4. Case Studies

The following are case studies of trail projects that involved significant wildlife issues. In addition to a contact name for further information, cross-references are listed to topics in the Primer.

Sand Creek Regional Trail

Integrated trail/wildlife planning

Sand Creek has been one of Denver's forgotten streams. It flows from wide open spaces east of Denver, through Aurora, under runways at the former Stapleton International Airport, through intensive industrial development in Commerce City and into the South Platte River.

With the development of Stapleton's Bluff Lake and other sites along the Creek as natural areas has come more attention.

Systematic ecological study before trail planning

As part of planning a trail system along the creek, an ecological assessment was completed to evaluate the existing vegetation and wildlife habitat along the creek.

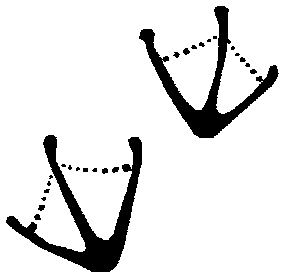
In order to evaluate the habitats, the 12-mile corridor was divided into 20 smaller segments, each about a half mile in length. Scientists estimated habitat quality in each of these segments based on overall plant and animal diversity.

Plant and animal diversity measured

Plant diversity was formulated based on the number of different types of vegetation that were present in the corridor. Also considered in the study of diversity were vegetation type, topsoil condition, soil texture, and abundance of noxious weeds.

Animal diversity was one of three components used to determine wildlife habitat quality. Animal diversity was based on the number of different species (species richness) in each segment.

Another component of the study was a rating of the corridors based on their ability to support a population of particular species of songbirds, water



birds, deer, medium-sized mammals, beaver, reptiles, and amphibians. Quantitative bird counts were particularly helpful in this portion of the study. Finally, the presence of rare animal species was taken into account.

Other habitat considerations

Other interesting factors used in assessing wildlife habitat included the degree of human disturbance, abundance of refuse, including piles of waste soil, asphalt or concrete, and abundance of transplantable vegetation. Evidence of human activity, grazing activity, and number of native species present were all used to determine a disturbance rating.

High quality areas avoided

Recommendations for trail alignments were evaluated based on this information. Areas of concern were established and avoided in trail planning, and existing trails or roads were used as much as possible for construction of new trails. Suggestions for habitat improvement were also included. The most important steps toward improvement included enhancing vegetation—restoration of native plant communities to provide a larger expanse and a greater diversity of habitat types; and stream and pond improvements—to provide additional open water.

For Information

Sand Creek Greenway; Stapleton Development Corp.
303-393-7700

Also see Primer topic: G. A site's existing impacts.

Chatfield Basin Conservation Network

Looking at the big picture

A group of over 35 public and private organizations and agencies is implementing an aggressive vision for wildlife and trails in the Chatfield Basin, on metro Denver's southwestern boundary.

Already the area has over three million visitors (in 1996), and the use and popularity of its trails, open spaces, 2,150 surface acres of water and 279 miles of streams will only grow with population increases.

Although approximately 39 percent of the Chatfield Basin is already conserved as a state or local park or some other kind of protected open space, the scattered conservation lands will not be enough to protect an interconnected open space system for wildlife and trails.

Their vision includes healthy protected areas that are sustainable and rich in indigenous species because these ecosystems are buffered and connected, with opportunities for hiking across the basin. The project vision is supported by five goals:

1. Conserve and enhance areas of significant wildlife habitat and protect a connected system in support of wildlife movement.

2. Conserve and enhance areas of significant vegetation.

3. Conserve open lands and wetlands to protect water quality and help reduce damage from flooding.

4. Create an interconnected, nonmotorized trail system for the Chatfield Basin.

5. Coordinate open space systems across jurisdictions in the basin.

Considerable cooperation

This is a complex conservation effort because it involves the cooperation of many people. Area parks and open space agencies will continue to manage and, as needed, expand core reserves, such as Roxborough State Park. These areas alone will not protect major wildlife movement corridors. The cooperation of private landowners and developers will be needed in planning housing developments and other uses in the buffer areas so that wildlife connections and important habitat areas are integrated into the larger system.

Trails are an integral part of the conservation plan

Trails planners were part of the Chatfield Network from the beginning and the proposed interconnected regional system of trails is fully integrated into the concept plan. By working together across the basin not only were trail planners able to cooperate across jurisdictions, but they were able to work directly with wildlife biologists to understand the wildlife sensitive areas to avoid.

For Information

Chatfield Basin Conservation Network, 303-660-7334

Also see Primer topic: C. Tools for a broader view.

Antelope Island State Park

Planning Backcountry trails in the midst of sensitive wildlife

Utah State Parks is in the process of implementing a backcountry trails plan that will add 40 miles of trail to Antelope Island State Park, near Salt Lake City, in the Great Salt Lake. To help with the process, the agency formed a wildlife advisory committee of experts from academia and other agencies.

The committee was created to bring a more scientific approach to park management, and to provide unbiased review of resource based programs and proposals. The wildlife committee was particularly interested in minimizing recreational impacts of trails in a setting that is home to both bighorn sheep and free-roaming bison.

The following are some of the important aspects of the trail program developed by the committee.

