

South Platte River Chatfield Downstream Channel Improvement Vegetation Management Plan



Prepared for:
**Colorado Water Conservation Board
Watershed Protection & Flood Mitigation Section**

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EXECUTIVE SUMMARY

The geographic focus of this Vegetation Management Plan (VMP) is a portion of the South Platte River within the Denver Metropolitan area. The specific study reach, approximately six (6) miles in length, begins at the Columbine Valley Country Club and ends downstream at the Bear Creek confluence near Hampden Avenue. The main purpose of this VMP is to address operation and maintenance (O&M) requirements tied to the Chatfield Downstream Channel Improvement Project (Project). The Project, originally designed and constructed by the U.S. Army Corps of Engineers (Corps) following the completion of the Chatfield flood control reservoir, provides flood conveyance and protection for flood prone properties located along the Project reach.

The Corps performs annual inspections of the Project to determine whether or not full compliance with the O&M requirements are being met by the non-federal sponsor which, in this case, is the Colorado Water Conservation Board (CWCB). The CWCB has worked in strong partnership with the Urban Drainage & Flood Control District (UD&FCD) to address inspection items and maintenance needs as outlined in Corps inspection reports. Full compliance includes removal of certain vegetation types in and along the channel to help ensure that the project maintains its original design capacity for flood protection. The Project has received a “minimally acceptable” rating from the Corps and is currently in jeopardy of becoming ineligible for federal flood disaster assistance (Public Law 84-99 and USACE 2008). The CWCB’s goal is to bring the project back into full compliance as soon as possible in such a way that respects the multitude of river corridor functions that are so unique and valuable within in a major metropolitan area.

The complexity of this VMP lies in the fact that the Project reach serves as a valuable corridor for fish and wildlife habitat as well as tremendous recreation opportunities afforded by an extensive trail system utilized by tens of thousands of visitors each year. The required vegetation removal, therefore, will require careful and thoughtful planning, intense community coordination and outreach, and well executed vegetation management using a phased approach to minimize mass disturbances.

Overall, this project aims to comply with Project O&M requirements, preserve and enhance the natural environment, and protect recreational interests.

This VMP aims to:

- 1) Phase 100% removal of channel-obstructing vegetation in the Project Reach
- 2) Attain acceptable Corps ratings for annual channel inspections
- 3) Maintain and enhance habitat quality and ecosystem functions to reduce negative impacts of the vegetation removal process
- 4) Coordinate with review agencies
- 5) Implement a public outreach campaign to educate citizens on the goals and benefits of the Chatfield Downstream Channel Improvement Project, and;
- 6) Develop a monitoring and evaluation strategy to allow for adaptive management.

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I. INTRODUCTION

Background

The Colorado Water Conservation Board (CWCB) owns right-of-way along the South Platte River below Chatfield Reservoir from Columbine Valley downstream to approximately Hampden Avenue. The right-of-way occurred during the federally constructed flood control project called “Chatfield Downstream Channel Improvement Project” (Project) completed by the U.S. Army Corps of Engineers (Corps). Maintenance requirements for the Project are the responsibility of the CWCB, and requirements are specified in the Project Operation & Maintenance (O&M) manual. The Project currently provides much needed flood protection for citizens and property located in this urbanized reach of the South Platte River, and the Great Flood of 1965 emphasized the importance of flood protection in the southern portion of the Denver Metropolitan area (CWCB 2007).

For many years the Project has received a "minimally acceptable" rating by the Corps based on observations and policy guidance with respect to annual Project inspections. The main reason for the low rating is due to vegetative growth in the channel and along the banks of the river consisting of willows, cottonwoods, and other native species that naturally thrive in the riparian corridor. The CWCB has worked closely with the Urban Drainage & Flood Control District to perform necessary maintenance operations including removal of non-native trees such as Russian Olives (*Elaeagnus angustifolia*) and unwanted vegetation in the channel bottom.

In January 2007, the Corps sent a letter to the CWCB detailing their PL 84-99 Rehabilitation and Inspection Program’s Continuing Eligibility Inspection and Federal Performance Evaluation Summary for the Project. The letter detailed the “minimally acceptable” Inspection Report, which was conducted on June 6th, 2006. Deficiencies and unacceptable ratings noted in the report included unwanted levee growth, encroachments, riprap/revetments/banks, culverts, and gates (USACE 2007). The report stated “... our office is recommending that a plan be prepared to remove all trees, brush, and weeds from riprap, weirs, drainage structures, and sandbars. The plan should identify where the removals will take place and how long it will take to complete, so that inspectors can readily identify progress” (USACE 2007).

Controversy has existed between the Corps and the local interests regarding willow and tree growth on the channel banks, located between the normal high water line and the top of the banks on either side of the channel. Public perception and input regarding the high value of the vegetation, in terms of environmental and aesthetic benefits at a minimum, has prevented the CWCB and the District from taking extreme action to remove the trees in question (CWCB 2007). The South Platte corridor includes one of the most highly utilized trail systems in the state and is enjoyed by thousands of outdoor enthusiasts.

In an attempt to address the issue, a technical study was commissioned by the CWCB and the District to demonstrate, through proper hydraulic modeling, that the vegetation does not substantially impact the flood conveyance capacity of Project. As a result, staff requested the Corps to initiate a Section 1135 study that would revise the O&M manual to allow for certain

types and quantities of vegetation to exist along the banks of the river (CWCB 2007). However, the 1135 effort was terminated due to lack of federal interest in revising the O&M manual. The Corps acknowledged their intent to categorize the Project condition as "unacceptable" if tree removal (as described in their inspection reports) was not conducted by the CWCB in a timely manner. An "unacceptable" rating would result in the removal of the Project from the PL 84-99 program thereby eliminating future federal funds to repair the Project after an actual flood event happens. It would also trigger potential floodplain mapping and flood insurance consequences by FEMA that would be undesirable (CWCB 2007).

In order to avoid negative flood protection consequences that would occur if the Project were to receive an "unacceptable" rating and to remain in compliance with Corps requirements, the CWCB initiated a Vegetation Management Pilot Project in late summer 2007. Pilot test plots were sprayed with FDA approved herbicide from Bowles Avenue to just upstream of the Union Avenue Boat Chutes, where an estimated 9 acres of vegetation was treated in the river channel bottom. In addition the CWCB initiated this phased Vegetation Management Plan (VMP) which not only details the phased removal of tree and willow growth along the Project reach as prescribed by the Corps, but also identifies non-floodway areas where replacement vegetation and mitigation could take place to maintain or enhance ecosystem benefits.

Authorization and Acknowledgements

The Omaha District of the U.S. Army Corps of Engineers (Corps) was founded in 1934 as a civil works district, primarily to support local flood control activities (USACE 2007). At the request of the Corps, the CWCB funded the VMP through the Chatfield Downstream Channel Operation & Maintenance Fund of the Watershed Protection and Flood Mitigation Section.

