

# SOUTH PARK WETLANDS FOCUS AREA COMMITTEE STRATEGIC PLAN

## I. INTRODUCTION

### WETLANDS STRATEGY

This wetland strategy identifies opportunities for the South Park Wetlands Focus Area Committee to work effectively for wetlands conservation in South Park. The process brings people together to help identify specific wetlands problems and realistic, equitable, solutions that achieve wetlands protection goals. Creating this strategy seeks to involve everyone in the South Park community with an interest in wetlands, and seeks to identify appropriate projects worthy of community support. Such strategies develop over time. First, the community must appreciate the wetlands resource; then they must gather and digest information about its wetlands and wetland characteristics. With assistance from various entities, the community can establish conservation priorities. With these priorities in mind, the community can formulate a strategy, and finally, an action plan, driven by the strategy, with a time table for achieving conservation objectives.

### WETLANDS

Wetlands are places where soils are inundated or saturated with water long enough and frequently enough to significantly affect the plants and animals that live there. Until recently, most people viewed wetlands as a hindrance to productive land use. As a result, many wetlands across North America were purposefully destroyed and are still being lost at a rate of thousands of acres per year. Although the current rate of wetland loss in Colorado is difficult to quantify, it is clear that many of the state's wetlands, especially around urban areas and along major rivers, have been destroyed or profoundly altered from their pre-settlement state.

Wetlands vary throughout different geographical locations and climate. However, several key functions and defining characteristics are common among all wetlands. These characteristics allow scientists to define an area as a wetland. Wetlands can be identified by their high water table, saturated soils, and characteristic plant species that tolerate saturated conditions. Wetlands are areas where water is the primary factor controlling the environment and the associated plant and animal life that thrive there. These transitional habitats occur between upland and aquatic environments.

### AN OVERVIEW OF SOUTH PARK AND ITS WETLANDS

The natural resources of South Park have lured humans for centuries. The Mountain Utes and other American Indians came for the hunting and salt. Immigrants from Europe and China came for the gold, coal, railroads, rangeland and timber. Today, people come for the natural landscape of South Park, which provides them with a variety of avocational and vocational opportunities.

The population of Park County has doubled from 1990 to 2000 and development plans continue. According to a 1999 resident survey, upon which the Park County Strategic Master Plan is partially based, most residents feel that quality of the environment is their highest-priority issue. As another strong indication of public sentiment about quality of life issues, the overwhelming majority (71 percent) of Park County voters passed a land and water conservation sales tax referendum in November 1997. This is the only sales tax to pass in Park County, among five other attempts. This tax generates dollars for the preservation and protection of water resources, acquisition of water rights and lands containing water rights, improvement of aquatic habitat, and conservation of water quality and quantity.

The wetlands of South Park are comparable to few others found in the world. The geologic and hydrologic setting found in South Park combines to create wetlands known as “extreme rich fens,” so named because of their high concentrations of minerals. These fens provide habitat for 14 state-rare plant species, two of which are globally rare Porter feathergrass (*Ptilagrostis porteri*) and Greenland primrose (*Primula egaliksensis*). They also provide habitat for 11 state- and globally-rare invertebrate species. Other wetland types located in Park County include playa lakes, wet meadows, springs, alkaline wet meadows and springs, kettle ponds and riparian wetlands.

South Park uplands are also globally unique. One is located on the basin floor and contains a globally rare grassland plant community of Arizona fescue (*Arizona fescue*) and slimstem muhly (*Muhlenbergia filiculmis*). In addition, this plant community provides habitat for 10-20% of the known breeding population of the globally imperiled mountain plover. Unique uplands are also located in the alpine of the Mosquito Mountain Range. 41 rare plants are associated with the presence of Leadville Limestone found in the area.

South Park has provided habitat for many of the birds, reptiles, amphibians, fish and mammals found throughout the mountainous landscape of Colorado. Recent Conservation assessments for the Southern Rockies, conducted through the Nature Conservancy, identified South Park as the largest and best of the montane grasslands within the Ecoregion (Pague, 2002). The grassland historically was filled with prairie dog towns and an abundant herd of mountain bison roamed South Park until the early 1900’s. Waterfowl numbers were once some of the highest in the state. The current number of waterfowl produced in the Park are miniscule compared to the numbers of the past. (More information can be found in Appendix A.).

## WETLANDS BENEFIT SOCIETY

Wetlands provide many benefits including:

- **Wildlife habitat** for wetland-dependent species that include imperiled, threatened, endangered, increasing, and stable species. Fish, reptiles, amphibians, mammals, and birds (shorebirds, waterfowl, and neo-tropical migratory songbirds) may use wetlands during part or all of their life cycles.
- **Biological diversity** of plant and animal species and plant and animal communities wherever they are located in the landscape.
- **Water and forage** for livestock. Wet meadows can produce excellent hay crops.
- **Better water quality** by physically, chemically, and biologically cleansing water of pollutants and debris.
- **Flood attenuation** by retarding the flow of fast-moving water that can be erosive and destructive and by reducing sedimentation that contributes to the pollution of water bodies. Wetlands can store large volumes of water during spring runoff and during storms and release it slowly back into the ground or the water channel.
- **Ground water recharge** by allowing it to infiltrate to deeper ground layers.
- **Recreational opportunities** including photography, wildlife watching, hunting, fishing, and nature walks.
- **Open space**, therefore, protection of wetlands simultaneously protects open space and provides all the benefits derived from open space.
- **Opportunities for scientific study and education** in the fields of biology, botany, zoology, ecology, and chemistry.
- **Wetlands perform these “services” at no direct cost to society.**

In a 1995 survey of residents of Colorado<sup>1</sup>, 83 percent agreed with the statement “Wetlands are very important and should be protected by the government.” In 1995, Ciruli Associates established that over 80% of Colorado residents agree that wetlands are very important and should be protected. In January of 1998 a national survey again revealed that 82% of voters believe that protecting wetlands is important to them. The survey results stated that, “across all demographic groups, voters solidly believe protecting

wetlands is important to them (men/women, Democrats/Republicans, Northeast, Midwest, South, West)". At a time when the nation and the State of Colorado are experiencing so much growth, it is encouraging that people recognize the value of this important natural resource. A recent national survey revealed very similar results across various demographic groups.<sup>2</sup> According to a 1999 survey of Park County residents, most feel that water quality, water supply, scenic quality, open space, air quality, and sewage treatment are high priorities for environmental protection; and believe that stream corridors, wetlands, wildlife habitat, and mountain peaks/slopes are high priorities for open space preservation. The people of Colorado are aware that protecting wetlands provides numerous benefits to society.

1. Ciruli Associates, December 1995, *Colorado Outdoors 2000*, Public Opinion Survey on Colorado Conservation and Outdoor Recreation
2. Lake Sosin Snell Perry & Associates, January 1998, *Clean Water Network, A Presentation of Findings*

## **THE COLORADO DIVISION OF WILDLIFE WETLANDS PROGRAM**

In 1997, the Colorado Division of Wildlife (DOW) launched a Wetlands Program within the Colorado Department of Natural Resources. DOW, through the Wetlands Program, promotes wetlands conservation by voluntary, incentive-based means involving “willing-to-participate” landowners and local communities. The Wetlands Program fosters cooperation among various groups and individuals interested in wetland conservation. DOW fosters the establishment of the Focus Area Committees in key areas of Colorado with committees including federal and state agencies, private wetlands conservation organizations, other non-governmental organizations and interested individuals. DOW is not the only entity involved in wetlands conservation, but it has become a major player in the wetlands conservation arena.

### **Goals of the Division of Wildlife Wetlands Program**

- Protect wetland-dependent wildlife through incentives and voluntary means. Several wildlife species that use wetlands habitat are imperiled, threatened, or endangered; therefore, their protection is priority.
- Protect wetlands habitat through incentives and voluntary means. In the program, the term “protection of wetlands habitat” refers to the use of one or all of the following actions: restoration, enhancement, management, and acquisition – of fee title or conservation easement – by a conservation entity such as a land trust, an individual, a non-governmental organization, or a government entity.
- Establish and foster wetlands protection partnerships between the Division of Wildlife, communities, non-governmental organizations, state government agencies, federal government agencies, and private landowners – for example, ranchers and farmers.
- Assist Colorado communities in generating a wetlands protection strategy for their community upon their request.
- Encourage interaction, cooperation, and partnering among wetland protection participants and provide an organizational tool – a statewide wetlands strategy that identifies opportunities to make wetlands protection programs in Colorado work better. A statewide strategy is a process for bringing together citizens, communities, development interests, water interests, government officials, and others to help identify common wetland protection goals and workable equitable solutions that achieve those goals. The process draws on all levels of government and the private sector to focus and coordinate wetland protection efforts.

### **Key Objective of the Wetlands Program**

- Protect 100,000 acres of biologically significant wetlands and associated uplands for wetland-dependent species – imperiled, threatened, endangered, increasing, or stable – by 2005.

