DRAFT

Spring Creek

Aquatic Ecosystem Restoration Study

Colorado Springs, CO.

Continuing Authorities Program, Section 206
Feasibility Report & Environmental Assessment

February, 2026

US Army Corps of Engineers
Albuquerque District

COLORADO SPRINGS
OLYMPIC CITY USA

DRAFT

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Executive Summary

This integrated feasibility report and environmental assessment (IFR/EA) presents the results of a U.S. Army Corps of Engineers (USACE) feasibility study to identify and evaluate alternatives to restore degraded wetland and riparian ecosystems along Spring Creek in Colorado Springs, Colorado. USACE is undertaking this effort in partnership with the City of Colorado Springs, CO, the non-Federal sponsor (Sponsor). The study is being conducted under the authority of Section 206 of the Water Resources Development Act of 1996, as amended.

The study area is located along the Spring Creek in Colorado Springs, Colorado. The Spring Creek basin is within the larger Fountain Creek Watershed (hydrologic unit code (HUC) 8: 11020003 - Fountain; HUC 4: 1102 - Upper Arkansas). Spring Creek's headwaters as well as the total length of the stream run through urban Colorado Springs. The study area is composed of three reaches:

- **Reach 1 (4.8 ac)** is bordered to the west by Wagner Park, to the south by Pikes Peak Ave., to the north by a city fire station, and to the east by commercial businesses.
- **Reach 2 (18.5 ac) Former Wetland** is located southwest of the intersection of Pikes Peak Ave. and S. Academy Blvd and directly south of Reach 1.
- **Reach 3 (2.2 ac)** is located directly south of Reach 2 and is bordered to the west and to the south by private land, and to the east by commercial businesses. This reach consists of a concrete lined (east and west banks) channel.

USACE proposes to implement wetland and riparian stream ecosystem restoration within the study area along Spring Creek. The proposed Federal (USACE) action would be within the study area and consistent with the Sponsor's plan to create a stream corridor along Spring Creek and support the greater vision for the Fountain Creek watershed to "create a healthy waterway with appropriate erosion, sedimentation, and flooding that supports diverse economic, environmental, and recreational interests" (FCVTF, 2009).

The Tentatively Selected Plan (TSP) is Alternative 23 which is also the National Ecosystem Restoration Plan. The TSP would achieve the ecosystem restoration objectives utilizing bank slope modification, construction of instream rock riffles, invasive species removal, removal of concrete within the study area, and native species plantings (to include riparian and wetland species). Based on October 2026 price levels, the estimated cost of the TSP is $13,349,543.

Table of Contents

Figures

Tables

Appendices

A. Changing Conditions
B. Ecosystem and Habitat Evaluation Model Results
C. Cost Estimate (Not Complete) [1]
D. H&H Engineering
E. Cultural Resources
F. Hazardous, Toxic and Radioactive Waste
G. Economics
H. Real Estate Plan
I. Civil Engineering
J. Public and Agency Coordination (To be completed post Public Review period)
K. Finding Of No Significant Impact
L. Monitoring & Adaptive Management Plan
M. Environmental

Abbreviations and Acronyms

AAHU	Average Annual Habitat Unit	IFR	Integrated Feasibility Report
ADA	Americans with Disabilities Act	Public	Information for Planning and Consultation website of the USFWS
APE	Area of Potential Effects	IWR	Institute for Water Resources
ASA(CW)	Assistant Secretary of the Army (Civil Works)	MBTA	Migratory Bird Treaty Act
ATR	Agency Technical Review	NEPA	National Environmental Policy Act
Ave.	Avenue	NER	National Ecosystem Restoration plan
CAP	Continuing Authorities Program (of the USACE)	O&M	Operation and Maintenance
CE/ICA	Cost-Effectiveness and Incremental Cost Analysis	OMRR&R	operation, maintenance, repair, replacement and rehabilitation
		P&G	Principles and Guidelines
CEQ	Council on Environmental Quality	PR&G	Principles Requirements and Guidelines
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act	P.L.	Public Law
CFR	Code of Federal Regulations	PED	Planning, Engineering and Design phase
cfs	Cubic feet per second	RCP	Regional Climate Projection (?)

[1] The Cost Estimate Appendix is currently incomplete, but a draft can be provided upon request.

COMPASS	The online cultural resource & paleontological database maintained by the State of Colorado	RCRA	Resource Conservation and Recovery Act
CWPP	Colorado Wetland Program Plan	SGCN	Species of Greatest Conservation Need
CY	Cubic Yards	SPD	South Pacific Division
DQC	District Quality Control	Sponsor	The non-federal sponsor, City of Colorado Springs
E.O.	Executive Order	spp.	Species
EA	Environmental Assessment	SWAP	State Wildlife Action Plan
EC	Engineering Circular	TOSC	Trails and Open Space Coalition
ECB	Engineering & Construction Bulletin	TSP	Tentatively Selected Plan
EP	Engineering Pamphlet	USACE	U.S. Army Corps of Engineers
EPA	Environmental Protection Agency	U.S.A.	United States of America
ER	Engineer Regulation	USC	United States Code (law)
ESA	Endangered Species Act	USFWS	U.S. Fish and Wildlife Service
FACStream	Functional Assessment of Colorado Streams	P1ESA	Phase 1 Environmental Site Assessment
FACWet	Functional Assessment of Colorado Wetlands		
FCI	Functional Condition Index		
FCVTF	Fountain Creek Vision Task Force		
ft.	Foot/Feet		
FWOP	Future Without Project		
GPS	Global Positioning System		
HEC-HMS	Hydrologic Engineering Center – Hydrologic Modeling System		
hr	Hour		
HSI	Habitat Suitability Index		
HTRW	Hazardous, Toxic, or Radioactive Waste		
HUC	hydrologic unit code		

1 Introduction

This integrated feasibility report and environmental assessment (IFR/EA) documents the planning process for the Spring Creek Aquatic Ecosystem Restoration Study along Spring Creek in the City of Colorado Springs, Colorado, and demonstrates consistency with U.S. Army Corps of Engineers (USACE) planning policy and with the National Environmental Policy Act (NEPA). The following sections provide background information regarding the basis for this study.

1.1 Project Purpose and scope

As part of the planning process for all Continuing Authorities Program (CAP) projects, a feasibility study must be completed. This feasibility study was conducted in accordance with USACE's CAP engineering pamphlet (EP 1105-2-58), Policy for Conducting Civil Works Planning Studies Engineering Regulation (ER 1105-2-103), and Aquatic Ecosystem Restoration Civil Works Mission and Evaluation Procedures EP (EP 1105-2-70), and with consideration given to the scope and scale of the recommended solution.

The purpose of the Spring Creek Ecosystem Restoration feasibility study is:

- Evaluate significant aquatic ecosystem degradation within the study area along Spring Creek;
- Formulate, evaluate, and screen potential solutions to these problems; and
- Recommend a series of actions and solutions that have a Federal interest and are supported by a non-Federal sponsor willing to provide the necessary items of local cooperation.

Environmental degradation within the study area along Spring Creek includes a loss of natural ecosystem structures, functions, and processes necessary to support native fish and wildlife habitat.

1.2 Study Authority

The study is being conducted under the authority of Section 206 of the Water Resources Development Act of 1996 [P.L. 104-303] as amended 33 USC § 2230 (Section 206) for aquatic ecosystem restoration. Under this authority, a project for aquatic ecosystem restoration should "improve the quality of the environment and be in the public interest … and cost effective." Per EP 1105-2-58, paragraph 35. a., the project should be "consistent with current policies and procedures governing projects of the same type which are specifically authorized by Congress."

1.3 Overview of Integrated Feasibility Report / Environmental Assessment

The USACE planning process used in this study is detailed in Chapter 4 of EP 1105-2-70. The purpose of the IFR/EA is to identify the plan that reasonably maximizes ecosystem restoration benefits, is technically feasible, and preserves environmental and cultural values consistent with NEPA. The purpose of the EA portion of this report is to identify and present information about potential environmental effects of the alternatives and to incorporate environmental considerations into the decision-making process. The six steps of the USACE planning process each align with a NEPA requirement. The list of the planning steps appears in Table 1 with the document Section and NEPA element to which they relate.

Table 1 Overview of IFA/EA

USACE Planning Step	NEPA Requirement	IFR/EA Section
1) Specify Problems and Opportunities	Purpose and Need for Action	Section 2
2) Inventory and Forecast Conditions	Affected Environment	Section 4
3) Formulate Alternative Plans	Alternatives Including Proposed Action	Section 3
4) Evaluate Effects of Alternative Plans	Environmental Consequences	Section 4
5) Compare Alternative Plans	Alternatives Including Proposed Action	Sections 3 & 4
6) Select Recommended Plan	Agency Preferred Alternative	Section 5

1.4 Lead Federal Agency and Non-Federal Sponsor

USACE is the lead Federal agency. The City of Colorado Springs submitted a letter request for assistance dated 26 December 2017 seeking USACE assistance with an ecosystem restoration project along Spring Creek. The City of Colorado Springs confirmed their support for the project with an additional letter requesting USACE assistance on 9 June 2021. USACE and the City of Colorado Springs signed a feasibility cost share agreement on 25 May 2022. The City of Colorado Springs is the non-Federal sponsor (Sponsor) for this study.

2 Study Area Location

The study area is located along the Spring Creek in Colorado Springs, Colorado (Figure 1). The Spring Creek basin is within the larger Fountain Creek Watershed (hydrologic unit code (HUC) 8: 11020003 - Fountain; HUC 4: 1102 - Upper Arkansas). Fountain Creek is a tributary to the greater Arkansas River system. Spring Creek's headwaters originate in urban Colorado Springs. The defined stream channel generally slopes from the northeast to the southwest and is approximately 4 miles long, from just under half a mile upstream of the project area to its confluence with Fountain Creek.

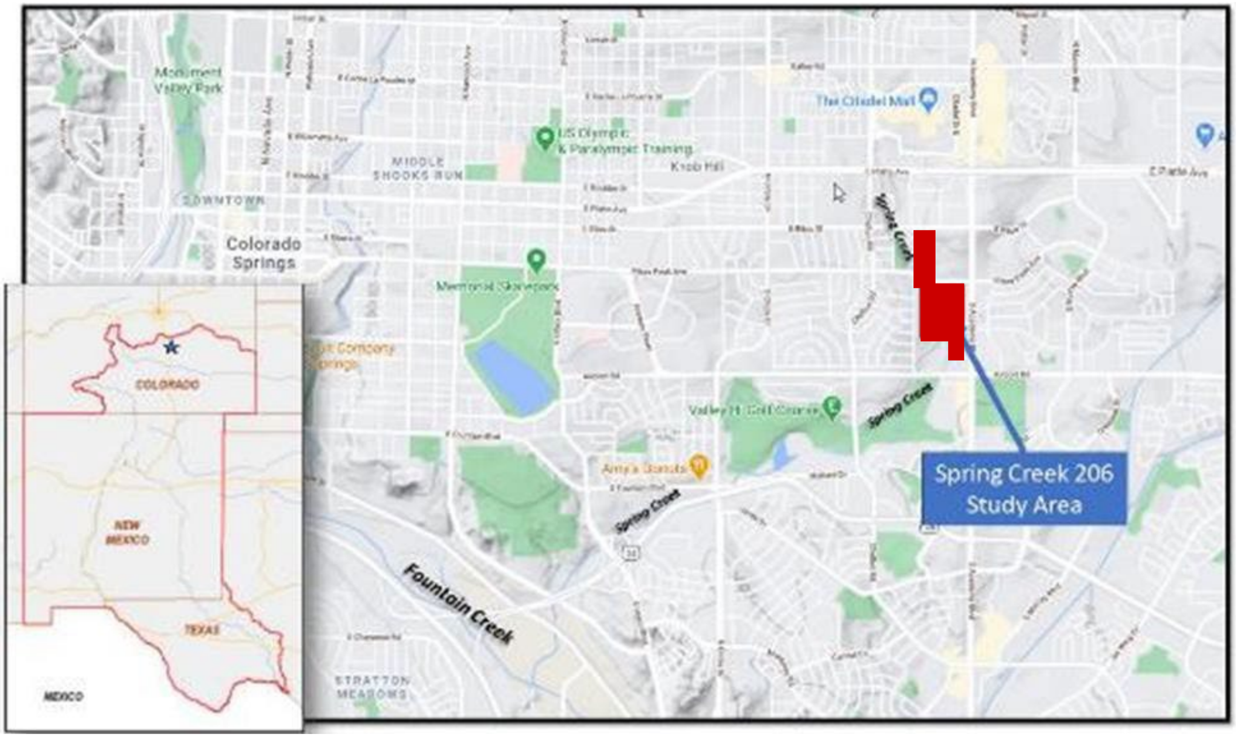


Figure 1: Location of project on the Spring Creek in Colorado Springs, CO.

For the purposes of this study, the area was divided into three reaches (Figure 2):

- Reach 1: Pikes Peak North is bordered to the west by Wagner Park, to the south by Pikes Peak Ave., to the north by a city fire station, and to the east by commercial businesses.
- Reach 2: Former Wetland is located southwest of the intersection of Pikes Peak Ave. and S. Academy Blvd and directly south of Reach 1.
- Reach 3: South Channel is located directly south of Reach 2 and is bordered to the west and to the south by private land, and to the east by commercial businesses.

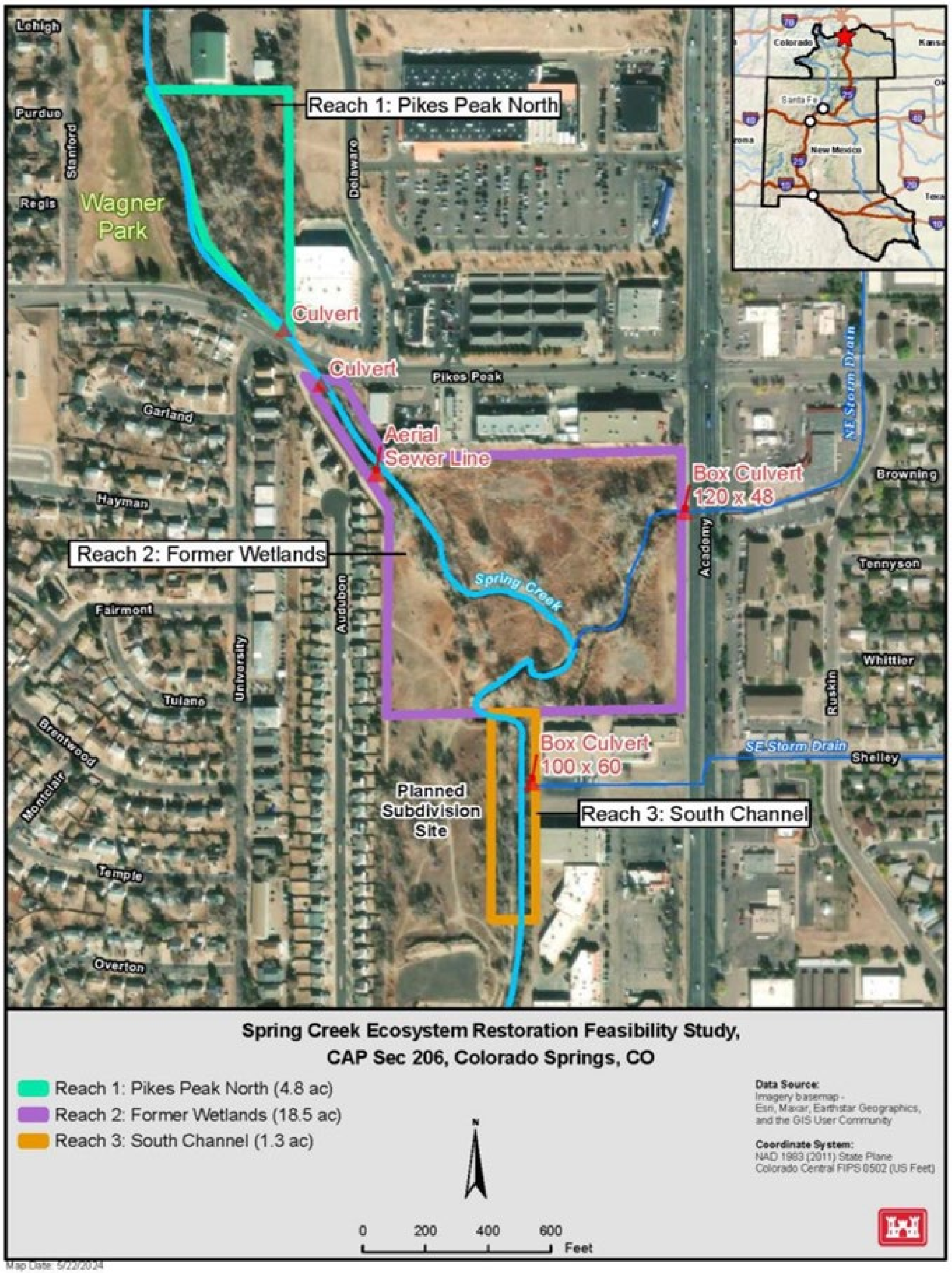


Figure 2: Spring Creek Ecosystem Restoration study reaches.

2.1 Historic and Existing Conditions

Spring Creek's headwaters are located in urban Colorado Springs. The defined stream channel runs approximately 4 miles, from just under half a mile upstream of the project area to its confluence with Fountain Creek (See Figure 10). Along the stream's course it transitions between a natural channel to various degrees of channelized, hardened, and culverted reaches. The stream conveys stormwater from urban development in the watershed which is one of the drivers of degradation of the stream. In several locations the stream corridor has been encroached on and straightened to accommodate development but remains an open earthen channel for over 3.4 miles of its length.

The Spring Creek basin slope ranges from 0.5% to 4.0% with most slopes being near 1%. The soil type is mostly variations of sandy soils that are well drained and are susceptible to both wind and water erosion in disturbed areas. The entire Spring Creek basin is underlain by bedrock consisting of the Pierre Shale and active seepage areas have been known to exists in the study area (a nod to the name Spring Creek). Seepage areas are characterized by shallow groundwater conditions and/or seeps and springs which discharge at the ground surface (City of Colorado Springs, 1993).

Historically, a mosaic of marsh, willow and cottonwood forests have existed along the stream channel since at least the 1940's with the most mature occurring in expansive floodplains. Herbaceous and emergent wetlands have historically been found along the Spring Creek corridor along with riparian grasslands. (City of Colorado Springs, 1993)

Reach 1 – Pikes Peak North is approximately 4.8 acres. The site is wooded with a steep 25ft bank down to Spring Creek on the west side and a generally sloping bank to a natural bench with a continued slope up on the east side. Spring Creek flows through a box culvert under Pikes Peak Avenue and then into Reach 2 – Former Wetland Site (Figure 3).

Figure 3: Box culvert on south end of Reach 1 under Pikes Peak Road. Image is taken facing south. Notice the steep bank on the right (west) side of the photo. (Date: 2022).

Reach 2 – Former Wetlands is approximately 18.5 acres. This land was previously owned by the Audubon Society and functioned as a wetlands bird sanctuary (Figure 4).

In 1982 this site was donated from the City of Colorado Spring to the Aiken Audubon Society, with dedication as a sanctuary (Figure 5). Nearby residents benefited from the undeveloped green space in an urban environment. Officially known as the Redwing Sanctuary, plans to utilize Reach 2 as a public space with stewardship opportunities for the community were discussed throughout the years, with no major projects passing conceptual phases (Hodges 2023, Foster-Bruder 2023, Campbell 2023).

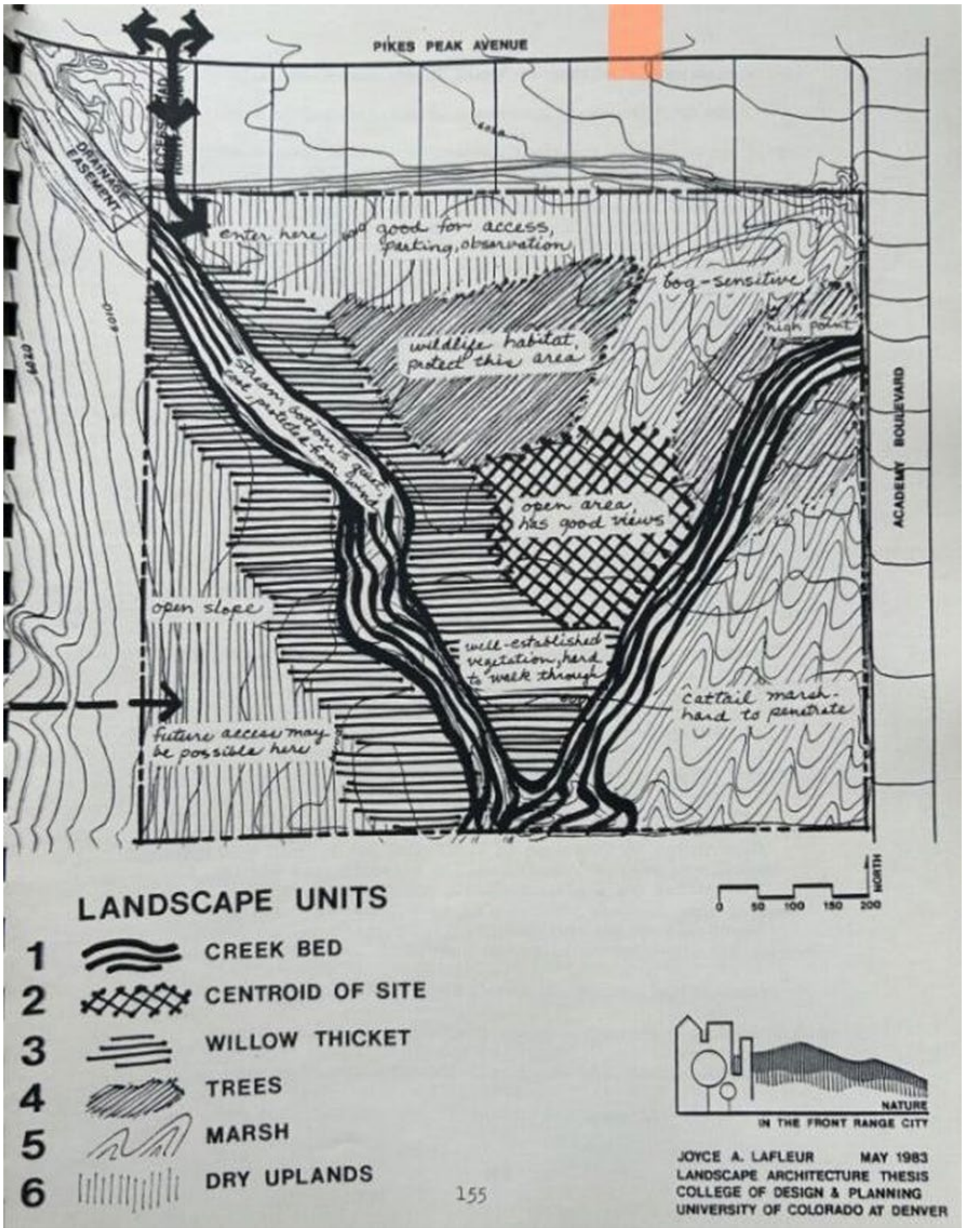


Figure 4: Approximate location of the former Audubon wetland site withing Reach 2 circa 1983. (Source: Lafleur, 1983)

Gazette
20 Jun 82

SPECIAL TO THE GT

NEARBY ESCAPE: Marshland at Academy Boulevard and Pikes Peak Avenue, donated to the Aiken Audubon Society, offers calm adjacent to the city's hustle.

Metropolitan marshland dedicated as a sanctuary

By Diane Wengler
GT Staff Writer

The only marshland located within a major metropolitan area in the United States will be dedicated as a sanctuary at 11 a.m. Monday at Academy Boulevard and Pikes Peak Avenue.

The 18-acre marsh, teeming with life, was a recent anonymous donation to the Aiken Audubon Society, said club president Stephen S. Campbell.

Campbell said the idea for the sanctuary came from Col. Phil Weinert, area engineer of the Army Corps of Engineers, who three years ago thought the land would make an ideal refuge. Weinert talked to Charles Campbell, then president of the Audubon Society, who then worked with the donor "to make sure the establishment of the refuge progressed smoothly."

Campbell said the society will establish guidelines for the public use of the marshland, which will be accessible by contacting officials at the Bear Creek Nature Center.

"It's a chance to get away and go to another kind of world," Campbell said. "We all lead stressful lives, and it good to get away to nature. We forget what life is really all about."

Future plans for the marsh include ecology tours for school children, fencing, signs and a boardwalk, Campbell said. Initial costs for improvements are expected to be at least $40,000.

Figure 5: Clipping of newspaper article showing the dedication of Reach 2 as a bird sanctuary in 1982. Source: Gazette clipping from Hodges 2023)

At one point, the Aiken Audubon Society constructed an observation tower on Reach 2 (Figure 6). However, this was removed when it became nonfunctional due to vandalism (Foster-Bruder 2023). During the early years of the Redwing Sanctuary, the Aiken

Audubon Society led monthly field trips, school groups and colleges conducted site visits, and the Boy and Girl Scouts of America frequented the area (Hodges 2023, Foster Bruder 2023, Campbell 2023).

Historically the former wetland site was dominated by sandbar willow, Baltic rush, three square and hairy sedge. Mallards, House Sparrows, Red-tailed Hawk, deer, racoons, and beavers have been observed in Reach 2 (Foster-Bruder 2023). These conditions indicate that the site maintained persistent surface and groundwater saturation, supporting the development of emergent wetland vegetation and associated habitat functions.

Figure 6: Former observation tower constructed by Aiken Audubon Society. (Source: Hodges 2023)

Over a 5-year period in the early 2000's, the stream began to experience persistent head cutting2[2], which led to the degradation of the system's hydrologic and ecologic function. As incision deepened the channel, the stream became increasingly disconnected from its floodplain, resulting in the lowering of the local water table and preventing recolonization by wetland plant species. Once the wetland vegetation communities died back, bank and soil stability were reduced which made the channel more vulnerable to erosion. Although head- cutting and stream incision can occur naturally, the rate, extent and persistence of the type of head-cutting occurring at Spring Creek is a clear indicator of anthropogenic influence and strongly tied to the hydrologic and geomorphic impacts of urbanization within the watershed. The interaction between altered hydrology from urbanization, physical changes to the channel, feedback from vegetation loss, and possibly the loss of ecological engineers (e. g. beaver) likely created a feedback loop that perpetuated channel incision and hydrologic disconnection into floodplain areas.

[2] Head cutting, in the context of stream channel erosion, refers to the process where a stream's bed erodes, creating a steeper, often vertical, drop in the streambed. This drop, known as a headcut, then migrates upstream as the stream continues to erode the surrounding area.

Over time, the site experienced a shift in wetland classification (i. e. based on the U.S Fish and Wildlife Service (USFWS) Cowardin Classification System) (Cowardin et al. 1979) from a Riverine Emergent wetland dominated by hydrophytic vegetation and saturated soils, towards an upland/riparian system with a mix of grassland and riparian corridor dominated by woody vegetation, especially shrubs and young trees. Subsequently, in 2010 the property was transferred to the City of Colorado Springs.

Currently, the stream within Reach 2 consists of a single incised channel with steep or nearly vertical banks, that are not connected to the former wetland and overbank areas (Figure 7). Riparian overstory trees along the streambank are vulnerable to bank erosion with large cottonwoods are being undercut and are showing signs of toppling. The existing box culvert at the northern end of the reach where the stream crosses under Pikes Peak Ave. acts as a grade control structure (See Figure 3). As-built plans for this culvert were provided by the Sponsor.

Figure 7: Photos of Reach 2 showing the stream incision. (Date: 2022)

There is a second box culvert that channels urban wasted water (runoff from residential, municipal and industrial parcels) into the site from the east (See Figure 2 for location relevant to Reach 2; Figure 8). Sections 5.4 and 5.5 cover waste and water quality.

The extent of riparian habitat in the study area has degraded, confining most riparian herbaceous and shrub species to the immediate streambank. Overstory trees have persisted at the site and have become established in the former wetland area.

Figure 8: Box culvert on east side of Reach 2.
Water consists mainly of urban wasted water. (Date: 2022)

Reach 3 – South Channel is approximately 2.2 acres. This narrow strip of land consists mainly of the channelized stream, with some overstory trees but mostly shrubs. The banks have been hardened with concrete. The concrete structure is failing in some areas along the channel and has sloughed off into the channel (Figure 9). Urban wastewater enters Spring Creek in this reach from the east through a box culvert (See Figure 2 for location relevant to Reach 3).

Figure 9: Reach 3 - South Channel image showing the hardening structures along the bank and a piece that has fallen into the stream channel. (Date: Aug 2022).

The current baseline condition of the Spring Creek Ecosystem Restoration study site is typical of an urban stream. Channelization, rerouting of drainage, invasive species flourishing, increased debris and trash, increased impervious surface, and increased stream incision have all led to a greatly modified, low-/non-functioning stream channel. There have been decreases in water quality due to increased temperature and runoff containing pollutants from point-sources and non-point sources.

The Fountain Creek riparian corridor, including its tributaries like Spring Creek, supports important migratory habitats (e. g. marshes, riparian groves, and dense thickets) that are critical for eastern migrants, raptors, riparian breeders, and waterbirds including rails, wading birds, and waterfowl. Given the ecological importance of riparian corridors within urbanized landscapes and the relative scarcity of this habitat type in El Paso County, Colorado, the habitats in Spring Creek that support species such as the Bald Eagle (*Haliaeetus leucocephalus*), Golden Eagle (*Aquila chrysaetos*), and migratory shorebirds including the Eastern Black Rail (*Laterallus jamaicensis jamaicensis*), Piping Plover (*Charadrius melodus*), Lesser Yellowlegs (*Tringa flavipes*), Grebes (*Aechmophorus* spp.), and other associated wading birds and waterfowl, are classified as Resource Category 4 under the USFWS Mitigation Policy (46 FR 7644–7663).

Resource Category 4 designates these habitats as having medium to low value, with a mitigation goal to minimize the loss of habitat value.

In contrast, for other migratory birds—particularly small to medium-sized riparian and upland species such as the Red-headed Woodpecker (*Melanerpes lewis*), Grasshopper Sparrow (*Ammodramus savannarum perpallidus*), Broad-tailed Hummingbird (*Selasphorus platycercus*), and Chimney Swift (*Chaetura pelagica*)—the habitats within Spring Creek are classified as Resource Category 3. This category applies to habitats of high to medium value, which are relatively abundant at the national level. The associated mitigation objective is no net loss of habitat value, with an emphasis on minimizing the loss of such habitat.

The proposed restoration strategy at Spring Creek includes bank stabilization, terrace regrading, invasive species removal, native riparian plantings, and improvements to water quality, quantity, and distribution would provide substantial ecological benefits to a wide range of migratory and resident bird species. Stabilizing streambanks would reduce erosion and sedimentation, resulting in improved water clarity and more stable shorelines, which are essential for water-dependent species such as grebes, rails, waterfowl, and wading birds. Regarding high terraces would enhance floodplain connectivity, promoting natural hydrologic regimes that support the development of diverse riparian vegetation communities and microhabitats, benefitting ground-nesting and insectivorous species such as the Grasshopper Sparrow and Red-headed woodpecker. The removal of invasive species would restore native plant dominance, improving habitat structure, food availability, and nesting opportunities across multiple trophic levels. Riparian vegetation plantings, including native flowering, seed-producing species, and other species that provide nesting structures, would produce critical resources for hummingbirds, sparrows, and other songbirds while supporting the establishment of cover and foraging habitat for waterbirds. Enhancing the quality and distribution of surface water would increase wetland extent and hydroperiod duration, directly supporting shallow water foraging and nesting habitat for priority shorebirds like the Eastern Black Rail and Piping Plover. Collectively, these measures would improve the overall ecological function and resilience of the riparian corridor, supporting migratory stopover use, breeding success, and long-term habitat value in a region where high-quality riparian habitat is increasingly limited.

2.2 Conceptual Ecological Model

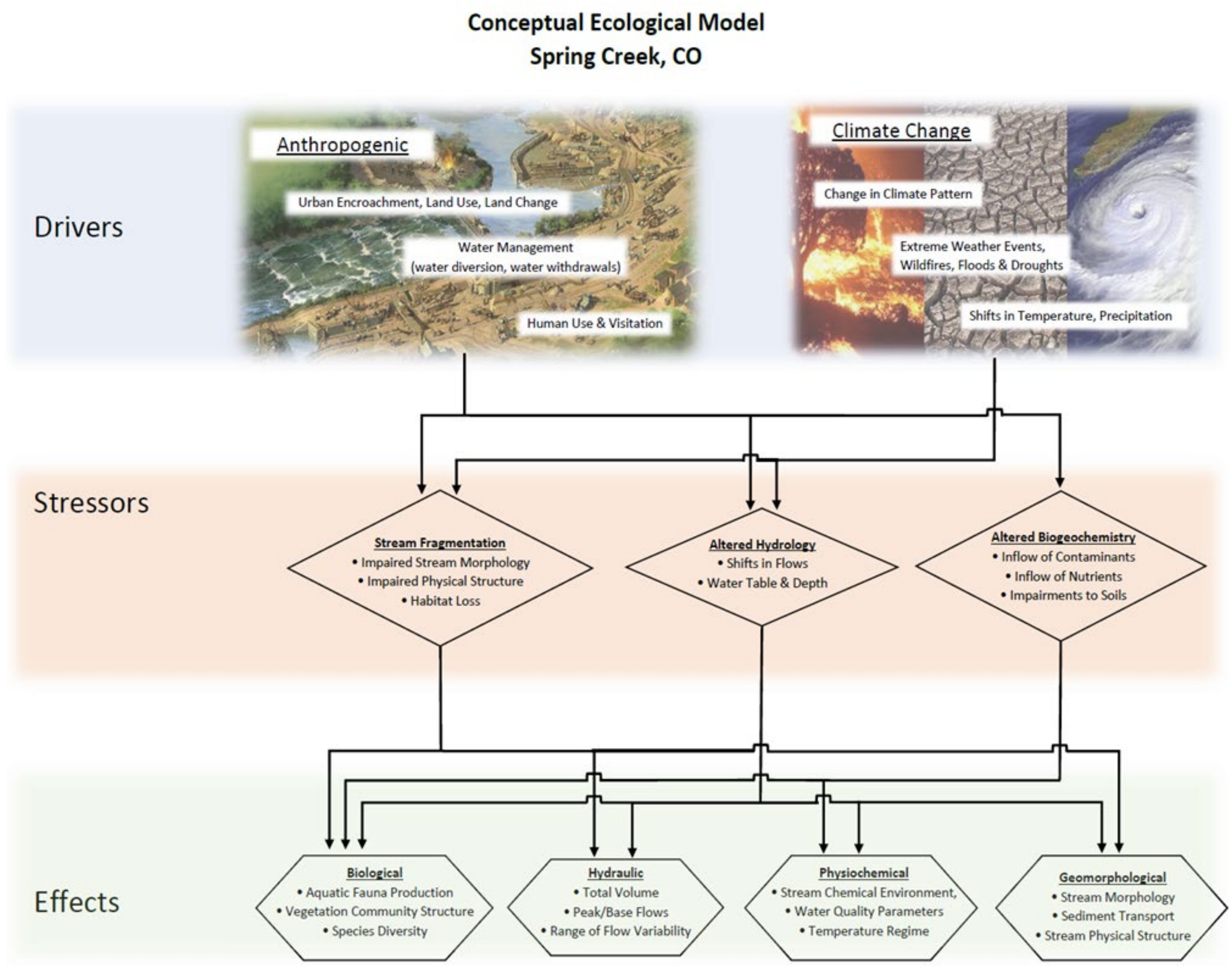
Conceptual Ecological Models (CEMs) as used in many restoration programs, as planning tools to guide and focus scientific support. The role of the CEM is to provide a framework for organizing interconnected components of the Spring Creek system, with the goal of building an understanding hypothesized linkages that explain major anthropogenically-driven alterations to the system. Identified within are specific stressors on the natural system, ecological effects of these stressors, and recommended biological and ecological attributes of the natural systems that can best serve as indicators of restoration. These are non-quantifiable ecological linkages between a stressor and a key attribute of the natural system that has been altered due to effects of that stressor.

The ecological condition of small urban streams in Colorado Springs is strongly influenced by external drivers, most notably the expansion of urban development and the associated land use changes that compress and fragment natural stream corridors. These pressures are compounded by water management activities such as diversions and withdrawals that alter natural flow regimes, while intense and frequent human use further degrades ecological integrity. Overlaying these influences is the broad-scale driver of climate change, expressed locally through shifts in temperature, precipitation, and the occurrence of extreme floods and droughts that strain both aquatic and riparian systems (Lukas et al. 2014; Mohoney et al. 2018; Frankson et al. 2022).

These drivers manifest as a set of stressors acting directly on the stream and floodplain environment. Impermeable surfaces and stormwater conveyance systems funnel contaminants and nutrient loads into the channel, disrupting water quality and biogeochemistry. Streamside habitats are lost and fragmented, opening space for invasive species to establish and displace native flora. Soil disturbance and altered hydrology further destabilize the system, lowering water tables, changing flow depth, timing, distribution and disrupting the seasonal cues necessary for riparian vegetation recruitment and persistence.

The accumulation of stressors produces a cascade of ecological effects. Aquatic fauna decline, with the loss of keystone species such as beaver that once enhanced habitat complexity and floodplain connectivity. The natural supply of woody debris and detritus diminishes, further reducing structural cover and food-web support. Vegetation dynamics shift toward less resilient communities, with riparian specialists replaced by upland generalists. Sediment transport regimes become impaired, soils oxidize and destabilize, and streams experience progressive erosion, incision, and channelization. The net result is a disconnected floodplain with fewer saturated soils, reducing opportunities for natural regeneration and ecosystem resilience (Hauer et al. 2016).

The degradation of these ecological processes ultimately compromises key ecological attributes that define stream health. Water chemistry and quality decline due to persistent inflows of urban contaminants. The productivity and diversity of aquatic communities are diminished, with simplified food webs and reduced habitat support. The riparian corridor loses its mosaic structure and complexity, undermining both biodiversity and ecological functions. Finally, the stream’s flow regime, morphology, and stability become altered, limiting the system's capacity to buffer disturbances and sustain long-term ecological and social values.



2.2.1 The next 50 Years (Future without Project Conditions)

There are no current plans known that aim to restore or further develop the study site. It is reasonable to assume that if this project is not implemented, the City of Colorado Springs would continue to manage the study area in the manner that it is currently managed.

