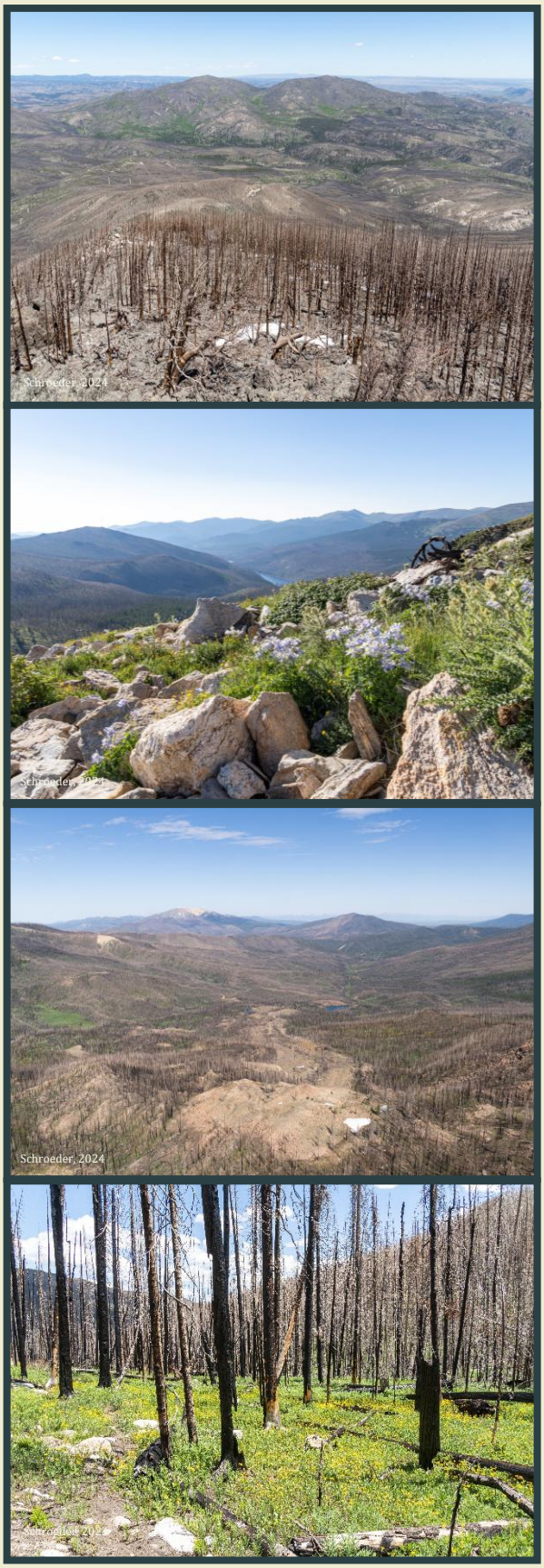

Post-Fire Noxious Weed Mapping in Arapaho & Roosevelt National Forests

February 2025

COLORADO NATURAL HERITAGE PROGRAM

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.

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EXECUTIVE SUMMARY

This report documents the Colorado Natural Heritage Program's 2024 surveys of the Arapaho Roosevelt National Forest burn scars for noxious weeds. CNHP crews surveyed the burn scars of the 2020 fires from May 28, 2024, to September 6, 2024. The crews comprised of 2 groups of 6 seasonal technicians. All data were collected on tablets using ESRI Field Maps. Data were made available to USFS staff throughout the summer as data were collected. Crews mapped polygons of weed populations and recorded an estimate of number of individuals and percent cover of the weeds within the polygon. Crews would also take a photo of the weed in context of its landscape.

Technicians recorded 18 species of noxious weeds across 3,610 polygons, covering a total of 19,550 acres. The most common species observed were *Cirsium arvense*, *Verbascum thapsus*, and *Bromus tectorum*. Among the surveyed burn scars, the Williams Fork fire scar had the highest percentage of weed coverage, with 10.8% of its area mapped as containing noxious weeds. However, it had the lowest total weed-infested acreage at 1,503 acres, with an average polygon size of 11.4 acres. The Cameron Peak fire scar had the largest total area of weed infestation, with 14,567 acres mapped, representing 8.6% of the burn scar. It also had the highest number of weed polygons, totaling 2,792, with an average polygon size of 5.3 acres. The East Troublesome fire scar had 3,480 acres of weed coverage, making up 3.9% of the total burn scar area. It contained 685 polygons, with an average size of 5.2 acres.

Table 1 below provides a detailed breakdown of weed species by burn scar.

Summary of Findings

Table 1. Summary of the noxious weeds found in the Cameron Peak, East Troublesome, and Williams Fork burn scars in 2024.

Noxious Weed Class	Scientific Name	Common Name	#Populations mapped	Total Acreage
Cameron Peak				
C	*Bromus tectorum*	Cheatgrass	149	2118.76
B	*Carduus acanthoides*	Plumeless thistle	4	4.34
B	*Carduus nutans*	Musk thistle	520	683.68
B	*Centaurea diffusa*	Diffuse knapweed	3	0.95
B	*Centaurea stoebe ssp. Micranthos*	Spotted knapweed	2	0.31
B	*Cirsium arvense*	Canada thistle	1200	7660.70
B	*Cirsium vulgare*	Bull thistle	33	4.22

Table 1. Summary of the noxious weeds found in the Cameron Peak, East Troublesome, and Williams Fork burn scars in 2024.				
C	*Convolvulus arvensis*	Field bindweed	5	2.18
B	*Euphorbia esula*	Leafy spurge	32	41.59
Watch List	*Hieracium caespitosum*	Meadow hawkweed	1	0.80
B	*Lepidium draba*	Hoary cress	3	1.89
B	*Linaria dalmatica & genistifolia*	Dalmatian toadflax	3	0.16
Other	*Melilotus spp.*	Sweetclover	6	81.42
B	*Onopordum acanthium*	Scotch thistle	5	17.35
Other	*Rumex crispus*	Curly doc	7	2.02
B	*Tripleurospermum inodorum*	Scentless chamomile	3	37.54
C	*Verbascum thapsus*	Common mullein	812	3909.43
TOTALS			**2788**	**14567.36**
East Troublesome				
C	*Bromus tectorum*	Cheatgrass	2	2.64
B	*Carduus acanthoides*	Plumeless thistle	3	12.89
B	*Carduus nutans*	Musk thistle	27	17.79
B	*Cirsium arvense*	Canada thistle	469	2748.94
B	*Cirsium vulgare*	Bull thistle	5	1.02
A	*Hieracium aurantiacum*	Orange hawkweed	1	1.46
Watch List	*Hieracium caespitosum*	Meadow hawkweed	3	2.20
B	*Leucanthemum vulgare*	Oxeye daisy	4	16.59
B	*Linaria vulgaris*	Yellow toadflax	1	0.87
Other	*Melilotus spp.*	Sweetclover	1	0.07
Other	*Rumex crispus*	Curly doc	16	35.93
B	*Tripleurospermum inodorum*	Scentless chamomile	128	601.27
C	*Verbascum Thapsus*	Common mullein	16	38.47

Table 1. Summary of the noxious weeds found in the Cameron Peak, East Troublesome, and Williams Fork burn scars in 2024.				
TOTALS			**676**	**3480.14**
Williams Fork				
B	*Carduus nutans*	Musk thistle	53	115.93
B	*Cirsium arvense*	Canada thistle	49	1311.05
B	*Leucanthemum vulgare*	Oxeye daisy	10	28.64
B	*Linaria vulgaris*	Yellow Toadflax	1	0.10
B	*Tripleurospermum inodorum*	Scentless chamomile	5	0.81
C	*Verbascum thapsus*	Common mullein	14	46.94
TOTALS			**132**	**1503.47**

Acknowledgments

The help and generosity of many experts is gratefully acknowledged. Thomas Bates (USFS), our primary contact for this project, played a critical role. His assistance with project logistics, species prioritization, and burn scar access was extremely valuable. Additionally, thank you to Amy Birtwistle (USFS) and Jonathon Bacovcin (USFS) for their assistance with access to the burn scars by providing up to date information on road conditions, blockages, hazards, and private land barriers.

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1.0 INTRODUCTION

1.1 Arapaho Roosevelt National Forest

Arapaho and Roosevelt National Forests (ARNF) are located within Colorado's Front Range, a Southern Rocky Mountain range that extends from southern Wyoming to central Colorado **(see Map 1)**. Combined, these forests extend from the foothills near Boulder and Fort Collins, to the Continental Divide and Wyoming border. They encompass 1.3 million acres of landscape and range in elevation from 5,000ft to over 14,000ft (*About the Area*, n.d.).

These forests are ecologically and biologically diverse, containing short-grass prairie, montane forest, subalpine forest, alpine tundra, and riparian zones. They also contain 1,937 miles of stream and 476 lakes. They provide habitat to a diversity of plant life, as well as ~400 species of wildlife including deer, elk, bighorn sheep, black bear, mountain lion, pronghorn antelope, coyotes, beaver, moose, rainbow trout, brook trout, brown trout, cutthroat trout, and lake trout. This also includes 6 federally protected 'regulatory' species and 127 plants, animals, and natural communities that are globally rare 'species of concern' **(see Appendix A)** (Colorado Natural Heritage Program & Cheadle, 2025). They also provide Coloradoans with critical ecosystem services including municipal/irrigated water, recreation, rangeland, timber harvesting, transportation, and approximately 2,200 prehistoric sites and 1,800 historic sites (Arapaho and Roosevelt National Forests and Pawnee National Grassland, 2001).

Preserving the biological diversity of Arapaho-Roosevelt is essential for supporting the health and sustainability of Colorado's plant, animal, and human communities, making it a top conservation priority (Arapaho and Roosevelt National Forests and Pawnee National Grassland, 2001).

1.2 Impact of Fire Disturbance

Biological diversity in forests is primarily influenced by changes to the composition and arrangement of its vegetation. In ARNF, fire is the main factor affecting vegetation. Naturally occurring fires are a regular phenomenon that rejuvenate ecosystems. Fires thin trees and clear dead vegetation, allowing new species stored in the seed bank to grow with its newly acquired sunlight, water, and nutrients. Burned organic matter releases nitrogen and phosphorus back into the soil, making it fertile for plant growth. Burned areas bring diversity as different plants and animals are adapted to different fire regimes, with some plants actually needing fire to germinate (Lentile et al., 2007).

Human activities have disrupted natural fire cycles in forest ecosystems, leading to more severe and destructive wildfires (Arapaho and Roosevelt National Forests and Pawnee National Grassland, 2001). Land management practices such as deforestation for agriculture, grazing, and slash-and-burn techniques contribute to wildfires by increasing fuel in the form of dead trees and dry vegetation while also removing natural fire breaks. Additionally, climate change, driven by human activity, has created warmer and drier conditions, making wildfires easier to ignite and spread more rapidly with greater intensity (Erickson et al., 2007) & (Why Wildfires Started by Human Activities Can Be More Destructive and Harder to Contain, 2024).

Decades of wildfire suppression near urban areas have led to an accumulation of dead wood and debris, increasing fuel loads and intensifying wildfires (Kreider et al., 2024). Furthermore, accidental, and intentional human ignitions—such as discarded cigarettes, campfires, power lines, and machinery sparks—have contributed to the growing frequency of large wildfires across Colorado (Wildfires, n.d.). Unlike lightning-induced fires, which often occur alongside rain and humidity that help slow fire spread, human-caused wildfires typically ignite during peak fire seasons, when extreme temperatures, low humidity, and high winds create ideal conditions for rapid fire growth (Why Wildfires Started by Human Activities Can Be More Destructive and Harder to Contain, 2024)

Higher severity burns negatively impact forest ecosystems by increasing vegetation mortality, increasing seed bank mortality, and damaging soils by reducing their nutrient fertility/moisture holding capacities (Lentile et al., 2007).

Additionally, and importantly for this project, fire can promote the invasion of non-native plants. Invasive species often thrive in disturbed areas because these environments provide conditions that give them a competitive edge over native species, with the main reasons being:

- **Reduced Competition and Increased Resource Availability:** Fires damage or eliminate native vegetation. This creates open space and resources, such as sun and water, that invasive species can exploit before native plants recover (Huebner, 2020), (Hunter et al., 2006), (Floyd et al., 2006), & (Erickson et al., 2007).

- **Bare Soil for Colonization:** Fires often result in bare soil, which is an ideal substrate for invasive species to establish, as they often have fast-germinating seeds and are adapted to grow in soils with poor nutrient availability (Invasive Plants, n.d.), (Hunter et al., 2006), (Floyd et al., 2006), & (Erickson et al., 2007).

- **Adaptations to Harsh Conditions**: Many invasive species are well-adapted to thrive in harsh, nutrient-poor (low phosphorus and nitrogen), or unstable environments, which are common in severely fire disturbed areas (Hunter et al., 2006), (Floyd et al., 2006), & (Erickson et al., 2007).

- **Seed Dispersal Opportunities:** Fire disturbance often coincides with human activity, which can unintentionally introduce and spread invasive species through vehicles, equipment, or clothing (Hunter et al., 2006) & (Erickson et al., 2007).

This leads to slower ecosystem recovery times and reduces biological diversity, causing severely burned areas to take years or decades to recover (Lentile et al., 2007).

1.3 Fire History in Arapaho and Roosevelt National Forests

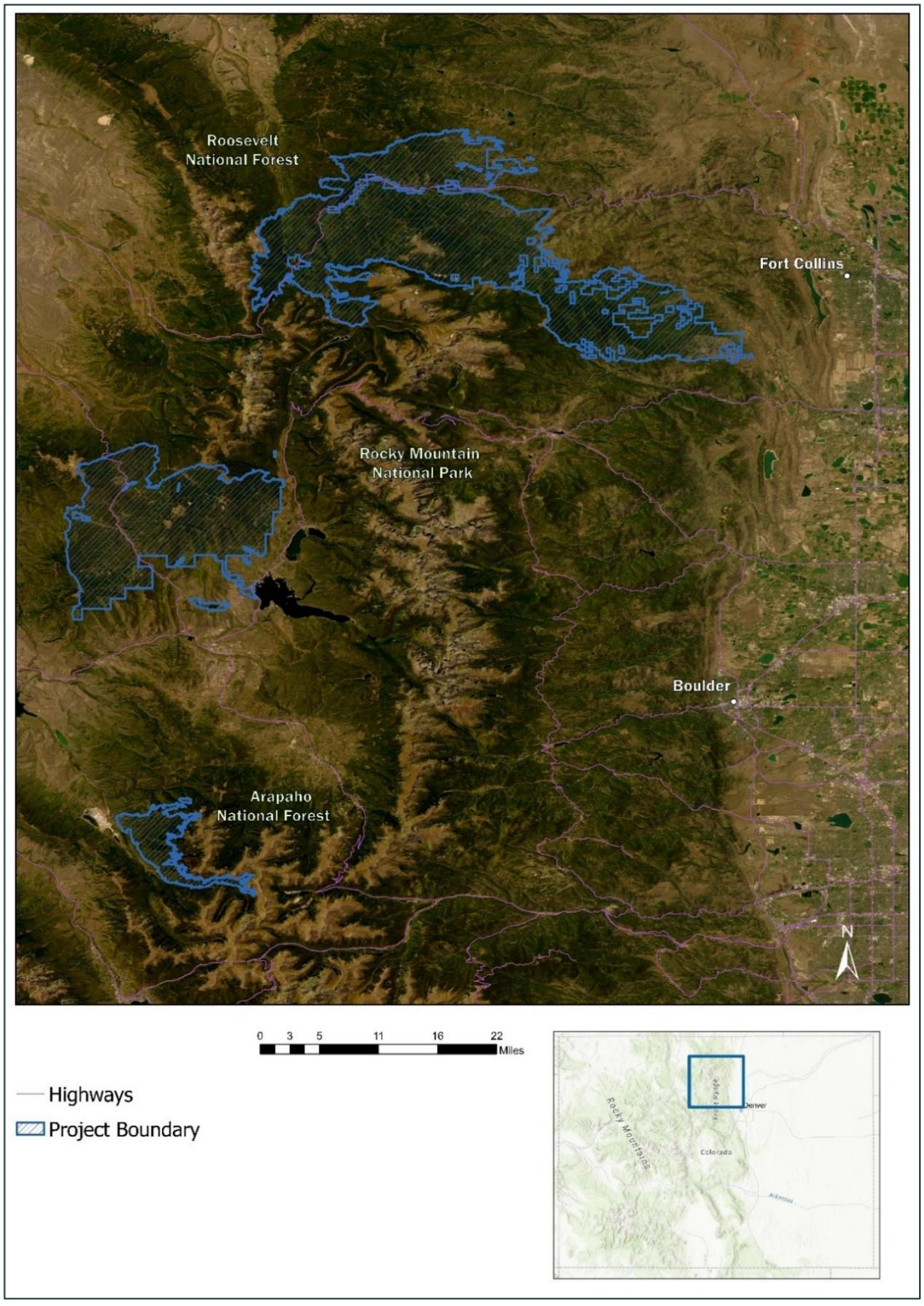
The Arapaho and Roosevelt National Forests have a fire history shaped by both natural processes and human activity **(see Table 2)**. Historically, these forests experienced a mix of low- and high-intensity fires that maintained ecological balance and promoted forest health. However, in 2020, several months of dry weather, high winds, and above-average temperatures led to over 9.5 million acres burning across the western United States. In northern Colorado and southern Wyoming, some of the largest fires since the early 1900s occurred ("The Historic 2020 Fire Year in Northern Colorado and Southern Wyoming: A Landscape Assessment to Inform Post-fire Forest Management," 2022). Within the Arapaho and Roosevelt National Forests, five major fires—Lefthand Canyon, CalWood, Williams Fork, East Troublesome, and Cameron Peak—burned over 300,000 acres, accounting for more than 25% of National Forest System lands. The Cameron Peak fire, at 208,913 acres, is the largest in Colorado history (2020 Fire Recovery Information, n.d.). This project focuses on the Cameron Peak, East Troublesome, and Williams Fork fires.

Table 2. Fire History within Arapaho and Roosevelt National Forests

Year	Name	Size	Cause
1870s	Lower Beaver Meadow Fire	200 acres	Human activity
1891	Upper Beaver Meadows Fire	100 acres	Unknown
1892	Vance Creek Fire	300 acres	Human activity
1908	Scott Gomer Creek Fire	350 acres	Unknown
1916	Deer Creek Fire	600 acres	Unknown
2011	Chrystal Fire	3200 acres	Human activity
2012	Hewlett Gulch Fire	7685 acres	Human activity
2020	Lefthand Canyon	460 acres	Unknown
2020	Calwood Fire	10,095 acres	Unknown
2020	Williams Fork Fire	14,833acres	Human activity
2020	East Troublesome Fire	193,892 acres	Human activity
2020	Cameron Peak Fire	208,913 acres	Under investigation but believed to be human activity
2023	Coarf Devils Fire	81 acres	Lightning

(*2020 Fire Recovery Information*, n.d.), (Coloradoan, 2022), (*Clear Creek Ranger District History*, n.d.), (Hewlett Gulch and High Park Wildfires || Utilities, n.d.), (Larson, 2020), (Wikipedia contributors, 2025)

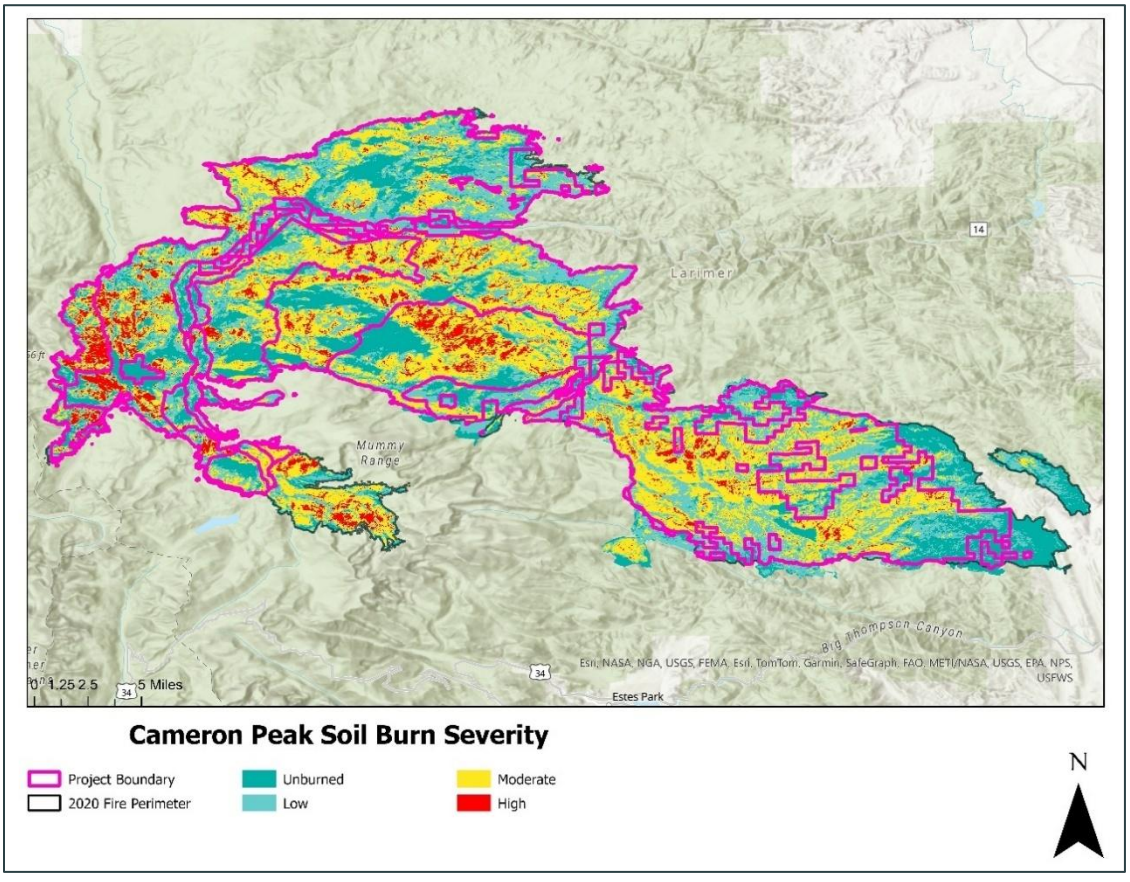
1.4 Area of Study



Map 1. Vicinity map of the Cameron Peak, East Troublesome, and Williams Fork fire scar project boundaries. The project area totaled 272,847 acres.

Cameron Peak Fire

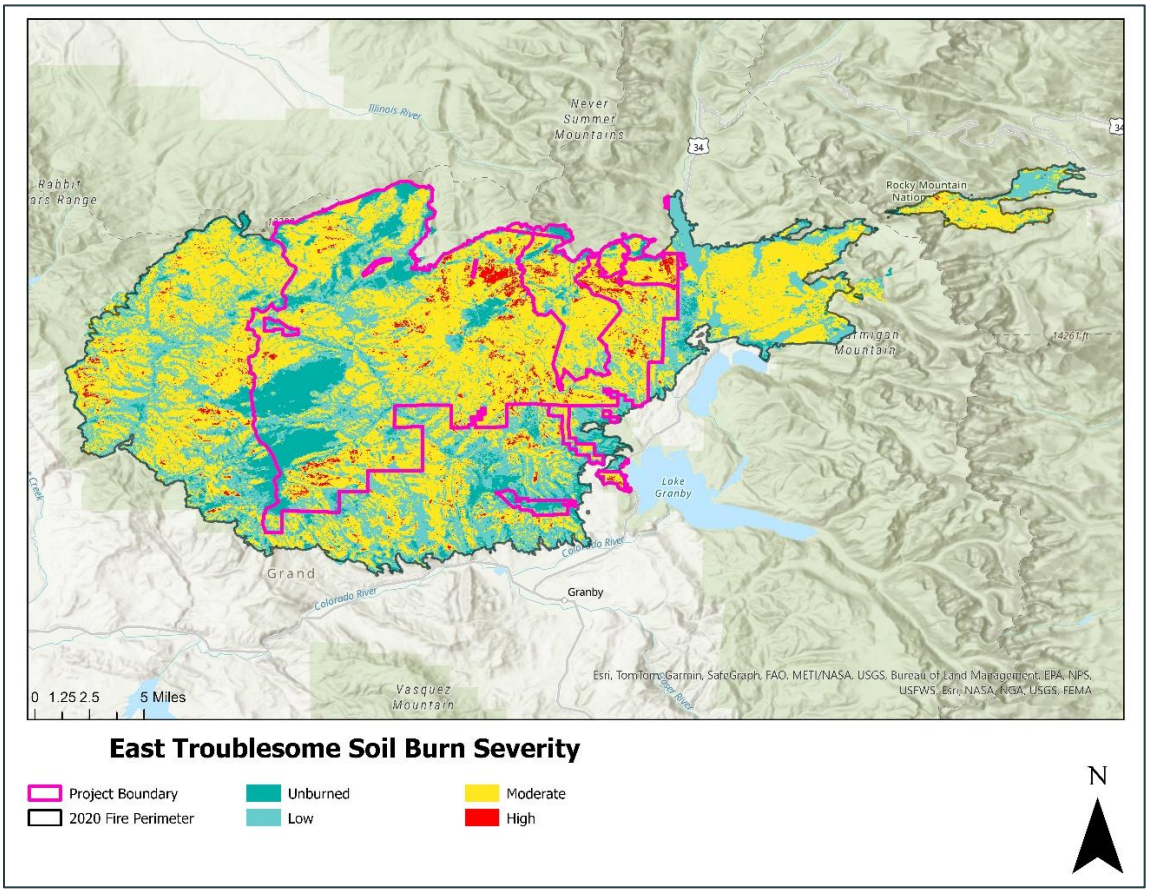
The Cameron Peak fire started on August 13th, 2020, near Cameron Pass, Colorado, and was contained 112 days later on December 2nd, 2020. The largest fire in Colorado history, it burned 208,913 acres across state, federal, and private lands and spanning elevations of 5,308-11,897ft. It burned lower montane forests dominated by ponderosa pine and Douglas fir, upper montane and subalpine forests with lodgepole pine, and subalpine forests with Engelmann spruce and subalpine fir. The percentage of high severity rea burned was 54.3% **(see Map 2)** ("The Historic 2020 Fire Year in Northern Colorado and Southern Wyoming: A Landscape Assessment to Inform Post-fire Forest Management," 2022). Over 41,700 acres of designated Wilderness Area, and 124 trails were burned (*Coalition for the Poudre River Watershed-Cameron Peak Fire*, n.d.). Over 1,050 river miles were burned, impacting the Poudre, Big Thompson, and Laramie watersheds. Thirty-two miles of Wild and Scenic River corridors were burned, and at least five reservoirs that store and deliver water to the Front Range for agriculture and drinking water needs were degraded from sediment and debris (Larimer County Office of Emergency Management, 2021). Sixteen mountain communities were affected by the fire economically, environmentally, and or through property damage as 461 structures were destroyed (*Coalition for the Poudre River Watershed-Cameron Peak Fire*, n.d.).