**Table 1. Strategies of the Division of Wildlife Wetlands Program**

<b>WETLANDS INITIATIVE LEGACY GRANT PROJECT</b>	The objective of this strategy is to protect 15,000 acres of biologically significant wetlands and associated uplands by 2000. This is a DOW partnership with Ducks Unlimited, The Nature Conservancy, Partners for Fish and Wildlife, Division of Parks and Outdoor Recreation, and Great Outdoors Colorado. A \$4.46 million GOCO grant and Partners funded this effort.
<b>WETLANDS PARTNERSHIPS</b>	This strategy promotes the opportunity for numerous entities (individuals, organizations, or agencies) to cooperate or partner with DOW and each other on wetlands protection efforts on a project-by-project basis or a long-term basis. Examples of partners: Colorado Natural Heritage Program, Ducks Unlimited, The Nature Conservancy, Division of Parks and Outdoor Recreation Natural Areas Program, USFWS Partners for Fish and Wildlife, Great Outdoors Colorado, Environmental Protection Agency, and Natural Resources Conservation Service.
<b>COMMUNITIES WETLANDS STRATEGIES</b>	This strategy provides the opportunity for communities that request it to receive information and assistance in planning wetlands protection and developing a wetlands strategy. The EPA 104-b-3 Grant Program provides some of the funding.
<b>NORTH AMERICAN WATERFOWL MGMT. PLAN PLAYA LAKES AND INTERMOUNTAIN WEST JOINT VENTURES IN COLORADO</b>	This strategy provides for participation in the Intermountain West Joint Venture and Playa Lakes Joint Venture of the North American Waterfowl Management Plan. The NAWMP aims to protect primarily waterfowl and shorebird species and wetlands habitat.
<b>USDA FARM BILL LIASON</b>	This strategy provides for a Farm Bill Liaison on the Wetlands Team to facilitate understanding of those programs in the 1996 Farm Bill that place an emphasis on wetlands, e.g., the Wetlands Reserve Program.
<b>U.S. CLEAN WATER ACT SECTION 404 PROGRAM LIASON</b>	This strategy provides for a Section 404 Liaison on the Wetlands Team to facilitate understanding of that program and the continuing communication with Army Corps of Engineers and EPA on Section 404.
<b>COLORADO WATERFOWL STAMP</b>	This strategy involves the administration of the Colorado Waterfowl Stamp Program that is funded primarily by Colorado Duck Stamp sales, DU MARSH funds, contributions from other project participants, and DOW funds. This project delivers wetlands protection projects with an emphasis on waterfowl.
<b>WETLANDS PROJECTS DATABASE</b>	This strategy involves maintaining a database that tracks numerous aspects of all DOW wetlands projects, including design, implementation, completion, project identification, funding allocations, and monitoring/evaluation efforts.
<b>WETLANDS FUNDING PROCESS</b>	This strategy facilitates securing funds for wetlands protection efforts. The WFP is a database of potential sources of funding for wetlands projects. Wetlands partners submit their requests by means of user-friendly applications. Coordination of funding efforts greatly enhances leveraging opportunities and maximizes efficiency in utilization of funds.
<b>WETLANDS PROJECTS MONITORING AND EVALUATION</b>	This strategy evaluates and monitors the efficacy of various wetlands protection efforts. Such evaluations will improve project design and refine funding allocations.
<b>WETLANDS TEAM</b>	This strategy involves a team of people that assists in project design and implementation. The Wetlands Team brings together many diverse disciplines in the DOW to address wetlands and associated wildlife. The team includes members with expertise in wetlands ecology and management, waterfowl and shorebird management, engineering, accounting, contracting, legal issues, water rights, and more.

## THE SOUTH PARK WETLANDS FOCUS AREA

### **The Wetlands Focus Area Concept**

One of the strategies in the Division of Wildlife Wetlands Program involves the North American Waterfowl Management Plan (NAWMP). Wetlands Focus Areas were initially designated to implement the NAWMP and to focus and concentrate protection efforts on wetlands in need of conservation. Ten Wetlands Focus Areas were formed across the state, including South Park, as the result of the efforts of the Intermountain West Joint Venture and the Playa Lakes Joint Venture, the Division of Wildlife, the Bureau of Land Management, and other agencies.

Wetlands Focus Area Committees for each of the ten designated Areas were formed. The membership of the Committees (in actuality “working groups”) is impressive in number and diversity, and, because of this, educators, recreationists, hunters, anglers, scientists, politicians, landowners, professionals, non-governmental organizations, and agencies, are now involved in the Wetlands Program. The NAWMP, its joint ventures and focus areas, is a strategy of the Wetlands Program to accomplish its goals and objectives, as described earlier.

Roles of the Wetlands Focus Area Committees:

- In the context of the Wetlands Program, generate project proposals – design, review, evaluate
- Rank project proposals being submitted to the Wetlands Funding Process
- Generate North American Wetland Conservation Act (NAWCA) grant proposals with assistance of the Wetlands Program team
- Assist in site visits for NAWCA grant proposals
- Assist in communicating with the local community on wetlands conservation and Wetlands Program goals and objectives
- Provide a forum for wetlands conservation discussions, i.e., meetings open to the community
- Assist in forming and nurturing wetlands conservation partnerships
- Access the skills of the Wetlands Team

### History of the South Park Committee

The South Park Wetlands Focus Area Committee originated in 1992. The original Strategic Plan (1996) stated, “The goals of the South Park Wetland Focus Committee include the following—Preserve the valuable resources provided by South Park’s wetlands through cooperation, acquisition, education, restoration and mitigation.”

The committee believed the most effective way to achieve wetland preservation was through acquiring conservation easements or outright purchase of wetlands. The group used the information in the following reports to determine wetland conservation priorities:

- 1) The South Park Heritage Resource Area Board Resource Inventory
- 2) Ecological Studies of Wetlands in South Park, Colorado: Classification, Functional Analysis, Rare Species Inventory, and the Effects of Removing Irrigation by David Cooper, 1990.
- 3) Extreme Rich Fens of South Park, Colorado: Their Distribution, Identification and Natural Heritage Significance by John Sanderson and Margaret March, 1996.
- 4) Environmental Function, Vegetation and the Effects of Peat Mining on Calcareous Fens in Park County, Colorado by J. Bradley Johnson, 1996.

In 1996, the original South Park Wetlands Focus Area Committee determined the Coleman (A. Wahl) Ranch as its Highest Priority Wetland Area. Other areas of high interest include: Red Hill Forest Ranch, Furman/Michigan Ranch, Middle Fork (Coil) Ranch, McNulty/Arrowhead Ranch, Schattinger Ranch, and the Gardner/Elkhorn Ranch. The original committee disbanded shortly after developing their Strategic Plan. In 1999, the committee reformed and has been functional since.

## Wetland Conservation Accomplishments To Date:

The following are projects completed through a variety of partnerships within Park County in the last fifteen years:

**Wahl Coleman Ranch:** This historic ranch is under contract for purchase and protection, including the highest significant historical and biological resources on the property. The purchase of the ranch will be completed through the partnership of Colorado Open Lands, Colorado Division of Wildlife, The Nature Conservancy, Colorado Natural Heritage Program, South Park Wetland Focus Area Committee, Park County Government and the Wahl family. Approximately 1,000 acres of wetland habitat and 1,250 acres of associated upland habitat will be protected in perpetuity. It is now for sale to a conservation buyer with easements to guarantee protection.

**High Creek Fen and Watershed Protection:** High Creek Fen is the most biologically diverse fen known in the Southern Rocky Mountains and contains more rare plant species than any other wetland known in Colorado. The Nature Conservancy began acquisition of this fen in 1991 and currently holds title to approximately 1,560 acres - 1,200 of which are wetlands. In addition, approximately 560 acres of wetlands and 4,500 acres of uplands were protected in the High Creek basin to maintain the hydrology that supports High Creek Fen.

**North American Wetland Conservation Act Grant:** The “South Park Valley Premier Wetlands and Mountain Plover Habitat Project” is a combination of wetland and grassland easements and riparian restoration efforts. Approximately 4 miles of creek will be restored, 6420 acres of Mountain Plover habitat protected, and over 1075 acres of extreme rich fens protected. In addition, riparian montane willow, wet meadow habitats, and a portion of the globally unique grassland plant community located on the basin floor of South Park will also be protected. This project began in 2001 and will continue until 2003.

### State Wildlife Areas Created:

**Teter-Michigan Creek:** The Division of Wildlife purchased 950 acres of wet meadows, riparian shrublands and uplands in the early 1990's. The site contains a small fen and several rare plant species.

**Tomahawk:** The Division of Wildlife purchased 1700 acres of upland and wetland habitat surrounding the Middle Fork of the South Platte River in the mid 1980's as mitigation for Spinney Mountain Reservoir. The Wildlife Area contains floodplain wetlands with fairly common riparian wetland plant communities.

### Riparian Enhancement Fencing Projects:

**Sweetwater Ranch** – Partners for Wildlife project of installing exclusionary fencing to protect 10 acres of riparian corridor along the South Fork of the South Platte River. Water control structures were rehabilitated to restore and enhance 5 acres of wetlands and upland habitat. Results include enhanced nesting and foraging habitat for migratory birds.

**Knight-Immler** – Trout Unlimited and DOW constructed exclusionary fencing along the DOW Fishing Access site of Knight-Immler. Approximately 3 miles of the South Platte River was excluded from grazing. Results of the project include wetland and riparian habitat enhancement along the corridor.

**Salt Creek** – Forest Service and Trout Unlimited partnership completed the construction of post and cable fencing of a large, heavily utilized dispersed recreation site to reduce sedimentation and erosion into Salt Creek. Approximately 5 acres of riparian habitat was protected. Results include a decrease in soil compaction and increase in riparian vegetation along Salt Creek.

**Wildcat Canyon** – Forest Service, Predator 4WD and Trout Unlimited completed the construction of approximately ½ mile of post and cable fencing along the South Platte River within the heavily utilized 4WD area of Wildcat Canyon to reduce sedimentation, soil compaction and restrict vehicle use off roads. Results of the project include the increase of riparian vegetation, reduction of roads and trails along the river and increase in wetland habitat. In the late 1980's, the Forest Service, Denver Water and Trout

Unlimited partnered to close approximately 60 miles of road in Wildcat Canyon and the surrounding uplands. Riparian fencing was also constructed to protect the riparian areas along the South Platte at Longwater Gulch.

**Wildlife Habitat Incentive Program (WHIP)** – Through the Natural Resource Conservation Service (NRCS), several wetland revegetation and enhancement projects have been completed in South Park: Eagle Rock Ranch along Tarryall Creek (project also included fish spawning access measures), Pruden and Union Creek willow plantings, restoration and willow plantings on the Pizzuto property and willow and cottonwood plantings on the Wilmsen property along Rock Creek.

**NRSC Wetland Reserve Program** – A Wetland Reserve Program conservation easement of 143 acres was placed on the Goosmann property along Tarryall Creek.

**Wetland Research of South Park** – several US EPA 104 (b) (3) grants have been awarded to conduct investigations into the environmental, ecological, hydrological and water quality functions of fens in South Park. Grants have also funded the inventory/mapping of fens and research of peat mining impacts on the fens located in Park County. A complete bibliography of South Park wetland references can be found in Appendix D.

**Brad Johnson, Ph.D.** - Ten documents written from 1996 – 2000 on the location, vegetation, ecology, functioning and effects of disturbance on the Calcareous Fens of South Park, Colorado.

**Colorado Natural Heritage Program** – Park County Inventory of Critical Biological Resources conducted in 2000. A Natural Heritage Assessment and Inventory of State Wildlife Area Wetlands in 1999.