The CWCB Watershed Protection and Flood Mitigation Section has a history of providing assistance and leadership throughout Colorado for floodplain management and mapping, flood hazard mitigation, stream restoration, and community assistance. Plans and projects are developed to reduce threats of flood hazards and enhance or mitigate stream corridors. The CWCB works closely with the Urban Drainage Flood Control District's Floodplain Management Program, which was established in 1974 to prevent new flood damage potential from being introduced into the 100-year floodplains while encouraging the utilization of non-structural methods of flood damage mitigation.

In addition to the project proponents described, The South Platte Working Group (SPWG) adds tremendous value to the effort. The SPWG is a large coalition to provide stewardship to enhance, protect, preserve, and conserve the natural and wildlife resources along the South Platte River. Partners include Arapahoe County, Bow Mar, Centennial, Cherry Hills Village, Columbine Valley, Englewood, Greenwood Village, Littleton, Sheridan, South Metro Land Conservancy, South Suburban Park Foundation, South Suburban Parks and Recreation, Trust for Public Lands, and the Urban Drainage and Flood Control District.

Purpose and Need

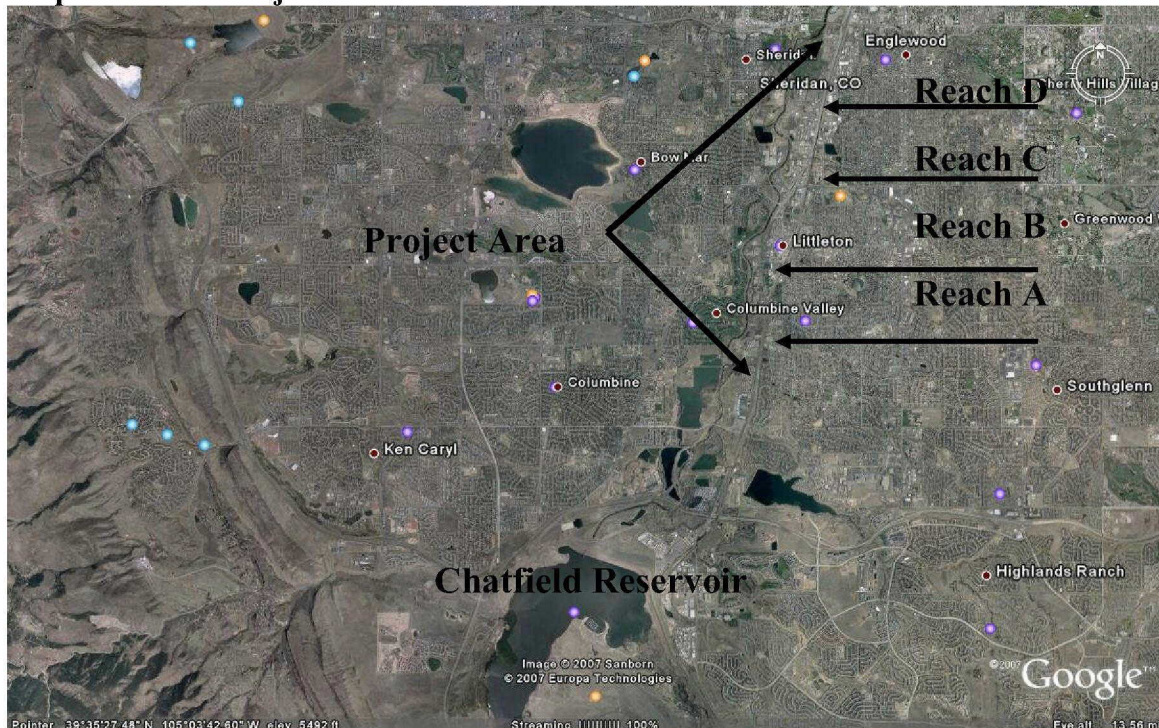
The purpose of this report is to comply with Corps requirements and remove 100% of channel obstructing vegetation, while still preserving ecological integrity, environmental quality, and maintaining recreational values in the South Platte Corridor below Chatfield Reservoir to Hampden Ave. This challenging objective requires adaptive management of natural resource use, visitor access, and ecological planning in the project area.

Project Approach

Key components of this VMP include addressing two main goals to be achieved by the CWCB. The first goal is to respond to the Corps inspection requirements pertaining to vegetation removal within the flood control channel. The second goal is to voluntarily provide environmental mitigation and enhancement, outside of the flood control channel but within the Project area.

In order to reach the 100% vegetation removal goal of this project, a Pilot Project was initiated late summer 2007 in an area documented as a Deficiency Location in the Corps inspection report (USACE 2007). As mentioned in the Background section, Pilot test plots were sprayed with FDA approved herbicide, where an estimated 9 acres of vegetation was treated in the river channel bottom. Field surveys were conducted to monitor the Pilot Project success and plan for additional vegetation removal phases over a period of 4 years which prioritize Corps requests. Details can be found in Chapter III. To reach the environmental mitigation goal, the entire Project area was separated into four main reaches shown in Map 1 and further described in Chapter II and III.

Map 1: Overall Project Area with Reaches Identified



The larger reach was separated to ensure that the entire project area included mitigation projects for a diverse habitat mosaic and to assist with monitoring. The reaches include.

Reach A) South Platte Park - Bowles Avenue

Reach B) Bowles Avenue - West Union Avenue (Pilot Project)

Reach C) West Union Avenue - West Oxford Avenue

Reach D) West Oxford Avenue - Hampden Avenue

Public Involvement

In addition to coordination with agencies and stakeholders, an extensive public education and outreach component of this VMP is vitally important. Public perception and input regarding the high value of the environment, in terms of environmental and aesthetic benefits needs to be taken into account as the South Platte corridor includes one of the most highly utilized trail systems in the state and is enjoyed by thousands of outdoor enthusiasts. The draft VMP plan will be summarized in a press release and posted for public review and comment. In addition, public meetings will be conducted prior to implementation of the proposed plan to provide detailed information to interested parties and to gain public input and facilitate collaboration on mitigation opportunities and potential assistance with seeding and planting of acceptable vegetation near the project to maintain habitat connectivity and value.



II. STUDY AREA DESCRIPTION

Environmental Setting

The South Platte River is the major landscape feature within the project site. The headwaters originate at approximately 12,500 feet in elevation in the northern Mosquito Range of the Rocky Mountains on the east of the Continental Divide in Colorado (USGS 2002), and flows northeast for over 100 miles descending to the project site which is in the elevation range of 5,330-5,280 feet. The South Platte River is classified as a fifth order stream within the project area and tributaries flowing into it include: Lee Gulch, Dutch Creek, Little's Creek, Big Dry Creek, and Bear Creek. These tributaries serve as important fish and wildlife corridors that connect the mountains, foothills, and plains ecosystems. Land use adjacent to the project site is dominated by residential, commercial, and industrial urban development with two golf courses and some preserved natural areas along the river. The South Platte River, within South Platte Park on the southern boundary of the project site, is not channelized. The Mary Carter Greenway Trail is along the upper bank of the river. That trail is heavily utilized by joggers, walkers, pet owners, and cyclists.

