Boulder County
Integrated Weed Management Plan







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Executive Summary

Situated at the intersection of the Great Plains and the Rocky Mountains, Boulder County is endowed with extraordinary geological and biological diversity, a natural heritage that helps form the foundation for an exceptional quality of life. Noxious weeds pose a threat to these cherished values, and in recognition of this threat, the state mandates and regulates noxious weed control throughout the state. Boulder County takes this stewardship mission seriously.

This Integrated Weed Management Plan lays out the county's goals, objectives, and strategies for noxious weed management on county-owned lands and private property:

- **Integrated Weed Management Objective:** Boulder County restores, improves, and maintains healthy, functioning ecosystems and economically viable agricultural lands through responsible, proactive, and adaptive management of noxious weeds in accordance with state law.
- Three broad **strategies** identify priorities: **manage, collaborate and communicate**, and **protect health and safety**. The plan provides details on the decision processes, tools and tactics employed to implement these strategies.

The plan is structured as follows:

- Overview of state regulations (Section 1) and Boulder County responsibilities (Section 2).
- Section 3 describes the adaptive decision process and tools as a reference for weed management on any land in Boulder County;
- Section 4 describes how Boulder County Parks & Open Space applies these process and tools to achieve Boulder County's goals on county-owned natural lands.
- Appendix A provides definition of terms; Appendix B provides detailed implementation plans for the three-year period 2024 to 2027. Details about costs of tools, herbicide selection process, and use of drones are provided in Appendices C, D, and E.

Noxious weed control is a complex problem; while most people can agree that biological diversity and ecosystem health are worthy objectives, there can be disagreement on the best ways to achieve them. Throughout the public engagement for this plan, the county received a large volume of public input, much of which has expressed concerns about the use of herbicides on county-owned natural lands. The county shares

these concerns and is committed to minimizing herbicide use.

Public input has helped informed and shaped the goals and implementation strategies in this Integrated Weed Management Plan, as presented in Appendix B, which describes implementation goals and strategy on county natural lands.

The **Integrated Weed Management Story Map** that accompanies this Integrated Weed Management Plan provides examples of how Boulder County applies these tools and processes across a range of noxious weed problems under varying circumstances and conditions.

1.0 Integrated Weed Management Overview

1.1 Colorado State Regulatory Requirements

The Boulder County Integrated Weed Management (IWM) program is managed pursuant to Article 5.5 of Title 35, Colorado Revised Statutes (C.R.S.), the Colorado Noxious Weed Act as amended Title 35. Agriculture (§§ 35-1-101 - 35-81-102). The Noxious Weed Act establishes the need and jurisdiction for statewide management of noxious weeds:

> *It is the intent of the general assembly that the advisory commissions appointed by counties and municipalities under this article, in developing undesirable plant management plans, consider the elements of integrated management as defined in this article, as well as all appropriate and available control and management methods, seeking those methods which are least environmentally damaging and which are practical and economically reasonable. C.R.S. 35-5.5-102*

This IWM Plan implements the mandates of Article 5.5 by setting forth management objectives, plans, methods, and practices that utilize a variety of techniques for overall integrated management of noxious weeds. In establishing a coordinated program for the integrated management of noxious weeds, the county intends to encourage and apply all appropriate and available management methods. See Appendix A for definitions of terms used in the IWM Plan.

1.2 Jurisdiction and Scope of IWM Plan

This IWM Plan shall apply to all public and private lands within unincorporated Boulder County, with the following exceptions:

- Federal and state lands. It is the duty of each state board, department, or agency that administers or supervises state lands to manage noxious weeds on any lands under its jurisdiction, using the methods prescribed by the local governing body in whose jurisdiction such state lands are located. The state weed coordinator shall survey those counties that include significant amounts of federal land to determine the level of cooperation and compliance by the federal government with this article. The local governing bodies of all counties and municipalities in this state are hereby authorized to enter into cooperative agreements with federal and state agencies for the integrated management of noxious weeds within their respective territorial jurisdictions.
- Municipalities are defined as: Any municipal service, function, facility, or property, whether owned by or leased to an incorporated municipality, unless the county and municipality agree otherwise pursuant to Part 2 of Article 1 of Title 29, C.R.S.
    - The county is authorized to enter into an intergovernmental agreement pursuant to Part 2 of Article 1 of Title 29, C.R.S., or pursuant to Article 20 of Title 29, C.R.S., with incorporated municipalities in the county, other counties, and state and federal boards, departments, entities, and agencies, in order to cooperatively control and manage noxious weeds under the Act.
    - The county also may enter nonbinding memoranda of understanding, or undertake other appropriate cooperative efforts, with these governmental entities or agencies

1.3 Relation to Other Boulder County Plans and Policies

The Boulder County Integrated Weed Management Plan combines and replaces two documents that have been in use over the last couple decades: *Boulder County Noxious Weed Management Plan and Boulder County Parks & Open Space Weed Management—Policies & Procedures.*

The IWM Plan aligns with and supports the Board of County Commissioners (BOCC) strategic goals, goals laid out in the Boulder County Comprehensive Plan (Agricultural Resources Element, Environmental Resources Element, and Open Space Element) and the Boulder County Parks & Open Space (BCPOS) Vision, Mission, and Goals, in particular the following stewardship goals and policies:

Boulder County Comprehensive Plan, Environmental Resources Element:

- **Conserve & Preserve.** Boulder County shall conserve and preserve environmental resources, including its unique or distinctive natural features, biodiversity, and ecosystems, through protection and restoration in recognition of the irreplaceable character of such resources and their importance to the quality of life in Boulder County (ERE Goal 1).
- **Sustain & Protect.** Boulder County sustains and protects native species, natural ecosystems, and the biodiversity of the region by designating High Biodiversity Areas, Natural Areas, Natural Landmarks, Significant Natural Communities, Critical Wildlife Habitats, Species of Special Concern, Wetlands, Riparian Areas, and Rare Plant Areas. Other resources and designations may be identified in the future. These designated areas and species lists also provide a point of reference for continued monitoring of long-term ecological change (ERE Goal 2).
- **Promote Viability & Integrity.** Boulder County shall promote the viability and integrity of all naturally occurring ecosystems and their native species populations by applying a variety of environmental resources management strategies in a manner consistent with current ecological principles and sustainable conservation practices (ERE Goal 3).
- **Enhance Environmental Health.** Boulder County shall continue to protect air, water, and soil resources and quality, as well as restore resources in a degraded condition to enhance overall environmental health. Pollution of air, water, and soil, as well as pollution caused by noise or light, shall be eliminated or minimized to the greatest extent possible to prevent potential harm to life, health, and property and to reduce incremental degradation of the environment (ERE Goal 4).

Boulder County Comprehensive Plan, Open Space Element

- **Steward.** Boulder County purposefully stewards its open space resources through sound management practices and appropriate visitor uses (OS Goal 3).
- **Management Plans and Policies.** Through planning and management, Boulder County strives to preserve significant resources and enhance protection and restoration of native ecosystems and their native species populations while also providing passive, sustainable, and enjoyable public uses that connect the public to their environment (OS Policy 3.01.02).
- **Adaptive Planning.** Boulder County monitors and evaluates uses and resources on open space to inform management decisions and seeks to be innovative in its approaches to on-the-ground management of open space resources, utilizing knowledge of current conditions, latest science, and best technologies and practices (OS Policy 3.03).

Boulder County Comprehensive Plan, Agricultural Element

- **Management Best Practices.** The county shall use, and encourage all land owners to use, Best Management Practices, which may include chemical, fire, mechanical, biological, cultural control for weeds; chemical, physical, and cultural control for vertebrate pests; and chemical, biological, and cultural control for insects (Ag Policy 3.03).
- **State, Federal, and Local Programs.** The county shall actively participate in state, federal, and local programs directed toward Integrated Pest Management programs for noxious weeds, and vertebrate and insect pests (AG Policy 3.02).
- **Certified Weed Free.** The county shall use and encourage the use of certified weed-free products, such as hay, mulch, gravel, bedding material, and general construction material (AG Policy 3.04).

Parks & Open Space Vision:

Leading the way to exceptional open space.

Parks & Open Space Mission:

To conserve natural, cultural, and agricultural resources and provide public uses that reflect sound resource management and community values.

Parks & Open Space Goals

1. To preserve rural lands and buffers.
2. To preserve and restore natural resources for the benefit of the environment and the public.
3. To provide public outreach, partnerships and volunteer opportunities to increase awareness and appreciation of Boulder County's open space.
4. To protect, restore, and interpret cultural resources for the education and enjoyment of current and future generations.
5. To provide quality recreational experiences while protecting open space resources.
6. To promote and provide for sustainable agriculture in Boulder County for the natural, cultural, and economic values it provides.

1.4 Integrated Weed Management Objective and Strategies

County-wide Integrated Weed Management Goal

The goal of integrated weed management is to restore, improve, and maintain healthy, functioning ecosystems and economically viable agricultural lands through responsible, proactive, and adaptive management of noxious weeds in accordance with state law.

Strategies to follow for use of the IWMP

1. **Manage:** Use IWM tools and best practices to improve and maintain ecosystem diversity and health by preventing the introduction of new noxious weed species, eradicating isolated or limited populations, containing, eliminating, and suppressing noxious weed species within the county, while decreasing the use of herbicides over time.
2. **Collaborate and Communicate:** All entities can collaborate and communicate with neighbors, expert staff, partners, peer agencies, private property owners, and the public to improve noxious weed management throughout the county and region.
3. **Protect Health and Safety:** Follow equipment safety guidelines, herbicide application labels, and best management practices to protect the health and safety of staff, the public, and ecological values.

1.5 Impacts of Noxious Weeds

Noxious weeds are alien, exotic, or invasive species that have become or have potential to become successfully established and have significant negative impacts to native ecosystems, agriculture, and water. According to the United States Department of Agriculture (USDA), the detrimental effects of noxious weeds in natural ecosystems may include a reduction in native biodiversity, changes in species composition, loss of habitat for dependent and native species (including wildlife), changes in biogeochemical cycling, and alteration of disturbance regimes.

All of Colorado's 85 state-designated noxious weed species cause harm or have the potential to cause harm to Colorado's agriculture, environment, economy, and public health. Well-documented impacts include:

Agriculture

- The Western Governors' Association (WGA) and the USDA, under a Shared Stewardship Memorandum of Understanding (MOU), agreed in June 2019 to pursue an effort to meaningfully address the large-scale infestation of invasive annual grasses on western forests and rangelands. The spread of invasive annual grasses –

such as cheatgrass, medusahead and ventenata – is causing major damage to western working lands.

- A study conducted by Montezuma County Colorado calculated annual economic losses caused by noxious weeds of more than $5M, not including aesthetic values, land values, infrastructure damage, or existing management costs (https://montezumacounty.org/wp-content/uploads/2023/02/Economic_Assessment_of_Noxious_Weeds_in_Montezuma_County.pdf).

Biodiversity

- According to the United States Forest Service "Invasive species have contributed to the 42% decline of U.S. endangered and threatened species and for 18% of U.S. endangered or threatened species, invasives are the main cause of these declines." (Invasive Plants (usda.gov))
- Colorado National Heritage Program has identified more than 52 rare species of plants, 32 rare animal species (18 vertebrate and 14 invertebrates), and 63 plant communities of concern in Boulder County. Rare native plants, such as the Wood Lily, Ute Ladies'-Tresses, and the Colorado butterfly plant, are under constant threat of extirpation by more aggressive noxious weed species, such as Musk and Canada thistles. In addition, plant communities like the Needle and Thread Complex, Antelope Bitterbrush Complex, and the Alderleaf Mountain-Mahogany Complex are facing decline because of invasive species and fire. (https://bouldercounty.gov/open-space/management/species-conservation-recovery-plans/)
- A recent report by the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services for the United Nations further states, "invasive nonnative species were a major factor in 60 percent of recorded extinctions of plants and animals." (Thematic Assessment Report on Invasive Alien Species and Their Control, Sept. 2023, https://www.ipbes.net/ias.)
- BCPOS has seen suppression of biodiversity across highly diverse, globally rare sites, as documented by Colorado Natural Heritage Program (County Survey Reports - Colorado Natural Heritage Program (colostate.edu)) through monitoring. Native vegetation is greatly impacted by winter annual invasive grasses (e.g., cheatgrass), with diversity declines up to 100% across monitored sites over seven growing seasons (unpublished BCPOS monitoring data). Rare plants and species of concern are also being suppressed, as seen through monitoring results. Three rare species of annual plants were found in treated sites, reappearing three and four years after control of cheatgrass. Other monitoring has revealed greater utilization by native wildlife and return of pollinating species when cheatgrass is controlled. (unpublished BCPOS monitoring data)

Economy

- The economic and social impacts of invasive species include both direct effects of a species on property values, agricultural productivity, public utility operations, native fisheries, tourism, and outdoor recreation, as well as costs associated with invasive species control efforts. A 2021 study estimated that invasive species have cost North America $2 billion per year in the early 1960s to over $26 billion per year since 2010 (Crystal-Ornela, R. et al. 2021). Globally, it is estimated that the economic cost of invasive species has been $1.288 trillion over the past 50 years (Zenni, R.D. et al. 2021).
- In 2019, global annual costs of biological invasions were estimated to exceed US$423 billion. Most global costs (92%) accrue from the negative impacts of invasive alien species on nature's contributions to people or on good quality of life, while only 8% of that sum is related to management expenditures of biological invasions. The benefits to people that some invasive alien species provide do not mitigate or undo their negative impacts, which include harm to human health (such as disease transmission), livelihoods, water security and food security, with reduction in food supply being by far the most frequently reported impact (more than 66%). (*Thematic Assessment Report on Invasive Alien Species and Their Control*, Sept. 2023, https://www.ipbes.net/ias.)

Some impacts of noxious weeds in Boulder County include:

- Loss and degradation of native ecosystems, flora, and fauna which greatly alter landscape diversity and function, as identified through monitoring of open space lands.
- Economic loss and production because of noxious weed pressure in traditional, sustainable, and organic agriculture.
- Impacts to water quality and quantity by invasive trees such as Russian Olive or Tamarisk, and plants such as Eurasian milfoil (affecting Boulder Reservoir in 2023), Hairy willowherb, and Purple loosestrife.

2.0 Boulder County IWM Plan Responsibilities and Delegation

2.1 Roles and Responsibilities

2.1.1 Local Advisory Board and County Staff

The governing body of each county and municipality shall appoint a local advisory board. Pursuant to CRS 35-5.5-107, the BOCC has appointed itself as the Local Advisory Board. The Local Advisory Board has delegated its authorized functions to the County Noxious Weed Coordinator and Community Planning & Permitting Department (CPP) enforcement staff.

1. Staff, as delegated by the Local Advisory Board, shall develop a recommended management plan for the integrated management of noxious weeds and recommend management criteria for noxious weeds within the area governed by the county. The management plan shall be reviewed at regular intervals but not less that once every three years for approval, modification, or rejection by the Local Advisory Board.
2. The Local Advisory Board declares noxious weeds and any state noxious weeds designated by rule to be subject to integrated management.
3. The BOCC shall have the sole and final authority to approve, modify, or reject the management plan, management criteria, management practice, and any other decision or recommendation of the staff delegated by the Local Advisory Board.
4. Staff, as delegated by the Local Advisory Board, may recommend to the Local Advisory Board that identified landowners be required to submit an individual integrated management plan to manage noxious weeds on their property.
5. Staff may also provide technical assistance to private and public landowners and facilitate development of management plans for their land.

2.1.2 Eradication and Management of Noxious Weeds on Private Property

As part of this Integrated Weed Management Plan, Boulder County adopts all requirements and duties set forth in Colorado Revised Statutes Section 35-5.5-101 et seq., including the procedures for entry, inspection, notification, and enforcement of noxious weeds on private property in Colorado Revised Statutes Sections 35-5.5-108.5 and 35-5.5-109. Consistent with Colorado Revised Statute Sections 35-5.5-105 and 35-5.5-109, the Boulder County Board of County Commissioners may also adopt ordinances, resolutions, rules, and other regulations necessary to effectively eradicate and manage noxious weeds on private property.

The Director of Community Planning & Permitting is responsible for performing all functions and duties necessary to comply with the requirements set forth in Colorado Revised Statutes Section 35-5.5-101 et seq., with respect to the regulation and enforcement of noxious weeds on private property.

2.1.3 Municipalities

Municipalities, as defined by CRS 31-1-101(6), are responsible for noxious weed management within their jurisdiction, under the provisions set forth in C.R.S 35-5.5-106. Acknowledging that noxious weeds do not recognize boundaries, the Act encourages cooperation among agencies to assist in control of noxious weeds.

2.2 Designation of Noxious Weeds in Boulder County

The Colorado Department of Agriculture maintains List A, List B, and List C noxious weeds and sets forth management plans for their required control. Additionally, Boulder County has elected to create a Local Noxious Weed List and has set forth management objectives for those species on Boulder County land and rights-of-way. These weeds are targeted for treatment because of their negative impacts on other organisms or the surrounding environment. For the complete list of Colorado Noxious weeds, visit the Colorado Department of Agriculture's website.

https://ag.colorado.gov/conservation/noxious-weeds/species-id

Several noxious weed species have native Colorado look-alike plants. For resources on how to distinguish these species, visit the Colorado Department of Agriculture's website or contact the Boulder County Noxious Weed Coordinator.

2.2.1 Boulder County List A Noxious Weed Species

All populations of List A noxious weeds in Colorado are designated for eradication by the State Department of Agriculture Commissioner. It is a violation of 8 CCR 1206-2" ("Rules") to allow any plant of any population of any List A species to produce seed or develop other reproductive propagules. Boulder County is known to have (or have had) 14 of the 18 List A species that occur in Colorado, which is the highest number of List A species in any Colorado county.

Table 2-1: List A Weeds and State Management Objectives

State Management Objective	Common name	Scientific Name	Treatment Methods for Boulder County from "Rules"
Eradicate	Dyer's woad	*Isatis tinctoria*	Mechanical, Herbicides
Eradicate	Rush skeletonweed	*Chondrilla juncea*	Mechanical, Herbicides
Eradicate	Yellow starthistle	*Centaurea solstitialis*	Mechanical, Herbicides
Eradicate	Cypress spurge	*Euphorbia cyparissias*	Mechanical, Herbicides
Eradicate	Giant reed	*Arundo donax*	Mechanical, Herbicides
Eradicate	Hairy willowherb	*Epilobium hirsutum*	Mechanical, Herbicides
Eradicate	Japanese knotweed	*Fallopia japonica*	Mechanical, Herbicides
Eradicate	Bohemian knotweed	*Fallopia bohemica*	Mechanical, Herbicides
Eradicate	Giant knotweed	*Fallopia sachalinensis*	Mechanical, Herbicides
Eradicate	Mediterranean sage	*Salvia aethiopis*	Mechanical, Herbicides
Eradicate	Myrtle spurge	*Euphorbia myrsinites*	Mechanical, Herbicides
Eradicate	Orange hawkweed	*Hieracium aurantiacum*	Herbicides
Eradicate	Purple loosestrife	*Lythrum salicaria*	Mechanical, Herbicides
Eradicate	Yellow flag iris	*Iris pseudacorus*	Mechanical, Herbicides

2.2.2 Boulder County List B Noxious Weed Species

List B noxious weeds have discrete statewide distributions and are subject to eradication, containment, or suppression in areas designated by the Department of Agriculture Commissioner in consultation with the State Noxious Weed Advisory Committee, local governments, and other interested parties. List B species must be managed in accordance with all the provisions of 8 CCR 1206-2" ("Rules"), including any applicable state noxious weed management plans. In addition, the Department of Agriculture Commissioner gathers data on List B species on a rotation schedule to determine management plan updates as set forth in 8 CCR 1206-2 ("Rules").