Identifying critical habitat a first step

A major first step was identifying critical wildlife habitat and the kinds of recreational activities that might impact it. Critical habitats for Antelope Island include areas where wildlife calve, lamb or fawn, critical winter range and habitat of threatened and endangered species.

To avoid wildlife conflicts in these area during sensitive times, motorized recreation is confined to park roads and excluded from the trail system.

Space and time limitations placed on recreation

In order to achieve the goal of providing access while protecting habitat, the park has developed a plan that limits recreation spatially and temporally.

The main spatial limitation on recreation is requiring trail users to remain on the trails. This part of the plan is based on the theory that wildlife may become accustomed to recreationists if their presence always occurs in the same area.

Temporal limitations in the park include seasonal closings. For example, Antelope Island's Frary Peak Trail is closed for six weeks while bighorn sheep are lambing.

Enforcement—staff and volunteer—is vital

Trail restrictions are enforced by park law enforcement staff. Rangers, who patrol the backcountry on bikes and horses, have the authority to issue citations.

In an effort to help the law enforcement staff, a volunteer trail patrol program also is being put into place. These volunteers are present primarily on weekends and other busy times to explain the program to park patrons. They are, in effect, salesmen for the entire management program at Antelope Island.

Tim Smith, manager of the park, says there have been few problems with off-trail use since the program's inception.

Interpretation used to encourage responsible trail use

As a way of encouraging responsible trail use, the park has introduced interpretive programs. These programs present the rationale behind the trail program and the opportunities and limits it places on recreationists. The park attempts to get the message across using a variety of means such as personal programs, interpretive signing and exhibits, publications, and other media outreach.

Trail impacts monitored

Antelope Island has a monitoring system in place that evaluates the impacts of the trail system on wildlife populations. Elements the park staff monitor on a (somewhat) regular basis include: habitat use; displacement; calving, lambing and fawning success; recruitment; causes of mortality; overall health of herds; and range conditions. Park staff conduct studies of the island's resources and encourage outside research.

For information

Utah State Parks, Antelope Island State Park; Tim Smith, Manager 801-322-4307

Also see Primer topic: H. How wildlife respond to trails.

Chatfield State Park

Visitors in a sensitive area

In creating a wildlife viewing area at Chatfield State Park, planners used three main strategies to avoid excessive disturbance of more than 90 active great blue heron nests and 135 active double-crested cormorant nests:

1. Controlling both the timing and location of visitors;

2. Educating visitors about the wildlife resources; and

3. Enforcing rules and regulations.

The first strategy—zoning—was crucial in protecting the birds. A recreational access schedule defines timing and types of human activities allowed within 150 meters of the waterbird colony.

From March 1 through April 30 the risk of human disturbance is high. During this period the birds return to the colony, court, build nests, lay eggs, and begin to incubate them. Therefore human access is limited to the viewing deck.

In this way the deck serves less as the only possible vantage point for visitors and more as a containment strategy to protect the water birds by concentrating the people.

For information

See Richard Larson, "Balancing Wildlife Viewing and Wildlife Impacts: A Case study," in R.L. Knight and K.J. Gutzwiller, *Wildlife and Recreationists*.

Crown Hill Park

Strong public support for wildlife management

Jefferson County (Colorado) Open Space Department's 250-acre Crown Hill Park is a neighborhood park in an urban setting. The park provides both important habitat for wildlife and recreation for a half million visitors each year.

The public has shown strong support for wildlife at Crown Hill Park, even when it has meant trail closures. A trail through a wetlands portion of the park is closed each year while waterfowl nest.

Recently there was support when a portion of the park was closed for two to three months due to the presence of nesting Swainson's hawks. Through interpretive efforts, the public was made aware of the situation.

In another situation, park-goers were initially outraged when coyotes arrived in the park, displacing resident foxes. Through education this has been turned around. Now park visitors are informally involved in coyote protection by making sure other visitors are not antagonizing the animals.

"Crown Hill is living proof that successful closures and good public compliance are possible with strong interpretive and volunteer efforts," says Jeffco's Colleen Gadd.

For information

Jefferson County Open Space, Colleen Gadd, 303-271-5995

Also see Primer topic: J. Managing trails with wildlife in mind.

Peron's Peak

The challenge of enforcing seasonal closures

Peron's Peak is a Colorado Division of Wildlife area purchased with hunter and angler dollars. The area is completely closed the day after hunting season ends through March 31 to make the area more attractive to animals and for deer fawning. The Division of Wildlife tries to make the animals feel that the area is secure. On April 1st, the area opens up west of the county road. The area east of the road remains closed due to peregrine falcon nesting. On July 15th the entire area is opened to the public.

Managers have faced ongoing problems enforcing the closures. Some cross-country skiers, hikers, and bikers ignore the signs and enter the area anyway. Some mountain bikers have ignored the signs at the east side closure and riden right up to the falcon eyries. This has the potential to cause falcons to abandon their nests.

For information

Colorado Division of Wildlife, Mike Zgainer, 970-247-0855

Also see Primer topics: H. How wildlife respond to trails, J. Managing trails with wildlife in mind, and L. Landownership.