In the future without project condition, flow conditions for Spring Creek would remain the same as present or reduce in volume due to changing conditions (Appendix A). Over the 50-year period of analysis, the channel is expected to continue to incise to the point of reaching bedrock, as has happened in Reach 1. In the "Future Without Project" (FWOP) scenario, the three reaches of the stream corridor are projected to undergo significant ecological, hydrologic, and geomorphic degradation over the next 50 years, with each reach facing distinct challenges. Reach 1, or "Pikes Peak North," will continue to experience severe channel incision, deepening the entrenched stream and further disconnecting it from its floodplain. This will exacerbate bank erosion, hinder sediment deposition, and reduce the quality of riparian habitats, favoring invasive species over native vegetation. The hydrologic regime will remain impaired, further limiting the ecological function of the site and degrading water quality. Reach 2, "Former Wetlands," once a vibrant bird sanctuary, will deteriorate into a fragmented riparian grassland. As the channel continues to erode and the floodplain disconnects from the stream, wetland vegetation will vanish, and invasive species will spread. Soil compaction and poor hydrologic conditions will further degrade the ecosystem, leaving the area with limited habitat value and reduced biodiversity. Reach 3, the "South Channel," will face continued erosion, physical instability, and the degradation of its artificial grade controls, exacerbating high-velocity flows and limiting sediment transport and deposition. The lack of floodplain connectivity and reduced vegetative complexity will diminish the site's capacity to support healthy aquatic and riparian communities. Over time, all three reaches will evolve into highly altered, degraded corridors with limited ecological function, reduced habitat quality, and diminished resilience.

3 POOCS

This section presents results of the first step of the planning process, the specification of water and related land resources problems, needs and opportunities in the study area. This section also establishes the planning objectives and constraints, which are the basis for formulation of alternative plans.

The need for the proposed Federal action arises from the significant degradation of natural ecosystem structures and processes that sustain ecological functions1 of the watershed as described in Section 2.2 of this report. Ecosystem structure and function provide various ecosystem goods and services of value to humans such as fish for recreational or commercial use, clean water to swim in or drink, and various esthetic qualities (EP 1105-2-70).

The purpose for the proposed Federal action is to work within the defined study area to enact solutions within USACE's authority to restore ecosystem process, structure, and function in the aquatic environment by addressing the problems identified during the feasibility study.

Restoration of ecosystem structures, functions, and processes would benefit nationally and regionally significant resources in the study area (see Section 2.4).

3.1 Problems, Opportunities, Objectives and Constraints

The problems, opportunities, objectives, and constraints are discussed in how they relate to the ecosystem's structure, processes, and function. An ecosystem's structure includes its topography and physical features such as soils and hydrology and vegetation; ecosystem processes are the physical, chemical and biological actions or events that link organisms and their environment; and ecosystem function is the capacity of natural structure and processes to provide goods and services that satisfy human needs, either directly or indirectly, for example clean water or habitat for wildlife species valued by people.

3.1.1 Problems

The primary problem this study addresses is ecosystem degradation along Spring Creek. Alteration of the environment and encroachment on the floodplain by human-made structures have degraded and continue to affect natural ecosystem structures, functions, and processes necessary to support fish and wildlife habitat along Spring Creek.

Since the arrival of European and American settlers in the 1800s, human activities have altered the watershed's hydraulic and geomorphic processes and reduced the area's ecological resources. Problems stemming from existing specific human impacts to the watershed that are the focus of this study include:

1. ***Problem 1 – Impervious Surface:*** Upstream development has reduced infiltration and increased local runoff and discharge through the study site, leading the stream to incise to accommodate the increased capacity.
2. ***Problem 2 – Disconnected Wetland:*** The incised channel has steep or nearly vertical banks, that are not connected to the former wetland and overbank areas.
3. ***Problem 3 – Degraded Aquatic and Riparian Habitat:*** There is degradation and loss of aquatic and riparian habitats due to morphological changes in the stream channel with most of the riparian herbaceous and shrub species confined to the immediate streambank.
4. ***Problem 4 – Invasive Species and Debris***: Increases in urban development and impervious surface near the study site has led to the recruitment and establishment of prolific invasive species. Preventing new stands of native species to developed or stopping their recruitment all together. Additionally, unregulated use and unguided/restricted access of the landscape has led to increased accumulation of debris and trash throughout the site.

The impacts outlined above have led to the degradation of ecosystem processes, structures, and functions in the study area.

3.1.2 Opportunities

This study recognizes an opportunity to enhance the Spring Creek's ecological functions, through restoring its structure and the ecological processes related to it. For example, increasing areas where water flows and is stored throughout the site would enhance ecosystem complexity and habitat value and increase the potential for improved water quality.

Opportunities to address problems for the study area include the following:

1. Restore wetland and riparian habitat with native plants for fish and wildlife including native fish, migratory birds, and amphibians; such habitat is scarce in this highly urbanized area.
2. Partner with the Sponsor on a project that is consistent with the larger community- supported regional objective to establish a wetland/stream corridor along Spring Creek.
3. Incorporate natural and nature-based features into alternatives.
4. A restored wetland on the Study Site would benefit the overall Fountain Creek Watershed through erosion control, sediment entrapment, nutrient cycling, groundwater recharge and water quality improvements.
5. Provide an outdoor experience within a highly urbanized area, that emphasizes the importance of wetland habitat in Colorado Springs and provides recreation opportunities for walking, birding, and connecting with nature.
6. Reduce flooding from storm events by reducing debris buildup on road culverts and lowering flow velocities in the project area.

This project has a rare opportunity to create and preserve critical wetland habitat in a densely developed urban area. The project would create a habitat corridor for species of concern (e.g. migratory birds, pollinator species, aquatic invertebrates, amphibians). Just south of the study area, approximately 1.2 miles of its length Spring Creek flows through and adjacent to the Valley Hi Golf Course (Figure 10). There is an approximately 19-acre wetland between the stream and the golf course that is hydraulically connected to the stream by a backwater (side) channel. The open space offered by the golf course provides additional habitat for wildlife and adds to the habitat corridor effect the stream exhibits. Downstream from Highway 24 culvert the stream flows adjacent to a 1.3-acre wetland connected to the stream by an overflow weir (Figure 10). The wetland was likely created as part of the highway construction. These wetlands and open space provide opportunity for aquatic, avian and terrestrial wildlife to travel along the stream corridor to and from the Fountain Creek corridor taking advantage of the associated riparian and wetland habitats. These southern wetland sites are not a part of this study, nor are they dependent upon it; they are mentioned for context because if this project is implemented, it would interact synergistically with those wetlands, increasing the length of available riparian habitat and each area's potential to benefit the environment. This is directly in line with a "systems planning" approach detailed in Section 3-3 of EP 1105-2-70.

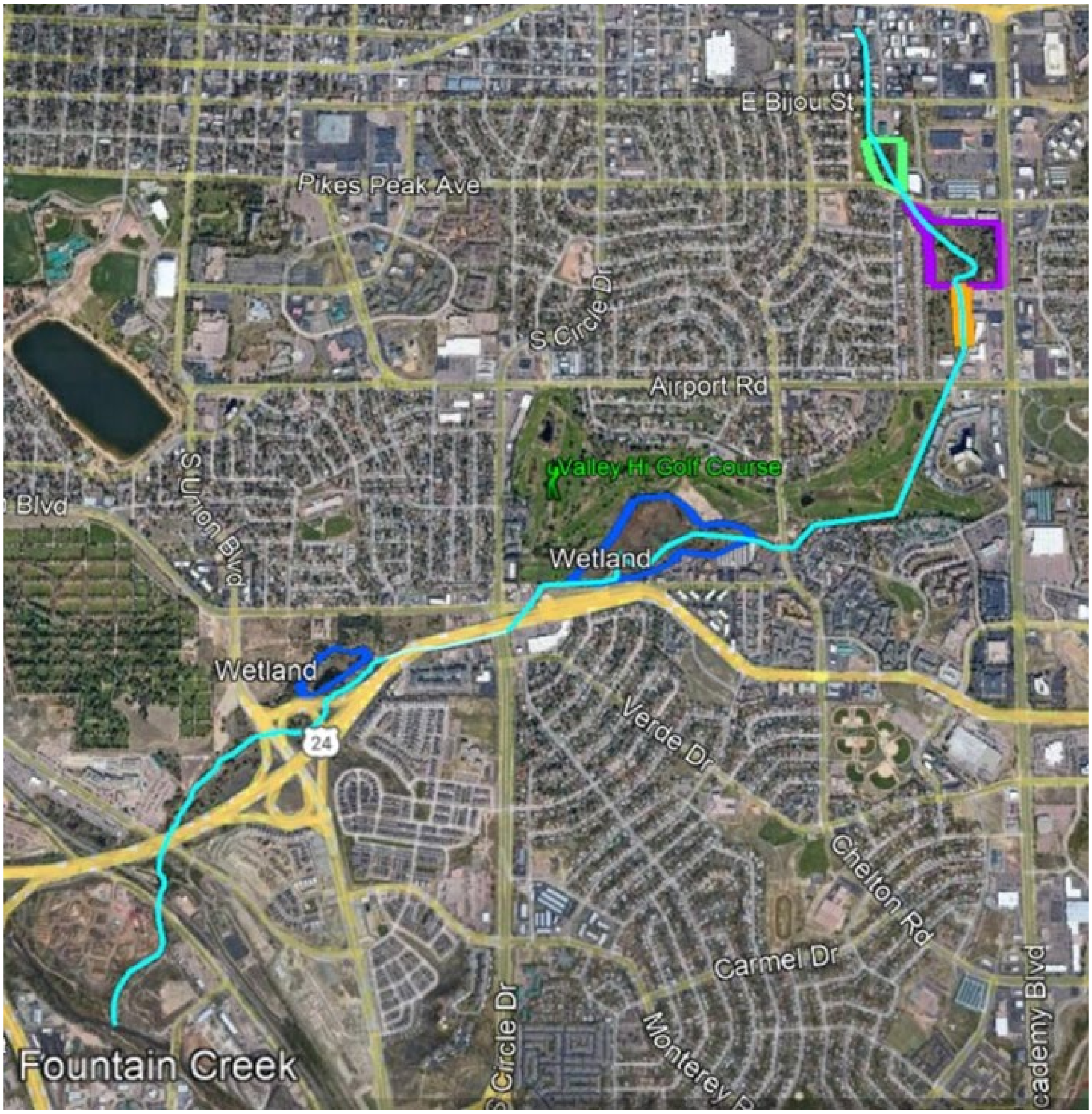


Figure 10 Spring Creek study area (green, purple, orange polygons) proximity to Valley Hi Golf Course and 19-acre wetland to the southwest and 1.3-acre wetland just north of confluence with Fountain Creek. Spring Creek is shown as a light blue line.

This project also represents an important opportunity to restore valuable wetlands and riparian habitat in an area with tremendous visibility. The local community is actively engaged and motivated to move forward with this restoration opportunity. Locals routinely walk the outer edge of the study area (opportunity to enhance recreation) and have participated in past trash pickup days within Reach 2 (opportunity to increase stewardship).

3.1.3 Objectives

The Federal objective in ecosystem restoration planning is to contribute to national ecosystem restoration. Contributions to national ecosystem restoration are increases in the net quantity and/or quality of desired improvements of structure, function, and services of ecosystem resources. “The objective of ecosystem restoration is to restore degraded ecosystem structure, function, and dynamic processes to a less degraded, more natural condition” (ER 1105-2-103). Ecosystem restoration aims to reverse the adverse impacts of human activity and restore ecological resources, including fish and wildlife habitat, to as close to previous levels as feasible, but not a higher level than would have existed under natural conditions in the absence of human activity. ER 1105-2-103 further identifies that “in urban settings, restoration of self- sustaining habitats that reflect historic conditions may be constrained by the significant large- scale modifications to the natural landscape. However, partial restoration may be possible, with significant and valuable improvements made to degraded ecological resources, including habitat features that support special status species, provide connectivity between natural areas for wildlife corridors, or help increase biodiversity in an area.”

Based on the problems identified in the study area, planning objectives include the following and consist of an effect, subject, location, and timing per EP 1105-2-70:

1. Improve the quality and increase the quantity and complexity of native riparian habitats within the entire study area over the study period of analysis of 50 years.
2. Reconnect and restore functioning native wetland habitats within Reach 2 of the study area over the period of analysis of 50 years.
3. Address past impacts and decrease future effects of urbanization on the entire study site over the study period of analysis of 50 years.
4. Contribute to the overall function of Spring Creek corridor over the study period of analysis of 50 years.

Table 2 shows the identified problems in the study area and objectives that address them. The period of analysis for this study is the 50-year period from 2025 to 2075.

Table 2 Restoration Objectives and the problems they address.

	PROBLEMS IN THE STUDY AREA			
OBJECTIVES	Problem 1: Impervious Surface	Problem 2: Disconnected Wetlands	Problem 3: Degraded Habitat	Problem 4: Invasive Species and Debris
1		X	X	X
2		X	X	X
3	X	X	X	X
4	X	X	X	X

3.1.4 Constraints

Planning constraints are significant barriers or restrictions that limit the extent of the planning process. Study-specific planning constraints are statements of things unique to the specific planning study that alternative plans should avoid. The following constraints (i.e. limitations on the range of measures and alternatives that can be proposed) have been identified for the study:

1. No measure can lead to increased flood risks for critical public infrastructure or adjacent homes.
2. No measure can impact the aerial sewer infrastructure crossing within Reach 2 (See Figure 2).

3.2 Resource Significance – Technical, Institutional, Public

This ecosystem restoration project is designed towards achieving a positive impact on significant ecosystem resources. The Spring Creek system provides an opportunity to restore a natural ecological system within a highly urbanized area and address the purpose and needs that are described in Section 1.5. The restoration of resources is significant for several reasons, spanning technical, institution, and public domains as described in the following sections.

Table 3 summarizes the technical, institutional, and public significance of the resources proposed for restoration.

Table 3: Technical, Institutional, and Public Significance.

Technical Significance	Institutional Significance	Public Significance
• Wetlands are a scarce resource in the Intermountain West. • Riparian and wetland areas face extreme degradation in urban environments. • Aquatic species, riparian-dependent species, and migrating waterfowl and passerines depend on scarce wetland habitat. • Opportunity exists to create a more connected habitat corridor along Spring Creek	• Fountain Creek Corridor Restoration Master Plan • Colorado Wetland Program Plan, 2020 – 2024 • Colorado 2023 State Water Plan • Colorado State Wildlife Action Plan 2015 • Endangered Species Act • Migratory Bird Treaty Act • North American Waterfowl Management Plan	• Enhance the Colorado Springs Public Parks system, including Wagner Park, through natural, healthy, riparian areas. • Reconnect previous community engagement with the site that included bird watching, hiking, and enjoying nature. • Build aquatic ecosystem stewardship in school age children through the City's water quality monitoring efforts that relies on students to visit stream sites.

3.2.1 Technical Significance

Technical significance of the resources proposed for restoration in the study area is supported by the fact that this restoration not only repairs a damaged aquatic ecosystem, but it also enhances the services that ecosystem provides. The degraded wetland and riparian habitats at the project site could support these ecological resources. Scarcity of such wetland resources is demonstrated by the fact that from the 1780's to the 1980's, wetland area in Colorado decreased by an estimated 50% from about 2 million to about 1 million acres (USFWS 1993).

In many areas of the Intermountain West, more than 80% of wildlife species depend on wetland and riparian areas at some point during their life cycle, therefore such riparian/riverine habitats are projected to increase biodiversity. The restoration of regionally rare wetland habitats would greatly benefit the increasingly scarce species of native amphibians, fish and reptiles, as well as riparian-dependent species, pollinators, and migrating birds, waterfowl and passerines would benefit from restoration of regionally rare wetland habitat (Azous, 2001). In arid climates like Colorado, where evaporation often exceeds precipitation, wetlands and riparian areas are irreplaceable habitats for vast numbers of resident and migratory waterfowl, shorebirds, wading birds, cranes, and raptors that either breed or stopover in wetlands during migration (CSU 2021).

Stream channels and wetlands in urban settings face unique challenges that include the ever- encroaching impervious surfaces associated with buildings, parking lots, roads, and sidewalks. This drastically changes the hydrology of the system and leads to degradation that in many cases cannot be reversed without further intervention, such as this ecosystem restoration study.

This study has the opportunity to set the foundation for stream and wetland corridor establishments along Spring Creek. This is of major technical significance. As mentioned in EP 1105-2-70, “often, rivers, waterways, and riparian forests serve as highly functional habitat corridors, and aquatic ecosystems inherently serve a connective function to other waterways and terrestrial landscapes.” The potential corridor would include, from north to south, the Spring Creek Sec 206 study area, the 19-acre wetland to the south, and the 1.3-acre wetland downstream of the Highway 24 culvert (See Section 2.3.2 for more details about this potential corridor).

Wetlands and channel connectivity in the area provide ecological functions including rearing and resting sites for aquatic and upland species, natural drainage, storage areas for floodwater, and water purification functions through natural filtration and sediment capture. The Fountain Creek Watershed associated with Spring Creek would derive a wide array of ancillary benefits from this project, making it a valuable investment for environmental sustainability, changing conditions adaptations, and human well-being.

3.2.2 Institutional Significance

Institutional significance of the resources proposed for restoration in the study area is supported by recommendations within the Fountain Creek Corridor Restoration Master Plan. In 2008, the goals for the Fountain Creek Corridor Restoration Master Plan were formulated in a series of meetings with the Fountain Creek Vision Task Force. The Master Plan identifies projects and a toolbox of restoration techniques that could improve watershed health:

1. Reduce erosion, sedimentation and flooding and improve water quality.
2. Create stable riparian and wetland ecosystems to attract and support native wildlife and vegetation.
3. Sustain productive agricultural lands along the corridor.
4. Develop a trail from Colorado Springs to Pueblo with recreational and educational opportunities.
5. Gain public and private support through partnerships to facilitate implementation and future funding.

The proposed restoration fits well within the goals of the Master Plan and would contribute to and benefit from the other restoration efforts underway in the watershed.

Institutional significance is also demonstrated by the project's alignment with the goals set forth in the Colorado Wetland Program Plan, 2020 – 2024 (CWPP; Marshall and Lemly 2020). The CWPP was developed by the Colorado Natural Heritage Program through grant funding from the EPA Region 8 Wetland Program Development Grant (CD-96852401). Aquatic ecosystem restoration within the study site help meet the following CWPP goals:

1. Protect and restore healthy, functioning wetlands and riparian areas through conservation, restoration, and adaptive management in the context of a changing climate.
2. Protect and restore Colorado's existing wetland areas, and the ecological functions and services they provide.
3. Support and enable public and private partners working to conserve and restore wetlands across Colorado.

Colorado's State Wildlife Action Plan (SWAP; Colorado Parks and Wildlife 2015), identifies the State's priorities for conserving wildlife species and habitats. Riparian and Wetland Habitats and Aquatic Habitats are identified as key habitats. Riparian woodlands and shrublands provide habitat for 26 Species of Greatest Conservation Need (SGCNs) including the federally listed Southwestern willow flycatcher (*Empidonax traillii extimus* - federally endangered), Yellow-billed cuckoo (*Coccyzus americanus* - federally threatened), and Preble's meadow jumping mouse (*Zapus hudsonius preblei* - federally threatened). Wetlands support 53 SGCNs throughout Colorado (CPW 2015); SGCNs that could be supported by emergent wetlands restored at Spring Creek might include amphibians (Northern or Plains leopard frog, Great Plains narrow mouth toad, Blanchard's cricket frog, Couch's spadefoot); birds (American bittern, long-billed curlew) and several insects.

Spring Creek is included in the SWAP's Eastern Plains Streams habitat category, which includes the tributaries to the big rivers of Colorado's eastern plains such as the Arkansas River. These streams provide primary habitat for 44 SGCNs (CPW 2015).

SGCNs found in Arkansas River headwaters streams include the state-threatened Arkansas Darter, state-endangered Plains minnow, and SGCN Southern redbelly dace.

The project aligns with institutional significance as codified in the Endangered Species Act and Migratory Bird Treaty Act (MBTA). The riparian, wetland and aquatic habitats described above, as restored by the Spring Creek 206 project, could provide migration stopover habitat for Southwestern willow flycatcher and Yellow-billed cuckoo. The mobility of avian species could allow for incidental or migratory occurrences of these or other federally listed avian species and MBTA protected species throughout the Spring Creek project footprint.

The historical range of Preble's meadow jumping mouse (federally threatened) included the headwaters of the Arkansas River, and Colorado Springs marks the species' southern distributional limits (USFWS 2018). The species is confined to riparian systems along the Front Range and while it has not been detected at Spring Creek, the project could restore suitable habitat.

Institutional significance is further demonstrated by the project's alignment with the values that guide the Colorado 2023 State Water Plan (CWCB, 2023). These values are:

1. A productive economy that supports vibrant, sustainable cities, agriculture, recreation, and tourism.
2. An efficient and effective water infrastructure system.
3. A strong environment with healthy watersheds, rivers, streams, and wildlife.
4. An informed public with creative, forward-thinking solutions that are sustainable and resilient to changing conditions and result in strong, equitable communities that can adapt and thrive in the face of adversity.

Finally, USACE policy strongly emphasizes the significance of wetlands. The 22 March 2024 SACW memorandum "*Civil Works Actions to Sustain and Advance the Nation's Waters and Wetlands After the Sackett Decision*" states,

> "All our Nation's waters and wetlands are valuable resources, regardless of jurisdictional status under the [Clean Water] Act."

This memorandum directs USACE, in carrying out its Civil Works missions, to use applicable authorities and available resources to engage in specific actions to protect, restore, and enhance our Nation's waters and wetlands.

> "The Corps will seek to increase support for Ecosystem Restoration projects, including those under Section 206 of the Continuing Authorities Program (CAP), through both project and budget development."

Wetlands, streams and riparian zones are significant in an institutional perspective because they represent a unique and rare resource. A resource becomes significant when it has a material bearing on the decision-making process (Skaggs, 2010). It may be covered by law or experts may have good scientific reason to consider the resource a priority or perhaps it could simply hold high degree of societal value and receives community support. The significance of a resource is often recognized in law, plans, policy statements, Tribes and private groups. The institutional significance of a project such as Spring Creek represents the legal frameworks that construct a restoration plan and the structures and contractual agreements that conserve assets and enable value generation. Such concepts of institutional value intertwine with other perspectives, creating opportunities for positive alignments between ecological restoration, societal values, and law (Jepson et al. 2017). The significance of the institutional value can also be demonstrated by the way which drives the imaged order that characterize, structure and shape societies.

The proposed actions related to the Spring Creek project are expected to generate benefits that would contribute to the overall Fountain Creek watershed, thus falling in direct alignment with Fountain Creek Corridor Plan. Similarly, Spring Creek restoration supports the Colorado State Wildlife Action Plan (SWAP), which identifies the State's priorities for conserving wildlife species and key habitats (e. g., Riparian, aquatic and wetland habitats).

The proposed restoration action in Spring Creek is expected to provide conditions that could increase the potential for habitat for Species of Greatest Conservation Needs (SGCN) including the federally listed Southwester willow flycatcher, Yellow-billed cuckoo, and Preble's Meadow Jumping mouse. The ecological lift expected from restoration action could support the Endangered Species Act, the Migratory Bird Treaty Act, the Bald and Golden Eagle Protection Act, the North American Waterfowl Management Plan, Executive Order No. 13186 and other federal law on natural resources.

Spring Creek also generates a significant and unique value from the institutional perspective. The legal frameworks that make up partnerships and decision-making structures are often driven by a collection of professionals making up the Human Asset of the institution. These are often a group of people (e. g., technical staff, volunteers, researchers, naturalists) who have knowledge and skills that enable the success of the institution. Similarly, the Infrastructure Asset of the institution, such as facilities that could be constructed (e. g., public access, boardwalk, viewing areas, public utilities) in, around or to Spring Creek that enable value generation and capture of heritage and a sense of ownership over this publicly accessible area. Spring Creek can become a common place for many uses (i. e., place to conduct research, or a place for recreation) and the above assets support the institutional significance which can lead to long-term narratives and a positive public identity of Spring Creek.

3.2.3 Public Significance

Members of the public have recognized the significance of the study site's resources both formally and informally.

Historically, this site was a thriving Audubon wetland site (See Section 2.1 for historical conditions of Reach 2), regularly visited and used to encourage stewardship of our natural places and wildlife. The local Audubon Society has shared historical information on the site, helped with public involvement efforts, and has shown an overall excitement for the Study.

Prior to the start of the study in 2021, the City held a trash pickup day at the site and collected over 80 tons of trash. In September 2023 the City once again held a trash pickup day, in partnership with the Creek Week organization, at the Study Site that doubled as a public outreach event. This event included participation from the United States Space Force, the Trails and Open Space Coalition, a local congressional member, and members of the local Audubon Society chapter, as well as community members from neighboring properties.

This study site holds public significance as a potential site for future Creek Week activities. Colorado Springs has several programs that help the public engage with their city's streams. This includes the Creek Week effort mentioned in the previous paragraph, and also a water quality monitoring program that includes the help of school age children. Nearby to the study site, the James Monroe Elementary School has expressed interest in using Spring Creek as a new water quality monitoring location if the study moves forward to construction.

Wagner Park, located west of Reach 1, is already loved by the community and frequently visited (See Figure 2 for the location of Wagner Park relevant to Reach 1). Completion of this restoration project would create a space where people can recreate beside a natural ecosystem within a highly urbanized area. Natural areas in this part of Colorado Springs are minimal with this site holding the potential to be the largest natural habitat within an otherwise highly urbanized area (Figure 11).

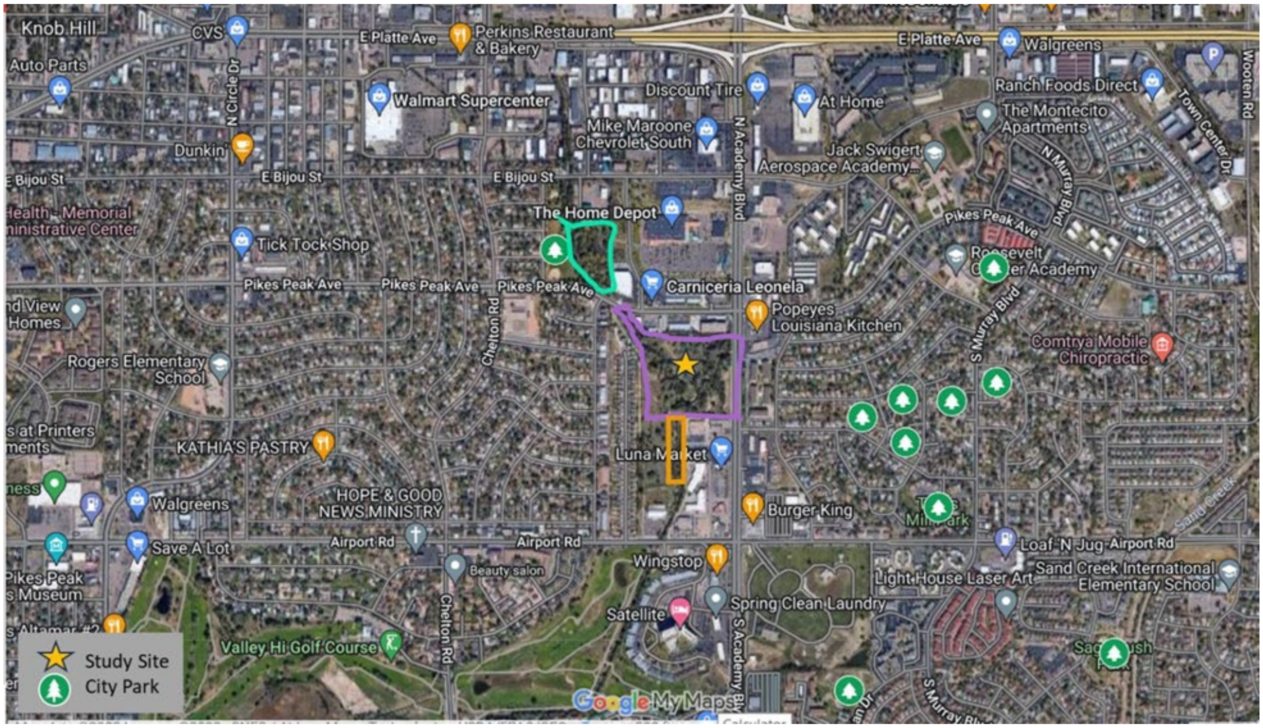


Figure 11: Map showing that the Study Area is the only "natural" area in a highly urbanized area of Colorado Springs.

3.3 Need for Action

USACE proposes to implement wetland and riparian stream ecosystem restoration within the study area along Spring Creek. The proposed federal (USACE) action would occur within the study area and aligns with the Sponsor's vision to establish a stream corridor along Spring Creek and support the greater plan for the Fountain Creek watershed to "create a healthy waterway with appropriate erosion, sedimentation, and flooding that supports diverse economic, environmental, and recreational interests" (FCVTF, 2009).

There is a need to restore and establish a functioning ecological system within a highly urbanized area. Significant wetland resources have declined to a point that the wetland ecosystem is not self-sustaining. Without intervention the wetland and riparian species in the area would degrade further leading to potential extirpation. The proposed federal action was developed to fulfill the project's purpose, and therefore directly reflects it. The project purpose serves as the foundational rationale guiding the design and justification of the federal action. USACE has the unique opportunity to address both ecological and social challenges in the study area by restoring aquatic and riparian habitat, their structure, composition and function, while also enhancing the site's heritage and community value as a green space within a rapidly urbanizing environment.

4 Plan Formulation

The guidance for conducting civil works planning studies requires the systematic formulation of alternative plans that contribute to the Federal objective. To ensure that sound decisions are made with respect to development of alternatives and ultimately with respect to plan selection, the plan formulation process requires a systematic and repeatable approach. This Section presents the results of the plan formulation process. Alternatives were developed in consideration of study area problems and opportunities as well as study objectives and constraints with respect to the four evaluation criteria described in the Principles and Guidelines (completeness, effectiveness, efficiency, and acceptability). Figure 12 presents a summary of the plan formulation process that will be presented throughout this Section.

Figure 12: USACE Plan Formulation process and break down of measures to alternatives to tentatively selected plan for the Spring Creek Feasibility Study. The team started with 17 measures. Screened out 5 measures for a final total of 12 measures. The team started with an initial array of 25 alternatives. The team reduced this to a final array of 7 alternatives. The team chose 1 alternative as the tentatively selected plan.

4.1 Management Measures

USACE and the Sponsor, along with input from interested stakeholders, developed a series of measures to be considered as potential elements of the project solution. A management measure is a feature or activity at a site that addresses one or more of the planning objectives and is a discrete element of a recommended project solution.

The management measures developed for this study were aimed at improving the aquatic ecosystem through addressing the lack of wetland connectivity, removal of invasive plants, side channel connections, increasing channel complexity, increasing large woody debris, and restoring degraded riparian conditions. Management measures are presented here in four groups based on the following measure types:

- **Wetland Restoration**: Measures associated with this functional grouping are intended to provide benefits to the ecosystem through improvements in the quality and quantity of wetland vegetative conditions focused largely around wetland habitats. Benefits are delivered through increases in nutrient uptake, water quality and organic delivery to wetland communities within the footprint. Wetlands would ensure diverse habitat for food sources for amphibians, resident wildlife and food for reptiles and migratory birds during all seasons.
- **Riparian Restoration**: Measures associated with this functional grouping are intended to provide benefits to the ecosystem through improvements in the quality and quantity of riparian vegetation. Benefits are delivered through increases in nutrient delivery to Spring Creek (e.g. insect drop, litterfall), sustaining diverse habitat for food sources for wildlife and resident fish, and providing visual and thermal cover for migratory birds, small mammals, amphibians etc. during all seasons. Also, thermal cover (shading) of the stream provided by riparian vegetation would buffer water temperature increases induced by shifting climatic conditions at the planetary scale.
- **Channel Diversity**: Measures associated with this functional grouping are intended to provide benefits to the ecosystem through improvements in the quality and quantity of the aquatic habitats including associated bankline and substrate along Spring Creek. Benefits are delivered through increasing the variety of channel features by placing hydraulic structures (constructed rock riffles and in-stream boulders) within Spring Creek, which improve delivery of food sources for wildlife and resident fish and conditions appropriate for invertebrate populations as well as resident and migratory birds. In-stream cover and refuge habitat for all organisms is provided.
- **Public access measures**: Measures associated with this functional grouping are intended to ensure sustainability and long-term benefits to the restoration project. Measures focus on maximizing connectivity between the natural environment and humans within the footprint to enhance interpersonal connections and stewardship. Physical measures are intended to ensure sustainability of restoration features in light of on-going human presence, particularly for sensitive wetland and riparian plant communities.

A total of 17 management measures were identified during preliminary planning stages and are described below.

Wetland Restoration

1. ***Wetland Rehabilitation:*** This measure consists of the alteration or removal of soil/material in an area to revamp a depression that can reinstate as a functional wetland. This measure provides natural contours and microrelief, or subtle variations in elevation (associated habitat), conducive to the rehabilitation of habitat diversity within wetlands. The re-establishment of wetlands would be of varying size and location depending on alternative development. Re-establishing wetlands provides habitat for fish, wildlife, and plants and would also provide an increase in overall biodiversity.
2. ***Wetland Plantings:*** This measure consists of the establishment of new or improvement of existing wetland emergent plant communities along the stream corridor. Plant palette would emphasize species tolerant of extended inundation. This measure provides benefit by improving wetland habitat and function.
3. ***Beaver Dam Analog Structures:*** This measure consists of the construction of man-made structures designed to mimic the form and function of natural beaver dams. Bever dam analogs improve water quality by trapping sediment in the ponds created by their dams and by slowing water flows during monsoons. This measure is only feasible in Reach 2 due to the area needed to create the large wetland spaces behind and in between the beaver dam analog structures.
4. ***Small Grade Control Structures:*** This measure consists of the construction of several small grade control structures within Reach 2. The structures may be created from riprap, formed concrete, or a combination of riprap and concrete and are placed across the channel and anchored in the streambanks to provide a "hard point" in the streambed that resists the erosion forces of the degradational zone and maintains a streambed elevation. The structures would support varying wetland depths across Reach 2. Creating varying streambed and wetland depths across Reach 2 may be beneficial in a future that is hotter and drier because deeper pools could become a place of respite for organisms while more shallow locations dry up. Size, number, building material, and location of small grade control structures will depend on the Alternative design.
5. ***Large Drop/Grade Control Structure:*** This measure consists of building a large drop structure at the southern end of Reach 2 with the main purpose of raising the streambed to an elevation that supports a wetland within Reach 2. The structure may be created from riprap, formed concrete, or a combination of riprap and concrete and are placed across the channel and anchored in the streambanks to provide a "hard point" in the streambed that resists the erosion forces of the degradational zone and maintains a streambed elevation. The size, location, and building material will depend on the Alternative design.

<u>Riparian Restoration</u>

6. ***Invasive Species Removal:*** This measure consists of removal of invasive plant species from within established riparian zones either chemically, mechanically, or by hand. The measure provides benefit by reducing potential for continued expansion of vegetation considered to have little ecological value or is harmful to native wildlife. The expected benefits also include increased potential for native plant survival rate and expansion.
7. ***Riparian Planting:*** This measure consists of the installation of a diverse set of riparian plants along degraded riparian areas. Riparian Planting includes a diverse plant palette tailored to the specific needs of the site intended to provide both horizontal and vertical plant complexity. Species native to the Fountain Creek corridor would be used (Fountain Creek Corridor Restoration Master Plan, 2011, pp. 40-42) and would include shrubs, sedges and rushes, grasses, and flowering plants commonly found along the aquatic fringe of southwest creeks. Installation is generally conducted by hand either with potted plants or live stakes. The measure provides benefit by increasing the amount and diversity of riparian vegetation to facilitate high productivity riparian communities. It would improve shade, prey production, wildlife habitat, fisheries habitat, and it would serve as a source of allochthonous input (i.e. provision of nutrients from external sources) for valued native flora and fauna.
8. ***Overstory Planting:*** This measure consists of the installation of a diverse set of riparian overstory plants along degraded riparian areas. Species native to Fountain Creek watershed that would be used under this measure include Plains cottonwood, narrowleaf cottonwood, and peachleaf willow. Installation is generally conducted by hand either with potted plants or live stakes. The measure provides benefit by increasing the amount and diversity of riparian overstory vegetation to facilitate high productivity riparian communities. The measure provides benefit by improving shade, prey production, wildlife habitat, shade that benefits aquatic resources and native fishes, and would serve as a source of allochthonous input.
9. ***Bank Slope Modification:*** This measure consists of modifying the banks along Spring Creek to create more gradual slopes and or to meet the needs of creating a bench or a wetland. Slope modification would consist of varying size and degree based on Alternative development. The measure provides benefit by increasing the amount and diversity of riparian vegetation to facilitate high productivity riparian communities.
10. ***Riparian Bench Construction:*** This measure consists of creating benches within the riparian area of Spring Creek. Benches may be of varying size and elevation depending on the location and overall Alternative design. The benefits

of this measure are to increase the channel capacity during a flood event, create bank stability, and increase riparian habitat diversity.

11. ***Remove Bank Hardening:*** This measure consists of removing the concrete that lines the west bank of Reach 3. This would increase riparian plant diversity by opening up a concrete lined area to "natural" conditions. The extent of area where the bank hardening would be removed is dependent on the Alternative design.
12. ***Side-channel High-flow Attenuation Area:*** This measure consists of creating a side- channel that Spring Creek spills into once flows reach a certain elevation. The side- channel would flow into an attenuation area that holds the excess flows. The attenuation area has an outflow channel that joins the main stem prior to exiting Reach 1. This measure is only applicable to Reach 1. This would create a side-channel riparian area that would receive periodic inundation during high-flow events.
13. **Physical Exclusion:** This measure consists of the installation of signage and fencing at sensitive riparian and wetland areas within Reach 1 where the probability of human disturbance is high. The physical exclusion measure does not directly benefit the ecosystem, but rather prevents the degradation of, and accelerates the accrual of, benefits provided by other measures. Physical exclusion would reduce trampling and disturbance impacts from passive recreation use, increase habitat for migratory birds (including waterfowl), and improve aquatic habitat. Signage provides benefit by directing visitors to stay on trails would reduce damage to sensitive ecological areas. Fencing provides benefit by excluding foot traffic in sensitive areas such as the riparian corridor or wetlands where sensitive plants and wildlife could be trampled. (This measure could have been grouped with Wetland Restoration Measures as well; it is grouped here because riparian areas are more comprehensive, including wetlands, channel and uplands associated with rivers or streams.)

