City of Fort Collins
Natural Areas Program

Vegetation Management Guidelines

Originally developed in 2004 and administratively adopted, an addendum was included to these guidelines in 2015 in conjunction with the revision of the 2015 Restoration Plan.

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Executive Summary

In 2004 Natural Areas Program staff was compelled to examine the need to expand our program's methods, treatments and management of vegetation as a result of a 270% increase in the acreage of land to be managed (approximately 29,000 acres).

A set of goals and principles, consistent with the Natural Areas' mission were established against which six vegetation management techniques were evaluated. The techniques included prescribed burning, fuel reductions, forest and shrubland thinning, salvage logging, prescribed grazing and weed control. All tools were judged to be consistent with the Natural Areas Program mission, goals and stated objectives with the exception of salvage logging which was determined to be inconsistent with the program's mission. The remaining five vegetation management activities may be employed in future management where specific objectives are defined. Because an overarching, general agreement could be reached on prescribed grazing, it was determined that grazing decisions will be made on a case by case basis.

This document and its policies are intended to provide broad direction related to how vegetation is managed on City of Fort Collins Natural Areas. This working document can and will be updated and modified as needed with input from the Natural Resources Advisory Board and approval by the Natural Resources Director.

Introduction

Background

Since 1992 the Natural Areas Program has actively managed and restored lands as part of an active land management and restoration program. Historically, program staff has successfully used standard methods for vegetation management and the control of weeds including mowing, weed spraying, hand pulling, etc. Growth of the Natural Areas Program land inventory in its first ten years demanded increased levels of staff effort through that decade. The addition of regional natural areas in 2003 and 2004, and the consequential tripling of the number of acres managed (now approximately 29,000 acres), produced the need to expand the vegetation management toolbox.

The need to expand ecological restoration efforts, increase weed control efforts, and manage vegetation beyond traditional reactive type treatments will require heightened efforts to restore cycles of periodic, natural disturbance. Fire, grazing, climate, and traditional human uses have worked together through the millennia to create and maintain natural balances in the ecosystems characteristic of the Fort Collins area. The disruption of this balance through human land settlement and development, conversion of native grasslands to agriculture, diversion/use of natural water flows, and other human uses are typically cited by scientists as a primary cause for the spread of weeds, catastrophic wildfires, and loss or degradation of wildlife habitat. The mission of the Natural Areas Program compels managers to reverse these trends on natural areas where possible.

As the weed control, restoration, and wildlife habitat management programs move forward into a collective resource management program, natural areas staff identified the need to develop a series of vegetation management guidelines to aid in decision making. These guidelines identify under what circumstances certain tools will be used to manage vegetation for multiple purposes on City of Fort Collins natural areas.

Process

During the spring of 2004, natural areas staff held a series of seven meetings to discuss a variety of vegetation management related topics. In addition, staff meet with experts on grazing management from Colorado State University (Dr. Jim Detling and Dr. Wayne Lehniger) as well as Heather Knight from The Nature Conservancy and John Fusaro of the Natural Resource Conservation Service. The purpose of these meetings was to gather information and agree to a set of internal "umbrella" guidelines that will guide future vegetation management activities. This document will be considered a "living document" that will be updated or modified as needed. However, any changes made to the document are intended to be reviewed and approved by the Natural Resources Director prior to implementation.

Natural Areas Program Mission Statement
The mission of the City of Fort Collins Natural Areas Program is to protect and enhance lands with existing or potential natural areas values, lands that serve as community separators, agricultural lands, and lands with scenic values. Protection of natural habitats and features is the highest priority, while providing opportunities for education and appropriate recreation for the Fort Collins community.

General Principles of Vegetation Management
Prior to the development of vegetation management guidelines, it became necessary to identify the specific vegetation management goals consistent with the mission of the Natural Areas Program. The ten generalized principles listed below provide the framework upon which specific management treatments (mechanical, biological, chemical and fire) will be evaluated. While the goals of vegetation management can be diverse, these principles are listed in general order of priority and provide guidance for future management.

Vegetation on Fort Collins Natural Areas will be managed to:

1. Promote ecosystem function
2. Maximize wildlife benefit including biodiversity and species of concern
3. Enhance pre-European landscape qualities including flora and fauna
4. Reduce prevalence of weeds and other undesirable species
5. Enhance visual/aesthetic appeal
6. Prevent and control erosion
7. Enhance the cultural landscape and protect historic structures
8. Prevent catastrophic wildfire
9. Reduce conflict with neighbor properties
10. Promote working landscapes

Likewise, listed below are a set of principles that guide the Natural Areas Program's decision making process:

1. Vegetation will be managed under a long-term (>30 years) timeframe. Public education will be necessary to understand vegetation management as both an on-going and evolutionary process.

2. Native plant communities in a state of "dynamic equilibrium" are not evolving since natural disturbance cycles (native grazers, wildfire) have been largely eliminated at the scale of our land conservation work. To sustain natural landscapes it will be necessary for management to initiate action to mimic natural disturbance regimes.

3. As increasingly large areas of land are acquired and managed, it will be necessary to integrate additional management tools into the management toolbox. Consistent with this, the Natural Areas Program should maintain the greatest number of management tools, yet employ each tool with discretion based on a case by case analysis.

4. Vegetation shall be managed for the purpose of improving resource condition specific to conservation objectives and consistent with the general principles listed above. Any financial or economic gain resulting from such action is considered a secondary benefit whose proceeds shall be reincorporated into the Natural Areas Program general operating budget.

5. Management tools shall be chosen such that the systemic health of a given site is increased and negative impacts to the land minimized

In the following sections of this document, the Vegetation Management Working Group (a subset of natural areas staff) outlines the general guidelines for specific vegetation management activities including: prescribed fire, fuels reduction, forest and shrubland thinning, salvage logging, prescriptive grazing and weed control. In each section, a policy basis for each guideline is presented in addition to a matrix that compares the activity against the 10 principles of vegetation management stated above.

