than 35 years. 2 eggs, monogamous bond. Both sexes incubate, incubation takes 31-32 days, development is semialtricial, young fly in 34 days, both sexes tend young ().

GLOBAL REPRODUCTIVE HABITAT COMMENTS:
Clutch size is 1-3 (usually 2). Incubation lasts about 5 weeks, by both sexes. Second hatched young often dies. Young first fly at 10-12.5 weeks, cared for by adults and may remain around nest for several weeks after fledging. Generally first breeds at about 5-6 years. Adults may not

lay every year.

Distribution:
GLOBAL RANGE:

STATE RANGE: Rare local summer resident very locally. At least 10 breeding pairs statewide. Uncommon to locally common winter resident in western valleys, in mountain parks, and on eastern plains. Casual nonbreeder on eastern plains. Historical breeding record from Arkansas River in Bent County in 1897 (Andrews and 1992). Increasing in Colorado (Nelson 1993).

COUNTY NAME:	REFERENCE:
Alamosa	Andrews and R 1992
Conejos	
Weld	
Adams	
Grand	
Logan	
Moffat	
Morgan	
Rio Blanco	
Garfield	
Rio Grande	
Routt	
Saguache	
Summit	
Mesa	
Gunnison	
Bent	
Montezuma	
La Plata	
Archuleta	
Sedgwick	
Washington	
Yuma	

Phenology:

JANA: P	APRA: R	JULA: R	OCTA: P
JANB: P	APRB: R	JULB: R	OCTB: P
FEBA: P	MAYA: R	AUGA: R	NOVA: P
FEBB: R	MAYB: R	AUGB: P	NOVB: P
MARA: R	JUNA: R	SEPA: P	DECA: P
MARB: R	JUNB: R	SEPB: P	DECB: P

"P" = Present (resident populations or regular migrants).
"A" = Present and active (eg. not hibernating).
"R" = Present, active and reproducing.
"Reproducing" is defined as follows:
Fish = spawning; Amphibians = breeding through egg hatching;
Reptiles = mating and egg laying through hatching;
Birds = earliest nest building/egg laying through fledging
Mammals = breeding, and birth through independence from a nest/den site or from lactation, whichever comes first
PHENOLOGY COMMENTS:

Locals incubating or even feeding young before last migrants pass through (Nelson 1993).

GLOBAL PHENOLOGY COMMENTS:
In the Columbia River estuary, foraging activity was most common at low tide and first daylight (Watson et al. 1991).

SREPROCOM: Nest often in fork of tall tree; of large sticks, vegetation, deeply lined with fine materials. Cliff nests range from minimal sticks to massive structure. Occasionally more than 1 nest. Perennial, known to use nest for longer than 35 years. 2 eggs, monogamous bond. Both sexes incubate, incubation takes 31-32 days, development is semialtricial, young fly in 34 days, both sexes tend young ().

Management:
MANAGEMENT COMMENTS:
Breeding range expanding possibly due to tree planting and erosion control. (). Widespread (national) efforts to protect and restore breeding populations have been generally successful (Wheye 1992).

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DATA PROVIDED BY THE COLORADO NATURAL HERITAGE PROGRAM;
CURRENT TO DEC 1995

Vertebrate Characterization Abstract for Colorado

PANDION HALIAETUS
OSPREY

Taxonomy:

TAXCLASS:	AVES	ORDER:	FALCONIFORMES
FAMILY:	ACCIPITRIDAE	GENUS:	PANDION

TAXONOMIC COMMENTS:
Blackish above and clear white below, only large bird of prey so patterned. Head largely white, suggestive of bald eagle, but has a black patch through cheeks (Peterson 1947).

Status:

GLOBAL RANK: G5 STATE RANK: S1B,SZN
FED. LEGAL STATUS: STATE LEGAL STATUS:
FED. AGENCY STATUS: FS

Habitat:

MINIMUM ELEV: 3500
MAXIMUM ELEV: 10000

HABITAT COMMENTS:
Breeds at reservoirs and large lakes (Andrews and R 1992).

REPRODUCTIVE HABITAT COMMENTS:
Nest in deciduous or coniferous tree (dead or alive), near or over water, also atop pole. Of sticks, sod, cowdung, rubbish. 3 eggs (2-4), monogamous bond (Ehrlich 1988).

GLOBAL REPRODUCTIVE HABITAT COMMENTS:
Nests may contain eggs in winter and early spring in Florida and Mexico, mainly in mid- to late spring in temperate regions of the U.S. and Canada. Clutch size is 1-4 (most often 3). Incubation lasts 4.5-5.5 weeks, usually mainly by female; male provides food. Young first fly at 44-59 days, dependent on parents for up to 6 weeks or more (less in north). First breeds usually at 3 years, sometimes at 4-5 years. Delays in clutch initiation, such as caused when Canada geese occupy nest sites, may cause a reduction in reproductive output (Steeger and Ydenberg, 1993, Can. J. Zool. 71:2141-2146). Number of young fledged increases with increased abundance of food resources. Large numbers may nest in a relatively small area when food resources are adequate and nesting sites are plentiful.

