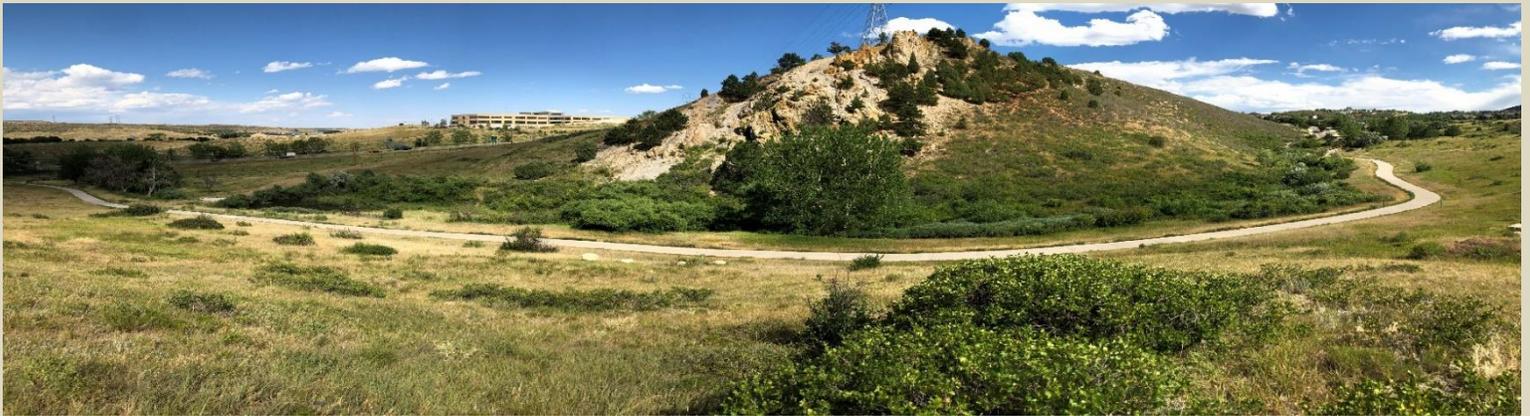




Biological Survey of Golden Open Space Property Jefferson County, Colorado



February 2021

CNHP's mission is to advance the conservation of Colorado's native species and ecosystems through science, planning, and education for the benefit of current and future generations.

Colorado Natural Heritage Program
Warner College of Natural Resources
Colorado State University

Report Prepared for:
Stewards of Golden Open Space
Golden, Colorado

Recommended Citation:

Sovell, J. R, and S. S. Panjabi. 2021. Survey of Golden Open Space Property Jefferson County, Colorado. Colorado Natural Heritage Program, Colorado State University, Fort Collins, Colorado.

Front Cover: Photos top to bottom: Kinney Run Open Space. © Jessica Smith, Kinney Run Open Space © John Sovell, and Kinney Run Open Space © Susan Panjabi.

Biological Survey of Golden Open Space Property Jefferson County, Colorado

John R. Sovell and Susan S. Panjabi

Colorado Natural Heritage Program
Warner College of Natural Resources

Colorado State University
Fort Collins, Colorado 80523



February 2021

Page Intentionally Left Blank

EXECUTIVE SUMMARY

The City of Golden owns 400 acres of Colorado's rarest and most threatened ecological zones: the Rocky Mountain foothills transition zone, a zone of diverse topography and landscape with montane foothill shrubland native grasslands and riparian woodland and shrubland. Threats include fragmentation from trails, roads, and other development near urban areas, overuse from recreation, and invasive species. Front Range foothill grasslands are included among the most imperiled ecosystems in Colorado due to residential and commercial development within this zone.

Stewards of Golden Open Space contracted with Colorado State University - Colorado Natural Heritage Program (CNHP) to provide a survey of significant ecological resources under license by the City of Golden within a subset of public open space properties and the privately-owned Stonebridge HOA open space. These sites were selected because they were identified by both the Stewards of Golden Open Space and CNHP as priorities for natural resource inventory. Selected sites surveyed amount to approximately 115 acres in size and represent approximately 30 percent of open space within the City of Golden.

The open space properties and the Stonebridge HOA property visited during this survey feature assemblages of plants that include grassland, shrubland, riparian areas, and rocky ridgelines. Undeveloped front range foothills are essential to provide habitat for rare species. This was supported by finding three rare plant species during the survey including the documentation of two new rare species and the previously documented occurrence of Ute Lady's tresses (*Spiranthes diluvialis*) a federally listed threatened species. This survey does not represent a multiple season survey and given the dry year in 2020, it is likely more species are present. A diversity of habitats that support a high degree of biodiversity were documented at the properties surveyed. This diversity gives these sites the capacity to support many plants that require highly specific habitats as well as animals that require a range of habitats. The abundance of plant and animal species recorded from the sites is indicative of their current good condition.

Maintaining or improving upon the quality of these natural areas in the face of increasing recreational and developmental pressures will be a challenge. The foremost consideration is protecting the plant and wildlife habitat that currently occurs on these open spaces. Conserving the current condition of the habitat and protecting intact habitat from fragmentation by new trails will be important for natural areas planning and management. Recommendations specific to the surveyed open space properties are:

- Protect the grassland, riparian woodland, and shrublands and avoid disturbing and fragmenting large patches of natural habitat.
- Deploy signage, field guides, and other interpretive resources with natural history information to help visitors connect with and appreciate plants and other elements of biodiversity and to educate the public on the sensitivity of the plants and wildlife species inhabiting the property and the need to stay on trail.
- Consider restricting recreation activities within severe winter range to avoid disturbing elk and mule deer during winter.
- Additional surveys, such as aquatic insects and pollinators, and conduct plant and wildlife surveys during additional seasons.

- Recognize the connection of Golden open space communities to the broader landscape and coordinate with adjacent land owners on issues that are common to open spaces across public and private ownership, such as endangered and threatened species, invasive weeds and recreation management.

ACKNOWLEDGEMENTS

Funding for this project was provided by the Stewards of Golden Open Space. Special recognition goes to Ann Norton, Jonathan Storer, and Tom Schweich for their guidance and support in project implementation. Thanks also goes to Jessica Smith, CNHP Botanist, and Zachariah Wilson, CNHP Intern for their assistance in the field. Pam Smith, CNHP Botanist provided critical assistance with plant identification. Tom Baldvins, CNHP Ecologist, provided important assistance with Arc Collector, which enabled accurate navigation and mapping for the project. Jill Handwerk, CNHP Botany and Vegetation Ecology Team Leader, was responsible for integrating results with the CNHP BIOTICS database. Helena Bitner, CNHP Intern, assisted with the development of rare plant species profiles.

We would also like to thank the following CNHP staff: Dave Anderson, Amy Greenwell, and Michael Menefee for their administrative and technical support of the project. This project contributed to CNHP's ongoing biological assessment of Jefferson County for the Jefferson County Open Space Department, and contributed important data to CNHP's Biotics Database.

ABOUT CNHP

CNHP was created in 1979 (then known as the Colorado Natural Features Inventory) to identify and describe areas of statewide and global conservation significance and to educate decision makers regarding the impacts of various land use options. In 1994, CNHP moved from the Museum of Natural History at the University of Colorado to our current home in the Warner College of Natural Resources at Colorado State University. We currently have a staff of over 30 botanists, ecologists, zoologists, spatial analysts, database developers, and conservation planners.

CNHP is Colorado's only comprehensive source of information on the status and location of Colorado's rarest and most threatened species and plant communities. We share information with a wide range of stakeholders in partnerships that work to ensure that Colorado's biodiversity resources are not diminished. CNHP has an enormous impact on conservation in Colorado through these partnerships.

CNHP tracks and ranks Colorado's rare and imperiled species and habitats and provides scientific information and expertise to promote the conservation of Colorado's wealth of biological resources. CNHP is a non-profit scientific organization affiliated with the Warner College of Natural Resources at Colorado State University. Our staff scientists conduct inventories for rare animals, plants, wetlands, riparian areas, and plant communities at the scale of a single parcel all the way to an entire County. Identifying and describing locations of Colorado's rarest species and habitats is critical for supporting conservation activities statewide. Information from these projects has been instrumental in some of Colorado's biggest conservation successes over the past 30 years, such as the Mountains-to-Plains project in Larimer County and the enlargement of Great Sand Dunes National Park and Preserve in Southern Colorado (<https://cnhp.colostate.edu/>).

TABLE OF CONTENTS

EXECUTIVE SUMMARY.....	v
ACKNOWLEDGEMENTS	vii
ABOUT CNHP	vii
INTRODUCTION	1
Site Description	2
METHODS.....	4
Plant Surveys	4
Wildlife Surveys	6
RESULTS.....	10
Plant Resources	11
Wildlife Resources	12
Bird Community.....	12
Ungulates	12
Butterfly Community	14
Plant communities.....	15
DISCUSSION	16
RECOMMENDATIONS.....	18
Weed Management in Natural Areas	20
REFERENCES	23
APPENDIX 1	27
Natural Heritage Status Ranks	28
Legal Designations for Rare Species	29
Element Occurrences and their Ranking.....	31
Potential Conservation Areas	32
Ranking of Potential Conservation Areas.....	33
Protection Urgency Ranks	33
Management Urgency Ranks	34
APPENDIX 2	36
APPENDIX 3	49
<i>Physaria x 1</i>	50
Taxonomic Comments.....	53

Ranks and Status 53

Description and Phenology..... 53

Habitat..... 54

Distribution..... 55

Threats and Management Issues..... 56

References..... 56

Smilax lasioneura..... 57

Rank and Status..... 57

Description and Phenology..... 57

Distribution..... 57

References..... 60

LIST OF FIGURES

Figure 1. Location of the City of Golden in Jefferson County, Colorado. 1

Figure 3. Location of the surveyed open space properties and their major ecological systems (Lowry et al. 2005). 2

Figure 3. View of the Foothill and Piedmont Grassland community at the Kinney Run site. 3

Figure 4. Elk and Mule Deer activity maps within the area of the surveyed open spaces (Colorado Parks and Wildlife 2020). 13

Figure 5. Common hop (*Humulus lupulus*) location on Stonebridge HOA open space. 14

Figure 6. Average temperature increases in Colorado in relation to average temperature changes across the country. From the National Oceanic and Atmospheric Association as highlighted in the article “This giant climate hot spot is robbing the West of its water”, the Washington Post, August 7, 2020. 17

LIST OF TABLES

Table 1. Open space properties surveyed by the Colorado Natural Heritage Program within the City of Golden. 3

Table 2. Surveyed open space rare plant community and plant survey target List. 4

Table 3. Surveyed open space rare wildlife target list. 6

Table 4. Bird species guilds used to calculate IBI scores. 9

Table 5. Guilds and ranking system for two of the six trophic guilds used to calculate bird IBI scores based on O'Connell et al. (2003). The specialist guild is indicated with an asterisk (*) and the other is a generalist guild. 9

Table 6. Rare plant species observed in 2020 at all the surveyed open spaces. 10

Table 7. Rare bird species observed in 2020 at all the surveyed open spaces as recorded on eBird. 10

Table 7. Definition of Natural Heritage Imperilment Ranks. 29

Table 8. Federal and State Agency Special Designations for Rare Species. 30

Table 9. Element Occurrence Ranks and their Definitions. 32

Table 10. Natural Heritage Program Biological Diversity Ranks and their Definitions. 33

Table 11. Natural Heritage Program Protection Urgency Ranks and their Definitions 34

Table 12. Natural Heritage Program Management Urgency Ranks and their Definitions 35

INTRODUCTION

The City of Golden is located approximately 7.5 miles west of Denver, Colorado (Figure 1). The Stewards of Golden Open Space contracted with Colorado State University - Colorado Natural Heritage Program (CSU-CNHP) to provide a survey of the biological resources under license by the City of Golden within a subset of public open space properties and adjacent privately-owned open space of the Stonebridge Home Owners Association (HOA) with permission of the HOA. The City of Golden is located next to the eastern edge of the Rocky Mountains. The City maintains 556 acres of parkland and open space with over 25 different sites and 24 miles of trails (City of Golden 2016). Of that approximately 402 acres are “open space” though the City has no formal designation thereof (City of Golden, 2020). There are an additional 8,000 acres of regional open space within the area surrounding the City. The City of Golden Parks Division manages City open space for recreation and to preserve and improve the natural environment while preventing the development of sensitive natural areas (City of Golden 2008).

A delay in contracting did not allow for early spring and summer field work excluding survey for some early occurring species. Additional survey work performed at the appropriate time of the year is warranted to assure coverage of all the rare and imperiled species with the potential to inhabit the open spaces and to compile a more complete species list.

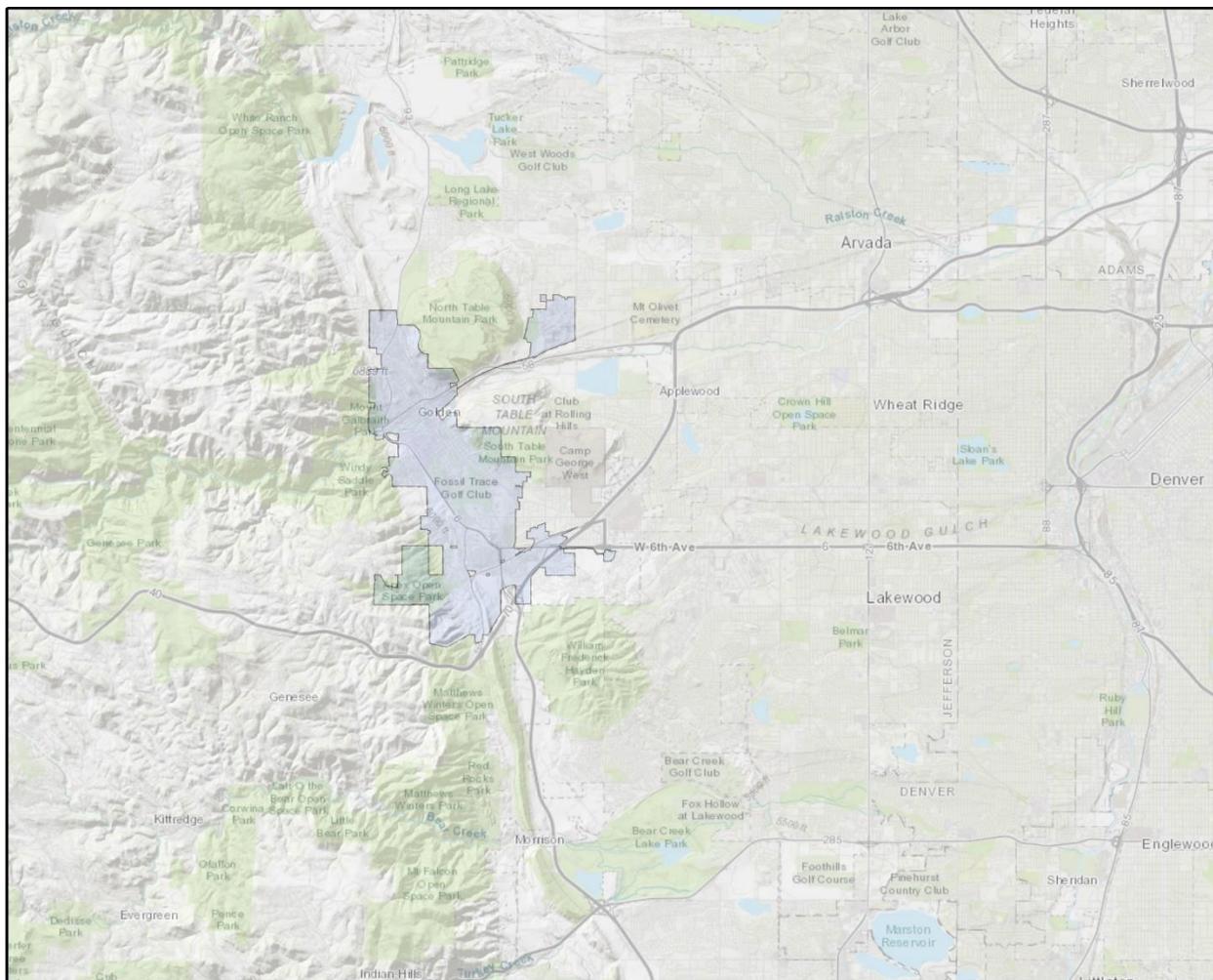


Figure 1. Location of the City of Golden in Jefferson County, Colorado.

Site Description

The City of Golden is located next to Colorado's Rocky Mountain complex. The open space properties surveyed included Clear Creek¹, Kinney Run, North Washington open space, and Stonebridge HOA (Figure 2). These properties contain diverse topography and a landscape dominated by montane foothill shrubland (23 acres), native grasslands (29 acres), riparian woodland and shrubland (24 acres), and invasive perennial grasslands (19 acres) (Table 1 and Figure 2) the sites were selected because they were identified by both the Stewards of Golden Open Space and the City of Golden as priorities for natural resource inventory and because access by CNHP biologists to these areas was granted by the City. The surveyed sites represent approximately 30 percent of open space within the City of Golden. Elevation of the sites ranges from 5,700 feet along Clear Creek to 6,200 feet at Stonebridge HOA.