Map 2. Soil burn severity of Cameron Peak.

East Troublesome Fire

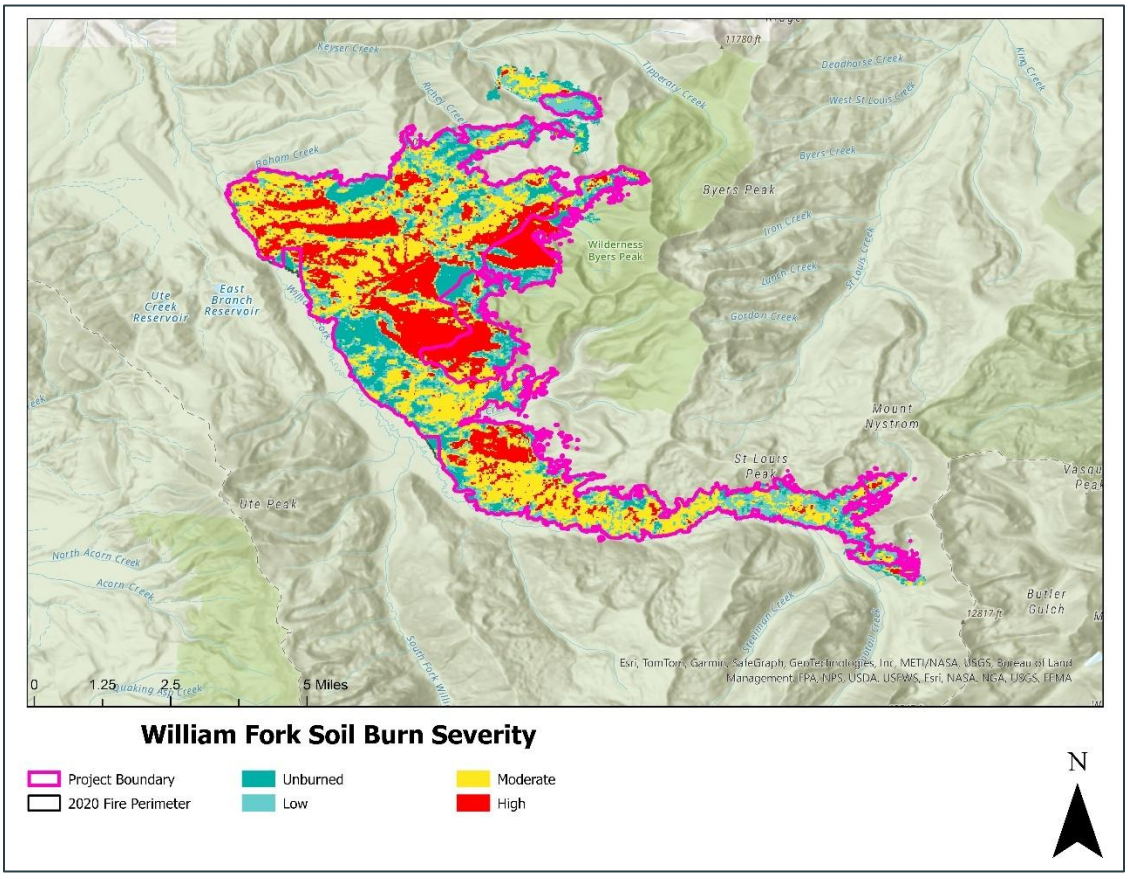
The East Troublesome fire started on October 14th, 2020, near Kremmling Colorado, and was contained on November 30th, 2020. It is the second largest fire in Colorado history, burning 193,892 acres of forest, wilderness, and private land (*2020 Fire Recovery Information*, n.d.). It burned 21,000 acres of wilderness area in Rocky Mountain National Park and is the largest fire in the park's history (*Current Fire Information & Regulations - Rocky Mountain National Park (U.S. National Park Service)*, n.d.). It affected elevations from 7,884 to 12,067 ft, primarily upper montane and subalpine forests dominated by subalpine fir, Engelmann spruce, and lodgepole pine ("The Historic 2020 Fire Year in Northern Colorado and Southern Wyoming: A Landscape Assessment to Inform Post-fire Forest Management," 2022). Small amounts of ponderosa pine and Douglas-fir were burned at the lowest elevations. The proportion of high severity burned areas within East Troublesome was 57.4% **(see Map 3)** ("The Historic 2020 Fire Year in Northern Colorado and Southern Wyoming: A Landscape Assessment to Inform Post-fire Forest Management," 2022). From the fire, 555 structures were lost, of which 366 were residences. It significantly impacted, via ash pollution and sedimentation, the Colorado River Headwaters, Big Thompson River, Fraser River, and Cache la Poudre Watersheds, contaminating water supplies and aquatic ecosystems across multiple states. It also caused sedimentation and debris runoff into the Willow Creek reservoir, Granby Reservoir, and Shadow Mountain Reservoir (*2020 Fire Recovery Information*, n.d.).



Map 3. Soil burn severity of East Troublesome.

Willliams Fork Fire

The Williams Fork fire started on August 14th, 2020, southwest of Fraser Colorado, and actively burned forest and wilderness areas until November 30th, 2020, even after receiving a foot of snow. It burned a total of 14,833 acres, ranging from 8,636 ft to 11,851ft, and reaching along the Continental divide and into the Byers Peak Wilderness Area ("The Historic 2020 Fire Year in Northern Colorado and Southern Wyoming: A Landscape Assessment to Inform Post-fire Forest Management," 2022). Its forests are primarily in forests dominated by lodgepole pine, Engelmann spruce, and subalpine fir, with minor components of ponderosa pine and Douglas-fir at lower elevations. In comparison to other 2020 fires, Williams Fork had the highest proportion of high-severity fire at 58.5% of its total area **(see Map 4)** (("The Historic 2020 Fire Year in Northern Colorado and Southern Wyoming: A Landscape Assessment to Inform Post-fire Forest Management," 2022). The fire impacted the Williams Fork Watershed, Fraser Watershed, and Colorado River Watershed, via ash runoff and sedimentation, which created short and long-term risks for water contamination for nearby communities and the surrounding environment (*Fire Footprints Stretch Across California, Colorado*, n.d.).



Map 4. Soil burn severity of Williams Fork.

1.5 Project Objectives

The purpose of this project is to continue existing survey, inventory, and monitoring work conducted on U.S. Forest Service lands. Following the Cameron Peak, East Troublesome, and Williams Fork fires of 2020, the U.S. Forest Service identified the need for additional support to survey, inventory, and monitor resources, to include wildlife, vegetation, aquatics, etc., in burned areas. This project specifically focuses on mapping noxious weeds within the Cameron Peak, East Troublesome, and Williams Fork burn scars to provide baseline data for future management within Arapaho and Roosevelt National Forests.

For the purposes of this project, a noxious weed in Colorado is defined as (*Noxious Weed Species ID | Department of Agriculture*, n.d.-b):

- **List A Species**- in Colorado these are designated by the Commissioner for eradication.

- **List B Species**- are species for which the Commissioner, in consultation with the state noxious weed advisory committee, local governments, and other interested parties, develops and implements state noxious weed management plans designed to stop the continued spread of these species.

- **List C Species**- are species for which the Commissioner, in consultation with the state noxious weed advisory committee, local governments, and other interested parties, will develop and implement state noxious weed management plans designed to support the efforts of local governing bodies to facilitate more effective integrated weed management on private and public lands. The goal of such plans will not be to stop the continued spread of these species but to provide additional education, research, and biological control resources to jurisdictions that choose to require management of List C species.

- **Watch List Species-** that have been determined to pose a potential threat to the agricultural productivity and environmental values of the lands of the state. The Watch List is intended to serve advisory and educational purposes only. Its purpose is to encourage the identification and reporting of these species to the Commissioner to facilitate the collection of information to assist the Commissioner in determining which species should be designated as noxious weeds.

- **Other**- species of additional concern to the U.S Forest Service.

All target species for weed mapping in 2024 are listed in **Appendix B**.

2.0 METHODS

Weed mapping within the Cameron Peak, East Troublesome, and Williams Fork fire scars consisted of three phases: 1) prioritization of areas within each scar, 2) field sampling to map all noxious weed populations within the scars, and 3) revision of the data for quality control. Area prioritization took place in spring of 2024, prior to the 2024 field season. Field sampling took place May-September 2024. Revision took place in fall 2024 and winter 2025.

2.1 Area Prioritization

Throughout spring 2024 three indicators of invasive species presence potential were used to determine areas of mapping importance within each burn scar **(see Map 5)**. Since the fire scars were such large areas, CNHP divided these into 1000-acre grids. These grids were given priority based on the following factors.

Soil Burn Severity – Fire severity is key predictor for the presence of invasives, with more severely burned areas more likely to have non-native species. Areas that experience more intense burns tend to have higher levels of exposed bare soil, reduced tree canopy cover, increased soil erosion, greater water runoff, increased light, and higher native seed mortality in the seed bank. These changes create favorable conditions for non-native species invasion (Hunter et al., 2006)

The severity classes are defined below:

- **Unburned / Very low:** The area after the fire was indistinguishable from pre-fire conditions. This does not always indicate the area did not burn. (i.e. canopy may be occluding the burn signal).

- **Low:** Areas of surface fire with little detected change in cover and little detected mortality of the dominant vegetation. Little to no change in the soil color, structure and condition occurred.

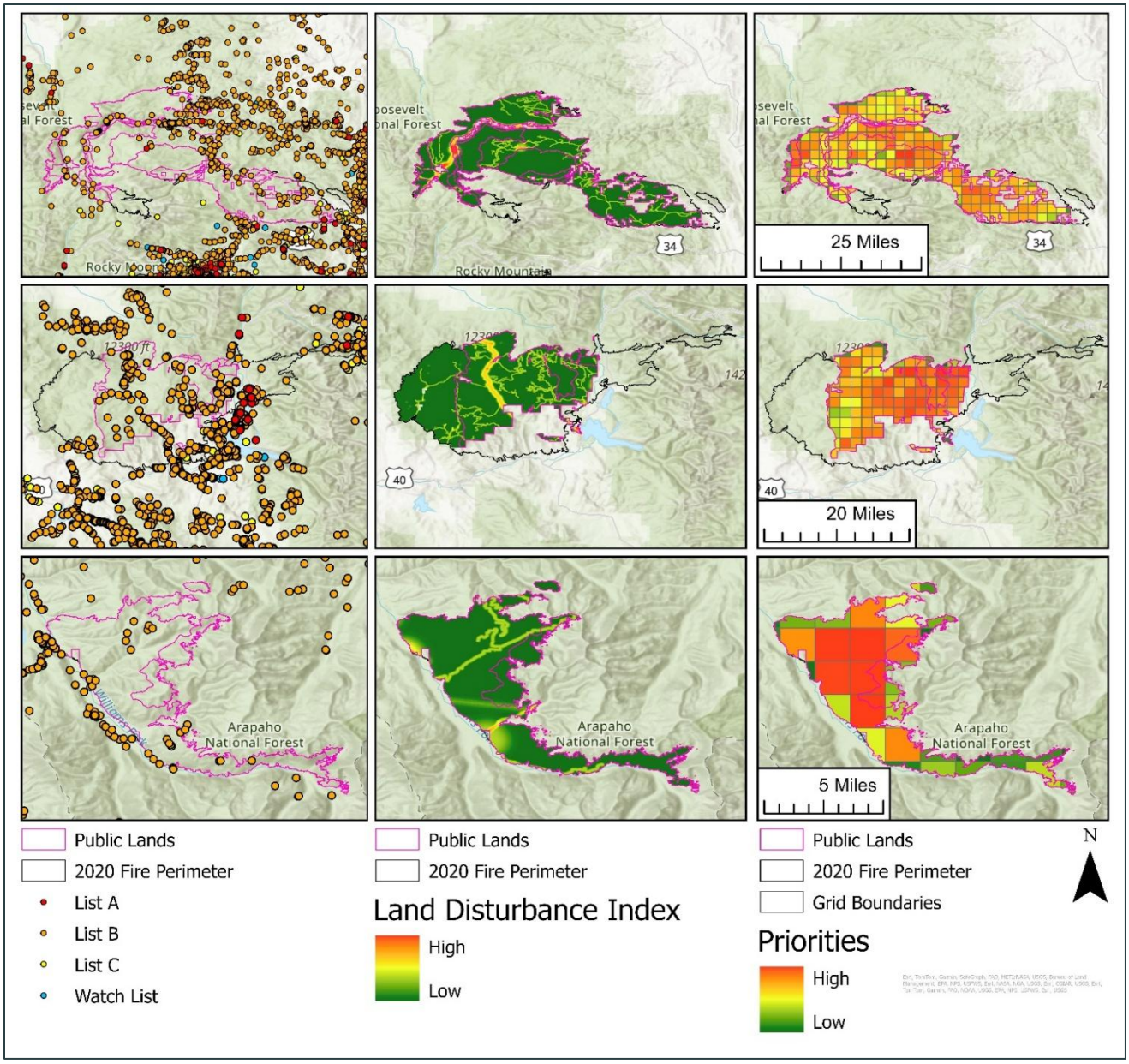
- **Moderate:** This severity class is between low and high and means there is a mixture of detected effects on the dominant vegetation.

- **High:** Areas where the canopy has high to complete consumption. Changes to soil structure, color and condition are significant and hydrophobicity may have occurred.

This layer was derived from the USDA BAER imagery support program. This classified burn severity into 4 different categories. Unburned or very low burned areas are areas that were indistinguishable from pre-fire conditions. Low burned area are areas with little detected change in cover and little mortality of dominant vegetation with little to no change in soil. Moderately burned areas signify a mix of effect between low and high burns on the dominant vegetation. High burn areas are places where the canopy had complete consumption and soil structure and condition experienced significant change (BAER, 2023).

Land Use Disturbance Index- Human activities that disturb land, such as road construction and land development, create environments with high potential for invasive species invasion. These activities disrupt soil by clearing vegetation and creating open spaces with no native plant competition. Additionally, construction machinery, vehicles, and the resulting infrastructure such as campgrounds, trails, or buildings facilitate the movement of invasive seeds which can attach to vehicles, clothing, or pets (Bajwa et al., 2017). Fire crew setups, machinery, and subsequent dozer lines which are used as fire breaks, also are vectors of weed spreading. Bulldozers often accumulate significant amounts of soil and vegetation debris in their undercarriage which is then carried and dispersed as crews move between wildland areas (Brooks et al., 2008). CNHP developed a map of Land Use Disturbance across Colorado. This models 8 anthropogenic impacts- agriculture, urban development, oil & gas development, surface mining, roads, utility lines, wind turbines, and solar installations- that were then combined into a single layer. Each individual impact was given its own weight and decay function, then they were additively combined to make the disturbance layer. The weights were scaled to produce a final range where scores => 500 are high impact, 250 - < 500 are moderate impact, > 0 - < 250 are low impact, and 0 is none or minimal impact (CNHP, 2016). Within the project area, the majority of the disturbance were from roads and trails. Along roadways, ARNF were already treating these weeds, so CNHP crews focused more on the weed populations that may have been brought in by hikers along existing trails.

Prior Noxious Weed Presence- The past occurrence of a noxious weed in an area indicates the likelihood of more nearby. Once a population of noxious weeds becomes established in an environment, it provides a seed source to spread to other weakened or disturbed areas nearby. Weeds thrive in similar conditions and suggests the area is disturbed or degraded, and likely has soil, nutrient, and light conditions ideal for establishment. Additionally, weeds produce large quantities of seed that spread easily through wind, water, animals, or human activity, enabling them to colonize nearby areas quickly. Many weeds also spread vegetatively through rhizomes, stolons, or runners, and form dense patches over time (Erickson et al., 2007). These combined factors indicate that it's likely there are more noxious weeds where prior occurrences have been found. (EDDMapS, 2024). Crews were provided with noxious weed locations from EDDMaps so that they would be able to investigate areas with established populations. This especially helped with planning hiking routes for the week.



Map 5. From left to right, existing polygons from EDDMaps, Land Disturbance Index (LDI), and 1,000-acre grid cells with assigned priority by CNHP. CNHP assigned priority based on average soil burn severity for the grid. Crews were instructed to survey near existing EDDMaps weed locations and along land disturbance from the LDI layer. From top to bottom, Cameron Peak, East Troublesome, and Williams Fork

2.2 Field Sampling

Pre-Field Season Trainings

For two weeks in May, all 12 technicians partook in training to prepare for the field season. These trainings are listed below.

- **Botany Training** – Technicians were trained by CNHP botanists on general and specific plant identification. This included understanding common botanical terminology and being able to recognize and describe common features of a plant. Classifying plants to the family level. Recognizing and recalling the names of target noxious weed species, and their common look-alikes. As well as learning to identify plant specimens to the species level through tools such as a dichotomous key, SIENet, Colorado Wildflowers app, Seek, and iNaturalist. Technicians participated in guided plants walks in the field where they practiced identifying plant family characteristics, diagnostic features of specific species, and keying out plants to the species level. Crews further studied the noxious weeds targeted in this project via online flashcards, for quick reference while in the field or office. Technicians were given a thistle guide with images of native and non-native Colorado thistles at various life stages for reference in the field.

- **Field Protocol Training** – After all plant ID trainings, the technicians spent a day at the Bobcat Ridge Natural Area. Here, they were trained on the Arapaho Roosevelt Weed Mapping protocol. This included, familiarizing themselves with the Field Maps layers and field forms. Technicians then practiced collecting and submitting data methods on project-specific weed species in the Natural Area

- **Post-Fire Safety Training** –The technicians completed a post-fire safety training, taught by the Colorado Forest Restoration Institute (CFRI). They learned how to prevent fires, identify potential fire hazards, and how to safely navigate post-fire areas, such as a burn scar.

- **Wilderness First Aid Training** – The technicians spent 16 hours learning how to identify and address medical issues that can arise in the backcountry. This included how to anticipate risks and hazards, identify medical, traumatic, environmental problems, recognize life-threatening issues, initiate basic care and deliver a cohesive report in the field. The technicians learned how to think creatively, adapt to changing situations, and learn valuable leadership, decision making, and communication skills in the field.

- **Leave No Trace Training** – Technicians learned the seven core principles designed to minimize human impact on the outdoors: how to plan ahead, travel and camp on durable surfaces, dispose of waste properly, leave what they find, minimize campfire impacts, respect wildlife, and be considerate of other visitors.

- **SPOT Satellite Training**- Crews learned and practiced SPOT Satellite check-in protocol for when out in the field.

Field Sampling

Over 8-day hitches, 12 technicians travelled to the targeted grids. In groups of three, they began at one end of the grid and walked the area in a loose zigzag pattern looking for populations of weeds **(see Figure 1)**. While surveying, they stayed within 30 meters of each other and did not lose visual contact with their other crew members. Crews searched for populations of weeds. Populations were defined as distinct groups and were within 5m to 10m between individuals. If individuals were greater than 5m – 10m apart, they were considered separate populations. Populations ranged from one-to-many individuals. Once a population of weeds was found, the crews searched more thoroughly by walking outward in a spiral extending from the weed.

Note: For individual plants, crews identified the main above ground stem of a solitary plant or main clump for cespitose plants.

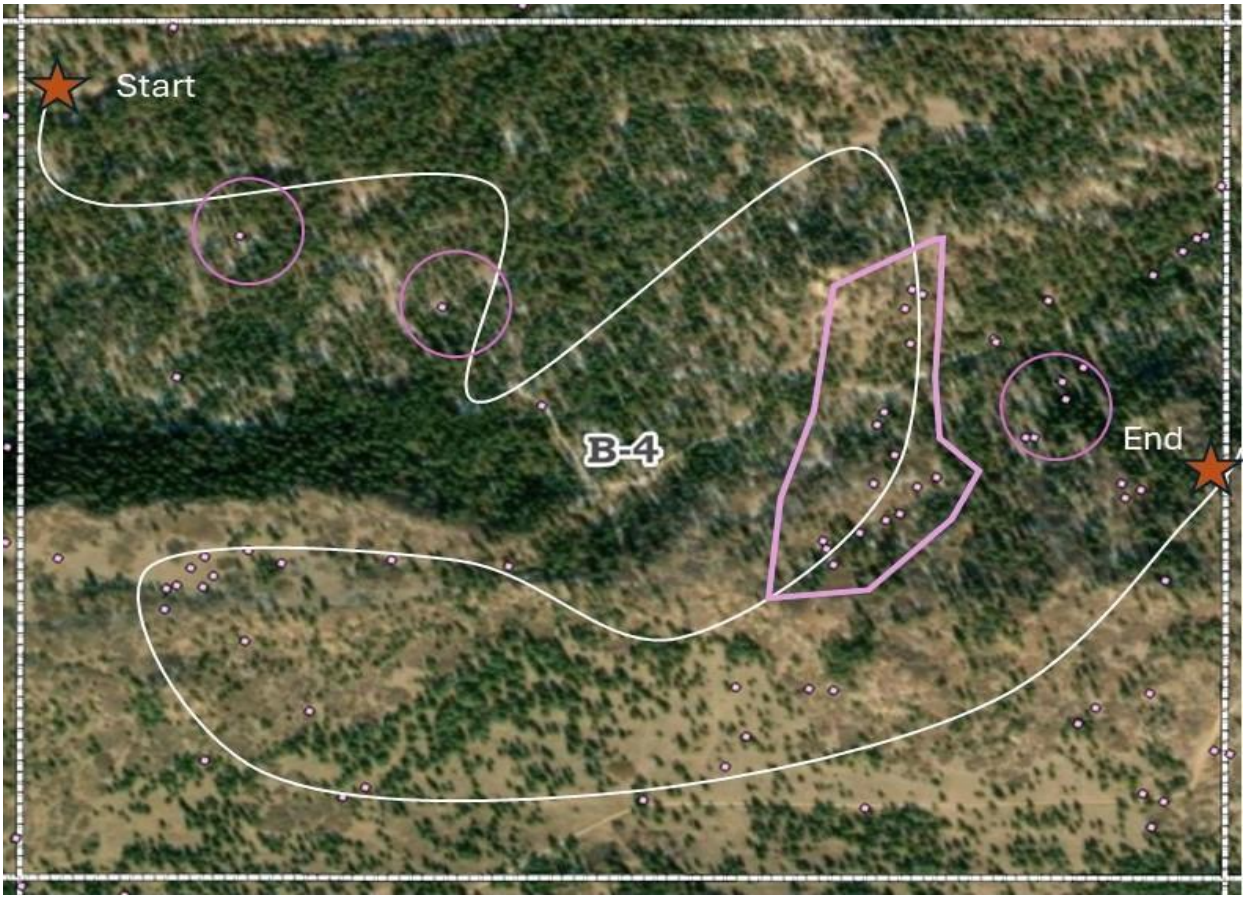


Figure 1. This shows a typical path through a grid. Surveyors walk a loose zig zag through the grid which is represented by the white line. When they find a population of weeds, they spend time in the area to search for/capture nearby individuals which is demonstrated by the pink circles around the pink dots which represent weeds. If crews come across large populations of weeds, they can group them all together into a single polygon such as demonstrated in the large polygon and circle on the right side of this diagram.