**Tarryall Corridor Management Project** – The goal of the project is to create a landowner-based coalition and to develop a plan that will work to preserve and enhance the Tarryall River ecosystem in such a way that wetlands and riparian areas, profitable agriculture, wildlife and waterfowl habitat diversity, historical structures, natural and visual landscapes and associated water resources are sustained.

## Goals of the South Park Wetlands Focus Area Committee

After much discussion lasting over the course of a year, the committee adopted the following goals by consensus:

- Conserve the entire range of wetland types found in South Park of quality and quantity sufficient to maintain healthy and viable natural communities and wetland dependent species.
- Maintain water quality, cultural and historic features, wildlife habitat, and agriculture associated with South Park's wetlands and surrounding uplands.
- Support the inventory and monitoring of natural resources closely associated with South Park's wetlands, surrounding uplands and associated species.
- Support planning related to wetland conservation in South Park.
- Assist the South Park community in understanding the value of wetlands and the need for their protection.

The term “conserve” refers to the use of one or all of the following actions: restoration, enhancement, management, and acquisition – of fee title or conservation easement – by a conservation entity such as a land trust, an individual, a non-governmental organization, or a government entity.

Wetlands include riparian areas.

Table 2. Goals of the South Park Wetlands Focus Area Committee Partners – An Illustration

The following table is a list of founding members and their individual goals for the Focus Area Committee. The goal statements reflect the similarities and differences of the wetland partners. The table is not meant to be stagnant, nor does it include all the members of the committee. It is only an illustration and was formed to help the committee define its goals.

Bill Gordon, Sweetwater Ranch	Conserve, protect, enhance and educate the values of South Park Wetlands
Dieter Erdmann and Jonathan Moore, Colorado Open Lands	Protect and buffer riparian areas along all major tributaries with existing fens, natural communities and critical ranchlands with significant heritage resources
Alan Carpenter, Land Stewardship Consulting, Inc.	Facilitate the conservation of the biologically significant wetlands and riparian areas in South Park
Leon Kot, Natural Resources Conservation Service	In addition to the others' goals, restoration and management of wetlands in South Park
Denise Culver, Colorado Natural Heritage Program	Facilitate and Partner. Focus on biologically significant, globally unique wetlands
Matt Moorhead, The Nature Conservancy	Conserve high priority, globally significant wetlands in functional natural systems including associated riparian and upland areas.
Carol Ekarius, Upper South Platte Watershed Protection Association	Protect water quality and ecological health in the Upper South Platte watershed. Focus on the protection of all wetlands in South Park, not necessarily only biologically significant ones. Protect ranchlands with heritage resources.
Mark Lamb, Colorado Division of Wildlife	All of the above, with the addition of associated uplands and protection of important wildlife habitat for species dependent upon them.
Gary Nichols, Park County Government	Protect and enhance wetlands and associated uplands for the purpose of maintaining/improving biological diversity, wildlife habitat, water quality and natural/cultural values of Park County and Colorado. Conserve and interpret biologically significant wetlands and riparian areas as strategies for education and sustainable economic development.
Stephanie Howard, USDA Forest Service, South Park Ranger District	Facilitate to meet the needs of the group. Pursue protection and restoration of South Park's wetlands and associated uplands through partnerships.
Alison Banks, Rocky Mountain Bird Observatory	Sustain viable populations of birds and conserve the habitats on which they depend.
George Meyers, Santa Maria Ranch	Preservation of watershed/wetlands health through educational incentives and custodial partnerships with landowners/managers through the facilitation of conservation easements.
Jim Fagerstrom, Ute Trail River Ranch	Create partnerships the along the Tarryall River corridor to protect wetland habitats.
Erik Brekke, Bureau of Land Management	Conserve, protect and manage significant wetland, riparian and natural systems on lands administered by the Bureau of Land Management. Participate in opportunities with other interested agencies, conservation organizations and interested groups to consolidate and protect significant wetland resources through land transactions that benefit all parties.
Brad Johnson, Colorado State University	Preservation of fens and other wetlands. Development of technically sound wetland restoration and monitoring plans.

## Strategies of the South Park Wetlands Focus Area Committee

The following strategies are utilized to achieve the goals. They are not in hierarchical order.

- **PARTNERING** – Establish and foster partnerships among private landowners, agencies, consultants, scientists, land trusts and educators.
- **EDUCATION AND OUTREACH** – Hold press conferences, wetland tours, workshops and other public events to deliver a clear and consistent message about wetland conservation.
- **INVENTORY** – Map wetlands, conduct inventories of birds and other wetland dependent species, monitor water levels and other projects to gather data to be used to protect wetlands. Strategies often include a combination of citizen science, professional studies, and science reviewers to analyze the data and studies that government agencies produce for permits and policy decisions.
- **STEWARDSHIP**- Demonstrate management activities that ensure the future health, productivity, and well being of the land and its natural communities and species, and to allow our successors opportunities at least equal to ours to use the land and its resources.
- **WETLAND AND RIPARIAN PROTECTION**
  - 1) **RESTORATION** – Modify a drained or degraded wetland where the soils, hydrology, vegetative community, and biological habitat are returned to the pre-disturbance natural condition.
  - 2) **ENHANCEMENT** – Modify an existing or degraded wetland, where specific functions and/or values are modified for the purpose of meeting specific project objectives. Some functions may remain unchanged while others may be degraded.
  - 3) **CREATION** – Form a wetland on a site which historically was not a wetland, or was a wetland but the site will be converted to a wetland with different hydrology, vegetation type or function than that which naturally occurred in the site.
- **MONITORING** – Evaluate results of South Park Wetlands Focus Area Committee’s actions.
- **CONSERVATION REAL ESTATE** - Acquire legal title to property by innovative, voluntary approaches such as purchase, donation, conservation easement, or other methods.

## Operating Principles of the South Park Wetlands Focus Area Committee

### Committee Members –

The South Park Wetlands Focus Area Committee is open to all persons interested in achieving its goals. Membership is voluntary, dynamic and unstructured. Meetings are held approximately bimonthly, dependent upon the needs of the group.

### How the Committee Operates -

The Committee functions as a working group. It seeks funding for high-priority projects through the Wetlands Program Funding Process, which matches requests with governmental sources of funding, and through other public and private funding sources independent of the Wetlands Program.

# THE SOUTH PARK WETLANDS FOCUS AREA COMMITTEE ACTION PLAN 2002-2004

## Area: **SOUTH FORK OF THE SOUTH PLATTE**

Including the upper reaches and tributaries downstream to Spinney Reservoir.

### Item:

- 1) Implement the North American Wetland Conservation Act grant
- 2) Complete The Nature Conservancy and Bureau of Land Management Land Exchange
- 3) Pursue further partnerships with surrounding landowners
- 4) Assess Sheep Creek on National Forest Lands
- 5) Complete post-n-cable fencing on National Forest Lands along FS Road 173 in the Sheep Creek area

Funding Status: Colorado Open Lands and partners received \$1,000,000 from NAWCA, \$300,000 from GOCO. Items 1, 2 & 3 are almost entirely funded. Need to obtain funding of \$25,000 to complete project items. Forest Service will fund and complete item 4. Trout Unlimited and US Forest Service will complete item 5 with partial State OHV Trails Grant funding.

Completed Items: Colorado Open Lands received both the NAWCA and GOCO grants. Sweetwater Ranch worked with Partners for Wildlife to complete the protection of riparian, wetland and upland habitats along the South Fork of the South Platte River. Riparian fencing was constructed along 3 miles of the South Platte within the Knight-Immler CDOW Fishing Access. High Creek Fen and Greater High Creek Basin funded.

## Area: **MIDDLE FORK OF THE SOUTH PLATTE**

Including the stretch from Fairplay to the confluence with the South Fork of the South Platte

### Item:

- 1) Santa Maria Ranch riparian fencing project with Partners for Wildlife funding
- 2) Columbia Reservoir Grant Application with Fishing is Fun through the USFWS to increase water storage capacity.
- 3) Pursue conservation easement for the Santa Maria Ranch
- 4) Pursue other conservation easements along the Middle Fork including donated easements which have been developing in the past year

Funding Status: Item 1 is funded through the Wetlands Program, Partners for Wildlife and NRCS EQIP program. Item 2 could potentially raise funding for the Columbia Reservoir project. Funding needed for item 3 and possibly 4.

Completed Items: Funding for the Santa Maria Ranch riparian fencing project has been obtained, but the project has yet to be completed.

## Area: **TARRYALL RIVER CORRIDOR**

Including upper reaches and tributaries downstream to confluence with the South Platte River

### Item:

- 1) Educate landowners on possibilities of the protection of the corridor
- 2) Begin identifying needs & wants of landowners
- 3) Pursue planning grant to complete item 2
- 4) Inventory biological components along lower stretches of the Tarryall through CNHP
- 5) Identify project coordinator if needed

- 6) Pursue possibilities of large grants: GOCO's Legacy Grant
- 7) Meet with landowners on the effects of the proposed Tarryall Creek Road Project
- 8) Implement Partners for Wildlife/WHIP project on the Eagle Rock Ranch utilizing Buena Vista prison crew
- 9) Pursue possibilities of Cline Ranch
- 10) Riparian post-n-cable fencing along Tarryall Creek in the Box Canyon area on National Forest Lands

Funding Status: Application for planning grants and inventory will be proposed. Legacy and other large grant possibilities will be investigated. Item 8 is funded. Item 10 will be funded and completed through partnerships with Trout Unlimited, Predator 4WD, OHV State Grant and the US Forest Service.

Completed Items: Several ranch tours of Eagle Rock Ranch. Several NRCS, Ducks Unlimited and Partners for Wildlife projects completed on the Eagle Rock Ranch. Colorado Open Lands currently holds the title for the Wahl Coleman Ranch and is looking to sell to a conservation buyer. Conservation easement through Wetland Reserve Program on the Goosman property completed. Gully rehabilitation on National Forest Lands near Tarryall Reservoir completed.

Area: **EDUCATION**

Item:

- 1) Implement diorama project with South Park City Museum
- 2) Support science and environmental education programs through the USPWPA and local schools
- 3) Place articles about wetlands and related matters in local newspapers, Society of Wetland Scientists newsletter, Colorado Riparian Association newsletter, USPWPA newsletter, etc.
- 4) Conduct tours of accomplishments and possible projects in the South Park Focus Area for neighboring landowners, agency personnel and legislators
- 5) Partner with other entities to hold a Landowner Workshop to educate landowners on wetland protection and enhancement possibilities in addition to other subjects provided by partners.
- 6) Decide whether or not to request advisory committee status with the Park County Commissioners

Funding Status: Funding for item 1 is complete. Funding of item 2 is being pursued by the USPWPA.