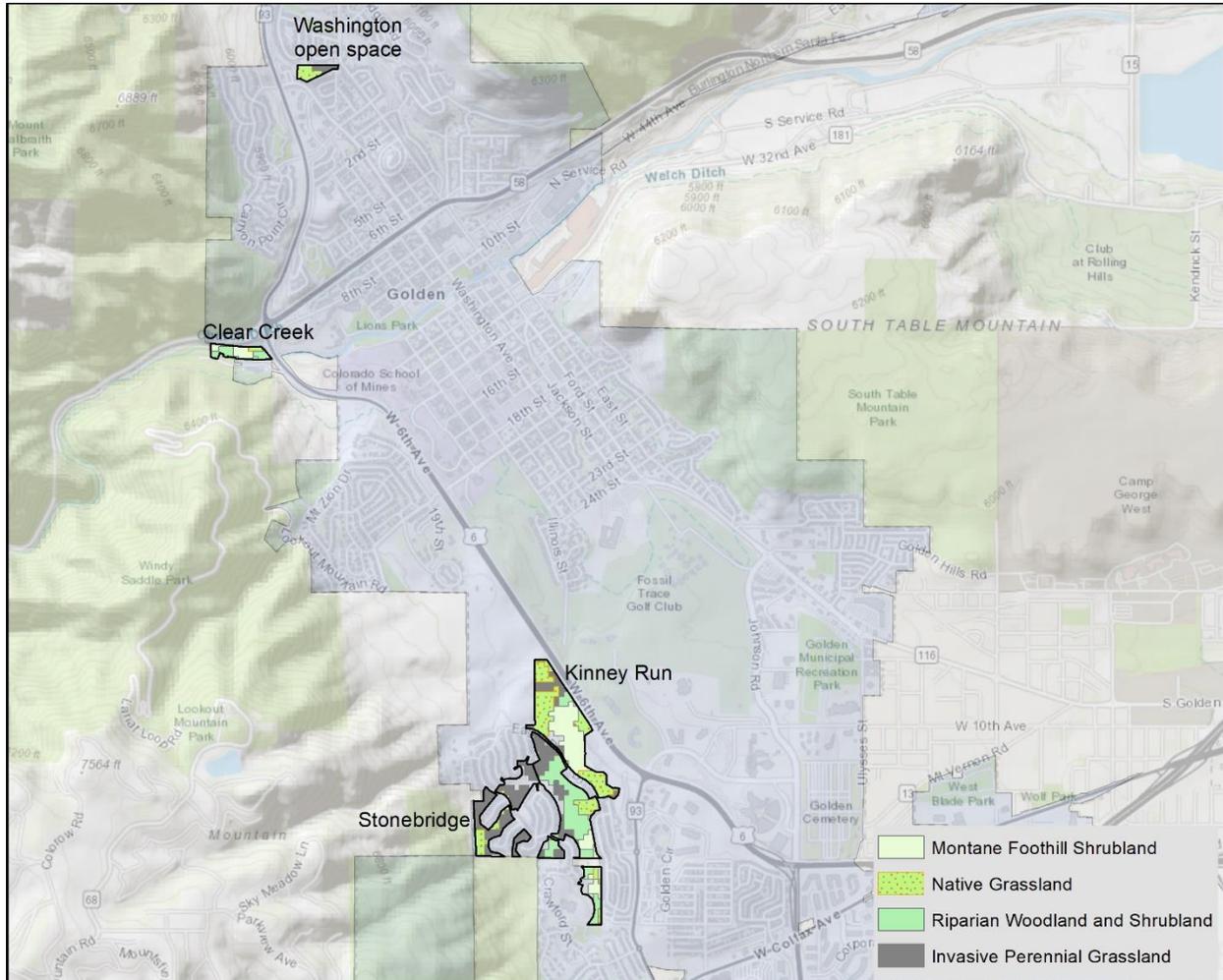


Figure 3. Location of the surveyed open space properties and their major ecological systems (Lowry et al. 2005).

¹ The Clear Creek property was surveyed only from open, in-use, public trails.

Table 1. Open space properties surveyed by the Colorado Natural Heritage Program within the City of Golden.

PROPERTY NAME	VEGETATION	SIZE IN ACRES ¹
Clear Creek	Rocky Mountain Lower Montane Riparian Woodland and Shrubland	3.0
	Rocky Mountain Gambel Oak-Mixed Montane Shrubland	2.0
	Western Great Plains Foothill and Piedmont Grassland	0.7
	Rocky Mountain Lower Montane-Foothill Shrubland	0.7
Kinney Run	Western Great Plains Foothill and Piedmont Grassland	21
	Western Great Plains Riparian Woodland and Shrubland	19
	Rocky Mountain Lower Montane-Foothill Shrubland	19
	Invasive Perennial Grassland	13
North Washington open space	Western Great Plains Foothill and Piedmont Grassland	4
Stonebridge HOA	Western Great Plains Foothill and Piedmont Grassland	4
	Western Great Plains Riparian Woodland and Shrubland	2
	Invasive Perennial Grassland	16

The areas surveyed support a rich diversity of plants and animals. Within the boundaries of the sites surveyed three major ecosystems come together: 1) Western Great Plains Foothill and Piedmont Grassland (Figure 3); 2) Rocky Mountain Lower Montane – Foothill Shrubland; and the 3) Rocky Mountain Lower Montane Riparian Woodland and Shrubland. Each system is further subdivided into several different plant communities or associations some of which are described and tracked by CNHP. For example, the Western Great Plains Foothill and Piedmont Grassland ecosystem includes 15 different plant associations (Decker et al. 2020). I Washington Open Space includes native grasslands, Clear Creek and Kinney Run contain Riparian Woodland Shrubland communities with Invasive Perennial Grassland Systems prevalent at Stonebridge HOA. (Figure 3).



Figure 3. View of the Foothill and Piedmont Grassland community at the Kinney Run site.

METHODS

A baseline inventory for plants, wildlife, and plant communities was conducted utilizing visual encounter surveys and targeting rare, at-risk species, and rare communities. These surveys involved walking each survey site and recording the species and plant communities encountered (Cutko 2009). This allowed surveyors to cover a greater area at each site and to perform more extensive search efforts in specific locations most suitable for rare taxon. For example, riparian ravines, where the rare Hops Azure butterfly (*Celestrina humulus*) would only occur were specifically targeted as were other locations particularly suitable for other butterflies listed in Table 1. Qualitative encounter surveys were used because they tend to produce significantly more species identifications per unit effort, particularly for rare species, than do qualitative transect surveys (Guralnick et al. 2017, Jetz et al. 2019).

Plant Surveys

Prior to conducting fieldwork, we developed a target list of plants of special conservation interest, targeting species known from the area that are tracked by the Colorado Natural Heritage Program (CNHP) such as: Rydberg twinpod (*Physaria vitulifera*), Forked three-awn grass (*Aristida basiramea*), Ute lady’s tresses orchid (*Spiranthes diluvialis*), Front Range milkvetch (*Astragalus sparsiflorus*), Rocky Mountain phacelia (*Phacelia denticulata*), Colorado butterfly plant (*Oenothera coloradensis*), Rocky Mountain polypody (*Polypodium saximontanum*), and others (Table 2). We also referred to detailed plant lists provided by Tom Schweich (2020a-c). Species considered to be non-native plants that were evident on the dates of our visits, including Colorado State Listed noxious weeds were recorded as found, because of their potential management concerns.

The selected City of Golden sites included Clear Creek, Kinney Run, North Washington, and Stonebridge HOA parcels (**Figure 2**). They were visited on July 24 (Susan Panjabi, Jessica Smith, Tom Schweich, and Zac Wilson), August 10 (Susan), and August 11 (Susan, Tom, and Zac) of 2020 to identify significant botanical resources present in the area. The goals of the project were to: identify potential conservation targets (i.e., rare plant and animal species, and plant communities), provide a final report and maps summarizing location and population information on any rare species, as well as the dominant plant communities and zoological information, and provide a GIS layer of all rare species locations along with relevant management recommendation.

Table 2. Surveyed open space rare plant community and plant survey target List.

SCIENTIFIC NAME	COMMON NAME
Plant Communities	
<i>Alnus incana</i> / Mesic Forb Shrubland	Thinleaf Alder / Mesic Forb Riparian Mixed Foothills Shrubland
<i>Andropogon gerardii</i> - <i>Schizachyrium scoparium</i> Western Great Plains Herbaceous Vegetation	Big Bluestem – Little Bluestem Xeric Tallgrass Prairie
<i>Andropogon gerardii</i> – <i>Sporobolus heterolepis</i> Western Foothills Herbaceous Vegetation	Big Bluestem – Prairie Dropseed Xeric Tallgrass Prairie
<i>Calamagrostis canadensis</i> Western Herbaceous	Bluejoint Reedgrass Montane Wet Meadow
<i>Carex nebrascensis</i> Herbaceous Vegetation	Nebraska Sedge Wet Meadow
<i>Cercocarpus montanus</i> / <i>Hesperostipa comata</i> Shrubland	Needle-and-Thread Grass Mixed Foothill Shrubland
<i>Danthonia parryi</i> Herbaceous Vegetation	Parry’s Oatgrass Montane Grassland
<i>Hesperostipa comata</i> Colorado Front Range Herbaceous Vegetation	Needle-and-Thread Mixed Grass Prairie

SCIENTIFIC NAME	COMMON NAME
<i>Juniperus scopulorum</i> / <i>Cercocarpus montanus</i> Woodland	Rocky Mountain Juniper / Mountain-mahogany Foothills Woodland/ Scarp Woodland
<i>Picea pungens</i> / <i>Alnus incana</i> Woodland	Blue Spruce /Thinleaf Alder Montane Riparian Forest
<i>Picea pungens</i> / <i>Betula occidentalis</i> Woodland	Blue Spruce / Birch Montane Riparian Woodland
<i>Pinus flexilis</i> / <i>Arctostaphylos uva-ursi</i>	Limber Pine/Kinnikinnik Lower Montane Woodland
<i>Pinus ponderosa</i> / <i>Alnus incana</i> Woodland	Ponderosa pine / Thinleaf Alder Woodland
<i>Pinus ponderosa</i> / <i>Arctostaphylos uva-ursi</i>	Ponderosa Pine/Kinnikinnik Lower Montane Forest
<i>Pinus ponderosa</i> / <i>Cercocarpus montanus</i> / <i>Andropogon gerardii</i>	Foothills Ponderosa Pine Scrub Woodlands
<i>Pinus ponderosa</i> / <i>Cercocarpus montanus</i>	Foothills Ponderosa Pine Scrub Woodlands
<i>Pinus ponderosa</i> / <i>Leucopoa kingii</i>	Foothills Ponderosa Pine Savannas
<i>Pinus ponderosa</i> / <i>Muhlenbergia montana</i>	Foothills Ponderosa Pine Savannas
<i>Pinus ponderosa</i> / <i>Quercus gambelii</i>	Foothills Ponderosa Pine Scrub Woodlands
<i>Populus angustifolia</i> / <i>Alnus incana</i> Woodland	Narrowleaf Cottonwood/ Thinleaf Alder Montane Riparian Forest
<i>Populus angustifolia</i> - <i>Pseudotsuga menziesii</i> Woodland	Narrowleaf Cottonwood – Douglas Fir Montane Riparian Forest
<i>Populus angustifolia</i> / <i>Salix drummondiana</i> - <i>Acer glabrum</i> Woodland	Narrowleaf Cottonwood / Drummond Willow – Rocky Mountain Maple
<i>Populus tremuloides</i> / <i>Corylus cornuta</i> Forest	Quaking Aspen / Beaked Hazelnut Montane Riparian Forest
<i>Pseudotsuga menziesii</i> / <i>Betula occidentalis</i> Woodland	Douglas Fir / Water Birch Montane Riparian Forest
<i>Pseudotsuga menziesii</i> / <i>Carex geyeri</i> Forest	Douglas Fir / Geyer’s Sedge Lower Montane Forest
<i>Pseudotsuga menziesii</i> / <i>Jamesia americana</i>	Douglas Fir/ Waxflower Lower Montane Forests
<i>Salix monticola</i> / <i>Calamagrostis canadensis</i> Shrubland	Rocky Mountain Willow / Bluejoint Reedgrass Montane Willow Carr
<i>Salix monticola</i> / <i>Carex utriculata</i> Shrubland	Rocky Mountain Willow / Beaked Sedge Montane Riparian Willow Carr
<i>Salix monticola</i> /Mesic Forbs Shrubland	Rocky Mountain Willow Montane Riparian Willow Carr
Plants	
<i>Agastache foeniculum</i>	Lavender hyssop
<i>Amorpha nana</i>	Dwarf wild indigo
<i>Aquilegia chrysantha</i> var. <i>rydbergii</i>	Golden columbine
<i>Aquilegia saximontana</i>	Rocky Mountain columbine
<i>Aristida basiramea</i>	Forked three-awn grass
<i>Astragalus sparsiflorus</i>	Front Range milkvetch
<i>Carex conoidea</i>	Openfield sedge
<i>Carex peckii</i>	Peck’s sedge
<i>Carex saximontana</i>	Rocky Mountain sedge
<i>Carex sprengeii</i>	Longbeak sedge
<i>Carex torreyi</i>	Torrey's sedge
<i>Claytonia rubra</i>	Redstem spring beauty
<i>Crataegus chrysoarpa</i>	Yellow hawthorn
<i>Cypripedium calceolus</i> ssp. <i>parviflorum</i>	American yellow lady's-slipper
<i>Geranium bicknellii</i>	Bicknell's northern crane's-bill
<i>Heuchera hallii</i>	Front Range alum-root

SCIENTIFIC NAME	COMMON NAME
<i>Hippochaete variegata</i>	Variegated horsetail
<i>Juncus vaseyi</i>	Vasey's rush
<i>Lilium philadelphicum</i>	Wood lily
<i>Malaxis monophyllos ssp. brachypoda</i>	White adder's-mouth
<i>Mimulus gemmiparus</i>	Weber's monkeyflower
<i>Nuttallia speciosa</i>	Jeweled blazingstar
<i>Oenothera coloradensis ssp. coloradensis</i>	Colorado butterfly plant
<i>Phacelia denticulata</i>	Rocky Mountain phacelia
<i>Physaria vitulifera</i>	Rydberg twinpod
<i>Physaria x 1</i>	Twinpod
<i>Polypodium saximontanum</i>	Rocky Mountain polypody
<i>Potentilla ambigens</i>	Southern Rocky Mountain cinquefoil
<i>Ribes americanum</i>	American current
<i>Selaginella weatherbiana</i>	Weatherby's spikemoss
<i>Sisyrinchium demissum</i>	Blue-eyed grass
<i>Smilax lasioneura</i>	Blue Ridge carrionflower
<i>Spiranthes diluvialis</i>	Ute lady's-tresses
<i>Telesonix jamesii</i>	James's false saxifrage
<i>Viola pedatifida</i>	Prairie violet

Wildlife Surveys

A target list of rare wildlife with potential to occur on the sites surveyed was prepared using information from a literature review and data from the Colorado Natural Heritage Program BIOTICS database (Colorado Natural Heritage Program 2020). The list of the animal target species developed for this survey is provided in Table 3.

Table 3. Surveyed open space rare wildlife target list.

SCIENTIFIC NAME	COMMON NAME	TRAKING STATUS	CNHP * RANK
Amphibians			
<i>Lithobatis pipiens</i>	Northern leopard frog		G5 S3
Birds			
<i>Accipiter gentilis</i>	Northern Goshawk	W	G5S3B
<i>Catharus fuscescens</i>	Veery	W	G5S3B, SZN
<i>Cypseloides niger</i>	Black Swift	F	G4S3B
<i>Empidonax traillii</i>	Willow Flycatcher	W	G5S4B, S4N
<i>Falco mexicanus</i>	Prairie Falcon	W	G5S4B, S4N
<i>Falco peregrinus anatum</i>	American Peregrine Falcon	F	G4T4S2B
<i>Haliaeetus leucocephalus</i>	Bald Eagle	F	G5S1B,S3N
<i>Loxia leucoptera</i>	White-winged Crossbill	W	G5S1B,SZN
<i>Numenius americanus</i>	Long-billed Curlew	F	G5S2B
<i>Seiurus aurocapillus</i>	Ovenbird	F	G5S2B
<i>Tympanuchus phasianellus jamesi</i>	Plains Sharp-tailed Grouse	F	G4T4S1
<i>Melanerpes lewis</i>	Lewis's Woodpecker	F	G4S3
Lepidoptera			
<i>Agapema homogena</i>	Rocky Mountain agapema	F	G4S2
<i>Atrytone arogos</i>	Arogos Skipper	F	G3S2
<i>Callophrys mossii schryveri</i>	Moss's Elfin	F	G4T3S2S3
<i>Celastrina humulus</i>	Hops Feeding Azure	F	G2G3S2

SCIENTIFIC NAME	COMMON NAME	TRAKING STATUS	CNHP * RANK
<i>Cicindela nebraskana</i>	A Tiger Beetle	F	G4S1?
<i>Coloradia luski</i>	Lusk's pinemoth	F	G4S1?
<i>Doa ampla</i>	A Moth	F	GNRS1
<i>Erynnis martialis</i>	Mottled Dusky Wing	F	G3S2S3
<i>Hesperia leonardus montana</i>	Pawnee Montane Skipper	F	G4T1S1
<i>Hesperia ottoe</i>	Ottoe Skipper	F	G3G4S2
<i>Pachysphinx modesta</i>	modest sphinx	F	G4G5S3?
<i>Paratrytone snowi</i>	Snow's skipper	W	G4S3
<i>Polites origenes</i>	Cross-line Skipper	F	G5S3
<i>Polites rhesus</i>	rhesus skipper	F	G4S2S3
<i>Proserpinus juanita</i>	Juanita sphinx	W	G4G5S3S4
<i>Pyrgus ruralis</i>	two-banded checkered-skipper	W	G5S3
<i>Pyrgus xanthus</i>	mountain checkered-skipper	F	G3G4S3
<i>Speyeria idalia</i>	Regal Fritillary	F	G3S1
<i>Sphinx drupiferarum</i>	wild cherry sphinx moth	F	G4S3
<i>Sphinx perelegans</i>	elegant sphinx moth	F	G4G5S1?
<i>Stinga morrisoni</i>	Morrison's skipper	F	G4G5S3S4
<i>Grammia sp. 1</i>	A Tiger Moth	F	G2G3SNR
Mammals			
<i>Cynomys ludovicianus</i>	black-tailed prairie dog	F	G4S3
Odonata			
<i>Hesperagrion heterodoxum</i>	Painted damsel	F	G5S1
<i>Plathemis subornata</i>	desert whitetail	F	G4S4
<i>Somatochlora ensigera</i>	plains emerald	F	G4S1
<i>Stylurus intricatus</i>	brimstone clubtail	F	G4S2
<i>Sympetrum costiferum</i>	safron-winged meadowhawk	F	G5S1?
Reptiles			
<i>Eumeces multivirgatus multivirgatus</i>	many-lined skink	F	G5T5S4
<i>Phrynosoma hernandesi</i>	short-horned lizard	W	G5S5
<i>Tropidoclonion lineatum</i>	lined snake	W	G5S3

*Information on the Global, State, and Federal rankings are provided in Appendix 1.