Bay Trail Project

San Francisco Bay's proposed 400-mile trail develops creative designs for wildlife

California's Bay Trail Project, is a proposed 400-mile shoreline hiking and bicycling trail system around the San Francisco Bay. Project planners are looking for effective ways to provide access while preserving natural shoreline resources.

To date, 170 miles of trail have been completed. The Bay Trail Project is now working to implement the more difficult trail segments, many of which are near wetland and shoreline habitat areas.

As public access is proposed along undeveloped shoreline areas, concerns have been raised about the impact hikers, bicyclists, and pets may have on the adjacent wildlife. The Bay Trail Project personnel are studying the interaction of shoreline recreationists and wildlife and looking for ways to avoid harmful impacts.

A particularly good job of considering wildlife is evident in several projects.

San Rafael—Shoreline Park Trail

Included in the two-and-a-half mile San Rafael Shoreline Master plan are two parallel fences planted between with native vegetation. This wetland buffer, which is unobtrusive and still effective in keeping dogs and other pets away from the marsh, was built by the developer of an adjacent property.

Although the trail is heavily used, monitoring has shown an increase in the number and diversity of shorebirds.

Other features of the project include:

• A program was developed to remove invasive exotic plants, such as pampas grass and French broom.

• A secondary trail between wetland ponds and the improved main trail was removed.

• A task force developed the shoreline master plan over a period of three years.

See Primer topic: J. Managing trails with wildlife in mind.

E. Palo Alto—Ravenswood Landing

In this joint effort, the Midpeninsula Regional Open Space District (MSROD) and San Mateo County realigned a trail and built observation decks to reduce growing conflicts between recreational use and wildlife preservation.

MSROD and the County worked with the Audubon Society to locate wildlife observation decks. The decks are raised and have railings to further deter trespassing into sensitive wildlife areas. Interpretive signs explain that the decks act as dead ends to protect wildlife.

See Primer topics: H. How wildlife respond to trails, J. Managing trails with wildlife in mind, and K. Making informed decisions.

San Leandro—Shoreline Marsh Improvements and Public Access Corridor

In considering a new link to the Bay Trail through San Leandro, alternative trail alignments were considered to protect 175 acres of prime Bay wetland and sand dune habitat.

There was 15 years of input from the public and from technical experts. An interpretive signage program was planned to educate users about sensitive wetlands.

The wetlands were enhanced through the introduction of tidal action through excavation of channels, creation of elevated islands, and installation of culverts. Also, a sensitive sand dune area was preserved for the least tern, a shorebird.

See Primer topic: K. Making informed decisions.

San Jose Riparian Corridor Study

The City of San Jose developed a riparian corridor policy to help limit public access in potentially sensitive areas. They conducted an extensive inventory of 150 miles of creeks and biotic resources and met with residents, interest groups, and the building industry.

The policies and guidelines developed by the city aim to protect riparian corridors for environmental and recreational purposes. They:

• Require a 100-foot setback from the riparian corridor for all active land uses;

• Seek to limit trails to one side of the riparian corridor;

• Direct lighting away from the corridor to reduce the impact of such lighting on wildlife;

• Direct runoff away from the corridor and into filtration areas;

• Locate interpretive nodes at least 500 feet apart.

See Primer topics: C. Tools for a broader view and E. The importance of streamside areas.

Babbs Creek Canyon Drainage Project

In constructing a pedestrian trail along Babbs Creek Canyon, efforts were made to maintain and enhance sensitive oak riparian habitat.

The trail was located at the outer edge of the creek buffer zone, 100 feet from the top of creek bank. The area is being revegetated with native species, with the goal of a continuous canopy of oaks along the 100-foot wide buffer.

Habitat sensitive street lighting (which focuses light on the street) is being encouraged to reduce unnatural nighttime lighting. In addition, water drainages are being monitored for pollutants.

See Primer topics: H. How wildlife respond to trails and E. The importance of streamside areas.

For information

Bay Trail Project; Janet McBride, Manager; P.O. Box 2050, Oakland, CA 94694-2050

Appalachian Trail

Even with careful study, sensitive wildlife can be overlooked

The conflict between wildlife and recreation has become a prominent issue for the well-known Appalachian Trail. In several cases, despite every effort to be sensitive to wildlife, trails have had to be relocated.

In one case, wildlife studies were conducted prior to building a new trail, and a trail route was determined. But unfortunately, following construction biologists discovered that the trail alignment was impacting falcon hacking sites.

The hacking sites (ledges where falcon eggs were hatched) also were attractive to hikers because of the spectacular views they afforded. The falcons were being disturbed by hikers. A relocation of the trail was necessary to protect these breeding sites.

A second relocation of the Appalachian Trail was necessary when the trail was discovered to be threatening the habitat of the Eastern Timberback rattlesnake. Again, biological studies had been done beforehand, but somehow the Timberback got overlooked until after construction of a mile and a half of this segment. A biologist suggested a new route, to protect both the habitat and the public.

For information

Appalachian Trail, Bob Proudman, 304-535-6331

Also see Primer topic: F. Species and places of special interest.

Humboldt & Huron Peaks

Rerouting trails reduces impacts

Use by hikers had created a serious erosion problem on Humboldt Peak's southwest slope. A gully formed with some spots up to ten feet wide and four feet deep. All vegetation was trampled so there was nothing to hold the topsoil when it rained.