Channel Diversity

14. ***Vane or J-hook Construction:*** This measure consists of installing structures that cut into the stream channel in an upstream direction to help push the channel into a meander and/or to protect a bank from further erosion. Potential vanes may be created from formed concrete, riprap with vegetation plantings, or a combination of riprap and concrete. Vanes would be of varying size and material depending on the Alternative design. Adding vanes could increase channel diversity, decrease stream velocity (by encouraging meanders), protect against erosion, and potentially increase the amount of riparian habitat.
15. ***Channel Location Modification:*** This measure consists of physically moving the channel laterally from one location to another location. This may be achieved through cut and fill, off channel construction, hardening, etc. This measure is only

feasible in Reach 1 and Reach 2. Reach 3 is too narrow to accommodate moving the channel. Channel location modification may help relieve erosion stress on banks, increase stream sinuosity, and/or increase riparian and instream habitat. The extent of channel location modification will depend on the Alternative design.

16. ***Boulder Clusters:*** This measure consists of adding structures (rocks, boulders, riffles, logs, etc.) to the stream channel to increase instream habitat diversity. Location, amount, material, and size will depend on the Alternative design.

Public Access Measures

17. ***Recreation and stewardship (non-structural measure):*** This measure consists of the installation of designated paths, educational signage, picnic tables, and/or sitting areas. This measure is meant to reduce the impact of pedestrian traffic through the study site by limiting foot traffic to designated trails. In addition, this measure provides awareness and educates the public of the ecological, wildlife, and cultural values of the area, which will increase potential for custodial care.

Management measures for this study are listed in Table 4, along with the related objective(s) that each measure addresses.

4.2 Screening Measures

Screening is the process of eliminating, based on planning criteria, those measures that will not be carried forward for consideration. Criteria are derived for the specific planning study, based on the planning objectives, constraints, and the opportunities of the study/project area. The following criteria were used to screen the measures (See Table 4):

- Each measure must meet at least one planning objective.
    - Measure must contribute towards addressing to at least one of the planning objectives described in Section 2.3.3.
- Each measure must avoid planning constraints.
    - Measure must not violate any of the constraints described in Section 2.3.4.
- Each measure must be feasible in consideration of access/land ownership considerations.
    - Real estate needed for measure must be available to the project.
- The size or scale of each measure must be appropriate for the Continuing Authorities Program and the Sponsor's capabilities.
    - Measure must not exceed scope of project authority.
    - Measure must not require operations and maintenance costs that would exceed the anticipated benefits.

Table 4: Management measures and their relation to the study objectives.

Management Measures	Objectives				Constraints		Real Estate Available?	Appropriate for CAP?
	Objective 1	Objective 2	Objective 3	Objective 4	Constraint 1	Constraint 2		
1: Wetland rehabilitation	X	X	X	X			X	X
2: Wetland Plantings	X	X		X			X	X
3: Beaver Dam Analog Structures	X	X	X	X	X			X
4: Small Grade Control Structures	X	X	X	X			X	X
5: Large Drop/Grade Control Structure:		X	X				X	
6: Invasive Species Removal			X	X			X	X
7: Riparian Planting	X			X			X	X
8: Overstory Planting	X		X	X			X	X
9: Bank Slope Modification	X	X	X	X			X	X
10: Riparian Bench Construction	X		X	X			X	X
11: Remove Bank Hardening	X		X	X			X	X
12: Side-channel High-flow Attenuation Area	X		X	X			X	
13: Physical Exclusion	X		X	X			X	X
14: Vane or J-hook Construction	X		X	X			X	X
15: Channel Location Modification	X		X	X			X	
16: Boulder Cluster	X			X			X	X
17: Recreation and stewardship			X				X	X

Measures were considered in light of the listed criteria; those that did not meet the criteria were screened out. Measures not carried forward included the following:

- **Measure 3: Beaver Dam Analog Structures**
    - This measure was screened out due to the concern that the structures may attract beaver to the area. The area is small (~18 acres) within a highly urban location with few overstory plants (primarily cottonwood trees) that could be easily over-harvested by beaver.
    - This measure was screened out due to the concern that beaver dam analog structures are not meant to be permanent and may “blowout” or fail

during a high flow event. There is widespread understanding that beaver dam analogue structures are typically used in rural settings where the flood risks from one beaver dam analogue structure failure can dissipate across a large landscape. (NAWM n.d.)

- **Measure 5: Large Drop/Grade Control Structure**
  - This measure was screened out due to stream stabilization guidance that states a series of grade control structures are more stable, less risk relying on one structure, offer more adaptive management options, and provide a more gradual stream profile (NRCS 2007).
  - This measure was screened out due to the high cost to construct a large concrete grade control structure compared to constructing a series of smaller rock structures.
  - This measure was screened out due to the expected impacts of the shifting climatic conditions at the planetary scale on the study site. Having a single large pool offers less diverse space for species to survive in as the pool dries out. Having a series of multiple tiered pools offers differing pool depths, more riparian refugia area, more adaptive management options, and less risk of entire wetland species loss during a prolonged drought.
  - This measure was screened out because a large concrete grade control structure does not offer the increased instream habitat benefits that a series of smaller rock structures offer. Rock structures offer habitat space for organisms, uninhibited movement of water, nutrients, and organisms through the hyporheic zone, and an overall reduced stress on the environment (due to shorter construction time).

- **Measure 12: Side-channel High-flow Attenuation Area**
  - This measure was screened out due to the large amount of earth movement required to create the side-channel, high-flow attenuation area. Preliminary calculations showed approximately 64,000 cubic yards (CY) of cut material and approximately 10,000 CY of fill material to create the side-channel and high-flow attenuation area. This would leave an excess of approximately 50,000 CY of spoil material. The PDT determined that for the potential habitat units (HU) we could get from the measure compared to the cost to move that much spoil material, we should ultimately screen this measure out.
  - This measure was also screened out due to the number of mature overstory trees that would need to be removed to create the measure. The PDT decided that shading Spring Creek prior to reaching Reach 2 is a priority to combat future increases in temperature. Keeping moving water

shaded (thus cooler) is one of the best ways to keep oxygen levels high enough to support aquatic biodiversity because higher temperatures decrease the solubility of oxygen in water (Marcy, Suter II and Cormier 2024).

- **Measure 14: Vane or J-hook Construction**
    - This measure was screened out because cross vanes are costly and have a relatively high risk of structural failure due to their position within the stream itself, so they should be installed only to protect infrastructure. There is no infrastructure to protect in this study area. Also, cross vanes constructed in deeply incised channels are at higher risk for arm slope failure (Hickman and Thompson n.d.). Similarly, J-Hooks should not be used in bedrock streams, those with highly unstable beds, or streams that are laterally unstable. Vanes with J- Hooks should also be avoided in streams with large sediment or debris loads and those with a gradient steeper than 3% (Maryland 2000; Genesee 2001).
    - This measure was screened out because there is exposed bedrock in Reach 1 and Reach 2 is sandy. Cross vanes are not recommended in streams which are composed of exposed bedrock or have beds of very fine, mobile material (fine sands and/or silt), which increases the risk of structural failure by undercutting (Hickman and Thompson n.d.). Since depth to bedrock is so shallow (about or less than 2 feet), J-hooks and cross-vanes are not recommended by much of the literature, because there is not enough sediment to anchor footer rocks in or create scour pools with (Maryland 2000).
- **Measure 15: Channel Location Modification**
    - This measure was screened out due to the cost being outside this CAP effort. Stream channel realignment would require a much larger amount of earth movement to realign the channel versus laying the banks back to create wetland areas in Reach 2, while the wetland area created would be similar. Furthermore, this measure would require additional rock or bank reinforcement to hold and stabilize the new channel alignment.
    - This measure was screened out because a full channel realignment carries high risks and consequences of failure if the geomorphology understanding and prediction is not precise.

4.3 Measures Carried Forward for Further Evaluation and Alternative Formation

After initial screening of measures was completed, remaining measures were analyzed for additional considerations including: combinability, dependability, mutual exclusion, and site identification for project implementation. USACE, the Sponsor, and local and regional stakeholders identified specific sites within the Spring Creek study area where one or more measures could address specific problems and opportunities. Preliminary measures were assigned to the proposed project footprint using best professional judgment of those features that will best function at the site for the intended benefits. Qualitative considerations of sustainability, O&M lifecycle costs, construction costs, real estate, scale, risk and reliability of performance, and benefit type were considered when applying measures to the proposed project. After screening out Measures 3, 5, 12, 14, and 15, the following twelve measures are carried forward to alternatives formulation. NOTE: Relevance to each Reach is given beside each measure.

- **Wetland Restoration Measures**
  - 1: Wetland Rehabilitation (Reach 2)
  - 2: Wetland Plantings (Reach 2)
  - 4: Small Grade Control Structures (Reach 2)
- **Riparian Restoration Measures**
  - 6: Invasive Species Removal (Reach 1, Reach 2)
  - 7: Riparian Planting (Reach 1, Reach 2, Reach 3)
  - 8: Overstory Planting (Reach 2, Reach 3)
  - 9: Bank Slope Modification (Reach 1, Reach 2, Reach 3)
  - 10: Riparian Bench Construction (Reach 1, Reach 2, Reach 3)
  - 11: Remove Bank Hardening (Reach 3)
  - 13: Physical Exclusion (Reach 1, Reach 2, Reach 3)
- **Channel Diversity Measures**
  - 16: Boulder Clusters (Reach 1, Reach 2, Reach 3)
- **Public Outreach/Education**
  - 17: Recreation and stewardship (Reach 1, Reach 2, Reach 3)

4.4 Formation of Alternatives

USACE began the formulation of the initial array of alternatives by assembling various combinations of management measures into a range of options per reach. Each option was comprised of several measures, each determined to provide benefits given the footprint of the respective reach. Options were formulated using an additive methodology starting with measures predicted to have the largest improvement to the location. Additional measures were added to the previous (smaller) option in order to increase the benefits relative to the previous option. After a series of meetings, the team identified which measures would best address the planning objectives and at what scale. The team selected a consistent size/scale for each measure based on the site conditions in order to maintain consistency between options. This was done so that adjustments to any of the measures' footprints or locations during the feasibility level design, would impact cost proportionally among all options that contain that measure.

Options created for each reach are shown below in Table 5. There are three options for Reach 1, two options for Reach 2 and two options for Reach 3. Note, due to the narrow size of Reach 3, there is no room for management measure 17: Recreation and stewardship.

Table 5: USACE combined measures together to create Options for each reach. Reach 1 has three options. Reach 2 has two options. Reach 3 has two options.

Management Measures	Reach 1			Reach 2		Reach 3	
	A	B	C	A	B	A	B
1: Wetland Rehabilitation				X	X		
2: Wetland Plantings				X	X		
4: Small Grade Control Structures				X	X		X
6: Invasive Species Removal		X	X	X	X		
7: Riparian Planting	X	X	X	X	X	X	X
8: Overstory Planting				X	X		
9: Bank Slope Modification	X	X	X	X	X	X	X
10: Riparian Bench Construction			X	X	X	X	X
11: Remove Bank Hardening						X	X
13: Physical Exclusion	X	X	X	X	X		
16: Boulder Clusters	X	X	X	X	X	X	X
17: Recreation and stewardship	X	X	X	X	X		

The management measures within each option are dependent upon each other. For example, in option Reach 2a, the management measure "wetland plantings" is dependent upon the management measure "bank slope modification" to create an area suitable for wetland establishment. The success of option Reach 2a is not dependent on the construction of any other options, like Reach 1a or Reach 3a.

4.4.1 Option Reach 1a

This option includes bank stabilization on the west side using boulder toe protection (Bank Slope Modification), plantings above boulder toe (Riparian Restoration Measure), adding boulder clusters in the stream (Channel Diversity Measures), creating walking/vehicle access to the area, and creating a sitting area with a sign and picnic table (Recreation and stewardship) (Figure 13).

Figure 13: Option – Reach 1a

4.4.2 Option Reach 1b

This option builds on Reach 1a by removing invasive species (Riparian Restoration Measure).

This option includes bank stabilization on the west side using boulder toe (Bank Slope Modification), plantings behind boulder toe (Riparian Restoration Measure), adding boulder clusters in the stream (Channel Diversity Measures), removing invasive species (Riparian Restoration Measure), creating walking/vehicle access to the area, and creating a sitting area with a sign and picnic table (Recreation and stewardship ; Figure 14).

Figure 14: Option - Reach 1b

4.4.3 Option Reach 1c

This option builds on Reach 1b by stabilizing and planting a small portion of the east bench (Riparian Bench Construction & Riparian Restoration Measure).

In all, this option includes bank stabilization on the west side using boulder toe (Bank Slope Modification), plantings behind boulder toe (Riparian Restoration), adding boulder clusters in the stream (Channel Diversity Measure), removing invasive species (Riparian Restoration), stabilizing and planting a small portion of the east bench, creating trail access to the area, and creating a sitting area with a sign and picnic table (Recreation and stewardship; Figure 15).

Figure 15: Option - Reach 1c

4.4.4 Option Reach 2a

Two constructed rock riffles (CRR1 & CRR2) would act as grade control structures to counter the incision that is occurring in the reach (Wetland Restoration Measures). Upstream of each CRR, the banks would be laid back at varying elevations and degrees of slope Bank Slope Modification) to create areas that could be permanently and periodically wet (wetlands) and planted with suitable wetland plants (Wetland Restoration Measures). All riparian areas disturbed would be replanted (Riparian Bench Construction). Overflow channel would be filled with material removed during bank modifications (Area F1). Area F2 would be filled to create a gradual slope suitable for a maintenance path to the center of the site. Stone would be added to the banks where there are currently sharp bends to stop the erosion occurring and stabilize the stream

(SBS1 & SBS2) (Bank Slope Modification Measures) including boulder clusters in the northern reaches of the stream (Channel Diversity Measures). Access paths into the site would include a trail from the west, south, and northeast corner (Recreation and stewardship) (Figure 16).

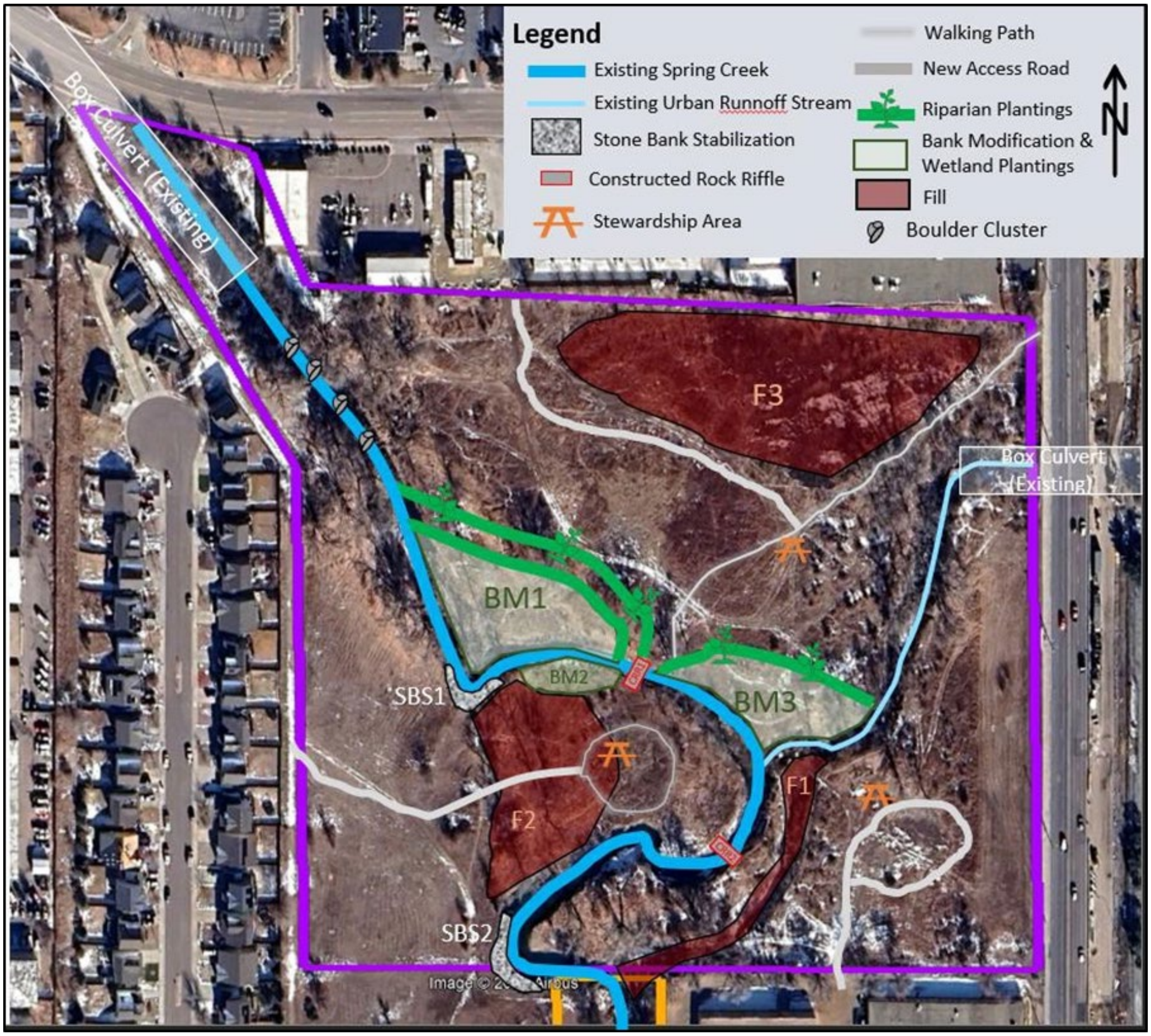


Figure 16: Option - Reach 2a

4.4.5 Option Reach 2b

This option builds on Reach 2a by doubling the size of the wetland areas (Wetland Restoration Measures). This is accomplished by increasing the amount of cut when laying back the banks.

Overall option Reach 2b includes, two constructed rock riffles (CRR1 & CRR2) would act as grade control structures to counter the incision that is occurring in the reach (Wetland Restoration Measures). Upstream of each CRR, the banks would be laid back at varying elevations and degrees of slope (Bank Slope Modification) to create areas that could be permanently and periodically wet (wetlands) and planted with suitable wetland plants (Wetland Restoration Measures). All riparian areas disturbed would be replanted (Riparian Bench Construction). Overflow channel would be filled with material removed during bank modifications (Area F1). Area F2 would be filled to create a gradual slope suitable for a maintenance path to the center of the site. Stone would be added to the banks where there are currently sharp bends to stop the erosion occurring and stabilize the stream (SBS1 & SBS2) (Bank Slope Modification) including boulder clusters in the northern portions of the stream (Channel Diversity Measures),. Access paths into the site would include a trail from the west, south, and northeast corner (Recreation and stewardship) (Figure 17).

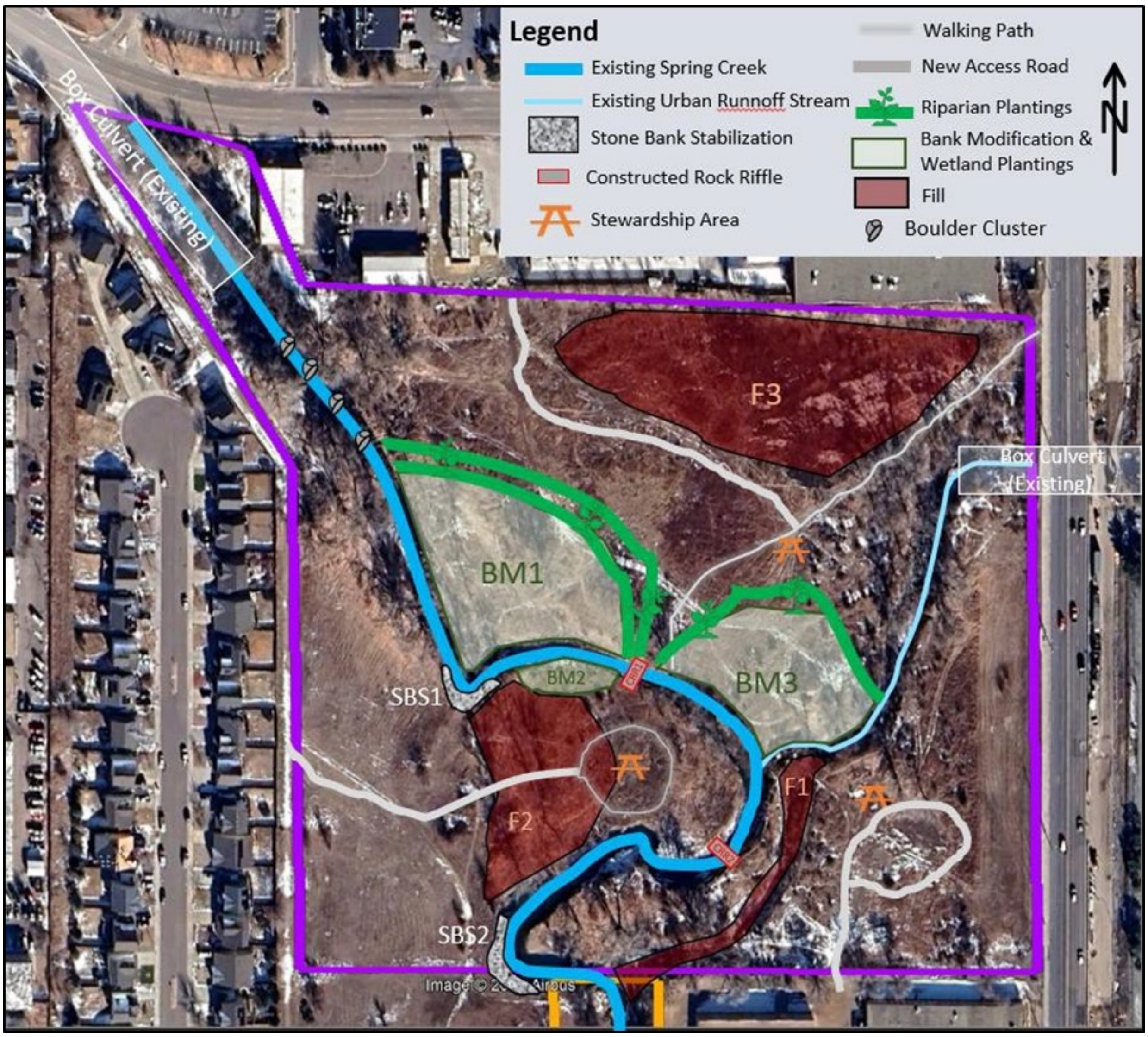


Figure 17: Option - Reach 2b

4.4.6 Option Reach 3a

This option includes instream boulder clusters (Channel Diversity Measures), removal of the concrete lining the west bank (Riparian Restoration), creating a 10ft bench and modifying the west bank slope (Riparian Bench Construction & Bank Modification). Riparian plantings along the 10ft bench and stabilizing the west bank slope with vegetated riprap (Riparian Restoration) (Figure 18).

Figure 18: Option - Reach 3a

4.4.7 Option Reach 3b

This option builds upon Reach 3a by adding a new rock riffle at the northern end of the Reach. This rock riffle would match the existing rock riffles in the Reach and help slow the velocity of the flows as water enters Reach 3 (Channel Diversity Measures).

This option includes instream boulder clusters (Channel Diversity Measures), removal of the concrete lining the west bank (Riparian Restoration Measures), creating a 10ft bench and modifying the west bank slope (Riparian Bench Construction & Bank Modification). Riparian plantings along the 10ft bench and stabilizing the west bank slope with vegetated riprap (Riparian Restoration Measures). Addition of a rock riffle at the northern end of the reach (Figure 19).

Figure 19: Option - Reach 3b

4.4.8 Combining Options into Alternatives

The Options outlined above were formulated and reviewed collaboratively by the various disciplines within the PDT. Each technical area contributed key information to conceptualize on Option combinations that would possibly meet study goals. With the support by the cost- analysis framework (please see Section 4.3), all possible combinations of Options were considered during this process, including the No-Action alternative, to ensure a complete assessment. Objective 2 of this study is - Reconnect and restore functioning native wetland habitats within the study area. Reach 2 is the only location where creating a viable wetland is possible. The PDT decided early on that any alternative that did not include Reach 2 and wetland rehabilitation would be screened out due to not meeting the objectives of the study. This means all alternatives developed (except the No Action) include Reach 2 with either option Reach 2a or option Reach 2b. Table 6 list the alternatives and the options included with that alternative.

The No-Action alternative is synonymous with the "Future Without-Project Condition". No project would be implemented by USACE to achieve the planning objectives. Evaluation of the No Action Alternative is required by USACE Planning guidance and by NEPA. As described throughout Section 5, the Spring Creek study site location could remain degraded under the No-Action Alternative (See Section 2.2). Habitat availability, quality, complexity, and connectivity would continue to deteriorate. The overall condition of the channel is anticipated to remain severely degraded. The No-Action Alternative is further described in terms of modeled Environmental Outputs below in Section 4. The No Action Alternative is described by Environmental Resources in Section 5. More information about the Future Without Project conditions can be found in Appendix B.

Table 6: Alternatives developed for HU calculation and Cost Equivalent / Incremental Cost Analysis (CE/ICA).

Alternatives developed for HU calculation and CE/ICA.	
Alt-1: No Action	**Alt-14:** 2a, 1a, 3a
Alt-2: 2a	**Alt-15:** 2a, 1b, 3a
Alt-3: 2b	**Alt-16:** 2a, 1c, 3a
Alt-4: 2a, 1a	**Alt-17:** 2b, 1a, 3a
Alt-5: 2a, 1b	**Alt-18:** 2b, 1b, 3a
Alt-6: 2a, 1c	**Alt-19:** 2b, 1c, 3a
Alt-7: 2b, 1a	**Alt-20:** 2a, 1a, 3b
Alt-8: 2b, 1b	**Alt-21:** 2a, 1b, 3b
Alt-9: 2b, 1c	**Alt-22:** 2a, 1c, 3b
Alt-10: 2a, 3a	**Alt-23:** 2b, 1a, 3b
Alt-11: 2a, 3b	**Alt-24:** 2b, 1b, 3b
Alt-12: 2b, 3a	**Alt-25:** 2b, 1c, 3b
Alt-13: 2b, 3b	

5 Alternative Evaluation

This section describes the alternatives to be evaluated and compared to determine which alternative will comprise the National Ecosystem Restoration (NER) Plan and tentatively selected plan (TSP). The tentatively selected plan is the alternative identified by USACE as most consistent with policy, prior to public review and incorporation of resulting comments into the planning process. The NER Plan is the alternative that maximizes ecosystem restoration benefits compared to costs, consistent with the Federal objectives. These alternatives were formulated as complete and acceptable plans regardless of which would ultimately be found to be most cost effective.

To evaluate the alternatives, USACE developed parametric costs and estimated environmental outputs to evaluate alternatives in a cost effectiveness and incremental cost analysis (CE/ICA). The environmental outputs and costs are described in the following sections 4.1 and 4.2 and the CE/ICA is described in Section 4.3. The PDT used the following criteria to screen alternatives and eventually choose a TSP:

- Any Alternative not considered a Best Buy[3] plan will be screened out.
- Alternatives will be compared on how well they meet (see Section 4.4):
    - Completeness, Effectiveness, Efficiency, Acceptability
    - The four Objectives of this study

5.1 Environmental Outputs

USACE estimated potential benefits for each alternative using two Habitat Suitability Index (HSI) models, the Functional Assessment of Colorado Wetlands (FACWet) and Functional Assessment of Colorado Streams (FACStream; Johnson et al. 2013; Johnson et al. 2016). Each of these models was approved for use by the USACE National Ecosystem Restoration Planning Center of Expertise for use in aquatic ecosystem restoration feasibility studies to calculate HUs for wetland and riparian work in Colorado. Reach 2 is the only reach where FACWet is applicable. There are no suitable potential habitat locations for wetland establishment in Reach 1 nor Reach 3. For this reason, all analysis focused on CE/ICA assessment and results will focus on the FACStream results for an even comparison of between the reaches and the subsequent Alternatives. FACWet is considered during the option-comparison process for Reach 2 (between Options 2a and 2b. For more information on the FACWet analysis on Reach 2, see Appendix B.

FACStream is a method for assessing functional condition of stream reaches in Colorado using 28 sub-variables to score 10 state variable (i. e. key function elements of streams, please see Appendix B for more detail on FACStream's state variables) that

[3] Bust Buy Plan - defined as those cost-effective plans that provide the greatest incremental increase in output (benefits) for the lowest incremental increase in cost.

combine to produce an overall condition score based on the degree of impairment (Johnson et al. 2016). The FACStream analysis process is like a report card, which represents the functional condition or “health” of a reach at increasing levels of detail. The condition score, state variables and sub variables are all scored using the academic grading scale where letter grades (A-F) correspond to numerical scores on a 50-100 scale (Table 7). Each grade represents a condition class defined by the degree of impairment. For example, pristine streams that have no impact would score 100 (A+) and a stream in a profoundly impaired state but still recognizable as a feature conveying water would score approximately 50 (F-), representing the lowest level of functioning for a reach.

Table 7: Scoring and Degree of Functional Impairment. Derived from Johnson et al. 2016.

Scoring and Degree of Functional Impairment		
Score	**Grade**	**Impairment**
90 – 100	A	Negligible
80 – 89	B	Mild
70 – 79	C	Significant
60 – 69	D	Severe
50 – 59	F	Profound (or unsustainable)

FACStream adopts a diagnostic approach, much like western medicine. In humans, the individual is assessed based on system components such as orthopedic, cardiovascular, psychological etc. In stream ecology these components are referred to as State Variables. Natural interactions between state variables produce a healthy system that can produce vital ecological functions. The condition of each variable is assessed by the degree of impairment, and the combination of scores for each of these components describes the overall condition of the reach. The evidence of departure lies in the interpretation of available data and documentation of observable factors including the presence of stressors and indicators of their severity and extent. FACStream is a forensic, weight-of-evidence method, meaning that variable scores must correspond with documented evidence. As in a court of law, evidence may be gathered by any investigative means from simple observations to rigorous long-term monitoring of complex parameters, depending on project circumstances.

Like the medical assessment example, FACStream guides the evaluator through a process that usually starts with a rapid evaluation of condition, which can then be expanded and augmented by intensive examination and assessment to identify specific areas of concern. FACStream is an ecological assessment tool adopting a systematic process that covers all aspects of stream health to arrive at the best professional judgement of reach condition based on documented evidence and a clear rationale. (See Appendix B for further FACStream information)

5.1.1 Reach 1, 2, and 3 FACStream Existing Conditions

The existing conditions for the Spring Creek study area Reach 1, Reach 2, and Reach 3 were analyzed through two site visits, interviews with the non-Federal sponsor, and review of aerial imagery. Existing conditions reflect a one-year period from Fall 2022 – Fall 2023 (Table 8).

Table 8: FACStream "Report Card" for the three reaches existing conditions within the Spring Creek study area.

SCALE	VARIABLES	REACH 1 Existing Conditions	REACH 2 Existing Conditions	REACH 3 Existing Conditions
Watershed	(Vhyd) Flow Regime	C-	C-	C-
	(Vsed) Sediment Regime	D	F	D
	(Vchem) Water Quality	B	B	B
Riparian	(Vcon) Floodplain Connectivity	F+	D	F+
	(Vveg) Riparian Vegetation	D+	D	D-
	(Vdeb) Debris	C-	C-	C-
Stream	(Vmorph) Stream Morphology	D-	D+	F
	(Vstab) Stability	D	F+	F
	(Vstr) Physical Structure	F	D	F
	(Vbio) Biotic Structure	D	C-	D
OVERALL REACH CONDITION SCORE		**D**	**D+**	**D**
DEGREE OF IMPARIMENT		**Severe**	**Severe**	**Severe**

Reach 1 represents the northern segment and the most upstream area of the project footprint. This is a linear-shaped site with dense woodland on a steep 25-ft bank down to Spring Creek on the west side and a generally sloping bank to a natural bench with a continued slope up on the east side. Reach 1 flows north to south through a box culvert under Pikes Peak Avenue and then into Reach 2 – Former wetland. Reach 1 is classified as a stream type "G" under the Rosgen Stream Classification (Rosgen, 1996; NEH, 2007) as a fully entrenched channel with a low width- to-depth ratio, on moderate gradients.

The FACStream results for Reach 1 indicate a severe degree of impairment. A single incised channel has facilitated high velocity flows, producing shifts in the magnitude and duration of peak flows and significantly altering the distribution of water throughout the Reach (Vhyd). The existing linear concrete channels in combination with drop structures eliminate the potential for sediment production, creating an un-balanced sediment transport process (Vsed).

Although the model results for water quality (Vchem) resulted in a mild degree of impairment, urban runoff is the major stressor driving the existing supply of metabolic agents into the Spring Creek watershed. The probability that the stream would maintain its geomorphic structure over time has been severely impaired (Vstab) and continuous entrenchment of stream has severely decreased the potential development of stream branching patterns and changes in stream cross-section such as stream enlargement or widening (Vmorp). In the existing wetland characteristics of Reach 1 and their functional capacity have been severely impaired.

Reach 2 supported wetland characteristics in the early 1980's dominated by sandbar willow, Baltic rush, three square and hairy sedge. Since then, Reach 2 experienced significant amount of incision that has led to an environmental shift from an emergent wetland to riparian and upland grassland with patches of invasive tamarisk. This Reach of Spring Creek is classified as a stream type "E" under the Rosgen Stream Classification (Rosgen, 1996; NEH, 2007) as a low- gradient meandering riffle-pool stream with low width-to-depth ratio and little deposition.

The existing condition within Reach 2 consists of a single incised channel with steep or nearly vertical banks, that are not connected to the former wetland and overbank areas. The rate of change, frequency, and timing of flow are not in seasonal synchrony, and the existing flow regime (Vhyd) operates outside of its natural range of variability. Over time, this effect has significantly limited the connectivity with its floodplain and has almost eliminated the potential for sediment production and transport (Vsed). There are mild impairments to water quality (Vchem), however the volume and timing of these inputs, which periodically deliver uncharacteristic levels of organic compounds (e. g. metals, toxins that bring fluctuations in pH, conductivity, and turbidity of the stream). Reach 2 experiences a severe degree of floodplain disconnect (Vmorph) that overtime has eliminated the potential of hydroperiods and consequently the duration of saturation of soils that promote riparian vegetation. The resiliency of Reach 2 and the channel's ability to recover after a large disturbance (i. e. large flood, wildfire, mass erosion event) has been profoundly impaired (Vstab). The existing wetland characteristics of Reach 2 have been severely impaired and in a non-functioning state, no longer possessing the basic criteria necessary to support wetland conditions.

Reach 3 is a narrow strip of land mainly of channelized stream dominated by shrub vegetation with sparse overstory trees. Reach 3 begins at the former confluence in the southern end of Reach 2, ending at the box culvert under Airport Road. The banks have been hardened with concrete, and in portions of the Reach these concrete structures have sloughed off into the channel. Reach 3 is classified as a stream type "G" under the Rosgen Stream Classification (Rosgen, 1996; NEH, 2007) with a low width-to-depth ratio, fully entrenched channel on moderate gradients. This Reach has 3 drop structures, an urban wastewater input into Spring Creek from the east through a box culvert and a pedestrian bridge that connects a commercial parking lot in the east to a pedestrian path located on the upland portion of Reach 3 on the west.

Reach 3 is driven by a single incised and hardened channel (Vmorph) that assists high velocity flows which over time, have degraded the hydrologic regime. The magnitude and duration of base and peak flows (Vhyd) have been severely impacted from the surrounding impervious surfaces (urban development) and widespread channel erosion, both which facilitate the degrading effects of focused urban stormwater inputs.

Flows through this channel have homogenized the geomorphology of the Reach and thus have eliminated natural sediment processes (Vsed). The existing stream temperature regime (Vchem) is mildly altered but still retains the abiotic habitat factors affected by temperature gradients that contribute to the diversity of organisms that inhabit all three Reaches. The existing dynamic balance between sediment supply and transport is not in equilibrium because of the hardened channels. The stream's ability to move, adapt and adjust (Vstab) is in a profound state of impairment due to a significant disconnect from its floodplain and poor riparian zone that support and enhance the resiliency of the stream.

5.1.2 Reach 1, 2, and 3 FACStream Future Without Project Condition (FWOP) / No-Action Alternative

The period of analysis for FWOP is 50 years, from 2025 to 2075. Table 9 shows the results for the FWOP analysis for Reaches 1, 2, 3.

Table 9: FACStream "Report Card" for the three reaches Future Without Project (FWOP) conditions within the Spring Creek study area.

SCALE	VARIABLES	REACH 1 FWOP	REACH 2 FWOP	REACH 3 FWOP
Watershed	(Vhyd) Flow Regime	-D	-D	-D
	(Vsed) Sediment Regime	F	F	D
	(Vchem) Water Quality	D	D	D
Riparian	(Vcon) Floodplain Connectivity	F	F	F
	(Vveg) Riparian Vegetation	-D	-D	F
	(Vdeb) Debris	D	D	-D
Stream	(Vmorph) Stream Morphology	+F	-D	F
	(Vstab) Stability	+F	F	+F
	(Vstr) Physical Structure	-F	F	-F
	(Vbio) Biotic Structure	F	-D	-F
OVERALL REACH CONDITION SCORE		**+F**	**-D**	**+F**
DEGREE OF IMPARIMENT		**Profound**	**Severe**	**Profound**

Without future restoration, planning, coordination and remediation efforts, the conditions in Spring Creek could continue to degrade. Future urban development rates coupled with projected changing conditions could impose severe demands on water supply and other water resources, causing impairments to the resiliency and health of the watershed (Lukas et al. 2014; Frankston et al. 2022). The Spring Creek ecosystem could experience an increase in vulnerability to extreme events (natural or anthropogenic disturbances) caused by severe detachment of floodplain, degradation to the riparian zone and impairments to the water source of in-flow. Although warmer temperatures are likely to alter the water balance in the project area (Doaesken et al. 2003; Mahoney et al. 2018), minimal changes are expected in the stream flow regime (Vhyd) within the next 50 years. The urban water runoff in combination with supplemental groundwater seepage could continue to maintain the total flow volume, including base and peak flows through all three Reaches. The existing condition is expected to maintain the hydraulic properties of the flow environment, and although a steady increase in urbanization and development is expected into the future, the annual volume and the variability in flows could remain constant in Reach 1 and 3. A FWOP scenario is estimated to produce further isolation of the floodplain leading to an increase in channel entrenchment and steeper bank gradients in Reach 2.

The degradation of the sediment regime (Vsed) assumes that excessive bank erosion, channelization, and the severe disconnect from the stream's floodplain would significantly hinder the potential for sediment production and sediment transport through the project footprint.

