SEVEN EASY PIECES

A TOOL FOR MANAGING NOXIOUS WEEDS ON YOUR LAND

Prepared by the Crooked River Weed Management Area

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Ordering Instructions

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Introduction

Weeds are rapidly becoming the most pressing management issue for many private landowners. Although most lands in Oregon harbor some noxious weeds, labor and funds are insufficient to permit control of all weedy species. As a result landowners and managers must, at least temporarily, choose which species to manage. Labor and financial resources are not and will not be sufficient to eradicate all invasive weeds. It is critical to use our limited resources in such a manner as to focus control efforts where they will do the most good. By using a structured, logical approach to weed management, land managers and owners should be able to protect and enhance the value of their properties. This manual presents a guide in seven easy steps (pieces) for the preparation of an integrated weed plan which is tailored to a specific site (Figure 1). The use of such a plan will enable managers and owners to be more efficient and cost effective at controlling weeds.

Basic steps in developing an integrated weed management plan covered in this guide:

1. Describe and map the property or management area
2. Inventory the weeds
3. Formulate management goals and objectives
4. Set priorities for weed management
5. Select management actions
6. Develop and implement an integrated weed plan
7. Develop and implement monitoring and evaluation

What is a weed?

Most definitions describe a weed as a plant growing where it is unwanted. However, a plant species can be desirable in one situation and undesirable in another. A weed is a plant which prevents the accomplishment of a landowner's management goals. The priority of a weed for treatment by that landowner may be measured by its impact on a site and by its interference with the landowner's goal. A weed is not necessarily a non-indigenous plant. A native plant such as western juniper (*Juniperus occidentalis*) can be considered a weed when it invades habitats and negatively impacts management objectives. In this guide, weeds are defined as those plant species which are listed as "noxious" by county weed boards or the Oregon Department of Agriculture and meet one or more of the following criteria:

- Aggressively invade or are detrimental to economic crops or native plant communities;
- Are poisonous to livestock;
- Are a carrier of detrimental insects, diseases or parasites;
- Are detrimental to the environmentally sound management of natural and agricultural ecosystems.

SEVEN EASY PIECES TO WEED MANAGEMENT PLANNING

A TOOL FOR MANAGING NOXIOUS WEEDS ON YOUR LAND

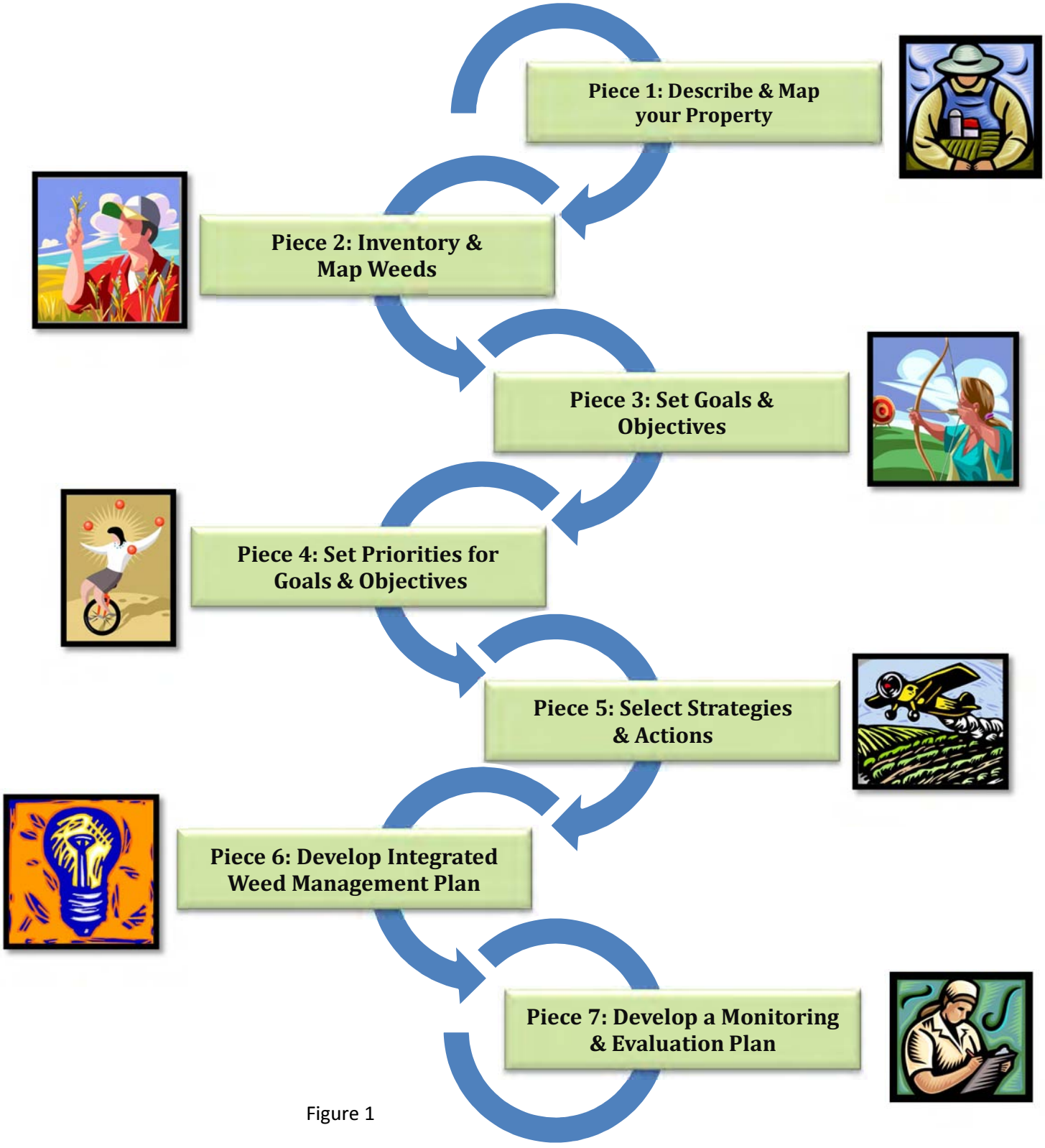


Figure 1

Why are we concerned about weeds?

- They contribute to a loss of agricultural productivity.
- After habitat destruction, they are the second greatest threat to the diversity of our natural resources.
- They adversely affect ecological processes in some of our most valuable and productive wildlife and recreational habitat. For example, cheatgrass (*Bromus tectorum*), medusahead rye (*Taeniatherum caput- medusae*) and African wiregrass (*Ventenata dubia*) increase fire frequencies and cause loss of perennial rangeland vegetation, which in turn can negatively affect wildlife populations.

Integrated Weed Management Plans (WMP)

Depending on what you already know about weeds on your property, you may need to gather information about the weeds you manage and their locations on your property. However, if you are the owner or manager of a smaller property and are already familiar with the weeds on your property you may be ready to draft a weed management plan using the approach and information presented in this manual.

Another approach to developing an Integrated Weed Management Plan appropriate for large ranch properties was put together by USDA Agriculture Research Service (ARS). Ecologically based invasive plant management (EBIPM) is a holistic framework that integrates ecosystem health assessment, knowledge of ecological processes and adaptive management to form a step-by step decision model. The goal of the EBIPM model is to move away from treating symptoms, which are the invasive plants, and direct managing efforts toward repairing the underlying causes that are facilitating the invasions. The model is easier to apply by integrating components of ecological knowledge in a user-friendly process (Figure 1- 2). This step by step process can guide a manager to implementing practical and effective restoration of rangeland. More information can be found on the EBIPM website www.ebipm.org.

Participating Ranches

As this planning format was developed, we worked with three local ranches to provide real life examples of integrated weed management plans. The owners or managers of these places assisted us in developing a process that would be usable to them. They would remind us that what we were proposing was too complicated or would take too much time and they wouldn't really use it. We would then work on suggesting methods that were easier to accomplish. We thank those folks for helping us develop a more usable format and we hope you will appreciate their willingness to volunteer their time to make this a more realistic process.

Ranch A is located on the Crooked River below Prineville. It occupies approximately 4800 acres. Meadow and upland habitats are prevalent. Meadows have issues with leafy spurge (*Euphorbia esula*) and Scotch thistle (*Onopordum acanthium*). Each year new noxious weed seeds or roots travel downstream and reinfest the areas along the river. Medusahead rye is

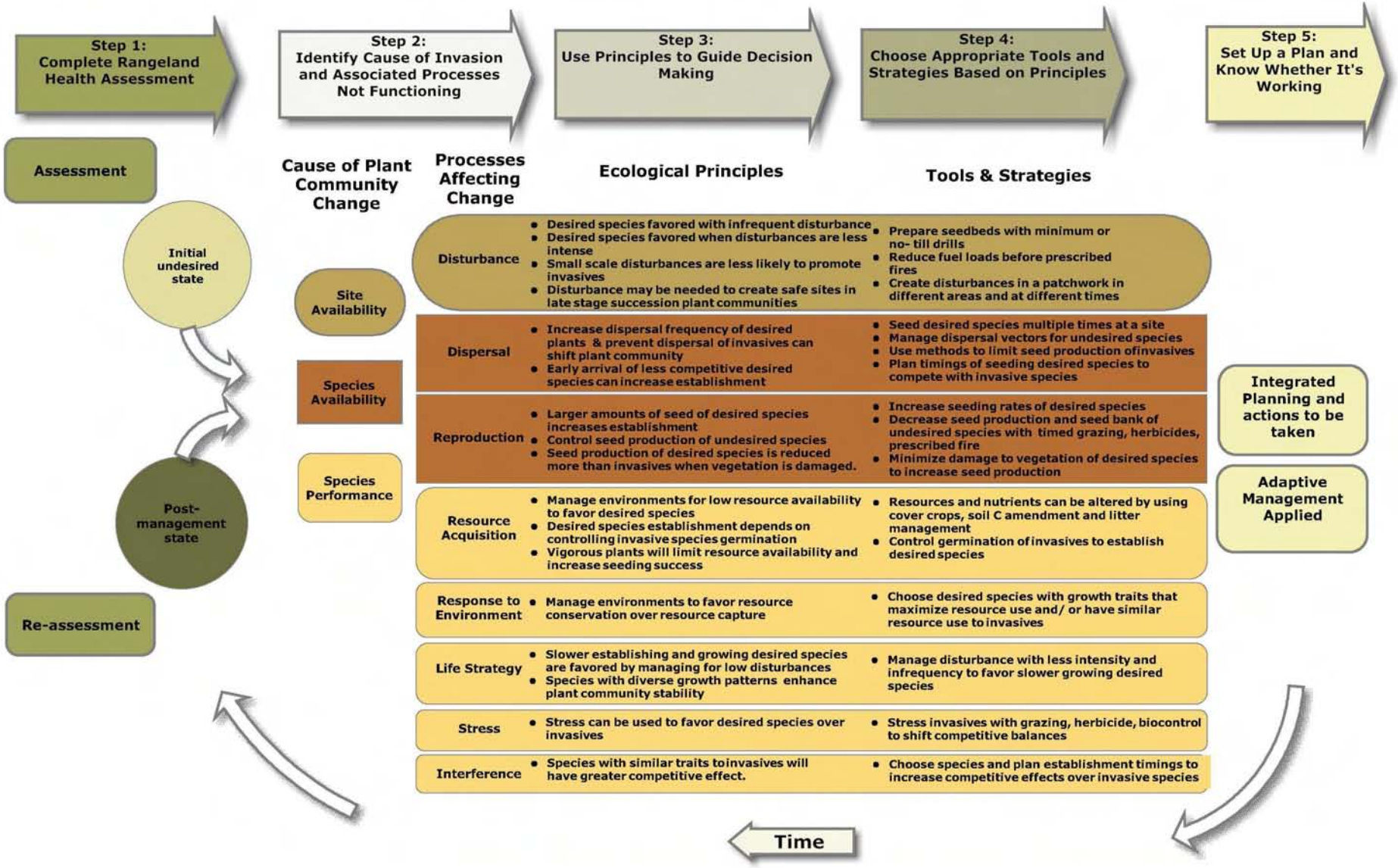


Figure 2: Ecological Based Integrated Pest Management (EBIPM) Model

to invading the uplands from adjacent public land. With the assistance of the Crooked River Weed Management Area (CRWMA) and the hard work of the manager, the noxious weeds in the irrigated meadows have been treated and are under control. The ranch now has time to work on their strategy for the uplands.

Ranch B is a small ranch (900+ acres) north of Prineville. The ground is leased and most recently is grazed by cattle in the fall. Pastures contained whitetop (*Lepidium draba*) and spotted knapweed (*Centaurea stoebe* ssp. *micranthos*). Medusahead rye is common in the uplands. For the next ten years the landowner intends to enroll most of the creek frontage into the Conservation Reserve Enhancement Program (CREP) and needs to manage the noxious weed invasion.

Ranch C is a large ranch approximately 20,000 acres near Paulina. The family runs a cow/calf operation and grows hay. The native rangeland is in near pristine condition with relatively few acres infested with noxious weeds. Small patches of Scotch thistle, Canada thistle (*Cirsium arvense*), Musk thistle (*Carduus natans*), Russian knapweed (*Acroptilon repens*), whitetop and medusahead rye are found on the property. A newly invaded, annual grass species African wiregrass (*Ventenata dubia*) threatens ecosystem integrity. It is invading so fast, we have yet to determine a viable strategy for control.

Piece 1: Describe and Map Your Property

In order to organize an effective weed management strategy, you must have a clear idea of the natural resources on your property and a means of mapping weed populations. Therefore, the first steps in the preparation of a weed management plan are to define the area to be managed and to acquire a map of the property.

Defining the Property or Management Area

Sometimes defining the management area is a simple task. In the case of smaller properties, or those with few weed infestations, it is often appropriate to regard the property as a single unit. If portions of the management area differ widely in factors such as weed species, topography, soils, elevation or management goals, it may be better to divide the area into separate management units. A rancher may want to divide their place into farm ground and rangeland. There is no rule about determining management units. However, each unit will need a management plan. If your place is small, consider the possibility of working with adjacent landowners to create one weed management area.

Gather Resources

1. Acquire an aerial photo from Crooked River Weed Management Area (CRWMA), Soil &Water Conservation District (SWCD), Natural Resource Conservation Service (NRCS soil survey), Farm Service Administration, county GIS departments, or the internet (Google earth) etc. Another option is a 7.5 minute topographic map at a scale of 1:24,000.

2. Delineate boundary of property or management area on base topographical map or aerial photograph. In most cases it is best to include the entire property in a single management plan. Consider working with adjacent landowners to create one or more Weed Management Plans.

3. Identify your resources and map fences and pastures. The following are examples of other important features to identify on your map:

- Barnyard
- Rangeland (pasture name)
- Horse pasture
- Winter feeding areas
- Sub-irrigated meadows
- Irrigated pasture
- Hay meadows
- Commercial timber
- Forest
- Important wildlife areas
- Riparian areas
- Wetlands, ponds
- Special features: hot springs, archeological sites, landing strip etc.
- Neighbors

On the following pages find aerial map examples for Ranches A, B and C.