Systematic ground searches were conducted by CNHP Wildlife Biologist John Sovell on July 29 and 30, 2020. The systematic ground searches consisted of surveying each of the open space sites (Figure 3). The investigator walked each survey site at a slow pace to find song birds, mammals, raptors, raptor sign (nests, whitewash, prey remains, molted feathers, plucking posts), reptiles, and insects. Butterflies were captured when possible with a sweep net and identified to species. Search efforts in specific habitats most suitable for rare taxon were emphasized during the ground surveys.

Field notations were recorded in a field notebook during the field survey. The information recorded included the location, date, UTM coordinates (collected in NAD 83, Zone 13) for any observations of CNHP tracked wildlife, active or inactive raptor nests, and signs of raptor activity including the occurrence of whitewash.

To evaluate trends over time in the bird community at the surveyed open spaces between the current year's survey and any future surveys, we calculated a Bird Index of Biotic Integrity (IBI) (O'Connell et al. 2003). Avian guilds, or groups of species fulfilling similar roles in the environment, are diverse and can be utilized for assessing response to environmental changes and ecosystem stressors. These guilds can be defined based on foraging behavior and substrate, nesting substrate, migratory

distance, and various other life history traits. An example is the Bald eagle (*Haliaeetus leucocephalus*) fulfilling the role of an apex predator that feeds on fish living in shallow waters as well as rabbits, ground squirrels, raccoons, and young deer. Changes in ecological condition can variably impact avian guilds, resulting in alterations to the bird community (Johnson 2014). Indices of bird biological integrity (IBIs), yield a quantitative metric that can be used to define the ecological integrity of a sampled area based on the avian community present. IBIs assume that changes in habitat quality or extent, upon which a specific guild is dependent, result in corresponding changes in the representation of that guild within the overall bird community. Within the IBI, guilds are ranked based on specialization, with specialist guilds receiving higher weight over generalist guilds. This ability to use the bird community to reflect ecological condition, particularly in urban areas where impacts can be multi-faceted, provides a valuable and informative indicator for monitoring programs (Johnson 2014).

The bird IBI used here is based on the methodology developed for bird communities of the mid-Atlantic Highlands. It is important to note that the bird IBI was modified from O'Connell et al. (2003) to reflect the land-use and habitat types on the open spaces surveyed (e.g., grasslands, shrublands, riparian areas, and rocky ridges). Specialist guilds included in the IBI tend to be associated with extensive grass, tree, and riparian cover. Therefore, higher IBI scores reflect bird communities associated with aspects of mature grasslands, shrublands, riparian area, function and composition. For example, sites with higher bird IBI scores consist of a bird community with more grassland and riparian-dependent species, ground gleaners, long distance migrants, and single-brooded or open ground nesters (i.e., specialists) but with fewer omnivores, exotic/non-natives, nest predators/brood parasites, temperate migrants, and resident species (i.e., generalists). The biotic or ecological "condition" described by the bird IBI then moves along a disturbance gradient from relatively intact, extensive, mature grass, shrub, and riparian land with high IBI scores to more disturbed, developed, or urban areas with low IBI scores. The response guilds incorporated into the bird IBI are listed in Table 4. An extensive discussion for why these guilds are chosen over others can be found in Appendix E of Marshall et al. (2016).

The IBI score represents the sum of the rank scores; scores determined by the proportion of species detected in each specialist and generalist guild at the surveyed open spaces. An example of the ranking protocol for one specialist and one generalist guild are presented in Table 5. The integrity represented by the IBI score is based upon a theoretical bird community of the highest integrity at the surveyed open spaces receiving a maximum IBI score of 87 and the theoretical minimum community, a score of 23, which corresponds to species from "specialist guilds" being detected at their highest ranked proportion and species from "generalist guilds" being detected at their lowest ranked proportion (Table 4). These scores are standardized by dividing by the maximum score of 87 to give a range from 0.24 to 1. Threshold levels for bird IBI scores were defined by O'Connell et al. (2003) who established thresholds that include four categories of condition corresponding to the proportional species richness of each specialist and generalist guild. For the bird IBI score at the surveyed open spaces these thresholds include the following categories:

- naturalistic (highest integrity) – score of 0.82-1.00;
- largely intact (high integrity) – score of 0.63-0.81;
- moderately disturbed (medium integrity) – score of 0.45-0.62; and
- humanisitic (low integrity) – score of 0.24-0.44.

Table 4. Bird species guilds used to calculate IBI scores.

Biotic Integrity Element	Guild Category	Response Guild	Number of Species in Guild	Guild Classification
Functional	Trophic	omnivore	56	generalist
	Insectivore Foraging Behavior	bark prober	5	specialist
		upper canopy forager	7	specialist
		lower canopy forager	15	specialist
		ground gleaner	12	specialist
		aerial screener	17	specialist
Compositional	Origin	exotic/non-native	6	generalist
	Migration Status	resident	38	generalist
		temperate migrant	35	generalist
	Number Of Broods	single-brooded	74	specialist
	Population Limiting	nest predator/brood parasite	9	generalist
Structural	Nest Placement	ground nester	22	specialist
		canopy nester	31	specialist
		shrub nester	18	generalist
	Primary Habitat	grassland dependent	7	specialist
		forest generalist	29	generalist
		interior forest obligate	10	specialist
		riparian obligate	23	specialist

Table 5. Guilds and ranking system for two of the six trophic guilds used to calculate bird IBI scores based on O'Connell et al. (2003). The specialist guild is indicated with an asterisk (*) and the other is a generalist guild.

Guild	Proportion of species detected	Rank
omnivore	0.000 - 0.290	5.0
	0.291 - 0.410	4.0
	0.411 - 0.480	3.0
	0.481 - 0.580	2.0
	0.581 - 1.000	1.0
bark prober*	0.000 - 0.060	1.5
	0.061 - 0.110	3.0
	0.111 - 0.170	4.0
	0.171 - 1.000	5.0

RESULTS

Three plant species of conservation concern are known from the survey areas. Two plant species observed include a very rare mustard (Twinpod, *Physaria x 1*) which has yet to be assigned a scientific name and an uncommon vine, Blue Ridge Carrionflower (*Smilax lasioneura*) (Table6). The twinpod mustard is only known from Jefferson County and is considered to be globally critically imperiled (GNA/S1). It is endemic to the sedimentary rock on or near Niobrara Shale and sandstone outcrops along the hogbacks. More information is needed on this species. The Blue Ridge Carrionflower vine is considered to be vulnerable to extinction on a state level (G5/S3S4) and has a restricted range along the Front Range Foothills of Colorado. These two plants are tracked by CNHP and both were observed on Kinney Run and Stonebridge HOA sample units. A federally listed threatened species has been known from the Clear Creek Open Space since 1994 and has been monitored for many years as part of a larger population along Clear Creek. The Clear Creek Open Space was surveyed by Jefferson County Ecologists in 2020 and they found 40 individuals (Pers. Comm. Anthony Massaro 08-24-2020).

Table 6. Rare plant species observed in 2020 at all the surveyed open spaces.

Scientific Name	COMMON NAME	CNHP* RANK	LOCATION	TRACKING STATUS
<i>Physaria x 1</i>	Twinpod	G1Q/S1	Kinney Run, Stonebridge HOA	Fully tracked
<i>Smilax lasioneura</i>	Blue Ridge Carrionflower	G5/S3S4	Kinney Run, Stonebridge HOA	Watchlisted
<i>Spiranthes diluvialis</i>	Ute Lady’s Tresses orchid	G2G3/S2	Clear Creek	Fully Tracked Federally Listed Threatened

*Information on the Global, State, and Federal rankings are provided in Appendix 1.

All the observed wildlife species were demonstrably secure globally (G5) and either apparently secure (S4) or secure (S5) within Colorado and none were tracked by CNHP. The most significant finding was the occurrence of Common hops (*Humulus lupulus*) on Stonebridge HOA. Common hops is the host plant for the hops feeding azure (*Celastrina humulus*), one of the rarest butterflies in Colorado. Review of eBird data from 2020 reveal numerous rare raptors and a rare shorebird, most of which are tracked by CNHP, which were observed on the open space sites surveyed (Table 7). It is unlikely that any of these birds were nesting at any of the survey sites but were rather finding suitable foraging habitat on the sites. The raptors are also probably utilizing the Apex Park butterfly closure area adjacent to some of these open spaces for foraging and potentially nesting.

Table 7. Rare bird species observed in 2020 at all the surveyed open spaces as recorded on eBird.

COMMON NAME	SCIENTIFIC NAME	CNHP* RANK	LOCATION	TRACKING STATUS
Bald Eagle	<i>Haliaeetus leucocephalus</i>	G5S1B,S3N	Clear Creek	fully tracked
Golden Eagle	<i>Aquila chrysaetos</i>	G5S3S4B,S4N	Clear Creek	not tracked
Peregrine Falcon	<i>Falco peregrinus</i>	G4S2B	Clear Creek	Fully tracked
Prairie Falcon	<i>Falco mexicanus</i>	G5S4B,S4N	Clear Creek, Kinney Run	watchlisted only
Snowy Egret	<i>Egretta thula</i>	G5S2B	Clear Creek	fully tracked

*Information on the Global, State, and Federal rankings are provided in Appendix 1.

Plant Resources

In total, we identified 144 plant taxa known from 48 plant families. Rare plant species included, new locations of an undescribed Twinpod hybrid (*Physaria x 1*, G1Q/S1, tracked by CNHP and awaiting a scientific description in the literature), and Blue Ridge Carrionflower (*Smilax lasioneura*, G5/S3S4 (watchlisted by CNHP). We documented a total of 33 plants not native to Colorado; 11 of these are on the state noxious weed list. See **Appendix 2** for a complete list of all taxa found. A confidential map showing the noteworthy locations, and more details on the Twinpod location has been provided to the Stewards of Golden Open Space as separate documents.

Our survey was conducted late in the growing season and many plants had bloomed, gone to seed or have senesced. Additional surveys are necessary to get a more complete list. The taxa on the target list are species that have the potential to be found at these survey sites. (Table 1).

North Washington open space is characterized by a diverse shortgrass prairie habitat. We observed many of the species documented by Tom Schweich (2020a). The site has a good combination of plants representative of native prairie ecosystems. This site would be excellent for teaching plains and foothill plants, as well as weeds. The size of the site is too small to warrant documentation as a CNHP plant community occurrence, and no rare plants were found.

The **Clear Creek open space**, examined only from open, public trails, supports a riparian area dominated by Cottonwood trees. Ute Ladies' Tresses orchid (*Spiranthes diluvialis*), which is a federally listed Threatened plant species, has been documented at this site, which is part of a mapped CNHP Element Occurrence. We observed a great deal of disturbance from both human and wildlife trails that included trampling, and weeds. Of particular note was the non-native Everlasting sweetpea (*Lathyrus latifolius*), which was abundant and growing over native vegetation. A native plant observation worth mentioning is Foxtail muhly (*Muhlenbergia andina*); an exciting find because it had not previously been documented in Jefferson County.

At **Kinney Run** and **Stonebridge HOA** we did not find any significant rare (CNHP tracked) plant communities, but we did find populations of two plant species on the target list: the newly discovered Twinpod hybrid of *Physaria vitulifera x bellii* known as *Physaria x 1* and Blue Ridge Carrionflower (*Smilax lasioneura*).

Physaria x 1 is the rarest plant species on the Golden Open Space properties and is globally critically imperiled. This taxon is currently known as *Physaria x 1*, which is a placeholder name in the CNHP database; this species is a relatively new to science and has yet to be named in the literature. *Physaria x 1* is only known from Colorado and more specifically only from large hogbacks along C-470. The habitat for this species is sedimentary (sandstone and limestone) outcrops. The G1Q rank is assigned by CNHP until the species is formally described. Once this happens, unless the plant is found to be more common and secure, the global rank will follow the S1 rank, and will be G1.

Blue Ridge Carrionflower is known from six counties in CO (USDA NRCS 2018, Ackerfield 2015), is uncommon in the outer foothills along the Front Range (Ackerfield 2015 and Weber and Wittmann 2012), and is the only representative of the Smilacaceae or Catbrier Family in Colorado. Species profiles for these target-list plants are presented in **Appendix 3**. Specific location information for these plants is being provided to the Stewards of Golden Open Space with separate files and maps. In general, *Physaria x 1* was found on outcrops of Lyons Sandstone, and the Blue Ridge Carrionflower was found in moist thickets near the main drainage of Kinney Run.

In general, all these open space areas provide significant habitat for plants and wildlife, including pollinators. Although there are many non-native plants, much habitat fragmentation, and disruption to hydrological processes, the areas connect to significant patches of foothills habitat to the west and the east. For example, observations of elk and other large animals show they use the corridors of Stonebridge HOA, Kinney Run and beyond as far as South Table Mountain. These small parcels connect the broader landscape and, although we did not find CNHP-tracked plant community occurrences, the communities present provide important connections to other foothills habitats that are of value for plants and wildlife.

Wildlife Resources

Including the 2020 eBird data there was a total of 146 animal species recorded at all surveyed open spaces including 120 birds, 8 butterflies, 6 mammals, 4 grasshoppers, 4 other insects, 3 dragonflies, and one mollusk. Five recorded bird species are rare including the Bald eagle (*Haliaeetus leucocephalus*), Golden eagle (*Aquila chrysaetos*), Peregrine falcon (*Falco peregrinus*), Prairie falcon (*Falco mexicanus*), and Snowy egret (*Egretta thula*). There are probably numerous small mammals from the order Rodentia and a number of additional bats that occupy the open spaces but trapping for those species was restricted by the funds available for completing the project.

Breeding populations of the Bald eagle are considered at low risk of extinction on a global scale but at high risk of extirpation within Colorado (G3/S1B). Breeding populations of the Golden eagle are at low risk of extinction globally and at moderate risk of extirpation in Colorado (G5/S3S4B). The Peregrine falcon is at low risk of global extinction and of high risk of extirpation in Colorado (G4S2B) while the Prairie falcon is at low risk both globally and within Colorado (G5S4B). Breeding populations of the Snowy egret are at low risk of global extinction, but at high risk of extirpation in Colorado (G5S2B).

Bird Community

There was a total of 120 bird species documented at all the surveyed open spaces in 2020 including 20 observed by CNHP researchers and another 100 identified from eBird. The previously discussed raptors and the Snowy egret were the most at risk species observed on the surveyed sites.

The 2020 bird IBI score of 0.64 indicates that the composition of the bird community on these open spaces is of good integrity. There was a high proportion of insectivores present from the aerial screener, bark proper, upper canopy forager, lower canopy forager, and ground gleaner specialist guilds on the surveyed open spaces (41 percent). A bird community of high integrity would have a minimum of 19 percent of its species represented by insectivores. With over two times that many insectivores the population at the surveyed open spaces is impressive. There is also a high percent of specialized ground nesting bird species at the open spaces. A bird community of low integrity would only have 10 percent or fewer of its species represented by ground nesters while that number at the surveyed sites was 17 percent. There were also very few nest predator-brood parasitic species represented at the open spaces. A bird community of low integrity would have 15 percent or more of its species represented by nest predators-brood parasites while that number at the surveyed sites was only 6 percent.

Ungulates

Walking surveys identified that evidence of elk including scat and browsed vegetation was very common throughout Stonebridge HOA and common at Kinney Run. The presence of elk scat and browse suggest high elk use at Stonebridge HOA and occupancy by elk of Kinney Run. Neighbors repeatedly noted presence of elk cows with newborn calves in Kinney Run (Ann Norton, Patrick Vitry, Judy St. Don,

personal communication, 2020). Species activity maps from the Colorado Division of Wildlife (2020) indicate that all three of those sites are important to elk, particularly supporting summer range and concentration areas during the winter months (Figure 4). This is also true of the Dakota Ridge Open Space on the north end of Golden. Elk winter concentration areas are defined as that part of the winter range where elk density is at least 200 percent greater than the surrounding winter range density for five winters out of ten from the first heavy snowfall to spring green-up. Elk severe winter range is defined as habitat where 90 percent of the individuals are located when the annual snow pack is at its maximum and/or temperatures are at a minimum in the two worst winters out of ten (Colorado Parks and Wildlife undated). Elk movement corridors are also present on the open spaces with elk apparently accessing the Fossil Trace Golf Course from Kinney Run.

There was also evidence of mule deer (*Odocoileus hemionus*) activity on these same three open spaces and species activity maps from the Colorado Parks and Wildlife (2020) verify mule deer on the three sites as well as on Dakota Ridge; particularly year-round concentration areas and severe winter range (Figure 4). Mule deer concentration areas include landscapes where higher quality habitat supports significantly higher mule deer densities than the surrounding areas and severe winter range mirrors that of elk. Maintaining the ecological integrity of grass and shrublands will benefit mule deer, promoting the viability of their populations on the open spaces and within the surrounding area.