While crews surveyed the landscape, crew members paid attention to their surrounding environment and aerial imagery on their tablet. Crew members looked for natural boundaries such as the borders of shrublands, riparian zones, or cliffs. These ecotones could have been ideal habitat for weeds and, if found, were examined while surveying the greater landscape. Crews also considered artificial boundaries such as roads, trails, and dozer lines made in 2020 by firefighters trying to create fire breaks. These provided vectors for weeds to be brought into the environment, and the disturbance allows weeds to establish themselves. At the end of the day, to not distribute more weeds, crews checked their shoes, clothes, and backpacks for stuck on seeds.

Before leaving the field vehicle for the day the crew lead coordinated safety measures and developed a plan on how to return to the field vehicle. Each crew member oriented themselves with landmarks to ensure a safe exit navigation if anyone is lost or disoriented. Crews exercised caution when surveying areas with lots of dead trees and wore protective equipment in those areas. Crews avoided loose soil throughout the burn scars to prevent slips and falls. At higher elevations, thunderstorms may approach quicker than anticipated. crews paid attention to the weather and how far they were from the field vehicle. Crews would not sample when thunder or lightning were present. When possible, they would wait in the car until 20-30 minutes after a crack of thunder before surveying.

Data Collection

Each crew was provided four iPads for collecting data, two main and two backups. To maintain battery life, these were in airplane mode when out in the field. Data was collected on the iPads using Field Maps forms using the integrated GIS.

The following is a data schema and instructions for each field.

Map Layers: The map used for this protocol was called ARNF_Noxious_Weed. When clicking on the map, layers would activate or deactivate. These layers helped visualize the burn scars and guide crews where to survey. The layers are defined below:

ARNF Polygon- showed the polygons drawn by crews within the scars as weeds were found.

Edd_Maps_ARNF- showed records of list A, B, C, and 'other' weed species from the last 10 years.

Reference_ARNF- included the public lands barrier, grids, grid numbers, and 2020 fire perimeter sublayers.

ARNF_Targeted- showed the priority map of Cameron Peak, East Troublesome, and Williams Fork.

ARNF_2020_SBS- showed fire burn severity for Cameron Peak, East Troublesome, and Williams Fork.

Land Use Disturbance- showed areas of high and low land use disturbance, accounting for development, agriculture, roads, oil/gas, transmission lines, wind turbines, solar farms, and mines.

Making a Polygon: When technicians found a new weed population in the field, they hit the + symbol in the bottom right corner of their offline area. This took them to the collection form.

Drawing a polygon: Technicians could either hit 'Add Point' and hand draw the perimeter of the weed population by adding each point one by one to make a polygon **(see Figure 2)**.

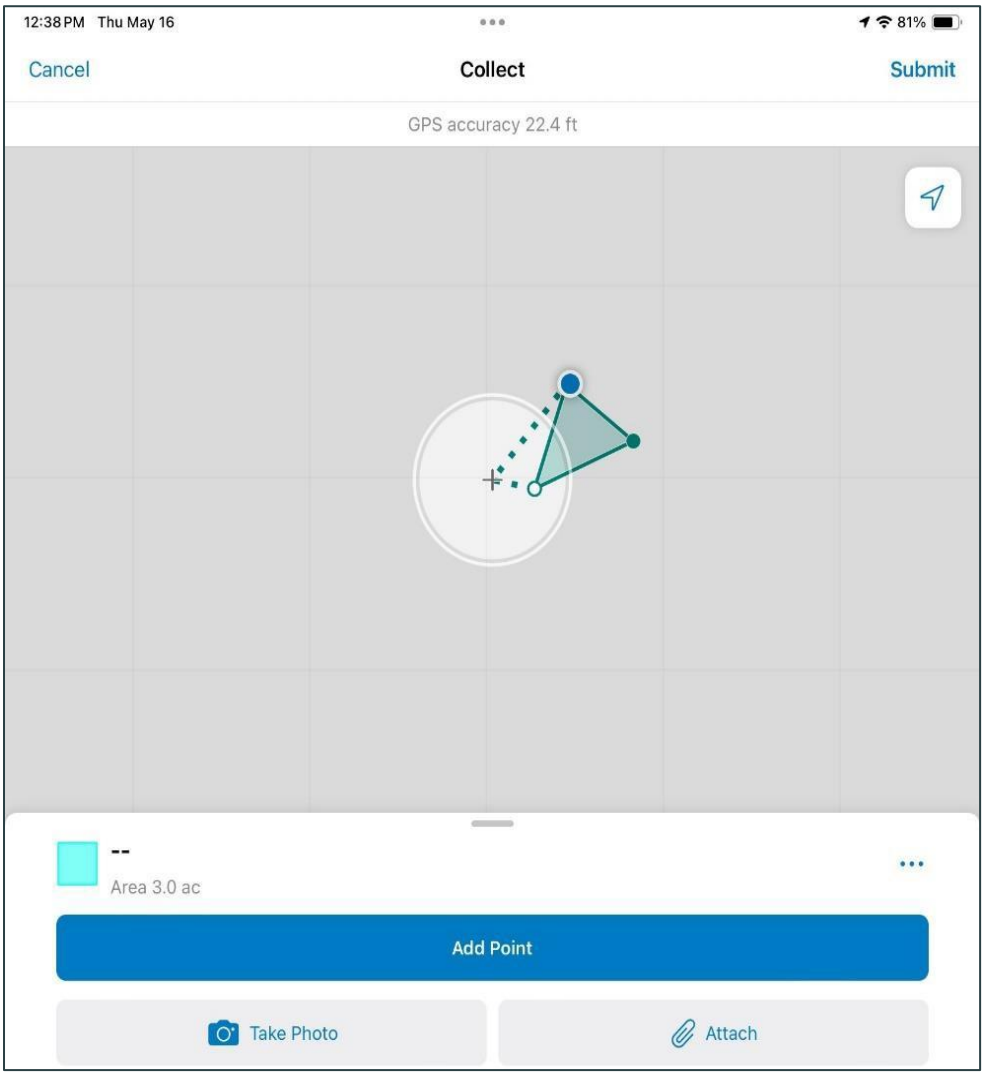


Figure 2. This is a visual of what the Field Maps screen looks like when drawing a polygon.

Photos/Attachments: Each polygon made needed to have a photo that captured the majority of weeds and their surrounding environment. This photo was taken in landscape **(see Figure 3)**.

Figure 3. An example of a continuous population photo of Cirsium arvense (Canada thistle) within the Cameron Peak burn scar, showing the majority of the population and its surrounding environment.

Filling out the Form (see Figure 4). Once the polygon was drawn, a Polygon_ID was generated by adding the OBJECTID to "ARNF". This creates a unique ID for each polygon with names such as "ARNF-1". After, technicians entered the 'PLANT CODE'. The 'SPECIES' and 'COMMONNAME' would auto populate. They then entered 'CoverClass', which was the approximate ocular % cover of the weed species within a 1x1 m area and 'Pattern', which represented how the population is growing. Pattern could be either 'continuous', which is when the population lacks gaps between individuals that are greater than 1 meter, 'patchy', which is when there are specific groupings of individuals, or N/A. N/A represented any pattern unlike continuous or patchy, such as with when a polygon is a single noxious tree. Technicians entered 'Status', which represented the life stage of the plant, which could have been- eradicated, sprouting, extant (flowering/mature), or dead standing. If there were less than 500 individuals, technicians recorded an accurate number count in 'Number of Individuals'. If there were more than 500 individuals, technicians recorded 'Density' as the number of individuals in a 1 x 1 m area. Technicians did not include density if they recorded the number of individuals. If the polygon consisted of a single weed, the cover class was 'Trace 0-1%' and the pattern was 'Continuous'.

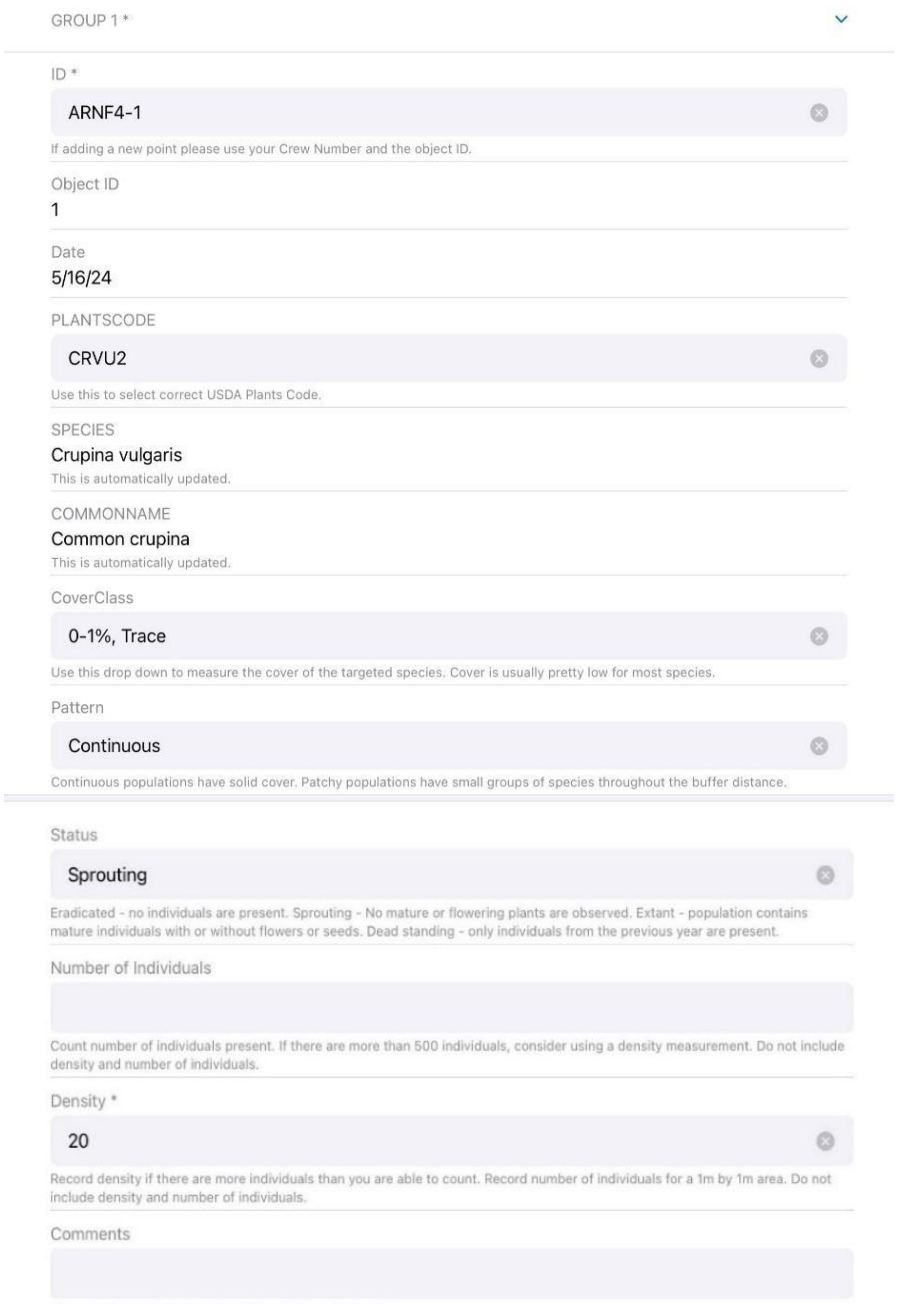


Figure 4. A visual of the data collection form in Field Maps.

Note: Each weed population technicians found was its own polygon and had its own collection form.

Syncing Data in Office- After each hitch when back at the office and in Wi-Fi, technicians synced their offline area within Field Maps. This officially uploaded and backed up the data to the Field Maps server. To do this, they clicked the 3-dots on the offline area download and hit 'Sync'.

2.3 Areas Not Surveyed

Areas that were not surveyed in 2024 included regions with extreme slopes, (over 45% grade), areas blocked by private land, and areas without road access.

See **Table 3, Table 4**, and Error! Reference source not found. for the 2024 road closures to protect public safety from the effects of the 2020 fires and post-fire flooding.

Table 3: Cameron Peak Forest Road Numbers	
129	344
129. A	177
129. B	177. B
154. C	177. C
345	345. B

(*Arapaho & Roosevelt National Forests Pawnee National Grassland - Alerts & Closures*, n.d.)

Table 4: East Troublesome Forest Road Numbers	
112	815.1
112.1A	815.2
112.1E	816.1
113	816.2
116	820.2
121.1	827.1
123.2A	831.1A
123.2B	834.1
123.2E	835.1
123.2G	835.2
190.1	835.2A
190.A	835.2B
258.1	835.2C
258.1D	835.3
258.2	835.3A
265.1	835.4
814.1	835.4

(Arapaho & Roosevelt National Forests Pawnee National Grassland - Alerts & Closures, n.d.-c)

Table 5: Williams Fork Forest Road Numbers	
140.3	141.1

(Arapaho & Roosevelt National Forests Pawnee National Grassland - Alerts & Closures, n.d.-b)

2.4 Data Revision

Post-Field Verification Mapping Revisions and Final Noxious Weed Polygons

After all data were collected, CNHP revisited each polygon in ArcPro and provided revisions. Firstly, polygon vertices were edited to eliminate distorted shaping, such as voids, self-intersections, or splits, caused by technological and user error. Additionally, polygon shapes were refined from geometric shapes to more organic figures that reflect natural or artificial boundaries in the landscape. If polygons of the same species were mapped within 10 meters of one another, they were merged to represent a singular population. This distance was chosen as the cutoff to account for GPS accuracy which is usually between 3-5m. Technicians lastly reviewed all photos and revised misidentifications of species, pattern, status, and cover classification. If crew technicians acknowledged a misidentification, CNHP staff would remove the polygon if the plant was a native species. If the polygon was an invasive, CNHP edited species and comments of the polygon.

Photo Accuracy Testing

After all data revisions, CNHP botanists tested how accurately the technicians' identified noxious weeds. We conducted an overall accuracy assessment by creating a shapefile containing every 10th polygon record, totaling 350 records. Two CNHP botanists reviewed the images and charted one of the following per record:

- Matches identification.
- Does not match identification.
- Need help identifying.

Out of the 350 records, 19 were either misidentified, missing photos, or too poor quality for identification, giving a 94% accuracy for these data. After reviewing photos and comments from the summer, crew technicians had the most trouble identifying some of the thistles. These problems usually occurred early in the summer when the thistle would just be sprouting and only the basal rosette was visible.

3.0 RESULTS

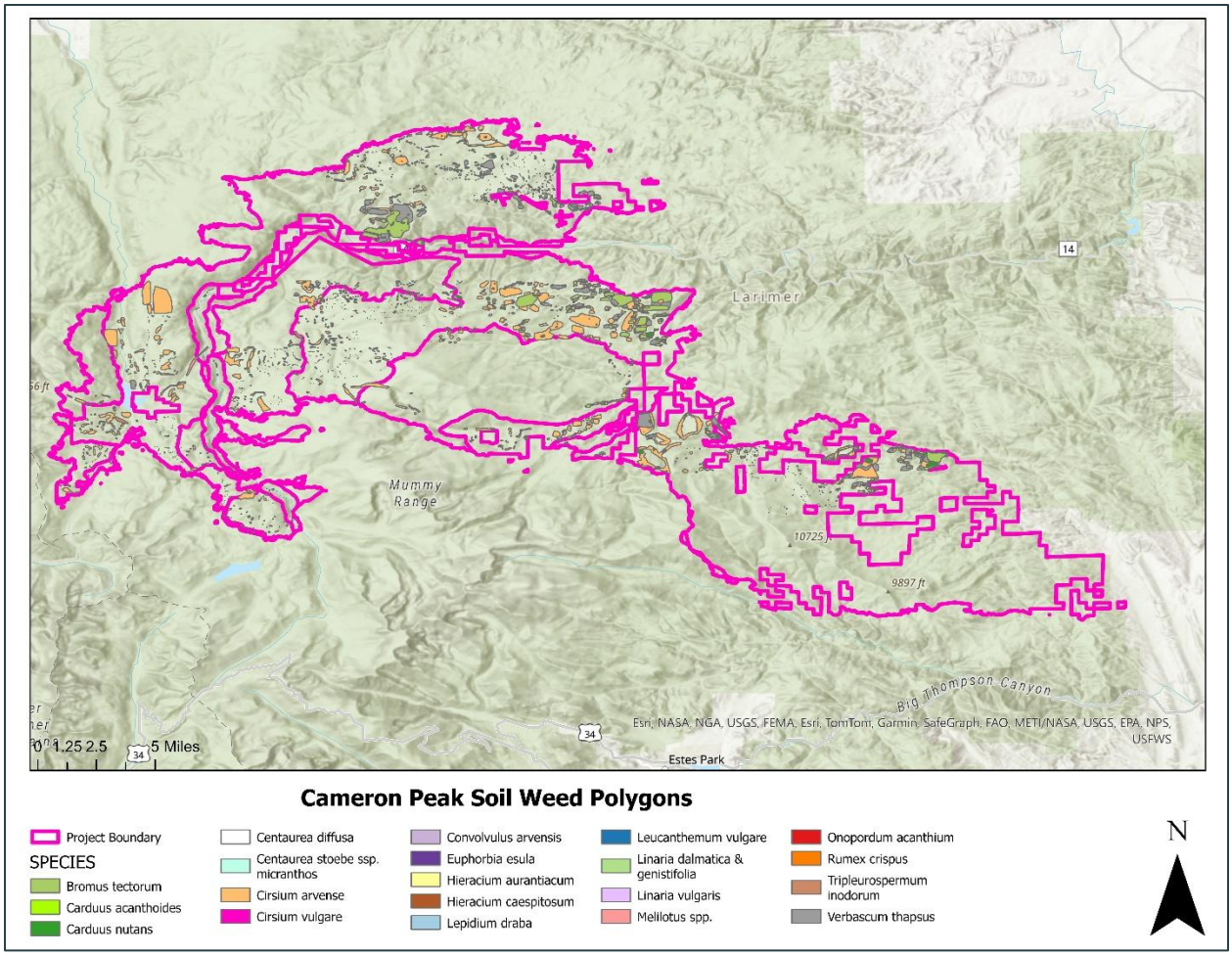
3.1 Cameron Peak

Weeds are widely dispersed throughout the Cameron Peak fire scar **(see Map 6)**. There were 2788 polygons recorded with an average area of 5.3 acres. *Cirsium arvense*, *Verbascum thapsus*, and *Bromus tectorum* had the largest total areas within the fire scar **(see Table 6)**. The concentrations of noxious plants were mainly found in four main areas detailed below.

Table 6. Summary of the cover class, acreage, and density of the noxious weeds found in Cameron Peak.

Species	Cover Class	Acreage
Bromus tectorum	0-1%, Trace	492.50
	1-5%, Low	1315.19
	5-25%, Medium	285.83
	25-75%, High	25.23
***Bromus tectorum* total**		**2118.76**
Carduus acanthoides	0-1%, Trace	4.34
Carduus acanthoides total		4.34
Carduus nutans	0-1%, Trace	392.45
	1-5%, Low	174.26
	5-25%, Medium	116.97
***Carduus nutans* total**		**683.68**
Centaurea diffusa	1-5%, Low	0.92
	5-25%, Medium	0.04
***Centaurea diffusa* total**		**0.95**
Centaurea stoebe ssp. micranthos	5-25%, Medium	0.31
***Centaurea stoebe ssp. Micranthos* total**		**0.31**
Cirsium arvense	0-1%, Trace	2714.36
	1-5%, Low	3990.59
	5-25%, Medium	903.63
	25-75%, High	35.69
	75-100%, Very High	16.43
***Cirsium arvense* total**		**7660.70**
Cirsium vulgare	0-1%, Trace	4.22
	1-5%, Low	0.00
***Cirsium vulgare* total**		**4.22**
Convolvulus arvensis	0-1%, Trace	1.20
	1-5%, Low	0.92
	5-25%, Medium	0.06

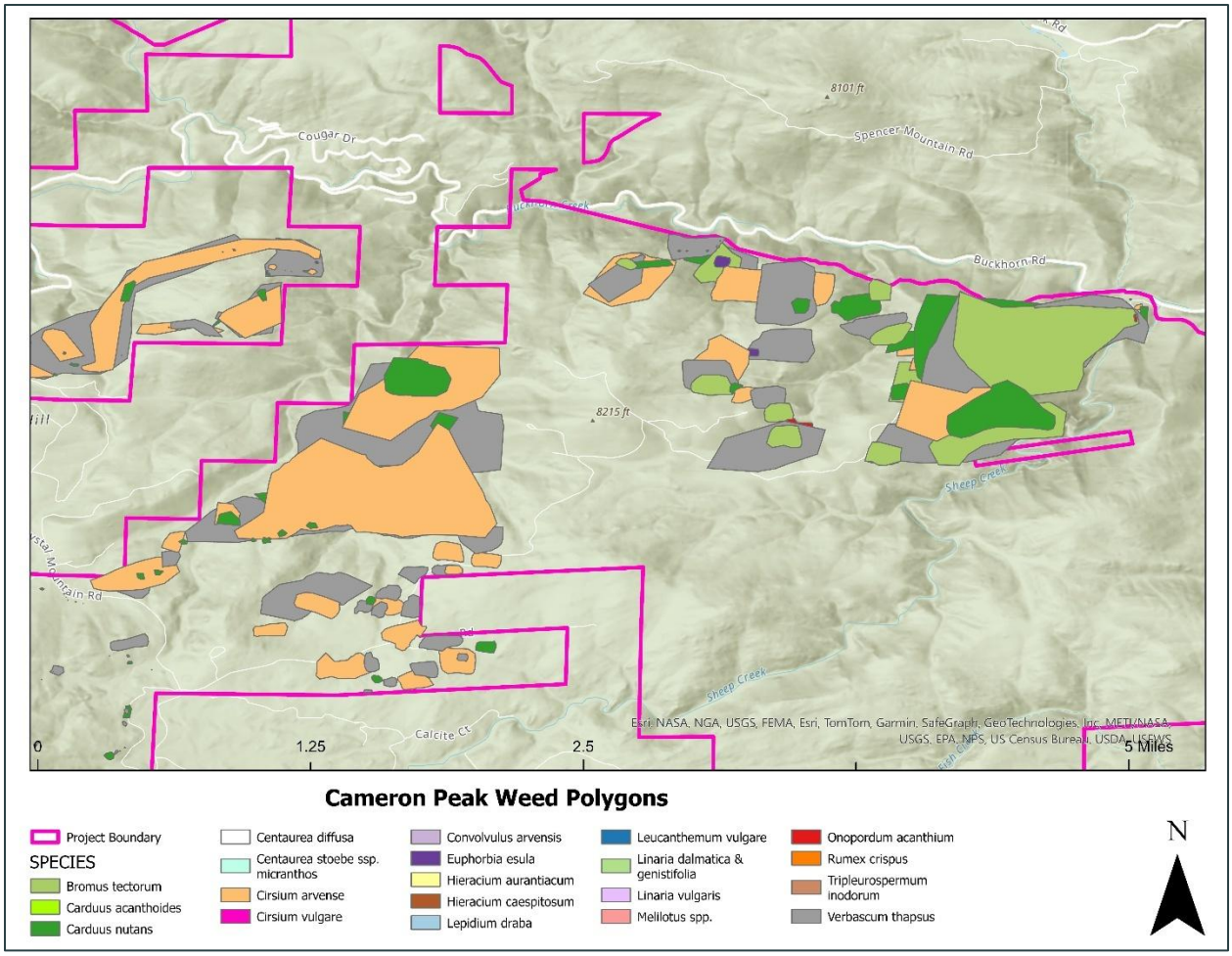
Table 6. Summary of the cover class, acreage, and density of the noxious weeds found in Cameron Peak.		
Species	**Cover Class**	**Acreage**
***Convolvulus arvensis* total**		**2.18**
Euphorbia esula	0-1%, Trace	41.45
	1-5%, Low	0.14
***Euphorbia esula* total**		**41.59**
Hieracium caespitosum	1-5%, Low	0.80
Hieracium caespitosum total		0.80
Lepidium draba	0-1%, Trace	1.89
***Lepidium draba* total**		**1.89**
Linaria dalmatica & genistifolia	0-1%, Trace	0.16
***Linaria dalmatica & genistifolia* total**		**0.16**
Melilotus spp.	0-1%, Trace	2.40
	1-5%, Low	22.78
	5-25%, Medium	56.25
***Melilotus spp.* total**		**81.42**
Onopordum acanthium	0-1%, Trace	17.16
	5-25%, Medium	0.19
***Onopordum acanthium* total**		**17.35**
Rumex crispus	0-1%, Trace	2.02
***Rumex crispus* total**		**2.02**
Tripleurospermum inodorum	0-1%, Trace	0.19
	1-5%, Low	37.35
***Tripleurospermum inodorum* total**		**37.54**
Verbascum thapsus	0-1%, Trace	1023.96
	1-5%, Low	2100.73
	5-25%, Medium	245.48
	25-75%, High	539.25
***Verbascum thapsus* total**		**3909.43**
Grand Total		**14567.36**



