

# Appendix C

Federal, State and Local Tools for Acquisition,  
Protection and Implementation / Funding Sources

### Federal Tools for Resource Protection

- The Endangered Species Act (ESA)
- The National Biological Survey
- The National Environmental Policy Act
- Section 404: Wetlands Protection
- Federal Land Preservation Incentives
- USDA Environmental Quality Incentive Program
- Federal Land Ownership and Management
- U.S. Fish and Wildlife Service

### State Tools for Resource Protection

- Wildlife Resource Information System (WRIS)
- System for Conservation Planning (SCOP)
- Great Outdoors Colorado (GOCO)
- Natural Areas Program
- Protection of Instream Flows and Natural Lake Levels
- State Wildlife Areas and Conservation Easements
- Habitat Improvement Programs
- State Trust Lands Fish and Wildlife Enhancement Projects

### Acquisition Tools for Local Government

- Criteria for Acquisition
- Alternative Land Acquisition Techniques
- Joint Management Plans
- Conservation Easements
- Local Government Tools for Resource Protection:
- Regulatory Approaches:
  - Zoning Texts and Maps
  - Use Restrictions
  - Density Restrictions
  - Tree Protection and Vegetation Management
  - River Corridor Protection Standards
  - Vegetation Barriers or Buffer Areas
  - Fencing Controls
  - Control on Public or Vehicular Access
  - Other Development Standards
  - Phasing of Development
  - Controls on Construction Activities
  - Integrated Approaches
  - Sensitive Lands
  - Wildlife Corridors
  - Agricultural and Open Space Zoning

- Performance Zoning
- Subdivision Review Standards
- Land Dedication Requirements
- Sanctuary Regulations
- All Overall Growth Management System
- Coordination with Other Land Development Codes

#### Incentive Based Approaches:

- Density Bonuses
- Clustering
- Transferable Development Rights
- Grants and Loans
- Preferential Tax Treatments

#### Acquisition Programs

- Fee Simple Purchase
- Integration into Park and Open Space Purchase Programs
- Sellbacks and Leasebacks
- Purchase 'Triggers': Options and Rights of First Refusal
- Life Estates
- Conservation Easements and Purchase of

#### Development

- Rights
- Land Dedication or Donations
- Impact Fees
- Land Trades

#### Development Agreements

- Memorandum of Agreement for Public Improvements (MOAPI)
- Annexation Agreements
- Joint Management Plans

### Federal Tools Resource Protection

Some policy and programs already exist that can be used by agencies and municipalities to achieve desire objectives. These programs and policies are in place and available to be utilized when common objectives can be identified.

In spite of the increasing importance of local and state governments, the federal government continues to play an important role in resource

protection. Since 1992, efforts to remove the federal government from wildlife and environmental issues have met with mixed success, and several key pieces of federal legislation have been re-authorized. Key areas of federal involvement will include regulations, incentives, and land acquisition and management programs for the protection of endangered and threatened species, the preservation of wetland areas that serve as valuable habitat for numerous species, and the conservation of land in general. While federal regulation in those areas is not expected to expand in the future, existing programs and regulations will continue to be important. The continued influence of the federal government will be particularly important in states like Colorado with vast tracts of federal land with prime habitat areas.

The future of habitat protection will therefore resemble an increasingly balanced partnership, with local, state, and federal governments each exercising unique protection powers. It is important that Colorado's local elected officials and residents understand the range of federal tools and programs available to supplement local habitat protection efforts. This chapter identifies the more important federal programs and summarizes their most significant provisions.

#### A. THE ENDANGERED SPECIES ACT

##### 1. THE ORIGINS OF THE ESA

The Endangered Species Act (ESA) was originally aimed at curbing poaching and smuggling of rare animals. It has evolved considerably since its first enactment in 1966, and was thoroughly rewritten in 1973. Section 9 of the act prohibits the "taking" of an endangered species. This term is defined broadly to include hunting, killing, and other actions that indirectly affect a species - such as harming or harassing the animals. The act has a broad scope and prohibits takings by private citizens or by state and local governments. It also authorizes citizen suits to enforce the act.

Section 7 of the act requires the mapping of the "critical habitat" areas that a species needs to survive and the establishment of "recovery plans" for each listed species. Although priority is to be given to species that may be in conflict with economic development, federal agencies have been largely unable to fulfill these directives in pace with the demands of the development community. While the absence of designated critical habitat or a recovery plan does not defeat the protection of a species, the enforcement of the act has resulted in severe penalties being placed on developers. These developers had no way of knowing in advance that development activity would be determined to be a taking of a species.

##### 2. HABITAT CONSERVATION PLANS

The rigidity of Sections 7 and 9 and the absence of a permitting

provision for non-federal activities has created the need to resolve endangered specie land-use conflicts in the private sector. In an early example of private sector initiative, a developer and local environmental interest groups formed a committee and prepared a workable habitat protection plan for a development that affected several butterfly species, which are an important indicator of the overall health of ecosystems. Under the San Bruno plan, the developer donated over 80% of the critical habitat area to the county, development was allowed to proceed on 14% of a critical habitat, and an annual contribution of \$60,000 was paid to the county government to offset management costs for the donated land. The U.S. Fish & Wildlife Service approved the Plan even though it was somewhat experimental.

### 3. NATURAL COMMUNITIES CONSERVATION PLANNING PROGRAM

While Habitat Conservation Plan (HCPs) result in both positive and negative effects for environmental and economic issues, a more general criticism can be directed towards the underlying single-species approach of the Endangered Species Act itself. An HCP does address the habitat needs of the subject threatened or endangered species, but is not required to analyze the larger biological patterns or effects on an entire ecosystem. This may result in incomplete studies and inadequate conservation measures, even after considerable sums have been spent on the development of the Plan.

A multi-species approach to habitat conservation would magnify all the problems associated with environmental regulation and would essentially be beyond the scope of the Act.

California has addressed this situation by initiating its own Natural Communities Conservation Planning Program (NCCP) that attempts to identify and resolve issues before the Endangered Species Act is applicable. In essence, the NCCP uses local planning resources to find ways to protect substantial assemblages of habitat land before the area becomes so fragmented or compromised by development that the listing of individual species is likely under ESA.

Because of its species-specific approach, the ESA often attempts to protect small, disconnected parcels of land where significant numbers of the threatened species exist, but not the larger tracts that would allow the continued health of the entire ecosystem of which the threatened species is a part. NCCP takes the broader view. Partners in the program - which include several agencies of state government and developers - enroll in the program and agree to set aside critical habitat areas and to monitor the ecosystems within them.

### COLORADO'S MEMORANDUM OF UNDERSTANDING

Colorado has recently become the first state in the U.S. to execute an agreement with the U.S. Department of the Interior designed to give

the state a greater role in the application of the Endangered Species Act (ESA). This agreement may have implications for the design of local habitat protections. In particular, as the Colorado Division of Wildlife acts pro-actively to prevent some species populations from declining, it may need the assistance and cooperation of Colorado's local governments. In some cases, the DOW may need to request that local programs be initiated or expanded to focus on habitat that is necessary to avoid application of the Endangered Species Act. On the positive side, if the state is successful in working with local governments to craft unique solutions within Colorado, local governments may, reap the benefit of being able to plan for habitat protection without having to work around the rigid federal requirements and remedies of the ESA.

### THE NATIONAL BIOLOGICAL SURVEY/BIOLOGIC DIVISION

For almost a century, there have been calls for the federal government to create a comprehensive biological inventory for the country. One hundred years ago, a division of biological survey was formed within the U.S. Department of Agriculture. In 1939, that function was transferred to the Department of the Interior, where it became the Fish & Wildlife Service. While many of the original goals of the agency were developed, the "survey" function gradually declined.

More recently, concerns over the loss of species, wildlife habitat, and other natural resources has created a myriad of environmental regulations at the local, state, and federal government levels. Across the country, these regulations have led to serious conflicts between environmental protection and economic growth. The Secretary of the Interior has termed these situations "economic and environmental train wrecks," because they sometimes lead to the derailing of major construction projects at the last minute because of an endangered species, wetlands, or late-emerging environmental issue. The increasing complexity of environmental regulation and the desire to minimize the number of future "train wrecks" has led to renewed calls for a comprehensive biological survey.

Although recent federal legislation has redefined NBS as the Biologic Division of the U.S. Geological Survey instead of a freestanding agency (effective September 1, 1996), its charge and role as a center for research science has not been altered.

### THE NATIONAL ENVIRONMENTAL POLICY ACT

The National Environmental Policy Act (NEPA) applies to actions undertaken, sponsored, and in some cases permitted by the federal government. The act is primarily a procedural mandate that requires all federal agencies to conduct an evaluation of any action that may be defined as a "major federal action" that may involve a "significant

impact on the natural environment." While judicial interpretations of this threshold definition vary with the circumstances, NEPA generally imposes a requirement that the agency at least consider all environmental impacts of a given action, as well as the alternative actions and measures that may mitigate such impacts. Although NEPA does not effect an outright prohibition even on those federal projects that do involve adverse environmental impacts, it does operate to provide more information about the potential adverse impacts of such projects and opens them to public scrutiny. Among those factors that must be considered is the effect of the proposed project on wildlife populations.

### SECTION 404 WETLANDS PROTECTION

Section 404 of the Clean Water Act is relevant to wildlife habitat protection whenever desired habitat will involve wetland areas. This federal act is administered jointly by the U.S. Army Corps of Engineers and the Environmental Protection Agency, and provides significant opportunities for comment and involvement by the U.S. Fish and Wildlife Service. Section 404 creates a permit system that regulates disturbances of wetlands when that disturbance will affect more than one acre of the wetlands. Although the President has recently discussed Executive Orders that would provide broad exceptions for single family homeowners involved in improving their own property for their own use, the permit requirements for land developers or builders are still strict. Permits can be denied if a proposed activity - including any dredging, channelization, or development in a wetland will result in a "significant degradation" of wetlands. Significant degradation can include diminished recreational or aesthetic values as well as damage to aquatic systems. In addition, permits can be issued with conditions requiring mitigation of wetland loss by restoring existing wetlands or creating new wetland areas.

Colorado's local governments should be aware that the need for a Section 404 permit may discourage development in wetlands and make it easier to steer development away from wetland habitats. If the existence of wetlands is documented as part of a local wildlife habitat inventory, that information should be passed on to both the Division of Wildlife and to the U.S. Fish and Wildlife Service so that it can be considered in future 404 permitting activities. In addition, when a developer proposes to build in wetlands and then mitigate the impacts off-site, the developer may be looking for existing wetlands to restore as part of the mitigation process. Colorado's local governments should therefore be prepared to suggest wildlife habitat areas where restoration or expansion of an existing wetland would promote the quality of the habitat itself.

In order to accommodate the need to mitigate wetlands off-site, some states have recently begun creating wetlands mitigation banks. The mitigation bank idea arose from criticism that builders were sometimes

mitigating their impacts on large wetlands by expanding small ones that were not sustainable or not large enough to achieve the goals of aquifer recharge, water quality improvements, or wildlife habitat protection. The intent of the bank system is to designate large and healthy wetland areas - often those that support a wide variety of wildlife species - and encourage developers to expand and improve those areas. In some cases, private investors have actually purchased significant healthy wetland areas and then sold the rights to improve and restore the buyers on an acre-by-acre basis. Potential buyers include builders looking for mitigation sites and an opportunity to get positive publicity by participating in a large and visible habitat area. To date, more than 46 wetlands mitigation banks are operating in the U.S., with most of those located in California and Florida. Oregon, Minnesota, New Jersey, Colorado, and other states have specifically endorsed the creation and operation of wetlands mitigation banks.

### FEDERAL LAND PRESERVATION INCENTIVES

Some federal laws offer financial incentives for land protection or impose disincentives by withholding government subsidies for adverse land uses. In many instances, the types of land protected may have important wildlife habitat value. While the scope and funding of these programs is under increasing pressure in Washington, programs such as the Wetlands Reserve Program and the Conservation Reserve Program still exist. In general, federal incentive programs are based on a simple and compelling argument that the government should not subsidize land uses that are harmful and contradict other established laws or policies. Such programs have proven to be effective in the context of agricultural and wetlands protection.

### 1. WETLANDS RESERVE PROGRAM

The federal Food Security Act of 1985 and the Food, Agriculture, Conservation, and Trade Act of 1990, known as the "farm bills," established a number of programs designed to provide incentives for retaining wetlands. Perhaps the most significant such program was provided in the "Swampbuster" provisions of the Food Security Act. These established a Wetlands Reserve Program, which offers incentives for preservation of up to 1 million acres of wetlands as well as disincentives for conversion.

Under this program, participating farmers prepare and implement wetlands conservation plans and the federal government pays the farmer for the value of the use of the conserved lands as well as a portion of the costs of restoration and conservation. In addition, if the farmer chooses to convert wetlands to agricultural use, the farmer becomes ineligible for federal agricultural price supports, crop insurance, or any other federal agricultural subsidy programs. By thus maintaining a preservation incentive while eliminating competing

incentives to convert wetlands, the federal government has provided a program that promotes the retention of wetlands and related habitat without causing financial harm to farmers. 1992 pilot program involved nine states, 50,000 acres of land, and \$47 million in funding. The 1996 reauthorization of the Farms Bills continued the Wetlands Reserve Program, but its scope is still modest. The program now authorizes the inclusion of 12,000 to 18,000 acres of land within Colorado.

### 2. CONSERVATION RESERVE PROGRAM

The 1985 and 1990 farm bills also included programs establishing a Conservation Reserve Program. Under this program, the federal government offers payments and executes voluntary 10-year agreements with farmers who elect to remove highly erosive cropland from production, thereby reducing environmental damage from runoff and preserving wildlife habitat. This should help offset some of the strongly negative affects of our increasingly monoculture agricultural industry on wildlife since WWII. About 36.4 million acres have been removed from production for at least 10 years under the program so far and have been planted with tame or native grasses. One important additional benefit to wildlife has been to reduce pressure on 32 million acres of grass interspersed with lands remaining in production. Almost 2 million acres of agricultural land within Colorado is included in the program - or approximately one-sixth of all the tilled land in the state. The Conservation Reserve Program has been continued under the 1996 reauthorization of the Farms Bills, in no small part because it has been shown to be a cost-effective way of reducing pollution that would otherwise have to be abated after the fact.

### 3. FOREST STEWARDSHIP INCENTIVES PROGRAM

The 1990 Farm Bill recognized the importance of stewardship of private forestland and land suitable for growing trees as a vital element in the conservation of the nation's natural resources. The bill created the Forest Stewardship Program (FSP) and the Stewardship Incentives Program (SIP), which are administered nationally and regionally by the U.S.F.S. and at the state level by the Colorado State Forest Service. The FSP provides education and technical assistance to private landowners. The SIP assists private landowners to implement the land stewardship activities recommended in their long-range forest plans and to manage their property for a variety of environmental benefits, including wildlife habitat. The program applies to landowners owning between 2 and 1000 acres of land suitable for growing trees, provided they meet eligibility requirements and implement their plans according to applicable regulations for a minimum of 10 years. Under the SIP, cost sharing can be used to promote the development of forest stewardship programs, reforestation, agroforestry, forest improvement, riparian and wetland protection, and the enhancement of fisheries and

wildlife habitat. From 1990 to 1995, \$1 million was distributed in Colorado to support the implementation costs of nearly 1,000 stewardship programs.

### USDA ENVIRONMENTAL QUALITY INCENTIVES PROGRAM

USDA Environmental Quality Incentives Program (EQIP) is a new cost-share program under the federal Agriculture Improvement and Reform Act99 that combines the functions of several existing USDA cost-sharing programs, including the Great Plains Conservation Program and the Colorado River Basin Salinity Control Program. The overall benefit of the combined program is the collaborative efforts between the various agencies to ensure that the program runs successfully. The Natural Resources Conservation Service is responsible for policies, priorities, and guidelines. The Farm Services Agency is responsible for administering the program at the state and local levels. Under EQIP, five- to ten-year contracts will be available to landowners to provide cost-share and incentive payments for up to 75% of the cost of installing conservation practices. EQIP is intended to make the administration of programs and funds more efficient. Payments to any person are limited to \$10,000 annually and \$50,000 for the life of the contract.

### FEDERAL LAND OWNERSHIP AND MANAGEMENT

About 50% of all threatened and endangered species listed under the Endangered Species Act occur at least once on federal land. In addition, about 36% of the more than 24,000 occurrences of federally listed species are found on federal lands. In some cases, more than 50% of the population of a threatened or endangered species lives on federal lands. As a result, the federal government can have a dramatic impact on the preservation of certain species simply through its actions as a landowner - and apart from its role in land regulation. This is particularly true in a state like Colorado, where the federal government owns more than one-third of all the land in the state. The federal agency with the largest opportunity to protect endangered species is the U.S. Forest Service, because 16% if all occurrences of listed species occur on lands that it manages. Lands managed by the Bureau of Land Management house 8% of the occurrences. Lands controlled by the Department of Defense account for 4% of occurrences, and lands managed by the U.S. Fish and Wildlife Service and the National Park Service each account for 3% of occurrences.

### OTHER KEY FEDERAL LAWS AND POLICIES

#### U.S. FISH & WILDLIFE SERVICE

The U.S. Fish & Wildlife Service (USFW) plays a key role in many



wildlife habitat protection issues, but it is not responsible for all federal wildlife concerns. The mission of USFW mission is tied to national goals, which frequently involve migratory, endangered, interjurisdictional, and international wildlife issues. USFW activities are also primarily concerned with public lands and land set aside specifically to protect critical wildlife habitat. In addition to its primary charge, the USFW also perceives the need to provide the public with opportunities for non-consumptive wildlife activities. Most USFW programs also attempt to set an example to encourage responsible stewardship for the environment and promote citizen involvement in wildlife issues.

It is important to recognize that state governments have a much different role in protecting wildlife habitat based on their various responsibilities to fulfill broad public interests, and local governments have a different role because of urban characteristics and interests. Because relatively little federal land is located in urban areas, the scope of USFW activities in urban areas is limited. One notable exception is the Rocky Mountain Arsenal, whose 27 square miles represent a huge urban wildlife reserve of great importance to the state and the region.

#### NATIONAL PARK SERVICE

Because of the recent development of several national recreation areas in cities, the National Park Service has become involved in the relatively new field of urban wildlife biology. Through research, management, and interpretation of urban wildlife issues, the National Park Service has shown that wildlife populations can thrive even in highly disturbed areas. The Service's increased willingness to work in disturbed environments will become a valuable tool for habitat protection measures in urban areas.

#### LAND AND WATER CONSERVATION FUND

The federal Land and Water Conservation Fund was established in 1965 to support federal purchases of national park, recreation, and conservation areas, and to make grants to state and local governments to acquire, develop, and improve recreation areas.

That purpose has been interpreted to include the acquisition of endangered species habitat. Revenue for the fund comes from leases of rights to resources along the Outer Continental Shelf, motor boat fuel taxes, recreational fees, and the sale of surplus federal property. The combined receipts from all those sources totals receipts \$3 or \$4 billion annually, but the full amount of receipts has never been made available for spending. Congress authorized a maximum annual spending limit of \$900 million, and the actual spending in any year is usually closer to \$200 or \$300 million. As a result of spending less than is received, the unspent

balance in the fund is now about \$8 billion. Over the thirty years that the fund has been in existence, \$5.3 billion has been spent for federal acquisitions of land, and \$3.2 billion has been spent for state acquisitions. At present, 80% of the fund is allocated to federal acquisitions and the remaining 20% to the states.

## State Tools for Resource Protection

State government plays a role in resource protection that differs fundamentally from the role of local governments. As described earlier, the Local Government Land Use Control Enabling Act (House Bill 1034) provides broad authority to counties and municipalities to regulate the use of land within their jurisdictions. This bill specifically recognized the importance of protecting habitat from land uses that would threaten a wildlife species. In addition, the Colorado Land Use Act encourages local governments to identify and regulate land uses in "Areas of State Interest" including significant wildlife habitat. Thus, the state has specifically delegated responsibility and authority for protecting wildlife habitat on private land to local governments.

However, the state does support local government in their efforts to protect habitat by providing information and financial help. Here, we offer a brief overview of state programs offering these kinds of support. Our intent is not to offer an exhaustive treatment of such programs, but instead is to provide an entry point for gaining further information. Appendix 1 lists contacts for each of the programs that we describe in more detail below.

#### A. WILDLIFE RESOURCE INFORMATION SYSTEM (WRIS)

The Colorado Division of Wildlife initiated the Wildlife Resource Information System (also known as "WRIS", rhymes with "miss") to support implementation of House Bill 1041. The objective of WRIS is the systematic collection and communication of data to support natural resource planning, particularly planning by local governments. WRIS uses a species mapping process to identify and delineate habitat for species that are economically important (e.g., deer, elk), as well as for species that are threatened, endangered, or are valuable as indicators of habitat health. Once these species have been identified, their known patterns of habitat use are digitized into geographic information systems, and are used to compile composite maps of sensitivity to impact. Composite maps show areas within a county that have high, moderate, and low sensitivity to impact from development. These maps are used by planners to decide which development proposals field personnel from the Division of Wildlife should review. Currently, there are 13 counties that use WRIS maps in a formal planning process and an additional 17 counties that use them informally. Local governments can contact the local Division of Wildlife office to find out about how to obtain help from the WRIS program. A variety of types of cooperation

between the Division and local governments are possible.

#### B. A SYSTEM FOR CONSERVATION PLANNING (SCOP)

A System for Conservation Planning (SCoP, pronounced "scope") is a Division of Wildlife project designed to help local communities set goals for conservation of wildlife diversity and to inform those communities of the economic and regulatory mechanisms available to achieve those goals. The SCoP project is:

*Developing a collaborative process to help decision-makers, planners, and citizens work together to set conservation priorities.*

*Producing accessible information systems that will help citizens and decision-makers foresee large scale, cumulative effects of changes in land use on wildlife diversity.*

#### C. GREAT OUTDOORS COLORADO

In 1992, the Colorado State constitution was amended to create the Great Outdoors Colorado Trust Fund ("GOCO") and phase out the capital construction fund by 1998. The constitutional amendment creating GOCO directs the board of the trust fund to make investments that are substantially equal over the long term for (1) wildlife programs through the Colorado Division of Wildlife, (2) outdoor recreation through the Colorado division of parks and outdoor recreation, (3) competitive grants to the state parks division, counties, municipalities, other political subdivisions, and non-profit and conservation organizations for the purpose of acquiring and managing open space and natural areas of statewide significance, and (4) competitive matching grants to local governments to acquire, develop, or manage open lands and parks.

The mission of the GOCO program is to help the people of Colorado preserve, enhance, appreciate, and enjoy the state's parks, wildlife, trails, rivers, open space, and views. These goals are to be accomplished by making strategic investments, fostering partnerships among diverse interests, and supporting education about the outdoor environment. One of the specific programs currently being developed is a nongame habitat protection grant. These grants could become an invaluable tool in Colorado for protection of wildlife habitat in urban areas. GOCO receives funding from state lottery proceeds and uses them to accomplish a variety of objectives for preserving, protecting and enhancing the state's wildlife, parks, rivers, trails and open space. Grants from GOCO support habitat protection through:

*Acquisition, leases, or easements of critical wildlife habitat;*

*Development of state parks and recreation areas;*

*Acquisition and maintenance of trails and River Greenways; and*

*Identification, acquisition, and management of unique open space and natural areas.*

The establishment of GOCO has created a number of opportunities for local governments and state agencies. The GOCO board of directors has developed a funding process with the Division of Wildlife and the Division of Parks and Outdoor Recreation to annually review funding requests from these agencies. The funding requests are to provide a base level of funding to projects that meet the objectives of GOCO and the Divisions. In addition, funding of grants in the areas of Open Space, Local Government, Trails, and Capacity Building/Planning are awarded annually or more frequently. Finally, GOCO has developed the Legacy Projects program to provide grants of between two and ten million for a few projects that integrate two or more of the funding areas to projects of statewide or regional significance.

#### D. NATURAL AREAS PROGRAM

The goal of the Colorado Natural Areas Program ("CNAP") is to help private landowners and public land agencies identify and conserve areas of land that contain special values-habitat for animals and plants, or paleontological, geological, or other natural features. Natural areas are protected by voluntary cooperative agreements; landowners keep all rights and management responsibilities. Since 1977, when the program began, it has developed voluntary cooperative agreements for protecting natural areas at 81 sites around the state. The CNAP staff is available to help identify natural areas and to advise on managing them to persevere their special value. The program offers some small grants to encourage research on natural areas.

#### E. PROTECTION OF INSTREAM FLOWS AND NATURAL LAKE LEVELS

One of the most important characteristics determining the quality of aquatic habitats is the amount of water in streams (the "instream flow") and lakes (the "natural lake level"). In 1973, Senate Bill 97 created a mechanism for protecting these characteristics. Unlike all other private and government entities, the Colorado Water Conservation Board ("CWCB") was empowered to hold rights to water that remained in streams or lakes. All other parties must divert and use water to maintain their beneficial use rights. The CWCB can obtain rights to water by purchase, donation, lease, contract etc., from private parties or local governments. This offers an important opportunity to counties and municipalities seeking to protect aquatic habitats. Unused water

rights can be donated to the CWCB to assure adequate water levels in streams and lakes. For example, the city of Boulder gave its rights to water in Boulder Creek and North Boulder Creek to protect instream flows there.

#### F. STATE WILDLIFE AREAS AND CONSERVATION EASEMENTS

The Colorado Division of Wildlife holds properties for habitat protection and wildlife recreation. There are 307,000 acres held in fee title across the state; about 30,000 acres are held through leases; and 70,000 additional acres are held under easements. These lands contain important habitat for a broad range of terrestrial and aquatic species.

#### G. HABITAT IMPROVEMENT PROGRAMS

The Colorado Division of Wildlife sponsors or collaborates in several programs to improve habitat for wildlife in Colorado. These program include:

##### 1. COOPERATIVE HABITAT IMPROVEMENT PROGRAM.

The Cooperative Habitat Improvement Program (CHIP) offers funds to share costs of habitat improvement for wildlife on private land. The program is flexible and intended to improve wildlife habitat without affecting agricultural production. Landowners determine the types of projects and where they will be implemented and are not obligated to allow public access to their land. Since 1993, the Habitat Improvement Program has contributed over \$80,000 to help share the cost of establishing 1,325 acres of wildlife habitat.

##### 2. PHEASANT HABITAT IMPROVEMENT PROGRAM.

The Pheasant Habitat Improvement Program is sponsored by the Division of Wildlife and involves landowners and eight chapters of Pheasants Forever within the state. The primary limitation on pheasant populations in eastern Colorado is the absence of areas with sufficient vegetation to allow pheasants to escape predators, and the goal of the program is to develop survival cover to increase pheasant survival through the winter and during nesting season. Pheasants Forever chapters develop plans that are implemented by landowners, including planting sorghum and switchgrass plots, establishing plum thickets, and payments to maintain tall wheat stubble to provide both food and cover. The Division of Wildlife provides funding and technical guidance for these habitat improvement projects. Expenditures under the program in 1994 were about \$300,000.

##### 3. HABITAT PARTNERSHIP PROGRAM.

The Habitat Partnership Program develops partnerships between landowners, land managers, sportsmen, the public, and the Colorado Division of Wildlife to reduce forage and fence conflicts between big game animals (primarily deer, elk, and antelope) and livestock on both public and private lands. The program includes improving big game

habitat to attract animals away from conflict areas; improving forage conditions to reduce competition between big game and livestock; redistribution of concentrations of big game; fence improvement or repair; leasing private land for winter range; monitoring vegetation and animals; and occasional direct payment if conflicts cannot be managed in other ways and the party is eligible for damage payments. There are 14 local HPP committees throughout the state that develop management plans within their regions, including landowner surveys, community meetings, and coordination with other resource agencies.

#### 4. COLORADO WATERFOWL STAMP PROGRAM AND PARTNERS FOR WILDLIFE.

The Colorado Waterfowl Stamp Program was initiated in 1990 by establishing a \$5.00 stamp requirement for waterfowl hunters and by initiating the sale of art prints with the stamp image. Funds from stamp sales have cooperatively funded the creation and enhancement of over 27,000 wetland and upland acres on 300 projects, including high-altitude ponds, eastern plains reservoirs, and western slope river bottoms. To date, funds from print sales have been spent outside the state in a designated North American Waterfowl Management Plan. A multi-agency project review committee serves as the technical advisory group for the selection of habitat projects on both public and private lands. Funding partnerships involving other government agencies, nonprofit organizations, private individuals, and industry are used to leverage the stamp funds for maximum effectiveness. When projects are implemented on private land, landowners retain complete control of their property, and there is no obligation to allow public access.