Distribution:
GLOBAL RANGE:

STATE RANGE: Rare to uncommon local summer resident in mountains and mountain parks; the largest concentration of nest sites are at the reservoirs of eastern Grand County. Many observations in the mountains and mountain parks are apparently of nonbreeders. Casual nonbreeder on eastern plains with two

possible breeding records. Spring/fall migrant in the western valleys, mountains, mountain parks, and on eastern plains. Accidental above timberline. There are some winter records, but they lack documentation to distinguish the birds from immature Bald Eagles (Andrews and Righter 1992).

COUNTY NAME:	REFERENCE:
Grand	Andrews and R 1992
Larimer	
Jackson	
Routt	
Pitkin	
Lake	
Gunnison	
La Plata	
Saguache	
Alamosa	
Pueblo	
Yuma	
Mesa	
Rio Blanco	

Phenology:

JANA:	APRA: P	JULA: R	OCTA: P
JANB:	APRB: P	JULB: R	OCTB: P
FEBA:	MAYA: P	AUGA: R	NOVA:
FEBB:	MAYB: R	AUGB: R	NOVB:
MARA: P	JUNA: R	SEPA: P	DECA:
MARB: P	JUNB: R	SEPB: P	DECB:

"P" = Present (resident populations or regular migrants).
"A" = Present and active (eg. not hibernating).
"R" = Present, active and reproducing.
"Reproducing" is defined as follows:
Fish = spawning; Amphibians = breeding through egg hatching;
Reptiles = mating and egg laying through hatching;
Birds = earliest nest building/egg laying through fledging
Mammals = breeding, and birth through independence from a nest/den site or from lactation, whichever comes first

PHENOLOGY COMMENTS:
Breeding dates are 21 May - 20 August (Nelson 1993).

SREPROCOM: Nest in deciduous or coniferous tree (dead or alive), near or over water, also atop pole. Of sticks, sod, cowdung, rubbish. 3 eggs (2-4), monogamous bond (Ehrlich 1988).

Management:

MANAGEMENT COMMENTS:
Populations have been shown to recover after the ban on DDT and the introduction of conservation programs that provided artificial nesting platforms (Wheye 1992).

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DATA PROVIDED BY THE COLORADO NATURAL HERITAGE PROGRAM;
CURRENT TO DEC 1995

Vertebrate Characterization Abstract for Colorado

PROGNE SUBIS
PURPLE MARTIN

Taxonomy:

TAXCLASS:	AVES	ORDER:	PASSERIFORMES
FAMILY:	HIRUNDINIDAE	GENUS:	PROGNE

GLOBAL TAXONOMIC COMMENTS:

Species limits in this complex are uncertain. Some authors treat P. SUBIS, P. CRYPTOLEUCA, P. DOMINICENSIS, P. SINALOAE, and P. CHALYBEA as conspecific (B83COM01NA). See Sheldon and Winkler (1993) for information on intergeneric phylogenetic relationships of Hirundininae based on DNA-DNA hybridization.

TAXONOMIC COMMENTS:

The largest swallow. Male is uniformly blue-black above and below. The female is light bellied (Peterson 1947).

Status:

GLOBAL RANK: G5 STATE RANK: S3B
FED. LEGAL STATUS: STATE LEGAL STATUS:
FED. AGENCY STATUS: FS

GLOBAL STATUS COMMENTS:

Breeding Bird Survey data indicate a significant population increase in central North America, 1966-1988, and a significant population increase in western North America, 1978-1988 (Sauer and Droege 1992). Western population may be decreasing due to starling competition for nest sites; house sparrows also may take over martin nest cavities. Populations have augmented by provision of nest boxes in some areas.

Habitat:

MINIMUM ELEV: 3500
MAXIMUM ELEV: 10000

HABITAT COMMENTS:

Breeds in loose colonies in old-growth aspen forests near parks and generally near water (Reynolds et al. 1991), and sometimes also seen in mixed aspen/Ponderosa pine or aspen/Douglas-fir forests. In some areas nests in dead trees near or standing in reservoirs (Andrews and Righter 1992).

GLOBAL REPRODUCTIVE HABITAT COMMENTS:

In southern Arizona, eggs are laid in July (Stutchbury 1991). Mating system involves monogamous pairing with extrapair fertilizations by older males. Clutch size is 3-8 (usually 4-5). Incubation lasts 15-16 days, by female. Male guards nest when females goes off to feed. Young are tended by both adults, leave nest 24-28 days after hatching (Harrison 1978), return to nest to roost for a few days

after fledging. Usually 1, sometimes 2 broods per season (also reported as only 1 nesting per year). Depending on the location, a few or many of the breeding males are one-year-olds. Most individuals breed for 2-3 seasons. Usually nests in colonies in east and midwest. In natural sites, breeds in single pairs or small groups.

Distribution:

GLOBAL RANGE: BREEDS: west of Cascades and Sierra Nevada from southwestern British Columbia south to northwestern Mexico and Arizona; east of Rocky Mountains from northeastern British Columbia, central Alberta, east through northern Minnesota, northern Wisconsin, southern Ontario, to Nova Scotia, south to Gulf coast and southern Florida. WINTERS: locally from northern South America south to northern Bolivia, northern Argentina, and southern Brazil, east of Andes; apparently mainly in southern Brazil (Hilty and Brown 1986, Stiles and Skutch 1989, Ridgely and Tudor 1989).