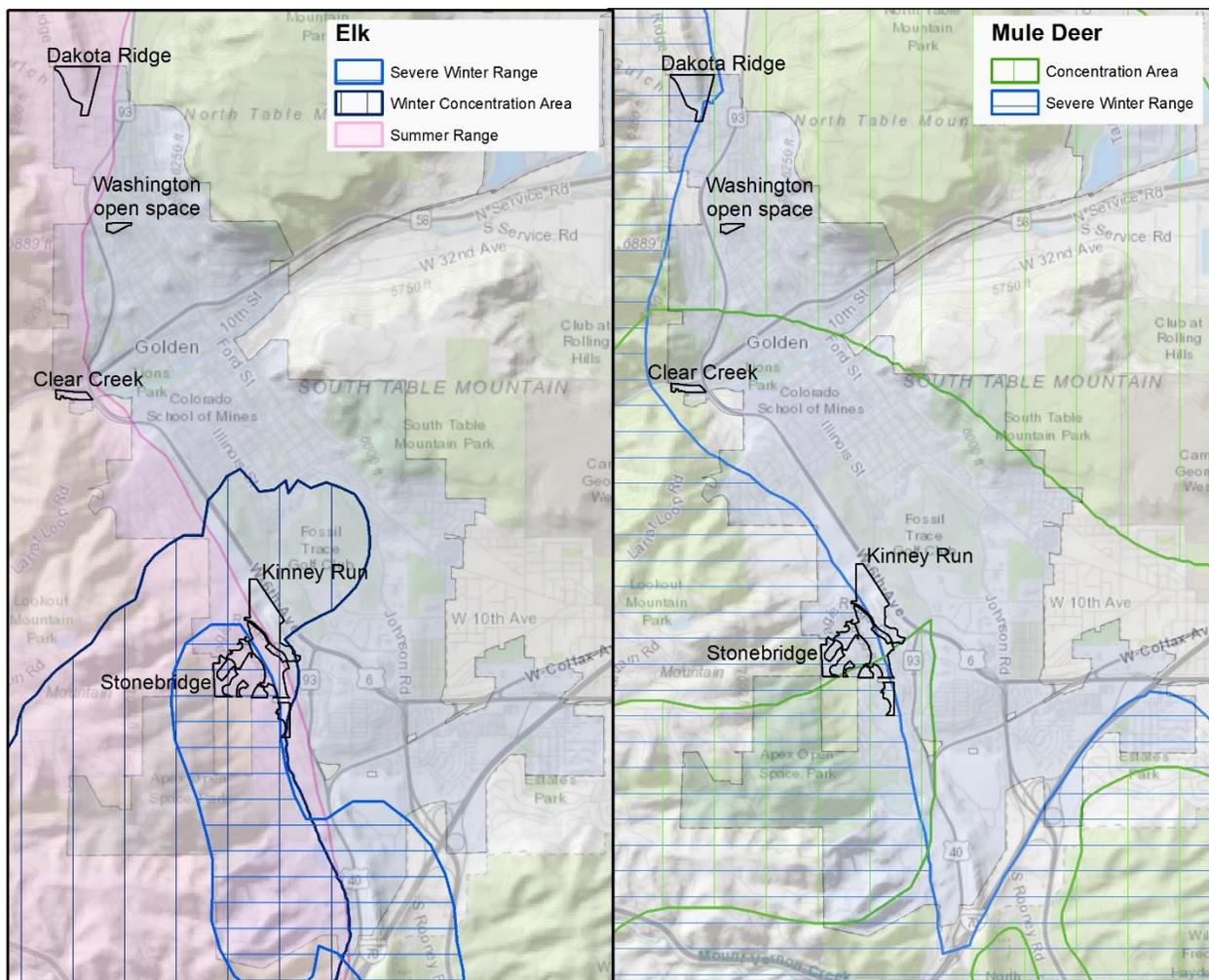


Figure 4. Elk and Mule Deer activity maps within the area of the surveyed open spaces (Colorado Parks and Wildlife 2020).

Butterfly Community

A total of 8 butterfly species were observed on the surveyed open spaces in 2020. Surveys were only conducted on two consecutive days in mid-July missing large portions of the adult flight period including the spring, early summer, and late summer flight periods of numerous species. In the future, surveys from May through August will be needed to capture the full flight period of all butterfly species with potential to occur on the open spaces including the rare species that are listed in Table 3 like the hops feeding azure.

Of note is the occurrence of a 5-meter diameter patch of Common hops, the host plant for the Hops azure, the rarest butterfly in Colorado (G2G3S2). The hops plant was observed on Stonebridge HOA open space, NAD83, Zone 13S, UTM 481313E and 4397749N (Figure 5). A much larger patch of Common hops was observed higher up in that same drainage on Apex Park, but no evidence of the Hops azure butterfly was apparent, although it was outside the butterflies mid-June flight period when the Apex Park occurrence was located. Given the presence of Common hops in the drainages of Apex Park it is possible that the butterfly does occur in the area. Surveys conducted during the butterfly's adult flight period are necessary to determine their presence or absence in the local area.

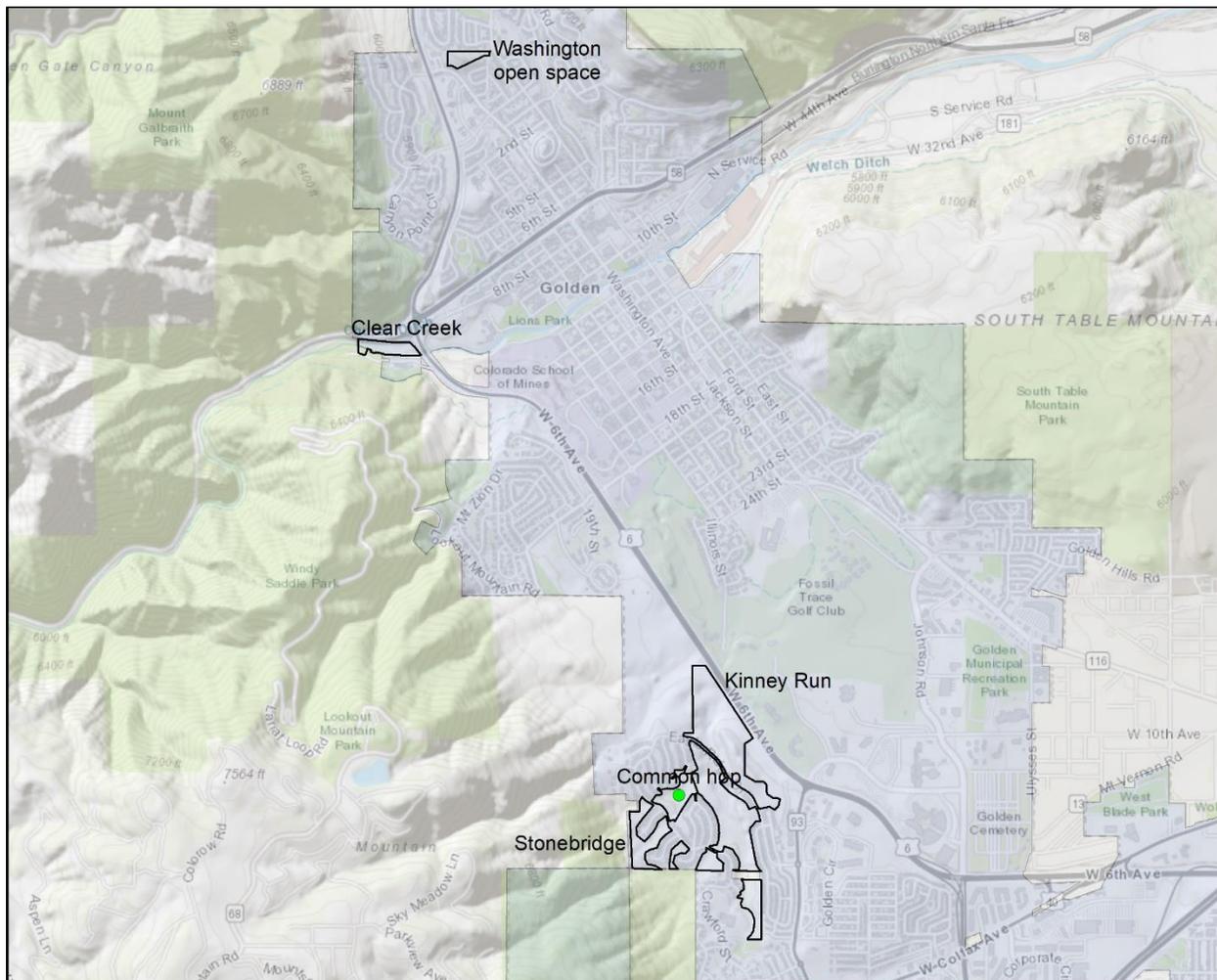


Figure 5. Common hop (*Humulus lupulus*) location on Stonebridge HOA open space.

Plant communities

The surveyed open space parcels are characterized by a mosaic of grasslands, shrublands, rock outcrops, and riparian areas. The foothills transition zone on the Colorado Front Range is among the rarest and most threatened of the ecological zones in Colorado. Grasslands in general are regarded as the most imperiled ecosystems in North America (Knopf and Samson 1997). The parcels support important habitat for wildlife and plants, however, the plant communities in and of themselves do not qualify for formal statewide or global conservation status designation. However, additional research is warranted to determine how the Golden Open Space communities are connected to communities of the same types in the broader landscape surrounding the properties.

DISCUSSION

Golden has experienced a 10 percent increase in population over the last decade and Jefferson County is projected to experience nearly 40 percent population growth over the next 30 years (State of Colorado 2020). This growth and the consequent demands for increased recreational opportunities have the potential to degrade functionality of the ecosystem within the area surrounding the City of Golden. One of the values identified in the Golden Vision 2030 process was the community's interest in, "Active outdoors and the environment," which highlights the priority placed on recreational opportunities by Golden's citizens (City of Golden 2010). The Kinney Run open space features a hard surface trail that connects to the US 6 regional trail and is heavily used by residents (City of Golden 2012). Additionally, the Clear Creek Master Plan highlighted the desire for the City to improve parkland and recreational opportunities and proposed several trail improvements along the creek corridor within city limits (Wenk Associates 2011). These efforts to improve recreational access and activity coupled with future growth in population of the area will stress the natural ecosystems of the City owned open space.

The open space properties visited during this survey feature assemblages of plants that include grassland, shrubland, riparian areas, and rocky ridgelines. These ecosystems provide a diversity of habitat for numerous species of plants and wildlife. The abundance of plant and animal species recorded from the sites is indicative of their current good condition. Maintaining or improving upon the quality of these natural areas in the face of increasing recreational and developmental pressures is recommended. Care should be taken to avoid excessive disturbance to these habitats as additions to the trail system is considered and intensity of recreational use increases. Colorado is expected to experience higher temperatures (Figure 6), larger and more intense fires, and the spread of invasive species, which will place additional stresses on our natural open space areas. This makes it even more crucial that the City of Golden proceed cautiously with plans for increasing recreation activities on City owned natural areas.

Creating and then managing recreational impacts is a difficult exercise. The desire to provide visitor access and quality of experience must be carefully weighed against impacts and harm to wildlife, plants, soil, and hydrology. Outdoor recreation has become a year-round presence on the landscape of the region, particularly on public lands, and is now the largest indirect impact disturbing the area's elk and deer populations on production grounds and winter range (Will et al. 2011, Mao et al. 2013). There is increasing demand for more recreational trails, as well as frequent use and expansion of unofficial trails, all of which fragment and diminish the quality of remaining wildlife habitat. This increase in recreation creates disturbance to the area's wildlife on a year-round basis, displacing them from favorable habitat (Duckett 2008, Will et al. 2011, Mao et al. 2013). Human disturbances during critical periods like winter can increase stress on wildlife during an already highly stressful period for elk and mule deer (Mao et al. 2013). Increase in recreation has been cited as a major factor in the decline of Colorado's elk, mule deer, bear, and mountain lion populations (Moa et al. 2013).

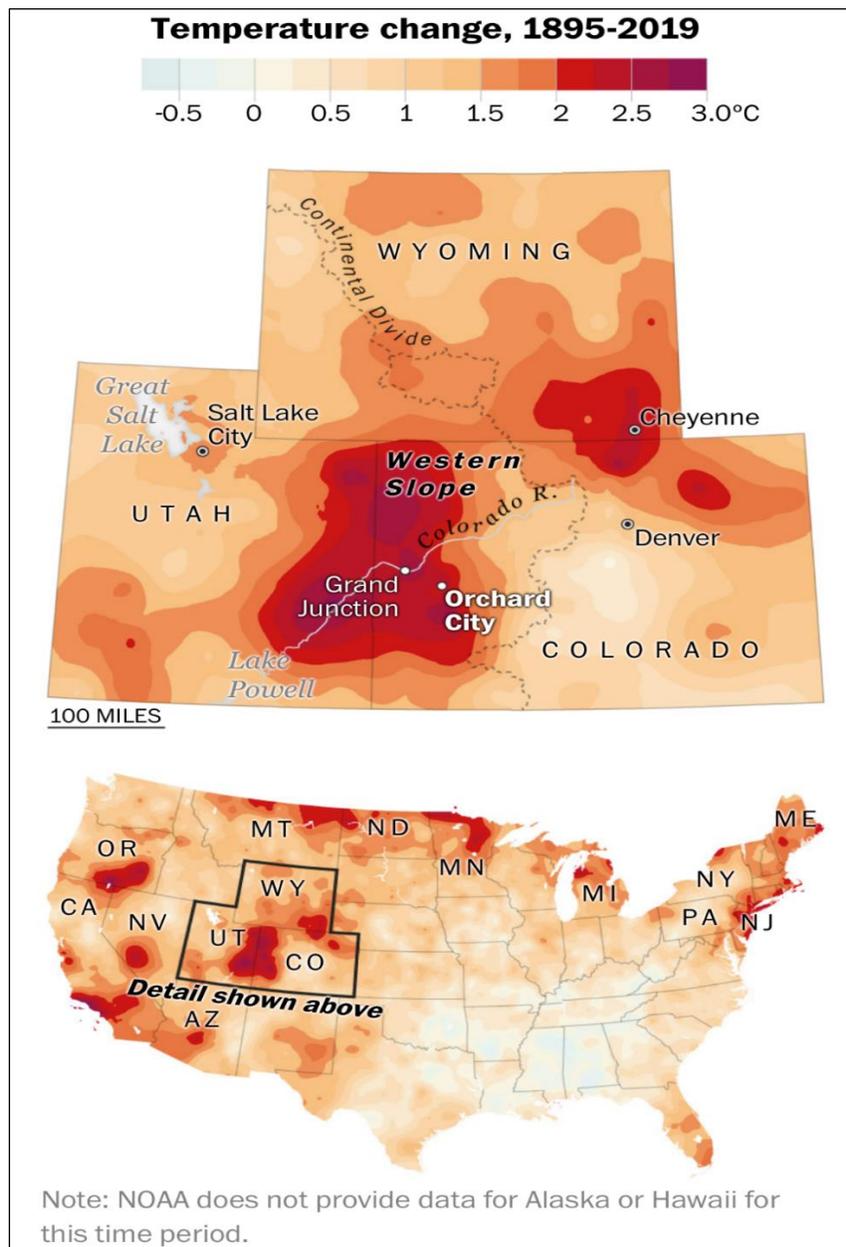


Figure 6. Average temperature increases in Colorado in relation to average temperature changes across the country. From the National Oceanic and Atmospheric Association as highlighted in the article “This giant climate hot spot is robbing the West of its water”, the Washington Post, August 7, 2020.

Recreational activity and trails are important sources of anthropogenic disturbance on open space lands in general and a primary source of fragmentation (Cushman et al. 2008). An assumption has been made that outdoor recreation is compatible with conserving species and wildlands. However, a new study by Larson et al. (2016) who analyzed 274 articles on the effects of non-consumptive recreation found more negative effects than expected for plants and wildlife. Trails facilitate negative human interactions with animals, allow the spread of invasive species, and gradually degrade the overall quality of the adjacent plant community (Decker 2018). Humans hiking off-trail is considered one of the most disturbing activities for wildlife (Miller et al. 2001). Alert distance, flush distance, distanced moved, and area of influence are all greater for wildlife when a human is hiking off-trail vs on-trail (Marion 2019). When wildlife flee or escape a perceived threat, they are, in most instances, evacuating an area of desirable habitat for an area of less desirable habitat (Marion 2019). Additionally, when humans are accompanied

by a dog, the area of influence on wildlife expands (Miller et al. 2001, Miller et al. 2020). Decker (2018) documented dogs that accompany recreationists on trails in Boulder County, Colorado, altered the activity patterns of wildlife (e.g., elk, mule deer, bobcat, rabbits, etc.) through direct (e.g., chasing wildlife) and indirect (e.g., scent sources like urine and feces) interactions. Lenth et al. (2008) suggest, “Trails that are kept dog-free or with dogs closely restricted to trails could protect against the demonstrated ecological impacts that dogs have on wildlife communities and could facilitate wildlife viewing opportunities for trail users” (p. 225).

The fragmenting effect of recreational trails is also tied to use type and frequency; some plant and animal species are quite tolerant of disturbance and able to move between patch fragments, while others will gradually be lost from the area if disturbance increases. Most documented effects of recreational use are more negative for smaller more sedentary species such as plants, reptiles, amphibians, small mammals, and invertebrates (Decker 2018). The influence trails have on plants and wildlife extends beyond their actual footprint with ungulates flushing at distances out to 200 meters from the trail edge (Taylor and Knight 2003) while some birds remain unbothered even when within 20 meters of a trail (Miller et al. 2001, Smith-Castro and Rodewald 2010). Trail development that avoids fragmenting large intact patches of natural vegetation will also protect migration corridors for important species such as elk and mule deer, and intact patches of habitat can serve as refugia for sensitive species in otherwise disturbed landscapes (Decker 2018). Best management practices suggest that new trail development should avoid previously undisturbed areas, and where possible, be concentrated in the influence zone of existing disturbances, such as along roadways (Decker 2018).

RECOMMENDATIONS

The surveyed open spaces contain natural areas that provide important habitat for plants and wildlife. The diverse vegetation types found on these sites each support a different suite of species, with plants and smaller or less mobile animals’ more-or-less confined to a single type, while larger animals’ range across multiple vegetation types during their lives. The foremost consideration is protecting the plant and wildlife habitat that currently occurs on these open spaces. The focus should be on conserving the current condition of the habitat that exists and protecting intact habitat from fragmentation by new trails. Based on our observations and the rare plant, plant community, and animal occurrences, we recommend the following:

- 1) Protect the grassland, riparian woodland, and shrublands and consider surveying proposed trail routes, other development areas (e.g., parking lots), routing newly constructed trails to avoid disturbing and fragmenting large patches of natural habitat.
- 2) Protect the occurrence of the Common hops on the Stonebridge HOA property to maintain important habitat for the rare hopes feeding azure butterfly.
- 3) Consider implementing and enforcing timing restrictions on recreation activities during winter to avoid disturbance of elk and mule deer on severe winter range and within winter conservation areas. Consider closing any newly developed trails in elk and mule deer winter habitat to recreation from December 1 – April 15.