Ranch A - Weed Management Resource Aerial Map

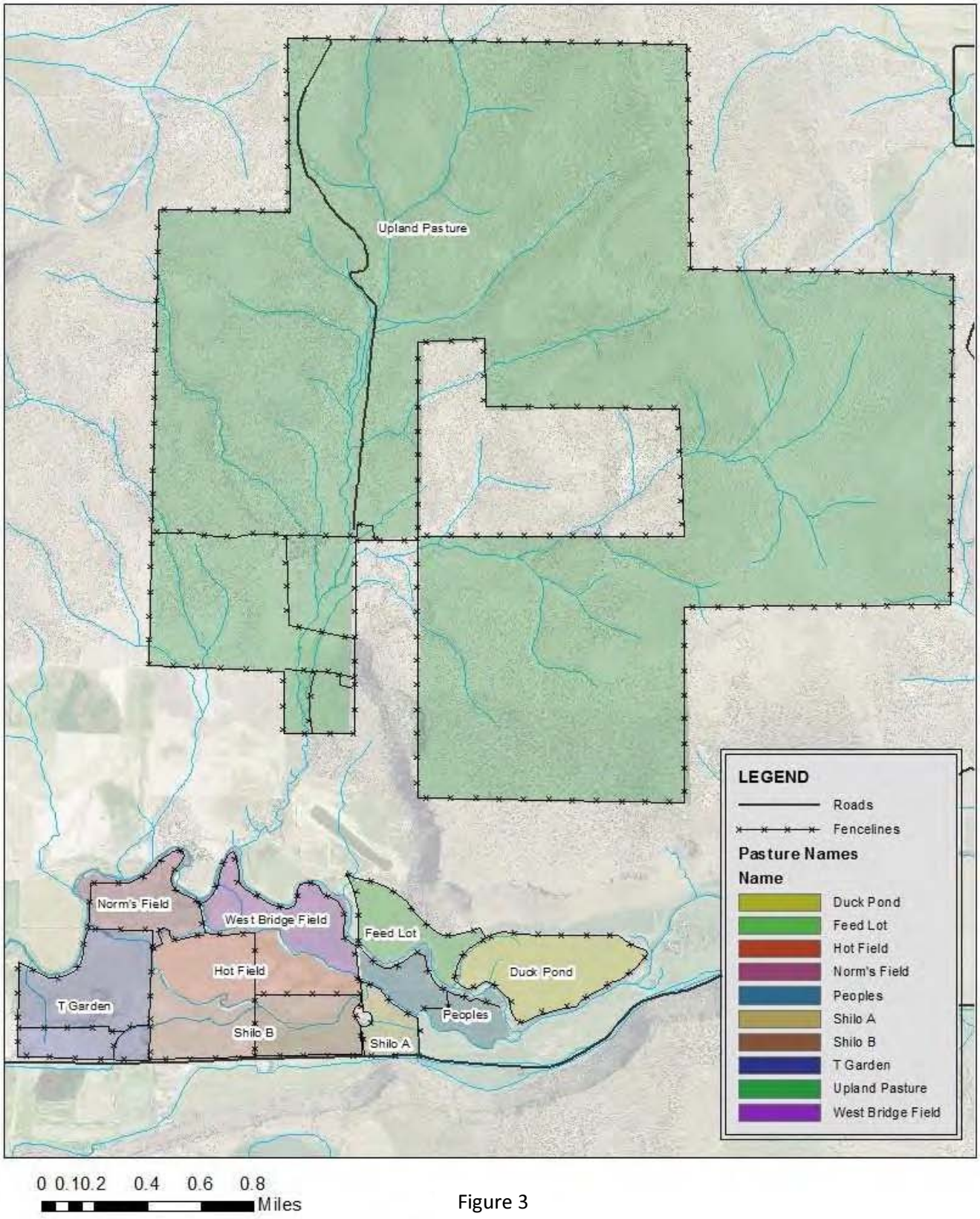


Figure 3

Ranch B - Weed Management Resource Aerial Map

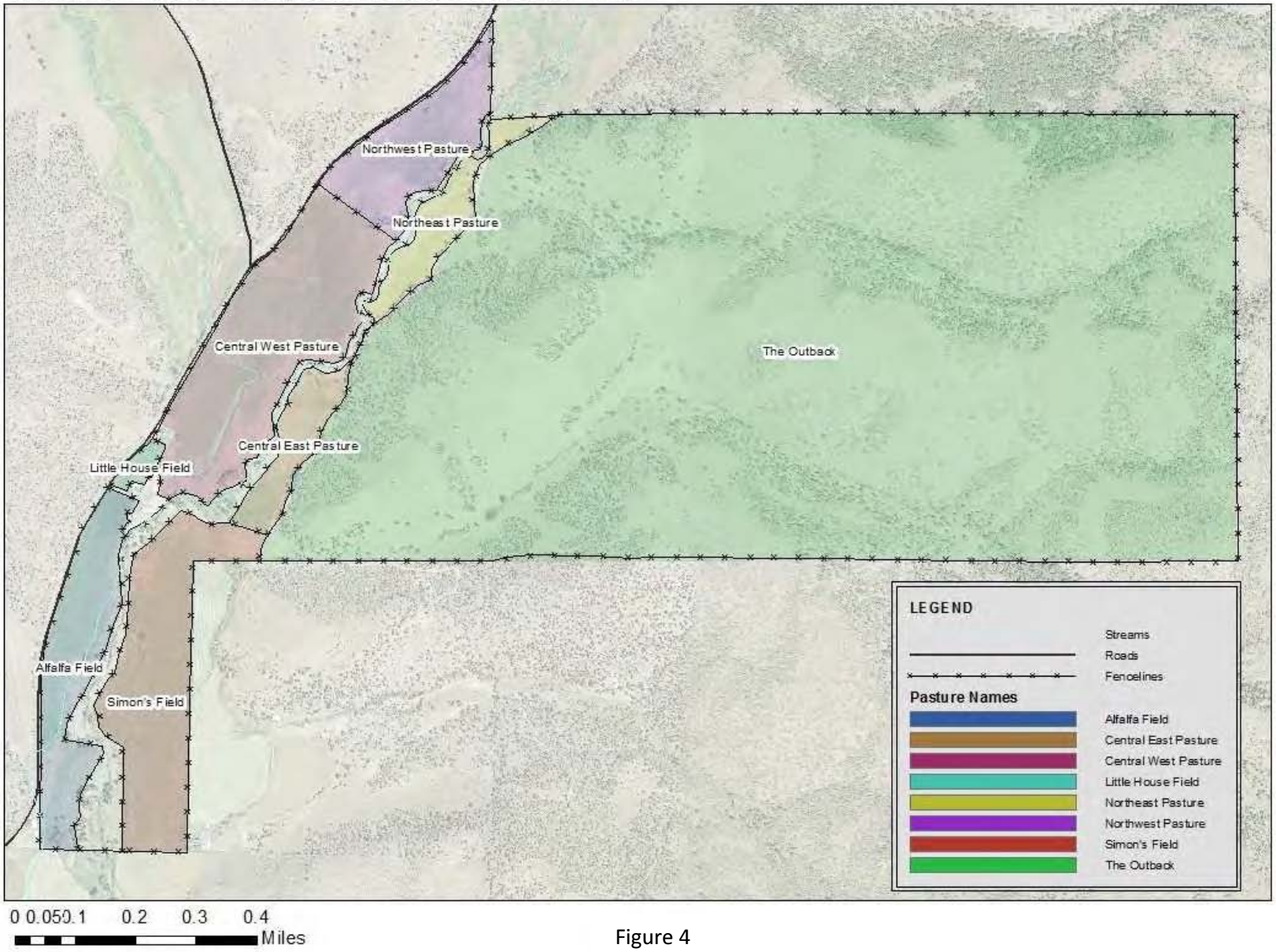


Figure 4

Ranch C - Weed Management Resource Aerial Map

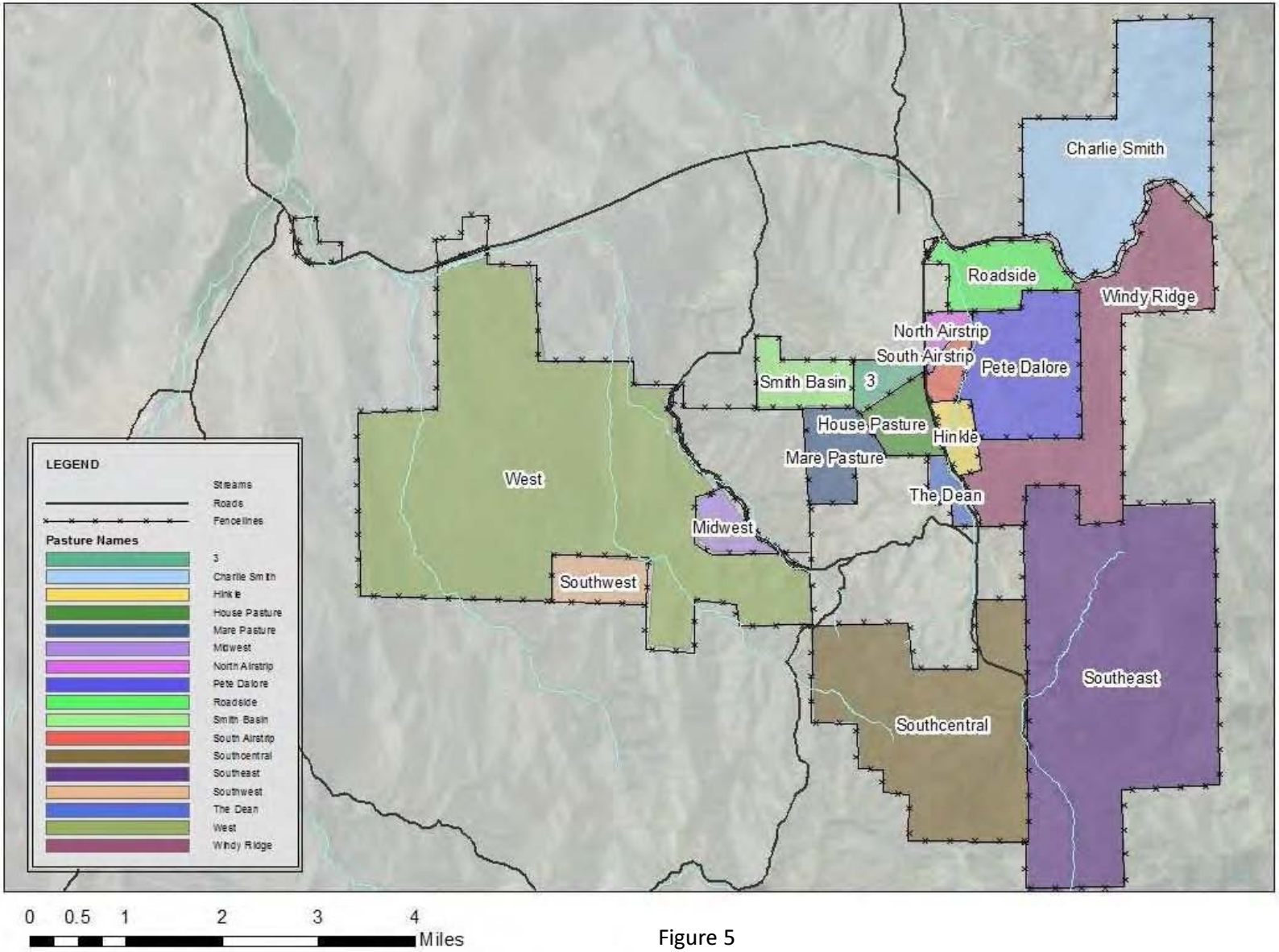


Figure 5

Piece 2: Inventory and Map Noxious Weeds.

The CRWMA can help you inventory and map your noxious weeds. Official county and Oregon State noxious weeds lists are located in Appendix A. There are other resources (Appendix B) and references (Appendix C) to assist with identification of your noxious weeds. See the following weed map examples for Ranch A, B and C.