Table 2-2: List B Noxious Weeds and State Management Objectives

State CDA Management Objective for Boulder County	Common Name	Scientific Name	Treatment Methods for Boulder County from "Rules"
Eliminate	Absinth wormwood	*Artemisia absinthium*	Mechanical, Herbicides
Eliminate	Blackhenbane	*Hyoscyamus niger*	Mechanical, Herbicides
Eliminate	Bouncingbet	*Saponaria officinalis*	Mechanical, Herbicides
Eliminate	Mayweed/stinking chamomile	*Anthemis cotula*	Mechanical, Cultural, Herbicides
Eliminate	Scentless chamomile	*Tripleurospermum inodorum*	Mechanical, Cultural, Herbicides
Eliminate	Chinese clematis	*Clematis orientalis*	Mechanical, Herbicides
Eliminate	Common tansy	*Tanacetum vulgare*	Mechanical, Cultural, Herbicides
Eliminate	Dames rocket	*Hesperis matronalis*	Mechanical, Cultural, Herbicides
Eliminate	Jointed goatgrass	*Aegilops cylindrica*	Mechanical, Herbicides
Eliminate	Plumeless thistle*	*Carduus acanthoides*	Mechanical, Herbicides
Eliminate	Russian knapweed	*Acroptilon repen*	Mechanical, Herbicides
Eliminate	Salt cedar (Tamarisk)	*Tamarix chinensis*	Mechanical, Herbicides
Eliminate	Salt cedar (Tamarisk)	*Tamarix ramosissima*	Mechanical, Herbicides
Eliminate	Wild caraway	*Carum carvi*	Mechanical, Herbicides
Eliminate	Yellow nutsedge	*Cyperus esculentus*	Mechanical, Herbicides
Eliminate	Yellow toadflax	*Linaria vulgaris*	Mechanical, Herbicides
Eliminate	Yellow x Dalmatian toadflax hybrid	*Linaria vulgaris x L. dalmatica*	Mechanical, Herbicides
Contain	Bull thistle	*Cirsium vulgare*	Elimination Zones: Mechanical, Herbicides
Contain	Common teasel	*Dipsacus fullonum*	Elimination Zones: Mechanical, Herbicides
Contain	Cutleaf teasel	*Dipsacus laciniatus*	Elimination Zones: Mechanical, Herbicides
Contain	Diffuse knapweed	*Centaurea diffusa*	Elimination Zones: Mechanical, Herbicides
Contain	Eurasian watermilfoil	*Myriophyllum spicatum*	Elimination Zones: Mechanical, Cultural, Herbicides
Contain	Hoary cress	*Lepidium draba*	Elimination Zones: Mechanical, Cultural, Herbicides
Contain	Houndstongue	*Cynoglossum officinale*	Elimination Zones: Mechanical, Herbicides
Contain	Leafy spurge	*Euphorbia esula*	Elimination Zones: Mechanical, Herbicides
Contain	Moth mullein	*Verbascum blattaria*	Elimination Zones: Mechanical, Cultural, Herbicides
Contain	Musk thistle	*Carduus nutans*	Elimination Zones: Mechanical, Herbicides
Contain	Oxeye daisy	*Leucanthemum vulgare*	Elimination Zones: Mechanical, Herbicides
Contain	Perennial pepperweed	*Lepidium latifolium*	Elimination Zones: Herbicides

(Table 2-2: List B Noxious Weeds and State Management Objectives cont.)

State CDA Management Objective for Boulder County	Common Name	Scientific Name	Treatment Methods for Boulder County from "Rules"
Contain	Russian olive	*Elaeagnus angustifolia*	Elimination Zones: Mechanical, Herbicides
Contain	Scotch thistle	*Onopordum acanthium*	Elimination Zones: Mechanical, Cultural, Biological, Herbicides
Contain	Scotch thistle	*Onopordum tauricum*	Elimination Zones: Mechanical, Cultural, Biological, Herbicides
Contain	Spotted knapweed	*Centaurea stoebe*	Elimination Zones: Mechanical, Herbicides
Contain	Sulfur cinquefoil	*Potentilla recta*	Elimination Zones: Mechanical, Cultural, Herbicides
Contain	Spotted x diffuse knapweed hybrid	*Centaurea x psammogena*	Elimination Zones: Mechanical, Herbicides
Suppress	Canada thistle	*Cirsium arvense*	Any method
Suppress	Dalmatian Toadflax	*Linaria etiolate,*	Any method
Suppress	Dalmatian Toadflax	*Linaria genistifolia*	Any method

**The Colorado Department of Agriculture identifies eradication, suppression, and containment management objectives by county. In elimination zones, the "rules" prescribe management techniques for the eradication or elimination of species; in suppression zones, management techniques are not prescribed, allowing for the use of any method to meet that objective. The table lists the methods outlined in the "Rules" for each elimination species and the elimination zone of containment species. For List B Containment Maps, please see Colorado Department of Agriculture website (County Weed Programs | Department of Agriculture (colorado.gov).*

2.2.3 Boulder County List C Noxious Weed Species that Require Management

List C noxious weeds are widespread and well-established noxious weed species for which control is recommended but not required by the state, although local governing bodies may require management. The Boulder County Local Advisory Board requires management for 14 of the 18 Colorado List C noxious weed species on Boulder County-owned land. Management objectives for these species on county lands will be informed by continued mapping and data collection by the BCPOS Noxious Weed Work Group.

Management is recommended, but not required, for these List C species on private property within Boulder County.

Table 2-3 List C Noxious Weeds and Management Objectives

Boulder County Management Objective for Boulder County Owned Land	Species Name	Scientific Name	Life Cycle*
Eliminate	Bulbus Bluegrass	*Poa bulbosa*	Perennial
Eliminate	Siberian Elm	*Ulmus pumila*	Perennial
Eliminate	Tree of Heaven	*Ailanthus latissimi*	Perennial
Suppress	Chicory	*Cichorium intybus*	Perennial
Suppress	Common Burdock	*Arctium minus*	Perennial
Suppress	Common Mullein	*Verbascum Thapsus*	Biennial
Suppress	Common St. Johnswort	*Hypericum perforatum*	Perennial
Suppress	Downy Brome "cheatgrass"	*Bromus tectorum*	Annual
Suppress	Field Bindeweed	*Convolvulus arvensis*	Perennial
Suppress	Perennial Sowthistle	*Sonchus arvensis*	Perennial

(Table 2-3 List C Noxious Weeds and Management Objectives cont.)

Boulder County Management Objective for Boulder County Owned Land	Species Name	Scientific Name	Life Cycle*
Suppress	Poison hemlock	*Conium maculatum*	Perennial
Suppress	Puncturevine	*Tribulus terrestris*	Perennial
Suppress	Redstem filaree	*Erodium cicutarium*	Perennial
Suppress	Velvet leaf	*Abutilon theophrasti*	Biennial

**Life cycle can inform which treatment methods will be most effective.*

2.2.4 Boulder County Local Noxious Weeds

The following species are not listed under "Rules" but have been declared local noxious weeds that pose a threat in Boulder County and require management on Boulder County-owned lands and rights-of-way. Although management is not required for these species on private property within Boulder County, it is recommended. Authority to designate additional noxious weeds is granted under C.R.S 35-5.5-108.

Table 2-4: Local Noxious Weeds and Management Objectives for Boulder County

Boulder County Management Objective for Boulder County Owned Land	Species Name*	Scientific Name	Life Cycle**
Eliminate	Common Reed	*Phragmites australis**	Perennial
Eliminate	Garlic Mustard	*Alliaria petiolate**	Perennial
Eliminate	Garden Loosestrife	*Lysimachia vulgaris**	Perennial
Eliminate	Meadow Hawkweed	*Berteroa incana**	Perennial
Eliminate	Tall Oat Grass	*Arrhenatherum elatius**	Annual
Suppress	Perennial Sweet Pea	*Hieracium caespitosum*	Perennial
Suppress	Kochia	*Kochia scoparia*	Annual
Suppress	Curly Dock	*Rumex crispus*	Perennial
Suppress	Crack Willow	*Salix fragilis*	Perennial
Suppress	Russian Thistle	*Salsola tragus*	Annual
Suppress	Blue Mustard	*Chorispora tenella*	Annual
Suppress	Wild Lettuce	*Lactuca serriola*	Biennial

**These species are on the Colorado Department of Agriculture Watchlist for Noxious Weeds.*

***Life cycle can inform which treatment methods will be most effective.*

3.0 IWM Adaptive Decision Process and Tools

3.1 Adaptive Decision Process

C.R.S. 35-5.5-104 sets forth a General Duty to Manage Noxious Weeds: "it is the duty of all persons to use integrated methods to manage noxious weeds through the implementation of appropriate management practices, if such weeds are likely to be materially damaging to the land of neighboring landowners."

IWM can restore ecological health using complementary weed control tools, including mechanical, cultural, chemical, and biological methods. IWM was originally developed in the 1960s for agricultural pests and then urban landscapes. Somewhat different approaches are needed when implementing an IWM approach on natural lands. For purposes of managing noxious weeds on lands in Boulder County, IWM is:

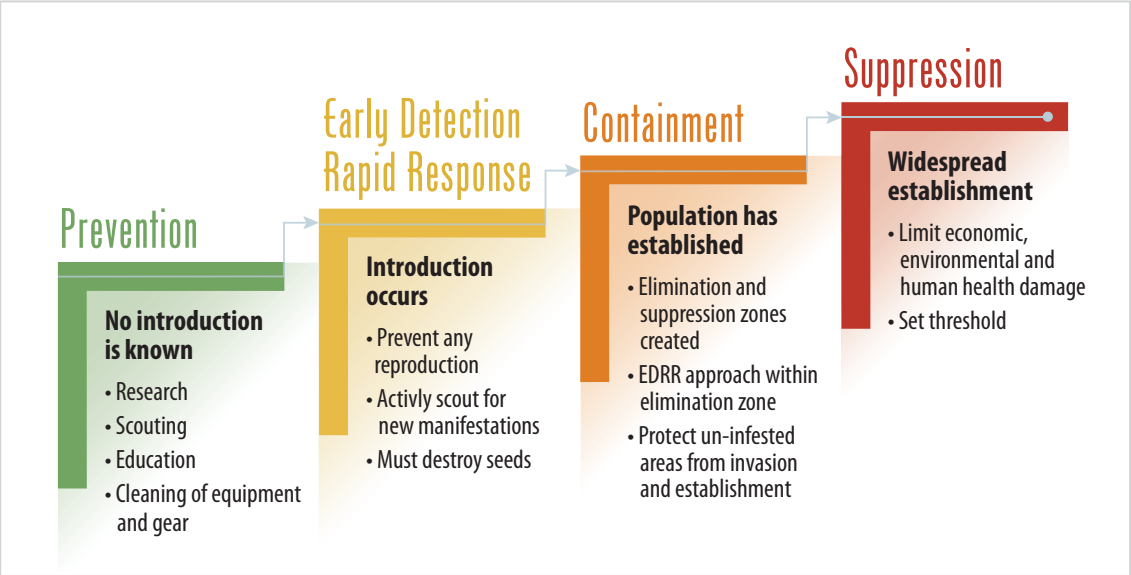
- An adaptive process that considers new science, technology, and understanding of noxious weeds and their environment.
- A decision-making system that adapts to changing conditions. Control methods are determined based on the noxious weed species and site-specific conditions, and methods are not universally applied to all noxious weed problems. It must be recognized that not every tool can be used successfully in every situation and there will be site-specific needs that will require flexibility to achieve the best weed management outcomes.
- A program to ensure minimizing the use of herbicides. IWM programs typically reduce the overall total use of herbicide over time because they employ a wider array of pest management techniques (i.e., physical, biological, and cultural weed control, as well as chemical control) that, in combination, are more effective at eliminating weed issues.

3.2 Noxious Weed Prevention and Detection

Prevention and early detection/rapid response are two of the best strategies for limiting the impacts of noxious weeds, as depicted in Figure 3-1. Once a weed is detected, eradication is the best method of noxious weed control. A recent example in Boulder County is Mediterranean Sage, a List A species detected west of US36 in the 1990s thanks to scouting efforts. Boulder County and City of Boulder have dedicated significant resources to controlling Med Sage, with great success, though this species has not yet been entirely eradicated.

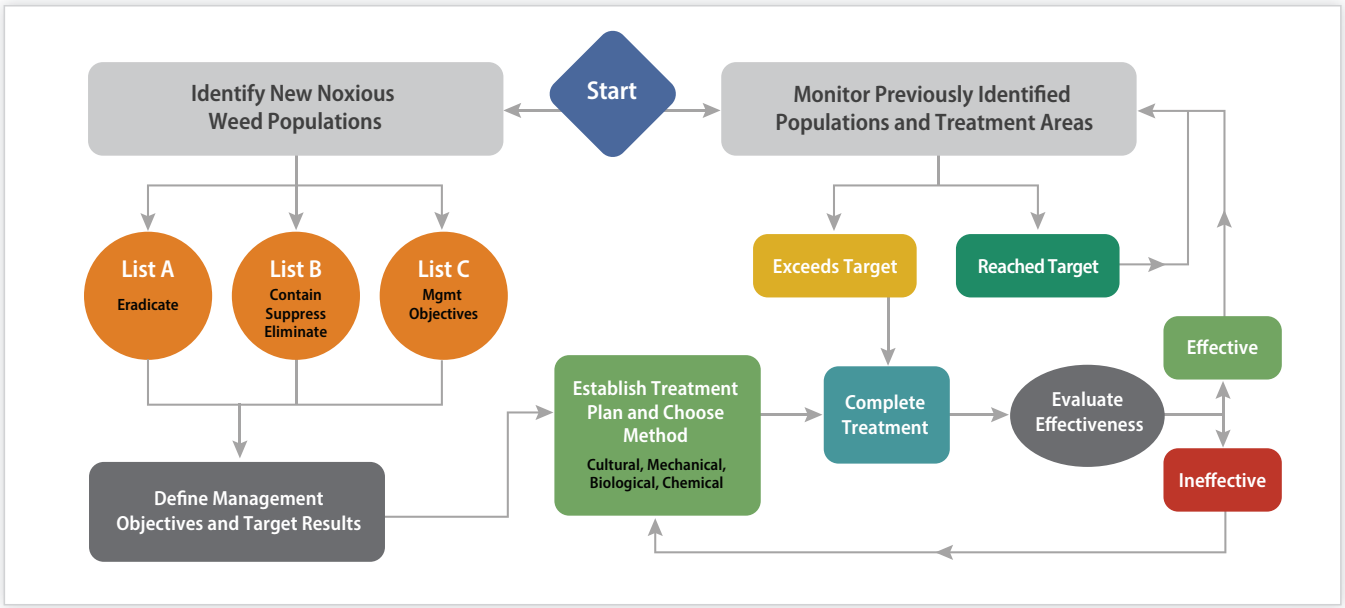
For established weed species, elimination (if possible) and containment are the next steps in the progression, along with protecting un-infested areas from being invaded. Finally, in the case of widespread establishment, elimination may not be possible or economically feasible, though elimination will continue to be pursued in high value natural areas or rangelands. In these cases, suppression is the goal.

Figure 3-1: Decision Model for Early Detection and Rapid Response



Once weeds are identified, selecting methods of control and tolerance levels or thresholds at which those methods are used can be complex, as illustrated in the Adaptive Decision Model (Figure 3-2). Tools include mechanical, cultural, biological, and chemical controls. How these controls are utilized depends upon the statewide management objectives, i.e., State List A requires eradication, List B comes with specific state suppression or elimination zones. Furthermore, programs to control noxious weeds often require a long-term commitment. For many noxious weed species, short-term lapses in active management can negate years of intensive control programs.

Figure 3-2: IWM Adaptive Decision Model



3.3 Integrated Weed Management Tools

Integrated weed management tools are described below. Many of the descriptions include discussion of how Boulder County utilizes these tools in the implementation of the IWMP on county natural lands. This information is intended to inform the public of the county's practices and to illustrate how other land managers can consider using these tools in their land management.

3.3.1 Cultural Tools

Cultural tools provide a targeted approach to weed management, minimizing harm to the surrounding environment. They can be adapted to different environmental conditions and weed species. By understanding the ecological principles behind weed growth and proliferation, land managers can tailor cultural practices to suit specific landscapes and weed populations.

Prevention – Preventing establishment of noxious weeds is the best method for control and reducing expansion of noxious weed populations. Prevention can be accomplished by minimizing disturbances and preventing seed transport. Maintaining healthy ecosystems and ecological function can also prevent noxious weed establishment, as a healthy functioning ecological system has higher resistance to weed establishment and expansion than on degraded and disturbed sites.

For example, to assist in the prevention of the spread of weed seeds along trails, the county has installed boot brush stations with educational plaques. This can help park users understand how the transportation of noxious weed seeds can cause further expansion of noxious weed problems. Additionally, staff plans to add signage to park kiosks to provide park patrons access to prevention methods and provide a means for reporting noxious weeds they may find in the park.

Along rights-of-way, prevention is accomplished by regularly cleaning roadside mowers and other equipment. Timing of mowing is also critical to prevention. These actions greatly aid in curbing further distribution of noxious weeds across the county.

Continuing Education – In order to stay current with research and science-based management practices, Boulder County staff take advantage of professional development opportunities through professional associations such as Western Society of Weed Science, Society for Range Management, Colorado Weed Management Association, Great Plains Grassland Conference, and High-Altitude Revegetation Workshops. These resources are available for other land managers in the region.

Public Outreach – Education is a critical component of county weed management. CSU Cooperative Extension and its agents work with Boulder County Weed Management to educate the public about noxious weed management. CSU Extension agents help by providing small acreage weed management workshops, conducting individual site visits to include agricultural, commercial horticulture, and home horticulture consultations, and offering other educational opportunities, such as the Native Plant Master Programs, which include impact of noxious weeds, weed identification, and management.