STATE RANGE: Common summer resident in lower mountains of northeast Mesa, northeast Delta, and northwest Gunnison counties. Rare to uncommon north to southeast Moffat and northern Routt County, east to Pitkin County, south to Montezuma, La Plata, and southwest Archuleta County. Accidental in east slope mountains and on eastern plains (Andrews and Righter 1992). Local in aspen woodlands, found [breeding] only in western Colorado (Nelson 1993).

COUNTY NAME:	REFERENCE:
Clear Creek	Andrews and R 1992
Routt	
Moffat	
Rio Blanco	
Garfield	
Eagle	
Boulder	
Morgan	
Pitkin	
Mesa	
Delta	
Gunnison	
Ouray	
San Miguel	
Dolores	
Montezuma	
La Plata	
Archuleta	
Saguache	
Alamosa	
Costilla	
Las Animas	

Phenology:

JANA:	APRA:	JULA: R	OCTA:
JANB:	APRB: P	JULB: R	OCTB:
FEBA:	MAYA: P	AUGA: P	NOVA:

FEBB:	MAYB: P	AUGB: P	NOVB:
MARA:	JUNA: R	SEPA: P	DECA:
MARB: P	JUNB: R	SEPB: P	DECB:

"P" = Present (resident populations or regular migrants).
"A" = Present and active (eg. not hibernating).
"R" = Present, active and reproducing.
"Reproducing" is defined as follows:
Fish = spawning; Amphibians = breeding through egg hatching;
Reptiles = mating and egg laying through hatching;
Birds = earliest nest building/egg laying through fledging
Mammals = breeding, and birth through independence from a nest/den site or from lactation, whichever comes first

PHENOLOGY COMMENTS:
Breeding dates 1 June - 31 July (Nelson 1993).

SREPROCOM:

Management:

MANAGEMENT COMMENTS:
Nesting is usually in bird boxes (Johnsgard 1979). Standing, dead trees, which are sometimes eliminated due to forestry practices, are essential to the Purple Martin (Wheye 1992). Competition with exotic birds is also thought to impact this species (Ellingson, A. pers. comm.)

GLOBAL MANAGEMENT COMMENTS:
See Mitchell (1988) for specifications for the construction and placement of nest boxes. See Bowditch (1990) for a description of predator guards (hardware cloth and PVC pipe) that deter crow and owl predation at martin houses. See Ginaven (1990) for information on using decoys to attract martins. The Purple Martin Conservation Association is co-sponsor of a program to locate, register, and monitor all North American breeding colonies.

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Allen and M 1952	Allen, R. P. and M. M. Nice. 1952. A Study of the Breeding Biology of the Purple Martin (Progne subis). Amer. Midland- Nat. 47(3):606-65.
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Peterson 1947	Peterson, R. T. 1947. A Field Guide to the Birds. Houghton Mifflin Company, Boston. 230 pp.
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DATA PROVIDED BY THE COLORADO NATURAL HERITAGE PROGRAM;
CURRENT TO DEC 1995

Invertebrate Characterization Abstract for Colorado

LYCAENA EDITHA
EDITH'S COPPER

Taxonomy:

TAXCLASS:	INSECTA	ORDER:	LEPIDOPTERA
FAMILY:	LYCAENIDAE	GENUS:	LYCAENA

GLOBAL TAXONOMIC COMMENTS:
Closely related to L. XANTHOIDES.

TAXONOMIC COMMENTS:
Montana- Wyoming, west Montana, northwest Colorado, Northern Utah, Idaho (smaller and more heavily marked) (Ferris and M 1981).

IDENTIFICATION COMMENTS:
Large brownish blotches on ventral hind wing; front wing 1.4-1.7 cm (Ferris and M 1981). Eggs pale-green, becoming white; pupa pink-tan no tail, many spots at underside of hind wing base, male uniformly grey on upperside, female grey with cream to orange upperside of forewing spots (Scott 1986).

Status:

GLOBAL RANK: G5 STATE RANK: S2S3
FED. LEGAL STATUS: STATE LEGAL STATUS:
FED. AGENCY STATUS:

Habitat:

MINIMUM ELEV:
MAXIMUM ELEV:

HABITAT COMMENTS:
Moist upland meadows (Ferris and Brown 1981). Mountain meadows, water courses, forest openings, roadsides (Pyle 1981).

REPRODUCTIVE HABITAT COMMENTS:
Eggs laid singly at or near base of host, no nests, eggs hibernate.

Distribution:

GLOBAL RANGE: SW Alberta south through mountains, including Rockies, and through Great Basin to Nevada and Colorado; east to Montana.

COUNTY NAME:	COUNTY STATUS	REFERENCE:
Moffat	Confirmed	
Routt	Confirmed	
Jackson	Confirmed	
Grand	Confirmed	
Gilpin	Confirmed	
Garfield	Confirmed	
Larimer	Confirmed	

STATE RANGE:

MOBILITY COMMENTS:
Male perch all day in low spots to await female.