Ranch A - Upland Weed Map

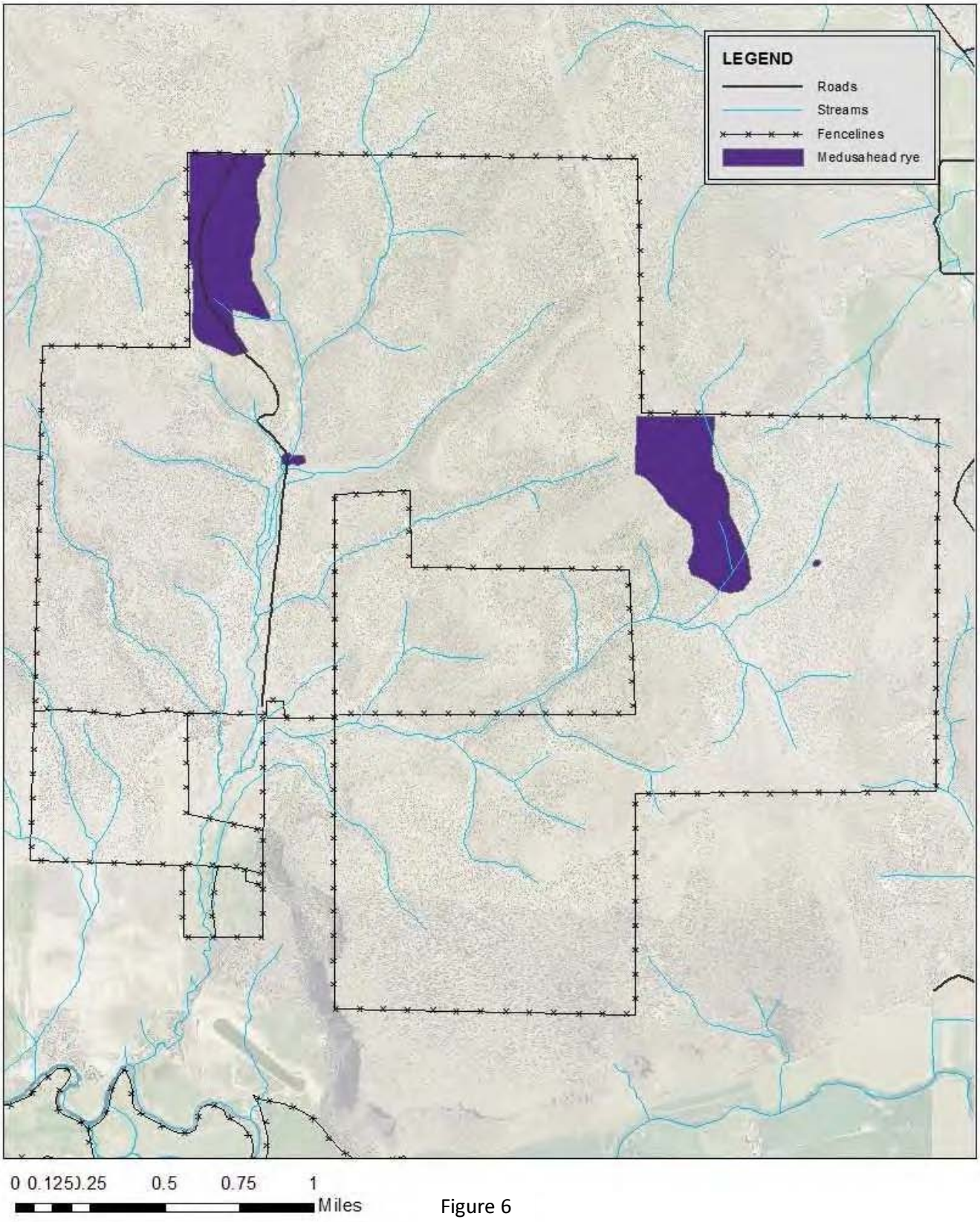


Figure 6

Ranch A - Lowland Weed Map

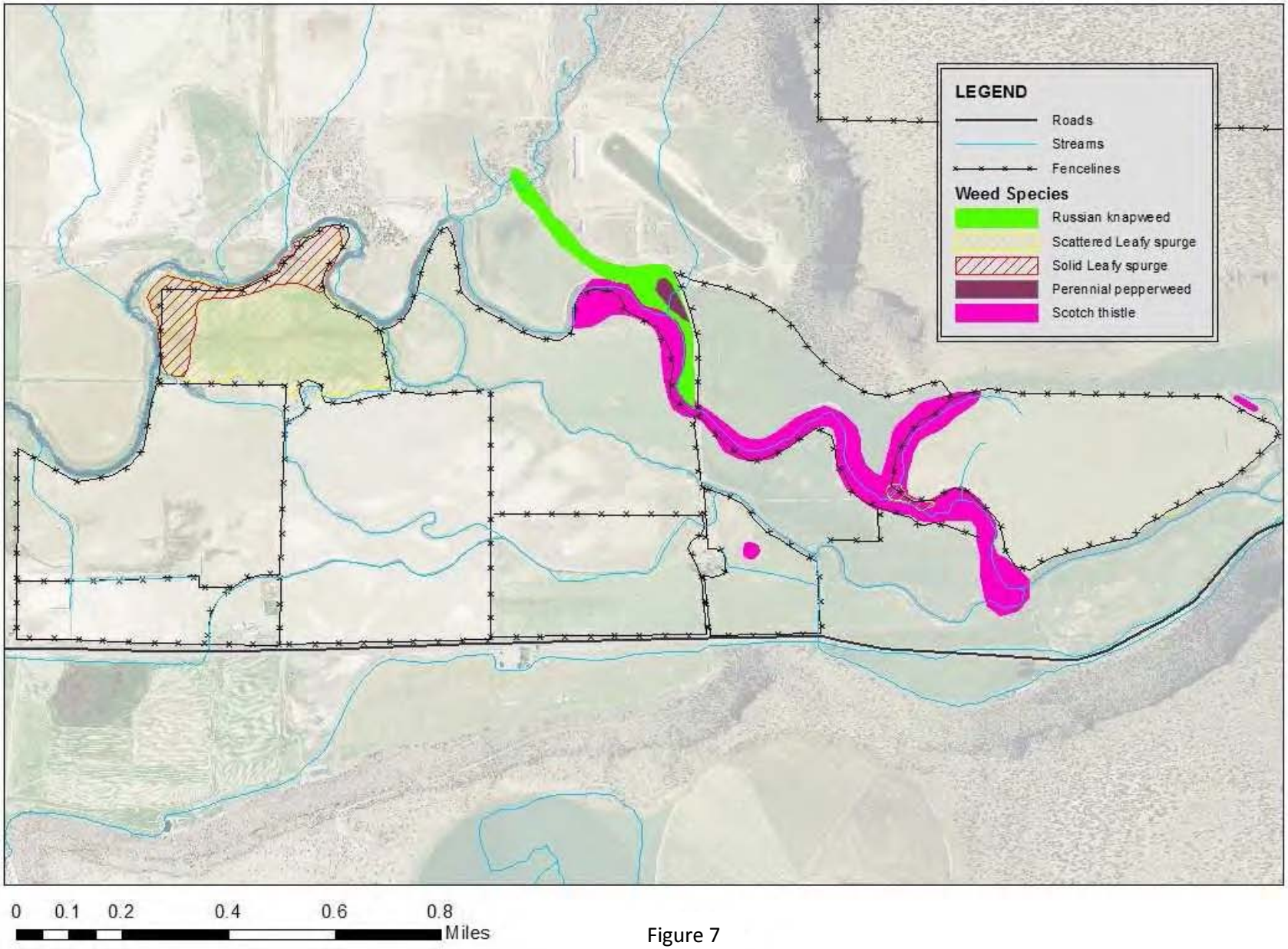


Figure 7

Ranch B - Weed Management Resource Aerial Map

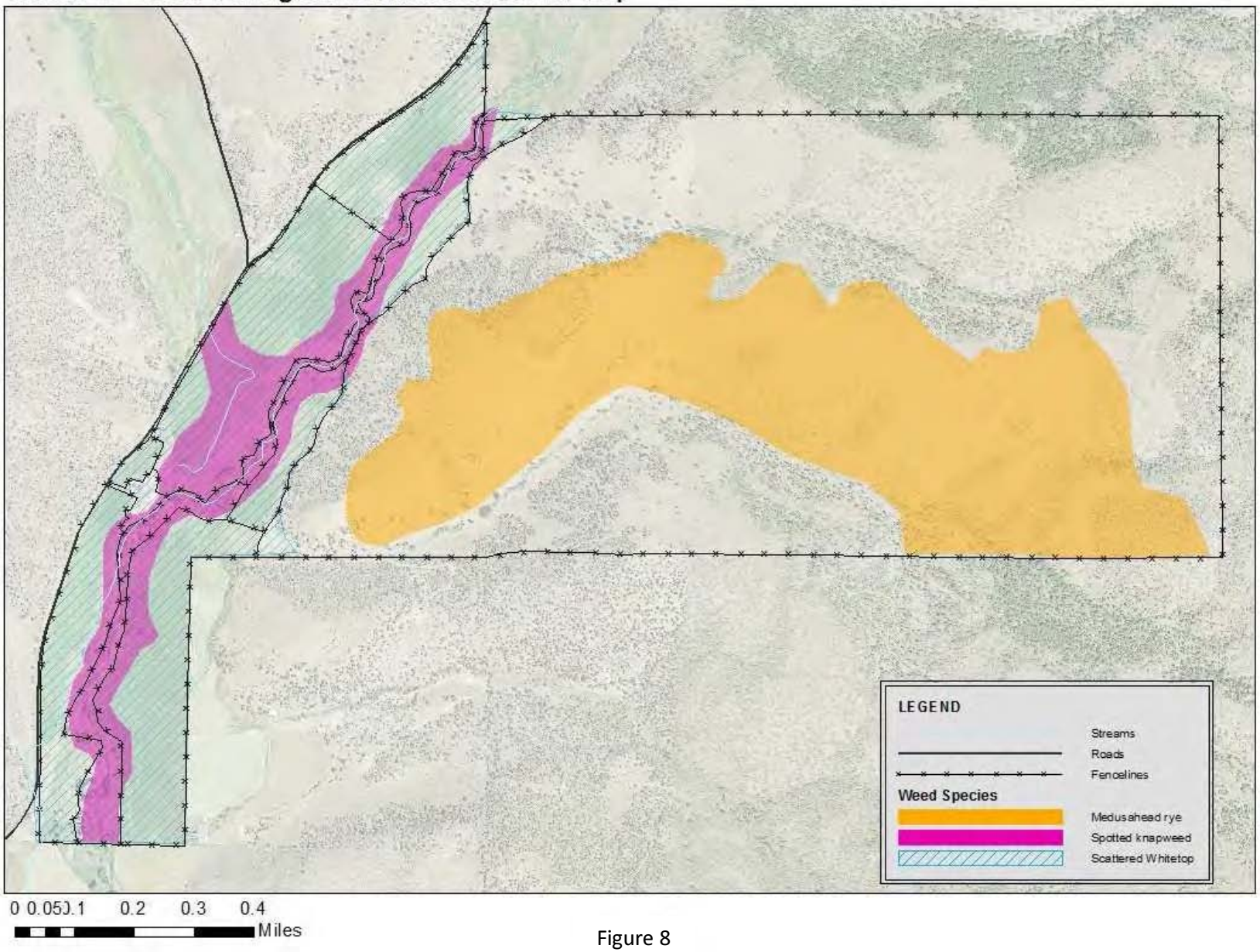


Figure 8

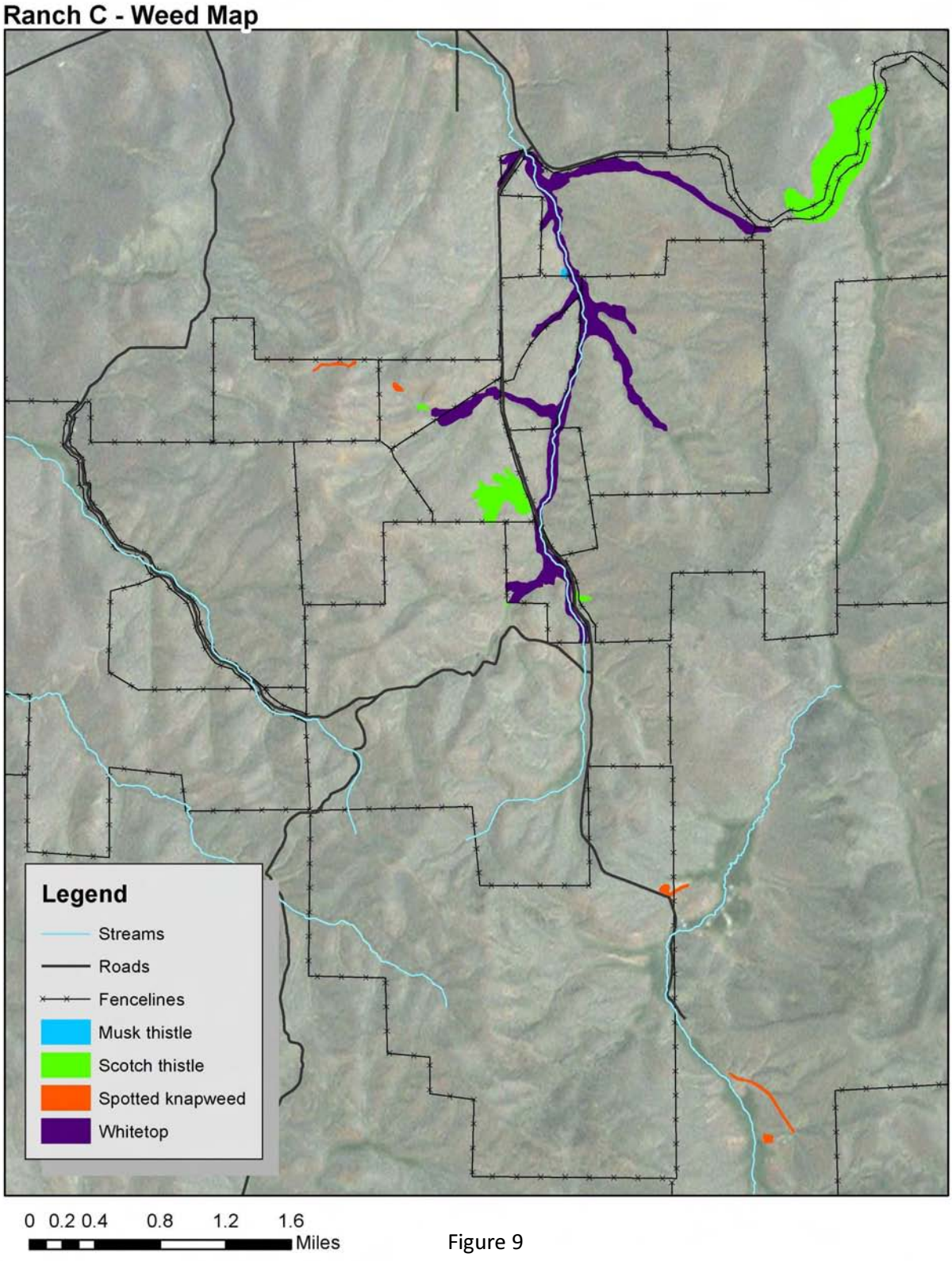

Ranch C - Weed Map
Legend
Streams
Roads
Fencelines
Musk thistle
Scotch thistle
Spotted knapweed
Whitetop
0 0.2 0.4 0.8 1.2 1.6
Miles

Figure 9

Piece 3: Set Weed Management Goals and Objectives

It is important to write a set of overall goals and objectives for the area your weed management plan encompasses. Goals and objectives need to focus on the end result, and they will assist you in monitoring the effectiveness of your plan.

- Your weed management goals are essentially land management goals. They will provide a general set of directions
- Your objectives are more specific. They should be measurable.

Weed Management Goals

Your aim is not just to kill weeds. In trying to create or maintain conditions on your ranch you are aiming to cost-effectively accomplish land management goals. When you set goals, you are aiming for a general result that is observable and achievable. You already know your goals, but if they are not written down, you will find it useful to have as a reference. Keep them in mind throughout your weed management work.

Here are examples of goals:

- Maintain a viable working ranch so that the children will be able to continue a family tradition.
- Generate enough income from the ranch to support two families.
- Improve ecological conditions in the sub-watershed.
- Improve the productivity of the pastures.
- Protect habitat for native plants and animals.
- Maintain a diverse landscape of plant communities.
- Increase the infiltration of water into the soil with greater capture and storage. Safely release water with minimal erosion and sedimentation.
- Improve overall range condition.
- Be a good neighbor; prevent weeds from your property infesting surrounding private and public lands.

Brainstorm possible goals for your weed plan. Check the goals by asking yourself a set of questions:

- Is this goal important enough to be a focus of weed management?
- Can I realistically expect to achieve this goal?

Revise your goals as you go along. As you consider your goals, some of them will be more important than others. Put a number next to each goal to indicate your initial sense of its relative importance.

Weed Management Objectives

Weed management objectives are drafted with timelines and are specific to locations. They need to be measureable and achievable and assist you in accomplishing attainable goals. Objectives guide actions. Your weed management objectives must take into consideration your resources and the weed species you are trying to control.

Here are some examples:

- Within five years, reduce the population of leafy spurge by 90% along a two mile stretch of Unnamed Creek.
- Within a year discuss common weed problems with all neighbors and within two years initiate control measures together with all cooperating neighbors. Keep talking to initially non-cooperative neighbors; a change of direction may be possible.
- Within five years reduce western juniper populations on 200 acres by 95%.
- Within two years introduce biocontrol agents for Canada thistle on the Big and Bigger pastures.
- Within two years of finding any small, new noxious weed populations, eradicate the weeds from the site.
- Within three years eliminate medusahead rye seed production on all roads, trails and power lines and at least ten feet on each side.
- Within three years produce weed free hay on four alfalfa grass hay fields on the old Summer Place.
- Determine if adequate desired vegetation is present on the Outback Pasture after medusahead control. If not revegetation may be needed.

Draft weed management objectives and ensure that the listed objectives will help you to achieve your goals. They need to lead to actions and guide them.
Check each objective by asking the following questions:

- Does this objective have a deadline?
- Have I defined the location, geographic limits of the objective?
- Will I be able to know whether I have reached this objective?
- Can I realistically expect to be able to meet this objective?
- Do I have the resources to target the weed? If not, where can I obtain these resources?

Number each objective to indicate your initial sense of its relative importance.
Keep revising your objectives as you go along.

We provide examples of Ranch A, B and C's objectives in Piece 4: Table 1, A-C.

Piece 4: Set Priorities for Goals and Objectives.

The majority of landowners may not find it possible to control every weed, noxious or otherwise that occurs on their property. Therefore it makes sense to focus management efforts on those weed species which have the greatest impact on the resource base, and those which become more difficult to manage if action is delayed. Weed management priorities can be established by prioritizing weed species and weed sites, in light of the established objectives. This will help direct resources to cost-effective action.

Priority Noxious Weed Species

Some landowners may have only one or two weed species on their property and it may be feasible to manage all their infestations. However, other landowners may have so many acres infested with noxious weeds that the task of controlling them seems overwhelming. In cases where a complete control program is not feasible in the short term, more time and money may be required than available. These landowners must decide which weed species are most important to manage. Examine your weed inventory and determine the potential impacts of the weed species on management goals and on feasibility of control. Examine the county noxious weeds lists and use your knowledge of local conditions in assigning these priority weeds. The Weed Management Area can help you with this task.

In general, noxious weed species which are rare on the property and those that have small populations should be eradicated while large infestations of weeds should be contained or suppressed.

Priority of Weed Sites

After prioritizing weed species to be managed, the next step is to determine which weed sites should be the highest priority.

High priority sites could be one or more of the following:

- Uninfested areas: Maintain health of plant community to resist weed invasion.
- Eradicate small infestations or single plants.
- Satellite populations: patches isolated or separated from main area of infestation.
- Seed dispersal sites: roadsides, parking areas, trails, ditches, streams.
- Other high impact areas continually disturbed: salting areas and corrals for livestock.

While large infestations should not normally be high priority sites, they are often well suited for biological control and revegetation. If weeds are found in high productive hay fields, these larger infestations may be a top priority in order to stop the noxious weed spread.

List Weed Objectives by Priority – Table 1

Template tables for Table 1 through 7 are found in Appendix D. Ranch A, B and C examples of priority objective tables follow:

Table 1-A. Ranch A Weed Objectives by Priority - March 1, 2011

Priority	OBJECTIVE
1	Continue to manage leafy spurge in center of Norm's Field to less than 5% leafy spurge. Maintain crop production.
2	Reduce leafy spurge population in buffer (100-200 ft.) around Norm's Field to less than 5% leafy spurge.
3	Survey and manage any new leafy spurge sites.
4	Eradicate Scotch thistle patches near Duck Pond within 5 years.
5	Eradicate Russian knapweed (NW River) within 3 years.
6	Contain the upland medusahead population.
7	Reduce 95% juniper in medusahead site and reduce medusahead population by 2017.
8	Continue to treat perennial pepperweed if it persists.
9	Manage obnoxious weeds along ditches and puncture vine in road.

Table 1-B. Ranch B Weed Objectives by Priority- April 19, 2011

Priority	OBJECTIVE
1	Reduce the population of medusahead in the Outback by 98% by 2015.
2	Do not permit spotted knapweed to re-establish on the ranch.
3	Do not permit whitetop and Scotch thistle populations to re-establish on the ranch.
4	Reduce Canada thistle population with biocontrols by 2020.
5	Manage nuisance weeds like cheatgrass, common mullein and chicory.

Table 1-C. Ranch C Weed Objectives by Priority - March 2011

Priority	OBJECTIVE
1	Within 2 years, monitor Ventenata and determine if it is possible to control in high priority areas.
1	Within 5 years, reduce the population of medusahead rye by 98% at Ranch headquarters' site.
2	Within 3 years, eliminate the Musk thistle population in Roadside Meadow.
3	Within 3 years of locating new Scotch thistle scattered sites, eradicate weeds from site.
4	Within 3 years, reduce Russian knapweed population by 90% behind the folks place.
4	Within 5 years, reduce whitetop population by 90% on 200 acres in the field at Hank's.
5	Monitor Canada thistle population and biocontrol agents released in 2010 until we decide agents are not working or Canada thistle is 85% controlled.
6	Within 2 years, treat any spotted knapweed populations that are located.
7	Within a year discuss common weed problems with all neighbors and within two years initiate control measures together with cooperating neighbors. Keep talking to initially non-cooperative neighbors; a change of direction may be possible.
8	For next 5 years, monitor the Gravel Pit for return of medusahead. Treat if any medusahead is found.

Piece 5. Select Weed Management Strategies and Actions

This is the action planning piece. A plan of attack that is based on knowledge of the weeds on your property and all options will be successful when combined with commitment and persistence. You will achieve your goals and objectives by using various actions based on the strategies presented below. As you consider the possibility of employing actions to manage noxious weeds, remember two key points.

1. An abundance of weeds is often symptomatic of certain environmental conditions. It is important to understand and deal with the underlying causes of weed infestation, and to take steps to counter them. If factors facilitating weed establishment and expansion are not addressed, weed problems will continue.
2. A single control technique is rarely sufficient to control a particular weed. The best results in weed control are usually obtained by combining different control methods in a coordinated effort.

To be successful an integrated plan based on goals and objectives must incorporate a number of these types of strategies:

- Prevention
- Physical strategies
- Cultural strategies
- Livestock grazing
- Biological control
- Use of herbicides
  Revegetation

The effectiveness of each strategy will depend on site conditions, size of infestation, and the weed species present.

Piece 5 - Table 2-A. Examples of Strategies Working with Weed Management Objectives

Objectives	Strategy
Within three years, reduce leafy spurge infestation in Griffin pasture by 80%	Treat with Tordon 22K (2 qts/acre) for the next three years in early summer within 100 feet of the creek. Treat with Plateau herbicide (12oz/acre) adjacent to the creek in early summer.
Within three years, reduce leafy spurge infestation in Griffin pasture by 80%	Seed appropriate weed-free irrigated pasture mix. Alter livestock grazing in order to facilitate seed establishment.
Within five years manage leafy spurge if it persists at 20% level	Introduce and establish biological control agents.
Within three years, eliminate over utilization of the spring pastures	Increase forage production to make sufficient feed available for late winter and early spring. Initiate prescribed grazing appropriate to the site.
Within 2 years , protect Jonas Creek from increasing weed infestation	Cross fence the spring pasture. Establish a riparian pasture. Spot spray if necessary to maintain relatively weed free zone. Manage season, intensity, and duration of grazing.
Within three years reduce livestock concentration on Jonas Creek	Establish off-site watering facilities, mineral/supplement placement, and a riparian pasture utilized in late summer.
Over the next five years, prevent new infestations of noxious weeds within 100 meters of property lines.	Work with the neighboring property owners.
Determine if adequate desired vegetation is present on the Outback Pasture after medusahead control.	The abundance of native species on site is not sufficient. Need to implement revegetation.

PREVENTION

Prevention is the most important weed management strategy but often the least used. Critical action is needed to prevent weeds from spreading and becoming established in new areas. Here are some ways you can practice prevention.

- Be knowledgeable about the weeds in the area, and take immediate action when you find invading weeds.
- Sow only certified seed.
- Prevent soil disturbance or destruction of native vegetation.
- Keep machinery and vehicles clean.
- Keep livestock in small quarantine areas for 7-10 days when moving from pastures infested with noxious weeds to pastures that are uninfested.
- Cut weed infested crops prior to seed formation.
- Do not move weed-infested soil or gravel.
- Do not transport hay or crop residues with weed seed.