The surrounding impervious surfaces would continue to facilitate runoff of organic/inorganic matter and other toxins into the Spring Creek system, steadily driving the stream's Water Quality (Vchem) towards severe impairment. In addition, changing conditions and other planetary projections are likely to influence the existing sparse tree canopy, which would alter the stream's temperature gradients, producing unfavorable abiotic environments that would stop supporting a diverse assemblage of aquatic organisms (Baird & Krueger, 2003).

The Floodplain Connectivity (Vcon) is expected to further degrade since the entrenchments could continue to deepen through excessive bank erosion, producing high terraces and steadily driving the disconnect further apart between the stream and its floodplain. The stream's Riparian Vegetation (Vveg) is forecasted to experience ongoing impairment, since the floodplain width is expected to significantly shrink, decreasing the spatial extent of suitable soil requirements that support riparian habitats. Other anthropogenic stressors would continue to facilitate the encroachment of exotic species, altering the composition and function of native riparian flora.

A decrease in the spatial extent of the riparian vegetation zone would drive the stream's Debris Supply (Vdeb) into further impairment. A decrease in tree canopy density could significantly reduce the supply of large woody debris, detritus, and other organic material into the aquatic environment. In the next 50 years, the supply of debris would rely on an ever-shrinking narrow band of riparian vegetation on steep banks that would be unable to supply the adequate volume of debris, leading towards a steady path towards a non-functioning condition.

In the FWOP scenario, Spring Creek's Stream Morphology (Vmorph) could degrade further since the existing channelization and entrenchment of would continue to decrease the potential for development of stream branching patterns and changes in stream cross-section such as stream enlargement or widening.

In Reach 3 the FWOP scenario constitutes continuous entrenchment of the existing stream and further damage and breakdown to the existing channel armoring. Similar to Reach 1, this confined outflow passage in Reach 3 could further restrict the ability for groundwater recharge and would almost eliminate the energy-transfer mechanisms to down-gradient habitats through hydrologic connectivity.

In a FWOP, the stream's Stability and Resilience (Vstab) is forecasted to undergo further impairment since the dynamic balance between sediment supply and transport would continue in disequilibrium because of the hardened channels and the stream's inability to move, adapt and adjust. Therefore, the probability that the stream could maintain its geomorphic structure over time could steadily decrease and the stream would most likely be unable to recover after a large disturbance event (i. e. large flood, wildfire, mass erosion event). The Physical Structure (Vstr) of Spring Creek (i. e. stream heterogeneity and stream structural diversity) would continue to experience poor erosion processes with limited formation of beds, banks, and substrates. In a FWOP condition, the continuous channelization in combination with the effects from channel armoring features would inhibit the complex processes of hydraulic and geomorphic interactions.

The Biotic Structure (Vbio) of Spring Creek takes into consideration the trophic interactions at the various levels of the biotic hierarchy and the FWOP scenario is forecasted to continue a trend towards further degradation. The existing riparian zone is nearly absent and restricted primarily to a narrow band on steeply sloped banks that have altered the community compositions of flora and fauna. Any existing functional guilds and trophic interactions would be further reduced, driving the stream's biotic structure further into a state of severe impairment across the three Reaches. In the next 50 years, Spring Creek could remain an urban green space, although such vegetative corridors remain at risk of further alterations.

5.1.3 Reach 1, 2, and 3 Alternative Habitat Units

An assessment of the existing condition of the study area was conducted based on the departure from a reference standard condition. During the process of comparing project conditions to existing conditions, as well as conditions over the life of the project at the 50-year mark. The composite FCI scores (i. e. the average of all FACStream functional scores, please see Appx B, Section 2.a.iv) are then translated into HUs which are then used in the CE/ICA (i. e. cost effectiveness and incremental cost analysis, please see more in Section 4.3). During the CE/ICA, the HUs are annualized across the 50-year planning horizon to produce an average annualized habitat unit (AAHU). Twenty-five ALTs were developed from the Action Alternative combinations from all Reaches, including a 'No Action ALT'. Table 10 summarizes HUs for each alternative, including incremental years and the corresponding AAHUs. For acres, FCI, HUs and AAHU for each alternative and each scenario, please see Table 22 in Appendix B, Section 8.

Table 10: Summary of HUs per alternative and corresponding AAHU

Alternative	Existing Conditions HU (2024)	FWOP HU	HU Year 1 (2025)	HU Year 10 (2034)	HU Year 20 (2044)	HU 50 Year (2074)	AAHU
Alt 1: No Action	4.15	2.28	4.12	3.62	3.14	2.28	3.040
Alt 2: 2a	4.15	2.28	4.19	4.2	4.22	4.23	4.174
Alt 3: 2b	4.15	2.28	4.3	4.4	4.5	4.67	4.467
Alt 4: 2a1a	4.15	2.28	4.27	4.48	4.6	5.09	4.645
Alt 5: 2a1b	4.15	2.28	4.28	4.5	4.64	5.19	4.697
Alt 6: 2a1c	4.15	2.28	4.3	4.56	4.71	5.25	4.755
Alt 7: 2b1a	4.15	2.28	4.34	4.64	4.85	5.44	4.887
Alt 8: 2b1b	4.15	2.28	4.34	4.66	4.87	5.54	4.929
Alt 9: 2b1c	4.15	2.28	4.36	4.66	4.88	5.60	4.953
Alt 10: 2a3a	4.15	2.28	4.28	4.56	4.64	4.92	4.626
Alt 11: 2a3b	4.15	2.28	4.28	4.58	4.67	4.95	4.647
Alt 12: 2b3a	4.15	2.28	4.34	4.64	4.81	5.27	4.821
Alt 13: 2b3b	4.15	2.28	4.34	4.62	4.87	5.30	4.850
Alt 14: 2a1a3a	4.15	2.28	4.3	4.6	4.76	5.69	4.915
Alt 15: 2a1b3a	4.15	2.28	4.3	4.61	4.78	5.79	4.955
Alt 16: 2a1c3a	4.15	2.28	4.3	4.61	4.8	5.85	4.982
Alt 17: 2b1a3a	4.15	2.28	4.37	4.67	4.92	6.04	5.105
Alt 18: 2b1b3a	4.15	2.28	4.36	4.68	4.92	6.14	5.135
Alt 19: 2b1c3a	4.15	2.28	4.37	4.68	4.93	6.20	5.159
Alt 20: 2a1a3b	4.15	2.28	4.31	4.6	4.87	5.72	4.969
Alt 21: 2a1b3b	4.15	2.28	4.31	4.61	4.88	5.82	5.005
Alt 22: 2a1c3b	4.15	2.28	4.33	4.61	4.88	5.88	5.025
Alt 23: 2b1a3b	4.15	2.28	4.37	4.67	4.93	6.07	5.117
Alt 24: 2b1b3b	4.15	2.28	4.37	4.7	4.98	6.17	5.173
Alt 25: 2b1c3b	4.15	2.28	4.41	4.74	5.06	6.23	5.234

5.2 Alternative Cost Estimates

Parametric costs were developed for each of the alternatives at October 2026 price levels. These costs include real estate, monitoring, adaptive management, and annual operations and maintenance costs. Interest during construction is an economic opportunity cost that was computed assuming a construction duration appropriate for the specified measure. Costs were annualized by considering the full economic cost, or the costs to realize the environmental benefits. Costs are annualized over the 50-year period of analysis using FY26 discount rate of 3.25% as summarized in Table 11. The total annualized cost is carried forward in the CE/ICA.

Table 11: Spring Creek Annualized Costs ($, FY27 Price Level)

Alternative	Project First Cost	Interest During Construction	Total Investment Cost	Annualized First Cost	Annualized O&M	Total Annualized Cost
Alt 2: 2a	$4,048,000	$48,100	$4,096,000	$166,800	$9,100	$186,200
Alt 3: 2b	$6,540,900	$118,500	$6,659,400	$271,200	$10,400	$292,000
Alt 4: 2a1a	$4,966,200	$53,300	$5,019,400	$204,400	$26,000	$251,100
Alt 5: 2a1b	$5,221,100	$56,200	$5,277,300	$214,900	$26,000	$261,600
Alt 6: 2a1c	$5,820,100	$62,300	$5,882,300	$239,600	$40,400	$300,600
Alt 7: 2b1a	$7,459,100	$123,700	$7,582,800	$308,800	$27,300	$356,900
Alt 8: 2b1b	$7,714,000	$126,600	$7,840,700	$319,300	$27,300	$367,400
Alt 9: 2b1c	$8,313,000	$132,700	$8,445,700	$344,000	$41,700	$406,400
Alt 10: 2a3a	$7,223,300	$80,500	$7,303,700	$297,500	$12,300	$330,400
Alt 11: 2a3b	$7,226,800	$80,500	$7,307,200	$297,600	$12,300	$330,600
Alt 12: 2b3a	$9,716,200	$150,900	$9,867,100	$401,900	$13,600	$436,200
Alt 13: 2b3b	$9,719,700	$150,900	$9,870,600	$402,000	$13,600	$436,400
Alt 14: 2a1a3a	$8,141,500	$85,700	$8,227,100	$335,100	$29,200	$395,300
Alt 15: 2a1b3a	$8,396,400	$88,600	$8,485,000	$345,600	$29,200	$405,800
Alt 16: 2a1c3a	$8,995,400	$94,700	$9,090,000	$370,300	$43,600	$444,800
Alt 17: 2b1a3a	$10,634,400	$156,100	$10,790,500	$439,500	$30,500	$501,100
Alt 18: 2b1b3a	$10,889,300	$159,000	$11,048,400	$450,000	$30,500	$511,600
Alt 19: 2b1c3a	$11,488,300	$165,100	$11,653,400	$474,700	$44,900	$550,600
Alt 20: 2a1a3b	$8,145,000	$85,700	$8,230,600	$335,200	$29,200	$395,500
Alt 21: 2a1b3b	$8,399,900	$88,600	$8,488,500	$345,700	$29,200	$406,000

5.3 Cost Effectiveness and Incremental Cost Analysis (CE/ICA)

A cost effectiveness and incremental cost analysis (CE/ICA) was conducted in Institute for Water Resources (IWR) Planning Suite, version 2.0.9.1 (USACE certified model), using AAHUs presented in 4.1.3 and average annual costs presented in Section 4.2. Plans are then compared in IWR Planning Suite by conducting CE/ICA, identifying the plans that are the best financial investments, and displaying the effects of each on a range of decision variables. The development of the complete alternative plans was completed with input from the entire team outside of this tool. Figure 20 displays a plot of alternative average annual costs and outputs (AAHUs).

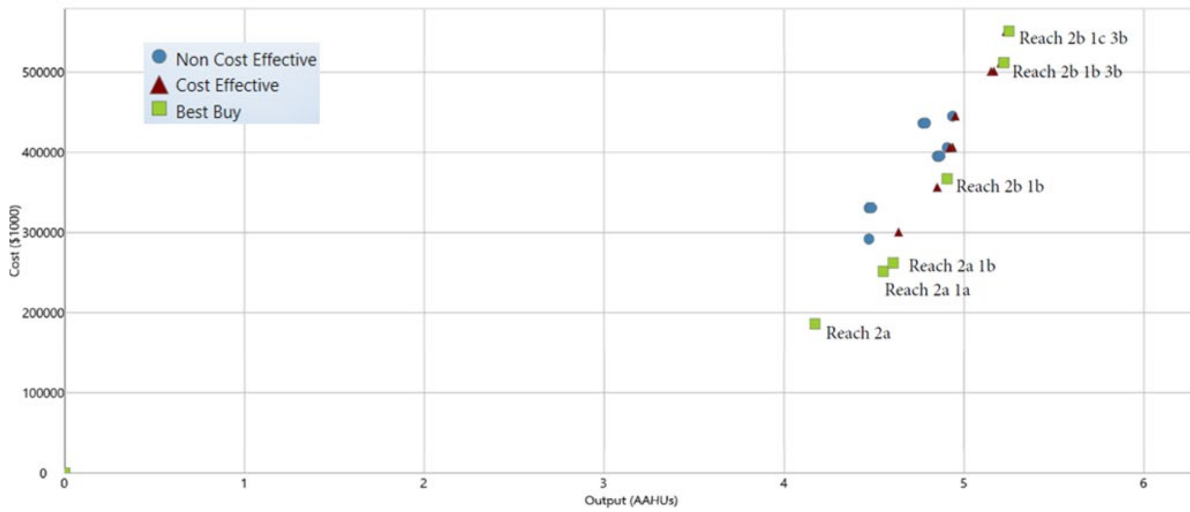


Figure 20: CE/ICA Alternative Comparison Plot

Cost effective plans are plans that provide a level of environmental output at the least cost. Of the 25 plans analyzed in CE/ICA 16 were cost effective and 4 were non-cost effective. Table 12 shows the alternatives and their cost effectiveness and if they are a best buy plan.

Table 12: Non-Cost-Effective Plans, Cost-Effective Plans, and Best Buy Plans. Average Annual Habitat Units (AAHUs).

Alternative	AAHUs	Annualized Cost	Annualized Cost (AAHUs)	Cost Effective (Y/N)	Best Buy Plan (Y/N)
Alt 1: No Action	0	0		Y	Y
Alt 2: 2a	4.17	$186,200	$44,652	Y	Y
Alt 3: 2b	4.47	$292,000	$65,324	N	N
Alt 4: 2a1a	4.55	$251,100	$55,187	Y	Y
Alt 5: 2a1b	4.605	$261,600	$56,808	Y	N
Alt 6: 2a1c	4.635	$300,600	$64,854	Y	N
Alt 7: 2b1a	4.85	$356,900	$73,588	Y	N
Alt 8: 2b1b	4.905	$367,400	$74,903	Y	Y
Alt 9: 2b1c	4.935	$406,400	$82,351	Y	N
Alt 10: 2a3a	4.47	$330,400	$73,915	N	N
Alt 11: 2a3b	4.485	$330,600	$73,712	N	N
Alt 12: 2b3a	4.77	$436,200	$91,447	N	N
Alt 13: 2b3b	4.785	$436,400	$91,202	N	N
Alt 14: 2a1a3a	4.85	$395,300	$81,505	N	N
Alt 15: 2a1b3a	4.905	$405,800	$82,732	N	N
Alt 16: 2a1c3a	4.935	$444,800	$90,132	N	N
Alt 17: 2b1a3a	5.15	$501,100	$97,301	Y	N
Alt 18: 2b1b3a	5.205	$511,600	$98,290	Y	N
Alt 19: 2b1c3a	5.235	$550,600	$105,177	Y	N

Alternative	AAHUs	Annualized Cost	Annualized Cost (AAHUs)	Cost Effective (Y/N)	Best Buy Plan (Y/N)
Alt 20: 2a1a3b	4.865	$395,500	$81,295	N	N
Alt 21: 2a1b3b	4.92	$406,000	$82,520	Y	Y
Alt 22: 2a1c3b	4.95	$445,000	$89,899	Y	N
Alt 23: 2b1a3b	5.165	$501,300	$97,057	Y	N
Alt 24: 2b1b3b	5.22	$511,800	$98,046	Y	Y
Alt 25: 2b1c3b	5.25	$550,800	$104,914	Y	Y

An incremental cost analysis identified 7 of the above plans as “Best Buy” plans, defined as those cost-effective plans that provide the greatest incremental increase in output (benefits) for the lowest incremental increase in cost. These best buy plans are displayed as a bar graph in Figure 21 and include Alt 1: (No Action), Alt 2-2a, Alt 4-2a1a, Alt 8-2b1b, Alt 21-2a1b3b, Alt 24- 2b1b3b, and Alt 25-2b1c3b.

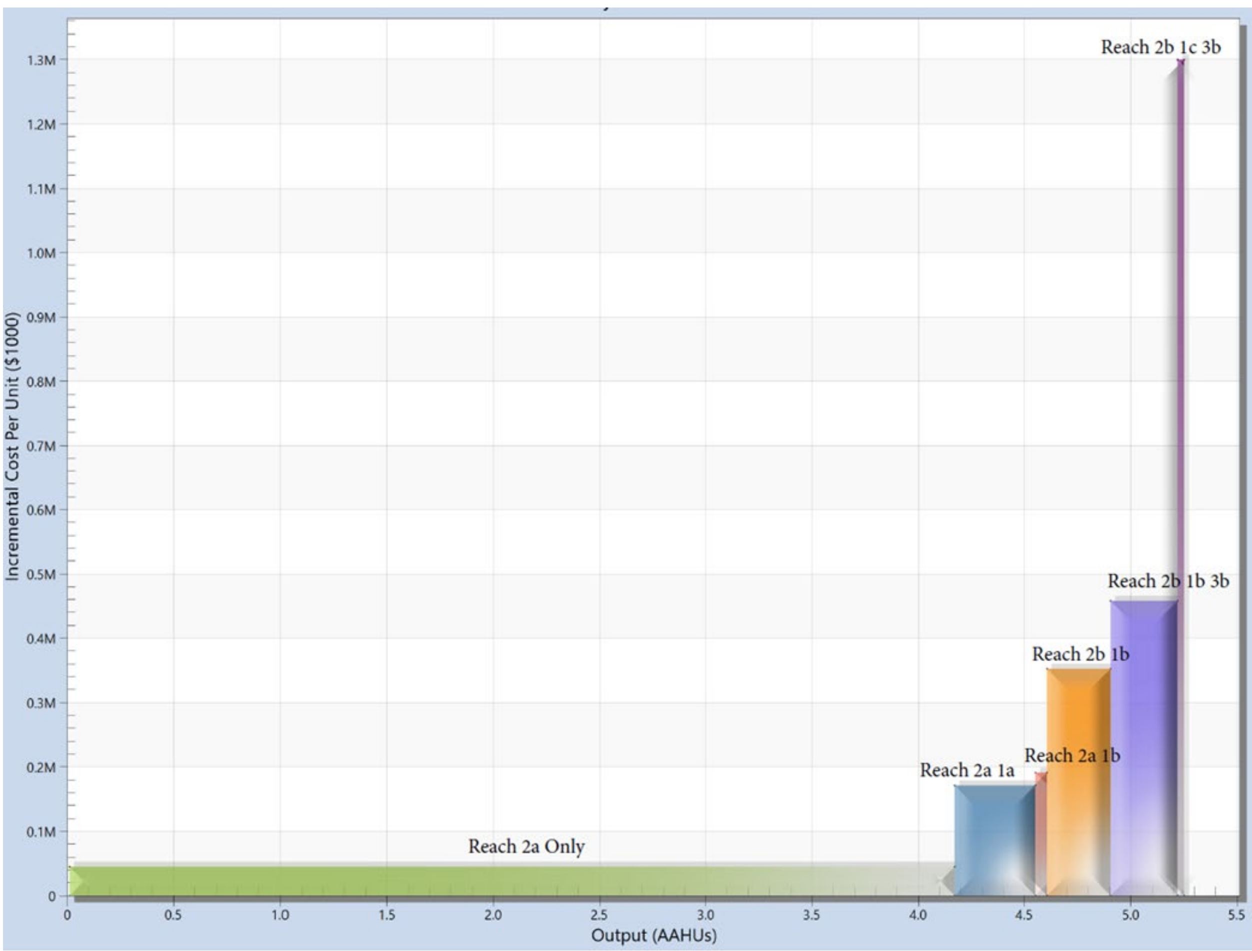


Figure 21: Best Buy Alternatives Box Plot.

A summary of the benefits, average annual cost, average annual cost per AAHU, and incremental cost per AAHU are displayed in Table 13. Based on the results of the

CE/ICA, the USACE carried forward all of the best buy alternatives in the final array. These seven alternatives were further compared in Section 4.4.

Table 13: Final Array Costs and Benefits.

Alternative	AAHUs	Annualized Cost	Incremental AAHU	Incremental Costs	Incremental Cost/AHHU
Alt 1: No Action	0	-	-	-	-
Alt 2: 2a	4.17	$186,200	4.17	$186,200	$44,652
Alt 4: 2a1a	4.55	$251,100	0.38	$64,900	$170,789
Alt 8: 2b1b	4.605	$261,600	0.055	$10,500	$190,909
Alt 21: 2a1b3b	4.905	$367,400	0.3	$105,800	$352,667
Alt 24: 2b1b3b	5.22	$511,800	0.315	$144,400	$458,413
Alt 25: 2b1c3b	5.25	$550,800	0.03	$39,000	$1,300,000

5.4 Completeness, Effectiveness, Efficiency and Acceptability

Completeness, effectiveness, efficiency, and acceptability are the four evaluation criteria specified in the Council for Environmental Quality (CEQ) Principles and Guidelines (P&G) for the evaluation and screening of alternative plans. Alternatives considered in any planning study should meet minimum subjective standards of these criteria in order to qualify for further consideration and comparison with other plans. A summary of how the final array of alternatives meets these criteria as well as the Objectives (please see Section 3.2.3) of the study is presented in Table 14.

- Completeness is the extent to which a given alternative plan provides and accounts for all necessary investments or other actions to ensure the realization of the planned effects.
- Effectiveness is the extent to which an alternative plan alleviates the specified problems and achieves the specified opportunities.
- Efficiency is the extent to which an alternative plan is the most cost effective means of alleviating the specified problems and realizing the specified opportunities, consistent with protecting the nation's environment.
- Acceptability is the extent to which the alternative plans are acceptable in terms of applicable laws, regulations and public policies.

NOTE: When considering the results of the CE/ICA, the full benefits of creating the wetland area are not considered due to the FACWet Analysis being left out of the calculations (Although the FACWet output was not used in the CE/ICA calculation, FACWet outputs were considered in the decision-making process, conceptualizing on the improvements of the wetland, and in summarizing completeness, effectiveness, efficiency and acceptability (Table 14) . Some aspects of wetland rehabilitation (such as length of riparian area, floodplain connectivity, etc.) are captured with FACStream, but the overall nature of a wetland is not. With this in mind, the PDT considered the rehabilitation of wetland and then the size of the wetland as marker of success in meeting Objective 2: Reconnect & restore native wetland habitats within Reach 2 Study Area. The larger the wetland area, the greater the success.

*Table 14: Spring Creek Alternatives Summary of Objectives and Completeness, Effectiveness, Efficiency, and Acceptability. LCLC = Length of Concrete Lined Channel. WVS = Watershed Variable Score. *FACWet and FACStream Scores do not show the full HUs/Benefits expected for Option Reach 2b.*

	1: Improve the quality & increase the quantity & complexity of native riparian habitats within the study area	2: Reconnect & restore native wetland habitats within Reach 2 Study Area	3: Address past impacts & decrease future effects of urbanization on the study site	4: Contribute to the overall function of Spring Creek corridor	Completeness	Effectiveness	Efficiency	Acceptability
Alt 1 No Action	Length of Riparian Area = 7,040 ft	0 ac of Wetland FACWet Score = 58 (F)	LCLC = 1,284 ft FACStream Score = 59 (F)	FACStream WVS = 62 (D-)	Complete	Not Effective	Not Efficient	Acceptable
Alt 2 2a Only	Length of Riparian Area = 6,911 ft	~1 ac of Wetland FACWet Score = 71 (C-) (+13)	LCLC = 1,284 ft FACStream Score = 63 (D) (+4)	FACStream WVS = 65 (D)	Complete	Somewhat Effective	Very Efficient	Acceptable
Alt 4 2a1a	Length of Riparian Area = 6,911 ft	~1 ac of Wetland FACWet Score = 71 (C-) (+13)	LCLC = 1,284 ft FACStream Score = 68 (D+) (+9)	FACStream WVS = 71 (C-)	Complete	Somewhat Effective	Efficient	Acceptable
Alt 8 2b1b	Length of Riparian Area = 6,911 ft	1-1.5 ac of Wetland FACWet Score = 71 (C-) (+13)	LCLC = 1,284 ft FACStream Score = 68 (D+) (+9)	FACStream WVS = 71 (C-)	Complete	Somewhat Effective	Efficient	Acceptable
Alt 21 2a1b3b	Length of Riparian Area = 7,632 ft	1-1.5 ac of Wetland FACWet Score = 71 (C-) (+13)	LCLC = 563 ft FACStream Score = 72 (C-) (+13)	FACStream WVS = 76 (C)	Complete	Effective	Efficient	Acceptable
Alt 24 2b1b3b (NER)	Length of Riparian Area = 7,867 ft	2-3 ac of Wetland FACWet Score = 77* (C+) (+19)	LCLC = 563 ft FACStream Score = 74* (C) (+15)	FACStream WVS = 77 (C+)	Complete	Most Effective	Efficient	Acceptable
Alt 25 2b1c3b	Length of Riparian Area = 7,867 ft	2-3 ac of Wetland FACWet Score = 77* (C+) (+19)	LCLC = 563 ft FACStream Score = 75* (C) (+16)	FACStream WVS = 77 (C+)	Complete	Most Effective	Least Efficient	Acceptable

Lowest Values | "F" Grades | Not Complete, Not Effective, Not Efficient, Not Acceptable

Mid Values | "D-, D, D+, C-" Grades | Somewhat Complete, Somewhat Effective, Least Efficient, Somewhat Acceptable

Highest Values | "C" or Better Grades | Complete, Effective, Efficient, Acceptable

5.4.1 Alternative 1—No-Action Alternative*

Objectives: The No-Action Alternative does not fully meet the objectives of this study.

Completeness: The No-Action Alternative is a complete plan because it is not dependent on the actions of others and it includes the necessary elements to achieve the subset of elements it is designed to deliver.

Effectiveness: The No-Action Alternative does not meet the effectiveness criterion because it does not achieve any of the planning objectives.

Efficiency: The No-Action Alternative is not efficient even though it does not require a financial investment by the Federal Government or the Sponsor. The No-Action alternative costs $0 but it also provides no benefits to the project site. The future without project conditions will remain unchanged and current trends will continue over the period of analysis.

Acceptability: The No-Action Alternative is acceptable in terms of applicable laws, regulations and public policies.

5.4.2 Alternative 2-2a Only

Objectives: Alternative 2-2a somewhat meets three of the four objectives. It does not meet Objective 1 because it decreases the length of riparian area (due to grading work to create wetlands in Reach 2. It only somewhat meets Objectives 2 through 4, but scores low in each. Specifically, Objectives 3 and 4 (Address past impacts & decrease future effects of urbanization on the study site, Contribute to the overall function of Spring Creek corridor). Alternative 2-2a leaves a FWOP condition in Reach 1 and Reach 3 meaning less connectivity and function within the Spring Creek corridor. Alternative 2-2a does not remove invasive species from Reach 1 which leaves a readily available seed supply to flow downstream into Reach 2. Alternative 2-2a leaves the concrete lining along Reach 3 which leads to water being heated back up as it travels through this area, does nothing to reduce velocity, and leaves a hardened riparian zone instead of a diverse, pervious, and ecologically functioning riparian zone.

Completeness: Alternative 2-2a is a complete plan because it is not dependent on the actions of others, and it includes the necessary elements to achieve the subset of elements it is designed to deliver.

Effectiveness: Alternative 2-2a is partially effective because it meets three out of four of the objectives. It does not meet Objective 1 because it decreases the length of riparian area. This alternative also only includes completed work in Reach 2. This means reaches 1 and 3 would further degrade in a Future Without Project Condition, leaving Reach 2 in an isolated state and thus less resilient. Also Reach 3's concrete lined channel and further degradation in a FWOP may inhibit upstream movement of species through the Spring Creek channel.

Efficiency: Based on the CE/ICA analysis, Alternative 2-2a is efficient and is considered a best buy plan. Alternative 2-2a has an incremental cost of $186,200 and an incremental output of 1.39 AAHUs. It provides benefits to the Reach 2 portion of the Spring Creek project site. Reach 2a has the lowest incremental cost per incremental output; this is largely due to it being the first ‘Best Buy’ plan after the No-Action plan and, while it is cost efficient, it is also limited in the geographic scope of the benefits it provides.

Acceptability: Alternative 2-2a is acceptable in terms of applicable laws, regulations and public policies.

5.4.3 Alternative 4-2a1a

Objectives: Alternative 4 – 2a1a somewhat meets three of the four objectives. It does not meet Objective 1 because it decreases the length of riparian area (due to grading work to create wetlands in Reach 2. It only somewhat meets Objectives 2 through 4, but scores low in each. Specifically, Objectives 3 and 4 (Address past impacts & decrease future effects of urbanization on the study site, Contribute to the overall function of Spring Creek corridor). Alternative 4- 2a1a does not remove invasive species from Reach 1 which leaves a readily available seed supply to flow downstream into Reach 2. Alternative 4-2a1a leaves a FWOP condition in Reach 3 translating to less connectivity and function within the Spring Creek corridor. Alternative 4-2a1a leaves the concrete lining along Reach 3 which leads to water being heated back up as it travels through this area, does nothing to reduce velocity, and leaves a hardened riparian zone instead of a diverse, pervious, and ecologically functioning riparian zone.

Completeness: Alternative 4-2a1a is a complete plan because it is not dependent on the actions of others, and it includes the necessary elements to achieve the subset of elements it is designed to deliver.

Effectiveness: Alternative 4-2a1a is somewhat effective because it meets three out of four of the objectives. It does not meet Objective 1 because it decreases the length of riparian area. This alternative also only includes completed work in Reach 1 and Reach 2. This means Reach 3 would further degrade in a Future Without Project Condition, leaving the benefits gained in Reach 1 and Reach 2 less likely to flow downstream through the degraded and concrete lined Reach 3. Also Reach 3’s concrete lined channel and further degradation in a FWOP may inhibit upstream movement of species through the Spring Creek channel.

Efficiency: Based on the CE/ICA analysis, Alternative 4-2a1a is efficient and is considered a best-buy plan. Alternative 4-2a1a has an incremental cost of $64,900 and incremental output of 0.38 AAHUs. It provides benefits to Reach 1 and Reach 2. It has a relatively low incremental cost per incremental output but does not include any benefits to the Reach 3 portion of the Spring Creek project.

Acceptability: Alternative 4-2a1a is acceptable in terms of applicable laws, regulations and public policies.

5.4.4 Alternative 8-2b1b

Objectives: Alternative 8-2b1b somewhat meets three of the four objectives. It does not meet Objective 1 because it decreases the length of riparian area (due to grading work to create wetlands in Reach 2. It only somewhat meets Objectives 2 through 4, but scores low in each. Specifically, Objectives 3 and 4 (Address past impacts & decrease future effects of urbanization on the study site, Contribute to the overall function of Spring Creek corridor). Alternative 8- 2b1b leaves a FWOP condition in Reach 3 meaning less connectivity and function within the Spring Creek corridor. Alternative 8-2b1b leaves the concrete lining along Reach 3 which leads to water being heated back up as it travels through this area, does nothing to reduce velocity, and leaves a hardened riparian zone instead of a diverse, pervious, and ecologically functioning riparian zone.

Completeness: Alternative 8-2b1b is a complete plan because it is not dependent on the actions of others, and it includes the necessary elements to achieve the subset of elements it is designed to deliver.

Effectiveness: Alternative 8-2b1b is somewhat effective because it meets three out of four of the objectives. It does not meet Objective 1 because it decreases the length of riparian area. This alternative also only includes completed work in Reach 1 and Reach 2. This means Reach 3 would further degrade in a Future Without Project Condition, leaving the benefits gained in Reach 1 and Reach 2 less likely to flow downstream through the degraded and concrete lined Reach 3. Also Reach 3's concrete lined channel and further degradation in a FWOP may inhibit upstream movement of species through the Spring Creek channel.

Efficiency: Based on the CE/ICA analysis, Alternative 8-2b1b is efficient and is considered a best buy plan. Alternative 8-2b1b has an incremental cost of 10,000 and an incremental output of 0.06 AAHUs. It provides benefits the Reach 1 and Reach 2 portions of the Spring Creek project site. This alternative has the lowest incremental output of any of the alternative in the final array and it is still limited in scope because it does not include any features in Reach 3.

Acceptability: Alternative 8-2b1b is acceptable in terms of applicable laws, regulations and public policies.

5.4.5 Alternative 21-2a1b3b

Objectives: Alternative 21-2a1b3b somewhat meets all four objectives. This alternative increases the amount of riparian area, creates a small wetland area, and completes work in all three reaches of the study area creating a more connected system. This alternative does not score as high in Objectives 2 and 3 due to the small wetland size created.

Completeness: Alternative 21-2a1b3b is a complete plan because it is not dependent on the actions of others, and it includes the necessary elements to achieve the subset of elements it is designed to deliver.

Effectiveness: Alternative 21-2a1b3b is somewhat effective because it somewhat meets all four of the objectives. However, the size of the wetland is considered much smaller than the previous wetland that existed leading to a only a gradual increase in the FACStream score, thanks in large part to the addition of Reach 3 and the removal of the concrete lined channel.

Efficiency: Based on the CE/ICA analysis, Alternative 21-2a1b3b is efficient and is considered a best buy plan. Alternative 21-2a1b3b has an incremental cost of $105,800 and an incremental output of 0.3 AAHUs. While it is less cost efficient than Alternatives 1, 2, 4, and 5 it has the desirable benefit of providing restoration features to all reaches in the Spring Creek project site.

Acceptability: Alternative 21-2a1b3b is acceptable in terms of applicable laws, regulations and public policies.

5.4.6 Alternative 24 – 2b1b3b

Objectives: Alternative 24-2b1b3b meets all four objectives. This alternative increases the amount of riparian area, creates a larger wetland area than alternative 2a, and completes work in all three reaches of the study area creating a more connected, complete, and resilient system.

Completeness: Alternative 24-2b1b3b is a complete plan because it is not dependent on the actions of others, and it includes the necessary elements to achieve the subset of elements it is designed to deliver.

Effectiveness: Alternative 24-2b1b3b is effective because it meets all four of the objectives. This alternative benefits all three reaches, adds additional acreage to the wetlands in Reach 2 and removes the concrete in Reach 3.

Efficiency: Based on the CE/ICA analysis, Alternative 24-2b1b3b is efficient and is considered a best buy plan. Alternative 24 has an incremental cost of $144,400 and an incremental output of 0.315 AAHUs. Alternative 24 provides benefits to all reaches in the Spring Creek project site, adds additional acreage of wetlands to the Reach 2 portion Spring, and has lower incremental cost when compared to Alternative 25.

Acceptability: Alternative 24-2b1b3b is acceptable in terms of applicable laws, regulations and public policies.

5.4.7 Alternative 25 – 2b1c3b

Objectives: Alternative 25-2b1c3b meets all four objectives. This alternative increases the amount of riparian area, creates a wetland area, and completes work in all three reaches of the study area creating a more connected, complete, and resilient system.

Completeness: Alternative 25-2b1c3b is a complete plan because it is not dependent on the actions of others, and it includes the necessary elements to achieve the subset of elements it is designed to deliver.

Effectiveness: Alternative 25-2b1c3b is effective because it meets all four of the objectives. This alternative benefits all three reaches including protecting an existing bench in Reach 1, adding additional acreage to the wetlands in Reach 2, and removing the concrete in Reach 3.

Efficiency: Based on the CE/ICA analysis, Alternative 25-2b1c3b is efficient and is considered a best buy plan. Alternative 25 has an incremental cost of $39,000 and an incremental output of 0.03 AAHUs. Alternative 25 is the 'max' alternative. It includes the highest amount of ecosystem restoration features of the alternatives in CE/ICA. However, compared to the other alternatives the incremental benefit of this alternative is very small.

Acceptability: Alternative 25-2b1c3b is acceptable in terms of applicable laws, regulations and public policies.

According to the results of the CE/ICA analysis, less than 50% of the habitat benefits are realized with Alternative 2-2a. However, this alternative did not include work completed in Reach 1 nor Reach 3. While this alternative offers some habitat benefits, the benefits captured through a more complete, connected, and native species prolific alternative are more favorable in this highly urban environment. Therefore, Alternative 2 has been screened out for lack of effectiveness.

According to the results of the CE/ICA analysis, over 50% of the habitat benefits are realized with Alternative 4-2a1a. However, this alternative did not include work completed in Reach 3 nor removal of invasive species from Reach 1. While this alternative offers habitat benefits, the benefits captured through a more complete, connected, and native species prolific alternative are more favorable in this highly urban environment. Therefore, Alternative 4 has been screened out for lack of effectiveness.

Alternative 5- 2a1b leaves a FWOP condition in Reach 3 meaning less connectivity and function within the Spring Creek corridor. Alternative 5-2a1b leaves the concrete lining along Reach 3 which leads to water being heated back up as it travels through this area, does nothing to reduce velocity, and leaves a hardened riparian zone instead of a diverse, pervious, and ecologically functioning riparian zone. Therefore, Alternative 5 has been screened out for lack of effectiveness

The PDT felt the CE/ICA analysis accurately showed that the investment in Alternative 25-2b1c3b as not really worth it for the habitat benefits. Protecting the existing bench in Reach 1 (Option Reach 1c), offers little benefit for the cost of the boulders and earthwork. The bench is small and will most likely be only minimally impacted in a FWOP or by the construction efforts that occur in the area. Therefore, Alternative 5 has been screened out for lack of efficiency.

6 Affected Environment and Environmental Consequences*

This section discusses all reasonably foreseeable impacts by assessing the existing conditions and future without-project conditions used for analysis during the study, as well as the probable environmental outcomes of implementing Action Alternatives. Such consequences of the Action Alternatives are not remote, speculative or purely coincidental but are likely enough that such effects should be considered and analyzed. Existing conditions are the physical, chemical, biological, and sociological characteristics of the study area. Characterizing resource conditions is critical for understanding the probable future condition of those resources (i.e., the future without-project condition) and for defining problems and opportunities.

The spatial scale of analysis focuses on the locations of the proposed sites to provide a comparison between the No-Action Alternative and the Action Alternative. The time scale for analysis is a 50- year period beginning in 2024 and extending to 2074.

6.1 Considerations of Changing Conditions

Changing conditions at the planetary scale is an important consideration in project planning. Information presented in the Changing Conditions Appendix informs how the relevant planetary factors would influence the project. The effects of changing conditions are addressed, consistent with ECB 2018-14 (USACE 2018), through discussion of literature findings and projections of future conditions developed for southern Colorado.

Over the 21st Century, there is model consensus in projections of warmer conditions relative to average for the period 1971-2000. Statewide, under the lower emissions scenario (RCP 4.5) average annual temperatures are projected to warm by ~2.3°F to ~7°F by 2050 relative to the average temperature for the period 1901-1960, and by ~2.5 to ~9.0°F by 2100 (mean = ~5°F); under the higher emissions scenario temperatures are projected to increase 2.5°F to 8.0°F by 2050, and approximately 7 to 15°F by 2100 (mean = ~11°F; Frankson et al. 2022:Figure 1).

Warmer temperatures are likely to alter the water balance in the project area, and in the watersheds that provide water to Colorado Springs. In the project area, warmer temperatures could likely increase evapotranspiration, resulting in reductions in soil moisture and surface water persistence. Hotter summer temperatures may exceed the thermal limits of desired plant and animal species and affect the long-term viability of habitats being restored.