Phenology:

JANA:	APRA:	JULA: R	OCTA:
JANB:	APRB:	JULB: R	OCTB:
FEBA:	MAYA:	AUGA: R	NOVA:
FEBB:	MAYB:	AUGB: R	NOVB:
MARA:	JUNA:	SEPA:	DECA:
MARB:	JUNB: R	SEPB:	DECB:

"P" = Adults or larvae present but mostly inactive (eg in diapause).
"A" = Adults present and active (eg. not in diapause), but not reproducing.
"R" = Adults present, active and reproducing.
"L" = Larvae present and active (eg. feeding and not in diapause).
"E" = Eggs present outside of the parent.
"U" = Pupae or prepupae present.

PHENOLOGY COMMENTS:
One brood: late June-August (Ferris and M 1981).

Selected Life History Traits:

REPRODUCTIVE COMMENTS:
Eggs laid singly at or near base of host, no nests, eggs hibernate.

FOOD COMMENTS:
Avid flower visitor. Larva feed on Potentilla or Ivesia (Ferris and M 1981). Host plants: Horkelia fusia, tenuiloba, Rumex, Potentilla. Adults frequently take nectar from dogbane tyanow (Pyle 1981).

ECOLOGY COMMENTS:
Adults may be abundant where found (Ferris and M 1981).

Known Threats and Management Issues::

References:

ABBREVIATED CITATION:	FULL CITATION:
Ferris and M 1981	Ferris, Clifford and F. M. Brown. 1981. Butterflies of the Rocky Mountain States. University of Oklahoma Press, Norman. 442 pp.
Pyle 1981	Pyle, Robert Michael. 1981. The Audubon Society

Field Guide to North American Butterflies. Alfred A. Knopf, Inc., New York. 915 pp.

Scott 1986 — Scott, James A. 1986. The Butterflies of North America: A Natural History and Field Guide. Stanford University Press, Stanford, California.

Stanford and A 1993 — Stanford, Ray E. and Paul A. Opler. 1993. Atlas of Western USA Butterflies. Denver and Fort Collins, Colorado. 275 pp.

DATA PROVIDED BY THE COLORADO NATURAL HERITAGE PROGRAM;
CURRENT TO DEC 1995

Invertebrate Characterization Abstract for Colorado

SPEYERIA EGLEIS
EGLEIS FRITILLARY

Taxonomy:

TAXCLASS:	INSECTA	ORDER:	LEPIDOPTERA
FAMILY:	NYMPHALIDAE	GENUS:	SPEYERIA

TAXONOMIC COMMENTS:
S.E. Secreta: (N.Colorado and S. Wyoming) vhw disc dark brick red-brown with well-defined silver spots (Ferris and Brown 1981); orangish on ups, basal two-thirds on unh red-brown and diffuses considerably over pale unh submarginal band; unh always silvered (Scott 1986).

IDENTIFICATION COMMENTS:
Distinct smoky or hazy appearance dorsally; vhw disc frequently has greenish overtone; spots usually silvered; spots that inwardly cap vhw marginal silver spots are usually gray-greenish; fw 2.3-3.4 cm; larva: dark velvety brown with brows of barbed blackish spines; pupa: tan or brownish with a few markings and "bumps" (Ferris and Brown 1981); eggs: pale yellow, becoming tan (Scott 1986).

Status:

GLOBAL RANK: G5 STATE RANK: S2
FED. LEGAL STATUS: STATE LEGAL STATUS:
FED. AGENCY STATUS:

Habitat:

MINIMUM ELEV:
MAXIMUM ELEV:

HABITAT COMMENTS:
Roadsides, open meadows, stream banks (Ferris and Brown 1981).

REPRODUCTIVE HABITAT COMMENTS:
Oviposition reported on festuca ovina and two species of potentilla; first instar larvae hibernate overwinter; larvae nocturnal; pupae hang freely from cremastral end of host plant (Ferris and Brown 1981); eggs laid singly and haphazardly near viola; no nests (Scott 1986).

Distribution:

GLOBAL RANGE: Oregon east to North Dakota and south to California and Colorado.

COUNTY NAME:	COUNTY STATUS	REFERENCE:
Moffat	Confirmed	Stanford and A 1993
Routt	Confirmed	
Jackson	Confirmed	
Rio Blanco	Confirmed	
Garfield	Confirmed	

Larimer	Possible
Montrose	Possible
Fremont	Possible

STATE RANGE:

N CO to Montana and westward (Ferris and M 1981) NW CO (Stanford and A 1993)

MOBILITY COMMENTS:

Males and occasionally females congregate at puddles and mud; strong, rapid flight (Ferris and Brown 1981); males patrol all day low to ground, along shaded forest lanes in Colorado (Scott 1986).

Phenology:

JANA:	APRA:	JULA: R	OCTA:
JANB:	APRB:	JULB: R	OCTB:
FEBA:	MAYA:	AUGA: R	NOVA:
FEBB:	MAYB:	AUGB:	NOVB:
MARA:	JUNA:	SEPA:	DECA:
MARB:	JUNB: R	SEPB:	DECB:

"P" = Adults or larvae present but mostly inactive (eg in diapause).
"A" = Adults present and active (eg. not in diapause), but not reproducing.
"R" = Adults present, active and reproducing.
"L" = Larvae present and active (eg. feeding and not in diapause).
"E" = Eggs present outside of the parent.
"U" = Pupae or prepupae present.