#### H. STATE TRUST LANDS FISH AND WILDLIFE ENHANCEMENT PROJECTS

The Colorado State Land Board manages about 3 million acres of land in Colorado. Recently the State Land Board and the Colorado Division of Wildlife entered into a memorandum of agreement to allow wildlife-related activities on some of the state trust lands. Lands are identified that have the highest values for wildlife watching, hunting, fishing, and other wildlife-related recreational uses. The program includes 74 properties totaling over 150,000 acres. Another 350,000 acres are currently targeted for enrollment in the program. The state land board has adopted a multiple-use policy for the use of the opened areas. The Division of Wildlife contributes funds for the program. A portion of the funds is used for property restoration and natural resource enhancement projects. These projects consist of water-related developments, fencing riparian corridors and other sensitive wildlife areas, replacement of fenced gates with cattle guards, wildlife habitat plantings, control of noxious weeds, repair of property damage caused by recreationists, and removal of trash and other clean-up activities.

COLORADO PROGRAM CONTACTS:

Colorado Division of Wildlife	
Wildlife Resource Information System	
Denver	303-291-7277
Denver	303-297-1192
Grand Junction	970-248-7178
Colorado Springs	719-473-2945
Montrose	970-249-3431
Colorado Division of Wildlife	303-485-0593
System for Conservation Planning (SCoP)	
Fort Collins	970-484-2836
Great Outdoors Colorado	
Denver	303-863-7522
Colorado Natural Areas Program	
Denver	303-866-3203
Forest Stewardship Program	
Fort Collins	970-491-6303
Wetlands Reserve Program	
Denver	303-236-2886
Denver	303-491-1968
Conservation Reserve Program	
Denver	303-291-7265
Great Plains Conservation Program	
Denver	303-236-2886
Colorado River Salinity Program	
Denver	303-236-2668
Partners for Wildlife	
Denver	303-291-7464
Cooperative Habitat Improvement Program	
Denver	303-291-7335

Pheasant Habitat Improvement Program	
Denver	303-291-7464
Sterling	970-521-0233
Habitat Partnership Program	
Denver	303-291-1192
Colorado Habitat Improvement Programs	
Denver	303-291-7265
Colorado Waterfowl Stamp Program	
Fort Collins	970-484-2836

**ACQUISITION PROGRAMS FOR LOCAL GOVERNMENT:**  
 County governments may find it advantageous to acquire connections in order to make direct linkage to the St. Vrain Greenway. Additional open space and recreation adjacent to the planning area are consistent with the Master Plan presented in this document.

**Land Acquisition**

**Objectives for Acquisition Program**  
 The primary objectives for the acquisition program are the purchase of key parcels of land which are important for the connection of lands which are part of the public open space, trail system or which possess important natural resource values. It is not the objective of the public entities to acquire all the private lands adjacent to this planning area for public use and a mix of public and private ownership is desirable and beneficial. The highest priority, therefore, is to establish a cooperative management system between public and private landowners to meet mutual objectives. Only those relatively few parcels of land that are essential for public purposes or are made available for purchase will be considered for acquisition.

**Criteria for Acquisition (Arizona Example)**  
 The following criteria were utilized by the Arizona State Parks Board with regard to acquisition of lands within the Verde River Corridor:

- 1) Critical Public Values and Importance to Resource

Management in the St. Vrain Corridor. Acquire lands that are essential to creation of the trail system and protection of the quality of the River and cottonwood natural system. The factors which determine criticality include the following: location, size, connection or adjacency to public land, critical habitat, biology, cultural resources, buffer to important resources, scenic values, private inholding surrounded by public land, and water rights. These lands consist of key parcels such as the Valley Concrete site, which is needed for connecting the Greenway trail, its adjacency to the State Park, and restoration and preservation of the cottonwoods.

2) Willing Seller/Willing Buyer Acquisition transactions between sellers and buyers will proceed on the basis of willing and motivated parties. Arizona State Parks has adopted the principle that condemnation will not be utilized to acquire properties in the St. Vrain River Corridor.

3) Flexible Approach In the purchase of properties, State Parks will take a flexible approach to acquisition that takes into account the landowners family situation and objectives, tax and estate issues, and economic objectives. To the extent that it is possible to meet State and landowner objectives the structure of the transaction will be tailored to these issues.

4) Availability of Funding. The State's ability to acquire lands is predicated on the availability of funds for acquisition. In the past, funding availability has fluctuated greatly and it is expected that these fluctuations will continue in the future.

5) Leverage and Flexibility of Terms. Since the State has limited resources, it will select those properties for acquisition that not only meet its criteria in terms of importance to the Greenway system, but in terms of the level of cooperation of the landowner. For example, a landowner that is willing to donate a portion of his or her land or structure flexible terms for an installment purchase will be more likely to be a higher priority than a seller that wants a cash purchase with no flexibility in terms.

**Alternative Land Acquisition Techniques**

Land or interests in land can be acquired using a wide variety of techniques that can be tailored to the needs and wishes of buyers and sellers. Land can be thought of as a bundle of rights, such as the right to develop houses or use the water or extract minerals, all of which can be used, sold or restricted as the owner wishes. For example, a landowner might sell water rights or the right to develop houses, to a local government, which severs that particular right from the full bundle of ownership rights and reduces the value of the remaining rights. The ability to sell, restrict or donate particular rights in property to achieve

landowner or public objectives means that there are many ways to preserve or protect land and meet both landowner and public objectives.

In general the greater the number of rights that are acquired or the higher the percentage of fair market value that is paid for a property, the greater the control that the purchaser will exercise. Thus a buyer that pays full price for a piece of land acquires the full bundle of rights which means that they have full control over the property and full management responsibility. A buyer that acquires only the water rights to a property has only the use of those rights and no use of any other property rights. The techniques that are described below vary from those that acquire full rights and property ownership responsibilities to those that, for little money, acquire only specific rights and thus less control over the use of the property.

## **Acquisition Tools for Local Government**

Because each Colorado community has its own topography, ecology, political climate, and goals for wildlife, it is unlikely that one community's resource protection program can simply be transplanted to a new location. In addition, the process of debating which alternative goals and tools may be appropriate for a city or county makes it much more likely that the resulting program will be successful. Finally, it is important to remember that wildlife does not respect jurisdictional boundaries. Because of the interjurisdictional nature of wildlife and natural resource projects, it is also important to coordinate activities with other local governments on the basis of biological or geographical boundaries rather than on purely political ones.

Within each community, a committee or task force should be established to create workable systems out of the policy directives created in ordinances and intergovernmental agreements. However, local governments should generally try to avoid establishing new administrative structures simply to deal with wildlife, since this will be a source of criticism that distracts attention from wildlife issues. Local committees implementing habitat protection programs should strive to get representation from the top levels of relevant boards - since that is where many decisions are made. At the same time, every effort should be made to design public outreach programs and citizen participation efforts to ensure that genuine community values are reflected in the program. This is particularly true in considering new regulations and acquisition programs.

Although a variety of different tools are available to protect wildlife habitat, all of them must conform to basic principles of constitutional

law and to requirements of Colorado statutes. Those restrictions are discussed in Chapter VI, which should be read in conjunction with this chapter.

### REGULATORY APPROACHES

#### 1. ZONING TEXTS AND MAPS

The Colorado General Assembly has provided broad enabling authority allowing counties and cities to zone their communities, but zoning is not mandatory. According to the Department of Local Government survey noted above, 26% of municipalities in Colorado and 14% of counties had no zoning in 1992. Enacting new zoning regulations or revising existing regulations is often one of the most effective ways of using local powers to protect important habitat. Those communities that have not yet enacted zoning controls are forfeiting a highly effective and versatile method of protecting wildlife habitat. Because each ordinance is tailored to the circumstances of the local government, zoning can address extremely localized issues that may be important for wildlife habitat protection.

In general, zoning ordinances are implemented through the use of both regulatory text and maps. Zoning regulations can therefore often be updated or amended by addressing the specific requirements in the ordinance text, or by adopting new maps that apply regulations to new areas, or a combination of both. For example, if a Colorado community wanted to protect existing trees because of their wildlife value:

One option would be for the town or county to enact a new subsection of text addressing tree protection and to make those requirements applicable to all zone districts.

A second option would be to draft similar protection language, but to add the new requirements to only specific zone districts through amendments to those chapters of the code.

A third option would be to create a new chapter or subsection creating a "habitat protection zone" and then amend the zoning map to apply that zone where it is appropriate. A fourth option would be to draft the protections into the text of an "overlay zone" and then amend the zoning maps to add the overlay district on top of the existing zoning districts.

Map amendments and broad text amendments are landscape level tools, while text amendments related to only a few districts or small areas are considered to be site level tools.

As the fourth option suggests, many of the protections described in this section as "specialized zoning controls" could also be imposed through the use of the "special overlay districts" described in subsection 3, and vice versa. In each case, the key question is whether the regulation is

intended to apply across an area that does not conform to existing zone district boundaries. If it does, then an overlay map district should probably be used.

Regardless of whether a text, map, or overlay district approach is used, it is usually wise to consider whether variances or exceptions should be available. Such instances would apply to where strict application of the regulations would create an unusual hardship or where unique circumstances make it unlikely that the regulation will in fact produce habitat protection benefits.

#### **Use Restrictions**

Often, the most dramatic way to protect wildlife habitat is to control the permitted uses on habitat lands and surrounding areas. Through its listing of uses-by-right, conditional uses, and the criteria for approval of conditional uses, a zoning ordinance can prevent traffic-intensive or people-intensity activities from occurring close to prime habitat areas, migration corridors, calving areas, and similar lands. In some cases, it may be wise to amend existing zoning ordinances to convert current uses-by-right into conditional uses subject to criteria designed to measure the impact of the activity on wildlife. This approach would allow applicants for those uses to move forward with their projects if they could design the site and manage their operations in wildlife-sensitive ways.

#### **Density Restrictions**

A second effective way to reduce impacts on wildlife is to control the density of development in and around habitat areas. At the landscape level, minimum lot size requirements or maximum residential densities can be amended to reduce the number of people on sensitive land and the frequency of human-animal interaction. At the site level, projects can be designed with a gradient of density away from the habitat sites. Areas near the habitat could have low densities, and development further back could have correspondingly higher densities. Through the use of gradients and clustering of development away from prime habitat, wildlife impacts can be dramatically reduced while maintaining the overall number of residential units on the land.

#### **Tree Protection and Vegetation Management**

One effective way to protect open space is to regulate the cutting of trees or vegetation that the target species use for cover or food, and the use of this tool has been increasing dramatically. In 1984, a national study published by the University of Pennsylvania identified less than 100 tree protection ordinances in use in the U.S. - with most of the ordinances coming from Florida or California. By 1989, however, a survey of all incorporated cities in California showed 159 city tree ordinances, and more than 50% of those contained protections against removal of trees. Perhaps more importantly, tree protection laws are no



longer confined to densely populated and rapidly growing states like Florida and California, they are being adopted everywhere. Some communities, such as Austin, Texas, and Thousand Oaks, California, prohibit the removal of any trees larger than a specified size.

Another important form of special regulation is vegetation management. Controlling the types of vegetation planted in, or removed from, an area is an effective way to attract desired species or discourage unwanted ones. Many approaches are available, but the more comprehensive and integrated ones will be more effective. For example, local regulations can specify the types of vegetation that must be maintained in designated greenways and wildlife corridors. Often, the vegetation requirements will differ from those in standard landscaping ordinances. Vegetation management can also be used to create a transition from undeveloped land to developed areas. In general, woodland and riparian areas are critically important for wildlife habitat, and such vegetation should be protected if possible. Wetlands should also be preserved to add biological diversity, filter runoff, and recharge groundwater systems. Some communities, like Lake County, Illinois, and Fairfax County, Virginia, require that a certain percentage of tree or vegetation cover remain on a site.

Whenever tree preservation or vegetation protection management ordinances are adopted, regulations should also clarify that trees and vegetation adequately protected by the developer will count towards the satisfaction of applicable minimum landscaping requirements in the zoning code. The effectiveness of vegetation protection programs often depends on the identification of what specific species of trees or vegetation will actually benefit a given species of wildlife in a given location - and tree and vegetation protections are therefore generally considered as site level tools.

### ***River Corridor Protection Standards***

Zoning can also promote healthy wildlife populations by protecting river corridors. Several good examples of river corridor protection are available. Park City, Utah, and several other communities have adopted standards requiring that development be set back at least 100 feet from rivers and streams and be buffered from view. Near Atlanta, Georgia, Fulton County has passed the Chattahoochee River Corridor Tributary Act that creates a 35-foot buffer zone along all banks of tributaries of the Chattahoochee, a National Wild and Scenic River.

In a recent case, similar regulations were upheld by the Montana Supreme Court. In the Denver Gateway area, development must be set back from First Creek a minimum of 200 feet, and other buffering controls apply.

### ***Requirements for Vegetative Barriers or Buffer Areas***

Vegetative barriers can be used to increase the perceived separation between developed and natural areas. They can also be used to either attract or repel different species of wildlife. For example, in areas where big game is not wanted, zoning and landscaping standards can require the planting of vegetation that large game animals do not like. On the other hand, the same code might require the planting of species that attract songbirds. Similarly, buffer zones can be used to decrease "line of site" distances for wildlife and humans, reduce noise disturbances of wildlife, protect critical habitat, and protect bodies of water. In many cases, careful research will be required to determine exactly how much buffer will be required in order to adequately protect the target species. Barrier and buffer requirements are usually site level tools.

### ***Controls on Fencing***

Where local wildlife goals call for keeping humans and large animals apart, zoning regulations might require perimeter fencing that is impassable to certain species. On the other hand, if a new development threatens to cut off a historic migration route or to separate related feeding areas, the code might put a limit on the heights of fencing to ensure that the fences are passable to wildlife. In still other cases, the goal may be to make sure that wildlife see the fences as they approach them, so that they can avoid entanglement. In general, fences lower than 40 inches tall will not be a barrier or a source of entanglement to large game animals. Fencing controls are usually site level tools, because their effectiveness often depends on the specific location and layout of the land.

### ***Controls on Public or Vehicular Access***

Another important category of zoning control is access. In Colorado's cities, towns, and counties, the issue of access is often an area of shared responsibility between the planning department and the public works or transportation department, and effective controls will require the joint efforts of both groups. In order to protect wildlife, it is often necessary to restrict human or vehicular access to areas that wildlife use or routes along which animals migrate. Access restrictions could include permanent road closures, locked or manned gates, or signs. In some cases, merely requiring that the point of access be hidden from the public may be adequate, and may still leave a road or trail open for use by emergency vehicles and others. Where vehicular access is the problem and pedestrian access is acceptable, the zoning code or public works standards might require that minor roads be converted into trails. Again, because the appropriate level of access depends on the location and layout of development, it is usually a site level tool.

### ***Other Development Standards***

In addition, specialized zoning regulations can be drafted to address numerous other development factors that affect wildlife. For example,

window well covers might be required at ground level in order to prevent small animals from falling into areas from which they cannot escape.

Developments in rural areas might be required to implement garbage management standards so that the introduction of people into an area does not result in added opportunities for wildlife to scavenge for the food that humans throw away. Examples of garbage management techniques include requirements that no garbage be placed outside primary or accessory structure, or that all garbage be disposed of in a single, well-secured and odor-proof building serving an entire development and located far from habitat areas.

Finally, it may be necessary to adopt special standards restricting noise - or nighttime noise - in sensitive habitat areas. Sage grouse, which are periodically considered for listing as a threatened species, are particularly sensitive to noise. Noise standards can be adopted as a performance standard (such as "no more than X decibels as measured at the edge of the habitat area) or by explicitly prohibiting the activities that create unacceptable levels of noise (such as all-terrain vehicle use, hunting, or woodcutting).

### ***Phasing of Development***

In some cases significant wildlife benefits can be gained by requiring new development to be constructed in specific phases. If the species to be protected can adjust to the presence of humans nearby, a phasing strategy might require that the first stages of development occur far from the prime habitat area, so that the animals are not presented with a dramatic disruption of their habitat. Instead, construction can begin far away and proceed towards the habitat area, with development densities declining as construction gets nearer to the buffer area or habitat. If the species to be protected is unable to adjust to nearby development, it may still make sense to require construction to begin far away from the prime habitat and corridor areas in order to allow the animals time to find alternative habitat areas on their own.

### ***Controls on Construction Activity***

Any zoning regulation that involves the need to treat sensitive areas carefully should address not only the desired outcome, but also the rules that must be followed during construction activity. Even when carefully crafted, standards are being implemented by a cooperative landowner or developer, a few careless activities during the construction phase can destroy the entire habitat that was intended to be protected. Construction controls may need to address:

- (1) prevention of accidental cutting of trees or vegetation,
- (2) restrictions on excavation near roots or root masses,
- (3) limitations on severe grade changes near the vegetation or in

- mating or calving areas,
- (4) restrictions on dumping of construction materials or toxic materials near important vegetation or other cover,
- (5) limitations on the use of fires to clear vegetation prior to construction,
- (6) limitations on the duration or hours of construction,
- (7) limitations on timing of construction to avoid critical times for the wildlife, such as calving periods,
- (8) limiting the number of project personnel or construction vehicles on site at any one time, through the use of transportation pools or staggered shifts,
- (9) restrictions on construction personnel access to wildlife areas, and/or speed restrictions on access roads.

### ***Integrated Approaches***

When considering a zoning approach to resource issues, it is useful to use an integrated approach and to ensure that other regulations reinforce the new zoning provisions. For example, design standards for development need to be modified to include wildlife considerations. Stormwater management ordinances may need to reflect water quality controls in natural areas that support wildlife. Other sensitive lands regulations may be needed to implement or reinforce a wildlife protection plan, such as scenic highway controls, river corridor protection, and steep slope protection.

In addition, when drafting new zoning regulations, it is always important to keep in mind the ability of the community to enforce the regulation and the cost and complexity of doing so. A sophisticated ordinance carefully targeted to achieve subtle goals is meaningless if the city or county does not have personnel who can and will enforce it or the budget to pay for the extra effort involved. Often, a simple zoning requirement can be as effective as a complicated clause with much less effort.

Overlay zones are specialized zone districts that supplement - but do not replace - the basic zoning regulations applicable to a property. They are useful tools when an area containing hazards, sensitive lands, or unique opportunities crosses several different standard-zoning districts. Overlay zones are becoming a popular and effective method of protecting wildlife habitat and natural resource features for larger areas that include several underlying zoning districts. An overlay zone effectively eliminates the need to revise the regulations for each zoning district. Instead, it superimposes additional regulations specifically targeted to protect important physical characteristics of the land.

As a resource protection tool, overlay districts have several advantages. They allow local governments to tailor regulations to specific issues that are relevant to a discrete, mappable area. Since

they do not affect the underlying zoning governing permissible densities and uses, they avoid the need to reopen old debates in those areas. They can also be drafted to reflect a balance of different goals, such as environmentally compatible development and open space protection. At the same time, overlay zoning has some drawbacks. If the terms of the zone are complicated, then it may require skilled staff to implement and enforce them. Some residents will see them as adding a layer of complexity to development approval processes. In general, overlay zones are used to address land characteristics that extend across a wide area or a variety of properties, and they are therefore often considered a landscape level tool.

### ***Sensitive Lands***

An increasing number of cities and counties in the Rocky Mountain West are adopting special overlay regulations to protect sensitive environmental areas. For example, Park City, Utah, recently adopted overlay regulations to protect a broad range of environmentally sensitive features including wetlands, stream corridors, steep slopes, ridge lines, and view corridors. In 1994, Summit County, Colorado, adopted a special overlay district and regulations stating that the county "seeks to fully protect wildlife habitats within the wildlife overlay zone from the significant adverse effects of development". The ordinance includes detailed definitions of what constitutes "significant adverse effects" of development and contains detailed provisions allowing the county to require a wildlife impact report from the developer either at the start of the application process or later if available information is not adequate to make a decision. The Summit County ordinance is comprehensive, flexible, and relatively short, all of which increase its usability and understandability.

### ***Wildlife Corridors***

A second popular use of overlay districts is to designate and protect corridors that serve as migration routes and provide continuous strips of habitat. They can also provide important aesthetic and recreational benefits to the community. Because of this important overlap of wildlife and human benefits, the community may be able to support wildlife corridors without understanding the full ecological importance of open space preservation. Care should be taken not to plan for recreational access or trails, however, in areas where that will compromise wildlife goals. Not every corridor needs to be a hiking or biking trail. Wildlife corridors are a good landscape scale protection tool because they need to be relatively continuous between patches of habitat in order to be effective.

Voters often think of greenways and corridors as parks and trails, but for wildlife a corridor can also be an undeveloped parcel, a drainageway, or a utility right-of-way. A carefully designed overlay can protect existing and natural features that promote species richness and diversity. They can also facilitate cooperative planning with other local

government functions such as designing drainage and flood control systems. The important underlying objective is to minimize habitat fragmentation by creating or enhancing ecological connections between larger wildlife habitat areas. The protection of wildlife corridors and greenways can produce measurable results in a short time with a minimum of inventory and other staff-intensive procedures. Those initial positive results may also encourage local officials to pursue additional protection measures.

Often, the overlay zone requires minimum setbacks from known wildlife movement areas or riparian areas. Wildlife corridors can also be accomplished in conjunction with other projects. For example, a utility corridor through a forest area could be cut to provide a transition ecosystem and be more aesthetically pleasing than the traditional clear-cut swath.

Flood and drainage control projects can utilize existing vegetation instead of replacing it with concrete. Stormwater management can be planned to support wetlands and riparian vegetation. Many other overlapping objectives exist within any local government system, and can be developed through interagency communication. In addition, certain uses can be prohibited or converted into conditional uses in an overlay area.

### **4. AGRICULTURAL AND OPEN SPACE ZONING**

Zoning and subdivision ordinances commonly require minimum lot sizes. In suburban single-family residential areas, minimum lot sizes typically range from one-quarter to two acres. To preserve agricultural areas, forests, wetlands, floodplains, and other types of wildlife habitat, Colorado communities have adopted a variety of special agricultural land and large-lot zoning programs that require larger minimum lot sizes. In addition, many of these ordinances increase the requirement that a specific percentage of each parcel must remain in open space. Lot size controls are generally considered to be site level controls.

A few communities have adopted exclusive agricultural zoning, which has proven to be quite effective in protecting farmland. To the degree that the community wants to protect types of wildlife habitat that are found in and around farming operations, this can be an effective wildlife tool. Generally, such zoning includes a large minimum parcel size - often 160 acres or greater - the exclusion of all non-farm land uses, and other restrictions such as limits on the number of building permits in the zone. Again, because they are usually aimed at large areas of farm or ranchland, agricultural zoning is a landscape scale tool.

Large-lot zoning provisions may come in a variety of forms. So-called "quarter-quarter" zoning allows each landowner one buildable lot per 40 acres of farmland. Once the allowable number of lots has been developed anywhere on the property, no more construction is allowed.

This approach works best in rural areas with only moderate growth pressure and larger farms, and is used extensively in the rural areas around Minneapolis/St. Paul.

In contrast, sliding-scale zoning decreases the number of residences allowed per acre as the parcel size increases. Thus a 10-acre parcel may be allowed one residence, a 40-acre parcel only two, and a 160-acre tract only three units. Sliding-scale zoning has shown to be effective in agricultural areas that are under development pressure. It allows some development to occur, but still preserves some farmland, particularly larger parcels. Adequate buffers must be established between agricultural and residential uses.

Large lot zoning has several features that work well to protect habitat. It prevents the development of large tracts of open spaces and agricultural areas. In addition, it may reduce inflationary land speculation by reducing the prospects for easy conversions to higher intensity, non-agricultural uses. It is also relatively simple to administer and involves little cost to government. On the other hand, large lot zoning can be harmful to wildlife habitat protection if it encourages valley floors or watersheds to be broken up into checkerboards of individual lots that ignore habitat values. Communities that use large lot zoning techniques to reduce overall densities should generally offer the alternative of clustering the same number of homesites in portions of the area without high habitat value - and should consider offering a density bonus for such clustering. It will often be more economical and marketable for a large landowner to create ten smaller homesites near existing roads and utility systems than to create ten large lots scattered across a valley - and will also have less impact on wildlife. In addition, communities that pursue large lot zoning should ensure that the standards they adopt allow for some economic use of each parcel of land.

## 5. PERFORMANCE ZONING

One alternative to traditional zoning is performance zoning, which regulates development primarily by limiting development impacts rather than densities or uses. Such ordinances may target either a single type of impact or a broad range of impacts - such as traffic generation, pollutant emissions, storm water runoff, and open space preservation. Developments that meet these standards are allowed regardless of whether they are residential, commercial, industrial, or institutional, but even low-density developments that fail to meet the standards are prohibited. While performance-zoning regulations have been used since the 1950s, they have become increasingly popular as local governments have realized that the impacts of development are relatively unrelated to the category of land use in question.

In the area of resource protection, performance standards may be expressed in terms of minimum open space ratios, maximum vegetation disturbance limits, maximum noise or glare limits, minimum contiguous

landscaping standards, or similar standards. Since habitat protection focuses on the impact of development on critical areas, performance zoning is basically well suited to wildlife protection.

Sophisticated performance zoning ordinances targeting multiple impacts may incorporate point systems. Development proposals are assigned point values for their ability to minimize a variety of impacts, and all development proposals must achieve specified minimum scores.

Breckenridge and Boulder, Colorado, are examples of communities that have embraced point systems, with emphasis on protection of environmentally sensitive areas and promotion of high-quality development. Performance zoning may either supplement or replace traditional zoning regulations. Thus, an overlay zone district might incorporate performance standards rather than specific development requirements. Communities that chose the performance approach, however, should make a commitment to careful measurement of individual impacts of development.

Performance standards have several distinct advantages over traditional zoning in some circumstances. They provide opportunities for developers to design innovative development layouts that can accommodate development while attaining wildlife goals. It does not presume that the solution contained in a set of physical zoning regulations is the only way to achieve the community's goal.

## 6. SUBDIVISION REVIEW STANDARDS

In contrast to zoning regulations, subdivision approval standards address primarily the size and shape of lots that can be made available for development and the amount of infrastructure that must be installed before development can proceed. Although originally designed to protect consumers from the sale of substandard or undevelopable lots and to protect the public from low quality development, subdivision standards have expanded to include many restrictions aimed at controlling the impacts of development. Under Colorado law, many controls that could be included in zoning regulations can also be addressed in subdivision controls, and vice versa. While Colorado cities and towns may appoint a planning commission and adopt subdivision regulations if they wish, Colorado counties are required to do both. Counties do not currently have the power to directly regulate the subdivision of land into parcels larger than 35 acres.

In order to protect wildlife habitat, for example, subdivision standards could require the use of large lots to limit the number of people living in the area, or could prohibit the creation of lots in sensitive areas. In addition many modern subdivision ordinances impose strict buffering requirements in an attempt to protect undeveloped areas. Subdivision regulations could also include standards requiring that storm drainage

be managed to promote riparian vegetation where that is desired or to avoid disturbing desert vegetation when it is important to the species. Similarly, lot size and shape regulations could be structured so as to minimize the number of different lots that are laid out along an important drainage or migration corridor, because human activity is often proportionate to the number of houses in the area.

While a public policy to restrict land subdivisions in an entire valley or watershed would be a landscape level tool, the drafting of specific subdivision standards to protect habitat values is a site level control.

## **Land Dedication Requirements**

Colorado statutes explicitly authorize county governments to require landowners to dedicate a portion of their land as future school and park sites as a condition of development. The Colorado and U.S. Supreme Courts have required that the required dedications be roughly proportional to the impacts of the proposed development. Local governments have considerable latitude to designate what land should be designated for future parks, and to decide whether the appropriate park for that area should be an active or passive area.

## 7. SANCTUARY REGULATIONS

In addition to zoning and subdivision-type controls, many local governments have discovered new and unique tools that will help to protect wildlife habitat. Although most of these solutions could be included in a zoning or subdivision ordinance, they are sometime adopted as a special permit requirement or a general policy of the government.

One increasingly popular tool is the creation of legislatively adopted "sanctuaries" for existing types of land use. Many agricultural areas encounter difficulties when new development locates nearby. The problems begin when relatively low land values attract residential or commercial development. After construction, new residents find that the pre-existing agricultural uses emit odors and stir up dust. These issues lead to conflict, often involving expensive litigation, and in many cases the initial users leave the area to seek new locations to avoid such conflicts and expenses. When the original agricultural area served as wildlife habitat, this leaves the habitat open to development. Where local governments wish to retain agricultural and wildlife uses, they can create sanctuaries that prevent the encroachment of incompatible uses. "Right to operate" provisions in such sanctuary zones immunize local farmers or ranchers against nuisance claims, re-zonings, or other pressures to require changes in operations that would be detrimental to the farm or ranch and might lead it to stop operations.