Warmer temperatures in the mountains may reduce water supply through effects on the snowpack, increased reservoir evaporation rates, and changes in surface runoff. It is reasonable to anticipate that these changes might lead to reductions in municipal and industrial water supply that would alter patterns of outdoor water use and wastage within the city limit, impacting base flows at the restoration site. Where water pools on the project site, warmer air temperatures may raise water temperatures, reducing water quality.

Projected changes in precipitation are equivocal, with some models projecting decreased annual precipitation by no more than 10% to increases of no more than 20%. There is some model agreement around projections of increased winter precipitation. In the Arkansas Valley, this is accompanied by 5-10% decreases in July and August precipitation, the two wettest months (Lukas et al. 2014, Frankson et al. 2022). Precipitable water in the atmosphere is projected to increase (Mahoney et al. 2018) and extreme precipitation events (e.g., 0.2 AEP), such as those typical in the summer season, may double in frequency (Kharin et al. 2013, Janssen et al. 2014, Janssen et al. 2016). The combination of less overall summer precipitation and concentration of that precipitation into bigger events may also mean more days with precipitation of a trace or less. Importantly, some studies indicate that the onset of the monsoon may be delayed by as much as a month (Cook and Seager 2013), potentially lengthening the early summer dry season and increasing the share of runoff that occurs once many plants have ended their growth for the year.

For the project area, these increases in precipitation variability would create opportunities for water storage but also create water supply challenges in some seasons (early summer) and prolonged drought years. Reductions in soil moisture could create challenges for establishing and maintaining vegetation outside the riparian and aquatic zones.

Ecosystem restoration and hydraulic features described in the action alternatives take into consideration potential future shifts in climatic conditions and other scenarios by ensuring channel parameters and biological features are based on conservative assumptions of both high and low flow volumes in order to maintain resiliency. Specifically, the alternatives calls for a series of constructed rock riffles which in turn allow for easier adaptive management of the site during low and high flow events. The alternatives also calls for bank stabilization at key locations to reduce the erosion of banks during intense high flow events. Lastly, the alternatives would use native plants with the ability to survive drying periods and thrive in wet periods.

6.2 Hydraulics and Hydrology

The Spring Creek Watershed contributing area to the downstream end of the study area (Airport Rd bridge) is approximately 2.9 square miles. The defined stream channel runs approximately 4 miles, from just under half a mile upstream of the project area to its confluence with Fountain Creek. Along the stream’s course, it transitions between a natural channel to various degrees of channelized, hardened, and culverted reaches. The stream conveys stormwater from development in the watershed, which is one of the drivers of degradation of the stream.

Stormwater runoff enters the study area in three locations: from the north through Pikes Peak Ave, from the northeast under S Academy Blvd, and from the southeast through a storm drain. It is assumed that there is sufficient flow in the creek to maintain a wetland restoration project. According to the hydrologic HEC-HMS model developed for this study, the flow from the north has a peak discharge of 520.4 cfs for a 2-yr, 2-hr storm and a peak discharge of 2705.6 cfs for a 100-yr, 2-hr storm. The northeastern flow from under Academy Blvd has a peak discharge of

234.5 cfs for a 2-yr, 2-hr storm and a peak discharge of 1250.1 cfs for a 100-yr, 2-hr storm. The southeastern flow from the storm drain has a peak discharge of 79.9 cfs for a 2-yr, 2-hr storm and a peak discharge of 443.2 cfs for a 100-yr, 2-hr storm.

The flow from the north first passes under East Bijou Street and along Wagner Park, where the channel has incised. The bank towards the park is steep while the left bank to the east is flatter with many trees and opens up towards a fire station. Evidence of unhoused populations in the area was observed. The channel bottom and banks show outcrops of shale and groundwater sources contributing to the channel flow. The channel flow then runs under Pikes Peak Ave and enters the study area in a short, straight reach with boulder-armored banks on both sides. An aerial sewer line runs across the channel and is a critical constraint on the water surface elevation in this area. As-built plans were provided for this sanitary sewer main by Colorado Springs Utilities. After this 350-ft section, the flow enters the project area, where the overbank areas open up into large grassy fields. However, the channel is incised, and the flow cannot access the floodplains.

From the east side, water directly enters the study area from under South Academy Blvd, collected from the urban areas to the east. This flow passes through an energy dissipation structure which is degraded, causing a large pool at the bottom. From here, the flow enters a narrow, forested channel before joining the main Spring Creek channel near the center of the study area.

The two flows converge near the center of the study area, and follow a short meander along steep, overhanging banks before entering an armored and channelized reach. The concrete on the banks is degraded and some large sheets of bank armor have fallen into the channel. A small amount of additional flow enters the channel from a stormwater drain on the east side, draining from a nearby parking lot. This channel continues until Airport Road, where the armored channel banks end and the flow continues down a rocky slope. In several locations mentioned previously, the stream corridor has been encroached on and straightened to accommodate development but remains an open earthen channel for over 3.4 miles of its length.

6.2.1 No-Action Alternative / Future Without Project Conditions

The No-Action alternative is synonymous with the "Future Without-Project Condition". No project would be implemented by USACE to achieve the planning objectives. Evaluation of the

No Action Alternative is required by USACE Planning guidance and by NEPA. As described throughout Section 5, the Spring Creek study site location would remain degraded under the No-Action Alternative. Habitat availability, quality, complexity, and connectivity would continue to deteriorate. The overall condition of the channel is anticipated to remain severely degraded.

6.2.2 Action Alternatives

The Tentatively Selected Plan (TSP) consists of the following options: Reach 1B, Reach 2B, and Reach 3B. The following excerpts are from the H&H Appendix E, Section 5.1 Focused Array of Alternatives:

Options for Reach 1B

Protect and Plant Bench, Boulder Cluster, Invasive Removal, and Stewardship

This alternative would involve longitudinal peak stone toe protection on the west bank of Reach 1, riparian plantings behind the stone toe, boulder clusters within the channel, a new access road to a stewardship area, and removal of invasive species on the east bank. The management measures included in this alternative are invasive species removal, riparian planting, physical exclusion, Boulder Clusters, and public outreach and education.

Options for Reach 2B

Larger Wetland Rehabilitation, Riparian Plantings, Constructed Rock Riffles, Stone Bank Stabilization, Fill Placement, and Stewardship

This alternative would involve boulder clusters in the channel entering Reach 2, larger bank modification for wetland rehabilitation, riparian plantings, two constructed rock riffles, stone bank stabilization at two key eroded outside bends, fill placement on-site, and two new access roads to stewardship areas. The management measures included in this alternative are wetland rehabilitation, wetland plantings, small grade control structures, invasive species removal, riparian planting, overstory planting, bank slope modification, riparian bench construction, Boulder Clusters, and public outreach and education.

Options for Reach 3B

West Bank Riparian Improvements and Added Rock Riffle

This alternative would involve a small riffle at the top of Reach 3, boulder clusters in the channel throughout Reach 3, removal of concrete, and slope adjustment, rock placement, and plantings on the west bank slope. The management measures included in this alternative are small grade control structure, riparian planting, bank slope modification, riparian bench construction, removal of bank hardening, and Boulder Clusters.

This combination of alternatives across the three reaches of the project area yielded the highest values in the plan formulation matrix as well as the FACStream scoring systems. The CE/ICA also supported this TSP as cost effective. While it was not the plan with the most efficient incremental cost per incremental output, the TSP maximizes the degree of achievement of the planning objectives and significance and magnitude of ecological benefits while maintaining an acceptable cost effectiveness. Construction-related effects are anticipated to be minor, well-managed, and temporary in nature. The project is expected to avoid significant impacts on water resources by implementing effective preventive measures. Therefore, a determination of May Affect, Not likely to Adversely Affect is expected for water resources and hydrology. Compliance with both Section 404 and Section 401 of the CWA would be addressed by applying an appropriate Nation Wide Permit (NWP) to the project. The USACE proposes to leverage a USACE Regulatory Section 404 NWP for the proposed action indicating that the NWP 27 would apply to the project. Construction of the project would comply with all provisions of any NWP applied to the project, including implementing all construction best management practices.

6.3 Geotechnical

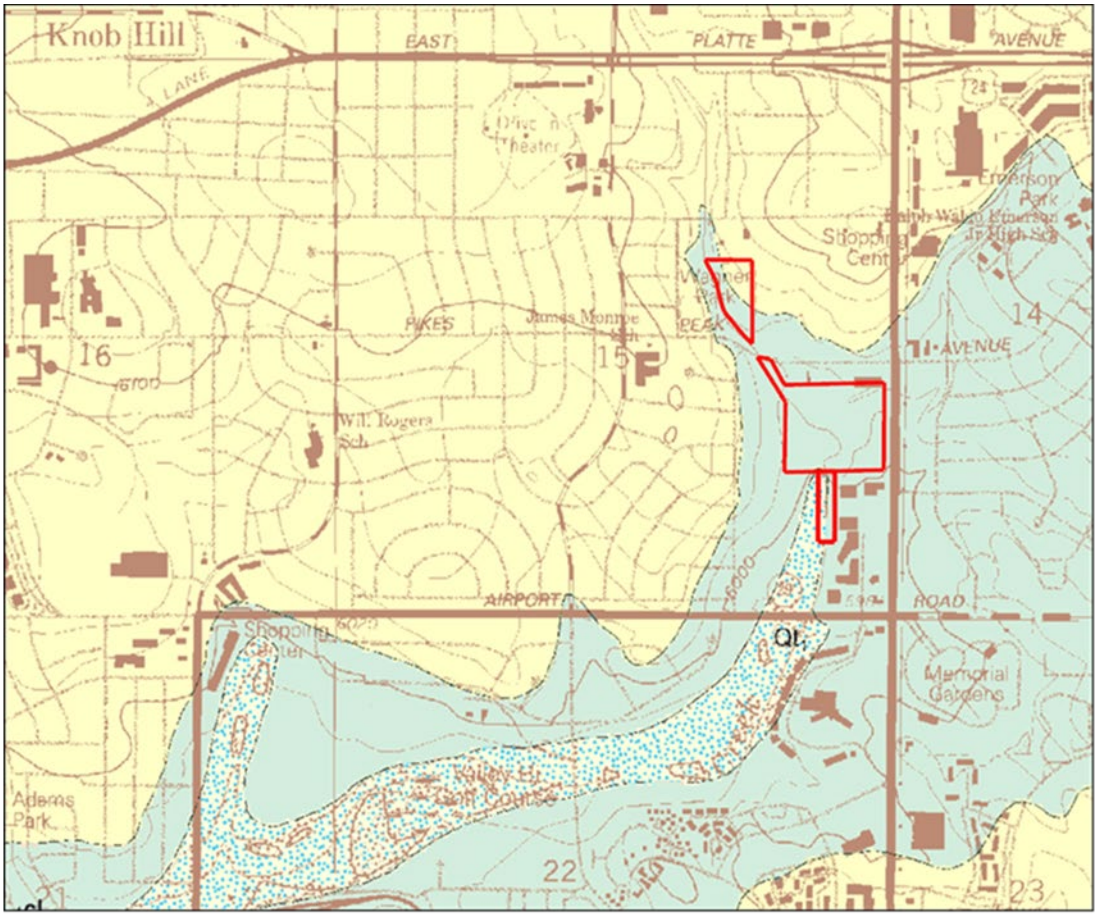
The following sections discuss the existing geologic conditions that are present at the Spring Creek project and are based upon existing publicly available information from the Colorado Geologic Survey.

6.3.1 Topography

The site topography varies in each reach, with the steepest topography occurring in Reach 1 of the project site, where Wagner Park is located, at about a 25% grade. Otherwise, the rest of the project site is moderately flat.

6.3.2 Geology

The geology at the project location includes the Cretaceous Pierre Shale (Kp), Quaternary eolian deposits (Qe), and Quaternary terrace alluvium (Qt1). The dominate lithology and bedrock is the Pierre Shale, an Upper Cretaceous gray shale and thin sandstone unit approximately 2,000 ft thick. This unit is flat-lying to dipping very shallow to the east (<5 degrees) in Colorado Springs. For geologic hazards, the Pierre Shale is known to include numerous bentonite beds, typically 1 to 3 Inches thick; it weathers to a brown to green clay with sulfate salts. This Pierre Shale is highly susceptible to slope instability in steep areas of Colorado Springs (Colorado Geologic Survey, 2000). Much of the creek bed of Spring Creek cuts into Pierre Shale locally (Figure 22).



Qt_1	**Terrace alluvium one (Holocene)**—Poorly to moderately sorted, unconsolidated, matrix-supported cobble gravel in a sandy, silty, or clayey matrix. Includes stream-channel deposits, flood-plain deposits, and low-terrace deposits up to 10 ft above Fountain and Monument Creeks
Qes	**Eolian sand (Holocene to late Pleistocene)**—Silty sand to coarse-grained sand deposited by wind and preserved on surfaces downwind (east-southeast) of mainstem river valleys. Covers terrace alluviums two and three (Qt_2 and Qt_3) and Pierre Shale east of Monument and Fountain Creeks
Kp	**Pierre Shale (Upper Cretaceous)**—Gray shale. Includes numerous bentonite beds that are typically 1-3 in. thick and occasionally up to 8 in. thick). Typically weathers to brown and olive-green clay, with curvilinear fractures filled with sulfate salts. Formation is mostly covered by Quaternary deposits and is particularly susceptible to slope instability in steep areas

Figure 22: Excerpt of site surficial geologic map from the Colorado Geologic Survey. Source: Carroll, 2002

The surficial units at the project location include terrace alluvium (Qt1) located on the west side of Spring Creek near Airport Road. It consists of poorly to moderately sorted, unconsolidated cobble gravel in a sandy, silty, or clayey matrix. It is estimated that this cobble gravel very thinly overlies the Pierre Shale between 1 and 5 ft thick, and probably thickens to the south of Airport Rd. The eolian sand in the northwest part of the map area consists of silty sand to coarse grained sand deposited by wind. It overlies the Pierre Shale an estimated 1-10 ft thick north, west, and east of the Spring Creek area. Groundwater table of Spring Creek is very shallow in the creek bed but is nonexistent in most areas because the Pierre Shale acts as an aquitard barrier to groundwater flow. Stormwater flow would stay on the surface overlying Pierre Shale bedrock, or flow through the very permeable Qe sand or Qt1 gravel units. Active seepage areas have been observed in Reach 1 and are characterized by shallow groundwater conditions which discharge above the ground surface.

6.3.3 Geotechnical Design Considerations

Because the Pierre Shale acts as an aquitard, there were no concerns about infiltration during the study. This characteristic also helps to sustain the new benches for wetlands.

Check structures, that will be constructed of rocks, will be founded on existing ground materials, either the shale or overburden. No geotechnical investigations were performed as part of this study. Bearing pressure for the check structures is anticipated to be less than minimum design values, as there is no site-specific investigation data to use.

6.3.4 No-Action Alternative / Future Without Project Conditions

If the Spring Creek CAP 206 project does not move forward to construction, the channel would continue to incise and cause unstable slopes to fail. Material would be washed down the creek and eventually, more of the existing rock near the ground surface could become exposed. Over time, this shale will weather.

6.3.5 Action Alternatives

With the TSP, all reaches would receive geotechnical benefits, including added riprap for slope stability and erosion protection, flatter slopes to improve slope stability, and prevention of shale weathering. In Reach 1, improved channel conditions include longitudinal peak stone toe protection on the west bank that would prevent and delay slope failures and prevent future erosion. In Reach 2, stone bank stabilization at two key eroded outside bends will prevent future erosion of the nearly vertical wall of earthen material in addition to the preventing erosion of the channel invert, where shale is shallowly located that is prone to weathering. Slopes will be laid back to stable conditions and be safer to the public. In Reach 3, failed concrete lining would be removed, and stable slopes would be graded. In all reaches, erosion is prevented and unstable earthen slopes are constructed to stable conditions. Fill placement for wetland rehabilitation and plantings also helps preserve site conditions and the underlying shale that is prone to weathering.

6.4 Hazardous, Toxic and Radioactive Waste

A Phase 1 Environmental Site Assessment (P1ESA) was conducted at the study site including a site visit in August 2022 (Appendix F). The objective of this P1ESA was to identify the potential presence of hazardous, toxic, or radioactive waste (HTRW) at the project site that may affect plan formulation. Environmental regulatory records, historic aerial photographs, site reconnaissance, and interviews were used to assess the historic and existing environmental conditions.

A regulatory agency search revealed no recognized HTRW occurrences associated with the study area. The study area did contain solid waste (trash), in the form of plastic bags, buckets, car and bike tires, bike parts, glass, concrete, metal grates, and waste associated with the encampments such as fast-food containers, clothes and the remains of tents and temporary housing structures. Although the breakdown of certain solid waste could eventually release HTRW substances, this is likely to occur over an extended timeframe, and only if the waste stays on the project site for that duration.

The regulatory agency search revealed multiple HTRW occurrences outside of, but within ½ mile of the study area, though none fall directly within it. Most HTRW occurrences involve underground storage tanks (USTs), but one notable HTRW occurrence, is Ameri Cleaners a dry cleaners classed as a conditionally exempt small quality generator by the Resource Conservation and Recovery Act (RCRA), due to halogenated solvent use. In 2009, Ameri Cleaners received a compliance advisory following a violation. While there have been past UST leaks, all reported violations are now closed, and no active leaks remain.

Aerial photography highlights land use changes over time, from terraced farmland to highly urbanized surrounding area. The study site itself has remained vegetated with a creek across the time range of the aerial photography. Topography has remained unchanged, except for local incision, up to 10ft in places, by Spring Creek.

6.4.1 No-Action Alternative / Future Without Project Conditions

The future without project conditions would remain similar to the current HTRW concerns at the study site. If there is an increase in homeless encampments, more solid waste can be expected, and future shifts in climatic patterns at the planetary scale may increase the magnitude of precipitation events, bringing more stormwater sourced solid waste on to the study site. Additionally, with no alteration to the hydraulic regime, increased incision of the stream bed may occur, which could lead to degradation of the bank, causing more concrete slabs to enter the stream, potentially trapping greater amounts of solid waste.

6.4.2 Action Alternatives

The Action Alternatives in general considered to result in improvements to the current site, as solid waste at the site would be removed, including the sections of concrete slab that have collapsed into the river. There is the possibility of increased solid waste in the form of trash, due to the four public access walkways, and with vehicle access there is also the possibility of illegal dumping, but these are considered minor likelihoods with the increased foot traffic for recreation to the site.

6.5 Water Quality

Spring Creek is a tributary of Fountain Creek. In the area highlighted in Figure 23, Fountain Creek to Hwy 47, the state monitors iron, temperature, lead, and E. Coli as a part of Colorado's Section 303(d) Monitoring and Evaluation List. This section of the Fountain Creek Watershed (which is downstream of the project site) has an impairment for E coli. Summer storms lead to increases in E. Coli in this stretch of Fountain Creek. A 2009 study (above the Spring Creek confluence) identified the source as bird fecal contamination (CDPHE 2010).

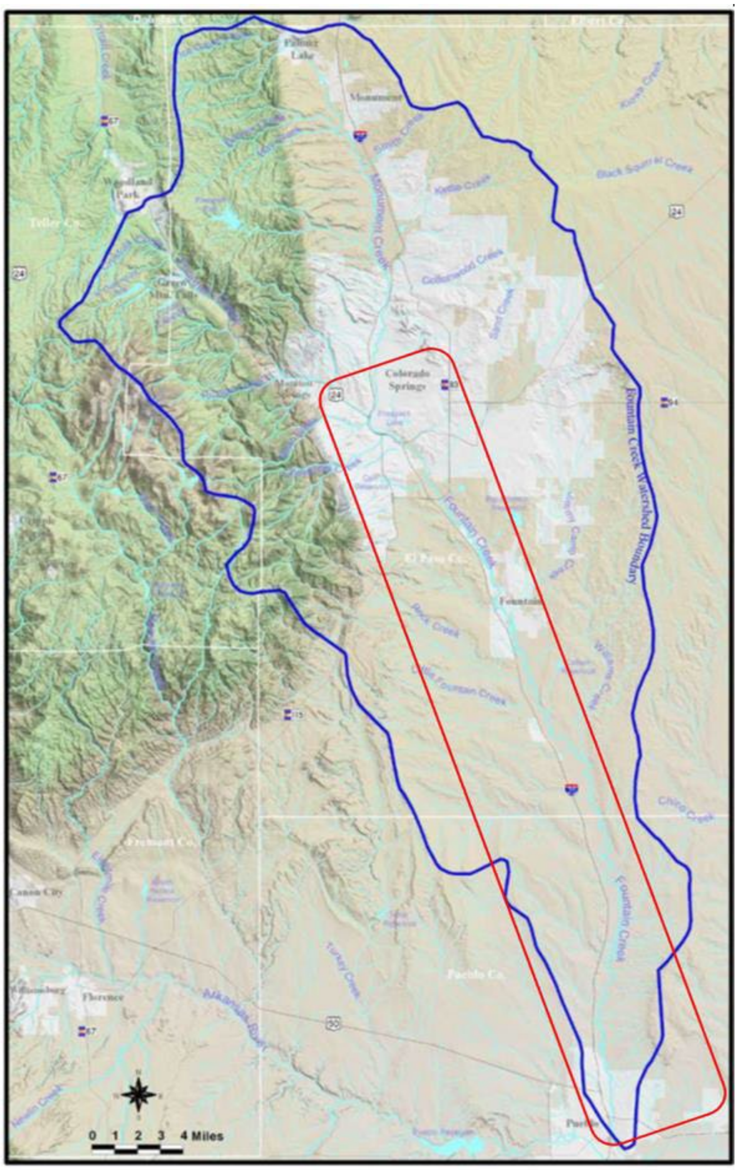


Figure 23: Fountain Creek monitoring area (red outline) per Section 303(d) Colorado's Monitoring and Evaluation List

As the study site is to be restored to a wetland, increases in avian fecal matter being transported to Fountain Creek need to be considered.

6.5.1 No-Action Alternative / Future Without Project Conditions

The FWOP conditions would remain like the current water quality conditions at the study site, with the potential for a degradation in water quality. Changing climatic conditions may increase the magnitude of precipitation events, bringing more stormwater sourced waste, including salts and organic contaminants from overland flow of highways and impervious surfaces. Additionally, with no alteration to the hydraulic regime, increased incision of the stream bed may occur, leading to degradation of the bank, causing more concrete slabs to enter the stream, potentially trapping and retaining greater amounts of solid waste.

6.5.2 Action Alternatives

The Action Alternatives in general considered to result in improvements to water quality, as solid waste and the sections of concrete slab would be removed. Stabilization of the banks and the rehabilitation of wetlands could help reduce river incision. The wetlands could also improve water quality as plants uptake dissolved metals and organic contaminants.

Construction activities associated with the restoration project may result in localized and short duration impacts on water quality. In Reach 2, excavation to reshape and stabilize streambanks as part of wetland restoration may temporarily disturb soils. In addition, the selective clearing of invasive vegetation could further contribute to minor sediment mobilization or organic material entering the water column. This work is proposed under Nationwide Permit 27 (Aquatic Habitat Restoration, Restoration, and Establishment Activities), authorized by Section 404 of the Clean Water Act (CWA), which covers aquatic habitat and wetland restoration actions. The State of Colorado's 401 Water Quality Certification confirms that activities permitted under NWP 27 are consistent with state water quality standards and are thus authorized to proceed under the CWA.

One potential risk during construction is the accidental release of fuels, oils, or other pollutants into nearby waterways. However, such incidents are expected to be minimal and short-lived. Prior to construction, the project team will obtain a general stormwater discharge permit under the NPDES program and will develop a Stormwater Pollution Prevention Plan (SWPPP) in compliance with federal and state regulations. The SWPPP will incorporate a suite of Best Management Practices (BMPs) aimed at protecting water quality throughout the duration of construction. These measures will include:

- Erosion control measures such as silt fences and straw wattles
- Prompt stabilization of disturbed areas through mulching, seeding, or ground cover
- Proper storage of fuels, lubricants, and solid waste well outside the floodplain or runoff-prone areas
- Routine inspection and maintenance of equipment to prevent fluid leaks

- Covering or stabilizing fill materials and using sediment barriers to prevent wind or runoff transport

By implementing these preventative measures and maintaining compliance with NPDES requirements, the project is expected to avoid significant impacts to surface water quality. Water resource integrity will be preserved, and any construction-related effects are anticipated to be minor, well-managed, and temporary in nature. Therefore, a determination of May Affect, Not likely to Adversely Affect is expected for water quality.

6.6 Wetlands and Floodplains

Wetlands are those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support a prevalence of vegetation typically adapted for life in saturated soil conditions. As described in Sections 2.1 and 2.3, herbaceous and emergent wetlands have historically occupied the Spring Creek corridor along with riparian grasslands (City of Colorado Springs, 1993).

Executive Order 11988 (Floodplain Management) requires Federal agencies to avoid, to the extent possible, the long and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative. Executive Order 11990 (Protection of Wetlands) is an overall wetlands policy applicable to all agencies managing Federal lands, sponsoring Federal projects, or providing Federal funds to state or local projects. It requires affected Federal agencies to follow avoidance, mitigation, and preservation procedures and to obtain public input before proposing new construction in wetlands.

Spring Creek is a stream that transitions between a natural flow-way into various degrees of channelized, hardened, and culverted reaches. The existing condition of Spring Creek is a relatively straight, fully entrenched channel system with a low width-depth ratio and minimal variance in the stream’s ability to bend and meander (i. e., stream sinuosity). The existing channelization and entrenchment dictate the stream’s morphology and decreases the potential development of stream branching patterns and stream enlargement or widening. Additionally, portions of existing bank armoring/hardening also influences the natural variability of changes to the slope or gradient of the stream, ultimately driving the evolutionary stage of Spring Creek’s wetlands further away from a functioning condition.

Currently no functioning wetlands exist in Reach 1, 2, or 3 of the study area. In Reach 1 and Reach 3, the continuous entrenchment of the stream and the gradual breakdown of the channel armor restricts the ability for groundwater recharge and further confines flow. The restriction of stream to a confined linear channel almost eliminates the energy-transfer mechanisms to down-gradient habitats through hydrologic connectivity. In Reach 1 and Reach 3 the riparian zone continues to shrink and the habitat availability for riparian organisms is restricted to the steep banks along the linear channel.

Sections of Reach 2, in particular the inflow and outflow areas of the former wetland also experience the effects of confined linear flow-ways. Although Reach 2 has the highest degree of wetland characteristics in Spring Creek, the wetland function and composition is severely degraded. The physical structure of the stream has been homogenized, resulting in poor distribution of water depth and velocity across a floodplain that at certain sections is restricted by high terraces. The confinement of the stream and its severe disconnect from its floodplain have shifted from once former wetland characteristics to an urban prairie dissected by a channel.

6.6.1 No-Action Alternative / Future Without Project Conditions

In the FWOP scenario, flow conditions for Spring Creek could maintain current conditions, however, the conditions in the future could become more variable due to changing conditions at the planetary scale, as discussed above. It is expected that the stream channel would continue to experience incision to the established grade control structures (culverts) and bank erosion, shifting the characteristics of wetland towards an upland condition. Therefore, in a FWOP scenario, wetlands would not reestablish in Reach 1 or 3. It is estimated that the physical structure of the stream In Reach 1 and Reach 3 could continue to experience damaging erosion process from periodic high flow events (Mahoney et al. 2018) that limit the formation of banks, and other natural substrate features characteristic of a functioning wetland.

It is estimated that a FWOP scenario in Reach 2 would eliminate the potential of wetland establishment. In response to the continued bank erosion, it is possible that the City would perceive a need to stabilize this reach and would transform the Reach to a complete channelized conveyance system, typical of an urban environment. The subtle wetland characteristics that currently persist, would continue to degrade and undergo major loss of spatial extent and wetland structure. The constant channelization of the stream would continue to produce the high-and-dry terraces found in Reach 2, and maintain that acute change in environment, rather than the gradual transition from wetland to upland, found in most healthy wetlands of the region. As land-use intensifies, so does the effects of urban encroachment into Spring Creek (Smith & Kuhn, 2015). Despite constant nutrient runoff from the surrounding urban area, the water quality of Spring Creek has been maintained at a reasonable and stable condition, but in a FWOP coupled with land use intensification the quality of water is estimated to decline.

Plans for development southwest of Reach 2 is estimated to increase stressors on the connectivity of habitats and steadily contribute to the overall decrease in the ecological functionality and composition of the former wetland. Effects of urban intensification also estimate that physical barriers to organism movements and abiotic processes (e. g. bicycle paths, fencing, additional roads and additional or enhanced water management structures) in support of adjacent City plans, could elevate the volume of impairment to the former wetland. The above stressors from urban intensification in combination with effects from anticipated climatic shifts at the planetary scale could drive Spring Creek towards unrealistic variations in the quantity, quality, timing and distribution of water, and severely impairing wetland function and composition.

6.6.2 Action Alternatives

Under the Action Alternatives, improvements to the wetland habitat in Reach 2 would increase the Composite FCI score and improve the degree of impairments currently present (EC) and in a FWOP scenario. The former wetland in Reach 2 is considered low-quality habitat, and under the Action Alternatives, is projected to undergo an increase in the spatial extent of wetland/riparian characteristics and an increase in the functions known to occur in floodplains and other hydric environments (Hauer et al. 2016). The Action Alternatives would influence 2,355 ft of stream length with newly modified banks that offer gentle slopes, facilitating hydrological connectivity into the lateral floodplain. The restored riparian zone would be planted with a transitional cottonwood-willow community, supported with interspersed mesic graminoid species that create a dynamic, multi-layered habitat that can support a wide range of plant and urban wildlife species (Stanford & Ward, 1993); NRCS b). In addition, the construction of in-stream features and bank stabilization structures is expected to enhance the aquatic environment by influencing change in the hydraulics and dictating the response of organisms (Thomas et al. 2000; Hauer et al. 2016). In Reach 2, two rock riffles, two stone-bank stabilization features, and a series of boulder clusters would counter channel incision, erosion and would add variation in the hydrogeomorphology of the stream system. The rock riffles acting as small grade control structures are expected to provide the appropriate annual hydroperiod required for various native flora species. The Action Alternatives consider the elevation range for native flora, which is determined by the inundation extents for high-frequency hydrologic scenarios corresponding to the annual hydroperiods suitable for the species in focus.

Although the Action Alternatives 2a and 2b are composed of similar restoration components, the key difference between these is in the volume/size of the proposed restoration components. The bank slope modifications for 2a would total approximately 4.61 acre-feet and 12.9 acre-feet for 2b. The vegetation plantings for 2a would cover approximately 0.85 ac, and 1.74 ac for 2b. The fill generated from the bank modification techniques would be deposited in upland locations within the project footprint. This fill material (totaling between 4.61-12.9 acre-feet) would be strategically placed throughout Reach 2 to enhance the microtopography of the upland system and provide subtle changes in topography that are often observed in functioning floodplains (Hauer et al. 2016). In general, the area of disturbance (i. e. bank modification and vegetation plantings) for Action Alternative 2b is approximately twice as large compared to Action Alternative 2a. The ecological patterns observed in species-area relationships describe how species-richness and complexity increase as the size of the habitat area increases (Scheiner, 2024). Alternative Action 2b would offer a greater degree of spatial and functional benefits than 2a, although both Action Alternatives would trigger hydrogeomorphic processes that can provide ecological benefits.

Construction activities are expected to result in short-duration impacts associated with grading, soil disturbance, and equipment movement within and near existing wetland areas. These temporary effects may involve vegetation clearing, soil compaction, and disruption of localized hydrologic patterns, potentially decreasing soil moisture and altering existing plant communities. Ground disturbance could also lead to elevated erosion and sediment transport, causing short-term increases in turbidity and reduced water quality in adjacent wetland zones. Overall, impacts to wetland resources are anticipated to be minor to moderate in scale. The disturbance window may also create opportunities for non-native species to encroach, particularly in areas with exposed soil. However, this risk is considered negligible. Implementation of strategic practices such as erosion control measures, a robust access plan, and prompt revegetation would support in limiting adverse effects. Over the long term, the action alternatives are anticipated to provide measurable ecological benefits, including restoration of natural hydrologic processes and enhancement of wetland functionality, with resulting impacts characterized as moderate to significant improvements to wetland resources. The Action Alternatives are projected to result in no effects on wetlands, since none are currently present. For floodplains, the Action Alternatives are expected to result in minor effects characterized by temporary disturbances with natural recovery expected. In the long term, this project would produce significant beneficial effects as floodplain system components are restored. Therefore, a determination of May Affect, Not likely to Adversely Affect is expected for floodplains.

The proposed activities would be conducted under NWP 27, which authorizes aquatic habitat restoration, enhancement, and establishment in accordance with Section 404 of the CWA. This permit addresses regulatory approval for projects that improve the function and condition of wetlands and other aquatic ecosystems. The USACE would conduct coordination with partners during a later stage of the project, such as the design and implementation phase. These restoration measures are designed to bolster wetland productivity and ecological resilience, however the former wetland in Reach 2 remains a challenged system. Nestled in the core of Colorado Springs, disconnected and confined to a sub-urban conduit, the Spring Creek system would have to undergo major transformation to reach a functional score that is near its reference standard (Smith & Kuhn, 2015).

The measures implemented under the Action Alternatives would enhance the complexity and the functionality of the stream and riparian complex/interchange that occur within floodplains (Hauer et al. 2016). As explained above, Executive Order 11988 requires Federal agencies to consider how their activities may encourage future development in floodplains. The proposed action will not alter land-use in the floodplain found in the project area. Although temporary effects are expected, the project is projected to avoid significant impacts in the floodplain zone by implementing effective preventive measures. Therefore, a determination of May Affect, Not likely to Adversely Affect is expected for floodplain resouces. Compliance with both Section 404 and Section 401 of the CWA would be addressed by applying an appropriate NWP to the project.

The Action Alternatives would improve Reach 2 from a severely altered wetland with nearly extinguished wetland functions towards a functioning wetland that has increased significantly in production capacity and able to provide key natural wetland functions. Consistency with the overall wetlands policy contained in Executive Order 11990 is achieved through CWA Section 404 compliance requirements and the USACE' preparation of the 404(b)(1) evaluation. The implementation of the proposed project will not result in a loss of wetlands in the project area. Therefore a determination of No Effect is expected on wetlands.

6.7 Vegetation Communities

A robust riparian community characteristic of cottonwood forests with herbaceous wetlands and riparian grasslands have historically occupied the Spring Creek corridor (City of Colorado Springs, 1993). These long hydroperiod vegetation communities existed along the stream channel since at least the 1940's with the most mature occurring in Spring Creek's once expansive floodplains. The existing condition of the Spring Creek vegetation is typical of an urban stream. Existing water courses have been greatly modified, via channelization and rerouting of drainage with widespread conversion of native vegetation to residential and commercial tracts. The complete industrialization and urbanization of the Fountain Creek watershed has been the main driver producing the existing conditions. Despite nutrient runoff from the surrounding urban area, the water quality of Spring Creek has been maintained at a reasonable and stable condition.

Riparian vegetation observed in the study area grows on the lower stream banks and in the channel where floodplain or low terraces exists. The riparian plant community consists of a mix of native cottonwood and willow including the introduced (non-native) Siberian elm and Russian olive trees. Saltcedar is a minor understory component following control efforts by the City. The introduced landscape plant Chinese privet is common in the understory as well. Sandbar willow and a variety of native and introduced grasses and forbs grow in the understory in these areas, but the herbaceous component of the riparian community is not very diverse. Species observed in the riparian zone are listed in Table 15.

Table 15: Riparian vegetation in the study area. Non-native (introduced) species are highlighted with red.

Stratum	Common Name	Scientific Name	Origin
Tree	Cottonwood	*Populus deltoides*	Native
Tree	Russian olive	*Elaeagnus angustifolia*	Introduced
Tree	Siberian elm	*Ulmus pumila*	Introduced
Shrub	Chinese privet	*Ligustrum sinense*	Introduced
Shrub	Sandbar willow, Coyote willow	*Salix exigua*	Native
Shrub	Saltcedar	*Tamarix chinensis*	Introduced
Forb	Cattail	*Typha latifolia*	Native
Forb	Horsetail	*Equisetum sp.*	Native

Forb	Showy milkweed	*Asclepias speciosa*	Native
Forb	Sunflower	*Helianthus annuus*	Native
Forb	Alfalfa	*Medicago sativa*	Introduced
Forb	Bitter dock	*Rumex obtusifolius*	Introduced
Forb	Western ragweed	*Ambrosia psilostachya*	Native
Forb	Teasel	*Dipsacus fullonum*	Introduced
Forb	Canada thistle	*Cirsium arvense*	Introduced
Grass	Smooth brome grass	*Bromus inermis*	Introduced

Upland vegetation in the study area grows away from the stream channel in relatively level high ground above the riparian zone or on the highest part of the stream bank where plants cannot readily access groundwater. Some mature cottonwood trees grow on the higher stream banks, but cottonwoods are not reproducing in the uplands.

The poor distribution of water in Reach 1 has significantly limited the stream's connectivity with its floodplain and has almost eliminated the potential for a robust vegetation structure. The exchange of sediment and nutrients between stream and floodplain has resulted in a chemical environment that supports a mix of native and exotic vegetation, composed of a dense canopy of trees with sparse patches of understory shrubs surrounded by grasses, all confined to a very steep bank. The upland area of Reach 1 on the west side of the Spring Creek channel is Wagner Park, a maintained and landscaped park with lawn grasses and planted landscape trees. The upland on the east side of Spring Creek in Reach 1 is wooded with a mix of native and non- native trees. This area is sloping from the creek grading into upland. Upland vegetation is listed in Table 16. Similar to Reach 1, the vegetation structure in Reach 3 is confined to a low terrace with limited width to support a complex riparian zone. The concrete channel armoring has been damaged at certain points affecting connectivity of the floodplain, and producing a degraded state characterized by a poor tree and shrub structure, a significant decrease in the spatial extent of herbaceous vegetation cover and an increase in the establishment of exotic vegetation.

Currently, the physical structure of the stream in Reach 2 experiences damaging erosion processes from periodic high-flow events that can cause erosion of the banks, and other natural substrate features. As a result, the riparian zone has decreased in spatial extent and has been confined to steep banks. Although Reach 2 has the highest potential for wetland establishment, the current condition of vegetation communities is characterized by monotypic and poor structure of tree, shrub and forb layers and a loss of vegetation mosaic along the stream.