Section 1: Guidelines for the Use of Prescribed Fire

Policy question:
As a general guideline, under what circumstances will the Natural Areas Program use prescribed fire to achieve goals related to vegetation management? Should the use of prescribed fire be permitted on an experimental basis?

Policy Guideline:
The use of prescribed fire (including experimental uses) shall be permitted for the purposes of achieving vegetation management objectives consistent with principles outlined in this document. The use of prescribed fire shall follow all local and state regulations for permitting and be coordinated with Poudre Fire Authority or other authorizing fire agency (e.g. Larimer County). When prescribed fire is used, the Natural Areas Program shall:

1. Complete a controlled burn plan detailing the timing, location, objectives, short and long-term benefits, risk of escape, line of authority and contingency plans;
2. Acquire all necessary state and local air quality permits;
3. Complete an inventory of on-site resources (wildlife, water, infrastructure, etc.) at risk from the activity and design plans for mitigation.

Discussion:
The Natural Areas Program recognizes that fire is a natural process with a historic basis in many of the plant communities commonly found locally and regionally. Fire is well documented in the scientific literature for creating a landscape mosaic of vegetation and disturbance patterns that creates a landscape heterogeneity beneficial for plant community and wildlife diversity. Fire can improve forest and grassland health by removing excessive biomass or decadent vegetation, recycling nutrients, and reducing weed infestations. In addition to these benefits, fire is a management tool that is "light on the land" since it does not in modify prior soil condition through soil compaction or erosion like the use of heavy equipment or machinery may promote.

The Vegetation Management Working group understood that the use of prescribed fire (including experimental uses) carries advantages and disadvantages that must be weighed on a case-by-case basis. The most significant, potential, negative impacts are those related to impairment of air and visual quality during a given burn. Prescribed fire also requires additional planning and permitting that other vegetation management activities do not. Finally, at this time, the Natural Areas Program does not have full capability to conduct its own prescribed burns and requires interagency assistance (Note: This is typical situation for non-federal land management agencies. Agencies similar in size or scope such as other municipal open space programs require interagency efforts for both prescribed and wildland fire suppression.).

Prescribed Fire – Summary

The table below shows how prescribed fire relates to the vegetation management principles established by the Natural Areas Program.

Relationship between Prescribed Fire and Vegetation Management Principles

(C = Consistent I = Inconsistent DO = Depends on Objectives N/A = Not applicable)

	C	I	DO	N/A	Comments
1. Promote ecosystem function	**X**				
2. Maximize wildlife benefit including biodiversity and species of concern			**X**		Can be used to create desired habitat for target species or impact non-target species
3. Enhance pre-European landscape qualities including flora and fauna	**X**				
4. Reduce prevalence of weeds and other undesirable species	**X**				
5. Enhance visual/aesthetic resources			**X**		Temporary "blackened" appearance. Can be used to open scenic vista is shrub or forest setting.
6. Prevent and control erosion		**X**			Exposes soil to erosion from heavy rains. Depends on soil texture and slope conditions.
7. Enhance the cultural landscape and protect historic structures				**X**	
8. Prevent catastrophic wildfire	**X**				
9. Reduce conflict with neighbor properties			**X**		Wildfire mitigation is a positive benefit. Smoke production during burn may cause a temporary negative impact.
10. Promote working landscapes				**X**	

This table shows that prescribed fire can be used to meet resource objectives when possible negative consequences (smoke production, potential erosion and visual impacts) can be managed or mitigated.

Section 2: Guidelines for Fuel Reduction Activities

Policy Question:
As a general guideline, should the Natural Areas Program engage in vegetation management activities with the objective of reducing biomass for the purposes wildfire mitigation in natural areas? If yes, when is it appropriate?

Policy Guideline:
The reduction of biomass through thinning, mowing, prescribed fire, or other treatments shall be permitted in areas where life, property, or other human values are determined to be at risk. Risk exposure may be determined by evaluating the type and quantity of vegetative buildup, it's proximity to property or other values, and the extent fire-prone conditions such as a hillside location, periods of drought conditions, "arson-prone" areas, and other similar factors.

In these instances, the Natural Areas Program shall:

1. Inventory the wildlife, plants and other resource values in advance of project to determine potential impacts of the proposed activities;
2. Implement appropriate actions to mitigate resource impacts;
3. Design the activity to enhance resource condition when possible (e.g. create irregular edges, "feather" edges to provide transition and avoid "hard" boundaries).
4. Select the method of treatment (mechanical, prescribed fire, chemical, etc) determined to be the least impact to the resources at risk when practical.

Discussion:
The Natural Areas Program recognizes that most natural areas lie within the suburban and ex-urban landscape. For this reason it may be necessary at times to manage vegetative (fuels) buildup within the natural areas for the sole purpose of wildfire risk mitigation to adjoining properties.

The Vegetation Management Working group recognized that the reduction of biomass through thinning, mowing, prescribed fire had the advantages of: 1) reducing exposure to catastrophic wildfire; 2) demonstrating intent and willingness to mitigate when necessary from a liability standpoint; and 3) being a good neighbor. The potential disadvantages of this guideline included: 1) activity may not have ecological benefit; 2) activity could impact primary conservation value; and 3) guideline is not consistent with the general concept of a "natural area" when fuels reduction is the single objective.

Fuels Reduction - Summary

The table below shows how fuels reduction activities relate to the vegetation management principles established by the Natural Areas Program.