The Colorado General Assembly has adopted a variation of this protection against nuisance claims by specifying that an agricultural operation cannot be defined as a nuisance. More specifically, "an



agricultural operation is not, nor shall it become, a private or public nuisance by any changed conditions in or about the locality of such operation after it has been in operation for more than one year." Local ordinances that define agricultural operations a nuisance or provide for their abatement as a nuisance are void.

## 8. AN OVERALL GROWTH MANAGEMENT SYSTEM

Protections for wildlife habitat can also be integrated into overall growth management systems through the use of urban growth boundaries, targeted growth strategies, and capital improvement programs. Again, because these tools generally address growth patterns in an entire jurisdiction, they are good examples of landscape scale protection tools.

### **Urban Growth Boundaries**

The use of growth boundaries allows cities to guide new development patterns by directing urban services to such areas and withholding them from others. In particular, communities with urban growth boundaries can ensure that those boundaries do not include sensitive habitat areas. If they do, then the city or town may want to re-think where it wants to install infrastructure so as to avoid habitat areas that it wants to protect.

The regional government for the Portland, Oregon, metropolitan area has delineated an urban growth boundary administered by local governments in compliance with state legislation. This program has proven generally successful in confining growth to the areas within the boundary. Within the boundary, development has often bypassed previously "urbanized" areas and located in outlying "urbanizable" areas (defined as available and suitable for urban development upon the extension of urban services), but the program has been generally successful at containing leapfrog development, preserving more outlying areas for agricultural and other less intensive uses, and maintaining order in metropolitan growth patterns.

Some communities have established urban growth boundaries even without a statewide mandate. The best known example in Colorado is the City of Boulder, which has delineated boundaries for the extension of urban services and has worked with Boulder County to channel growth to areas adjacent to already developed areas, thus precluding development and costly service extensions in the mountainous areas bordering the city. A number of cities in Larimer County including Loveland and Fort Collins have drawn urban growth area boundaries.

### **Targeted Growth Strategies**

Another similar approach is that of designating development areas to which new growth is targeted within a region. Again, a targeted growth

system could reduce development in large areas of a county or region where sensitive habitat areas exist. One recent example comes out of the MetroVision 2020 Task Force of the Denver Regional Council of Governments. As an alternative to dispersed development patterns that may result as the region adds a predicted 900,000 people over the next 25 years, the MetroVision 2020 Task Force has recommended consideration of development of satellite cities where growth would be channeled. Open space or undeveloped land would physically separate these satellite cities - which could be existing communities or new planned communities - from the central urban area. Most of the new growth would be directed to existing satellite communities with the capacity for growth, including Castle Rock, Bennett, Evergreen, Brighton, Erie, Longmont, and Idaho Springs. Other urban growth would be limited to existing cities and already approved master planned communities. In some cases, this would tend to preserve contiguous areas of habitat and/or wildlife corridors between the settlement centers.

Several Colorado counties have adopted the targeted development approach as part of their overall land use management system. For example, Larimer County has entered into several intergovernmental agreements with some of its constituent cities that target new development to already built-up areas such as Fort Collins and Loveland. However, not all municipalities in the county have signed such agreements, and thus some growth has occurred in several smaller, outlying communities with limited infrastructure and services. Even where targeted growth agreements have been signed, they often do not take into account wildlife concerns.

In general, targeted growth arrangements cannot be effective as habitat protection tools unless they involve the cooperation of at least the county government or a regional planning area. Although individual cities and towns can protect limited areas within their borders, efforts to protect nearby areas will always be subject to development permitted by the county or an adjacent city or town.

### **Capital Improvements Programming**

In addition to urban growth boundaries and targeted growth schemes, Colorado's local governments can incorporate wildlife protection goals into their capital improvements programs and budgets. In many jurisdictions around the country, a strong relationship has been shown between the presence of infrastructure and development of the land. Local governments can effectively discourage the development of habitat areas by not planning for or budgeting for water or sewer lines or roads in the area, and by discouraging the creation of special districts to finance those elements of infrastructure. Since the creation of all water, wastewater, and metropolitan districts is subject to the approval of either the county or city government in which it is located, local governments can prevent the creation of infrastructure financing

districts by withholding that approval.

## 9. COORDINATION WITH OTHER LAND DEVELOPMENT CODES

Wildlife habitat protection does not exist in a vacuum. It must be consistent with, and reflected in, the other local government land use control systems. In addition to the types of zoning, subdivision, and growth management controls described above, wildlife protection standards must be coordinated with street and access codes, annexation policies, and environmental control systems. Street design codes should be drafted to allow smaller and less disruptive streets near wildlife areas, and to allow alternative access patterns directing traffic movements to less sensitive areas. Local annexation policies should reinforce habitat protection by providing that annexation or development agreements must be consistent with wildlife protection plans and regulations, and to discourage the extension of utilities into sensitive areas. Unless all of a city's or county's land use controls work together to treat habitat areas in a consistent way, they will probably not be effective.

## B. INCENTIVES

A second important category of tools for implementing habitat protection is incentives. Many local governments that are reluctant to adopt land use regulations are more willing to adopt incentives. With careful attention, incentives can sometimes be as effective - or even more effective - than regulations. When crafting an incentive approach to wildlife habitat, however, it is important to ensure that the incentives offered to enhance wildlife do not undermine other important community goals. Once again, habitat protection does not exist in a vacuum, and local government incentive programs need to be integrated as carefully as its regulatory programs.

### 1. DENSITY BONUSES

Perhaps the most common form of incentive is development density bonuses. In these programs, the local government offers landowners a chance to construct more residential or commercial development on their land if they will take certain actions to promote wildlife. The required actions can include locating development outside of prime habitat areas, implementing groundwater runoff controls to avoid erosion into streams used by wildlife, planting specific types of vegetative cover that attract (or repel) wildlife, or avoiding glare and traffic movements near wildlife areas or corridors. The amount of additional development density allowed should vary depending on the importance and difficulty of the landowner's actions to promote wildlife, but are commonly in the range of a 25 to 50% bonus. Larger bonuses may create fairly significant development impacts and may raise questions about the rationale behind the base zoning density. Care should be taken to avoid granting incentives that result in additional



wildlife impacts that are greater than the benefit gained by the landowner's habitat protection measures.

## 2. CLUSTERING

A second form of incentive is cluster zoning, which provides flexibility for developers to construct buildings in clusters while remaining within the constraints of overall average density restrictions. Under cluster zoning, maximum densities are calculated not for individual lots, but for overall development areas. Rather than requiring uniform intervals between building sites, such ordinances often waive minimum lot size and dimension requirements to allow tight clusters of buildings in some areas, with other portions of the parcel set aside for open space or habitat uses. Often, the local government imposes a requirement that clustering cannot occur unless most or all of the land that is left undeveloped is protected from future development through the use of a conservation easement or deed restriction. In other cases, the government reserves site plan review authority over the clustered development to ensure that the layout, visibility, and design do not create negative impacts on the area. Cluster zoning concepts are widely used to permit development while setting aside areas for the preservation of sensitive areas, such as forested areas, wildlife habitat, wetlands, agricultural areas, and other such resources. While some cities and counties allow clustering throughout their jurisdiction, others target the tool where it is particularly important to protect sensitive land or habitat.

## 3. TRANSFERRABLE DEVELOPMENT RIGHTS

A third form of development incentive for habitat protection is density transfers, which are usually implemented through a transferable development rights ("TDR") program. Density transfers involve the shifting of permissible development densities from unsuitable development areas to more appropriate sites - in this case from important habitat areas to less important areas. Under this concept, the local government studies and designates appropriate "sending" and "receiving" areas on a map. A participating landowner in a sending area transfers development rights to another landowner in a receiving area, who increases his or her development rights in that area beyond what would otherwise be possible. In general, the price of development rights being transferred is left to the private market, and the local government does not try to affect that price one way or another.

TDR programs can be designed to be voluntary in the sending and receiving areas, mandatory in both areas, or voluntary in one area and mandatory in the other. The effects of the tool will depend greatly on which option is chosen. In addition, the success of the program in protecting wildlife habitat will depend in large part in the careful balancing of opportunities in sending and receiving areas, so that

excessive sending areas do not flood the market and restrictive receiving areas do not limit the usability of the credits for sale. Importantly, TDR programs seldom work if the underlying zoning is too generous with development density, because neither potential buyers nor potential buyers of transferable rights have any incentive to participate.

## 4. GRANTS AND LOANS

A fourth form of local government incentive to promote the protection of important habitat is the use of grants and loans. Local governments can make grants or loans to support the acquisition or management of important wildlife areas, to promote wildlife education, and complete wildlife inventories. In the alternative, the local government can apply to the state and federal governments or to non-profit foundations and associations for money to fund such grants.

In addition, grant and loan programs can sometimes be used to supplement regulatory tools. At the same time they change their regulations regarding land development, some communities make financial resources available to help landowners cover the added cost of complying with those regulations.

Grants and loans have several advantages as a habitat protection tool. Their effect can be direct and immediate. Development proposals can be changed, information can be collected, and education efforts can begin. In addition, public loans and grants can often be used as matching funds to obtain additional private investment or financing. A little seed money can go a long way towards a long-term financing solution. They can also make the adoption of new regulations more politically acceptable by giving the public an easy means to comply with them. Revolving loan funds can go further by allowing a fixed amount of government seed money to be used over and over again as the recipients repay the loans.

## 5. PREFERENTIAL TAX TREATMENT

A fifth form of incentives to preserve habitat is preferential tax treatment. Although Colorado's system of property assessment and taxation is regulated by the General Assembly and by constitutional provisions such as the TABOR and Gallagher amendments, there are still some opportunities for local governments to craft incentives for preservation of important lands.

### **Use Assessments**

Where potential profits motivate landowners to convert low-density land uses to higher intensities, or to convert important habitat areas into intensive development areas, preferential tax programs can counter these motives by providing incentives to maintain existing low

intensity uses. One of the most important forms of preferential taxation is current use assessments. Local governments levy real property taxes against the assessed value of property. Under standard practice, tax assessors determine value based upon the "highest and best use" of a property, which reflects the highest potential use of such property. Current use assessments alter assessment practices by requiring assessments to reflect actual current uses rather than prospective potential uses. Where development pressures create higher property values and tax burdens, current use assessments provide tax relief to landowners who choose to continue agricultural, forestry, rangeland, or other low-density uses that are consistent with continued habitat value.

The Colorado Constitution provides a preferential tax system to encourage continued agricultural land uses. While other properties are valued by standard practices considering various potential uses, assessors must value agricultural land "solely by consideration of the earning or productive capacity of such lands . . . ". Thus, despite the potential highest and best uses that may be available, where a landowner wishes to keep land in continued agricultural use, tax assessments will reflect such continued use, rather than the value of land under more intense uses<sup>23</sup>. On the other hand, Colorado taxes nonagricultural open space at twice the residential rate, increasing pressures to develop such property, even if the landowner and local government would like to preserve the property as open space for other public purposes. Where agricultural land functions effectively as wildlife habitat, agricultural use assessments can serve a dual purpose.

Another application of the current use assessment concept allows private landowners to contract with government agencies to restrict the use of their properties. Such agreements limit the range of potential highest and best uses, thereby decreasing the assessed value of the properties and providing tax relief to landowners that agree to such restrictions. Often, this can be done through a conservation easement or deed restriction as well as through a development agreement. Because use assessments are granted based on the use of a specific parcel of land, they work as a site level habitat protection.

### **Tax Credits**

Another tax incentive approach that has proven to be successful in preserving open space involves offering income tax credits for the value of approved conservation easements. Federal tax deductions are available for donations of qualifying open space or open space easements to non-profit organizations. This tool is frequently used by private land trusts and is discussed in more detail below. In general, preferential tax systems present an equitable way to encourage open space or low density uses by requiring tax assessments to reflect current rather than prospective values. They also help accomplish land conservation goals without the use of regulations. On the other hand, most preferential tax systems cannot delay development pressure

indefinitely. Potential profits from the development of habitat land can easily outweigh the benefits of a property tax break. Where there is no recapture provision, as in Colorado, preferential taxes may reward land speculators and developers by lowering holding costs until the development market creates sufficient profit incentives for conversion to nonagricultural uses. Finally, such tax systems do create indirect public costs in the form of foregone tax revenues.

Tax credits are primarily a site level tool, since easements depend on the specific parcel of land involved.

### C. ACQUISITION PROGRAMS

One of the most effective ways of preserving wildlife habitat is to buy it. Local ownership often simplifies management decisions and provides a relatively permanent way to protect the habitat. Government acquisition strategies can be used effectively as a supplement to regulations, especially where control of the land is necessary to prohibit essentially all development in sensitive environmental areas or to prohibit general public access for recreational and other purposes. While regulatory protection programs must leave an economic use of the land for the owner, government ownership removes that obstacle, because the government is essentially agreeing to use the land for non-economic purposes. Thus, when communities believe that the only way to protect habitat is to prevent virtually all use of the area, they should seriously consider fee or development rights acquisition programs.

Ownership programs generally fall into two categories. First, some programs seek to buy the land itself, which are often called "fee ownership" programs. The second type of program seeks to buy the rights to develop the land into uses inconsistent with its role as wildlife habitat, and are often called "sellback", "leaseback", or "development rights" programs. Local communities interested in obtaining land or development rights for habitat preservation should also think about incentives that may be available to induce the landowner to donate the land to the community or to a third party who will manage it. Often, such donations can be a way for wealthy landowners to obtain a valuable tax deduction. Among other things, the local government can also agree to name the protected habitat area in honor of the landowner making the donation.

Because acquisition programs focus on the need to acquire specific areas of land and the value of that land, they are often thought of as site level tools. However, if the community pursues a consistent strategy to acquire lots of land or development rights in a defined habitat area, the result can be an effective landscape level protection.

#### 1. FEE SIMPLE PURCHASE

Ownership of land includes rights of possession, access, exclusion, disposition, and rights to specified uses such as mining, hunting, or development. Where one party owns the entire bundle of these rights,

that party owns the land "in fee simple." Acquisition of land in fee simple gives the purchaser full title to and possession of all rights associated with the purchased property, subject only to the constraints imposed by nuisance laws and valid public regulations - including zoning and subdivision. Fee simple ownership provides the simplest and most effective means of implementing habitat control - where the government owns the land, the government controls its development, redevelopment, preservation, and access. Once the government entity assumes fee simple ownership, it has a broad range of options: The government may convey selected interests in the land, restrict future uses of the land, lease the land, or otherwise control the bundle of property rights in a manner consistent with its habitat objectives.

#### 2. INTEGRATION INTO PARK AND OPEN SPACE PURCHASE PROGRAMS

Many Colorado communities already have a program in place for the acquisition of open space for parks and trails. Most often, such programs are included in the city, town, or county's regular capital improvements programming, where they must compete with other pressing needs for public investment. In other cases - notably Boulder, Jefferson, and Douglas Counties - the voters of the county have approved a separate tax to fund a free-standing open space acquisition program that does not need to compete for scarce public monies. Where such programs exist, it may be possible to expand them to include the acquisition of important habitat lands merely by amending the list of eligible types of land and criteria for the selection of habitat lands. In many cases, this expansion would be consistent with the intent of the existing program, and would not require the creation and funding of an open space program specifically designed for wildlife. In cases where open space purchase programs have been approved through voter referendums, however, great care should be taken to ensure that an expansion of the program is clearly consistent with the referendum approved by the voters.

#### 3. SELLBACKS AND LEASEBACKS

Once the government owns the land, however, it does not need to retain ownership of the entire bundle of sticks in order to protect wildlife habitat. It can use its position as the owner of the land to facilitate the rezoning of the land or to impose negative easements, deed restrictions, or development agreements, and then resell the land to a third party. This is known as a "purchase and sellback" transaction. Alternatively, a city or county government could purchase the property and then lease it to a third party subject to conditions and restrictions as provided in the lease. This is known as a "purchase and leaseback".

#### 4. PURCHASE "TRIGGERS": OPTIONS AND RIGHTS OF FIRST

#### REFUSAL

Just as the local government may not need to keep ownership of the entire fee interest in land to achieve its goals, it may not need to purchase the property at all until an alternative use or sale of the land is contemplated. Purchase "triggers" apply the basic concept of purchase options in real estate transactions - they provide a means for a potential purchaser to "tie up" a property without actually buying it. By purchasing an option on property, a potential purchaser reserves the exclusive right to purchase the property within a specified time period or in the event that certain events happen. A related tool is a "right of first refusal", under which the local government entity pays for a first right to purchase a property if the property is to be sold. The buyer of a right of first refusal often does not need to negotiate a price in advance, but is obligated to match a bona fide offer submitted by another potential purchaser. This avoids the difficulty of valuing habitat land now, but does protect the seller against having to sell at a bargain price when there is a better offer from another potential buyer. Because right of first refusal programs leave the potential purchase price for the land to be determined by a third party, they may create problems for local governments that need predictable costs in order to meet their budget constraints and funding cycles. To avoid this problem, local governments that want to tie down the price of a future purchase now should instead buy an option or execute a right of first refusal with a clear statement of the agreed upon price.

#### 5. LIFE ESTATES

In some cases, a Colorado town, city, or county may be able to achieve its wildlife habitat goals through the acquisition of life estates in important lands. Not infrequently, the owners of agricultural or ranch lands would prefer not to develop their lands and would like to see the farm or ranch remain intact as long as possible. However, many of these same owners would like to be able to pass their land on to their children for them to do with as they wish. For that reason, they are unwilling to grant easements or impose deed restrictions or covenants that would bind their children in their use and disposition of the land. In those circumstances, and if prime habitat areas or corridors are involved, the local government may want to purchase a life estate in the land and lease the property back to the current owner at roughly the same cost. The terms of the transaction allow the government to control the use of the land during the owner's lifetime, but terminate that control at the time of the owner's death. Even though the land could be put to incompatible uses some time in the future, the purchase of a life estate can buy time for the local community to consider follow-up steps and/or to raise money for the eventual purchase of the property. Again, since life estates are negotiated for specific parcels of land, the purchase of a life estate is considered a site level protection tool.

**6. EASEMENTS AND PURCHASES OF DEVELOPMENT RIGHTS**

Easements can be viewed as just a few of the bundle of rights that are included in fee simple ownership. They constitute severable interests in land. The severable nature of easements allows a landowner to convey or reserve specific rights associated with a property apart from the right to poses and use the land in general. By applying the law of easements, local governments can control land development without buying the fee simple interest in the habitat land itself. Easements and development rights programs are essentially programs enabling the local governments to pay landowners to forgo certain land development rights, and documenting the transfer of those development rights to the government.

**7. LAND DEDICATIONS AND IMPACT FEES**

Land dedications are conveyances of land from a private owner to a local government - either voluntarily or to offset the anticipated impacts of a proposed development. An increasing number of Colorado local governments are imposing land dedication requirements or fees-in-lieu of dedication as conditions for permit approvals. State statutes explicitly authorize Colorado's county governments to impose land dedication requirements or fees-in-lieu for parks and schools, and a large number of home rule municipalities impose similar requirements.

**8. LAND TRADES**

Finally, local governments should always consider whether the most cost-effective way to acquire habitat lands may be to trade other lands owned by the government that are no longer needed for their original purposes. In the course of time, many towns and counties discover that they have an inventory of land parcels in or near developed areas that the government no longer needs. Instead of selling those parcels on the open market, the government may want to consider a trade for habitat lands further away. In cases where the current owner of the habitat lands is holding it for future development, a potential trade for land nearer to water and sewer lines and market demands may be very attractive.

**D. DEVELOPMENT AGREEMENTS**

Often, Colorado's local governments may find opportunities to protect quality wildlife habitat through negotiations with individual landowners at the time when specific development proposals are brought forward. The most flexible technique for doing so is a development agreement. Colorado statutes specifically allow cities and counties within the state to enter into development agreements obligating both the government and the landowner to carry out certain actions in order to "vest" a preferred development plan for a period of time. Development agreements can give the landowner more certainty that the government will not act to delay or deny the development activity for a

period longer than the statutory period of three years. In return, the local government can ask the landowner to design and operate the proposed development in ways that will protect or even enhance the existing wildlife habitat on the property. Because they are negotiated on a project-by-project basis, development agreements can be an effective site scale tool for habitat protection.

**Funding Sources by Recreational Type**

- Legend for Acronyms:  
 GOCO - Great Outdoors Colorado  
 CDPOR-Colorado Division of Parks & Outdoor Recreation  
 CDOW-Colorado Division of Wildlife  
 CHS-Colorado Historic Society  
 CDLA-Colorado Department of Local Affairs  
 CCAH-Colorado Council of Arts and Humanities  
 VOC-Volunteers for Outdoor Colorado  
 USFS-U.S. Forest Service  
 BLM-Bureau of Land Management  
 BOR-Bureau of Reclamation  
 NPS-National Park Service, Rivers & Trails Conservation Assistance  
 EDA-Economic Development Administration  
 EPA-Environmental Protection Agency  
 NEA-National Endowment for the Arts  
 RMYC-Rocky Mountain Youth Corps

Activity - STATE PARK, CAMPING, LAKE FISHING, WATCHABLE WILDLIFE INTERPRETIVE KIOSK, TRAIL LINK TO BLM LAND

Source of funds - CDPOR/Lottery Funds, GOCO, Land & Water Conservation Fund, BOR, DOW/Watchable Wildlife, BLM

GREENWAY TRAIL (PARALLEL EQUESTRIAN), PUBLIC ART, PARKING, PICNIC TABLES, RESTROOMS  
 City/Bond Issue, Sales Tax, GOCO, CDPOR Trails Program, CDOT, Local Volunteers, VOC, Local water & Sanitation District, CCAH, RMYC

ACCESSIBLE LOOP TRAIL-WATCHABLE WILDLIFE INTERPRETIVE KIOSK  
 DOW/Watchable Wildlife, GOCO, Audubon Society, USFS/Sost Share, Ducks Unlimited, Local Hunting Clubs, Student Groups

ACCESSIBLE LOOP TRAIL- FISHING ACCESS  
 DOW/Fishing is Fun, Local Irrigation Canal Co., Americans

w/Disabilities, Trout Unlimited, Local Service Clubs

INTERPRETIVE SIGNAGE / NATURAL- CULTURAL-RECREATIONAL RESOURCES  
 NPS/Rivers and Trails, EDA/public Tourism, NEA/Design Arts, CHS/Gaming Funds, BLM/Recreation Div., local library, museum

HISTORIC STRUCTURES REHABILITATION, INTERPRETATION  
 City, CHS/Gaming Fund, local museum, CDOT/Enhancement Funds, Local Corporations, Business Groups, Boettcher or Gates Foundation

CITY PARK/ VISITOR CENTER/ COUNTY OPEN SPACE/ NATURAL AREA  
 Private Landowners/ Local Land Trust, Trust for Public Lands, County, GOCO, USFS, CDPOR/ Trails Program

BOATING ACCESS  
 County, Local Mine, Utility Company, Stockgrowers Association, Boating Groups, Irrigation Company, Water Board

STREAM REHABILITATION/ WETLAND AND RIPARIAN PROTECTION  
 EPS, County, Trout Unlimited, Ducks Unlimited, Audubon Society, The Nature Conservancy, Department of Health Stream Rehabilitation, Coors Foundation, Local Groups

ABANDONED MINE RECLAMATION, INTERPRETATION  
 EPA, State Mined Land Reclamation, Division of Minerals and Geology Abandoned Mines Fund, Colorado Historic Society

STATE WILDLIFE REFUGE, PICNICKING, RESTROOM, WATCHABLE WILDLIFE  
 DOW, GOCO, National Fish & Wildlife Foundation, Ducks Unlimited, Rocky Mountain Elk Foundation

**Wetland Delineation Report  
St. Vrain Greenway  
Boulder and Weld Counties  
Colorado**

*Prepared for—*

**The City of Longmont  
c/o: Design Workshop  
1390 Lawrence Street, Suite 200  
Denver, CO 80204**

*Prepared by—*

**ERO Resources Corporation  
1842 Clarkson Street  
Denver, CO 80218**

**November 16, 2000**



**WETLAND DELINEATION REPORT**  
**ST. VRAIN GREENWAY**  
**BOULDER AND WELD COUNTIES, COLORADO**

**NOVEMBER 16, 2000**

ERO Resources Corporation surveyed the proposed St. Vrain Greenway project area for wetlands during August and September 2000.

**Methods**

Wetlands were delineated following the guidelines and criteria of the U.S. Army Corps of Engineers 1987 Wetland Delineation Manual. Most wetland boundaries were mapped in the field using a Trimble Pro XRS Global Positioning System (GPS) receiver and TBC1 data logger using real time differential correction. This method records data positions with less than 1-meter error. An aerial photograph at a scale of 1 inch equals 250 feet was also used to identify wetland boundaries. For areas where GPS mapping was not practical due to lack of landowner permission to enter or areas surrounded by open water or otherwise unreachable, wetland boundaries were determined by interpretation of aerial photography.

**Location**

The St. Vrain Greenway study area is the St. Vrain River and portions of its associated floodplain from Main Street in Longmont east to the City of Longmont's Compost Facility and former landfill, not including tributaries such as Left Hand Creek, Dry Creek, and Spring Gulch. The study area is located in Township 2 North, Range 69 West, NE ¼ Section 10, N ½ Section 11, and Section 12 in Boulder County, and in Township 2 North, Range 68 West, Sections 7 and 8 in Weld County, Colorado as shown in Figure 1. The UTM coordinates of the western end of the study area are Zone 13: 491,280mE, 4,444,090mN. The UTM coordinates of the eastern end of the study area are Zone 13: 498,500mE, 4,445,000mN.

## **Overall Site Description**

The St. Vrain River and the surrounding uplands in the study area have been heavily influenced by human activities such as lining the banks with riprap, construction of drop structures and diversion structures for irrigation, construction of irrigation canals, cultivation, and mining. Surrounding land uses include active and inactive gravel mines, pasture, irrigated fields, dedicated open space, hunting preserves, an abandoned railroad grade, and a limited amount of industrial use.

The vegetation of these areas is highly variable, but in general, vegetated upland areas are covered by weedy plant species adapted to colonize disturbed sites, or by pasture grasses in less disturbed areas. Common upland species in the study area include smooth brome (*Bromus inermis*), western wheatgrass (*Agropyron smithii*), cheatgrass (*Bromus tectorum*), kochia (*Kochia scoparia*), goosefoot (*Chenopodium* sp.), western ragweed (*Ambrosia psilostachya*), bindweed (*Convolvulus arvensis*), and many others.

## **Wetlands and Waters of the U.S. Description**

The wetlands and waters of the U.S. within the study area occur primarily along the St. Vrain River. Wetlands and jurisdictional waters at the site are shown in Figure 2 through 10 and are described below.

### **St. Vrain River**

The St. Vrain River is a perennial stream that is considered a water of the U.S. subject to the jurisdiction of the U.S. Army Corps of Engineers under Section 404 of the Clean Water Act. The river is bordered by wetlands that vary from a narrow fringe along the base of the bank to extensive wetland complexes on terraces adjacent to the river. The most abundant plant species occurring in wetlands adjacent to the river are sandbar willow (*Salix exigua*) and reed canarygrass (*Phalaris arundinacea*). These two species occur in almost every wetland mapped within the study area. Other species occurring in wetlands adjacent to the river vary widely from site to site. The most common plant species observed in the study area are listed in Table 1.

The soils along the St. Vrain River have been mapped by the SCS as Manter sandy loam, Loveland soils, and Niwot soils in Boulder County, and aquolls and aquents with gravelly substratum, Bankard sandy loam, Colby loam, and Shingle loam in Weld County. Hydrology of wetlands along the St. Vrain is indicated by seasonal flooding and occasionally by inundation or saturation near the surface. Irrigation return flows hydrologically influence many of the wetlands along the river.

### **Open Water in Man-Made Ponds**

A number of man-made ponds occur in the study area within the floodplain of the St. Vrain River. The Corps will probably take jurisdiction over these ponds and the narrow fringe of wetlands that typically border them because they appear to be groundwater supported. Plant species typically bordering these ponds include Russian olive, sandbar willow, peach-leaf willow, plains cottonwood, salt cedar, three-square, reed canarygrass, cattails, curly dock, and Canada thistle.

### **Spring-fed Wetlands**

Two wetlands observed at the Boulder County Open Space property appear to be fed by natural springs. One spring occurs just west of County Line Road on the Boulder County property (wetland BC3). This wetland is dominated by emergent and aquatic vegetation such as watercress and duckweed with sandbar willow becoming more common where the spring-fed wetland merges with wetlands associated with the river. A second spring occurs further west, on the edge of an old oxbow (wetland BC9). This area has been heavily modified by human activity, including several ditches carrying irrigation return flows. Also, beaver have built a series of dams across a channel fed by the spring, flooding a large area including part of a nearby cornfield (wetland BC8). As a result, the spring, seasonal flooding from the river, and irrigation return flows influence the hydrology of this wetland. Wetland BC8 may require a site visit with the Corps to determine its jurisdictional boundary, given the many factors influencing its hydrology.