Volunteer Events – Several species of noxious weeds can be managed by mechanical methods of removal, but it is very labor and time intensive. Volunteer events provide valuable assistance in strategic areas. These events include List A removal and scouting, trail clearing, seed head bagging in sensitive areas, and noxious weed tree removal. In addition to helping remove the species, volunteers learn about noxious weeds, how to identify them, and how to report infestations. This educational component supports and assists in the prevention of weed spread and the long-term goals of the IWM Plan and BCPOS in general. Learn more about volunteering opportunities here: https://bouldercounty.gov/volunteer/parks-and-open-space/.

Other preventative measures include avoiding the use of imported topsoil on restoration projects, requiring weed-free mulch and seeding materials, and perhaps most significantly, maintaining healthy landscapes resilient to weed invasion.

Table 3-1: Prevention and Cultural Tools

Method	Benefits	Challenges	Resources Required
Prevention: Public education	• Increases awareness of impacts of noxious weeds	• Ensuring our messages are getting out to the public	• Staff Time • Research • Materials • Coordinate with CSU Extension
Prevention: Scouting	• Identifies new infestations that can be managed before larger infestations occur	• Time consuming to survey large areas • Challenges due to rugged terrain	• `Staff time • `Drone technology may be beneficial
Prevention: Cleaning vehicles and equipment between sites	• Prevents seeds from being transferred from one site to another. Decreases the number of new invasions	• County wide and contractor compliance is difficult to encourage	• Equipment • Staff Time • Education
Prevention: Public boot brush stations	• Prevents seeds from being transferred from one site to another. Decreases the number of new invasions	• Use is encouraged but not always followed	• Staff time • Boot brush stations • Maintenance of boot brush stations
Revegetation	• Increases competition with noxious weed following disturbance • Increases native habitat and biodiversity	• Ability to get equipment into areas • Availability of local native seeds • Labor and time intensive to hand seed • Weather has large impact on success • Requires follow-up noxious weed control	• Equipment and equipment maintenance • Research • Staff time • Local seed – can be costly at a large scale
Research	• Informs adaptive management decisions • Guides decisions on treatment methods • Provides data and information to advance science	• Time intensive for staff • Subject to availability of funding	• Staff time • Funding for outside research

Revegetation – Revegetation with native species is used in areas where there are insufficient native plants or native seedbank to naturally restore the area. This condition is commonly found in areas where arable farming has occurred or where grazing or other disturbances, such as floods and prairie dogs, have depleted native plants and seedbanks. Revegetation is also utilized post disturbance with trail or general infrastructure construction projects to reduce the occurrence of noxious weeds that establish post construction. Each open space site is evaluated for desired outcomes, and consultation with Plant Ecology and Agricultural Resources staff is an integral part of revegetation efforts.

Research – The Boulder County staff utilize the BCPOS Small Grant Research program and collaborates with research institutions to conduct research that informs noxious weed management activities and their efficacy. These studies, along with monitoring data collected by the county's Noxious Weed Work Group, provide valuable information on management activities. Such studies can focus on restoration, weed management utilizing organic methods, insect biocontrol and/or herbicide application, mapping and monitoring riparian corridors, and prescribed fires for cheatgrass suppression. Tours of the field sites in Boulder County and on sites in other counties in Northeast Colorado take place each season to highlight and demonstrate results of research. Other land managers are encouraged to learn from and participate in on-going research occurring in Boulder County and the Front Range.

3.3.2 Mechanical Tools

Mowing – Mowing is a tool to that can be effective for controlling and suppressing certain types of noxious weeds. When timed correctly, mowing can prevent help reduced seed proliferation. Boulder County utilizes tractor mowing to assist in controlling noxious weeds on open space and within roadside rights-of-way.

- **Open space** mowing is used for noxious weed suppression on areas when feasible, which aids in preventing weeds from flowering and dispersing seed.
- **Roadside mowing** provides management of vegetation at intersections and along roadways to provide clear lines of sight for motorists and cyclists. Mowing roadside edges also provides improved reaction times for motorists when wildlife is present in/or crossing roadways. Mowing roadsides encourages perennial grasses over broadleaf vegetation (typically noxious weeds) and reduces potential for roadside fire ignition and roadway distribution of noxious weed seeds.

Weed Whipping/Whacking – this form of mechanical control provides the same benefits as mowing and is utilized in areas that are difficult for large tractor-mounted mowers to access, such as road signage, trailheads, structures, wet areas, restoration areas with shrubs, trees, and sensitive, desirable plantings.

Hand Pulling and Digging – Hand pulling and digging are used to eliminate isolated or scattered patches of annual and biennial noxious weeds, including many List A species. On county open space, this method relies heavily on volunteer projects to be successful because it can be so labor intensive (more information under "Volunteer Projects" in 2.2.2 Cultural Methods section below). It can be effective where scattered plants or small concentrated populations are found. However, digging or pulling large areas or dense populations of plants disturbs the soil, allowing other noxious weeds to establish. This method is not effective on deep-rooted or rhizomatous-spreading perennials. This method may also be utilized in sensitive areas. Manual hand-pulling should be repeated prior to seeds setting at least twice a year for seven to ten years or longer.

Seed Head Removal – This method is often used in combination with others to prevent seed development and dispersal for List A species, List B species selected for eradication, and other noxious weeds growing in high priority areas (e.g., restoration and revegetation sites). When elimination of a population from an area is the objective, seed head removal alone is insufficient. It is considered a suppression method when used alone.

Prescribed Fire (Rx Fire) – Prescribed fire can be used as a control method for noxious weeds. It has limited long-term results and applications as the seed source is often not addressed through fire alone. For instance, if cheatgrass infestations are present it can be detrimental to native ecosystems if the fire burns too hot. In addition, prescribed fire has been documented to cause high native shrub and plant mortality, with limited control of cheatgrass infestations. Prescribed fire activities can be expensive relative to other forms of control. However, under certain circumstances, prescribed fire can provide ecological benefits to existing native vegetation that may aid in suppression of noxious weeds.

Table 3-2: Mechanical Tools

Method	Benefits	Challenges	Resources Required
Mowing	• Prevents seed set in some species • Treats large areas relatively quickly	• Late use can result in spread • Only suppresses most perennial species • This method may increase density in some species • May negatively affect desirable species	• Special Equipment • Equipment Maintenance • Staff Time • Training
Weed whipping	• Prevents seed set in some species • Treats large areas relatively quickly	• Late use can result in spread • Only suppresses most perennial species • This method may increase density in some species • May negatively affect desirable species	• Special Equipment • Equipment Maintenance • Staff Time • Training
Hand Pulling	• Effective with small or isolated patches • Ideal for sensitive sites, i.e., new restoration sites and wetlands	• Labor-intensive success relies heavily on volunteer support • Densely infested areas could be invaded by new noxious weeds because of disturbance • This method may increase density in some species	• Time intensive – additional staff or volunteers needed for large scale • Bags for disposal • Labor intensive • Need for repeated efforts over multiple years
Digging	• Can be very effective with small or isolated patches	• Labor-intensive success relies heavily on staff hours and volunteer support • ·Densely infested areas could be invaded by new noxious weeds because of disturbance • This method may increase density in some species	• Time intensive – additional staff or volunteers needed for large scale • Bags for disposal • Labor intensive • Need for repeated efforts over multiple years
Seed head collection	• Prevents seed set	• Bagging is required, very time and labor intensive • Cannot eradicate perennial species and, therefore, is often combined with other methods	• Time intensive – additional staff or volunteers are needed for large scale • Labor intensive • Bags for disposal • Need for repeated efforts over multiple years
Prescribed (Rx) Fire	• Can suppress several species of noxious weeds • Beneficial for local ecosystems • Helps reduce fire risk in the wildland-urban interface	• Disturbance caused may facilitate additional invasions • Often needs to be used in combination with other tools to be effective long term • Safety • Burn windows are limited • Burn restrictions include weather, air quality, wildlife, and rare plant concerns.	• Rx fire staff time • Must close the area to the public • Special equipment • Training • Smoke permits

3.3.3 Biological Tools

Biological Control – Biological weed control is an important component of the IWM program. The use of insects that can attack different areas of the plant in different stages of life can assist in suppressing noxious weed infestations. However, biological control agents are not utilized on species designated by the Commissioner for eradication. The reason is that the management objective requires the prevention of any seed development, and most field releases take three to five years for establishment of an insect population to become numerous enough to affect a noxious weed infestation. Eradication of a noxious weed species cannot be attained through insect biocontrol alone. The most effective scenario is when the noxious weed infestation is suppressed to a "tolerable level," where insect agents are significantly limiting distribution and abundance of the target noxious weed species, and the noxious weed density is no longer considered detrimental to the desired plant community.

Grazing & Browsing – Grazing and browsing can be effective for noxious weed suppression on a small scale but has limited success with eradication and containment. Livestock movement from site to site can be a vector for moving noxious weed seeds to new locations. Goat browsing is typically more expensive than other control measures because of the intensive herd management required to achieve desired objectives. Cattle and horse grazing may be conducted through agricultural leases on some county natural lands. Here, tenant goals and IWM Plan are complementary.

To protect native Bighorn sheep populations from disease transmission from domestic sheep and goats, Colorado Parks and Wildlife recommends against grazing domestic sheep and goats in areas utilized by bighorn sheep herds and adjacent suitable habitat.[1] Bighorn rams can roam miles and may contact domestic sheep and goats on forays. The sheep protection area in western Boulder County is shown on Map 3-1 below.

[1] Disease transmission from domestic sheep and goats to native, wild populations of bighorn sheep has been documented in more than 70 peer reviewed scientific publications (TWS and AAWV, 2015). 1Bighorn sheep are highly susceptible to the bacterial strains that cause pneumonia, which are easily carried by domestic sheep and goats (Besser et al, 2012). The bighorn sheep are impacted by direct mortality, but also by the disease then becoming enzootic and causing infections to be conveyed from ewes to their lambs, who succumb to the disease. (George et al, 2009.) Therefore, the impact on herds is severe via both the immediate mortalities, as well as depressed lamb recruitment for several years after the initial transmission. Currently, there is no vaccine or treatment for wild Bighorn sheep.

Maintaining effective spatial separation between wild bighorn sheep and domestic sheep and goats is the only effective tool currently available for mitigating the risk of disease transmission between species.

References:

Besser TE, Highland MA, Baker K, et al. Causes of Pneumonia Epizootics among Bighorn Sheep, Western United States, 2008–2010. Emerging Infectious Diseases. 2012;18(3):406-414. doi:10.3201/eid1803.111554.

George, J.L., R. Kahn, M.W. Miller, and B. Watkins. 2009. Colorado Bighorn Sheep Management Plan 2009-2019. Special Report Number 81, Colorado Division of Wildlife, Terrestrial Resources. Denver, Colorado. 83 p. + appendices.

The Wildlife Society and American Association of Wildlife Veterinarians Joint Issue Statement- Domestic Sheep and Goats Disease Transmission Risk to Wild Sheep, 2015. https://wildlife.org/wp-content/uploads/2015/03/WS-DS_DiseaseTransmission_TWS-AAWV_JointStatement_APPROVED.pdf

Map 3-1: Bighorn Sheep Protection Area

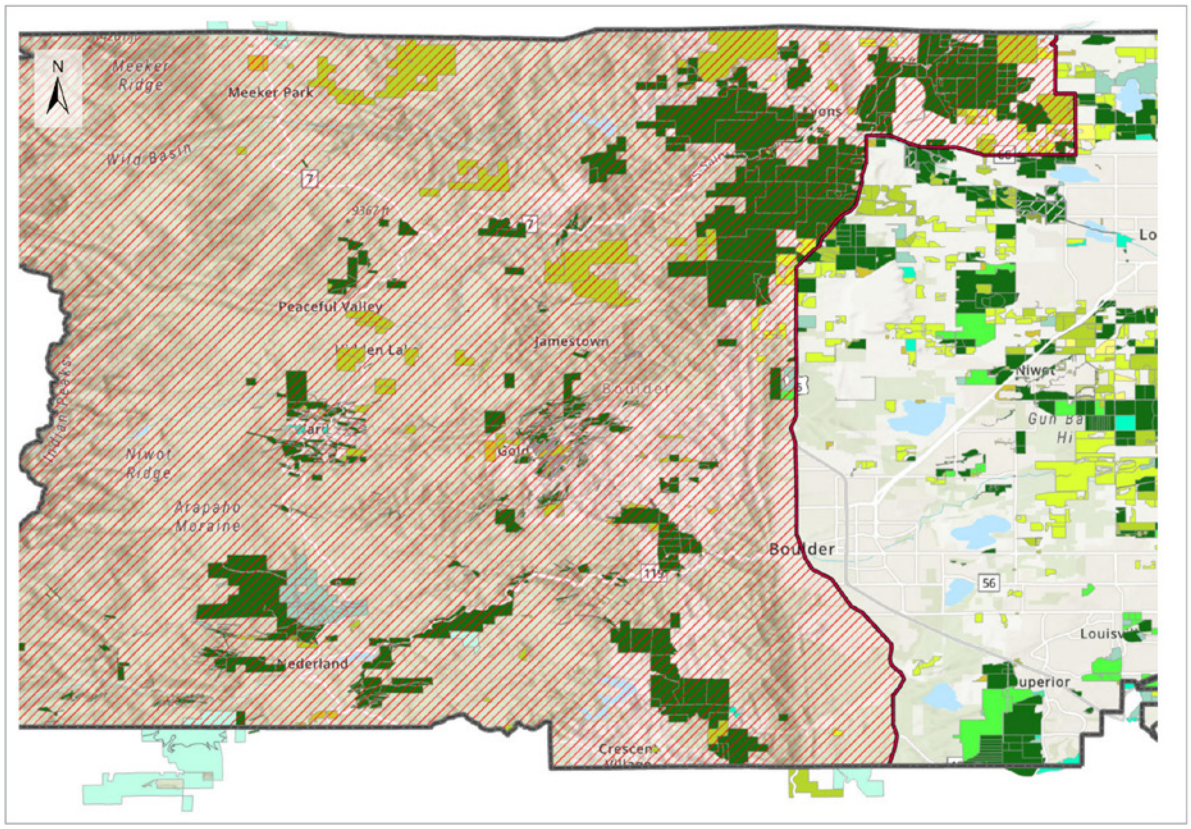


Table 3-3: Biological Tools

Method	Benefits	Challenges	Resources Required
Insects	• Suppresses several species of noxious weeds	• Not available for all species Cannot be used in eradication efforts • Not always available for purchase – limited stock • Do not work in all terrains, soil types, etc.	• Biological materials • Staff time • Insects are species specific
Rust	• Suppresses several species of noxious weeds	• Not available for all species • Cannot be used in eradication efforts • Not always available for purchase – limited stock & current reclassification	• Biological materials • Staff time
Grazing & Browsing	• Prevents seed set • Can cause root reserves to be depleted if used in an ongoing-repetitive manner • Can access remote and difficult terrain	• Late use can result in spread • Not a selective method • Intense grazing can lead to disturbance and may facilitate additional invasions • Some noxious weed species are toxic to livestock. • Not all topography is grazable • Presence of predators in open space • CPW recommends against grazing goats and domestic sheep in western Boulder County; see Map 3-1	• Expensive for large- scale contract • In house would require new staff, training and acquiring a herd • Watering infrastructure • Fencing

3.3.4 Chemical Tools

Herbicide applications are used to control noxious weeds when they are the most practical tool. Criteria for herbicide use include size and location of infestation, other species characteristics (e.g., plant phenology or growth cycles), terrain characteristics (such as slope steepness, rockiness of terrain, proximity to water, likelihood of runoff), efficacy, worker safety, environmental impacts, timing and cost of application, resistance concerns, and alternatives available. In comparison to other methods, herbicide treatments can be relatively cost-effective for large-scale infestations. Depending on the management objective, herbicides can be the most effective method for achieving the desired control of certain noxious weed species (i.e., List A perennial species that need to be eradicated). In other situations, their use is not needed or desired (i.e., newly seeded restoration areas).

Boulder County is adopting herbicide selection criteria in this IWMP applicable to IWM practices on Boulder County natural lands. See Section 4 for details. Other land managers are encouraged to consult this guidance. Adherence to product labels is essential; the label is the law.

The Noxious Weed Work Group utilizes the herbicide application methods outlined below. Other land managers can consult these descriptions to inform their application practices.

Spot Spraying is used to eliminate or contain small or isolated patches of noxious weed species. This method is used along trails and road rights-of-way and in natural areas to minimize off-target impacts to other sensitive or desirable plants or to prevent seed distribution of noxious weeds using larger equipment. This method may include the use of backpack sprayers, handheld spraying nozzles from trucks or Utility Terrain Vehicles (UTV's), and drones.

Stump Treatments are used to apply herbicide directly to the cut portion of woody noxious weeds, such as Russian Olives and Tamarisk. This method reduces the amount of herbicide needed to control large woody species and is highly effective with minimal off-target impacts. This method includes the use of hand pump sprayers and sponge applicators.

Broadcast Spraying is used to treat large infestations for elimination and containment of noxious weeds. It is also used to prepare large priority areas identified by BCPOS staff for restoration. This method can also be used for emergency treatments in accordance with the Early Detection Rapid Response program outlined by the Colorado Department of Agriculture. Broadcast spraying is often the most effective and cost-effective method to control large noxious weed infestations because of size, type of infestation and nature of topography. Vegetation management for infrastructure and rights-of-way also requires the use of broadcast spraying for both maintenance and safety of structures. Broadcast spraying may be accomplished through different types of applications:

- **Backpack Sprayers –** utilized for smaller dense infestations of noxious weeds along rights-of-way and for infrastructure maintenance.
- **UTV Boom application –** utilized for smaller dense infestations of noxious weeds and rights-of-way and infrastructure maintenance.
- **Roadside Truck Boom –** utilized for controlling noxious weeds in roadside rights-of-way for prevention of further distribution and movement onto private lands.
- **Tractor Rig Application –**utilized when there is reasonable terrain that allows for the safety of the operator and safe operation of equipment.
- **Drone Applications –** This type of application can be used when the topography of treatment areas becomes too severe for the safe operation of tractor rig application and creates concern for worker safety, or the treatment area is so large that other methods become impractical. Drones can provide smaller remote applications in areas that cannot be accessed by other means. See Appendix E, IWMP Drone Application Policy, for more details.