- 4) Educate the public on the importance of winter range areas and the need for trail and area closures. This may involve the creation of brochures, use of educational signs for important habitat areas, local educational television and radio spots, etc.
- 5) Create local field guides specific to the Open Space areas including natural history information to help visitors connect with and appreciate plants and other elements of biodiversity.
- 6) Consider signage on open space trails that encourage people to stay on-trail.
- 7) Educate the public on the sensitivity of the plants and wildlife species inhabiting the property. Interpretive signs describing how the properties ecological resources support viable populations of functioning native plant communities and even rare plants as well as populations of elk and mule deer would increase public acceptance for maintaining some undisturbed habitat for conservation purposes (Schenk et al 2007, Skupien et al. 2016).
- 8) Limit disturbance as much as possible. In particular, approach weed treatments with great caution (see section on Weed Management in Natural Areas below). Monitor to see if weeds are a problem (i.e., are they expanding or stable). If necessary, spot treat and monitor to make sure the treatment is working. Please note that in some cases it is best to do nothing, especially when water quality or native species and soils could be threatened with the use of herbicides. Weed treatments in sensitive areas should include minimal and precise herbicide application and immediate follow-up replanting of native species if bare soil areas are created (Smith et al. 2015).
- 9) Control disturbance and predation on wildlife by domestic pets. Uncontrolled domestic pets can disturb wildlife and transmit diseases to native wildlife. Limiting the presence of domestic dogs or even designating specific trails for dogs and establishing 'on leash' policies for those trails would benefit wildlife, particularly ungulates and ground nesting birds.
- 10) Conduct further surveys, especially at additional times of year such as spring and early summer, to identify a more complete list of plants and wildlife present in the open space areas. Additional species are sure to be found.
- 11) Survey for aquatic insects to help elucidate the significance and condition of the ecological communities found in wetland and riparian areas.
- 12) Identify pollinators and other factors effecting the reproductive ecology and long-term viability of the rare plants as well as those with a high floristic quality index.
- 13) Apply a Floristic Quality Assessment (FQA) to the full species list to date to identify species and sites that may warrant extra conservation attention within the open space areas. The FQA method is used to calculate various indices that reflect the condition of a site based on the plant species present. The core of the FQA method is the use of "coefficients of conservatism" (C-values), which are assigned to all native species in a flora following the methods described by Swink and Wilhelm (1994). C-values range from 0 to 10 and represent an estimated probability that a plant is likely to occur in a landscape relatively unaltered from pre-European settlement conditions. High C-values are assigned to species likely to occur in high-quality natural areas, while low C-values are assigned to species that tolerate human disturbance. C-values for Colorado species were assigned by a panel of botanical experts, as described in Rocchio (2007). FQA indices provide consistent, quantitative measures of floristic integrity that can be used in any plant community, do not require extensive sampling equipment, and can be applied to

existing data sets.

The foothills transition zone on the Colorado Front Range is among the rarest and most threatened of the ecological zones in Colorado. Foothills grassland supply important habitat for native plants and wildlife and this habitat is particularly under threat from residential development along the Front Range of Colorado including in the area of Golden. The parcels support important habitat for plants, wildlife and plant communities. However, additional research is warranted to identify additional rare plant and wildlife including butterflies, small mammals, bats, and other rare plants that might reside on these and other open space properties within the City of Golden.

An effort on the behalf of The stewards of Golden Open Space, the City of Golden, and its partners to protect these impressive natural areas from disturbance and fragmentation will be important to conserving these wildlands in the face of climate change and the pressures of a growing population.

Weed Management in Natural Areas

The first goal in any successful landscape management of weeds is to protect intact habitats from disturbances (Sovell and Smith 2019). Intact habitats are resilient to weed infestations. If you disrupt native landscapes to treat targeted weed species, there is a high likelihood you will either introduce more weeds or increase the footprint of the existing weeds (Pritekel et al. 2006, Nicholas et al. 2008). Traditionally accepted weed management strategies do not reduce weed cover in wildlands and natural areas. The recommended cultural, mechanical and chemical actions originally developed for agricultural lands, are often too aggressive or harmful to wildlands. Wildlands are far more complex, and success is much more difficult. Wildlife including insect pollinators must be protected and many chemicals used on agriculture and rangelands are not safe or even tested for wildlife (Cal-IPC 2005). Landscape-wide treatments can have a high likelihood of spreading weeds due to the diverse array of habitats and plants. What works in one area may harm another area. Successful weed management in wildlands relies on understanding the invader and the invaded system and tackling small areas with follow-up monitoring. Because disturbance is what initially leads to weed invasions, simply removing a weed without eliminating the disturbance rarely results in a successful treatment and may result in opening up a disturbed soil to a secondary invasion of a new or the same weed (Pearson et al. 2016, Pearson and Ortega 2009).

Rapid response for low cover weeds is one of the best management strategies other than prevention of activities that spread noxious weeds. Plants for which rapid response works best are typically found on the State Noxious Weed List A or Watchlist. Two List A species were found at the open space, Myrtle spurge (*Euphorbia myrsinites*) and Hairy willowherb (*Epilobium hirsutum*), and based on the habitat and location of the open space, resource managers should be on the lookout purple loosestrife (*Lythrum salicaria*) in the wetlands. Garlic mustard (*Alliaria petiolata*) is a state watchlisted noxious weed that is showing up in many drainages in Jefferson County; it should also be watched for and a rapid response initiated if it is found.

The two List A weed species are high priority for management though early detection rapid response actions. Small infestations of these two species may be hand dug, but care must be taken to remove the entire root stock and any rhizome fragments. Sites must be checked for re-growth from missed root fragments several times within the same growing season. It is important to do this early in the infestation because once the cover reaches a certain point eradication is not likely. There are approved chemicals that can be used to treat these species. However, following CSU Extension guidelines, it should be noted that chemical applications are considered appropriate for range and pasture lands and

not for areas with natural resources (Smith et al. 2015) (Colorado Department of Agriculture noxious weed FACT SHEET <https://ag.colorado.gov/conservation/noxious-weeds/noxious-weed-species/myrtle-spurge> ; <https://ag.colorado.gov/conservation/noxious-weeds/noxious-weed-species/hairy-willow-herb>). Multiple manual treatments and follow-up monitoring within the same growing season are essential for success. At CNHP we have documented myrtle spurge populations are not controlled with a single visit during the growing season. To be successful you need to pull sprouts in early spring and once or twice throughout the season to prevent flowering and remove new sprouts that show up throughout the season. If you miss sprouts you get another seed set. Weeds have different seed longevities and sites will need to be monitored for a minimum of five years or more depending on the species.

The removal of all non-native species and noxious weeds in an area that no longer naturally supports native plants is a difficult task and may actually increase invasion footprints. A non-native plant still performs the same functions as native species in terms of structure and food for wildlife, filtration of runoff, and providing buffer lands. Non-native species tend to decrease over time without treatment in natural areas with a diverse assemblage of native species (Kowarik 2008). These areas are evident in the unfragmented grasslands and shrubland areas of the surveyed open space. It is essential to understand that weed treatments can be a form of disturbance, causing habitats to stay in an ecological successional (disturbance) stage that favors the establishment of weeds. In most cases where a species is targeted for elimination, treatment only temporarily removes the species, or it is replaced by a different weedy species. New research indicates that removal of the target weed often not only results in a secondary invasion by other non-native exotic species but there is simplification (reduced biodiversity) of the site. This occurs because of the complexity of weed invasions and our lack of understanding of how and why these invasions are occurring (FEIS 2015, Pearson and Ortega 2009). This is the reason a site plan should be created for weed treatments on a site by site basis. These site plans will include the biology of the target weed(s), expected results, monitoring strategy, and also take into consideration the disturbance to soils and impacts to wildlife (Tu et al. 2001, Kowarik 2008, Pearson and Ortega 2009, Potts 2010, Smith et al. 2015, Mui and Panjabi 2016). A plan that only calls for spraying weeds once a season is bound to fail, and although it may meet your compliance goals, it is not effective in wildlands and was initially designed for agriculture and rangeland weed management.

An integrated weed management plan employs a combination of weed control strategies to protect and/or achieve lasting restoration of native plant communities and the natural processes that support them (Smith et al 2015). A key element of a management plan is to compile a complete list and map of the noxious weeds known from the management area. Once this is completed management techniques for controlling the weeds can be selected based on the weed species detected. There are five viable broad categories of weed management techniques that could be employed at the surveyed open spaces. These include prevention; prescribed burning; and manual, biological, chemical treatments. A most effective/lasting approach will integrate a combination of several techniques. An integrated weed management plan that includes revegetation with native plants and selects multiple control techniques that ideally interact to provide effective and feasible control for each target weed species will result in the most successful restoration results.

Weed Treatment Recommendations:

- 1) Target the rapid response treatment species first. Site plans should be in place before any weed treatments that include the goals for your site. This allows resource managers to consider options and even the necessity for treatments. The presence of a weed alone is not always a good indicator.

- 2) If an action is warranted, follow BMPs for treating weeds in the vicinity of wildlife and rare plants (Mui and Panjabi 2016, Cal-IPC.org 2015) and monitor treatment within the same growing season.
- 3) Herbicides should not be a first choice in wildlands and if used, should be used at the appropriate growing stage, be the proper herbicide for the plant, and consider the habitat, degree of infestation and potential for being successful. If you do not plan to monitor, you should not treat.
- 4) Prioritize surveys for new invading species (List A Noxious Weeds) and recognize when you are treating weeds that have a low potential for successful treatment (i.e. those that are present in large numbers not only on open space properties but are also in the surrounding landscape and could move into treated areas (i.e. Mullein, Cheatgrass and especially Smooth Brome grass).
- 5) Minimize soil damage with overspray, trampling, and off-road vehicle use to access sites.
- 6) Minimize trail building and soil disturbance in intact healthy systems.
- 7) Monitor treatments to see if they are helping or causing an increase. Monitoring in the same season is really the only way to be successful. Waiting a year after treatments is too late for many species which may have already begun to reproduce. If you can't monitor, you may need to consider not treating some species.

REFERENCES

- Ackerfield, J. 2015. Flora of Colorado. Botanical Research Institute of Texas. BRIT Press, Fort Worth, Texas. 818 p.
- Cal-IPC.org. 2015.. Best Management Practices for Wildland Stewardship: Protecting Wildlife When Using Herbicides for Invasive Plant Management. Cal-IPC Publication 2015-1. California Invasive Plant Council. www.cal-ipc.org. Accessed November 2019.
- City of Golden. 2008. Parks and recreation Master Plan. Golden, Colorado
- City of Golden. 2010. Golden Vision 2030. Golden, Colorado.
- City of Golden. 2012. Souths Neighborhoods Plan. Planning Commission Resolution No. PC12-23. Golden, Colorado
- City of Golden. 2016. City of Golden Parks and Recreation Master Plan Update 2016. Golden. Colorado.
- City of Golden. 2020. City of Golden, Colorado, Where the West Lives! Date Accessed: 9 December 2020, URL: <https://www.cityofgolden.net/>.
- Colorado Natural Heritage Program. 2020. Biodiversity Tracking and Conservation System (BIOTICS). Colorado Natural Heritage Program, Colorado State University, Fort Collins.
- Colorado Parks and Wildlife. Undated. Colorado Parks and Wildlife GIS species activity mapping definitions publicly available data. Colorado Parks and Wildlife, Denver Colorado.
- Colorado Parks and Wildlife. 2020. Colorado Parks and Wildlife all species activity maps. Colorado Parks and Wildlife GIS Unit. Denver, Colorado.
- Cushman, S.A., K. McGarigal, and M.C. Neel. 2008. Parsimony in landscape metrics: Strength, universality, and consistency. *Ecological Indicators* 8:691-703.
- Cutko, A. 2009. Biodiversity Inventory of Natural Lands: A How-To Manual for Foresters and Biologists. Arlington, Virginia: NatureServe.
- Decker, K. 2018. Fragmentation and connectivity considerations for Larimer County Open Space Lands. Colorado Natural Heritage Program, Colorado State University, Fort Collins.
- Decker, K., R. Rondeau, J. Lemly, D. Culver, D. Malone, L. Gilligan, S. Marshall. 2020. Guide to the Ecological Systems of Colorado. Colorado Natural Heritage Program, Colorado State University, Fort Collins, Colorado.
- Duckett, S. 2008. Moose management plan data analysis unit M-5 Grand Mesa and Crystal River Valley. Colorado Division of Wildlife. Grand Junction, Colorado.
https://cpw.state.co.us/Documents/Hunting/BigGame/DAU/Moose/M5DAUPlan_GrandMesaCrystalRiver2009.pdf. Accessed April 2020.
- FEIS. 2015. Fire Effects Information System (FEIS) USDA Forest Service.
<http://www.fs.fed.us/database/feis/plants/forb/eupesu/all.html>.

- Guralnick, R., R. Walls, and W. Jetz. 2018. Humboldt Core – toward a standardized capture of biological inventories for biodiversity monitoring, modeling and assessment. *Ecography* 41: 713–725.
- Jetz, W., M. A. McGeoch, R. Guralnick, S. Ferrier, J. Beck, M. J. Costello and M. Fernandez, G. N. Geller, P. Keil, C. Merow, C. Meyer, F. E. Muller-Karger, H. M. Pereira, E. C. Regan, D. S. Schmeller, and E. Turak. 2019. Essential biodiversity variables for mapping and monitoring species populations. *Nature Ecology and Evolution* 3: 539-551.
- Johnson, M. J. 2014. Breeding bird monitoring: Mid-Atlantic Network 2013 summary report. Natural Resource Data Series NPS/MIDN/NRDS—2014/736. National Park Service, Fort Collins, Colorado.
- Kowarik, I. 2008. On the Role of Alien Species in Urban Flora and Vegetation. *Urban Ecology* 2008, pp. 321-338. Springer 2008.
- Knopf, F. L., and F. B. Samson. 1997. Ecology and conservation of Great Plains vertebrates. Springer-Verlag New York, New York. 20 p.
- Larson C. L., S. E. Reed, A. M. Merenlender, and K.R. Crooks. 2016. Effects of Recreation on Animals Revealed as Widespread through a Global Systematic Review. *PLoS ONE* 11(12): <https://journals.plos.org/plosone/article/file?id=10.1371/journal.pone.0167259&type=printable>.
- Lowry, J. JH. Jr, R. D. Ramsey, K. Boykin, D. Bradford, P. Comer, S. Falzarano, W. Kepner, J. Kirby, L. Langs, J. Prior-Magee, G. Manis, L. O'Brien, T. Sajwaj, K. A. Thomas, W. Rieth, S. Schrader, D. Schrupp, K. Schulz, B. Thompson, C. Velasquez, C. Wallace, E. Waller, B. Wolk. 2005. Southwest Regional Gap Analysis Project: final report on land cover mapping methods. RS/GIS Laboratory, Utah State University, Logan, Utah.
- Lenth, B.E., R.L. Knight, and M.E. Brennan. 2008. The Effects of Dogs on Wildlife Communities. *Natural Areas Journal*. 38: 218-227.
- Marion, J.L. 2019. Impacts to Wildlife: Managing Visitors and Resources to Protect Wildlife. Technical Report. Prepared for the Interagency Visitor Use Management Council. March 2019 (1).
- Marshall, M., C. Tzilkowski, and K. Callahan. 2016. Streamside bird monitoring protocol for the Eastern Rivers and Mountains Network: Protocol narrative version 3.0. Natural Resource Report NPS/ERMN/NRR—2016/1224. National Park Service, Fort Collins, Colorado.
- Miller, S. G., R. L. Knight, and C. K. Miller. 2001. Wildlife responses to pedestrians and dogs. *Wildlife Society Bulletin* 29: 124-132.
- Miller, A. B., D. King, M Rowland, J. Chapman, M. Tomosy, C. Liang, E. S. Abelson, and R. Truex, R. 2020. Sustaining wildlife with recreation on public lands: a synthesis of research findings, management practices, and research needs. Gen. Tech. Rep. PNW-GTR-993. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 226 p.
- Mao, J., J. Groves, K. Wright, D. Cacho, and P. Will. 2013. Avalanche Creek elk herd E-15 data analysis unit plan game management units 43 and 471. Colorado Parks and Wildlife. Glenwood Springs, Colorado. https://cpw.state.co.us/Documents/Hunting/BigGame/DAU/Elk/E15_AvalancheCreek.pdf. Accessed April 2020.

- Mui, C. H. Y., and S. Spackman Panjabi. 2016. Recommended Best Management Practices for Managing Noxious Weeds on Sites with Rare Plants. Colorado Department of Agriculture-Noxious Weed Program and Colorado State University Colorado Natural Heritage Program. http://www.cnhp.colostate.edu/download/documents/2016/BMP_Noxious_Weeds_on_Sites_with_Rare_Plants_CMui_SPanjabi_May_2016.pdf
- NatureServe. 2019. NatureServe Explorer: AN online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available <http://explorer.natureserve.org>. (Accessed: August 2020).
- Nicholas, R., D.L. Larson, and S.C. Huerd. 2008. Soil modification by invasive plants; effects on native and invasive species of mixed-grass prairies. *Biological Invasions*. 10:177-190.
- O'Connell, T. J., R. P. Brooks, M. J. Lanzone, and J. A. Bishop. 2003. A bird community index for the Mid-Atlantic Piedmont and Coastal Plain. Final Report to the USGS Patuxent Wildlife Research Center. Report No. 2003-02, Penn State Cooperative Wetlands Center, University Park, Pennsylvania.
- Pearson, D., and Y. Ortega. 2009. Managing Invasive Plants in Natural Areas: Moving Beyond Weed Control. In, *Weeds: Management, Economic Impacts and Biology*. Editor: Rudolph V. Kinglerly. Nova Science Publishers, Inc. pp. 1-22.
- Pearson D. E., Y. K. Ortega, J. B. Runyon, and J. L. Butler. 2016. Secondary invasion: The bane of weed management. *Biological Conservation* 197 (2016) 88-17.
- Potts, S. G., J. C., Biesmeijer, C. Kremen, P. Neumann, O. Schweiger, and W. E. Kunin. 2010. Global pollinator declines: trends impacts and drivers. *Trends in Ecology and Evolution* 25:345-353.
- Pritekel, C., A. Whittemore-Olson, N. Snow, J. C. Moore. 2006. Impacts from invasive plant species and their control on the plant community and belowground ecosystem at Rocky Mountain National Park, USA. *Applied Soil Ecology*. 32(1):132-141.
- Rocchio, J. 2007. Floristic Quality Assessment Indices for Colorado Plant Communities. Prepared for CO Department of Natural Resources, Division of Wildlife, Wetlands Program and U.S. EPA, Region 8, Denver CO.
- Schenk, A. M. Hunziker, and F. Kienast. 2007. Factors influencing the acceptance of nature conservation measures—a qualitative study in Switzerland. *Journal of Environmental Management* 83: 66–79.
- Skupien, G. M., K. M. Andrews, and L. R. Larson. 2016. Teaching tolerance? Effects of conservation education on wildlife acceptance capacity for the American alligator. *Human Dimensions of Wildlife* 21: 264-279.
- Schweich, T. 2020a. Botanical Resources of the North Washington Open Space. Available online at: <http://www.schweich.com>.
- Schweich, T. 2020b. Checklist Flora of Native and Naturalized Vascular Plants of Golden and Vicinity, Jefferson County, Colorado. Available online at: <http://www.schweich.com>.
- Schweich, T. 2020c. Plant Checklist for Kinney Run, Jefferson County, Colorado. Available online at: <http://www.schweich.com>.