Relationship between Fuel Reduction and Vegetation Management Principles

(C = Consistent I = Inconsistent DO = Depends on Objectives N/A = Not applicable)

	C	I	DO	N/A	Comments
1. Promote ecosystem function			**X**		"Un-natural" accumulations of fuels could increase wildfire intensity/severity.
2. Maximize wildlife benefit including biodiversity and species of concern			**X**		Downed woody material may be important for rodents and wood boring birds. However, removal of downed woody material may improve range quality for species dependant on grass for forage.
3. Enhance pre-European landscape qualities including flora and fauna		**X**			
4. Reduce prevalence of weeds and other undesirable species	**X**				
5. Enhance visual/aesthetic resources			**X**		
6. Prevent and control erosion		**X**			
7. Enhance the cultural landscape and protect historic structures	**X**				Mitigates risk of damage due to wildfire
8. Prevent catastrophic wildfire	**X**				
9. Reduce conflict with neighbor properties	**X**				Mitigates risk to neighboring properties
10. Promote working landscapes				**X**	

This table shows that fuels reduction is a very specific activity that can mitigate the risk of wildfire to both human and natural values. However, fuels reduction without very specific objectives will typically be inconsistent with natural areas management objectives.

Section 3: Guidelines for Forest and Shrubland Thinning

Policy Question:
As a general policy, should the Natural Areas Program engage in management activities with the objective of reducing biomass (forest or shrubland thinning) for the purposes of resource benefit (e.g. enhancing wildlife habitat) in natural areas? If yes, when is it appropriate?

Policy Guideline:
The reduction of biomass through mechanical, chemical or other (prescribed fire) means is permitted for the purposes of improving resource benefit including but not limited to: restoration to native or targeted plant communities, enhancement of wildlife habitat, removal of diseased trees or those infested with non-native pests, enhancing scenic features, creation or maintenance of designated recreational trails.

Discussion:
The mission of the Natural Areas Program is to "…*protect and enhance lands with existing or potential natural areas values*…". Thus the mission statement guides the program to implement management activities consistent with existing or potential habitat for target wildlife, native plant communities, or other natural value. It is possible that forest thinning, like grazing has economic value through a lease. However, these guidelines state that economic benefit alone is not enough cause to engage in this activity and that there must be a demonstrated resource benefit. Possible disadvantages recognized by the group included unknown indirect impacts to non-target species and exhibiting preference of one conservation value over another.

Forest and Shrubland Thinning - Summary

The table below shows how forest and shrubland thinning relates to the vegetation management principles established by the Natural Areas Program.

Relationship between Forest/Shrubland Thinning and Vegetation Management Principles

(C = Consistent I = Inconsistent DO = Depends on Objectives N/A = Not applicable)

	C	I	DO	N/A	Comments
1. Promote ecosystem function			**X**		
2. Maximize wildlife benefit including biodiversity and species of concern	**X**				Typically used to enhance some habitat feature.
3. Enhance pre-European landscape qualities including flora and fauna				**X**	Pre-European condition is largely unknown.
4. Reduce prevalence of weeds and other undesirable species			**X**		Depends on condition of soil, seed bank, and nearby weeds.
5. Enhance visual/aesthetic resources	**X**				Can open a scenic viewpoint
6. Prevent and control erosion		**X**			Less biomass to intercept rain and surface flows.
7. Enhance the cultural landscape and protect historic structures	**X**				Mitigates risk of damage due to wildfire.
8. Prevent catastrophic wildfire	**X**				Reduces fuel loadings.
9. Reduce conflict with neighbor properties			**X**		Depends on many factors.
10. Promote working landscapes	**X**				Promotes forest management activities such a sustaining wood/fiber supplies, etc.

This table shows that forest and/or shrubland thinning can be used to meet defined resources objectives. However, forest and shrubland thinning without very specific objectives will typically be inconsistent with natural areas management objectives.

Section 4: Guidelines for Salvage Logging

Policy Question:
As a general guideline, should the Natural Areas Program permit salvage logging in forests following catastrophic disturbance (wildfire, windstorm, insect/disease) for the purpose of utilization of dead timber? If so, under what circumstances? If not, why not?

Policy Guideline:
The Natural Areas Program shall not permit salvage logging activities on natural areas when an overarching resource (biological, ecological, hydrological, etc.) benefit cannot be demonstrated. Salvage logging solely for the purposes of economic utilization (no resource benefit) is inconsistent with the general principles of vegetation management and philosophy of the natural areas program.

Discussion:
The Vegetation Management Working Group focused on an existing situation at Bobcat Ridge Natural Area. The 2000 Bobcat Ridge Fire consumed more than 22,000 acres of montane forest including approximately 1,000 acres within Bobcat Ridge Natural Area. The Natural Areas Program acquired the property in 2003. At that time, an existing (but not formally leased) salvage logging operation was removing dead (standing or lying), but merchantable timber. This policy question was driven by whether that operation should be permitted to continue and if it were determined to have ecological or other outcomes valued by the Natural Areas Program.

The Oregon Society of American Foresters provides the following characterization of salvage logging which helped the Vegetation Management Working Group understand the activity (a more complete statement is provided in Appendix A):

Salvage harvesting removes timber from an area that has been altered by an unforeseen and uncontrollable event, such as wildfire, that results in large concentrations of dead and damaged trees. Salvage harvesting is a reactive treatment with the principal purpose of recovering economic value of the trees that have been damaged. Other objectives may include reducing the risk of future wildfire, insect, or safety problems or promoting faster reforestation. Because dead and damaged trees decay quickly and consequently lose economic value, the timeliness of conducting salvage harvesting is imperative.