PHYSICAL STRATEGIES

Tillage or Cultivation

- For annual weeds, the objective of tillage is to prevent seed production and to deplete current seed reserves in the soil. This is accomplished by encouraging weeds to germinate and then killing them.
- With perennials, tillage destroys underground roots, depletes seed reserves in the soil and prevents seed production. However, be aware that for rhizomatous weeds, such as Canada thistle and perennial pepperweed, this practice may spread underground roots and increase the infestation.
- Tillage should be timed to catch the first flush of weeds before sowing a crop or in dry, warm, sunny conditions so that the weeds cannot transplant themselves.
- Autumn tillage can be effective in killing winter annuals and biennials and suppressing perennials. It can also aid in stimulating the germination of new weeds that will be susceptible to winter frost.

Hand Weeding or Pulling

- Hand weeding can be used to manage small patches or individual plants of annuals, biennials and non-creeping perennials.
- Persistent pulling can manage some creeping perennial weeds such as Dalmatian toadflax if done in loose soils.
- Pulling works best in moist soils particularly if these soils are sandy or gravelly.
- Seed disturbed areas immediately because hand weeding can create a fresh seedbed for weed germination.
- Wear gloves and a long sleeved shirt. Some people have allergic reactions to chemicals in weeds.
- Pull weeds before they set seed. Make sure entire root is pulled out.

- If seeds are present, prevent dispersal by bagging and then burning on site if possible. Do not compost material.

Mowing or Cutting

- Mow weeds before they produce seed; never after they have gone to seed.
- Perennial weeds usually require several cuttings before the energy in the roots is depleted. If only a single cut is feasible, the best time is just before blooming because energy in the roots is at its lowest level and because viable seed can be produced just after flowering in some species.
- Cut weeds as close to the ground as possible when soil moisture is depleted. Many weeds will still produce seed below the cutter blades, but seed production and spread potential are much reduced.

Burning

- Burning should occur while seeds are still in the seed head. Intense heat will destroy some seeds remaining in the seed head, but only a small number of seeds on or below the soil surface will be consumed.
- Burning is not effective in killing underground roots and is therefore of most benefit only for managing annual weeds or reducing the dissemination of weeds that are already in seed. Burning can also create a flush of nitrogen which can potentially increase the weed population the next season.
- In combination with other treatments, fire can be a useful tool. Burning can reduce dry matter so that herbicide application will be more effective. Chemical can more easily reach the growing plants.
- Oregon Department of Forestry, Natural Resources Conservation Service and community fire cooperatives can provide assistance for prescribed burning.

CULTURAL STRATEGIES

Crop Rotation

- Certain weeds are associated with specific crops and crop rotations because the weed can compete well with the crop or because it is not destroyed by the herbicides and cultivations normally used for that crop.
- Continuous cropping of small grains results in an increase in annual weeds.
- Perennial forages and permanent pastures favor development of perennial weeds such as quackgrass and Canada thistle.

Competition - Maximizing Competition to Suppress Weeds

- When you are using competition as a weed management tool, it is critical to get early establishment of a vigorous, dense crop.
- A firm, moist, warm seedbed with no clods encourages rapid crop germination.
- Where moisture is available, increasing the crop seeding rate can provide competition against weeds.
- If your weeds germinate in cool conditions like mustards, better to seed late in combination with early tillage or herbicide treatment. If your weeds prefer warm soils and germinate later, try early season seeding.

- Choose a crop variety that is well adapted to your local conditions of soil, climate, and disease resistance.
- Use of fertilizer may encourage weeds. Native pasture does not need fertilizer. In row crop production, target the fertilizer to the crop row rather than between rows.
- Improve drainage to reduce weeds that prefer moist to wet soils.
- Use amendments to adjust soil pH to the level favoring the crop not the weed.

LIVESTOCK GRAZING

Landowners can use cattle, sheep and goats to selectively graze certain weed species, thereby weakening them and reducing seed production. Each of these types of livestock may find different weed species palatable, so a multi-species grazing strategy may be appropriate. Livestock can also be trained to eat certain weeds. For more information see Kathy Voth's website at www.livestockforlandscapes.com.

Livestock grazing strategies are most useful for:

- Non-toxic and palatable (at least at some point during the year) weeds. Weeds vary greatly in their palatability to types of livestock. Horses and cattle are primarily grazers favoring grass while sheep and goats are browsers and will prefer broadleaf weeds. Goats will feed on woody weeds such as blackberry.
- Leafy spurge control. Goats and sheep are effective control agents for all but the smallest infestations, especially in riparian areas.
- Low-level, widespread weed infestations where other control techniques are not cost-effective.

Livestock grazing has limitations as a strategy:

- Lack of availability and sufficient numbers of goats and sheep or cattle when and where you need them to create impact.
- Need for water and fencing or herding to concentrate livestock movement.
- The need to manage the intensity and duration of livestock grazing carefully to avoid overgrazing, and allow desirable species to recover from grazing impacts.
- Predators such as coyotes, cougars and black bears may kill grazing animals, especially sheep and goats. In rural residential areas, dogs may be a problem.
- Using the proper kind of animal to manage the weeds on your property.
- Need for someone with knowledge of animal husbandry to manage the animals.
- Make sure the nutritional requirements of the animal species are met while grazing on the weed populations.
- Palatability of weeds varies widely throughout the growing season. For example, young shoots of Canada thistle is palatable to cattle, while old, mature stalks are not.
- Livestock grazing can control weeds but may not eliminate them.
- Livestock must have close management in order to be successful. Simply turning animals into a pasture and expecting weed problems to vanish is not realistic.
- You must manage the intensity and duration of livestock grazing to prevent the animals from depleting the desirable plant species they are grazing, or creating disturbance which favors the establishment of weeds.

- When animals are moved from one area to another, they can spread weed seeds in fur or in manure. Grazing should be done before weeds set seed or provide an area for animals to be held for 7 to 10 days after removal from weed infested sites.
- Be sure animals are not feeding on toxic weeds such as water hemlock, poison hemlock, halogeton, St John's wart and Russian knapweed. Toxicity can vary greatly by type of animal and seasonality of use.
- Costs may be high. They may include capital and maintenance costs for infrastructure such as fencing and water, creating holding area to confine animals which have been grazing areas where weed seeds are present, contracting with a person to supply and manage grazing animals such as goats and sheep, and transporting livestock into and out of area.

BIOLOGICAL CONTROL

Biological control agents are natural organisms (usually insects, nematodes, fungi or viruses) that can be used to reduce weed populations. These agents are usually natural enemies of weeds in their native environments of Europe and Asia. In a natural environment, plants are constantly defending themselves from insects and other organisms that are reducing the plants ability to grow and reproduce. When plants are transported to new locations and environments, these herbivores are often not imported with them. In this case, the introduced plant species may be able to expand its population and become a troublesome weed. One method of controlling these weeds is to find organisms in the plant's native range that attack the plant and keep it controlled. After a lengthy period of laboratory and field testing to determine if the organism will not attack other non-target plants, they may be released to control the weed in its new location. The federal government approves individual insect species as biocontrol agents.

Biological control is best suited to large, dense infestations where other management strategies are neither cost effective nor environmentally desirable. In most cases it will not eradicate the weed. Degree of control may be variable and will take several years to achieve.

Oregon Department of Agriculture has a very strong biological control program. In many cases they are willing to provide bioagents to landowners. The following weeds are targets of biological control in Oregon (see Appendix E for full list of weeds and agents).

- Canada, Scotch, bull, and musk thistles
- Dalmatian and yellow toadflax
- Diffuse and spotted knapweed
- Leafy spurge
- Purple loosestrife
- Field bindweed
- Yellow starthistle
- Mediterranean sage
- St. John's wart

HERBICIDE

Herbicides are chemicals designed to kill or injure plants. They do not address the reasons for weed infestations and spraying an herbicide may merely treat a symptom. Even if an herbicide eradicates a weed infestation, another weed may appear if the underlying cause of the infestation persists.

Your choice of herbicide depends on several factors. They include:

- The target weed species
- Stage of growth
- Crops or other plants on the site
- Soil texture and depth
- Distance from water
- Herbicide labels

Herbicides work best:

- Eradicating pure stands of a single weed species where desirable non-target plants are scarce or absent.
- On rhizomatous weed species (weeds with underground creeping roots) that are unpalatable to livestock, require repeated pulling or cutting for control, or are located in remote areas where pulling and cutting is difficult.
- Where minimal soil disturbance is warranted.
- Used in combination with other control methods.

Before choosing herbicides:

- Carefully consider potential environmental impacts and public concern.
- Most County Weed Control Supervisors will make recommendations as to which chemical to use on a particular weed species, the rate to apply and the time of year for best results. (See Crook Co. Noxious Weed Treatment Recommendations in Appendix F). Your Weed Supervisor or Weed Management Area personnel can provide you with names of licensed applicators in your area.
- Always read and understand the label on the herbicide. You must apply the chemical according to the instructions. *The label is the law!*
- Some herbicides require a license to apply. If you are going to apply restricted use herbicides yourself, you must take the training and pass an exam for certification. A training manual can be ordered from your local Extension office and ODA provides the test.
- Make sure you have appropriate personal protective equipment when applying herbicides.
- Know what your long term plans are for the piece of ground to be treated. For example if using a chemical that is residual on broadleaf weeds, you would not want to plant alfalfa soon after.
- Take precautions to ensure the herbicide does not move beyond the area where it is applied. Do not increase the concentration of the herbicide beyond the limit set by the manufacturer on the label. *More is not better.* Higher concentrations can injure animals and damage non-targeted plants.
- Know and understand the best growth stage of the weed and crop for application of the herbicide.

- Know and understand whether to apply the herbicide to the soil or weed leaves (or both).
- Make sure the herbicide works on your soil type. Soil pH and hard water may affect the herbicide.
- How close to water or other environmentally sensitive areas can the herbicide be applied.

REVEGETATION

If weed management goals for your rangeland include establishing a more weed resistant plant community, protecting habitat for native plants and animals, or improving range condition; a revegetation strategy may be necessary. Landowners and managers often focus on controlling weeds, and not the existing or resulting plant community. Often weed management actions can cause disturbance to a site. These disturbed sites may recover naturally, but in some cases it may take years before desirable plants become established at high enough densities to compete with noxious weeds. Revegetation is expensive and may not always need to be implemented. Revegetation Guidelines for the Great Basin: Considering Invasive Weeds an Agricultural Research Service Publication (ARS-168, October 2008, Sheley, R. et al.) provides a step-by-step guide to the processes and procedures of establishing desired plant species on your ranch.

STRATEGIES IN REVIEW

Piece 5 – Table 2-B. Summary of Weed Management Strategies

Strategy	Comments and Descriptions
Prevention	Seed soil disturbances. Use certified seed. Clean machinery, vehicles, and animals. Control sources of weed seed production.
Pulling	Suited to small infestations that can be eradicated or managed with a small amount of labor.
Mowing/Cutting	Suited to sites that are small and accessible with equipment and that can be mowed more than once in a growing season. Combine with other methods where possible.
Livestock Grazing	Suited to areas where rotational grazing could be put into place and that have a weed that is palatable to livestock. Check that the appropriate type of livestock is also available at the right growth stage for grazing to be effective.
Cultural Practices	Suited to areas that could be farmed or managed to maximize competition from beneficial plants.
Biological Control	Suited to extensive areas where cost effective methods are warranted. Or use biological control agents to supplement other management strategies.
Herbicide Use	Use the right herbicide on the target weed at the right stage of growth. Soils and water are a concern. Check with County Weed Supervisor or Weed Management Area for advice. Follow label instructions.
Burning	Useful when in combination with other methods. Mostly used for annual weeds.
Revegetation	Establishing desired species with active management. Weed density should be significantly reduced to minimize competition with seeded or planted species. May only be necessary if desired plants are not adequate on the site. Natural regeneration is an inexpensive alternative.

Piece 5 – Table 2-C. Advantages and Disadvantages of Weed Management Strategies

Strategy	Advantages	Limitations
Prevention	Low-cost. Prevents seed production. No permit.	Actions required before weed infestation.
Pulling	No permit. Prevents seed production. Can use near water.	Disturbs soil. Must be repeated. Labor-intensive. Root fragments may remain. Moist or loose soils required.
Mowing/Cutting	No permit. Prevents seed production. Can use near water. No soil disturbance.	Roots remain, and plant may resprout. Timing important; must repeat treatment; labor-intensive; Costly.
Tillage/Seeding	No permit. Establish preferred species. Can use near water.	Repeat treatment usually required. Labor-intensive. Costly. Dry soil conditions required. Best suited for agricultural settings or heavily infested grassland.
Burning	May destroy some seeds. Mimics natural processes.	Public relations (smoke). Timing limited. Liability issues. Intensive planning. Seeds in soil unaffected. Re-vegetation may be necessary.
Biological Control	Cost-effective. Self-perpetuating. Self-dispersing. Long-term	Takes time to establish. Not effective on all weeds or in all habitats. Does not eradicate weeds.
Herbicide use	No soil disturbance. Kills roots and seed banks. Can be selective.	Limitations near water. Public perception. Timing important. Must generally repeat treatments. Costs. Permits and regulations.
Revegetation	Improves forage production. Promotes land health. Native plants and animals may benefit. Long-term.	Expensive, difficult, several year process.

We provide examples of action strategies for Ranch A, B, and C in Piece 5 Table 2, A-C.

Table 3-A. Ranch A Weed Objectives and Action Strategies – March 1, 2011

OBJECTIVE	STRATEGY
Continue to control leafy spurge in center of Norm's Field to less than 5%. Maintain crop production.	Treat spurge with Tordon 22K at label rate every 3 years. Spot spray if necessary.
Reduce leafy spurge population in buffer (100-200 ft.) around Norm's Field to less than 5% leafy spurge.	CRWMA establish a demo plot to test new chemical "Perspective" on northern tip. Use Milestone every year. Fall 2011
Survey and control any new leafy spurge sites.	Survey for satellite populations June through August. Treat with appropriate chemical in summer.
Eradicate Scotch thistle patches near Duck Pond within 5 years.	Survey and treat with 2,4-D in spring and fall.
Eradicate Russian knapweed (NW River) within 3 years.	Burn spring 2011. Use Milestone 7oz/acre in the fall.
Contain the upland medusahead population.	Cattle graze in the spring (April). Spray roads, power line and edges in the fall until full scale control can begin. Winter or spring burn 2012.
Reduce juniper in medusahead site and reduce medusahead population by 2017	Apply for small grant to cut juniper in 2011 or 2013. Cut juniper. Treat medusahead after juniper control. Seed and keep cattle off for at least one year.
Continue to control perennial pepperweed.	Treated with Escort in 2008. Monitor for 3 years and treat with Escort if necessary.
Control obnoxious weeds along ditches and puncture vine in road.	Survey and treat weeds if necessary. 2,4-D or Glyphosate may be used.

Table 3-B. Ranch B Weed Objectives and Action Strategies-April 19, 2011

OBJECTIVE	STRATEGY
Reduce the population of medusahead in the Outback by 98% by 2016.	Received small grant to treat 50 acres. Treatment occurred with Plateau fall 2010 and spring 2011.
Reduce the population of medusahead in the Outback by 98% by 2016.	Fall 2011 treat satellite populations and establish a 20 ft. boundary around large patch. Treat with Plateau (Panoramic 6oz/acre) in the fall. Possible to treat with Roundup early in spring before native species green-up.
Reduce the population of medusahead in the Outback by 98% by 2016.	Fall 2013, begin treating and closing in on larger patch. Treat with Plateau in the fall (October-November).
Reduce the population of medusahead in the Outback by 98% by 2016.	Modify cattle management to spring grazing and survey adjacent grazed areas for medusahead.
Do not allow spotted knapweed to re-establish on the ranch.	For the next 3 years, survey disturbance from CRWC diversion dam project for weed populations. If spotted knapweed is found, treat with 5 oz./A Milestone in June or July before seeds form.
Do not allow whitetop and Scotch thistle populations to re-establish on the ranch.	For the next 3 years survey pasture for whitetop and Scotch thistle populations. If whitetop is located treat with Cimmaron Plus, Telar or Escort at 1oz/acre in May when the plant is blooming. If Scotch thistle is found you can use 2, 4-D, Milestone (1oz/acre), or Escort (1oz/acre). Treat rosettes early in spring or bolting plants before bloom.
Reduce Canada thistle population with biocontrols by 2020.	In 2013 survey for biocontrols released in 2010 on Canada thistle population. Look for mites when vegetation is 2-4inches high; look for green galls past bloom, if they are present let them work. If the CRWMA determines they didn't take hold then treat site with Milestone (5oz/acre) when plant is in bud stage (June).
Control nuisance weeds cheatgrass, mullein, chicory	Survey, treat if necessary with glyphosate or 2, 4-D (broadleaves) in spring. Spot spray or treat before native species green-up.