PHENOLOGY COMMENTS:

1 brood: late June-early August; emergence of adults sometimes staggered so may be found most of summer (Ferris and Brown 1981); late June-mid August (Scott 1986).

Selected Life History Traits:

REPRODUCTIVE COMMENTS:

Oviposition reported on festuca ovina and two species of potentilla; first instar larvae hibernate overwinter; larvae nocturnal; pupae hang freely from cremastral end of host plant (Ferris and Brown 1981); eggs laid singly and haphazardly near viola; no nests (Scott 1986).

FOOD COMMENTS:

Host plants: Viola adunca, Purpurea (and vars. Venosa and integrifolia), nuttallii, walteri; larvea eat learves (Scott 1986); adults avid flower feeders (Ferris and Brown 1981).

Known Threats and Management Issues::

References:

ABBREVIATED CITATION: FULL CITATION:

Ferris and M 1981	Ferris, Clifford and F. M. Brown. 1981. Butterflies of the Rocky Mountain States. University of Oklahoma Press, Norman. 442 pp.
Scott 1986	Scott, James A. 1986. The Butterflies of North America: A Natural History and Field Guide. Stanford University Press, Stanford, California.
Stanford and A 1993	Stanford, Ray E. and Paul A. Opler. 1993. Atlas of Western USA Butterflies. Denver and Fort Collins, Colorado. 275 pp.

DATA PROVIDED BY THE COLORADO NATURAL HERITAGE PROGRAM;
CURRENT TO DEC 1995

Invertebrate Characterization Abstract for Colorado

SPEYERIA HYDASPE
HYDASPE FRITILLARY

Taxonomy:

TAXCLASS: INSECTA ORDER: LEPIDOPTERA
FAMILY: NYMPHALIDAE GENUS: SPEYERIA

TAXONOMIC COMMENTS:
S.h. Conquista: very large vhw discal spots, fw 2.2-3.2 cm (2 old, doubtful co. Records); S.h. Sakuntala (Ferris and M 1981).

IDENTIFICATION COMMENTS:
Disc and adjacent areas of vhw reddish and maroon, with violaceous overscaling in fresh specimens; opaque spots are quadrate (Ferris and M 1981); unh red-brown with lavender tint, pale unh submarginal band is uniformly lightly suffused with this color also, unh large round unsilvered spots, ups wing bases are dark; larva: nearly black, lacking middorsal stripe, dorsal spines black, lateral spines yellow-orange to orange-brown at their bases (Scott 1986).

Status:

GLOBAL RANK: G5 STATE RANK: S2
FED. LEGAL STATUS: STATE LEGAL STATUS:
FED. AGENCY STATUS:

Habitat:

MINIMUM ELEV:
MAXIMUM ELEV:

HABITAT COMMENTS:
Aspen areas, frequents roadsides in forested areas and sunlit glades (Ferris and Brown 1981); moist dense woodlands (Scott 1986).

REPRODUCTIVE HABITAT COMMENTS:
First instar hibernate over winter; larva nocturnal (Ferris and M 1981); eggs laid singly and haphazardly near violets; no nests (Scott 1986).

Distribution:

GLOBAL RANGE: Central British Columbia, S. Alberta south to northern California, central Utah, and northern Colorado.

COUNTY NAME:	COUNTY STATUS	REFERENCE:
Moffat	Confirmed	Stanford and A 1993
Routt	Confirmed	
Jackson	Confirmed	
Garfield	Confirmed	

STATE RANGE:
Rocky Mtns from SE BC to N NM (Ferris and M 1981) NW CO

(Stanford and A 1993)

MOBILITY COMMENTS:
Wary and difficult to approach; strong, rapid flight (Ferris and M 1981).

Phenology:

JANA:	APRA:	JULA: R	OCTA:
JANB:	APRB:	JULB: R	OCTB:
FEBA:	MAYA:	AUGA: R	NOVA:
FEBB:	MAYB:	AUGB: R	NOVB:
MARA:	JUNA:	SEPA: R	DECA:
MARB:	JUNB: R	SEPB:	DECB:

"P" = Adults or larvae present but mostly inactive (eg in diapause).
"A" = Adults present and active (eg. not in diapause), but not reproducing.
"R" = Adults present, active and reproducing.
"L" = Larvae present and active (eg. feeding and not in diapause).
"E" = Eggs present outside of the parent.
"U" = Pupae or prepupae present.

PHENOLOGY COMMENTS:
1 brood: July-August; emergence of adults sometimes staggered so may be found during most of summer (Ferris and M 1981); June-September; adults most common July-August (Scott 1986).

Selected Life History Traits:

REPRODUCTIVE COMMENTS:
First instar hibernate over winter; larva nocturnal (Ferris and M 1981); eggs laid singly and haphazardly near violets; no nests (Scott 1986).

FOOD COMMENTS:
Host plants: viola glabella, orbiculata, nuttallii, purpurea, adunca; larva eat leaves (Scott 1986); adults nectar on various composites expecially those with yellow flowers (Ferris and M 1981).