Table 3-4: Chemical Tools

Method	Benefits	Challenges	Resources Required
Herbicide Application via spot treatments	• Selective application • Effective method for several difficult to control species	• Impractical for large areas • Potential off target impacts of desirable plants • Weather conditions limit application windows • Resistance management	• Herbicide • Staff time • Research • Special equipment • Training • Licenses • Personal Protective Equipment
Herbicide Application via broadcast ground treatments	• Effective method for several difficult to control species • Covers large areas that require treatment • Aids in restoration of historically disturbed sites	• Ability to get equipment into areas • Potential off target impacts of desirable plants • Weather conditions limit application windows • Resistance management	• Herbicide • Staff time • Research • Special equipment • Training • Licenses • Personal Protective Equipment
Herbicide Application via broadcast aerial treatments	• Covers large areas that require treatment • Ability to access difficult or dangerous terrain • Less risk for staff members • Minimal drift	• Drift may occur if label or weather factors are not followed • May cause noise for neighboring residents • Weather conditions limit application windows	• Expensive outside contract • Herbicide

4.0 IWM Adaptive Decision Process and Tools on BCPOS Natural Lands

4.1 BCPOS IWM Strategy

This section describes Integrated Weed Management strategy and practices on natural lands managed primarily by the Resource Management Division of BCPOS. BCPOS natural lands encompass approximately 34,000 acres of natural areas and native rangelands. These natural lands do not include leased dryland and irrigated crop production lands, irrigated pasturelands, and irrigated forage or leased rangelands, which are governed by the Cropland Policy and their leases. Management of these leased lands is administered and enforced by the Agricultural Resources Division.

BCPOS natural lands are managed with the purpose of preserving biodiversity in Boulder County. This Integrated Weed Management plan also informs vegetation management practices in support of public safety along road rights-of-way and trails and in support of maintaining the integrity of certain county infrastructure.

The Noxious Weed Work Group within the Resource Management Division of BCPOS provides valuable noxious weed and vegetation management services to support the land stewardship work of many other work groups in the department and throughout the county. Resource Management Work Groups supported by the Noxious Weeds Work Group include Plant Ecology, Forestry, and Wildlife Biology. Other BCPOS divisions that the Noxious Weed Work Group supports are Recreation & Facilities, Resource Planning, and Agriculture & Water Resources. They also coordinate frequently with the Road Maintenance Division of the Public Works Department for vegetation management along roadsides in Boulder County for public safety.

Boulder County relies on best practices and scientific evidence to inform weed management. Integrated weed management tools and practices are carefully selected based on the required state management guidelines for specific List A, B, or C species (as discussed in Section 3), the size of infestation (i.e., single plant to large monoculture infestations), location (i.e., critical habitat, riparian areas, sensitive areas, etc.), and best management tools and practices for individual species, as informed by state guidance and in consultation with other experts and land managers.

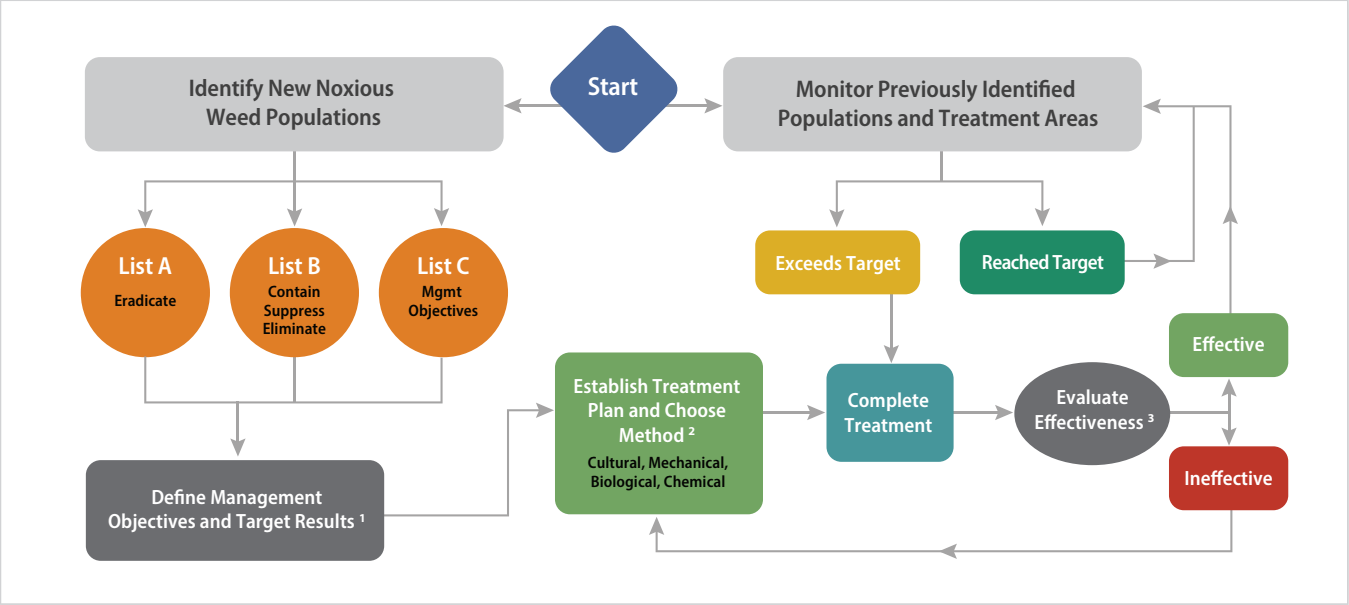
BCPOS' implementation strategy utilizes four primary management objectives to guide the work of the Noxious Weeds Work Group. The BCPOS Management Objectives are: **Eradicate, Preserve Biodiversity, Suppress,** and vegetation management to **Protect Roads, Trails, and Other Infrastructure**. The BCPOS Management Objectives are informed by the Colorado Department of Agriculture's Noxious Weed Lists (A, B C, and Watchlist species), and field observations. The County Management Objectives have also been developed to help achieve BCPOS' broader stewardship goals for natural lands under their purview.

The BCPOS Management Objectives are an important aspect of BCPOS' overall strategy for reducing the impact of noxious weeds on BCPOS natural lands in an impactful and prioritized manner. Section 4 of the IWM Plan details the methods the Noxious Weeds Work Group uses to prioritize noxious weed management activity from year to year and to select the tools and methods that will be used to conduct integrated weed management activities.

4.2 BCPOS IWMP Implementation Decision Model Summary

The IWM Plan is implemented on BCPOS natural lands consistent with the IWM Decision Model introduced in Section 3 (Figure 3-2) and updated to apply to BCPOS in Figure 4-1 below. This model outlines the steps the Noxious Weed Work Group follows to plan for and implement the BCPOS IWM Plan. In general, the decision model describes a cycle wherein a noxious weed population is identified, management objectives are defined, including desired results (or outcomes), treatment plan and methods are identified, treatment is completed, and effectiveness is evaluated and monitored, with subsequent treatments occurring until target results are achieved, adjusting the methods along the way as needed. The narrative and flow charts following Figure 4-1 provide more specific details about the BCPOS Management Objectives, the treatment planning process, and treatment method selection.

Figure 4-1: BCPOS Integrated Weed Management Adaptive Decision Model



¹ See "BCPOS Management Objectives and Treatment Prioritization Process" for details (Figure 4-2).
² See "BCPOS Treatment and Method Selection Process" for details (Figure 4-3).
³ If off-target impacts occur, revise Treatment Plan and Method.

4.2.1 Identify and Inventory Noxious Weed Populations and Areas of Concern

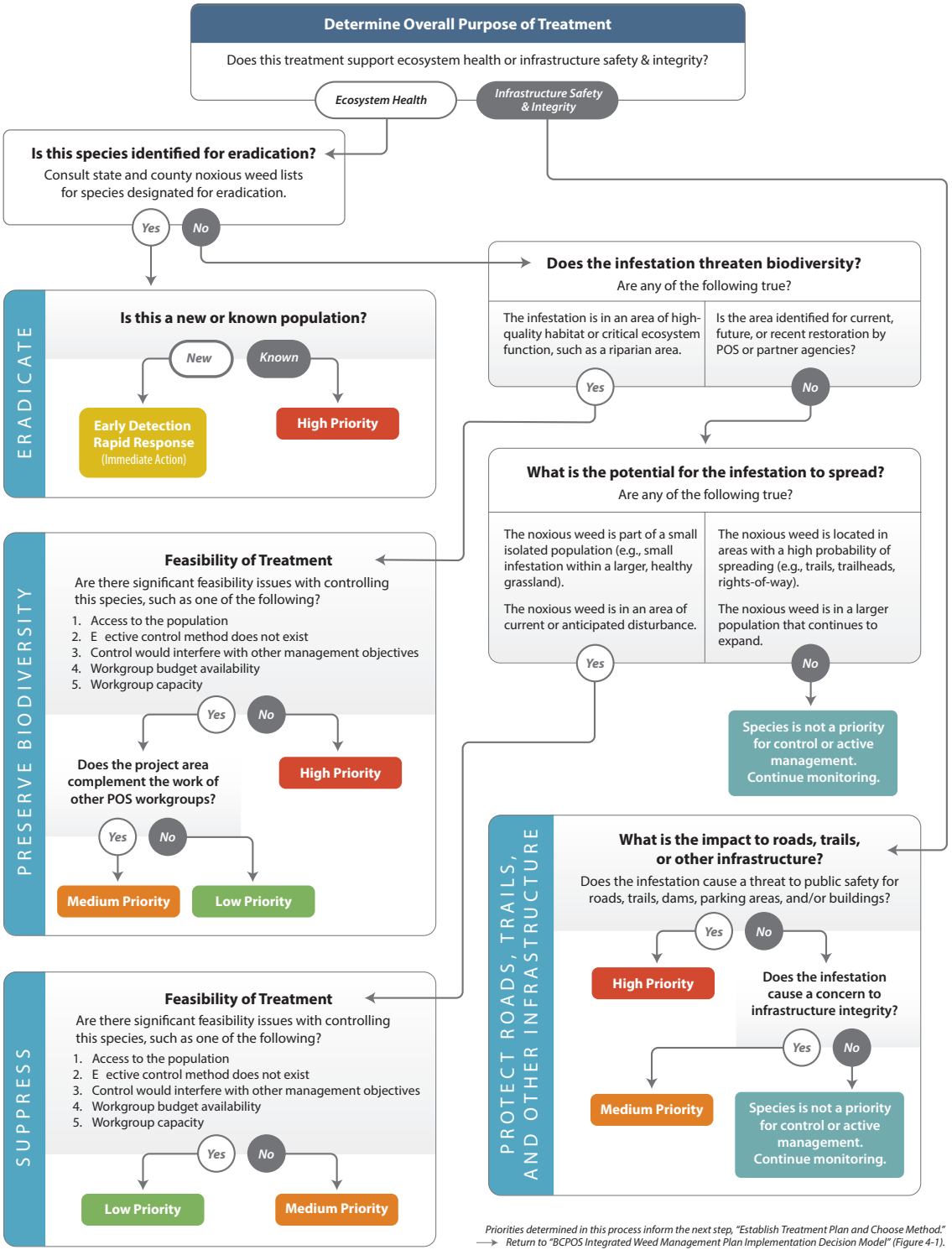
The first step in the decision model is to identify noxious weed populations and areas of concern on BCPOS natural lands. This inventory of locations is compiled from the sources of information outlined below. These sources are consulted to identify and inventory noxious weed populations and areas of concern. Part of the inventory process includes identifying which State or Local Weed List the inventoried species appear on, if any. Based on this information, work plans are designed to scout and map the current location and extent of the infestation to inform the subsequent steps in the decision model and determine all applicable and viable Integrated Weed Management methods and treatments.

- State weed lists and maps
- State and local historical data
- Satellite imagery
- Scouting in the field
- Input from other BCPOS work groups
- Reports from other county departments and partner agencies
- Reports from the public

4.2.2 BCPOS Management Objectives and Treatment Prioritization

The BCPOS Management Objectives provide a framework for guiding the treatment priorities for the noxious weed populations and areas of concern identified in the previous step. This prioritization tool is used to create a prioritized work plan. Figure 4-2, "BCPOS Management Objectives and Treatment Prioritization Process," illustrates how the BCPOS Management Objectives influence treatment priorities for work planning purposes. Descriptions of the BCPOS Management Objectives for BCPOS natural lands that are implemented through the IWM Plan follow Figure 4-2. The BCPOS Management Objectives are **Eradicate, Preserve Biodiversity, Suppress,** and **Protect Roads, Trails, and Other Infrastructure.**

Figure 4-2: BCPOS Management Objectives and Treatment Prioritization Process



4.2.2.1 Eradicate

The objective of **Eradicate** is to reduce the reproductive success of a noxious weed species or specified noxious weed populations in largely uninfested regions to zero and to permanently eliminate the species or population within a specified period. Once all specified weed populations are eliminated or prevented from reproducing, intensive management efforts continue until the existing seed bank is exhausted. The state identifies species on List A and B for eradication. Boulder County identifies species on List C and the Local list for Eradication based on distribution within the county and the high potential for successful eradication.

The treatment approach for Eradication species varies. For annual or biennial species, mechanical treatment methods are effective prior to seed setting. For perennial species, a combination of mechanical methods and herbicide methods are often needed to ensure that seed production is prevented, and the plant is removed from the environment. In addition, herbicide that affects the root structure of perennial species is often essential to achieving the **Eradicate** objective. Seasonal timing is critical to prevent any seed from setting and subsequently proliferating, while also eliminating the root structure of perennial species that would otherwise allow individuals to persist into subsequent growing seasons. With discreet populations of **Eradicate** species dispersed throughout the county, it is challenging to get this timing right in as many places as possible during a relatively short window where treatment methods are most successful.

Eradicate is a high priority for IWM treatment.

4.2.2.2 Preserve Biodiversity

The objective **Preserve Biodiversity** supports ecosystem function with a priority on lands of significant environmental value by removing noxious weed species and reestablishing desired native plant populations and overall ecosystem function. In Boulder County, lands of significant value for preserving biodiversity are designated in the Boulder County Comprehensive Plan under the Environmental Resource Element (ERE). Designations include High Biodiversity Areas, Critical Wildlife Habitats, Wetlands and Riparian Areas, Preble's Meadow Jumping Mouse Conservation Areas, Significant Natural Communities, and Rare Plant Areas. Boulder County preserves many of these lands through acquisition and management. BCPOS natural lands with resources designated by the ERE as affected by noxious weed infestations with a high likelihood of achieving the desired condition or ecosystem function through IWM and other land management actions are given a high priority for IWM treatment. The story map that accompanies this plan highlights many examples of this work.

IWM work to support the **Preserve Biodiversity** objective is interdisciplinary in nature, often requires multiple treatment methods and tools, and typically takes multiple seasons of management actions to attain desired conditions. At the onset of a site treatment, herbicides are often a critical tool to significantly decrease noxious weed infestations and encourage native plant communities to restore themselves. In restoration projects, herbicide use decreases significantly over time as preferred vegetation is established and the overall site becomes more resilient to noxious weed invasion in the absence of new disturbance. In some cases, one herbicide application removes enough noxious weed pressure to allow remanent native vegetation to re-establish without active restoration of plant communities through seeding and plantings.

BCPOS manages many acres of natural lands affected by past disturbances, resulting in conditions conducive to noxious weed infestations. Some disturbances are caused by humans, such as intensive agriculture, mining, and fire suppression, while other disturbances, such as fires and floods, are aspects of natural processes. A significant management challenge for BCPOS is prioritizing finite resources such as staff capacity, budget, equipment, and seasonality to support successful implementation of **Preserve Biodiversity** efforts in tandem with other needed IWM work. Additionally, in many cases, large areas of BCPOS natural lands with the highest biodiversity characteristics are in mountain and foothills environments; these lands present challenges for conducting IWM treatments when considering access and worker safety. Emerging tools with drone technology and new herbicides present opportunities for overcoming these challenges in support of biodiversity preservation objectives.

Although treatment of natural lands targeted by the **Preserve Biodiversity** objective has a high priority for IWM treatment, there is limited overall capacity to conduct the on-going restoration and related IWM activity essential

to achieving BCPOS longer-term restoration goals for an area of concern. So, the department takes on only a limited number of restoration projects at a time. See Appendix B, IWMP Implementation on Boulder County Natural Lands, 2024-2027, for a list of current priorities.

4.2.2.3 Suppress

The **Suppress** objective is to reduce the vigor of noxious weed populations within an infested region to decrease the propensity of noxious weed species from spreading to surrounding lands and to mitigate the negative effects of noxious weed populations on infested lands. Suppression efforts may employ a wide variety of IWM techniques. BCPOS emphasizes mechanical methods, including field mowing, weed whipping, grazing/browsing, and biological methods for suppression.

Herbicide may also be used in select situations, primarily to prevent new populations from emerging or spreading to new areas, address dense infestations, or suppress difficult perennial invasive species. The priority of suppression actions is medium to low depending on severity of the potential for new impacts. The long-term goal of suppression is to keep the invasive plants in check so native plants can rebound to outcompete the invasives. Suppression areas are continually monitored. If no improvement occurs, adaptive management may dictate the use of other tools.

Due to consistently documented occurrences of disease transmission to bighorn sheep from domestic sheep and goats (which causes lethal pneumonia via transmission of Pasteurella bacterial strains), BCPOS will not graze domestic sheep and goats in areas known to be utilized by bighorn sheep herds and adjacent suitable habitat where bighorn are likely to foray (bighorn rams often roam miles outside of normal ranges and may contact domestic sheep and goats on forays). These areas include Ron Stewart Preserve at Rabbit Mountain, Southdown Indian Mountain, Hall Ranch, Heil Ranch, Riverside, Adams Cowger, Billings, and other smaller parcels owned by BCPOS west of US36 and north of Hwy 66, west of 75th Street, and 83rd Street to Larimer County Road 2.

4.2.2.4 Protect Roads, Trails, and Other Infrastructure

The objective for **Protect Roads, Trails, and Other Infrastructure** is to manage all vegetation in the vicinity of roads, trails, parking area, dams, and buildings for public safety and to maintain the integrity of this infrastructure. IWM actions are given a high priority if there is a public safety concern. If there is a concern for infrastructure integrity, IWM actions are given a medium priority.

The purpose of managing vegetation at intersections and along roadways is to provide clear lines of sight for motorists and cyclists. Treating roadside edges also provides improved reaction times for motorists when wildlife or other obstacles are present in the vicinity of roadways. Roadside treatment methods encourage perennial grasses over broadleaf vegetation (typically noxious weeds), reduce the potential for roadside fire ignition, and diminish the distribution of noxious weed seeds along road corridors that could subsequently spread to adjacent lands.