Siberian elm and saltcedar are able to grow in the uplands, and saltcedar has been managed by the City in Reach 2. However, much of the upland area in Reach 2 and Reach 3 consists of open fields with scattered elm trees. This is an upland area that is predominantly open with herbaceous vegetation and scattered elm and cottonwood trees. Although these areas have considerable non-native and early successional "weeds" such as kochia and tumbleweed, there are also numerous species of forbs (wildflowers) that may provide nectar and foraging habitat for pollinators and other insects.

Table 16: Upland vegetation in the study area. Non-native species (introduced) are highlighted in red.

Habit	Common Name	Scientific Name	Origin
Tree	Cottonwood	*Populus deltoides*	Native
Tree	Siberian elm	*Ulmus pumila* L	Introduced
Tree	Juniper	*Juniperus monosperma* or *J. scopulorum*	Native
Tree	Russian olive	*Elaeagnus angustifolia*	Introduced
Cactus	Prickly pear cactus	*Opuntia* sp.	Native
Forb	Horse weed	*Conyza canadensis*	Native
For	Sunflower	*Helianthus annuus*	Native
For	Alfalfa	*Medicago sativa*	Introduced
For	Rocky mountain beeplant	*Cleome serrulata*	Native
For	Blackfoot daisy	*Melampodium cinereum*	Native
For	Russian thistle	*Salsola kali*	Introduced
For	Western ragweed	*Ambrosia psilostachya*	Native
For	Evening primrose	*Oenothera* spp.	Native
For	Milkvetch	*Astragalus* sp.	Native
Grass	Blue grama	*Bouteloua gracilis*	Native
Grass	Smooth brome grass	*Bromus inermis*	Introduced
Grass	Slender wheatgrass	*Elymus trachycaulus*	Native

6.7.1 No-Action Alternative / Future Without Project Conditions

It is estimated that the FWOP scenario would hinder the system's ability to support desirable riparian habitat composed of a robust tree, shrub, herbaceous and aquatic layer. The inability to support various layers of riparian vegetation could be largely due to a complete disconnect between the stream and its floodplain. With future impairment to the hydrologic and sediment regime of Reach 2, the structure and complexity of the various vegetation layers are expected to experience further degradation, primarily from the effects of a shrinking of the riparian zone and the severe constriction of vegetation to the unstable banks of the channels within Reach 2.

In a FWOP, the entrenchments would continue to deepen the flow-way in Reach 2, severely damaging the hyporheic zone and the groundwater to surface water exchange of energy and matter that supports healthy wetlands. The steady entrenchment could continue to promote excessive bank erosion, producing the high terraces that separate the floodplain further apart from its stream. The frequency and duration of soil saturation would certainty diminish, since overbanking events could almost be eliminated, and floodplain saturation could cease to occur. The effect is estimated to impact the stream's riparian zone, and it is forecasted that Reach 2 would experience ongoing degradation in vegetation structure, experiencing a decrease in plant density, diversity and function. A decrease in the spatial extent of the riparian vegetation zone would drive the stream's chemical environment into a state of degradation. A reduction of tree canopy density in Reach 2 would significantly decrease the supply of large woody debris, detritus, and other organic material into the aquatic environment. Additionally, a shrinking tree canopy would allow for more direct sunlight into the stream, allowing for higher temperatures into the aquatic environment and disturbing the biogeochemical processes that support wetland vegetation.

Similar, to Reach 2, the riparian zone in Reach 1 and Reach 3 is expected to experience a decrease in width and further degradation of the layer structure (i. e. tree canopy, shrub understory and herbaceous ground layer). The linear channelized flow-way in Reach 1 and Reach 3 is expected to reduce the probability of vegetation regeneration, producing favorable

conditions for encroachment of upland species. The impaired hydrologic regime into the future would not favor the conditions required to establish and sustain riparian soils and vegetation; producing a FWOP estimate characterized by a severe condition of Spring Creek's vegetation communities.

6.7.2 Action Alternatives

With the Action Alternatives, the floodplain's width would increase approximately by 20-40% in spatial extent, enhancing the rate of saturation frequency and saturation duration for all three Reaches. With an improved bank- height ratio, the floodplain would experience saturation every 1.0 - 1.5 years, instead of a return interval of 5 - 10 years that occurs under EC. Floodplain hydroperiods (days per year of soil saturation) are anticipated to exceed the 14 consecutive days per year during growing conditions. Because of an increase in soil saturation patterns, the Action Alternatives are projected to significantly increase the woody and herbaceous vegetation cover. Riparian vegetation is expected to colonize recruitment bars and establish a root structure and roughness, which would stabilize banks and generate conditions that are suitable for the productivity of other organisms in those same habitats (fish, amphibian and invertebrate presence).

As described in Section 2.1, the habitat structure of the existing condition can be characterized as riparian vegetation with a mix of native and non-native flora species, and as part of the Action Alternatives the vegetation removal would total approximately 0.85 ac for 2a and 1.74 ac for 2b. The bank modification techniques that would follow the vegetation removal efforts would focus on alleviating the steep slopes that have developed over time, by designing a series of floodplain terraces with gentle slopes supported by riparian plantings and wetland plantings. Riparian plantings such as coyote willow (*Salix exigua*), narrowleaf cottonwood (*Populus angustofolia*) and wild plum (*Prunus americana*) would be targeted on the higher terraces to align with fewer rates of inundation, compared to the lower terraces where aquatic/wetland vegetation such as tufted hairgrass (*Deschamsia cespitosa*), arrowhead (*Sagittaria latifolia*) and marshy milkweed (*Asclepias speciosa*) would be targeted to align with inundation rates that occur more frequently. Wetland plantings would have a higher planting density compared the riparian plantings to align with the different habitat requirements between these vegetation communities, for more detail on planting plan please see Appendix B, Section 11.

During construction, short-term impacts are anticipated due to ground disturbance, grading, and equipment access in and around current wetland areas. These impacts may include temporary vegetation removal, soil compaction, and localized disruption of hydrology, which could reduce soil saturation and disturb existing plant communities. Construction activities may also result in increased erosion and sedimentation, temporarily affecting water quality and turbidity in adjacent wetland zones. Such effects on wetland resources would be considered minor to moderate. The potential for invasive species colonization may increase during this disturbance window, particularly in areas where bare soils are exposed, however the effects from invasive species would be considered negligible. Additionally, noise and increased human presence may temporarily displace wetland-dependent wildlife. These effects, however, are expected to be temporary in nature and will be minimized through best management practices such as erosion control, site access planning, and timely revegetation. In the long term, the Action Alternatives are expected to yield substantial benefits to wetland resources and would be considered moderate to significant by restoring natural hydrologic connectivity and reestablishing functional wetland conditions. Riparian and wetland plantings would provide an instant assemblage and structure of flora that would interact and support other elements of the floodplain environment. Such vegetation structure would boost plant species diversity by 20% and would the foundations for the establishment of a functioning aquatic and riparian food-web system. Such significant increase of vegetation would also promote a greater input of organic debris into the stream, including the potential for the in-stream structures to capture woody debris and develop woody structure that would complement the structure of adjacent riparian corridors. Although these Action Alternatives are anticipated to increase the input of detritus and large woody debris by 60%, stressors from the surrounding urban environment would continue to influence one or two structural characteristics of the outer riparian perimeter and could continue to exacerbate periods of stress upon on vegetation communities.

Temporary and minor impacts to the riparian corridor would occur during construction. Invasive species would be selectively removed, thinning the available amount of vegetation while the new, native plantings establish. Overall, impacts to vegetation and terrestrial resources would be permanent and beneficial.

6.8 Fish & Wildlife

Wildlife communities in Colorado Springs and the greater El Paso County are typical of those in the foothill grassland ecoregion habitats of eastern Colorado (Chapman et al. 2006). Spring Creek was historically an important source of water for the surrounding environment and provided vital habitat for wildlife. The greater Fountain Creek watershed has been highly developed, converting Spring Creek into a true “urban greenspace”, a remnant patch of natural landscape with some potential to support assemblages of flora & fauna. Wildlife resources expected within the study area are limited to generalist species that have the ability to tolerate disturbed habitats in highly developed areas.

The spread of urbanization has almost eliminated the presence of large mammals. However, several meso-predator species could use the vegetative corridor of Spring Creek at different times of the year. It is anticipated that medium size carnivore mammals such as bobcat (*Lynx rufus*), coyote (*Canis latrans*), red fox (*Vulpes vulpes*), Virginia opossum (*Didelphis virginiana*), racoon (*Procyon lotor*), striped skunk (*Mephitis mephitis)* and mink (*Neovison vison*) utilize Spring Creek. Other mammalian species that can tolerate disturbed and fragmented habitats include muskrat (*Ondatra zibethicus),* porcupine (*Erethizon dorsatum*), fox squirrel (*Sciurus niger*), Mexican woodrat (*Neotoma mexicana*), meadow vole (*Microtus pennsylvanicus*), deer mouse (*Peromyscus manicalatus*) and several bat species such as the Big brown bat (*Eptesicus fuscus*) could occupy the study footprint.

Avian species noted during a site visit Species observed include American robin (*Turdus migratorius*), Canada goose (*Branta canadensis*), common Mallard (*Anas platyrhynchos*), red-tailed hawk (*Buteo jamaicensis*), Cooper's hawk (*Accipiter cooperii*) and mourning dove (*Zenaida macroura*). Other avian species expected in the study area that could also be classified as habitat generalists include the Black-billed magpie (*Pica hudsonia*), Woodhouse's Scrub-Jay (*Aphelocoma woodhouseii*), House finch (*Haemorphous mexicanus*), Dark-eyed junco (*Junco hyemalis*), Northern flicker (*Colaptes auratus*), American crow (*Corvus brachyrhynchos*), Western bluebird (*Sialia mexicana),* Great horned owl (*Bubo virginianus*) and a small number of visual-foraging wading birds species such as the Black-crowned night-heron (*Nyctiocorax nyctiocorax*) and the Great blue heron (*Ardea herodias*).

Herpetofauna species occurring throughout Colorado Springs and expected to be utilizing Spring Creek include the American bullfrog (*Rana catesbeiana*), Mexican Spadefoot toad (*Spea multiplicata*), Plains Spadefoot toad (*Spea bombifrons*), Woodhouse's toad (*Anaxyrus woodhousii*), Prairie lizard (*Sceloporus consobrinus*), Prairie ringneck snake (*Diadophis punctatus*), Western terrestrial garter snake (*Thamnophis elegans*), Gopher snake (*Pituophis catenifer*), Great plains rat snake (*Pantherophis emoryi*), Northern water snake (*Nerodia sipedon*) and the Prairie rattlesnake (*Crotalus viridis*).

Aquatic invertebrates are a vital component of freshwater systems. They process large amounts of organic material within the stream and transfer that energy to animals in higher trophic levels such as fish, frogs, bats, birds, and small mammals. The presence of water throughout Spring Creek supports a great arrangement of invertebrates, each with their own food habits and ecological role.

The majority of aquatic invertebrates can be classified as scavengers, feeding on bottom sediments or decayed plant material such as snails (*spp. Lymnaeoidea*), aquatic and terrestrial earthworms (*spp. Lumbricoidea*) and chironomid insects (*spp. Chironomidae*). Others may filter small particles and microorganisms from the water column. Such organisms with this form of feeding habit include mosquito larvae (*spp. Culicidae*), black fly larvae (*spp. Simuliidae*) and caddisfly larvae (*spp. Hydropsychidae*). A small number of species feed on emergent vegetation such as field slugs (*spp. Agriolimacidae*), various grasshoppers (*spp. Acrididae*), as well as caterpillars during the larval stages of butterflies and moths (*spp. Lepidopteridae*).

There are also predators, most notably the dragonflies (*spp. Gomphidae*) and damselflies (*spp. Calopterygidae*) that develop underwater during their immature stages. Other predators in the aquatic environment include water striders (*spp. Gerridae*), leeches (*spp. Glossiphoniidae*) and backswimmers (*spp. Notonectidae*). Various transient species may visit the aquatic environment along Spring Creek to drink or collect water for nest construction and maintenance. Some of these organisms include spiders (*spp. Araneae*), western honeybee (*Apis mellifera*), paper wasp (*Polistes dominula*) and European mantis (*Mantis religiosa*).

The land use/urbanization together with changes in hydrology have altered the system's ability to support wildlife use and complex trophic interactions. The presence of wildlife assemblages is typical of an urban condition, where in Reach 1 and Reach 3, the linear flow-ways have eliminated the potential for microhabitat development. The different flows along the various morphological features of the stream, could produce subtle conditions where key microhabitats develop within the larger stream. The lack of stream complexity in Reach 1 and Reach 3 currently restrict the potential for habitat complexity, eliminating the productivity of organisms and their participation in robust trophic interactions.

In Reach 2, the decrease in spatial extent of the riparian zone in combination with stressors from the surrounding urban environment (e. g. presence of non-native species, dispersal barriers, steep banks, channel armoring) have degraded conditions to support a diverse assemblage of species and communities. Although, some wetland characteristics continue to persist in Reach 2, the altered hydrologic regime restricts the potential for the establishment of aquatic fauna and other organisms associated with riparian communities.

The suitability and requirements for wildlife presence and survival along the Spring Creek corridor is greatly hindered, with barriers such as the surrounding urban setting (e. g., secondary and tertiary highways), pedestrian trails and other barriers that impede aquatic organisms in the stream itself (e. g., water control structures).

6.8.1 No-Action Alternative / Future Without Project Conditions

In a FWOP scenario, the volume of wildlife assemblages and wildlife use along with the trophic interactions at the various levels of the biotic hierarchy are forecasted to continue a trend towards degradation. The existing riparian zone is nearly absent and restricted primarily to a narrow band on steep sloped banks. The continuation of such riparian zone condition into the future could intensify the stressors affecting faunal communities, towards a state where any existing functional guilds and trophic interactions could almost be eliminated. The FWOP condition of the stream's biotic structure would experience a state of severe impairment across the three Reaches. In the next 50 years, these "islands" of habitat within the urban landscape are expected to experience a decrease in their riparian/wetland extent, limiting their function and further damaging elements of their composition. In a FWOP scenario, Spring Creek could remain an urban green space, although such vegetative corridors remain at risk of further alterations.

6.8.2 Action alternatives

Under the Action Alternatives, the width-depth ratio is anticipated to improve and favor conditions of increased stability, which would enhance the dynamics and equilibrium between hydraulics and sediment. Such effects could also increase stability of habitat patches and elicit the establishment of quality habitat for a wide group of wildlife communities.

The implementation of the Action Alternatives would provide an increase in heterogeneity of the stream's physical structure. The effects of diverse velocities and depths could produce patches of coarse and fine scale stream beds that support a diverse benthos and a healthy water column. Under the Action Alternatives, improvements in the stream's hydrologic regime over a wider and revamped floodplain, would provide an increase in patches with suitable habitat structure, and would meet the habitat characteristics which are required for wildlife use and the establishment of robust trophic interactions. Various groups of species such as fish, amphibian, invertebrates, birds and small mammals would benefit from the bank modifications which would establish a suitable transition zone between the aquatic, riparian and upland habitats. Similarly, the constructed rock riffles and boulder clusters would create a diverse range in hydraulic properties (e. g. stream velocity, water depth and gradients in the chemical environment such as temperature and dissolved oxygen) that provide a transition zone between aquatic habitats that develop within the water column. Such variations have the potential to create a mosaic of available niches for organisms to exploit.

During the construction phase, wildlife resources are expected to experience minor to moderate short-term adverse impacts. Construction activities such as grading, vegetation clearing, noise, and increased human presence may temporarily displace common urban-adapted species, including birds, amphibians, reptiles, and small to medium sized mammals. Ground-nesting birds or small amphibians may be directly disturbed if present during site preparation, particularly in the wetland margins or along overgrown banks. However, these impacts will be localized, temporary, and reversible, with no long-term habitat loss. Implementation of BMPs (e.g., vegetation clearing outside nesting season, erosion control, limiting access routes) would help minimize these effects. Due to the already fragmented and degraded state of habitat in the existing condition, these impacts are not expected to result in significant population-level effects and therefore are considered adverse but minor to moderate in intensity.

Over the long term, the Action Alternatives are anticipated to produce moderate to significant beneficial effects on wildlife resources. The restoration of natural hydrologic regimes, floodplain connectivity, riparian vegetation structure, and wetland function would dramatically improve habitat quality, functionality and availability for a variety of wildlife species. Native plantings, increased water retention, and restored hydroperiods would create critical foraging, nesting, and sheltering areas for wetland and riparian-associated birds (e.g., warblers, herons, blackbirds), amphibians (e.g., chorus frogs, toads), small mammals, and invertebrates. The reintroduction of habitat complexity, such as large woody debris and pool-riffle sequences, would enhance aquatic habitat for macroinvertebrates and improve conditions for native fish species. The cumulative effect of these improvements would be to reestablish a more functional and resilient ecosystem, capable of supporting greater species diversity and abundance than current conditions allow. Given the scale of restoration and the degraded baseline, these benefits are considered long-term, ecologically meaningful, and therefore moderate to significant in intensity.

It is important to understand that Spring Creek occurs in an urban setting that already poses challenges to wildlife's habitat requirements and movements. These stressors produce challenges for the establishment of wildlife communities, and only a few species can adapt to the urban conditions and the stressors that dictate the Spring Creek system.

This project would result in minor, temporary, construction-related adverse impacts to fish and wildlife resources. The impacts to fishery resources would be related to temporary site runoff and periods of increased turbidity, which could make feeding, breeding and sheltering difficult for species not accustomed to these conditions. Carefully implemented BMPs would minimize any incidental fallback of material into the creek during construction and would minimize the introduction of fuel, petroleum products, or other deleterious material from entering into the waterway. The impacts to wildlife resources would be related to noise and visual disturbance during the construction activity. All construction would take place outside of nesting season of migratory birds in order to minimize impacts to nesting birds. No significant, negative impacts would occur to fish and wildlife as a result of the project; therefore, a determination of May Affect, Not likely to Adversely Affect is expected for fish and wildlife resources.

6.9 Threatened and Endangered Species

Section 7 of the Endangered Species Act (ESA) (7 U.S.C. § 136, 16 U.S.C. § 1531 et seq.) states that all Federal departments and agencies shall ensure that any actions authorized, funded, or carried out by them do not jeopardize the continued existence of any threatened or endangered species and their habitats. Protected species are defined as those listed as threatened, endangered, or proposed or candidate for listing by the USFWS. The Colorado Dept. of Game and Fish regulate State threatened and endangered species including other species of special status. Protected habitats include those areas designated by the USFWS as critical habitat under the ESA and sensitive ecological areas as designated by State or Federal rulings. Coordination letters with USFWS can be found in Appx J. Table 17 outlines the Federally protected species and the State listed species known in El Paso County, Colorado.

In Reach 2, the sensitive habitats could include plant communities that are limited in distribution and for seasonal use of areas for wildlife (e. g., migration routes, dispersal corridors, breeding, or summer/winter areas). No Federally listed species are known to be present in the Spring Creek project footprint, however the mobility of avian and insect species could allow for incidental or migratory occurrences of Federally listed species throughout the Spring Creek project footprint. The Monarch butterfly (*Danaus plexippus*) and the Suckley's Cuckoo Bumble bee (*Bumbus suckleyi*) are proposed for listing and have the potential to occur at Spring Creek, however the project is not likely to jeopardize the continued existence of either species and would not require further discussion with the USFWS. Federal threatened and endangered species with potential to occur in the Spring Creek watershed, as identified by the USFWS's Information for Planning and Consultation (IPaC) database obtained February 2025, are listed in Table 17 (USFWS 2025). Full IPaC report found in Appendix J.

Table 17: Federal and State listed threatened, endangered, and candidate species with potential to occur in the Spring Creek watershed.

Federally Listed Species				
Common Name	***Scientific name***	**Federal Status***	**Habitat/Occurrence**	**Potentially in Spring Creek?**
Eastern Black Rail	*Laterallus jamaicensis* ssp. *jamaicensis*	T	This bird occurs in wetlands, require dense vegetative cover	No (no suitable wetland habitat on site)
Piping Plover	*Charadrius melodus*	T	This bird nests and feeds along rivers/lakes on sand and gravel beaches; in eastern CO, Arkansas and S. Platte River basins.	No (no suitable habitat)
Ute Ladies'-tresses	*Spiranthes diluvialis*	T	This flowering plant occurs along riparian edges, gravel bars, high flow channels, wetlands, seeps, and moist to wet meadows along perennial streams	No (no suitable habitat; site is too disturbed)
Monarch Butterfly	*Danaus plexippus*	C (Proposed Threatened)	North American migratory populations of this insect are impacted by loss and degradation of habitat (conversion of grasslands to agriculture, use of herbicides, incompatible management of overwintering sites, urban development), exposure to insecticides, effects of shifting climatic conditions.	Potential to occur since native wildflower nectar sources exist in upland portions of site. The project is not likely to jeopardize the continued existence of the species.

Suckley's Cuckoo Bumble Bee	*Bombus suckleyi*	C (Proposed Endangered)	This insect is a generalist pollinator, inhabiting open meadows at a wide range of elevations. They rely on a wide range of flower species mostly in the Asteraceae family. Historic observations most often occur at higher elevation meadows within pine forest or sub-alpine zones. The presence of this species is entirely dependent on the presence of suitable host species, especially the western Bumble Bee (*Bombus occidentalis*).	Likelihood is low, due to low-quality foraging habitat and the effects of habitat fragmentation. Probability of presence increases if there is evidence of host species presence (*B. occidentalis*). The project is not likely to jeopardize the continued existence of the species.
*Status: T = threatened; E = endangered; C = candidate				

State Listed Species				
Common Name	***Scientific name***	**State Status***	**Habitat/Occurrence**	**Potentially in Spring Creek?**
Burrowing owl	*Athene cunicularia*	T	This diurnal bird occupies dry, open areas with short grasses and no trees. They nest and live in underground burrows, often created by Prairie dogs, ground squirrels and badgers.	Low likelihood due to the lack of burrowing opportunities. Potential increases if prairie dog burrows are present.
Greenback Cutthroat Trout	*Oncorhynchus clarkii stomias*	T	Native to headwaters of the South Platte; require clear, cold, well oxygenated water; 2012 genetic work found only natural pure greenback population in Bear Creek SW of CO Springs; subsequently stocked and reproducing in S. Platte drainage.	No (no suitable habitat)
River otter	*Lontra canadensis*	T	Otters occupy riparian zones, with bank availability for dens and open water availability for foraging and playing. Their diet consists of aquatic animals like crayfish, frogs, fish and young beavers and muskrats.	Low likelihood due to the poor habitat characteristics, lack of large areas of open water and the lack of natural streambanks.
Kit fox	*Vulpes macrotis*	E	Kit foxes occupy sparsely covered, semi-desert shrublands, spending most of the day in dens and emerging at night to hunt.	Low likelihood due to the urban characteristics of the landscape

Preble's Meadow jumping mouse	*Zapus hudsonius preblei*	T	Small rodent occupying riparian shorelines with dense combination of grasses, forbs and shrubs with a taller tree canopy structure. Rarely found in upland areas that are adjacent to riparian corridors.	Low likelihood due to poor shoreline vegetation structure and low density of grasses and forbs.
*Status: T = threatened; E = endangered; C = candidate				

6.9.1 No-Action Alternative / Future Without Project Conditions

Biotic conditions and habitat structure at Spring Creek are expected to degrade in the next 50 years in a FWOP scenario. The habitat availability for Federal and state protected species is expected to decrease in value and future alterations could progressively eliminate the suitability for the presence of protected species and sensitive habitats. The existing riparian zone would continue to shrink and degrade in vertical structure, decreasing the potential of habitat suitability and habitat use for Federally threatened and endangered species.

6.9.2 Action Alternatives

Under an Action Alternative scenario, the effects of improvement in the stream's hydrologic regime over a wider and revamped floodplain, would produce benefits to the habitat structure that would benefit a wide array of flora and fauna, including special status species. Although the potential for the establishment of trophic interactions would increase, the presence of Threatened and Endangered remains highly unlikely. Spring Creek corridor would remain isolated, almost like an "island" surrounded by an "ocean" of urban environment. Such disconnect from other natural areas is often a difficult stressor that limits the emigration, immigration and dispersal of wildlife, especially sensitive species such as the ones on Table 17.

Construction activities are expected to cause temporary disturbances to listed species that may be present, particularly species that rely on aquatic and riparian habitats. The presence of heavy equipment, increased noise levels, and human activity may lead to the short-term displacement of wildlife from the immediate work zone footprint. Nesting, foraging, and movement patterns could be temporarily disrupted, especially for species sensitive to visual or auditory disturbance. Although these effects are expected to be localized and reversible, they may temporarily reduce habitat availability. However, the risk of wildlife injury, mortality or significant impairments would be considered low, provided that seasonal timing restrictions and pre-construction biological surveys are implemented prior to initiating work. Over the long term, however, the Action Alternatives are anticipated to be beneficial by enhance habitat quality and connectivity, supporting greater biodiversity and ecosystem function once construction is complete and vegetation is reestablished. Under the Action Alternatives, a No Effect determination is anticipated for federally listed and state listed Threatened and Endangered Species.

Common Name	*Scientific name*	Federal Status*	Effects Determination
Eastern Black Rail	*Laterallus jamaicensis* ssp. *jamaicensis*	T	No Effect. Suitable habitat is not present at the site.
Piping Plover	*Charadrius melodus*	T	No Effect. Suitable habitat is not present at the site.
Ute Ladies'-tresses	*Spiranthes diluvialis*	T	No Effect. Suitable habitat is not present at the site.
Monarch Butterfly	*Danaus plexippus*	C (Proposed Threatened)	No Effect. Suitable habitat is not present at the site.
Suckley's Cuckoo Bumble Bee	*Bombus suckleyi*	C (Proposed Endangered)	No Effect. Suitable habitat is not present at the site.

Common Name	*Scientific name*	State Status*	Species Determination
Burrowing owl	*Athene cunicularia*	T	No Effect. Suitable habitat is not present at the site.
Greenback Cutthroat Trout	*Oncorhynchus clarkii stomias*	T	No Effect. Suitable habitat is not present at the site.

River otter	*Lontra canadensis*	T	No Effect. Suitable habitat is not present at the site.
Kit fox	*Vulpes macrotis*	E	No Effect. Suitable habitat is not present at the site.
Preble's Meadow jumping mouse	*Zapus hudsonius preblei*	T	No Effect. Suitable habitat is not present at the site.

6.10 Needs and Considerations of All at Risk Communities

Federal agencies promote and work toward proactively incorporate the needs and considerations of all at risk communities and identify communities that are marginalized, underserved, and overburdened by pollution. The affected environment is located in El Paso County, Colorado Springs, Colorado. The population of Colorado Springs has experienced steady growth since 1970 and is projected to increase further to 600,000 by 2040 (City of Colorado, PlanCOS). Table 18 shows the historical trends in population in the El Paso County and Colorado Springs. According to the 2023 Census Population Estimates Program the demographics of El Paso County are as follows: 82.3% White alone, 7% African American, 1.4% American Indian and Alaska Native, 3.4% Asian, 0.4% Native Hawaiian, 5.4% Two or more races, and 19.1% Hispanic or Latino.

Table 18: Population Statistics for Affected Area

	1970	1980	1990	2000	2010	2020
El Paso County	235,972	309,524	397,014	516,929	622,263	730,395
Colorado Springs	135,517	215,105	281,140	360,890	417,355	478,961

Income and employment statistics are a proxy for health of the local economy. Historical trends in labor force, employment, and unemployment rate for Colorado Springs are presented in Table 19. The statewide unemployment is included in Table 19 for comparison. Unemployment rate in Colorado Springs does not significantly deviate from the statewide rate. Decreases in labor force and employment occurred in 2010 and 2020 in response to nationwide recessions. According to most recent American Community Survey, the median household income of Colorado Springs is $78,568. The poverty rate is 9.5% compared to the statewide poverty rate of 9.4%. The top employers in Colorado Springs include education, healthcare, retail, as well as professional, scientific, and technical services.

Table 19: Employment Statistics for Affected Area

Statistics	1990	2000	2010	2020
Labor Force	199,987	276,430	317,659	354,187
Employment	186,647	268,413	286,620	330,254
Unemployment Rate	6.70%	2.9%	9.8%	6.8%
Statewide Unemployment Rate	5.1%	2.7%	9.1%	6.8%

6.10.1 No-Action Alternative / Future Without Project Conditions

In the FWOP scenario, anticipated trends in population and income in the affected area could continue. El Paso County and the city of Colorado Springs is a growing population and is expected to experience increasing population growth over the 50-year period of analysis. Labor force and employment numbers are expected to increase as population increases.

6.10.2 Action Alternatives

Under an Action Alternative, anticipated trends in population and income in the affected area would remain largely unaffected by the action. Some increase in employment during the duration of construction of the project is expected. Upon completion of the project the citizens of El Paso County and the city of Colorado Springs would experience benefits to their quality of life in the form of an improved ecosystem and accessible green space for recreating and enjoying nature.

6.11 Cultural and Historic Properties

6.11.1 No-Action Alternative/ Future Without Project Conditions

An examination of History Colorado records and COMPASS database in April and December 2022 showed no past surveys of the project area. The entirety of the project area (30 acres) has been determined to be the area of potential effects (APE). An examination of History Colorado records and COMPASS database showed no known sites within 500 meters of the project area. On 8 December 2022, USACE performed a Non-Collection Archaeological Survey of the proposed project area for the ecosystem restoration along Spring Creek, totaling approximately 30 acres. The purpose of this survey was to identify any existing and unknown cultural resources within the project area. No cultural resources were identified within the project area.

Fieldwork was conducted on 8 December 2022 by USACE archaeologist, Kaitlyn Fuqua. Prior to conducting fieldwork, background maps were loaded into Avenza for recording. A backup Trimble GeoXH handheld GPS unit (2005 series) was brought to document any newly identified sites. Fieldwork was performed under a State of Colorado Archaeological Survey

[Non- Collection Permit (No. 82083) issued on 30 September 2022 – 28 February 2023]. Permission for survey was granted from landowners, City of Colorado Springs and Pikes Peak Real Estate Foundation, Inc. Point location data was recorded on Avenza with georeferenced images of the APE and documented resources. Survey began at the northern portion of the project area in Reach 1, proceeding to Reaches 2 and 3.15 meter transects were walked to ensure coverage; vegetative ground cover was limited due to the season, though the ground visibility was limited by modern debris.

Portions of the project area were not able to be surveyed due to temporary camps with occupants living in the project area. For the safety of the archaeologist, and the privacy of the camp occupants, these areas were avoided. The avoided areas were heavily disturbed by humans, modifying the landscape so extensively that the likelihood of finding cultural resources is low. While much of the project area was covered in modern debris and had evidence of previous modern occupation, current occupants were clustered on the western bank of Reach 1, the southern portion of Reach 2, and Reach 3. In addition, due to the steepness of the stream banks (15-30% slope) and lack of stability due to active erosion, the stream banks were not able to be surveyed. The results of the survey are detailed in “A 30 Acre Cultural Resources Survey Along Spring Creek in Colorado Springs, El Paso County” and is included in Appendix E.

6.11.2 Action Alternative

USACE performed a cultural resources survey of the project area on 8 December 2022 and did not identify any cultural resources within the project area. The following Tribes were consulted regarding concerns about the undertaking or known cultural resources within the project area: Apache Tribe of Oklahoma, Cheyenne and Arapaho Tribes of Oklahoma, Comanche Nation of Oklahoma, Fort Sill Apache Tribe, Jicarilla Apache Nation, Kiowa Tribe, Mescalero Apache Tribe, Northern Arapaho Tribe, Northern Cheyenne Tribe, Southern Ute Tribe, Ute Indian Tribe of the Uintah & Ouray Reservation, and Ute Mountain Ute Tribe. The City of Colorado Springs Historic Preservation Board was also sent consultation letters. No responses to consultation were received. USACE determined that this undertaking would result in “No Historic Properties Affected” and received Colorado State Historic Preservation Office concurrence on February 27, 2025 (HC#82716). Therefore, the without project alternative would be a continuance of the existing situation and there would not be an impact to known cultural resources. Any of the Action Alternatives would feature the same outcome with no impact to known cultural resources.

If, during construction activities, any previously unidentified or unanticipated historical, archaeological, and cultural resources are discovered or found, activities that may damage or alter such resources will be suspended. Resources covered by this paragraph include, but are not limited to: any human skeletal remains or burials; artifacts; shell, midden, bone, charcoal, or other deposits; rock or coral alignments, pavings, wall, or other constructed features; and any indication of agricultural or other human activities. Upon such discovery or find, immediately notify the Contracting Officer so that the appropriate authorities may be notified and a determination made as to their significance and what, if any, special disposition of the finds should be made. This may cause delays to the project and increases costs. Any changes in scale or scope of the project may need further consultation with Colorado State Historic Preservation Office and interested Tribes.

6.12 Air Quality, Sound, and Aesthetics

Air quality is defined by the concentration of various pollutants in the atmosphere at a given location. The 2025 State of the Air Report shows (ALA, 2025):

- The Colorado Springs, CO metro area ranked 23rd worst in the nation for ozone pollution. The ranking was based on the area's worst county's average number of unhealthy days—10 days per year, an F grade, in El Paso County, Colorado. This was better than the area's ranking in last year's report of 20th worst, with 12.5 days per year, an F grade.
- The Colorado Springs, CO metro area ranked 131st worst in the nation for short-term particle pollution. The ranking was based on the area's worst county's average number of unhealthy days—1.2 days per year, a C grade, in El Paso County, Colorado. This was better than the area's ranking in last year's report of 124th worst, with 0.3 days per year, a B grade.

Sounds and noise are defined as undesirable sound that interferes with communication, is intense enough to damage hearing, or is otherwise intrusive. Sound is a physical phenomenon consisting of vibrations that travel through a medium, such as air, and are sensed by the human ear. Human response to noise varies depending on the type and characteristics of the noise distance between the noise source and the receptor, receptor sensitivity and time of the day. Sounds within the project footprint are often generated by activities essential to the community's prosperity such as construction and vehicular traffic. Therefore, any noise generated from the proposed action would be considered minor, of short-duration, and associated with infrequently conducted activities and would not likely cause any appreciable adverse effects.

Aesthetics include the presence and appearance of landforms, water surfaces, vegetation, and human created features relative to the surrounding and settings of the area. The aesthetics of Spring Creek could be considered as an ontology of mature strands of cottonwoods, with a robust native understory vegetation community, and with clean running water. Areas that have experienced severe vegetation thinning/clearing, illegal dumping or areas that have accrued litter are considered aesthetically poor.

6.12.1 No-Action Alternative / Future Without Project Conditions

It is anticipated that the next 50 years the development rate could steadily increase, and the surrounding urban environment could augment in density. The air quality is expected to remain the same in a FWOP scenario.

Sounds and noise are also expected to remain the same, with vehicular traffic from the surrounding urban core accounting for most of the noise into Spring Creek. The aesthetics of Spring Creek is expected to degrade significantly and could shift from a natural area/former wetland towards conditions that are characteristic of an unkept urban park. In a FWOP scenario the landscape features and the natural appearance of the riparian corridor could shrink, and accumulation of litter may continue to accrue from human-use.

6.12.2 Action Alternatives

The Action Alternatives aim to enhance ecological resilience and improve the overall health of the stream system, its riparian corridor, and the surrounding contributing areas. During the construction phase, air, sound and aesthetic resources could experience minor to moderate short term adverse effects. Construction activities such as grading, vegetation clearing and increase human and work activities could temporarily affect these types of resources, however, noise and air pollution would be limited and would occur temporarily during construction. Mitigation of such effects would be addressed by the implementation of BMPs and would not be expected to cause appreciable adverse effects for these reasons.

In the long term, and as riparian and stream habitats are restored, the project is expected to have significant beneficial effects on air quality, sound, and aesthetics. Increased vegetation cover, particularly through the planting of native trees and shrubs, would contribute to air purification by capturing airborne pollutants and producing oxygen. The presence of dense vegetation would also help buffer and absorb sound, reducing noise pollution from nearby urban or roadway sources, creating a more serene environment. Additionally, the aesthetic appeal of the area would improve as the restored habitat introduces a more diverse and vibrant landscape, replacing degraded conditions with lush greenery, flowing water, and increased wildlife presence. These improvements would not only benefit ecological function but also enhance the experience for visitors and the surrounding community. In general the Action Alternatives would produce insignificant effects on air quality, sound and aesthetic resources.

The Spring Creek area is in attainment, meeting the National Ambient Air Quality Standards (NAAQS) for all pollutants. Because the project area is in attainment, the analysis will compare project-related emissions to the US Environmental Protection Agency's (USEPA) thresholds (100 tons per year maximum). Once the project's construction methods are developed and the construction equipment is identified, project emissions will be identified and compared to the USEPA's threshold, likely indicating that the project-related emissions are well below the 100 tons per year threshold.

7 National Ecosystem Restoration Plan/Tentatively Selected Plan*

7.1 Choosing the National Ecosystem Restoration Plan (NER)

The Federal objective in ecosystem restoration planning is to contribute to national ecosystem restoration. Contributions to national ecosystem restoration are increases in the net quantity and/or quality of desired improvements of structure, function, and services of ecosystem resources. The recommended plan (ALT 24 – 1b 2b 3b) ordinarily is the alternative having the maximum excess of monetary and non-monetary beneficial effects over monetary and non-monetary costs. This plan occurs where the incremental beneficial effects just equal the incremental costs, or alternatively stated, where the extra ecosystem value is just worth the extra costs. This plan should be called the National Ecosystem Restoration (NER) plan. The CE/ICA does not dictate which alternative is the NER plan. However, the information developed by both analyses can inform decision-making by progressively proceeding through the available levels of output to ask whether the next level is “worth it”; that is, whether the ecosystem benefit of the output in the next level is worth its additional cost.

According to the results of the CE/ICA analysis, over 50% of the habitat benefits are realized with Alternative 4-2a1a. However, this alternative did not include work completed in Reach 3 nor removal of invasive species from Reach 1. While this alternative offers habitat benefits, the benefits captured through a more complete, connected, and native species prolific alternative are more favorable in this highly urban environment. For these reasons, Alternative 4-2a1a was not considered the NER plan.

The PDT felt the CE/ICA analysis accurately showed that the investment in Alternative 25-2b1c3b as not really worth it for the habitat benefits. Protecting the existing bench in Reach 1 (Option Reach 1c), offers little benefit for the cost of the boulders and earthwork. The bench is small and will most likely be only minimally impacted in a FWOP or by the construction efforts that occur in the area. For this reason, the team did not consider Alternative 25-2b1c3b the NER plan.