- Smith, P., S. Panjabi and J. Handwerk. 2015. Integrated Noxious Weed Management Plan- U.S. Air Force Academy and Farish Outdoor Recreation Area. El Paso County, Colorado. Produced for the U.S. Air Force Academy by the Colorado Natural Heritage Program.
- Smith-Castro, J. R., and A. D. Rodewald. 2010. Behavioral responses of nesting birds to human disturbance along recreational trails. *Journal of Field Ornithology* 81: 130–138.
- Sovell, J. R, and P Smith. 2019. Survey of Critical Biological Resources, South Hogback Open Space, Ken-Caryl Ranch, Jefferson County, CO. Colorado Natural Heritage Program, Colorado State University, Fort Collins, Colorado.
- State of Colorado. 2020. Colorado Department of Local Affairs, State Demography Office. Accessed 6 August 2020, <https://demography.dola.colorado.gov/>.
- Swink, F. and G. Wilhelm. 1994. *Plants of the Chicago region* 4th edition. Indiana Academy of Science, Indianapolis, Indiana.
- Taylor, A. R., and R. L. Knight 2003. Wildlife responses to recreation and associated visitor perceptions. *Ecological Applications* 13: 951–963.
- Tu, M., C. Hurd, and J.M. Randall. 2001. *Weed Control Methods Handbook*, The Nature Conservancy, <http://tncweeds.ucdavis.edu>, version: April 2001.
- USDA, Natural Resources Conservation Service, PLANTS Database [USDA PLANTS]. 2018. <http://plants.usda.gov/>. Accessed 2018.
- Weber, W. A. and R. C. Wittmann. 2012. *Colorado Flora, Eastern Slope, A Field Guide to the Vascular Plants*, Fourth Edition. Boulder, Colorado. 555 p.
- Wenk Associates. 2011. *Clear Creek Corridor Master Plan*.
- Will, P., K. Wright, T. Trant, and J. Mao. 2011. D - 13 (Maroon Bells deer) data analysis unit game management units 43, 47, and 471. Colorado Division of Wildlife. Glenwood Springs, Colorado. <https://cpw.state.co.us/Documents/Hunting/BigGame/DAU/Deer/D13-DAU.pdf>. Accessed April 2020.

APPENDIX 1

Natural Heritage Methodology

Natural Heritage Status Ranks

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 description of each of the Natural Heritage ranks is provided in Table 7.

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 7. 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 8 defines the special status assigned by these agencies and provides a key to abbreviations used by CNHP.

Table 8. 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 9.

Table 9. 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.

Potential Conservation Areas

In order to successfully protect populations or occurrences CNHP designs Potential Conservation Areas (PCAs). These PCAs focus on capturing the ecological processes that are necessary to support the continued existence of a particular element occurrence of natural heritage significance. PCAs may include a single occurrence of a rare element, or a suite of rare element occurrences or significant features. The PCA is designed to identify a land area that can provide the habitat and ecological processes upon which a particular element occurrence, or suite of element occurrences, depends for its continued existence. The best available knowledge about each species' life history is used in conjunction with information about topographic, geomorphic and hydrologic features; vegetative cover; and current and potential land uses. In developing the boundaries of a PCA, CNHP scientists consider a number of factors that include, but are not limited to:

- Ecological processes necessary to maintain or improve existing conditions;
- Species movement and migration corridors;
- Maintenance of surface water quality within the PCA and the surrounding watershed;
- Maintenance of the hydrologic integrity of the groundwater;
- Land intended to buffer the PCA against future changes in the use of surrounding lands;
- Exclusion or control of invasive exotic species; and
- Land necessary for management or monitoring activities.

The boundaries presented are meant to be used for conservation planning purposes and have no legal status. The proposed boundary does not automatically recommend exclusion of any activity. Rather, the boundaries designate ecologically significant areas in which land managers may wish to consider how specific activities or land use changes within or near the PCA affect the natural heritage resources and sensitive species on which the PCA is based. Please note that these boundaries are based on our best estimate of the primary area supporting the long-term survival of targeted species and plant communities. A thorough analysis of the human context and potential stresses has not been conducted. However, CNHP's conservation planning staff is available to assist with these types of analyses where conservation priority and local interest warrant additional research.

Ranking of Potential Conservation Areas

CNHP uses element and element occurrence ranks to assess the overall biological diversity significance of a PCA, which may include one or many element occurrences. Based on these ranks, each PCA is assigned a biological diversity rank (or B-rank). See Table 10 for a summary of these B-ranks.

Table 10. Natural Heritage Program Biological Diversity Ranks and their Definitions.

B1	Outstanding Significance (irreplaceable): only known occurrence of an element A-ranked occurrence of a G1 element (or at least C-ranked if best known occurrence) concentration of A- or B-ranked occurrences of G1 or G2 elements (four or more)
B2	Very High Significance: B- or C-ranked occurrence of a G1 element A- or B-ranked occurrence of a G2 element One of the most outstanding (for example, among the five best) occurrences rangewide (at least A- or B-ranked) of a G3 element Concentration of A- or B-ranked G3 elements (four or more) Concentration of C-ranked G2 elements (four or more)
B3	High Significance: C-ranked occurrence of a G2 element A- or B-ranked occurrence of a G3 element D-ranked occurrence of a G1 element (if best available occurrence) Up to five of the best occurrences of a G4 or G5 community (at least A- or B-ranked) in an ecoregion (requires consultation with other experts)
B4	Moderate Significance: Other A- or B-ranked occurrences of a G4 or G5 community C-ranked occurrence of a G3 element A- or B-ranked occurrence of a G4 or G5 S1 species (or at least C-ranked if it is the only state, provincial, national, or ecoregional occurrence) Concentration of A- or B-ranked occurrences of G4 or G5 N1-N2, S1-S2 elements (four or more) D-ranked occurrence of a G2 element At least C-ranked occurrence of a disjunct G4 or G5 element Concentration of excellent or good occurrences (A- or B-ranked) of G4 S1 or G5 S1 elements (four or more)
B5	General or State-wide Biological Diversity Significance: good or marginal occurrence of common community types and globally secure S1 or S2 species.

Protection Urgency Ranks

Protection urgency ranks (P-ranks) refer to the timeframe in which it is recommended that conservation protection occurs. In most cases, this rank refers to the need for a major change of protective status (for example agency special area designations or ownership). The urgency for protection rating reflects the need to take legal, political, or other administrative measures to protect the area. Table 11 summarizes the P-ranks and their definitions.

Table 11. Natural Heritage Program Protection Urgency Ranks and their Definitions

P1	Protection actions needed immediately. It is estimated that current stresses may reduce the viability of the elements in the PCA within 1 year.
P2	Protection actions may be needed within 5 years. It is estimated that current stresses may reduce the viability of the elements in the PCA within this approximate timeframe.
P3	Protection actions may be needed, but probably not within the next 5 years. It is estimated that current stresses may reduce the viability of the elements in the PCA if protection action is not taken.
P4	No protection actions are needed in the foreseeable future.
P5	Land protection is complete and no protection actions are needed.

A protection action involves increasing the current level of protection accorded one or more tracts within a potential conservation area. It may also include activities such as educational or public relations campaigns, or collaborative planning efforts with public or private entities, to minimize adverse impacts to element occurrences at a site. It does not include management actions. Situations that may require a protection action may include the following:

- Forces that threaten the existence of one or more element occurrences at a PCA. For example, development that would destroy, degrade or seriously compromise the long-term viability of an element occurrence; or timber, range, recreational, or hydrologic management that is incompatible with an element occurrence's existence;
- The inability to undertake a management action in the absence of a protection action; for example, obtaining a management agreement;
- In extraordinary circumstances, a prospective change in ownership or management that will make future protection actions more difficult.

Management Urgency Ranks

Management urgency ranks (M-ranks) indicate the timeframe in which it is recommended that a change occur in management of the PCA. This rank refers to the need for management in contrast to protection (for example, increased fire frequency, decreased grazing, weed control, etc.). The urgency for management rating focuses on land use management or land stewardship action required to maintain element occurrences at the potential conservation area.

A management action may include biological management (prescribed burning, removal of exotics, mowing, etc.) or people and site management (building barriers, re-routing trails, patrolling for collectors, hunters, or trespassers, etc.). Management action does not include legal, political, or administrative measures taken to protect a potential conservation area. Table 12 summarizes M-ranks and their definitions.

Table 12. Natural Heritage Program Management Urgency Ranks and their Definitions

M1	Management actions may be required within one year or the element occurrences could be lost or irretrievably degraded.
M2	New management actions may be needed within 5 years to prevent the loss of the element occurrences within the PCA.
M3	New management actions may be needed within 5 years to maintain the current quality of the element occurrences in the PCA.
M4	Current management seems to favor the persistence of the elements in the PCA, but management actions may be needed in the future to maintain the current quality of the element occurrences.
M5	No management needs are known or anticipated in the PCA.

APPENDIX 2

Plant and Wildlife Species Recorded at the Surveyed Open Space Properties

PLANTS (rare species of concern are in bold)

Plant Family Common Name	Plant family Scientific Name	Plant Scientific Name	Plant Common Name	Non native=x; Colorado Noxious Weed List Category=B or C	Clear Creek	Kinney Run- northern parcels including Eagle Ridge	Kinney Run southern parcels Shelton school to Apex	Stone bridge
Maple	<i>Aceraceae</i>	<i>Acer negundo</i>	Box elder		x	x	x	x
Soapberry	<i>Sapindaceae</i>	<i>Acer glabrum</i>	Rocky Mountain maple			x		
Agave	<i>Agavaceae</i>	<i>Yucca glauca</i>	Great Plains yucca			x		x
Onion	<i>Alliaceae</i>	<i>Allium x proliferum</i>	Tree onion	x (garden escapee)		x		
Sumac	<i>Anacardiaceae</i>	<i>Rhus trilobata</i> var. <i>trilobata</i>	Skunkbrush				x	x
Sumac	<i>Anacardiaceae</i>	<i>Toxicodendron rydbergii</i>	Poison ivy		x		x	
Carrot	<i>Apiaceae</i>	<i>Angelica ampla</i>	Giant angelica			x		x
Carrot	<i>Apiaceae</i>	<i>Conium maculatum</i>	Poison hemlock	C				x
Dogbane	<i>Apocynaceae</i>	<i>Apocynum</i> sp.	Dogbane		x			
Milkweed	<i>Asclepidaceae</i>	<i>Asclepias speciosa</i>	Common milkweed		x			
Sunflower	<i>Asteraceae</i>	<i>Achillea millefolium</i>	Common yarrow					x
Sunflower	<i>Asteraceae</i>	<i>Ambrosia psilostachya</i>	Westwern ragweed					x
Sunflower	<i>Asteraceae</i>	<i>Artemisia dracunculus</i>	Tarragon			x		x
Sunflower	<i>Asteraceae</i>	<i>Artemisia fridgida</i>	Fringed sage			x		x
Sunflower	<i>Asteraceae</i>	<i>Artemisia ludovicinaa</i>	Louisiana sage			x	x	x
Sunflower	<i>Asteraceae</i>	<i>Carduus nutans</i>	Musk thistle	B				x
Sunflower	<i>Asteraceae</i>	<i>Cirsium arvense</i>	Canada thistle	B		x	x	x
Sunflower	<i>Asteraceae</i>	<i>Cirsium undulatum</i>	Wavyleaf thistle					x
Sunflower	<i>Asteraceae</i>	<i>Conyza canadensis</i>	Horseweed		x			
Sunflower	<i>Asteraceae</i>	<i>Ericameria nauseosa</i> var. <i>graveolens</i>	Rubber rabbitbrush			x	x	x
Sunflower	<i>Asteraceae</i>	<i>Ericameria nauseosa</i> var. <i>nauseosa</i>	Rubber rabbitbrush			x		x
Sunflower	<i>Asteraceae</i>	<i>Grindelia squarosa</i>	Curlycup gumweed		x		x	x
Sunflower	<i>Asteraceae</i>	<i>Gutierrezia sarothrae</i>	Broom snakeweed			x		x

Plant Family Common Name	Plant family Scientific Name	Plant Scientific Name	Plant Common Name	Non native=x; Colorado Noxious Weed List Category=B or C	Clear Creek	Kinney Run-northern parcels including Eagle Ridge	Kinney Run southern parcels Shelton school to Apex	Stone bridge
Sunflower	<i>Asteraceae</i>	<i>Heliantus pumilus</i>	Little sunflower			x	x	x
Sunflower	<i>Asteraceae</i>	<i>Heterotheca vilosa</i>	Hairy false goldenaster		x	x	x	x
Sunflower	<i>Asteraceae</i>	<i>Liatrix punctata</i>	Dotted blazingstar					x
	<i>Asteraceae</i>	<i>Onopordum acanthium</i>	Scotch thistle	B				x
Sunflower	<i>Asteraceae</i>	<i>Ratibida columifera</i>	Prairie coneflower			x		x
Sunflower	<i>Asteraceae</i>	<i>Senecio integermis</i>	Ragwort					x
Sunflower	<i>Asteraceae</i>	<i>Solidago sp.</i>	Goldenrod			x	x	x
Sunflower	<i>Asteraceae</i>	<i>Symphotrichium porteri</i>	Smooth white aster		x			x
Sunflower	<i>Asteraceae</i>	<i>Townsendia grandiflora</i>	Largeflower easter daisy			x		
	<i>Asteraceae</i>	<i>Tragopogon dubius</i>	Western salsify	x				x
Birch	<i>Betulaceae</i>	<i>Alnus incana ssp. tenuifolia</i>	Thinleaf alder		x			
Birch	<i>Betulaceae</i>	<i>Betula occidentalis</i>	Water birch		x			
Borage	<i>Boraginaceae</i>	<i>Cynoglossum officinale</i>	Houndstongue	B		x		x
Borage	<i>Boraginaceae</i>	<i>Lithospermum sp.</i>	Stoneseed, Puccoon			x		x
Borage	<i>Boraginaceae</i>	<i>Onosmodium bejariense var. occidentale</i>	Western marbleseed			x		
Mustard	<i>Brassicaceae</i>	<i>Boechera sp.</i>	Rockcress				x	
Mustard	<i>Brassicaceae</i>	<i>Camelina microcarpa</i>	Littlepod false flax	x		x		
Mustard	<i>Brassicaceae</i>	<i>Erysimum capitatum</i>	Wallflower				x	
Mustard	<i>Brassicaceae</i>	<i>Physaria x 1</i>	Twinpod			x		
Mustard	<i>Brassicaceae</i>	<i>Thlaspi arvense</i>	Field pennycress	x		x		x
Cactus	<i>Cactaceae</i>	<i>Opuntia macrorhiza</i>	Western pricklypear					x
Cactus	<i>Cactaceae</i>	<i>Opuntia polyacantha</i>	Plains pricklypear					x
Hemp	<i>Cannabaceae</i>	<i>Celtis reticulata</i>	Netleaf hackberry				x	
Hemp	<i>Cannabaceae</i>	<i>Humulus neomexicana</i>	New Mexican hops			x		x
Honeysuckle	<i>Caprifoliaceae</i>	<i>Symphoricarpos sp.</i>	Snowberry			x	x	x
Pink	<i>Caryophyllaceae</i>	<i>Silene sp.</i>	Catchfly			x		

Plant Family Common Name	Plant family Scientific Name	Plant Scientific Name	Plant Common Name	Non native=x; Colorado Noxious Weed List Category=B or C	Clear Creek	Kinney Run-northern parcels including Eagle Ridge	Kinney Run southern parcels Shelton school to Apex	Stone bridge
Cypress	<i>Cupressaceae</i>	<i>Juniperus scopulorum</i>	Rocky Mountain juniper		x			x
Carex	<i>Cyperaceae</i>	<i>Carex microptera</i>	Small-winged sedge				x	
Sedge	<i>Cyperaceae</i>	<i>Schoenoplectus tabernaemontani</i>	Softstem bulrush			x		
Sedge	<i>Cyperaceae</i>	<i>Scirpus pallidus</i>	Cloaked bulrush			x		
Teasel	<i>Dipsacaceae</i>	<i>Dipsacus fullonum</i>	Common teasel	B		x		x
Oleaster	<i>Elaeagnaceae</i>	<i>Elaeagnus angustifolia</i>	Russian olive	B		x		
Horsetail	<i>Equisetaceae</i>	<i>Equisetum hymenale</i>	Horsetail		x			
Horsetail	<i>Equisetaceae</i>	<i>Equisetum sp.</i>	Horsetail				x	
Heath	<i>Ericaceae</i>	<i>Arctostaphylos uva-ursi</i>	Kinnikinnick			x		
Spurge	<i>Euphorbiaceae</i>	<i>Euphorbia myrsinites</i>	Myrtle spurge	A		x		x
Pea	<i>Fabaceae</i>	<i>Amorpha fruticosa</i>	False indigo			x		
Pea	<i>Fabaceae</i>	<i>Astragalus drummondii</i>	Drummond's milkvetch			x		x
Pea	<i>Fabaceae</i>	<i>Astragalus flexuosus</i>	Flexible milkvetch			x		
Pea	<i>Fabaceae</i>	<i>Dalea purpurea</i>	Purple prairie clover			x		x
Pea	<i>Fabaceae</i>	<i>Glyceriza lepidota</i>	Wild licorice		x			
Pea	<i>Fabaceae</i>	<i>Lathyrus latifolius</i>	Everlasting sweetpea	X garden escape	x			
Pea	<i>Fabaceae</i>	<i>Lupinus argenteus</i>	Silvery lupine					x
Pea	<i>Fabaceae</i>	<i>Psoralidium sp.</i>	Scurfpea			x		
Pea	<i>Fabaceae</i>	<i>Psoralidium tenuiflorum</i>	Slimflower scurfpea					x
Pea	<i>Fabaceae</i>	<i>Robinia sp.</i>	Locust	x	x			
Pea	<i>Fabaceae</i>	<i>Securigera varia</i>	Crown vetch	X garden escape			x	
Pea	<i>Fabaceae</i>	<i>Thermopsis rhombifolia</i>	Golden banner					x
Beech	<i>Fagaceae</i>	<i>Quercus gambelii</i>	Gambel oak	planted				x
Geranium	<i>Geraniaceae</i>	<i>Geranium sp.</i>	Geranium				x	x
Currant	<i>Grossulariaceae</i>	<i>Mahonia repens</i>	Oregon grape			x		
Currant	<i>Grossulariaceae</i>	<i>Ribes cereum</i>	Wax currant			x	x	x