## **Conclusions**

The attached wetland delineation map (Figures 2 through 10) shows the boundaries of wetlands and waters at the site. Table 2 shows wetland acronyms, figure number, data source, and a brief description for each wetland. The wetland boundaries in this report are preliminary, until reviewed and accepted by the Corps. Completed routine wetland determination forms and representative photos are attached.

## **References**

- Environmental Laboratory. 1987. Corps of Engineers Wetland Delineation Manual. Technical Report 7-87-1, US Army Engineer Waterways Experiment Station, Vicksburg, Miss.
- U.S. Fish and Wildlife Service (USFWS). 1988. National List of Plant Species that occur in Wetlands: Region 5 – Central Plains.



**Table 1. Common wetland plants in the St. Vrain Greenway study area**

Latin Name	Common Name	Indicator Status
<i>Agropyron repens</i>	quackgrass	FAC
<i>Agrostis gigantea</i>	redtop	FACW
<i>Apocynum cannabinum</i>	dogbane	FAC
<i>Asclepias incarnata</i>	swamp milkweed	OBL
<i>Cirsium arvense</i>	Canada thistle	FACU
<i>Conium maculatum</i>	poison hemlock	FACW
<i>Conyza canadensis</i>	horseweed	FACU-
<i>Dipsacus fullonum</i>	teasel	NI
<i>Distichlis spicata</i>	saltgrass	NI
<i>Echinochloa crusgalli</i>	barnyard grass	FACW
<i>Elaeagnus angustifolia</i>	Russian olive	FAC
<i>Eleocharis palustris</i>	spikerush	OBL
<i>Equisetum laevigatum</i>	smooth scouring rush	FACW
<i>Festuca pratensis</i>	meadow fescue	FAC
<i>Helianthus nuttallii</i>	Nuttall's sunflower	FAC
<i>Hordeum jubatum</i>	foxtail barley	FACW
<i>Juncus balticus</i>	Baltic rush	OBL
<i>Lemna sp.</i>	duckweed	OBL
<i>Nasturtium officinale</i>	watercress	OBL
<i>Oenothera villosa</i>	evening primrose	FAC
<i>Phalaris arundinacea</i>	reed canarygrass	FACW
<i>Polygonum coccinium</i>	scarlet smartweed	OBL
<i>Polygonum lapathifolium</i>	smartweed	OBL
<i>Polygonum persicaria</i>	pink lady's thumb	OBL
<i>Polypogon monspeliensis</i>	rabbitfoot grass	OBL
<i>Populus deltoides</i>	plains cottonwood	FAC
<i>Rumex crispus</i>	curly dock	FACW
<i>Salix amygdaloides</i>	peach-leaf willow	FACW
<i>Salix exigua</i>	sandbar willow	OBL
<i>Scirpus americanus</i>	three-square bulrush	OBL
<i>Scirpus lacustris</i>	soft stem bulrush	OBL
<i>Solidago canadensis</i>	goldenrod	FACU
<i>Spartina pectinata</i>	prairie cordgrass	FACW
<i>Tamarix ramosissima</i>	salt cedar (tamarisk)	FACW
<i>Typha latifolia</i>	cattail	OBL
<i>Verbena hastata</i>	blue vervain	FACW
<i>Veronica sp.</i>	speedwell (brooklime)	OBL

Indicator status refers to the probability of a plant occurring in wetlands in this region according to the National List of Plant Species that Occur in Wetlands (US Fish and Wildlife Service, 1987). Obligate wetland plants (OBL) occur in wetlands an estimated 99 percent of the time. Facultative wetland plants (FACW) occur in wetlands 67 to 99 percent of the time. Facultative plants (FAC) occur with 34 to 66 percent probability in wetlands. Facultative upland plants (FACU) occur with 1 to 33 percent probability in wetlands. Non-indicator (NI) refers to plants for which insufficient information is available to determine indicator status.

Table 2. St. Vrain Greenway Wetlands

Acronym	Comment	Wetland/WUS	Description	Data Source	Figure
CFP1		Wetland	willow shrub	GPS	Figure 2
CFP2	seasonally flooded, includes some uplands	Wetland	willow shrub	GPS	Figure 2
CFP3	south side of creek, east of Main Street	Wetland	willow shrub	GPS	Figure 2
CFP4		Wetland	emergent	aerial photography	Figure 2
BA1	south side of creek, above drop structure, partially fed by irrigation return	Wetland	willow shrub	GPS	Figure 2
BA2	stream that enters St. Vrain from south	Wetland/WUS	willow shrub	GPS	Figure 2
BA3	south bank of creek from drop structure south	Wetland	willow shrub	GPS	Figure 2
BA4		Wetland	willow shrub	GPS	Figure 3
WUS1	large man-made pond	WUS	open water	aerial photography	Figure 2
WUS2	large man-made pond	WUS	open water	aerial photography	Figure 2
WUS3		WUS	riverine	aerial photography	Figure 3
T1	seasonally flooded terrace	Wetland	willow shrub	aerial photography	Figure 3
T2	seasonally flooded terrace	Wetland	willow shrub	aerial photography	Figure 3
T3	seasonally flooded terrace	Wetland	willow shrub	aerial photography	Figure 3
T4	seasonally flooded terrace	Wetland	willow shrub	aerial photography	Figure 3
T5	seasonally flooded terrace	Wetland	willow shrub	aerial photography	Figure 3
T6	seasonally flooded terrace	Wetland	willow shrub	aerial photography	Figure 4
T7	seasonally flooded terrace	Wetland	willow shrub	aerial photography	Figure 4
T8	seasonally flooded terrace	Wetland	willow shrub	aerial photography	Figure 4
GF1	seasonally flooded terrace	Wetland	willow shrub	aerial photography	Figure 4
GF2	seasonally flooded terrace	Wetland	willow shrub	aerial photography	Figure 4
GF3		Wetland	willow shrub	aerial photography	Figure 4
JB1	seasonally flooded, saturated in places	Wetland	willow shrub	GPS	Figure 4
WUS4		WUS	open water	aerial photography	Figure 4
BC1	seasonally flooded, north side of creek	Wetland	willow shrub/emergent	GPS	Figure 5
BC2	seasonally flooded, north side of creek	Wetland	willow shrub	GPS	Figure 6
BC3	spring	Wetland	willow shrub/emergent	GPS	Figure 6
BC4	seasonally flooded, south side of creek	Wetland	willow shrub	GPS	Figure 6
BC5	seasonally flooded, south side of creek	Wetland	willow shrub/emergent	GPS	Figure 5
BC6	seasonally flooded, includes upland pockets	Wetland	willow shrub/emergent	GPS	Figure 5
BC7	seasonally flooded, south side of creek	Wetland	willow shrub/emergent	GPS	Figure 5
BC8	old irrigation ditch and flooded field	Wetland	emergent	GPS	Figure 5
BC9	old oxbow, spring	Wetland	emergent	GPS	Figure 5
BC10		Wetland	willow shrub/emergent	aerial photography	Figure 5
BC11	seasonally flooded terrace	Wetland	willow shrub/emergent	aerial photography	Figure 5
BC12	seasonally flooded terrace	Wetland	willow shrub	aerial photography	Figure 5

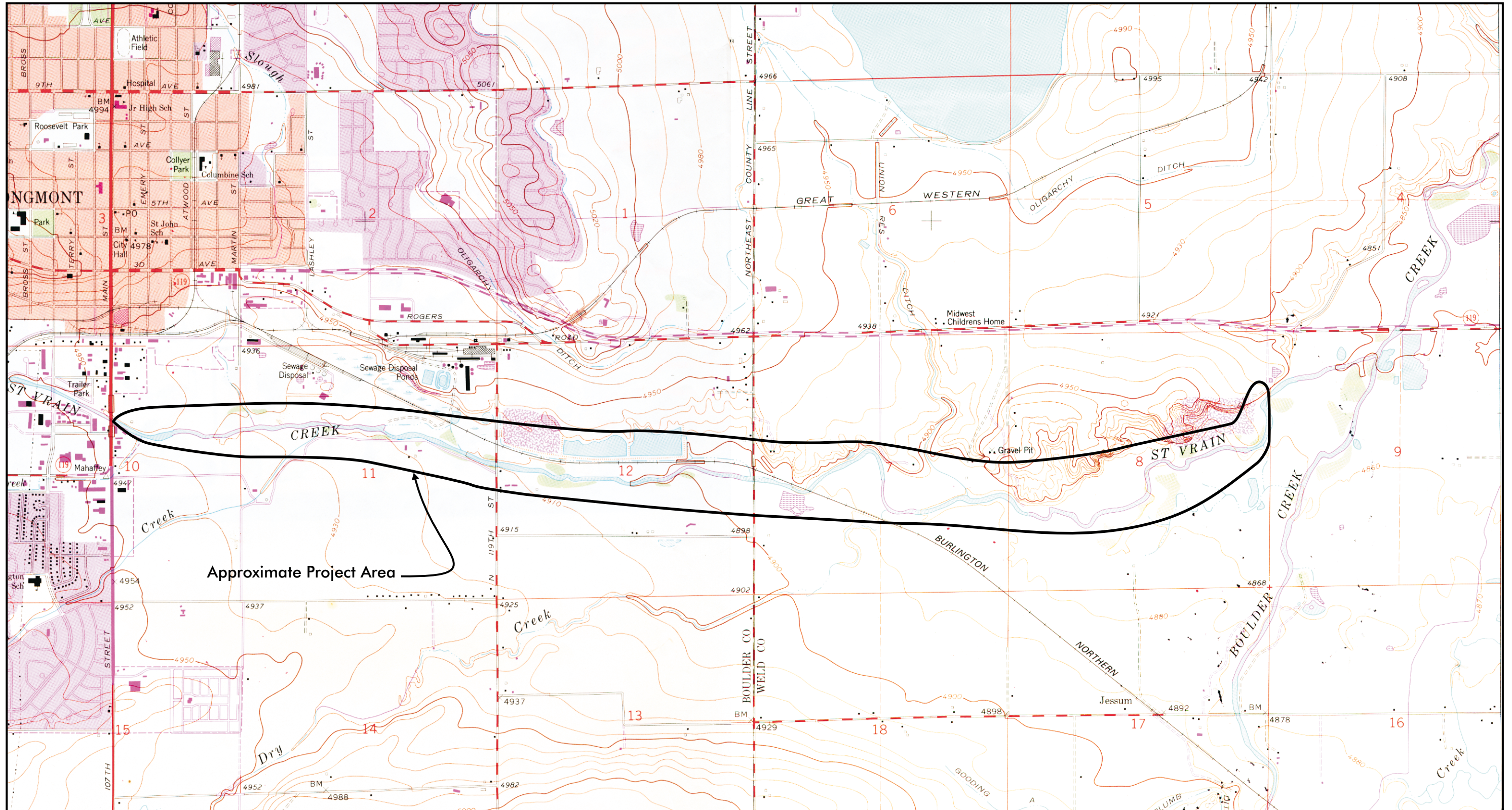
Table 2. St. Vrain Greenway Wetlands

Acronym	Comment	Wetland/WUS	Description	Data Source	Figure
T9		Wetland		aerial photography	Figure 5
T10		Wetland		aerial photography	Figure 5
T11		Wetland		aerial photography	Figure 5
WUS5	man-made pond	WUS	open water	aerial photography	Figure 6
WUS6	man-made pond	WUS	open water	aerial photography	Figure 6
PQ1	seasonally flooded terrace	Wetland	willow shrub	aerial photography	Figure 6
PQ2	seasonally flooded terrace	Wetland	willow shrub	aerial photography	Figure 6
PQ3	seasonally flooded terrace	Wetland	willow shrub	aerial photography	Figure 6
WUS7	man-made pond	Wetland	open water	aerial photography	Figure 7
ST1	old oxbow next to creek, irrigation return and seasonal flooding	Wetland	willow shrub/emergent	GPS	Figure 7
PQ4		Wetland	willow shrub/emergent	aerial photography	Figure 7
PQ5	drainage from irrigated area	Wetland	willow shrub	aerial photography	Figure 7
C1		Wetland	willow shrub	aerial photography	Figure 7
C2		Wetland	willow shrub/emergent	aerial photography	Figure 7
C3		Wetland	willow shrub	aerial photography	Figure 7
C4		Wetland	willow shrub/emergent	aerial photography	Figure 7
C5		Wetland	willow shrub/emergent	aerial photography	Figure 7
SSR1	east end of Sandstone Ranch	Wetland	willow shrub/emergent	GPS	Figure 8
SSR1UP	terrace above wetland	Upland	grassland	GPS	Figure 8
SSR2		Wetland	emergent	GPS	Figure 8
SSR3		Wetland	emergent	GPS	Figure 8
SSR4		Wetland	willow shrub/emergent	GPS	Figure 8
SSR5		Wetland	willow shrub/emergent	GPS	Figure 8
SSR5UP		Upland	willow shrub	GPS	Figure 8
SSR6	north side of creek at Sandstone Ranch	Wetland	saturated	GPS	Figure 8
SSR7	low area next to Spring Gulch	Wetland	saturated	GPS	Figure 7
SSR8	low area next to Spring Gulch	Wetland	willow shrub	aerial photography	Figure 7
SSR9	pond with fringe of wetlands	Wetland	saturated	GPS	Figure 7
SSR10	pond with fringe of wetlands	Wetland	emergent	GPS	Figure 7
SSR10UP	formerly irrigated area	Upland	grassland	GPS	Figure 7
SSR11		Wetland	willow shrub/emergent	aerial photography	Figure 8
LM1	seasonally flooded terrace south of creek	Wetland	willow shrub/emergent	GPS	Figure 9
LM2	seasonally flooded terrace south of creek	Wetland	willow shrub/emergent	GPS	Figure 9
LM3	seasonally flooded terrace south of creek	Wetland	willow shrub/emergent	GPS	Figure 9
LM4	seasonally flooded terrace south of creek	Wetland	willow shrub/emergent	GPS	Figure 9
LM5	oxbow, backwater area next to creek	Wetland	willow shrub/emergent	GPS	Figure 9

Table 2. St. Vrain Greenway Wetlands

<b>Acronym</b>	<b>Comment</b>	<b>Wetland/WUS</b>	<b>Description</b>	<b>Data Source</b>	<b>Figure</b>
LM6	includes sandbars, a few upland areas	Wetland	willow shrub	GPS	Figure 8
LM7	narrow fringe south of creek	Wetland	emergent	GPS	Figure 8
LM8	includes sandbars, a few upland areas	Wetland	willow shrub	GPS	Figure 8
LM9	includes gravel bars	Wetland	willow shrub	GPS	Figure 7
LM10		Wetland	willow shrub/emergent	aerial photography	Figure 7
WUS8	man-made pond	WUS	open water	GPS	Figure 7
WUS9	man-made pond	WUS	open water	aerial photography	Figure 7
WUS10	man-made pond	WUS	open water	aerial photography	Figure 9
WUS11	man-made pond	WUS	open water	aerial photography	Figure 9
HA1	seasonally flooded terraces north of creek	Wetland	willow shrub/emergent	GPS	Figure 8
HA2	seasonally flooded terraces north of creek	Wetland	willow shrub/emergent	GPS	Figure 8
HA3	seasonally flooded terraces north of creek	Wetland	willow shrub/emergent	GPS	Figure 8
HA4	man-made wetland	Wetland	willow shrub/emergent	aerial photography	Figure 8
HA5	seasonally flooded terraces north of creek	Wetland	willow shrub/emergent	GPS	Figure 8
CF1	north side of creek at Compost Facility	Wetland	willow shrub/emergent	GPS	Figure 9
CF2	north side of creek at Compost Facility	Wetland	willow shrub/emergent	GPS	Figure 9
CF3	north side of creek at Compost Facility	Wetland	willow shrub/emergent	GPS	Figure 9
CF4	north side of creek at Compost Facility	Wetland	willow shrub/emergent	GPS	Figure 9
CF5	north side of creek at Compost Facility	Wetland	willow shrub/emergent	GPS	Figure 9
CF6	wetland complex, north side of creek	Wetland	willow shrub/emergent	GPS	Figure 9
CF7	seasonally flooded fringe next to creek	Wetland	willow shrub	GPS	Figure 9
CF1UP		Upland	willow shrub/grassland	GPS	Figure 9
WUS12	Spring Gulch	WUS	riverine	aerial photography	Figure 7





Approximate Project Area



ERO Resources Corp.  
1842 Clarkson Street  
Denver, CO 80218  
(303) 830-1188  
Fax: 830-1199

St. Vrain Greenway Master Plan  
T2N, R69W, Sections 10, 11 & 12  
T2N, R68W, Sections 7 & 8

Longmont Quadrangle,  
Boulder and Weld Counties, Colorado





Figure 1  
Project Area

Prepared for: Design Workshop  
File: 1300-Figs.cdr  
October 2000



Figure 2  
Wetland Map

Prepared for  
Design Workshop  
July 2000

-  Study Area Boundary
-  Waters of the U.S.
-  Sample Points
-  Wetlands  
**CFP-4**



**ERO**  
ERO Resources Corp.  
1842 Clarkson Street  
Denver, CO 80218  
(303) 830-1188  
Fax: 830-1199

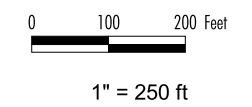








Figure 3  
Wetland Map

Prepared for  
Design Workshop  
July 2000

-  Study Area Boundary
-  Waters of the U.S.
-  Sample Points
-  Wetlands



**ERO**  
ERO Resources Corp.  
1842 Clarkson Street  
Denver, CO 80218  
(303) 830-1188  
Fax: 830-1199







1" = 250 ft





Figure 4  
Wetland Map

Prepared for  
Design Workshop  
July 2000

-  Study Area Boundary
-  Waters of the U.S.
-  Sample Points
-  Wetlands



**ERO**  
ERO Resources Corp.  
1842 Clarkson Street  
Denver, CO 80218  
(303) 830-1188  
Fax: 830-1199



BC-7  
1" = 250 ft







BC-1

BC-9  
Spring  
BC-8



Figure 5  
Wetland Map

Prepared for  
Design Workshop  
July 2000

-  Study Area Boundary
-  Waters of the U.S.
-  Sample Points
-  Wetlands



**ERO**  
ERO Resources Corp.  
1842 Clarkson Street  
Denver, CO 80218  
(303) 830-1188  
Fax: 830-1199

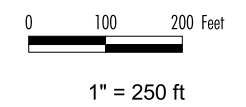








Figure 7  
Wetland Map

Prepared for  
Design Workshop  
July 2000

-  Study Area Boundary
-  Waters of the U.S.
-  Sample Points
-  Wetlands



SSR-6      SSR-5 up      SSR-5      SSR-4

IM-8

**ERO**  
ERO Resources Corp.  
1842 Clarkson Street  
Denver, CO 80218  
(303) 830-1188  
Fax: 830-1199

0 100 200  
1" = 250 ft






Figure 8  
Wetland Map

Prepared for  
Design Workshop  
July 2000

- Study Area Boundary
  - Waters of the U.S.
  - Sample Points
  - Wetlands
- CF-3

CF-2

IM-4

IM-5

CF-1

HA-1

**ERO**

ERO Resources Corp.  
1842 Clarkson Street  
Denver, CO 80218  
(303) 830-1188  
Fax: 830-1199

0 100 200 Feet





1" = 250 ft





Figure 9  
Wetland Map

Prepared for  
Design Workshop  
July 2000

-  Study Area Boundary
-  Waters of the U.S.
-  Sample Points
-  Wetlands



**ERO**  
ERO Resources Corp.  
1842 Clarkson Street  
Denver, CO 80218  
(303) 830-1188  
Fax: 830-1199

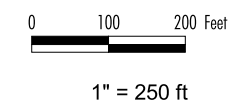






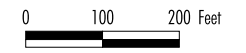


Figure 10  
Wetland Map

Prepared for  
Design Workshop  
July 2000

-  Study Area Boundary
-  Waters of the U.S.
-  Sample Points
-  Wetlands

**ERO**  
ERO Resources Corp.  
1842 Clarkson Street  
Denver, CO 80218  
(303) 830-1188  
Fax: 830-1199



1" = 250 ft





ST. VRAIN GREENWAY  
PHOTO LOG  
AUGUST - SEPTEMBER 2000



**Photo 1** - St. Vrain River, view east from Sandstone Ranch.



**Photo 2** - Willow shrub wetlands, view east from Main Street.

ST. VRAIN GREENWAY  
PHOTO LOG  
AUGUST - SEPTEMBER 2000



**Photo 3** - Seasonally flooded wetlands along Spring Gulch.



**Photo 4** - Seasonally flooded willow shrub and emergent wetlands along the St. Vrain.



ST. VRAIN GREENWAY  
PHOTO LOG  
AUGUST - SEPTEMBER 2000



**Photo 5** - Willow shrub/emergent wetland in oxbow (wetland ST1).



**Photo 6** - Gravel bar and willow shrub wetlands, Longmont Property.

ST. VRAIN GREENWAY  
PHOTO LOG  
AUGUST - SEPTEMBER 2000



**Photo 7** - Wetland fringe along St. Vrain River, view west from Boulder County Property.



**Photo 8** - Seasonally flooded wetlands and gravel bars, Boulder County Property.

ST. VRAIN GREENWAY  
PHOTO LOG  
AUGUST - SEPTEMBER 2000



**Photo 9** - Seasonally flooded wetlands and gravel bars, Boulder County Property.



**Photo 10** - Emergent wetland in backwater area.



ST. VRAIN GREENWAY  
PHOTO LOG  
AUGUST - SEPTEMBER 2000



Photo 11 - Typical wetland fringe at base of bank.



Photo 12 - Spring-fed wetland (wetland BC9).

ST. VRAIN GREENWAY  
PHOTO LOG  
AUGUST - SEPTEMBER 2000



Photo 13 - Spring-fed wetland (wetland BC3).



Photo 14 - Wetland south of spring (wetland BC8).



ST. VRAIN GREENWAY  
PHOTO LOG  
AUGUST - SEPTEMBER 2000



**Photo 15** - Man-made pond at CFP property.



**Photo 16** - Mixed riparian vegetation along St. Vrain River, typical view.

ST. VRAIN GREENWAY  
PHOTO LOG  
AUGUST - SEPTEMBER 2000



**Photo 17** - Mixed riparian, Left Hand Creek.



**Photo 18** - Cottonwood gallery, Longmont Property.



ST. VRAIN GREENWAY  
PHOTO LOG  
AUGUST - SEPTEMBER 2000



**Photo 19** - Cottonwood gallery, western portion of study area.



**Photo 20** - Cottonwood gallery, willow shrub wetlands in background south of Compost Facility.

ST. VRAIN GREENWAY  
PHOTO LOG  
AUGUST - SEPTEMBER 2000



**Photo 21** - Cottonwood gallery and disturbed grassland, south of Compost Facility.



**Photo 22** - Disturbed grassland, just east of Main Street.



ST. VRAIN GREENWAY  
PHOTO LOG  
AUGUST - SEPTEMBER 2000



**Photo 23** - Disturbed grassland, Sandstone Ranch.



**Photo 24** - Upland grassland and pine plantation, Sandstone Ranch.

ST. VRAIN GREENWAY  
PHOTO LOG  
AUGUST - SEPTEMBER 2000



**Photo 25** - Dry grassland, Longmont Property.



**Photo 26** - Dry grassland, Boulder County Property.

ST. VRAIN GREENWAY  
PHOTO LOG  
AUGUST - SEPTEMBER 2000



**Photo 27** - Disturbed grassland, Boulder County Property.



**Photo 28** - Prairie dog town, near confluence of St. Vrain River and Left Hand Creek.

**Vegetation and Habitat Inventory  
St. Vrain Greenway  
Boulder and Weld Counties  
Colorado**

*Prepared for—*

**The City of Longmont  
c/o: Design Workshop  
1390 Lawrence Street, Suite 200  
Denver, CO 80204**

*Prepared by—*

**ERO Resources Corporation  
1842 Clarkson Street  
Denver, CO 80218**

**November 16, 2000**



## CONTENTS

Introduction .....	1
Location.....	1
Overall Site Description .....	2
Plant Communities .....	2
Cultivated Fields .....	2
Cottonwood Gallery .....	2
Dry or Disturbed Grassland .....	3
Landscaped/Unvegetated Areas .....	3
Mesic Grassland .....	3
Mixed Riparian .....	3
Prairie Dog Towns .....	4
Pine Plantation .....	4
Russian Olive Dominated Riparian .....	4
Riparian Shrub .....	4
Siberian Elm Dominated Riparian .....	4
Upland Grassland .....	4
Wetland .....	5
Wildlife Habitat .....	5
Mammals.....	5
Birds .....	6
Amphibians and Reptiles .....	8
Threatened and Endangered Species .....	8
Ute Ladies'-tresses Orchid .....	9
Colorado Butterfly Plant .....	9
Preble's Meadow Jumping Mouse .....	10
Bald Eagle .....	11
Recommendations .....	12
Weed Control .....	12
Sensitive Areas .....	15
Potential Areas for Enhancement .....	16
Summary of Recommendations .....	17
Selected References .....	18

**VEGETATION AND HABITAT INVENTORY**  
**ST. VRAIN GREENWAY**  
**BOULDER AND WELD COUNTIES, COLORADO**  
**NOVEMBER 16, 2000**

**Introduction**

The City of Longmont is updating its St. Vrain Greenway Master Plan. As part of this update, ERO Resources conducted a field review of the project area for wetlands, vegetation types, and sensitive wildlife habitat. Fieldwork was conducted mostly during August 2000. Wetlands were delineated following the guidelines and criteria of the U.S. Army Corps of Engineers 1987 Wetland Delineation Manual as described in a separate report. Most wetland boundaries were mapped in the field using a Trimble Pro XRS Global Positioning System (GPS) receiver and TBC1 data logger using real time differential correction. For areas where GPS mapping was not practical, due to lack of landowner permission to enter or areas surrounded by open water or otherwise unreachable, wetland boundaries were determined by interpretation of aerial photography. All vegetation types were mapped in the field based on aerial photography and visual inspection for those properties where access was granted. For areas where access was not granted, vegetation types were mapped from aerial photography only.

**Location**

The St. Vrain Greenway study area is the St. Vrain River and a portion of its associated floodplain from Main Street in Longmont east to the City of Longmont's Compost Facility and former landfill, not including tributaries such as Left Hand Creek, Dry Creek, and Spring Gulch. The study area is located in Township 2 North, Range 69 West, NE ¼ Section 10, N ½ Section 11, and Section 12 in Boulder County, and in Township 2 North, Range 68 West, Sections 7 and 8 in Weld County, Colorado. The approximate study area boundary is shown in Figure 1. The UTM coordinates of the



western end of the study area are Zone 13: 491,280mE, 4,444,090mN. The UTM coordinates of the eastern end of the study area are Zone 13: 498,500mE, 4,445,000mN.

### **Overall Site Description**

The St. Vrain River and the surrounding uplands in the study area have been heavily influenced by human activities such as lining the banks with riprap, construction of drop structures and diversion structures for irrigation, construction of irrigation canals, cultivation, and mining. Surrounding land uses include active and inactive gravel mines, pasture, irrigated fields, dedicated open space, hunting preserves, an abandoned railroad grade, and a limited amount of industrial use.

### **Plant Communities**

A partial list of plant species observed in the St. Vrain Greenway study area is shown in Table 1. Vegetation types in the study area were mapped at a level of detail suitable for planning purposes. Plant communities were categorized as cultivated fields, cottonwood gallery, dry or disturbed grassland, landscaped or unvegetated, mesic grassland, mixed riparian, prairie dog town, pine plantation, Russian olive dominated riparian, riparian shrub, Siberian elm dominated riparian, upland grassland, and wetland. Plant communities are shown in Figures 2 through 10.

### **Cultivated Fields**

Cultivated fields occur in the floodplain of the St. Vrain River within the study area. These areas are typically irrigated. Some formerly irrigated and cultivated areas are no longer cultivated and have reverted to weedy, dry grassland.

### **Cottonwood Gallery**

The cottonwood gallery vegetation type consists of areas dominated by mature plains cottonwood with an open understory of grasses and forbs. This community typically occurs on higher terraces within the floodplain, in slightly drier areas than the mixed riparian and riparian shrub vegetation types. Peach-leaf willow and Siberian elm commonly occur scattered throughout this community. Narrow-leaf cottonwood occurs occasionally in this community, possibly having escaped from cultivation. Common

understory plants include western wheatgrass, smooth brome, kochia, whitetop, wild allysum, Canada thistle, teasel, velvetweed, peppergrass, wild rose, and snowberry.