Although some benefits from this activity were identified (economic gain from a lease that could further other conservation work, and the removal of hazard trees along trails and other recreational areas), there was overwhelming group support to not permit this activity. The rationale broke down into three specific areas: 1) there was no scientific basis to support salvage logging as an ecological "benefit"; 2) dead trees or "snags" are widely recognized to support a variety of wildlife; and 3) salvage logging is inconsistent with the concept of "naturalness" that the natural areas program is founded.

Salvage Logging - Summary

The table below shows how salvage logging activity relates to the vegetation management principles established by the Natural Areas Program.

Relationship between Salvage Logging and Vegetation Management Principles

(C = Consistent I = Inconsistent DO = Depends on Objectives N/A = Not applicable)

	C	I	DO	N/A	Comments
1. Promote ecosystem function		**X**			Eliminates biomass from the natural system
2. Maximize wildlife benefit including biodiversity and species of concern		**X**			Eliminates snag trees for nesting perching. Removes carbon mass for decomposers.
3. Enhance pre-European landscape qualities including flora and fauna		**X**			Contrary to what a pre-European landscape condition following catastrophic disturbance
4. Reduce prevalence of weeds and other undesirable species				**X**	
5. Enhance visual/aesthetic resources			**X**		Depends on individual preferences
6. Prevent and control erosion		**X**			Less biomass to intercept rain and surface flows
7. Enhance the cultural landscape and protect historic structures				**X**	
8. Prevent catastrophic wildfire	**X**				Reduces fuels
9. Reduce conflict with neighbor properties				**X**	
10. Promote working landscapes	**X**				Promotes forest management activities such as production of wood and fiber.

This table shows that salvage logging is inconsistent with natural areas management objectives at this time .

Section 5: Guidelines for Prescriptive Grazing

Policy Question:
As a general guideline, should the Natural Areas program use prescriptive grazing by domesticated cattle and other grazers in natural areas as a tool to manage vegetation? If yes why? If no, why not?

Policy Guideline:
Decisions on prescriptive grazing by domesticated cattle and other grazers will be made on a case-by-case and site-by-site basis.

Discussion:
This issue was difficult to address because of the complexity of the issue and limited staff expertise. Ultimately there was no consensus amongst staff. Dr. Jim Detling and Dr. Wayne Lehniger from Colorado State University were consulted, each spending 2 hours with staff making presentations and answering questions. The following narrative reflects both the consultations and staff discussions associated with prescriptive grazing. In Appendix B is a listing of what other local open space programs are doing relative to prescriptive grazing.

It is generally accepted that grasslands as we know them today (including natural areas managed by the City of Fort Collins) evolved and have coexisted with large ungulate grazing. However, historically neither bison nor cattle were ever the only grazers. Other grazing animals included insects, small mammals, and native ungulates such as deer, elk, and antelope which may have been equally or more important grazers in some instances. Similarly, other natural disturbance processes including fire and drought combined with grazing shaped the composition and structure of grasslands prior to European settlement of the area. Since that time (circa 1840 in the Fort Collins area), agriculture, land conversion to developed uses, and 20th century infestations of noxious weeds have acted to negatively impact the distribution and ecological integrity of grasslands native to the Fort Collins area.

It is generally accepted that grasslands require some form of periodic aboveground biomass removal (disturbance) to ensure well-developed root systems. Today, larger-scale disturbance by fire or grazing (with the exception of prairie dog towns) is generally lacking or absent on Fort Collins natural areas. The long-term health and habitat quality of city-owned grasslands may depend on a carefully planned and measured prescriptive grazing or prescribed burning program. Dr. Lehniger indicated that mowing did not "mimic" either grazing or burning since the recycling of nutrients and biomass removal processes are not replicated.

The Vegetation Working Group indicated that case-by-case and site-by-site decisions should carefully weigh the possible advantages and disadvantages listed below prior to permitting prescriptive grazing on city-managed natural areas:

Possible Advantages

- Benefit from biomass removal and nutrient recycling
- "Mimics" natural disturbance regime
- Sense of "rural character" or supporting working landscapes
- Carefully planned grazing could improve grassland condition
- Income from lease

Possible Disadvantages

- Potential conflict with recreation users or management necessary to reduce interaction between users and grazers (fence, staff, etc.)
- Competition for forage resources with wildlife
- Cattle may graze non-target species/not graze targeted species, or timing of grazing may not be optimal.
- Staff resources will be required to administer, manage, and monitor leased areas
- Un-natural appearance of "cow patties", fencing and stock tanks
- Departs from concept of "wilderness" or "naturalness"
- Possible public debate over cattle grazing on public lands and the issue of private benefit derived from public land.

Some of the key conclusions our group was able to agree on were the following:

- Herbivory is an ecological process
- Acknowledgement that grazing by native fauna was part of the historical regime for grasslands types found in the Fort Collins area.
- Restoration of native grazers is appropriate in natural areas.
- Acknowledgement that "prescriptive" grazing was the question under discussion, not grazing by native wildlife.
- Prescriptive grazing can fall into two categories: native (bison, others) and non-native (cattle, sheep, goats, etc.).
- There was strong opposition to permitting grazing in riparian areas.
- Grazing should be kept in the management toolbox for vegetation management but prescribed on a case-by-case basis.

Prescribed Grazing - Summary

The table below shows how prescriptive grazing relates to the vegetation management principles established by the Natural Areas Program.