Plant Family Common Name	Plant family Scientific Name	Plant Scientific Name	Plant Common Name	Non native=x; Colorado Noxious Weed List Category=B or C	Clear Creek	Kinney Run-northern parcels including Eagle Ridge	Kinney Run southern parcels Shelton school to Apex	Stone bridge
Waterleaf	<i>Hydrophyllaceae</i>	<i>Hydrophyllum fendleri</i>	Fendler's waterleaf			x		
Juncus	<i>Juncaeae</i>	<i>Juncus arcticus</i>	Arctic rush		x			
Rush	<i>Juncaeae</i>	<i>Juncus confusus</i>	Colorado rush		x	x	x	
Mint	<i>Lamiaceae</i>	<i>Mentha spicata</i>	Garden spearmint	x				x
Mint	<i>Lamiaceae</i>	<i>Mondarda fistula</i> var. <i>menthifolia</i>	Beebalm/Wild bergamont			x		
Mint	<i>Lamiaceae</i>	<i>Nepeta cataria</i>	Catnip	x			x	x
Flax	<i>Linaceae</i>	<i>Linum lewisii</i>	Lewis flax			x		x
Olive	<i>Oleaceae</i>	<i>Syringa vulgaris</i>	Common lilac	X garden species	x			
Evening primrose	<i>Onagraceae</i>	<i>Epilobium ciliatum</i>	American willow-herb					x
Evening primrose	<i>Onagraceae</i>	<i>Epilobium hirsutum</i>	Hairy willow-herb	A		x		x
Evening primrose	<i>Onagraceae</i>	<i>Epilobium</i> sp.	Willow-herb				x	x
Evening primrose	<i>Onagraceae</i>	<i>Oenothera biennis</i>	Common evening-primrose					x
Evening primrose	<i>Onagraceae</i>	<i>Oenothera curtiflora</i>	Velvetweed				x	
Poppy	<i>Papaveraceae</i>	<i>Argemone</i> sp.	Prickly poppy			x	x	x
Pine	<i>Pinaceae</i>	<i>Pinus ponderosa</i>	Ponderosa pine		x			
Plantain	<i>Plantaginaceae</i>	<i>Linaria dalmatica</i>	Dalmatian toadflax	B			x	
Plantain	<i>Plantaginaceae</i>	<i>Linaria vulgaris</i>	Butter and eggs	B	x			
Plantain	<i>Plantaginaceae</i>	<i>Penstemon secundiflorus</i>	Sidebells penstemon					x
Plantain	<i>Plantaginaceae</i>	<i>Plantago major</i>	Common plantain	x				x
Plantain	<i>Plantaginaceae</i>	<i>Veronica americana</i>	American speedwell			x		
Plantain	<i>Plantaginaceae</i>	<i>Veronica anagallis-aquatica</i>	Water speedwell			x		
Grass	<i>Poaceae</i>	<i>Achnatherum hymenoides</i>	Indian ricegrass			x		
Grass	<i>Poaceae</i>	<i>Achnatherum robustum</i>	Sleepygrass					x
Grass	<i>Poaceae</i>	<i>Acnatherum scribneri</i>	Scribner's needlegrass				x	
Grass	<i>Poaceae</i>	<i>Agropyron cristatum</i>	Crested wheatgrass	x		x	x	
Grass	<i>Poaceae</i>	<i>Agrostis</i> sp.		x	x		x	

Plant Family Common Name	Plant family Scientific Name	Plant Scientific Name	Plant Common Name	Non native=x; Colorado Noxious Weed List Category=B or C	Clear Creek	Kinney Run-northern parcels including Eagle Ridge	Kinney Run southern parcels Shelton school to Apex	Stone bridge
Grass	Poaceae	<i>Andropogon gerardii</i>	Big bluestem			x		x
Grass	Poaceae	<i>Bouteloua curtipendula</i>	Sideoats gramma					x
Grass	Poaceae	<i>Bromus inermis</i>	Smooth brome	x	x	x	x	x
Grass	Poaceae	<i>Dactylis glomerata</i>	Orchardgrass	x		x		
Grass	Poaceae	<i>Dichanthelium oligosanthes var. scribnerianum</i>	Few-flowered panicgrass		x			
Grass	Poaceae	<i>Elymus elymoides</i>	Squirreltail					x
Grass	Poaceae	<i>Koeleria macrantha</i>	Junegrass					x
Grass	Poaceae	<i>Muhlenbergia andina</i>	Foxtail muhly		x			
Grass	Poaceae	<i>Nassella viridula</i>	Green needlegrass			x	x	x
Grass	Poaceae	<i>Panicum sp.</i>	Panicgrass					x
Grass	Poaceae	<i>Phleum pratense</i>	Timothy	x				x
Grass	Poaceae	<i>Poa compressa</i>	Canada bluegrass	x				x
Grass	Poaceae	<i>Polypogon monspeliensis</i>	Rabbitsfoot grass	x		x		
Grass	Poaceae	<i>Schizachyrium scoparium</i>	Little bluestem		x			
Grass	Poaceae	<i>Thinopyrum intermedium</i>	Intermediate wheatgrass	x		x		
Buckwheat	Polygonaceae	<i>Eriogonum effusum</i>	Spreading buckwheat					x
Buckwheat	Polygonaceae	<i>Rumex crispus</i>	Curly dock			x	x	x
Buttercup	Ranunculaceae	<i>Clematis ligusticifolia</i>	Western white virgin's-bower		x			
Rose	Rosaceae	<i>Cercocarpus montana</i>	Mountain mahogany			x		x
Rose	Rosaceae	<i>Crataegus succulenta</i>	Rocky Mountain hawthorn			x	x	
Rose	Rosaceae	<i>Geum sp.</i>	Avens			x		
Rose	Rosaceae	<i>Physocarpus monogynus</i>	Ninebark				x	
Rose	Rosaceae	<i>Potentilla fissa</i>	Bigflower cinquefoil					x
	Rosaceae	<i>Potentilla recta</i>	Sulphur cinquefoil	B				x

Plant Family Common Name	Plant family Scientific Name	Plant Scientific Name	Plant Common Name	Non native=x; Colorado Noxious Weed List Category=B or C	Clear Creek	Kinney Run-northern parcels including Eagle Ridge	Kinney Run southern parcels Shelton school to Apex	Stone bridge
Rose	<i>Rosaceae</i>	<i>Potentilla sp.</i>					x	
Rose	<i>Rosaceae</i>	<i>Prunus americana</i>	American plum					x
Rose	<i>Rosaceae</i>	<i>Prunus virginiana var. melanocarpa</i>	Choke cherry		x	x	x	x
Rose	<i>Rosaceae</i>	<i>Rosa sp.</i>	Rose		x			x
Rose	<i>Rosaceae</i>	<i>Rubus deliciosus</i>	Delicious raspberry				x	x
Madder or Coffee	<i>Rubiaceae</i>	<i>Galium sp.</i>	Bedstraw		x			
Willow	<i>Salicaceae</i>	<i>Populus angustifolia</i>	Narrowleaf cottonwood		x		x	
Willow	<i>Salicaceae</i>	<i>Populus deltoides</i>	Plains cottonwood		x		x	x
Willow	<i>Salicaceae</i>	<i>Populus x acuminata</i>	Lanceleaf cottonwood		x			
Willow	<i>Salicaceae</i>	<i>Salix amygdaloides</i>	Peachleaf willow					x
Willow	<i>Salicaceae</i>	<i>Salix exigua</i>	Sandbar willow		x		x	x
Willow	<i>Salicaceae</i>	<i>Salix x fragilis</i>	Crack willow	x			x	
Sandalwood	<i>Santalaceae</i>	<i>Comandra umbellata</i>	Bastard toadflax			x		
Figwort	<i>Scrophulariaceae</i>	<i>Scrophularia lanceolata</i>	Lanceleaf figwort			x		
Figwort	<i>Scrophulariaceae</i>	<i>Verbascum thapsus</i>	Woolly mullein	x	x	x	x	x
Catbriar	<i>Smilacaceae</i>	<i>Smilax lasioneura</i>	Blue Ridge carrionflower			x		
Nightshade	<i>Solanaceae</i>	<i>Solanum sp.</i>	Nightshade			x		
Cattail	<i>Typhaceae</i>	<i>Typha latifolia</i>	Broadleaf cattail			x		x
Nettle	<i>Urticaceae</i>	<i>Urtica dioica ssp. gracilis</i>	Stinging nettle					x
Grape	<i>Vitaceae</i>	<i>Parthenocissus sp.</i>	Virginia creeper				x	

WILDLIFE (rare species are in bold)

FAMILY	SCIENTIFIC_NAME	COMMON_NAME	CNHP* RANK	CLEAR CREEK	KINNEY RUN	STONEBRIDGE HOA	WASHINGTON PARK
BIRD							
Accipitridae	Accipiter cooperii	Cooper's Hawk	G5S3S4B,S4N	X	X		
Accipitridae	Accipiter striatus	Sharp-shinned Hawk	G5S3S4B,S4N	X	X		
Accipitridae	Aquila chrysaetos	Golden Eagle	G5S3S4B,S4N	X			
Accipitridae	Buteo jamaicensis	Red-tailed Hawk	G5S5B,S5N	X	X	X	
Accipitridae	Buteo swainsoni	Swainson's Hawk	G5S5B	X	X	X	
Accipitridae	Haliaeetus leucocephalus	Bald Eagle	G5S1B,S3N	X			
Aegithalidae	Psaltriparus minimus	Bushtit	G5S4		X	X	X
Alcedinidae	Megaceryle alcyon	Belted Kingfisher	G5S5N	X			
Anatidae	Aix sponsa	Wood Duck	G5S4B	X			
Anatidae	Anas crecca	Green-winged Teal	G5S5B,S4N	X			
Anatidae	Anas platyrhynchos	Mallard	G5S5	X	X		
Anatidae	Aythya americana	Redhead	G5S4B	X			
Anatidae	Branta canadensis	Canada Goose	G5S5	X	X		X
Anatidae	Mareca strepera	Gadwall	G5S5B	X	X		
Anatidae	Mergus merganser	Common Merganser	G5S4B,S5N	X			
Anatidae	Spatula cyanoptera	Cinnamon Teal	G5S5B		X		
Anatidae	Spatula discors	Blue-winged Teal	G5S5B	X			
Apodidae	Aeronautes saxatalis	White-throated Swift	G5S5B	X	X		
Ardeidae	Ardea herodias	Great Blue Heron	G5S3B	X	X		
Ardeidae	Egretta thula	Snowy Egret	G5S2B	X			
Ardeidae	Nycticorax nycticorax	Black-crowned Night-Heron	G5S3B	X			
Argasidae	Argas cooleyi	Cliff Swallow	G5S5B	X	X		
Bombycillidae	Bombycilla cedrorum	Cedar Waxwing	G5S4B,S5N	X			
Cardinalidae	Passerina amoena	Lazuli Bunting	G5S5B	X	X	X	
Cardinalidae	Passerina caerulea	Blue Grosbeak	G5S4B		X		
Cardinalidae	Pheucticus melanocephalus	Black-headed Grosbeak	G5S4B	X	X	X	
Cardinalidae	Piranga ludoviciana	Western Tanager	G5S4B	X	X	X	
Cathartidae	Cathartes aura	Turkey Vulture	G5S4B	X	X		

FAMILY	SCIENTIFIC_NAME	COMMON_NAME	CNHP* RANK	CLEAR CREEK	KINNEY RUN	STONEBRIDGE HOA	WASHINGTON PARK
Certhiidae	Certhia americana	Broad-winged Hawk	G5S5B	X			
Certhiidae	Certhia americana	Brown Creeper	G5S5	X			
Charadriidae	Charadrius vociferus	Killdeer	G5S5	X			
Cinclidae	Cinclus mexicanus	American Dipper	G5S5	X			X
Columbidae	Columba livia	Rock Pigeon	G5SNA	X	X		
Columbidae	Zenaida macroura	Mourning Dove	G5S5	X	X	X	
Corvidae	Aphelocoma woodhouseii	Woodhouse's Scrub Jay	G5S5	X	X	X	
Corvidae	Corvus brachyrhynchos	American Crow	G5S5	X	X	X	
Corvidae	Corvus corax	Common Raven	G5S5	X	X		
Corvidae	Cyanocitta cristata	Blue Jay	G5S5	X	X		
Corvidae	Cyanocitta stelleri	Steller's Jay	G5S5		X		
Corvidae	Pica hudsonia	Black-billed Magpie	G5S5	X	X	X	X
Falconidae	Falco mexicanus	Prairie Falcon	G5S4B,S4N	X	X		
Falconidae	Falco peregrinus	Peregrine Falcon	G4S2B	X			
Falconidae	Falco sparverius	American Kestrel	G5S5B	X	X	X	
Fringillidae	Haemorhous cassinii	Cassin's Finch	G5S5	X		X	
Fringillidae	Haemorhous mexicanus	House Finch	G5S5	X	X	X	
Fringillidae	Loxia curvirostra	Red Crossbill	G5S5	X			
Fringillidae	Spinus pinus	Pine Siskin	G5S5			X	
Fringillidae	Spinus psaltria	Lesser Goldfinch	G5S4B	X	X	X	
Fringillidae	Spinus tristis	American Goldfinch	G5S5	X		X	
Hirundinidae	Hirundo rustica	Barn Swallow	G5S5	X	X		
Hirundinidae	Riparia riparia	Bank Swallow	G5S5	X	X		
Hirundinidae	Stelgidopteryx serripennis	Northern Rough-winged Swallow	G5S5	X	X		
Hirundinidae	Tachycineta bicolor	Tree Swallow	G5S5	X	X		
Hirundinidae	Tachycineta thalassina	Violet-green Swallow	G5S5	X	X	X	
Icteridae	Agelaius phoeniceus	Red-winged Blackbird	G5S5	X	X	X	
Icteridae	Euphagus cyanocephalus	Brewer's Blackbird	G5S5B,S4N	X	X		
Icteridae	Icterus bullockii	Bullock's Oriole	G5S5	X	X		
Icteridae	Molothrus ater	Brown-headed Cowbird	G5S5	X	X	X	

FAMILY	SCIENTIFIC_NAME	COMMON_NAME	CNHP* RANK	CLEAR CREEK	KINNEY RUN	STONEBRIDGE HOA	WASHINGTON PARK
Icteridae	Quiscalus mexicanus	Great-tailed Grackle	G5S4	X			
Icteridae	Quiscalus quiscula	Common Grackle	G5S5B,S4N	X	X	X	
Icteridae	Sturnella neglecta	Western Meadowlark	G5S5	X	X		
Icteridae	Xanthocephalus xanthocephalus	Yellow-headed Blackbird	G5S5		X		
Icteriidae	Icteria virens	Yellow-breasted Chat	G5S4B	X	X		
Mimidae	Dumetella carolinensis	Gray Catbird	G5S4B	X	X		
Mimidae	Toxostoma rufum	Brown Thrasher	G5S4		X		
Motacillidae	Anthus rubescens	American Pipit	G5S4B	X			
Pandionidae	Pandion haliaetus	Osprey	G5S3B	X			
Paridae	Poecile atricapillus	Blackcapped Chickadee	G5S5	X	X		
Paridae	Poecile atricapillus	Black-capped Chickadee	G5S5	X	X	X	
Paridae	Poecile gambeli	Mountain Chickadee	G5S5	X	X	X	
Parulidae	Cardellina pusilla	Wilson's Warbler	G5S4B	X	X		
Parulidae	Geothlypis tolmiei	MacGillivray's Warbler	G5S4B	X			
Parulidae	Geothlypis trichas	Common Yellowthroat	G5S4B	X	X		
Parulidae	Leiothlypis celata	Orange-crowned Warbler	G5S5		X		
Parulidae	Setophaga coronata	Yellow Warbler	G5S5	X	X		
Parulidae	Setophaga coronata	Yellow-rumped Warbler	G5S5	X	X		
Passerellidae	Chondestes grammacus	Lark Sparrow	G5S4	X			
Passerellidae	Junco hyemalis	Dark-eyed Junco	G5S5	X	X	X	
Passerellidae	Melospiza lincolni	Lincoln's Sparrow	G5S5B	X	X		
Passerellidae	Melospiza melodia	Song Sparrow	G5S5	X	X	X	
Passerellidae	Passerculus sandwichensis	Savannah Sparrow	G5S4B		X		
Passerellidae	Pipilo chlorurus	Green-tailed Towhee	G5S5	X	X		
Passerellidae	Pipilo maculatus	Spotted Towhee	G5S5	X	X	X	
Passerellidae	Poocetes gramineus	Vesper Sparrow	G5S5	X			
Passerellidae	Spizella breweri	Brewer's Sparrow	G5S4B	X			
Passerellidae	Spizella passerina	Chipping Sparrow	G5S4B,S5N	X	X		
Passerellidae	Zonotrichia leucophrys	White-crowned Sparrow	G5S5	X	X	X	
Passeridae	Passer domesticu	House Sparrow	G5S5	X		X	