Table 3-C. Ranch C Weed Objectives and Action Strategies

OBJECTIVE	STRATEGY
Within 2 years, monitor *Ventenata* and determine if it is possible to control in high priority areas.	Map areas of *Ventenata*, identify high priority habitats and develop strategy if possible.
Within 5 years, reduce the population of medusahead rye by 98% at Ranch Headquarters'.	Fall treat medusahead rye with Panoramic (6oz/acre) for 3 years. Hire applicator.
Within 3 years, eliminate the Musk thistle population in Roadside Meadow.	Spray with Milestone or 2, 4-D in the spring until eradicated.
Within 3 years, eliminate the Musk thistle population in Roadside Meadow.	Appropriate grazing practices will be used to sustain perennial vegetation.
Within 3 years of locating new Scotch thistle scattered sites, eradicate weeds from site.	Each year, actively survey and treat with 2,4-D or Milestone (1oz/acre) satellite populations of Scotch thistle. Manual control will be used for small patches.
Within 3 years, reduce Russian knapweed population by 90% behind the folks place.	Each year treat 5 acres of Russian knapweed population behind the folks place in the fall with Milestone (7oz/acre).
Within 5 years, reduce whitetop population by 90% on 200 acres in the field at Hanks.	Broadcast spray 100 acres of whitetop in the spring of 2011 and the other 100 acres in 2012 with Telar (1 oz/acre). Continue spot treating the 200 acres every year until population is under control.
Monitor Canada thistle population and biocontrol agents released in 2010 until we decide agents are not working or Canada thistle is 85% controlled.	In June look for the mites. In September or October look for galls made from gall fly. If agents flourish in the next 5 to 10 years, transport them to other thistle patches around the ranch. If agents are not found ask CRWMA for help and if determined they did not take, treat with Milestone or 2,4-D pre-bloom.
Within 2 years, treat any spotted knapweed populations that are located.	Each year survey for spotted knapweed and treat patches with Milestone in June-September.
Within a year discuss common weed problems with all neighbors and within two years initiate control measures together with cooperative neighbors. Keep talking to initially non-cooperative neighbors; a change of direction may be possible.	Contact neighbors before May where boundaries issues exist. See who is interested in cross boundary treatments. Schedule treatment. Visit with other neighbors as opportunities arise.
Within next 5 years, keep medusahead out of gravel pit.	Monitor medusahead rye to continue to keep it from reoccurring in the gravel pit. If any is found, flag sites and treat with Panoramic (6oz/acre) the following fall.

Piece 6. Develop an Integrated Weed Management Plan

Now that you have gathered the information and tools necessary for completing all the parts of the plan, it is time to assemble an integrated weed management plan. We have already:

- Decided on the boundaries and obtained or made an appropriate map of the management area.
- Identified natural and man-made resources in the area that require protection from weeds and marked those resources on your map.
- Identified problem weeds and learned something about their biology and ecology, especially in relation to your area.
- Performed a weed inventory in which the locations and types of weed are labeled on your map.
- Developed goals and objectives for your weed management plan.
- Set priorities about which weeds and sites need to be addressed.
- Selected appropriate management strategies and timing for each weed, considering such factors as local environmental conditions, cost, practicality, and potential damage to non-target organisms and the environment.

Think Prevention and Best Management Strategies! (Appendix G).

- Manage livestock grazing on native grasslands and seeded pastures to maintain a healthy plant community.
- Avoid management practices, farming activities, recreational use, or other activities that damage native plant communities, making them vulnerable to weed invasion.
- Avoid activities that disturb the soil or promote dispersal of weeds. Disturbed areas often become new weed seedbeds.
- Reseed disturbed soil with native or domestic species that are adapted to the climate and soil conditions in your area.
- Plant native trees, shrubs, and herbaceous species to rehabilitate riparian areas.
- Practice good land stewardship to maintain and improve the health of native plants.

Choose the Optimal Management Actions

For your integrated weed management, choose a combination of strategies with the following qualities:

Sufficiently beneficial to merit the costs:

- Evaluate the costs and benefits of possible management action
    - Is an herbicide's potential damage to desirable plants acceptable?
    - Is it acceptable to create a new seedbed by digging out plants?
    - Is the continued presence of the weed site for many years acceptable if biological control agents are released?
    - Does the return in production (such as increased forage) justify the cost of applying an herbicide?
    - If you don't treat, will costs increase as the weed spreads and your productivity declines elsewhere?

Applied at the most effective time
Most management actions are effective only during certain periods of a weed's life cycle. Treat the weeds when they are the most vulnerable and when actions are expected to have the least impact on the ecosystem.

Least damaging to non-target plants and animals
Non-target organisms include native plants, wildlife, insect pollinators and insects that feed on target weeds species.

Least hazardous to human health
Herbicides can harm human health when handled or applied incorrectly. Choose effective herbicides with the lowest toxicity.

Least damaging to the environment
Use herbicides according to directions on the label. Prior to application, carefully read the product label, checking for any precautions and restrictions on use. Obtain more information if you need it. Learn how to calibrate your sprayer so you are using the correct amount of herbicide or consider employing a licensed pesticide applicator, certified to apply pesticides.

Effective in the long term
One-shot weed control does not work. Develop a follow-up monitoring plan and schedule maintenance treatments as part of your normal land management operations. Keep in mind that a combination of management actions that together address the underlying cause of the weed infestation and spread will be effective for managing weeds in the long term.

As you prepare the plan remember these:

- Ask for help.
- Try new things.
- Work with your neighbors.
- Don't allow short-term success to lull you into complacency.
- Remember that persistence is critical.
- Be aware that patience is necessary for success.

Integrated Weed Plan – Tables 4 and 5

Table 4 is the main part of your plan. If you complete Table 4, your plan is written. Table 5 is included to record your weed treatments. This table will be essential when you begin to evaluate your success. You will be able to compare chemical, dose, target weed growth stage and weather after treatment. All these factors may affect treatment results. Examples of Table 4 and 5 for Ranch A, B and C follow. Using your aerial weed map to record treatments is also helpful (see Figure 10).

Table 4-A. Ranch A Integrated Weed Management Plan- March 1, 2011

Priority	Objectives	Weed Species	Planned Strategies	Plant Stage/ Time of Action	Date Planned	Actual Date
1	Continue to manage leafy spurge in center of Norm's Field to less than 5%. Maintain crop production.	Leafy spurge	Treated in 2008. Treat spurge with Tordon 22K at label rate every 3 years. Spot spray if necessary.	Pre-bloom or bloom	July 2011, 2014, 2017	No plants
2	Reduce leafy spurge population in buffer (100-200 ft.) around Norm's Field to less than 5% leafy spurge.	Leafy spurge	Treated with Plateau in 2008. Not good kill. Better results with Milestone. Treat every 3 years.	Pre-bloom or bloom	July 2011, 2014, 2017	6/26/11
3	Survey and manage any new leafy spurge sites.	Leafy spurge	Survey and treat any new sites with appropriate chemical in July.	Bloom	June/July 2011, 2012, 2013	No new sites
4	Eradicate Scotch thistle patches near Duck Pond within 5 years.	Scotch thistle	Survey and treat with 2, 4-D in spring and fall.	Rosettes or bolting	May-September	6/30/11
5	Eradicate Russian knapweed (NW River) within 3 years.	Russian knapweed	Burn spring 2011. Use Milestone 7oz/acre in the fall	Senescence	October-November	10/28/11
6	Contain the upland medusahead population.	Medusa-head rye	Graze cattle in the spring (April). Spray roads, power line and edges in the fall until full scale control can begin. Winter or spring burn 2012.	Dormant	October-November	10/20/11 to 10/24/11
7	Reduce juniper in medusahead site and reduce medusahead population by 2017.	Medusa-head rye	Apply for small grant to cut juniper in 2011 or 2013. Cut juniper. Treat medusahead after juniper control. Seed and defer cattle for at least one year.	Dormant	October-November	2011 Grant Successful 2012 cut
8	Continue to manage perennial pepperweed.	Perennial pepperweed	Treated with Escort in 2008. Monitor for 3 more years and treat with Escort if necessary.	Bloom	July 2011, 2012, 2013	No plants
9	Manage obnoxious weeds along ditches and puncture vine in road.	Poison hemlock, puncture vine	Survey and treat weeds if necessary.	Pre-bloom	June/July 2011-2017	No plants

Table 4-B. Ranch B Integrated Weed Management Plan- March 1, 2011

Priority	Objectives	Weed Species	Planned Strategies	Plant Stage/ Time of Action	Date Planned	Actual Date
1	Reduce the population of medusahead in the Outback by 98% by 2016.	Medusa-head rye	Received small grant to treat 50 acres. Treatment occurred fall 2010 and spring 2011.	Dormant	Fall 2010	Fall 2010/ Spring 2011
1	Reduce the population of medusahead in the Outback by 98% by 2016.	Medusa-head rye	Fall 2011 treat outlier populations and establish a 20 ft boundary around large patch. Treat with Plateau (Panoramic 6oz/acre) in the fall. Possible to treat with Roundup early in spring before native species green-up.	Dormant	Fall 2011-2012 (October)	
1	Reduce the population of medusahead in the Outback by 98% by 2016.	Medusa-head rye	Fall 2013 begins treating and closing in on larger patch. Treat with Plateau in the fall (October-November).	Dormant	Fall 2013	
1	Reduce the population of medusahead in the Outback by 98% by 2016.	Medusa-head rye	Modify cattle management to spring grazing and survey adjacent grazed areas for medusahead.	Dormant	Fall 2011	
2	Do not allow spotted knapweed to re-establish on the ranch.	Spotted knapweed	For the next 3 years, survey disturbance from CRWC diversion dam project for weed populations. If spotted knapweed is found, treat with 5 oz/acre Milestone in June or July before seeds form.	Pre-bloom	June 2011-2013	
3	Do not allow whitetop and Scotch thistle populations to re-establish on the ranch.	Whitetop & Scotch thistle	For the next 3 years survey pasture for whitetop and Scotch thistle populations. If whitetop is located treat with Cimmaron Plus, Telar or Escort at 1oz/acre in May when the plant is blooming. If Scotch thistle is found you can use 2,4-D, Milestone (1oz/acre), or Escort (1oz/acre). Treat rosettes early in spring or bolting plant before bloom.	Whitetop-blooming; Scotch thistle rosette or pre-bloom	May 2011-2013; June 2011-2013	No Plants

Table 4-B. Ranch B Integrated Weed Management Plan- March 1, 2011

Priority	Objectives	Weed Species	Planned Strategies	Plant Stage/ Time of Action	Date Planned	Actual Date
4	Reduce Canada thistle population with biocontrols by 2020.	Canada thistle	In 2013 survey for biocontrols released in 2010 on Canada thistle population. Look for mites when vegetation is 2-4inches high; look for green galls past bloom if they are present let them work. If the CRWMA determines they didn't take hold then treat site with Milestone (5oz/acre) when plant is in bud stage (June or July).	Pre-bud or budstage	June 2011-2013 survey	
5	Manage nuisance weeds like cheatgrass, common mullein and chicory.	Cheat-grass, chicory, Mullein	Survey and treat if necessary with glyphosate or Plateau (cheatgrass) in spring or fall, 2,4-D (broadleaves) in spring. Spot spray or treat before native species green-up.	Cheatgrass-dormant; others pre-bloom	March or October; June-July	

Table 4-C. Ranch C Integrated Weed Management Plan- March 1, 2011

Priority	Objectives	Weed Species	Planned Strategies	Plant Stage /Time of Action	Date Planned	Actual Date
1	Protect rangeland integrity. Monitor *Ventenata* populations. In 2 years determine most vulnerable habitat.	Ventenata, African wiregrass	Monitor Ventenata and determine if control is possible.	Anthesis ; grass flower is present	June or July 2012	
1	Within 5 years, reduce the population of medusahead rye by 98% at Ranch Headquarters'.	Medusa-head rye	Fall treat medusahead rye with Panoramic (6oz/acre) for 3 years. During this pastures rest year from grazing could use Landmark (4.5oz/acre). Hire applicator.	Fall greenup or dormant	Oct.-2011	Nov. 11, 2011
2	Within 3 years, eliminate the Musk thistle population in Roadside Meadow.	Musk Thistle	Until eradicated, treat with Milestone or 2, 4-D in the spring. Use appropriate grazing practices to maintain perennial vegetation.	Rosette to pre-bloom	June or July 2011	June-2011
3	Within 3 years of locating new Scotch thistle scattered sites, eradicate weeds from site.	Scotch thistle	Each year, actively survey and treat with 2,4-D or Milestone (1oz/acre) satellite populations of Scotch thistle. Manual control will be used for small patches.	Rosette to pre-bloom	May-Early July 2011	June 2011
4	Within 3 years, reduce Russian knapweed population by 90% behind the folks place.	Russian knapweed	Each year treat 5 acres of Russian knapweed population behind the folks place in the fall with Milestone (7oz/acre).	Plant senescing	Oct.-Nov. 2011	Nov. 2011
4	Within 5 years, reduce whitetop population by 90% on 200 acres in the fields at Hanks.	whitetop	Broadcast spray 100 acres of whitetop in the spring of 2011 and the other 100 acres in 2012 with Escort (1oz/acre). Continue spot treating the 200 acres every year until population is under control.	Blooming	May 2011	June 2011

Table 4-C. Ranch C Integrated Weed Management Plan- March 1, 2011

Priority	Objectives	Weed Species	Planned Strategies	Plant Stage/ Time of Action	Date Planned	Actual Date
5	Monitor Canada thistle population and biocontrol agents released in 2010 until we decide agents are not working or Canada thistle is 85% controlled.	Canada thistle	In June look for the mites. In September or October look for galls made from gall fly. If agents flourish in the next 5 to 10 years, transport them to other thistle patches around the ranch. If agents are not found ask CRWMA for help and if determined they did not take, treat with Milestone or 2,4-D pre-bloom.	Mites -2-4 in. veg Fly-past bloom Treat-Bud stage	June & Sept. 2013	
6	Within 2 years, treat any spotted knapweed populations that are located.	Spotted knapweed	Within 2 years, treat any spotted knapweed populations that are located.	Rosette to pre-bloom	June or July 2011	None 2011
7	Within a year discuss common weed problems with all neighbors and within two years initiate control measures together with cooperative neighbors. Keep talking to initially non-cooperative neighbors; a change of direction may be possible.	All	Contact Name neighbors before May where boundary issues exist. See who is interested in cross boundary treatments. Schedule treatment. Visit with other neighbors as opportunities arise.	Dormant	January, 2012	
8	For next 5 years keep medusahead out of gravel pit area.	Medusa-head rye	Monitor medusahead rye to continue to keep it from returning to the gravel pit area. Flag sites and treat the following fall with Plateau or Panoramic.	Monitor-flowers Treat-Dormant	June 2011	

Table 5-A. Ranch A Integrated Weed Management Treatment Record Form - 2011

Action	Weed Species & Stage of Growth	Pasture Name: Est. size of Treatment Area	Type of Treatment: Herbicide Formulation	Date of Treatment	Weather Conditions: Days to 1st Rain
Treat spurge with Tordon 22K at label rate for 3 years. Spot spray if necessary.	Leafy spurge flowering	Norm's field edges	Milestone 8oz, Hasten 8oz, 2(25) gallon tanks	6/26/2011	Temp 75 no wind
Treat new spurge locations w/ Tordon 22K at label rate 3 yrs. Spot spray if necessary.	Leafy spurge post bloom	West bridge (34 acres)	Tordon 22K 12.75 gal, Inplace 3.25 gal, Syltac 1.25 gal	8/4/2011	Temp 64 no wind
Eradicate Scotch thistle patches from Duck Pond within 5 years.	Scotch thistle bolting	Duck Pond	Milestone 8oz, Hasten 8oz, 3(25) gallon tanks	6/30/2011	Temp 75 Wind 0
Eradicate Scotch thistles from any new locations within 5 years of finding them.	Scotch thistle bolting	People Field	Milestone 8oz	7/1/2011	Temp 70s wind 5mph
Eradicate Scotch thistles from any new locations within 5 years of finding them.	Scotch thistle rosette	N. E. Bridge	Milestone 8oz, Hasten 8oz	5/24/2011	Temp 75s
	Pre-bloom		Milestone 8oz, Hasten 8oz, 3(25) gallon tanks		Wind 10mph
Eradicate Scotch thistles from any new locations within 5 years of finding them.	Scotch thistle pre-bloom	Shilo	Milestone 8oz, Hasten 8oz, 4(25) gallon tanks	7/7/2011	Temp 80s wind 5mph
Eradicate Russian knapweed from NW Bridge within 3 years. Burn in spring, treat in fall.	Russian knapweed	NW Bridge (2 acres)	Burn	May	Temp 60s, no wind
	Russian knapweed Post-Bloom		Milestone 8oz, Hasten 8oz, 3(25) gallon tanks	10/28/2011	Temp 50s wind 10mph <1/10 on 29th
Contain the upland medusahead population.	Medusahead dormant	Jap Creek (25 acres)	Plateau 19 oz, Inplace 4.3/4, MSO 51oz 21(25) gal tanks	10/20-24/11	Temp 50s no wind
Survey and treat weeds as necessary.	Puncture vine blooming	Roads	Round-up 25oz, Hasten 80z	7/25/2011	Temp 70s wind 15mph

Table 5-B. Ranch B Integrated Weed Management Treatment Record Form 2011

Action	Weed Species & Stage of Growth	Pasture Name: Est. size of Treatment Area	Type of Treatment: Herbicide Formulation	Date of Treatment	Weather Conditions: Days to 1st Rain
Write small grant and treat medusahead with *Plateau* Fall or Spring	Medusahead Dormant	Hill (50acres)	Plateau 6oz/acre	Nov-10	Cold and clear: 7 days
Treat outlier populations and establish a 20 ft buffer	Medusahead Dormant	Hill (10acres)	Plateau 6oz/acre	November ?,2011	Cold and clear
Survey and treat medusahead patches 2013 on ward	Medusahead Dormant	all over ranch	Plateau 6oz/acre	Nov-11	
Modify cattle management	Medusahead Dormant	Hill (50acres)	Spring grazing	No grazing in 2011	
2011-2013 Survey disturbance from CRWC diversion dam. If spotted knapweed is found, treat with *Milestone* 5oz/acre in June or July	Spotted knapweed-blooming	diversion dam (2acres)		Not treated	
2011-2013 survey pasture for whitetop and Scotch thistle populations. If whitetop is located treat with *Cimmaron Plus, or Escort* at 1oz/acre in May when plant is blooming. If Scotch thistle is found use 2,4-D, *Milestone* or *Escort* (10z/acre). Treat rosettes in spring or bolting plants before bloom.	Whitetop-blooming & Scotch thistle-rosettes	Front field (10 aces)	Escort	April 23-26,2011	Partly cloudy: 2days
In 2013 survey for biocontrols released in 2010 on Canada thistle population. Look for biocontrol insects, if they are present let them work. If CRWMA determine they did not take, treat with *Milestone* (5oz/acre) when plants in bud stage (June)	Canada thistle	Along creek			
Survey and treat with glyphosate or *Plateau* (cheatgrass) in spring or fall, 2,4-D (broadleaves) in spring. Spot spray or treat before native species green-up	Cheatgrass, chicory, mullein	all around ranch	Round-up	Apr-11	Clear: 2 days