Completed Items: Funding for the diorama was provided by the Wetlands Program and the Governor's Office of Energy Management. Several press releases have been printed in the Fairplay Flume and USPWPA newsletters. A Wetlands Workshop was held in Jefferson in February, 2001 – 27 landowners were in attendance.

Area: **THREE MILE CREEK**

Including tributaries on National Forest downstream to Spinney Mountain Ranch SWA.

Item:

- 1) Determine feasibility of proceeding with planned treatment on private and state lands
- 2) Continue streambank revegetation and stabilization on tributaries located on National Forest Lands

Funding Status: Funding possibly through EQIP, CDOW. Item 2 funded through US Forest Service.

Completed Items: Proper Functioning Condition assessment on National Forest Land stretch complete. Approximately ½ mile of South Fork of Three mile Creek stabilized and revegetated in 2000.

## Appendix A: AN OVERVIEW OF SOUTH PARK AND ITS WETLANDS

### NATURAL HISTORY

#### *GEOGRAPHY, CLIMATE AND UNIQUENESS OF SOUTH PARK*

South Park is a grass-dominated basin, fifty miles long and thirty-five miles wide located in central Colorado. South Park is one of four intermountain basins in Colorado, and is surrounded on all sides by mountains. It is bordered to the west by the Buffalo Peaks and the Mosquito Range, to the north by the southern end of the Park Range, to the east by the Kenosha Mountains, Tarryall Mountains, and Puma Hills, and to the south by Black and Thirtynine Mile mountains. The headwaters for two major rivers, the South Platte and the Arkansas Rivers, originate in South Park. Elevations range from over 14,000 feet to 8500 feet on the floor of South Park. South Park is located within the Southern Rocky Mountain ecoregion (Bailey *et al.* 1994). Most of South Park is located within Park County.

The climate in South Park is generally characterized by long, cold, and moist winters, and short, cool, dry summers. Climatic data from the Town of Fairplay indicate that this area receives approximately 13 inches of precipitation each year. Average minimum and maximum temperatures are, respectively, 9 and 69 degrees Fahrenheit. The average total snowfall in Fairplay is 84 inches (South Park Ranger District, US Forest Service).

Park County supports several unique and interesting vegetation types. The vegetation on the floor of South Park is dominated by a globally rare grassland composed primarily of Arizona fescue (*Festuca arizonica*) and slimstem muhly (*Muhlenbergia filiculmis*). This grassland plant community is the largest example of its type ever documented (1.3 million acres). The vegetation here is generally short and sparse as a result of the dry, windy climate, historic and current grazing, fires, and, to a much lesser extent, prairie dog activity. These conditions provide habitat for an estimated 15-20% of the known breeding population of the globally imperiled mountain plover. Currently, this area includes a mosaic of agricultural and rural residential areas, and large areas grazed by cattle and domestic bison.

The wetlands of South Park are comparable to few others found in the world. The geologic and hydrologic setting found in South Park combines to create wetlands known as “extreme rich fens,” so named because of their high concentrations of minerals. These fens provide habitat for a suite of rare plant species and plant communities. In David Cooper’s study of 53 wetlands in South Park, he states, “Most of the wetland community types are common throughout the west. However, the extreme rich fens, characterized by peat soils and calcium carbonate rich water, appear to be unique to South Park in the southern Rocky Mountains.” Porter feathergrass (*Ptilagrostis porteri*) is known only from Colorado, with its center of global distribution in South Park wetlands. Other rare plants found here are regional endemics, species that are rarely found south of the arctic, and are disjunct populations in South Park. The extreme rich fens also harbor unique invertebrate species, some of global significance and are important for providing sediment trapping and element cycling. Unfortunately, approximately 20 % of the fen communities in South Park have been drained or mined for peat (Sanderson and March 1996). Other wetland types located in Park County include playa lakes, springs, wet meadows, kettle ponds and riparian wetlands. A highly unusual wetland of alkaline wet meadows and springs is found in the southwestern part of Park County, in the vicinity of Antero Reservoir.

At higher elevations the vegetation is dominated by willows (*Salix* spp.), spruce-fir (*Picea engelmannii*-*Abies lasiocarpa*), ponderosa pine (*Pinus ponderosa*), lodgepole pine (*Pinus contorta* ssp. *latifolia*), bristlecone pine (*Pinus aristata*), quaking aspen (*Populus tremuloides*) and alpine communities. South Park supports the most extensive and high-quality occurrences of bristlecone pine (*Pinus aristida*) ever documented.

The Mosquito Range, which forms the western border of South Park, is one of the botanical “hotspots” in Colorado. Few other areas in the state support such a high number of rare plant species. A total of 41 rare plants have been documented in the alpine regions of this relatively small mountain range. High-elevation outcrops of Leadville Limestone are thought to be a predominant factor in setting the stage for such high densities of rare plant species. The habitats in the higher elevations of the Mosquito Range are

characterized by alpine meadows, rock outcrops, scree slopes, boulder fields, alpine lakes, willow carrs, permanent snow fields, and krummholz Engelmann spruce (*Picea engelmannii*). Several 14,000 foot peaks occur in the Range, and it is a very popular area for recreational use. This area is also known for its past gold and lead mining activities.

## HUMAN HISTORY

South Park is a large (1,000-square mile) mountain park where resources and open spaces seem endless and forgiving. Its diverse natural assets include high mountains, grasslands, springs, rivers, wetlands, tundra, montane forests, minerals and wildlife. The vision of South Park's abundance, real or imagined, has lured and inspired visitors and entrepreneurs for centuries.

The history of South Park encompasses the classic Western themes of discovery, exploitation, and conflicts over land and resources. While the discovery of minerals and proliferation of mining occurred for a relatively brief time during the 19<sup>th</sup> century, legends and historic documents from that period have contributed greatly to modern images of the area. The region's real wealth resides in its remaining natural resources and inspirational human stories.

Mountain Utes and other American Indians used South Park for hunting and gathering salt. Spanish explorers searching for gold discovered instead herds of bison, elk, and antelope. Trappers and mountain men explored every mountain and valley for beaver and new horizons. John C. Fremont, an early military surveyor, and Kit Carson, a trapper-guide, recorded their findings in great detail. Subsequent visitors described a 'paradise' where the fulfillment of many dreams was possible. And so, stories of adventure and abundance have been handed down from one generation to the next.

The earliest gold discovery in South Park was along Tarryall Creek near Como. During the 1850s thousands flooded the area in search of riches. By 1860 at least 11,000 people lived in South Park, compared to 25,000 people in all of Colorado. The influx of prospectors created towns like Hamilton, Tarryall, Jefferson, Buckskin, and Fairplay. Cattle ranches were established to feed the miners while irrigation supplemented the production of hay. Then, the first boom turned to bust, largely due to competition for mining claims, lack of water for sluicing, and the relatively small amount of gold recovered by primitive mining techniques.

Within ten years, South Park braced for a second wave of speculation, financed by deep-pocketed Eastern investors. Spurred by the American Civil War, this era of mineral extraction became even more entrenched on the landscape. During the 1880s, two railroads opened up South Park to intense exploration and settlement. Hunting and fishing expeditions via the Denver, South Park & Pacific and Colorado Midland Railroads became popular among folks from Denver and Colorado Springs. Chinese and Italian immigrants built the railroads. Italian, Chinese, and English immigrants mined the coal. Scandinavian immigrants cut timber for the railroads, mines, and towns. Texas cattlemen provided beef and grain. Although the late 1800s were a prosperous time for ranching, heady growth of the industry waned with the decline of mining. Nonetheless, cattle ranching and hay production remain a vital segment of the current economy. The second mining boom and establishment of large ranches were substantial enough that many pioneers settled here permanently.

Despite the myths and hyperbole, contemporary residents know that South Park is colder, more arid, and less rich in mineral resources than legend would suggest. Current disputes over the right to develop land and water are as intense as any of the 19<sup>th</sup>-century mining booms. The new battle is largely a legal and political one concerning groundwater, residential development and un-adjudicated surface water rights.

## CURRENT SOCIOECONOMIC CONDITIONS

South Park's most poignant story involves the influx of new people with diverse values and financial interests. Each year thousands come to settle and millions more come to recreate. The economy is now largely dependent on seasonal activities, such as camping, hiking, boating, climbing, fly-fishing, mountain biking, and four-wheeling. Trail rides have replaced round-ups, guest accommodations are supplementing cattle operations, subdivisions are replacing rangelands, and second homes are being constructed where miner's cabins once stood. Housing developments, retail areas and new recreation facilities are reshaping the landscape.

South Park's population is growing at a rate that is unprecedented since the last gold rush. Census data from the Colorado State Demographer's Office indicate that population more than doubled between 1990 and 2000, making this the third-fastest growing area in the state. Likewise, the number of business establishments more than doubled during the same period.

According to a 1999 resident survey upon which the Park County Strategic Master Plan is partially based, most residents feel that quality of the environment is their highest priority issue. Survey results indicate that residents also 1) strongly support non-motorized outdoor recreation, ranching/agriculture, and museums/historical sites as future economic development priorities; 2) strongly oppose heavy industry, resource extraction, real estate development, motorized recreation and light manufacturing as future economic development priorities; 3) feel that water quality, water supply, scenic quality, open space, air quality, and sewage treatment are high priorities for environmental protection; and 4) believe that stream corridors, wetlands, wildlife habitat, and mountain peaks/slopes are high priorities for open space preservation.

As another strong indication of public sentiment about quality of life issues, the overwhelming majority (71 percent) of Park County voters passed a land and water conservation sales tax referendum in November of 1997. This is the only sales tax to pass in Park County, among five other attempts. This tax will generate approximately \$500,000 in 2001 for the preservation and protection of water resources, acquisition of water rights and lands containing water rights, improvement of aquatic habitat, and conservation of water quantity and quality.

While recreation and real estate have replaced extractive industries as the main source of revenue for many South Park communities, there are no easy answers to the problem of rapid growth. Some people favor strict regulations or no development at all. Others believe that freedom to develop private property and unrestricted access to public lands are constitutionally protected rights. The ultimate goal for local government is to develop community-based plans that support the development of a sustainable economic base, and to guide the use of both private and public lands so that South Park will continue to be a desirable place to visit and live.