FAMILY	SCIENTIFIC_NAME	COMMON_NAME	CNHP* RANK	CLEAR CREEK	KINNEY RUN	STONEBRIDGE HOA	WASHINGTON PARK
Phalacrocoracidae	Phalacrocorax auritus	Double-crested Cormorant	G5S4	X	X		
Picidae	Colaptes auratus	Northern Flicker	G5S5	X	X	X	
Picidae	Dryobates pubescens	Downy Woodpecker	G5S5	X	X		
Picidae	Dryobates villosus	Hairy Woodpecker	G5S5	X			
Picidae	Sphyrapicus nuchalis	Red-naped Sapsucker	G5S5		X		
Poliopitilidae	Poliopitila caerulea	Blue-gray Gnatcatcher	G5S5B	X	X		
Regulidae	Regulus calendula	Ruby-crowned Kinglet	G5S5B	X	X		
Scolopacidae	Actitis macularius	Spotted Sandpiper	G5S5	X	X		
Scolopacidae	Gallinago delicata	Wilson's Snipe	G5S5		X		
Sittidae	Sitta canadensis	Red-breasted Nuthatch	G5S5	X	X	X	
Sittidae	Sitta carolinensis	White-breasted Nuthatch	G5S5B,S4N	X	X	X	
Strigidae	Bubo virginianus	Great Horned Owl	G5S5		X		
Sturnidae	Sturnus vulgaris	Eurasian Collared-Dove	G5SNA	X	X	X	
Sturnidae	Sturnus vulgaris	European Starling	G5SNA	X	X		
Trochilidae	Archilochus alexandri	Black-chinned Hummingbird	G5S4B	X	X	X	
Trochilidae	Selasphorus platycercus	Broad-tailed Hummingbird	G5S5	X	X	X	
Troglodytidae	Catherpes mexicanus	Canyon Wren	G5S5	X			
Troglodytidae	Salpinctes obsoletus	Rock Wren	G5S4	X			
Troglodytidae	Troglodytes aedon	House Wren	G5S5	X	X	X	
Turdidae	Catharus guttatus	Hermit Thrush	G5S5B	X	X		
Turdidae	Catharus ustulatus	Swainson's Thrush	G5S5B	X			
Turdidae	Myadestes townsendi	Townsend's Solitaire	G5S5	X	X	X	
Turdidae	Sialia currucoides	Mountain Bluebird	G5S5	X	X		
Turdidae	Sialia mexicana	Western Bluebird	G5S5B, S4N	X	X	X	
Turdidae	Turdus migratorius	American Robin	G5S5	X	X	X	
Tyrannidae	Contopus cooperi	Olive-sided Flycatcher	G4S3S4B	X			
Tyrannidae	Contopus sordidulus	Western Wood-Pewee	G5S5	X	X		
Tyrannidae	Empidonax oberholseri	Dusky Flycatcher	G5S5B	X	X		
Tyrannidae	Empidonax occidentalis	Cordilleran Flycatcher	G5S5B	X	X		
Tyrannidae	Sayornis saya	Say's Phoebe	G5S5B	X	X	X	

FAMILY	SCIENTIFIC_NAME	COMMON_NAME	CNHP* RANK	CLEAR CREEK	KINNEY RUN	STONEBRIDGE HOA	WASHINGTON PARK
Tyrannidae	Tyrannus verticalis	Western Kingbird	G5S5B	X	X		
Vireonidae	Vireo gilvus	Warbling Vireo	G5S5B	X	X		
Vireonidae	Vireo plumbeus	Plumbeous Vireo	G5SNRB		X		
BUTTERFLY							
Hesperiidae	Atalopedes campestris	Sachem Skipper	G5SNA			X	
Hesperiidae	Lon taxiles	Taxiles Skipper	G5S5	X			
Nymphalidae	Cercyonis pegala	Common Wood-Nymph	G5S5		X	X	
Nymphalidae	Vanessa cardui	Painted Lady	G5S5B		X	X	
Papilionidae	Papilio multicaudata	Two-tailed Swallowtail	G5S5			X	
Papilionidae	Papilio rutulus	Western Tiger Swallowtail	G5S5		X		
Pieridae	Colias eurytheme	Orange Sulphur	G5S5			X	
Pieridae	Pieris rapae	Cabbage White	G5SNA		X	X	
DRAGONFLY							
Aeshnidae	Anax junius	Common green darner	G5S5		X		
Libellulidae	Libellula forensis	Eight-spotted Skimmer	G5S4		X	X	
Libellulidae	Sympetrum corruptum	Variiegated Meadowhawk	G5S5		X		
GRASSHOPPER							
Acrididae	Ageneotettix deorum	Whitewiskered Grasshopper	G5SNR		X		
Acrididae	Dissosteira carolina	Carolina Grasshopper	G5SNR		X	X	
Acrididae	Malanoplus bivattatus	Two-striped Grasshopper	G5SNR		X	X	
Acrididae	Melanoplus confusus	Pasture Grasshopper	G5SNR			X	
Other INSECT							
Coenagrionidae		Bluets			X		
Formicidae	Pogonomyrmex occidentalis	Western Harvester Ant	GNRSNR		X		
Gerridae	Aquarius remigis	A Water Strider	GNRSNR		X		
Sphecidae	Sphex pensylvanicus	Great Black Wasp	GNRSNR			X	
MAMMAL							
Canidae	Canis latrans	Coyote	G5S5			X	
Canidae	Vulpes sp.	Fox					
Cervidae	Cervus elaphus	Elk	G5S5		X	X	

FAMILY	SCIENTIFIC_NAME	COMMON_NAME	CNHP* RANK	CLEAR CREEK	KINNEY RUN	STONEBRIDGE HOA	WASHINGTON PARK
Cervidae	Odocoileus hemionus	Mule Deer	G5S4		X		
Felidae	Lynx rufus	Bobcat	G5S4			X	
Vespertilionidae		Bat				X	
MOLLUSC							
Physidae	Physa gyrina	Tadpole Physa	G5S5		X		

APPENDIX 3

Plant Species profiles for Taxa of Conservation Interest

Physaria x 1

Author: in preparation by Ackerfield and Smith

Brassicaceae (Mustard Family)



Close up of *Physaria x 1* by Teresa Burkert.



Close up of *Physaria x 1* by Teresa Burkert.



Close up of *Physaria x 1* in fruit by Pamela Smith.



Close up of *Physaria x 1* by Pamela Smith.

Taxonomic Comments

This record is for the entity *Physaria vitulifera* x *P. bellii* also known as *Physaria x 1*.

Ranks and Status

Global rank: G1Q

State rank: S1

Federal protection status: None

State protection status: None

Description and Phenology

General description: *Physaria x 1* is a hybrid species resulting from a cross between *Physaria vitulifera* and *P. bellii*. A hybrid had been suggested by botanists visiting populations of plants that appeared to have intermediate morphological characteristics of the two species. Genetic investigations conducted on these populations with intermediate characters confirmed the existence of a hybrid as an entity distinct from either of the two parents (Kothera 2007). This study also included an analysis of leaf morphology data which demonstrated the hybrids were different from the parental species and that the leaf characters were intermediate between the two. The leaves of *Physaria x 1* are often fiddle-shaped with

incised margins. The fruits are irregular and wrinkly. The sinus at the top and bottom of the fruit appear subequal.

Look Alikes: This hybrid could be confused with *Physaria bellii*, or *Physaria vitulifera*. *Physaria vitulifera* has larger, fiddle shaped leaves, and the constriction separating the locules of the fruit is much deeper above than below. The basal leaf margins on *P. bellii* are not incised, while they are deeply and broadly incised on *P. vitulifera*. The hybrid species, *P. vitulifera x bellii* has incised leaves, though less than in *P. vitulifera*, and wrinkly fruits (Ackerfield 2012, Smith et al. 2011).

Phenology: Flowers April-May, fruit in June-July.

Habitat



Habitat of *Physaria x 1* by Pamela Smith.

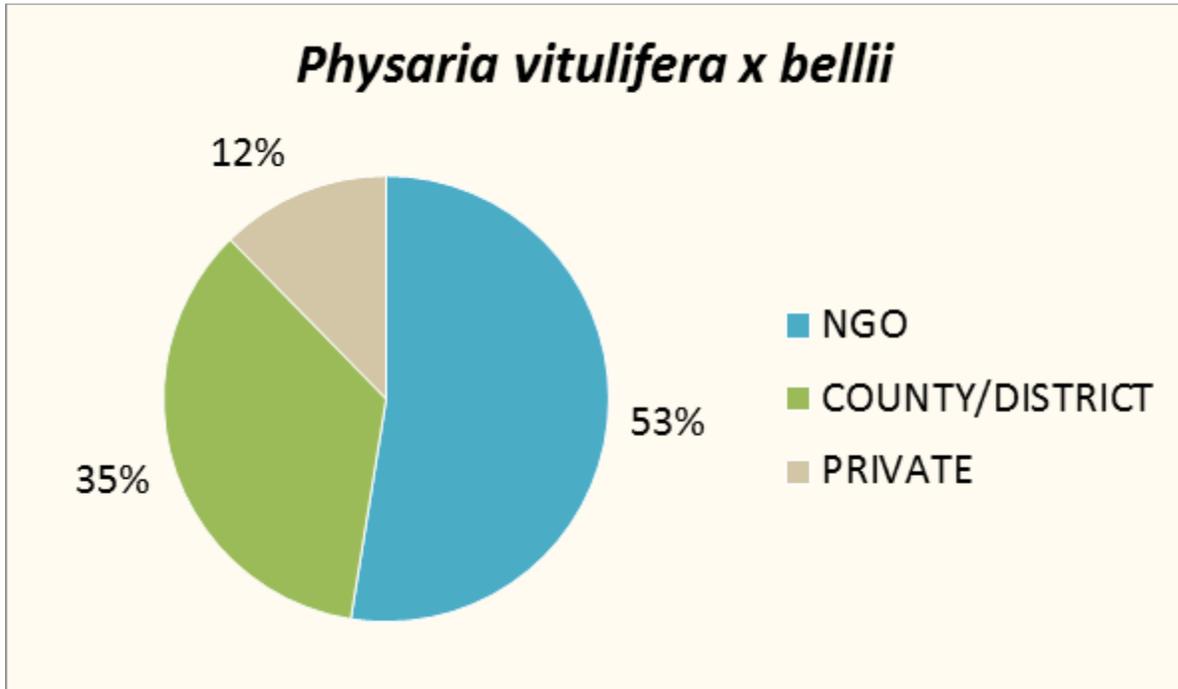
This hybrid plant species is found on hogback ridges composed of sedimentary rocks (shale, red sandstone and limestone soils). Sites are dry, south and west facing, and steep. Dominant plant communities are foothills shrublands. Associated species include: *Krascheninnikovia lanata*, *Oryzopsis hymenoides*, *Comandra umbellata*, *Cercocarpus montanus*, *Rhus aromatica* subsp. *trilobata*, *Pascopyrum smithii*, *Penstemon secundiflorus*, *Yucca glauca*, *Hesperostipa comata*, *Nassella viridula*, *Mahonia repens*, *Stanleya pinnata*, *Helianthus pumila*, *Oenothera howardii*, *Quercus gambelii*, *Psoralidium tenuiflorum*, and *Lomatium orientale* (Colorado Natural Heritage Program occurrence records as of 2017).

Elevation Range: 5,627 - 6,253 feet (1,715 - 1,906 meters)

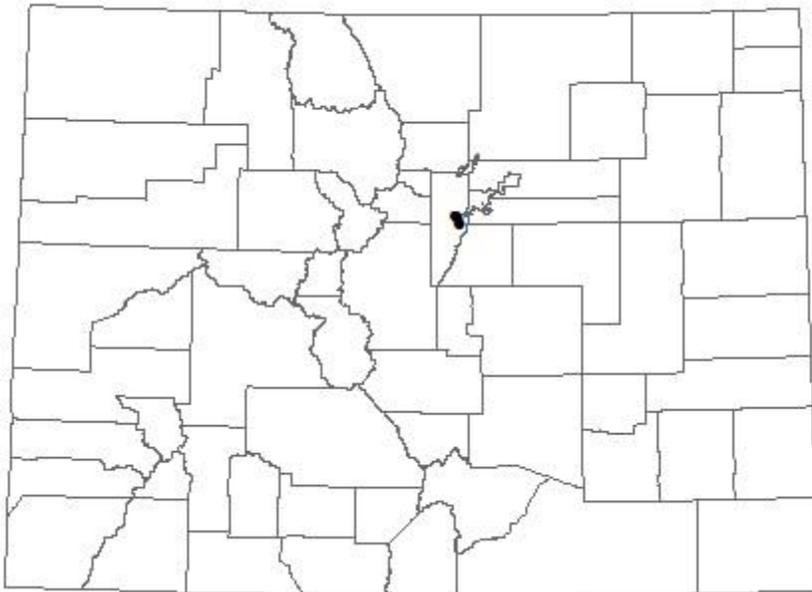
Distribution

Colorado endemic: Yes

Global range: Colorado endemic, known only from Jefferson County.



Distribution of *Physaria x 1* in Colorado according to mapped land ownership/management boundaries (CNHP 2017, COMaP).



Distribution of *Physaria x 1* in Colorado.

Threats and Management Issues

Known occurrences are found in natural areas and open spaces. Threats include game and social trails running through the occurrences, and competition from and/or unintended consequences of controlling numerous non-native plants. Avoiding development of trails or other construction activities would likely ensure that these populations can continue to exist in this area. Colorado climate scenarios for 2050 suggest temperature will increase by 3-7 F and precipitation may decrease or increase. The impact to any given rare plant habitat is likely to vary. Long-term monitoring that includes weather and soil moisture data is critical to understanding climate impacts.

References

Colorado Natural Heritage Program and the Geospatial Centroid. 2017. The Colorado Ownership and Protection Map (COMaP). Colorado State University, Ft. Collins, CO.

Kothera, L., S. M. Ward, and S. E. Carney. 2007. Assessing the threat from hybridization to the rare endemic *Physaria bellii* Mulligan (Brassicaceae). *Biological Conservation* 140: 110-118.

NatureServe. Unpublished. Concept reference for taxa which have not yet been described; to be used as a placeholder until a citation is available which describes the circumscription of the taxon.

Smilax lasioneura

Common name: Blue Ridge Carrionflower, Herbaceous Greenbriar

Author: Hook.

Family: Smilacaceae; the Catbriar Family

Taxonomic comments: Synonyms include *Nemexia lasioneura* (Hook.) Rydb, *Smilax herbacea* (Hook.) A. DC. (USDA plants)

Rank and Status

Global rank: G5

State rank: S3S4

Federal protection status: none

State protection status: none (*Smilax herbacea* listed as threatened in Ohio according to USDA plants)

CNHP status: watchlisted only

Description and Phenology

General description: Herbs. Stems annual, erect to ascending, branched, 2–2.5 m, herbaceous, glabrous; prickles absent. Leaves evenly distributed, proximalmost smaller, narrower; petiole 1.5–9 cm, shorter than blade; tendrils numerous, long, functional; blade not lustrous, pale green abaxially, ovate to round, 4–8 × 3–6 cm, not glaucous, pubescent abaxially, with transparent trichomes, base cordate, margins entire, convex, apex acuminate to rounded and cuspidate. Umbels many, axillary to leaves, to 35-flowered, dense, globose; peduncle to 12+ cm, short. Flowers: perianth greenish; tepals 35–45 mm; anthers equaling or shorter than filaments; ovules (1–)2 per locule; pedicel 0.5–1.5 cm. Berries bluish black to black, subglobose, 8–10 mm, glaucous. $2n = 26$. (Flora of North America)

Look alike: not likely to be confused with other Colorado plants.

Phenology: Flowering May-June, fruiting in fall (Flora of North America)

Habitat: *Smilax lasioneura* is found in shrublands in the outer foothills of the Front Range in Colorado.

Elevation range: 5200-7500 feet in Colorado

Distribution

Colorado: Larimer, Boulder, Jefferson, Arapahoe, Douglas, Elbert, El Paso, and Pueblo counties.

Global range: Iowa, Tennessee, Arkansas, Illinois, Nebraska, Kentucky, Mississippi, Kansas, Michigan, Colorado, Canada (Manitoba, Ontario, Saskatchewan), Pennsylvania, Florida, Minnesota, Indiana,

Missouri, Ohio, New York, Wisconsin, North Dakota, Wyoming, Georgia, North Carolina, Louisiana, Oklahoma, South Dakota, Montana, Alabama, South Carolina (SEInet)

Threats and management issues: The species is found in one of the fastest developing areas in Colorado. It is considered uncommon in Colorado and is known from a limited area along the Front Range outer foothills (Ackerfield 2015). Some populations have been found near popular walking trails and natural areas, vulnerable to human influence and trampling. In addition, this species is monoecious, that is the male and female plants are on separate plants and both are required to produce fruits.

Photos:



All above photos found on Minnesota Wildflowers website.



Photo of *Smilax lasioneura* taken at Kinney Run by Susan Panjabi.



Habitat for *Smilax lasioneura* taken at Kinney Run by Jessica Smith.

References

Ackerfield, J. 2015. Flora of Colorado. BRIT Press. First Ed.

Colorado Natural Heritage Program. 2020. CNHP Tracked Vascular Plant Species. Available online at <https://cnhp.colostate.edu/ourdata//trackinglist/custom-tracking/?group=11>

Flora of North America. (26) pp 474. Available online at http://www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=242101936

Minnesota Wildflowers. 2020. *Smilax lasioneura* (Blue Ridge Carrion flower). Available online at <https://www.minnesotawildflowers.info/flower/blue-ridge-carrion-flower>.

SEInet. 2020. Specimen records. Available online at <http://swbiodiversity.org/seinet/collections/listtabledisplay.php?db=all&taxa=Smilax+lasioneura&usethes=1&taxontype=2&sortfield1=collectionname&sortfield2=&sortorder=&page=2>

USDA, NRCS. 2018. The PLANTS Database. National Plant Data Team, Greensboro, NC USA. Available online at <https://plants.sc.egov.usda.gov/core/profile?symbol=SMLA3>