### **Dry or Disturbed Grassland**

The dry grassland vegetation type consists of highly variable grasslands and disturbed, weedy uplands within the floodplain. Past grazing or cultivation has typically disturbed these areas. Common plant species include smooth brome, western wheatgrass, tall wheatgrass, pigweed, western ragweed, cheatgrass, musk thistle, diffuse knapweed, goosefoot, bindweed, saltgrass, annual sunflower, golden aster, common mallow, prickly pear, groundcherry, common purslane, curly dock, green bristlegrass, and sand dropseed.

### **Landscaped/Unvegetated Areas**

Landscaped or unvegetated areas are typically covered by bluegrass lawns and ornamental shade trees, or are unvegetated. Some of these areas are covered by dense stands of weeds such as kochia, diffuse knapweed, and pigweed.

### **Mesic Grassland**

The mesic grassland vegetation type was observed only once, in an irrigated meadow on the Boulder County Open Space property. This irrigated meadow is dominated by meadow fescue, quackgrass, and foxtail barley.

### **Mixed Riparian**

The mixed riparian vegetation type is intermediate between the cottonwood gallery and riparian shrub vegetation types. Mixed riparian has relatively less shrub component than riparian shrub, and more shrub component than cottonwood gallery. No one tree species dominates this community, with a mixture of plains cottonwood, Siberian elm, Russian olive, crack willow, and peach-leaf willow forming the tree component. The understory commonly includes sandbar willow, smooth brome, reed canarygrass, whitetop, dogbane, and wild licorice. Other plant species sometimes occurring in this vegetation type include boxelder, showy milkweed, wild asparagus, Canada thistle, wild mock-cucumber, smooth scouring rush, green ash, white sweetclover, catnip, Virginia creeper, three-leaf sumac, New Mexico locust, and poison ivy.



### **Prairie Dog Towns**

Prairie dog towns are included as a vegetation type because the vegetation of these areas is so heavily influenced by the grazing activities of black-tailed prairie dogs. The vegetation of these areas is kept close-cropped by the prairie dogs, and includes large areas that have been grazed to bare ground. Plant species occurring within the prairie dog towns typically include weedy species such as bindweed, kochia, western ragweed, and curly dock.

### **Pine Plantation**

The pine plantation vegetation type was observed only once, as a small grove of pine trees of unknown species at the Sandstone Ranch property.

### **Russian Olive Dominated Riparian**

The Russian olive dominated riparian vegetation type occurs scattered throughout the study area, often predominating on irrigation ditches and around the margins of man-made ponds. In addition to Russian olive, other plant species occurring in this community include Siberian elm, plains cottonwood, and sandbar willow.

### **Riparian Shrub**

The riparian shrub vegetation type is dominated by dense stands of sandbar willow and reed canarygrass. Other plant species that typically occur in this community include peach-leaf willow, prairie cordgrass, and cottonwood saplings.

### **Siberian Elm Dominated Riparian**

The Siberian elm dominated riparian vegetation type occurs in similar locations as Russian olive dominated riparian. Siberian elm is the dominant tree; otherwise, this vegetation type is similar to the Russian olive dominated community.

### **Upland Grassland**

The upland grassland vegetation type occurs on the bluffs and gently sloping hills north of the floodplain at the Sandstone Ranch. This community is not riparian, or river-influenced. Common plant species include western wheatgrass, fringed sage, yucca,

intermediate wheatgrass, smooth brome, cheatgrass, winterfat, rabbitbrush, kochia, alfalfa, prickly pear, and needle-and-thread.

### **Wetland**

The wetlands within the study area occur along the St. Vrain River. The river is bordered by wetlands that vary from a narrow fringe along the base of the bank to extensive wetland complexes on terraces adjacent to the river. The most abundant plant species occurring in wetlands adjacent to the river are sandbar willow and reed canarygrass. These two species occur in almost every wetland mapped within the study area. Other species occurring in wetlands adjacent to the river vary widely from site to site. Common plant species observed in wetlands, in addition to sandbar willow and reed canarygrass, include broad-leaved cattail, redtop, dogbane, swamp milkweed, Canada thistle, poison hemlock, horseweed, teasel, saltgrass, barnyard grass, spikerush, Nuttall's sunflower, foxtail barley, Baltic rush, duckweed, watercress, common evening primrose, smartweed, pink lady's thumb, curly dock, peach-leaf willow, three-square bulrush, soft-stem bulrush, prairie cordgrass, saltcedar, blue vervain, and brooklime.

### **Wildlife Habitat**

#### **Mammals**

*Whitetail deer, fox squirrel, and eastern cottontail.* Common mammal species in riparian habitat within the study area include whitetail deer, fox squirrel, and eastern cottontail. These eastern species have moved westward along riparian corridors with abundant food and cover (Fitzgerald et al. 1994). All three of these species were observed during fieldwork. Whitetails are most abundant in the eastern portion of the study area. Signs of whitetail deer are common in the dense riparian shrub and mixed riparian vegetation types.

*Beaver and muskrat.* Beaver are abundant wetlands in the study area. This species was not directly observed, but two beaver lodges were observed, as well as dams, canals, and recently cut cottonwood and willow. Beaver activity is especially evident at the



Boulder County Open Space property. Muskrats were not observed, but probably also occur in the study area.

***Black-tailed prairie dog.*** Black-tailed prairie dogs are abundant in dry grasslands in the study area. Most of the prairie dogs occur south of the river, with the largest town located on Boulder County Open Space property. Smaller prairie dog towns are scattered throughout upland areas south of the river. The only prairie dogs observed north of the river were two burrows and at least one prairie dog observed at the Sandstone Ranch. Prairie dogs help provide habitat for other species by creating an environment that is inviting to other animals. Prairie dogs also provide an important food source for avian and mammalian predators. Species such as prairie rattlesnakes, burrowing owls, and black-footed ferrets are closely linked to prairie dogs (Fitzgerald et al. 1994).

***Small rodents.*** Other small rodents that are known to occur in riparian habitat in the study area based on past trapping surveys include deer mouse, prairie vole, meadow vole, house mouse, western harvest mouse, and Norway rat (ERO 1998; Savage and Savage 1998). The house mouse and Norway rat are introduced species that may compete with or displace native species. Preble's meadow jumping mouse, a threatened species, has not been documented to occur within the study area in several trapping surveys (see *Threatened and Endangered Species* below). Other small rodents, including the hispid pocket mouse and thirteen-lined ground squirrel, probably occur in dry or upland grassland habitats within the study area.

***Other miscellaneous mammals.*** Other mammals that occur or are likely to occur in the study area based on suitable habitat include coyote, red fox, striped skunk, raccoon, and porcupine. Raccoon sign was observed in the form of tracks on the banks of the river and a partial skeleton. All of these species probably frequent the riparian habitat along the river, although the coyote may be more common in more open areas.

## **Birds**

The timing of fieldwork in August influenced the number of bird species observed. Additional surveys earlier in the breeding season or during migration would increase the number of species observed.

**Raptors.** Raptors observed during fieldwork included red-tailed hawk, prairie falcon, great-horned owl, and turkey vulture. Red-tailed hawks are common throughout the study area, and may nest in a large cottonwood at the Sandstone Ranch. A prairie falcon was observed in flight above the Sandstone Ranch. A turkey vulture was observed in flight near the Longmont Compost Facility. Great horned owls were observed at the Compost Facility, on Longmont property south of the Compost Facility, and at the Boulder County property. Red-tailed hawks and great horned owls were most frequently observed in cottonwood gallery habitat where large trees provide suitable nesting and perching habitat. A bald eagle survey for the St. Vrain River from Main Street east to N 119<sup>th</sup> Street also documented the presence of red-tailed hawks and American kestrels (Beane and DeHaven 1999). An inventory of the Sandstone Ranch by Schafer and Associates in 1998 documented the following raptor species in addition to those already mentioned: rough-legged hawk, ferruginous hawk, Swainson's hawk, northern harrier, and sharp-shinned hawk (Schafer & Associates 1998).

**Gallinaceous birds.** The only gallinaceous birds observed were three wild turkeys, one adult and two juveniles, at the Sandstone Ranch. The observation of juveniles suggests that wild turkeys probably breed in the study area. The 1998 inventory of Sandstone Ranch also documented the occurrence of ring-necked pheasant and chukar (Schafer & Associates 1998).

**Water birds.** Water birds observed during fieldwork include great blue heron, black-crowned night heron, double-crested cormorant, killdeer, mallard, and Canada goose. Great blue herons and mallards are common along the riverbanks in the study area, and were frequently flushed during the course of fieldwork. Great blue herons typically nest in large colonies in secluded cottonwood groves. No evidence of heron nesting was observed in the study area, although the large amount of cottonwood gallery habitat could provide potential nesting sites. Two black-crowned night herons were observed in a large crack willow on Spring Gulch at the Sandstone Ranch. Cormorants and Canada geese were occasionally observed in flight near the river. The 1998 inventory of Sandstone Ranch also documented the occurrence of blue-winged teal, green-winged-teal, common



snipe, American avocet, greater yellowlegs, solitary sandpiper, spotted sandpiper, and long-billed dowitcher, mostly on Spring Gulch (Schafer & Associates 1998).

**Other birds.** Other small birds observed during fieldwork include barn swallow, belted kingfisher, and cliff swallow (over or near open water); red-winged blackbird and yellow warbler (in wetlands or riparian); downy woodpecker (in cottonwood gallery); and eastern kingbird, western kingbird, black-billed magpie, American goldfinch, black-capped chickadee, mourning dove, and northern flicker (in all habitat types). All of these species probably nest in the study area. Mourning doves are especially abundant in the study area, and nests with eggs or young were discovered on three separate occasions in dense thickets of riparian willows and wetlands. The 1998 Sandstone Ranch inventory documented additional species of small birds, including American crow, blue jay, house wren, American robin, Townsend's solitaire, common yellowthroat, song sparrow, Say's phoebe, brown-headed cowbird, house finch, rock dove, European starling, common grackle, Brewer's blackbird, house sparrow, western meadowlark, horned lark, vesper sparrow, northern rough-winged swallow, and bank swallow (Schafer & Associates 1998).

### **Amphibians and Reptiles**

Amphibians and reptiles observed during fieldwork included frogs, snakes, and an unidentified skink. Frogs, either northern leopard frogs or bullfrogs, are abundant on the banks of the St. Vrain and in backwater areas and wetlands. Tadpoles were observed in backwater areas at the Boulder County Open Space Property. Plains garter snakes were frequently observed in the study area. Other snakes that may occur in the drier habitats in the study area include the prairie rattlesnake and bull snake.

### **Threatened and Endangered Species**

Three threatened species that have the potential to occur in wetland or riparian habitats in the study area are the Ute ladies'-tresses orchid (*Spiranthes diluvialis*), the Colorado butterfly plant (*Gaura neomexicana* ssp. *coloradensis*), and the Preble's meadow jumping mouse (*Zapus hudsonius preblei*). The bald eagle also has the potential to roost in the study area.

### **Ute Ladies'-tresses Orchid**

The following types of habitat are considered to potentially support populations of *Spiranthes diluvialis*—

1. Areas determined to be jurisdictional wetlands;
2. Seasonally moist areas near springs, lakes, irrigation ditches, or perennial streams and their associated flood plains;
3. Old stream channels and alluvial terraces;
4. Sub-irrigated meadows;
5. Areas supporting vegetation indicative of seasonally wet areas or areas dominated by vegetation considered to be facultative wet.

Based on these criteria, the wetland, riparian shrub, mixed riparian, and mesic grassland vegetation types in the study area may potentially support the orchid. The other vegetation types within the study area are too dry or too disturbed to provide habitat for the orchid.

In August 1998, a portion of the study area from Main Street to just east of N 119<sup>th</sup> Street was surveyed for the orchid, and it was not found. Figure 11 shows areas surveyed in 1998, as well as areas reviewed by ERO in August 2000 as part of the current study. No orchids were observed in these areas during fieldwork; however, it should be noted that potential habitat is present, and that 2000 was a very dry year. *Spiranthes* is known to sometimes remain dormant during unusually dry years. In addition, some areas were not observed for the orchid due to lack of access. The areas surveyed in 1998 can be excluded from further surveys for the orchid. The reach of the river to the east should be considered to contain potential habitat and should be resurveyed in the future, concentrating specifically on known crossing sites or areas of impact to wetlands.

### **Colorado Butterfly Plant**

The Colorado butterfly plant was listed as a threatened species on October 18, 2000 and the U.S. Fish and Wildlife Service has not yet published formal survey guidelines for this species. The Colorado butterfly plant occurs on subirrigated alluvial soils on level or slightly sloping floodplains and drainage bottoms between 5,000 and 6,400 feet in elevation in north-central Colorado, southeastern Wyoming, and western Nebraska.



Colonies are often found in low depressions along wide, active stream channels. The Colorado butterfly plant typically occurs in habitats created and maintained by streams that are active within their floodplains, with vegetation that is relatively open and not overly dense or overgrown.

The area surveyed for Ute ladies'-tresses orchid in 1998 also was surveyed concurrently for the Colorado butterfly plant, and the butterfly plant was not observed. The same recommendation for the Ute ladies'-tresses orchid applies for the butterfly plant. The reach of the St. Vrain River east of the area surveyed in 1998 should be considered to contain potential habitat and should be resurveyed in the future, concentrating specifically on known crossing sites or areas of impact to riparian habitat.

### **Preble's Meadow Jumping Mouse**

Preble's meadow jumping mouse (*Zapus hudsonius preblei*) is a threatened species with the potential to occur in riparian habitats in this part of Colorado. Preble's mice typically inhabit areas characterized by well-developed plains riparian vegetation with relatively undisturbed grassland and a water source in close proximity (Armstrong et al. 1997). Recent studies have suggested that Preble's may have a wider ecological tolerance than previously thought, and that the requirement for diverse vegetation and well-developed cover can be met under a variety of circumstances (Meaney et al. 1997). Radio-tracking studies conducted by the Colorado Division of Wildlife (CDOW) have documented Preble's using upland habitat adjacent to wetlands and riparian areas (Shenk and Sivert 1999). Additional research by CDOW has suggested that habitat quality for PMJM can be predicted by the amount of shrub cover available at a site (White and Shenk 2000).

Based on the above criteria, the study area fits the description of potential Preble's habitat; however, there have been no recent captures of Preble's on the St. Vrain downstream from Longmont despite numerous trapping surveys. The locations of several recent trapping surveys in or near the study area are described in our related report *Preble's meadow jumping mouse habitat assessment for the St. Vrain Greenway* (ERO Resources 2000).

Based on the available trapping data and ERO's review of available habitat in the project area, we feel that the western  $\frac{1}{3}$  of the project area from Main Street to N 119<sup>th</sup> Street should be excluded from the need to do further trapping surveys for mouse. This reach of the St. Vrain has been most heavily influenced and disturbed by human activities. Cultivated land, weeds, and a few scattered prairie dog towns cover the uplands immediately to the south of the riparian area in this reach. The uplands north of the river in this reach are covered by weeds, several man-made ponds, and other disturbed lands. In addition, this area has been more extensively trapped than the reach of the river east of N 119<sup>th</sup> Street.

The eastern  $\frac{2}{3}$  of the project area, from N 119<sup>th</sup> Street east is less disturbed by human activity and is bordered by slightly higher quality uplands than the western  $\frac{1}{3}$ . This area also has been trapped less intensively and generally has a wider riparian corridor. In our opinion, there is a remote possibility that Preble's may be present in this eastern portion of the project area, and more trapping may be needed.

### **Bald Eagle**

Bald eagles, a threatened species, are known to frequent the study area from approximately the Boulder/Weld County line east (Ron Beane, DaTiMbi, personal communication). The St. Vrain corridor provides good winter habitat for bald eagles with the presence of large bodies of water, large cottonwoods for roosting, and an abundant supply of prairie dogs for food. A bald eagle survey for the St. Vrain River from Main Street east to N 119<sup>th</sup> Street found that the reach of the river from Main Street to N 119<sup>th</sup> Street was not likely to provide nesting or roosting habitat for bald eagles, but noted the presence of an important eagle winter roost located to the east (Beane and DeHaven 1999). This winter roost generally occurs near the confluence of the St. Vrain River and Boulder Creek, although the location varies from year to year (Jerry Craig, Colorado Division of Wildlife, personal communication). Overwintering bald eagles are typically present in this part of Colorado from mid-November through the end of March. The Division of Wildlife recommends maintaining a  $\frac{1}{4}$ - to  $\frac{1}{2}$ -mile buffer around bald eagle roost sites to reduce disturbance to the birds.



## Recommendations

### Weed Control

The Colorado Noxious Weed Act lists plants that have been identified as problem weeds or have been recommended for control through public testimony. These plants are listed in the State Noxious Weed List. Information on weed control comes from the handbook *Creating an Integrated Weed Management Plan* (Colorado Natural Areas Program 2000). The following weeds that occur in the study area have been identified as the among the top ten most widespread and destructive in the state:

- ***Canada thistle*** – Canada thistle is abundant throughout the study area and occurs in nearly every riparian area observed. Canada thistle typically infests areas intermediate in moisture and can often be found dominating the transition zone between wetland and upland. Mowing and herbicides are the most effective control measures, although Canada thistle tends to grow near water, restricting the use of certain herbicides.
- ***Diffuse knapweed*** – Diffuse knapweed is common in upland areas throughout the study area. Diffuse knapweed is most common in dry grassland areas that have been highly disturbed by cultivation or overgrazing, but can also invade undisturbed native prairie. Prevention is the best way to control diffuse knapweed. Areas near known stands should be monitored and any new knapweed plants should be destroyed. Established plants or stands can be pulled or treated with herbicide.
- ***Field bindweed*** – Field bindweed was observed only in the most disturbed areas, limited mostly to prairie dog towns and to the most disturbed grasslands in the study area. Field bindweed is difficult to control and is unaffected by pulling, mowing, or burning. Repeated applications of herbicides may be the only way to control it. Field bindweed cannot tolerate shade, so maintaining a healthy cover of perennial plants can help prevent establishment.
- ***Whitetop (or hoary cress)*** – Whitetop is abundant in riparian communities in the study area. This weed is a frequent component of the cottonwood gallery and mixed riparian communities. As with Canada thistle, mowing and herbicide applications are the most effective control methods.
- ***Musk thistle*** – Musk thistle occurs in the study area, but is not common. Relatively small infestations were observed in the study area, consisting of scattered individual plants. Biological controls have been introduced for this species, and this may account for its low abundance for a noxious weed.
- ***Russian knapweed*** – Russian knapweed was observed only once, as a few scattered individual plants at the Sandstone Ranch. This species should be a high priority for control, since it was only observed in one small area, and

should be eradicated before it proliferates further. The best way to control Russian knapweed is with a combination of herbicide and seeding competitive grasses.

The State Noxious Weed List also lists weed species that are not yet common or widespread in Colorado and should be considered high priorities for control and eradication before they can proliferate and cause economic and environmental damage.

The following species in this category were observed in the study area:

- ***Bouncingbet (or soapwort)*** – Bouncingbet is sometimes cultivated in gardens for its showy flowers. This plant was only observed at the Boulder County Property. A small population occurs on a gravelly berm north of the river, near the east end of the property. This plant should be a high priority for control, since it is not yet widespread in the study area. Pulling or mowing several times a year can control Bouncingbet.
- ***Common teasel*** – Teasel occurs scattered throughout the margins of wetlands in the study area. It appears to be more common in the eastern portion of the study area. Cutting seed stalks after flowering is the recommended control method.

The following additional state-listed noxious weeds were observed in the study area:

- ***Quackgrass*** – The only significant population of quackgrass observed occurs in an irrigated meadow mapped as mesic grassland on the Boulder County Property. Quackgrass is an early successional species that may eventually be replaced by other grasses. For this reason, this species is probably not a high priority for control.
- ***Cheatgrass (downy brome)*** – Cheatgrass is one of the most abundant and widespread weeds in the West, often infesting overgrazed or disturbed areas. Within the study area, it occurs in disturbed grasslands and in the understory of the cottonwood gallery. Cheatgrass is so widespread and resistant to control methods that the most effective control may be to establish and maintain healthy stands of perennial plants that can compete with this weed.
- ***Poison hemlock*** – Poison hemlock occurs in riparian areas scattered throughout the study area. The most significant population occurs at the Boulder County Open Space property. This plant is highly poisonous and contact with bare skin should be avoided. Hand pulling (with gloves) and spot treatment with herbicides can control this plant.
- ***Green foxtail*** – Green foxtail is a common weed of gardens and other disturbed areas. It occurs sporadically in disturbed grasslands throughout the study area, and is not a high priority for control. Most control methods are geared towards removing green foxtail from crops, and little information is available about control in natural areas.
- ***Kochia*** – Kochia is abundant and widespread in upland areas with a history of disturbance. It is common in the study area in dry grasslands, cottonwood gallery, and prairie dog towns. The seedlings of this annual can be treated with herbicide. Small infestations can be pulled by hand.
- ***Tamarisk*** – Tamarisk (salt cedar) is a shrub or small tree invades wetlands and riparian areas and should be eradicated if possible. Tamarisk occurs in riparian areas throughout the study area, but is most common in the eastern portion of the study area. If not eradicated, tamarisk will become a serious environmental problem in the future by competing with native willows and cottonwoods and reducing biological diversity along the St. Vrain River. Control of tamarisk should be given the highest priority. An effective control method is cutting the stems close to the ground, followed by application of herbicides to the cut stump.
- ***Russian thistle*** – Russian thistle is not common in the study area, and was only observed as a few scattered individuals at the Longmont property south of the compost facility. Mowing or pulling young plants could control this small infestation.



Another invasive plant that occurs in the study area, but is not listed on the noxious weed list is Russian olive. Russian olive is an aggressive, non-native tree of riparian areas. Control of this tree is controversial, because some believe that Russian olive is a food source for wildlife. In general, when locating a trail or other improvement, it is not necessary to avoid removing Russian olives.

In summary, assuming limited resources for weed control, the highest priorities for control should be tamarisk, Russian knapweed, and bouncingbet.

### **Sensitive Areas**

The most valuable vegetation types for wildlife habitat are the wetland, riparian shrub, and mixed riparian communities. These areas are characterized by dense vegetation that provides cover for migratory and nesting birds, as well as many other types of wildlife, as described above in the *Wildlife Habitat* section. These areas also form a relatively continuous movement corridor along the river for deer and other wildlife. Currently, only two bridge crossings, at N 119th Street and Weld County Road 1 at the Boulder/Weld County line, interrupt this corridor. Future creek crossings should be kept to a minimum and carefully located so as to minimize fragmentation of the riparian corridor.

The cottonwood gallery vegetation type also provides important wildlife habitat. The many large trees provide potential nesting and roosting sites for raptors as described above in the *Wildlife Habitat* section. Owls and other cavity nesting birds may use dead or hollow cottonwoods for nesting. In the easternmost portion of the study area, bald eagles may roost in large cottonwoods during the winter. The understory of the cottonwood gallery areas is often highly disturbed and made up of weedy plant species, offering opportunities for enhancement. Russian olive and Siberian elm dominated riparian habitats are similar, but are not as valuable because smaller, non-native trees dominate in these areas.

The open waters of the river and man-made ponds (shown on the maps as waters of the U.S.) provide habitat for waterfowl and shorebirds. Impacts to these areas should be avoided whenever possible.

The upland grassland vegetation type at the Sandstone Ranch should be avoided if possible because it is the largest area of undisturbed prairie within the study area. Unlike the areas mapped as dry or disturbed grassland that are covered by introduced pasture grasses and weeds, this area is covered mostly by native prairie vegetation.

Other potentially sensitive areas include the two natural springs at the Boulder County Open Space Property. The U.S. Army Corps of Engineers requires an individual Section 404 permit for activities in wetlands within 100 feet of springs. If a trail or other improvements are located near these areas, no disturbance should occur within 100 feet of these two springs.

### **Potential Areas for Enhancement**

The cultivated fields and dry or disturbed grasslands are the least sensitive vegetation types within the study area. Although some birds and small mammals may nest and feed in these areas, placing a trail or other improvements in these areas would have less impact on wildlife than if a trail were placed in riparian areas. Because these areas are generally lacking in native vegetation, they would be good candidates for enhancement by restoring native prairie grasses and wildflowers. Establishment of perennial vegetation is especially important for the highly disturbed and weed-infested areas of the Sandstone Ranch, specifically the area south of the residence and north of the river.

The ponds at the CFP Estate or Pavlokais Property, located mostly north of the river, at the western end of the study area, presents good opportunities for wildlife habitat enhancement. Creating additional wetlands around the margins of the existing ponds could enhance their value for wildlife. These ponds currently have steep banks with little or no wetland development. The ponds could be expanded by creating gently sloping banks where wetland vegetation would establish. The two adjacent ponds separated by a berm could be connected, or the berm could be reduced to an island. Many such improvements are possible to make the ponds more attractive to waterfowl and other wildlife.

Other man-made ponds occur within the study area that could be similarly enhanced by creating wetlands. These include the two ponds at the Sandstone Ranch, and the two

ponds on Longmont Property south of the compost facility. Once commercial gravel-mining activities are complete, the remaining gravel pits could also provide opportunities for wetland creation and enhancement.

The mesic meadow at the Boulder County Open Space Property also provides opportunities for enhancement. The water table here appears to be close to the surface, as indicated by the presence of the two nearby natural springs. The vegetation of this meadow is dominated by quackgrass and meadow fescue, two non-native species. Additional wetlands might be easily created in this area by changing the topography. More extensive investigations of soil and ground water are recommended in this area.

The St. Vrain River has been straightened, channelized, and armored with riprap in some sections of the study area. Possible improvements could include allowing the river to take a more natural course by replacing the steep banks with more gradual banks covered by wetlands and riparian vegetation. The Longmont Property south of the Compost Facility provides one example. An approximately 400-foot reach of the south riverbank (located between wetlands LM1 and LM2 on the wetland map, Figure 9) currently consists of a steep bank with a narrow fringe of wetlands bordered by dry grassland. This area could be a good place to create new wetlands.

### **Summary of Recommendations**

1. The trail should be placed in the lower quality vegetation types of dry or disturbed grassland and cultivated fields while avoiding other vegetation types and wetlands as much as possible.
2. The riparian shrub, mixed riparian, wetland, and cottonwood gallery vegetation types should be protected as much as possible because these areas provide valuable habitat for wildlife.
3. Construction of new creek crossings should be kept to a minimum or designed to minimize disruption of migration corridors for wildlife along the river.
4. The two natural springs at the Boulder County Property should be avoided if possible.
5. At least one additional trapping survey for Preble's meadow jumping mouse should be scheduled for the 2001 trapping season, possibly at the Boulder County Open Space Property.



6. For that part of the project area not surveyed for the Ute ladies'-tresses orchid and Colorado butterfly plant in 1998, site-specific surveys should be planned for areas where potential habitat will be affected by the project.
7. Limit disturbance within the eastern ½ mile of the project area because this area provides potential roosting habitat during the winter for bald eagles.
8. Weed control efforts should focus on establishing healthy stands of perennial grasses and other native vegetation in weed-infested areas. Tamarisk, Russian knapweed, and bouncingbet should be high priorities for control because they are not yet widespread in the study area but have the potential to become problems in the future.
9. The easiest areas to create and enhance wetlands in the project area are the existing man-made ponds, most of which are bordered by only a narrow fringe of wetlands, if any.

### **Selected References**

- Armstrong, D.M., M.E. Bakeman, A. Deans, C.A. Meaney, and T.R. Ryon. 1997. Report on habitat findings of the Preble's meadow jumping mouse. Boulder, Colorado. Report to the U.S. Fish and Wildlife Service and Colorado Division of Wildlife.
- Beane, Ron. 2000. Personal communication with Steve Butler, ERO Resources Corporation. October.
- Beane, R. and M. DeHaven. 1999. Bald eagle field investigation. Ken Pratt Boulevard Extension. Prepared for Carter & Burgess, Inc. by ERO Resources Corp. April 9, 1999.
- Colorado Natural Areas Program. 2000. Creating an Integrated Weed Management Plan: A Handbook for Owners and Managers of Lands with Natural Values. Published by Colorado Natural Areas Program, Colorado State Parks, Colorado Department of Natural Resources, and Colorado Department of Agriculture. March 2000.
- Craig, Jerry. 2000. Colorado Division of Wildlife. Personal communication with Steve Butler, ERO Resources Corporation. October.
- ERO Resources Corporation. 1998. Preble's meadow jumping mouse trapping survey for the Ken Pratt Boulevard Extension. Report submitted to the U.S. Fish and Wildlife Service.
- ERO Resources Corporation. 2000. Preble's meadow jumping mouse trapping survey for the St. Vrain Greenway. Report submitted to the U.S. Fish and Wildlife Service.
- Fitzgerald, J.P., C.M. Meaney, and D.M. Armstrong. 1994. Mammals of Colorado. Denver Museum of Natural History and University Press of Colorado.
- Meaney, C.A., A. Deans, N.W. Clippenger, M. Rider, N. Daly, and M. O'Shea-Stone. 1997. Third year survey for Preble's meadow jumping mouse (*Zapus hudsonius*

*preblei*) in Colorado. Boulder, Colorado. Under contract to Colorado Division of Wildlife.