The PDT’s NER plan decision came down to Alternative 21-2a1b3b and Alternative 24-2b1b3b. Based on the CE/ICA results, Alternative 21-2a1b3b gives 75% of the habitat benefits for the investment. However, as discussed in Section 4.4 the CE/ICA did not include the full wetland habitat benefits possible on Reach 2, since preliminary delineation of the existing wetland did not capture areas of improvement. Although the FACWet model output was not directly incorporated into the CE/ICA calculations, its results were reviewed and considered during the PDT’s deliberations and decision-making process. The FACWet output contributed to refining the conceptual understanding of wetland enhancements and supported the evaluation of the PDT’s NER plan in terms of completeness, effectiveness, efficiency, and acceptability (please see Appx B – Section 7). The PDT recognizes that larger wetland areas are resilient to a drying climate, able to absorb more water during large runoff events (common in urban systems) and are more ecologically rare in arid regions. Alternative 24-2b1b3b significantly increases the size of the wetland within Reach 2 compared to Alternative 21-2a1b3b. Alternative 24 would produce an increase in wetland spatial extent of 163% (from 1.34 ac to 3.53 ac) whereas Alternative 21 would produce and increase in wetland spatial extend of 97% (from 1.34 ac to 2.64 ac). For this reason, the PDT chose Alternative 24-2b1b3b as the NER plan.

7.2 Tentatively Selected Plan

Following guidance and due to overwhelming support from the PDT and the Sponsor, the NER plan is the TSP. Alternative 24-2b1b3b maximizes the ecosystem output for the cost and supports a wetland that is twice the size of a “2a” option with added ecosystem connected support upstream and downstream of this wetland area. The work completed in Reaches 1 and 3 would create a connected and more resilient system overall.

Albuquerque District presented the Spring Creek Section 206 TSP to the South Pacific Division leadership on 9 December 2024. The Division agreed with the chosen TSP on 20 December 2024 through the signing of the *Spring Creek, Colorado Springs, CO, Continuing Authorities Program (CAP) Section 206, TSP Milestone Meeting Memorandum for Record (MFR).*

This comprehensive description of the TSP is intended to support a common vision of the final project and a defendable feasibility level cost estimate, to document feasibility level risks and for uncertainties to be investigated further and resolved during the Design and Implementation phase. Since this is an ecosystem restoration project designed to improve ecosystem function and quality, the TSP is also identified as the least environmentally damaging practicable alternative (LEDPA), as required by the Clean Water Act under Section 404 (Title 40, Part 230 of the Code of Federal Regulations (40 CFR Part 230)).

The LDPA is defined as the alternative that achieves the project’s basic purpose while causing the least harm to the aquatic environment, so long as it is also practicable. The proposed ALTs were evaluated considering the Section 404(b)(1) Guidelines to determine the LEDPA. Since the Spring Creek project’s purpose and need is to restore and improve the ecological integrity of a degraded urban stream corridor, the preferred alternative must achieve measurable ecological uplift in a manner that is both technically feasible and minimizes adverse impacts to waters of the People of the United States.

Among the array of evaluated alternatives, including the No-Action alternative, the TSP design using efficient and effective volumes of bank stabilization and native riparian plantings emerged as the LEDPA. Components of the TSP would minimize ongoing bank erosion, reduce the variation in sediment regimes, and facilitate mechanisms for floodplain connectivity while also establishing habitat complexity and improving the physical transactions between hydrology, geomorphology and biological agents like flora, fauna and other organisms. Additionally, the TSP qualified into the ‘best-buy plan’ group of ALTs based on the CE/ICA analysis and resulted in a low incremental costs when compared to other alternatives composed of similar components.

The Spring Creek project has an aquatic ecosystem restoration focus, with the key objective being environmental benefits, and not a commercial or industrial activity. In the context of the LEDPA, the 'least damaging plan' and the 'preferred plan' for ecosystem restoration projects often overlap, since both strive to reach the most effective plan for restoration without and do not cause unnecessary impacts. The TSP would minimize further degradation and encroachment of urbanization to this reach of the system and would not introduce unnecessary materials beyond what is structurally required. The TSP's design is to incorporate natural processes (e.g., sediment accretion, hyporheic exchange, establishment of aquatic/riparian habitats, organic matter conditioning and cycling) into the Spring Creek system.

While some temporary disturbance is expected during implementation (e.g., vegetation clearing, minor fill for toe protection), these impacts are minimal and would offset by long-term ecological gains. The approach supports the project's basic purpose while avoiding more environmentally damaging or less practicable alternatives, thus representing the LEDPA consistent with 40 CFR Part 230.

7.3 Tentatively Selected Plan Components

The components of the TSP are generally described earlier in this document and can be seen in Figure 24. This section separates the specific actions into demolition activities and construction activities to better characterize those actions that correct existing issues and those that implement new or improved features. Together these actions work together to deliver a full suite of restoration benefits within the project footprint and include adequate actions to ensure long term sustainability of the results in an urban site with constant public access.

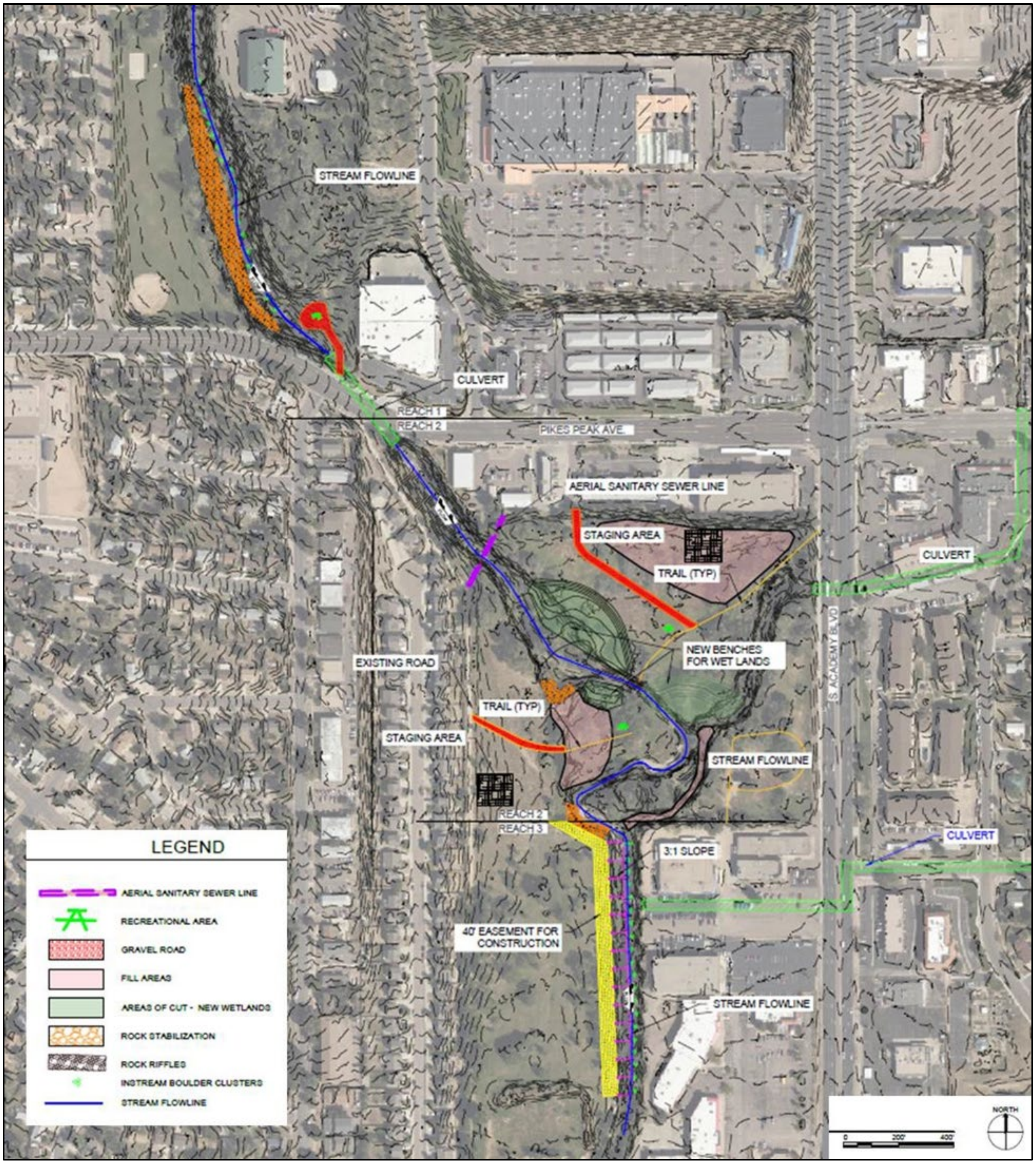


Figure 24: Spring Creek CAP 206 TSP (Alternative 24-2b1b3b) exhibit.

7.3.1 Option Reach 1B: Protect and Plant Bench, Boulder Cluster, Invasive Removal, and Stewardship

This alternative would involve stone toe protection on the west bank of Reach 1, riparian plantings behind the stone toe, boulder clusters (Figure 25) within the channel, a new access road to a stewardship area, and removal of invasive species on the east bank.

Figure 25: Example of boulder clusters.

The management measures included in this alternative are invasive species removal, riparian planting, bank toe stabilization, boulder clusters, and public stewardship area (Figure 26).

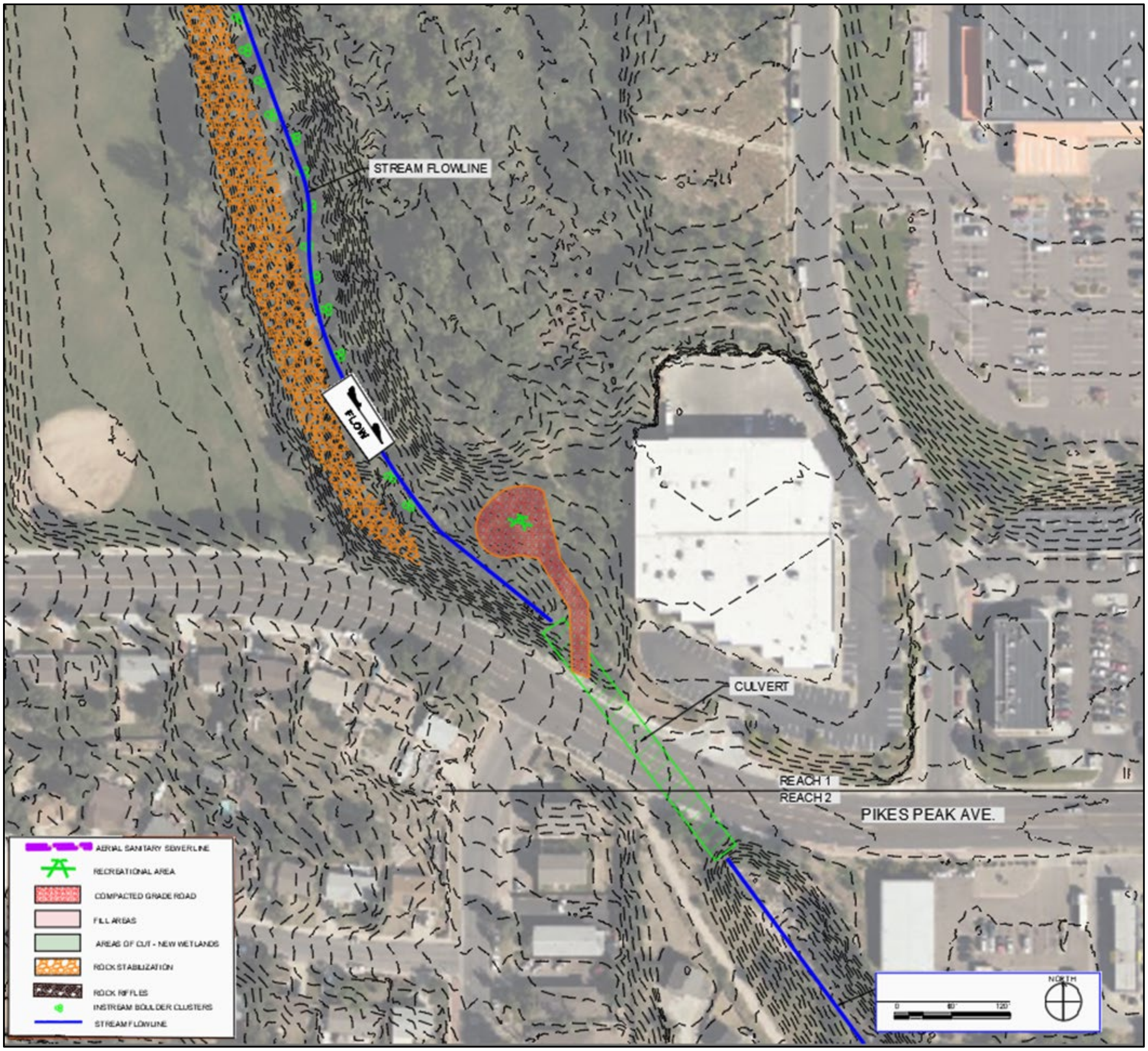


Figure 26: Spring Creek CAP 206 TSP (Alternative 24-2b1b3b) Reach 1b exhibit.

7.3.2 Option Reach 2B: Larger Wetland Rehabilitation, Riparian Plantings, Constructed Rock Riffles, Stone Bank Stabilization, Fill Placement, and Stewardship

This alternative would involve boulder clusters in the channel entering Reach 2, larger bank slope modification (including riparian bench creation) for wetland rehabilitation and plantings (Figure 27), two constructed rock riffles (Figure 28), stone bank stabilization at two key eroded outside bends, fill placement on-site, and designated trails to stewardship areas.

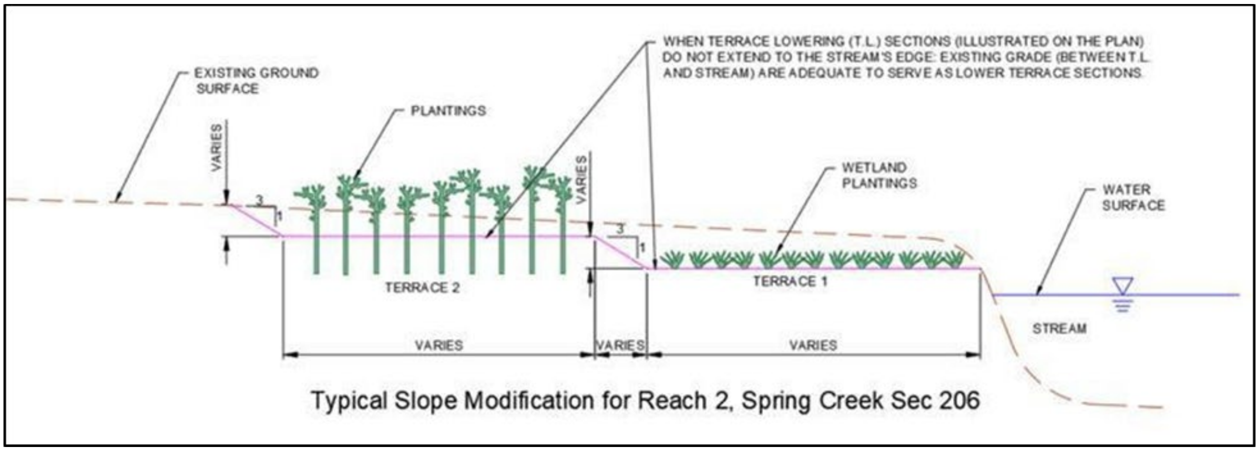


Figure 27: Slope modification example for Reach 2.

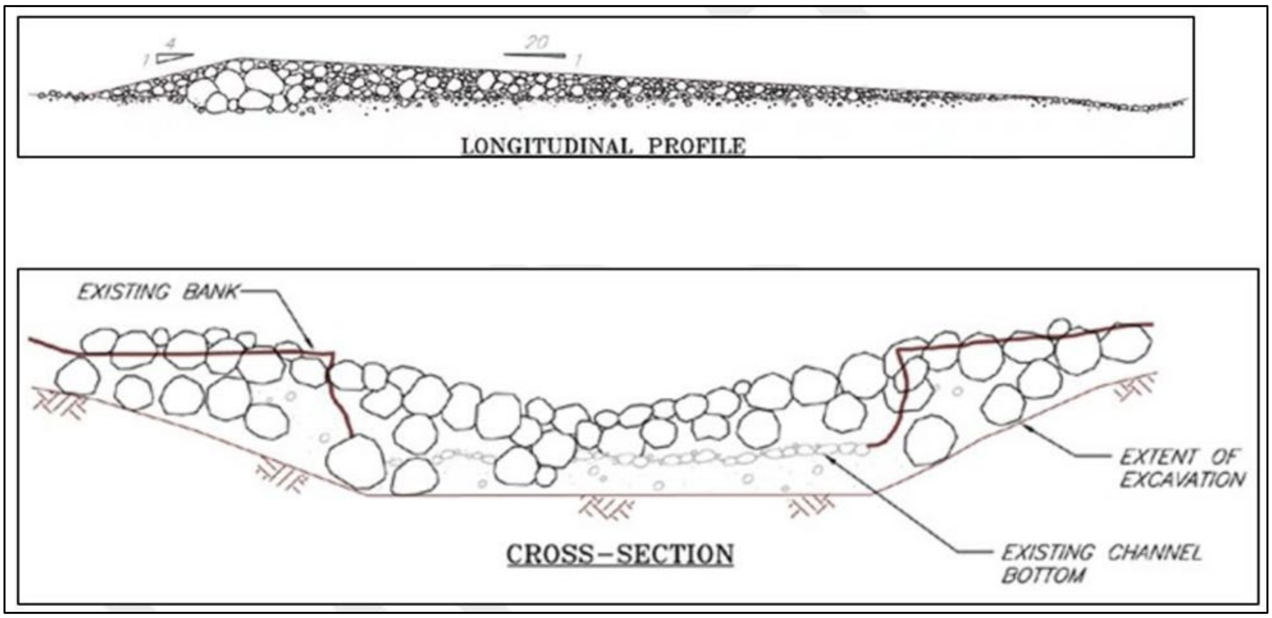


Figure 28: Example schematics of constructed rock riffles.

The restored riparian zone would be planted with a transitional cottonwood-willow community, interspersed with mesic graminoid species, creating a dynamic, multi-layered habitat that supports a wide range of plant and urban wildlife species (Stanford & Ward, 1996). In addition, the construction of in-stream features and bank stabilization structures would enhance the aquatic environment compared to the future without project condition (Figure 29).

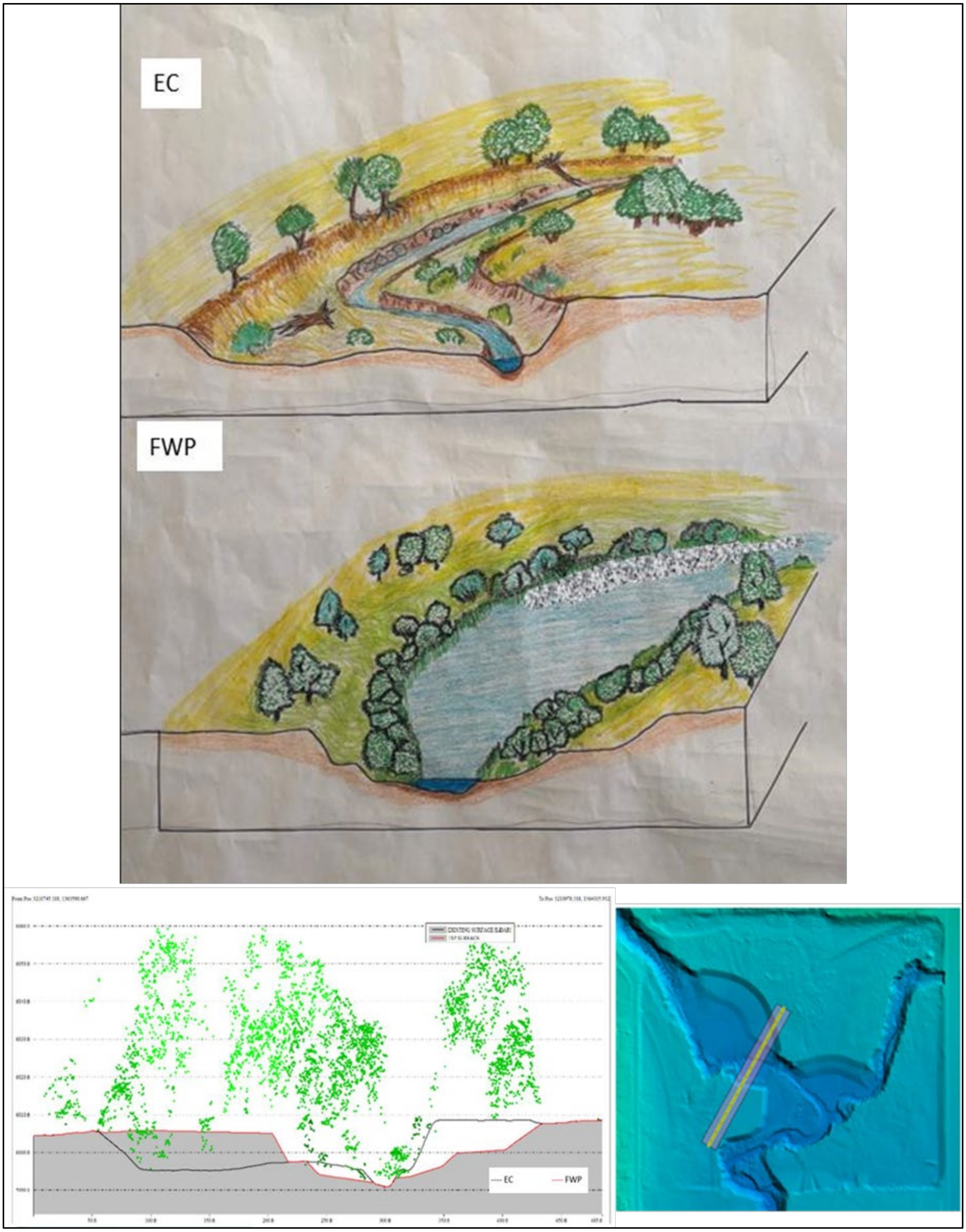


Figure 29: Artist's interpretation of the existing conditions (EC) compared to the Future with Project condition (FWP) for a section of Reach 2, based on cross-sections (bottom). Overlaid cross-sections of EC and FWP. Note that green marks correspond to trees and other vegetation.

The management measures included in this alternative are wetland rehabilitation, wetland plantings, two small grade control structures, invasive species removal, riparian planting, overstory planting, bank slope modification, riparian bench construction, boulder clusters, and public outreach and education (Figure 30).

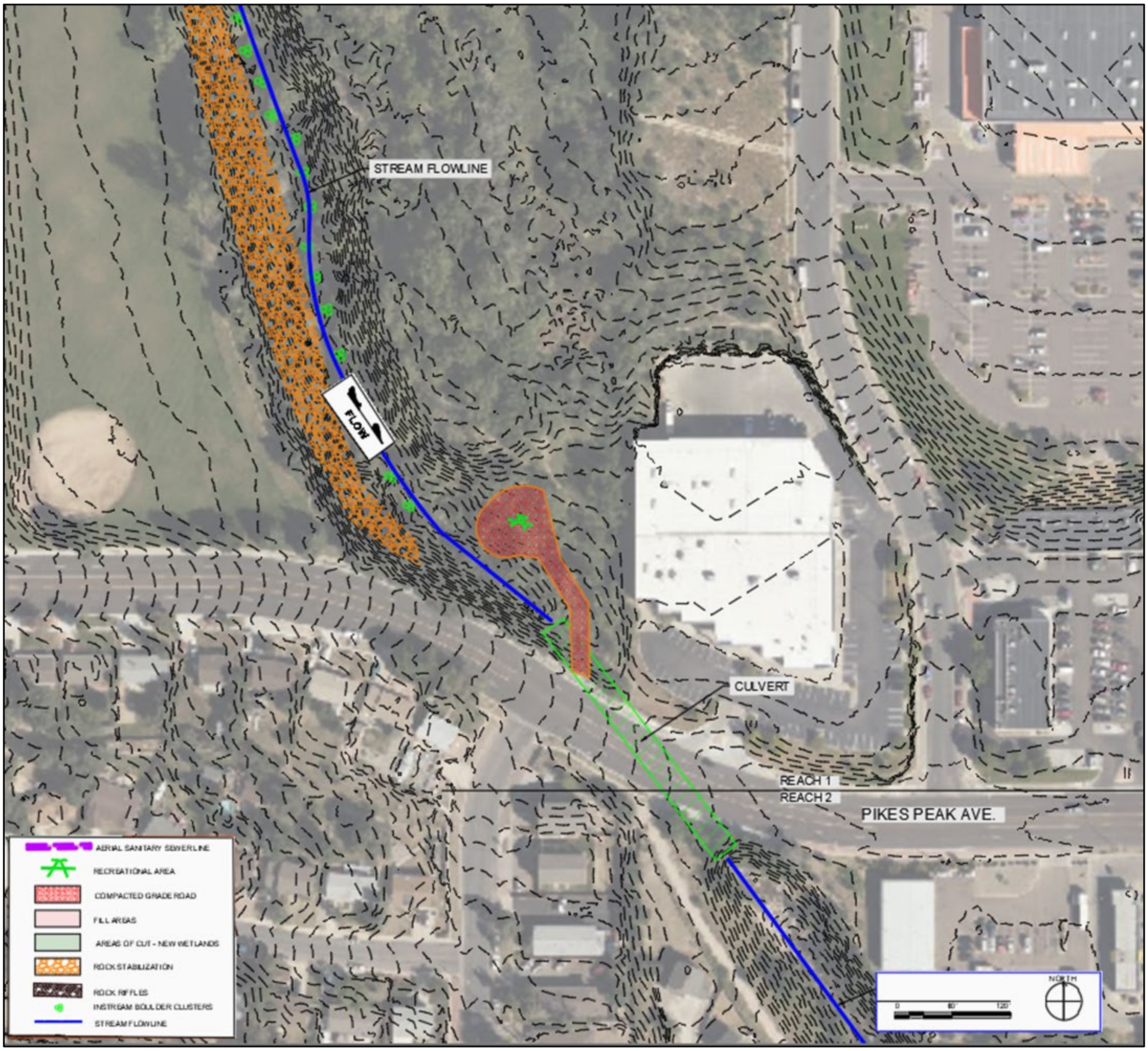


Figure 30: Spring Creek CAP 206 TSP (Alternative 24-2b1b3b) Reach 2b exhibit.

7.3.3 Option Reach 3B: West Bank Riparian Improvements and Added Rock Riffle

This alternative would involve a small riffle (Figure 31) at the top of Reach 3. This riffle would slow the water velocity coming into Reach 3. Boulder clusters in the channel would provide instream habitat diversity throughout Reach 3. The removal of concrete, and slope adjustment, rock placement, and plantings on the west bank slope would create a pervious and diverse riparian habitat area along this otherwise channelized section of stream.

Figure 31: Existing small riffle in Reach 3. New riffle would be constructed to match the existing riffles.

The management measures included in this alternative are a small grade control structure, riparian plantings, bank slope modification, riparian bench construction, removal of bank hardening, and boulder clusters. (Figure 32)

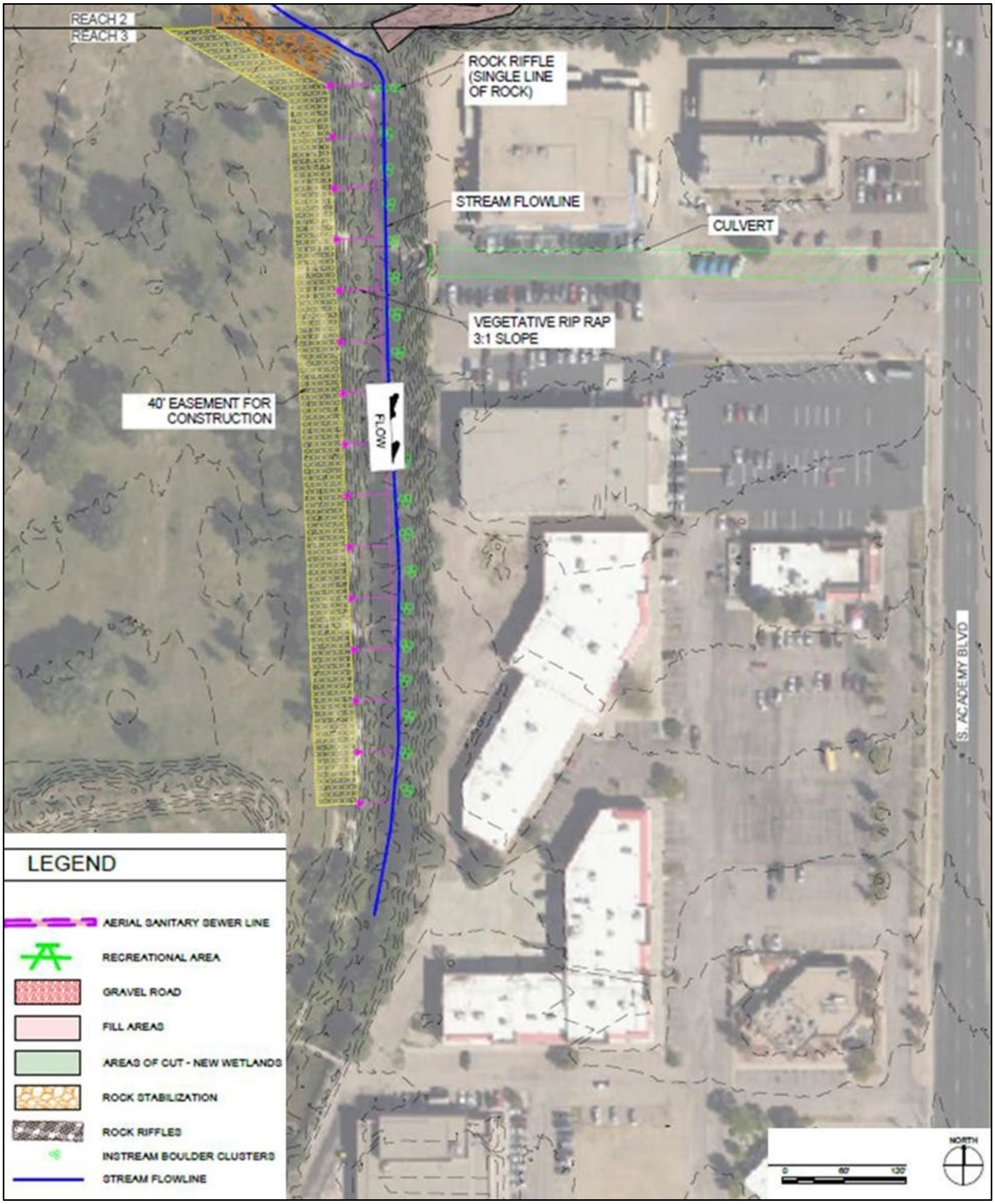


Figure 32: Spring Creek CAP 206 TSP (Alternative 24-2b1b3b) Reach 3b exhibit.

7.4 Recreation Plan

One of the objectives of the Spring Creek project is to decrease the impacts of urbanization on the site. An enhancement of the Spring Creek corridor has the potential to generate and increase various forms of value (Jepson et al. 2017). Recreation components of the project serve to foster environmental stewardship in the community and decrease occurrence of debris and trash dumping on the site.

7.4.1 Proposed Improvements

At present, there is no recreation features in the Spring Creek project area. The proposed recreation features include paved recreation trails in Reach 1 and Reach 2, picnic benches in Reach 2, and educational/interpretive signage in Reach 2. The costs of the recreation components are listed below in Table 20. The costs were annualized using a 50-year period of analysis and the current FY25 discount rate of 3.0%.

Table 20: Cost of Recreation Features

Reach Segment	Total First Cost	Annualized Costs
Reach - 1B	$56,000	$2,200
Reach - 2B	$262,000	$10,200
TOTAL	**~$318,000**	**$12,400**

7.4.2 Recreation Justification

The recreation plan was evaluated using the Unit Day Value (UDV) Method. The proposed project would improve ecosystem conditions and provide quality wetland and riparian habitat for local wildlife. Additionally, the proposed recreation features provide a unique opportunity for walking, running, biking, picnicking, birdwatching, and wildlife viewing along Spring Creek stream corridor in an otherwise urban setting. The benefits were evaluated using UDV from EGM 24-02 and estimated visitation numbers. The Benefit-Cost Ration (BCR) comparing the annual benefits and annual costs is 4.27 which surpassed the required 1.0 for justifying the recreation components of the project (Table 21). Policy requires that the total cost of the recreation features does not exceed 10% of the overall total project cost. The total cost of recreation features for this project is $318,000 which does not exceed the threshold set by policy. Additional information on the recreation valuation and justification can be found in economics appendix.

Table 21: Summary of Annual Recreation Costs and Benefits.

Annual Recreation Benefits	$53,000
Annual Recreation Costs	$12,400
Benefit Cost Ratio	4.27

7.5 Design, Construction, Civil Engineering Considerations

Design and construction considerations include the conditions as follows:
The sanitary sewer line that extends from the west side of Spring Creek to the east side of the creek (See Figure 2, Figure 33, and Figure 34). This line will need to remain undisturbed

during the entire construction process. For more information on the overhead sanitary sewer line and access to the sites and the staging areas, refer to the Civil Appendix.

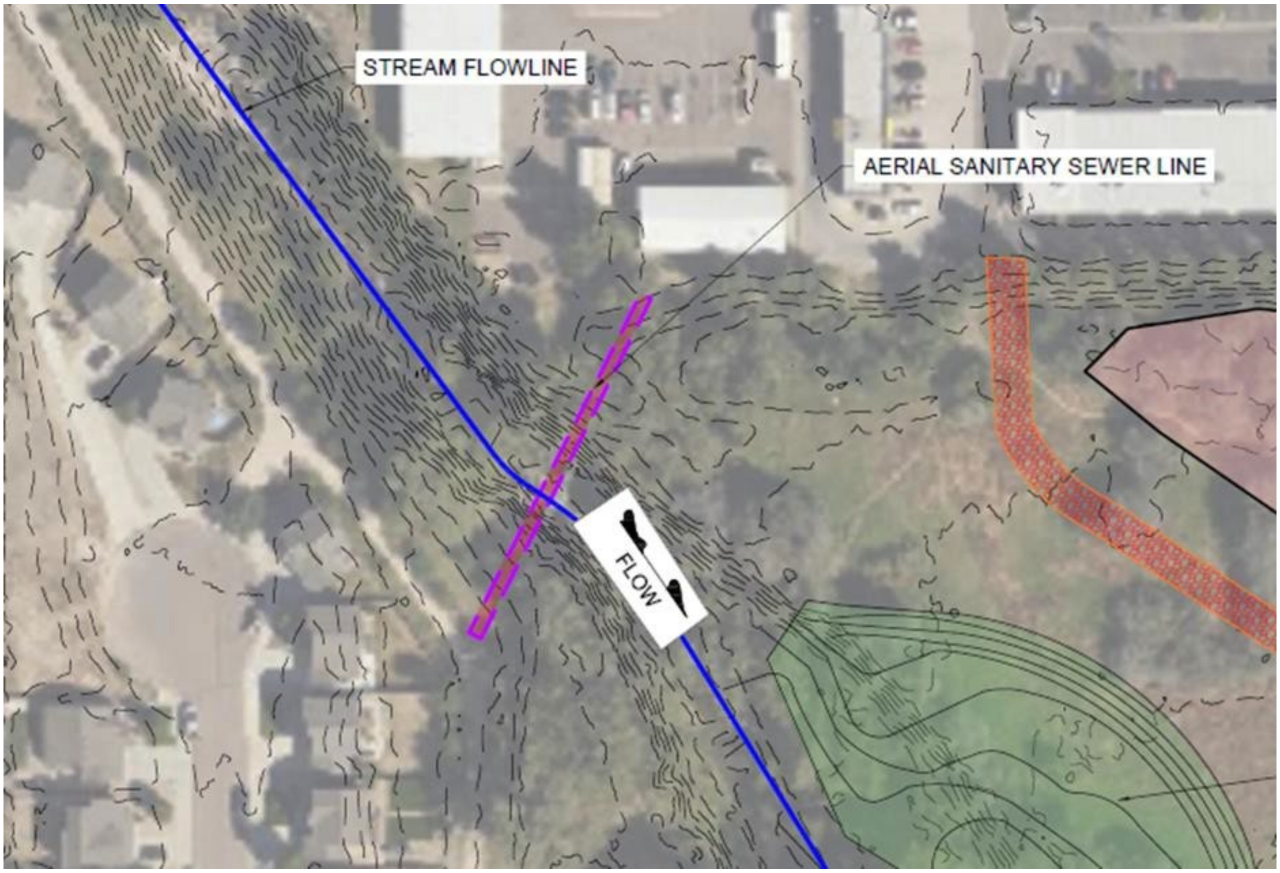


Figure 33: Location of existing aerial sanitary sewer line.

Figure 34: Photo of existing aerial sanitary sewer line.

The three existing box culverts that feed Spring Creek shown below will need to remain undisturbed. These box culverts will be control points for the flow line of Spring Creek. Storm water drainage from the upstream areas contribute to the flows in these culverts, this could be a concern during the monsoon season. (Figures 35 – 37)

Figure 35: Northern most culvert in study area. Between Reach 1 and Reach 2.