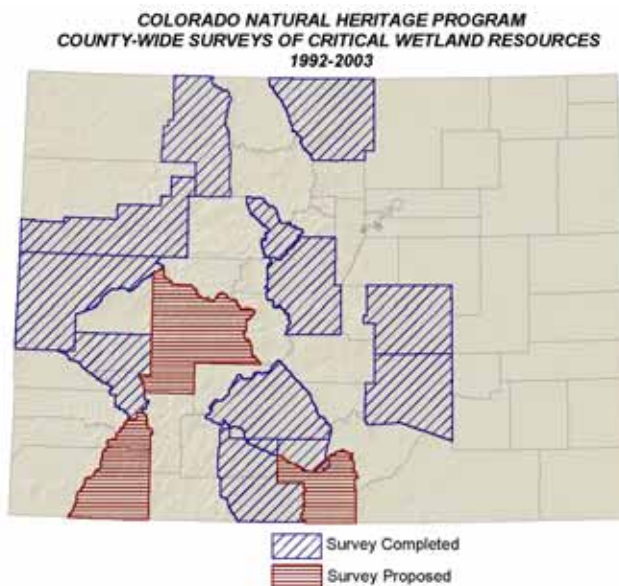
## Appendix B: CNHP INVENTORY AND INFORMATION

### INTRODUCTION TO THE COLORADO NATURAL HERITAGE PROGRAM AND THE INFORMATION GATHERED ABOUT WETLANDS IN SOUTH PARK:

The Colorado Natural Heritage Program (CNHP) is considered by many to be the state's primary, comprehensive biological diversity data center. The mission of CNHP is to preserve the natural diversity of life by contributing the scientific foundation that leads to lasting conservation of Colorado's biological wealth. In cooperation with other partners, CNHP has developed a wide-ranging program to help identify and document high quality examples of biological diversity and to set conservation priorities. This section of the SLV Wetlands Strategy describes how the committee utilized CNHP's products.

CNHP is part of an international network of conservation data centers that use the Biological and Conservation Data System developed by The Nature Conservancy. CNHP has developed effective relationships with several state and federal agencies, including the Colorado Natural Areas Program, Colorado Department of Natural Resources and the Colorado Division of Wildlife, the U.S. Environmental Protection Agency, Bureau of Land Management, and the U.S. Forest Service. Numerous local governments and private entities also work closely with CNHP. Use of the data by many different individuals and organizations, including Great Outdoors Colorado encourages a proactive approach to development and conservation thereby reducing the potential for conflict. Information collected by the Natural Heritage Programs around the globe provides a means to protect species before the need for legal endangerment status arises. CNHP is located in Fort Collins at Colorado State University and is a sponsored program of the College of Natural Resources.

Since 1994, CNHP's Wetlands Program has systematically surveyed and assessed biologically significant wetlands within the following counties: Park, Larimer, Routt, Rio Grande, Conejos, El Paso, Pueblo, Garfield, Mesa, and Summit counties. Additionally, wetlands in watershed areas such as the Closed Basin of the San Luis Valley (Saguache and northern Alamosa counties) and the Uncompahgre River Basin (Ouray and eastern Montrose counties) have been surveyed. The objectives of the surveys are to: 1). identify the locations of the biological significant or critically imperiled wetland plant populations and communities, 2). conduct functional assessments (see below), 3). assess the conservation value of each wetland, and 4). systematically prioritize the wetlands for conservation action. ***The results of these wetland surveys provide land managers with prioritized lists of tangible conservation targets that provide an opportunity to protect the range of wetland types in Colorado.***



Functional assessments are conducted at each of the wetlands surveyed using a qualitative, descriptive method based on the best professional judgment of staff ecologists while incorporating some of the principles of several qualitative methods, such as the hydrogeomorphic (HGM) assessment method (Smith, *et al.* 1995), the wetland evaluation technique (WET) (Adam and Stockwell 1983), and the Montana Wetland Field Evaluation (Berglund 1996). The twelve functional categories used to assess each wetland are

listed below. Additionally, each wetland is classified according to both the Cowardin *et al.* (1979) and the hydrogeomorphic (HGM) (Brinson 1993) classification systems.

- Overall functional integrity
- Flood attenuation and storage
- Sediment/shoreline stabilization
- Groundwater discharge/recharge
- Dynamic surface water storage
- Elemental cycling
- Removal of imported nutrients, toxicants, and sediments
- Habitat diversity
- General wildlife habitat
- General fish/aquatic habitat
- Production export/food chain support
- Uniqueness

### **The 2000 Park County Inventory of Critical Biological Resources**

Over 115 rare or imperiled plant species, animal species, and significant plant communities (elements) have been documented in Park County. About 50 of these natural heritage elements are globally significant. The other elements found in the County have state-wide significance. Overall, the concentration of elements indicates that conservation in Park County will have local and state-wide as well as global benefits. Research efforts for the Park County Inventory of Critical Biological Resources were prioritized based on the level of significance of the elements, as well as the estimated potential threats to those elements. Private lands and wetlands in the County are subject to increasing development pressures, so the species and communities contained in such areas were the primary focus of our research, wherever access could be obtained from the landowners.

CNHP biologists visited 35 of the 85 targeted inventory areas. Surveys were conducted for all of the species listed in boldface in Table 5. A total of 83 new occurrences were identified, and updated information was gained on another 60 occurrences. A total of 59 plant species, 20 animal species, and 30 significant plant communities have been identified in Park County (see Table 5). Recently observed and accurately documented occurrences of the G1 through G3 elements provide the foundation for a total of 35 Potential Conservation Areas that follow (see Table 3 for a summary of these PCAs). All of the data collected are housed and maintained in the Biological and Conservation Data System (BCD). Despite our best efforts, we did not locate any occurrences of boreal toads, greenback cutthroat trout, or Pawnee montane skippers.

### **CNHP POTENTIAL CONSERVATION AREAS**

CNHP proposed 35 Potential Conservation Areas (PCA) that it believes are necessary to successfully protect populations or occurrences. These proposed conservation areas focus on capturing the ecological processes that are necessary to support the continued existence of one or more element occurrences of natural heritage significance. Proposed conservation areas may include a single occurrence of a rare element or a suite of rare element occurrences or significant features.

The goal of the PCA process is to identify a land area that can provide the habitat and ecological processes upon which a particular element occurrence or suite of elements occurrences depends for their continued existence. The best available knowledge of each species' life history is used in conjunction with information about topographic, geomorphic, and hydrologic features, vegetative cover, as well as current and potential land uses. The proposed boundary does not automatically exclude all activity. Consideration of specific activities or land use changes proposed within or adjacent to the proposed conservation planning

boundary should be carefully considered and evaluated for their consequences to the element on which the conservation unit is based.

## PROPOSED CONSERVATION AREA PLANNING BOUNDARIES

Once the presence of rare or imperiled species or significant natural communities has been confirmed, the first step towards their protection is the delineation of a proposed conservation planning boundary. In general, the proposed boundary is an estimate of the landscape that supports the rare elements as well as the ecological processes that allow them to persist. In developing such boundaries, CNHP staff considered a number of factors that include, but are not limited to:

- the extent of current and potential habitat for the elements present, considering the ecological processes necessary to maintain or improve existing conditions;
- species movement and migration corridors;
- maintenance of surface water quality within the site and the surrounding watershed;
- maintenance of the hydrologic integrity of the groundwater, e.g., by protecting recharge zones;
- land intended to buffer the site against future changes in the use of surrounding lands;
- exclusion or control of invasive exotic species;
- land necessary for management or monitoring activities.

As the label "conservation planning" indicates, the boundaries are for planning purposes. They delineate ecologically sensitive areas where land-use practices should be carefully planned and managed to ensure that they are compatible with protection goals for natural heritage resources and sensitive species. All land within the conservation planning boundary should be considered an integral part of a complex economic, social, and ecological landscape that requires wise land-use planning.

## RANKING OF PROPOSED CONSERVATION AREAS

One of the strongest ways that the CNHP uses element and element occurrence ranks is to assess the overall biodiversity significance of a site, which may include one or many element occurrences. Based on these ranks, each site is assigned a (or B-) **rank**:

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

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

## PROTECTION URGENCY RANKS

Protection urgency ranks (P-ranks) refer to the timeframe in which it is recommended that conservation protection occur. In most cases, this rank refers to the need for a major change of protective status (for example agency special area designations or ownership). The urgency for protection rating reflects the need to take legal, political, or other administrative measures to protect the area. Protection urgency ranks are as follows:

**P1** Very High Urgency. Protection actions needed immediately. It is estimated that current stresses may reduce the viability of the elements in the PCA within 1 year.

**P2** High Urgency. Protection actions may be needed within 5 years. It is estimated that current stresses may reduce the viability of the elements in the PCA within this approximate timeframe.

**P3** Moderate Urgency. Protection actions may be needed, but probably not within the next 5 years. It is estimated that current stresses may reduce the viability of the elements in the PCA if protection action is not taken.

**P4** Low Urgency. No protection actions are needed in the foreseeable future.

**P5** Low Urgency. Land protection is complete and no protection actions are needed.

A protection action involves increasing the current level of legal protection accorded one or more tracts within 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. Situations that may require a protection action are as follows:

- Forces that threaten the existence of one or more element occurrences at a PCA. For example, development that would destroy, degrade or seriously compromise the long-term viability of an element occurrence; or timber, range, recreational, or hydrologic management that is incompatible with an element occurrence's existence;
- The inability to undertake a management action in the absence of a protection action; for example, obtaining a management agreement;
- In extraordinary circumstances, a prospective change in ownership or management that will make future protection actions more difficult.

#### MANAGEMENT URGENCY RANKS

Management urgency ranks (M-ranks) indicate the timeframe in which it is recommended that a change occur in management of the element or PCA. This rank refers to the need for management in contrast to protection (for example, increased fire frequency, decreased grazing, weed control, etc.). The urgency for management rating focuses on land use management or land stewardship action required to maintain element occurrences at the potential conservation area.

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. The following codes are used to indicate the action needed to be taken at the area:

**M1** Very High Urgency. Management actions may be required within one year or the element occurrences could be lost or irretrievably degraded.