Watershed Description

Historically flows in this portion of the South Platte River were influenced by spring snow melts which corresponded with seasonal high flows, but drought, localized heavy rain fall, and floods have impacted the flow regime (Galat et al. 2005). Chatfield Reservoir, approximately 3 miles upstream from the project site, was completed in 1975 after the Great Flood of 1965. Heavy rains on Plum Creek resulted in flood discharges as high as 100,000 cubic feet per second (cfs) in the South Platte River which heavily impacted the city of Denver (CWCB 2008). The South Platte River, which was once a braided stream in the area, was channelized downstream after the completion of the dam. Water flows became regulated and large scouring events and floods extending throughout the floodplains no longer occur. Average annual discharge from 1997 to 2007 calculated from the USGS gage "South Platte River Below Union Ave, at Englewood" was 165.14 cfs with a maximum of 410.4 cfs and a minimum of 88.2 cfs (USGS 2008). The climate is semi-arid, with a mean annual precipitation of approximately 16 inches. The average winter temperature is 30.6°F and average summer temperature is 69 °F (CSU 2003, WRCC 2006).

Threatened and Endangered Species

The purpose of the Endangered Species Act (ESA) of 1973 (as amended, 16 USC 1531 *et seq.*) is to provide a means whereby the ecosystems upon which endangered and threatened species may be conserved and to provide a program for the conservation of such species. The ESA requires that consultation regarding protection of such species be conducted with the U.S. Fish and Wildlife Service (USFWS) prior to implementation of projects. Threatened and endangered species were researched (Appendix B) for this project to ensure that any potential impacts could be avoided. It was determined that the VMP would have no adverse effects upon any of the species. Block Clearances regarding Ute ladies'-tresses orchid (*Spiranthes diluvialis*), and Preble's meadow jumping mouse (*Zapus hudsonius preblei*), have been provided from the USFWS. Their decision resulted from previous studies and surveys (USFWS 2006, ERO 2006, ERO 2007, Ark Ecological Services LLC 2006).

Plant Associations

Field surveys using the U.S. National Vegetation Classification Standard clarified by Colorado Natural Heritage Program was used in this analysis (Carsey et al. 2003). Riverine Wetlands occur in the project area, which are typically known to occur along low-elevation floodplains of mid- to high order streams, which have a perennial flow. These systems are mainly supported by over bank flows and are important for flood control, maintaining water quality, stabilizing streambanks, and providing habitat for fish and wildlife.

Several types of wetland and riparian plant associations can be found in the project area and they are all classified as Deciduous Dominated Forests and Woodlands. These associations are most commonly found below 7000 ft in elevation and are dominated by shrublands, grasslands, and deciduous woodlands. In general, the project site is a riparian plant community. The river banks are characterized by cottonwood and willow. Native upper floodplains are characterized by cottonwood with snowberry understory. Upper floodplains have been seeded with smooth brome or have been heavily grazed with adjacent smooth brome pastures and have a few large cottonwoods. A mixture of the following plant associations are found within the project area and descriptions of each plant association are provided in Table 1.

- 1) Plains Cottonwood–Peachleaf Willow/Sandbar Willow Woodland
(*Populus deltoids-Salix amygdaloides/Salix exigua*)
- 2) Plains Cottonwood/Western Snowberry Woodland
(*Populus deltoids-Symphoricarpos occidentalis*)
- 3) Plains Cottonwood/Smooth Brome Woodland
(*Populus deltoids-Bromus inermis*)

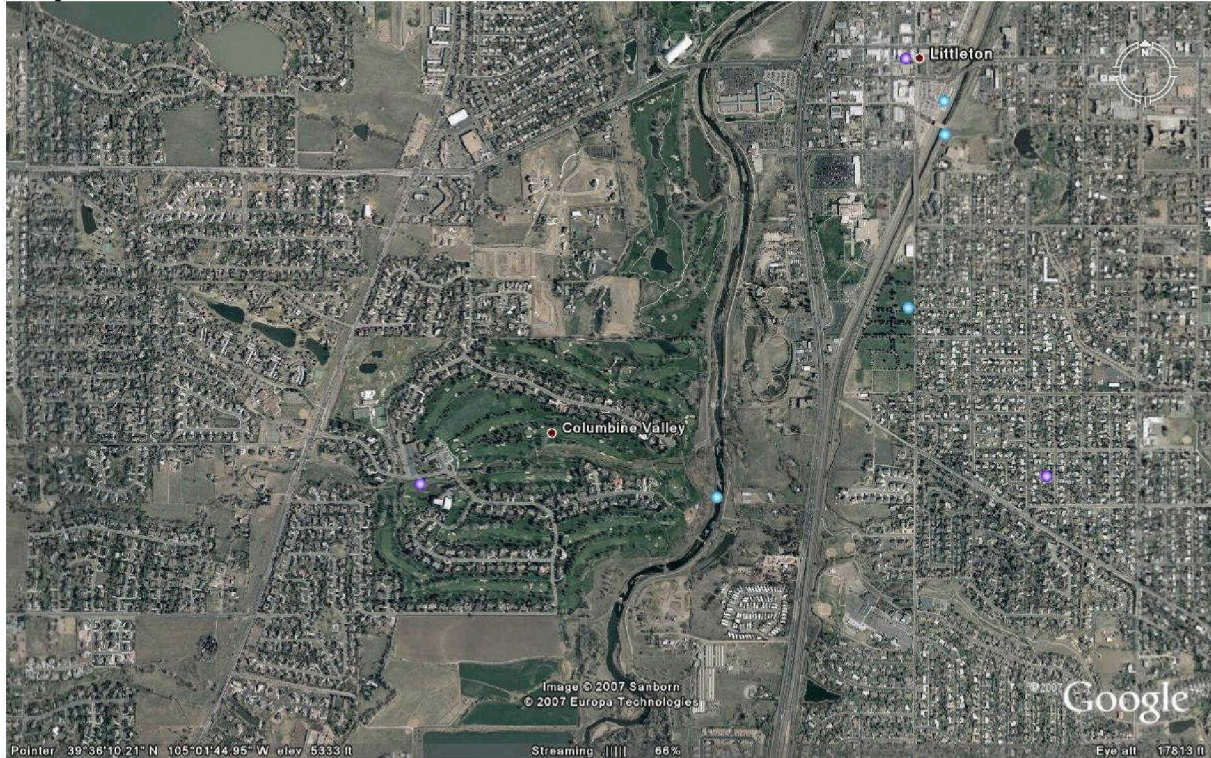
Table 1: U.S. National Vegetation Classification for the Chatfield Downstream Channel Improvement Project Site (Carsey et al. 2003)