The Colorado Fourteeners Initiative organized a project to fix this trail in southcentral Colorado. They carefully imported rock from nearby quarries, plugging up the gulley with nearly 180 tons of rock.

The group cut a new trail around the gulley and transplanted the vegetation from the newly cut trail to the site of the old gulley.

At nearby Huron Peak, the Initiative moved an existing trail away from endangered plant species and from soils that were inappropriate for trails.

The Huron Peak trail was not well delineated at the top, and as a result, many social trails had been created on the climb down. Hence, trail consolidation was necessary to eliminate social trails.

For information

Colorado Fourteeners Initiative, Keith Desrosiers, 303-278-7525 x114

Also see Primer topic: F. Species and places of special interest.

Snowmass's Tom Blake Trail

Thinking of wildlife at every stage

Wildlife issues were taken into consideration throughout the construction of the Tom Blake Trail in Snowmass, Colorado. Because the nearby ski area had been required to complete an environmental impact study, trail planners were already aware of sensitive species and habitat in the area.

Project planners made certain to leave snags (dead trees) for nesting birds along the trail tread. Slash piles (small huts about 4-6 ft. wide) were also created in the same area to serve as shelter for small mammals.

Both snags and slash piles were left as a way of helping wildlife adjust to the intrusion of recreationists into their habitat. Twice a year—in the fall and spring—the trail is closed for a month during elk and deer calving and migration.

To date, monitoring has not detected any negative impacts to wildlife. The trail may be benefiting some local wildlife by providing a path for migration during heavy snow season. Future management of the trail will be by a local housing developer.

For information

Town of Snowmass (Colorado); Dawn Keating, Biologist, 970-923-5524

Also see Primer topics: J. Managing trails with wildlife in mind and F. Species and places of special interest.

St. Vrain Greenway

A trail project as midwife to river restoration

As part of the St. Vrain Greenway, residents of Longmont, Colorado, are reclaiming the river that flows through their community, The Greenway trail begins in Golden Ponds Park and runs along Main Street through heavily industrialized areas.

Large pieces of concrete, asphalt, and car parts—among other things—had been dumped along the banks of the river. To prepare the area for trail construction and river restoration, the Longmont Parks and Recreation Department removed this debris and eased the gradient next to the river.

The department also removed noxious weeds along the trail corridor and re-seeded, reintroducing native plants. They planted trees, and added benches and trash cans.

The restoration work was done to create a better trail setting, but was also effective in improving wildlife habitat. More foraging and shelter were provided.

Some sensitive species were thought to have migrated out of the area during construction, but have returned since the project was completed.

For information

Longmont Parks and Recreation Department, Paula Fitzgerald, 303-651-8448

Also see Primer topic: G. A site's existing impacts.

Wheat Ridge Greenbelt

Reconfiguring a riparian trail

At one time an 8-foot asphalt trail—narrow by urban standards—wound through the Wheat Ridge (Colorado) Greenbelt. In order to reduce congestion on the trail, a second paved trail was built for bicyclists and rollerbladers and the original asphalt path was replaced with crusher fines. Use of the original trail was then limited to equestrian and pedestrian traffic.

An environmental analysis was completed prior to construction of the trails. An endangered orchid, ute's ladies tresses was found in the area. Other endangered species thought to be present were not found.

Throughout construction, the city's park naturalist walked the alignment with the contractor to point out and have avoided such things as nesting trees and fox dens. The city moved the new "fast" trail as far away from the riparian corridor as possible, while still staying within the designated greenway.

The area with the "slower,"crusher fines path was designated as a conservation area, due to citizen request.

Enhancements to the habitat are being made through planting.

For information

City of Wheat Ridge, Margaret Paget, Park Naturalist, 303-423-1122

Also see Primer topic: E. The importance of streamside areas.

5. Sources of Information

Internet resources

Note: It may be convenient to access this list online and take advantage of the active links already established to the sites listed below. The list may be found at Colorado State Parks' website (www.dnr.state.co.us/parks/), where it will be kept updated.

GENERAL INFORMATION ABOUT TRAIL PLANNING, CONSTRUCTION, AND MANAGEMENT

Austin (Texas) Metropolitan Trails Council, How-to guide for neighborhood trail planning and development.
http://www.austin360.com/greenzone/amtc/build.htm

Austin (Texas) Metropolitan Trails Council: Sources of books on planning, building, maintaining, and managing trails, including volunteerism.
http://www.austin360.com/greenzone/amtc/resource.htm

Appalachian Trail Conference: Includes general information on management plans and other stewardship activities, as well as a land trust to protect their trail corridor.
http://www.atconf.org/programs.html

University of Idaho Extension Forestry: Building forest trails
http://www.ets.uidaho.edu/extforest/august97.htm

South Carolina Trails Program: Trails management, including searchable bibliographies and information on funding, construction, and greenways.
http://www.sctrails.net/trails/trails_mgmt.html

Purdue University Cooperative Extension Service: How to plan an interpretive trail
http://persephone.agcom.purdue.edu/~agcom/Pubs/FNR/FNR-124.html