**M2** High Urgency. New management actions may be needed within 5 years to prevent the loss of the element occurrences within the PCA.

- M3** Moderate Urgency. New management actions may be needed within 5 years to maintain the current quality of the element occurrences in the PCA.
- M4** Low Urgency. Current management seems to favor the persistence of the elements in the PCA, but management actions may be needed in the future to maintain the current quality of the element occurrences.
- M5** Low Urgency. No management needs are known or anticipated in the PCA.

**Table B-1. Park County Potential Conservation Areas**

The following PCAs were identified during the 2000 Park County Inventory of Critical Biological Resources. The Biodiversity Significance, Protection Urgency, and Management Urgency Ranks are included (see page 19 for rank definitions). PCAs are listed in approximate order for conservation action.

PCA Name	Biodiversity Rank	Protection Urgency Rank	Management Urgency Rank
Jefferson and Guernsey Creeks	B1	P1	M3
High Creek	B1	P2	M2
Mosquito Range	B1	P2	M3
Old Railroad	B2	P1	M1
Antero Reservoir	B2	P1	M2
South Fork of South Platte River	B2	P1	M2
Fremont's Fen	B2	P2	M3
Sacramento Creek	B2	P2	M3
North Tarryall Creek at Como	B2	P2	M3
Black Mountain at Aspen Park	B2	P3	M2
Lost Park	B2	P3	M2
Beaver Creek at Beaver Ridge	B2	P3	M3
Fourmile Creek at Peart	B2	P3	M3
Geneva Park North	B2	P3	M3
Hollthusen Gulch/Tarryall Creek Fen	B2	P3	M3
Middle Fork South Platte River	B2	P3	M3
South Fork South Platte Fen	B2	P3	M3
East Lost Park	B2	P4	M2
Geneva Park	B2	P4	M2
South Park	B2	P4	M4
Trout Creek	B3	P2	M2
Crooked Creek Spring	B3	P2	M2
South Jefferson	B3	P2	M4
Handcart Gulch	B3	P3	M2
Buffalo Creek at Pony Park	B3	P3	M3
Jefferson Hill	B3	P3	M3
Lower Tarryall Creek	B3	P3	M3
Ruby Creek	B3	P3	M3
Teller Mountain	B3	P3	M3
Sullivan Mountain	B3	P3	M4
Black Mountain	B3	P3	M4
McCurdy Park	B3	P3	M4
Craig Park	B3	P4	M3
Long Gulch at Platte River Mountains	B3	P4	M3
Elevenmile Canyon	B3	P4	M4

### The Natural Heritage Ranking System

Information is gathered by CNHP on Colorado's plants, animals, and plant communities. Each of these species and plant communities is considered an **element of natural diversity**, or simply an **element**. Each element is assigned a rank that indicates its relative degree of imperilment on a five-point scale (e.g., 1 =

extremely rare/imperiled, 5 = abundant/secure). The primary criterion for ranking elements is the number of occurrences, i.e., the number of known distinct localities or populations. This factor is weighted more heavily because an element found in one place is more imperiled than something found in twenty-one places. Also of importance is the size of the geographic range, the number of individuals, trends in both population and distribution, identifiable threats, and the number of already protected occurrences.

Element imperilment ranks are assigned both in terms of the element's degree of imperilment within Colorado (its State or S-rank) and the element's imperilment over its entire range (its Global or G-rank). Taken together, these two ranks give an instant picture of the degree of imperilment of an element. CNHP actively collects, maps, and electronically processes specific occurrence information for elements considered extremely imperiled to vulnerable (S1 - S3). Those with a ranking of S3S4 are "watch-listed," meaning that specific occurrence data are collected and periodically analyzed to determine whether more active tracking is warranted. A complete description of each of the Natural Heritage ranks is provided in Table B-2.

#### TABLE B-2. DEFINITION OF COLORADO NATURAL HERITAGE IMPERILMENT RANKS.

Global imperilment ranks are based on the range-wide status of a species. State imperilment ranks are based on the status of a species in an individual state. State and Global ranks are denoted, respectively, with an "S" or a "G" followed by a character. **These ranks should not be interpreted as legal designations.**

**G/S1** Critically imperiled globally/state because of rarity (5 or fewer occurrences in the world/state; or very few remaining individuals), or because of some factor of its biology making it especially vulnerable to extinction.

**G/S2** Imperiled globally/state because of rarity (6 to 20 occurrences), or because of other factors demonstrably making it very vulnerable to extinction throughout its range.

**G/S3** Vulnerable through its range or found locally in a restricted range (21 to 100 occurrences).

**G/S4** Apparently secure globally/state, though it might be quite rare in parts of its range, especially at the periphery.

**G/S5** Demonstrably secure globally/state, though it may be quite rare in parts of its range, especially at the periphery.

#### ELEMENT OCCURRENCE RANKING

Actual locations of elements, whether they be single organisms, populations, or plant communities, are referred to as element occurrences. The element occurrence is considered the most fundamental unit of conservation interest and is at the heart of the Natural Heritage Methodology. In order to prioritize element occurrences for a given species, an element occurrence rank (EO-Rank) is assigned according to their ecological quality whenever sufficient information is available. This ranking system is designed to indicate which occurrences are the healthiest and ecologically the most viable, thus focusing conservation efforts where they will be most successful. The EO-Rank is based on 3 factors:

**Size** - the extent of the occurrence.

**Condition** - an integrated measure of the quality of biotic and abiotic factors, structures, and processes *within* the occurrence and the degree to which they affect the continued existence of the element occurrence.

**Landscape Context** - an integrated measure of the quality of biotic and abiotic factors, structures, and processes *surrounding* the occurrence.

Each of these factors are rated on a scale of A through D, with A representing an excellent grade and D representing a poor grade. These grades are then averaged to determine an appropriate EO-Rank for the occurrence. If there is insufficient information available to rank an element occurrence, an EO-Rank is not assigned. Possible EO-Ranks and their appropriate definitions are as follows:

- The occurrence is relatively large, pristine, defensible, and viable.
- The occurrence is small but in good condition, or large but removed from its natural condition and/or not viable and defensible.
- The occurrence is small, in poor condition, and possibly of questionable viability.
- The occurrence does not merit conservation efforts because it is too degraded or not viable.

**Table B-3. Targeted Elements of Global or State-wide Concern**

List of targeted elements, organized by taxonomic group, identified for Park County Inventory of Critical Biological Resources in 2000. Species and communities that received top priority during our inventory efforts are presented in bold type. Please see Table B-2 for rank explanations.

Elements	Common name	Global rank	State rank	Federal status	State status	Federal sensitive
<b>Animals-vertebrates</b>						
<b><i>Bufo boreas</i> pop 1</b>	<b>Boreal toad (southern rocky mountain population)</b>	<b>G4T1Q</b>	<b>S1</b>	<b>C</b>	<b>E</b>	<b>FS</b>
<i>Buteo regalis</i>	Ferruginous hawk	G4	S3B,S4N		SC	FS/BLM
<i>Charadrius alexandrinus nivosus</i>	Western snowy plover	G4T3	S1B,SZN	(PS:LT)	SC	BLM
<b><i>Charadrius montanus</i></b>	<b>Mountain plover</b>	<b>G2</b>	<b>S2B,SZN</b>	<b>PT</b>	<b>SC</b>	<b>FS/BLM</b>
<i>Falco peregrinus anatum</i>	American peregrine falcon	G4T3	S2B,SZN			
<i>Grus americana</i>	Whooping crane	G1	SAN	(LE,XN)	E	
<i>Haliaeetus leucocephalus</i>	Bald eagle	G4	S1B,S3N	(PS:LT,PDL)	T	
<i>Pelecanus erythrorhynchos</i>	American white pelican	G3	S1B,SZN		SC	BLM
<b><i>Oncorhynchus clarki stomias</i></b>	<b>Greenback cutthroat trout</b>	<b>G4T2T3</b>	<b>S2</b>	<b>LT</b>	<b>T</b>	
<i>Gulo gulo</i>	Wolverine	G4	S1		E	FS
<i>Lynx canadensis</i>	Lynx	G5	S1	(PS:LT)	E	FS
<i>Mustela nigripes</i>	Black-footed ferret	G1	SH	(LE,XN)	E	
<i>Sorex nanus</i>	Dwarf shrew	G4	S2			FS
<b>Animals-invertebrates</b>						
<i>Cicindela nebraskana</i>	A tiger beetle	G4	S1?			
<b><i>Hesperia leonardus montana</i></b>	<b>Pawnee montane skipper</b>	<b>G4T1</b>	<b>S1</b>	<b>LT</b>		
<i>Oeneis alberta</i>	Alberta arctic	G4	S3			
<i>Oeneis polixenes</i>	Polixenes arctic	G5	S3			
<i>Polites rhesus</i>	Rhesus skipper	G4	S2S3			
<i>Pyrgus xanthus</i>	Xanthus skipper	G3G4	S3			
<i>Physa skinneri</i>	Glass physa	G5	S2			
<b>Plant communities</b>						
<i>Carex simulata</i>	wet meadow	G4	S3			
<i>Cercocarpus montanus/Stipa comata</i>	mixed foothill shrublands	G2	S2			
<i>Danthonia parryi</i>	montane grasslands	G3	S3			
<i>Eleocharis quinqueflora-Triglochin</i> spp.	alkaline spring wetland	GU	S2			
<b><i>Festuca arizonica-Muhlenbergia filiculmis</i></b>	<b>montane grasslands</b>	<b>G2</b>	<b>S2</b>			
<b><i>Kobresia myosuroides-Thalictrum alpinum</i></b>	<b>extreme rich fen</b>	<b>G1?</b>	<b>S1</b>			
<b><i>Kobresia simpliciuscula-Scirpus pumilus</i></b>	<b>extreme rich fen</b>	<b>G2?</b>	<b>S1</b>			
<i>Pentaphylloides floribunda/Deschampsia cespitosa</i>	montane riparian shrubland	G4	S3S4			
<i>Phippsia algida</i>	alpine wetlands	GU	SU			
<i>Picea engelmannii/Trifolium dasyphyllum</i>	timberline forests	G2	S2			
<i>Picea pungens/Betula occidentalis</i>	montane riparian woodlands	G2	S2			
<b><i>Pinus aristata/Festuca arizonica</i></b>	<b>montane woodlands</b>	<b>G4</b>	<b>S3</b>			