Savage and Savage. 1998. Preble's meadow jumping mouse trapping survey report for Camas/Cooley Gravel Company Bigelow Tract Proposed Expansion. Report submitted to the U.S. Fish and Wildlife Service.

Schafer and Associates. 1998. Sandstone Ranch Master Plan Interim Report of Findings and Recommendations: Ecological Resources. Prepared for Winston Associates, Boulder, Colorado. May 19, 1998.

Shenk, T.M. and M.M. Sivert. 1999. Movement patterns of the Preble's meadow jumping mouse as they vary across time and space. Fort Collins, Colorado. Colorado Division of Wildlife.

White, Gary C. and Tanya M. Shenk. 2000. Relationship of Preble's Meadow Jumping Mouse Densities to Vegetation Cover. Colorado Division of Wildlife Report.

**Table 1. Partial Plant List for the St. Vrain Greenway**

<b>Latin Name</b>	<b>Common name</b>	<b>Comment</b>
<i>Acer negundo</i>	boxelder	native tree
<i>Agropyron elongatum</i>	tall wheatgrass	introduced grass
<i>Agropyron intermedium</i>	intermediate wheatgrass	introduced grass
<i>Agropyron repens</i>	quackgrass	introduced grass - on noxious weed list
<i>Agropyron smithii</i>	western wheatgrass	native prairie grass
<i>Agrostis gigantea</i>	redtop	introduced grass of wet areas
<i>Allysum minus</i>	wild allysum	weedy forb
<i>Amaranthus sp.</i>	pigweed	weedy forb
<i>Ambrosia psilostachya</i>	western ragweed	native forb
<i>Apocynum cannabinum</i>	dogbane	native forb of riparian areas
<i>Aristida purpurea</i>	three-awn	native prairie grass
<i>Artemisia frigida</i>	fringed sage	native prairie plant
<i>Asclepias incarnata</i>	swamp milkweed	native plant of wet areas
<i>Asclepias speciosa</i>	showy milkweed	native forb
<i>Asparagus officinalis</i>	wild asparagus	introduced forb
<i>Bromus inermis</i>	smooth brome	introduced pasture grass
<i>Bromus (Anisantha) tectorum</i>	cheatgrass (downy brome)	introduced grass - on noxious weed list
<i>Cardaria draba</i>	whitetop	weedy forb - top 10 noxious weed
<i>Carduus nutans</i>	musk thistle	weedy forb - top 10 noxious weed
<i>Celtis reticulata</i>	netleaf hackberry	small native tree
<i>Centaurea diffusa</i>	diffuse knapweed	weedy forb - top 10 noxious weed
<i>Centaurea repens</i>	Russian knapweed	weedy forb - top 10 noxious weed
<i>Ceratoides lanata</i>	winterfat	native forb
<i>Chenopodium album</i>	goosefoot	weedy plant of disturbed areas
<i>Chrysothamnus nauseosus</i>	rabbitbrush	native shrub
<i>Cirsium arvense</i>	Canada thistle	weedy forb - top 10 noxious weed
<i>Conium maculatum</i>	poison hemlock	riparian forb - on noxious weed list
<i>Convolvulus arvensis</i>	bindweed	weedy forb - top 10 noxious weed
<i>Conyza canadensis</i>	horseweed	introduced forb of wet areas
<i>Dipsacus fullonum</i>	teasel	weedy plant of wet areas - on noxious weed list
<i>Distichlis spicata</i>	saltgrass	native grass of alkaline areas
<i>Echinochloa crusgalli</i>	barnyard grass	introduced grass of wet areas
<i>Echinocystis lobata</i>	wild mock-cucumber	native vine
<i>Elaeagnus angustifolia</i>	Russian olive	introduced tree
<i>Eleocharis palustris</i>	spikerush	native wetland plant
<i>Equisetum laevigatum</i>	smooth scouring rush	native plant of wet areas
<i>Festuca pratensis</i>	meadow fescue	introduced pasture grass
<i>Fraxinus pennsylvanica</i>	green ash	introduced tree
<i>Gaura parviflora</i>	velvetweed	native plant of disturbed areas
<i>Glycyrrhiza lepidota</i>	wild liccorice	small native shrub of riparian areas
<i>Grindellia squarosa</i>	curlycup gumweed	native forb of distubed areas
<i>Helianthus annuus</i>	annual sunflower	native forb of distubed areas
<i>Helianthus nuttallii</i>	Nuttall's sunflower	native forb of wet areas
<i>Heterotheca villosa</i>	golden aster	native forb of distubed areas
<i>Hordeum jubatum</i>	foxtail barley	native grass of alkaline areas
<i>Juncus balticus</i>	Baltic rush	native wetland plant
<i>Kochia scoparia</i>	kochia	introduced forb - on noxious weed list
<i>Lemna sp.</i>	duckweed	native wetland plant
<i>Malva neglecta</i>	common mallow	introduced weed of distubed areas
<i>Medicago sativa</i>	alfalfa	introduced forb, often cultivated
<i>Melilotus alba</i>	sweetclover	introduced forb



**Table 1. Partial Plant List for the St. Vrain Greenway**

<b>Latin Name</b>	<b>Common name</b>	<b>Comment</b>
<i>Muhlenbergia asperifolia</i>	Alkali muhli	native grass of alkaline areas
<i>Nasturtium officinale</i>	watercress	introduced forb of wet areas
<i>Nepeta cataria</i>	catnip	introduced forb of riparian areas
<i>Oenothera villosa</i>	evening primrose	native forb of riparian areas
<i>Opuntia sp.</i>	prickly pear	native prairie plant
<i>Parthenocissus vitacea</i>	virginia creeper	native vine
<i>Penstemon sp.</i>	penstemon	native forb
<i>Phalaris arundinacea</i>	reed canarygrass	introduced grass of wet areas
<i>Physalis virginiana</i>	groundcherry	native forb of disturbed areas
<i>Poa pratensis</i>	Kentucky bluegrass	introduced grass
<i>Polygonum coccinium</i>	scarlet smartweed	native wetland forb
<i>Polygonum lapathifolium</i>	smartweed	native wetland forb
<i>Polygonum persicaria</i>	pink lady's thumb	native wetland forb
<i>Polypogon monspeliensis</i>	rabbitfoot grass	introduced grass of wet areas
<i>Populus angustifolia</i>	narrow-leaf cottonwood	native tree, possibly escaped from cultivation
<i>Populus deltoides</i>	plains cottonwood	native tree
<i>Portulaca oleracea</i>	purslane	introduced, weedy forb of waste areas
<i>Rhus trilobata</i>	three-leaf sumac	native shrub
<i>Robinia neomexicana</i>	New Mexico locust	native shrub or small tree
<i>Rosa woodsii</i>	wild rose	native shrub
<i>Rumex crispus</i>	curly dock	weedy, introduced forb
<i>Salix amygdaloides</i>	peach-leaf willow	native shrub or small tree
<i>Salix exigua</i>	sandbar willow	native shrub
<i>Salix fragilis</i>	crack willow	introduced tree
<i>Salsola iberica</i>	Russian thistle	introduced plant of waste areas
<i>Saponaria officinalis</i>	bouncing bet	weedy forb - on noxious weed list
<i>Scirpus americanus</i>	three-square bulrush	native wetland plant
<i>Scirpus lacustris</i>	soft stem bullrush	native wetland plant
<i>Setaria viridis</i>	bristle grass	grass of disturbed areas - on noxious weed list
<i>Solanum rostratum</i>	buffalo bur	native forb of disturbed areas
<i>Solidago canadensis</i>	goldenrod	native forb
<i>Spartina pectinata</i>	prairie cordgrass	native prairie plant
<i>Sporobolus airoides</i>	alkali sacaton	native grass of alkaline areas
<i>Sporobolus cryptandrus</i>	sand dropseed	native prairie grass
<i>Stipa comata</i>	needle-and-thread	native prairie grass
<i>Symphoricarpos occidentalis</i>	snowberry	small native shrub
<i>Tamarix ramosissima</i>	salt cedar	invasive, introduced tree
<i>Toxicodendron sp.</i>	poison ivy	native vine
<i>Typha latifolia</i>	cattail	common wetland plant
<i>Ulmus pumilla</i>	Chinese elm	introduced tree
<i>Verbena hastata</i>	blue vervain	native forb
<i>Veronica sp.</i>	speedwell	introduced plants of wetlands
<i>Yucca glauca</i>	yucca	native forb

**Table 2. Common and Latin Names of Birds and Other Wildlife Referred to in Text**

<b>Birds</b>	
American avocet	<i>Recurvirostra americana</i>
American crow	<i>Corvus brachyrhynchos</i>
American goldfinch	<i>Carduelis tristis</i>
American kestrel	<i>Falco sparverius</i>
American robin	<i>Turdus migratorius</i>
bald eagle	<i>Haliaeetus leucocephalus</i>
bank swallow	<i>Riparia riparia</i>
barn swallow	<i>Hirundo rustica</i>
belted kingfisher	<i>Ceryle alcyon</i>
black-billed magpie	<i>Pica pica</i>
black-capped chickadee	<i>Parus atricapillus</i>
black-crowned night heron	<i>Nycticorax nycticorax</i>
blue jay	<i>Cyanocitta cristata</i>
blue-winged teal	<i>Anas discors</i>
Brewer's blackbird	<i>Euphagus cyanocephalus</i>
brown-headed cowbird	<i>Molothrus ater</i>
burrowing owl	<i>Athene cunicularia</i>
Canada goose	<i>Branta canadensis</i>
chukar	<i>Alectoris chukar</i>
cliff swallow	<i>Hirundo pyrrhonota</i>
common grackle	<i>Quiscalus quiscula</i>
common snipe	<i>Gallinago gallinago</i>
common yellowthroat	<i>Geothlypis trichas</i>
double crested cormorant	<i>Phalacrocorax auritus</i>
downy woodpecker	<i>Picoides pubescens</i>
eastern kingbird	<i>Tyrannus tyrannus</i>
European starling	<i>Sturnus vulgaris</i>
ferruginous hawk	<i>Buteo regalis</i>
great blue heron	<i>Ardea herodias</i>
greater yellowlegs	<i>Tringa melanoleuca</i>
great-horned owl	<i>Bubo virginianus</i>
green-winged teal	<i>Anas crecca</i>
horned lark	<i>Eremophila alpestris</i>
house finch	<i>Carpodacus mexicanus</i>
house sparrow	<i>Passer domesticus</i>
house wren	<i>Troglodytes aedon</i>
killdeer	<i>Charadrius vociferus</i>
long-billed dowitcher	<i>Limnodromus scolopaceus</i>
mallard	<i>Anas platyrhynchos</i>
mourning dove	<i>Zenaida macroura</i>
northern flicker	<i>Colaptes auratus</i>
northern harrier	<i>Circus cyaneus</i>
northern rough-winged swallow	<i>Stelgidopteryx serripennis</i>
prairie falcon	<i>Falco mexicanus</i>
red-tailed hawk	<i>Buteo jamaicensis</i>
red-winged blackbird	<i>Agelaius phoeniceus</i>
ring-necked pheasant	<i>Phasianus colchicus</i>
rock dove (common pigeon)	<i>Columba livida</i>
rough-legged hawk	<i>Buteo lagopus</i>
Say's phoebe	<i>Sayornis saya</i>
sharp-shinned hawk	<i>Accipiter striatus</i>

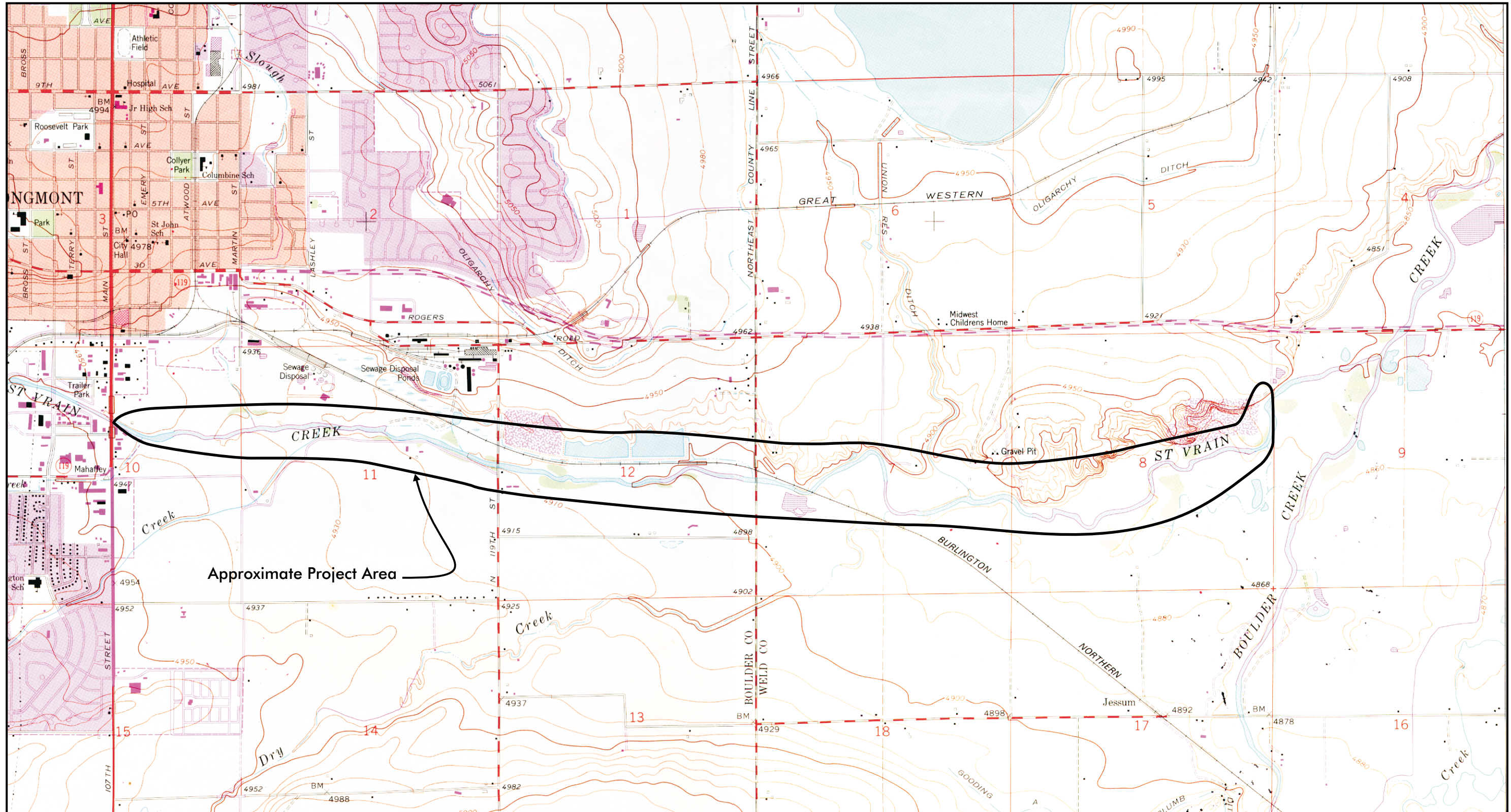
**Table 2. Common and Latin Names of Birds and Other Wildlife Referred to in Text**

solitary sandpiper	<i>Tringa solitaria</i>
song sparrow	<i>Melospiza melodia</i>
spotted sandpiper	<i>Actitis macularia</i>
Swainson's hawk	<i>Buteo swainsoni</i>
Townsend's solitaire	<i>Myadestes townsendi</i>
turkey vulture	<i>Cathartes aura</i>
vesper sparrow	<i>Pooecetes gramineus</i>
western kingbird	<i>Tyrannus verticalis</i>
western meadowlark	<i>Sturnella neglecta</i>
wild turkey	<i>Meleagris gallopavo</i>
yellow warbler	<i>Dendroica petechia</i>

<b>Mammals</b>	
beaver	<i>Castor canadensis</i>
black-tailed prairie dog	<i>Cynomys ludovicianus</i>
coyote	<i>Canis latrans</i>
deer mouse	<i>Peromyscus maniculatus</i>
eastern cottontail	<i>Sylvilagus floridanus</i>
fox squirrel	<i>Sciurus niger</i>
hispid pocket mouse	<i>Perognathus hispidus</i>
house mouse	<i>Mus musculus</i>
meadow vole	<i>Microtus pennsylvanicus</i>
muskrat	<i>Ondatra zibethica</i>
Norway rat	<i>Rattus norvegicus</i>
porcupine	<i>Erethizon dorsatum</i>
prairie vole	<i>Microtus ochrogaster</i>
Preble's meadow jumping mouse	<i>Zapus hudsonius preblei</i>
raccoon	<i>Procyon lotor</i>
red fox	<i>Vulpes fulva</i>
striped skunk	<i>Mephitis mephitis</i>
thirteen-lined ground squirrel	<i>Citellus tridecemlineatus</i>
western harvest mouse	<i>Reithrodontomys megalotis</i>
white-tailed deer	<i>Odocoileus virginianus</i>

<b>Amphibians and Reptiles</b>	
bullfrog	<i>Rana catesbiana</i>
northern leopard frog	<i>Rana pipiens</i>
garter snake	<i>Thamnophis sp.</i>
bull snake	<i>Pituophis melanoleucus</i>
prairie rattlesnake	<i>Crotalus viridis</i>
skink (unidentified)	<i>Eumeces sp.</i>





Approximate Project Area



ERO Resources Corp.  
1842 Clarkson Street  
Denver, CO 80218  
(303) 830-1188  
Fax: 830-1199

St. Vrain Greenway Master Plan  
T2N, R69W, Sections 10, 11 & 12  
T2N, R68W, Sections 7 & 8

Longmont Quadrangle,  
Boulder and Weld Counties, Colorado

Figure 1  
Project Area

Prepared for: Design Workshop  
File: 1300-Figs.cdr  
October 2000



Figure 2  
Vegetation and Habitat Types

Prepared for  
Design Workshop  
October 2000

-  Study Area
  -  Waters of the U.S.
- Vegetation Types
-  Cultivated
  -  Cottonwood Gallery
  -  Dry Grassland
  -  Landscaped/Unvegetated
  -  Mesic Grassland
  -  Mixed Riparian
  -  Prairie Dog Town
  -  Prairie Dog Town - Abandoned
  -  Pine Plantation
  -  Russian Olive Dominated Riparian
  -  Riparian Shrub
  -  Siberian Elm Dominated Riparian
  -  Upland Grassland
  -  Wetland

**ERO**  
ERO Resources Corp.  
1842 Clarkson Street  
Denver, CO 80218  
(303) 830-1188  
Fax: 830-1199

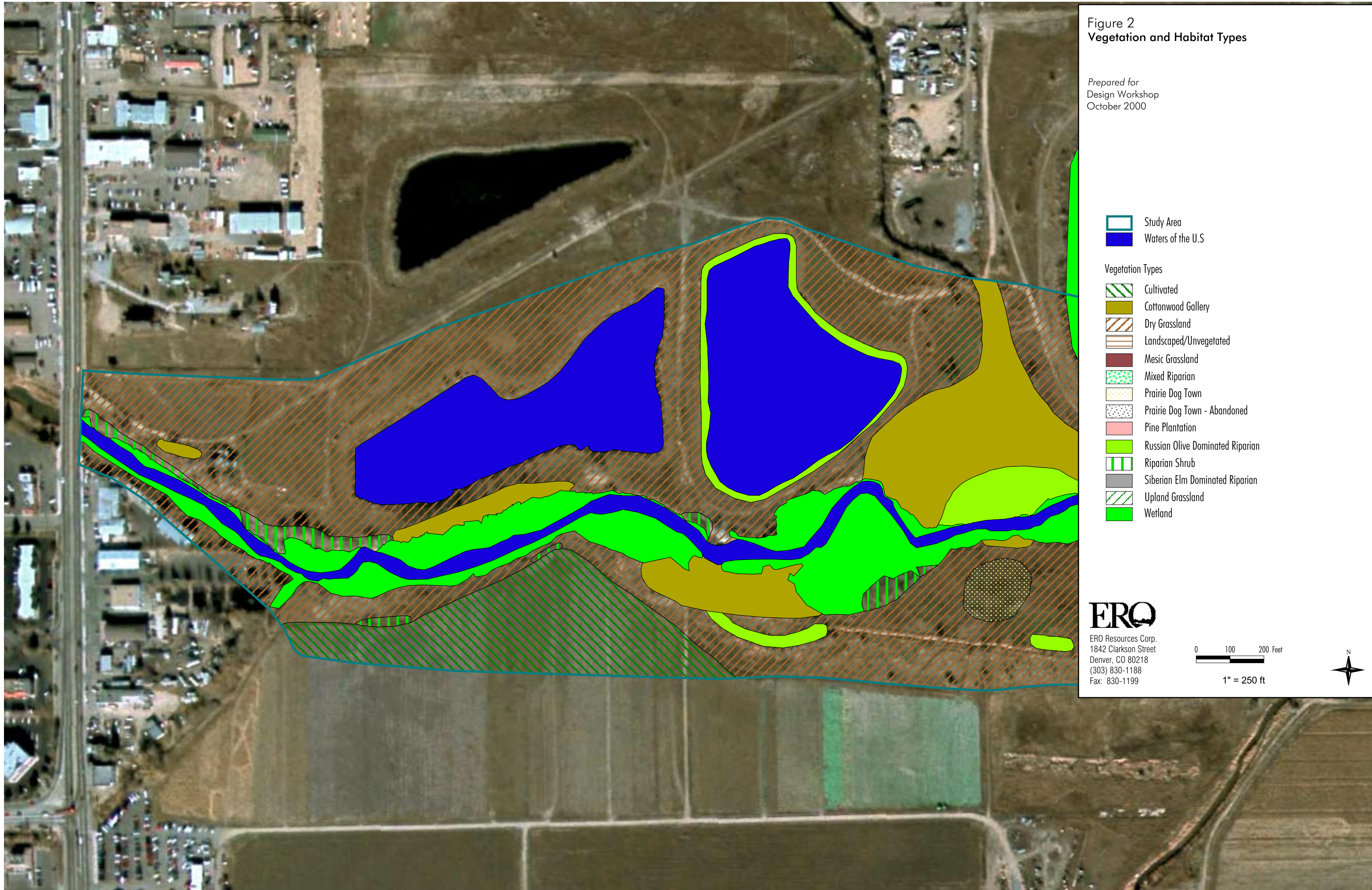
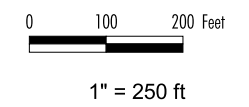
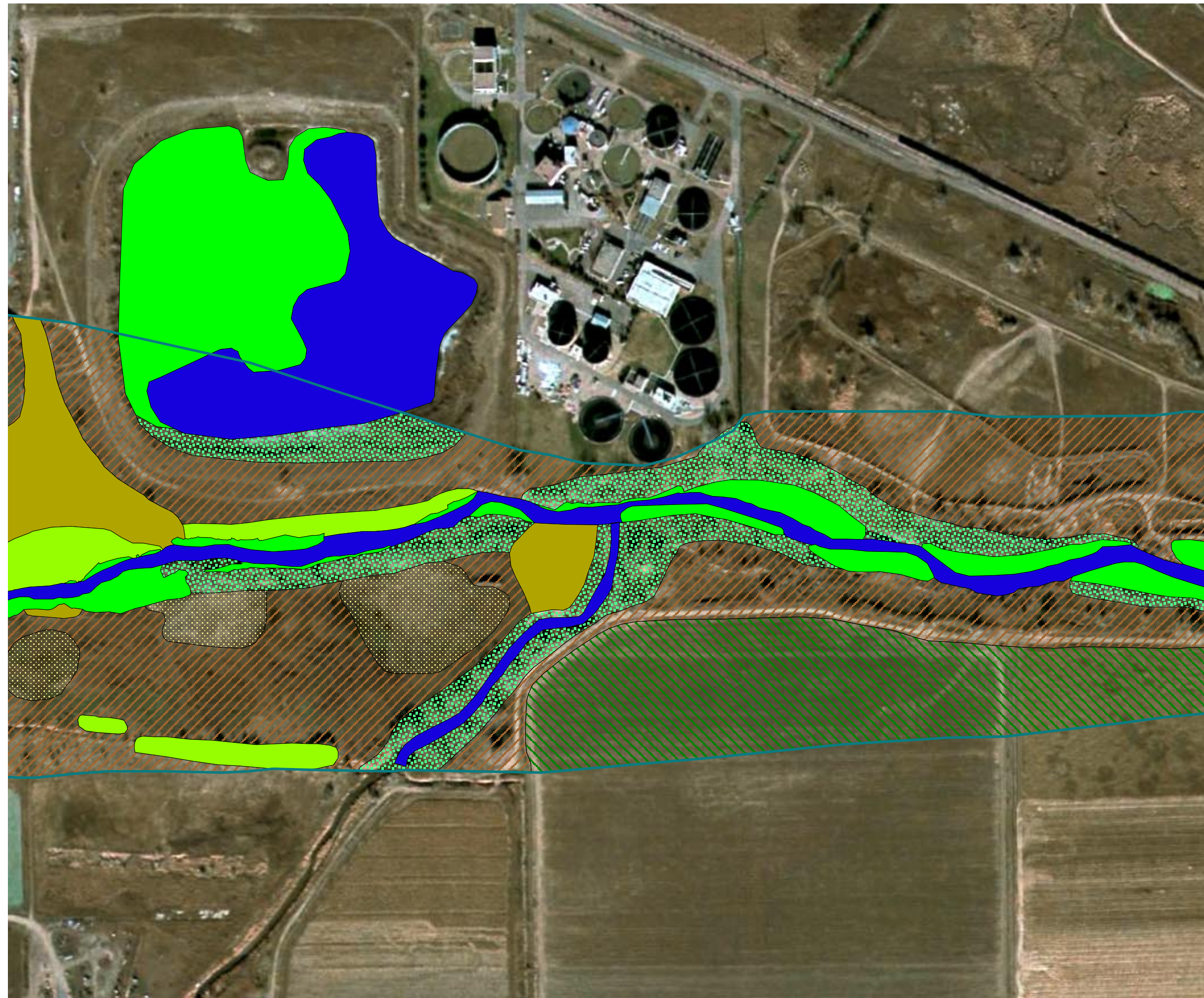




Figure 3  
Vegetation and Habitat Types

Prepared for  
Design Workshop  
October 2000



- Study Area
- Waters of the U.S.