Plant Association	Plant Association Description	Ecological Processes	Average % Cover Primary Vegetation
Plains Cottonwood – Peachleaf Willow/ Sandbar Willow Woodland	Mix of sapling/pole-sized cottonwood and willow. Dense tree canopy with little herbaceous cover. Found on low stream banks and frequently flooded islands.	Early to mid-seral stage. Willow dominated moist-soil and cottonwood in drier soil; overtime cottonwoods mature and dominate.	33% <i>Populus deltoids</i> 29% <i>Salix exigua</i> 17% <i>Equisetum arvense</i> 17% <i>Salix amygdaloides</i>
Plains Cottonwood / Western Snowberry Woodland	Widely-spaced, mature plains cottonwood and western snowberry understory. Elevated ridges and flat areas of floodplain.	Late seral stage. Large, widely-spaced trees. Located on highest surface of floodplain.	51% <i>Populus deltoides</i> 26% <i>Symphoricarpos occidentalis</i> 15% <i>Elymus lanceolatus</i> 15% <i>Spartina pectinata</i>
Plains Cottonwood / Smooth Brome Woodland	Few large plains cottonwood, little to no shrub understory, monotypic growth of non-native smooth brome. Upper terrace of floodplain	Smooth brome undergrowth product of direct seeding or invasion from livestock pasture. Native grasses out-competed; heavy grazing pressure. No cottonwood regeneration.	47% <i>Bromus inermis</i> 44% <i>Populus deltoides</i> 43% <i>Anemone Canadensis</i> 27% <i>Poa pratensis</i>

Project Reach Descriptions

Each project reach can be viewed in maps found in this section (Map 2, Map 3, Map 4, and Map 5). Reaches were surveyed for engineered structures, habitat features and functional values, geomorphology, and substrate. Descriptions of site characteristics for each reach are located below.

Map 2: Reach A) South Platte Park to Bowles Avenue

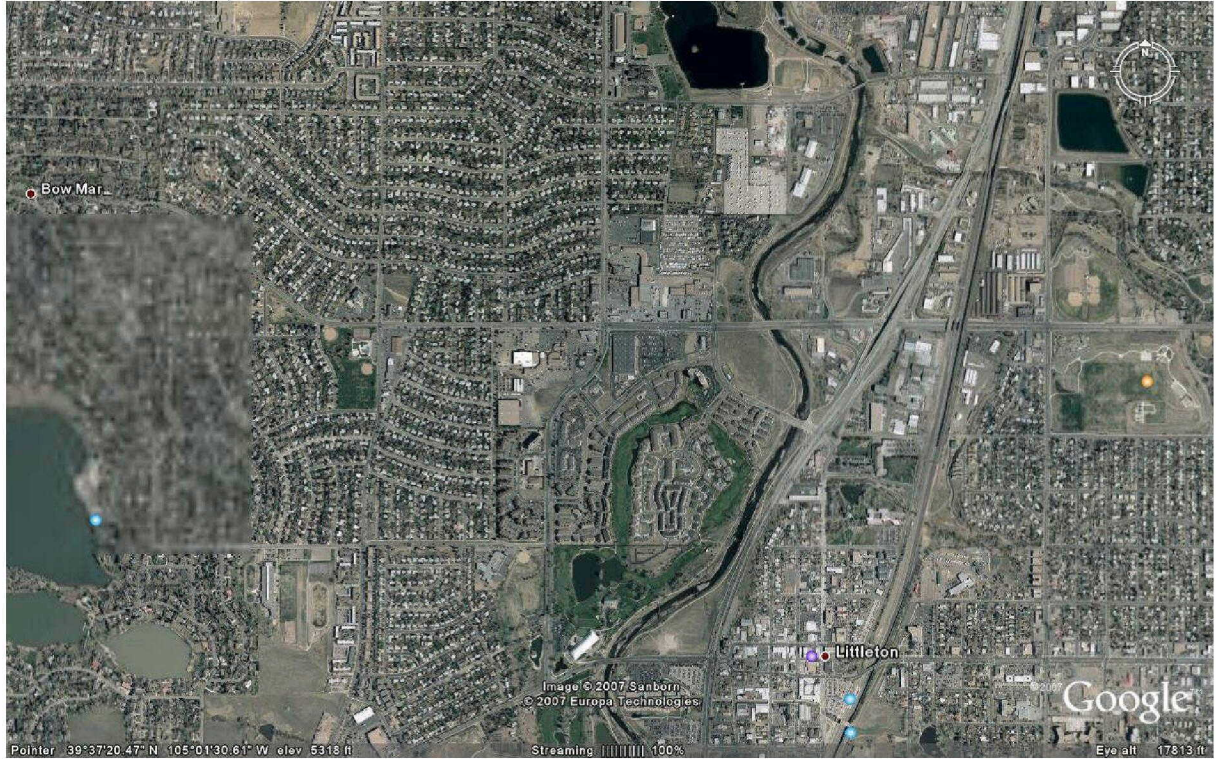


Reach A) South Platte Park to Bowles Avenue

Engineered Structures – Reach A includes the location where the flood control channel starts and includes a series of drop structures, ramps, culverts, and bridges. **Vegetation** – The riparian habitat in this reach is dominated by cottonwood gallery forests on the upper floodplain and narrow willow riparian habitat in the channel and along the banks of the river. Sandbars are dispersed throughout the reach and are dominated by willow. The understory along the banks contains cattails, sedge, rush, with a diverse layer of grasses and forbs. Upland-riparian cottonwood galleries have shrub understories. However, several contain smooth brome, which may have historically been seeded. Off-channel low areas, which may be historic oxbows, occur along the reach and have dense wetland vegetation. This reach is diverse in vegetative communities. **Wildlife** – Essential breeding habitat for dozens of species of resident and migratory birds can be found in this reach. Mature cottonwood trees provide nesting, hunting, perching, and loafing habitat for raptors. Bald eagles frequently fly over the area in the winter. A pair attempted to nest in a tree on an adjacent property south of the reach. This reach has extremely important habitat for mammals, reptiles, and amphibians. Riparian woodland and shrubland ecosystems provide optimum shelter and food for wildlife and function as movement corridors. Off-channel wetland and aquatic habitats are important nursery habitats for fish. Riparian habitat is

generally considered the single most important wildlife habitat in Colorado. This reach is highly valuable to wildlife species. Potential listed species that may find suitable habitat in this site include the northern leopard frog (*Rana pipiens*), common garter snake (*Thamnophis sirtalis*), peregrine falcon (*Falco peregrinus anatum*), ferruginous hawk (*Buteo regalis*), western yellow-billed cuckoo (*Coccyzus americanus*), and Iowa darter (*Etheostoma exile*). Hydrology – Channel is sinuous to some degree in this reach but straightens through the Hudson’s Garden and Columbine Country Club areas. Drainages in the reach include Lee Gulch, Dutch Creek, and Little’s Creek. Several ponds occur adjacent to the river including Lee Gulch Pond, Denver Seminary Pond, Hudson’s Garden Pond, Columbine Country Club, Centennial Golf Course and Watson Lake. Soils – River alluvium consists of sand, gravel, and cobble with some large boulders. Sandbars are stabilized with roots from willow thicket in most in channel areas. Sandbars are small to medium sized and can be found dispersed through out the reach Bank soils are higher in organic material and include sandy clay silt.