Relationship between Prescribed Grazing and Vegetation Management Principles

(C = Consistent I = Inconsistent DO = Depends on Objectives N/A = Not applicable)

	C	I	DO	N/A	Comments
1. Promote ecosystem function			**X**		Biomass removal and nutrient recycling, could have negative impacts as well
2. Maximize wildlife benefit including biodiversity and species of concern			**X**		Typically prescribed to enhance a specified target
3. Enhance pre-European landscape qualities including flora and fauna	**X**				Restoration of native grazers such as bison, etc. Not true for domesticated animals.
4. Reduce prevalence of weeds and other undesirable species	**X**				Must be carefully prescribed
5. Enhance visual/aesthetic resources	**X**				Native grazers enhance "wilderness" appeal. Domesticated grazers enhance "rural character".
6. Prevent and control erosion		**X**			Overgrazing can lead to erosion.
7. Enhance the cultural landscape and protect historic structures				**X**	
8. Prevent catastrophic wildfire	**X**				Enhance biomass removal
9. Reduce conflict with neighbor properties			**X**		
10. Promote working landscapes	**X**				Grazing is a form of land utilization for human benefit.

The table above shows that carefully managed prescriptive grazing with defined objectives and monitoring parameters can be used to meet resource objectives. However, it is important to note that grazing by domesticated cattle versus native grazers is likely to produce differing results depending how carefully the animals are "ranched" (i.e. grazing rotation, defined pastures, etc.).

Section 6: Guidelines for Weed Control

Policy Question:
As a general policy, what means of weed control (plants) are appropriate for use in Natural Areas? What thresholds warrant initial management action control weeds?

Policy Guideline:
The City of Fort Collins Natural Areas Program will use an integrated approach to weed management (or "Integrated Weed Management System" (IWMS)) on all sites managed by the program. An integrated weed management system includes the use of chemical, cultural, and mechanical means of weed control. In special circumstances, biological agents of weed control will be used only when it can be scientifically demonstrated that the biological agent is target specific and does not produce secondary, negative ecological consequences.

Discussion:*
Noxious weeds present perhaps the most significant ecological threat to Natural Areas system wide. The City of Fort Collins Natural Areas Program manages noxious weed species as defined by the State of Colorado Noxious Weed Law (Title 35 Article 5.5). The noxious weed law assigns species to a priority list based on current extent of state-wide weed infestation, invasive characteristics, and potential economic and ecological impacts. The Natural Areas Program will use the state weed list as a "minimum required" management guideline and will assess additional non-native species and control intensity measures as staff deem necessary.

No single method of control can be expected to satisfactorily manage weedy exotic plant species across the broad spectrum of habitats encompassed by City of Fort Collins natural areas. It is thus necessary to utilize an IWMS to promote the competitive vigor of the desired native vegetation (cultural control) while eliminating non-desirables through chemical, mechanical, or biological means. At the same time, an understanding of the exotic species' biology is used to reduce existing infestations, and to prevent their further establishment and reproduction.

The goals of the weed control program are as follows:

1. Prevent the establishment of new exotic plant populations.
2. Enhance the ecological integrity of City of Fort Collins Natural Areas through an aggressive reduction in the extent and degree weed occupied lands.
3. Heighten the effectiveness of weed control through inventory, monitoring, and adaptive weed management.

In the paragraphs to follow, we provide a brief description of each form of weed control and illustrate their appropriate use within the Integrated Weed Management System.

*It is important to begin this discussion by stating that this section deals with plant invasive species (weeds) and not with faunal species such as non-native fish, insects, or other animal species.

Chemical Weed Control
Chemical control refers to the use of synthetic -made chemical products (herbicides) as control agents. All herbicides used by the City of Fort Collins Natural Areas Program are approved by the U.S. Environmental Protection Agency for that purpose. Herbicide controls target plants in a variety of ways. Some interfere with hormone production, which may cause uncontrolled growth. Some interfere with vital life processes. There are two basic types of herbicides: selective and non-selective. Selective herbicides target a particular grouping of plants such as broad-leaf plants or the mustard family. Non-selective herbicides control any plant that receives a sufficient dose of the herbicide. Herbicides can be foliar applied or soil applied. Some may be applied either way. Some have a half-life of several years allowing for residual control of the target species, while others become inactive once bound to soil particles.

Cultural Weed Control
Cultural control involves the cultivation of desirable plants, in this case native species, on a site where weed control has already met with some success. The principle behind cultural control is competition. The desirable species compete with the weedy species for resources, thereby inhibiting the weedy species' ability to invade and take over a site. Cultural control can be executed with varying degrees of intensity. It can range from activities as simple as enhancing previously established species to intensive tillage and re-seeding.

Mechanical Weed Control
Mechanical control includes every other non-biological method of direct control. The most common practices in exotic plant management are mowing, pulling, or burning. Other methods include tilling, chaining, root plowing, or flooding. Many of these methods can be costly as they require greater labor intensity or specialized equipment.

Biological Weed Control
Biological weed control is the introduction of native or non-native weed pests (mites, beetles, domestic livestock (sheep, goats, etc.) for the purpose of interfering with some portion of weed (plant) development including rooting, reproduction, or foliar development.

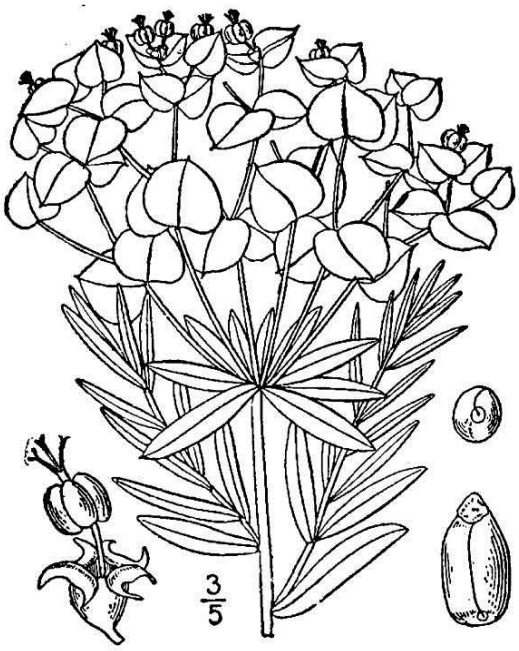
Although biological pests have been used in the past by the natural areas program, there is growing concern that there may be secondary or non-target impacts that are not possible to control, measure or monitor. For instance, the introduction of flea beetles into a field to control leafy spurge may assist in controlling that species, however, it is not well understood what other undesirable environmental interactions could result from the release of this non-native insect. For this reason, there was agreement among the vegetation management-working group to set a very high threshold in order to demonstrate the biological agent is target specific with little risk of secondary, non-target impacts.