Map 6. Distribution map of all noxious weeds within Cameron Peak in 2024

Buckhorn Road and Sheep Creek

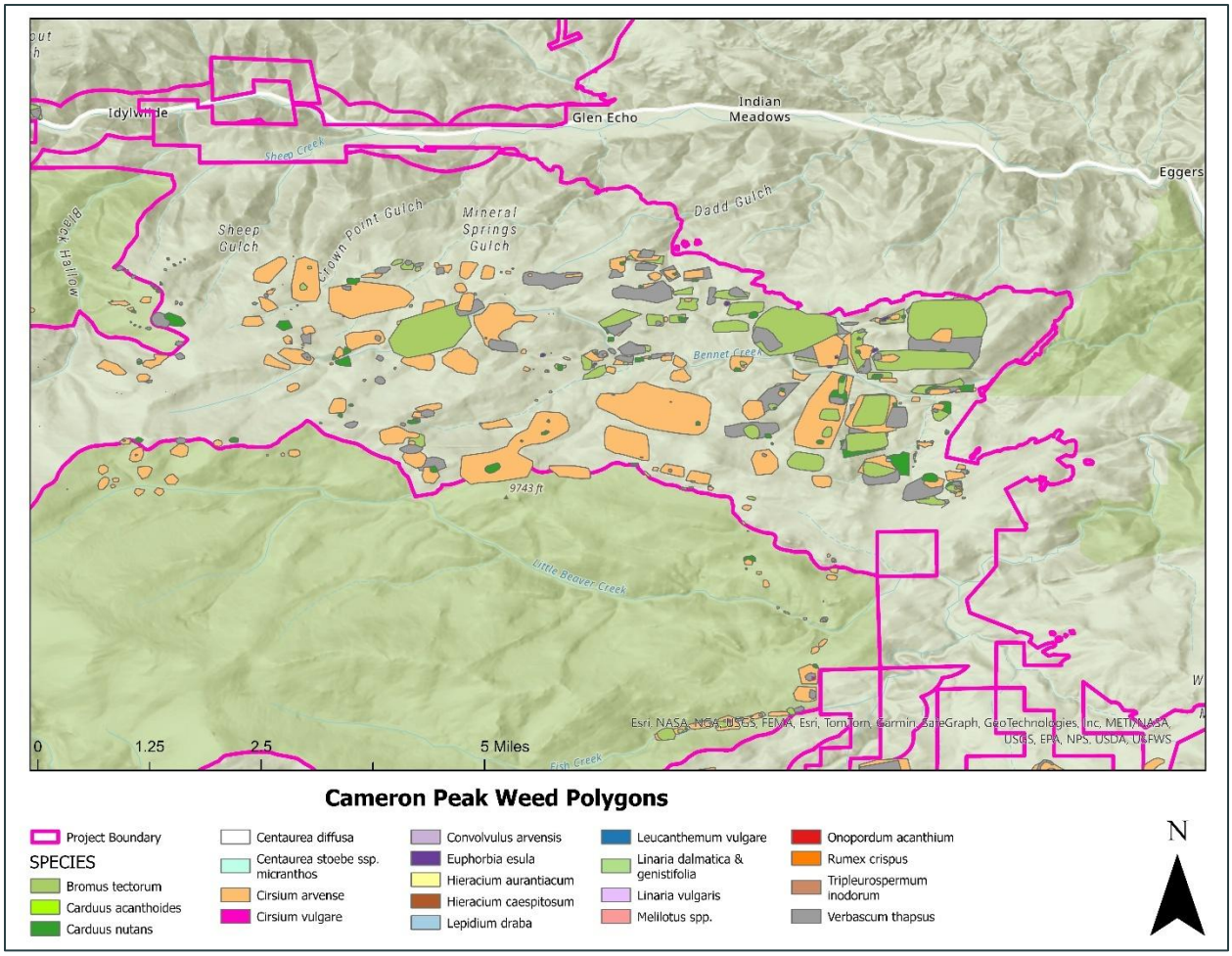
Summer field crews found large polygons of weeds throughout this area **(see Map 7)**. Populations occurred on slopes and along ridges. *Verbascum thapsus* was the main weed found in this area with approximately 378 acres. *Bromus tectorum* was also a dominant noxious weed. The majority of these weeds were found near the entrance to the burn scar from Buckhorn Road and along the edge of the burn scar near Buckhorn Road. Some of the largest polygons *Carduus nutans*, *Bromus tectorum*, and *Verbascum thapsus* are occur along the slopes above Sheep Creek. These occur within or near the Big Thompson River Potential Conservation Area. This conservation area is known for its high biodiversity and potential habitat for Preble's Meadow Jumping Mouse. Crews also found large polygons of weeds along a ridge northeast from Crystal Mountain Road. These typically occurred above Lakey Canyon.



Map 7. Distribution map of noxious weeds found within the Buckhorn Road and Sheep Creek regions of Cameron Peak

Bennet Creek

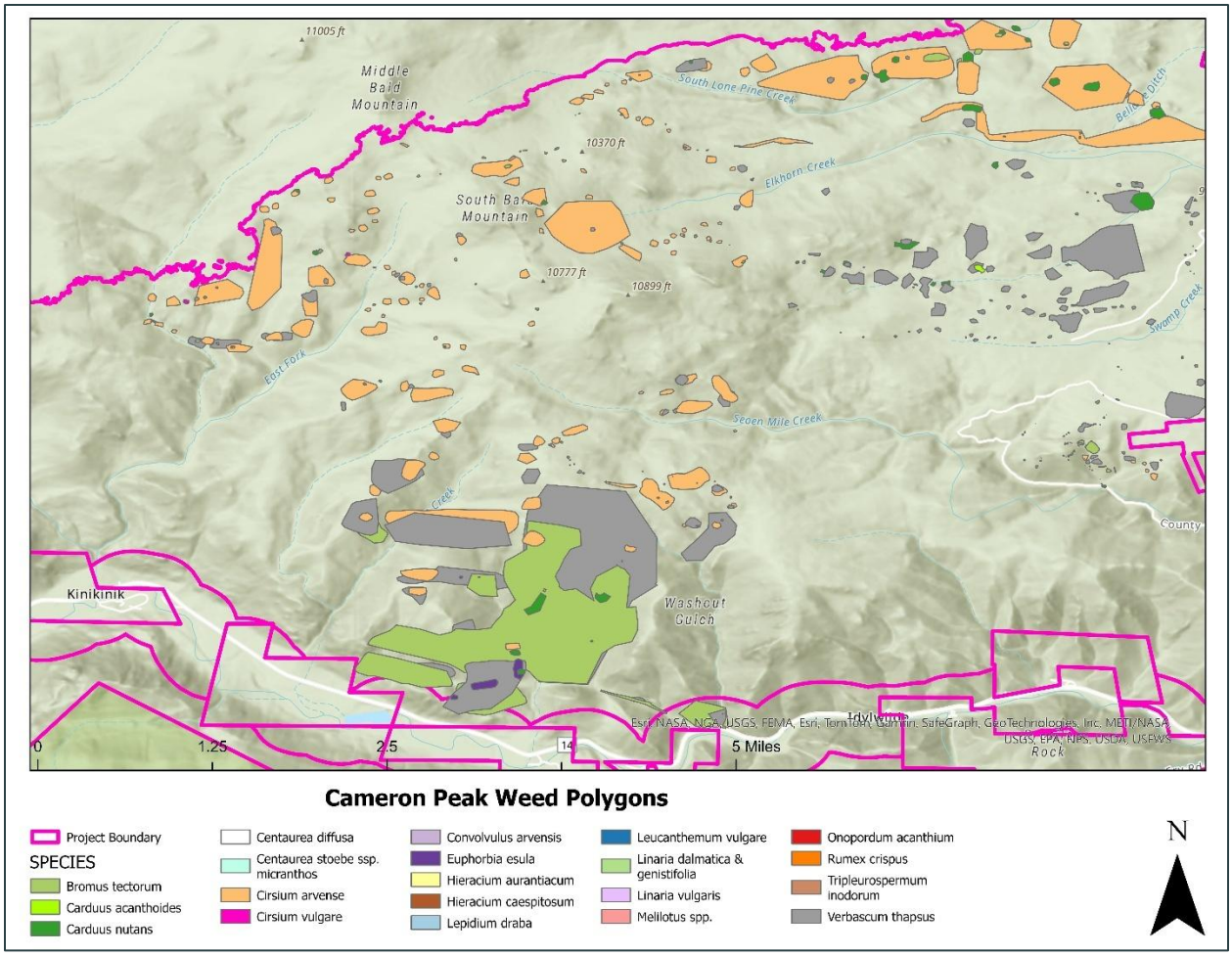
Noxious weed populations were abundant throughout the area Bennet Creek and Crown Point Road **(see Map 8)**. Many of these weed polygons occurred along the various gulches in this area such as Crown Point Gulch, Mineral Springs Gulch, and Dadd Gulch. *Cirsium arvense* was the most common species with an area of 1747 acres, and *Bromus tectorum* was the second most common species with an area of 1168 acres. Along Bennet Creek, there is a rare grassland of Muhlenbergia montana - *Hesperostipa comata* Grassland, and portions of the mapped community overlap some of these weed polygons such as *Bromus tectorum* and *Verbascum Thapsus* (Colorado Natural Heritage Program & Cheadle, 2025). Additionally, there is the Bennet Creek potential conservation area with high biodiversity. This potential biodiversity area overlaps many of the weed polygons in the eastern portion of Map 8.



Map 8. Distribution map of noxious weeds found within the Bennet Creek regions of Cameron Peak

North of CO Hwy 14

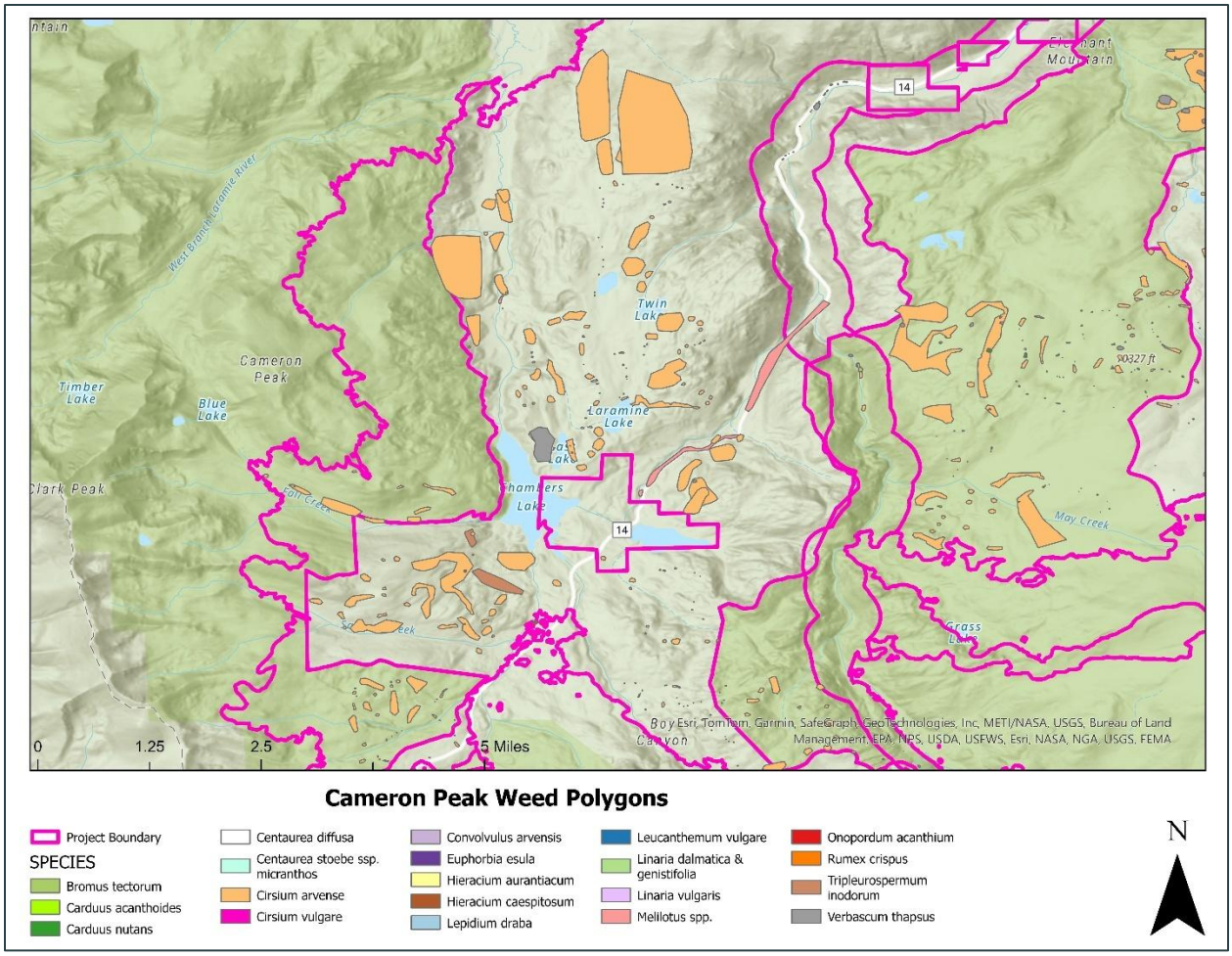
The majority of noxious weeds here were *Verbascum thapsus* with 909 acres and *Bromus tectorum* with 610 acres **(see Map 9)**. These occurrences typically occurred on the south facing aspects north of highway 14. The largest polygon of *Verbascum thapsus* was 519 acres and the largest polygon of *Bromus tectorum* was 456 acres. Hwy 14 also provides a large disturbance providing a corridor for noxious species to spread. Areas along Washout Gulch contain a small rare shrubland of *Artemisia tridentata* ssp. *wyomingensis* / *Leymus ambiguous* (Colorado Natural Heritage Program & Cheadle, 2025). Large patches of *Verbascum thapsus* and *Bromus tectorum* overlap the occurrences of this community. Smaller polygons of thistles such as *Carduus nutans* and *Cirsium arvense* occurred along small dirt roads and trails in the more northern sections of this fire scar.



Map 9. Distribution map of noxious weeds found North of CO Hwy 14 in Cameron Peak

West of CO Hwy 14

Almost all weeds found in this section were *Cirsium arvense,* which covered 1440 acres **(see Map 10)**. The largest polygon of *Cirsium arvense* reached 373 acres. These populations were typically found near top of Tunnel Creek. Crews did also find a large polygon along skyline ditch near the boundary of the national forest. Along the Laramie River, there is the Skyline Campground North potential conservation area, a rare shrubland of Salix geyeriana - Salix monticola / Calamagrostis canadensis, and an occurrence of the tracked species wood frog (*Lithobates sylvaticus*) (Colorado Natural Heritage Program & Cheadle, 2025). The majority of weed polygons were not in this area; however, crews did find several polygons of *Cirsium arvense* in the area.



Map 10. Distribution map of noxious weeds found West of CO Hwy 14 in Cameron Peak

Cameron Peak Soil Burn Severity

CNHP extracted the soil burn severity for each weed polygon in Cameron Peak burn scar **(see Table 7)**. When looking at the mean soil burn severity for Cameron Peak, *Tripleurospermum inodorum* was found in areas with the highest burn severity, and *Hieracium caespitosum* was found in areas with the lowest burn severity. Most species were found between low and moderate burn severity. Biases could include crew sampling bias by surveying these areas more than unburned or severely burned locations. However, the crews often reported that areas in high burn severity were still recovering from the 2020 fire. These areas were devoid of all species and contained only bare soil. Future surveys may benefit from focusing on areas between low and moderate burn severity.

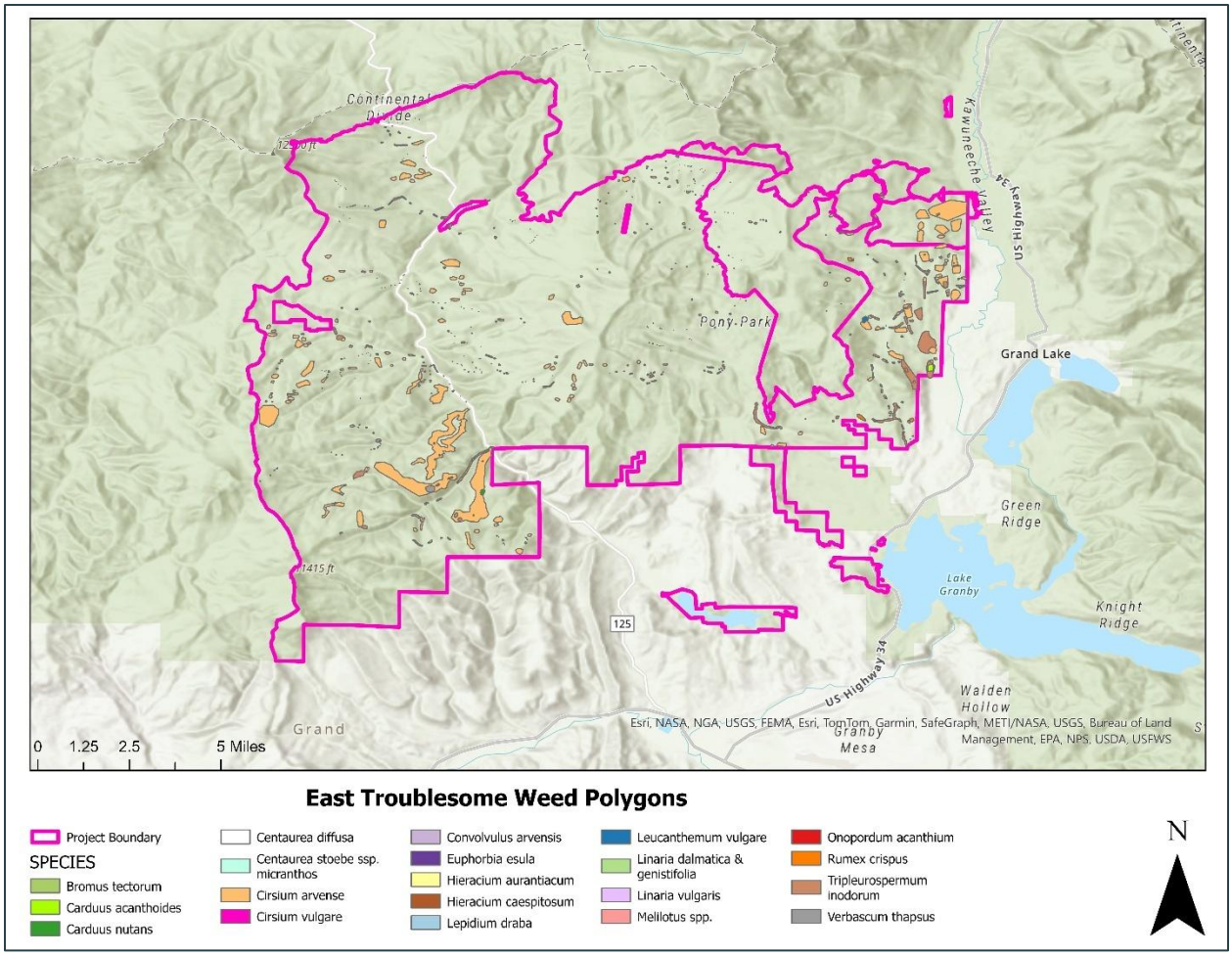
Table 7: Cameron Peak Soil Burn Severity	
Species	**Mean SBS**
Verbascum thapsus	2.41
Carduus nutans	2.48
Centaurea stoebe ssp. Micranthos	1
Centaurea diffusa	1.36
Bromus tectorum	2.25
Linaria dalmatica	2
Cirsium arvense	2.61
Carduus acanthoides	2.12
Cirsium vulgare	2.31
Rumex crispus	2.55
Euphorbia esula	2.06
Onopordum acanthium	2.88
Convolvulus arvensis	1.72
Lepidium draba	3.45
Melilotus sp.	1.18
Tripleurospermum inodorum	3.75
Hieracium caespitosum	0.7

3.2 East Troublesome

Weeds were dispersed throughout all of the Williams Fork burn scar **(see Map 11)**. There were 685 polygons recorded with an average area of 5.24 acres. *Cirsium arvense* and *Tripleurospermum inodorum* had the largest total areas within the fire scar **(see Table 8)**. The concentrations of noxious plants were mainly found in the main areas detailed below.

Table 8. Summary of the cover class, acreage, and density of the noxious weeds found in East Troublesome.		
Species	Cover Class	Acreage
Bromus tectorum	0-1%, Trace	0.306076
	1-5%, Low	2.34
***Bromus tectorum* total**		**2.64**
Carduus acanthoides	0-1%, Trace	0.25
	1-5%, Low	12.64
***Carduus acanthoides* total**		**12.89**
Carduus nutans	0-1%, Trace	14.39
	1-5%, Low	3.40
***Carduus nutans* total**		**17.79**
Cirsium arvense	0-1%, Trace	761.75
	1-5%, Low	1322.85
	5-25%, Medium	643.11
	25-75%, High	15.98

Table 8. Summary of the cover class, acreage, and density of the noxious weeds found in East Troublesome.		
Species	Cover Class	Acreage
	75-100%, Very High	5.25
***Cirsium arvense* total**		**2748.94**
Cirsium vulgare	0-1%, Trace	0.99
	1-5%, Low	0.03
***Cirsium vulgare* total**		**1.02**
Hieracium aurantiacum	0-1%, Trace	1.46
***Hieracium aurantiacum* total**		**1.46**
Hieracium caespitosum	0-1%, Trace	2.20
***Hieracium caespitosum* total**		**2.20**
Leucanthemum vulgare	0-1%, Trace	10.39
	1-5%, Low	5.23
	25-75%, High	0.96
***Leucanthemum vulgare* total**		**16.59**
Linaria vulgaris	1-5%, Low	0.87
***Linaria vulgaris* total**		**0.87**
Melilotus spp.	0-1%, Trace	0.07
***Melilotus spp.* total**		**0.07**
Rumex crispus	0-1%, Trace	21.63
	1-5%, Low	14.30
***Rumex crispus* total**		**35.93**
Tripleurospermum inodorum	0-1%, Trace	410.15
	1-5%, Low	162.91
	5-25%, Medium	28.21
***Tripleurospermum inodorum* total**		**601.27**
Verbascum thapsus	0-1%, Trace	19.93
	1-5%, Low	18.54
***Verbascum thapsus* total**		**38.47**
Grand Total		**3480.14**



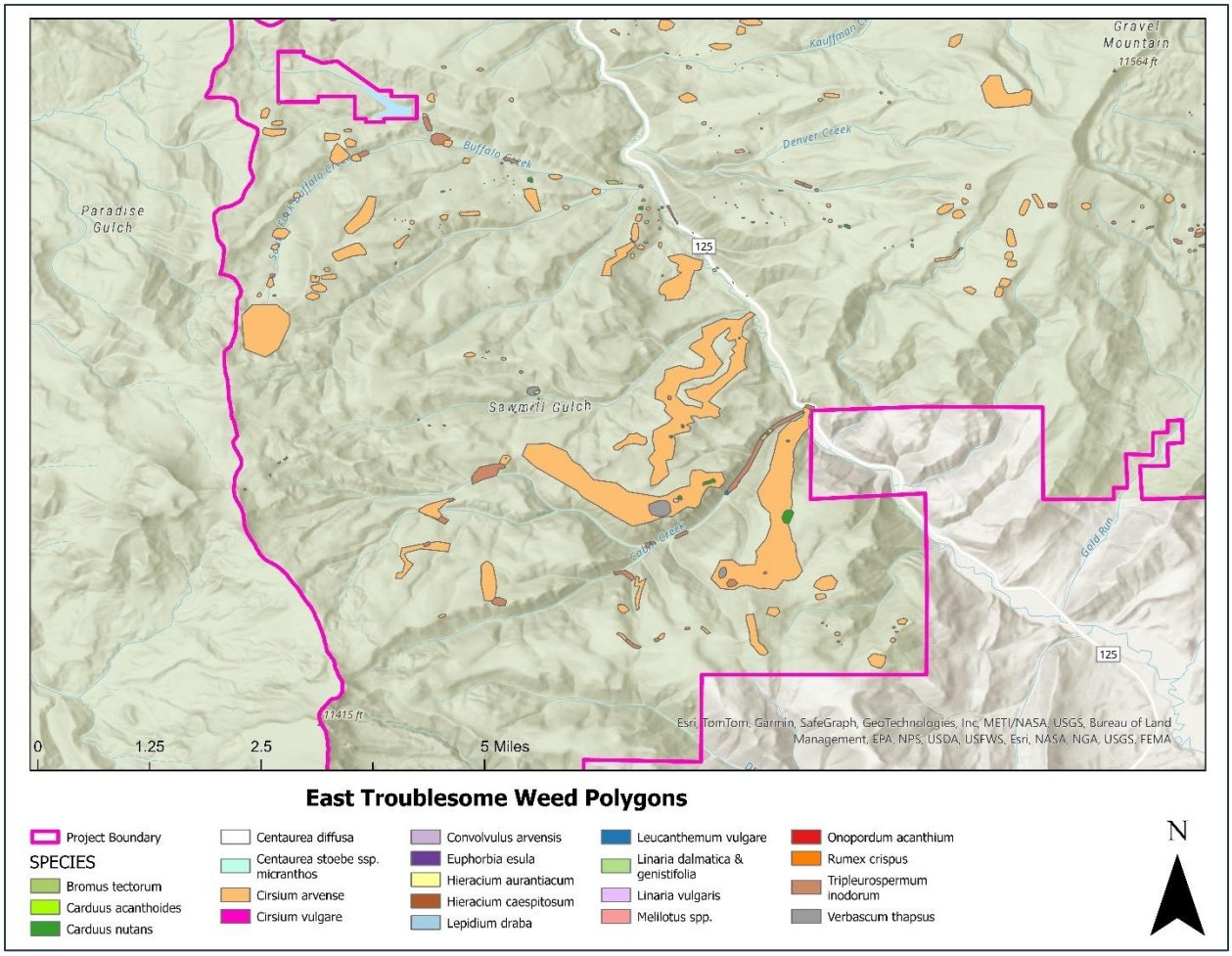
Map 11. Distribution map of all noxious weeds within East Troublesome in 2024

Southwest East Troublesome

The southwest portion of the East Troublesome fire scar is dominated by *Cirsium arvense* **(see Map 12)**. A 333-acre population that is patchy, has 1-5% cover class, and density of 5, is located along and below eastern Sawmill Gulch. Just below this population, is another population of *Cirsium arvense* that is 323 acres, patchy, has a 1-5% cover class, and density of 5 along and above County Rd 21. The third population is 355 acres, patchy, with a 1-5% cover class, and density of 5, located along, and just below County Rd 21. This population surrounds 4 drainages that stem from Eastern, Willow Creek. There are small, patchy populations of *Tripleurospermum inodorum* along County Rd 21. Smaller populations of *Cirsium arvense* are scattered along Willow Creek, which contains a tracked natural community (*Salix monticola* / *Calamagrostis canadensis* Wet Shrubland) as well as is dominated by palustrine scrub shrub and herbaceous wetlands as it travels south (Colorado Natural Heritage Program & Cheadle, 2025).