North Carolina Cooperative Extension Service: "Recreational Forest Trails: Plan for Success," including types of trails, design, layout, construction, studying the land
http://www.ces.ncsu.edu/nreos/rrea/rectrailstoc.html

North Carolina State University: Recreational Forest Trails: "Top Ten Construction Tips" and sources of information
http://www.ces.ncsu.edu/nreos/rrea/topten.html

University of Minnesota Trail Planning, Construction, and Maintenance Bibliography
http://www.lib.umn.edu/for/bib/trls.html

FEDERAL LANDS AND AGENCIES

U.S. Fish and Wildlife Service
Threatened and Endangered Species Data Set:
http://www.fws.gov/pullenl/cais/tespec.html
Endangered Species Act:
http://www.fws.gov/r9endspp/esa.html#Lnk03

USDA Forest Service: Chapter 1.3 of Trails Management Handbook. Includes typical information needed for trail system analysis.
http://www.fs.fed.us/im/directives/fsh/2309.18/2309.18_1

Bureau of Land Management: General statement about stewardship activities, including trails.
http://www.blm.gov/budget/1998/98rec.html

USDA Forest Service: Newsletter about an Off-Highway Vehicle (OHV) proposal for Daniel Boone National Forest
http://www.atving.com/editor/trails/db.htm

National Park Service Planning Homepage
http://www.nps.gov/planning/

USDA Forest Service Homepage
http://www.fs.fed.us/

U.S. Forest Service Wildlife page
http://www.fs.fed.us/outdoors/wildlife/get.htm

U.S. Environmental Protection Agency Homepage
http://www.epa.gov/

USDA National Resource Conservation Service
http://www.nrcs.usda.gov/

NRCS Technical Resources, includes the National PLANTS database.
http://www.nrcs.usda.gov/TechRes.html

American Trails articles on trails in wetlands.
http://www.outdoorlink.com/amtrails/resources/trailbuilding/BuildTFWetlands.html

Council on Environmental Quality—NEPAnet,
http://ceq.eh.doe.gov/nepa/ nepanet.htm

NATURAL RESOURCE INFORMATION

Rocky Mountain Ecology: Wildlife links, ecological problems, trail links
http://www.afternet.com/~tnr/mountain/

clay.net® Environmental Professional's Homepage, designed specifically for environmental consultants and remediation professionals. Includes state and federal agencies and legislation.
http://www.clay.net/

Texas Agricultural Extension Service: Wildlife management information
http://leviathan.tamu.edu:70/1s/pubs/wildlife

Olympic National Forest: Ecology of Aquatic and Riparian Ecosystems: An Examination of Forest Management Alternatives
http://www.olympus.net/gov/onf/ecomgt/research/riparian.htm

Natural Resources Research Information Pages: Outdoor Recreation Research
http://sfbox.vt.edu:10021/Y/yfleung/recres.html

Colorado Division of Wildlife
http://www.dnr.state.co.us/wildlife/

Links to state wildlife agencies
http://www.ndsu.nodak.edu/instruct/devold/twrid/html/ gov.htm

Colorado Mountain Club
http://www.cmc.org/cmc/

Craighead Environmental Research Institute: Corridors and Reserve Design
http://www.avicom.net/ceri/col/reserve.html

Craighead Environmental Research Institute: Reserve Design--links to corridor analysis, habitat preservation, movement across landscapes
http://www.avicom.net/ceri/reserve/index.html

Bay Trail Project: Creative designs for conservation along trails
http://www.abag.ca.gov/bayarea/baytrail/innovsol.html

International Association for Landscape Ecology,
http://www.edc.uri.edu/iale/

Society for Conservation Biology
http://conbio.rice.edu/scb/

Wildlife Biology Information Page
http://members.aol.com/Bioweb98/thankyou.htm

RESTORATION

Colorado State Parks: Revegetation along trail corridors
http://www.outdoorlink.com/amtrails/resources/trailbuilding/BuildTFReveg.html

Army Corps of Engineers: Habitat Restoration Recommendations
http://www.swt.usace.army.mil/factbook/tc_71.htm

Bibliography of Literature describing riparian restoration and revegetation projects
http://www.habitat-restoration.com/rrrbib.htm

Ecological Restoration
http://wfscnet.tamu.edu/courses/wfsc406/restore.htm

Restoration and Management News
http://wiscinfo.doit.wisc.edu/arboretum/rmn/homepage.html

MISCELLANEOUS

Links to State Trail Programs
http://www.outdoorlink.com/amtrails/resources/statetrails/index.html

North Quimper Penninsula (Washington) Wildlife Corridor: Project to preserve wildlife corridor of native vegetation connecting habitat areas.
http://www.olympus.net/community/saveland/corridor.htm

FUNDING AND ASSISTANCE

Colorado State Trails Program
http://www.dnr.state.co.us/parks

Colorado Division of Wildlife—Fishing is Fun
http://www.dnr.state.co.us/wildlife/

USDA Natural Resources Conservation Service: Conservation Programs, including, incentive programs for wildlife, wetlands, soil, environmental quality.
http://www.nrcs.usda.gov/NRCSProg.html