Table 5-C. Ranch C Integrated Weed Management Treatment Record Form 2011

Action	Weed Species & Stage of Growth	Pasture Name: Est. size of Treatment Area	Type of Treatment: Herbicide Formulation	Date of Treatment	Weather Conditions: Days to 1st Rain
Fall treat medusahead rye with Panoramic (6oz/acre) for 3 years. During this pastures rest year from grazing could use Landmark (4.5oz/acre). Hire applicator.	Medusahead fall greenup or dormant	Ranch headquarters' & Gilcrest pasture (20acres)	Panoramic (6oz/acre)	10-Nov-11	Cold and clear
Until eradicated, treat with Milestone or 2, 4-D in the spring. Use appropriate grazing practices to maintain perennial vegetation.	Musk thistle rosettes	Roadside meadow (2acres)	Milestone (1oz/acre)	21-Jun-11	Sunny 75 degrees; least a week before rain
Each year, actively survey and treat with 2,4-D or Milestone (1oz/acre) satellite populations of Scotch thistle. Manual control will be used for small patches.	Scotch thistle rosettes; pre-bloom	Where ever found	Milestone (1oz/acre)	21-Jun-11	Sunny 75 degrees; least a week before rain
Each year treat 5 acres of Russian knapweed population behind the folks place in the fall with Milestone.	Russian knapweed going dormant	Folks place, Co. road, Lower Washburn (5acres)	Milestone (7oz/acre)	9-Nov-11	Cold and clear
Broadcast spray 100 acres of whitetop in the spring of 2011 and the other 100 acres in 2012 with Escort (1 oz/acre). Continue spot treating the 200 acres every year until population is under control.	Whitetop Bloom or pre-bloom	Lower Washburn (200 acres)	Escort (1oz/acre)	8-Jun-11	Partly cloudy; 69 degrees
Within 2 years, treat any spotted knapweed populations that are located.	Spotted knapweed	Along roads	Milestone (5oz/acre)	Not treated	

Ranch A - Treatment Map

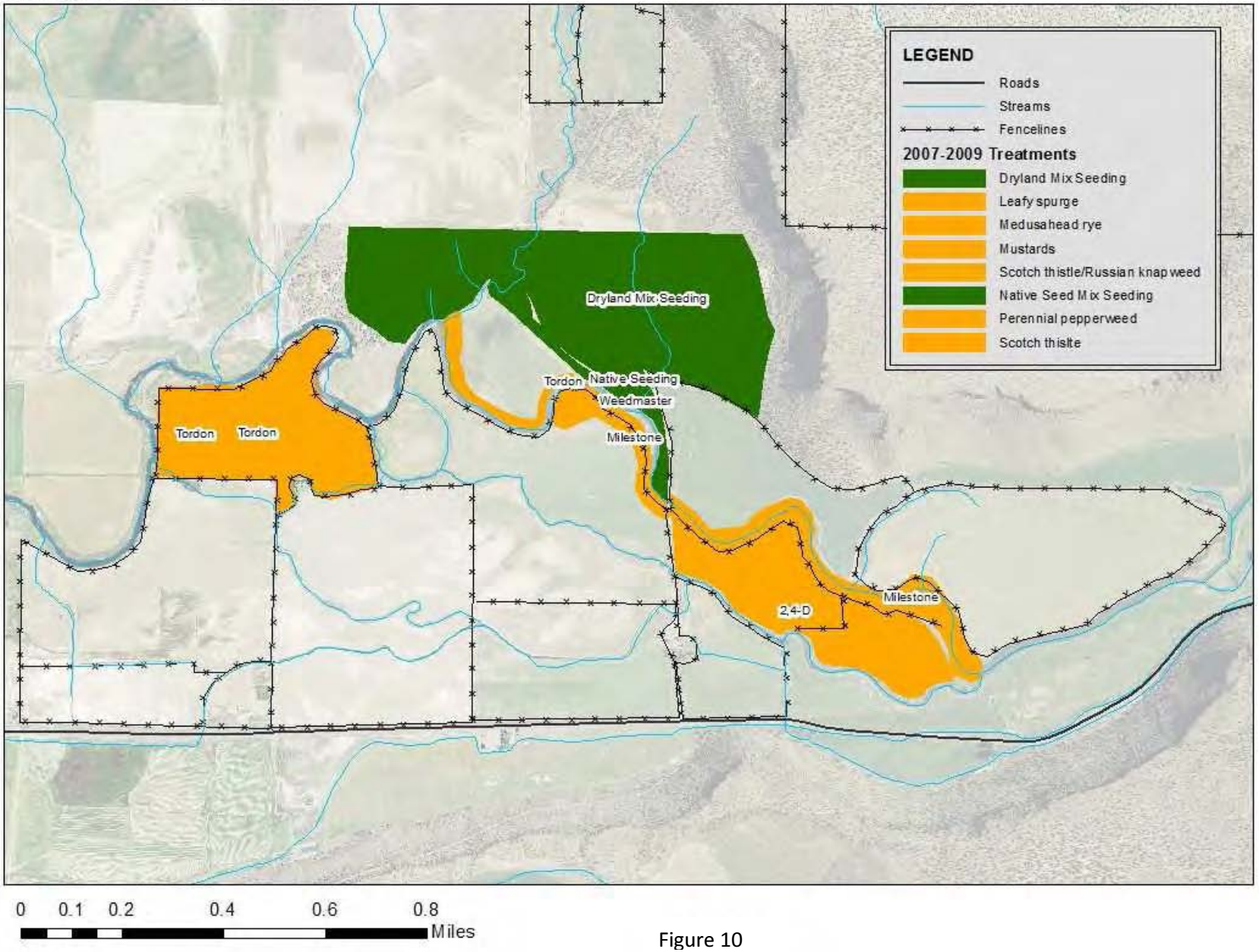


Figure 10

Piece 7. Develop a Monitoring and Evaluation Program In Order To Apply Adaptive Management

Before you begin applying your management strategies and taking action please consider establishing a monitoring system to assist with evaluating the effectiveness of your integrated weed plan. It is essential for overall success that you assess the effectiveness of your management strategies. Good monitoring will help you decide if your weed strategy is succeeding and/or needs to be modified. This process is known as "adaptive management" (see Appendix H for Herbicide and Ecological Terminology). Table 5 Ranch C is an example for planning your monitoring methods.

Keep it Simple

We know that if the monitoring takes too much of your time or costs are too expensive, it will be dropped from your priority schedule. At the very least, we will suggest that you use your property weed map and a camera to photograph each of the infestations where the plan calls for implementation. Every year or two, after taking action, remap and rephotograph your weed sites.

Written Observations

The most basic form of monitoring is simply writing down reference notes about what you see in the field. This will allow you to compare observations over a period of time. Write down and keep your records.

Record your observations about:

- Weed species and locations in specific areas.
- Size and abundance of weed infestations.
- Site disturbances that may be encouraging weed spread or promoting weed establishment.
- Currently uninfested areas that are prime sites for establishment.

Examples of Observational Monitoring

1. **Weed Management Objective**: Eliminate the patch of leafy spurge in Herb's field in five years.
2. **Monitoring action**: Check the infestation from May to June and after treatment in September.
3. **Management action**: Plan for an immediate follow-up treatment to eliminate annual seed production and to kill adult plants.

Table 6. Ranch C Integrated Weed Management Monitoring Form

Priority	Weed Management Objectives	Weed Species	Planned Weed Management Monitoring Methods	Stage/Time for Action	Action Date	Actual Date
1	Within 2 years, monitor Ventenata and determine if it is possible to manage in high priority areas.	Ventenata	Map areas of Ventenata, identify high priority areas and develop strategy if possible.	green	June 2012	
1	Within 5 years, reduce the population of medusahead rye by 98% at Ranch Headquarters'.	Medusa-head rye	Establish 1 photo point that will be used for all medusahead locations. Re-take photo June after treatment. Pace method.	green	June 2011	
1	Within 5 years, reduce the population of medusahead rye by 98% on the Gilchrest Road, the Brennon Place, & Trout Creek holding pasture.	Medusa-head rye	Establish 1 photo point that will be used for all medusahead locations. Re-take photo June after treatment.	green	June 2011	
2	Within 3 years, eliminate the Musk thistle population in Roadside Meadow.	Musk thistle	Establish photo monitoring point in Roadside Meadow for musk thistle. Re-photo after treatment.	bolting	June 2011	
3	Within 3 years of locating new Scotch thistle scattered sites, eradicate weeds from site.	Scotch thistle	No monitoring needed.			
4	Within 3 years, reduce Russian knapweed population by 90% behind the folks place.	Russian knapweed	Continue to monitor photo point by folk's place that was established by the CRWMA.	blooming	August 2011	
4	Within 5 years, reduce whitetop population by 90% on 200 acres in the Camp Creek Drainage.	whitetop	Establish 1 photo monitoring point in Roadside pasture for whitetop. Re-take photo after treatment each year.	blooming	June 2011	
5	Monitor Canada thistle population and biocontrol agents released in 2010 until we decide agents are not working or Canada thistle is 85% controlled in Lower Trout Creek.	Canada	CRWMA will continue to monitor and re-photograph biocontrol release site.	blooming	June-August 2013	

Photo Monitoring

This works best when monitoring species that can be easily distinguished from other plants during flowering. This technique may not be as effective for short statured plants without showy flowers. If you are using photo monitoring, take the photos from permanent locations (photo points). Set up photo points in selected weed infestations where you have established specific management objectives. Select the location of the photo point so that most or all of the area you will treat can be seen in the photo. You may want to mark your photo site with a fence post or something that you will not run over with farming equipment. Painting stakes with a bright color may help with the relocation.

Record the patches on the map and take the copy of the original photo out in the field with you. This will help you make comparisons. Record your notes in a field journal or data sheet as provided in Table 7 and retake the photograph of the same area.

Record locations of your photo points on your weed map with an arrow showing the direction of the photo and assign a unique number to each point. If you are using a GPS record the coordinates of your photo points. Mark photo points in the field with stakes that you will not run over with equipment. Paint your stakes a bright color to help locate or mark with a GPS unit.

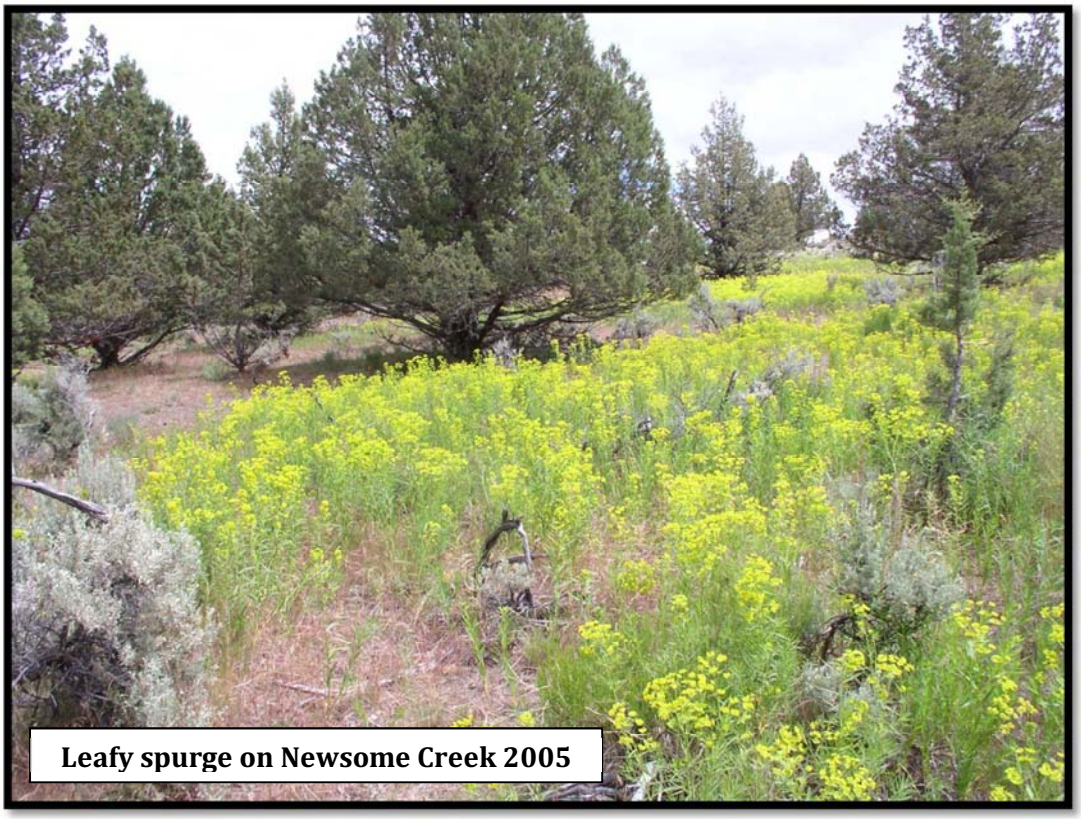
Take photos when the target weed is in peak flowering period. Take pictures at a fixed focal length and close to the same date or plant stage each year. Include obvious background features such as mountains, fences, trees to help position the photo with the same scene. Label the photos in your computer or print and label with photo point numbers. Print previous photos to take with you in the field in order to frame the same scene. Keep a log of photos taken and place a sign in the photo (see Figure 7-11).

Example of Photo Monitoring

1. **Weed Management Objective**: Reduce the diffuse knapweed infestation in the horse pasture to less than six patches within five years.
2. **Monitoring action**: Set up photo monitoring sites at all disjunct patches of knapweed. Photograph at blooming time each year after treatment.
3. **Management action**: Examine photographs and set schedule for follow-up and next year's treatment.

Table 7. Ranch C Photo Monitoring Record Form

OBJECTIVE	WEED	PHOTO MONITORING SITES	NO.	DATE	DATE	DATE
Within 5 years, reduce the population of medusahead rye by 98% at Ranch Headquarters'.	Medusa-head rye	Establish 1 photo point that will be used for all medusahead locations. Re-take photo June after treatment. Photo point by willow tree.	M-1	20-June 2011		
Within 5 years, reduce the population of medusahead rye by 98% on the Gilcrest Road and the Brennon Place Trout Creek holding pasture.	Medusa-head rye	Establish 1 photo point that will be used for all medusahead locations. Re-take photo June after treatment. Photo point on north fenceline.	M-2	20-June 2011		
Within 3 years, eliminate the Musk thistle population in Roadside Meadow.	Musk thistle	Establish photo monitoring point in Roadside Meadow for musk thistle. Re-photo after treatment. Photo point by right gate post.	MT-1	July 2010	July 2011	
Within 3 years of locating new Scotch thistle scattered sites, eradicate weeds from site.	Scotch thistle	No monitoring needed.				
Within 3 years, reduce Russian knapweed population by 90% behind the folks place.	Russian knapweed	Continue to monitor photo point by folk's place that was established by the CRWMA. Photo point off east side of pasture.	RK-1	July 2010		
Within 5 years, reduce whitetop population by 90% on 200 acres in the Camp Creek Drainage.	whitetop	Establish 1 photo monitoring point in Roadside pasture for whitetop. Re-take photo after treatment each year. Photo pt. in SE corner of fenceline.	W-1	June 2010	July 2011	
Monitor Canada thistle and biocontrol agents released in 2010 until we decide agents are not working or Canada thistle is 85% controlled in L. Trout Creek.	Canada thistle	CRWMA will continue to monitor and re-photograph biocontrol release site. Photo pt. off south end of Trout Creek.	CT-1	July 2010		



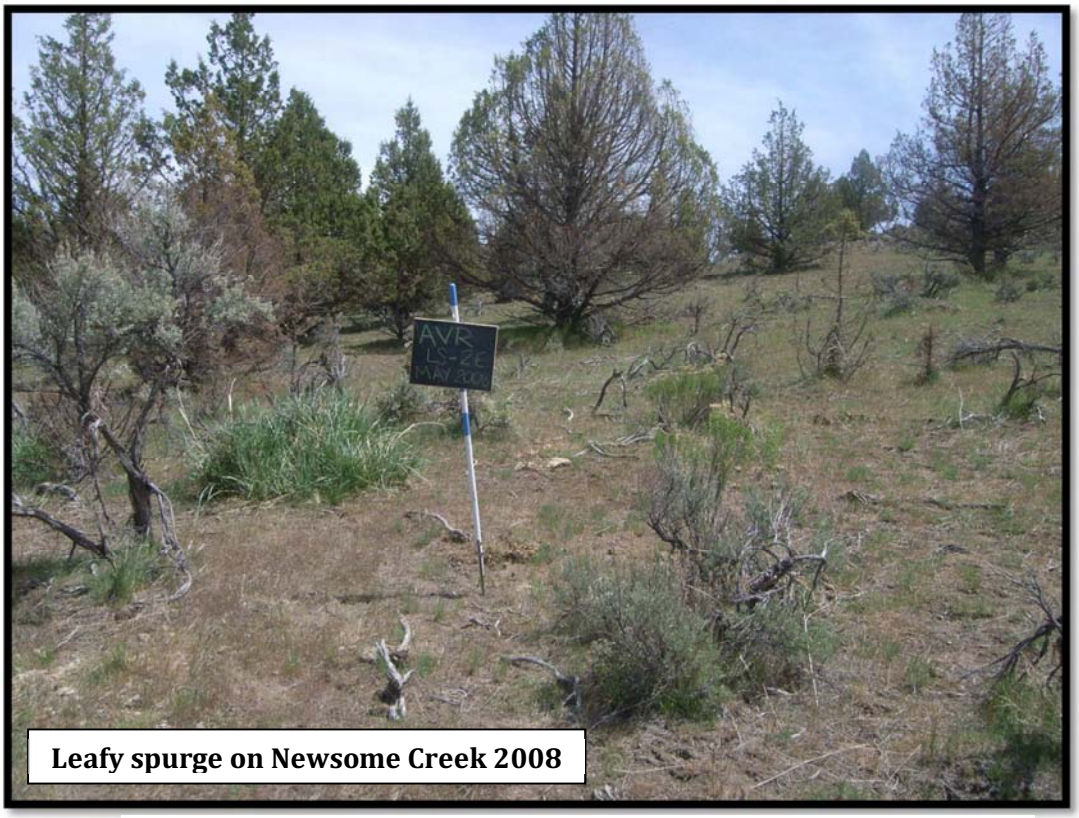


Figure 11. Example of Photo Monitoring Point (Before & After)

Collecting Quantitative Monitoring Data

Besides remapping, rephotographing and recording some notes, we hope you might take the next step and actually sample plots for density, cover or frequency. Given the constraints of field methods, time and money, the bottom line is whether or not monitoring is enabling you to evaluate the effectiveness of your weed management plan and eventually save you time and money by altering treatments to appropriate levels. Monitoring is only useful if you keep re-evaluating your treatment areas over time. Photographs and/or written records will help you document changes that are occurring as a result of your weed management actions.