The use of biological agents for the purposes of weed control shall consider:

- target specificity
- decades or more of relevant research by qualified organizations
- demonstration that non-target impacts are not significant
- policies or best management practices recognized by nation-wide "clearinghouses" of such information by qualified organizations

Prevention

In addition to the control methods listed above there are preventative measures that can be taken to help stop the spread of new infestations. Prevention implies not allowing the exotic species to become established in the first place. This differs from the other control methods since it is not a direct attack on the targeted weed species. Rather, it uses an indirect approach primarily through educational outreach. Such programs as the Certified Weed-free Hay and Noxious Weed Awareness Week programs are good examples that promote education and prevention.



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Bromus tectorum image courtesy of: USDA-NRCS PLANTS Database / **Hitchcock, A.S. (rev. A. Chase). 1950. *Manual of the grasses of the United States*. USDA Misc. Publ. No. 200. Washington, DC.**

Weed Control - Summary

The table below shows how weed control relates to the vegetation management principles established by the Natural Areas Program.

Relationship between Weed Control and Vegetation Management Principles

(C = Consistent I = Inconsistent DO = Depends on Objectives N/A = Not applicable)

	C	I	DO	N/A	Comments
1. Promote ecosystem function	**X**				
2. Maximize wildlife benefit including biodiversity and species of concern	**X**				
3. Enhance pre-European landscape qualities including flora and fauna	**X**				
4. Reduce prevalence of weeds and other undesirable species	**X**				
5. Enhance visual/aesthetic resources	**X**				
6. Prevent and control erosion			**X**		Any biomass removal can expose soil to erosion.
7. Enhance the cultural landscape and protect historic structures	**X**				
8. Prevent catastrophic wildfire	**X**				
9. Reduce conflict with neighbor properties	**X**				
10. Promote working landscapes				**X**	

This table shows that weed control may be accomplished in a manner that meets the defined resource objectives and remains consistent with the vegetation management principles.

Appendix A

Background position paper on salvage harvesting borrowed from the Oregon Society of American Foresters.

Salvage Harvesting
A Position by the Oregon Society of American Foresters

Issue
Salvage harvesting has generated considerable controversy, particularly when proposed on public lands. Some view salvage harvests as a way to use resources that would otherwise be wasted and to generate some economic benefits in impacted communities. Others view salvage harvests as causing additional harm to the environment and some also view salvage and other commercial harvesting on federal forest lands as inappropriate. In recent years these contrasting perspectives have resulted in major disagreements over salvage harvesting on public land, including legal actions to prevent or to expedite its use. Actions that delay salvage harvesting are an important issue because damaged trees quickly deteriorate and lose value, which can limit project viability and harvest system options as potential timber values decline.

Background
Salvage harvesting removes timber from an area that has been altered by an unforeseen and uncontrollable event, such as wildfire, that results in large concentrations of dead and damaged trees. Salvage harvesting is a reactive treatment with the principal purpose of recovering economic value of the trees that have been damaged. Other objectives may include reducing the risk of future wildfire, insect, or safety problems or promoting faster reforestation. Because dead and damaged trees decay quickly and consequently lose economic value, the timeliness of conducting salvage harvesting is imperative.

Since the late 1980s, major wildfires and forest health problems in the West generated numerous salvage harvesting plans on federal lands, many of which were appealed by interest groups opposed to the practice. In 1995 Congress passed the "Salvage Rider" (PL 104-19) to restrict such administrative appeals, an action that sparked further controversy and arguments between opponents and proponents of salvage harvesting. Although the Salvage Rider expired in 1996, the difference of opinions concerning salvage harvesting continues because of contrasts in philosophy as well as in the interpretation of science related to the issue. Some scientists believe that human intervention following wildfires should be a low priority and that "natural" recovery of the forest is most appropriate[1].

However, this approach largely ignores important economic and social concerns. Many other scientists and forestry professionals conclude that careful management of forests based on evolving research and experience can facilitate the development of desirable forest conditions.

Salvage harvesting triggers legal requirements for reforestation, which normally exceed the mandates for forest restoration following wildfires or other catastrophic events. Additionally, the money generated from salvage harvesting can help fund restoration practices that can mitigate some of the adverse impacts of the catastrophic event. Examples include erosion control, invasive weed control, and active reforestation. This is particularly important on federal lands where a portion of receipts from any harvest is dedicated to forest restoration.

Research on salvage harvesting is limited and has been subject to different interpretations. However, existing research indicates that variability among forest sites and harvest methods can result in similarly variable effects on forest resources. This variability points to the need for site-specific plans for salvage harvesting that address environmental, economic, and social concerns. Additionally, it is important to consider the environmental, economic, and social effects of not salvaging. Although the random nature of catastrophic events precludes the preparation of detailed, site-specific plans beforehand, the value of preparing preliminary salvage plans should be recognized and integrated with routine forest planning activities. Finally, an efficient public participation process allows both adequate opportunities for constructive public input as well as timely implementation of approved plans.

[1]Beschta et al. 1995. Wildfire and salvage logging: recommendations for ecologically sound post-fire salvage logging and other post-fire treatments on federal land in the west. Report to Pacific Rivers Council, Eugene, OR. Available online.