<i>Pinus aristata/Festuca thurberi</i>	lower montane woodlands	G3	S2			
<i>Pinus aristata/Juniperus communis</i>	montane woodlands	GU	SU			
<i>Pinus aristata/Ribes montigenum</i>	<b>upper montane woodlands</b>	<b>G2G4</b>	<b>S1</b>			
<i>Pinus aristata/Trifolium dasyphyllum</i>	<b>upper montane woodlands</b>	<b>G3</b>	<b>S3</b>			
<i>Populus tremuloides/Betula occidentalis</i>		G2G3	S2			
<i>Populus tremuloides/Lonicera involucrata</i>	montane riparian forests	G3	S3			
<i>Puccinellia airoides</i>	<b>salt meadows</b>	<b>G4</b>	<b>S1</b>			
<i>Salicornia rubra</i>	<b>salt meadows</b>	<b>G2</b>	<b>S1?</b>			
<i>Salix brachycarpa/Carex aquatilis</i>	subalpine riparian/wetland carr	G2G3	S2S3			
<i>Salix drummondiana</i> /mesic forb	drummonds willow/mesic forb	G4	S4			
<i>Salix eriocephala</i> var. <i>ligulifolia</i>	montane willow carr	G2G3	S2S3			
<i>Salix monticola/Calamagrostis canadensis</i>	montane willow carr	G3	S3			
<i>Salix monticola/Carex aquatilis</i>	montane riparian willow carr	G3	S3			
<i>Salix monticola/Carex utriculata</i>	montane riparian willow carr	G3	S3			
<i>Salix monticola</i> /mesic forb	montane riparian willow carr	G3	S3			
<i>Salix monticola</i> /mesic graminoid	montane riparian willow carr	G3	S3			
<i>Salix planifolia/Caltha leptosepala</i>	subalpine riparian willow carr	G4	S4			
<i>Salix planifolia/Carex aquatilis</i>	subalpine riparian willow carr	G5	S4			
<b>Plants</b>						
<i>Aquilegia saximontana</i>	Rocky mountain columbine	G3	S3			
<i>Armeria scabra</i> ssp. <i>sibirica</i>	Sea pink	G5T5	S1			FS
<i>Askellia nana</i>	Dwarf hawksbeard	G5	S2			
<i>Astragalus bodinii</i>	Bodin milkvetch	G4	S2			
<i>Astragalus molybdenus</i>	Leadville milkvetch	G3	S2			FS
<i>Botrychium echo</i>	Reflected moonwort	G2	S2			FS
<i>Botrychium lunaria</i>	Common moonwort	G5	S2S3			
<i>Botrychium pallidum</i>	Pale moonwort	G2G3	S2			FS
<i>Braya glabella</i> var. <i>glabella</i>	Arctic braya	G5T?	S1			FS
<i>Braya humilis</i>	Alpine braya	G5	S2			
<i>Carex leptalea</i>	Bristle-stalk sedge	G5	S1			
<i>Carex livida</i>	<b>Livid sedge</b>	<b>G5</b>	<b>S1</b>			<b>FS/BLM</b>
<i>Carex oreocharis</i>	<b>Grassyslope sedge</b>	<b>G3</b>	<b>S1</b>			
<i>Carex scirpoidea</i>	<b>Canadian single-spike sedge</b>	<b>G5</b>	<b>S2</b>			<b>BLM</b>
<i>Carex tenuiflora</i>	<b>Slender-flower sedge</b>	<b>G5</b>	<b>S1</b>			
<i>Carex viridula</i>	<b>Green sedge</b>	<b>G5</b>	<b>S1</b>			<b>BLM</b>
<i>Castilleja puberula</i>	Downy indian-paintbrush	G2G3	S?			
<i>Cylactis arctica</i> ssp. <i>acaulis</i>	<b>Nagoon berry</b>	<b>G5T5</b>	<b>S1</b>			<b>FS</b>
<i>Cypripedium calceolus</i> ssp. <i>parviflorum</i>	Yellow lady's-slipper	G5	S2			

<i>Delphinium ramosum</i> var. <i>alpestre</i>	Colorado larkspur	G?T2	S2			
<i>Draba borealis</i>	Northern rockcress	G4	S2			
<i>Draba crassa</i>	Thick-leaf whitlow-grass	G3	S3			
<i>Draba exunguiculata</i>	Clawless draba	G2	S2			
<i>Draba fladnizensis</i>	Arctic draba	G4	S2S3			
<i>Draba grayana</i>	Gray's peak whitlow-grass	G2	S2			
<i>Draba incerta</i>	Yellowstone whitlow-grass	G5	S1			
<i>Draba oligosperma</i>	Woods draba	G5	S2			
<i>Draba porsildii</i>	Porsild draba	G3G4	S1			
<i>Draba streptobrachia</i>	Colorado divide whitlow-grass	G3	S3			
<i>Eriogonum coloradense</i>	Colorado wild buckwheat	G2	S2			BLM
<b><i>Eriophorum altaicum</i> var. <i>neogaeum</i></b>	<b>Altai cottongrass</b>	<b>G4?T3?</b>	<b>S3</b>			<b>FS</b>
<b><i>Eriophorum gracile</i></b>	<b>Slender cottongrass</b>	<b>G5</b>	<b>S2</b>			<b>BLM</b>
<i>Eutrema edwardsii</i> ssp. <i>penlandii</i>	Penland alpine fen mustard	G1G2	S1S2	LT		
<i>Ipomopsis globularis</i>	Globe gilia	G2	S2			FS
<b><i>Machaeranthera coloradoensis</i></b>	<b>Colorado tansy-aster</b>	<b>G2</b>	<b>S2</b>			<b>FS</b>
<i>Nuttallia densa</i>	Arkansas canyon stickleaf	G2	S2			BLM
<i>Oxytropis parryi</i>	Parry oxytrope	G5	S1			
<b><i>Packera pauciflora</i></b>	<b>Few-flowered ragwort</b>	<b>G4G5</b>	<b>S1S2</b>			<b>BLM</b>
<i>Parnassia kotzebuei</i>	Kotzebue grass-of-parnassus	G4	S2			
<i>Phippsia algida</i>	Snow grass	G5	S2			
<i>Phlox kelseyi</i> ssp. <i>salina</i>	Marsh phlox	G4T3?Q	S1			
<i>Physaria alpina</i>	Avery peak twinpod	G2?	S2?			
<i>Picradenia helenioides</i>	Intermountain bitterweed	G3G4Q	S1			
<i>Potentilla rupincola</i>	Rocky mountain cinquefoil	G5?T2	S2			FS
<b><i>Primula egaliksensis</i></b>	<b>Greenland primrose</b>	<b>G4</b>	<b>S2</b>			<b>FS/BLM</b>
<b><i>Ptilagrostis porteri</i></b>	<b>Porter feathergrass</b>	<b>G3G5T2</b>	<b>S2</b>			<b>FS/BLM</b>
<i>Ranunculus gelidus</i> ssp. <i>grayi</i>	Tundra buttercup	G4G5	S2			
<b><i>Salix candida</i></b>	<b>Hoary or silver willow</b>	<b>G5</b>	<b>S2</b>			<b>BLM</b>
<i>Salix lanata</i> ssp. <i>calcicola</i>	Lime-loving willow	G4T4	S1			FS
<b><i>Salix myrtilifolia</i></b>	<b>Low blueberry willow</b>	<b>G5</b>	<b>S1</b>			<b>FS/BLM</b>
<i>Salix serissima</i>	Autumn willow	G4	S1			FS/BLM
<i>Saussurea weberi</i>	Weber saussurea	G2G3	S2			BLM
<b><i>Sisyrinchium pallidum</i></b>	<b>Pale blue-eyed grass</b>	<b>G2G3</b>	<b>S2</b>			<b>BLM</b>
<i>Telesonix jamesii</i>	James' telesonix	G2G3	S2?			
<b><i>Thellungiella salsuginea</i></b>	<b>Salt-lick mustard</b>	<b>G4G5</b>	<b>S1</b>			
<i>Townsendia rothrockii</i>	Rothrock townsend-daisy	G2?	S2?			
<b><i>Trichophorum pumilum</i></b>	<b>Little bulrush</b>	<b>G5</b>	<b>S2</b>			<b>FS/BLM</b>
<b><i>Unamia alba</i></b>	<b>Prairie goldenrod</b>	<b>G5</b>	<b>S2S3</b>			
<b><i>Utricularia ochroleuca</i></b>	<b>Northern bladderwort</b>	<b>G4?</b>	<b>S1?</b>			

## Appendix C. ROCKY MOUNTAIN BIRD OBSERVATORY

The Rocky Mountain Bird Observatory (RMBO), along with the Colorado Natural Heritage Program, serves on the Wetlands Team. RMBO is a non-profit organization dedicated to the conservation of birds and their habitat throughout the Rocky Mountains and Great Plains. Founded in 1988 in Brighton, Colorado, RMBO has been contributing to the knowledge and conservation of birds in Colorado for over ten years. RMBO works directly with the CDOW Wetland Program to provide information and expertise regarding all bird species in the state and to provide a liaison to the national ALL BIRD conservation movement. RMBO participates in the progress and implementation of the four major bird plans: The North American Waterfowl Management Plan, Partners in Flight Plan, North American Waterbird Conservation Plan and United State Shorebird Conservation Plan. The significance of these activities for the South Park Focus Area Committee is that waterfowl, waterbird, and wetlands conservation activities (including funding) are traditionally related.

Park County is located within the following bird plan regions:

- Intermountain West Joint Venture created by the North American Waterfowl Management Plan,
- Intermountain West Shorebird Planning Region created by the United States Shorebird Conservation Plan,
- Intermountain West/Southwest Desert Region created by the North American Waterbird Conservation Plan,
- Southern Rockies Physiographic Area created by the Partners in Flight Plan,
- Southern Rockies/Colorado Plateau Bird Conservation Region created by the North American Bird Conservation Initiative.

One Important Bird Area has been identified in South Park by RMBO and Audobon-Colorado. An Important Bird Area is a site that provides essential habitat to one or more bird species during some portion of the year, including breeding season, migration and/or winter. The Basin/Bald Hill supports approximately 300 breeding Mountain Plovers in good condition native habitat. The site is owned by the State Land Board and Bureau of Land Management but leased by the Division of Wildlife as the "Reinecker Ridge State Wildlife Area". It is located approximately 7 miles east of the town of Fairplay (Cafaro 2000).