Map 3: Reach B) Bowles Avenue to West Union Avenue



Reach B) Bowles Avenue to West Union Avenue (Pilot Project Location)

Engineered Structures – Reach B includes a series of drop structures, ramps, culverts, and bridges. Vegetation – Riparian habitat is dominated by a narrow willow riparian fringe along the river in this highly urban and industrial location. The understory consists of cattails, sedge, rush, grass, and forbs. Deciduous trees were planted in the upland-riparian zone several years ago. Aside from the cottonwood gallery on the Oxbow property on the east bank of the river between W. Belleview Ave. and Big Dry Creek, few cottonwood galleries are found in this reach. Drainages into the channel occur along the reach and have dense wetland vegetation. Wildlife – This area provides breeding habitat for numerous species of resident birds, particularly Neo-tropical migrants. It is habitat for fish and invertebrates,

mammals, reptiles, and amphibians. Riparian ecosystems provide optimum shelter and food for wildlife and function as movement corridors. Potential listed species that may find suitable habitat in this site include the northern leopard frog, common garter snake, peregrine falcon, bald eagle, ferruginous hawk, western yellow-billed cuckoo, and Iowa darter.

Hydrology – Channel in this reach is sinuous but modified and has water features, Big Dry Creek and ponds at Centennial Golf Course. Soils – River alluvium consists of sand, gravel, and cobble with some large boulders. Bank soils have higher organic material.

Map 4: Reach C) West Union Avenue – West Oxford Avenue



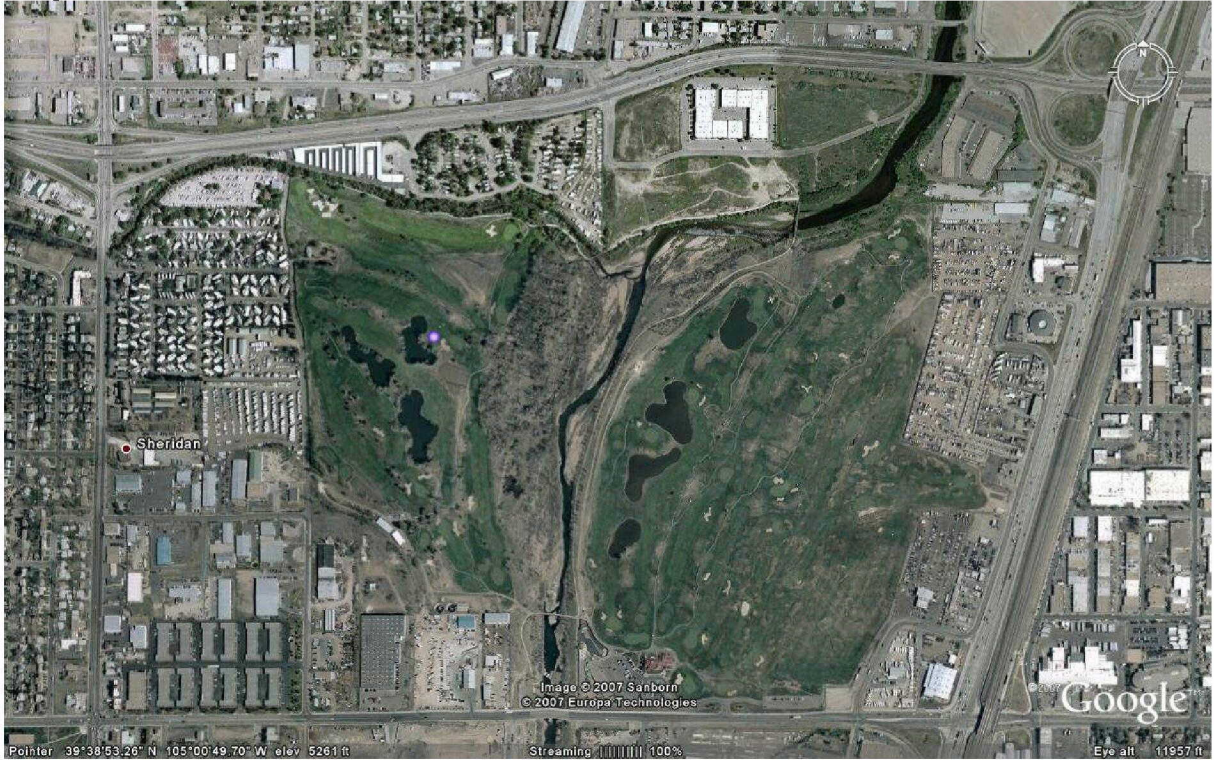
Reach C) West Union Avenue - West Oxford Avenue

Engineered Structures – Reach C includes a series of drop structures, ramps, culverts, and bridges. Vegetation – The riparian habitat is mainly a narrow willow corridor on the banks of the river. The riparian community in this highly industrialized reach has been significantly reduced. Long continuous sandbars occur on both banks of the river south of West Oxford Ave. The willow understory contains cattails, sedge, rush, grass, and forbs.

The upland habitat adjacent to the riparian fringe is planted with young deciduous trees.

Wildlife – The reach provides breeding habitat for birds, particularly Neo-tropical migrants. It has critical habitat for fish and aquatic invertebrates, and habitat for small mammals, reptiles and amphibians. Riparian ecosystems provide optimum shelter and food for wildlife and function as movement corridors. Potential listed species that may find suitable habitat in this site include the northern leopard frog, common garter snake, western yellow-billed cuckoo, and Iowa darter. Hydrology – Some drainages and ponds. Soils – River alluvium consists of sand, gravel, and cobble with some large boulders. This reach has been highly modified by engineered drop structures. Bank soils are higher in organic material.

Map 5: Reach D) West Oxford Avenue – Hampden Avenue



Reach D) West Oxford Avenue - Hampden Avenue

Engineered Structures – Reach D includes a series of drop structures, ramps, culverts, and bridges. Vegetation – High quality riparian habitat in this reach is found in this reach and is dominated by large, undisturbed cottonwood gallery forest adjacent to wide continuous sandbars with willow thicket. The willow understory consists of cattails, sedge, rush, grass, and forbs. The upland-riparian understory is dominated with shrubs. This reach may contain suitable habitat for the Federal and State Listed Threatened Ute ladies’-tresses orchid. Wildlife – Essential breeding habitat for numerous of species of resident and migratory birds. Open sandbars provide critical foraging habitat for shorebirds. Mature cottonwood trees provide nesting, hunting, perching, and loafing habitat for raptors. The intact deciduous forest is important habitat for mammals. Wetlands, sandbars, and riparian shrublands are important habitat for reptiles and amphibians. Off-channel wetland and aquatic habitats are important nursery habitats for fish. Riparian woodland and shrubland ecosystems provide optimum shelter and food for wildlife. The Bear Creek tributary, which flows from the foothills to the plains, joins the South Platte River providing an important migratory corridor for wildlife such as, mule deer that migrate between the two ecosystems. Potential listed species that may find suitable habitat in this site include the Preble’s meadow jumping mouse, northern leopard frog, common garter snake, peregrine falcon, bald eagle, ferruginous hawk, western yellow-billed cuckoo, and Iowa darter. This reach is highly valuable to wildlife species. Hydrology – This reach includes the confluence of Bear Creek and the S. Platte River which creates a large flood plain which supports riparian cottonwood gallery forest. Several Englewood Golf Course Ponds occur in the reach as well. Soils – River alluvium consists of sand, gravel, and cobble with some large boulders. Bank soils are higher in organic material and include sandy clay silt.