North Fork Cabin Creek, along Country Rd 21, houses palustrine, scrub shrub wetland along its entirety. Sawmill Gulch houses a rare community (*Picea pungens* / *Alnus incana* Riparian Woodland) to its west. There are small populations of *Cirsium arvense* overlapping this natural community

(Colorado Natural Heritage Program & Cheadle, 2025). The 333-acre patch of *Cirsium arvense* overlaps with the tracked natural community *Salix monticola* / *Calamagrostis canadensis* Wet Shrubland boundary, that is along eastern Sawmill Creek, Willow Creek, and several extending drainages south of Sawmill Gulch (Colorado Natural Heritage Program & Cheadle, 2025). Approximately 34 populations of *Cirsium arvense* are found along the length of South Fork Buffalo Creek, which contains emergent/herbaceous palustrine wetlands and attaches to Willow Creek (Colorado Natural Heritage Program & Cheadle, 2025).

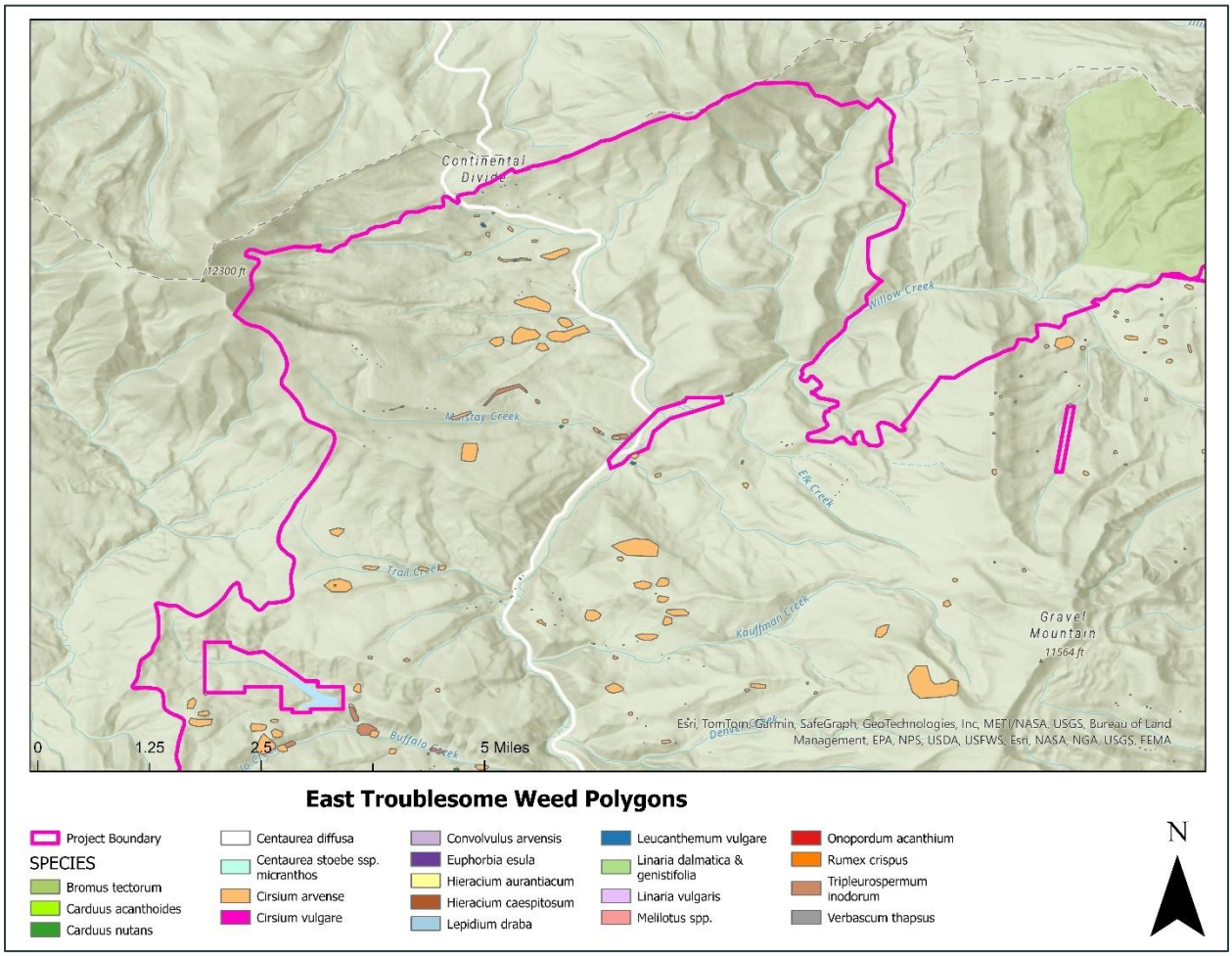


Map 12. Distribution map of noxious weeds found in the Southwest region of East Troublesome

Northwest East Troublesome

Multiple patches of *Cirsium arvense* with average size of 2.3 acres line County Rd 4, State Highway 125, Mulstay Creek, Pass Creek, and multiple associated drainages and nearby hiking trails **(see Map 13)**. There is a tracked natural community (*Salix wolfii* / *Calamagrostis canadensis* Wet Shrubland) here, which *Cirsium arvense* overlaps (Colorado Natural Heritage Program & Cheadle, 2025). Pass Creek lines State Highway 125 and is lined with scrub-shrub and herbaceous palustrine wetlands. Northern Pass Creek as it moves west contains fens, which are surrounded by small patches of

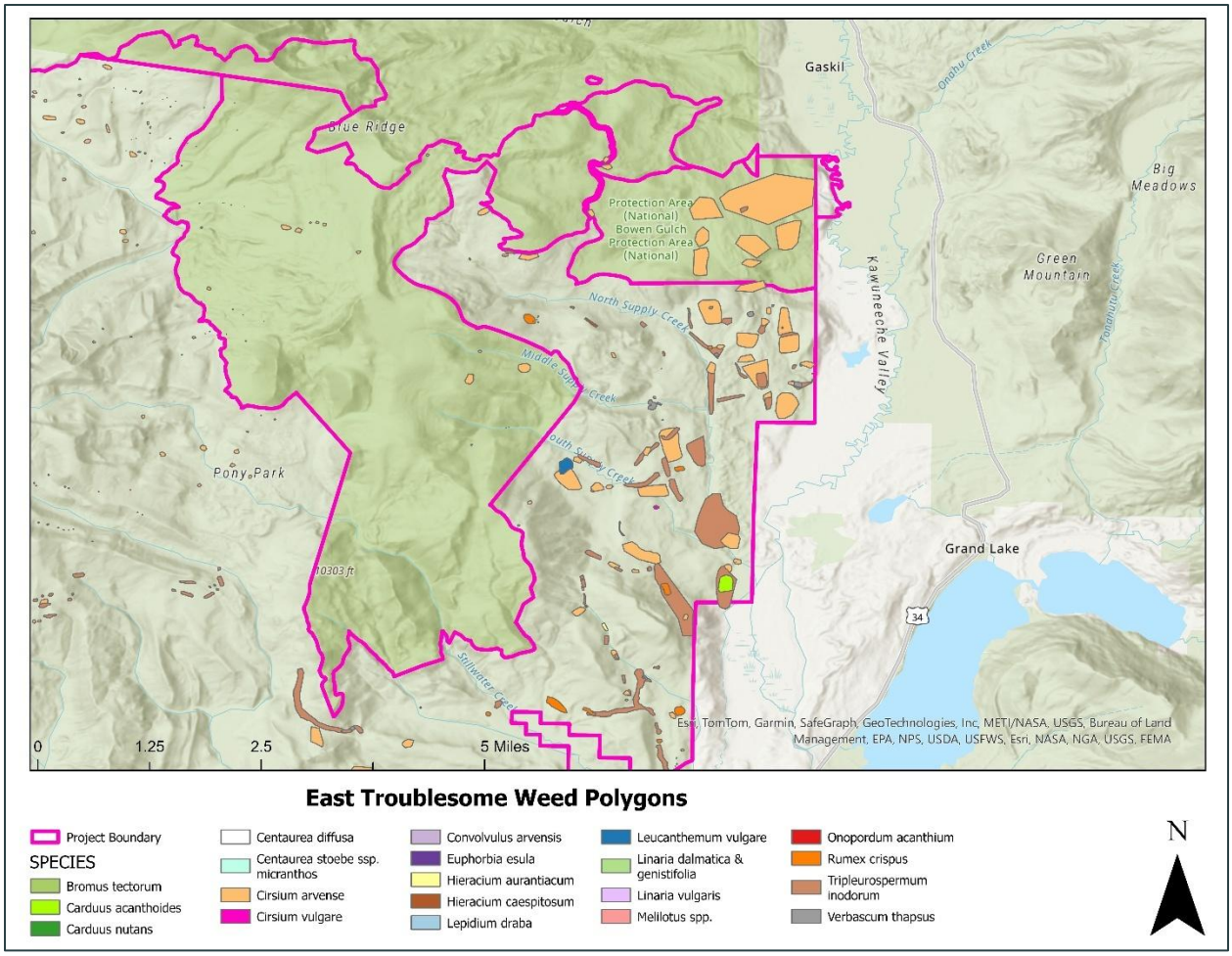
Cirsium arvense. Mulstay Creek is lined with palustrine, scrub shrub wetland (Colorado Natural Heritage Program & Cheadle, 2025).



Map 13. Distribution map of noxious weeds found in the Northwest region of East Troublesome

East-East Troublesome

This region is the densest in noxious weeds. It is dominated most by *Cirsium arvense* and *Leucanthemum vulgare* **(see Map 14)**. These populations line County Rd 4, Soda Creek, County Rd 455, South Supply Creek, North Supply Creek, Supply Jeep Trail, the Bowen Gulch Protection Area, and branching drainages/landscape. Throughout this region, lining the creeks, are palustrine scrub-shrub wetlands, rare amphibian, and bird communities, and rare '*Deschampsia cespitosa* Wet Meadows' (Colorado Natural Heritage Program & Cheadle, 2025).



Map 14. Distribution map of noxious weeds found in the Eastern region of East Troublesome

East Troublesome Soil Burn Severity

CNHP extracted the soil burn severity for each weed polygon in East Troublesome burn scar **(see Table 9)**. When looking at the mean soil burn severity for East Troublesome, *Carduus acanthoides* was found in areas with the highest burn severity, and *Carduus nutans* was found in areas with the lowest burn severity. Most species were found between low and moderate burn severity though closer to moderate burn severity than Cameron Peak weed polygons. Biases could include crew sampling bias by surveying these areas more than unburned or severely burned locations. However, the crews often reported that areas in high burn severity were still recovering from the 2020 fire. These areas were devoid of all species and contained only bare soil. Future surveys may benefit from focusing on areas between low and moderate burn severity.

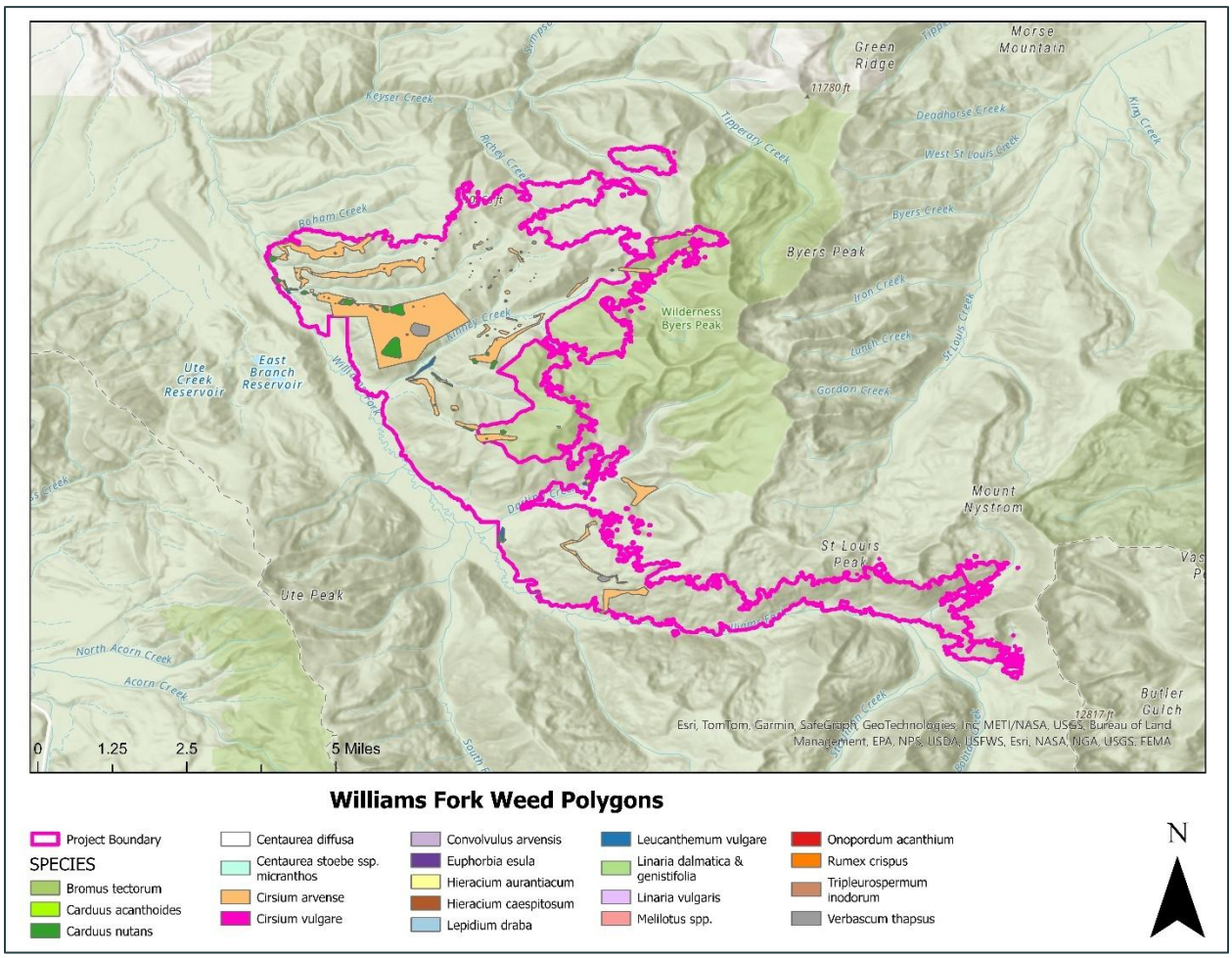
Table 9: East Troublesome Soil Burn Severity	
Species	**Mean SBS**
Cirsium arvense	2.61
Cirsium vulgare	3
Verbascum thapsus	2.41
Tripleurospermum inodorum	2.50
Leucanthemum vulgare	2.78
Rumex crispus	2.62
Bromus tectorum	1.70
Carduus acanthoides	2.80
Hieracium auranticum	3
Hieracium caespitosum	3
Carduus nutans	1.81
Linaria vulgaris	2

3.3 Williams Fork

Weeds were dispersed throughout all of the Williams Fork burn scar **(see Map 15)**. There were 132 polygons recorded with an average area of 11.4 acres. *Cirsium arvense* and *Carduus nutans* had the largest total areas within the fire scar (**see Table 10)**. The concentrations of noxious plants were mainly found in two main areas detailed below.

Table 10. Summary of the cover class, acreage, and density of the noxious weeds found in Williams Fork.		
Species	Cover Class	Acreage
Carduus nutans	0-1%, Trace	89.55
	1-5%, Low	18.99
	5-25%, Medium	7.38
***Carduus nutans* total**		**115.93**
Cirsium arvense	0-1%, Trace	1.43
	1-5%, Low	1306.63
	5-25%, Medium	2.99
***Cirsium arvense* total**		**1311.05**
Leucanthemum vulgare	0-1%, Trace	3.73
	1-5%, Low	24.91
***Leucanthemum vulgare* total**		**28.64**
Linaria vulgaris	5-25%, Medium	0.10
***Linaria vulgaris* total**		**0.10**
Tripleurospermum inodorum	0-1%, Trace	0.33
	1-5%, Low	0.47
	5-25%, Medium	0.00
Tripleurospermum inodorum total		0.81
Verbascum thapsus	0-1%, Trace	33.24

Table 10. Summary of the cover class, acreage, and density of the noxious weeds found in Williams Fork.		
Species	Cover Class	Acreage
	1-5%, Low	13.70
***Verbascum thapsus* total**		**46.94**
Grand Total		**1503.47**

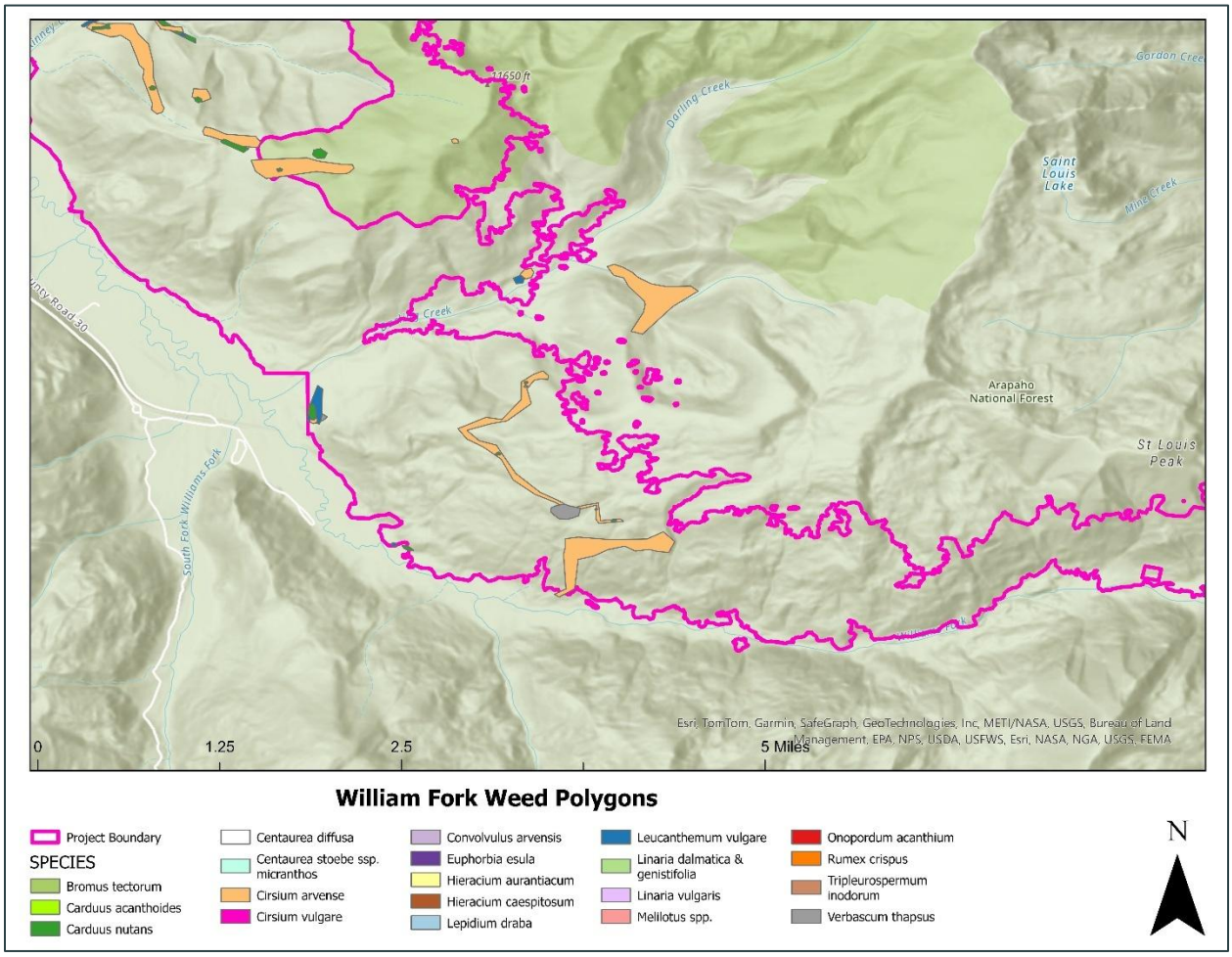


Map 15. Distribution map of all noxious weeds within Williams Fork in 2024

South Williams Fork (Below Darling Creek)

The largest patches of weeds in southern Williams Fork fire scar are a 45-acre and a 36-acre patch of *Cirsium arvense* beginning ~1000m south of Darling Creek **(see Map 16)**. These patches overlap two drainages that stem from the, western, Williams Fork River, one of which flows into a scrub-shrub wetland located 1000m east (Colorado Natural Heritage Program & Cheadle, 2025). They have densities of 2 & 3 and are patchy in pattern. Other noxious species, *Verbascum thapsus*, *Leucanthemum vulgare,* and *Carduus nutans* occur in small patches scattered throughout the

southern parts of the fire scar and are found around waterways, making them a vector for dispersal in the surrounding area.



Map 16. Distribution map of noxious weeds found in the Southern region of Williams Fork

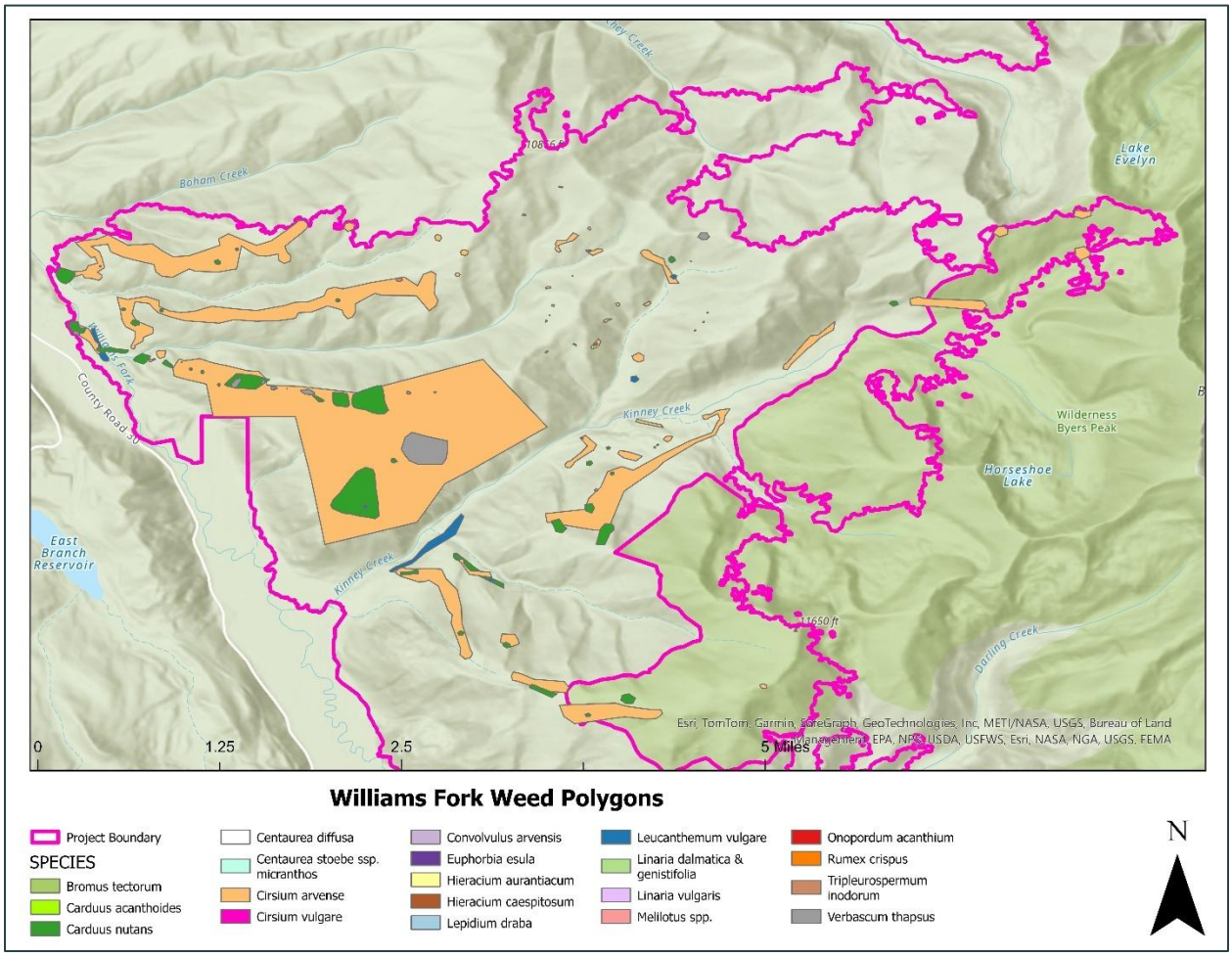
North Williams Fork (Above Darling Creek)

Northern Williams Fork is dominated by three large polygons of *Cirsium arvense* **(see Map 17)**. The dominating polygon is 732 acres, with a density of 8, cover class of 1-5%, and is patchy. This polygon sits ~70m north of Kinney Creek and Kinney Creek Rd and contains small (20-40 acre), patches, of *Carduus nutans*. This patch of *Cirsium arvense* overlaps 8 drainages that stem from either Kinney Creek or Williams Fork River. Smaller patches of *Cirsium arvense* averaging 10.4 acres are also found intermittently along and below Kinney Creek Rd, overlapping 7 drainages that stem from Kinney Creek. Eastern Kinney Creek contains palustrine, scrub shrub wetlands and a potential fen (Colorado Natural Heritage Program & Cheadle, 2025). Additionally, there is an 11-acre patch of *Leucanthemum vulgare* lining the western Kinney Creek Rd.