Vegetation Types

- Cultivated
- Cottonwood Gallery
- Dry Grassland
- Landscaped/Unvegetated
- Mesic Grassland
- Mixed Riparian
- Prairie Dog Town
- Prairie Dog Town - Abandoned
- Pine Plantation
- Russian Olive Dominated Riparian
- Riparian Shrub
- Siberian Elm Dominated Riparian
- Upland Grassland
- Wetland

**ERO**  
ERO Resources Corp.  
1842 Clarkson Street  
Denver, CO 80218  
(303) 830-1188  
Fax: 830-1199

0 100 200 Feet

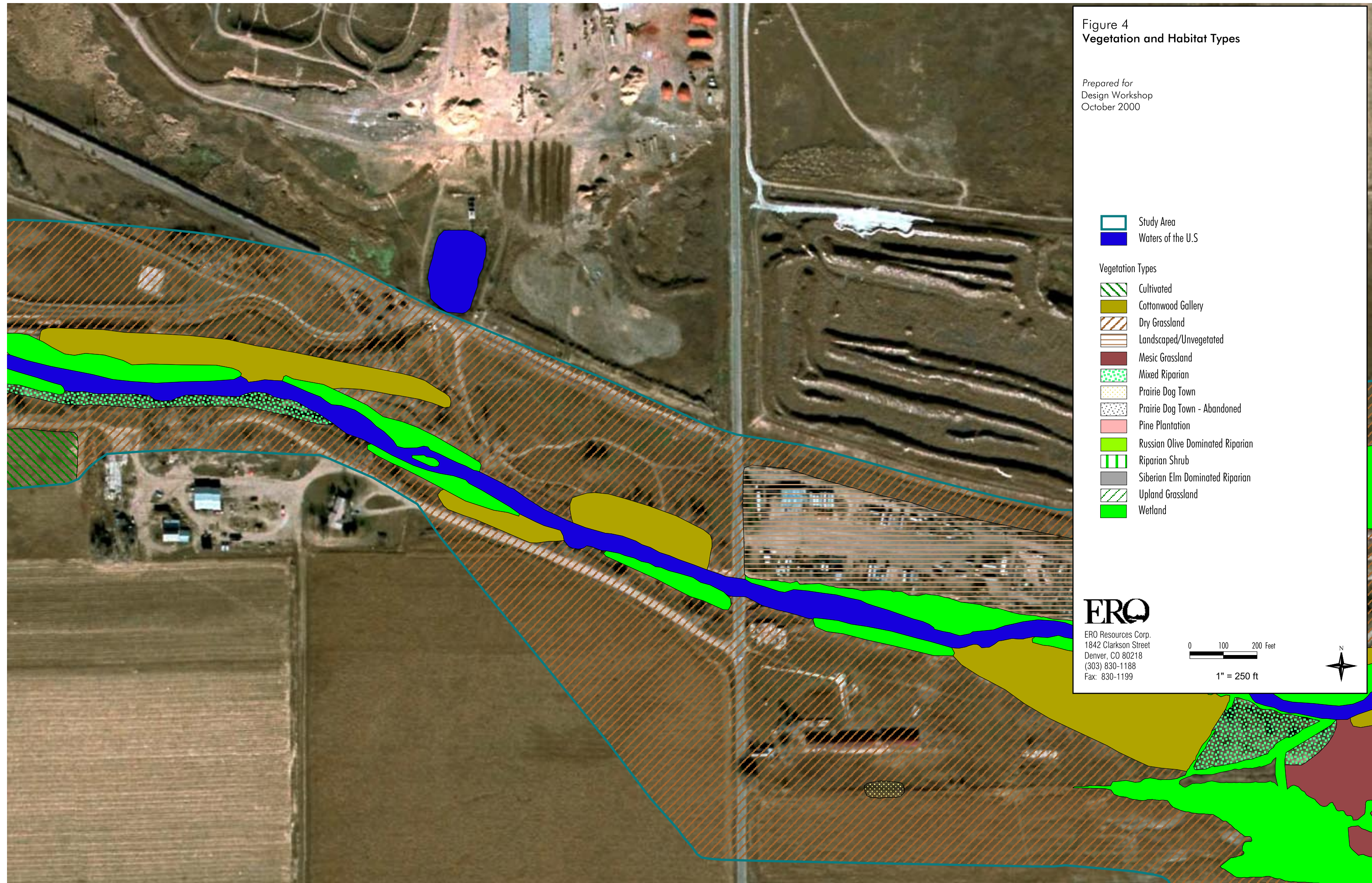
1" = 250 ft





Figure 4  
Vegetation and Habitat Types

Prepared for  
Design Workshop  
October 2000



- Study Area
- Waters of the U.S.
- Vegetation Types**
- Cultivated
- Cottonwood Gallery
- Dry Grassland
- Landscaped/Unvegetated
- Mesic Grassland
- Mixed Riparian
- Prairie Dog Town
- Prairie Dog Town - Abandoned
- Pine Plantation
- Russian Olive Dominated Riparian
- Riparian Shrub
- Siberian Elm Dominated Riparian
- Upland Grassland
- Wetland

**ERO**  
ERO Resources Corp.  
1842 Clarkson Street  
Denver, CO 80218  
(303) 830-1188  
Fax: 830-1199

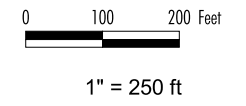
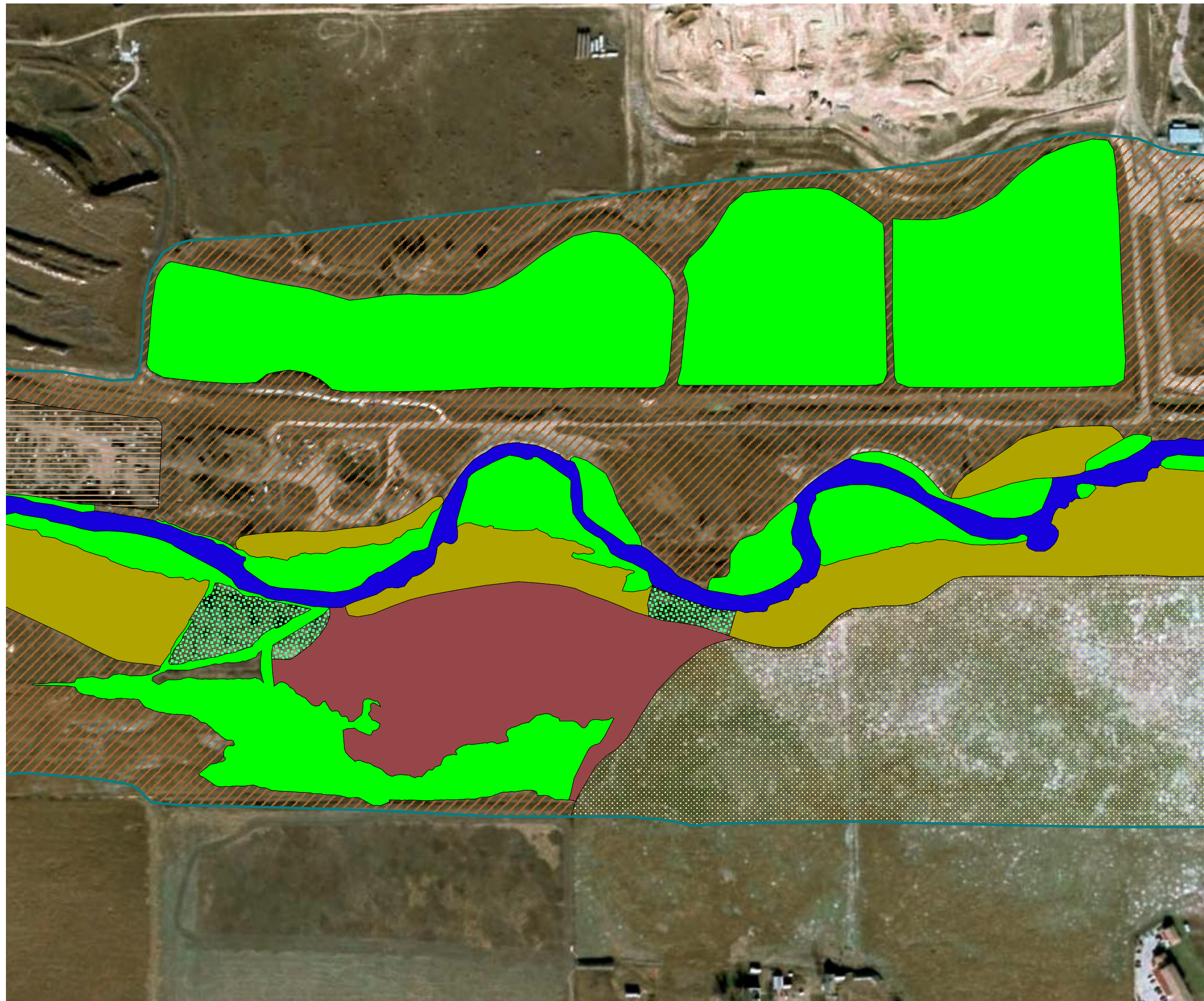




Figure 5  
Vegetation and Habitat Types

Prepared for  
Design Workshop  
October 2000



- Study Area
- Waters of the U.S.

Vegetation Types

- Cultivated
- Cottonwood Gallery
- Dry Grassland
- Landscaped/Unvegetated
- Mesic Grassland
- Mixed Riparian
- Prairie Dog Town
- Prairie Dog Town - Abandoned
- Pine Plantation
- Russian Olive Dominated Riparian
- Riparian Shrub
- Siberian Elm Dominated Riparian
- Upland Grassland
- Wetland

**ERO**  
ERO Resources Corp.  
1842 Clarkson Street  
Denver, CO 80218  
(303) 830-1188  
Fax: 830-1199

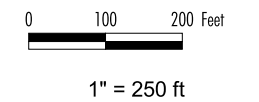




Figure 6  
Vegetation and Habitat Types

Prepared for  
Design Workshop  
October 2000

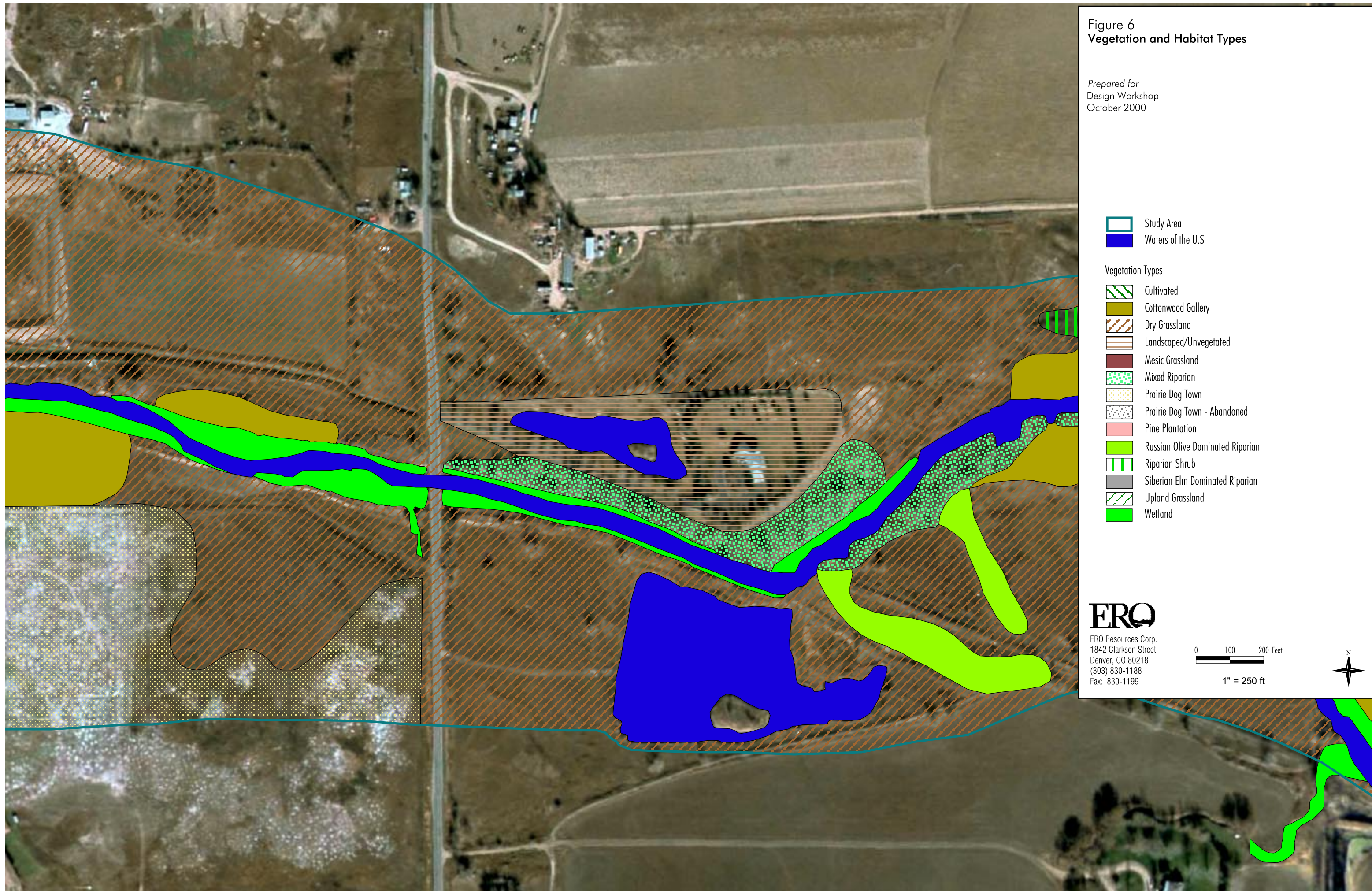
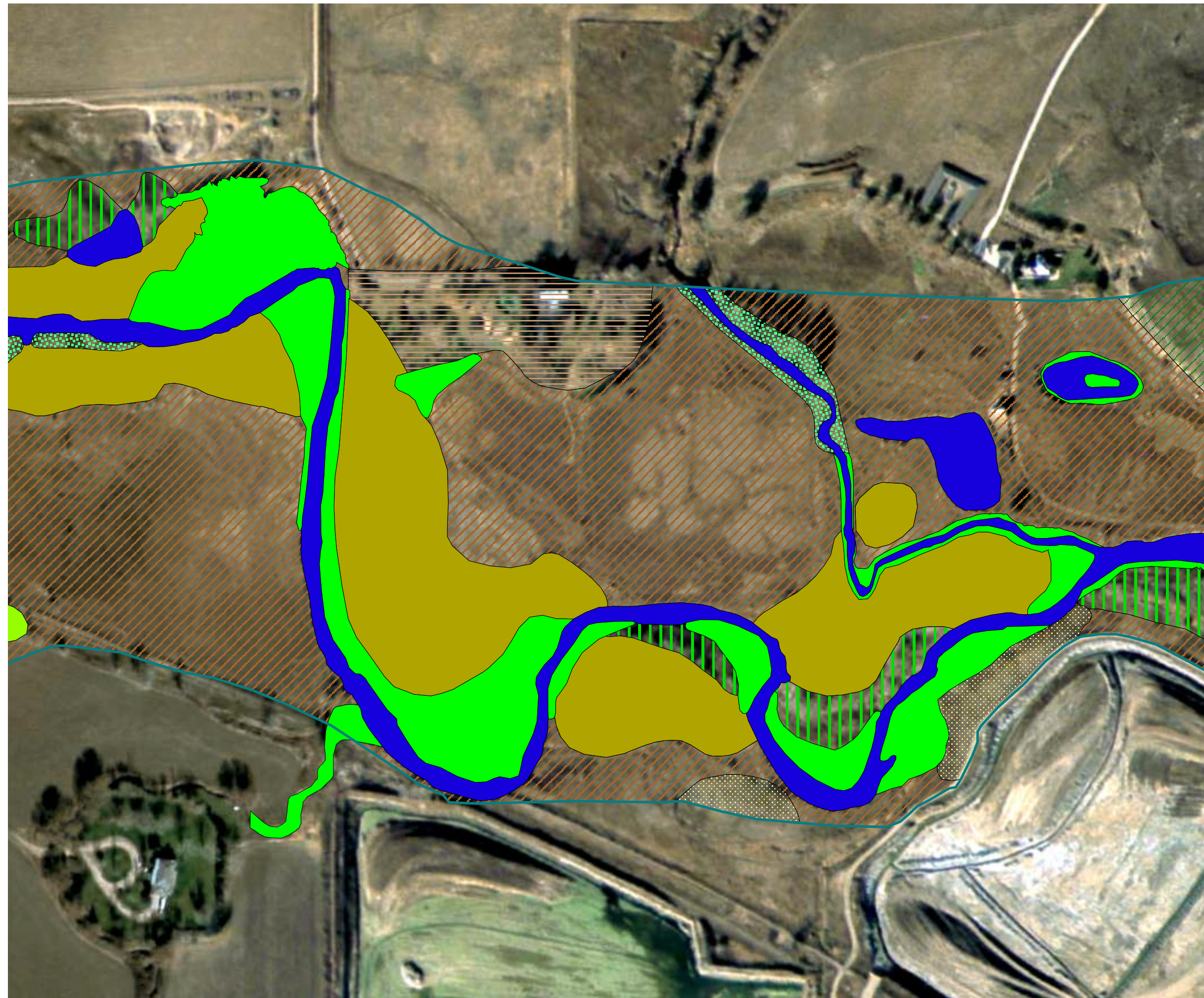






Figure 7  
Vegetation and Habitat Types

Prepared for  
Design Workshop  
October 2000



-  Study Area
-  Waters of the U.S

Vegetation Types

-  Cultivated
-  Cottonwood Gallery
-  Dry Grassland
-  Landscaped/Unvegetated
-  Mesic Grassland
-  Mixed Riparian
-  Prairie Dog Town
-  Prairie Dog Town - Abandoned
-  Pine Plantation
-  Russian Olive Dominated Riparian
-  Riparian Shrub
-  Siberian Elm Dominated Riparian
-  Upland Grassland
-  Wetland

**ERO**  
ERO Resources Corp.  
1842 Clarkson Street  
Denver, CO 80218  
(303) 830-1188  
Fax: 830-1199

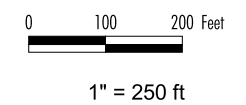
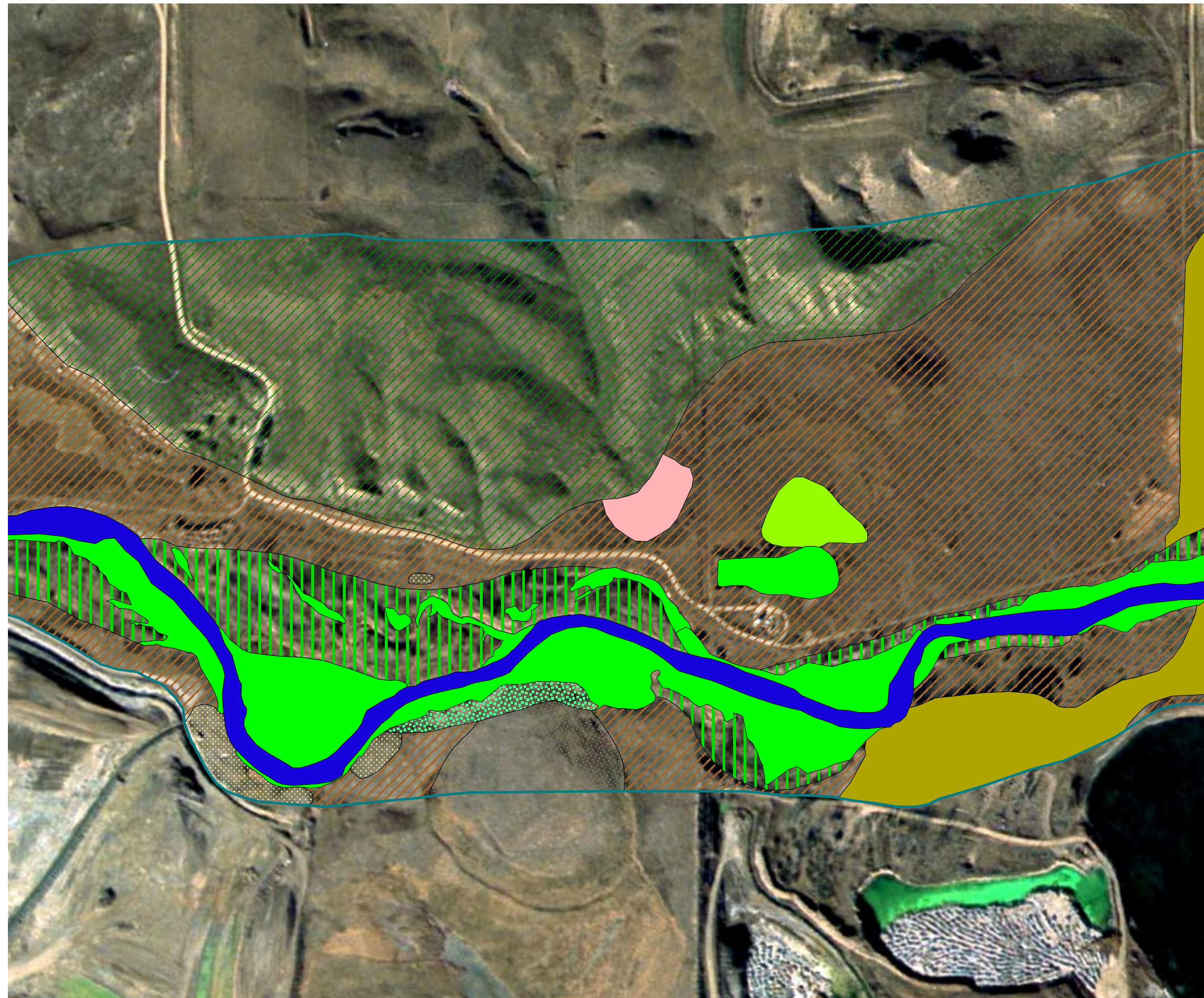




Figure 8  
Vegetation and Habitat Types

Prepared for  
Design Workshop  
October 2000



-  Study Area
-  Waters of the U.S.
  
- Vegetation Types**
-  Cultivated
-  Cottonwood Gallery
-  Dry Grassland
-  Landscaped/Unvegetated
-  Mesic Grassland
-  Mixed Riparian
-  Prairie Dog Town
-  Prairie Dog Town - Abandoned
-  Pine Plantation
-  Russian Olive Dominated Riparian
-  Riparian Shrub
-  Siberian Elm Dominated Riparian
-  Upland Grassland
-  Wetland

**ERO**  
ERO Resources Corp.  
1842 Clarkson Street  
Denver, CO 80218  
(303) 830-1188  
Fax: 830-1199

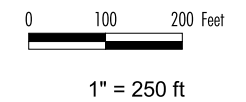


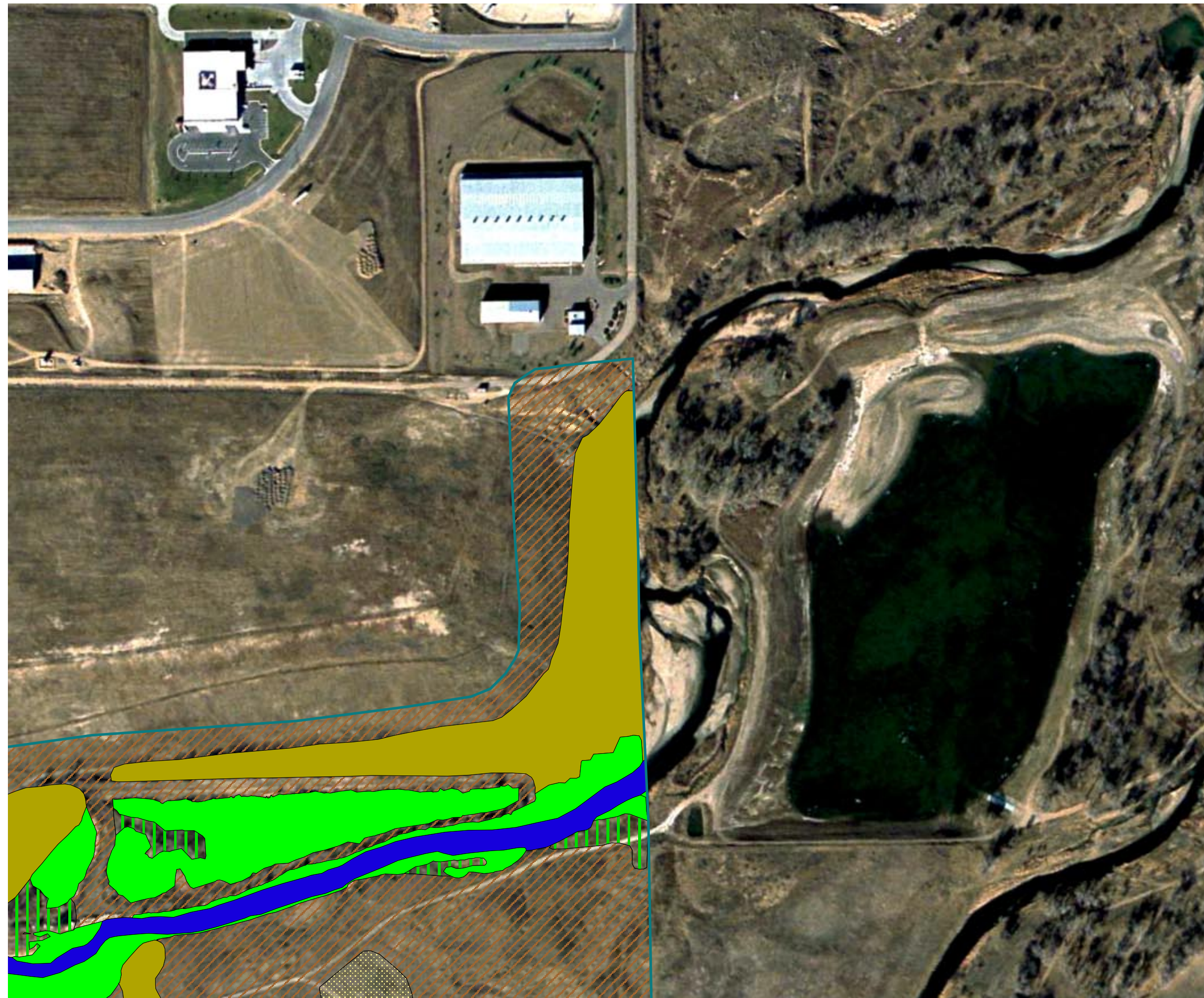






Figure 10  
Vegetation and Habitat Types

Prepared for  
Design Workshop  
October 2000



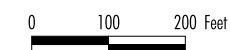
-  Study Area
-  Waters of the U.S.