III. VEGETATION MANAGEMENT PLAN

Vegetation Management Goals

This VMP addresses two main goals to be achieved by the CWCB. The first goal is to respond to the Corps inspection requirements pertaining to vegetation removal within the flood control channel. The second goal is to voluntarily provide environmental mitigation and enhancement, outside of the flood control channel but within the Project area, on a reach by reach basis. The four reaches were described in Chapter II. In a letter dated April 15, 2008 the Corps provided its review summary of the Spring 2008 project inspection. In a nutshell, the Corps stated its intention to enforce complete vegetation removal, as described in the full inspection report transmitted also on April 15, 2008, by no later than the end of 2010 (USACE 2008). Based on communications with partner(s), the plan described in this section of the report differs from the Corps requirement, and calls for complete vegetation removal by 2012. The CWCB and its partner(s) will be working closely with the Corps to report on maintenance progress (UDFCD 2008). The CWCB will expend available funds in a reasonable manner, and in such a way that attempts to meet the challenging requirement set forth by the Corps.

Vegetation Removal Phases

In order to address the first main goal, this VMP prescribes phases of vegetation removal that began in 2007 and are planned to occur over a four year period with ongoing management and maintenance thereafter. Full descriptions for each phase of the vegetation removal prioritize the requests of the Corps and are summarized and then further discussed below (See Appendix C for example photos for each phase):

Pilot Project (2007): Vegetation removal in test plots within in-channel sandbars in a Deficiency Location documented by the Corps (in USACE 2007).

Phase 1 (2008-2009): In-Channel Vegetation Removal (Sandbars and Channel Bottom).

Phase 2 (2010): Bank Vegetation Removal near Structures (Bridges, Drops, and Culverts).

Phase 3 (2011 and 2012): Bank Vegetation Removal between Structures (Open Channel Sections).

Pilot Project: 2007 Vegetation Removal (9 Acre In-Channel Sandbars)

As previously stated, a Pilot Project was initiated late summer 2007 in an area documented as a Deficiency Location in the Corps inspection report (USACE 2007). Pilot test plots were sprayed in-channel on sandbars with FDA approved herbicide from Bowles Avenue to just upstream of the Union Avenue Boat Chutes, where an estimated 9 acres of vegetation was treated in the river channel bottom. Field surveys were conducted to monitor the Pilot Project success and plan for additional vegetation removal phases over a period of 4 years which prioritize Corps requests.

Bi-Monthly project monitoring surveys in September 2007, November 2007, and January 2008 reveal that the test plots have reduced vegetation, that aesthetics are still optimal, and that both recreationists and wildlife are using the area (Figure A). In fact, the additional use of park visitors may result in further environmental planning needs, as areas which were chock full of vegetation are now opened and available for use. This sudden use should be monitored and access points to the river may need to be established to reduce the chance of safety threats, vegetation trampling, and Neo-tropical migratory bird nesting disruption.

In addition to bi-monthly monitoring of the pilot project, detailed surveys of the entire project reach were conducted to identify sensitive habitats which may require protection, mitigation, or detailed assessment. These opportunities are further discussed in the following section on mitigation. In summary, off-channel areas and upland sites were explored for vegetation and habitat enhancement opportunities. Off-channel areas included natural drainage confluence such as Lee Gulch, Dutch Creek, Little's Creek, Big Dry Creek, and Bear Creek. Wetland/riparian areas adjacent to and off-channel of each reach included: Reach A) South Platte Park Wildlife area, Lee Gulch and pond, Dutch Creek, Watson Lake, Reach B) Bowles/Sante Fe Corner, Prince/Belview corner, Centennial Golf Course, Big Dry Creek, Reach C) Centennial Park and creek, long sandbars near industrial area, and Reach D) Englewood Golf Course and Bear Creek

Figure A: Wildlife Use at Pilot Project Area



Phase 1: 2008 and 2009 - Vegetation Removal (In-Channel Sandbars and Channel Bottom)

The Corps has indicated that there is a critical need to remove all vegetation within the channel for human safety and engineering reasons. Therefore, the VMP prioritizes Corps requests to remove 100% of the sandbar vegetation within the first two years (2008-2009).

In addition to vegetation removal, it is recommended that that environmental planning and recreational use be addressed during this timeframe to reduce negative impact on the aquatic environment. This phase should include a detailed assessment of all reaches and a plan to address recreational use. In addition, a delineation of specific areas for protection and mitigation should be solidified.

Project monitoring of the 2007 Pilot Project treatment site should continue to be evaluated to determine effectiveness of treatment techniques, need for above and below ground vegetative removal, and vegetative removal impacts on water quality and erosion. There should be an assessment and trial/pilot project of vegetative debris removal and seeding with Corps approved species on treatment sites (Appendix A). In addition, an assessment of species and amount of vegetative re-growth in treatment sites should be conducted. And lastly, vegetation and habitat enhancement at (recommended) off-channel and upland locations should commence.

Phase 2: 2010 - Vegetation Removal (Bank Vegetation near engineered structures)

The secondary priority for the Corps has been indicated as a need to focus on engineered structures within the project reach including bridges, drop structures, culverts, and outfall structures. Therefore, this VMP recommends complete removal of obstructive vegetation, which can be considered vegetation that is visually blocking the inspectability of each feature or perhaps hydraulically impeding flow at each feature. The second phase of vegetation removal along the project is anticipated in 2010.

Monitoring progress and implementing adaptive management at previous treatment sites will be important in this phase for effectiveness of treatment techniques, vegetative removal impacts on water quality and erosion, and impacts/benefits to wildlife and recreation. An assessment of vegetative debris removal and seeding with Corps approved species on treatment sites should be evaluated in addition to an evaluation of vegetation re-growth in treatment sites to best stage for adaptive management.

Incorporating Corps recommendations given at each annual channel inspection will be a key component to the success of this multi-objective project and continue vegetative and habitat enhancement at off-channel and upland locations should continue to be monitored as well.

Phase 3: 2011 and 2012 - Vegetation Removal (Bank Vegetation between engineered structures)

The last priority the Corps has indicated for vegetation removal includes bank vegetation along the open channel sections of the river and on the river banks between engineered structures. Therefore the VMP recommends that during 2011 and 2012, all channel banks be treated per Corps specifications between engineered structures.

In addition to vegetation removal, it is recommended that previous treatment sites are monitored to evaluate treatment techniques and impacts on water quality and erosion both in-channel and near structures in order to best continue planning for and adaptive management, assessment of vegetative debris removal and vegetative seeding with Corps approved species on treatment sites and sensitive habitats. Species and amount of vegetative re-growth in treatment sites should be assessed.

It is also recommended that continued mitigation and vegetative enhancements are implemented to offset negative impacts of riparian habitat removal in off-channel and upland locations. The effectiveness of vegetation removal as well as the mitigation projects should be assessed to attain both acceptable Corps compliance ratings for floodplain channels and adequate habitat quality, wildlife and vegetation species diversity, stream-bank erosion control, and water quality protection.