At the northernmost region of the Williams Fork burn scar are two 100-acre polygons of *Cirsium arvense*. These have a 1-5% cover class, are patchy, and have densities of 4. These sit in-between 3

drainages that stem from western, Williams Fork River and the northern Boham Creek. These drainages have palustrine wetlands to the west and east, as well as a fen to the east. Additionally, at the northernmost part of the Williams Fork burn scar, directly along the Williams Fork River, are small populations of *Carduus nutans*, *Verbascum thapsus*, and *Cirsium arvense*, and *Leucanthemum vulgare*.

Directly west of the largest *Cirsium* populations (within 300-700 meters), lining the western boundary of the burn scar, is Williams Fork River. This region is characterized by a palustrine, emergent, forested, and scrub shrub wetlands. It houses the rare community "*Salix geyeriana* - *Salix monticola* / *Calamagrostis canadensis* Wet Shrubland" (Colorado Natural Heritage Program & Cheadle, 2025).



Map 17. Distribution map of noxious weeds found in the Northern region of Williams Fork

William's Fork Soil Burn Severity

CNHP extracted the soil burn severity for each weed polygon in East Troublesome burn scar **(see Table 11)**. When looking at the mean soil burn severity for William's Fork, *Cirsium arvense* was found

in areas with the highest burn severity, and *Tripleurospermum inodorum* was found in areas with the lowest burn severity. Most species were found between moderate and high burn severity. William's Fork contained higher burn severity in across the entire burn scar. Future surveys may benefit from focusing on areas with moderate or high burn severity.

Table 11: Williams Fork Soil Burn Severity

Species	Mean SBS
Leucanthemum vulgare	2.69
Cirsium arvense	3.56
Carduus nutans	3.22
Tripleurospermum inodorum	2
Verbascum thapsus	3.05

4.0 RECOMMENDATIONS

The State of Colorado's Commissioner has designated actions in response to listed noxious weed species. List A Species are designated for eradication. List B Species require a state noxious weed management plan aimed at stopping their continued spread, developed in consultation with advisory committees, local governments, and other stakeholders. List C Species also involve collaboration with these groups to create and implement management plans, but the goal is not to stop their spread entirely. Instead, the focus is on supporting local efforts through education, research, and biological control resources for jurisdictions that choose to manage these species. Watch List Species are not officially designated as noxious weeds but are considered a potential threat to agriculture and the environment. This list serves as an advisory tool, encouraging people to identify and report these plants. The information gathered helps the Commissioner determine if any of these species should be officially classified as noxious weeds (*Noxious Weed Species ID | Department of Agriculture*, n.d.-b).

To assist in effective management of the noxious weeds found in the Cameron Peak, East Troublesome, and Williams Fork fire scars, the ecology, life cycle, and recommended treatments of each weed found are outlined below.

4.1 Noxious Weed Ecology and Treatment

List A Species

Table 12: Ecology of *Hieracium aurantiacum* - Orange Hawkweed

Season	Winter			Spring			Summer			Autumn		
Month	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov
Germination												
Flowering												
Active Growth												
Fruiting												
Optimum Treatment												
Native Range	Northern and Central Europe											
Dispersal/Distribution	Seeds (12-50 per flower head) and a spreading its root system via stolons, rhizomes, or adventitious root buds to form dense patches. Orange hawkweed occurs in grasslands and other open areas, forests, and wetlands. Sites most vulnerable to orange hawkweed establishment are disturbed areas, including roadsides, pastures, hay fields, abandoned farmland, mountain meadows, logged areas, and forest clearings.											
Seed Viability	7 years											
Threat to Ecosystem	Allelopathic effects on surrounding vegetation by releasing chemicals into the soil											

(Department of Natural Resources Trails and Waterways et al., 2003) & (*Hieracium Aurantiacum*, n.d.)

Table 13: Treatment for *Hieracium aurantiacum* - Orange Hawkweed			
Treatment Options	**Details**	**Prevention**	**Notes**
Chemical	Effective in gaining initial control of a new invasion or a severe infestation but is not a complete or long-term solution.	Minimize soil disturbance and quickly revegetate disturbed areas.	Orange hawkweed has the ability to sprout from stolons and rhizomes following control treatments. Control efforts should concentrate on the periphery of established populations, where most sexual and vegetative reproduction occurs. Integrated management that combines herbicide application with fertilizer applications geared towards improving the growth of preferred native species is recommended.
Mechanical	Eliminate small infestations by carefully digging out the rosettes. All stolons, rhizomes, and roots must be removed to prevent resprouting on-site. Mowing is not effective control method since basal rosettes can't be reached by the mower blades. Mowing can help reduce or prevent seed production but can encourage vegetative spreading.		

(*Hieracium Aurantiacum*, n.d.)

List B Species

Table 14: Ecology of *Carduus acanthoides* – Plumeless Thistle												
Season	Winter			Spring			Summer			Autumn		
Month	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov
Germination												
Active Growth												
Flowering												
Fruiting												
Optimum Treatment												
Native Range	Europe and Asia											
Dispersal/Distribution	Wind, animals, and human activities. Temperate grasslands and disturbed areas, typically, pastures, stream valleys, fields, and roadsides.											
Seed Viability	10+ years											
Threat to Ecosystem	Plumeless thistle suppresses native species growth and biodiversity.											

(Desrochers et al., 2000)

Table 15: Treatment for *Carduus acanthoides* – Plumeless Thistle			
Treatment Options	**Details**	**Prevention**	**Notes**
Chemical	Herbicides containing aminopyralid (e.g., Milestone) are effective when applied during the rosette to early bolting stages in spring or fall. Use selective broadleaf herbicides (e.g., aminopyralid, clopyralid, dicamba, or picloram) to minimize damage to native grasses.	Detect plants early by regularly checking fields, roadsides, and disturbed areas for rosettes and report new populations to weed management agencies. Establish and maintain dense native or pasture grasses to outcompete seedlings. Additionally, reseed bare soils after disturbances such as construction, overgrazing, or fire. Avoid overgrazing and rotate grazing to allow vegetation recovery. Limit seed spread by preventing maturation. Mow or remove plants before they flower. Clean agricultural or construction equipment and livestock, as seeds can latch onto them.	Apply chemical or mechanical removal in early spring or fall when plants are in the rosette stage. This ensures better absorption of herbicides and prevents seed production. Once the plant has flowered, it is more difficult to control, and cutting or mowing at this stage may lead to faster seed dispersal. Avoid spraying near water sources or sensitive habitats to prevent contamination. Additionally, overusing of broad-spectrum herbicides may reduce pollinator-friendly plants in the area. Monitoring is required for several years as seeds can remain viable in the soil for up to 10 years.
Mechanical	Before flowering, hand-pulling or digging is effective for small infestations; ensure removal of the entire root. Mowing before seed production reduces seed spread.		
Biological	The thistle-head weevil (Rhinocyllus conicus) and thistle rosette weevil (Trichosirocalus horridus) have been used to reduce seed production and weaken the plant.		
Cultural	Establishing competitive grass cover through reseeding helps suppress plumeless thistle growth.		

(Plumeless Thistle | Jefferson County, CO, n.d.)

Table 16: Ecology of *Carduus nutans- Musk Thistle*												
Season	Winter			Spring			Summer			Autumn		
Month	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov
Germination												
Active Growth												
Flowering												
Fruiting												
Optimum Treatment												
Native Range	Western Europe, Central Europe, and temperate Asia											
Dispersal/Distribution	Wind, water, wildlife, livestock, and human activities. It's found on all types of land except deserts, dense forests, high mountains, coastal areas, and newly cultivated fields. It most often occurs where competition is low or on disturbed sites, waste areas, along roads, or in overgrazed or disturbed pastureland.											
Seed Viability	3 years											
Threat to Ecosystem	Musk thistle forms dense stands, especially on highly disturbed sites and has shown to have allelopathy.											

(*Carduus Nutans*, n.d.)

Table 17: Treatment for *Carduus nutans- Musk Thistle*			
Treatment Options	**Details**	**Prevention**	**Notes**
Chemical	Clopyralid, dicamba, MCPA, picloram, 2,4-D, metsulfuron, and chlorsulfuron applied when seedlings or rosettes. Helps control a new invasion or severe infestation, but not a long-term solution.	The key to management is to prevent seed production and to deny it suitable habitat for invasion. Musk thistle seedlings are intolerant of intense competition, especially for light.	Target control efforts at seedling and rosette growth stages. Overgrazing by livestock and wildlife should be avoided, because rosette survival increases as grazing intensity increases, and bare spots caused by over-grazing are prime sites for musk thistle germination and establishment. No matter what method is used to kill weeds, reestablishment of competitive, desirable plant cover is imperative for long-term control.
Mechanical	Any mechanical method that severs the root below the soil surface will kill musk thistle. It's essential to revegetate the site with desirable plants, such as competitive grasses, to compete with and seeds in the soil that that may reinvade.		
Biological	Thistle crown weevil (Trichosirocalus horridus) larvae feed on the growing points of thistle rosettes and developing shoots.		

(*Carduus Nutans*, n.d.)

Table 18: Ecology of *Centaura diffusa* – Diffuse Knapweed												
Season	Winter			Spring			Summer			Autumn		
Month	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov
Germination												
Active Growth												
Flowering												
Fruiting												
Optimum Treatment												
Native Range	Europe and Central Asia											
Dispersal/Distribution	Gravity and wind, animals, human activities, and water. It's found in shortgrass steppe in the Front Range foothills and eastern plains, adjacent pinyon-juniper-oak and higher elevation montane zones. Additionally, disturbance areas such as transportation corridors, water ways, gravel pits, rangeland and industrial areas.											
Seed Viability	2-5 years											
Threat to Ecosystem	Diffuse knapweed threatens ecosystems by outcompeting native plants for resources, reducing biodiversity, and altering soil health through allelopathic chemicals. Its spread also degrades wildlife habitat and reduces forage quality for livestock, leading to economic losses in agriculture and grazing lands.											

(Innes & Zouhar, 2020)

Table 19: Treatment for *Centaura diffusa* – Diffuse Knapweed			
Treatment Options	**Details**	**Prevention**	**Notes**
Chemical	Herbicides can be effective, when applied during the rosette to early bolt stages in spring or to rosettes in the fall. Recommended herbicides include: Aminopyralid (Milestone): Apply 5-7 oz/acre in spring at rosette to early bolt stage or in fall to rosettes. Clopyralid + Triclopyr (Redeem R&P): Apply 1.5-2 pints/acre during rosette to early bolt stage or in fall to rosettes. 2,4-D Amine: Apply 1 qt./acre in spring or fall to rosettes before flowering stalk elongation.	Detect plants early by regularly checking fields, roadsides, and disturbed areas for rosettes and report new populations to weed management agencies. Establish and maintain dense native or pasture grasses to outcompete seedlings. Additionally, reseed bare soils after disturbances such as construction, overgrazing, or fire. Avoid overgrazing and rotate grazing to allow vegetation recovery. Limit seed spread by preventing maturation. Mow or remove plants before they flower. Clean	The best time for mechanical removal (hand-pulling or mowing) is before flowering and seed production (typically early to mid-summer). Herbicide application is most effective at the rosette to early bolt stage (spring or fall) when the plant is actively growing. Biological control agents take time to establish and are most effective when combined with other management strategies. Repeated treatments over multiple years are necessary to exhaust the seed bank, which remains viable in the soil for us to 8 years. Be cautious when using herbicides as some (e.g., aminopyralid, clopyralid) target broadleaf plants and may harm desirable forbs and
Mechanical	Hand-pulling or digging is effective for small infestations. Remove entire taproot to prevent regrowth. Mowing can		

Table 19: Treatment for *Centaura diffusa* – Diffuse Knapweed			
Treatment Options	**Details**	**Prevention**	**Notes**
	reduce seed production if at the early flowering stage; Mowing will not eradicate the weed.	agricultural or construction equipment and livestock, as seeds can latch onto them. Minimize soil disturbances from construction, road maintenance, or off-road vehicle use and reseed with competitive vegetation as soon as possible.	legumes. Use proper application techniques to prevent runoff and drift. Do not compost diffuse knapweed, as seeds may remain viable. Instead, bag and dispose of plants in landfill-approved waste or burn them in accordance with local regulations.
Cultural	Promoting the growth of competitive grasses to suppress diffuse knapweed. This can include reseeding areas with native grasses to establish a competitive plant community.		
Biological	Lesser Knapweed Flower Weevil (Larinus minutus) adults feed on knapweed foliage, and larvae consume seeds, reducing seed production. Knapweed Root Weevil (Cyphocleonus achates) larvae feed on roots, weakening the plant and reducing its competitive ability.		

(Innes & Zouhar, 2020b)

Table 20: Ecology of *Centaurea stoebe ssp. micranthos – Spotted Knapweed*												
Season	Winter			Spring			Summer			Autumn		
Month	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov
Germination												
Active Growth												
Flowering												
Fruiting												
Optimum Treatment												
Native Range	Central Europe											
Dispersal/Distribution	Wind, animals, and human activity. It's found in meadows, pastures, roadsides, and sandy or gravelly floodplains of streams and rivers.											
Seed Viability	3-5 years											
Threat to Ecosystem	Causes decline in forage and crop production and erosion. Roots do not hold soil as well as native problem. Releases a toxin that reduces growth of native species. Has a taproot.											

(Innes & Fire Effects Information System, 2021) & (Jefferson County Parkway, 2021)

Table 21: Treatment for *Centaurea stoebe ssp. micranthos – Spotted Knapweed*			
Treatment Options	**Details**	**Prevention**	**Notes**
Chemical	Products containing active ingredients such as clopyralid or glyphosate can be effective for large infestations.	Remove plants before they flower and produce seeds. Limit soil disturbance by avoiding overgrazing, and minimizing construction, off-road vehicles, and foot traffic. Establish and maintain dense perennial native or pasture grasses to outcompete seedlings. Additionally, reseed bare soils after disturbances such as construction, overgrazing, or fire. Avoid overgrazing and rotate grazing to allow vegetation recovery. Limit seed spread by preventing maturation. Mow or remove plants before they flower. Clean agricultural or construction equipment and livestock, as seeds can latch onto them. Avoid using contaminated hay, straw, or mulch that may contain knapweed seeds and only purchase certified weed-free forage. Properly dispose of weeds by bagging and pulled plants and placing the, in the trash, not compost or burn piles, as seeds can remain viable.	Spotted knapweed seeds can remain viable in the soil for 8+ years, making long-term monitoring and repeated treatments essential. Mechanical removal is best done before seed set (typically mid to late summer) to prevent further spread. Herbicide application is most effective in the rosette stage (spring or fall) when the plant is actively growing. Mowing should be done before flowering but may require follow-up treatments, as it does not eliminate root systems. Clopyralid and Aminopyralid are effective against spotted knapweed, but they can persist in soil and affect non-target plants. Glyphosate can be used but is non-selective, potentially harming desirable vegetation.
Mechanical	Hand-pulling is effective for small infestations. It's necessary to remove the entire root to prevent regrowth. This method requires repeated efforts throughout the growing season and over multiple years to ensure long-term control. Mowing can be done before the plants set seed, to reduce seed production and spread,		
Cultural	Promoting the growth of competitive grasses to suppress diffuse knapweed. This can include reseeding areas with native grasses to establish a competitive plant community.		

(Innes & Fire Effects Information System, 2021b)

Table 22: Ecology of *Cirsium arvense- Canada Thistle*												
Season	Winter			Spring			Summer			Autumn		
Month	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov
Germination												
Flowering												
Active Growth												
Fruiting												
Optimum Treatment												
Native Range	Southeastern Europe and the Eastern Mediterranean											
Dispersal/Distribution	Seeds are dispersed by wind, aided by a pappus that allows them to travel over long distances. It also spreads through horizontal roots that can extend over 15 feet, enabling new shoots to emerge and form dense colonies. In Colorado, it thrives in various ecosystems, including cultivated fields, riparian areas, pastures, forests, lawns, gardens, roadsides, and waste areas.											
Seed Viability	Up to 20 years											
Threat to Ecosystem	Canada thistle competes aggressively with native vegetation for resources such as water, nutrients, and light, often leading to the displacement of native plant species. Its extensive root system can alter soil structure and nutrient cycling, negatively impacting soil health. It can form dense monocultures, it reduces habitat diversity, adversely affecting wildlife that depend on native plants.											

(Beck & Colorado State University, 2013)

Table 23: Treatment for *Cirsium arvense- Canada Thistle*			
Treatment Options	**Details**	**Prevention**	**Notes**
Chemical	Herbicides containing active ingredients like 2,4-D, dicamba, or clopyralid are commonly used. For best results, applications should target the rosette stage in spring or during fall regrowth.	Monitor disturbed areas for new plants. Detect and remove them early to prevent spread. Maintain healthy, dense native plant cover to outcompete Canada thistle.	Canada thistle has a deep and extensive root system and spreads through both seeds and roots (rhizomes), making it difficult to control with a single treatment method. Be careful with mechanical removal as it may stimulate root fragments to grow new plants. Herbicide is best applied in late spring (rosette to pre-bloom stage) or early fall when the plant is sending energy to the roots. Cutting before seed set (usually June–July) reduces spread but must be repeated every few weeks to prevent regrowth. Canada thistle is persistent, and eradication may take multiple years of integrated control.
Mechanical	Mowing or cutting every 3 to 4 weeks from June through September can suppress Canada thistle by depleting its energy reserves. Doing before seed set, can weaken the plants.		
Cultural	Maintaining healthy and competitive native vegetation.		

Table 23: Treatment for *Cirsium arvense- Canada Thistle*			
Treatment Options	**Details**	**Prevention**	**Notes**
Biological	The seedhead weevil (Larinus planus) and pathogens such as the rust fungus (Puccinia punctiformis) are possible biological controls. They reduce thistle strength and seed production, but their effectiveness varies, and they are typically used as part of an integrated management plan rather than as standalone solutions.		

(Beck & Colorado State University, 2013) (*Canada Thistle | Jefferson County, CO*, n.d.)

Table 24: Ecology of *Cirsium vulgare - Bull Thistle*												
Season	Winter			Spring			Summer			Autumn		
Month	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov
Germination												
Active Growth												
Flowering												
Fruiting												
Optimum Treatment												
Native Range	Temperate Europe, Asia, and North Africa											
Dispersal/Distribution	Disperses through wind-blown seeds and is found in drainages, meadows, rights-of way, and disturbed sites.											
Seed Viability	Up to 3 years											
Threat to Ecosystem	Outcompetes native plants and forage species											

(Abbey, n.d.) & (*Bull Thistle | Jefferson County, CO*, n.d.)

Table 25: Treatment for *Cirsium vulgare - Bull Thistle*			
Treatment Options	**Details**	**Prevention**	**Notes**
Chemical	Clopyralid, dicamba, MCPA, picloram, 2,4-D, metsulfuron, and chlorsulfuron applied when seedlings or rosettes. Helps control a new invasion or severe infestation, but not a long-term solution.	The key to management is to prevent seed production, maintaining healthy natural communities, and monitor several times a year. Prevent spread by	Seedling and rosette growth stages are the most logical to target for control effort. A single mowing will not control a bull or musk thistle infestation, because infestations often consist of

Table 25: Treatment for *Cirsium vulgare - Bull Thistle*			
Treatment Options	**Details**	**Prevention**	**Notes**
Mechanical	Any mechanical method that severs the root below the soil surface will kill bull thistle. It's essential to re-vegetate the site with desirable plants to compete with bull thistle seeds left in the soil. Tillage, hoeing, and hand pulling may provide effective control, if done before the reproductive growth stages to prevent seed production.	cleaning mowers, vehicles, and tillage equipment after operation in an infested area.	nonuniform development and flowering.
Biological	Thistle crown weevil (Trichosirocalus horridus) larvae feed on the growing points of thistle rosettes and developing shoots. Bull thistle gall fly (Urophora stylata) larvae feed within seed producing tissues of developing seedheads.		

(Cirsium Vulgare, n.d.)

Table 26: Ecology of *Euphorbia esula* – Leafy Spurge												
Season	Winter			Spring			Summer			Autumn		
Month	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov
Germination												
Active Growth												
Flowering												
Fruiting												
Optimum Treatment												
Native Range	Europe and Asia											
Dispersal/Distribution	Explosive seed capsules allow for spreading up to 15ft from the parent plant. Seeds also spread via animals and water. They are found in disturbed sites, meadows, pastures, abandoned fields and roadside areas between 5,000 and 6,000 feet. Found in hot and cold climates but prefers dry locations but can tolerate moisture.											
Seed Viability	8+ years											
Threat to Ecosystem	Displaces native vegetation and forage species											

(*Leafy Spurge | Jefferson County, CO*, n.d.) & (Unknown, n.d.)

Table 27: Treatment for *Euphorbia esula* – Leafy Spurge			
Treatment Options	**Details**	**Prevention**	**Notes**
Chemical	Long-term control of large, well-established populations of leafy spurge, especially large, is unlikely with herbicides alone because of its ability to "purge" chemicals from its root system. Herbicides are costly and negatively impacts the surrounding environment.	Clean seeds and root pieces off of equipment before moving it into an uninfested area. Small populations should be treated before focusing on large populations because treatments for large infestations are typically unsuccessful. Protect uninfested areas, treating small infestations first, and treating large populations from the outside edges inward.	Persistent monitoring and evolving methods are essential to long-term management. Leafy spurge sprouts emerge from surviving root portions even after of all aboveground tissue is gone. Monitoring and follow-up treatments may be necessary for up to 10 years after aboveground removal. Integrated management is necessary. Combining goat grazing and herbicide treatments or herbicides and grass seeding often provided better control than each treatment alone.
Mechanical	Repeated cutting or mowing can limit leafy spurge seed production but doesn't reduce vegetative spread.		
Biological	Grazing by domestic sheep and goats can reduce leafy spurge stem abundance, but roots survive, and plants can still spread vegetatively. Leafy spurge typically recovers once the grazing pressure is removed. Flea beetles have been most successful in providing long-term biological control as of 2010		

(Euphorbia Esula, n.d.)

Table 28: Ecology of *Lepidium draba* – Hoary Cress												
Season	Winter			Spring			Summer			Autumn		
Month	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov
Germination												
Active Growth												
Flowering												
Fruiting												
Optimum Treatment												
Native Range	Western Asia and Southeastern Europe											
Dispersal/Distribution	Hoary cress produces heart-shaped seed pods containing two oval, red-brown seeds, each about 1/2 inch long. Mature plants can produce between 1,200 to 4,800 seeds. It also spreads through an extensive root system, including deep taproots and lateral roots that can extend up to 30 feet within three years. These roots can regenerate new plants from fragments, contributing to its rapid spread. In Colorado, hoary cress invades rangelands, pastures, streambanks, and open forests. It prefers moderately moist, alkaline to saline soils but can tolerate a wide range of conditions.											

Table 28: Ecology of *Lepidium draba* – Hoary Cress	
Seed Viability	1-2 years
Threat to Ecosystem	Displace native species and reduce grazing quality. Hinders the growth of desired species by releasing chemicals that reduce seed germination and root growth.

(*Hoary Cress – Adams County Extension*, n.d.) & (*Hoary Cress | Jefferson County, CO*, n.d.)

Table 29: Treatment for *Lepidium draba* – Hoary Cress

Treatment Options	Details	Prevention	Notes
Chemical	Applying 2,4-D early in the plant's growth stage, before the bud stage, can provide control. Reapplication in the fall may be necessary if new growth appears	Maintaining healthy plant communities through proper land management can help prevent hoary cress establishment. Practices include minimizing soil disturbance, promoting competitive vegetation, and monitoring for early detection.	The best time to apply herbicides is during the rosette to pre-bud stage in spring or in fall when the plant is storing nutrients in its root system. Lepidium draba spreads through rhizomes, making it difficult to eradicate with a single treatment. A combination of herbicides (rotate and mix herbicides to prevent resistance), mechanical removal, and cultural practices is the most effective strategy. It can take multiple years of treatment to fully deplete root reserves. Hoary cress can accumulate toxic levels of selenium, making it unsafe for livestock grazing in heavily infested areas. Herbicides should be chosen carefully to avoid non-target damage, especially in sensitive ecosystems.
Mechanical	Hand Pulling: For small populations, hand digging can be effective but it's necessary to remove as much of the root system as possible to prevent regrowth. Consistent and repeated efforts are necessary for success. When combined with herbicide applications, mowing can reduce seed production and weaken the plants.		
Biological	There are no approved biological control agents for hoary cress in the United States. However, research is ongoing to evaluate the gall mite Aceria drabae and the shoot-feeding weevil Ceutorhynchus turbatus.		
Cultural	Sheep and goats can graze on hoary cress, especially seedlings, to reduce its spread. Cattle tend to avoid it, and ingestion can lead to tainted milk.		

(*Biological Control of Lepidium Draba - COLORADO STATE UNIVERSITY*, n.d.), (*Cress, Hoary or Whitetop (Lepidium Draba), Hairy (Lepidium*, 2022), (*Hoary Cress | Jefferson County, CO*, n.d.), & (United States Department of Agriculture, 2017b)

Table 30: Ecology of *Leucanthemum vulgare* – Oxeye Daisy												
Season	Winter			Spring			Summer			Autumn		
Month	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov
Germination												
Active Growth												
Flowering												
Fruiting												
Optimum Treatment												
Native Range	Europe and temperate regions of Asia											
Dispersal/Distribution	The plant spreads primarily through seed dispersal. Each flower head can produce up to 200 flat seeds that are 0.08 inches (2 mm) long. These seeds are dispersed by wind, water, animals, and human activities, facilitating its spread across various landscapes. Oxeye daisy can be found on roadsides, meadows, pastures, and other disturbed areas.											
Seed Viability	5-10 years											
Threat to Ecosystem	Biodiversity reduction, forage plant reduction, soil degradation (erosion). Agricultural Impact: Oxeye daisy serves as a host and reservoir for several species of gall-forming nematodes that feed on crop											

(Mangold et al., 2009) & (*Oxeye Daisy, Leucanthemum Vulgare - Mid-Atlantic Invaders Tool*, n.d.)

Table 31: Treatment for *Leucanthemum vulgare* – Oxeye Daisy			
Treatment Options	**Details**	**Prevention**	**Notes**
Chemical	Apply aminopyralid (Milestone) at 4-6 oz per acre with a non-ionic surfactant during the pre-flower bud stage for optimal control. Apply metsulfuron (Escort XP) at 1 oz per acre with a surfactant during the flowering stage. Consider potential impacts on non-target species.	Maintain healthy, competitive vegetation. Practice proper grazing management, minimize soil disturbance, and quickly revegetate disturbed areas.	Regular monitoring and follow-up treatments are required to prevent reinfestation. Herbicides such as aminopyralid and metsulfuron, can harm native plants and forage species. Spot treat with selective herbicide to minimize unintended damage. The best time for mechanical control is early spring or after rainfall, when the soil is moist, making root removal easier. Herbicide treatments are most effective before flowering (spring to early summer) when the plant is actively growing and absorbing nutrients.
Mechanical	Hand pull small populations and extract the entire root system to prevent regrowth. This method requires persistence over several years due to the plant's seed longevity. Regular mowing can reduce seed production if done as soon as flower buds appear.		
Cultural	Sheep and goat grazing can help suppress populations.		

(Colorado Department of Agriculture - Conservation Services, n.d.) & (Mangold et al., 2009b)

Table 32: Ecology of *Linaria dalmatica & genistifolia* – Dalmatian Toadflax												
Season	Winter			Spring			Summer			Autumn		
Month	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov
Germination												
Active Growth												
Flowering												
Fruiting												
Optimum Treatment												
Native Range	Southeastern Europe and Southwestern Asia											
Dispersal/Distribution	The plant primarily reproduces through seed dispersal (500,00 seeds). Most seeds fall within five feet of the parent plant. The small, winged seeds can be dispersed by wind, especially when falling onto crusted snow, allowing them to be blown across the surface. Additionally, seeds may be spread by animals such as cattle and deer that consume the seed capsules. Dalmatian toadflax thrives in disturbed areas such as roadsides, abandoned lots, fields, gravel pits, clearings, and overgrazed rangelands. In Colorado, it is found at elevations ranging from 5,000 to over 10,000 feet.											
Seed Viability	2-10 years											
Threat to Ecosystem	Dalmatian toadflax poses a significant threat to ecosystems by displacing native plant species, reducing biodiversity, and altering habitat structure. Its aggressive growth and high seed production enable it to outcompete native vegetation, leading to monocultures that diminish forage availability for wildlife and livestock.											

(Colorado State University Extension, 2016), (*Linaria Dalmatica Ssp. Dalmatica Plant Assessment Form California Invasive Plant Council*, n.d.), (Sing & Peterson, 2011), & (*Southwest Colorado Wildflowers, Linaria*, n.d.).

Table 33: Treatment for *Linaria dalmatica & genistifolia* – Dalmatian Toadflax			
Treatment Options	**Details**	**Prevention**	**Notes**
Fire	Burning is not usually effective because root buds and buried seeds are unaffected by fire, and burning can increase the competitiveness of toadflax by removing surrounding native plants.	Maintain native plant communities by limiting spring grazing (since toadflax seedlings can more effectively compete with grazed plants), minimizing soil disturbance, and seeding disturbed sites with desirable species. Prevent seeds and root pieces from entering new areas by checking and and cleaning equipment, livestock, and vehicles.	Keys to successful control of toadflax are prevention of seed production, depleting root reserves, and killing seedlings before vegetative reproduction begins (within 2-3 weeks of germination).
Chemical	Picloram at the rate of 1.5 to 2 lb a.i. per acre, is suggested to be the most effective herbicide treatment for Dalmatian toadflax, although it will not usually provide complete control, and it may also harm native plants.		
Mechanical	Removal of the aboveground portion of toadflax plants can eliminate seed production for that year (if done in spring or		

Table 33: Treatment for *Linaria dalmatica & genistifolia* – Dalmatian Toadflax			
Treatment Options	**Details**	**Prevention**	**Notes**
	early summer, before seed set), and reduce the current year's growth, but it will not kill them. Removal each year for 5 or 6 years may be necessary to deplete the remaining root system of reserves, and 10 to 15 years may be required to remove seedlings produced from dormant seeds. Hand-pulling, mowing, and tillage can prevent seed production.		
Biological	Domestic sheep and goats can help suppress stands of Dalmatian toadflax and limit seed production. Stem-boring weevil (Mecinus janthinus) larvae and adults feed on shoots of both toadflax species, seems to be the most promising biocontrol agent for toadflax.		

(Species: Linaria Spp., n.d.)

Table 34: Ecology of *Onopordum acanthium* – Scotch Thistle												
Season	Winter			Spring			Summer			Autumn		
Month	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov
Germination												
Active Growth												
Flowering												
Fruiting												
Optimum Treatment												
Native Range	Southern Europe and Central Asia											
Dispersal/Distribution	The primary dispersal method is wind, aided by the plant's pappus—a tuft of hairs attached to the seed. Additionally, seeds can be spread by water, animals, and human activities such as machinery movement and transportation of contaminated soil. Scotch thistle thrives in disturbed areas, including rangelands, roadsides, and riparian zones. It prefers moist environments but can establish in various soil types											
Seed Viability	7-39 years											
Threat to Ecosystem	Outcompetes native vegetation, reduces forage plants, obstructs access to water sources when the infestation is dense.											

("A WEED REPORT From the Book Weed Control in Natural Areas in the Western United States," 2013) & (Adams County Weed Department, n.d.)

Table 35: Treatment for *Onopordum acanthium* – Scotch Thistle			
Treatment Options	**Details**	**Prevention**	**Notes**
Chemical	Herbicides can be effective, when applied at the rosette stage in early spring or fall. Use products containing aminopyralid, chlorsulfuron, metsulfuron, or clopyralid. Due to the seed's longevity in the soil, multiple years of treatment may be necessary.	Maintain healthy pastures and minimizing soil disturbances. Use weed-free crop seeds, manure, and hay, and clean harvesting and tillage equipment. Eliminate infestations in areas adjacent to cropland and along waterways.	Treatments are most effective when applied at the rosette stage (before bolting). Once the plant has bolted and started flowering, control becomes significantly more difficult. Herbicides work best on young plants in spring or fall. Cutting or mowing must be done before seed set to prevent further spread.
Mechanical	For small populations, mechanical methods such as tilling, hoeing, and digging are effective. Appy these techniques during the plant's first year before it stores energy or in the second year before seed production. Severing the roots below the soil surface can prevent regrowth. Mowing during early flowering can reduce seed production.		
Cultural	Proper grazing management and re-vegetation of disturbed sites can suppress Scotch thistle.		

(Scotch Thistle | Jefferson County, CO, n.d.)

Table 36: Ecology of *Tripleurospermum inodorum* – Scentless Chamomile												
Season	Winter			Spring			Summer			Autumn		
Month	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov
Germination												
Active Growth												
Flowering												
Fruiting												
Optimum Treatment												
Native Range	Europe											
Dispersal/Distribution	Seeds are readily dispersed by wind, water, equipment, vehicles, and as contaminants in soil, fill material, crop seed, and animal feed. Seeds can float for up to 12 hours, facilitating spread along watercourse. This plant thrives in disturbed areas such as roadsides, fields, meadows, pastures, rights-of-way, and drainages. It prefers areas with high soil moisture and is often found near ponds, streams, and other areas prone to seasonal flooding											
Seed Viability	3-11 years											

Table 36: Ecology of *Tripleurospermum inodorum* – Scentless Chamomile	
Threat to Ecosystem	Forms dense stands that outcompete native vegetation and reduces crop yields on cultivated lands.

(CWmaAdm1n, 2021), (Douglas et al., 1984), (Ministry of Agriculture, 2014), & (Saskatchewan Invasive Species Council, n.d.)

Table 37: Treatment for *Tripleurospermum inodorum* – Scentless Chamomile			
Treatment Options	**Details**	**Prevention**	**Notes**
Chemical	Apply Escort XP (Metsulfuron-methyl) at a rate of 0.33 ounces per acre during the rosette to bolting stages in spring to early summer. Add a non-ionic surfactant at 0.32 ounces per gallon of water or 1 quart per 100 gallons of water to enhance efficacy. Apply Telar (Chlorsulfuron) similar to Escort XP, with the same rate and timing. Ensure the addition of a non-ionic surfactant as specified above. Apply Milestone (Aminopyralid) at 7 ounces per acre during the same growth stages. For optimal results, apply these herbicides when plants are actively growing and have Scentless chamomile is resistant to 2,4-D and other phenoxyacetic acid herbicides.	Regularly monitor and quickly remove new infestations to prevent establishment. Limit soil disturbance that can create bare soil. Clean vehicles, machinery, and tools. Establish and maintain dense stands of native grasses, to outcompete scentless chamomile.	The most effective time to control scentless chamomile is in the rosette or seedling stage before it flowers and produces seeds. Avoid late season treatments because mature plants with flowers can still produce viable seeds even after being treated with herbicides or mechanical removal. Most grazing animals avoid scentless chamomile due to its unpalatable taste. Overgrazed pastures can allow it to spread aggressively. Rotational grazing helps maintaining a healthy grass cover helps suppress chamomile establishment. Some recommended herbicides (e.g., Aminopyralid) can remain active in the soil and affect non-target plants. Apply on calm days to prevent drift. Do not apply herbicides near streams, wetlands, or sensitive habitats where they may impact non-target vegetation.
Mechanical	Hand remove entire plants, ensuring complete root removal to prevent regrowth. This method is effective for small infestations but must be repeated as new plants germinate. Mowing is not recommended since plants can regrow after cutting.		

(Ann Larson & Irene Shonle, n.d.)

List C Species

Table 38: Ecology of *Bromus tectorum*- Cheatgrass												
Season	Winter			Spring			Summer			Autumn		
Month	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov
Germination												
Active Growth												
Flowering												
Fruiting												
Optimum Treatment												
Native Range	Southern Europe, northern Africa, and southwestern Asia											
Dispersal/Distribution	Seeds can be spread by wind and water, as well as via their short awns that allow them to attach to animals, humans, and machinery. It is found in disturbed areas and grassland communities.											
Seed Viability	2-5 years											
Threat to Ecosystem	Outcompetes native species and increases fire frequency.											

(Deschutes County, n.d.), (United States Department of Agriculture, 2014), & (United States Department of Agriculture, 2017)

Table 39: Treatment for *Bromus tectorum*- Cheatgrass			
Treatment Options	**Details**	**Prevention**	**Notes**
Cultural	Cheatgrass is not competitive with established perennials, particularly grasses; therefore, biological suppression with desirable perennials can be an effective management method.	Maintain native plant coverage to keep communities resistant to cheatgrass invasion. Implement proper grazing management to prevent the invasion of cheatgrass.	Cheatgrass is especially prevalent in the early stages of fire succession or following other disturbances when shrubs, trees, perennial grasses, and other invasive plants are removed, and that cheatgrass density can increase dramatically 2 to 3 years after disturbance. It can rarely be controlled or eradicated with a single method with effective control requiring, eliminating live plants, preventing seed formation, and controlling seed germination and emerging seedlings
Chemical	Quizalofop, fluazifop-p-butyl, sethoxydim, paraquat, glyphosate, imazapic, sulfometuron methyl, and atrazine are suitable herbicides. One year of chemical application will only temporarily thin the cheatgrass population and may actually increase cheatgrass seed production, therefore reatment must be repeated from 2 to 5 years consecutively.		
Biological	Livestock grazing can reduce cheatgrass cover. To prevent seed production, graze plants before they turn purple.		

Table 39: Treatment for *Bromus tectorum*- Cheatgrass			
Treatment Options	**Details**	**Prevention**	**Notes**
Physical	For small populations, hand pulling is effective. Cutting or mowing is not recommended unless it can be repeated several times per year, for several years. Domestic sheep grazing can suppress cheatgrass density, growth, seed production, and mulch accumulations. This is best in areas without desirable perennials than in areas where desirable perennials are present and need to be protected.		

(*Bromus Tectorum*, n.d.)

Table 40: Ecology of *Verbascum thapsus* – Common Mullein												
Season	Winter			Spring			Summer			Autumn		
Month	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov
Germination												
Active Growth												
Flowering												
Fruiting												
Optimum Treatment												
Native Range	Europe and Asia											
Dispersal/Distribution	Disperses seeds via wind and water. A single mullein plant can make up to 240,000 seeds. It grows in disturbed habitats, including roadsides, pastures, rangelands, and open areas. It prefers well-drained soils with a pH between 6.5 and 7.8 and can grow in dry, sandy soils as well as chalk and limestone.											
Seed Viability	100 years											
Threat to Ecosystem	They form dense stands that displace native vegetation, reduce biodiversity, and alter habitat structures. Its rapid growth and prolific seed production enable it to outcompete native species, especially in disturbed sites.											

(*Common Mullein | Jefferson County, CO*, n.d.) & (CWmaAdm1n, 2020)

Table 41: Treatment for *Verbascum thapsus* – Common Mullein			
Treatment Options	**Details**	**Prevention**	**Notes**
Chemical	First year rosettes are easily killed by herbicide, but second year plants are more resistant. Aim herbicide directly into the center of the rosette to increase effectiveness.	Given the long-lived seed bank, prevent spread by reducing soil disturbance. High levels of germination are possible in a wide range of temperatures, and germination percentages can be increased by 38% after only 5 seconds of light exposure.	The very long-lived seed bank suggests that eradication of common mullein is unlikely, and even minimal disturbances may encourage common mullein establishment.
Mechanical	Plants severed through the root crown below the basal leaves will not sprout. Flowering stalks should be removed from the site to limit additions to the seed bank.		
Biological	Weevils (Gymnaetron tetrum) may destroy up to 50% of common mullein seeds		

(Verbascum Thapsus, n.d.)

Watch List and 'Other' Species

Table 42: Ecology of *Hieracium caespitosum* – Field Bindweed												
Season	Winter			Spring			Summer			Autumn		
Month	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov
Germination												
Active Growth												
Flowering												
Fruiting												
Optimum Treatment												
Native Range	Europe and Asia											
Dispersal/Distribution	Primarily disperses through seed production. Each plant can produce between 25 to 300 seeds, which are dispersed locally. They are typically found in pastures, lawns, gardens, cultivated fields, waste areas, roadsides, and rangelands.											
Seed Viability	40 years											
Threat to Ecosystem	It competes with native plants and crops for resources, leading to reduced biodiversity and agricultural productivity. It also causes structural damage via its root system which can damage infrastructure, such as roads and buildings, by infiltrating cracks and crevices.											

(Mary Ellen Harte & Kelly Uhing, n.d.)

Table 43: Treatment for *Hieracium caespitosum* – Field Bindweed			
Treatment Options	**Details**	**Prevention**	**Notes**
Fire	Prescribed fire is not an effective method for controlling meadow hawkweed	Regularly monitor and quickly remove new infestations to prevent establishment. Limit soil disturbance that can create bare soil. Clean vehicles, machinery, and tools. Establish and maintain dense stands of native grasses.	Meadow hawkweed's stolons, rhizomes, and adventitious root buds make control efforts complicated.
Chemical	Herbicide is most effective early in the growing season, when plants are in the rosette stage, because treatment prevents flowering and seed production. They help gain initial control of a new invasion or a severe infestation, but not a complete or long-term solution.		
Mechanical	Use hand-pulling on small populations of meadow hawkweed if the entire root system is removed. Digging can control small populations but can also stimulate the growth of new plants from rhizomes, stolons, and fragmented roots that are left behind. Mowing is not effective because it stimulates vegetative spread, and mower blades miss low-lying rosettes		

(Hieracium Caespitosum, n.d.)

Table 44: Ecology of *Melilotus spp.* – Sweetclover												
Season	Winter			Spring			Summer			Autumn		
Month	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov
Germination												
Active Growth												
Flowering												
Fruiting												
Optimum Treatment												
Native Range	Eurasia											
Dispersal/Distribution	Primarily dispersed by wind as well as human activities, such as the movement of gravel, soil, forage, or straw. They are found in prairies, meadows, roadsides, and disturbed sites.											
Seed Viability	70 years											
Threat to Ecosystem	Displaces native vegetation and alters soil dynamics by fixing nitrogen.											

(*1 – Introduction*, n.d.), (Klein, 2011), (*Melilotus Alba, M. Officinalis*, n.d.), & (Spellman & Wurtz, 2011)

Table 45: Treatment for *Melilotus spp.* – Sweetclover			
Treatment Options	**Details**	**Prevention**	**Notes**
Fire	A single growing season fire in May, June, or July reduces Sweetclover abundance. 3 to 5 years of successive May or June fires controls sweetclover seed production	Maintaining healthy, native, natural communities as best as possible. Limit grazing, construction, or any other form of disturbance that exposes bare soil.	Treatment need to be applied before plants flower to deplete the seed bank and to damage plants when carbohydrate stores are lowest, to reduce chances of recovery. Sweetclover is nearly impossible to kill after large crown buds are produced from August to November.
Chemical	Herbicides are most effective on 1st-year sweetclover when used with other control methods. Herbicides decrease sweetclover biomass and seed production and are most useful in gaining initial control of a new invasion or a severe infestation but are not a long-term solution.		
Mechanical	Hand-pulling has been successful for controlling small sweetclover populations when the soil is moist (early spring or late fall) and complete root removal is easiest. It's necessary to remove the entire root because failure to do so could mean plant survival. Cutting is most effective if done before large amounts of carbohydrates are stored (usually late summer) and cutting may be more effective on 2nd-year than 1st-year plants.		
Cultural	Sweetclover abundance is reduced when perennial vegetation cover is high. Sweetclover can eradicated within about 2 years of establishing perennial species cover.		

(Melilotus Alba, M. Officinalis, n.d.-b)

Table 46: Ecology of *Rumex crispus* - Curly doc												
Season	Winter			Spring			Summer			Autumn		
Month	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov
Germination												
Active Growth												
Flowering												
Fruiting												
Optimum Treatment												
Native Range	Europe and Asia											
Dispersal/Distribution	Wind dispersed and is found in disturbed areas such as roadsides, pastures, and low-maintenance turf.											
Seed Viability	50 years											
Threat to Ecosystem	Outcompetes native species via it's taproot.											

(*Curly Dock | Integrated Crop Management*, n.d.), (*Curly Dock*, n.d.), (Team, n.d.), & (*Curly Dock*, n.d.)

Table 47: Treatment for *Rumex crispus* - Curly doc			
Treatment Options	**Details**	**Prevention**	**Notes**
Chemical	Apply systemic herbicides during the rosette stage in early spring or in the fall. Use products containing aminopyralid (e.g., Milestone®).	Maintain healthy, competitive vegetation. Practice proper grazing management, minimize soil disturbance, and quickly revegetate disturbed areas.	Curly dock has a long, taproot that enables it to regenerate if not completely. Long term integrated management is necessary due to its 50-year viable seed bank.
Mechanical	Mechanical methods include hand-pulling, mowing, hoeing, tillage, and burning. For small populations, manual removal is effective as long as the taproot is fully removed. Any root fragments left behind can resprout. Mowing or cutting can suppress spreading temporarily if done after flowering but before seed development. Repeated mowing would be necessary.		
Cultural	Maintain healthy, dense vegetation can suppress curly dock establishment		

(Colorado Department of Agriculture et al., n.d.) & (Frank Hassler, 2024)

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APPENDIX A. REGULATORY AND 'OF CONCERN' SPECIES IN ARAPAHO ROOSEVELT NATIONAL FOREST

Table 48: Documented Regulatory Species within 1 mile of the project area.

Major Group	Scientific Name	Common Name	Global Rarity	State Rarity	ESA Status	CO Status	Other Status
Birds	Aquila chrysaetos	Golden Eagle	G5	S3S4B, S, 4N			BGEPA/BLM/SWAP Tier 1
Birds	Haliaeetus leucocephalus	Bald Eagle	G5	S3B, S3N		SC	BGEPA/BLM/SWAP Tier 2/USFS
Fish	Oncorhynchus clarkii stomias	Greenback Cutthroat Trout	G5T1Q	S2	LT	ST	SWAP Tier 1
Fish	Oncorhynchus clarkii	Cutthroat Trout	G5	S4	PS		SWAP Tier 1
Mammals	Lynx canadensis	Lynx	G5	S1	LT	SE	SWAP Tier 1
Mammals	Zapus hudsonius preblei	Meadow Jumping Mouse	G5T2	S1	LT	ST	SWAP Tier 1

(Colorado Natural Heritage Program & Cheadle, 2025)

Table 49: Documented 'Other Species of Concern' species within 1 mile of the project area: Rare Species, Natural Communities, and Species of Economic, Recreational, or Conservation Value.