Known Threats and Management Issues::

References:

ABBREVIATED CITATION: FULL CITATION:

Ferris and M 1981 Ferris, Clifford and F. M. Brown. 1981. Butterflies of the Rocky Mountain States. University of Oklahoma Press, Norman. 442 pp.

Scott 1986 — Scott, James A. 1986. The Butterflies of North America: A Natural History and Field Guide. Stanford University Press, Stanford, California.

Stanford and A 1993 — Stanford, Ray E. and Paul A. Opler. 1993. Atlas of Western USA Butterflies. Denver and Fort Collins, Colorado. 275 pp.

DATA PROVIDED BY THE COLORADO NATURAL HERITAGE PROGRAM;
CURRENT TO DEC 1995

Invertebrate Characterization Abstract for Colorado

VALVATA SINCERA
MOSSY VALVATA

Taxonomy:

TAXCLASS:	GASTROPODA	ORDER:	MESOGASTROPODA
FAMILY:	VALVATIDAE	GENUS:	VALVATA

IDENTIFICATION COMMENTS:
yellowish-brown in color, spire medium, suture well impressed; whorls evenly rounded, regularly increasing in diameter. Aperature circular, umbilicus round and deep. Operculum multispiral, circular and translucent. (Wu 1993).

Status:

GLOBAL RANK: G?
STATE RANK: S3
FED. LEGAL STATUS:
STATE LEGAL STATUS:
FED. AGENCY STATUS:

Habitat:

MINIMUM ELEV:
MAXIMUM ELEV:

HABITAT COMMENTS:
Inhabits high altitude lakes in the western plateau. Chiefly a species of lakes and deep water (Baker 1928). It has been demonstrated that in the northern part of its range it also occurs in small water bodies, as do other presumably cold-stenothermal species (Clarke 1973). At one site, found on a sandy substrate in 5m of water, pH 8.3, total oxygen 10 ppm, free carbon dioxide 1ppm, and alkalinity as CaCO3 (Harman and Berg 1971). Also reported on substrates of mud with or without coarser sediments and on rocks (Clarke 1973). See Wu 1989.

REPRODUCTIVE HABITAT COMMENTS:

Distribution:

COUNTY NAME:	COUNTY STATUS	REFERENCE:
Moffat	Confirmed	Wu 1989
Routt	Confirmed	
Rio Blanco	Confirmed	
La Plata	Confirmed	
San Juan	Confirmed	
Mineral	Confirmed	
Conejos	Confirmed	
Rio Grande	Confirmed	
Fremont	Confirmed	

STATE RANGE:
Inhabits high altitude lakes in the western plateau. Headwaters of the Yampa, White, San Juan and Rio Grande

River drainages. A locality in Wellsville's hot springs might represent an introduced population (Wu 1989).

Phenology:

JANA:	APRA:	JULA:	OCTA:
JANB:	APRB:	JULB:	OCTB:
FEBA:	MAYA:	AUGA:	NOVA:
FEBB:	MAYB:	AUGB:	NOVB:
MARA:	JUNA:	SEPA:	DECA:
MARB:	JUNB:	SEPB:	DECB:

"P" = Adults or larvae present but mostly inactive (eg in diapause).
"A" = Adults present and active (eg. not in diapause), but not reproducing.
"R" = Adults present, active and reproducing.
"L" = Larvae present and active (eg. feeding and not in diapause).
"E" = Eggs present outside of the parent.
"U" = Pupae or prepupae present.

PHENOLOGY COMMENTS:

Selected Life History Traits:

Known Threats and Management Issues::

References:

ABBREVIATED CITATION:	FULL CITATION:
Baker 1928	Baker, F. C. 1928. The Freshwater Mollusca of Wisconsin, Part I, Gastropoda. Bull. Wisconsin Geol. and Natu. Hist. Surv., 70:1-507.
Clarke 1973	Clarke, A. H. 1973. The Freshwater Molluscs of the Canadian Interior Basin. Malacologia, 13:1-509.
Harman and O 1971	Harman, W. N. and C. O. Berg. 1971. The Freshwater Snails of Central New York. Search, Cornell Univ. Agricultural Staion. 1(4):1-68.
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EXAMPLES OF FIELD FORMS

SITE NO. DATE: RECORDER

WETLAND DATA FORM

Size (indicate acres or hectares):

Wetland Class: Riverine Lacustrine Depressional Slope

Water source:

Hydroperiod: Permanent Seasonal Intermittent

Flooding/Inundation: Continuous Frequent Occasional Rare Never

Water Chemistry: pH_____ conductivity_____ marl alkali iron

General Soils Description (Peat/Alluvium? Mottles? Gley? Cobbles? Parent material (if known), etc.):_____

% Open Water: % Vegetated: % Bare Ground:

Plant associations in Vegetated Portion	% of Veg area	Comments
Miscellaneous minor associations		

FUNCTIONAL EVALUATION

Ratings: 1=no; 2=low; 3=medium; 4=high; 5=very high Confidence in Rating: a=low; b=medium; c=high