Selected References

Fitzgerald, S.A. 2002. Post-Fire Salvage Cutting and Rehabilitation Treatments. In Fire in Oregon's Forests: Risks, Effects, and Treatment Options. S.A. Fitzgerald (ed.). Oregon Forest Resources Institute, Portland, Oregon.

McIver, J.D. and L. Starr. 2000. Environmental Effects of Postfire Logging: Literature Review and Annotated Bibliography. General Technical Report PNW-GTR-486. USDA Forest Service, Pacific Northwest Research Station, Portland, Oregon. Available as a pdf file.

Adopted by the Oregon Society of American Foresters (OSAF) Executive Committee on May 7, 2003. This statement will expire May 7, 2008 unless after thorough review it is renewed by the OSAF.

Appendix B

Response from other agencies on Prescriptive Grazing

Larimer County Open Lands
Larimer County does not have a formal policy. Grazing decisions are made based on the management plan for each open space property. Managers determine the appropriateness of grazing and the work through the Natural Resource Conservation Service to develop a grazing plan that meets the objectives of the agency and the lessee/landowner.

Ken-Caryl Ranch, Littleton, CO.
Ken-Caryl Ranch does not have formalized cattle grazing but is considering the issue as part of putting the "ranch" back into the open space property. Logistics are current limitation to the ranch related to public acceptance/etc. Managers have used goats in the past for the purposes of weed control with some success. The envision goats may have additional effectiveness in hard to reach areas like steep slopes, drainages, and in the under story of dense thickets. They are considering cattle grazing for the purposes of breaking down thatch in our tallgrass prairie areas and stimulating growth of the warm season grass species but have used prescribed burning to achieve those objectives..

Boulder County Parks & Open Space
Boulder County Parks & Open Space has a considerable amount of grazing on County owned open space parcels. Grazing occurs as part of our direction to preserve agriculture through leasing land for grazing and also as a management tool on lands for which the management priorities are not agricultural (primarily wildlife habitat and recreation). Most grazing occurs using cattle, but also horses and some sheep.

City of Boulder Open Space and Mountain Parks
First Response - City of Boulder's Open Space and Mountain Parks program has an extensive grazing program that goes back to the inception of our program in the late 1960's. "Preservation of agricultural uses and land suitable for agricultural production" are charter values of our program and we have over 15,000 acres of our nearly 43,000 acre system in prescriptive grazing management at one time of the year or another. Often our tenants are descendants of the original homesteaders and/or families who have been pursuing this lifestyle for generations. Our haying and grazing practices also help us to keep valuable agricultural water rights in production, help to preserve species of concern and provide IPM benefits.

Second Response - We do allow livestock grazing on our open space. Livestock grazing is for two main purposes. First, it meets one of our department's missions, which is to support agriculture on open space. Under the mission, we lease appropriate lands to those interested in grazing it. Livestock grazing plans are developed individually for each grazing lease. Second, it is used as a management tool on open space, primarily for weed control. We will either work with a tenant to graze for weed control, or acquire our

own animals. We haven't bought any of our own cattle, but we have purchased or leased goats and llamas.

Grazing is a beneficial management tool. Controversy over grazing on open space usually comes about when those that do not understand the use of livestock grazing question it's benefit. We have to work very closely with our agricultural tenants so that they follow our grazing guidelines, that are usually different from what they are used to. Usually, there is a learning curve involved when tenants are getting used to our grazing management.

On properties that are recently acquired and have not been set up for our standards of grazing, there is usually a lag time to get those standards in place. For example, if a riparian area is not fenced for better grazing control, it can take a year or more until we get the fencing in place. In the meanwhile, some areas may get more grazing pressure than we prefer.

Addendum

2015 Update of the Natural Areas Department Vegetation Management Plan

The following is an update to the 2007 Vegetation Management Guidelines. This update is provided in conjunction with the 2015 Restoration Plan. The policy questions raised herein remain as in the 2007 guidelines with the exception of syntax changes. Updated information on each policy area is provided. Importantly, changes to policy guidance are highlighted below.

Section 1: Guidelines for the Use of Prescribed Fire

Policy Question:
As a general guideline, under what circumstances will the Natural Areas [Department] utilize prescribed fire to achieve goals related to vegetation management? Should the use of prescribed fire be permitted on an experimental basis?

2015 Update:
The Natural Areas Department has conducted over 30 burns of various acreages since 2007. Controlled burns are considered in two categories; "prescribed" burns (permitted through the state) exceed the State of Colorado Department of Public Health and Safety threshold of 10 acres of grasslands or 50 or more slash piles, "agricultural" burns are permitted at the local level (county and fire district) and are less than 10 acres of grassland or less than 50 slash piles. The Natural Areas Department completes on average 1 prescribed burn per year with the assistance of required qualified contract personnel (currently under contract with The Nature Conservancy) and roughly 5 agricultural burns per year exclusively with in-house staff.

Policy Guideline:
The use of fire as a management tool shall be permitted for the purpose of achieving vegetation management objectives consistent with principles outlined in this document. The use of controlled burns shall follow all local and state regulations for permitting and be coordinated with the fire district in which the property lies.

When prescribed fire is used, the Natural Areas Department shall:

1. Complete a prescribed burn plan detailing the timing, location, objectives, short and long-term benefits, risk of escape, line of authority and contingency plans;
2. Acquire all necessary state and local air quality and/or open burn permits;
3. Complete an inventory of on-site resources (wildlife, water, infrastructure, etc.) at risk from the activity and design plans for mitigation.

When conducting a controlled burn under the auspices of an agricultural burn, the Natural Areas Department shall:

1. Complete a controlled burn checklist ensuring proper pre-project communications, staff assignments, and post-project follow-up.
2. Acquire all necessary state and local air quality and/or open burn permits.