Major Group	Scientific Name	Common Name	Global Rarity	State Rarity	ESA Status	CO Status	Other Status
Amphibians	Anaxyrus boreas pop. 1	Boreal Toad (Southern Rocky Mountain Population)	G4T1T2Q	S1		SE	BLM/SWAP Tier 1/USFS
Amphibians	Lithobates pipiens	Northern Leopard Frog	G5	S3		SC	BLM/SWAP Tier 1/USFS
Amphibians	Lithobates sylvaticus	Wood Frog	G5	S3		SC	SWAP Tier 2/USFS

Table 49: Documented 'Other Species of Concern' species within 1 mile of the project area: Rare Species, Natural Communities, and Species of Economic, Recreational, or Conservation Value.							
Major Group	**Scientific Name**	**Common Name**	**Global Rarity**	**State Rarity**	**ESA Status**	**CO Status**	**Other Status**
Birds	Accipiter atricapillus	American Goshawk	G5	S3B			BLM/SWAP Tier 2/USFS
Birds	Accipiter cooperii	Cooper's Hawk	G5	S3S4B,S 4N			
Birds	Aegolius funereus	Boreal Owl	G5	S2			SWAP Tier 2/USFS
Birds	Antigone canadensis tabida	Greater Sandhill Crane	G5T5	S2B,S4N		SC	SWAP Tier 1
Birds	Ardea herodias	Great Blue Heron	G5	S3B			
Birds	Branta canadensis	Canada Goose	G5	S5			
Birds	Carpodacus cassinii (Haemorhous cassinii)	Cassin's Finch	G5	S5			SWAP Tier 2
Birds	Centrocercus urophasianus	Greater Sage-Grouse	G3G4	S4		SC	BLM/SWAP Tier 1/USFS
Birds	Contopus cooperi	Olive-sided Flycatcher	G4	S3S4B			SWAP Tier 2/USFS
Birds	Glaucidium gnoma Northern Pygmy-Owl	IMBCR	G4G5	S3B			
Birds	Lagopus leucura	White-tailed Ptarmigan	G5	S4			SWAP Tier 1/USFS
Birds	Leiothlypis virginiae	Virginia's Warbler	G5	S5			SWAP Tier 2/USFS
Birds	Leucosticte australis	Brown-capped Rosy-finch	G4	S3B,S4N			BLM/SWAP Tier 1
Birds	Loxia leucoptera	White-winged Crossbill	G5	S1B			
Birds	Meleagris gallopavo	Wild Turkey	G5	S5			
Birds	Pandion haliaetus	Osprey	G5	S3B			
Birds	Passerina amoena	Lazuli Bunting	G5	S5B			SWAP Tier 2

Table 49: Documented 'Other Species of Concern' species within 1 mile of the project area: Rare Species, Natural Communities, and Species of Economic, Recreational, or Conservation Value.							
Major Group	**Scientific Name**	**Common Name**	**Global Rarity**	**State Rarity**	**ESA Status**	**CO Status**	**Other Status**
Birds	Passerina cyanea	Indigo Bunting	G5	S3S4B			
Birds	Pelecanus erythrorhynchos	American White	G4	S1B			BLM/SWAP Tier 2
Birds	Picoides dorsalis	Three-toed Woodpecker	G5	S3S4			USFS
Birds	Seiurus aurocapilla	Ovenbird	G5	S2B			
Birds	Selasphorus platycercus	Broad-tailed Hummingbird	G5	S5			BLM
Crayfish	Faxonius neglectus	Ringed Crayfish	G5	S2			
Fish	Catostomus discobolus	Bluehead Sucker	G4	S4			BLM/SWAP Tier 1/USFS
Fish	Couesius plumbeus	Lake Chub	G5	S1		SE	SWAP Tier 2/USFS
Fish	Oncorhynchus clarkii pleuriticus	Colorado River Cutthroat Trout	G5T3	S3			
Insects	Arctia sp. 1	A Tiger Moth	G1	S1			
Insects	Bombus occidentalis	Western Bumble Bee	G3	S3S4			BLM/SWAP Tier 2/USFS
Insects	Callophrys mossii schryveri	Moss's Elfin	G4T4	S2S3			SWAP Tier 2
Insects	Isocapnia vedderensis	A Stonefly	G4	S1			
Insects	Somatochlora hudsonica	Hudsonian Emerald	G5	S1			SWAP Tier 2/USFS
Insects	Suwallia wardi	A Stonefly	G3	S2			
Mammals	Alces alces	Moose	G5	SNA			
Mammals	Antilocapra americana	Pronghorn	G5	S4			
Mammals	Cervus canadensis (Cervus elaphus)	Elk	G5	S5			

Table 49: Documented 'Other Species of Concern' species within 1 mile of the project area: Rare Species, Natural Communities, and Species of Economic, Recreational, or Conservation Value.

Major Group	Scientific Name	Common Name	Global Rarity	State Rarity	ESA Status	CO Status	Other Status
Mammals	Corynorhinus townsendii pallescens	Pale Lump-nosed Bat	G4T3T4	S2		SC	BLM/SWAP Tier 1/USFS
Mammals	Corynorhinus townsendii	Townsend's Big-eared Bat	G4	S2			BLM/USFS
Mammals	Eptesicus fuscus	Big Brown Bat	G5	S5			
Mammals	Gulo gulo	Wolverine	G4	S1		SE	SWAP Tier 1
Mammals	Lontra canadensis	Northern River Otter	G5	S3S4		ST	BLM/SWAP Tier 2/USFS
Mammals	Myotis ciliolabrum	Western Small-footed Myotis	G5	S4			BLM
Mammals	Myotis evotis	Long-eared Myotis	G5	S4			BLM
Mammals	Odocoileus hemionus	Mule	G5	S4			
Mammals	Oreamnos americanus	Mountain Goat	G5	SNA			
Mammals	Ovis canadensis	Bighorn Sheep	G4	S4			SWAP Tier 2/USFS
Mammals	Puma concolor	Mountain Lion	G5	S4			
Mammals	Sorex eximius montanus	Pygmy Shrew	G4T2T3	S2			SWAP Tier 2/USFS
Mammals	Sorex nanus	Dwarf Shrew	G4	S2			SWAP Tier 2 9491
Mammals	Ursus americanus	Black Bear	G5	S5			
Natural Communities	Abies lasiocarpa - Picea engelmannii / Calamagrostis canadensis	Swamp Forest Montane Riparian Forests	G5	S2			
Natural Communities	Alnus incana / Equisetum arvense	Wet Shrubland Montane Riparian Shrublands	G3	S1			
Natural Communities	Alnus incana / Mesic Graminoids	Wet Shrubland Montane Riparian Shrubland	G3	S2			

Table 49: Documented 'Other Species of Concern' species within 1 mile of the project area: Rare Species, Natural Communities, and Species of Economic, Recreational, or Conservation Value.							
Major Group	**Scientific Name**	**Common Name**	**Global Rarity**	**State Rarity**	**ESA Status**	**CO Status**	**Other Status**
Natural Communities	Artemisia cana ssp. viscidula / Festuca thurberi	Shrubland Western Slope Sagebrush Shrublands	G2G3	S2S3			
Natural Communities	Artemisia tridentata ssp. wyomingensis / Leymus ambiguus	Shrubland Mixed Foothill Shrublands	G2	S2			
Natural Communities	Artemisia tridentata ssp. wyomingensis / Pseudoroegneria spicata	Shrub Grassland Xeric Sagebrush Shrublands	G4	SU			
Natural Communities	Calamagrostis canadensis	Western Wet Meadow Montane Wet Meadows	G4	S4			
Natural Communities	Carex utriculata	Wet Meadow Beaked Sedge Montane Wet Meadows	G5	S5			
Natural Communities	Cercocarpus montanus / Achnatherum scribneri	Shrubland Foothills Shrubland	G3	S3			
Natural Communities	Cercocarpus montanus / Hesperostipa neomexicana	Shrubland Foothills Shrubland	G2G3	S2			
Natural Communities	Danthonia intermedia Grassland	Montane Grasslands	G2G3	S2			
Natural Communities	Danthonia parryi Grassland	Montane Grasslands	G3	S3			
Natural Communities	Deschampsia cespitosa Wet Meadow	Mesic Alpine Meadow	G4	S4			
Natural Communities	Eleocharis quinqueflora	Fen Alpine Wetlands	G4	S4			
Natural Communities	Glyceria grandis	Wet Meadow American Mannagrass	G2?	S1			

Table 49: Documented 'Other Species of Concern' species within 1 mile of the project area: Rare Species, Natural Communities, and Species of Economic, Recreational, or Conservation Value.							
Major Group	**Scientific Name**	**Common Name**	**Global Rarity**	**State Rarity**	**ESA Status**	**CO Status**	**Other Status**
Natural Communities	Juncus arcticus ssp. littoralis	Wet Meadow Western Slope Wet Meadows	G5	S5			
Natural Communities	Juniperus scopulorum / Purshia tridentata	Woodland Foothills Pinyon-Juniper Woodlands	G2	S2			
Natural Communities	Juniperus scopulorum / Purshia tridentata	Woodland Foothills Pinyon-Juniper Woodlands	G2	S2			
Natural Communities	Muhlenbergia montana - Hesperostipa comata	Grassland Montane Grasslands	G1G2	S2			
Natural Communities	Picea pungens / Alnus incana	Riparian Woodland Montane Riparian Forests	G3	S3			
Natural Communities	Picea pungens / Cornus sericea	Riparian Woodland Montane Riparian Forest	G4	S2			
Natural Communities	Pinus ponderosa / Cercocarpus montanus / Andropogon gerardii	Open Woodland Foothills Ponderosa Pine Scrub Woodlands	G2	S2			
Natural Communities	Pinus ponderosa / Leucopoa kingii	Woodland Foothills Ponderosa Pine Savannas	G3	S3			
Natural Communities	Pinus ponderosa var. scopulorum / Purshia tridentata	Southern Rocky Mountain Woodland Ponderosa Pine / Antelope Bitterbrush Southern Rocky Mountain Woodland	G3G5	S5			
Natural Communities	Populus angustifolia / Alnus incana	Riparian Woodland Montane Riparian Forest	G3	S3			
Natural Communities	Populus angustifolia / Salix (monticola, drummondiana, lucida)	Riparian Woodland Narrowleaf Cottonwood/Mixed Willows Montane Riparian Forest	G3	S2			
Natural Communities	Populus angustifolia / Salix exigua	Riparian Woodland Narrowleaf Cottonwood Riparian Forests	G4	S4			

Table 49: Documented 'Other Species of Concern' species within 1 mile of the project area: Rare Species, Natural Communities, and Species of Economic, Recreational, or Conservation Value.

Major Group	Scientific Name	Common Name	Global Rarity	State Rarity	ESA Status	CO Status	Other Status
Natural Communities	Populus tremuloides / Shepherdia canadensis	Forest Persistent Aspen Forests	G3G4	S1			
Natural Communities	Purshia tridentata / Artemisia frigida / Hesperostipa comata	Shrubland Mixed Foothill Shrublands	G1G2	S1S2			
Natural Communities	Purshia tridentata / Muhlenbergia montana	Shrubland Mixed Foothill Shrublands	G2	S2			
Natural Communities	Ribes cereum / Leymus ambiguus	Shrubland Mixed Foothill Shrublands	G2	SU			
Natural Communities	Salix drummondiana / Calamagrostis canadensis	Wet Shrubland Lower Montane Willow Carrs	G3	S3			
Natural Communities	Salix geyeriana - Salix monticola / Calamagrostis canadensis	Wet Shrubland Montane Willow Carrs	G3	S2			
Natural Communities	Salix geyeriana / Carex aquatilis	Wet Shrubland Montane Willow Carr	G3	S2			
Natural Communities	Salix geyeriana / Mesic Graminoids	Wet Shrubland Geyer's Willow/Mesic Graminoid	G3?	S2			
Natural Communities	Salix ligulifolia	Wet Shrubland Montane Willow Carr	G2G3	S3			
Natural Communities	Salix lucida ssp. caudata	Wet Shrubland Montane Riparian Shrubland	G3Q	S2			
Natural Communities	Salix monticola / Calamagrostis canadensis	Wet Shrubland Montane Willow Carr	G3	S3			
Natural Communities	Salix monticola / Carex utriculata	Wet Shrubland Montane Riparian Willow Carr	G3	S3			
Natural Communities	Salix planifolia / Caltha leptosepala	Wet Shrubland Subalpine Riparian Willow Carr	G4	S4			

Table 49: Documented 'Other Species of Concern' species within 1 mile of the project area: Rare Species, Natural Communities, and Species of Economic, Recreational, or Conservation Value.							
Major Group	**Scientific Name**	**Common Name**	**Global Rarity**	**State Rarity**	**ESA Status**	**CO Status**	**Other Status**
Nonvascular Plants	Dicranum polysetum	Wavyleaf Broom Moss	G5	S2			
Vascular Plants	Aquilegia chrysantha	Golden Columbine	G4	S2			USFS
Vascular Plants	Aquilegia saximontana	Rocky Mountain Columbine	G3	S3			
Vascular Plants	Astragalus sparsiflorus	Front Range Milkvetch	G2G3	S2S3			SWAP Tier 2
Vascular Plants	Botrychium echo	Reflected Moonwort	G4	S3S4			
Vascular Plants	Botrychium minganense Mingan's moonwort	CNHP	G5	S3			
Vascular Plants	Callitriche heterophylla ssp. heterophylla	Two-headed Water-starwort	G5T5	S3			
Vascular Plants	Carex diandra	Lesser Panicled Sedge	G5	S2			
Vascular Plants	Carex lasiocarpa	Slender Sedge	G5	S2			
Vascular Plants	Carex limosa	Mud Sedge	G5	S3			
Vascular Plants	Carex livida	Livid Sedge	G5	S2			USFS
Vascular Plants	Carex microglochin	Small-tipped sedge	G5	S2			
Vascular Plants	Carex peckii	Peck Sedge	G5	S1			
Vascular Plants	Carex saximontana	Rocky Mountain Sedge	G5	S2			

Table 49: Documented 'Other Species of Concern' species within 1 mile of the project area: Rare Species, Natural Communities, and Species of Economic, Recreational, or Conservation Value.							
Major Group	**Scientific Name**	**Common Name**	**Global Rarity**	**State Rarity**	**ESA Status**	**CO Status**	**Other Status**
Vascular Plants	Cypripedium fasciculatum	Clustered Lady's-slipper	G4	S3S4			
Vascular Plants	Cypripedium parviflorum	American Yellow Lady'sslipper	G5	S2			USFS
Vascular Plants	Draba crassa	Thick-leaf Whitlow-grass	G4	S3			
Vascular Plants	Draba exunguiculata	Clawless Draba	G2G3	S2S3			SWAP Tier 2/USFS
Vascular Plants	Draba fladnizensis	Arctic Draba	G5	S3			
Vascular Plants	Draba grayana	Gray's Peak Whitlow-grass	G3	S3			SWAP Tier 2/USFS
Vascular Plants	Draba streptobrachia	Colorado Divide Draba	G3	S3			
Vascular Plants	Festuca hallii	Hall Fescue	G5	S1			USFS
Vascular Plants	Lewisia triphylla	Dwarf Spring Beauty	G4?	S2			
Vascular Plants	Neottia borealis (Listera borealis)	Northern Twayblade	G5	S2			
Vascular Plants	Neottia convallarioides (Listera convallarioides)	Broad-leaved Twayblade	G5	S2			
Vascular Plants	Phacelia denticulata	Rocky Mountain Phacelia	G3	S3			
Vascular Plants	Physaria bellii	Bell's Twinpod	G2G3	S2S3			SWAP Tier 2
Vascular Plants	Polypodium saximontanum	Rocky Mountain Polypody	G3?	S3S4			

Table 49: Documented 'Other Species of Concern' species within 1 mile of the project area: Rare Species, Natural Communities, and Species of Economic, Recreational, or Conservation Value.

Major Group	Scientific Name	Common Name	Global Rarity	State Rarity	ESA Status	CO Status	Other Status
Vascular Plants	Potentilla rupincola (Potentilla effusa var. rupincola)	Rocky Mountain Cinquefoil	G5? T2	S2			SWAP Tier 2/USFS
Vascular Plants	Rhododendron albiflorum	White-flowered Azalea	G5	S2			
Vascular Plants	Rubus arcticus ssp. acaulis	Nagoon Berry	G5T5	S1			USFS
Vascular Plants	Rubus pubescens	Dwarf Red Raspberry	G5	S2			
Vascular Plants	Salix candida	Hoary or Silver Willow	G5	S2			USFS
Vascular Plants	Sceptridium multifidum (Botrychium multifidum)	Leathery Grape Fern	G5	S1S2			
Vascular Plants	Subularia aquatica var. americana	Water Awlwort	G5T5	S1			

(Colorado Natural Heritage Program & Cheadle, 2025)

***Table Definitions**

Regulatory Species – Species with federal protection under the Endangered Species Act or Bald and Golden Eagle Protection Act along with FWS designated critical habitat.

Other Species of Concern – Other globally rare species and plant communities, BLM or USFS sensitive species, state listed species, or Tier 1 and Tier 2 priority species from Colorado's State Wildlife Action Plan, and species of economic and recreational value.

Major group – The major group in which the element falls: Amphibians, Birds, Crayfish, Fish, Insects, Mammals, Mollusks, Communities, Nonvascular Plants, Reptiles, and Vascular Plants.

Scientific Name – The scientific name of the species or plant community

Common Name – The common name of the species or plant community.

Global Rarity – The rarity rank used by CNHP and The Natural Heritage Network to track how rare a species or plant community is globally, ranging from G1 (rarest) to G5 (most common).

State Rarity - The rarity rank used by CNHP and The Natural Heritage Network to track how rare a species or plant community is in Colorado, ranging from S1 (rarest) to S5 (most common).

ESA Status – Federal status under the Endangered Species Act: Endangered (E), Threatened (T), or Federal Candidate (C) with qualifiers for Partial Status (PS) and experimental populations (XN). Global Rarity – The rarity rank used by CNHP and The Natural Heritage Network to track how rare a species or plant community is globally, ranging from G1 (rarest) to G5 (most common).

CO Status – State status per Colorado Parks & Wildlife: Endangered (SE), Threatened (ST), or State Special Concern (SC).

Other Status – Other status such as BLM sensitive species (BLM), U.S Forest Service sensitive species (USFS), and Tier 1 and Tier 2 priority species from Colorado's State Wildlife Action Plan (SWAP Tier 1, SWAP Tier 2).

APPENDIX B. TARGET LIST OF WEEDS FOR MAPPING IN 2024

Table 50: List of all noxious weeds for mapping in Arapaho Roosevelt National Forest

Scientific Name	Common Name	USDA Species Code	List
Alhagi pseudalhagi	Camelthorn	ALPS3	A (Not Known in CO)
Crupina vulgaris	Common crupina	CRVU2	A (Not Known in CO)
Salvinia molesta	Giant salvinia	SAMO5	A (Not Known in CO)
Hydrilla verticillata	Hydrilla	HYVE3	A (Not Known in CO)
Taeniatherum caput-medusae	Medusahead	TACA8	A (Not Known in CO)
Myriophyllum aquaticum	Parrotfeather	MYAQ2	A (Not Known in CO)
Centaurea virgata	Squarrose knapweed	CEVI	A (Not Known in CO)
Peganum harmala	African rue	PEHA	A (rare; <10 pop)
Isatis tinctoria	Dyer's woad	ISTI	A (rare; <10 pop)
Brassica elongata	Elongated mustard	BREL2	A (rare; <10 pop)
Butomus umbellatus	Flowering rush	BUUM	A (rare; <10 pop)
Centaurea x moncktonii	Meadow knapweed	CEMO6	A (rare; <10 pop)
Chondrilla juncea	Rush skeletonweed	CHJU	A (rare; <10 pop)
Senecio jacobaea	Tansy ragwort	SEJA	A (rare; <10 pop)
Centaurea solstitialis	Yellow starthistle	CESO3	A (rare; <10 pop)
Euphorbia cyparissias	Cypress spurge	EUCY2	A (uncommon; >10 pop)
Arundo donax	Giant reed	ARDO4	A (uncommon; >10 pop)
Epilobium hirsutum	Hairy willow-herb	EPHI	A (uncommon; >10 pop)

Table 50: List of all noxious weeds for mapping in Arapaho Roosevelt National Forest			
Scientific Name	**Common Name**	**USDA Species Code**	**List**
Salvia aethiopis	Mediterranean sage	SAAE	A (uncommon; >10 pop)
Euphorbia myrsinites	Myrtle spurge	EUMY2	A (uncommon; >10 pop)
Hieracium aurantiacum	Orange hawkweed	HIAU	A (uncommon; >10 pop)
Lythrum salicaria	Purple loosestrife	LYSA2	A (uncommon; >10 pop)
Iris pseudacorus	Yellow flag iris	IRPS	A (uncommon; >10 pop)
Artemisia absinthium	Absinth wormwood	ARAB3	B
Hyoscyamus niger	Black henbane	HYNI	B
Saponaria officinalis	Bouncingbet	SAOF4	B
Cirsium vulgare	Bull thistle	CIVU	B
Cirsium arvense	Canada thistle	CIAR4	B
Clematis orientalis	Chinese clematis	CLOR	B
Tanacetum vulgare	Common tansy	TAVU	B
Dipsacus fullonum	Common teasel	DIFU2	B
Dipsacus laciniatus	Cutleaf teasel	DILA4	B
Linaria dalmatica & genistifolia	Dalmatian toadflax	LIDA/LIGED	B
Hesperis matronalis	Dame's rocket	HEMA3	B
Centaurea diffusa	Diffuse knapweed	CEDI3	B
Myriophyllum spicatum	Eurasian watermilfoil	MYSP2	B
Lepidium draba	Hoary cress	LEDR	B
Cynoglossum officinale	Houndstongue	CYOF	B
Centaurea x psammogena = C.	Hybrid knapweed		B

Table 50: List of all noxious weeds for mapping in Arapaho Roosevelt National Forest			
Scientific Name	**Common Name**	**USDA Species Code**	**List**
stoebe x C. diffusa			
Linaria vulgaris x L. dalmatica	Hybrid toadflax		B
Aegilops cylindrica	Jointed goatgrass	AECY	B
Euphorbia esula	Leafy spurge	EUES	B
Anthemis cotula	Mayweed chamomile	ANCO2	B
Verbascum blattaria	Moth mullein	VEBL	B
Carduus nutans	Musk thistle	CANU4	B
Leucanthemum vulgare	Oxeye daisy	LEVU	B
Lepidium latifolium	Perennial pepperweed	LELA2	B
Carduus acanthoides	Plumeless thistle	CAAC	B
Rhaponticum repens	Russian knapweed	ACRE3/CERE6	B
Elaeagnus angustifolia	Russian olive	ELAN	B
Tamarix chinensis, T. parviflora, and T.	Salt cedar	TACH2	B
Tripleurospermum inodorum	Scentless chamomile	TRIN11	B
Onopordum acanthium	Scotch thistle	ONAC	B
Centaurea stoebe ssp. micranthos	Spotted knapweed	CESTM	B
Potentilla recta	Sulfur cinquefoil	PORE5	B
Carum carvi	Wild caraway	CACA19	B
Cyperus esculentus	Yellow nutsedge	CYES	B
Linaria vulgaris	Yellow toadflax	LIVU2	B
Poa bulbosa	Bulbous bluegrass	POBU	C
Cichorium intybus	Chicory	CICHO	C

Table 50: List of all noxious weeds for mapping in Arapaho Roosevelt National Forest			
Scientific Name	**Common Name**	**USDA Species Code**	**List**
Arctium minus	Common burdock	ARMI2	C
Verbascum thapsus	Common mullein	VETH	C
Hypericum perforatum	Common St. Johnswort	HYPE	C
Bromus tectorum	Downy brome	BRTE	C
Convolvulus arvensis	Field bindweed	COAR4	C
Halogeton glomeratus	Halogeton	HAGL	C
Sorghum halepense	Johnsongrass	SOHA	C
Sonchus arvensis	Perennial sowthistle	SOAR2	C
Conium maculatum	Poison hemlock	COMA2	C
Tribulus terrestris	Puncturevine	TRTE	C
Elymus repens	Quackgrass	ELRE4	C
Erodium cicutarium	Redstem filaree	ERCI6	C
Ulmus pumila	Siberian elm	ULPU	C
Ailanthus altissima	Tree of Heaven	AIAL	C
Abutilon theophrasti	Velvetleaf	ABTH	C
Panicum miliaceum	Wild-proso millet	PAMI2	C
Gypsophila paniculata	Baby's Breath	GYPA	Watch List
Bothriochloa bladhii	Caucasian bluestem	BOBL	Watch List
Anchusa officinalis	Common bugloss	ANOF	Watch List
Phragmites australis	Common reed	PHAU7	Watch List
Alliaria petiolata	Garlic Mustard	ALPE4	Watch List
Lysimachia vulgaris	Garden loosestrife	LYVU	Watch List
Rubus armeniacus	Himalayan blackberry	RUAR9	Watch List
Berteroa incana	Hoary alyssum	BEIN2	Watch List
Hieracium caespitosum	Meadow hawkweed	HICA10	Watch List

Table 50: List of all noxious weeds for mapping in Arapaho Roosevelt National Forest			
Scientific Name	**Common Name**	**USDA Species Code**	**List**
Asphodelus fistulosus	Onionweed	ASFI2	Watch List
Lathyrus latifolius	Perennial Sweet Pea	LALA4	Watch List
Cytisus scoparius	Scotch broom	CYSC4	Watch List
Sphaerophysa salsula	Swainsonpea	SPSA3	Watch List
Zygophyllum fabago	Syrian beancaper	ZYFA	Watch List
Arrhenatherum elatius	Tall Oatgrass	AREL3	Watch List
Ventenata dubia	Ventenata grass	VEDU	Watch List
Bryonia alba	White bryony	BRAL4	Watch List
Bothriochloa ischaemum	Yellow bluestem	BOIS	Watch List
Reseda lutea	Yellow mignonette	RELU	Watch List
Rumex crispis	Curly dock	RUCR	Other
Salsola spp.	Russian thistle	SALSO	Other
Bromus spp.	Annual brome spp.	BROMU	Other
Logfia arvensis	Field cotton rose	LOAR5	Other
Melilotus spp.	Sweetclover	MELIL	Other
Leucanthemum x superbum	Shasta daisy		Other
Ceratocephala testiculata	Bur buttercup	CETE5	Other
Gypsophila scorzonerifolia	Garden baby's breath	GYSC	Other
Phalaris arundinacea	Reed canarygrass	PHAR3	Other
Silene spp.	Non-native campion	SILEN	Other

(*Noxious Weed Species ID | Department of Agriculture*, n.d.)