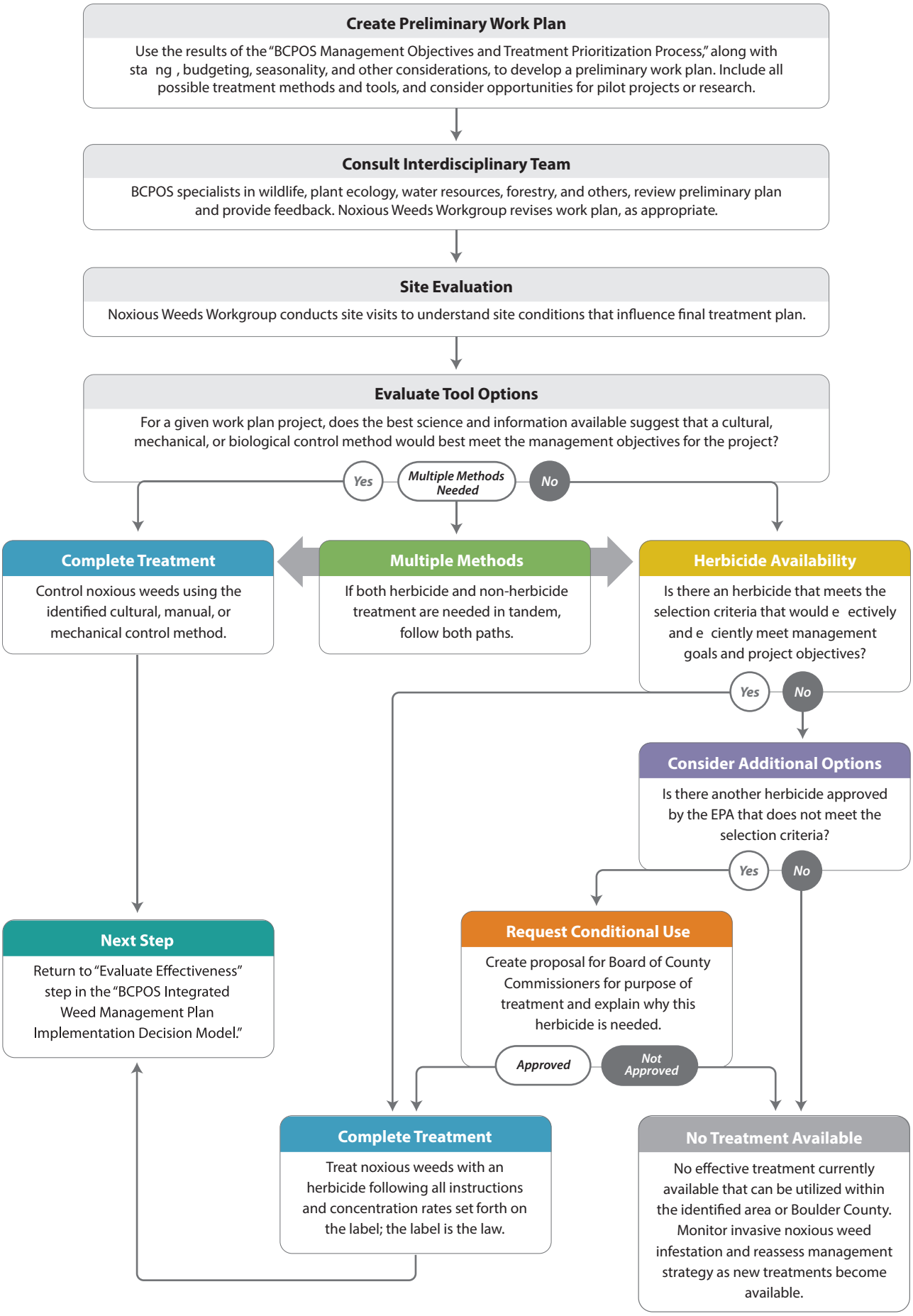
When total vegetation removal is necessary, herbicide is currently the best option, as it targets the entire root structure. However, when the height of the vegetation is the primary concern, mechanical methods are utilized. New mechanical methods, such as steam weeding, will be piloted for trailhead parking areas that require total vegetation control.

4.2.3 Treatment Planning and Method Selections

Although the prioritization of potential treatments is guided by the BCPOS Management Objectives outlined above, additional considerations go into developing overall work plans each year. As illustrated in Figure 4-3, Treatment Plan and Method Selection Process, considerations include factors such as seasonality, budget, staffing, and input from BCPOS staff specialists, including Plant Ecology, Forestry, Wildlife Biology, and Water Resources. In addition, site evaluations, timing, and best management practices inform the selection of treatment tools and methods.

BCPOS utilizes all the tools and methods described in Section 3. Figure 4-3 describes the process for planning and selecting appropriate treatment tools.

Figure 4-3: Treatment Plan and Method Selection Process



4.3 Herbicide Selection and Use

Although most BCPOS Integrated Weed Management actions emphasize mechanical, cultural, and biological treatment tools, BCPOS uses herbicides selectively to achieve the BCPOS Management Objectives. In addition, BCPOS has a goal to decrease the acres of land on which herbicides are applied over time. At the present time, the goal is to decrease the average number of acres upon which herbicide is applied from an average of 1,120 acres in 2021-2023 to 560 acres per year by 2030.

4.3.1 Herbicide Selection Using WHO Guidelines

When herbicides are deemed necessary for use, BCPOS selects herbicides whose actives ingredients have the lowest human health and environmental impacts that will achieve the management objective. To determine which herbicides are approved for use, BCPOS considers only herbicides approved by the United States Environmental Protection Agency (EPA) and registered by the Colorado Department of Agriculture (CDA) for general use. BCPOS then cross-references this list with the most recent World Health Organization's (WHO) Recommended Classification of Pesticides by Hazard and Guidelines to Classification (Chemical Safety and Health (who.int)). Refer to Appendix D for a detailed description of the selection process using the WHO guidelines.

4.3.2. Approval Process for Special Use Herbicide Under "Early Detection Rapid Response"

If the need arises to deviate from the herbicide selection process outlined above, BCPOS will present a proposal to the Board of County Commissioners, acting as the Local Advisory Board, for approval. The proposal will include an explanation of why the chemical is needed, the hazard associated with the chemical (e.g. the material safety data sheet and product label), the location, extent, and timing of treatment, and an explanation of why none of the approved herbicides and other methods have been effective. Two possible scenarios where this need could arise would be the discovery of a previously unreported noxious weed species in Boulder County where immediate eradication through **Early Detection Rapid Response** (see Fig. 3-1) is the desired course of action or if resistance is detected within a population of noxious weeds that cannot be addressed with any herbicide approved under the herbicide selection process, or other control methods.

4.4 Herbicide Spray Buffers

When spraying herbicide adjacent to property boundaries, BCPOS follows buffer distances depending on application method, location, and herbicide label. Buffers are summarized in the table below based on the application method.

Table 4-1: Herbicide Spray Buffers

Application Method	Distance from Private Property*
Backpack Sprayer	0 feet
UTV	2 feet
Roadside Truck	2 feet
Tractor	5 feet
Drone	25 feet or 660 feet from homes

**For noxious weeds that fall into the buffer zone, mechanical methods or spot application will be utilized.*

4.5 Record Keeping Requirements for Use of Herbicides

Boulder County keeps pesticide application records in accordance with C.R.S. 35-10-111. This includes the collection and three-year retention of:

1. Name and address of person for whom application was made.
2. Location where application was made; location of a field should be fully described.
3. Target pest. This means the specific pest for which the application was made.
4. Site.
5. Specific pesticide applied. This shall be accomplished by recording the Environmental Protection Agency (EPA) registration number of the pesticide product.
6. Dilution rate. This is the amount of formulated product or active material per unit of volume of carrier specified as such. In the case of a product applied out of the container without mixing, the entry should be "no dilution."
7. Application rate. This is the total gallons or pounds of the final tank mix applied per unit of area or volume.
8. Carrier, if other than water.
9. Date and time of application.
10. Name and license number of the person who made or supervised the application.
11. Endangered Species Protection Bulletin for the county and month in which the application was made for any pesticide product used, when required by the label. If there is not an active Endangered Species Bulletin use limitation for the county and month in which the application was made, no Endangered Species Protection Bulletin is required to be maintained in the applicator's records.

4.6 Communication and Notification Processes for Herbicide Use

4.6.1 Application Notification on Public Lands and Rights-of-way

When applying herbicides to open public lands or rights-of-way, BCPOS will notify the public via the BCPOS Noxious Weed webpage; Invasive Plants & Weed Management on Open Space - Boulder County.

- Notification of herbicide applications conducted by BCPOS on natural lands or in public rights-of-way will be posted by 8 a.m. the Friday prior to the week of application.
- Additionally, when herbicides are applied on any turf, ornamental, aquatic categories, or along trails, notice of application signs will be posted consistent with C.R.S. 35-10-112.
- Application history is available on the webpage until the end of the calendar year.

4.6.2 Registry of Pesticide-Sensitivity Persons Notification

BCPOS notifies all pesticide-sensitive persons per C.R.S 35-10-112 requirements: applicators shall take reasonable actions to give notice of the date, approximate time, and address or location of the property to be treated for every turf or ornamental pesticide application at least 24 hours prior to the application to any persons whose names are on the published registry and their primary residence, primary place of employment, or principal school abutting the property being treated.

For more information on the Pesticide-Sensitive persons registry, visit Pesticides | Department of Agriculture (colorado.gov).

4.7 Training and Safety

BCPOS adheres to the regulations of C.R.S. 35-10-109, which include:

- Certify all staff employees who may apply pesticides as field technicians.
- Require Certified Operators License for all Noxious Weed Work Group Technicians
- Require Qualified Supervisor Licenses for all Noxious Weed Work Group Specialists
- Require knowledge and understanding of BCPOS Fertilizer, Herbicide and Pesticide Application and Storage Standard Operating Procedure, including completing all outlined required training

BCPOS Noxious Weed Group staff must maintain their Qualified Supervisor License in the following categories:

- Agricultural Weed Control
- Rangeland Pest Control
- Industrial and Right-of-way Weed Control
- Aquatic Pest Control
- Forest Pest Control
- Turf Pest Control

5.0 IWM Plan Review and Update Process

5.1 IWM Plan Review

BCPOS staff, as delegated by the Local Advisory Board, will review this IWM Plan as needed but no less than every three years, as required by the Act. For this review, BCPOS staff will develop any recommended management plan revision for the integrated management of noxious weeds and recommend management criteria for noxious weeds within the area governed by the county.

5.2 Three-Year IWM Implementation Updates

Appendix B, IWMP Implementation on Boulder County Natural Lands, 2023-2027, will be updated every three years for the upcoming three-year period. This update will reflect the experiences and lessons learned through the adaptive management process, including research and monitoring.

5.3 Updating IWM Plan for Additional Noxious Weeds

List A. Future List A noxious weed species which the Commissioner of the Department of Agriculture designates by rule pursuant to the Act shall be automatically incorporated into this IWM Plan without the need for the BOCC to amend the IWM Plan. Similarly, any deletions of species from List A or transfer of species from List A to Lists B or C, which the Commissioner of the Department of Agriculture accomplishes pursuant to the Act, shall be automatically incorporated into this IWM Plan without the need for the BOCC to amend the IWM Plan.

List B. Future List B noxious weed species which the Commissioner of the Department of Agriculture designates by rule pursuant to the Act shall be automatically incorporated into this IWM Plan without the need for the BOCC to amend the IWM Plan. Similarly, any deletions of species from List B or transfer of species from List B to Lists A or C, which the Commissioner of the Department of Agriculture accomplishes pursuant to the Act, shall be automatically incorporated into this IWM Plan without the need for the BOCC to amend the IWM Plan.

List C. Future List C noxious weed species that occur within the county, which the Commissioner of the Department of Agriculture designates by rule pursuant to the Act, shall be automatically incorporated into this IWM Plan without the need for the BOCC to amend the IWM Plan. Similarly, any deletions of species from List C or transfer of species from List C to Lists B or A, which the Commissioner of the Department of Agriculture accomplishes pursuant to the Act, shall be automatically incorporated into this IWM Plan without the need for the BOCC to amend the IWM Plan. Management of List C species is currently recommended but not required by the Commissioner of the Department of Agriculture and is at the discretion of the BOCC; therefore, any future requirements for management of incorporated List C species shall be done by the BOCC through an amendment to this IWM Plan following a public hearing, with 30 days prior notice given to the public.

Local weeds. The BOCC reserves the right to designate local noxious weeds in the future, pursuant to amendment of the IWM Plan, consistent with state law. Any future designation of local noxious weeds shall include the required management objectives and associated management plans, methods, or techniques for all affected landowners.

5.4 Annual Reports

Annually, the BCPOS Noxious Weed Work Group summarizes the work completed pursuant to this IWM Plan on BCPOS natural lands and rights-of-way. This summary can be found in the BCPOS annual reports, Annual Reports - Boulder County. Additionally, the BCPOS Noxious Weed Work Group will provide noxious weed infestation and distribution data to the Colorado Department of Agriculture for any species designated for eradication or any species undergoing a rule change under "Rules."

Appendix A: Glossary of Terms

The following definitions shall apply to the terms used in this IWMP:

Act: the Colorado Noxious Weed Act, Article 5.5 of Title 35, C.R.S., as amended.

Adjacent: meeting or touching at some point or having nothing of the same kind intervening.

Agricultural Extension Agent: the agent in the Colorado State University Cooperative Extension office who provides weed education to the public and may assist in the development of individual noxious weed management plans.

Alien Plant: a plant species (exotic or invasive) which is not indigenous to the State of Colorado.

Biological Management: the use of an organism to disrupt the growth of noxious weeds.

Board: the Board of County Commissioners of Boulder County (BOCC).

Boulder County Community Planning & Permitting Department (CPP): Formerly called the County Land Use Department, employs the Director of Community Planning & Permitting and is authorized to assist the County Weed Coordinator and other authorized federal, state, and local noxious weed management officials as provided in this Plan.

Chemical Management: the use of herbicides to disrupt the growth of noxious weeds.

Colorado Noxious Weed Act: The Act, as defined above.

Commissioner: The Commissioner of the Colorado Department of Agriculture or the Commissioner's designee.

Compliance Waiver: a written exemption granted by the Commissioner to the county or a landowner that releases the county and/or landowner from certain obligations to eradicate a specific population of List A or List B noxious weed species.

Containment: see "Management Objective," below.

County: The County of Boulder (Boulder County).

County Weed Coordinator: The Weed Coordinator appointed by the Board, through the Director of the Boulder County Parks & Open Space (BCPOS) Department, to conduct the duties and functions of noxious weed management as specified under this IWM Plan.

Cultural Management: those methodologies or management practices conducted to favor the growth of desirable plants over noxious weeds, including but not limited to maintaining an optimum fertility and plant moisture status in the area, planting at optimum density and spatial arrangement in the area, and planting species and eco-types most suited to the area.

Elimination: see "Management Objective," below.

Environmental Impact Quotient (EIQ): Cornell University Herbicide Toxicity Management Tool that rates herbicide toxicity impacts in areas of worker safety, consumer safety and ecological safety.

Eradication: see "Management Objective," below.

Escaping Ornamental Plants: exotic horticultural plant species which invade other lands, becoming an ecological or economic nuisance to the present management goals of those lands.

Exotic: refers to a plant species that is non-native and may generally bring adverse effects to the ecological balance in an ecosystem

Federal Agency: each agency, bureau, or department of the federal government responsible for administering or managing federal land.

Federal Land Manager: the federal agency having jurisdiction over any federal lands affected by the Act.

Infestation: the presence of a large number of invasive plants on a site that causes displacement of native vegetation or negatively impacts native ecosystems or ecological functions.

Infested Acreage: an area of land containing a noxious weed species, defined by the actual perimeter of the infestation delineated by the canopy cover of the plants, and excluding areas not subject to infestation.

Integrated Weed Management (IWM): the planning and implementation of a coordinated program utilizing a variety of methods and tools to manage noxious weeds to achieve specified management objectives (control, suppress, contain, eradicate) and promote desirable plant communities. Such methods may include, but are not limited to, education, preventive measures, good stewardship; and the tools include biological, cultural, mechanical, and chemical controls.

Landowner: any owner of federal, tribal, state, county, municipal, or private land.

List A Noxious Weed Species: rare noxious weed species that are subject to eradication wherever detected statewide to protect neighboring lands and the state as a whole.

List B Noxious Weed Species: noxious weed species with discrete statewide distributions that are subject to eradication, containment, or suppression in portions of the state designated by the Commissioner in order to stop the spread of these species.

List C Noxious Weed Species: widespread and well-established noxious weed species for which the Commissioner recommends but does not require management, although the Board may in its discretion require management.

Local Advisory Board: The Board of County Commissioners of Boulder County (BOCC), or such other entity as the Board may constitute to fulfill the role of the local advisory board under the Act.

Local Noxious Weed: any weed of local importance in the county which has been declared a noxious weed by the Board.

Management: any activity that prevents a plant from establishing, reproducing, or dispersing itself.

Management Objective: the specific, desired result of integrated management efforts, including:

- **Control:** management of the species is recommended but not required by the county or state.
- **Eradication.** Reducing the reproductive success of a noxious weed species or specified noxious weed population in largely un-infested regions to zero and permanently eliminating the species or population within a specified timeframe (the state specifies time frames for all listed weed species). Once all specified weed populations are eliminated or prevented from reproducing, intensive efforts continue until the existing seed bank is exhausted.
- **Elimination.** Removal or destruction of all emerged, growing plants of a population of List A or List B, List C species designated for eradication by the Commissioner of the Department of Agriculture or the Local Advisory Board. It is the first step in achieving eradication and is succeeded by efforts to detect and destroy newly emerged plants arising from seed, reproductive propagule, or remaining root stock for the duration of the seed longevity for the particular species.
- **Containment.** Maintaining an intensively managed buffer zone that separates infested regions, where suppression activities prevail, from largely un-infested regions, where eradication activities prevail.
- **Suppression.** Reducing the vigor of noxious weed populations within an infested region, decreasing the propensity of noxious weed species to spread to surrounding lands, and mitigating the negative effects of noxious weed populations on infested lands. Suppression efforts may employ a wide variety of integrated management techniques.
- **Restoration.** Removal of noxious weed species and reestablishment of desirable plant communities on lands of significant environmental or agricultural value to help restore or maintain said value.

Management Plan: a noxious weed management plan developed by any person, the Commissioner, or the Board, using integrated management techniques, methods, or practices.

Mechanical Management: those methodologies or management practices that physically disrupt plant growth, including but not limited to, tilling, mowing, burning, flooding, mulching, hand-pulling, grazing, and hoeing.

Municipality: a local governing body as set forth in C.R.S. Section 31-1-101(6).

Native Plant: a plant species which is indigenous to the state.

Neighboring: For Boulder County, a neighboring property is any property within a one-half mile radius of the boundary of the subject property.

Noxious Weed: a (alien, exotic or invasive) plant or parts of an alien plant that have been designated by rule as being noxious or have been declared to be a noxious weed by the Board and meets one or more of the following criteria:

- Aggressively invades or is detrimental to economic crops or native plant communities.
- Is poisonous to livestock.
- Is a carrier of detrimental insects, diseases, or parasites.
- Has a direct or indirect detrimental effect on the environmentally sound management of natural or agricultural ecosystems.

Noxious Weed Management: the planning and implementation of an integrated program to manage noxious weed species.

Occupant: see "Person," below.

Person or Occupant: an individual, partnership, corporation, association, or federal, state, or local government or agency thereof owning, occupying, or controlling any land, easement, or rights-of-way, including but not limited to any city, county, state, or federally owned and controlled highway, drainage or irrigation ditch, spoil bank, borrow pit, gas and oil pipeline, high voltage electrical transmission line, or rights-of-way for a canal or lateral.