Function	Comments
Groundwater Recharge R: C:	
Groundwater Discharge R: C:	
Flood Storage R: C:	
Shoreline Anchoring R: C:	
Sediment Trapping R: C:	
L.T. Nutrient Retention R: C:	
S.T. Nutrient Retention R: C:	
Downstream foodchain support R: C:	
Within foodchain support R: C:	
Fish habitat R: C:	
Wildlife habitat R: C:	
Passive Recreation R: C:	
Heritage Value R: C:	

Comments:

COLORADO NATURAL HERITAGE PROGRAM
ELEMENT OCCURRENCE RECORD:

(ID:____) NEW?: ____ UPD? ____

SCIENTIFIC NAME: _____ (EONUM):_____

ITENAME): _____ SURVEYSITE: _____

(PRECISION) __ COUNTY (code): CO _____ / CO _____ / CO _____

QUADNAME(S): _____ (QUADCODE): _____ / _____ / _____

(DOTNUM): ____/ ____/ ____

(LAT): _____ (S): _____ (N): _____

(LONG): _____ (E): _____ (W): _____

TOWNRANGE: _____ SECTION(S): __,__,__,__ MERIDIAN: __

TRSNOTE: _____

DIRECTIONS: _____

(PHYSPROV): _____ (WATERSHED): _____

SURVEYDATE: 1. 9. . . - . . - . . (LASTOBS): . . . . . - . . . - . . (FIRSTOBS): . . . . . - . . . - . . .
m d (year)

EORANK: _____ EORANKDATE: 1. 9. . . - . . . - . . .

EORANKCOM: _____

ECODATA: _____
(pop'n. size and structure, extent, reproduction, disease, precation / community condition, size, dominance, special features)

GENDESC: _____
(habitat, landform, land use, associated species, etc.)

MINELEV: _____ MAX ELEV: _____

MANAME: _____ (CNTND1): ____

MANAME: _____ (CNTND2): ____

MANAME: _____ (CNTND3): ____

MGMTCOM: _____
(threats e.g. oversnading, overcollecting AND mgmt resolutions e.g. fire, fencing, etc)

PROTCOM: _____
(threats e.g. development, etc AND protection resolutions e.g. acquisition, easement, special designation)

OWNER: _____

OWNERCOM: _____

COMMENTS: _____

DATASENS: _____ BOUNDARIES: _____ PHOTOS: _____

SPECIMENS: _____

BESTSOURCE: _____

JRCECODES: _____ COUS / _____ COUS / _____ COUS / _____ COUS

_____ COUS / _____ COUS / _____ COUS / _____ COUS

TRANSCRIBER: . . - . . . - . . . _____ (MAPPER): . . . - . . . - . . . _____ (OCI): . . . - . . . - . . . _____

MAP MARGIN BK COMPLETED? ____ EOLOG BK COMPLETED? ____

COEOR.FRM 3/94

SUPPLEMENTAL FIELD DATA: RARE SPECIES OCCURRENCE

WEATHER: _____

SLOPE: _____ ASPECT: _____ ELEV.: _____ TOPO. POS.: _____

LIGHT: _____ MOISTURE: _____ GEOLOGY: _____

SOIL: _____

HABITAT COMMENTS: _____

_____

COMMUNITY COMMENTS: _____

_____

_____

_____

DISTURBANCE: _____

_____

THREATS: _____

POPULATION DOCUMENTED VIA: Specimen ___ Sight ___ Tracks/sign ___ Songs/calls ___ Roadkill ___ Photo ___ Verbal ___

ID PROBLEMS? (yes/no): _____ ID COMMENTS: _____

SPECIMEN NUMBER: _____ REPOSITORY: _____

NUMBERS OBSERVED: _____ POPULATION SIZE ESTIMATE: _____
(give age and sex if known)

ESTIMATED AMOUNT OF POTENTIAL HABITAT (acres): _____ PERCENT OF POTENTIAL HABITAT OCCUPIED: _____

POPULATION SIZE AND HABITAT AREA COMMENTS: _____

_____

REPRODUCTION: _____

DISEASE OR PREDATION: _____

PHENOLOGICAL CONDITION: _____

BEHAVIORAL NOTES: _____

_____

_____

EO RANKING CONSIDERATIONS:

RANK _____ COMMENT _____

QUALITY: A B C D _____
(pop'n. size, productivity, vigor of individuals, etc.)

CONDITION: A B C D _____
(habitat pristine, recoverable, degraded, etc.)

VIABILITY: A B C D _____
(likelihood of long-term survival, based on intrinsic biological factors)

DEFENSIBILITY: A B C D _____
(likelihood of long-term survival, based on intrinsic and extrinsic site factors)

Colorado Natural Heritage Program - College of Natural Resources - Colorado State University

Site Survey Summary

SURVEY SITE NAME:_____

SITE NAME_____ NEW:___ EXISTING:___ UNDECIDED:___ NO:___

ite Visit Chronology
1.9. . . . . Surveyor(s) Sourcecode (F96***01COUS)

_____

_____

_____

_____

County (CO)_____ Quadname_____ Quadcode_____

(A) DIRECTIONS:(distance and direction from prominent feature shown on topographic map, including township range and section):

(B): ROAD DIRECTIONS TO SITE:

(C): LOCATION OF SITE ACCESS POINT:(where to park, location of important trail):

IS MAP ATTACHED (Y or N)?___ TIA BOUNDARY MAP (Y or N)?___ MAP OF ROUTE WALKED (Y or N)?___ SITE MAP (Y OR N)?___

ELEMENT OCCURRENCES:
List all elements sought, reported, or confirmed at the site. Generate simple letter or number codes which identify the location of each element occurrence on the base map. Indicate whether the element was found (Y, N, N/A) on the date of the site visit, and whether a return visit is needed.