Pace Method

The Pace Method is a quick and easy way to record weed presence or absence to determine percent weed frequency over other methods that are time consuming. Some weeds are not showy and you can't see them very easily in a photo. Medusahead may be one that a photograph wouldn't really show off a change. Collecting presence or absence data on the end of your boot may be more effective. Each right step record whether the species of concern is within a "soup can" area (about 3 inches around) adjacent to the top of your boot. Walk straight lines or meander in a zigzag pattern through the infestation. Record the presence or absence of the weed on 50 right boot paces (do not record on your left paces). This method will give you a percent frequency and should take less than ½ hour. If you found the plant present 50 times, you would have a 100% frequency; if you found it 25 times, you would have a 50% frequency. If you established this method before treatment and each year after, you would have a relative frequency of the change in weed infestation and a method to determine whether your weed treatment was effective. See the pace monitoring data sheet (Table 8).

Example of Using Pace Monitoring

1. **Weed Management Objective**: Reduce the frequency of medusahead in Herb's pasture to less than 10% within five years.
2. **Monitoring action**: Survey the site when the medusahead has headed out and count presence or absence 50 times using Pace method.
3. **Management action**: If unsatisfied with control, schedule follow-up treatment before plant goes to seed.
4. **Revegetation monitoring**: If the medusahead population is reduced to 10%, determine whether the frequency of native species is high enough for natural regeneration to replace the weed.
5. **Revegetation action**: If sufficient native plants are not on site, implement revegetation. After 2 or 3 years site preparation, drill your selected seed mix at the appropriate rate.

Table 8. PACE Monitoring Data

Weed species: _____
Date of monitoring: _____
Name of observer: _____
Pasture Name: _____
Location of monitoring plots within pasture: _____
Action # from treatment reporting form: _____
Photo plot #:_____

Circle the type of plant unit being counted or estimated: *Presence of rooted plants* *Presence of flowering stems* *Other (specify)*

Does the data include seedlings or rosettes? *Yes* *No*

Present = P Absent = A

Weed	**Paces**																								
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Weed																									
	26	**27**	**28**	**29**	**30**	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**	**41**	**42**	**43**	**44**	**45**	**46**	**47**	**48**	**49**	**50**

Example Data Form

Weed	**Paces**																								
knapweed	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
	P	P	A	A	A	A	P	A	P	A	A	A	A	P	P	P	P	P	P	P	P	P	P	A	A
Weed	**Paces**																								
knapweed	**26**	**27**	**28**	**29**	**30**	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**	**41**	**42**	**43**	**44**	**45**	**46**	**47**	**48**	**49**	**50**
	P	P	P	P	P	A	A	A	P	P	P	A	A	P	A	A	A	P	P	P	A	A	A	A	A

Presence (add # of "P") = 25 Percent Frequency (25÷50) = 50%

Implement Monitoring Plans

The most critical step in any monitoring program is to begin doing it. If you don't do any monitoring it will be difficult to determine if you are meeting your weed management objectives. Monitoring may save you time and money by insuring that your control efforts are as effective as possible. After you begin monitoring follow the cycle described below and in Figure 12.

1. Collect field data consistently and according to your plan.
2. Write down what you see using data sheets or a field book or both.
3. Evaluate your monitoring results immediately after you collect the data.
4. Determine whether you need to alter your actions on the basis of the gathered information.
5. Revise your weed plan actions or strategies. Determine if revegetation is necessary.
6. Begin this cycle again.

You will need more than one year's data to determine whether a treatment has succeeded or failed. Many weed populations respond dramatically to annual weather conditions. For example, in a dry year Scotch thistle may not germinate and you will think you have eliminated the population, but if there is more moisture the following year the Scotch thistle infestation may be back and even increase. However, do not feel discouraged, the seed is being flushed out of the soil. If you are persistent, eventually you will be victorious.

Adaptive Management Model

Figure 12

CONCLUSION

Now that you have read this manual, it's time to prepare a weed management plan. The sooner you begin to apply what you have learned, the sooner you can benefit from it. As you prepare your plan, please remember these six key points.

1. **Ask for help:** There are many resources available to you. Get to know your county weed supervisor, county extension agent, cooperative weed management coordinator, Oregon Department of Agriculture weed person and other knowledgeable people, and take advantage of their knowledge and experience.

2. **Try new things:** If a particular Integrated Weed Management program doesn't work, try a different combination of control techniques. Monitoring will show when it is necessary to try different ways of controlling weeds.

3. **Work with your neighbors:** Two heads and wallets are greater than one. Weeds do not respect land ownership or political boundaries. Weed management is an undertaking where cooperation can produce great rewards.

4. **Don't let short-term success lull you into complacency:** Controlling weeds is an on-going management responsibility that will not disappear even if there are initial management successes. The goal is to learn from your successes and failures and become more effective and efficient in the future.

5. **Persistence is critical:** Doing a little bit here and a little bit there every once in a while will not produce much in the way of good results. The fight must go on each growing season. If you do not treat one year all the work you did in previous year, will be lost. You need to be vigilant every year. Just think of all the weed seeds that are waiting for you to take a break.

6. **Work Safe!** (Appendix I)

Good Luck!

APPENDIX A.

Appendix A. Crook County and Oregon State Noxious Weed Lists

Oregon State "A" list*

Common Name, Scientific Name

African rue, *Peganum harmala*

Camelthorn, *Alhagi pseudalhagi*

Coltsfoot, *Tussilago farfara*

Common reed, *Phragmites australis ssp. australis*

Common Cordgrass, *Spartina anglica*

Dense-Flowered Cordgrass, *Spartina densiflora*

Saltmeadow Cordgrass, *Spartina patens*

Smooth Cordgrass, *Spartina alterniflora*

European water chestnut, *Trapa natans*

Flowering rush, *Butomus umbellatus*

Giant hogweed, *Heracleum mantegazzianum*

Barbed Goatgrass, *Aegilops triuncialis*

Ovate Goatgrass, *Aegilops ovata*

Goatsrue, *Galega officinalis*

King-devil Hawkweed, *Hieracium piloselloides*

Meadow Hawkweed, *Hieracium pratense*

Mouse-ear Hawkweed, *Hieracium pilosella*

Orange Hawkweed, *Hieracium aurantiacum*

Yellow Hawkweed, *Hieracium floribundum*

Hydrilla, *Hydrilla verticillata*

Japanese dodder, *Cuscuta japonica*

Kudzu, *Pueraria lobata*

Common Name, Scientific Name

Matgrass, *Nardus stricta*

Oblong spurge, *Euphorbia oblongata*

Paterson's curse, *Echium plantagineum*

Purple nutsedge, *Cyperus rotundus*

Silverleaf nightshade, *Solanum elaeagnifolium*

Spanish heath, *Erica lusitanica*

Skeletonleaf bursage, *Ambrosia tomentosa*

Squarrose knapweed, *Centaurea virgata*

Iberian star thistle, *Centaurea iberica*

Purple Starthistle, *Centaurea calcitrapa*

Syrian bean-caper, *Zygophyllum fabago*

Texas blueweed, *Helianthus ciliaris*

Plumeless thistle, *Carduus acanthoides*

Smooth distaff thistle, *Carthamus baeticus*

Taurian thistle, *Onopordum tauricum*

Woolly distaff thistle, *Carthamus lanatus*

White bryonia, *Bryonia alba*

Yellow floating heart, *Nymphoides peltata*

Oregon State "B" List

(*indicates targeted for biological control)

Common Name, Scientific Name

Armenian/Himalayan blackberry, *Rubus armeniacus (R. procerus, R. discolor*)

Biddy-biddy, *Acaena novae-zelandiae*

French* Broom, *Genista monspessulana*

Portuguese Broom, *Cytisus striatus*

Scotch* Broom, *Cytisus scoparius*

Spanish Broom, *Spartium junceum*

Buffalobur, *Solanum rostratum*

Butterfly bush, *Buddleja davidii (B.variabilis)*

Common bugloss, *Anchusa officinalis*

Common crupina/bearded creeper, *Crupina vulgaris*

Creeping yellow cress, *Rorippa sylvestris*

Cutleaf teasel, *Dipsacus laciniatus*

Dodder, *Cuscuta spp.*

Dyers woad, *Isatis tinctoria*

English ivy, *Hedera helix (H. hibernica)*

Eurasian watermilfoil, *Myriophyllum spicatum*

False brome, *Brachypodium sylvaticum*

Field bindweed*, *Convolvulus arvensis*

Garlic mustard, *Alliaria petiolata*

Common Name, Scientific Name

Giant horsetail, *Equisetum telmateia*

Gorse*, *Ulex europaeus*

Halogeton, *Halogeton glomeratus*

Herb Robert, *Geranium robertianum*

Houndstongue, *Cynoglossum officinale*

Johnsongrass, *Sorghum halepense*

Jointed goatgrass, *Aegilops cylindrical*

Jubata grass, *Cortaderia jubata*

Diffuse knapweed*, *Centaurea diffusa*

Meadow knapweed*, *Centaurea pratensis (C. jacea x C. nigra)*

Russian knapweed*, *Acroptilon repens*

Spotted knapweed*, *Centaurea stoebe (C. maculosa)*

Giant knotweed, *Fallopia sachalinense (Polyganum)*

Himalayan knotweed, *Fallopia polystachyum (Polyganum)*

Japanese knotweed(fleece flower), *Fallopia japonica(Polyganum cuspidatum)*

Kochia, *Kochia scoparia*

Lesser celandine, *Ranunculus ficaria*

Mediterranean sage*, *Salvia aethiopis*

Common Name, Scientific Name

Medusahead rye, *Taeniatherum caput-medusae*

Old man's beard, *Clematis vitalba*

Parrots feather, *Myriophyllum aquaticum*

Perennial peavine, *Lathyrus latifolius*

Perennial pepperweed, *Lepidium latifolium*

Poison hemlock, *Conium maculatum*

Policeman's helmet, *Impatiens glandulifera*

Puncturevine*, *Tribulus terrestris*

Purple loosestrife*, *Lythrum salicaria*

Quackgrass, *Agropyron repens*

Ragweed, *Ambrosia artemisiifolia*

Rush skeletonweed*, *Chondrilla juncea*

Saltcedar*, *Tamarix ramosissima*

Shiny geranium, *Geranium lucidum*

Small broomrape, *Orobanche minor*

South American waterweed, *Egeria densa (Elodea)*

Spikeweed, *Memizonia pungens*

Spiny cocklebur, *Xanthium spinosum*

Spurge laurel, *Daphne laureola*

Leafy spurge*, *Euphorbia esula*

Common Name, Scientific Name

Myrtle spurge, *Euphorbia myrsinites*

St. Johnswort/Klamath weed*, *Hypericum perforatum*

Sulfur cinquefoil, *Potentilla recta*

Swainsonpea/Austrian peaweed, *Sphaerophysa salsula*

Tansy ragwort*, *Senecio jacobaea*

Bull thistle*, *Cirsium vulgare*

Canada thistle*, *Cirsium arvense*

Italian thistle*, *Carduus pycnocephalus*

Milk thistle*, *Silybum marianum*

Musk thistle*, *Carduus nutans*

Scotch thistle, *Onopordum acanthium*

Slender-flowered thistle*, *Carduus tenuiflorus*

Dalmatian toadflax*, *Linaria dalmatica (L. genista)*

Yellow toadflax*, *Linaria vulgaris*

Velvetleaf, *Abutilon theophrasti*

Hairy whitetop, *Lepidium pubescens (Cardaria)*

Hoary cress, *Lepidium draba (Cardaria)*

Yellow flag iris, *Iris pseudacorus*

Yellow nutsedge, *Cyperus esculentus*

Yellow starthistle*, *Centaurea solstitiali*

Crook County Invasive Species List

"A" List

Jointed goatgrass, *Aegilops cylindrica Host.*
Musk thistle, *Carduus nutans L.*
Yellow starthistle, *Centaurea solstitialis L.*
Squarrose knapweed, *Centaurea virgata Lam.*
Skeletonweed, *Chondrilla juncea L.*
Wild carrot, *Daucus carota L. ssp. Carota*
Leafy spurge, *Euphorbia esula L.*
Perennial pepperweed, *Lepidium latifolium L.*
Dalmatian toadflax, *Linaria dalmatica (L.) P. Mill.*
Purple loosestrife, *Lythrum salicaria L.*
Scotch thistle, *Onopordum acathium L.*
African Rue, *Peganum harmala L.*
Mediterranean sage, *Salvia aethiopis L.*
Tansy ragwort, *Senicio jacobaea L.*
Eurasian watermilfoil, *Myriopyllum spicatum*

"B" List

Russian knapweed, *Acroptilon repens (L.) DC.*
Whitetop, Hoary Cress, *Cardaria draba (L.) Desv.*
Diffuse knapweed, *Centaurea diffusa Lam.*
Spotted knapweed, *Centaurea stoebe*
Canada thistle, *Cirsium arvense (L.) Scop.*
Poison hemlock, *Conium maculatum L.*
Houndstongue, *Cynoglossum officinale L.*
Scotchbroom, *Cytisus scoparius (L.) Link*
St. Johnswort, Klamath Weed, *Hypericum perforatum L.*
Yellow flag Iris, *Iris pseudacorus L.*
Sulfur cinquefoil, *Potentilla recta L.*
Common groundsel, *Senecio vulgaris L.*
Spiny sowthistle, *Sonchus asper (L.) Hill*
Medusahead rye, *Taeniatherum caput-medusae (L.) Nevski*

"C" List

Western water hemlock, *Cicuta douglasii (DC.) Coult. & Rose*
Bull Thistle, *Cirsium vulgare (Savi) Ten.*
Field bindweed, *Convolvulus arvensis L.*
Teasel, *Dipsacus fullonum L.*
Kochia, *Kochia scoparia (L.) Schrad.*
Yellow sweetclover, *Melilotus officinalis (L.) Lam.*
Bur buttercup, *Ranunculus testiculatus Crantz.*
Russian thistle, *Salsola iberica L.*
Common mullein, *Verbascum thapsus L.*
Chicory, *Cichorium intybus* L.

Explanation of "A, B, and C" listed species:

"A" Designated Weed: A weed of known economic importance which occurs in the state in small enough infestations to make eradication or containment possible; or is not known to occur, but its presence in neighboring states make future occurrence in Oregon seem imminent (Table 1).

- **Recommended action**: Infestations are subject to eradication or intensive control when and where found.

"B" Designated Weed: A weed of known economic importance which is regionally abundant, but which may have limited distribution in some counties (Table 2).

- **Recommended action:** Limited to intensive control at the state, county or regional level as determined on a site specific, case-by-case basis. Where implementation of a fully integrated statewide management plan is not feasible, biological control (when available) shall be the primary control method.

"C" Designated Weeds: weeds of known economic importance are which is widespread throughout an area, but with enough impact to warrant notice.

- **Recommended action:** Limited to intensive control at the state, county or regional level as determined on a site specific, case-by-case basis. Containment may be the only mode of action.

APPENDIX B.

Appendix B. Crook County Contacts for Weed & Revegetation Assistance

Housed in the OSU/Crook County Extension Service
498 SE Lynn Blvd
Prineville, OR 97754
(541) 447-6228

- **Crooked River Weed Management Area**
  Brooke Gray, Coordinator
  brooke.gray@oregonstate.edu
  (541) 447-9971
  http://crwma.co.crook.or.us
- **Soil and Water Conservation District**
  Libby Stahancyk
  libby.rodgers@oregonstate.edu
  (541) 447-3548

Crook County Weed Supervisor
Kev Alexanian
kev.alexanian@co.crook.or.us
(541) 447-7958

Oregon Department of Agriculture
Dave Langland
dlanglan@oda.state.or.us
(541)548-2241

Mike Crumrine
mcrumrine@oda.state.or.us
(541)604-6580

Natural Resource Conservation Service
Chris Mundy, District Conservationist
Redmond Service Center
625 SE Salmon Road
Redmond, OR 97756
Chris.mundy@or.usda.gov
(541) 923-4358 Ext: 112

Modern Weed Control
www.modernweedcontrol.com
Andy Gray
(541) 633-6118

Round Butte Seed
1225 NW Gardner Rd
Prineville, OR 97754
(541) 447-5609

Deschutes Basin Native Plant Seed Non-profit
Berta Youtie
(541) 447-8166

APPENDIX C.