Restoration: see "Management Objective," above.

Population: a group of designated noxious weeds of the same species occupying a particular geographic region and capable of interbreeding.

State: The State of Colorado.

Propagule: a part of a plant (such as a cutting, seed, or spore) that serves to propagate the plant (i.e., causes or allows the plant to reproduce).

State Noxious Weed Advisory Committee: A committee of 15 members appointed by the Commissioner of the Department of Agriculture to make recommendations on the designation of noxious weeds and to carry out related functions as specified in Section 35-5.5-108.7 of the Act.

State Weed Coordinator: a person within the Division of Conservation Services of the State Department of Agriculture whom the Commissioner designates to, among other functions, provide guidance to and coordinate with local government weed managers, such as the County Weed Coordinator, as provided for in Section5-5.5-117 of the Act.

Suppression: see "Management Objective," above.

Weed: any plant growing where it is unwanted.

Appendix B: IWMP Implementation on Boulder County Natural Lands, 2024-2027

This Implementation Appendix provides the framework and details for noxious weed treatment planned for implementation by the BCPOS Noxious Weeds Work Group on BCPOS natural lands from 2024 through 2027. The Implementation Appendix is guided by the BCPOS Management Objectives described in section 4. The BCPOS Noxious Weed Work Group will create annual plans to meet the Implementation Goals described below. Annual plans will also indicate locations and planned methods for implementation as described in Figure 4-2 and 4-3. Factors such as new species or infestations, natural disasters, man-made disturbance and broader BCPOS goals and priorities will also inform work planning. Annual reports will be created to track progress.

B-1. Implementation Goals

In addition to and in support of the BCPOS Management Objectives and Treatment Priorities outlined in section 4, BCPOS has defined the following Implementation Goals. These goals have been informed, developed, and refined over the course of the IWMP planning process in 2023 and 2024.

Implementation Goal 1. Reduce herbicide applications by 50% by 2030.

The metric used to measure this goal is annual acres treated. The 3-year average of 1,120 acres treated in 2021-2023 will serve as the baseline. The goal is to reduce the number of acres treated annually to 560 acres by 2030. Note that progress on this goal may not appear incremental or linear given the cheatgrass elimination goal that follows under Goal 2.

Implementation Goal 2. Eliminate about 3,000 acres of cheatgrass infestations within High Biodiversity Areas located along the foothills by 2030.

Conduct targeted drone applications of herbicide within Cheatgrass Management Areas located in High Biodiversity Areas characterized by rugged foothill terrain in the vicinity of Rabbit Mountain, Hall Ranch, Heil Valley Ranch, and Walker Ranch. Refer to section B-4. Biodiversity Preservation Management Area, Protection of High Biodiversity Areas Threatened by Cheatgrass Dominance below for more details.

Implementation Goal 3. Implement a range of pilot projects to evaluate effectiveness of select noxious weed management treatments and their applicability to BCPOS natural lands.

Tools to be piloted are goat browsing, steam weeding, soil amendments, and new volunteer-supported efforts. Refer to section B-2. Pilot Projects below for additional detail.

Implementation Goal 4. Conduct surface water impacts study.

BCPOS will solicit outside expertise to formulate and execute a study to evaluate the impacts of BCPOS' herbicide applications on surface water that will inform adaptive management strategies. Potential BCPOS study sites include Walden Ponds, Pella Ponds, and Western Mobile Lakes 3 and 4.

Implementation Goal 5. Continue supporting integrated weed management research on BCPOS natural lands.

Support funded and non-funded academic and small grant research that will inform BCPOS natural resource management decisions.

Implementation Goal 6. Update reporting methods to increase availability of BCPOS integrated weed management activity data.

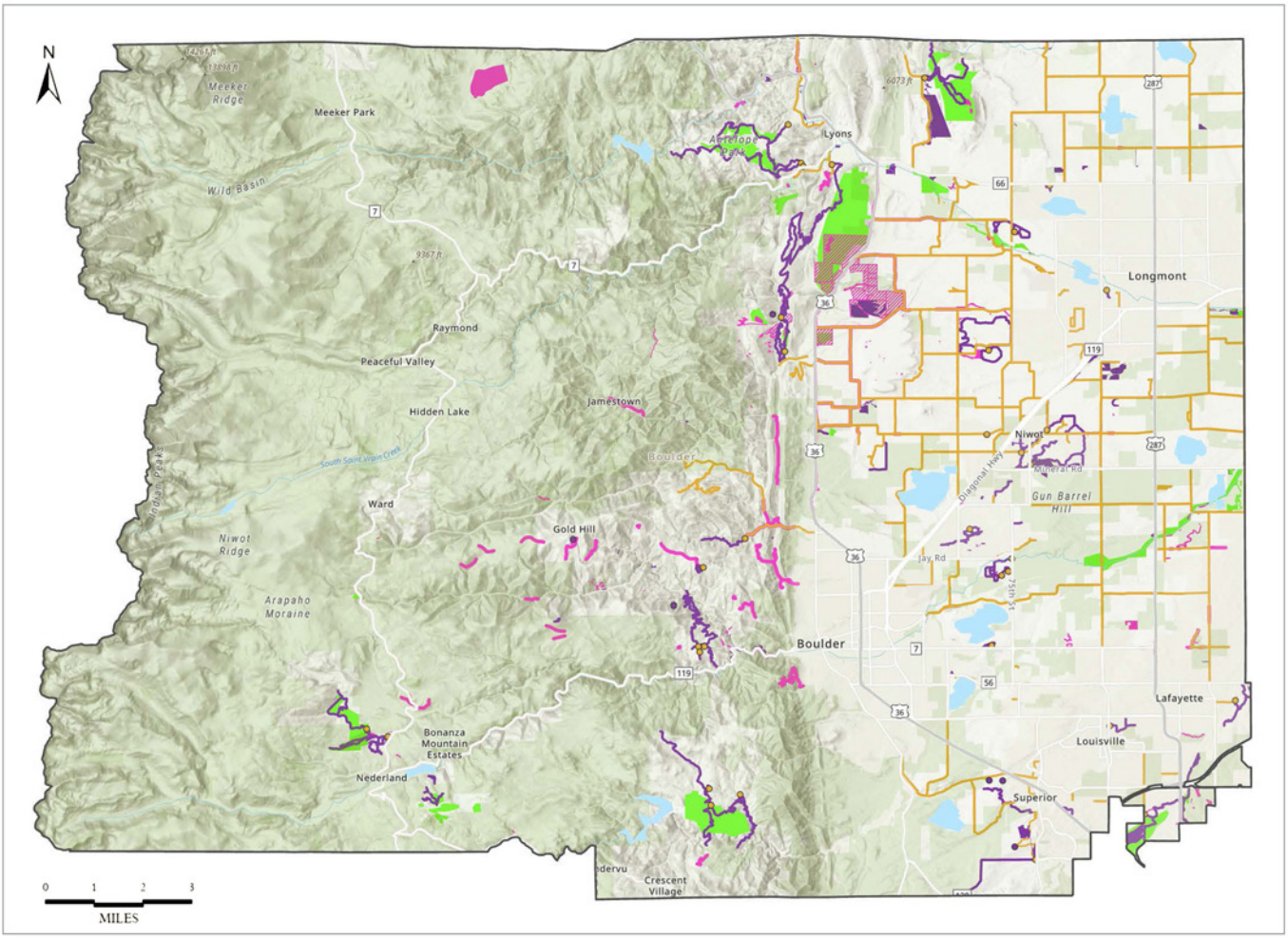
Update reporting methods to increase availability of weed management activity data on the Boulder County web site.

Implementation Goal 7. Implement Integrated Weed Management actions in fulfillment of the BCPOS Management Objectives discussed in Section 4.

Each of the four BCPOS Management Objectives discussed in Section 4 has a corresponding Management Area. Actions planned under each Management Objective are summarized below in Sections B3 through B6. Implementation Map B-1 provides a summary of the Management Areas. Here are the goals for each Management Area:

- Reduce populations of **Eradicate** species within Eradication Management Areas.
- **Preserve Biodiversity** on BCPOS natural lands by conducting and maintaining restoration projects in Biodiversity Protection Management Area.
- **Suppress** designated noxious weed populations in Suppression Management Areas.
- **Protect Roads, Trails, and Other Infrastructure** by managing vegetation to increase public safety and preserve structure integrity.

Implementation Map B-1: Summary of Management Objectives by Area



LEGEND

- Eradication
- Biodiversity Preservation
- Suppression
- Protect Infrastructure

B-2. Pilot Projects

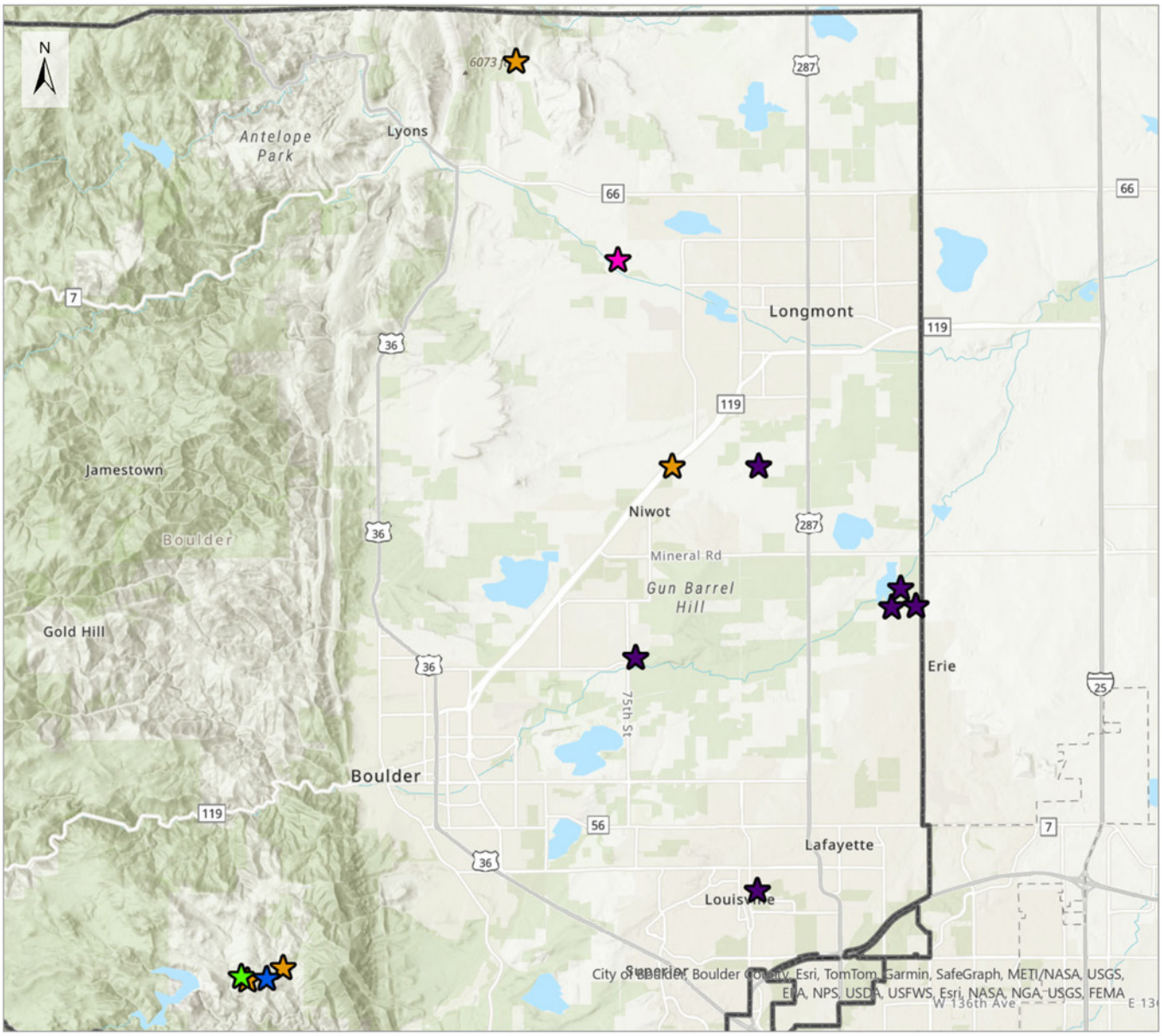
As described in Implementation Goal 3, BCPOS is implementing a range of pilot projects to evaluate effectiveness of select noxious weed management treatments and their applicability to BCPOS natural lands. These four treatment methods were identified during the 2023-2024 public planning process as having potential for application on BCPOS natural lands.

1. **Hand digging List A Species.** In 2023, BCPOS began a pilot project testing mechanical methods for removing Hairy willowherb at Pella Ponds, the location of one of the infestations of this Eradicate species. The pilot project is testing the effectiveness of hand digging Hairy willowherb is a three-year volunteer pilot effort that begin in 2023. One challenge to achieving eradication is that the entire rootstalk must be removed along with any existing rhizomes of the plant in the ground to avoid regrowth from root fragments. Another challenge is that the ground disturbance from digging can create opportunities for other noxious weeds to take hold in the disturbed soil. The pilot project is evaluating strategies for overcoming these challenges
2. **Steam Weeding.** A steam weeding pilot project will be initiated at Ron Stewart Preserve at Rabbit Mountain Trailhead to test effectiveness of this tool for total and targeted vegetation management. If it is determined to be feasible and scalable, second priority locations are the Walker Ranch Loop and Ethel Harrold Trailheads, followed by the LoBo Regional Trail. The extent of the initial pilot project will be dependent on budget, staffing, and availability of contracted services and/or equipment.
3. **Soil Amendment.** Soil amendment for cheatgrass control in a High Biodiversity Area will be trialed at Walker Ranch. Test plots will be monitored and evaluated. If the method is determined to be effective and scalable, expansion to other locations will be evaluated.
4. **Goat browsing.** Goat browsing for suppression of broadleaf noxious weeds will be evaluated for effectiveness and scalability through pilot projects at locations on the following properties: Harney-Lastoka, Keyes, Bailey-Kenosha, and Wildview (Hillcrest Heights). All of these properties fall outside the Bighorn sheep protection area (see section 3.3.3).
5. **Volunteer Projects Expansion.** BCPOS has begun the new "Weed Warriors" volunteer program at Walker Ranch. The program will involve volunteers in controlling invasive weeds manually without using herbicides. Initially, volunteers will work on a one-mile section along the Walker Ranch Loop trail with a 5-year time horizon. At each visit (minimum 3 per year), they will pull invasive weeds, check specific points in their designated area, and fill out a simple form with the data. Training is provided. Volunteers must be at least 16 years old or be accompanied by an adult parent/guardian. More info at https://bouldercounty.gov/volunteer/opportunities/details/weed-warriors/.

   One-time volunteer opportunities and Youth Corps team projects will continue to be offered.

Map B-2 below indicates the planned locations of these pilot projects.

Implementation Map B-2: Potential Locations of Pilot Projects, 2024-2027



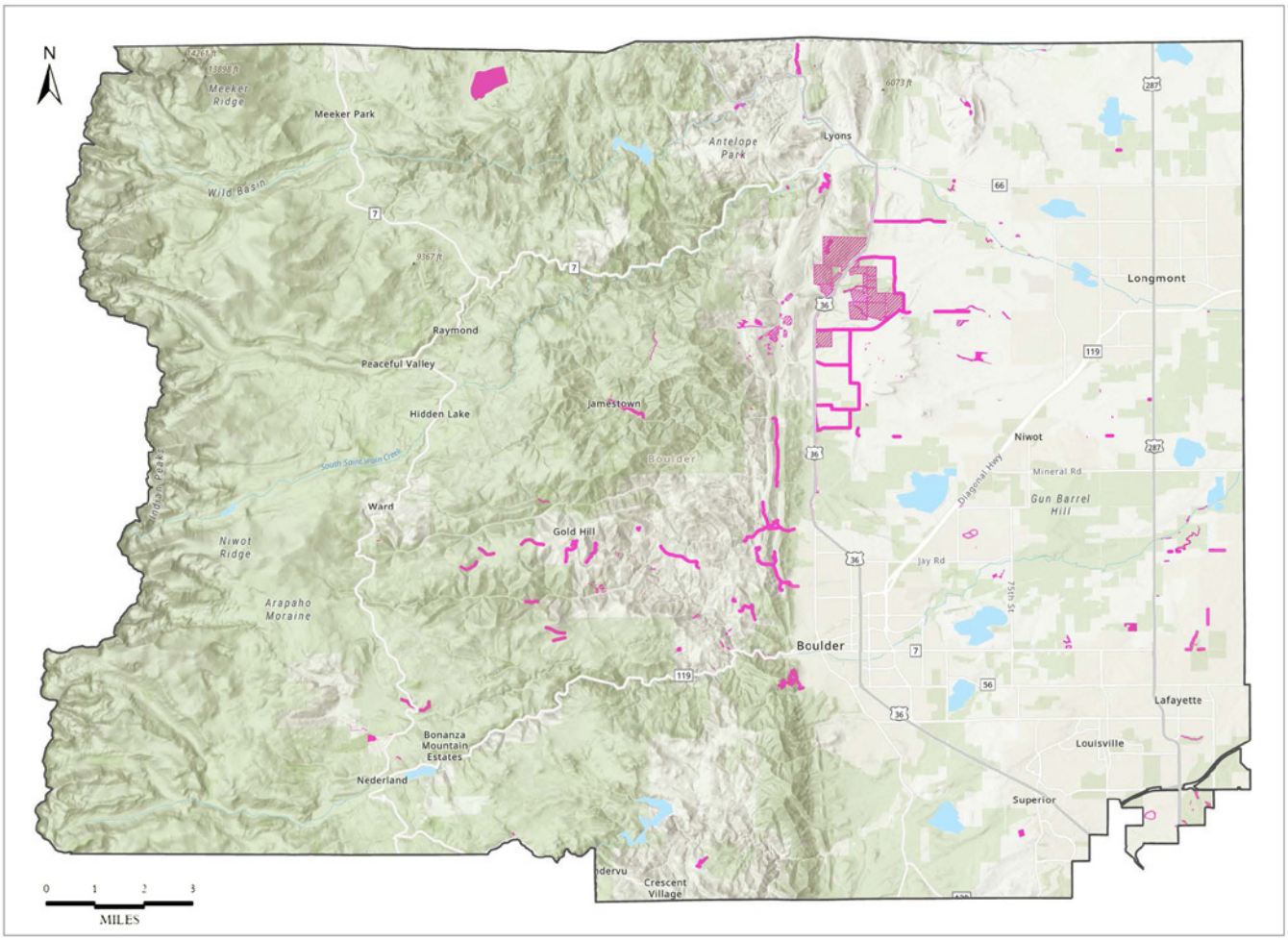
LEGEND

- Mechanical List A
- Steam Weeding
- Soil Amendment – Cheatgrass Control
- Goat Grazing
- Weed Warriors

B-3. Eradication Management Areas

State law requires BCPOS to prevent propagation and to remove all plants of species designated as eradication species on Lists A and B on BCPOS natural lands. Implementation Map B-3 shows the locations on BCPOS natural lands that BCPOS is actively monitoring and/or treating for eradication. The goal of the treatments is to eradicate their presence by preventing them from becoming established and spreading throughout the county. Eradication treatments are a high priority for the Noxious Weed Work Group.