Short-term and long-term projects for vegetation management in the South Platte River Chatfield Downstream Channel should be identified for the future and adaptive management should be continued in perpetuity.



Monitoring and Adaptive Management

It is recommended that regular monitoring and assessments take place at the treatment sites to evaluate: Effectiveness of treatment techniques, erosion and water quality impacts, sandbar conditions, wildlife use, river access, and recreational impacts. Adaptive management approaches allow for adjustments to treatment techniques based on evaluations and assessments.

IV. ENVIRONMENTAL MITIGATION

Environmental Mitigation Goals

The second main goal of this VMP is to voluntarily provide environmental mitigation and enhancement, outside of the flood control channel but within the Project area, on a reach by reach basis.

Vegetation Replacement

Acceptable vegetation species that can be replanted within the channel sandbars and along the river banks have been discussed with the Omaha Corps. (Refer to appendix A for a list plant species and vendor list). There is a concern for soil erosion and water quality impacts with the removal of large amounts of undesirable plants. Therefore, recommendations for acceptable vegetative characteristic for soil stabilization with plantings in the channel and streambank were requested from the Corps. The following characteristic were provided by Pam Graham and Bob Warden from the Corps, Omaha District (Graham & Warden 2008):

- Species that do not decrease the capacity of the flood channel
- Species that stabilize the soil similar to a landscape mat
- Species with fine roots and above ground growth
- Species of Graminoids are preferred

Recommended local vendors for seeds and plants include Hydra Aquatic Inc, Pawnee Butte Seed Co., Western Native Seed, and Granite Seed Co, and Rocky Mountain Native Plants Co. (Appendix A). Acreage costs depend on species selection, density, and maintenance and would take quite a bit of calculation and research to determine. Hypothetically for lowland riparian, if an acre is seeded at 10 lbs of seed/acre and the average cost is \$150 per pound, it would be \$1,500/acre. Above and beyond seeding costs, enhancement activities could run as high as \$30,000/acre depending on specific implementation measures.

Stream Confluence Protection

In general it is recommended that natural drainage confluence areas are protected and enhanced including: Lee Gulch, Dutch Creek, Little's Creek, Big Dry Creek, Bear Creek

Conservation Opportunities

In addition, outside of the flood control channel but within the Project area, on a reach by reach basis there are various mitigation opportunities which include habitat conservation easements and enhancement. Adjacent land ownership and general interest in participation still needs to be determined, but the initial analysis showed that the following areas may be explored for each reach.

- Reach A) South Platte Park - Bowles Avenue: Wildlife Area, Lee Gulch and pond, Dutch Creek, Watson Lake
- Reach B) Bowles Avenue - West Union Avenue (Pilot Project): Bowles/Santa Fe Corner, Prince/Belleview Corner, Centennial Golf Course, Big Dry Creek
- Reach C) West Union Avenue - West Oxford Avenue: Centennial Park and Creek, & long sandbars near industrial area.
- Reach D) West Oxford Avenue - Hampden Avenue: Englewood Golf Course, Bear Creek

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APPENDICES

Appendix A: Plant Species List Approved by the Corps - Recommended Channel Soil Stabilization and Riparian Upland Planting Species. Selected species are native to the riparian plant community in the Front Range of Colorado (CDNR 1998, Hydra Aquatic Inc 2006, USFS 2008, NRCS 2008). The majority of these plants have rapid rates of establishment.

Plant Species	Duration	Active Growth Period	Height*	Rigidity	Growth	Water Depth
Streambank Plant Species						
GRAMINOID						
<i>Carex aquatilis</i>	perennial	summer	0.5' - 2.9'	low	bunch	moist; occasionally dry
<i>Carex nebrascensi</i>	perennial	spring/summer	1' - 3'	low	rhizomatous	moist; occasionally dry
<i>Carex microptera</i>	perennial	spring/summer	0.7' - 2'	low	bunch	seasonal flooding
<i>Eleocharis acicularis</i>	perennial	spring/summer/fall	0.5' - 1.5'	low	rhizomatous	moist
<i>Eleocharis palustris</i>	perennial	spring	1.3' - 3'	medium	rhizomatous	moist; occasionally dry
<i>Juncus balticus</i>	perennial	spring	1.1' - 3.6'	medium	sod-forming	seasonal flooding
<i>Juncus longistylis</i>	perennial	spring/summer	1.75'	low	rhizomatous	seasonal flooding
<i>Juncus nodosus</i>	perennial	spring	0.3' - 2'	low	single stem	seasonal flooding
<i>Puccinellia nuttalliana</i>	perennial	spring/summer	0.8'	low	rhizomatous	seasonal flooding
<i>Triglochin maritima</i>	perennial	summer/fall	0.1 - 2'	low	--	moist
FORBS						
<i>Ranunculus cymbalaria</i>	perennial	spring/summer	0.2' - 1'	low	singlecrown	moist; occasionally dry
Riparian Upland Plant Species						
GRAMINOID						
<i>Bouteloua curtipendula</i>	perennial	warm season grass	0.8' - 2.6'	low	bunch grass	moist; occasionally dry
<i>Hesperostipa comata</i>	perennial	cool season grass	1' - 3'	low	bunch grass	moist to dry
<i>Hordeum jubatum</i>	perennial	cool season grass	0.7' - 2'	low	bunch grass	moist to dry
<i>Nasella viridula</i>	perennial	cool season grass	1.6' - 3.2'	low	bunch grass	moist to dry
<i>Schizacarium scoparius</i>	perennial	warm season grass	1' - 3'	medium	bunch grass	moist; occasionally dry
<i>Sorghastum nutans</i>	perennial	warm season grass	3' - 6.5'	medium	sod former	moist to dry
<i>Spartina pectinata</i>	perennial	warm season grass	1.6' - 6.5'	medium	sod former	moist
<i>Sporobolus airoides</i>	perennial	warm season grass	1.5' - 3'	low	bunch grass	moist; occasionally dry
FORBS						

<i>Galium boreale</i>	perennial	spring/summer	1' - 3'	low	single crown	moist; occasionally dry
<i>Solidago canadensis</i>	perennial	summer/fall	1' - 2'	medium	rhizomatous	moist; occasionally dry
<i>Heterotheca villosa</i>	perennial	summer/fall	1' - 2'	medium	multiple stem	dry
<i>Machaeranthera bigelovii</i>	perennial	fall	1' - 3'	medium	multiple stem	dry
SHRUBS						
<i>Prunus americana</i>	perennial	spring/summer	6' - 15'	high	shrub	moist to dry
<i>Pumus virginiana</i>	perennial	spring/summer	Up to 15'	high	shrub	moist to dry
<i>Ribes aureum</i>	perennial	spring/summer	4' - 10'	high	shrub	moist to dry
<i>Rosa woodsii</i>	perennial	spring/summer	3' - 6'	medium	shrub	moist to dry
<i>Symphoricarpos occidentalis</i>	perennial	spring	Up to 3'	medium	shrub	moist to dry

Vendor List

Hydra Aquatic Inc,

1614 Escalante Ave. SW, Albuquerque, NM 87104

(505) 281-5749

<http://www.hydraaquatic.com/>

Pawnee Butte Seed Co.