## Appendix D. REFERENCES

- Adamus, P.R. and L.T. Stockwell 1983. A Method for Wetland Functional Assessment, U.S. Department of Transportation, Federal Highway Administration, Washington D.C.
- Appel, J. L. 1995. Hydrogeologic framework of the High Creek Calcareous Fen, South Park, Park County, Colorado. Master's Thesis. University of New Mexico.
- Bailey, R.G., Avers, P.E., King, T., McNab, W.H. 1994. Ecoregions and subregions of the United States (map). Scale 1:7,500,000; colored. U.S. Geological Survey, Washington, DC.
- Berglund, J. 1996. Montana Wetland Field Evaluation Form and Instructions. Prepared for Montana Department of Transportation.
- Brunstein, F. C. and Yamaguchi, D. K. 1992. The oldest known Rocky Mountain bristlecone pines (*Pinus aristata* Engelm.). Arctic and Alpine Research **24**: 253-256.
- Cooper, D. J. 1990. An Evaluation of the effects of peat mining on wetlands in Park County, Colorado. Unpublished Report, Prepared for Park County .
- Cafaro, K.A. 2000. Important Bird Areas of Colorado. Audobon – Colorado. Boulder, CO.
- Chronic, J. 1964. Geology of the southern Mosquito Range, Colorado. The Mountain Geologist **1**: 103-113.
- Cooper, D. J. 1991. Ecological studies of wetlands in South Park, Colorado: Classification, functional analysis, rare species inventory, and the effects of removing irrigation. Unpublished US EPA report.
- Cooper, D. J. 1996. Water and soil chemistry, floristics, and phytosociology of the extreme rich High Creek fen, in South Park, Colorado, U.S.A. Canadian Journal of Botany **74**: 1801-1811.
- Cooper, D. J. and Sanderson, J. 1997. A Montane *Kobresia myosuroides* Fen Community Type in the Southern Rocky Mountains of Colorado, U.S.A. Journal of Arctic, Antarctic and Alpine Research **29**: 300-303.
- Cooper, D.J. Ecological Studies of Wetlands in South Park, Colorado: Classification, Functional Analysis, Rare Species Inventory, and the Effects of Removing Irrigation. Prepared for Park County and EPA. Boulder, CO.
- Cooper, D.J. and MacDonald, L. H. 2000. Restoring the vegetation of mined peatlands in the Southern Rocky Mountains of Colorado, USA. Restoration Ecology Vo. 8, No. 2, pp. 103-111.
- De Voto, R. 1964. Stratigraphy and structure of Tertiary rocks in south western South Park. The Mountain Geologist **1964**: 117-126.
- De Voto, R. H. 1971. Geologic history of South Park and geology of the Antero Reservoir quadrangle, Colorado. Quarterly of the Colorado School of Mines, 66(3). 90 pp.
- Durrani, J. 1980. Seismic investigation of the tectonic and stratigraphic history eastern South Park, Park County Colorado. Thesis, School of mines? .
- Ettinger, M. 1964. Geology of the Hartsel area, South Park, Park County, Colorado. The Mountain Geologist **1**: 127-132.
- Gard, M. Yarbrough, S. and Lewis, B. 2000. South Park Wetland Evaluation. Available from U.S. Bureau of Land Management, NARSC, Lakewood, Colorado

- Gentry, M. 1996. South Park Strategic Plan. Prepared for the Colorado Division of Wildlife, Colorado Wetlands Initiative. Park County, Colorado.
- Jehn Water Consultants, I. and Leonard Rice Consulting Water Engineers, I. 1998. Initial surface and ground water modeling report of the South Park Conjunctive Use Project. Prepared for the City of Aurora,
- Johnson, J. B. and Gerhardt, T. D. 2002. Mapping and characterization of mires and fens in South Park, Park County, Colorado. Unpublished report submitted to the U.S. BLM.
- Johnson, J. B. and Steingraeber, D. A. In Review. Vegetation assemblages and ecological gradients of the calcareous mires of South Park, Colorado, USA. Canadian Journal of Botany .
- Johnson, J. B. and Gerhardt, T. D. In Prep. An Inventory and Mapping of Fens and Other Wetlands in South Park, Park County, Colorado. Being prepared for the U.S. Bureau of Reclamation.
- Johnson, J. B. 2000. The Ecology of Calcareous Fens in Park County, Colorado. Ph.D. Dissertation. Colorado State University.
- Johnson, J. B. 2000. An evaluation of the effects of the South Park Conjunctive Use Project on wetland resources in northern South Park, Park County, Colorado: an expert witness report. Unpublished report submitted to the U.S. Bureau of Land Management .
- Johnson, J. B. 2000. Documentation of reference conditions in the slope wetlands of the southern Rocky Mountains: reference database, site descriptions, and revised functional models. Report Submitted to U.S. EPA , Region 8 and the Colorado Department of Natural Resources .
- Johnson, J. B. 1999. An Evaluation of Wetland Resources in Northern South Park, Park County, Colorado. Submitted to Park County Government and The Center of Colorado Water Conservancy District.
- Johnson, J. B. and Steingraeber, D. A. 1999. Evaluation of the Nation Hydrogeomorphic Slope Wetland Guidebook in the Rocky Mountains and Development of Regional Models. Submitted to the US EPA Region VIII and the Colorado Department of Natural Resources.
- Johnson, J. B. 1999. An Evaluation of Wetland Resources in Northern South Park, Park County, Colorado. Submitted to Park County Government and The Center of Colorado Water Conservancy District.
- Johnson, J. B. 1998. The Calcareous Fens of Park County: Their Vegetation, Environmental Functioning, and the Effects of Disturbance. Submitted to US EPA, Colorado Dept. of Natural Resources and Park County Government.
- Johnson, J. B. 1997. The Calcareous Fens of Park County: Their Environmental Functioning and Vegetational Recovery after Mining. U.S. EPA and Park County Department of Environmental Health.
- Johnson, J. B. 1996. Environmental Function, Vegetation and the Effects of Peat Mining on a Calcareous Fen in Park County, CO. U.S. EPA and Park County Department of Environmental Health.
- Johnson, J. B. 1996. The Environmental Functioning of a Calcareous Fen in Park County, Colorado, and the Effects of Peat Mining. Society of Wetland Scientists Newsletter 8:4-6.
- Kettles, S., Sarr, D. A. and Culver, D. 1999. A Natural Heritage Assessment and Inventory of State Wildlife Area Wetlands. Prepared for Division of Wildlife. Colorado Natural Heritage Program. Colorado State University. Ft. Collins, CO.
- Kruse, E. G. and Haise, H. R. 1974. Water use by native grasses in high altitude Colorado meadows. Agricultural Research Service, U.S. Department of Agriculture, ARS-W6,

- Leachman, B. and Osmundson, B. 1990. Status of the mountain plover: A literature review. Unpublished US FWS Report. Golden , CO .
- Lozano, E. 1967. Stratigraphy and structure of Tertiary rocks in central South Park, Park County, Colorado. *The Mountain Geologist* **4**: 119-126.
- Pierson, C. T. and Singewald, Q. D. 1953. Results of reconnaissance for radioactive minerals in parts of the Alma district, Park County, Colorado. US Government Printing Office, Washington, D.C., USGS Circular 294.
- Sanderson, J. and March, M. 1996. Extreme rich fens of South Park, Colorado: Their distribution, identification, and natural heritage significance. Unpublished report submitted to US EPA, Region VIII.
- Sawatzky, D. 1964. Structural geology of south eastern South Park, Park County, Colorado. *The Mountain Geologist* **1**: 133-139.
- Shapins Associates, I. 1996. South Park heritage resource area study. unpublished report submitted to Park County .
- Sharp, R. R. and Aamodt. 1976. Uranium concentrations in natural waters South Park, Colorado. .
- Simmons, R. L. and T. Simmons. 1999. South Park Historic Contexts. Prepared for Park County, Tourism and Community Development Office. Front Range Research Associates, Inc.. Denver, CO.
- Singewald, Q. D. 1950. Gold placers and their geologic environment in northwestern Park County, Colorado. U.S. Geological Survey Bulletin 955,
- Smith, R. D., A. Ammann, C. Bartoldus, & M.M. Brinson 1995. An Approach for Assessing Wetland Functions Using Hydrogeomorphic Classification, Reference Wetlands, and Functional Indices. Technical Report WRP-DE-9, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.
- Spackman, S. Culver, D. and Sanderson, J. 2001. Park County inventory of critical biological resources. Unpublished report prepared for Park County.
- Spahr, N. and Ruddy, B. 1983. Reservoir evaporation in central Colorado. USGS Water-Resources investigation report 83-1403.
- Spahr, N. E. 1981. Variations in climate characteristics as related to evapotranspiration in South Park, Central Park County, Colorado. U.S. Geological Survey, Water-Resource Investigation 80-86, Lakewood, CO.
- Stark, J. T. Johnson, J. H. Behre, C. H., Jr. Powers, W. E. Howland, A. L. and Gould, D. B. 1949. Geology and origin of South Park, Colorado. *Geological Society of America Memoir* **33**: 188.
- Tweto, O. 1974. Reconnaissance geologic map of the Fairplay West, Mount Sherman, South Peak, and Jones Hill 71/2minute quadrangles, Park, Lake, and Chaffee counties, Colorado. U.S. Geological Survey Miscellaneous Field Studies Map MF-555, scale 1:62,500. .
- Tweto, O. Moench, R. H. and Reed, J. C., Jr. 1978. Geologic map of the Leadville 10 x 20 quadrangle, northwestern Colorado. U.S. Geological Survey Miscellaneous Investigations Series Map 1-999, scale 1:250,000. .
- Valdes, G. 1967. Geology of the Jones Hill Quadrangle, South Park, Park County, Colorado. Master's Thesis. Colorado School of Mines.
- Walter, I. A. Siemer, E. G. Quinlan, J. P. and Burman, R. D. 1990. Evapotranspiration and agronomic

responses in formerly irrigated mountain meadows, South Park, CO. Submitted to Board of Water Commissioners, City and County of Denver,

Wilmarth, V. R. 1959. Geology of the Garo Uranium-vanadium-copper deposits, Park County, Colorado. *In:* (ed.) Contributions to the geology of uranium. U.S. Government Printing Office, Washington, D.C.