Implementation Map B-3. Eradication Management Areas

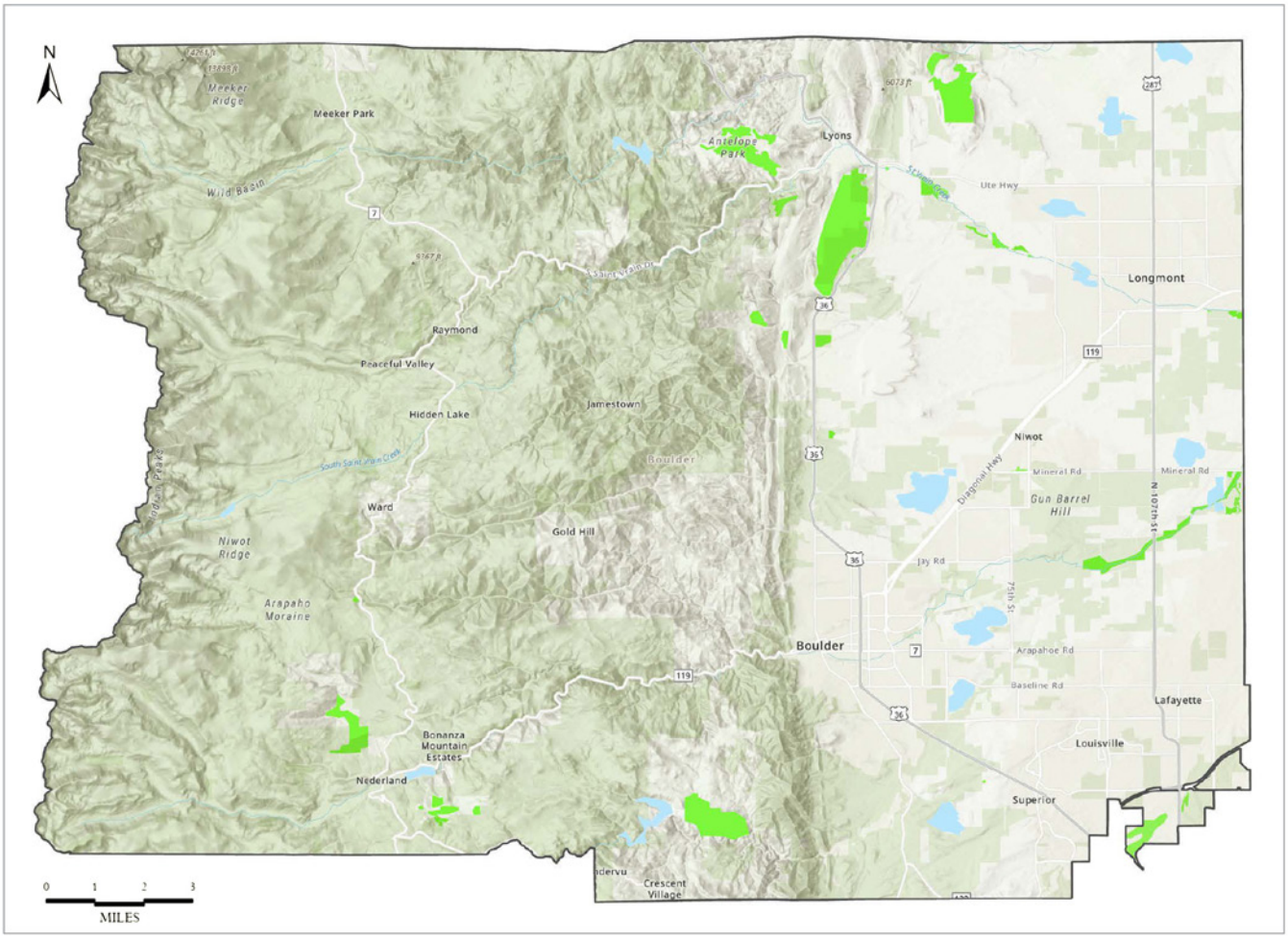


The Noxious Weeds Work Group spends extensive time each year scouting, mapping, and treating infestations of these species. The map above indications locations where this work has occurred in 2023 and is expected to continue in 2024 to 2027. Treatment type and priority is dependent on species, size of infestation, timing, and location. Treatment methods recommended by the State are emphasized. Large-scale collaborative efforts with federal, municipal, surrounding counties and private entities are needed for eradication to be successful. County staff will continue to actively partner in such efforts.

B-4. Biodiversity Preservation Management Areas

BCPOS actively manages natural lands for their natural resource value, primarily to preserve biodiversity that is unique to Boulder County and the Front Range. IWM is an important tool for preserving native species and ecosystem function on these lands under the **Preserve Biodiversity** Management Objective. Implementation Map B-4a, Biodiversity Preservation Management Areas, shows the locations where BCPOS Noxious Weed Work Group is working in support of this objective.

Implementation Map B-4a: Biodiversity Preservation Management Areas



LEGEND

Biodiversity Preservation

The types of project work areas are described below along with their locations. The project work area types include Active Restoration Areas, Restoration Area Maintenance, Wildlife or Plant Improvement Areas, and Protection of High Biodiversity Areas Threatened by Cheatgrass Dominance.

Active Restoration Areas

Active restoration areas typically occur in generally valuable habitat areas such as wetlands, riparian corridors, grasslands, and forests. These projects include reseeding and/or planting. Some sites require removal of all vegetation prior to seeding for the best chance at establishment. This can be accomplished with broadcast herbicide application or tilling of the soil. Due to the disturbance required to restore a site, restoration sites are initially very susceptible to noxious weed invasion. Active management using spot spraying of herbicide and mechanical methods is required to prevent the noxious weeds from outcompeting the new desired vegetation. Cultural methods are also heavily utilized during restoration projects to help limit noxious weed pressure and

allow native vegetation to become established. Many of these projects are implemented collaboratively with multiple work groups and often involve other partners. These areas are a high priority for treatment given the overall investment in the effort and alignment with the department's overall biodiversity preservation goals.

Current priority efforts will occur at the following locations:

- Archdiocese
- Broomfield North
- Hall Ranch 2
- Keyes
- Monarch
- Mountainview Egg Farm
- Prairie Run
- Rock Creek Farm
- Ruth Roberts
- Swanson
- Walden Ponds Wildlife Habitat
- Wildview (Hillcrest Heights)

Restoration Area Maintenance

After active restoration is completed, maintenance of the revegetated sites is required to ensure long-term establishment of desired native plant communities. The timeline for maintenance is site specific. Tools include spot application of herbicide for dense infestations or perennial species and mechanical methods. Restoration maintenance priority areas are located on the following properties:

- Bush
- Colp
- Indian Mountain
- Hall Ranch
- Heil Valley Ranch
- Bailey-Kenosha Ponds
- Rabbit Mountain
- Trevarton
- Western Mobile
- Prairie Run

Wildlife or Plant Habitat Improvement Areas

For these areas, integrated weed management actions are implemented to enhance the remanent vegetation to better support specific species or ecosystem services. To successfully meet management objectives for these sites, these projects rely on treatments methods that include targeted spot herbicide applications and mechanical methods.

The locations and resource considerations for current priority projects are:

Location	Natural Resource Considerations
Bush Pond	Leopard Frog & Wetland Improvement
Caribou Ranch & Mud Lake	Riparian Corridor, Alpine Meadow, Wood Lily habitat
Prairie Run	Riparian Corridor, Wetland Improvement, Grassland Improvement
Reynolds Ranch	Aspen Regeneration
Rock Creek Drainage & Buffalo Gulch	Preble's Meadow Jumping Mouse & Riparian Corridor
South St. Vrain Corridor (2 sites)	Preble's Meadow Jumping Mouse & Riparian Corridor
Williams Merlin	Limber Pine

Protection of High Biodiversity Areas Threatened by Cheatgrass Dominance

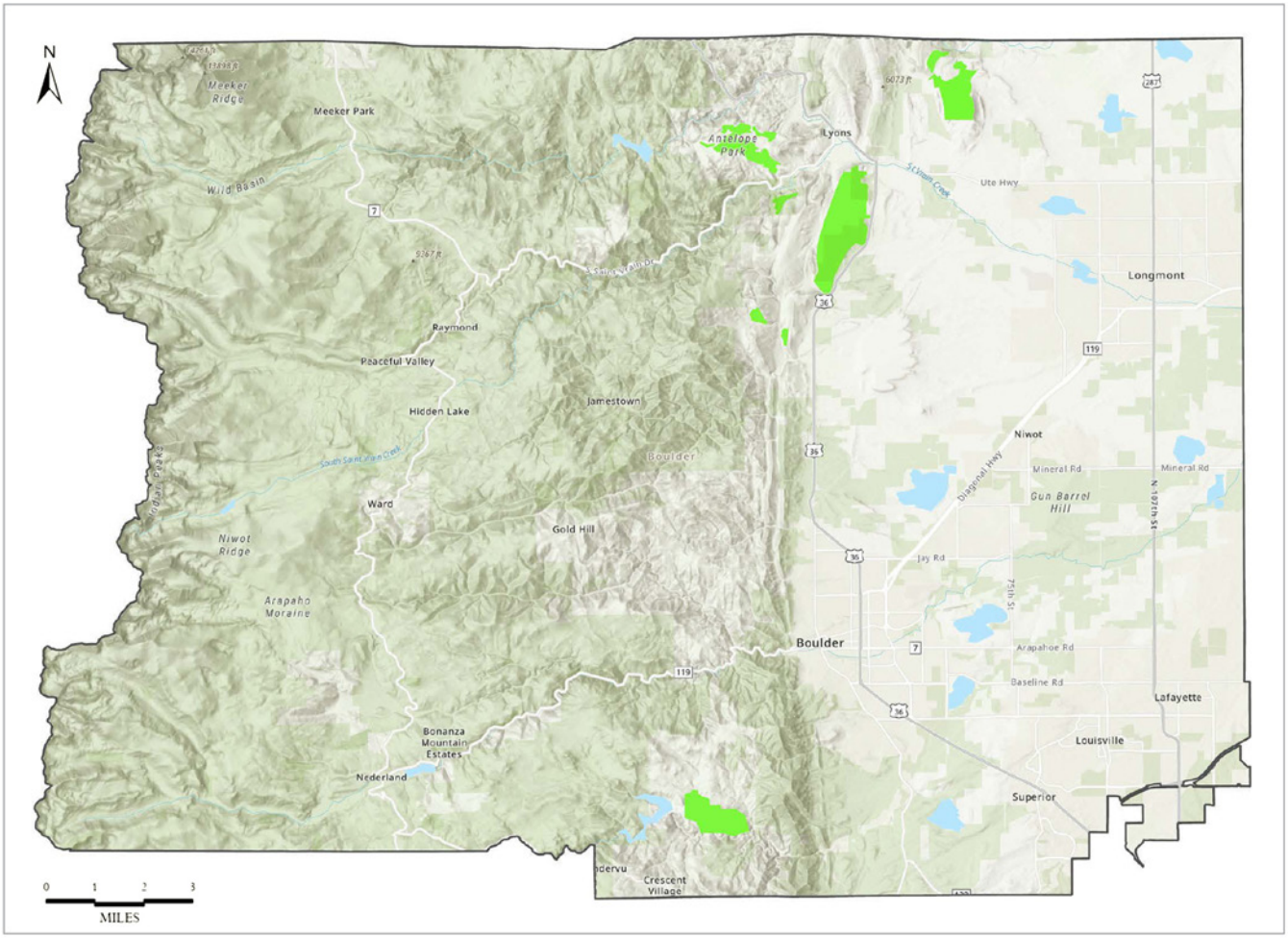
High Biodiversity Areas are designated in the Environmental Resource Element of the Boulder County Comprehensive Plan. These areas have been recognized by the Colorado Natural Heritage Program for outstanding biodiversity on a global scale – meaning their biodiversity is unique and irreplaceable. This biodiversity is threatened in some locations by cheatgrass dominance.

Since 2019, BCPOS has successfully conducted treatments on about 4,300 acres of cheatgrass infestation within High Biodiversity Areas. And now, populations of cheatgrass within those treatment areas have been largely eradicated. Without competition from that cheatgrass, native plant communities in the treatment areas have rebounded from native seed source still present in the soil.

These past treatments have consisted of broadcast herbicide application to infested areas accompanied by ongoing monitoring. Going forward, drone application is planned for foothills areas where access is challenging due to steep and/or rocky terrain. These properties are identified with an asterisk (*) in the list below and identified on Implementation Map B-4b, Drone Application for Biodiversity Preservation. The drone application areas are about 3,000 acres in total. In addition to the drone application areas, a pilot project to study of the effectiveness of using soil amendments as a management tool for cheatgrass infestations is planned for Walker Ranch.

- Etter*
- Hall Ranch 2*
- Hall Ranch*
- Heil Valley Ranch*
- Lindsay
- Mayhoffer
- Rabbit Mountain*
- Trevarton*
- Walker Ranch* (also, Soil Amendment Pilot Project)
- Wolf Run *
- Zaharias

Implementation Map B-4b: Drone Application Areas for Biodiversity Preservation



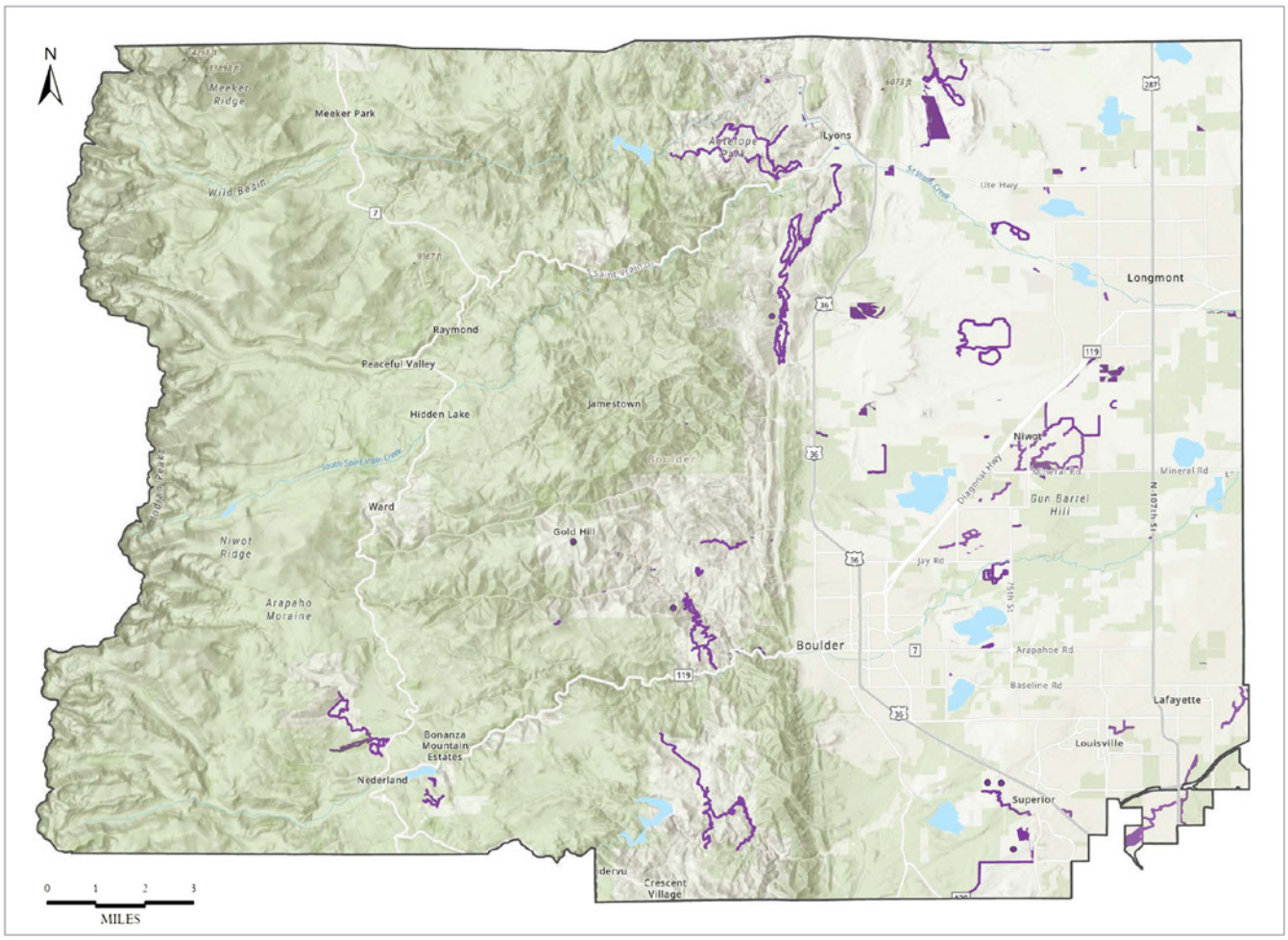
LEGEND

Biodiversity Preservation

B-5. Suppression Management Areas

The objective for Suppression Management Area is to reduce plant vigor and propensity to spread. In general, areas with known populations of noxious weeds designated for suppression are evaluated throughout the growing season and prioritized by infestation size, potential to spread and location. Timing is critical to prevent seed production and spread. Additionally, Boulder County operates under a "good neighbor" policy, meaning public requests for weed suppression are prioritized. Implementation Map B-5, Biodiversity Preservation Management Areas shows the locations where BCPOS Noxious Weed Work Group is working in support of this objective.

Implementation Map B-5. Suppression Management Areas



LEGEND

Suppression

County road rights-of-way and BCPOS trail corridors are also prioritized for suppression purposes. The purpose is to reduce the potential for noxious weeds to spread by dispersed seed via vehicles or trail users. Trail locations are shown on Map B-5 above and rights-of-way are shown on Map B-6 in the next section. Planned actions include:

County Road Rights-of-Way suppression treatment approach:

- Mow along all accessible county-maintained roads three times a year. Some canyon roads are mowed once or twice a year and mountain roads are mowed by special request.
- Herbicide applications may occur in areas where noxious weeds are encroaching on agricultural lands or public lands and along State Highways.

Trailheads & Trails suppression treatment approach:

- Evaluate trail corridors during late spring/early summer for noxious weed infestation. Mechanical methods are utilized in the summer to prevent seed set and if populations are dense enough targeted herbicide applications may occur in late Summer to early Fall.
- Continue to implement cultural methods such as signage and boot brush stations to help prevent noxious weed spread along these corridors.