DATE - Yr	19	19	19	19	Revisit	Comments
Month-Day					needed?	
Element	Found?	Found?	Found?	Found?		

SITE DESCRIPTION - General visual description:(geology, substrate or soil; dominant vegetation types; major landforms; hydrologic features; landscape context). Note key ecological processes. If applicable, described both the inventory area and the conservation site.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

ELEVATION: max._____ min._____ SITE AND/OR ELEMENT PHOTOS (photographer, roll and frame #):_____

STEWARDSHIP:

Land Use Comments:

Describe current and past land use, improvements, and structures, and possible stewardship implications.

A)Current

)Historic

C) Ownership: Public____ Private____ Mixed____ Adjacent public____

OTHER VALUES (recreation or general open space, scenic vistas, general wildlife, etc.)

Potential Hazards Comments:

Describe any potential hazards, both natural (e.g. cliffs, caves, venomous snakes, etc.), and of anthropogenic nature e.g. mine shafts, old wells, dangerous structures. Prescribe appropriate precautions.

Exotic Flora/Fauna Comments:

List problem exotic species and the effects on the element(s). If possible prescribe control methods.

f-site Considerations:

escribe off-site land uses (e.g. farming, ranching, mining, urban development, stream perturbations) and how the landscape context might affect the element(s) on the site and future management.

Information Needs:

Site and Element Management Recommendations:

Summarize the expected management needs for the site and its element(s).

Managed Area Comments:

Explain relationship to existing managed areas.

Tract Ownership (name, address, phone # - attach contact history form if applicable):

TOPOGRAPHIC BASE MAP:
Attach a photocopy of the topographic map or aerial photograph showing the site. Note author and date on each map. Label map with the appropriate quadname, indicate EOs, code for the path traveled, code for the TIA boundary, code for the site boundary.

Boundary Justification:

PROTECTION URGENCY: (circle one)
P1 immediately threatened
P2 threat expected within 5 yrs.
P3 threatened, but not in the next 5 yrs.
P4 no threats imminent
p5 land protection complete

MANAGEMENT URGENCY: (circle one)
M1 management needed this year
M2 management needed within 5 yrs to prevent loss of Eos
M3 management needed within 5 yrs. to maintain quality
M4 management may be needed in the future
M5 no management needed

Protection Urgency Comments (& date)

Management Urgency Comments (& date)

THREAT ASSESSMENT TABLE: Name of preparer_____ Date_____

Source of Stress	Stress	Targeted Ecosystem(s)/ Elements(s)Impacted	Reversibility of Stress	Current Negative Impacts of Stress on System	Potential for Stress to Increase in the Future

DETAILED SKETCH MAP:
The purpose of this map is to show fine details of the site which are not shown on the topographic base map. This map can be used to show (1) EO locations, (2) study plots or marked individuals, (3) natural landmarks, and (4) disturbance features such as structures and trails. Include scale and indicate north.

SPECIES LIST OR COMMUNITY COMPOSTION

For communities indicate relative abundance (eg. d-dominant, c-common, p-present, t-trace). List common species or any others that are characteristic or distinctive of the community.

species		species	

SUPPLEMENTAL FIELD DATA: COMMUNITY OCCURRENCE

SLOPE:_____ ASPECT_____ ELEVATION:_____ TOPOGRAPHIC POSTITION_____

KEY ECOLOGICAL FACTORS: (hydrology, fire, herbivory,etc.)

HABITAT COMMENTS:

DISTURBANCE: (natural or anthropogenic):

THREATS:

SIZE (estimate acres, compare to other occurrences or similar communities):

CONDITION (is it pristine, occurring in a natural landscape, etc.):

COLORADO NATURAL HERITAGE PROGRAM
TARGETED INVENTORY AREA FORM

TIA Name:_____ TIA #:_____
Location: _____
Quadrangle(s):_____Quad Code(s):_____

Survey priority: Very High:_____ High:_____ Medium:_____ Low:_____
Survey phenology (what time of year do surveys need to take place?): _____

Map and aerial photo examination:

initials	date	photo source	photo type	photo number	photo date	notes

Description: _____

Disturbance features: _____

Survey features:

element	potential/known (lastobs)	phenology	specific search areas

Comments:

Information needs: _____

Experts and other sources:_____

Ownership (attach contact history form if necessary):

Preliminary surveys (drive-by, aerial, etc.):
Needed (Y/N)?:_____
Prelim. survey date: _____ Investigators: _____
Description/evaluation: _____

-- see reverse --

Site visit history:

date	investigators	elements found? (list)	comments	field forms complete?

Note: Site survey summary, including map, need to be completed for every TIA surveyed. EORs need to be completed for every significant element found. Attach field forms to this sheet.

Additional notes: