Administration Building
West Hearing Room
5334 S. Prince St.
Littleton, CO 80120
303-795-4630
303-738-7915 TTY

Nancy A. Doty, Chair, District 1
Nancy Sharpe, District 2
Rod Bockenfeld, District 3
Nancy Jackson, Chair Pro-Tem, District 4
Bill Holen, District 5

Study Session

January 19, 2016

The Arapahoe County Board of County Commissioners typically holds weekly Study Sessions on Monday and Tuesday. Study Sessions (except for Executive Sessions) are open to the public and items for discussion are included on this agenda. Agendas (except for Executive Sessions agendas) are available through the Commissioners' Office or through the County's web site at www.arapahoegov.com. Please note that the Board may discuss any topic relevant to County business, whether or not the topic has been specifically noticed on this agenda. In particular, the Board typically schedules time each Monday under "Committee Updates" to discuss a wide range of topics. In addition, the Board may alter the times of the meetings throughout the day, or cancel or reschedule noticed meetings. Questions about this agenda? Contact the Commissioners' Office at 303-795-4630 or by e-mail at commissioners@arapahoegov.com

Study Session Topics

10:00 A.M. Calendar Updates (WHR)
Diana Maes
BoCC Administration Manager

10:30 A.M. BOCC Updates (WHR)
Board of County Commissioners

11:30 A.M. *Joint Project Proposal - City Of Aurora - Triple Creek Greenway, Phase 3 (WHR)

Discuss a recommendation from Open Spaces staff and the Open Space Trails Advisory Board (OSTAB) to the Board of County Commissioners to approve the funding request from the City of Aurora for $2,050,000 towards the Triple Creek Greenway, Phase 3 project

Request: Information/Direction

Shannon Carter, Open Spaces Department Director
Josh Tenneson, Grants and Acquisitions Administrator
Janet Kennedy, Director, Finance
Tiffanie Bleau, Senior Assistant County Attorney

Documents: BSR_SS_TRIPLE CREEK III_01.05.16.PDF

Break

1:00 P.M. *Align Arapahoe - Service First (WHR)
Chandra DeSimone, Performance Management Analyst, Department of Strategy & Performance
Matthew Nii, Performance Management Analyst, Department of Strategy & Performance
BoCC

2:00 P.M. A Team Meeting (WHR)
Arapahoe County Elected Officials

3:00 P.M. Arapahoe County Fair Update (WHR)
Request: Information

Shannon Carter, Director, Intergovernmental Relations/Open Space
Andrea Rasizer, Director, Communication Services
Don Klemme, Director, Community Resources

3:30 P.M. * Executive Session (WHR)
Executive Study Session and County Attorney Administrative Meeting [Section 24-6-402 (4)(b)C.R.S.](As required by law, specific agenda topics will be announced in open meeting prior to the commencement of the closed and confidential portion of this session) (WHR)

Ron Carl, County Attorney

*** To Be Recorded As Required By Law**
WHR - West Hearing Room

Arapahoe County is committed to making its public meetings accessible to persons with disabilities. Assisted listening devices are available. Ask any staff member and we will provide one for you. If you need special accommodations, contact the Commissioners' Office at 303-795-4630 or 303-738-7915 TTY.
Please contact our office at least 3 days in advance to make arrangements.

Board Summary Report

Date: January 5, 2016

To: Board of County Commissioners

Through: Shannon Carter, Open Spaces Department Director

From: Josh Tenneson, Grants and Acquisitions Manager

Subject: Joint Project Proposal – City of Aurora – Triple Creek Greenway Corridor, Phase 3

Direction/Information: To provide information and seek direction on a proposal from the City of Aurora requesting funding for the Triple Creek Greenway Corridor, Phase 3 project.

Request and Recommendation:
The recommendation from Open Spaces staff and the Open Space Trails Advisory Board ("OSTAB") to the Board of County Commissioners is to approve the funding request from the City of Aurora for $2,050,000 towards the project.

Background:
The long-range vision for the Triple Creek Greenway Corridor (TCGC) is to create a continuous 27-mile corridor that stretches from the South Platte River in north Denver that follows Sand Creek and its tributaries south to the Aurora Reservoir and Arapahoe County Fairgrounds. The TCGC project will create 14 miles of new trail and greenway through southeast Aurora and unincorporated Arapahoe County. The project will provide significant regional benefits to wildlife as well as thousands of bicyclists, pedestrians, and equestrians by creating new access points and trail connections.

Phase 1 of the project was approved by Arapahoe County in 2009 (the County contributed $155,000), which supported a greenway study and other planning-related tasks. In part, the study identified strategic acquisitions needed to achieve greenway continuity and functionality.

Phase 2 was approved by Arapahoe County in 2012 (the County contributed $2 million). Through the Phase 2 effort, the project partners acquired numerous key open spaces properties along the TCGC, totaling 250 acres. Geographically these acquisitions nearly completed the greenway acquisition phase from Colfax Avenue to E-470.

The City of Aurora now requests funding to acquire two of the final major open space land acquisitions remaining in the corridor.

Links to Align Arapahoe:

Increase Intergovernmental Cooperation
Increase Community and Regional Partnerships
Improve Park, Trail and Open Space Opportunities
Improve Customer Experience

Optimize Use of Resources
Enhance Quality of Life

Discussion:
The City of Aurora has already been able to secure most of the funding needed to acquire over 388 additional acres of property in this TCGC Phase 3 effort. The City is now asking the County for some of the last funding ($2,050,000) required to complete the acquisitions. Committed project partners include the City of Aurora, Trust for Public Land, Great Outdoors Colorado, Department of Defense, Natural Resources Damages Funds, and private funders.

The two properties that are being proposed for acquisition will remain undeveloped except for some limited recreation structures and trails. Both properties will be acquired within a two-year timeframe. Arapahoe County will hold a conservation easement on each of the properties.

The first property is known as the Murphy Creek Property (77.5 acres), and it sits just upstream from where Murphy Creek joins Coal Creek in the adjacent Confluence Open Space, which was acquired in Phase 2. In addition to providing benefits to the TCGC, the property also serves as a buffer to the Buckley Air Force Base. The second property is known as the Coal-Senac Creek Connection Property (310.8 acres), and it encompasses the confluence of Senac and Coal Creeks. This acquisition will buffer the large State Land Board property to the south.

As the following table demonstrates, the County's funds will be highly leveraged by funds from the other project partners.

Partner Contributions:

Use of Funds	***Arapahoe County***	***Aurora***	***GOCO***	***NRDS***	***DOD***	***TPL & Private***	***Total***
Land Acquisition	$2,050,000	$335,000	$2,000,000	$4,000,000	$1,100,000	$515,000	$10,000,000
Due Diligence Costs		$3,000	$50,000			$47,000	$100,000
Total	$2,050,000	$338,000	$2,050,000	$4,000,000	$1,100,000	$562,000	**$10,100,000**

Alternatives:
Delay, modify or deny funding.

Fiscal Impact:
The Open Space Resolution authorizes the County to contribute funds from the Open Space Sales and Use Tax for eligible joint projects between the County and municipalities or other governmental entities in the County. $2,050,000 of "joint project funding" from the Open Space Acquisition and Development fund will go towards this project. The fund balance exceeds this amount. The County will not incur annual maintenance cost for this project.

Concurrence:
Please see attached recommendation from OSTAB.

Attorney Comments:
None

Reviewed By:
Josh Tenneson
Grants and Acquisitions Manager

Shannon Carter, Director
Intergovernmental Relations and Open Spaces

Tiffanie Bleau
Assistant County Attorney

Janet Kennedy, Director
Finance

Attachments:
1. OSTAB Recommendation – December 7, 2015
2. Triple Creek Phase 3 Joint Project Request

Shannon Carter | Director

ARAPAHOE COUNTY
PROTECT. CONNECT. ENJOY.

OSTAB Recommendation

Date: December 7, 2015

To: Board of County Commissioners

From: Open Space Trails and Advisory Board (OSTAB)

Subject: Joint Project Proposal – City of Aurora – Triple Creek Greenway, Phase 3

OSTAB Recommendation – After considering the request from the City of Aurora as an action item on this date, OSTAB recommends to the BOCC expenditure of up to $2,050,000 of Arapahoe County Open Space Acquisition and Development funds toward the Triple Creek Greenway, Phase 3 project, subject to full funding from all other sources and execution of an IGA.

Motion by: Sharon Powers

Seconded by: Harriet LaMair

Vote: __7___ Yes
__0___ No
__0___ Abstain
__0___ Absent and Excused

6934 South Lima Street Unit A | Centennial, CO 80112 | 720-874-6540 | TDD 720-874-6574 | Fax 720-874-6743 | www.co.arapahoe.co.us

Parks, Recreation & Open Space

Open Space and Natural Resources
15151 E. Alameda Parkway, Ste. 4600
Aurora, Colorado 80012
303.739.7166
www.nature@aurora.org

City of Aurora

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September 9, 2015

Mr. Shannon Carter, Open Spaces and Intergovernmental Relations Director, and
Arapahoe County Open Space & Trails Advisory Board (OSTAB)
6934 S Lima St, Unit A
Centennial, CO 80112

Re: Joint Project Funding Request - Triple Creek Greenway Corridor Phase 3: Implementation

Dear Shannon and OSTAB Members:

The Aurora Parks, Recreation & Open Space Department (PROS) respectfully submits the enclosed Joint Project Funding Request to undertake Phase 3 of the Triple Creek Greenway Corridor.

Phase 1 of this project was approved by OSTAB and the Board of County Commissioners (BOCC) in 2009, resulting in a $155k award from Arapahoe County Open Space Funds to prepare a greenway study and perform other planning-related tasks. The outcome of that effort has provided the foundation for advancing the Triple Creek project into Phase 2, which entails the purchase of properties that had been identified in the study as strategic acquisitions needed to achieve greenway continuity and functionality.

Phase 2 was approved by OSTAB and the BOCC in 2012, resulting in a $2M award from the Arapahoe County Open Spaces Funds. This funding was used to match approximately $7M in other funding sources for the implementation of Phase 2 acquisition efforts for Triple Creek Corridor. The first two Phases have been successfully concluded in the purchase of approximately 250 acres in trail and stream corridor.

Aurora PROS has been able to pull together an estimated $8.05M from various sources to acquire 388 additional acres for greenway purposes and public benefit in Phase 3 of the Triple Creek project. The funding partners for Phase 3 include:

- City of Aurora
- Trust for Public Land;
- Great Outdoors Colorado
- Northeast Greenway Corridor, NRDS funds
- Department of Defense- REPI
- Arapahoe County Open Spaces Request

Aurora PROS is now seeking formal consideration and approval of the $2,050,000M from Arapahoe County as Joint Project funds.

Thank you for your consideration of our Joint Project Funding Request, and for your continued support and partnership on this regionally significant trail project.

Sincerely,

Thomas F. Barrett
Director
Aurora Parks, Recreation & Open Space Dept.

Joint Project Funding Request

For

Triple Creek Greenway Corridor
Phase 3: Implementation

Arapahoe County Open Spaces
September 8, 2015

City of Aurora
Parks, Recreation & Open Space (PROS)
The Quality of Life Department

JOINT PROJECT FUNDING REQUEST

Triple Creek Greenway Corridor

Phase 3: Acquisition

1) Scope of Project

The Triple Creek Greenway Corridor (TCGC) is comprised of land acquisitions, trail expansions, and trailhead development projects designed to expand and extend the greenway. Building on the success of acquisitions completed under our previous joint project, this phase includes properties that will complete the greenway and trail along Murphy Creek and protect the headwaters of Sand Creek at the confluence of Coal Creek and Senac Creek. A majority of these properties will remain undeveloped and provide permanent protection along an area otherwise prime for future development. Please see map titled *TCGW_Phase3_AreaMap* for a view of all properties purchased in Phase 2 and planned acquisitions under this Joint funding project request.

2) Project Summary

The Triple Creek Greenway Corridor project, comprised of Sand Creek, Coal Creek, and Senac Creek in southeast Aurora, is an ambitious plan to add fourteen miles of interconnected greenway and trails between the existing terminus of the Sand Creek Regional Greenway and nearly 30,000 contiguous acres of publicly owned land surrounding the Aurora Reservoir. When completed, pedestrians, bicyclists, equestrians, and wildlife will be able to travel an uninterrupted 27-mile route from the Aurora Reservoir to the South Platte River. In the larger context, the corridor will provide additional connective loops to the Front Range Trail segments including the High Line Canal, Cherry Creek Trail and Toll Gate Creek Trail for a wide variety of uses and public benefit.

In 2012, Aurora began implementing Phase 2 of the TCGC initiative, a series of acquisitions made possible by combined funds from an Arapahoe County Open Spaces Joint Project, the first Natural Resource Damages (NRD) settlement from the Rocky Mountain Arsenal Wildlife Refuge, Great Outdoors Colorado's River Corridor Initiative (GOCO), and an Adams County Open Space grant, totaling over $9 million which protected approximately 250 acres. Geographically, this extension completed the greenway from Colfax Avenue to E-470. Significant opportunities exist to acquire and preserve additional key properties that will expand and buffer the greenway and protect its natural functions along Murphy Creek, and to preserve the ecosystem at the confluence of Senac Creek and Coal Creek. Degraded areas will be restored to complement the ecological system, wildlife habitat, storm water management, water quality, and other open space values. This project provides significant benefits to thousands of residents who currently utilize the Sand Creek Regional Greenway and the High Line Canal Trail as well as provide an opportunity to introduce this amenity to individuals and families new to this growing metro area.

To gain additional credence toward our efforts to protect this series of stream corridors, we hired CNHP to prepare a survey of biological resources for the entire corridor. Please find a copy attached, which supports this special preservation effort.

Through this Phase 3 effort, Arapahoe County's $2 million investment will help complete the next phase of the initiative, which add another 388.3 acres to the corridor, including the Murphy Creek Property (77.5 ac), and the Coal-Senac Creek Connection (310.80). The final 62.1-acre property is also shown in this application, but not included in the total acreage since we anticipate the requested GOCO funds will only allow us to acquire two of the final three critical acquisitions left to complete the Triple Creek Greenway Corridor Project. Future enhancements will also add connections to new recreation trails and to other Front Range Trail segments including an additional 67 miles of trail along the High Line Canal, the Cherry Creek Trail and the Toll Gate Creek Trail.

3) Plans and Vision

The open space acquisition and trail expansion components of the Triple Creek Greenway Corridor project dovetail with several goals and policies included in both Arapahoe County's and Aurora's Plans and Open Space Visions.

Arapahoe County Comprehensive Plan

This project helps implement the Open Space, Parks and Trails section of Arapahoe County's Comprehensive Plan, which recommends "using open space as a means to help direct growth, maintain rural character, conserve wildlife habitat, create edges to the urban environment and provide opportunities for education, scientific research, wildlife observation, hiking and passive and active recreation activities." Several open space goals and policies will also be achieved through this project, including:

- <u>Goal OS 1 –Develop a Countywide Open Space, Parks and Trails System</u>

  Arapahoe County will have a countywide connected system of open space, and will contain parks, trails and recreation facilities in Growth Areas that provide active and passive recreation opportunities for County residents.

- <u>Policy OS 1.1 – System of Connected Countywide System of Open Space, and Public Parks and Trails</u>

  Arapahoe County will work to improve a connected system of open space and increase residents' access to public parks and trails in Growth Areas.

- <u>Policy OS 1.3 – Plan for Non-Motorized Trails in Growth Areas and for Regional Connections</u>

  The County will promote trails planning to provide a non-motorized transportation alternative.

Arapahoe County Open Space Resolution and Master Plan

Established in 2003 and extended in 2011, Arapahoe County's open space program is designed to "preserve urban and rural open space and natural lands; protect the land that preserves water quality in rivers, lakes and streams; provide, maintain and improve neighborhood parks, open space, sports fields, picnic facilities, and biking, walking and multiuse trails; protect wildlife habitat and corridors; protect views, vistas and

ridgelines; preserve agricultural and ranch lands; and enhance and maintain designated heritage areas." Nearly all of these goals will be achieved through this joint project.

The Triple Creek Greenway Corridor is also identified as an "Open Space Opportunity Corridor" in the Arapahoe County Open Space Master Plan that was approved in June 2010. The Plan encourages preservation and enhancement of riparian corridors, in addition to creating an interconnected greenway system following waterways, grasslands, ridgelines and other appropriate corridors the link core habitat areas, parks and open spaces areas, as well as connections to neighborhoods, schools, businesses, and other activity centers.

Aurora's Goals and Relevant Plans

In July 2011, Aurora and Arapahoe County completed Phase 1 of this long-term effort – the *Triple Creek Greenway Corridor Study* (Study), a joint planning effort designed to identify greenway and trail opportunities to connect the existing terminus of the Sand Creek Regional Trail at east Colfax Avenue to the Aurora Reservoir. The Study identified a preferred route for the greenway and trail and located a number of alternatives lest the requisite land acquisition and trail alignment to implement the favored option proved unfeasible. The Study also explored trail considerations, including universal design standards, street crossings and grade separations, floodplain encroachment, and trail width and surface types appropriate for varying uses such as foot traffic, road biking, and equestrians.

The transportation chapter of the 2009 City of Aurora Comprehensive Plan Update recommends the provision of a more balanced transportation system for the future of the city. An extensive trail network is mapped, which designates the Triple Creek Corridor as a "proposed soft surface regional trail." Additionally, two key strategies in the Comprehensive Plan directly relate to this project:

"Preserve and interconnect open space corridors to preserve existing wildlife corridors and extend the urban trail system."

"Expand and enhance trails and open space system as part of the regional network, connected to adjoining municipalities providing access via trails to destinations in Aurora."

The Triple Creek Greenway Corridor concept is consistent with Aurora's Parks, Recreation & Open Space (PROS) Department's *Framework Master Plan 2007* that outlines the fundamental actions, roles, and responsibilities of the department. The plan explicitly recommends to: 1) "*provide trails, greenways, and greenbelts as major connecting elements of the parks and open space system*;" and 2) "*strive to establish a well-integrated, community-wide system…for bicyclists and pedestrians*."

The City is currently finalizing an update to its *Bicycle and Pedestrian Master Plan*. The draft document reflects comments, concerns, ideas and recommendations gathered regarding needed improvements to the bicycle and pedestrian network. The public was encouraged to provide comments by way of an online survey and interactive mapping exercise as well as open house forums. Support for the Triple Creek Trail was evident as participants reviewed and marked up maps.

4) Describe Project and How It Fits into Joint Project Definition

a. *County Preservation Focus*

Acquisitions in Phase 3 of the Triple Creek Greenway Corridor will permanently protect approximately 388.3-acres for open space, wildlife habitat, and recreational access, including:

Coal-Senac Creek Connection Property

This property contains 310.8 acres and encompasses the confluence of Senac Creek and Coal Creek. The two creeks converge around the base of a ridge that rises some 70 feet between them to an elevation of 5,700 feet, and is dominated by a remnant patch of the Western Great Plains Shortgrass Prairie ecosystem. Additional shortgrass prairie patches exist on the uplands to the east of Coal Creek as it flows northward from the confluence. Studies completed by the Colorado Natural Heritage Program (CNHP) and the Nature Conservancy, reveal that grasslands and their associated riparian areas are among the most imperiled ecological systems in Colorado. Shortgrass prairie is a conservation priority in this project as it provides habitat for grassland bird species which, according to CNHP, may constitute one of the fastest declining vertebrate populations in North America.

The majority of this property is comprised of Western Great Plains Riparian Woodland, Shrubland and Herbaceous ecosystem. The mature cottonwoods and willows that sporadically line the two creeks provide nesting, perching and foraging cover for species including bald eagle, Bullock's oriole, northern flicker, western kingbird and western wood-pewee. This area also contains prairie dog colonies, providing prey for raptors and other predators, as well as potential nesting habitat for burrowing owls. Pronghorn frequent this area year-round, and the two creeks form major migration corridors for a healthy population of mule deer, as well as coyotes, raccoons and other mammals. This corridor is also an important fall and spring stopover for a wide range of migrating birds. Coal Creek only flows intermittently, leaving pools behind that are fed by underground seepage and rainfall. These emergent wetland pools provide habitat for northern leopard frogs and ornate box turtles, and breeding habitat for spadefoot and Woodhouse's toads, all indicators of good water quality. Native fish species including fathead minnows and black bullheads can also be found in the pools and in the streams when they are flowing. The acquisition and protection of this property will set aside nearly a mile and a half of this unique and diverse aquatic system.

Overall this property contains an incredible diversity of habitats, plants and animals due to the variety of ecosystem types and landforms converging here. Additionally, stunning views of the Front Range and the eastern plains greatly enhance the attractiveness of this property, which will attract countless visitors and residents to enjoy the Triple Creek Greenway Corridor and Trail. Please see map titled *TCGW_Phase3_Coal_Senac_Connection.*

Murphy Creek Property

Straddling the Murphy Creek streambed, this 77.5-acre property is just upstream from where Murphy Creek joins Coal Creek in the adjacent Confluence Open Space, which was protected as part of the previous phase of acquisitions in the Triple Creek Greenway Corridor. The northern boundary of the property also adjoins the Picadilly East acquisition and lies in the broad relatively flat floodplain separating Murphy and Coal Creeks. This expanse contains very sandy soils, with remnant cottonwood trees which at one time grew along channels, but have long been abandoned by the meandering waters of the creek. A prairie dog colony here provides forage for the nearby wintering bald eagles, and ferruginous hawks are frequently observed in this area. This is a heavily used migration corridor for mammals including mule deer, white-tailed deer, coyotes, raccoons, and bobcat, and provides a key connection between other protected properties to the north and west, and the proposed open space acquisitions surrounding Buckley Air Force Base to the south. Please see map titled *TCGW_Phase3_MurphyCreekProperty.*

b. Need, Urgency and Opportunity

This project builds on the success of the first phase of Triple Creek land acquisitions, providing additional opportunity to "start from scratch" and design the Triple Creek Greenway Corridor in a manner that includes large swaths of open space and trails to accommodate a wide range of users from pedestrians, to bicyclists, to equestrians while maintaining a healthy corridor for water and wildlife. While much of this area is within the flood plain, swift action must be taken to capitalize on existing opportunities that will vanish when the economy and the market for land sales and development improves. In the future, growth pressures will undoubtedly rebound and influence land use changes. Some strategically located properties are currently available and the owners have expressed interest in selling, resulting in a window of opportunity that will not last forever. Development on these parcels could have deleterious effects to the health of the riparian areas along the creeks and the wildlife that rely on this corridor for food and shelter. In addition, industrial, commercial, and residential uses on these parcels would prevent important trail connections and inhibit the long-term ability to achieve the full extent of the plan. In order to take advantage of the temporarily slow real estate market, partners must act quickly to implement the Triple Creek Greenway Corridor vision before these parcels are developed.

The land acquisition projects included in this application are urgent. Many of the landowners of the key properties are considering listing their land for sale when asked about their plans by The Trust for Public Land (TPL). TPL has negotiated an option agreement on the Murphy Creek property to allow the partners time to complete the fund raising for acquisition. This agreement will expire in the next 12-months should funding be unavailable to complete the acquisition, allowing the sellers to seek alternate buyers. The Coal-Senac Creek Connection is owned by developers who are waiting for the real estate market to recover and building to resume in southeastern Aurora before they submit development plans, so the window to acquire this land before it is developed is slowly closing. Aurora has secured matching funds from GOCO and NRDS to complete these acquisitions, but without the leverage of Arapahoe County funds, these acquisitions cannot be accomplished.

c. Significant Regional Public Benefit and Users

When the Triple Creek Greenway is eventually complete, it will create 14-miles of new trail and greenway in southeast Aurora, an area expected to add 166,000 new residents and businesses over the next 20 years. The existing Sand Creek Regional Greenway trail and the High Line Canal trail both end at Colfax Avenue, without a sufficient access point for citizens and visitors in this region to safely and efficiently enter the trails. The previous phase of the Triple Creek Greenway Corridor included acquisitions that provided pedestrian access to a number of existing parks, recreation facilities, and open space parcels in Arapahoe County, including the Aurora Sports Park, the Springhill Park and Golf Course, the Beck Recreation Center, Sand Creek Riparian Preserve, and the Coal Creek Rodeo Arena. The Phase 3 acquisitions will provide additional access to these facilities and focus on connecting the greenway and trail on the southeastern edge of the corridor to the 30,000 acres of public open space surrounding the Aurora Reservoir.

While there are several regional trails that provide open space and recreation opportunities north and west of this area, this section of Aurora and Arapahoe County is currently underserved. This project will buffer and expand the current open space and wildlife habitat along the corridor and make critical trail connections that provide access to several existing recreational amenities, while offering new recreation opportunities in advance of the expected growth.

The successful completion of the Triple Creek Greenway Corridor project will encourage healthy lifestyles and provide better opportunities for families to access trails, parks and natural areas close to home. Approximately 23,000 people currently live within one mile of the Triple Creek Greenway Corridor with an additional 17,000 homes projected within planned residential areas such as the Waterstone and Parklands Developments within coming years, located along Coal Creek, just east of E-470 and south of Alameda Avenue. Furthermore, over 7000 children and their families visit the Morrison Nature Center and Star K Ranch each year and their experiences have been greatly enhanced through acquisitions made under the Phase 2 project and the new trail linking the Sand Creek Trail to the High Line Canal Trail. This project will also provide significant regional benefits to the thousands of trail users who already frequent the Sand Creek Regional Greenway and the High Line Canal Trail while providing new trail heads and access points.

Several existing neighborhoods and planned communities will have trails that tie into the Triple Creek Greenway Corridor, providing access for walking, bicycling, and horseback riding, as well as off-street access to parks and recreation facilities. Additionally, the Arapahoe County Open Space Master Plan envisions a new 30-mile trail corridor along Quincy Avenue that will initially connect the Arapahoe County Fairgrounds to the Aurora Reservoir and eventually extend east to the 2800-acre Bijou Basin Open Space.

This project will also serve as an important model for the private sector – most notably the development community – to design and construct neighborhoods and commercial properties in concert with the overall greenway vision. Well-planned parks and inviting, safe public riparian open spaces that promote public access have a direct correlation to robust local economies. This project will bring maximum benefit to developers, merchants, and residents all along the corridor.

d. Not Readily Achievable Through Other Mechanisms

Land acquisition is the critical first step in implementing the Triple Creek Greenway Corridor project. The acquisitions included in this application have an estimated fair market value of $10 million, and some of the landowners are eager to sell, providing a window of opportunity that could close if Arapahoe County funding is unavailable for this project. Aurora was awarded approximately $4 million Natural Resource Damages funds from the Rocky Mountain Arsenal Settlement (also referred to as Northeast Greenways Corridor or NGC); however these funds may only be used on acquisition of lands for habitat replacement and restoration and must also be leveraged to maximize on-the-ground impacts. Great Outdoors Colorado has committed $2.05 million to implement the next phase of the Triple Creek Greenway Corridor plan, and these funds must be spent within two years. Buckley Air Force Base has also committed $1.1 million from the FY15 Department of Defense's Readiness and Environmental Protection Integration (REPI) program to help acquire the Murphy Creek property.

5) Partnerships

Aurora has partnered with The Trust for Public Land to implement the land acquisitions necessary to complete the greenway and trail. As mentioned above, GOCO awarded $2,050,000 to help complete the next stage of the implementation, to add 388.3-acres to the greenway and fill in critical gaps to conserve unique plant, animal and cultural resources. The Natural Resource Damage Trustees have also awarded $4 million in NRD funds resulting from the natural resource damages settlement related to the Rocky Mountain Arsenal and partners at Buckley Air Force Base have committed funds through REPI.

The Northeast Greenway Corridor Working Group, which includes the Sand Creek Regional Greenway Partnership, Aurora, Adams County, Brighton, Commerce City, Denver, and Thornton, is also undertaking complementary efforts designed to enhance the natural resources near the Rocky Mountain Arsenal National Wildlife Refuge through a connected system of stream and river corridors, riparian ecosystems, wildlife migration routes, and recreation trails in the northeast metro region. The connections and regional trailhead at the High Line Canal also complement the efforts of the High Line Canal Working Group.

6) Request and Budget Summary

Coal-Senac Creek Connection:

City of Aurora–	$335,000 (appropriated cash and in-kind)
Arapahoe County Open Spaces –	$1,750,000
Great Outdoors Colorado –	$1,730,000
Natural Resource Damage Funds –	$3,700,000
Private Grants –	$515,000
Trust for Public Land–	$20,000 (cash and in-kind)
Total Estimated Cost –	***$8,050,000***

Murphy Creek Property:

City of Aurora –	$3,000 (in-kind)
Arapahoe County Open Spaces –	$300,000
Great Outdoors Colorado –	$320,000
Natural Resource Damage Funds –	$300,000
Department of Defense-REPI –	*$1,100,000*
Trust for Public Land –	$27,000 (cash and in-kind)
Total Estimated Cost –	***$2,050,000***

Grand Total Estimated Cost - $10,100,000

7) Timeline

September 2015

Arapahoe County OSTAB – Presentation and initial funding request

September 2015

Arapahoe County BOCC – Presentation and formal request for funding

October 2015

Aurora City Council – Approval of IGA for Joint Project

October 2015

Arapahoe County BOCC – Final Approval and Execution of IGA

February 2016

Aurora City Council – Closing on Murphy Creek Property

January 2016-2017

Continue negotiations and due diligence tasks

Prior to June 2017

Closing for Coal-Senac Creek Connection

APPLICANTS:

City of Aurora, Parks, Recreation & Open Space Department

Open Space & Natural Resources Division

15151 E. Alameda Parkway, suite 4600

Aurora, CO 80012

Attn: Pat Schuler

303-326-8947

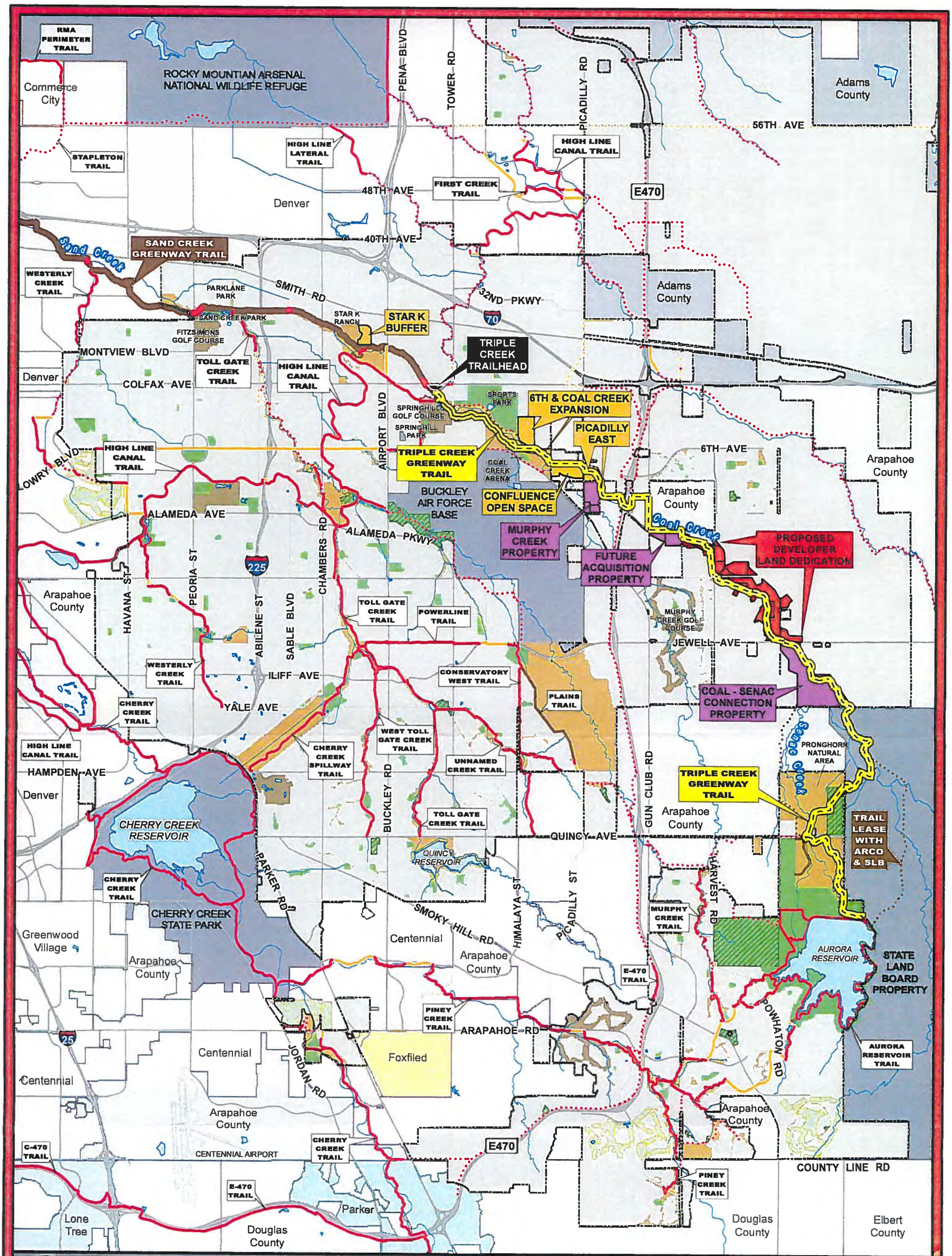
The Trust for Public Land

1410 Grant St., suite D210

Denver, CO 80202

Attn: Hillary Merritt

303-837-1414 x 302



TRIPLE CREEK GREENWAY PHASE 3 AREA MAP

Parks, Recreation & Open Space Department
August, 2015

PHASE 3 ACQUISITIONS
PROPOSED DEVELOPER LAND DEDICATION

COMPLETED ACQUISITIONS
WITH CONSERVATION EASEMENT
WITHOUT CONSERVATION EASEMENT

PREFERRED TRAIL ROUTE
EXISTING TRAIL
PROPOSED TRAIL

REGIONAL TRAILS
EXISTING HARD SURFACE REGIONAL TRAIL
PROPOSED HARD SURFACE REGIONAL TRAIL
EXISTING SOFT SURFACE REGIONAL TRAIL
PROPOSED SOFT SURFACE REGIONAL TRAIL
SIDEWALK CONNECTOR
PROPOSED SIDEWALK CONNECTOR

PARK
UNDEVELOPED PARK
OPEN SPACE
GOLF COURSE
PRIVATE GOLF COURSE
CITY OF AURORA
GOVERNMENT LAND

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Survey of Biological Resources in the Triple Creek Greenway City of Aurora

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Cover photograph: An emergent wetland in the channel of Coal Creek within parcel c52 (*photo by John Sovell*)

Executive Summary

The proposed Triple Creek Greenway is located mainly within Arapahoe County, with the northern portion extending into Adams County. The Triple Creek Greenway will add 14 miles of interconnected open space and trails between the existing Sand Creek Regional Greenway and the public land surrounding the Aurora Reservoir. The project will offer pedestrians, bicyclists, and equestrians 27 miles of uninterrupted travel from the reservoir to the South Platte River. Through funding partnerships, the project has become a collaborative effort of many entities, including the City of Aurora, Great Outdoors Colorado, Arapahoe County Open Space, Adams County Open Space, Trust for Public Land, Sand Creek Regional Greenway Partnership and the Rocky Mountain Arsenal Natural Resource Damage Fund.

In August 2011 The City of Aurora contracted with Colorado State University, through its Colorado Natural Heritage Program (CNHP), to survey for critical biological resources in the vicinity of the proposed greenway. The results will provide an additional data resource for the City of Aurora in developing conservation priorities and management goals for the planned extension of the regionally-important open space corridor.

During 2012 and 2013, CNHP surveyed 66 parcels totaling almost 3,400 acres. The vegetation ranged from mature cottonwood galleries to abandoned homesteads and active agricultural lands. Two occurrences of the northern leopard frog (*Lithobates pipiens*) were documented along Coal and Senac creeks. A Ferruginous Hawk (*Buteo regalis*) was documented in the northeastern portion of the Survey Area and a pair of nesting Bald Eagles is present near the survey areas south boundary. Numerous black-tailed prairie dog (*Cynomys ludovicianus*) towns were delineated throughout the survey area. There were no significant plant communities or tracked plant or other animal species documented.

The ecological systems within the proposed greenway corridor include: Western Great Plains Shortgrass Prairie and Western Great Plains Riparian Woodland, Shrubland and Herbaceous. The riparian areas are located along Sand, Coal and Senac creeks. The riparian woodland and shrublands are degraded by several noxious non-native species e.g., leafy spurge (*Euphorbia esula*), Scotch thistle (*Onopordum acanthium*), and cheatgrass (*Bromus tectorum*). These invasive plants dominate the herbaceous understory and have successfully out-competed native forbs and grasses. The overstory of the three creeks is a mix of mature cottonwoods, peachleaf willow (*Salix amygdaloides*), crack willow (*Salix fragilis*) and Russian olive (*Elaeagnus angustifolia*) which grow within the wide floodplains of the major drainages. Although the creeks have an abundance of invasive plants, there is sparse regeneration of native cottonwood and willow within the woody understory of all three creeks.

The survey did not result in discoveries that warrant the designation of Potential Conservation Areas (PCAs) or Sites of Local Significance (SLS). Nonetheless, there are a number of rare biological resources that have been identified coupled with habitats and ecological integrity that are worthy of conservation as part of the Triple Creek Greenway. Engaging in management practices that protect and prolong the continued existence of these valuable resources is paramount to sustaining biodiversity for the greenway corridor.

ACKNOWLEDGEMENTS

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Thank you to CNHP staff who contributed to this project, including Amy Lavender, Jeremy Siemers, and Katie Hestko for their assistance with data management and field work.

The City of Aurora Parks, Recreation & Open Space Department contracted with CNHP and oversaw management of the project. Funding assistance was provided by the Arapahoe County Open Space Program.

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Background

Location

The proposed Triple Creek Corridor extends from the existing Sand Creek Regional Greenway, at East Colfax Avenue, to beyond the Star K Ranch to connect with the Aurora Reservoir and Arapahoe County Fairgrounds and Regional Park. The name "Triple Creek" is derived from the three creeks within the proposed corridor, Sand, Coal, and Senac creeks (Figure 1).

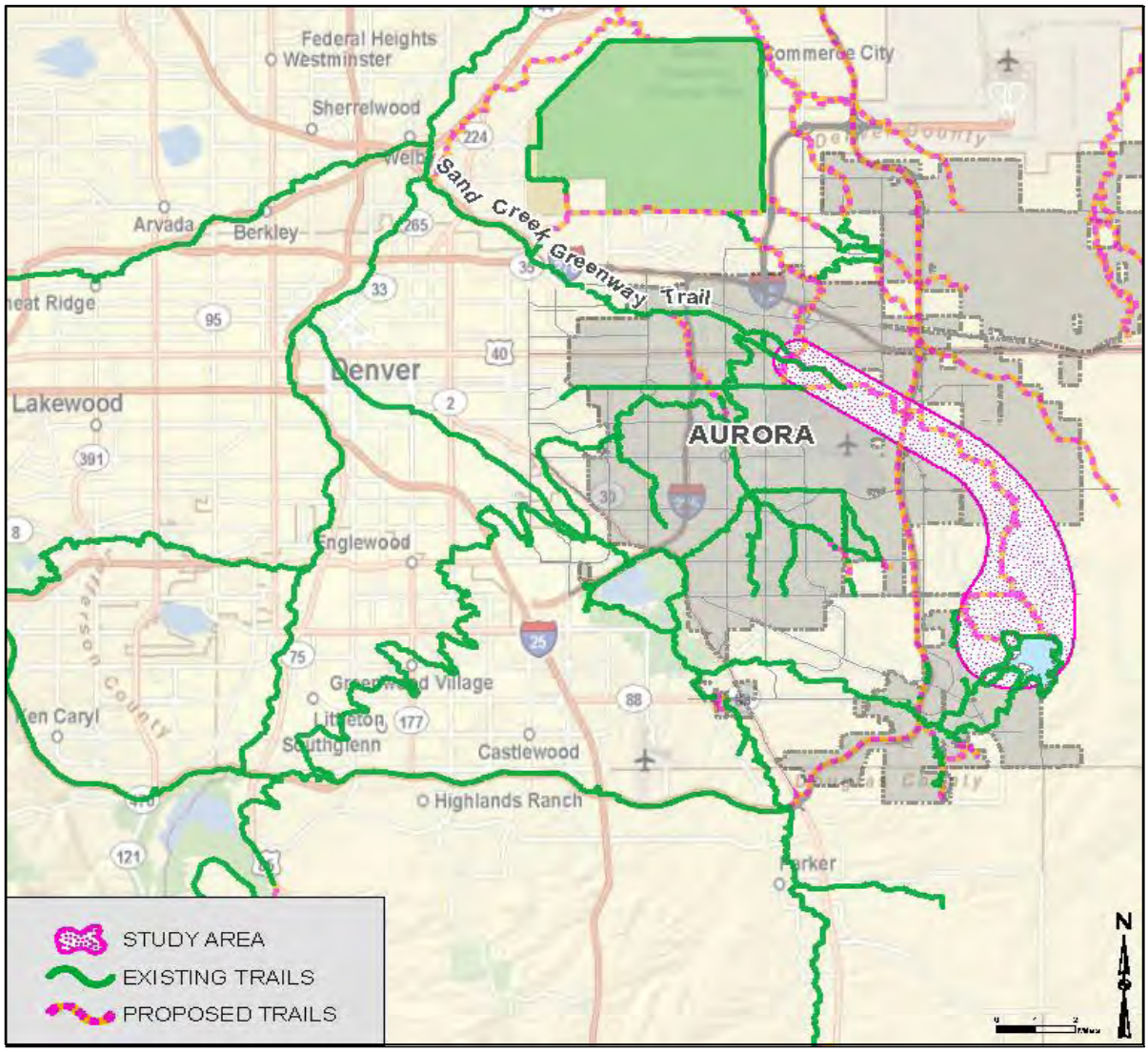

Figure 1. Conceptual boundary of the Triple Creek Greenway corridor with existing and proposed trails.

The proposed extension will connect existing trails, thus providing benefits to thousands of residents who currently utilize the Sand Creek Regional Greenway and the High Line Canal Trail. Contiguous habitats, especially wetland and riparian areas, provide habitat and food sources for wildlife, birds, and plants, as well as for people. Additionally, the survey area will provide citizens with a sense of the pre-urbanized character of the area. Pro-active and informed land planning decisions are necessary to preserve the natural resources and rural character that provide both economic assets and environmental qualities. The Colorado Natural Heritage Program (CNHP) approached this project with the intent of addressing this

need. CNHP is a research unit within the Warner College of Natural Resources at Colorado State University. CNHP is comprised of a multi-disciplinary team of scientists, information managers, and conservation planners that gathers and analyzes comprehensive information on rare, threatened, and endangered species and significant plant communities of Colorado. CNHP is the state's primary, comprehensive, biological diversity data center, gathering information and field observations to help develop statewide conservation priorities. CNHP is a member of NatureServe, an international network of conservation data centers that use the Biological and Conservation Data System developed by The Nature Conservancy. There are 85 conservation data centers, including one in each of the 50 United States. Information collected by the Heritage Programs throughout the globe provides a means to protect species before the need for legal endangerment status arises. Methods used to conduct this project were those employed worldwide throughout Natural Heritage Programs and Conservation Data Centers. CNHP's primary focus was to identify the locations of the plant and animal populations and plant communities on CNHP's list of rare and imperiled elements of biodiversity, assess their conservation value, and systematically prioritize these for conservation action.

The locations of biologically significant areas were identified by:

- Examining existing biological data for rare or imperiled plant and animal species and significant plant communities (collectively called elements);
- Accumulating additional existing information (e.g., interviews of local experts); and
- Conducting extensive field surveys.

Survey Area

The Triple Creek Greenway proposed site is located within northeastern Arapahoe County and southeastern Adams County (Figure 2). The Survey Area encompasses approximately 5,000 acres.

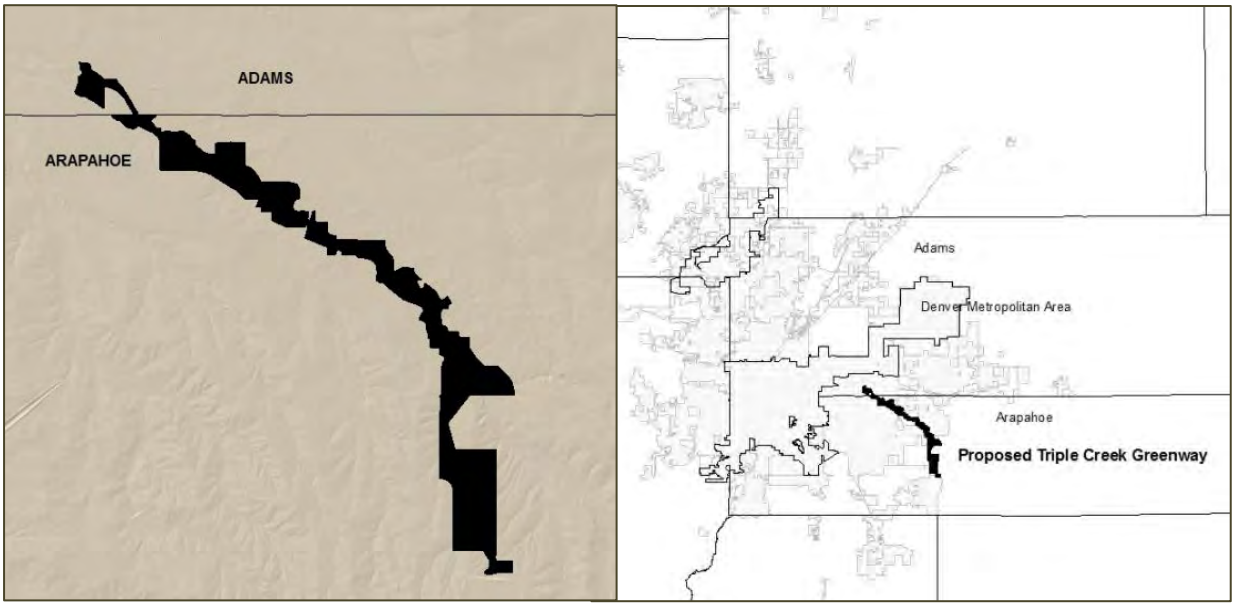

Figure 2. Location of Survey Area in Arapahoe and Adams Counties.

Land Ownership

Of the approximately 3,800 acre project area, 1,430 acres, or 38%, is owned by the City and maintained as either parks, open space, or a golf course. A total of 245 acres, or 6%, is additional City property. The remaining 2,145 acres, or 56%, is privately owned.

Buckley Air Force Base is located on the western boundary and the Lowry Range forms the southeastern boundary (Figure 3). Numerous subdivisions are located east and west of the Survey Area.

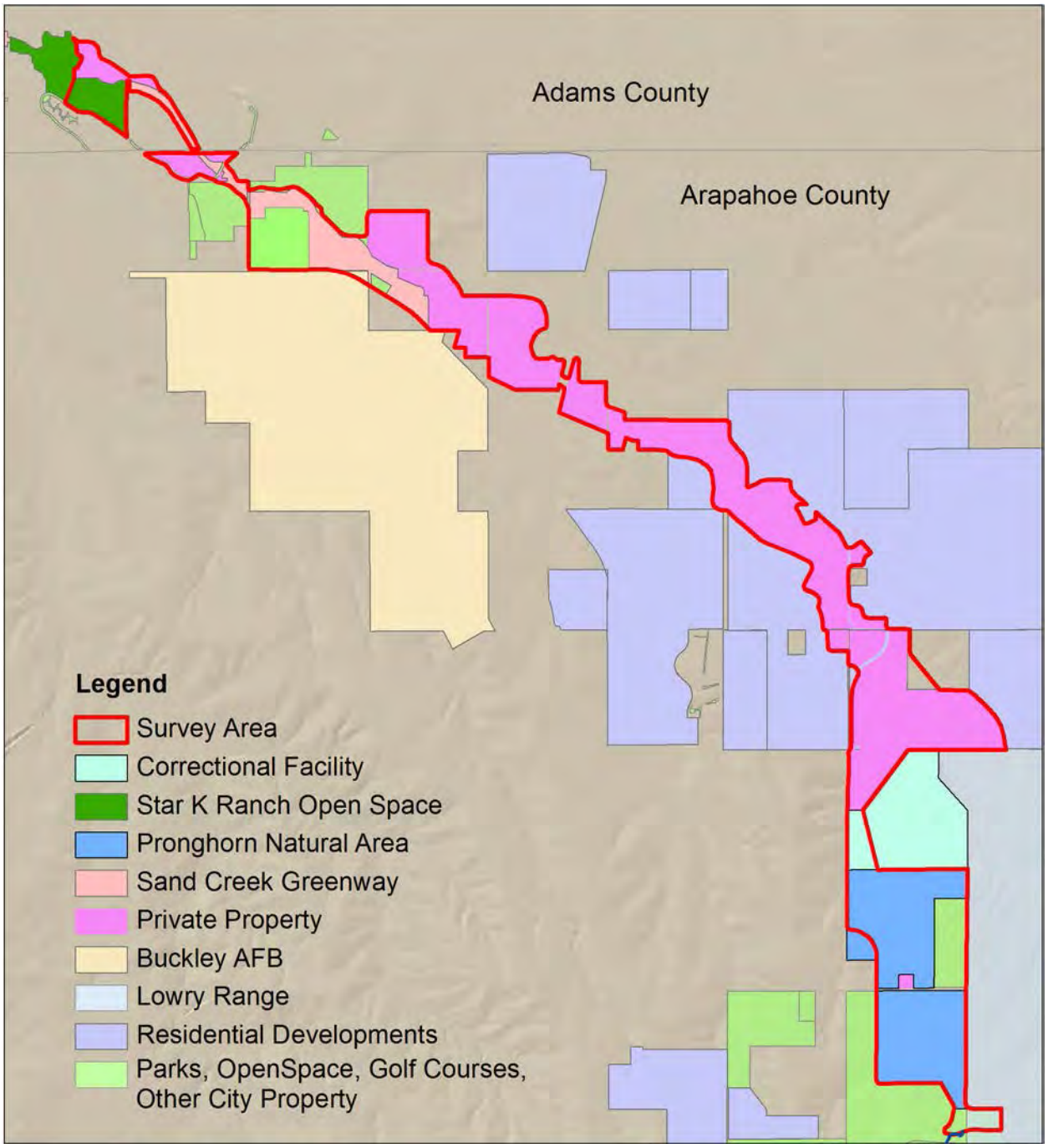

Figure 3. Land Ownership within and surrounding Triple Creek Greenway.

Hydrology

Senac Creek flows north into Coal Creek, which flows south to north from the Lowry Range located on the southeast edge of the project area. Coal Creek and Murphy Creek join to form Sand Creek, which continues to bisect the survey area, flowing in a north westerly direction (Figure 4). The entire survey area lies within the South Platte River watershed. Sand Creek is a direct tributary of the South Platte River.

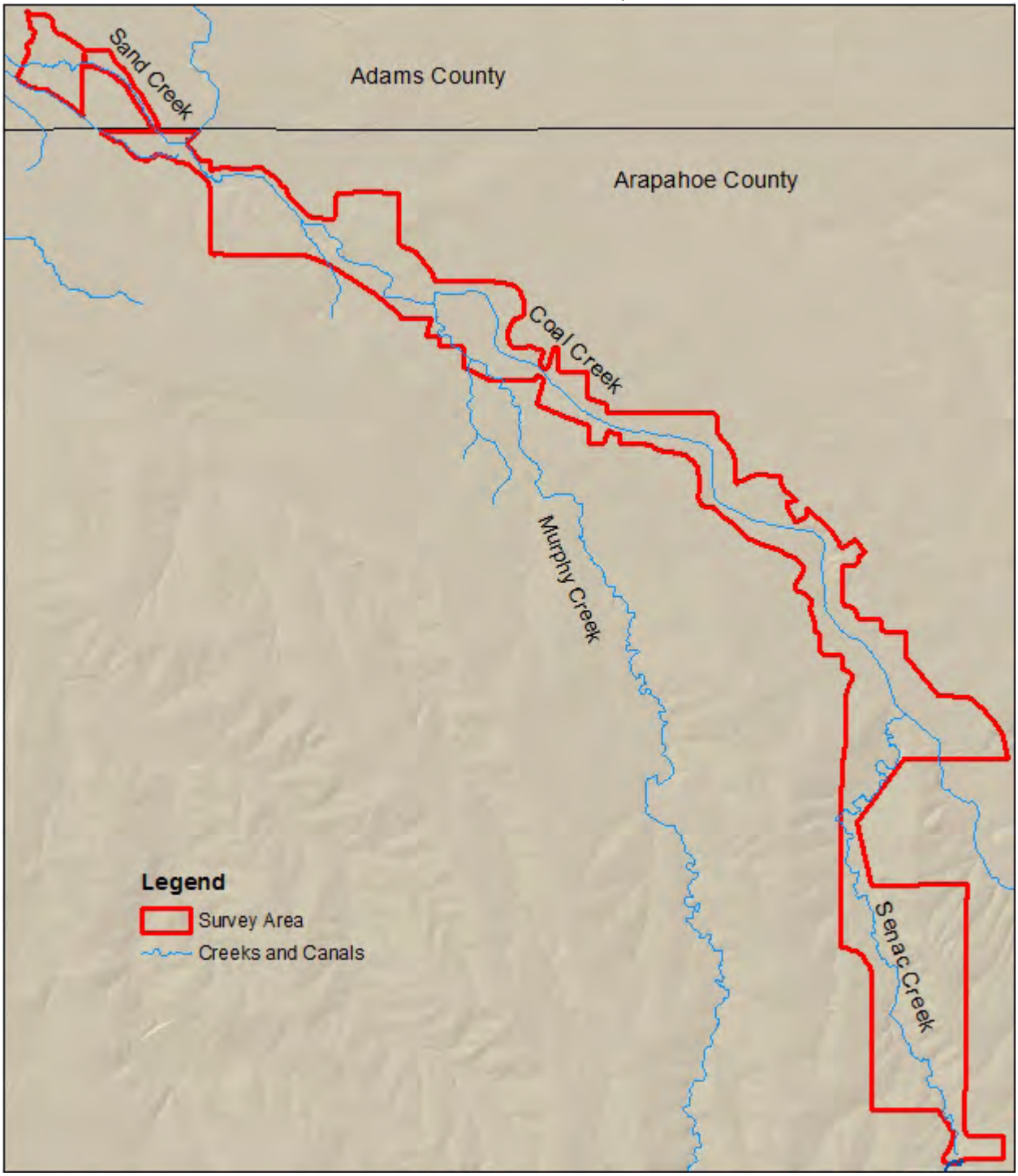

Figure 4. Rivers and Reservoirs within Survey Area.

Geology

The geology of the survey area is defined by the Denver Basin, a huge depression that underlies most of northeastern Colorado, including Denver (Foutz 1994). Geologically the basin is defined by alluvium washed down from the mountains with eolian sand and silt deposited by winds, which overlie sedimentary sandstones, shales, mudstones, and claystones deposited by an ancient sea (Figure 5) (Chronic and Williams 2012).

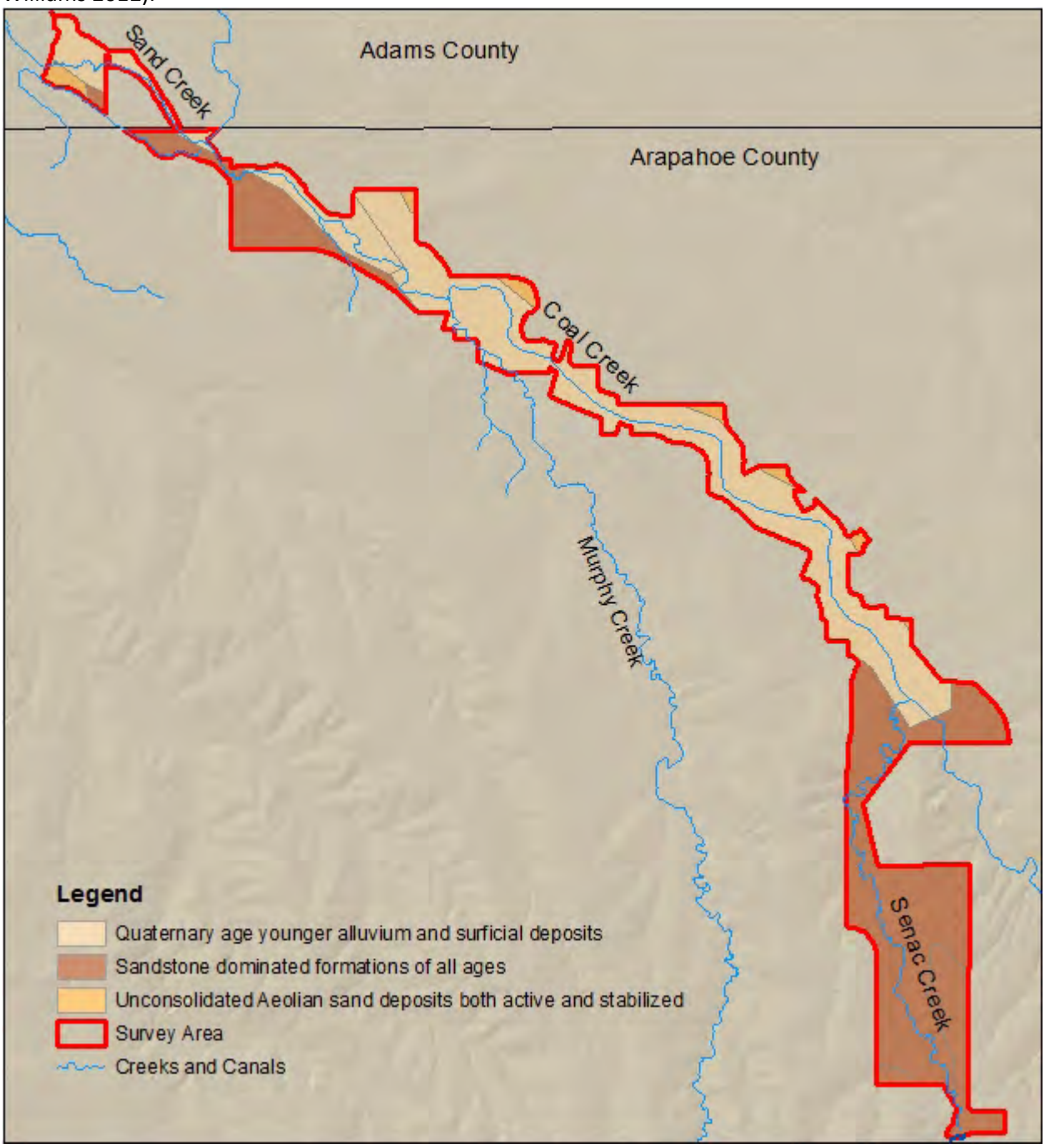

Figure 5. The Geology of the Study Area.

Soils

Soils within the survey area were formed from weathered sedimentary substrates, including hard shale and sandstones, alluvial sediments, and loose material deposited by wind. Soils are characterized as sandy loam, silt loam, clay, loam, loamy alluvial, and sandy alluvial deposits (U.S.D.A. Soil Conservation Service 1971).

Ecological Systems

Ecological systems are dynamic assemblages or complexes of plant and/or animal communities that 1) occur together on the landscape; 2) are tied together by similar ecological processes, underlying abiotic environmental factors or gradients; and 3) form a readily identifiable unit on the ground (CNHP 2013). Terrestrial ecological systems occur on the landscape at intermediate geographic scales of 10s to 1,000s of hectares and persist for 50 or more years. Systems are shaped by ecological processes thatinclude natural disturbances such as fire, erosion, and flooding. The pattern and distribution of systems may be dependent on a variety of soil surface and bedrock features, or other environmental gradients including local climate and precipitation, area hydrology, and elevation.

Figure 5. Geology within Survey Area.

The ecological system is a practical working unit for both land managers and conservation professionals. Viability specifications are useful tools for ranking occurrences of ecological systems and their constituent plant associations. Each system has specifications for ranking its quality based on size, condition, and landscape context. The ranking process facilitates the identification of the best examples of each system. The ecological system descriptions and specifications presented here are applicable to ecological occurrences throughout the Central Shortgrass Prairie ecoregion, and were used in developing conservation targets for the ecoregion as well as in the evaluation of potential conservation areas.

The use of ecological systems in ecoregional planning is intended to identify major native prairie types that, if conserved and managed at appropriate scales, would protect the majority of the plants, animals, and natural communities associated with them. A key assumption of this approach is that most native prairie species can be maintained in viable numbers in native prairie landscapes. Those exceptional species that either tolerate or specialize in habitats affected by conversion of native prairie to tilled agriculture may need to be dealt with on an individual basis.

There are two ecological systems (excluding residential and cultivated lands) within the Survey Area; Western Great Plains Riparian Woodland, Shrubland and Herbaceous and Western Great Plains Shortgrass Prairie (Table 1, Figure 6) (CNHP 2013).

Table 1. Ecological Systems within Triple Creek Greenway Survey Area

Ecological System	Acres
High Intensity Residential	2,157
Herbaceous Planted/Cultivated	954
Western Great Plains Riparian Woodland, Shrubland and Herbaceous	484
Western Great Plains Shortgrass Prairie	205
Total	3,800

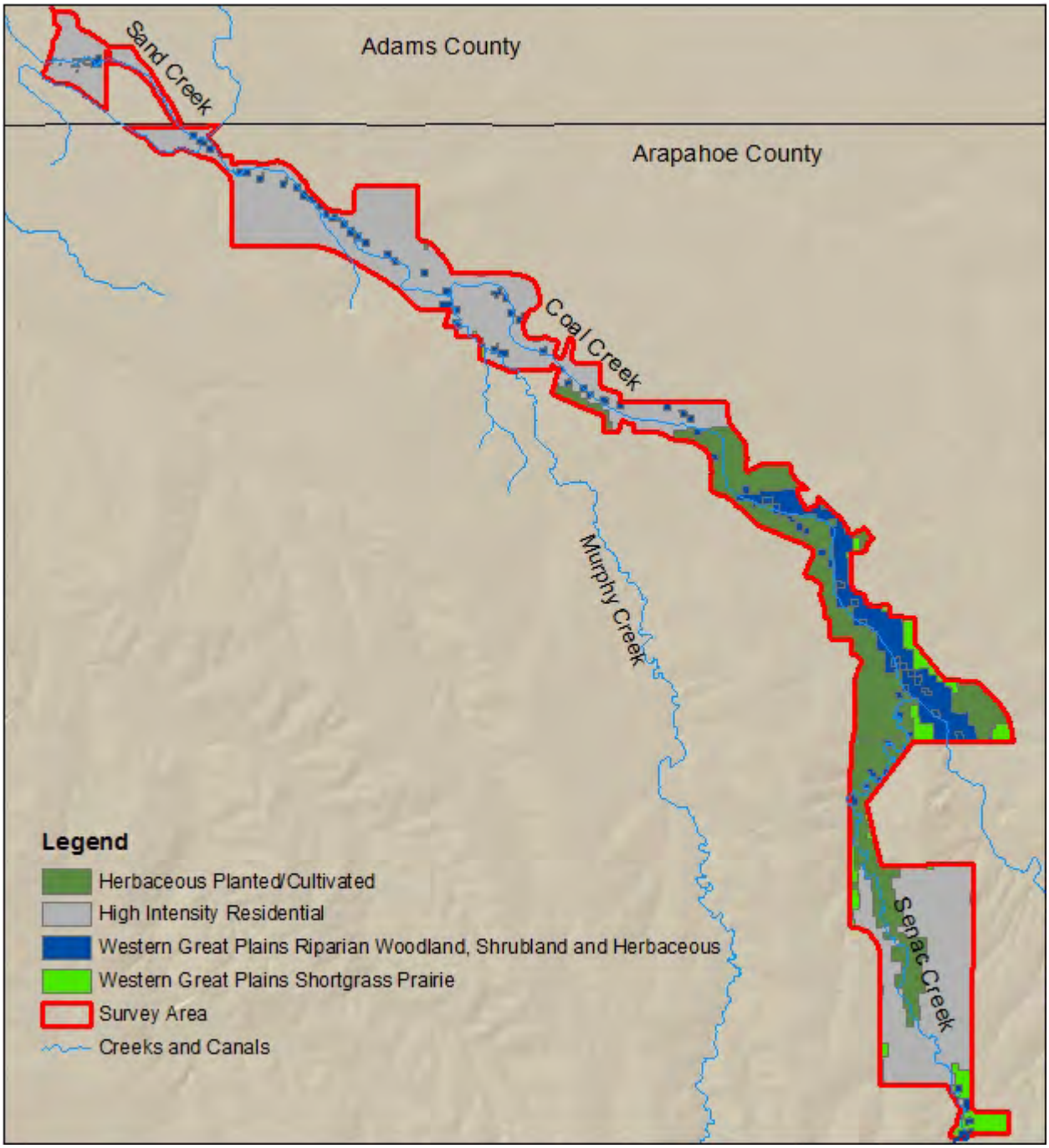

Figure 6. Ecological Systems within Survey Area.

Western Great Plains Shortgrass Prairie

This system is found primarily in the western half of the Western Great Plains Division east of the Rocky Mountains. It ranges from the Nebraska Panhandle south into Texas and New Mexico, although some examples may reach as far north as southern Canada where it grades into Northwestern Great Plains Mixedgrass Prairie.

In much of its range, this system forms the matrix system with grama grasses (*Bouteloua* spp.) dominating

this system. Other associated graminoids may include buffalo grasses (*Buchloe dactyloides*), needle and thread grass (*Hesperostipa comata*), June grass (*Koeleria macrantha*), Western wheatgrass (*Pascopyrum smithii*), three-awn grass (*Aristida purpurea*) and sand dropseed (*Sporobolus cryptandrus*). Although tallgrass and mixedgrass species may be present especially on more mesic soils, they are secondary in importance to the sod-forming short grasses. Shrub species such as fringed sage (*Artemisia frigida*) and rabbitbrush (*Chrysothamnus* spp.) that dominate the Western Great Plains shrubland systems may also be present.

This system, in combination with the associated wetland systems, represents one of the richest areas in the United States for large mammals. Grassland bird species may constitute one of the fastest declining vertebrate populations in North America. A healthy shortgrass prairie system should support viable populations of pronghorn, endemic grassland birds, prairie dog complexes, and other Great Plains mammals. Historically, such areas would also have been populated by bison in sufficient numbers to support populations of wolves.

Western Great Plains Riparian Woodland, Shrubland and Herbaceous

This system is found in the riparian areas of medium and small rivers and streams throughout the Western Great Plains. It is likely most common in the Central Shortgrass Prairie and Northern Great Plains Steppe, but extends west into the Wyoming Basins. Dominant vegetation overlaps broadly with portions of large river floodplain systems, but the overall abundance of vegetation is generally lower. Vegetation may be a mosaic of communities that are not always tree or shrub dominated. Communities within this system range from riparian forests and shrublands to tallgrass wet meadows and gravel/sand flats.

Dominant species include; plains cottonwood (*Populus deltoides*), willows (*Salix* spp.), western wheatgrass (*Pascopyrum smithii*), sand dropseed (*Sporobolus cryptandrus*), little bluestem (*Schizachyrium scoparium*), big bluestem (*Andropogon gerardii*), and Johnsongrass (*Sorghastrum nutans*). Plant associations of the North American Arid West Emergent Marsh ecological system may occur along or adjacent to portions of this system.

Native amphibians and reptiles (e.g., leopard frogs, spadefoot toads, ornate box turtles), and native prairie fishes are indicators of a healthy riparian shrubland and woodland system.

This system is composed of associations found on alluvial soils in highly variable landscape settings, from deep cut ravines to wide, braided streambeds. Hydrologically, the associated rivers tend to be more flashy with less developed floodplain than on larger rivers, and typically dry down completely for some portion of the year.

These areas are often subjected to heavy grazing and/or agriculture and can be heavily degraded. *Tamarix* spp. and less desirable grasses and forbs can invade degraded examples up through central Colorado. Furthermore, groundwater depletion and lack of fire have created additional species changes.

METHODS

The methods for assessing and prioritizing conservation needs over a large area, such as a county, are necessarily diverse. CNHP follows a general method that is continuously being developed specifically for this purpose. This *Survey of Biological Resources in the Triple Creek Greenway* was conducted in several steps summarized below. Additionally, input from the City of Aurora and its stakeholders were sought at all stages.

Collect Existing Information

A variety of sources were searched for existing information. For biological resources, data sources included CNHP's conservation database (Biotics), Colorado Division of Wildlife, published/unpublished literature, and others.

Identify rare or imperiled species and significant plant associations with potential to occur in Survey Area

The information collected in the previous step was used to refine a list of potential species (both plants and animals) and natural plant communities and to refine our search areas. In general, species and plant communities tracked by CNHP and that have been recorded from the survey site or from adjacent counties are included in this list.

Identify Targeted Inventory Areas

CNHP used existing databases, experts, and GIS layers (e.g., digital photo orthoquads, geology, landcover, soils, etc.) to develop the target species list and to identify areas to inventory ("targeted inventory areas"). Once the species list and targeted inventory area map were developed, an inventory time table was generated based on the species' natural history (e.g., breeding season).

Given the unique nature of this project, rather than identifying specific sub-areas as targeted inventory areas (TIAs), each individual parcel within the survey area was considered as one TIA. Seven parcels were eliminated from field survey per the City's request. Roadside surveys were useful in further resolving the natural condition of these areas. Because the condition of shrublands is especially difficult to discern from aerial photographs, a quick survey from the roads revealed such aspects as weed infestation and vegetation composition.

Contact Landowners

Obtaining permission to conduct surveys on private property was essential to this project. Land ownership of the parcels within the survey area was determined using GIS land ownership coverage obtained from the City. Landowners were then either contacted by phone or in person. If landowners could not be contacted, or if permission to access the property was denied, this was recorded and the site was not visited. **Under no circumstances were private properties surveyed without landowner permission.**

Conduct Field Surveys and Gather Data

TIAs where access could be obtained were visited at the appropriate time as dictated by the seasonal occurrence (or phenology) of the individual elements. It was essential to conduct the surveys during times when the targeted elements would be detectable. For instance, plants are often not identifiable without flowers or fruit that are only present during certain times of the year or breeding birds cannot be surveyed outside of the breeding season, because they are most visible in breeding plumage and are easier to spot when singing to attract mates. Amphibians are best surveyed in spring when adults are calling and mating,

in mid-summer when tadpoles are out and adults are still active and in late summer when metamorphs are present. The methods used in the surveys varied according to the elements that were being targeted. In most cases, the appropriate habitats were visually searched in a systematic fashion that would attempt to cover the area as thoroughly as possible in the given time. Where necessary and permitted, voucher specimens were collected and deposited in local university museums and herbaria.

When a rare species or significant plant community was discovered, its precise location and known extent were recorded with a global positioning system (GPS) unit. Other data recorded at each occurrence included numbers observed, breeding status, habitat description, disturbance features, observable threats, and potential protection and management needs. The overall significance of each occurrence, relative to others of the same element, was estimated by rating the size of the population or community, the condition or naturalness of the habitat, and the landscape context (its connectivity and its ease or difficulty of protecting) of the occurrence. These factors are combined into an element occurrence rank, useful in refining conservation priorities. See Appendix I, Natural Heritage Program Methodology, for more about element occurrence ranking.

Site visits and assessments were conducted on the following two levels:
1) Roadside or adjacent land assessments. Many of the sites could be viewed at a distance from a public road or from adjacent public land. While on the ground the field scientist was able to see, even from a distance, many features not apparent on maps and aerial photos. These assessments determined the extent of human and livestock impacts on the Study Area, which included ditching, adventive plant species, plant species indicative of intensive livestock use, stream bank destabilization, major hydrologic alterations, excessive cover of non-native plant species, or new construction. Sites with one or more of these characteristics were generally excluded as potential conservation areas and no extensive data were gathered at these areas. If roadside assessments of private lands yielded the potential presence of an element occurrence, landowner contact was initiated, and if permission was given, an on-site assessment was performed.

2) On-site assessments. On-site assessment was the preferred method, as it is the only assessment technique that can yield high-confidence statements concerning the known or potential presence of rare and imperiled elements or excellent examples of common associations. On-site assessments are also the most resource intensive because of the effort required to contact landowners. In several cases where on-site assessments were desired, they could not be conducted because either field personnel were denied access to the property by the landowner, or CNHP was unable to gain a response from the landowner during the time frame of the survey effort.

The methods used in the animal surveys varied according to the animal that was being targeted. In most cases, the appropriate habitats were visually searched in a systematic fashion, attempting to cover the area as thoroughly as possible in the given time. Some types of organisms require special techniques to document their presence. For animals, these techniques are summarized below followed by specific reference sources for animals:

- Amphibians: visual observation, vocal surveys and capture using aquatic dip nets (Hammerson 1999)
- Birds: visual observation or identification by song or call (Kingery 1998, Andrews and Righter 1992, National Geographic Society 2006)
- Invertebrates: sweep netting (Opler et al. 2009, Scott 1986)
- Mammals: visual observation, pit fall trapping, Sherman live trapping and mist-netting for bats (Fitzgerald et al. 1994)

The techniques used for plants and plant communities are summarized below also followed by specific reference sources:

- Lists of all plant associations in the Study Area, including the percent cover by that community. In almost all cases, plant associations were immediately placed within both the International National Vegetation Classification (Anderson et al. 1998; Comer et al. 2003) and the Comprehensive Statewide Wetlands Classification (Carsey et al. 2003). Plant synonym followed Kartesz (1999).
- Vegetation data using Weber and Wittman (2012) and Culver and Lemly (2013) for each major plant association in the wetland were collected using visual ocular estimates of species cover in a representative portion of the plant association, including non-native species.
- UTM coordinates and elevation from Garmin GPSmap 76CSx.
- Current and historic land use (e.g., grazing, logging, recreational use) when apparent.
- Notes on geology and geomorphology.
- Reference photos of the site.
- Indicators of disturbance such as logging, grazing, flooding, etc.

RESULTS

Prior to the 2012 summer field season, 97 Targeted Inventory Areas (TIAs) were identified from the parcels of interest in Adams and Arapahoe Counties. Seven parcels (268 acres) were not ground surveyed, but were road surveyed per the request of the City of Aurora. Thirty-one parcels (384 acres) were not field surveyed due to either obvious anthropogenic disturbances (e.g. landfill, airstrip, pasture, farm field) or because the landowners denied access or did not respond to requests for access. The remaining 59 parcels (3,098 acres) were field surveyed (Table 2, Figure 7).

A total of 115 plants and animals were recorded from the Triple Creek survey area including 44 vascular plants, and 71 animals. The animals included three amphibians, 41 birds, 15 invertebrates, 11 mammals, and one reptile. For a complete list of plants and animals see Appendix II.

Two new element occurrences of the northern leopard frog (*Lithobates pipiens*), two new occurrences of black-tailed prairie dog (*Cynomys ludovicianus*), an update of a known bald eagle (*Haliaeetus leucocephalus*) breeding occurrence, and one new occurrence of ferruginous hawk (*Buteo regalis*) were documented. (Table 3). A description of these critical animal resources and of the three creeks of the survey area starts below, followed by a discussion of the recorded invasive plant species.

Table 2. Targeted Inventory Area Results.

PARCEL STATUS	Number of Parcels	Acres	Percent
City Requested Do Not Contact	7	268	7
Not Ground Surveyed	31	384	10
Ground Surveyed	59	3098	83
TOTALS	97	3750	100

Table 3. Significant Species Documented from Survey Area.

Scientific Name	Common Name	Global Rank	State Rank	US ESA	Federal Sensitive	State Sensitive
Amphibians						
Lithobates pipiens	Northern Leopard Frog	G5	S3			
Birds						
Haliaeetus leucocephalus	Bald Eagle	G5	S1B, S3N		BLM/FS	ST
Buteo regalis	Ferruginous Hawk	G4	S3B, S4N		BLM/FS	SC
Mammals						
Cynomys ludovicianus	Black-tailed Prairie Dog	G4	S3		BLM/FS	SC

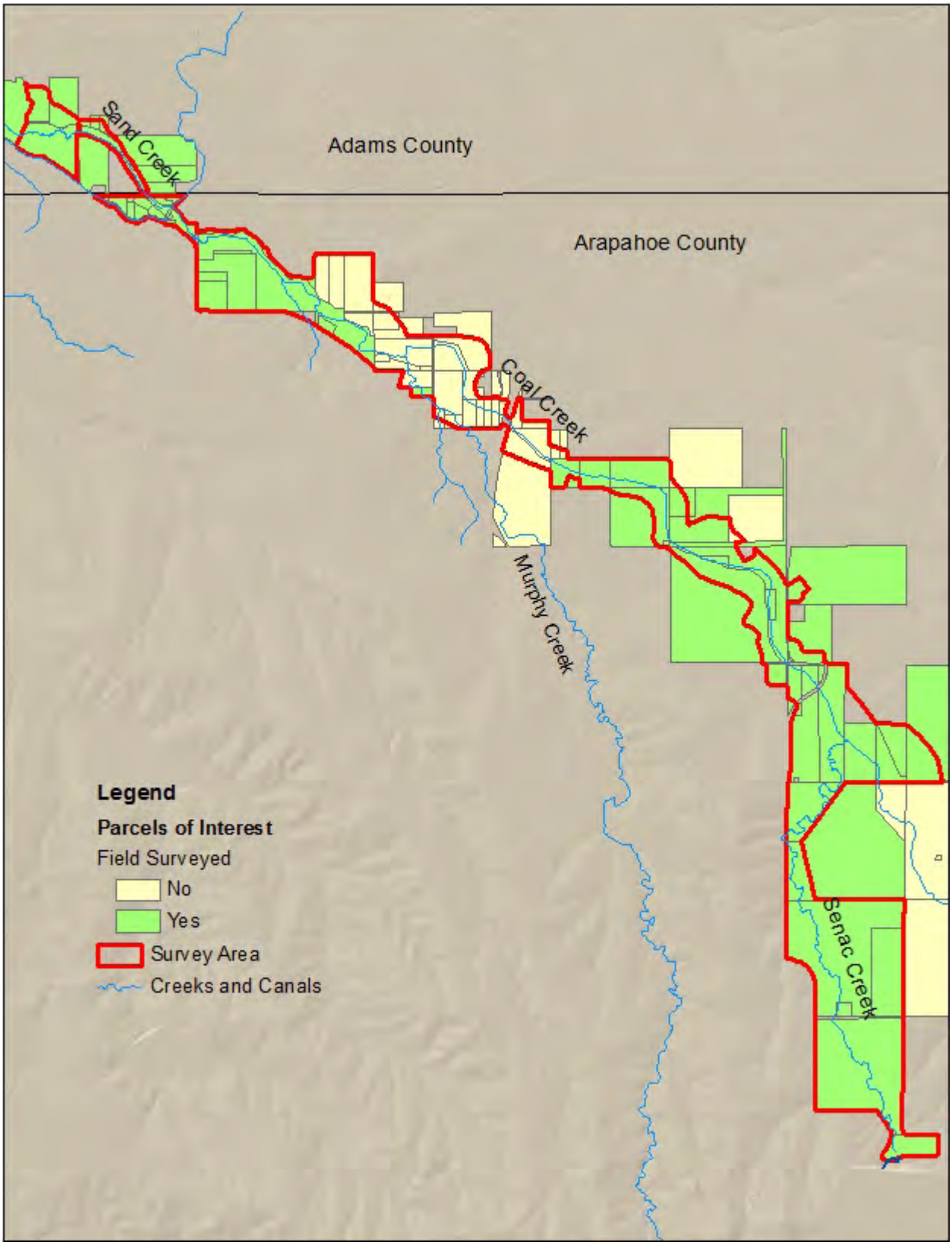

Figure 7. Survey status of the 97 parcels identified as Targeted Inventory Areas.

Amphibians

Northern Leopard Frog

The northern leopard frog was recorded from Senac and Coal creeks, in pools of the creek channel fed by rainwater runoff, and in wetlands associated with the drainages, but fed by groundwater seepage (Figure 8). The northern leopard frog occurs throughout Colorado from the plains to the mountains up to 12,000 feet (3,700 m). Northern leopard frogs are currently ranked by NatureServe as secure globally (G5) and vulnerable in Colorado (S3). However, populations of northern leopard frog are declining across their range. The exact cause of the decline is unknown and needs further investigation (Hammerson 1999), but threats include habitat loss, commercial overexploitation, and, in some areas, probably competition or predation by introduced species. Part of the statewide decline in Colorado may be due to predation by the increasingly abundant bullfrog (*Lithobates catesbiana*), which is native to the eastern U. S., but introduced in Colorado. Bullfrogs were observed further downstream on Sand Creek during this survey. Steps should be taken to prevent establishment of bullfrogs at the northern leopard frog sites and bullfrogs should be eradicated if they do become established. In summer, northern leopard frogs commonly occupy wet meadows and fields, and natural and irrigation-created wetlands.

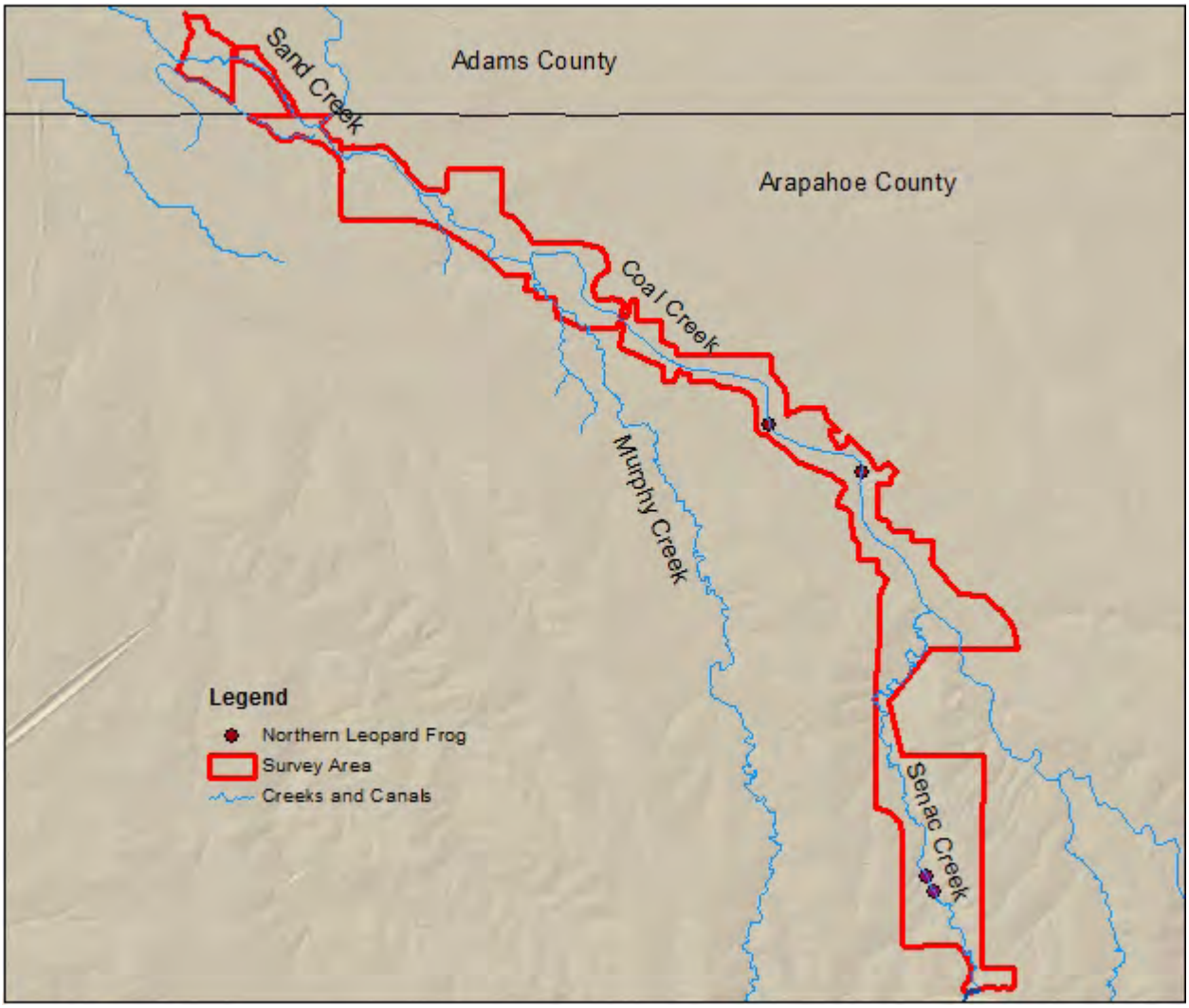

Figure 8. Location of Northern Leopard Frogs

Northern leopard frog. Photo by John Sovell.

Northern leopard frog. Photo by John Sovell.

Birds

Bald Eagle

A known occurrence of a bald eagle (*Haliaeetus leucocephalus*) nest was revisited and the pair was observed successfully breeding at the nest site with two chicks in the nest. Breeding habitat for bald eagles consists of forested areas near large bodies of water (Andrew and Mosher 1982, Usgaard and Higgins 1995); in this case Aurora Reservoir. Nests typically are placed in tops of tall trees located near suitable foraging habitat (Anthony and Isaacs 1989). Bald eagles are currently ranked by NatureServe as secure globally (G5) and breeding populations are rare in Colorado (S1B). Factors affecting the quality of foraging habitats include the characteristics of the prey base (Livingston et al. 1990), the structure of the aquatic habitat (MacDonald and Austin-Smith 1989), and the extent of human development and disturbance (McGarigal et al. 1991). This nest location is fairly isolated, but care must be taken in developing any recreational trails as activity during the breeding season within 400 meters will disturb the nesting pair, potentially causing them to abandon the nest site. Bald eagles breed in suitable habitats throughout much of North America, including Alaska, Canada, and all 48 contiguous states in the U.S. except for Vermont and Rhode Island, and parts of Mexico (Buehler 2000). No records exist of bald eagles breeding outside of North America (Buehler 2000). Many of the bald eagles breeding in Colorado, including this nesting pair, migrate seasonally as necessary when food becomes unavailable (Harmata and Stahlecker 1993). Bald eagles are opportunistic foragers and their diet varies greatly, depending upon the location and the availability of various types of prey (Todd et al. 1982). In most regions bald eagles forage in aquatic habitats and prefer fishes (Stalmaster and Kaiser 1998). Major threats to the bald eagle include the loss of critical habitat components such as nest trees (Weekes 1974), perch sites, and winter roosts (Hansen et al. 1981) to natural or man-induced causes. Human activities and disturbance can affect populations of bald eagles and other birds in many important ways. Human disturbance can alter foraging patterns, distribution, and breeding habitat use (Brown and Stevens 1997); reduce reproductive success and foraging efficiency (White and Thurow 1985, Stalmaster and Kaiser 1998); and increase energy expenditures and stress (Knight and Knight 1983, Fernandez and Azkona 1993). To protect this breeding site a map of the location is not being included in this report.

Colorado Parks and Wildlife has also identified Bald Eagle winter range along approximately 3 miles of Sand Creek within the proposed greenway corridor (Figure 9). The eagle winter range is associated with black-tailed prairie dog colonies present within, and adjacent to, the proposed greenway corridor. Prairie dogs supply important winter forage from November through February for the eagles. Care must be taken to avoid human disturbance from November through February, when eagles inhabit the site.

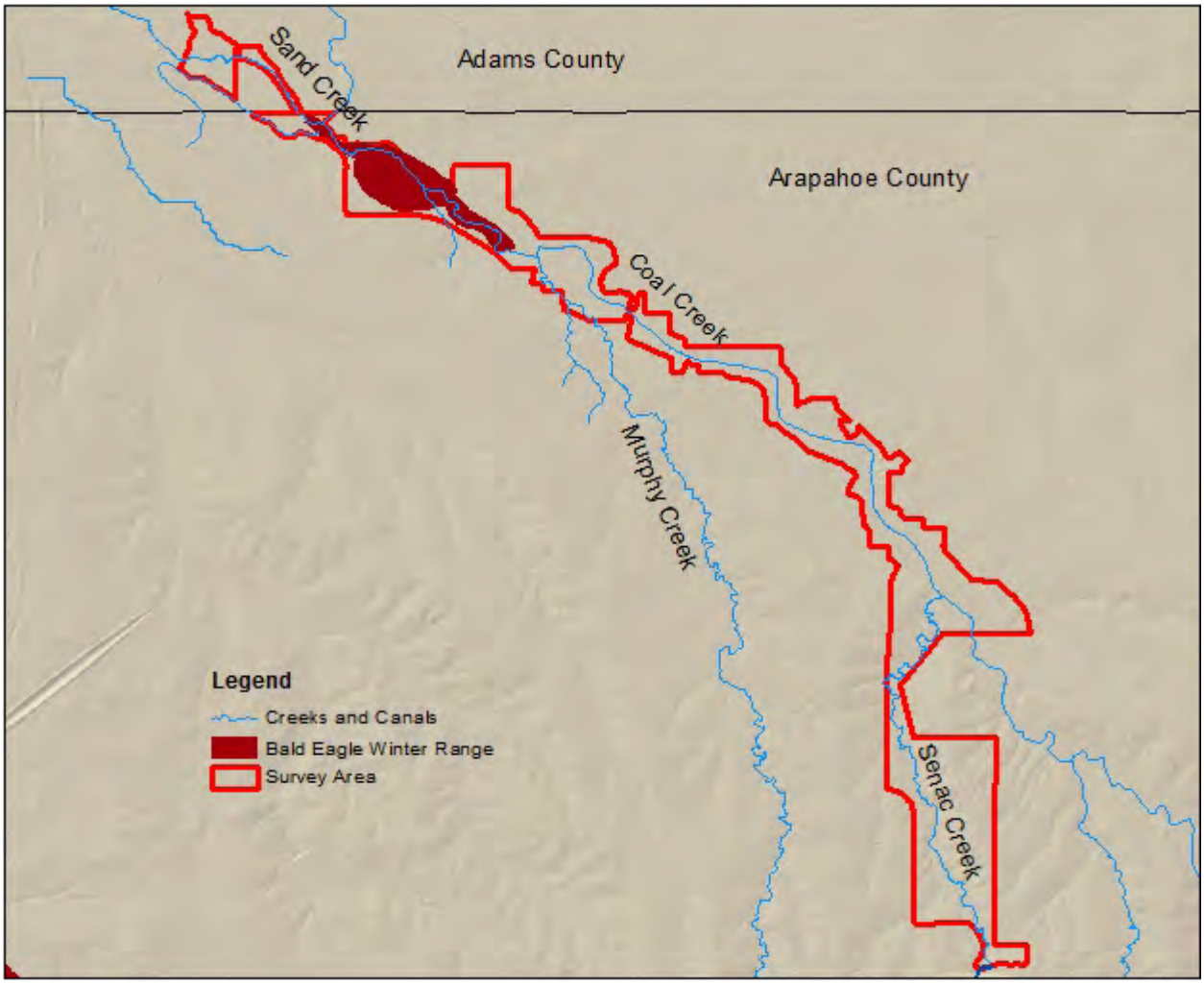

Figure 9. Location of Bald Eagle Winter Range

Immature Bald Eagle along Murphy Draw. Photo from the City of Aurora.

Ferruginous Hawk

One observation of ferruginous hawk (*Buteo regalis*) was recorded from the survey area, within the immediate vicinity of prairie dog towns (Figure 10). The ferruginous hawk occurs throughout the eastern half of Colorado and in northwestern Colorado from Moffat to Mesa counties (Kingery 1998). NatureServe ranks ferruginous hawks apparently secure across their range (G4), but Colorado's breeding population is considered vulnerable (S3B), based on human reduction of the primary winter prey base (prairie dog colonies), small population size, and human encroachment into available habitat. This raptor is also ranked apparently secure in the United States (N4) by NatureServe. In Colorado, ferruginous hawks are fairly common winter residents, but are rare to uncommon summer residents on the eastern plains (Andrews and Righter 1992, Kingery 1998). About 1,200 birds winter in Colorado (Johnsgard 1990), that comprises about 20 percent of the total winter population in the United States (Andrews and Righter 1992). North American Breeding Bird Survey data for the U.S. and Canada indicate a relatively stable population from 1990 – 2004 (Sauer *et al*. 2005). Ferruginous hawks inhabit grasslands and semi-desert shrublands, and are rare in pinon-juniper woodlands. Breeding birds nest in isolated trees, on rock outcrops, on structures such as windmills and power poles, or on the ground. Wintering birds concentrate around prairie dog towns, and their numbers and distribution vary widely with the availability of prairie dogs (Andrews and Righter 1992). Loss of grasslands is likely a long-term threat (Olendorff 1993). Ferruginous hawks are easily disturbed during the breeding season (February to July 15th) (Bechard *et al.* 1990) and will abandon nests, particularly in the early stages of nesting (White and Thurow 1985).

East of the Rocky Mountains on the plains of Colorado the ferruginous hawk winter primarily in grasslands, where prairie dogs are abundant (Bechard and Schmutz 1995). Wintering populations are tolerant of some human activity and agricultural practices including cultivation. Many prairie dog colonies exist both within the study area and adjacent to it. Consequently, City of Aurora biologists have observed ferruginous hawk along Sand Creek during winter, loafing and probably hunting prairie dogs that are active on warm, clear winter days.

Ferruginous Hawk. Photo from Wikipedia Commons

Figure 10. Location of Ferruginous Hawk.

Mammals

Black-tailed Prairie Dog

The Survey Area supports black-tailed prairie dog (*Cynomys ludovicianus*) population that is separated by Interstate E470, effectively creating two populations or independent complexes (Figure 11). In Colorado, black-tailed prairie dogs occupy the eastern 40 percent of the state (Fitzgerald *et al.* 1994). Throughout its range, the species occurs in much lower densities and in smaller colonies than it did historically (Fitzgerald et al. 1994, Hoogland 1996). NatureServe ranks this species as apparently secure across its range (G4), and vulnerable in Colorado (S3). Rangewide, the area prairie dogs occupy has declined dramatically, from about 110 million acres (45 million ha) historically to about 1.4 million acres (0.56 million ha) - a decline of about 99 percent (U.S. Fish and Wildlife Service 2002). Approximately 37 percent of the historical habitat has been converted to cropland, and is now generally unavailable as habitat due to continuous disturbance. In the metropolitan Denver area, populations of prairie dogs have also declined dramatically, as once suitable prairie has been converted to industrial and residential development and cropland. In urban areas, harassment and predation by domestic pets can be a problem. In addition, outbreaks of plague (caused by the bacillus *Yersinia pestis* and transmitted by fleas) continue to reduce or even eliminate some colonies (Barnes 1982). Through their foraging behavior and their clipping of tall plants, black-tailed prairie dogs significantly change the composition of plant communities throughout their range (Hoogland 1996). This alteration of the landscape improves the habitat for many other animals such as burrowing owl (*Athenia cunicularia*), which nest in their burrows and prairie dogs are an important prey species for many predators. Consequently, the presence of prairie dogs greatly increases the zoological diversity of prairie ecosystems (Clark *et al.* 1982, Hoogland 1995).

Within the vicinity of the study area black-tailed prairie dogs are increasingly competing for available habitat with human development. Urbanization impacts how prairie dogs interact with the landscape. Burrow density is significantly higher in colonies surrounded by urban development and roads and in urban areas, colonies actually occupy fewer surface acres then they would on more open landscapes (Johnson and Collinge 2003). Literally there are more prairie dogs packed into a smaller area. The implications of urbanization for prairie dogs and the habitats they occupy include increased prairie dog density, which increases competition for available resources leading to declines in habitat quality and ultimately declines in prairie dog population size. In essence, in urban areas higher prairie dog density, rather than indicating higher habitat quality, actually results in degraded landscapes. In addition, prairie dog dispersal is reduced in urbanized landscapes because of barriers such as roads and buildings, resulting in even higher prairie dog densities and even more habitat degradation. Furthermore, in the event of plague, high density colonies may experience increased plague transmission rates and decreased recolonization rates, due to dispersal barriers, jeopardizing the survival of urban colonies. However, the potential for plague to occur in an urban colony will depend on what species, in addition to prairie dogs, may transmit plague between colonies, and how potential dispersal barriers, such as roads, affect these species. In effect, because of their isolation, urban prairie dog colonies may be protected against plague outbreaks.

The effect that these high density urban prairie dog colonies are having on the proposed greenway corridor is discussed within the profile for Sand Creek (see page 36), where prairie dog densities are negatively impacting the landscape.

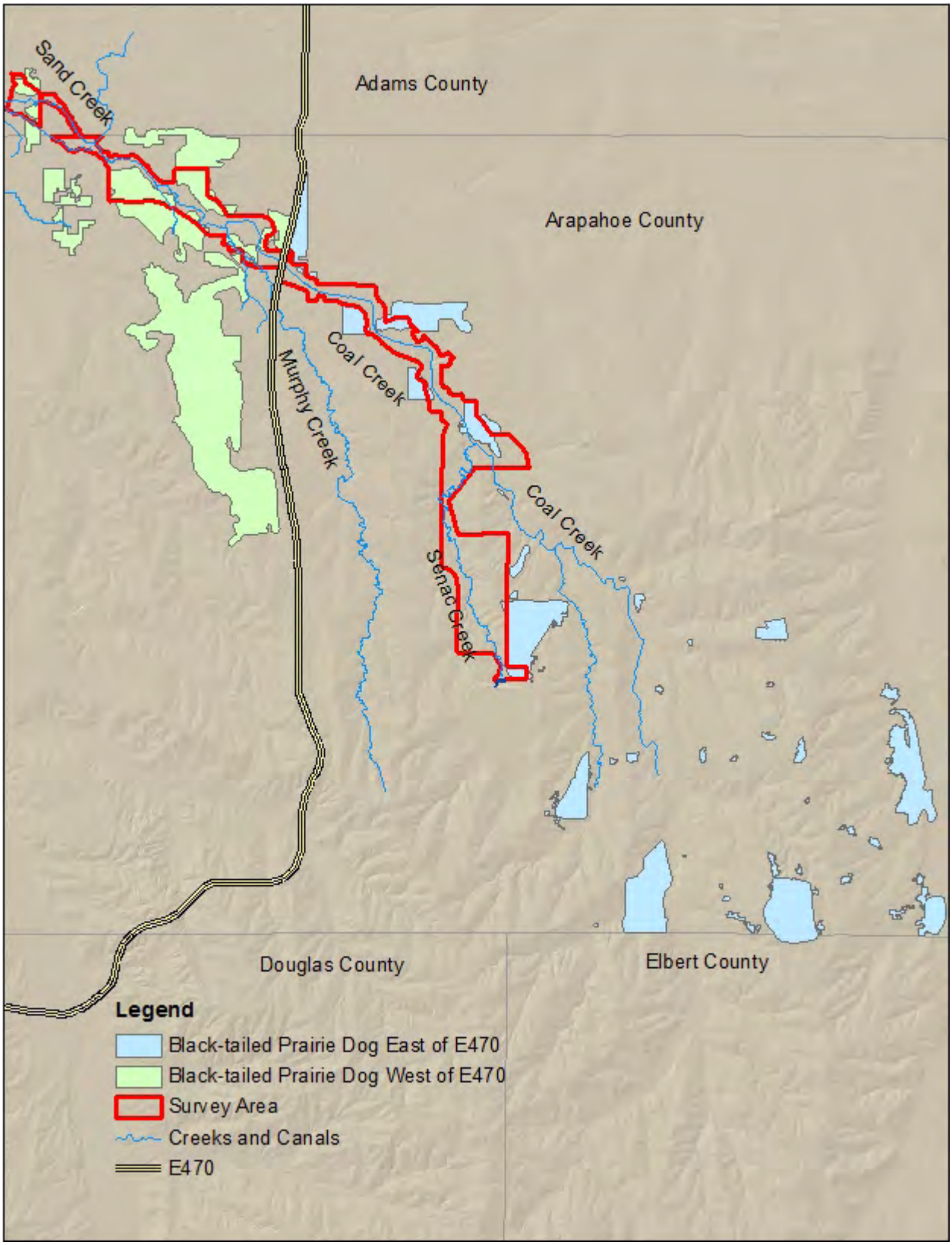

Figure 11. Location of Black-tailed Prairie Dog Towns.

Black-tailed prairie dog. Photo by John Sovell.

Senac Creek Profile

Senac Creek is the main outlet for Aurora Reservoir, flowing north through the Survey area. Agricultural areas and open space line the banks of the creek. It is an ephemeral stream with several low areas that retain water throughout the growing season. The Lowry Range is on the eastern boundary and Pronghorn Natural Area is located between Aurora Reservoir and the Ridge View Youth Services Center to the north. The vegetation is dominated by mature cottonwood (*Populus deltoides*) with Russian olive (*Elaegnus angustifolia*) and non-native forbs, dominated by leafy spurge (*Euphorbia esula*) and Scotch thistle (*Onopordum acanthium*). There were a number of emergent wetland plants recorded from the area including Nebraska sedge (*Carex nebrascensis*), Bulrush (*Schoenoplectus acutus*), black sedge (*Carex praegracilis*), broadleaf cattail (*Typha latifolia*), narrowleaf cattail (*Typha angustifolia*), and three-square (*Scirpus pungens*).

Animals tracks documented by CNHP within this area include the northern leopard frog (*Lithobates pipiens*) and a nesting pair of bald eagles (*Haliaeetus Leucocephalus*), which occur within the area mapped in Figure 12. The eagles were originally observed nesting in the area in 2005 and have returned to the same nest site most of the intervening years up to and including 2013. This nest site should be protected from human disturbance and to maintain viability of the leopard frog population, bullfrogs (*Lithobates catesbeianus*) should be prevented from establishing within the pools found along the channel of Senac Creek. Bullfrogs are present farther up the drainage on Sand Creek. In addition to these two tracked species, the tracked black-tailed prairie dog also occupies the grassland of Pronghorn Natural Area within this reach of Senac Creek.

A wide range of birds use the cottonwood/ willow riparian habitat and the wetlands present along Senac Ceek including Bullock's oriole (*Icterus bullockii*), red-tailed hawk (*Buteo jamaicensis*), red-winged blackbird (*Agelaius phoeniceus*) and western kingbird (*Tyrannus verticalis*) among others and these forests potentially supply important stopover habitat for numerous other birds during spring and fall migration. Evidence, including tracks and scat, of Coyote (*Canis latrans*), long-tailed weasel (*Mustela frenata),* mule deer (*Odocoileus hemionus*) and raccoon (*Procyon lotor*) were also recorded from this area.

Pronghorn Natural Area. Photo by John Sovell.

Prairie dog town. Photo by John Sovell

Senac Creek. Photo by John Sovell.

Senac Creek. Photo by John Sovell

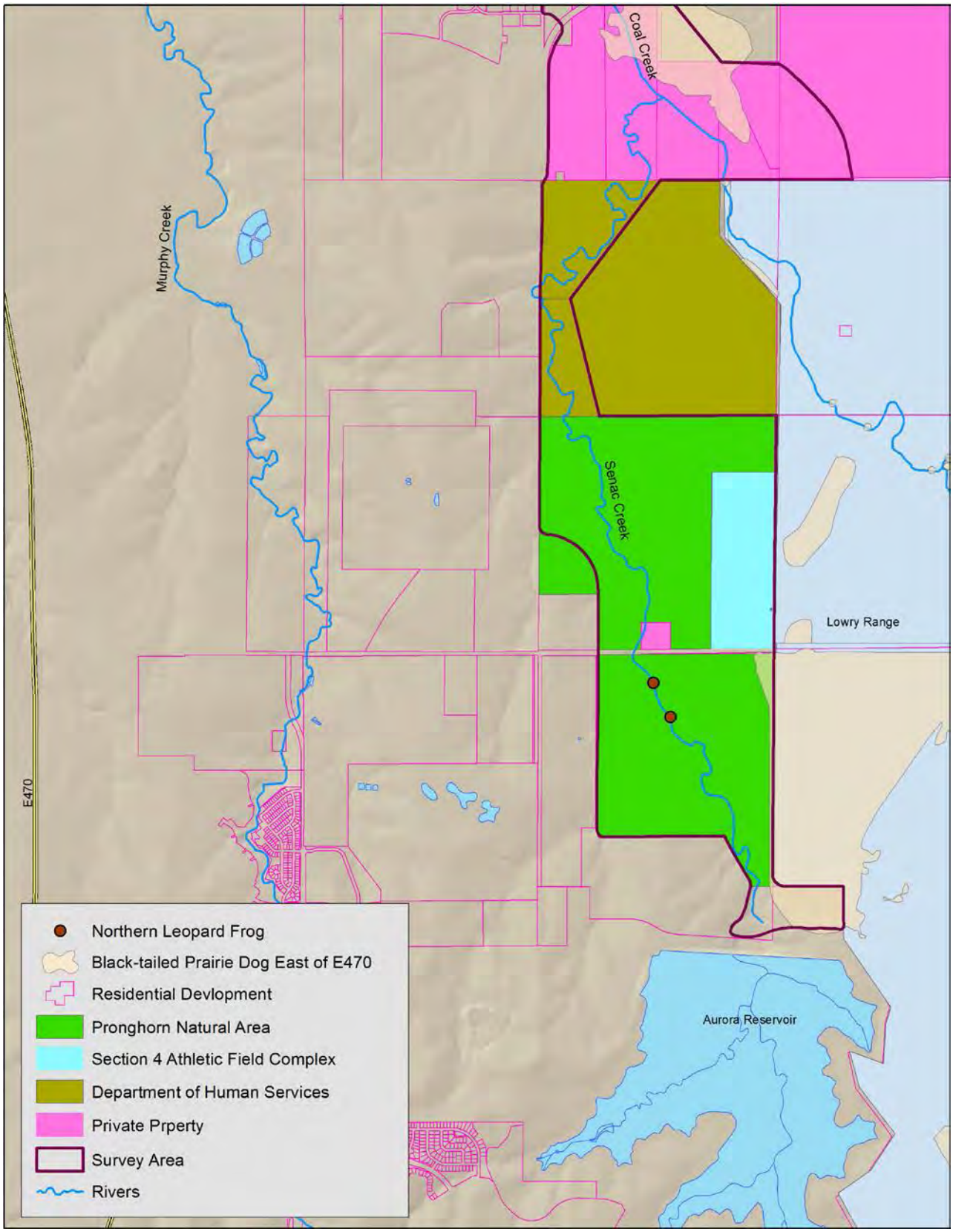

Figure 12. Overview of Senac Creek.

Coal Creek Profile

Coal Creek confluences with Senac Creek within the survey area, as it flows north to Sand Creek. Within this reach, the creek is ephermeral, generally dry and degraded, and flows north eventually passing through several residential areas (Figure 12). Most of the creek occurs within an entrenched channel where meanders of the creek have reestablished themselves. The dry banks of the upper floodplain support native herbaceous plants, but weedy nonnatives including kochia (*Bassia scoparia),* cheatgrass (*Bromus tectorum*), and smooth brome (*Bromus inermis*) are abundant. There is also an abundance of leafy spurge (*Tithymalus (Euphorbia) esula*) and cheatgrass in the herbaceous understory beneath the cottonwood (*Populus deltoides*) and peachleaf willow (*Salix amygdaloides)*. Some of the emergent wetland plants recorded here includes softstem bulrush (*Schoenoplectus tabernaemontani*), cattail (*Typha* spp.) and spotted ladysthumb (*Polygonum persicaria*). Other wetland plants recorded included Nebraska sedge (*Carex nebrascensis*), Bulrush (*Schoenoplectus acutus*), black sedge (*Carex praegracilis*), beaked sedge (*Carex utriculata*), and spikerush (*Eleocharis palustris*).

Within the channel of the creek, pockets of water support occurrences of northern leopard frogs, which is a CNHP tracked species (Figure 12). To maintain viability of the leopard frog population, bullfrogs should be prevented from establishing within these pools of water. These pools also support populations of fathead minnows (*Pimephales promelas*) and black bullheads (*Ameiurus melas*). The marsh pond snail (*Lymnaea elodes*), Physid snails (*Physa* sp.) and tadpoles of the Woodhouse's toad (*Bufo woodhousii*) were also found in these pools. Such a diversity of aquatic life suggests that water quality is still fair-to-good along this portion of Coal Creek.

Upslope along the southern portions of the creek, where urban development has not yet reached, there are a number of black-tailed prairie dog towns, also a CNHP tracked species, occupying the grassland that exists here (Figure 13). According to GIS coverage's supplied to CNHP by the City of Aurora, the areas occupied by the prairie dogs have been approved for residential development. Completion of development within these areas will result in fragmentation and potential loss of the prairie dog populations.

A wide range of birds use the cottonwood/ willow riparian habitat, including American goldfinch (*Spinus tristis*), Bullock's oriole (*Icterus bullockii*), northern flicker (*Colaptes auratus*) western kingbird (*Tyrannus verticalis*), and western wood-pewee (*Contopus sordidulus*) among others and these forests potentially supply important stopover habitat for numerous other birds during spring and fall migration. Evidence, including tracks, scat and burrowing, of Coyote (*Canis latrans*), plains pocket gopher (*Geomys bursarius*), mule deer (*Odocoileus hemionus*) and raccoon (*Procyon lotor*) were also recorded from the Coal Creek reach.

Photos from the Coal Creek survey. Photos by John Sovell and Bernadette Kuhn.

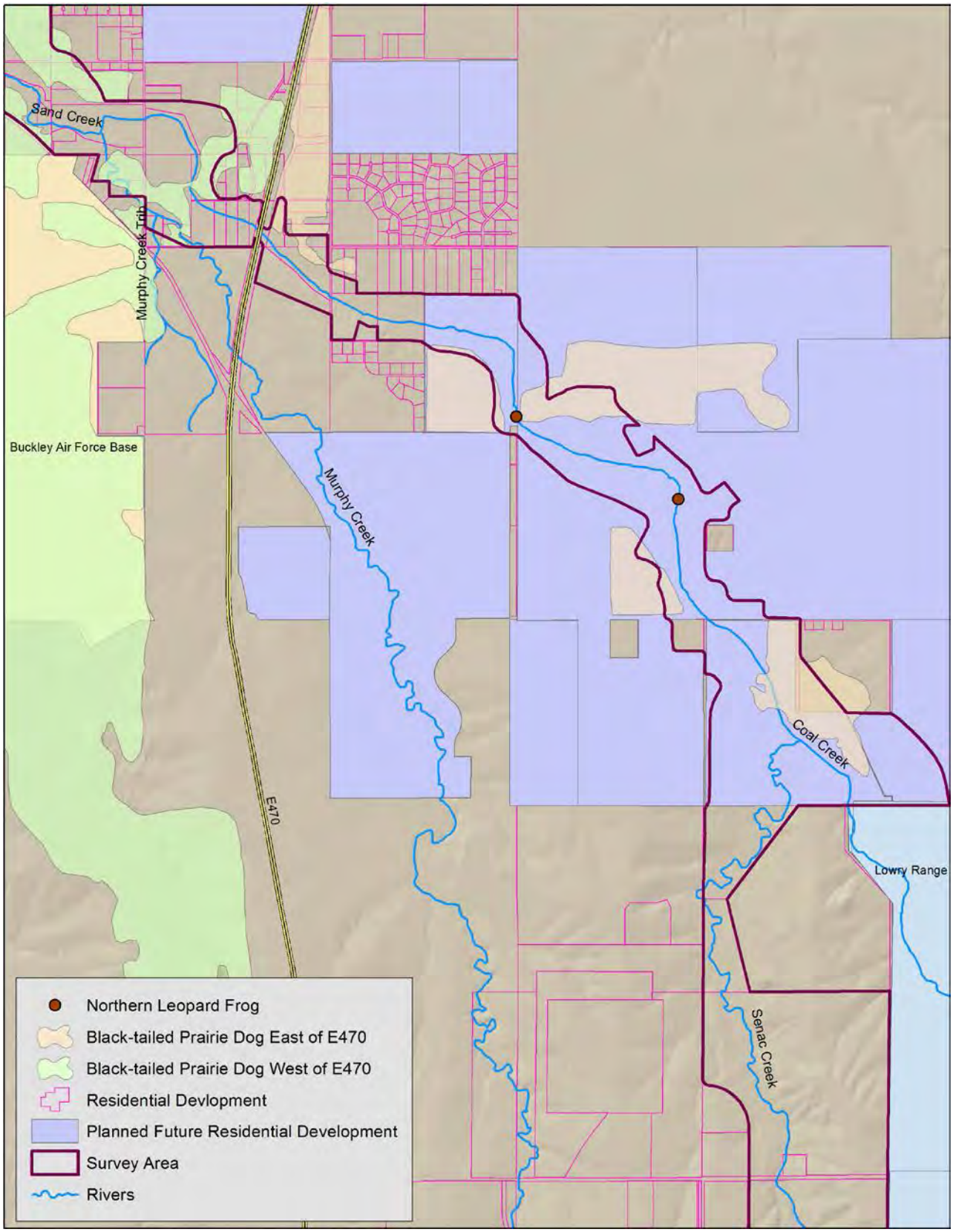

Figure 13. Overview of Coal Creek.

Sand Creek Profile

Sand Creek is a perennial stream that supports a mature cottonwood gallery forest with a non-native forb and graminoid understory. The creek is formed at the junction of Murphy Creek and Coal Creek and this is the most modified stretch of the survey area with dense residential and commercial development occupying the uplands along the creek (Figure 13). Sand Creek, along much of its length here, is protected within two open spaces, the Sand Creek Greenway and Star K Ranch Open Space. The Sand Creek Greenway is an existing recreational path that follows Sand Creek into the Star K Ranch Open Space, in Adams County. The creek is highly incised here and occupies a deep channel lacking stream meanders and stream braiding resulting in stagnant waters that are highly eutrophic and that contain a great deal of algae. The large amount of development adjacent to the creek with a high percent of paved surfaces and landscaped lawns appears to result in a great deal of pollution running-off into the creek, creating these eutrophic conditions.

On the west side of Airport Road, the plant community along Sand Creek is an open, cottonwood gallery forest with an understory dominated by a non-native grass- smooth brome (*Bromus inermis*). Large stands of plains cottonwood (*Populus deltoides*) dominate the overstory. Noxious weeds are present in small patches including Canada thistle (*Cirsium arvense*), teasel (*Dipsacus fullonum)*, and leafy spurge (*Euphorbia esula*). As Sand Creek flows east under Airport Road, the channel becomes more incised. The banks are dominated by peachleaf willow (*Salix amygdaloides*), crack willow (*Salix fragilis*), and coyote willow (*Salix exigua*). Emergent wetland plants are present along the creek, including softstem bulrush (*Schoenoplectus tabernaemontani*), cattail (*Typha* spp.) and spotted ladysthumb (*Polygonum persicaria*).

There were two CNHP tracked species recorded from the Sand Creek portion of the Survey area, the ferruginous hawk and the black-tailed prairie dog (Figure 14). The ferruginous hawk was observed hunting in a large prairie dog town north of Buckley Air Force Base. In this part of the Survey area, prairie dogs were exploiting grassland that still persisted as patches spread amongst the dense residential and commercial developments. The areas occupied by the prairie dogs are intensely grazed and degraded with high abundance of nonnative plant species. Because of the intense development, there is no room for prairie dog towns to move on the landscape or for new recruits into the population to expand into adjacent and unoccupied habitat because none exists. Consequently, colony density is high and prairie dog grazing has reduced herbaceous ground cover resulting in a high percentage of bare ground that has been exploited by weedy vegetation resulting in a ground cover dominated by kochia (*Bassia sieversiana*) and cowpen daisy (*Verbesina enceloides*). In addition, this area is utilized by wintering bald eagles and has been identified by the Colorado Division of Parks and Wildlife as bald eagle winter range.

In addition to the tracked species, CNHP also found black bullhead *(Ameiurus melas*), which are tolerant of low levels of dissolved oxygen, red shiner (*Cyprinella lutrensis*), the nonnative bullfrog, grasshoppers, dragonflies and damselflies in the area. Additional sightings and evidence, such as tracks and scat, of mammals included bobcat (*Lynx rufus*), coyote, desert cottontail (*Sylvilagus audobonii*), fox squirrel (*Sciurus niger*), mule deer and white-tailed deer (*Odocoileus virginianus*). It also appears that there are active beaver (*Castor canadensis*) dams and ponds in this area, although no beavers, tracks, or scat were observed during completion of survey work.

The expansive cottonwood gallery forest along this reach of Sand Creek provides good quality habitat for riparian songbirds and raptors. The numerous birds observed here included American robin (*Turdus migratorius*), black-billed magpie (*Pica hudsonia*), blue jay (*Cyanocitta cristata*), house wren (*Troglodytes aedon*), northern flicker, mourning dove (*Zenaida macroura*), red-tailed hawk, Say's phoebe (*Sayornis saya*), and western wood-peewee among others.

Eutrophic water conditions along Sand Creek.

Denuded black-tailed prairie dog colony.

Pond along Sand Creek.

Black bullhead catfish.

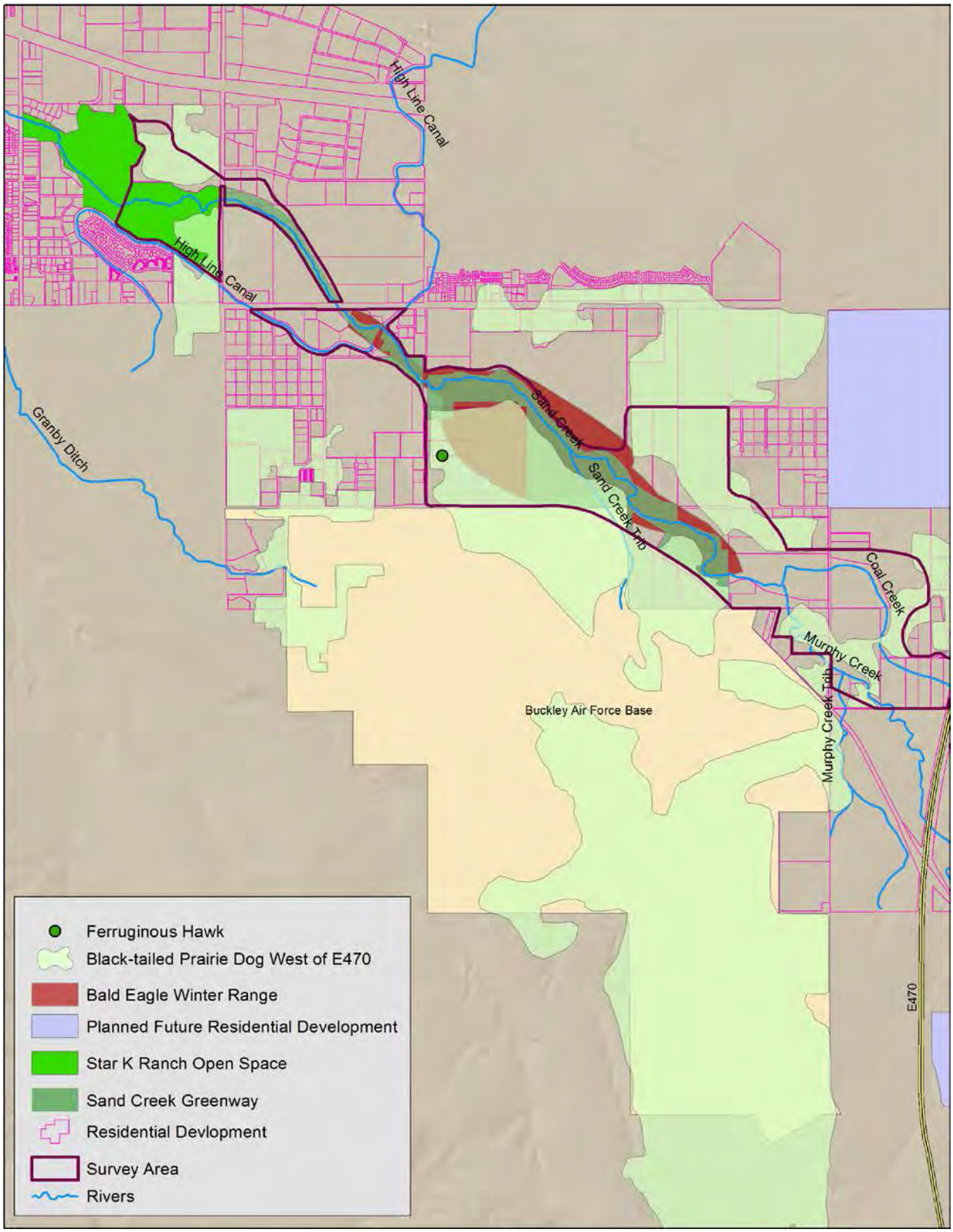

Figure 14. Overview of Sand Creek.

Non-native Plant Species

In Colorado there are 498 (14.5% of total flora) invasive plant species (CDA 2013). Invasion of non-native and aggressive species and their replacement of native species is a threat to Colorado. The Colorado Department of Agriculture Noxious Weed Program lists species according to their degree of invasiveness. List A species are designated by the State Commissioner for eradication. No List A species were documented during the project. List B weed species are species for which the State develops and implements state noxious weed management plans designed to stop the continued spread of these species. List C weed species are species for which the Commissioner will develop and implement state noxious weed management plans designed to support the efforts of local governing bodies to facilitate more effective integrated weed management on private and public lands. Below is a table listing the List B and C species documented within the survey area.

List B species
documented within the watershed:
Bull thistle (*Cirsium vulgare*)
Butter and eggs (*Linaria vulgaris*)
Canada thistle (*Breea arvense*)
Dalmatian toadflax (*Linaria dalmatica*)
Houndstongue (*Cynoglossum officinale*)
Leafy spurge (*Euphorbia esula*)
Musk Thistle (*Carduus nutans*)
Ox-eye daisy (*Chrysanthemum leucanthemum)*
Perennial pepperweed (*Lepidium latifolium*)
Quackgrass (*Elytrigia repens*)
Russian-olive (*Elaeagnus angustifolia*)
Salt cedar (*Tamarix ramosissima*)
Scotch thistle (*Onopordum tauricum*)
White top or hoary cress (*Cardaria draba*)

List C species
documented within the watershed:
Chicory (*Cichorium intybus*)
Common burdock (*Arctium minus*)
Common mullein (*Verbascum thaspus*)
Downy brome (*Bromus tectorum*)
Field bindweed (*Convolvulus arvensis*)
Johnsongrass (*Sorghum halepense*)
Perennial sowthistle (*Sonchus arvensis*)
Puncturevine (*Tribulus terrestris*)
Redstem filaree (*Erodium cicutarium*)
Wild proso millet (*Panicummillaceum*)

Scotch thistle. Gary A. Monroe @ USDA-NRCS PLANTS Database

Russian olive. J.S. Peterson @ USDA-NRCS PLANTS Database

Leafy spurge. Photo from Wikipedia Commons.

DISCUSSION

Preservation of the ecological integrity of Sand, Coal, and Senac creeks and the critical biological resources of the surrounding uplands will benefit from maintaining the natural hydrology of the creeks and from preventing excessive disturbance of their associated wetlands and cottonwood gallery forests. In addition, needed restoration of the Survey area through elimination of weeds would improve ecological integrity and habitat values for wildlife and enhance biodiversity of the Triple Creek project area.

This study has identified that there are a number of rare biological resources present within the Triple Creek project area that are sensitive to human disturbance and human induced changes to the landscape. These include populations of northern leopard frog and black-tailed prairie dog and ferruginous hawk, a nesting occurrence of bald eagles, winter hunting and loafing habitat for bald eagles and cottonwood gallery forests that support a diverse population of breeding songbirds, raptors and supply stopover habitat in the spring and fall suitable for migrating birds. When developing the planned greenway, care should be taken to avoid surface disturbance to the landscapes supporting these biological resources. Human recreational activity should be managed to avoid disturbing the nesting bald eagles during the breeding season, March 1 through August 31, with no activity allowed within 400 meters of the nest (Mathisen et al. 1971). The greenway should be designed to protect riparian functions. Efforts should concentrate on including the flood plain, its banks, and portions of the uplands in the greenway system on at least one side of the river and preferably both sides. It is during this journey from upland to creek channel that most of the filtering of sediments and chemicals takes place. This protected area should be wide enough to filter out sediment and nutrients. The following is a list of guidelines for maintaining riparian functions in a greenway (Labaree 1997):

- Make greenways continuous along the creek.
- Cover both sides of the creek if possible.
- Include in the greenway the creek's floodplain, riparian forest, associated wetlands, intermittent tributaries, gullies, and swales.
- Undertake a comprehensive study of the site's sediment and nutrient flow to establish how much is entering the riparian zone and how much it will need to filter. If this is not possible, rely on results from studies done at similar sites.
- Base greenway width on comprehensive study of the site. Riparian greenways which neighbor intensive land uses such as clearcutting, monoculture, or shopping malls will need to be wide enough to absorb excess nutrients and toxins.
- Maintain a band of natural vegetation along the banks of the creek to protect its temperature moderation function.
- Avoid mowing creekside vegetation, as this practice will decrease its filtering effectiveness.
- Supplement natural sediment trapping function of the greenway with retention basins or vegetated berms where necessary.
- Supplement, if necessary, natural nutrient filtering functions of the greenway with a tree harvesting regime (derived in consultation with local forester and ecologist) to maximize nutrient uptake.

Management is necessary to control and eliminate weeds within the floodplains of the drainage, which are dominated by exotic species (see above). An integrated weed management strategy should be implemented to control exotics. The use of many pesticides is restricted within riparian zones. If chemical controls are used, care should be taken to ensure that the method of application is designed to avoid adverse impacts to native species. If herbicide application occurs, seeding or planting native species could improve the ecological integrity of the site. Occasional spring burning may also be effective in controlling

exotic species. Fires were frequent in plains riparian woodlands and they helped maintain the characteristic open canopy of the woodland. Thus, periodic controlled burns may have the added benefit of maintaining community structure as well as controlling weeds.

Water flow, or discharge, within streams of a region will exhibit seasonal patterns influenced by many factors, including precipitation, temperature, runoff from the surrounding landscape, and ground water discharge. Patterns in water flow of streams from the area of the Triple Creek project exhibit peak volumes of flow in late spring, with a smaller peak in late summer corresponding to the onset of the summer monsoons (Figure 15). Flows during winter are generally low. Alteration in the patterns of natural stream flow can result from water diversion projects such as ground water pumping and the construction of dams, and by changing the extent and rate of surface water runoff. The effect that alterations within the landscape will have on stream flows depends on the type and number of alterations, and can include a decline in the volume of peak flow, an increase in peak flow, and/or a change in the timing of peak flows (Figure 15). Changes in the natural patterns of stream flow can have many effects on riparian corridors.

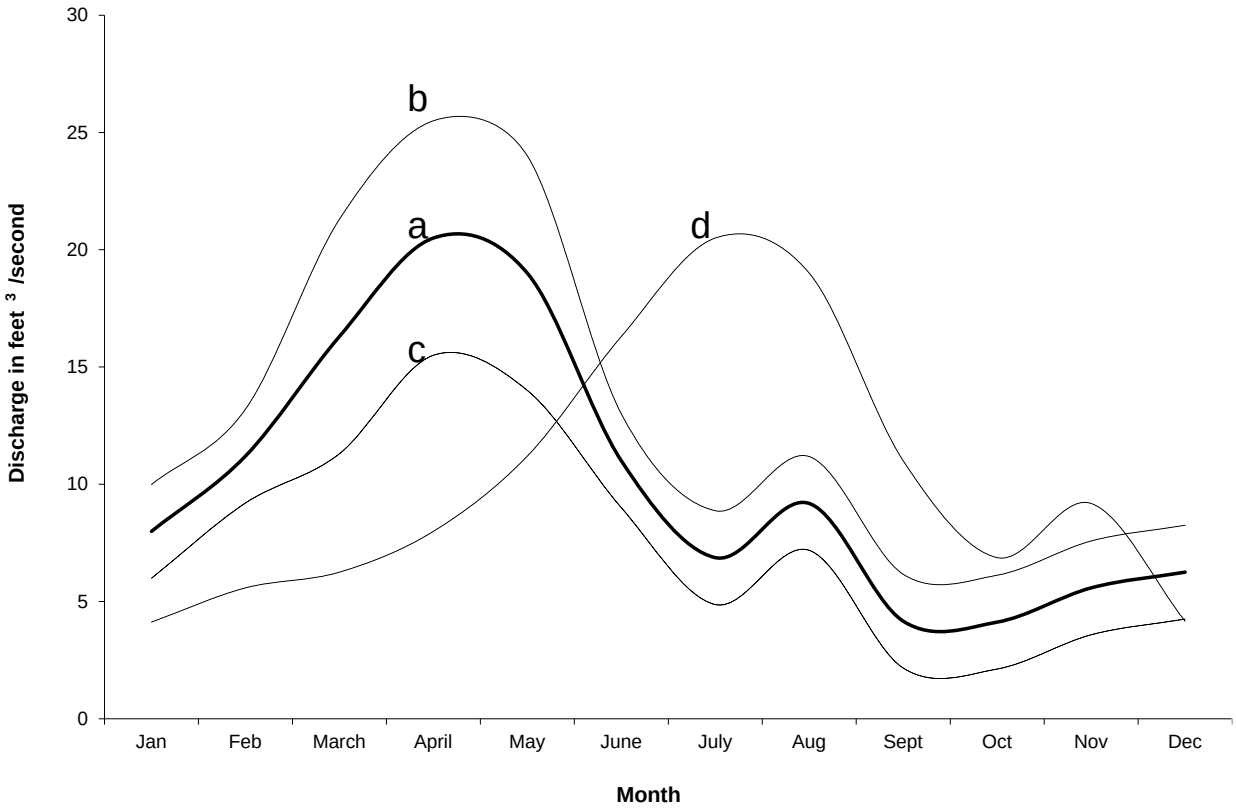

Figure 15. Mean monthly stream flow statistics for Cherry Creek at Parker, Colorado from 1991-2005: (a) (USGS National Water Information System Web Data 2005). Modification to this natural pattern of stream flow could include increasing the volume of peak flows (b), decreasing peak flows (c), or changing the time at which peak flows occur (d).

Increasing urban development adjacent to the creeks will continue to degrade their biological values. Urbanization can result in the loss of upland vegetation leading to more rapid water runoff, an influx of pollutants, elevated stream flows, and increased erosion after rainfall events and during periods of snowmelt (Patten 1998, USDA et al. 1998). Elevated stream flows can lead to channelization and loss of stream meanders and stream braiding, both important for substrate deposition that creates barren bars

upon which plant regeneration can occur. Channelization also can disrupt riffle and pool complexes needed at different times in the life cycle of aquatic animals including amphibians, fish, and aquatic invertebrates (USDA et al. 1998). Increased runoff can increase sediment loading, which decreases water quality and compromises survival of aquatic animals (USDA et al. 1998). Increases in water runoff will also lead to a proportional reduction in ground water recharge, leading to a lowered water table, reducing water available to riparian vegetation. Groundwater withdrawal also can cause a drop in the water table resulting in reduced stream flows and reducing the amount of water available to riparian vegetation, ultimately leading to decline and death of the vegetation. Dams can retain water in spring, during periods of heightened rainfall and snowmelt, causing insufficient spring flows required for seed dispersal and channel scouring (Patten 1998). Scouring leaves barren sandy areas where seeds can implant and germinate. Without these mechanisms riparian plants such as cottonwood cannot regenerate. The release of water from dams can cause higher than normal summer flows that scour away spring germinating saplings, again resulting in a lack of plant regeneration (Patten 1998). Sand and gravel mining intercepts the water table, disrupting runoff and ground water flow into stream channels, and reducing the water available to the riparian corridor (Patten 1998, USDA et al. 1998). This again, has an impact on the survival of riparian plants and animals. Finally, these alterations in seasonal patterns of flow compromise the survival of native plant species adapted to such conditions and favors establishment of non-native plants (USDA et al. 1998). The effects of these alterations may be detrimental to maintaining the viability and integrity of semi-arid riparian ecosystems like those of the Triple Creek project area.

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APPENDIX I

NATURAL HERITAGE METHODOLOGY

The Natural Heritage Ranking System

To determine the status of species within Colorado, CNHP gathers information on plants, animals and plant communities. Each of these elements of natural diversity is assigned a rank that indicates its relative degree of imperilment on a five-point scale (for example, 1 = extremely rare/imperiled, 5 = abundant/secure). The primary criterion for ranking elements is the number of occurrences (in other words, the number of known distinct localities or populations). This factor is weighted more heavily than other factors because an element found in one place is more imperiled than something found in twenty-one places. Also of importance are the size of the geographic range, the number of individuals, the trends in both population and distribution, identifiable threats and the number of protected occurrences.

Element imperilment ranks are assigned both in terms of the element's degree of imperilment within Colorado (its State-rank or S-rank) and the element's imperilment over its entire range (its Global-rank or G-rank). Taken together, these two ranks indicate the degree of imperilment of an element. CNHP actively collects maps and electronically processes specific occurrence information for animal and plant species considered extremely imperiled to vulnerable in the state (S1 - S3). Several factors, such as rarity, evolutionary distinctiveness and endemism (specificity of habitat requirements), contribute to the conservation priority of each species. Certain species are “watchlisted,” meaning that specific occurrence data are collected and periodically analyzed to determine whether more active tracking is warranted. A complete description of each of the Natural Heritage ranks is provided in Table 4.

This single rank system works readily for all species except those that are migratory. Those animals that migrate may spend only a portion of their life cycles within the state. In these cases, it is necessary to distinguish between breeding, non-breeding and resident species. As noted in Table 4, ranks followed by a "B,” for example S1B, indicate that the rank applies only to the status of breeding occurrences. Similarly, ranks followed by an "N,” for example S4N, refer to non-breeding status, typically during migration and winter. Elements without this notation are believed to be year-round residents within the state.

Table 4. Definition of Natural Heritage Imperilment Ranks.

G/S1	Critically imperiled globally/state because of rarity (5 or fewer occurrences in the world/state; or 1,000 or fewer individuals), or because some factor of its biology makes it especially vulnerable to extinction.
G/S2	Imperiled globally/state because of rarity (6 to 20 occurrences, or 1,000 to 3,000 individuals), or because other factors demonstrably make it very vulnerable to extinction throughout its range.
G/S3	Vulnerable through its range or found locally in a restricted range (21 to 100 occurrences, or 3,000 to 10,000 individuals).
G/S4	Apparently secure globally/state, though it may be quite rare in parts of its range, especially at the periphery. Usually more than 100 occurrences and 10,000 individuals.
G/S5	Demonstrably secure globally/state, though it may be quite rare in parts of its range, especially at the periphery.
G/SX	Presumed extinct globally, or extirpated within the state.
G#?	Indicates uncertainty about an assigned global rank.
G/SU	Unable to assign rank due to lack of available information.
GQ	Indicates uncertainty about taxonomic status.
G/SH	Historically known, but usually not verified for an extended period of time.
G#T#	Trinomial rank (T) is used for subspecies or varieties. These taxa are ranked on the same criteria as G1-G5.
S#B	Refers to the breeding season imperilment of elements that are not residents.

S#N	Refers to the non-breeding season imperilment of elements that are not permanent residents. Where no consistent location can be discerned for migrants or non-breeding populations, a rank of SZN is used.
SZ	Migrant whose occurrences are too irregular, transitory and/or dispersed to be reliably identified, mapped and protected.
SA	Accidental in the state.
SR	Reported to occur in the state but unverified.
S?	Unranked. Some evidence that species may be imperiled, but awaiting formal rarity ranking. Note: Where two numbers appear in a state or global rank (for example, S2S3), the actual rank of the element is uncertain, but falls within the stated range.

Legal Designations for Rare Species

Natural Heritage imperilment ranks should not be interpreted as legal designations. Although most species protected under state or federal endangered species laws are extremely rare, not all rare species receive legal protection. Legal status is designated by both the U.S. Fish and Wildlife Service under the Endangered Species Act or by the Colorado Division of Wildlife under Colorado Statutes 33-2-105 Article 2. In addition, the U.S. Forest Service recognizes some species as "Sensitive," as does the Bureau of Land Management. Table 5 defines the special status assigned by these agencies and provides a key to abbreviations used by CNHP.

Table 5. Federal and State Agency Special Designations for Rare Species.

Federal Status:	
1. U.S. Fish and Wildlife Service (58 Federal Register 51147, 1993) and (61 Federal Register 7598, 1996)	
LE	Listed Endangered: defined as a species, subspecies, or variety in danger of extinction throughout all or a significant portion of its range.
LT	Listed Threatened: defined as a species, subspecies, or variety likely to become endangered in the foreseeable future throughout all or a significant portion of its range.
P	Proposed: taxa formally proposed for listing as Endangered or Threatened (a proposal has been published in the Federal Register, but not a final rule).
C	Candidate: taxa for which substantial biological information exists on file to support proposals to list them as endangered or threatened, but no proposal has been published yet in the Federal Register.
PDL	Proposed for delisting.
XN	Nonessential experimental population.
2. U.S. Forest Service (Forest Service Manual 2670.5) (noted by the Forest Service as S")	
FS	Sensitive: those plant and animal species identified by the Regional Forester for which population viability is a concern as evidenced by: Significant current or predicted downward trends in population numbers or density. Significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution.
3. Bureau of Land Management (BLM Manual 6840.06D) (noted by BLM as "S")	
BLM	Sensitive: those species found on public lands designated by a State Director that could easily become endangered or extinct in a state. The protection provided for sensitive species is the same as that provided for C (candidate) species.
4. State Status:	
The Colorado Division of Wildlife has developed categories of imperilment for non-game species (refer to the Colorado Division of Wildlife's Chapter 10 – Nongame Wildlife of the Wildlife Commission's regulations). The categories being used and the associated CNHP codes are provided below.	
E	Endangered: those species or subspecies of native wildlife whose prospects for survival or

	recruitment within this state are in jeopardy, as determined by the Commission.
T	Threatened: those species or subspecies of native wildlife which, as determined by the Commission, are not in immediate jeopardy of extinction but are vulnerable because they exist in such small numbers, are so extremely restricted in their range, or are experiencing such low recruitment or survival that they may become extinct.
SC	Special Concern: those species or subspecies of native wildlife that have been removed from the state threatened or endangered list within the last five years; are proposed for federal listing (or are a federal listing "candidate species") and are not already state listed; have experienced, based on the best available data, a downward trend in numbers or distribution lasting at least five years that may lead to an endangered or threatened status; or are otherwise determined to be vulnerable in Colorado.

Element Occurrences and their Ranking

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

Size – a measure of the area or abundance of the element's occurrence. Takes into account factors such as area of occupancy, population abundance, population density, population fluctuation and minimum dynamic area (which is the area needed to ensure survival or re-establishment of an element after natural disturbance). This factor for an occurrence is evaluated relative to other known and/or presumed viable, examples.

Condition/Quality – an integrated measure of the composition, structure and biotic interactions that characterize the occurrence. This includes measures such as reproduction, age structure, biological composition (such as the presence of exotic versus native species), structure (for example, canopy, understory and ground cover in a forest community) and biotic interactions (such as levels of competition, predation and disease).

Landscape Context – an integrated measure of two factors: the dominant environmental regimes and processes that establish and maintain the element and connectivity. Dominant environmental regimes and processes include herbivory, hydrologic and water chemistry regimes (surface and groundwater), geomorphic processes, climatic regimes (temperature and precipitation), fire regimes and many kinds of natural disturbances. Connectivity includes such factors as a species having access to habitats and resources needed for life cycle completion, fragmentation of ecological communities and systems and the ability of the species to respond to environmental change through dispersal, migration, or re-colonization.

Each of these factors is rated on a scale of A through D, with A representing an excellent rank or D representing a poor rank. These ranks for each factor are then averaged to determine an appropriate EO-Rank for the occurrence. If not enough information is available to rank an element occurrence, an EO-Rank of E is assigned. EO-Ranks and their definitions are summarized in Table 6.

Table 6. Element Occurrence Ranks and their Definitions.

A	Excellent viability.
B	Good viability
C	Fair viability.
D	Poor viability.
H	Historic: known from historical record, but not verified for an extended period of time.
X	Extirpated (extinct within the state).
E	Extant: the occurrence does exist but not enough information is available to rank.
F	Failed to find: the occurrence could not be relocated.

Identify Conservation Needs and Opportunities

Once the biological inventory has identified species, plant communities, and ecological systems in the Survey Area, it is necessary to interpret these data from a conservation planning standpoint. In order to do this, CNHP has developed methods to delineate the local geographic areas that are necessary to maintain long-term persistence of the species and plant communities of interest. Potential Conservation Areas (PCAs) are delineated to focus attention on species and plant communities of highest conservation priority at global and statewide levels (see The Natural Heritage Ranking Method for details on PCA methods). In addition, Sites of Local Significance (SLSs) are identified in order to emphasize biological resources that are not among the highest priorities for conservation at a statewide level, but are nonetheless very significant to supporting species at the local level. SLSs contribute to the character of the local area and the overall local diversity of plants and communities present, and therefore warrant conservation consideration.

APPENDIX II

PLANT AND ANIMAL SPECIES LIST

Species in bold font indicate those that are tracked by CNHP

Common Name	Scientific Name	Parcel No.	Date
AMPHIBIANS			
Bullfrog	*Lithobates catesbeianus*	G, H and I	7/31/2013
Bullfrog	*Lithobates catesbeianus*	Sand Creek Greenway S. of Colfax	8/1/2012
Woodhouse Toad (tadpoles)	*Bufo woodhousii*	c63	6/3/2013
Northern Leopard Frog	***Lithobates pipiens***	**c62**	**6/3/2013**
Woodhouse Toad (tadpoles)	*Bufo woodhousii*	c62	6/3/2013
Northern Leopard Frog	***Lithobates pipiens***	**c53**	**6/18/2013**
Northern Leopard Frog	***Lithobates pipiens***	**Pronghorn Open Space South of Quincy**	**6/20/2013**
BIRDS			
Red-tailed Hawk	*Buteo jamaicensis*	c32	10/10/2011
Northern Flicker	*Colaptes auratus*	Star K Ranch	7/31/2012
Mourning Dove	*Zenaida macroura*	Star K Ranch	7/31/2012
Teal	*Anas sp.*	Star K Ranch	7/31/2012
American Robin	*Turdus migratorius*	H and I	7/31/2012
Blue Jay	*Cyanocitta cristata*	G	7/31/2012
Western Wood-Pewee	*Contopus sordidulus*	G	7/31/2012
House Wren	*Troglodytes aedon*	G	7/31/2012
Horned Lark	*Eremophila alpestris*	A and B	7/31/2012
Red-tailed Hawk	*Buteo jamaicensis*	Star K Ranch	8/1/2012
Say's Phoebe	*Sayornis saya*	Star K Ranch	8/1/2012
Western Kingbird	*Tyrannus verticalis*	Star K Ranch	8/1/2012
House Wren	*Troglodytes aedon*	Star K Ranch	8/1/2012
Western Kingbird	*Tyrannus verticalis*	Sand Creek Greenway S. of Colfax	8/1/2012
Blue Jay	*Cyanocitta cristata*	Sand Creek Greenway S. of Colfax	8/1/2012
Morning Dove	*Zenaida macroura*	Sand Creek Greenway S. of Colfax	8/1/2012
Northern Flicker	*Colaptes auratus*	Sand Creek Greenway S. of Colfax	8/1/2012
Black-billed Magpie	*Pica hudsonia*	Sand Creek Greenway E. of Tower Rd	8/1/2012
Ferruginous Hawk	***Buteo regalis***	**Sand Creek Greenway E. of Tower Rd**	**8/1/2012**
Black-billed Magpie	*Pica hudsonia*	Sand Creek Greenway N. of Highway 30	8/6/2012
Red-tailed Hawk	*Buteo jamaicensis*	Sand Creek Greenway N. of Highway 30	8/6/2012
Mourning Dove	*Zenaida macroura*	Sand Creek Greenway N. of Highway 30	8/6/2012
Western Kingbird	*Tyrannus verticalis*	Sand Creek Greenway N. of Highway 30	8/6/2012
Northern Flicker	*Colaptes auratus*	c60	8/6/2012

Common Name	Scientific Name	Parcel No.	Date
Western Meadowlark	*Sturnella neglecta*	c60	8/6/2012
Red-winged Blackbird	*Agelaius phoeniceus*	c62	6/3/2013
Eastern Kingbird	*Tyrannus tyrannus*	c62	6/3/2013
Mourning Dove	*Zenaida macroura*	c62	6/3/2013
Lark Sparrow	*Chondestes grammacus*	c62	6/3/2013
Mourning Dove	*Zenaida macroura*	c62	6/3/2013
European Starling	*Sturnus vulgaris*	c62	6/3/2013
Western Kingbird	*Tyrannus verticalis*	c62	6/3/2013
American Robin	*Turdus migratorius*	c62	6/3/2013
Killdeer	*Charadrius vociferus*	c62	6/3/2013
Brewer's Blackbird	*Euphagus cyanocephalus*	c60	6/3/2013
Great Horned Owl	*Bubo virginianus*	c63	6/3/2013
Western Wood-Pewee	*Contopus sordidulus*	c63	6/3/2013
Brewer's Blackbird	*Euphagus cyanocephalus*	c58	6/18/2013
American Goldfinch	*Spinus tristis*	c58	6/18/2013
Western KingBird	*Tyrannus verticalis*	C56	6/18/2013
Western Meadowlark	Sturnella neglecta	c53	6/18/2013
House Finsh	*Haemorhaus mexicanus*	c56	6/18/2013
Red-winged Blackbird	*Agelaius phoeniceus*	c53	6/18/2013
Western Wood-Pewee	*Contopus sordidulus*	c53	6/18/2013
Black-crowned Hight Heron	*Nycticorax nycticorax*	c53	6/18/2013
Mourning Dove	Zenaida macroura	c68	6/18/2013
Mourning Dove	Zenaida macroura	c70	6/19/2013
American Kestrel	*Falco sparverius*	c70	6/19/2013
Eastern Kingbird	Tyrannus tyrannus	c70	6/19/2013
Vesper Sparrow	*Pooecetes gramineus*	c69	6/19/2013
Western Kingbird	*Tyrannus verticalis*	c69	6/19/2013
Swainson's Hawk	*Buteo swainsoni*	c69	6/19/2013
Red-winged Blackbird	*Agelaius phoeniceus*	u74	6/19/2013
Brewer's Blackbird	*Euphagus cyanocephalus*	u74	6/19/2013
Killdeer	*Charadrius vociferus*	u74	6/19/2013
Red-tailed Hawk	*Buteo jamaicensis*	u75	6/19/2013
Bald Eagle (Nesting pair 2 fledglings)	*Haliaeetus leucocephalus*	u76	6/19/2013
Bullock's Oriole	*Icterus bullockii*	Pronghorn Open Space North of Quincy	6/20/2013
Red-winged Blackbird	*Agelaius phoeniceus*	Pronghorn Open Space North of Quincy	6/20/2013
Mallard	*Anas platyrhynchos*	Pronghorn Open Space North of Quincy	6/20/2013

Common Name	Scientific Name	Parcel No.	Date
Western Kingbird	*Tyrannus verticalis*	Pronghorn Open Space North of Quincy	6/20/2013
Vesper Sparrow	*Pooecetes gramineus*	Pronghorn Open Space North of Quincy	6/20/2013
FISH			
Fathead Minnow	*Pimephales promelas*	G, H and I	7/31/2013
Black Bullhead	*Ameiurus melas*	G, H and I	7/31/2013
Red Shiner	*Cyprinella lutrensis*	Sand Creek Greenway S. of Colfax	8/1/2012
Red Shiner	*Cyprinella lutrensis*	Sand Creek Greenway E. of Tower Rd	8/1/2012
Red Shiner	*Cyprinella lutrensis*	Sand Creek Greenway N. of Highway 30	8/6/2013
Fathead Minnow	*Pimephales promelas*	Sand Creek Greenway N. of Highway 30	8/6/2012
Black Bullhead	*Ameiurus melas*	c53	6/18/2013
Fathead Minnow	*Pimephales promelas*	c53	6/18/2013
INVERTEBRATES			
Amphipoda			
Amphipoda	unknown	Star K Ranch	8/1/2012
Hemiptera			
Backswimmer	unknown	Star K Ranch	8/1/2012
Hymenoptera			
Western Harvester Ant	Pogonomyrmex occidentalis	Star K Ranch	8/1/2012
Western Harvester Ant	Pogonomyrmex occidentalis	Sand Creek Greenway S. of Colfax	8/1/2012
Lepodoptera			
Painted Lady	Vanessa cardui	u75	6/19.2013
Odonata			
Twelve-spotted Skimmer	*Libellula pulchella*	H and I	7/31/2013
Common Green Darner	*Anax junius*	H and I	7/31/2013
Variable Darner	*Aeshna interrupta*	H and I	7/31/2013
Widow Skimmer	*Libellula luctuosa*	H and I	7/31/2013
Common Green Darner	*Anax junius*	Sand Creek Greenway E. of Tower Rd	8/1/2012
Common Whitetail	*Plathemis lydia*	Sand Creek Greenway E. of Tower Rd	8/1/2012
Common Green Darner	*Anax junius*	Sand Creek Greenway N. Highway 30	8/6/2012
Orthoptera			
Two-striped Grasshopper	*Melanoplus bivittatus*	G	7/31/2013
Carolina Grashopper	*Dissosteira longipennis*	Sand Creek Greenway E. of Tower Rd	8/1/2012
Carolina Grashopper	*Dissosteira longipennis*	Sand Creek Greenway N. of Highway 30	8/6/2012
Mollusca			

Common Name	Scientific Name	Parcel No.	Date
Physid snail	*Physa* sp.	G, H and I	7/31/2013
Marsh Pond Snail	*Lymnaea elodes*	Parcel c62 @ Riverbend Marsh Pond Snail	6/3/2013

MAMMALS

Black-tailed Prairie Dog	***Cynomys ludovicianus***	**c12**	**10/10/2011**
Black-tailed Prairie Dog	***Cynomys ludovicianus***	**c17 and c18**	**10/10/2011**
Black-tailed Prairie Dog	***Cynomys ludovicianus***	**c21 and c22**	**10/10/2011**
Black-tailed Prairie Dog	***Cynomys ludovicianus***	**BB**	**10/10/2011**
Black-tailed Prairie Dog	***Cynomys ludovicianus***	**c29**	**10/10/2011**
Black-tailed Prairie Dog	***Cynomys ludovicianus***	**c31 and c32**	**10/10/2011**
Black-tailed Prairie Dog	***Cynomys ludovicianus***	**u49**	**10/10/2011**
Black-tailed Prairie Dog	***Cynomys ludovicianus***	**c69**	**10/10/2011**
Black-tailed Prairie Dog	***Cynomys ludovicianus***	**c69, 70 and c71**	**10/11/2011**
Black-tailed Prairie Dog	***Cynomys ludovicianus***	**c72**	**10/11/2011**
Black-tailed Prairie Dog	***Cynomys ludovicianus***	**u79**	**10/11/2011**
Black-tailed Prairie Dog	***Cynomys ludovicianus***	**Star K Ranch**	**7/31/2012**
Bobcat (tracks)	*Lynx rufus*	H and I	7/31/2012
Raccoon (tracks)	*Procyon lotor*	H and I	7/31/2012
Common Muskrat	*Ondatra zibethicus*	G	7/31/2012
Black-tailed Prairie Dog	***Cynomys ludovicianus***	**B and A**	**7/31/2012**
Coyote	*Canis latrans*	Star K Ranch	8/1/2012
Mule Deer	*Odocoileus hemionus*	Star K Ranch	8/1/2012
Desert Cottontail	*Sylvilagus Audobonii*	Star K Ranch	8/1/2012
Fox Squirrel	*Sciurus niger*	Star K Ranch	8/1/2012
Mule Deer	*Odocoileus hemionus*	c11	8/1/2012
Black-tailed Prairie Dog	***Cynomys ludovicianus***	**c11**	**8/1/2012**
Plains Pocket Gopher	*Thomomys or Geomys*	c11	8/1/2012
Coyote	*Canis latrans*	Sand Creek Greenway E. of Tower Rd	8/1/2012
White-tailed Deer	*Odocoileus virginianus*	Sand Creek Greenway E. of Tower Rd	8/1/2012
Black-tailed Prairie Dog	***Cynomys ludovicianus***	**Sand Creek Greenway E. of Tower Rd**	**8/1/2012**
Raccoon (tracks)	*Procyon lotor*	Sand Creek Greenway N. Highway 30	8/6/2012
Fox Squirrel	*Sciurus niger*	Sand Creek Greenway N. Highway 30	8/6/2012
Mule Deer (tracks)	*Odocoileus hemionus*	Sand Creek Greenway N. Highway 30	8/6/2012
Black-tailed Prairie Dog	***Cynomys ludovicianus***	**Sand Creek Greenway N. Highway 30**	**8/6/2012**

Common Name	Scientific Name	Parcel No.	Date
Plains Pocket Gopher	*Geomys bursarius*	Sand Creek Greenway N. Highway 30	8/6/2012
Mule Deer (tracks)	*Odocoileus hemionus*	c62	6/3/2013
Raccoon (tracks)	*Procyon lotor*	c62	6/3/2013
Pla1ns Pocket Gopher	*Geomys bursarius*	c62	6/3/2013
Pla1ns Pocket Gopher	*Geomys bursarius*	c68	6/18/2013
Black-tailed Prairie Dog	***Cynomys ludovicianus***	**c72**	**6/19/2013**
Mule Deer (tracks)	*Odocoileus hemionus*	Pronghorn Open Space North of Quincy	6/20/2013
Raccoon (tracks)	*Procyon lotor*	Pronghorn Open Space North of Quincy	6/20/2013
Coyote (scat)	*Canis latrans*	Pronghorn Open Space North of Quincy	6/20/2013
Mule Deer (two fawns)	*Odocoileus hemionus*	Pronghorn Open Space South of Quincy	6/20/2013
Long-tailed Weasel	*Mustela frenata*	Pronghorn Open Space South of Quincy	6/20/2013
Black-tailed Prairie Dog	***Cynomys ludovicianus***	**Pronghorn Open Space South of Quincy**	**6/20/2013**
REPTILES			
Plains Garter Snake	Thamnophis radix	c62	6/3/2013
VASCULAR PLANTS			
Spotted ladysthumb	*Polygonum persicaria*	Star K Open Space; Sand Creek Greenway	8/1/2012
Kochia	*Bassia sieversiana (Kochia scoparia)*	entire site	6/18-20/2013
Canada thistle	*Breea (Cirsium) arvense*	entire site	6/18-20/2013
Smooth brome	*Bromus inermis*	entire site	6/18-20/2013
Cheatgrass	*Bromus tectorum*	entire site	6/18-20/2013
Nebraska sedge	*Carex nebrascensis*	entire site	6/18-20/2013
Black sedge	*Carex praegracilis*	entire site	6/18-20/2013
Beaked sedge	*Carex utriculata*	entire site	6/18-20/2013
Poison hemlock	*Conium maculatum*	entire site	6/18-20/2013
Bindweed	*Convolvulus arvensis*	entire site	6/18-20/2013
Houndstongue	*Cynoglossum officinale*	entire site	6/18-20/2013
Teassel	*Dipsacus fullonum*	entire site	6/18-20/2013
Russian olive	*Elaeagnus angustifolia*	entire site	6/18-20/2013
Spikerush	*Eleocharis palustris*	entire site	6/18-20/2013
Slender wheatgrass	*Elymus trachycaulus*	entire site	6/18-20/2013
Scouringrush horsetail	*Equisetum hyemale* var. *affine*	entire site	6/18-20/2013
Golden-aster	*Heterotheca villosa*	entire site	6/18-20/2013
Foxtail grass	*Hordeum jubatum*	entire site	6/18-20/2013
Baltic rush	*Juncus balticus*	entire site	6/18-20/2013

Common Name	Scientific Name	Parcel No.	Date
Common duckweed	*Lemna minor*	entire site	6/18-20/2013
Blue flax	*Linum perenne*	entire site	6/18-20/2013
Alfalfa	*Medicago sativa*	entire site	6/18-20/2013
Yellow sweetclover	*Melilotus officinale*	entire site	6/18-20/2013
Scotch thistle	*Onopordum acanthium*	entire site	6/18-20/2013
Switchgrass	*Panicum virgatum*	entire site	6/18-20/2013
Western wheatgrass	*Pascopyrum smithii*	entire site	6/18-20/2013
Kentucky bluegrass	*Poa pratensis*	entire site	6/18-20/2013
Smartweed	*Polygonum ambibium*	entire site	6/18-20/2013
Plains cottonwood	*Populus deltoides* ssp. *monilifera*	entire site	6/18-20/2013
Cursed buttercup	*Ranunculus sceleratus* var. *multifidus*	entire site	6/18-20/2013
Skunk brush	*Rhus trilobata*	entire site	6/18-20/2013
Arumleaf arrowhead	*Sagittaria cuneata*	entire site	6/18-20/2013
Peach-leaf willow	*Salix amygdaloides*	entire site	6/18-20/2013
Coyote willow	*Salix exigua*	entire site	6/18-20/2013
Crack willow	*Salix fragilis*	entire site	6/18-20/2013
Bulrush	*Schoenoplectus acutus*	entire site	6/18-20/2013
Three-square	*Scirpus pungens*	entire site	6/18-20/2013
Cultivated ryegrass	*Secale cereale*	entire site	6/18-20/2013
Sago pondweed	*Stuckenia pectinata*	entire site	6/18-20/2013
Leafy spurge	*Tithymalus (Euphorbia) esula*	entire site	6/18-20/2013
Narrowleaf cattail	*Typha angustifolia*	entire site	6/18-20/2013
Broadleaf cattail	*Typha latifolia*	entire site	6/18-20/2013
Cowpen daisy	*Verbesina enceloides*	entire site	6/18-20/2013
Water speedwell	*Veronica anagallis-aquatica*	entire site	6/18-20/2013