Biological Control is another suppression technique that can reduce plant vigor and potential for spread on certain species. Biological Control is utilized on sites where suppression species have a high density, and when the site is not identified for future restoration due to current feasibility. It is also utilized on suppression species that at their current density are not causing appreciable impacts on biodiversity or ecosystem functions. Since 2015, BCPOS has completed an average of 25 releases per year. BCPOS plans to continue making annual releases at a similar rate. Locations, shown in Map B-5, where bugs are intended to be released for this purpose are:

- Betasso Preserve
- Bush
- Centennial
- Cohig
- Heil Valley Ranch
- Mayhoffer
- Schmidt Trust

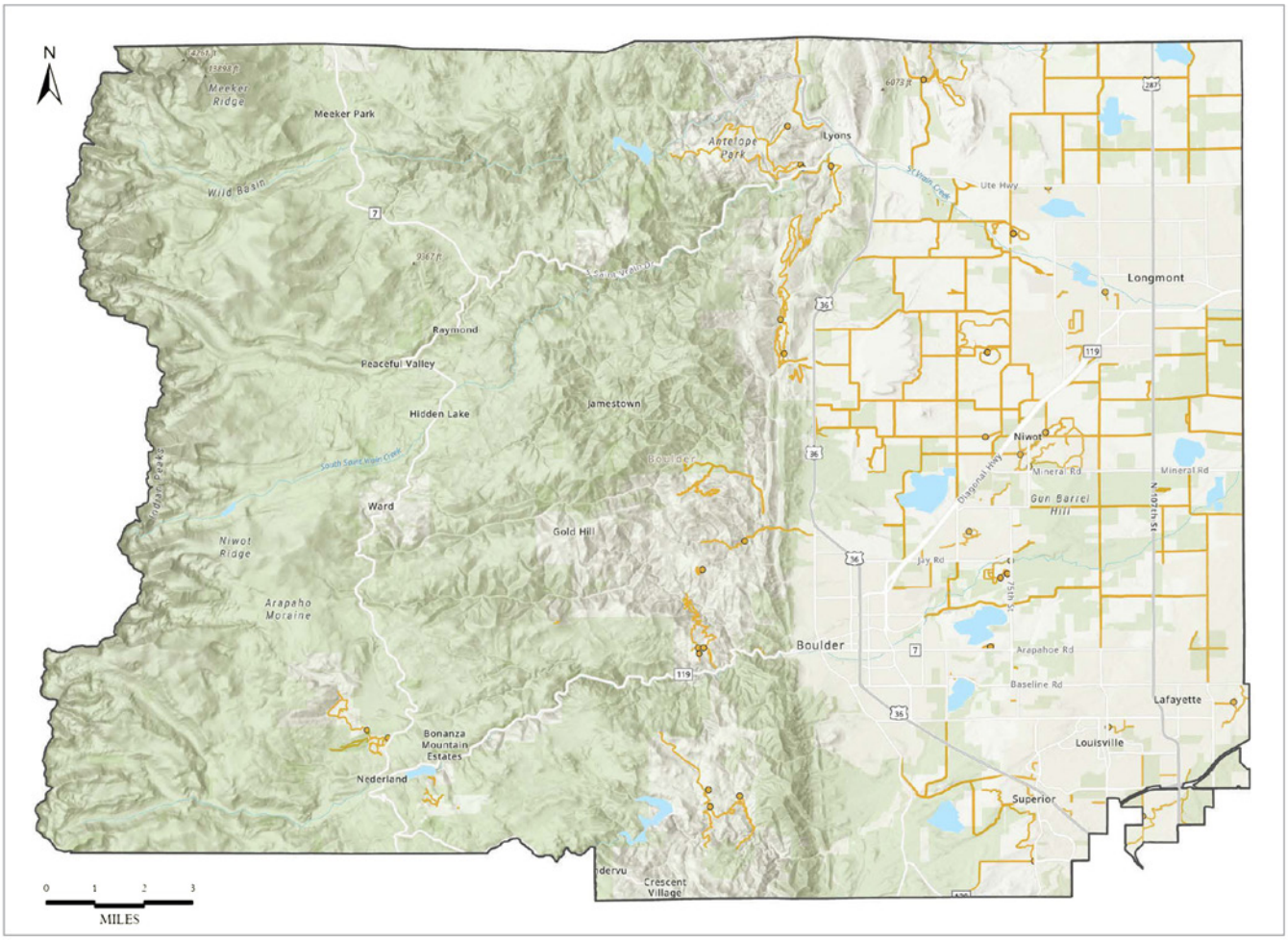
Field mowing and weed whipping is a widely used suppression method. The following properties are known to have infestations that are evaluated and prioritized for treatment year-to-year as shown on Map B-5 Suppression Management Areas.

- Anhawa
- Ansbaugh
- Anthony
- Barnes
- Betasso Preserve
- Bezark-Solod
- Blume-Paranka
- Boland
- Braly
- Brewbaker-Sorensson
- Brown
- Bush
- Canino
- Casey
- Centennial
- Centennial Ranch
- Centrebridge
- Chavez
- Cito
- Clark (David & Joseph)
- Cohig
- Colp
- Coppolecchia
- Country Creek
- Cover
- Cowdry
- Curry-Archuleta
- Cushman
- Dean
- DeSimone
- Doniphan
- Dowe Flats
- Flagg Park
- Forsberg (Bob)
- Frisby
- Gatt
- Girl Scouts 2
- Golden-Fredstrom (CE)
- Grabow
- Hahn
- Hall (Mary)
- Hall Ranch
- Hay
- Heil Valley Ranch
- Hillside Estates
- Hilton
- Hirschfeld
- Hyman-Rice
- Inn at Rock N River
- Kendall
- Keyes
- Laber (Henry)
- Lagerman
- Lamb-Clark
- Legion Park
- Lhatso
- Lutz
- Lyons Foothills Investments
- Mayes
- Mayhoffer
- Mccrosky
- Miller
- Monarch Park
- Morrison
- Mountainview Egg Farm
- Niwot Estates
- Parks And Open Space Facility
- Peck
- Pella Crossing
- Peppertree
- Pitner
- Puma 66
- Rabbit Mountain
- Rademacher
- Ramey
- Rivers-Bozeman
- Rock Creek Farm-Hewit
- Rock Creek Farm-Nelson
- Saylor
- Schima
- Schmidt Trust
- Shortridge (Amy)
- Spychalla
- Stewart
- Suitts
- Telleen
- Thomas
- Walden Ponds Wildlife Habitat
- Western Mobile
- Wheeler
- Wildview (Hillcrest Heights)
- Wilkie
- Willis Heights
- Wilson
- Zaharias

B-6. Protect Roads, Trails, and Other Infrastructure Management Areas

To provide for public safety, BCPOS conducts total vegetation management to maintain sight lines along county roadways, support wildfire suppression, and maintain dam integrity. This work is of the highest priority for the BCPOS Noxious Weeds Work Group each year. BCPOS also conducts vegetation management for infrastructure integrity at trails, trailheads, and historic buildings. While this is a medium priority in work planning, a proactive, rotational approach prevents excessive vegetation build-up from impacting the integrity of infrastructure at known hot spots and limiting treatment methods to mechanical methods such as weed whipping, mowing, or hand work and minimal spot treatments of herbicide when necessary. Implementation Map B-6, Protect Roads, Trails & Other Infrastructure Management Areas shows the locations where BCPOS Noxious Weed Work Group is working in support of this objective.

Implementation Map B-6. Protect Roads, Trails, and Other Infrastructure Management Areas



LEGEND

Protect Infrastructure

The Noxious Weed Work Group seeks to respond quickly to other work group and public requests within this management area to address issues in a timely manner. Oftentimes, this work overlaps with suppression actions, however any safety concern would elevate the priority. Infrastructure managed for this objective include intersections, guardrails, medians, trailheads, trails, historic buildings, dams, and spillways. Locations where mechanical treatments are planned to support fire suppression objectives near residential areas include:

- BCPOS Headquarters
- Coen
- Erin Arsenault
- Johnson Trust
- Mayhoffer
- Valley Investments

B-7. Staffing, Budget, and Other Resources

Staffing and budget are major factors in how BCPOS prioritizes work. When considering "scaling up" integrated weed management efforts by adding new or additional projects to our workplan, commensurate increases in staffing, budget and other resources and equipment are essential to success. This section outlines BCPOS's current staffing and budget, including internal and external sources of funding that have supported the work of the Noxious Weeds Work Group in recent years. These staffing and funding levels are representative of the budget and staffing needed to implement the plan as described herein. Any significant changes to the implementation plan would require equally significant increases in budget, staffing, and equipment needs.

The BCPOS Noxious Weeds Work Group currently has four full time equivalent (FTE) staff devoted to invasive weed management. An additional nine seasonal staff positions are hired annually. One full-time staff and two seasonal staff have duties devoted to roadside mowing. The remaining three full-time staff and seven seasonal staff have duties focused on invasive weed management. Notably, BCPOS staff in other work groups (i.e., plant ecologists, wildlife biologists, foresters, contracting, planners, resource protection, education and outreach, volunteer coordinators etc.) are also actively involved in interdisciplinary efforts that support BCPOS's weed management work supporting stewardship of BCPOS natural lands. Efforts vary in size and scope involving planning, implementation, and monitoring.

The BCPOS Noxious Weeds Work Group's annual operating budget of approximately $91,000 budget pays for required trainings, equipment, tools, and supplies. From this budget, $25,000 is set aside yearly for Wildland Restoration Volunteers (WRV) to engage volunteers to complete invasive weeds removals on private lands.

Category	Cost
Personnel: 4 FTEs, 2023	$460,000
Personnel: 9 Seasonals, 2023	$380,000
Annual Operating, 2023	$91,000
BCPOS Capital (average annual) (sales tax)	$100,000
Grants for Capital Projects (average annual)	$56,000
TOTAL	**$1,087,000**

In addition to personnel and operating budgets, annual capital project funding is available from the Capital and Stewardship Projects budget through BCPOS' internal department-wide budget prioritization process. This funding typically supports project work performed by contractors. This internal funding is often used as match for grants and partnership contributions. Recently, BCPOS has received grant funding from the Colorado Division of Agriculture, the Rocky Mountain Elk Foundation, and the RESTORE Colorado program through the National Fish and Wildlife Foundation supporting weed management projects on BCPOS natural lands.

The sum of these direct expenses is $1.087 million per year. This does not include costs budgeted at the departmental or county level such as purchase and maintenance of large equipment (e.g., vehicles, mowers, and rigs), fuel, and general overhead/administrative expenses.

Appendix C: Summary of Weed Management Tool Costs

The estimated cost of a range of integrated weed management tools is provided below. These figures do not account for equipment costs and fuel costs.

Table C-1: Weed Management Tool Costs

Tool Type	Method	Cost/100 Acres - Low(a)	Cost/100 Acres - High(b)	Cost/100 Acres - Average
n/a	**Monitoring**	**$ 1,406.50**	**$ 4,019.50**	**$ 2,713.00**
Broadcast	**Aerial Spraying - Contract**	**$ 3,800.00**	**$ 11,300.00**	**$ 7,550.00**
Broadcast	**Tractor Spraying**	**$ 4,359.37**	**$ 15,593.00**	**$ 9,976.19**
Spot	**Backpack Spraying**	**$ 4,813.00**	**$ 20,152.00**	**$ 12,482.50**
Broadcast	**Field Mowing (c) (3x/yr)**	**$ 11,397.60**	**$ 19,238.00**	**$ 15,317.80**
Spot	**Weed Whipping (c) (3x/yr)**	**$ 8,139.00**	**$ 27,736.00**	**$ 17,937.50**
Spot	**Manual (hand pull or dig) (c) (3x/yr)**	**$ 12,058.50**	**$ 31,656.00**	**$ 21,857.25**
Broadcast	**Goats - Contract (d)**	**$ 103,900.00**	**$ 128,500.00**	**$ 116,200.00**

NOTES:

(a) Low-cost influences: less dense infestation, ease of access for equipment (flat, not rocky), and lower cost herbicide

(b) High-cost influences: more dense infestation, difficult access (steep, obstacles, rocky), higher cost herbicide

(c) Will likely require repeat treatments each season

(d) Cost based on: Louisville $1,039/acre and Lyons $1,285/acre.

Appendix D: Herbicide Selection Process

Various organizations play a role in regulating safe herbicide use globally. In general, a well-regulated and informed approach to herbicide selection for weed control can offer several advantages:

1. **Safety and Health Considerations:**

- Herbicide classifications can include information on the potential health risks associated with the use of specific chemicals. Following recommended classifications helps reduce the risk of adverse effects on human health.
- Guidelines may provide information on the appropriate protective measures and equipment to minimize exposure during herbicide application.

2. **Environmental Impact:**

- Proper classifications can guide users in selecting herbicides that have lower environmental impact, such as those with reduced persistence in soil or lower toxicity to non-target organisms.
- Guidelines encourage the use of integrated weed management practices, promoting a holistic and sustainable approach to weed control.

3. **Effectiveness and Target Specificity:**

- Classification systems help users choose herbicides that are effective against specific weed species while minimizing harm to desirable plants.
- Information on mode of action and target specificity can aid in developing strategies that prevent the development of herbicide-resistant weeds.

4. **Regulatory Compliance:** Adhering to recommended classifications ensures compliance with national and international regulations governing pesticide use.

5. **Risk Mitigation:**

- Understanding the potential risks associated with different herbicides allows users to make informed decisions and implement risk mitigation measures.
- Guidelines include information on buffer zones, application rates, and other practices to minimize the risk of unintended consequences.

6. **Global Consistency:** International guidelines, if followed, contribute to a consistent and standardized approach to pesticide use, promoting a unified global effort to address weed control challenges.

When herbicides are deemed necessary for use, Boulder County selects herbicides whose active ingredients have the lowest human health and environmental impacts by following both these guidelines:

- Consider only herbicides that are approved by the U.S. Environmental Protection Agency (EPA) and registered by the Colorado Department of Agriculture (CDA) for general use.
- Cross-reference this list with the World Health Organizations (WHO) Recommended Classification of Pesticides by Hazard and Guidelines to Classification (Chemical Safety and Health (who.int)).

According to the WHO Guidelines, individual active ingredients are classified in a series of tables from "extremely hazardous" (Table 1) to "unlikely to present hazard" (Table 5). Boulder County approves the use of any herbicide that contains an active ingredient on Table 4 "Slightly Hazardous (Class III) technical grade active ingredients in pesticides," or Table 5 "Technical grade active ingredients of pesticides unlikely to present acute hazard in normal use." *The WHO Recommended Classification of Pesticides by Hazard and Guidelines to Classification* can be found at this link: https://iris.who.int/bitstream/handle/10665/332193/9789240005662-eng.pdf?sequence=1

The WHO evaluates only single active ingredients but provides a tool to evaluate multiple active ingredients (Identification of HHPs | Pesticide Registration Toolkit | Food and Agriculture Organization of the United Nations (fao.org)). If all the active ingredients in a mixture have been evaluated by the WHO and those are on Table 4 or Table 5, Boulder County staff can utilize the WHO Excel spreadsheet to evaluate mixture.

For any active ingredient that has not been evaluated by the WHO, Boulder County contracts out an evaluation to be done following the WHO guidelines. If the evaluation places the active ingredient on Table 4 or Table 5, it is approved for use.

Boulder County reserves the right to add any new active ingredients without updating the plan if the active ingredients fall under any of the above-mentioned processes.

Additional resources that discuss the human health and environmental impact included on the active ingredient list are:

- Cornell University Environment Impact Quotient (EIQ) – Field Use Rating (FUR) Tool
- US-EPA Databases Related to Pesticide Risk Assessment
- Pesticide Toxicity to Bees, NC Dept. of Agriculture and CS Structural Pest Control and Pesticides Division

Although these sources are not utilized to make the decision on which active ingredients are approved, they provide valuable information and are used within the treatment plan decision-making process.

References

Databases Related to Pesticide Risk Assessment | US EPA

Environmental Impact Quotient – Field Use Rating, Cornell University

https://cals.cornell.edu/new-york-state-integrated-pest-management/risk-assessment/eiq/eiq-calculator

Pesticide Toxicity to Bees "Traffic Light"

The information in this table was compiled by the North Carolina Dept. of Agriculture and Crop Science, Structural Pest Control and Pesticides Division from the North Carolina Agricultural Chemicals Manual (2016); WIN-PST tool referenced in USDA NRCS/Xerces Society Agronomy Technical Note #9; EPA list of RT25 data; and Pacific Northwest Extension Publication 591 How to Reduce Bee Poisoning from Pesticides by Hooven, L., Sagili, R., and Johansen, E.

Appendix E: IWMP Drone Application Policy

Overview

Boulder County staff recommends limited aerial applications on Boulder County Parks & Open Space (BCPOS) natural areas for the control of noxious weeds, primarily cheatgrass. This method is used infrequently but makes it possible to treat inaccessible area, areas with extreme grades, and areas with some of the highest biodiversity. Other application methods may not be safe in these areas and pose risks to the health and safety of employees. The use of drones allows Boulder County to safely meet the needs for application as dictated by the Management Objectives (outlined in Section 4) and Implementation Goals (See Appendix B, IWMP Implementation on BCPOS Natural Lands, 2024-2027) on these sites. Drones are characterized by low flight height (8-12 feet is optimal) and minimal drift (up to 10 feet).

Application Site Selection

The following criteria will be used to identify drone treatment areas:

- Applications will be conducted in areas identified as mostly inaccessible by motorized ground vehicles or areas where it would reduce safety hazards for ground crews; for example, areas with steep grades and rocky terrain.
- Because of low application height (8-12 feet is optimal) and drift potential (5-10 feet), applications will occur no closer than 660 feet from municipality boundaries or residential areas adjacent to BCPOS properties.

Notification of Drone Application

A variety of notifications for drone applications will be employed:

- Notice will be posted on the BCPOS Invasive Weeds webpage by 8 a.m. on the Friday prior to week of application. See www.boco.org/weeds.Members of the public will have the option to sign up for email or text messages; these notifications will post on the Friday prior to the week of application.
- Other notification methods may be used including signage and property closures.

Drone Buffers

BCPOS' recommended drone buffers are outlined below. Recommended buffers are significantly greater than application buffers specified on product labels.

- 25 feet from the BCPOS property boundaries in cases where there are no adjacent residences.
- 1/8 of a mile (660 feet) from municipal boundaries or residential areas adjacent to Boulder County Open Space.
- If application occurs within 1/8 of a mile (660 feet) from a trail, that trail will be closed on the day of application.
- If adjacent landowner requests or agrees to a smaller buffer, it may be considered.
- 25 feet from the transition line of riparian areas into terrestrial areas next to open water.

Drift Mitigation Measures for Drones

Drift mitigation measures are based on best management practices and will include:

- On-site weather monitoring; no treatment when winds exceed herbicide label requirements.
- No treatment when weather forecasts predict chance of rain in next 48 hours.
- BCPOS will monitor drift through use of drift cards wherever drone application is used.