PO Box 100, 605 25th Street Greeley, CO. 80632 (800) 782-5947

(970) 356-7002 Fax (970) 356-7263

<http://www.pawneebutteseed.com/>

Western Native Seed

P.O. Box 188, Coaldale, CO 81222 Phone: (719) 942-3935 FAX: (719) 942-3605 Email:

info@westernnativeseed.com

Granite Seed Co

1697 West 2100 North

Lehi, Utah 84043

(801) 768-4422

<http://www.graniteseed.com/>

Rocky Mountain Native Plants

3780 Silt Mesa Road, Rifle, CO 81650 # (970) 625-4769

<http://www.rmnativeplants.com/>

Appendix B: Listed Species Study

<u>Common Name</u>	<u>Scientific Name</u>	<u>Status</u>	<u>Description</u>	<u>Occurrence</u>	<u>Recommendation</u>	<u>Reference</u>
FEDERAL and STATE LISTED SPECIES						
Black-footed ferret	<i>Mustela nigripes</i>	FE	Occupies prairie dog colonies on short- and mid-grass prairie. Known only to exist in remnant restored population in Wyoming.	Not Probable		Fitzgerald et al. 1994. CDOW 2008.
Pallid sturgeon	<i>Scaphirhynchus albus</i>	FE	Large river obligate inhabiting free-flowing streams of the upper Missouri and Mississippi River.	Not Probable		USFWS 2007a.
Least tern (interior population)	<i>Sternula antillarum</i>	FE, SE	Once inhabited heavily scoured sandbars in eastern Colorado but no longer available due to changes in flow. Now nest on reservoir shores.	Rare; Unlikely		Andrews & Righter 1992. Kingery 1998.
Whooping crane	<i>Grus americana</i>	FE	Observed on reservoir mudflats and agricultural area, which are not available in or near project site. Casual migrant on eastern plains.	Not Probable		Andrews & Righter 1992. CDOW 2008. Audubon Society 2007
Mexican spotted owl	<i>Strix occidentalis lucida</i>	FT	Occupies mixed-conifer forests; closed canopy or rocky-canyons. Suitable habitat not available in project site.	Not Probable		USFWS 2008a.
Piping plover	<i>Charadrius melodus</i>	FT	Nest on broad, sandy beaches; reservoir mudflats and shores. Typically nest in southeastern Colorado. Suitable habitat not available in project site.	Not Probable		Andrews & Righter 1992. Kingery 1998. Audubon Society 2007
Preble's meadow jumping mouse†	<i>Zapus hudsonius preblei</i>	FT, ST	Inhabit grassland understories/wet meadows in wooded willow areas along streams. Project site on historic habitat; no findings along South Platte River downstream of Chatfield Reservoir in recent years. Not in critical habitat.	Unknown, Probable habitat	Coordinate with USFWS for renewal of clearance in Nov 2008.	Fitzgerald et al. 1994. Linner 2008. USFWS 2006 USFWS 2008b. ERO 2007
Ute ladies'-tresses orchid†	<i>Spiranthes diluvialis</i>	FT, ST	Occur in wet meadows; some grassy understories associated with perennial stream terraces, floodplains, open riparian willow-woodlands. Not recently documented along the South Platte River in Front Range.	Rare; Probable habitat	Coordinate with USFWS for renewal of clearance in Nov 2008.	Fertig et al. 2005. Linner 2008. USFWS 2006 USFWS 2008c. ERO 2006
Bald Eagle	<i>Haliaeetus leucocephalus</i>	ST, D	Commonly wintering along Front Range. Possible fly-over, perch, and forage in project site. In 2004, pair attempted to nest on property adjacent to the river and northern edge of South Platte Park.	Fairly common; Likely	Preserve mature cottonwood trees and snags along the river corridor.	Andrews & Righter 1992. CDOW 2008. Kingery 1998. Audubon Society 2007

STATE SPECIES OF CONCERN						
Western Yellow-billed Cuckoo	<i>Coccyzus americanus</i>	SC, C	Rare spring and fall migrants; summer residents in Front Range. Inhabits lowland, riparian woodland with dense understories. Nest in shrubs.	Rare; Probable	Replant shrubs in cottonwood understories above river channel.	Andrews & Righter 1992. CDOW 2008. Kingery 1998.
Northern Leopard Frog	<i>Rana pipiens</i>	SC	Breeds along stream, permanent/semi-permanent pond, marsh. Declining associated with predaceous, non-native bullfrog and stocked predatory fishes. Extensive urban development impacting habitat.	Uncommon; Probable	Herbicide treatment applied as late into the fall as possible when frogs are dormant	CDOW 2008. Hammerson 1999.
Common Garter Snake	<i>Thamnophis sirtalis</i>	SC	Breeds along stream, permanent/semi-permanent pond, marsh. Extensive urban development impacting habitat.	Uncommon; Probable	Herbicide treatment applied as late into the fall as possible when snakes are dormant	CDOW 2008. Hammerson 1999.
American Peregrine Falcon	<i>Falco peregrinus anatum</i>	SC	Nest on cliffs. Spring and fall migrant at site. Rare but possible fly-over, perch, and forage in project site.	Rare; Probable	Preserve mature cottonwood trees and snags along the river corridor.	Andrews & Righter 1992. CDOW 2008. Kingery 1998.
Ferruginous Hawk	<i>Buteo regalis</i>	SC	Winter east of the Rocky Mountains in Colorado. Prairie dog is primary prey. Nest in isolated trees and ground. No suitable nesting and foraging habitat.	Rare; Probable	Preserve mature cottonwood trees and snags along the river corridor.	Andrews & Righter 1992. CDOW 2008. Kingery 1998.
Iowa Darter	<i>Etheostoma exile</i>	SC	Inhabits slow, clear water with vegetative, sand, mud bottoms. Commonly found along stream banks with vegetation extending into water, undercut banks, temporarily flooded areas, impounded pools.	Uncommon; Likely	Stabilize and re-plant treatment sites with graminoids. Avoid chemical treatment of project sites during reproductive periods: spawning Apr to July; fries July to Aug.	CDOW 2008. Copes 2005.

F- Federally endangered, SC- State species of concern, FT-Federally Threatened, C-Federal candidate species, SE-State endangered, D-Federally delisted, ST-State threatened

*These federal listed species are identified for Arapahoe County by the U.S. Fish and Wildlife Service Colorado Field Office (USFWS 2007b). For additional information contact: 303-236-4773 or 970-243-2778

† Block Clearances for these species have been provided by the USFWS Colorado. Refer to references including USFWS 2006, ERO 2006, ERO 2007, Ark Ecological Services LLC 2006.

Colorado listed species and species of special concern obtain from the Colorado Division of Wildlife (CDOW 2007/2008).

Appendix C: Photographs of Project Area

Reach A - Boat Chute



Reach A - Potential Conservation Easement



Reach B - Pilot Project Fall 2007



Reach B - Pilot Project Winter 2008



Reach C – Near Prince St.



Reach C – Below Union Ave.



Reach D – Cottonwood Gallery near Bear Creek confluence