Sources specific to Colorado Trail Projects

Boulder County Parks and Open Space, Michael Sanders, Senior Resource Specialist/Wildlife, 303-441-3952

City of Boulder Open Space Department, P.O. Box 791, Boulder, CO 80306

Bureau of Land Management, Jim McBrayer, Outdoor Recreation Planner, Little Snake Resource Center, Craig, CO, 970-826-5083

Continental Divide Trail Alliance, 303-838-3760

Colorado Division of Wildlife
Wildlife Habitat Biologists: Western Region: Bob Clark, 970-249-3431, Montrose; Northeast Region: Rick Moss, 970-484-2836, Ft. Collins; Southeast Region: Bruce Goforth, 719-539-3529, Salida
Natural Diversity Information Source (online, available Fall 1998): http://www.dnr.state.co.us/ wildlife/
Colorado List of Threatened and Endangered Species: http://www.dnr.state.co.us/wildlife/ T&E/list.html
Colorado State Wildlife Statute 33
http://web.intellinetusa.com/cgi-dos/statsrcf.exe?N

Colorado Dept. of Transportation, Gay Page, Bicycle/Pedestrian Program Manager, 303-757-9982J51

Colorado Natural Areas Program; E-mail: dnr.parksna@state.co.us;
website: http://elbert.state.co.us/cnap

Colorado Natural Heritage Program, John Armstrong, Environmental Review Coordinator, 254 General Services. Bldg., Colorado State University, Fort Collins, CO 80523, 970-491-7331

Colorado State Parks Trails Program, 1313 Sherman Street, Room 618, Denver, CO 80203 ; email: MacTrail@aol.com, website: www.dnr.state.co.us/parks/
Also see the Wildlife Bibliographic Data Base at this website.

Colorado Weed Management Association
http://linden.fortnet.org/CWMA/#index1

Jefferson County Open Space Department, Randall Frank, Natural Resources Supervisor, 700 Jefferson County Parkway, Suite 100, Golden, CO 80419, 303-271-5986

Summit County Open Space and Trails Department, Scott Hobson, P.O. Box 5660, Frisco, CO 80442; 970-668-4060.

U.S. Army Corps of Engineers,
Denver (Omaha District), 303-979-4120;
Pueblo (Albuquerque District), 719-543-6915;
Grand Junction (Sacramento District), 970-243-1199.

U.S.D.A. Forest Service, Rocky Mountain Region, Recreation and Public Service, 303-275-5045;
Melanie Woolever, Wildlife Biologist, 303-275-5007

General Trail References

Note: Also see the references listed in the Wildlife and Trails Primer.

Ashbaugh, B. L., and R. F. Holmes. 1967. Trail Planning and Layout. National Audobon Society. New York, NY. 104p.

Fogg, G. E. 1986. A Site Design Process. National Recreation and Park Assoc., Alexandria, VA. 185p.

Fogg, G. E. 1981. Park Planning Guidelines Revised. National Recreation and Park Assoc., Alexandria, VA. 202p.

Larsen, D. M., and W. R. Miles. Nature Trails. Agricultural Extension Service, University of Minnesota. Extension Bulletin Number 368. 15p.

PLAE, Inc. 1993. A Design Guide for Universal Access to Outdoor Recreation. Berkeley, CA. 240p.

USDA Forest Service 1985. Trails Management Handbook. (FSH 2309.18) 84p.

6. Glossary

Included here are terms used in the handbook or terms likely to be encountered in other sources of wildlife information.

ABIOTIC. Not living; often referring to the non-living components of the ecosystem such as water, rocks, and mineral soil.

AGE STRUCTURE (of a population). The percentage of the population at each age level, or the number of individuals of each sex at each age level.

BASELINE SURVEY. The initial set of measurements in an ongoing monitoring study, typically done before the system is changed by management

BIODIVERSITY. The variety of life and its processes; including the variety of living organisms, the genetic differences among them, the communities and ecosystems in which they occur, and the ecological and evolutionary processes that keep them functioning, yet ever changing and adapting.

BIOTIC. Life and living organisms, especially characteristics of entire populations or communities

CANDIDATE SPECIES. A species being considered for listing by the federal government as threatened or endangered.

CANOPY. Formed by the branches and leaves of trees in a wood or forest.

CARRYING CAPACITY. The number of recreationists that can be accommodated in a specific area based on ecological, physical, facility, and/or social factors.

CONNECTIVITY. The state of being functionally connected by movement of organisms, materials, or energy.

CORRIDOR. Narrow continuous areas of favorable habitat that allow the movement of animals, birds and plants along them.

CORVIDS. Birds of the Corvidae or crow family.

DETRITUS. Organic particles or other loose material that result directly from disintegration of leaves, stems, or other materials.

DISPERSAL. The managerial action of distributing a given amount of wilderness use over a larger area, such as through the construction of additional trails, with the intention of lessening impacts to wilderness areas.

DISTURBANCE. A discrete event, either natural or human-induced, that causes a change in the condition of an ecological system.

DIVERSITY (index). A measure of the biological diversity within an environment which can be used to detect stress on an environment.

ECOSYSTEM. A system formed by the interaction of living organisms, including people, with their environment. Spatially, ecosystems are described for areas in which it is meaningful to talk about these relationships.