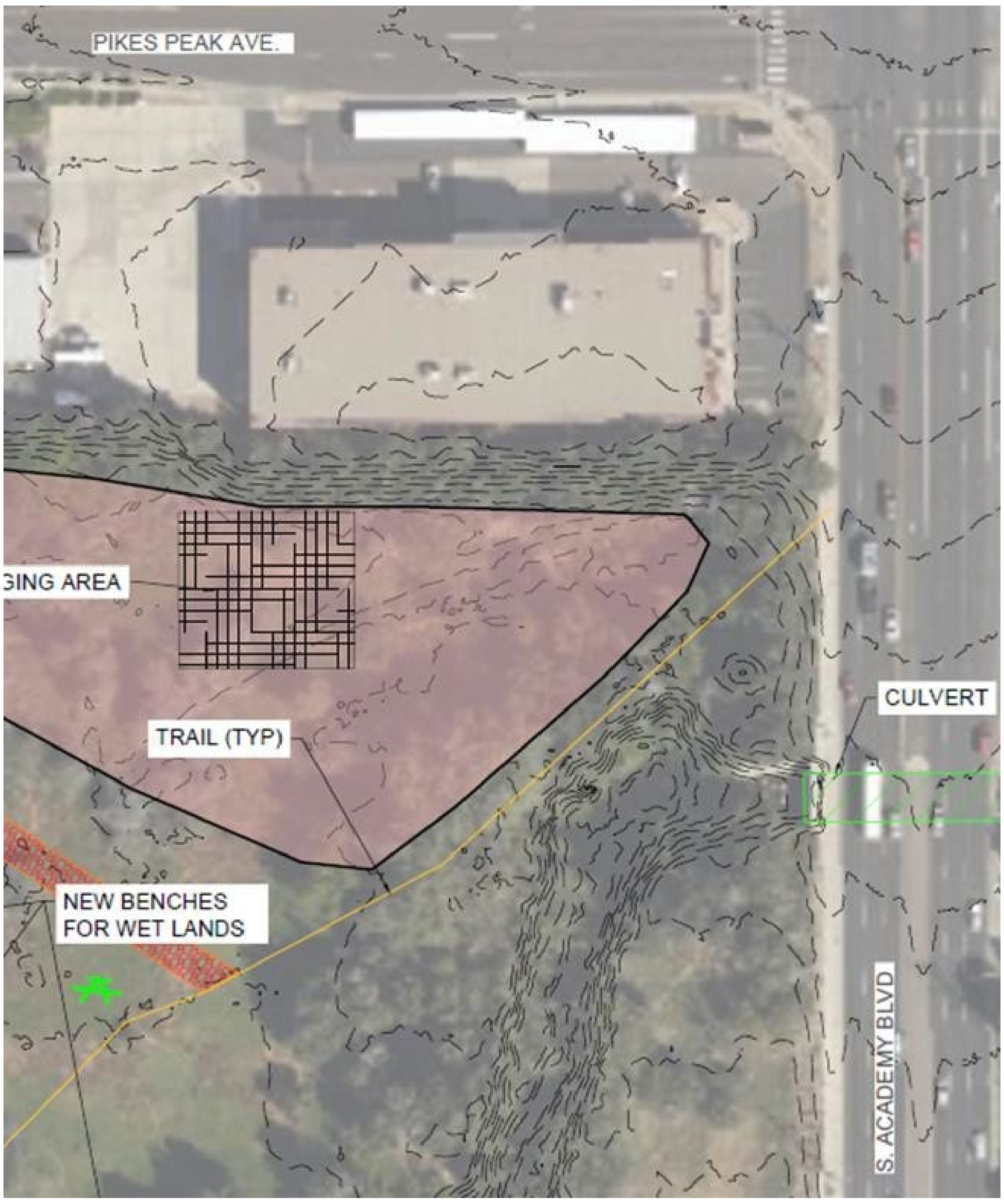


Figure 36: Culvert on east side of Reach 2.

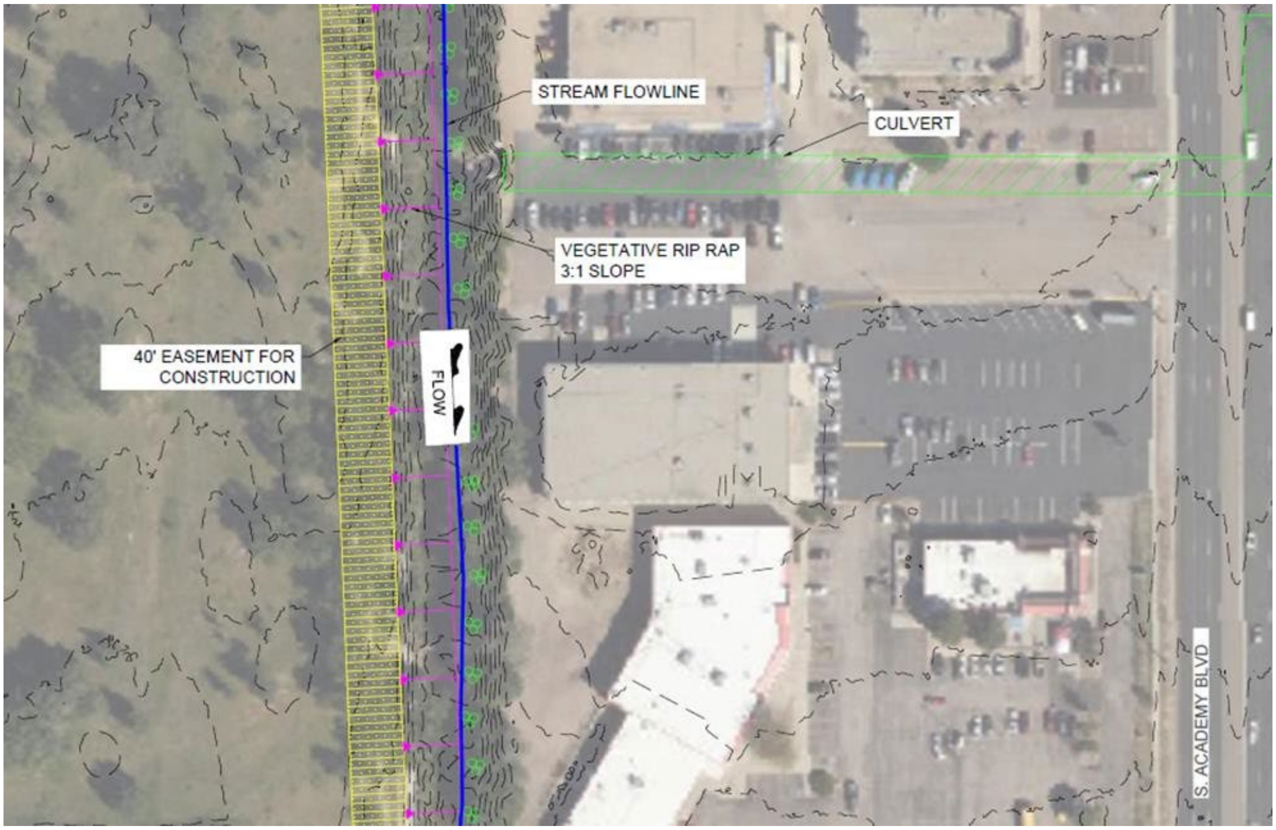


Figure 37: Culvert on east side of Reach 3.

The new “Benches for Wet Areas” will require excavation of earth, which is to be placed in the three fill areas onsite (Figure 38). This is to help minimize any offsite disposal of excavated material and reduce the cost of earthwork.

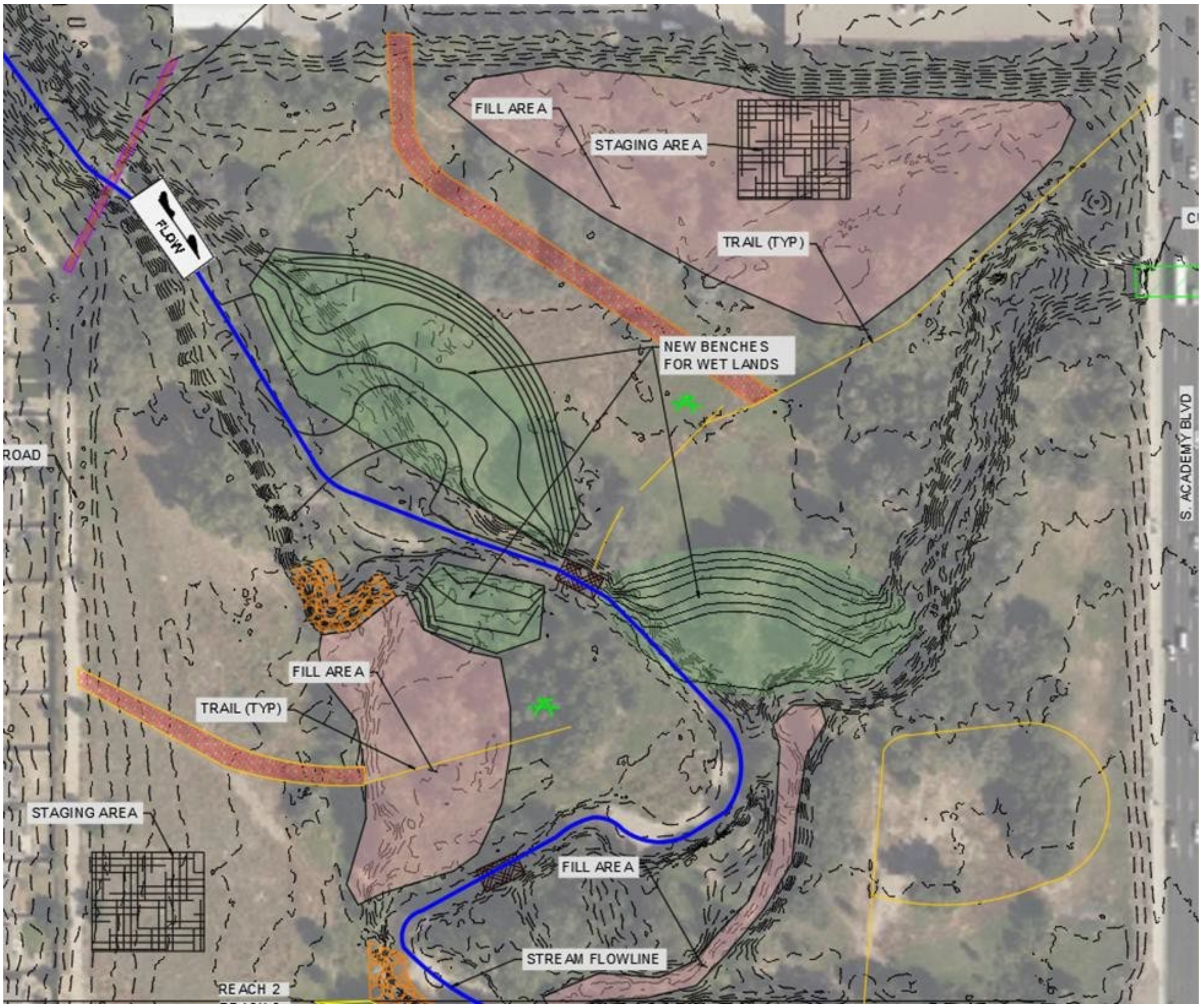


Figure 38: Fill areas shown in light red. All are located in Reach 2.

Rock stabilization (See Figure 30 for locations) will need to be provided at locations where the creek has significant erosion issues. Rock stabilization is to be placed on the west bank of reach one and at two locations on the second reach where there are sharp curves of the creek.

Crossing of the creek during construction will be necessary, temporary culverts for the temporary construction road will be required (Figure 39). These culverts will be removed once construction is complete. The creek in the vicinity of these culverts is to be restored to the condition it was prior to construction. Construction access for the Reach 1 section should be taken from the west side of the river.

Figure 39: Temporary pipes used during construction.

The staging areas will need to have access to a public road so the contractor will have reasonable access. The proposed locations for the two staging areas are included on the exhibit (see Figure 38 for staging area locations). All applicable permits will need to be adhered to before, during and post construction. Staging areas will need to be returned to their preconstruction condition.

The northern area (Reach 1) has vegetation such as trees. Work within the proximity of the vegetation will need to minimize disturbance to native trees and their root system.

7.5.1 Design

- Constructed Rock Riffles (Reach 2)
  - These are ramps or low weirs with long aprons made from riprap or small boulders that are constructed at intervals approaching natural riffle spacing. These structures are intended to provide limited grade control and habitat diversity.
    - The two structures that are part of the Reach 2 alternatives are specifically placed based on natural riffle spacing and sufficiently within the riffle section of the stream's natural pool-riffle-run sequence.
  - The upstream slope of rock fill should be 4:1, steeper than the downstream slope that may be as gradual as 50:1 should be considered. Specific design considerations to be further developed in the design and implementation (D&I) phase.

- The peak crest height is recommended to be at least 2 ft, however the hydraulic jump should be drown out during larger events. Specific design considerations to be further developed in the D&I phase.
- The riffle crest and downstream surface should be V-shaped to direct the flow towards the channel centerline, reducing bank scour along the riffle and maintaining depth for the downstream pool.
- Banks should be protected with riprap from the channel centerline up to the top of bank to prevent flanking and toe in at the downstream end to protect from scour.
- Geotextile may be used underneath the stone structures to prevent leaching of fine material.
- Stone for the structure should be well-graded and properly sized. Past applications have been successful even with stone up to 3.3 ft in diameter. Stone size recommendations have been made using the USACE riprap sizing guidelines.
- At low flows, structures should concentrate flows to maintain sufficient depth for habitat and passage of aquatic organisms. At high flow, stability analysis should be conducted to ensure the structure will remains in place for flows up to a given recurrence interval. In this case, depths and velocities from the modeled 1% AEP scenario were used for design.
  - The materials used for these structures are not intended to be mobile during higher flows like natural riffle materials.
- Dimension guidelines and ranges are recommended according to past applications and studies conducted in Tate (1988), Newbury and Gaboury (1993a), Wittler (1996), and Newbury et al., (1999).
- Example Construction Sequence:
  - Excavate trench in stream bed to a depth equal to the total thickness of the heading and footing rocks.
  - Place footing rocks with no gaps in between the footings.
  - Install filter fabric.
  - Place select backfill behind the footing rocks.
  - Install heading rocks on top of and slightly set back from the footing rocks, such that part of the heading rock is resting on the select backfill. Heading rocks should span the seams of the footing rocks, with no gaps between the rocks.
  - Place select backfill behind heading rocks ensuring that any voids between the rocks are filled. Hand placement or “chinking” may be necessary to ensure voids are filled and there is no sub-surface flow in the structure.

- Small Rock Riffle (Reach 3)

- Stone for the structure should be well-graded and properly sized. Stone size recommendations have been made using the USACE riprap sizing guidelines.
- Banks should be protected with riprap from the channel centerline up to the top of bank to prevent flanking.
- At low flows, the structure should act as grade control for the flows to maintain sufficient depth upstream. At high flow, stability analysis should be conducted to ensure the structure will remains in place for flows up to a given recurrence interval. In this case, depths and velocities from the modeled 1% AEP scenario were used for design.

7.6 Lands, Easements, Rights-of-Way, Relocations, and Disposal Areas (LERRD)

Ecosystem restoration projects require fee interest as the minimum interest in real property to support the project, the Sponsor partially holds this interest for the project lands. However, the Sponsor would seek a construction easement on Parcel No. 6415414033 located on Reach 3 which is privately owned.

Parcel No. 6415102021 (Reach No. 1) which consists of 5.03 acres and Parcels No. 6415414035 which consists of 5,635 sq feet and Parcel No. 6415414106 composed of 23,652 sq feet (Reach No. 2) are owned by the Sponsor. Additionally, the Sponsor has a conservation easement on Parcel No. 6415414013 which consists of 18 acres and is a part of Reach No. 2.

The Sponsor's estimated LERRD costs is $27,250.00, which represents their approximate upfront financial obligation in fulfilling their real estate responsibilities to implement the Recommended Plan.

Table 22: Sponsor's estimated LERRD costs.

Account	LERRD Category	% Contingency	Cost
01	Lands and Damages		22,500
01	Incremental RE Costs		$0
01	Relocation Assistance Program (P.L. 91-646)		$0
01	Facility/Utility Relocations		$0
	Subtotal LERRD's:		22,500
01	Non-Federal Administrative Costs (includes crediting)		
	Total Non-Fed LERRD's:		
30	Federal Administrative Costs		$5,000
	Total Real Estate Costs:		$27,500

See the Real Estate appendix for further information related to LERRD's

7.7 Environmental Considerations

Pursuant of NEPA compliance, agencies shall identify and include in the action all relevant and reasonable Best Management Practices (BMPs) that could reduce negative construction effects of the proposed Federal action.

BMPs during and following project construction would include:

BMP Category	BMP Description
Erosion Control	Install silt fences, wattles, and sediment traps downslope of disturbed areas to prevent runoff from carrying sediment into wetlands and stream channels.
	Stabilize exposed soils with biodegradable erosion control blankets or straw mulch immediately after grading or excavation, especially near regarded banks and wetland benches.
	Limit ground disturbance to the minimum area required for construction access and grading.
Construction Timing & Access	Restrict construction to dry-season or low-flow periods to minimize sedimentation, bank destabilization, and hydrologic disruption.
	Avoid in-water work during sensitive wildlife periods (e.g., nesting season for birds, amphibian breeding).
	Use designated access paths and staging areas to limit compaction and disturbance outside work zones, particularly near floodplain and wetland edges.
Wildlife & Vegetation Protection	Pre-clearance wildlife surveys to avoid disturbing nesting birds, amphibians, or other sensitive species in and near the construction area.
	Flag and avoid high-quality vegetation patches, native trees, and wetland remnants where feasible.
	Phase invasive species removal with immediate replanting of native vegetation to reduce colonization by opportunistic invasives.

BMP Category	BMP Description
Materials and Equipment Management	Use only clean, non-toxic, and appropriately sized fill and rock material, especially in aquatic or wetland zones (e.g., avoid introducing fines or contaminated fill).
	Prevent equipment leaks by conducting regular maintenance and inspecting machinery before entering the site.
	Designate fueling and maintenance zones away from the floodplain or stream to prevent contamination from spills.
Water Quality Protection	Designate fueling and maintenance zones away from the floodplain or stream to prevent contamination from spills.
	Monitor turbidity at downstream locations during in-stream construction activities to stay within water quality thresholds.
	Use biodegradable hydraulic fluids in equipment operating near or in water.
Reclamation and Site Stabilization	Replant all disturbed areas promptly with native species suited to the riparian and wetland zones (e.g., sandbar willow, Baltic rush).
	Include a native seed mix with nurse species to provide quick cover and reduce erosion while slower-growing wetland species establish.
	Implement a short-term irrigation plan for riparian plantings, especially during establishment in year 1–2.

Category of BMP	Description of BMP
General	Work area is restricted to the footprint delineated on the project drawings.
Flow-ways	No net loss of wetland or sensitive aquatic sites
Flow-ways	Stormwater plan to prevent stormwater runoff to ensure any unnecessary environmental damage
Flow-ways	Wetland soil excavation in all Reaches would occur during established in-water work windows
Water Quality	Turbidity control measures (e. g. coffer dam, silt curtains, or similar) would be used to isolate construction and minimize

	turbidity impacts
Flow-ways	The use of marsh mats/swamp pads or temporary rock placement would be used to minimize impacts to wetland soils, as needed
Flow-ways	Work would be conducted in the dry, to the extent practicable
Flow-ways	All required de-watering activities during construction would use appropriate devices (e. g. pumps, sandbags, sumps)
Floodplain Management	Water removed from the site would be discharged in an upland location (preferably vegetated) or a location that would not incur damage due to water discharge
Floodplain Management	All equipment to be thoroughly cleaned prior to in-water construction work
Floodplain Management	No refueling activities would occur near surface waters, and equipment would be regularly checked for drips or leaks
Ditches & Holes	Construction water pits, ponds, reservoirs, or other trenches, ditches, and holes etc., if authorized, shall be maintained such that they present no hazard to wildlife
Vegetation	Except in areas to be cleared, do not remove, cut, deface, injure, or destroy vegetation patches without permission
Migratory Birds	Whenever possible, removal, disturbance or modification to vegetation would occur outside of bird nesting season (1 March - 31 August). If avoidance of nesting season is not possible, surveys would be conducted, and any active nests found would be avoided.
Wildlife	The potential exists in approaching wildlife further becoming a nuisance. Measures to prevent negative wildlife interactions or wildlife damages to property include keeping tools and other equipment closed to the extent possible to prevent inhabitation of wildlife.
Wildlife	Trash and unneatened food must be policed to prevent wildlife attraction and the development of nuisance behavior. Personnel must not feed, water, harass, collect, possess, harm, disturb, or destroy wildlife or their parts to include but not limited to flying insects, snakes, bats, birds, nests, animal burrows or other ecological components.
Existing trees	Any trees that are planned to be demolished shall be analyzed prior to their removal and any activity that involves in tree removal or tree trimming must be coordinated.

7.8 Cost Estimate

A detailed cost estimate for the TSP has been prepared as part of the study. Based on October 2024 price levels, the estimated project cost is $13,349,543 as shown in Table 23. (The project first cost includes, team labor and traditional survey costs for preconstruction engineering and design, labor for construction oversight, construction costs, LERRD values, and contingencies.) Specific PED related costs will be described in the Cost Engineering appendix (to be added to the final report with a Class III Cost Estimate).

7.9 Cost Share

As specified in the Section 206 authority, the cost share for design and implementation (construction) is 65% Federal and 35% non-Federal (Table 23). These costs are at the Oct 2026 price level and will be updated upon completion of the Class III cost estimate for the final report.

Table 23: Cost Apportionment Table for Spring Creek Sec 206. (Oct 2024 Prices)

Spring Creek CAP Section 206 Study Cost Apportionment Table			
	Federal	Non-federal	Total
Feasibility Phase			
Total Feasibility Phase	**$700,000**	**$600,000**	**$1,300,000**
D&I Phase			
Construction/PED/Construction Management	$12,022,043	$0	12,022,043
LERRD	$0	$27,500	$27,500
	$12,022,043	$27,500	$12,049,543
Adjustments			
5% Non-Fed Minimum Cash Contribution	$0	$0	$0
Additional Non-Fed Cash Contribution	($4,189,840)	$4,189,840	$0
Total D&I Phase	**$7,832,203**	**$4,217,340**	**$12,049,543**
	65%	35%	
Feasibility & D&I Phases			
Feasibility Phase	$700,000	$600,000	$1,300,000
D&I Phase	$7,832,203	$4,217,340	$12,049,543
Total Cost Apportionment	**8,532,203**	**4,817,340**	**13,349,543**

7.10 Operations, Maintenance, Repair, Rehabilitation, and Replacement

The Sponsor is responsible for all long-term project operations, routine maintenance, repairs, replacements, and rehabilitation following completion of construction. USACE recommends that annual inspections are conducted, and that operations and maintenance strategies are established to ensure the project's success. Such strategies could include protection of plantings from wildlife or human presence for several years, coupled with annual noxious weed removal plans until vegetation is adequately established. The in-stream structures may require minor reshaping or material replacement if they are disturbed by high-water events. Some woody debris or sediments may accumulate on or around the in-stream structures, and if it is deemed to be causing impairments to the structural function, it should be removed to reduce the risk of failure. If the project is approved, a detailed OMRR&R manual would be developed during the design and implementation phase and would be submitted to Sponsor upon completion of construction. The estimate for O&M costs will be added once the Class III cost estimate is finalized as a part of the Final Report. Please see the Environmental Appendix (under sub-section O&M and AM Plan).

7.11 Monitoring and Adaptive Management

After completion of construction, a Monitoring and Adaptive Management Plan will be finalized to monitor success and maturation of the restoration project. The Monitoring and Adaptive Management Plan contains specific recommendations for monitoring key metrics of project success and outlines triggers and remedial actions if metrics are not reached. A draft of the plan is included in Appendix L (under Monitoring and Adaptive Management Plan). It is a USACE requirement that monitoring occur to assess project performance and determine whether AM options need to be considered/engaged to attain project objectives. Monitoring and AM are not the same as inspections or O&M. The AM plan assumes potential minor project adjustments, in accordance with the moderate scale of the project.

Key metrics to be monitored would be:

- Invasive plant distribution
- Native plant survival and function based on percentage of plants that have survived and canopy cover and shrub cover.
- Native emergent plant cover on pond fringe and pond shallow habitat
- Pond shallow water coverage
- Channel and in-stream structure condition and function

The primary concern is that plantings would not adequately cover the restoration area. In the case of plant coverage not meeting specified targets, USACE and the local sponsor would evaluate the need to do additional plantings and /or invasive control. Please refer to Draft Monitoring and Adaptive Management Plan for more detail on possible adaptive management actions. The amount budgeted for monitoring and adaptive management to assist the project in meeting restoration targets in the first 10-years of the project life would be provided once the Class III cost estimate is complete as a part of the Final Report. The cost share for monitoring and adaptive management is 65% Federal and 35% non-Federal. The nature and cost of potential adjustment measures assumes activities such as replanting failed vegetation, replacing failed stone/boulder/rock riprap, removing accumulated sediment or debris from side channels and inlet/outlet structures.

7.12 Risk and Uncertainty

Risks that have been identified by USACE are listed in Table 24, including steps that would be taken to reduce those risks. The consequence severity is based on the eRR – LOW, MED, HIGH.

Table 24: Residual Risk Table for Spring Creek Section 206.

Risk	PDT Action	Likelihood	Consequence	Consequence Severity
Cut and Fill on site does not balance, only excess cut possible	Calculate the cut/fill balance using CADD post-TSP.	Very Unlikely	Cost and schedule impacts	VERY LOW
An in-depth climate analysis is requested / required by the USACE Climate CoP	Perform in-depth climate analysis	Very Unlikely	Cost and schedule impacts	
Failure to reconnect former wetland due to the elevation differences	Modify designs to achieve reconnection of the wetland	Very Unlikely	Reduced benefits, cost and schedule impacts	
Changing climate and hydrology may decrease final wetland area.	Implemented – Consider native plantings to withstand periodic drying if wetlands not submerged year-round	Very Unlikely	Reduced benefits	
Ground movement over time, instability of slope, Reach 1 susceptible to earth slide	Structures proposed to be built are made of rock to allow for movement without failure. Avoid plant species that can make a slope more unstable.	Unlikely	Reduced benefits, potential cost impacts for rock replacements	
Failure of designed rock structures including rock bank protection, rock armoring, constructed rock riffles	Choose rock size, shape, and gradation appropriately. Construct appropriately for the site conditions and according to design.	Very Unlikely	Cost impacts to repair or replace failed structures	
HTRW sites may be found on study site, site would not be suitable for a wetland unless mitigation occurs.	Mitigation would be necessary prior to completing construction	Very Unlikely	Cost and schedule impacts	

7.13 Sponsor Views

The City of Colorado Springs (Non-federal Sponsor) supports and encourages the formulation of this ecosystem restoration CAP study.

8 Compliance with Applicable Environmental Laws, Regulations, and Executive Orders*

Environmental compliance for Spring Creek includes compliance with the National Environmental Policy Act (42 U.S.C. § 4321 et seq.) and various Executive Orders, and other applicable laws and regulations summarized in Table 25. NEPA statute and the Department of Defense (DoD) NEPA implementing procedures govern NEPA compliance for USACE Civil Works. Feasibility level consultation and coordination documents are found in the Appendix J, Public Scoping.

Table 25: Summary of Project Compliance with Environmental Laws, Policies, and Regulations.

Law/Policy/Regulation – Federal Acts	Compliance Action
American Indian Religious Freedom Act	No Effect
Bald and Gold Eagle Protection Act (16 U.S.C. 668-668(c)),	No Effect. The presence of eagles is unlikely in and around Spring Creek. However, all major work activities would occur outside of their sensitive season (December 1st – August 31st), a period of breeding and parental-care activity (courtship, nest selection, nest building, egg laying and fledgling independence). Additionally, if an eagle(s) is already present within 500 ft. of the area where the Proposed Action is slated to occur but have not yet begun, then any work would be delayed until the eagle(s) leave the area.
Clean Air Act (42 U.S.C § 7401 et seq.)	Insignificant Effects Action Alternatives may affect, but not likely to adversely affect. Construction would produce insignificant effects on air quality. Upon completion of construction, project would not be a source of pollutants
Clean Water Act – Section 404, 401 (33 U.S.C § 1251 et seq.)	Insignificant Effects The project is expected to avoid significant impacts on water resources by implementing effective preventive measures and the project may affect, but not likely to adversely affect water resources and hydrology. Compliance with both Section 404 and Section 401 of the CWA would be addressed by applying an appropriate NWP to the project. The USACE proposes to leverage a Section 404 NWP 27 for this project.
Endangered Species Act (16 U.S.C. §§ 1531-1544)	No Effect The project site does not contain suitable habitat of listed species, therefore no effects are anticipated for federally listed and state listed Threatened and Endangered Species.
Fish and Wildlife Coordination Act (16 U.S.C. §§ 661–666c)	Early coordination on this study began in Oct 2022, and the ongoing coordination is currently sufficient. The FWCA does not apply.

Law/Policy/Regulation – Federal Acts	Compliance Action
Migratory Bird Treaty Act (16 U.S.C §§ 703-712)	Insignificant Effects To reduce the threat of impacting migratory birds that may be present during construction, the proposed project would implement several of the avoidance and minimization measures detailed in the USFWS *National Avoidance & Minimization Measures for Birds* (8 July 2024) and USACE's *Migratory Bird Treaty Act Best Management Practices* (14 June 2024) as detailed below.
National Historic Preservation Act (54 U.S.C §§ 300101 et seq.)	USACE determined that this undertaking would result in "No Historic Properties Affected" and received Colorado State Historic Preservation Office concurrence on February 27, 2025 (HC#82716).
Executive Order 11990 Protection of Wetlands	The TSP supports EO 11990, with the goal to improve and enhance the existing wetland and the adjacent riparian habitat. CWA Section 404/401 permits would apply since the proposed project work would occur within the floodplain and stream channel.
Executive Order 11988 Floodplain Management	The TSP supports EO 11988, with the goal to enhance floodplain function and composition. Per ER 1165-2-26 (implementation of EO 11988), the USACE determined that the various components of the Spring Creek restoration project are not projected to result in adverse impacts such as a rise/increase in the water surface elevation which could cause higher flood risks. Section 404/401 permits would apply since the proposed project work would occur within the floodplain and stream channel.

9 Public Involvement, Review, and Consultation*

Public involvement activities and agency coordination are summarized in this Section. Stakeholders, agencies, Tribes, and other interested parties are integral in providing input for defining problems, opportunities, objectives, constraints, and for developing strategies that support development of the range of alternatives to be analyzed for feasibility and environmental compliance.

In accordance with NEPA public involvement requirements (40 CFR 1506.6) and USACE Planning policy (ER 1105-2-103), opportunities are presented for the public to provide oral or written comments on potentially affected resources, environmental issues to be considered, and the agency's approach to the analysis.

9.1 Public Scoping Comments and Resources of Concern

USACE and the City of Colorado Springs sought an opportunity to hold a public involvement meeting that coincided with a community led and volunteer driven program (Figure 30). Creek Week, an annual watershed level trash and debris cleanup effort, offered a unique setting to engage and communicate with the public.

Figure 40: SPA PDT and Colorado Springs discussing alternative design concepts.

As part of the USACE scoping process, a public involvement meeting took place on 29 September 2023 from 1400-1800. The USACE team displayed three (3) draft alternative design posters as well as a diagram explaining proposed Federal project timelines. The City of Colorado Springs and Trails and Open Space Coalition (TOSC) provided information and educational materials to the public. Team members interacted with the public in an informal setting, discussing proposed features and locations, hosting individual or group site walks, and fielding questions or concerns in a conversational manner (Figure 31).

Figure 41: SPA PDT discussing the CAP Study process with Colorado Springs City Council members and community members.

This approach resulted in high levels of engagement and participation with invested community members. Overall, sixteen (16) community members completed the sign-up form, with approximately double participating in the public involvement meeting throughout the day.

Main concerns voiced during this in-person meeting and in the subsequent follow up emails to the project email address included the following:

- Make sure to include Americans with Disabilities Act (ADA) access to the site including possible Braille signs and wheelchair access.
- The community wants a natural space to walk and bird watch. There are mostly small parks nearby with very little natural areas.
- This space used to be beautiful when the Audubon was running the site. Would like to see it accessible like that again.
- Team should work to connect existing City trail systems to this site.
- Excited this project is occurring.

The general view is that the restoration of the Spring Creek Study Area wetlands and riparian areas, would provide many ecological and community benefits.

A NEPA compliant 30-day public comment period would occur for this study and the results of that public comment period would be included in the Public Scoping Appendix J.

9.2 Draft IFR / EA Public Review

USACE Planning policy and NEPA require a public comment period, during which any person or organization may comment on the draft FR/EA. For this study, the public comment period will run for 30 days, from 25 February 2026 to 26 March 2026. USACE will consider all comments received during the comment period.

9.3 Agency and Tribal Government Consultation and Coordination Process

In February 2025, SPA sent coordination letters for Section 106 Compliance to the Colorado State Historic Preservation Office (CO SHPO), Ute Tribe, Cheyenne Tribe, Mescalero Apache Tribe, Fort Sill Apache Tribe, Comanche Nation, Apache Tribe of Oklahoma, Kiowa Tribe, Jicarilla Apache Nation, Cheyenne and Arapaho Tribes, and the Northern Arapaho Tribe.

On 27 February 2025, the CO SHPO responded with concurrence that the Spring Creek Sec 206 project will result in no historic properties affected, 36 CFR 800.4(d)(1).

Coordination with USFWS began with an email correspondence in October of 2022. Since that time, USACE has corresponded with USFWS via email and phone on matters related to this study.

9.4 Peer Reviewed Process

USACE developed the Review Plan for this feasibility study, with South Pacific Division (SPD) approval on 13 May 2025. Peer review for this study was designed to meet all pertinent

USACE policies (e.g. Engineering Circulars [EC] including EC 1165-2-217). This plan requires internal and external technical review of the IFR/EA and appendices. This study has adhered to this guidance and this document is undergoing District Quality Control review and will undergo Agency Technical Review.

10 Recommendations

The following language outlines the USACE's recommendations for project approval and authorization for implementation.

SPA recommends that Alternative 24-2b1b3b, be implemented as the TSP for the Spring Creek Aquatic Ecosystem Restoration Project as generally described in this report.

Based on October 2024 price levels, the estimated project first cost to design and implement the recommended plan is $13,349,543. The Federal portion of the project first cost is 65%, or $8,532,203. The non-Federal sponsor's required portion of project first cost is 35%, or $4,817,340. The non-Federal sponsor shall, prior to implementation, agree to perform the following items of local cooperation:

1. Provide 35% of total project costs for design and implementation as further specified below:
    i. Provide all lands, easements, and rights-of-way, including those required for relocations, the borrowing of material, and the disposal of dredged or excavated material; perform or ensure the performance of all relocations; and construct all improvements required on lands, easements, and rights-of-way to enable the disposal of dredged or excavated material all as determined by the Government to be required or to be necessary for the construction, operation, and maintenance of the project;
    ii. Provide, during design and implementation, any additional funds necessary to make its total contribution equal to 35% of total project costs;
2. Shall be responsible for all costs related to project operations, maintenance, repair, rehabilitation, and replacement;
3. Shall not use funds from other Federal programs, including any non-Federal contribution required as a matching share therefore, to meet any of the non- Federal obligations for the project unless the Federal agency providing the Federal portion of such funds verifies in writing that expenditure of such funds are authorized to be used to carry out the project;
4. Prevent obstructions or encroachments on the project (including prescribing and enforcing regulations to prevent such obstructions or encroachments), such as any new developments on project lands, easements, and rights-of-way, or the addition of

facilities which might reduce the outputs produced by the project, hinder operation and maintenance of the project, or interfere with the project's proper function;

5. Shall not use the project or lands, easements, and rights-of-way required for the project as a wetlands bank or mitigation credit for any other project;
6. Comply with all applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646, as amended (42 U.S.C. 4601-4655), and the Uniform Regulations contained in 49 CFR Part 24, in acquiring lands, easements, and rights-of-way required for construction, operation, and maintenance of the project, including those necessary for relocations, the borrowing of materials, or the disposal of dredged or excavated material; and inform all affected persons of applicable benefits, policies, and procedures in connection with said Act;
7. For so long as the project remains authorized, operate, maintain, repair, rehabilitate, and replace the project, or functional portions of the project, including any mitigation features, at no cost to the Federal Government, in a manner compatible with the project's authorized purposes and in accordance with applicable Federal and state laws and regulations and any specific directions prescribed by the Federal Government, with the exception that the non-federal sponsors can cease O&M activities on the project's nonstructural and non- mechanical features 10 years after the Secretary of the Army determines success;
8. Give the Federal Government a right to enter, at reasonable times and in a reasonable manner, upon property that the non-Federal sponsor owns or controls for access to the project for the purpose of completing, inspecting, operating, maintaining, repairing, rehabilitating, or replacing the project;
9. Hold and save the United States free from all damages arising from the construction, operation, maintenance, repair, rehabilitation, and replacement of the project and any betterments, except for damages due to the fault or negligence of the United States or its contractors;
10. Keep and maintain books, records, documents, or other evidence pertaining to costs and expenses incurred pursuant to the project, for a minimum of three years after completion of the accounting for which such books, records, documents, or other evidence are required, to the extent and in such detail as will properly reflect total project costs, and in accordance with the standards for financial management systems set forth in the Uniform Administrative Requirements for Grants and Cooperative Agreements to State and Local Governments at 32 Code of Federal Regulations (CFR) Section 33.20;
11. Comply with all applicable Federal and state laws and regulations, including, but not limited to: Section 601 of the Civil Rights Act of 1964, Public Law 88-352 (42 U.S.C. 2000d) and Department of Defense Directive 5500.11 issued pursuant thereto; Army Regulation 600-7, entitled "Nondiscrimination on the Basis of Handicap in Programs

and Activities Assisted or Conducted by the Department of the Army"; and all applicable Federal labor standards requirements including, but not limited to, 40 U.S.C. 3141- 3148 and 40 U.S.C. 3701 – 3708 (revising, codifying and enacting without substantial change the provisions of the Davis- Bacon Act (formerly 40 U.S.C. 276a et seq.), the Contract Work Hours and Safety Standards Act (formerly 40 U.S.C. 327 et seq.), and the Copeland Anti-Kickback Act (formerly 40 U.S.C. 276c et seq.);

12. Perform, or ensure performance of, any investigations for hazardous substances that are determined necessary to identify the existence and extent of any hazardous substances regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Public Law 96-510, as amended (42 U.S.C. 9601-9675), that may exist in, on, or under lands, easements, or rights-of-way that the Federal Government determines to be required for construction, operation, and maintenance of the project. However, for lands that the Federal Government determines to be subject to the navigation servitude, only the Federal Government shall perform such investigations unless the Federal Government provides the non-Federal sponsor with prior specific written direction, in which case the non-Federal sponsor shall perform such investigations in accordance with such written direction;
13. Assume, as between the Federal Government and the non-Federal sponsor, complete financial responsibility for all necessary cleanup and response costs of any hazardous substances regulated under CERCLA that are located in, on, or under lands, easements, or rights-of-way that the Federal Government determines to be required for construction, operation, and maintenance of the project;
14. Agree, as between the Federal Government and the non-Federal sponsor, that the non-Federal sponsor shall be considered the operator of the project for the purpose of CERCLA liability, and to the maximum extent practicable, operate, maintain, repair, rehabilitate, and replace the project in a manner that will not cause liability to arise under CERCLA; and
15. Comply with Section 221 of Public Law 91-611, Flood Control Act of 1970, as amended (42 U.S.C. 1962d-5b), and Section 103(j) of the Water Resources Development Act of 1986, Public Law 99-662, as amended (33 U.S.C. 2213(j)), which provides that the Secretary of the Army shall not commence the construction of any water resources project or separable element thereof, until each non-Federal interest has entered into a written agreement to furnish its required cooperation for the project or separable element.

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