Vegetation Types

-  Cultivated
-  Cottonwood Gallery
-  Dry Grassland
-  Landscaped/Unvegetated
-  Mesic Grassland
-  Mixed Riparian
-  Prairie Dog Town
-  Prairie Dog Town - Abandoned
-  Pine Plantation
-  Russian Olive Dominated Riparian
-  Riparian Shrub
-  Siberian Elm Dominated Riparian
-  Upland Grassland
-  Wetland

**ERO**

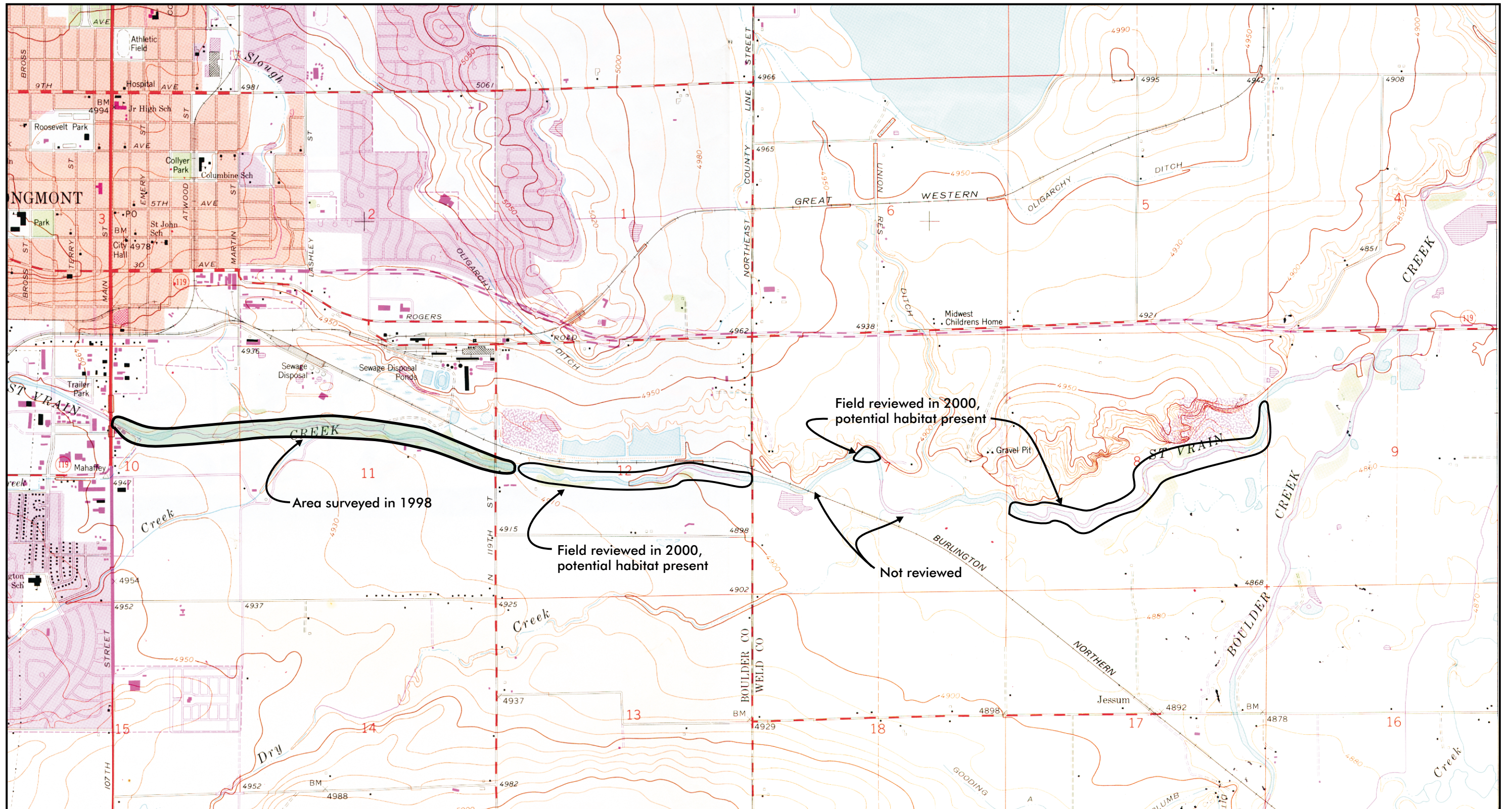
ERO Resources Corp.  
1842 Clarkson Street  
Denver, CO 80218  
(303) 830-1188  
Fax: 830-1199



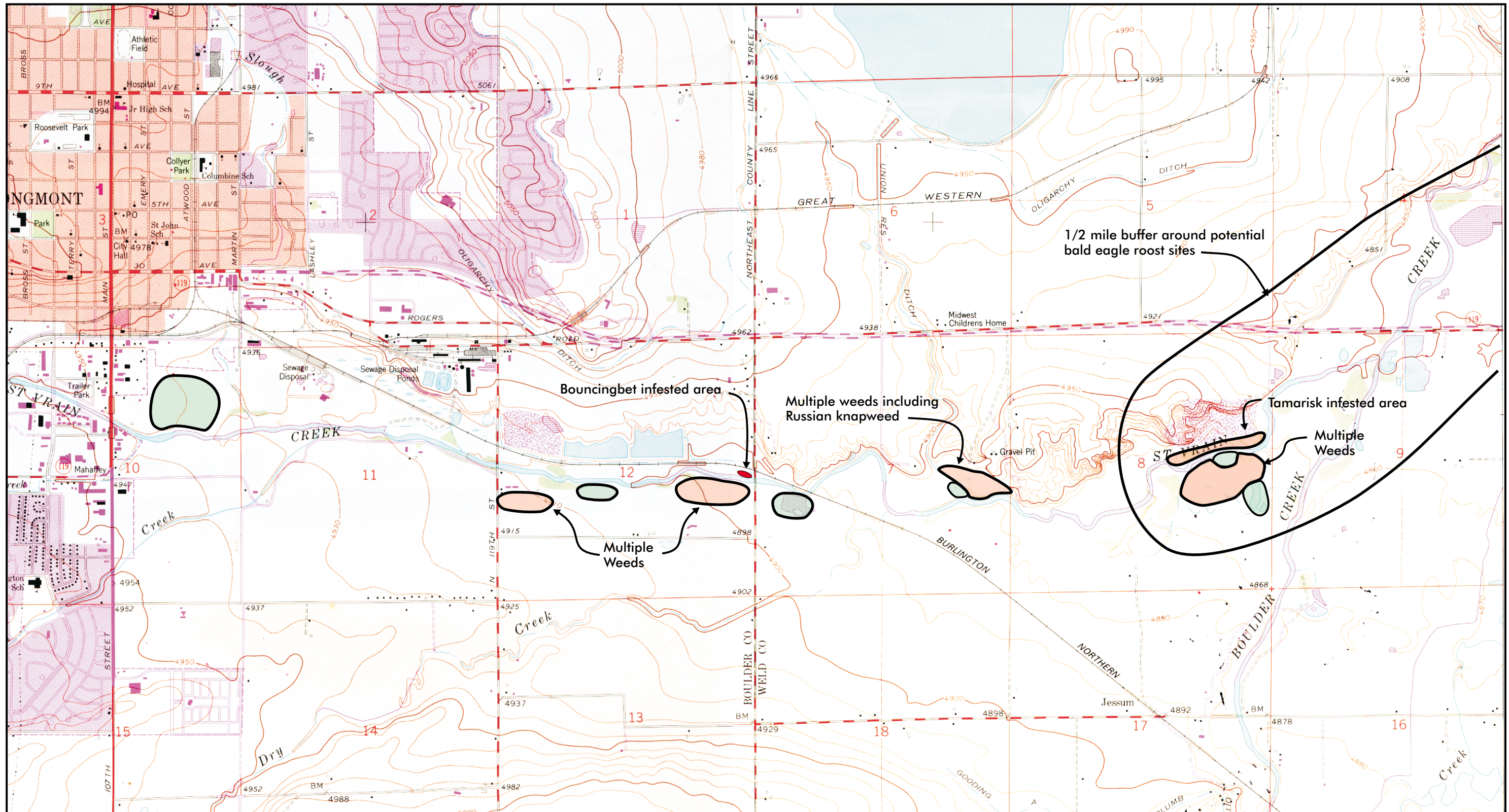
1" = 250 ft













ERO Resources Corp.  
 1842 Clarkson Street  
 Denver, CO 80218  
 (303) 830-1188  
 Fax: 830-1199

**St. Vrain Greenway**

-  Significant weed infested areas
-  Potential areas for wetland enhancement

**Figure 12**  
**Opportunities for Enhancement**

Prepared for: Design Workshop  
 File: 1300-Figs.cdr  
 October 2000



ST. VRAIN GREENWAY  
PHOTO LOG  
AUGUST - SEPTEMBER 2000



**Photo 1** - St. Vrain River, view east from Sandstone Ranch.



**Photo 2** - Willow shrub wetlands, view east from Main Street.

ST. VRAIN GREENWAY  
PHOTO LOG  
AUGUST - SEPTEMBER 2000



**Photo 3** - Seasonally flooded wetlands along Spring Gulch.



**Photo 4** - Seasonally flooded willow shrub and emergent wetlands along the St. Vrain.



ST. VRAIN GREENWAY  
PHOTO LOG  
AUGUST - SEPTEMBER 2000



**Photo 5** - Willow shrub/emergent wetland in oxbow (wetland ST1).



**Photo 6** - Gravel bar and willow shrub wetlands, Longmont Property.

ST. VRAIN GREENWAY  
PHOTO LOG  
AUGUST - SEPTEMBER 2000



**Photo 7** - Wetland fringe along St. Vrain River, view west from Boulder County Property.



**Photo 8** - Seasonally flooded wetlands and gravel bars, Boulder County Property.



ST. VRAIN GREENWAY  
PHOTO LOG  
AUGUST - SEPTEMBER 2000



**Photo 9** - Seasonally flooded wetlands and gravel bars, Boulder County Property.



**Photo 10** - Emergent wetland in backwater area.

ST. VRAIN GREENWAY  
PHOTO LOG  
AUGUST - SEPTEMBER 2000



Photo 11 - Typical wetland fringe at base of bank.



Photo 12 - Spring-fed wetland (wetland BC9).



ST. VRAIN GREENWAY  
PHOTO LOG  
AUGUST - SEPTEMBER 2000



Photo 13 - Spring-fed wetland (wetland BC3).



Photo 14 - Wetland south of spring (wetland BC8).

ST. VRAIN GREENWAY  
PHOTO LOG  
AUGUST - SEPTEMBER 2000



**Photo 15** - Man-made pond at CFP property.



**Photo 16** - Mixed riparian vegetation along St. Vrain River, typical view.



ST. VRAIN GREENWAY  
PHOTO LOG  
AUGUST - SEPTEMBER 2000



**Photo 17** - Mixed riparian, Left Hand Creek.



**Photo 18** - Cottonwood gallery, Longmont Property.

ST. VRAIN GREENWAY  
PHOTO LOG  
AUGUST - SEPTEMBER 2000



**Photo 19** - Cottonwood gallery, western portion of study area.



**Photo 20** - Cottonwood gallery, willow shrub wetlands in background south of Compost Facility.



ST. VRAIN GREENWAY  
PHOTO LOG  
AUGUST - SEPTEMBER 2000



**Photo 21** - Cottonwood gallery and disturbed grassland, south of Compost Facility.



**Photo 22** - Disturbed grassland, just east of Main Street.

ST. VRAIN GREENWAY  
PHOTO LOG  
AUGUST - SEPTEMBER 2000



**Photo 23** - Disturbed grassland, Sandstone Ranch.



**Photo 24** - Upland grassland and pine plantation, Sandstone Ranch.



ST. VRAIN GREENWAY  
PHOTO LOG  
AUGUST - SEPTEMBER 2000



Photo 25 - Dry grassland, Longmont Property.



Photo 26 - Dry grassland, Boulder County Property.

ST. VRAIN GREENWAY  
PHOTO LOG  
AUGUST - SEPTEMBER 2000



**Photo 27** - Disturbed grassland, Boulder County Property.



**Photo 28** - Prairie dog town, near confluence of St. Vrain River and Left Hand Creek.



**Preble's Meadow Jumping Mouse  
Habitat Assessment for  
The St. Vrain Greenway  
Boulder and Weld Counties  
Colorado**

*Prepared for—*

**The City of Longmont  
c/o: Design Workshop  
1390 Lawrence Street, Suite 200  
Denver, CO 80204**

*Prepared by—*

**ERO Resources Corporation  
1842 Clarkson Street  
Denver, CO 80218  
(303) 830-1188**

**November 16, 2000**

**PREBLE'S MEADOW JUMPING MOUSE HABITAT ASSESSMENT FOR THE  
ST. VRAIN GREENWAY**

**BOULDER AND WELD COUNTIES, COLORADO**

**NOVEMBER 16, 2000**

**Introduction**

The City of Longmont is updating its St. Vrain Greenway Master Plan. As part of this update, ERO Resources conducted a field review of the project area for potential Preble's meadow jumping mouse habitat. Fieldwork was conducted mostly during August 2000. Habitat quality was evaluated by visual inspection for those properties where access was granted. For areas where access was not granted, habitat quality was evaluated from public roads and from aerial photography.

The St. Vrain Greenway study area is the St. Vrain River and a portion of its associated floodplain from Main Street in Longmont east to the City of Longmont's Compost Facility and former landfill, not including tributaries such as Left Hand Creek, Dry Creek, and Spring Gulch. The study area is located in Township 2 North, Range 69 West, NE ¼ Section 10, N ½ Section 11, and Section 12 in Boulder County, and in Township 2 North, Range 68 West, Sections 7 and 8 in Weld County, Colorado. The approximate study area boundary is shown in Figure 1.

**Project Description**

The proposed project consists of construction of a trail from Main Street in Longmont, east to the eastern boundary of the City of Longmont's former landfill site. The trail alignment is unknown at this time, but may include several crossings of the St. Vrain River and other facilities.

**Ecological and Other Features of the Assessment Area**

The St. Vrain River and the surrounding uplands in the study area have been heavily influenced by human activities such as lining the banks with riprap, construction of drop structures and diversion structures for irrigation, construction of irrigation canals,



cultivation, and mining. Surrounding land uses include active and inactive gravel mines, pasture, irrigated fields, dedicated open space, hunting preserves, an abandoned railroad grade, and a limited amount of industrial use. A semi-permanent homeless encampment occurs along the banks of the river in the reach from Main Street to N 119<sup>th</sup> Street. Other disturbances in this reach include cultivation of the area south of the river. Gravel mining is occurring and has occurred in the past in several locations in the floodplain of the St. Vrain River in the study area.

The vegetation of these areas is highly variable but, in general, vegetated upland areas are covered by weedy plant species adapted to colonize disturbed sites, or by pasture grasses in less disturbed areas. Common upland species in the study area include smooth brome (*Bromus inermis*), western wheatgrass (*Agropyron smithii*), cheatgrass (*Bromus tectorum*), kochia (*Kochia scoparia*), goosefoot (*Chenopodium* sp.), western ragweed (*Ambrosia psilostachya*), bindweed (*Convolvulus arvensis*), and many others.

The St. Vrain River is a perennial stream bordered by wetlands that vary from a narrow fringe along the base of the bank to extensive wetland complexes on terraces adjacent to the river. The most abundant plant species occurring in wetlands adjacent to the river are sandbar willow (*Salix exigua*) and reed canarygrass (*Phalaris arundinacea*). Common trees or shrubs in the riparian corridor next to the river include plains cottonwood (*Populus deltoides*), Siberian elm (*Ulmus pumila*), Russian olive (*Elaeagnus angustifolia*), crack willow (*Salix fragilis*), and peach-leaf willow (*Salix amygdaloides*). The understory commonly includes smooth brome (*Bromus inermis*), prairie cordgrass (*Spartina pectinata*), whitetop (*Cardaria draba*), dogbane (*Apocynum cannabinum*), and wild licorice (*Glycyrrhiza lepidota*). Other plant species sometimes occurring include boxelder (*Acer negundo*), milkweed (*Asclepias* sp.), Canada thistle (*Cirsium arvense*), smooth scouring rush (*Equisetum laevigatum*), white sweetclover (*Melilotus alba*), and catnip (*Nepeta cattaria*).

## **Conclusions and Discussion**

Preble's mice typically inhabit areas characterized by well-developed plains riparian vegetation with relatively undisturbed grassland and a water source in close proximity (Armstrong et al. 1997). Recent studies have suggested that Preble's may have a wider

ecological tolerance than previously thought, and that the requirement for diverse vegetation and well-developed cover can be met under a variety of circumstances (Meaney et al. 1997). Radio-tracking studies conducted by the Colorado Division of Wildlife (CDOW) have documented Preble's using upland habitat adjacent to wetlands and riparian areas (Shenk and Sivert 1999). Additional research by CDOW has suggested that habitat quality for PMJM can be predicted by the amount of shrub cover available at a site (White and Shenk 2000).

Based on the above criteria, the study area fits the description of potential Preble's habitat. However, there have been no recent captures of Preble's on the St. Vrain downstream from Longmont despite numerous trapping surveys. The locations of several recent trapping surveys in or near the study area are shown in Figure 2. An extensive trapping survey of more than 2000 trap nights was conducted on both banks of the St. Vrain near the confluence with Left Hand Creek in August and September 2000 (David Kane, personal communication). In addition, ERO Resources trapped on the St. Vrain at N 119<sup>th</sup> Street in 1998. This trapping survey also failed to capture Preble's. The small mammals captured during this 1998 survey were mostly deer mice and house mice, indicating the highly disturbed nature of this reach of the river. A search of the Colorado Natural Heritage Program (CNHP) database found additional trapping surveys in or near the project area including Boulder Creek Estates by Stoecker Ecological Consultants in 1997, the Bigelow Tract (just south of the Sandstone Ranch Property) by Savage and Savage in 1998, the Conveyor Corridor site on Boulder Creek by Savage and Savage in 1998, and the Longmont Property by Savage and Savage in 1999.

Based on the available trapping data and our review of available habitat in the project area, ERO believes that the western  $\frac{1}{3}$  of the project area from Main Street to N 119<sup>th</sup> Street should be excluded from the need to do further trapping surveys for Preble's mouse. This reach of the St. Vrain has been most heavily influenced and disturbed by human activities. Cultivated land, weeds, and a few scattered prairie dog towns cover the uplands immediately to the south of the riparian area in this reach. The uplands north of the river in this reach are covered by weeds, several man-made ponds, and other disturbed



lands. In addition, this area has been more extensively trapped than the reach of the river east of N 119<sup>th</sup> Street.

The eastern  $\frac{2}{3}$  of the project area, from N 119<sup>th</sup> Street east is less disturbed by human activity and is bordered by slightly higher quality uplands than the western  $\frac{1}{3}$ . This area also has been trapped less intensively and generally has a wider riparian corridor. It appears there is a remote possibility that Preble's may be present in this eastern portion of the project area, and more trapping may be needed.

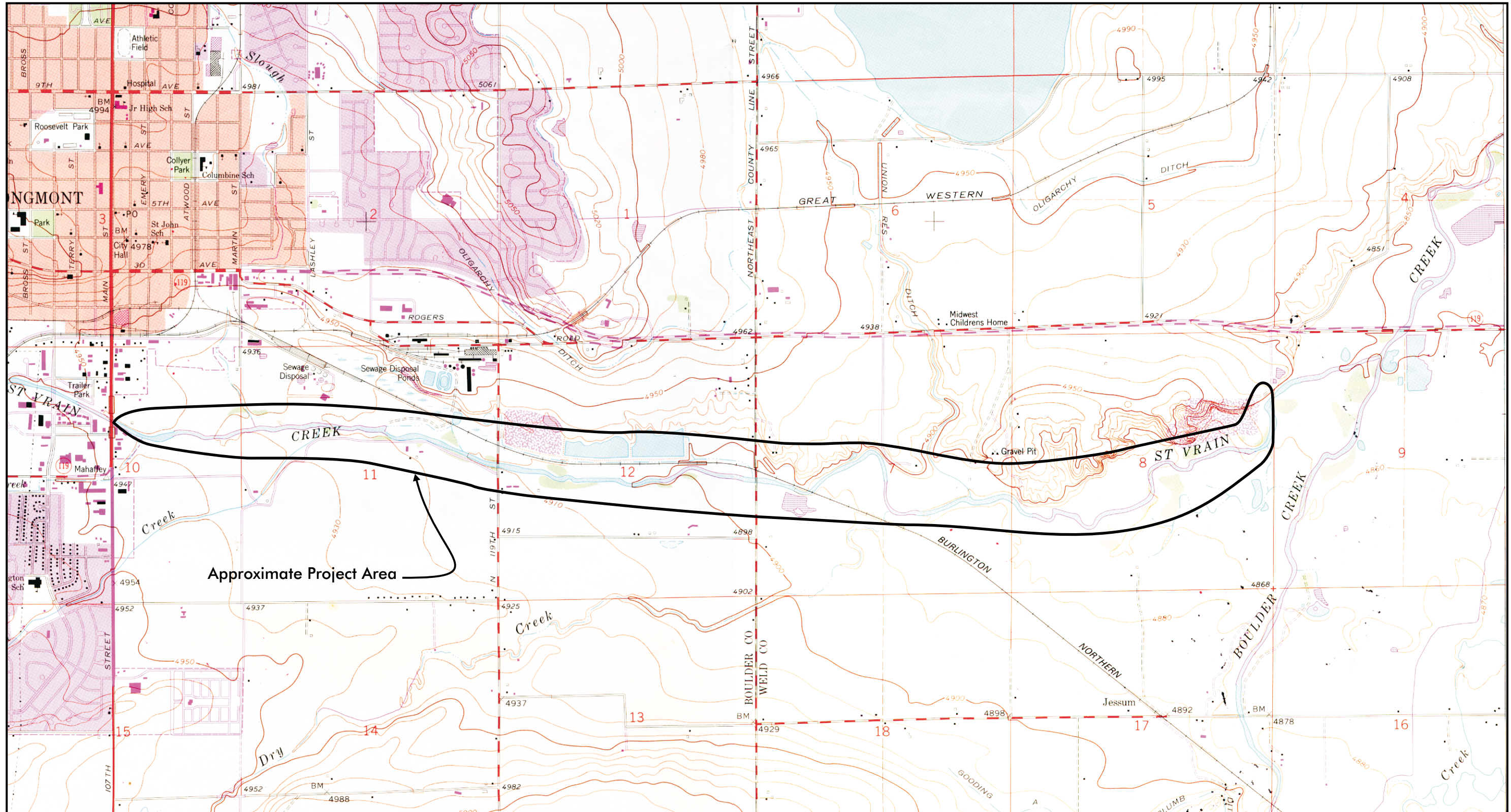
## References

- Armstrong, D.M., M.E. Bakeman, A. Deans, C.A. Meaney, and T.R. Ryon. 1997. Report on habitat findings of the Preble's meadow jumping mouse. Boulder, Colorado. Report to the U.S. Fish and Wildlife Service and Colorado Division of Wildlife..
- Colorado Natural Heritage Program. 2000. Database search.
- Meaney, C.A., A. Deans, N.W. Clippenger, M. Rider, N. Daly, and M. O'Shea-Stone. 1997. Third year survey for Preble's meadow jumping mouse (*Zapus hudsonius preblei*) in Colorado. Boulder, Colorado. Under contract to Colorado Division of Wildlife.
- Shenk, T.M. and M.M. Sivert. 1999. Movement patterns of the Preble's meadow jumping mouse as they vary across time and space. Fort Collins, Colorado. Colorado Division of Wildlife.
- White, Gary C. and Tanya M. Shenk. 2000. Relationship of Preble's Meadow Jumping Mouse Densities to Vegetation Cover. Colorado Division of Wildlife Report.

## Qualifications of Surveyors

Qualifications of W. Stephen Butler have been previously submitted to the U.S. Fish and Wildlife Service and are available upon request. Mr. Butler has a Master of Environmental Management degree from Duke University, School of the Environment and a B.S. in Biology from Indiana University. He has 5 years experience conducting trapping surveys for Preble's meadow jumping mouse and has experience identifying and handling Preble's in the field.





Approximate Project Area



ERO Resources Corp.  
 1842 Clarkson Street  
 Denver, CO 80218  
 (303) 830-1188  
 Fax: 830-1199

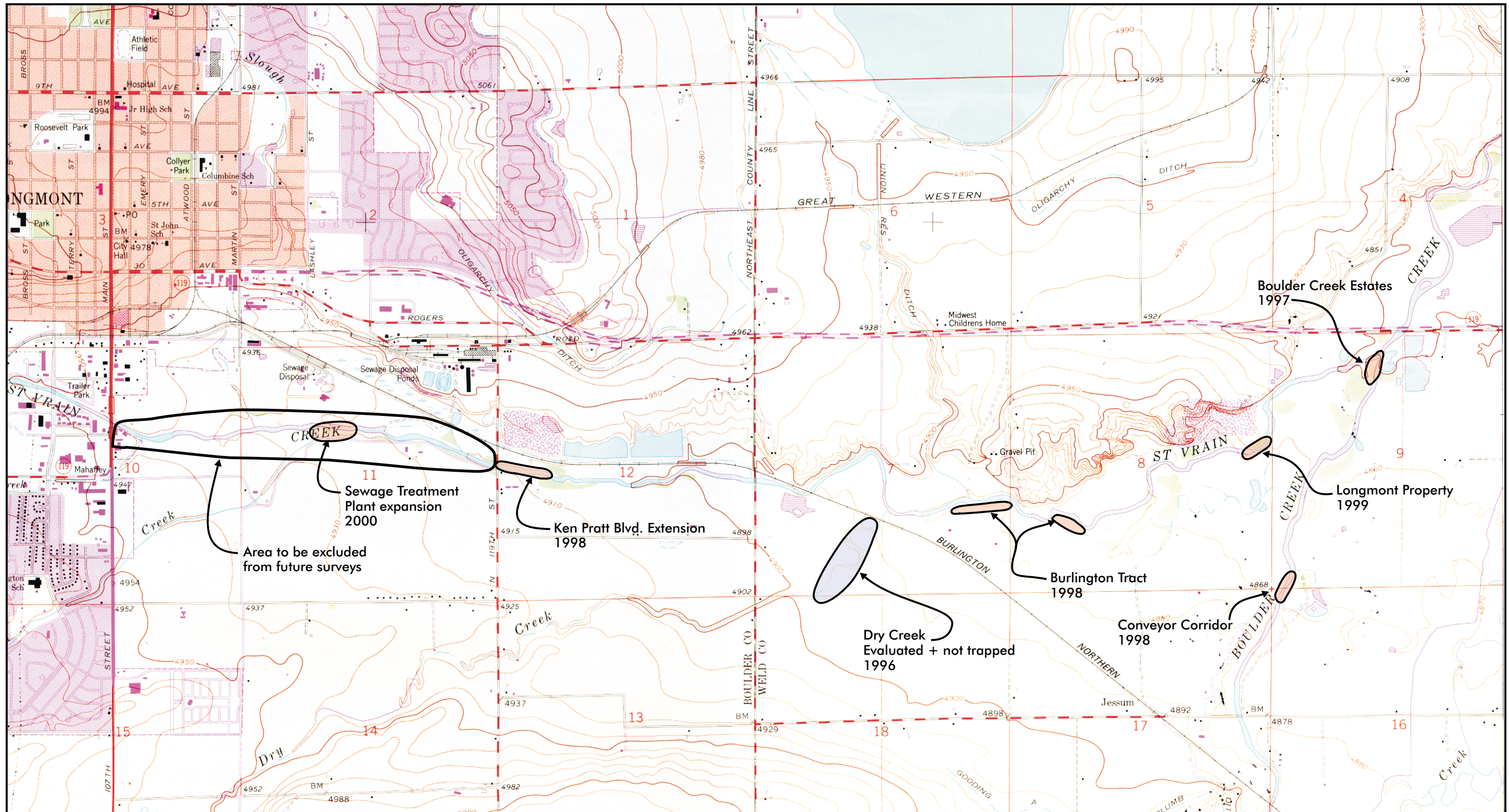
St. Vrain Greenway Master Plan  
 T2N, R69W, Sections 10, 11 & 12  
 T2N, R68W, Sections 7 & 8

Longmont Quadrangle,  
 Boulder and Weld Counties, Colorado




Figure 1  
 Project Area

Prepared for: Design Workshop  
 File: 1300-Figs.cdr  
 October 2000





ERO Resources Corp.  
 1842 Clarkson Street  
 Denver, CO 80218  
 (303) 830-1188  
 Fax: 830-1199

- St. Vrain Greenway**
-  Past negative trapping surveys
  -  Habitat evaluated, not trapped
  -  Area to be excluded from future surveys

**Figure 2**  
 Trapping Surveys for Preble's  
 Meadows Jumping Mouse in  
 Study Area

Prepared for: Design Workshop  
 File: 1300-Figs.cdr  
 October 2000



ST. VRAIN GREENWAY  
PHOTO LOG  
AUGUST - SEPTEMBER 2000



**Photo 1** - St. Vrain River, view east from Sandstone Ranch.



**Photo 2** - Willow shrub wetlands, view east from Main Street.



ST. VRAIN GREENWAY  
PHOTO LOG  
AUGUST - SEPTEMBER 2000



**Photo 3** - Seasonally flooded wetlands along Spring Gulch.



**Photo 4** - Seasonally flooded willow shrub and emergent wetlands along the St. Vrain.

ST. VRAIN GREENWAY  
PHOTO LOG  
AUGUST - SEPTEMBER 2000



**Photo 5** - Willow shrub/emergent wetland in oxbow (wetland ST1).



**Photo 6** - Gravel bar and willow shrub wetlands, Longmont Property.



ST. VRAIN GREENWAY  
PHOTO LOG  
AUGUST - SEPTEMBER 2000



**Photo 7** - Wetland fringe along St. Vrain River, view west from Boulder County Property.



**Photo 8** - Seasonally flooded wetlands and gravel bars, Boulder County Property.

ST. VRAIN GREENWAY  
PHOTO LOG  
AUGUST - SEPTEMBER 2000



**Photo 9** - Seasonally flooded wetlands and gravel bars, Boulder County Property.



**Photo 10** - Emergent wetland in backwater area.



ST. VRAIN GREENWAY  
PHOTO LOG  
AUGUST - SEPTEMBER 2000



Photo 11 - Typical wetland fringe at base of bank.



Photo 12 - Spring-fed wetland (wetland BC9).

ST. VRAIN GREENWAY  
PHOTO LOG  
AUGUST - SEPTEMBER 2000



Photo 13 - Spring-fed wetland (wetland BC3).



Photo 14 - Wetland south of spring (wetland BC8).



ST. VRAIN GREENWAY  
PHOTO LOG  
AUGUST - SEPTEMBER 2000



**Photo 15** - Man-made pond at CFP property.



**Photo 16** - Mixed riparian vegetation along St. Vrain River, typical view.

ST. VRAIN GREENWAY  
PHOTO LOG  
AUGUST - SEPTEMBER 2000



**Photo 17** - Mixed riparian, Left Hand Creek.



**Photo 18** - Cottonwood gallery, Longmont Property.



ST. VRAIN GREENWAY  
PHOTO LOG  
AUGUST - SEPTEMBER 2000



**Photo 19** - Cottonwood gallery, western portion of study area.



**Photo 20** - Cottonwood gallery, willow shrub wetlands in background south of Compost Facility.

ST. VRAIN GREENWAY  
PHOTO LOG  
AUGUST - SEPTEMBER 2000



**Photo 21** - Cottonwood gallery and disturbed grassland, south of Compost Facility.



**Photo 22** - Disturbed grassland, just east of Main Street.



ST. VRAIN GREENWAY  
PHOTO LOG  
AUGUST - SEPTEMBER 2000



**Photo 23** - Disturbed grassland, Sandstone Ranch.



**Photo 24** - Upland grassland and pine plantation, Sandstone Ranch.

ST. VRAIN GREENWAY  
PHOTO LOG  
AUGUST - SEPTEMBER 2000



Photo 25 - Dry grassland, Longmont Property.



Photo 26 - Dry grassland, Boulder County Property.



ST. VRAIN GREENWAY  
PHOTO LOG  
AUGUST - SEPTEMBER 2000



**Photo 27** - Disturbed grassland, Boulder County Property.



**Photo 28** - Prairie dog town, near confluence of St. Vrain River and Left Hand Creek.