ECOSYSTEM MANAGEMENT. The skillful, integrated use of ecological knowledge at various scales to produce desired resource values, product, services, and conditions in ways that also sustain the diversity and productivity of ecosystems. This approach blends physical, biological, and cultural/ social needs.

EDGE. A significant change in structure or composition caused by natural events such as fire and wind or human-caused events.

EDGE EFFECTS. Tendency to have greater variety and density of organisms in the boundary zone between communities.

EDGE SPECIES. Species living primarily or most frequently or numerously at junctions of communities.

ENDANGERED SPECIES. Any species listed under the Endangered Species Act which is in danger of or threatened with extinction throughout all or most of its range.

ENVIRONMENTAL IMPACT STATEMENT (EIS). An environmental analysis, as required by the National Environmental Policy Act (NEPA), for proposed federal actions that may have a significant effect on the quality of the human environment (40 CFR 1502.3).

EROSION. The detachment and movement of soil from the land by wind, water or gravity.

EXOTIC SPECIES. Species that occur in a given place, area, or region as the result of direct or indirect, deliberate or accidental introduction of the species by humans, and for which introduction has permitted the species to cross a natural barrier to dispersal.

FACULTATIVE. Having the capacity to live under different conditions; organisms that can live in a certain way but are not obliged to and may, under certain conditions, adopt another mode of life.

FLAGSHIP SPECIES. Species that are popular and charismatic and which therefore attract popular support for their conservation.

FLUSHING DISTANCE. The distance at which wildlife flee from a disturbance.

FORAGE. All browse and herbaceous plants that are available to feed livestock or wildlife.

FORBS. Seed plants with nonwoody, green stems (herbaceous plants); especially a plant other than a grass.

FOREST-INTERIOR SPECIES. Species living primarily or most frequently in the interiors of forests.

GUILD, SPECIES. Group of species having similar requirements and foraging habits and thus similar roles in the community.

HABITAT. The natural environment of a plant or animal.

HABITAT EVALUATION PROCESS (HEP). A process developed by the U.S. Fish and Wildlife Service as a structured and quantitative way of evaluating habitat before and after a project and determining how much mitigation is needed to compensate for damage.

HABITAT FRAGMENTATION. A process by which habitats are increasingly subdivided into smaller units, resulting in their increased insularity as well as an overall loss of habitat area.

HABITAT SECURITY. The condition of being safe from disturbance.

HABITAT SUITABILITY INDEX (HSI). A scale is created by rating the habitat for each species before and after a project on a scale from 0 (= totally unsuitable habitat) to 1.0 (= optimal habitat).

HARDENING. The manual, mechanical, or chemical compaction of the trail tread resulting in a hard, flat surface that sheets water effectively and resists the indentations that are created by use.

INDICATOR. A specific measurement used to gauge a resource or social condition.

INDIGENOUS SPECIES. Any species of flora or fauna that naturally occurs in wilderness areas that was not introduced by humans.

INDIRECT EFFECTS. Those effects occurring at a later time or at some distance from the triggering action.

LACUSTRINE. Living in or beside a lake.

LAND AND RESOURCE MANAGEMENT PLAN (LRMP) Programmatic level Forest-wide plan (required by NFMA) setting overall management direction, standards, and guidelines for a National Forest.

LANDSCAPE. Heterogeneous land area composed of a cluster of interacting ecosystems that is repeated in similar form throughout.

LEAVE NO TRACE (LNT). Educational program designed to instill behaviors in the wilderness that “leave no trace” of human activities or occupation.

LIMITS OF ACCEPTABLE CHANGE (LAC). A planning framework that establishes explicit measures

of the acceptable and appropriate resource and social conditions in wilderness settings as well as the appropriate management strategies for maintaining or achieving those desired conditions.

LANDSCAPE SCALE. At the broader scale of a landscape, i.e., several square kilometers.

LAYER. Horizontal stratum in a plant community, i.e., the tree layer comprising the canopy, the shrub layer comprising the shrubby understory, the herb layer comprising grass and herbaceous plants, and the ground (moss) layer comprising the ground surface, lichens and mosses.

MANAGEMENT INDICATOR SPECIES (MIS). A wildlife species whose population status and trend in a certain habitat type indicates the population and trend of other species that depend on the same habitat.

MANAGEMENT ZONES. Areas identified for different management techniques and/or uses.

MATRIX, LANDSCAPE. The most extensive and most connected habitat type in a landscape, which often plays the dominant role in landscape processes.

METAPOPULATION. A set of partially isolated populations belonging to the same species. The populations are able to exchange individuals and recolonize sites in which the species has recently become extinct.

MITIGATE. Actions to avoid, minimize, reduce, eliminate, or rectify the adverse impact of a management practice.

MONITORING. The collection of information to determine the effects of resource management and to identify changing resource conditions or needs.

MULTIHABITAT SPECIES. A species that uses more than one type of habitat over the course of the year or its life.

NATIONAL WILDERNESS PRESERVATION SYSTEM (NWPS). All lands covered by the Wilderness Act and all subsequent designations, irrespective of the department or agency having jurisdiction.