Policy Guideline Change:
The policy guideline above now references two distinct controlled burn situations that require unique approaches to permitting, documentation, and site inventory. This change now allows for smaller agricultural burn projects to proceed with planning appropriate to project size.

Section 2: Guidelines for Fuel Reduction Activities

Policy Question:
As a general guideline, should the Natural Areas Department engage in vegetation management activities with the objective of reducing biomass for the purpose of wildfire mitigation in natural areas? If yes, when is it appropriate?

2015 Update:
In 2012 the Natural Areas Department initiated a program to mitigate the spread of wildfire from natural areas to neighboring lands via the mowing of fire mitigation lines on those properties that posed a significant risk of fire ignition and lacked clear control opportunities such as paved trails, wetlands, etc. These lines are managed in accordance with vegetation conditions, i.e. they are mowed more frequently when fire dangers is higher.

Policy Guideline:
The reduction of biomass through thinning, mowing, prescribed fire, or other treatments shall be permitted in areas where life, property, or other human values are determined to be at risk. Risk exposure may be determined by evaluating the type and quantity of vegetative buildup, its proximity to property or other values, and the extent fire-prone conditions such as a hillside location, periods of drought conditions, "arson-prone" areas, and other similar factors.

In these instances, the Natural Areas Department shall:

1. Inventory the wildlife, plants and other resource values in advance of project to determine potential impacts of the proposed activities;
2. Implement appropriate actions to mitigate resource impacts;
3. Design the activity to enhance resource condition when possible (e.g. create irregular edges, "feather" edges to provide transition and avoid "hard" boundaries).
4. Select the method of treatment (mechanical, prescribed fire, chemical, etc.) determined to be the least impact to the resources at risk when practical.

Policy Guideline Change:
No change at this time.

Section 3: Guidelines for Forest and Shrubland Thinning

Policy Question:
As a general policy, should the Natural Areas Department engage in management activities with the objective of reducing biomass (forest or shrubland thinning) for the purposes of resource benefit (e.g. enhancing wildlife habitat) in natural areas? If yes, when is it appropriate?

2015 Update:
To date, the Natural Areas Department has not undertaken forest or shrubland thinning projects on a significant scale.

Policy Guideline:
The reduction of biomass through mechanical, chemical or other (prescribed fire) means is permitted for the purposes of improving resource benefit including but not limited to: restoration to native or targeted plant communities, enhancement of wildlife habitat, removal of diseased trees or those infested with non-native pests, enhancing scenic features, creation or maintenance of designated recreational trails.

Policy Guideline Change:
No change at this time.

Section 4: Guidelines for Salvage Logging

Policy Question:
As a general guideline, should the Natural Areas Program permit salvage logging in forests following catastrophic disturbance (wildfire, windstorm, insect/disease) for the purpose of utilization of dead timber? If so, under what circumstances? If not, why not?

2015 Update:
No logging operations of any type have occurred on natural areas since the 2007 Vegetation Management Plan.

Policy Guideline:
The Natural Areas Program shall not permit salvage logging activities on natural areas when an overarching resource (biological, ecological, hydrological, etc.) benefit cannot be demonstrated. Salvage logging solely for the purposes of economic utilization (no resource benefit) is inconsistent with the general principles of vegetation management and philosophy of the natural areas program.

Policy Guideline Change:
No change at this time.

Section 5: Guidelines for Prescriptive Grazing

Policy Question:
As a general guideline, should the Natural Areas program use prescriptive grazing by domesticated cattle and other grazers in natural areas as a tool to manage vegetation? If yes why? If no, why not?

2015 Update:
The Natural Areas Department continues to explore the use of grazing as a management tool. With the purchase of Soapstone Prairie Natural Area, grazing became an issue that included more than ecological implications. The ecological values of grazing were clear with the quality of habitat on Soapstone, however, Natural Areas did initiate a riparian fence building project to better control access to water and the associated impacts to streams and wetlands. The cultural and agricultural values of grazing were also evident as the ranchers in the area depend on the grass of Soapstone to supplement their own pastures.

The department is also looking to bring the benefits of grazing to more urban properties. There are undoubtedly barriers to the feasibility of finding the correct leasee who will be in alignment with our vision of grassland health as opposed to maximizing profits. Work in this area will continue.

Policy Guideline:
Decisions on prescriptive grazing by domesticated cattle and other grazers will be made on a case-by-case and site-by-site basis.

Policy Guideline Change:
No change at this time.

Section 6: Guidelines for Weed Control

Policy Question:
As a general policy, what means of weed control are appropriate for use in natural areas? What thresholds warrant initial management action to control weeds?

2015 Update:
Since 2007 the Natural Areas Department has made tremendous progress on the reduction of the noxious weed species that have traditionally posed a threat to our region, namely leafy spurge and Canada thistle. Infestations of these species still exist, but at a rate roughly 10% of the geographic area occupied in the early 2000s. Staff has shifted

their focus towards State of Colorado List A species as well as providing primarily for the success of restoration projects in both grassland and riparian areas.

Policy Guideline:
The City of Fort Collins Natural Areas Department will use an integrated approach to weed management (or "Integrated Pest Management") approach on all sites managed by the department. An integrated pest management approach includes the use of chemical, cultural, mechanical, and biological means of weed control. Biological control species will only be used when tested and sanctioned for such use by the State of Colorado Department of Agriculture Plant Division and the USDA-APHIS.

Policy Guideline Change:
"Intergrated Weed Management System (IWMS)" changed to Integrated Pest Management (IPM) to be consistent with prevailing professional nomenclature. Guidance on the use of biological control species now reflects the authority and rigorous testing performed by USDA-APHIS and the Colorado Palisade Insectory to insure minimal risk.