NATIONAL WILD AND SCENIC RIVER SYSTEM. Rivers with outstanding remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values designated by Congress under the Wild and Scenic Rivers Act for preservation of their free-flowing condition.

NATIONAL ENVIRONMENTAL POLICY ACT (NEPA) Legislation declaring the productive harmony with nature, and protection of the environment, to be national policy. NEPA provides for analyzing the environmental consequences of proposed management actions on all National Forest System lands, including management actions taken in wilderness.

NATIVE SPECIES. Any species of flora or fauna that naturally occurs in an area and that was not introduced by humans.

NATURALIZED SPECIES. Any non-indigenous species of flora or fauna that is close genetically or resembles an indigenous species and that has become established in the ecosystem as if it were an indigenous species.

NEOTROPICAL MIGRANT. A bird that migrates to temperate North America from Central or South America and back over the course of the year.

NEST CAVITIES. Naturally occurring holes in trees, used by birds for nesting.

NEST PARASITES. Cowbirds and other birds that lay eggs in nests of other species of bird and leave their young to be raised by others.

NEST PREDATION. Jays and other birds that prey on eggs or nestlings.

NOXIOUS WEED. Plant that is invasive, displacing native species.

OBLIGATE. Obligatory; limited to one mode of life or action.

OFF-HIGHWAY VEHICLE (OHV). Any motorized vehicle used for travel in areas normally considered inaccessible to conventional highway vehicles. OHVs generally include dirt motorcycles, dune buggies, jeeps, 4-wheel drive vehicles, snowmobiles, and ATVs.

PALUSTRINE. Growing in marshes or swamps.

PASSERINES. Large order of birds, which includes small and medium-sized perching birds and songbirds such as crows, tits, warblers, thrushes, and finches

PATCH, LANDSCAPE. A nonlinear surface area differing in appearance from its surroundings, typically a small (less than 50 acres) portion of the landscape; small patches the size of an individual tree canopy are frequently called gaps.

PREDATION. When an organism catches and kills other organisms for food.

PUNCHEON. A log or timber structure built to cross a boggy area. Usually consists of sills, stringers, and a log deck.

RANGE. The geographic extent of habitat used by a species.

RAPTORS. Hawks, eagles, owls or other birds of prey.

RECORD OF DECISION (ROD). The portion of a Final Environmental Impact Statement that identifies the proposed action, signed by the appropriate deciding officer.

RECREATIONAL STOCK. Pack and saddle stock used primarily for transporting recreationist and their gear. Both commercial pack station and individual stock are included. Usually horses and mules but may also be llamas, or goats.

RECREATION OPPORTUNITY SPECTRUM (ROS). A means of classifying and managing recreational opportunities based on physical setting, social setting and managerial setting. Wildernesses, are normally managed entirely for the "primitive" ROS class.

RIPARIAN. The land and vegetation immediately adjacent to a body of water, such as a stream, lake, or river; such vegetation depends upon a perpetual source of water.

RIVERINE. Living in rivers.

SOCIAL TRAILS. Unplanned trails that developed informally.

SENSITIVE SPECIES. Those species on an official state list or recognized by another agency, needing special management to prevent them from becoming endangered or threatened.

SINGLE-TRACK TRAIL. A trail wide enough only for one user to travel and requires getting off the trail to allow another user to pass.

SNAGS. Standing dead trees.

SUCCESSION. The more or less predictable change in the composition of communities following a natural or human disturbance.

TAKE. Harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.

TREAD. The actual surface portion of a trail upon which users travel excluding backslope, ditch, and shoulder. Common tread surfaces are native material, soil cement, asphalt, concrete, or crushed rock.

UNTRAMMELED. An untrammeled area is which human influence does not impede the free play of natural forces or interfere with natural processes in the ecosystem.

WATERSHED. The entire area that contributes water to a drainage system or stream. Portion of the forest in which all surface waters drain to a common point.

WETLAND. Areas that are inundated by surface or ground water with a frequency sufficient to support a prevalence of vegetative or aquatic life dependent upon the water for growth and reproduction.

WILDERNESS. An area of wilderness is defined in sec. 2(c) of the Wilderness Act (16 U.S.C. 1131-1136).

WILDLIFE SIGN. Feathers, rubs, scraps, beds, and other evidence of wildlife use.

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Please send us your comments!

Use this form to suggest ways of improving this handbook or go on-line to tell us at: www.dnr.state.co.us/parks/
Send this form to: Stuart Macdonald, Colorado State Parks—Trails Program, 1313 Sherman Street, Room 618, Denver, CO 80203, email: MacTrail@aol.com, fax: 303-866-3206. Thank you.

CHAPTER 1. INTRODUCTION

CHAPTER 2. WILDLIFE AND TRAILS PRIMER

Any additional topics to cover? Rules of thumb to suggest? Additional reading to add for a topic?

CHAPTER 3. WILDLIFE AND TRAILS CHECKLIST

Any comments on the overall process? Additional steps to suggest?

CHAPTER 4. CASE STUDIES

Do you have other trail projects to recommend where important wildlife lessons were learned?

CHAPTER 5. SOURCES OF INFORMATION

Do you have other sources of information to recommend?

CHAPTER 6. GLOSSARY

Any other terms to include? Better defintions to suggest?