Appendix C. Weed References

1. **2010 PNW Weed Management Handbook**
   Ed. Ed Peachey, OSU
   Publications Orders
   Ext & Station Communications
   Oregon State University
   422 Kerr Admin. Bld.
   Corvallis, OR 97331-2119
   1-800-561-6719
   puborders@oregonstate.edu

2. **Weeds of the West**
   Western Society of Weed Science
   Cooperative Extension Services
   9th Edition, 2004

3. **Field Guide to Weeds of Eastern Oregon**
   Institute for Applied Ecology
   http://appliedeco.org/invasive-species-resources/weed-guides/E-OR weed guide webview version.pdf

4. **Crooked River Weed Management Area Website**
   http://crwma.co.crook.or.us/

5. **Western Invasives Network**
   http://www.westerninvasivesnetwork.org/

6. **Revegetation Guidelines for the Great Basin: Considering Invasive Weeds**.
   Sheley, R., J. Mangold, K. Goodwin, and J. Marks. October 2008. USDA, ARS-168. 52pp.

APPENDIX D.

Table 1. Weed Objectives by Priority

Priority	Objective

Table 3. Weed Objectives and Action Strategies

OBJECTIVE	STRATEGY

Table 4. Integrated Weed Management Plan

Priority	Objectives	Weed Species	Planned Strategies	Plant Stage/ Time of Action	Date Planned	Actual Date

Table 5. Integrated Weed Management Treatment Record Form

Action	Weed Species & Stage of Growth	Pasture Name: Est. size of Treatment Area	Type of Treatment: Herbicide Formulation	Date of Treatment	Weather Conditions: Days to 1st Rain

Table 6. Integrated Weed Management Monitoring Form

Priority	Weed Management Objectives	Weed Species	Planned Weed Management Monitoring Methods	Stage/Time for Action	Action Date	Actual Date

Table 7. Photo Monitoring Record Form

OBJECTIVE	WEED	PHOTO MONITORING SITES	NO.	DATE	DATE	DATE

Table 8. PACE Monitoring Data

Weed species: _____
Date of monitoring: _____
Name of observer: _____
Pasture Name: _____
Location of monitoring plots within pasture: _____
Action # from treatment reporting form: _____
Photo plot #:_____

Circle the type of plant unit being counted or estimated: *Presence of rooted plants* *Presence of flowering stems* *Other (specify)*

Does the data include seedlings or rosettes? *Yes* *No*

Present = P Absent = A

Weed	**Paces**																							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Weed																									
	26	**27**	**28**	**29**	**30**	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**	**41**	**42**	**43**	**44**	**45**	**46**	**47**	**48**	**49**	**50**

Example Data Form

Weed	**Paces**																							
knapweed	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
	P	P	A	A	A	A	P	A	P	A	A	A	A	P	P	P	P	P	P	P	P	P	P	A	A
Weed	**Paces**																								
knapweed	**26**	**27**	**28**	**29**	**30**	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**	**41**	**42**	**43**	**44**	**45**	**46**	**47**	**48**	**49**	**50**
	P	P	P	P	P	A	A	A	P	P	P	A	A	P	A	A	A	P	P	P	A	A	A	A	A

Presence (add # of "P") = 25% Percent Frequency (25÷50) = 50%

APPENDIX E.

Appendix E. Available Biological Control Agents and Host Weeds

Host Plant	Bio agent	Agent type	Transport Stage	Control Effectiveness
Canada thistle	*Ceutorhynchus litura*	Crown/root weevil	Adult	Good
	Urophora cardui	Stem gall fly	Galls	Fair
Dalmatian toadflax	*Mecinus janthinus*	Stem boring weevil	Adult	Excellent
Diffuse knapweed	*Bangasternus fausti*	Seed head weevil	Adult	Good
	Cyphocleonus achates	Root boring/gall weevil	Adult	Fair
	Larinus minutus	Seed head weevil	Adult	Excellent
	Sphenoptera jugoslavica	Root boring beetle	Adult	Good
Field bindweed	*Aceria malherbae*	Eriophyid mite	Plant	
Leafy spurge	*Aphthona cyparissiae*	Root/defoliating flea beetle	Adult	Excellent
	Aphthona czwalinae	Root/defoliating flea beetle	Adult	Excellent
	Aphthona flava	Root/defoliating flea beetle	Adult	Fair
	Aphthona lacertosa	Root/defoliating flea beetle	Adult	Excellent
	Oberea erythrocephala	Root/ stem boring beetle	Adult	Good
Mediterranean sage	*Phrydiuchus tau*	Root/crown weevil	Adult	Good
St. Johnswort	*Agrilus hyperici*	Root/stem boring beetle	Adult	Excellent
	Aplocera plagiata	Defoliating moth	Larvae	Fair
	Chrysolina hyperici	Defoliating beetle	Adult	Excellent
	Chrysolina quadrigemina	Defoliating beetle	Adult	Excellent
Spotted knapweed	*Bangasternus fausti*	Seed head weevil	Adult	Good
	Cyphocleonus achates	Root boring/gall weevil	Adult	Fair
	Larinus minutus	Seed head weevil	Adult	Excellent
Yellow starthistle	*Eustenopus villosus*	Seed head weevil	Adult	Excellent
	Larinus curtus	Seed head weevil	Adult	Excellent
	Bangasternus orientalis	Seed head weevil	Adult	Poor

APPENDIX F.

Appendix F. Crook County Weed Treatment Recommendations

Weed Species	*	Chemical Treatment	Timing
Canada thistle *Cirsium arvense*	P	**Milestone (5 oz/acre) (1qt/acre) Tordon 22-K Curtail (2qt/acre)	Full Bloom to the first killing frost Fall (September 1 to October 15)
Dalmatian toadflax *Linaria dalmatica*	P	Telar (1.33 oz/acre) + Tordon 22-K (1qt/acre) Tordon 22-K spot treatment (2qt/acre) **The CRWMA only funds biocontrols for this species**	June 1 to October 15
Diffuse knapweed *Centaurea diffusa*	B	Tordon 22-K (1qt/acre) + 2,4-D Amine (1qt/acre) **Milestone (5-7oz/acre)** Curtail (2qt/acre) Weedmaster (1.5qt/acre)	May 1 to July 15 (Rosette to pre-bloom)
Houndstongue *Cynoglossum officinale*	B	Escort (1.5oz/acre) Tordon 22-K (1qt/acre)	Spring and Fall Rosette Stage
Leafy Spurge *Euphorbia esula*	P	**Next to Water:** Rodeo (2qt/acre)-use multiple applications Tordon 22-K (2qt/acre) **Plateau or Panoramic (12oz/acre)**	Early Summer (June)
Mediterranean sage *Salvia aethiopis*	B	Escort (1oz/acre) Tordon 22-K (1qt/acre) + 2,4-D Amine (1qt/acre) 2,4-D LV 6 (2qt/acre)	Spring and Fall Rosette Stage
Medusahead Rye *Taeniatherum caput-medusae*	A	**NON-CROP ONLY:** Oust (1oz/acre) Landmark XP (4.5oz/acre) 1 year grazing restriction **Plateau or Panoramic (6oz/acre)**	Pre-emergent: Late fall and Winter
Perennial pepperweed *Lepidium latifolium*	P	**Escort (1.5oz/acre)** **Telar (1.5oz/acre)**	Pre-Senescence (May 1 to September 1)
Poison hemlock *Conium maculatum*	B	2, 4-D Amine (1qt/acre) + Weedmaster (1qt/acre) 2,4-D Amine (2qt/acre)	Spring, from rosette to mature

Weed Species	*	Chemical Treatment	Timing
Russian knapweed *Acroptilon repens*	P	Redeem (2qt/acre) Tordon 22-K (2qt/acre) ****Milestone (7oz/acre)** Transline (1.33 pt/acre)	Prior to snow fall and frozen soil Fall (September 1 to December 1)
Scotch thistle Onopordum acanthium **Musk thistle** *Carduus nutans*	B	Tordon 22K (1qt/acre) Escort (1oz/acre) ****Milestone (7oz/acre)**	Spring and Fall Rosette Stage
Spotted knapweed *Centaurea stoebe*	B	Curtail (2qt/acre) ****Milestone (7oz/acre)** Tordon 22-K (1qt/acre) + 2,4-D Amine (1qt/acre)	Spring (May 1 to July 15) Fall (August 15 to October 1)
St. Johnswort *Hypericum perforatum*	P	Escort (1oz/acre) Tordon 22-K (1qt/acre) + 2,4-D Amine (1 qt/acre)	Spring (May 1 to July 1)
Whitetop *Cardaria draba*	P	**Telar (1oz/acre)** Cimmaron Plus (0.5 g/gallon H2O) or Cimmaron Max(Escort (1oz/acre)	Spring (April 1 to May 15) When plants are in bloom
Yellow starthistle *Centaurea solstitialis*	A	****Milestone (5oz/acre)** Curtail (2qt/acre) Tordon 22-K (1qt/acre) + 2,4-D Amine (1qt/acre)	Spring (May 1 to July 15) Rosette Stage

* A=annual; B=biennial; P= perennial **Preferred treatments listed in BOLD**

Crook County Weed Control
1306 N Main Street Prineville, OR 97754 Office (541) 447-6228 Fax (541)447-2977

Always Read and Follow Label Directions!

Know the restrictions on the chemical you are using before you spray. Use pesticides wisely (NEVER USE MORE THAN THE RECOMMENDED RATE): follow all mixing and application instructions and wear personal protective gear and clothing. Tordon 22-K is a restricted use chemical. You must possess a pesticide applicator's license to obtain this product. If you would like more information in regards to obtaining a license, please contact the Oregon Department of Agriculture. The utilization of an organo-silicone surfactant, (phase or syl-tac) will be mandatory with all applications of all materials. A surfactant rate of 1 quart per one hundred gallons of water will be utilized. There will be no exceptions to the recommendations for herbicide formulations or timing of application without the permission of the Crook County Weed Master.

****CAUTION! It's against the law to sell hay that has been treated with Milestone. If you are selling hay Transline can be used in place of Milestone**

Trash Weeds Treatment Recommendations
Take this sheet to your local Ag dealership for appropriate products

Species	Timing	Chemical Rates (per acre)	Alternative Treatment & Management
Bur buttercup, goathead *Ceratocephala testiculata*	March 1 to April 1	1/3oz Cimmaron	Round-up can be used in non-vegetated areas such as driveways
Bull thistle *Cirsium vulgare*	May to June	5 to 7oz Milestone	Can be dug up below the soil surface
Common mallow, buttonweed *Malva neglecta*	During Active Growth	2% or 48oz of Roundup or 16oz to 32oz of Banviel 1oz Escort	Can be grubbed, but plants tend to be difficult to remove below the soil surface
Canada thistle *Cirsium arvense*	Full bloom to first killing frost	7oz Milestone	Canada thistle is rhizomatous, making pulling, burning or cutting ineffective control methods. Biocontrols are available
Cheatgrass *Bromus tectorum*	March	16oz Roundup	Small patches can be pulled
Chicory *Cichorium intybus*	June-August	22oz Transline 1qt MCPA	Small patches can be pulled
Clasping pepperweed *Lepidium perfoliatum*	April	64oz 2,4-D	Small patches can be pulled
Dandelion *Taraxacum officinale*	During Active Growth	64oz 2,4-D	Dandelion can be dug up before seed set
Field bindweed *Convolvulus arvensis*	During Active Growth	2% or 48oz Roundup or 32oz Banveil	Pulling is an ineffective form of control
Foxtail barley *Hordeum jubatum*	April to May	48oz Roundup	Small patches can be pulled
Horsetail *Equisetum arvense*	Summer months	2oz Telar	Horsetail can be controlled through cultivation
Kochia *Kochia scopana*	During Active Growth	48oz 2,4-D	Multiple applications may be needed due to multiple germinations
Lamb's quarter *Chenopodium album*	During Active Growth	48oz 2,4-D	Small patches can be pulled
Myrtle spurge *Euphorbia myrsinites*	May to August	32oz 2,4-D Amine or 32oz Dicamba	Myrtle spurge is highly toxic and extreme caution should be taken if using mechanical control.

Cutleaf nightshade *Solanum triforum*	During Active Growth	Weedmaster or Curtail	Seeds are viable for up to 30 years and fruits are poisonous so stop this plant from setting seed
Perennial sowthistle *Sonchus arvensis*	may to June	48oz 2,4-D	Small patches can be pulled
Poison hemlock *Conium maculatum*	April to may	64oz 2,4-D	Poison hemlock is toxic and caution should be taken when using mechanical control. Burning green material can be harmful to your health
Puncturevine, goathead *Tribulus terrestris*	During Active Growth	48oz 2,4-D	Small patches can be grubbed and seeds picked up with duct tape
Purple mustard *Chorispora tenella*	At less than 4 inches in heights	0.125oz Cimmaron Plus	Small patches can be pulled
Purslane *Portulaca oeracea*	During Active Growth	2% or 48oz Roundup	Stop from going to seed
Russian thistle *Salsola kali*	During Active Growth	48oz 2,4-D	Spray when less than 12 inches in height
Tansy mustard, Flixweed *Descurainia pinnata*	During Active Growth	64oz 2,4-D	Small patches can be pulled or mowed
Jim Hill Tumble mustard *Sisymbrium altissimum*	April to June	64oz 2,4-D	Small patches can be pulled or mowed
Water Hemlock *Cicuta maculata*	April-May or June during wet springs	2.5qts LV-6	Water hemlock is highly poisonous and extreme caution should be practiced
White Horehound *Marrubium vulgare*	During Active Growth	Weedmaster or Triclopyr	Small patches can be pulled

Note: Milestone should not be used in gardens, nor should manure that may contain Milestone. Round-up is however safe and effective for almost all weeds in garden settings

Crook County Weed Control

1306 N Main Street Prineville, Oregon 97754

Office (541)447-7958 Fax (541)447-2977

<u>**Always Read and Follow Label Directions!**</u>

Know the restrictions on the chemical you are using before you spray. Use pesticides wisely **(NEVER USE MORE THAN THE RECOMMENDED RATE)**: follow all mixing and application instructions and wear personal protective gear and clothing. Tordon 22-K is a restricted use chemical. You must possess a pesticide applicator's license to obtain this product. If you would like more information in regards to obtaining a license, please contact the Oregon Department of Agriculture. The utilization of an organo-silicone surfactant, (phase or syl-tac) will be mandatory with all applications of all materials. A surfactant rate of 1 quart per one hundred gallons of water will be utilized. There will be no exceptions to the recommendations for herbicide formulations or timing of application without the permission of the Crook County Weed Master.

APPENDIX G.

Appendix G. Best Management Practices to Control the Spread of Noxious Weeds

Early Detection and Prevention

- Learn how to identify weeds species in the field in order to spot them while performing other land management activities.
- Report noxious weed infestations not previously known in the area to the Crooked River Weed Management Area Coordinator, Brooke Gray, or local weed supervisor, Kev Alexanian.
- Periodically inspect high-traffic areas, watering areas and salt licks, bedding and feeding grounds, roads, livestock trails, ditch and stream banks to detect new weed infestations, particularly in disturbed areas.
- If you find a small number of isolated noxious weed plants and you can remove the entire root system, you may want to pull them and leave them. If flowers or seeds are present, place the weeds in a plastic bag for safe disposal. Mark site with flagging or GPS and monitor the site routinely.
- Discuss weed issues with neighbors. A neighbor might have a weed infestation adjacent to your common boundary or you may need to know that your neighbor has sensitive vegetation that may cause you to adjust your weed treatment or you might have a weed infestation that your neighbor needs to know.
- Buy weed-free hay, straw and mulch. Buy certified, weed-seed free hay or buy from a reliable source. Inspect the interior of a couple of bales prior to loading, if possible, prior to bringing onto your property, and if not then, for sure when unloading.
- Buy certified (noxious-weed free) seed. All seed sold commercially as certified seed has a label with percent weed seed identified. Read the label. Ask to see the detailed seed label. It will list the weeds present by species. Select the seed lot with weeds seeds already on your land and try to avoid planting seeds of new weeds.
- Bring in only inspected weed-free road material sources such as soil and gravel. You may need to inspect sources yourself for weed species. Bare soil provides an ideal environment for weed establishment. Perhaps visit the gravel pit yourself to survey weeds.
- Before heavy/maintenance, fire control or neighbor's equipment enters your ranch, inspect it and require it to be steam-cleaned or washed to remove weed seeds, soil, and debris prior to entry. When bringing in equipment from off the ranch, wash until all dirt and vegetation is removed.

Management Practices

- Establish and maintain healthy vegetation communities. Avoid grazing practices that reduce plant vigor. A good stand will deter weeds, but will not stop them from spreading completely.
- Minimize disturbances. Widely dispersed weed seed gain a foothold quickly in these bare soil areas.

- Reseed disturbed area as soon as the disturbance ends. Avoid leaving uncovered piles of exposed soil in construction areas or work yards. Re-vegetate as soon as possible.
- Do not transport weed seeds that are stuck on clothing, boots or shoes, gear, pets or livestock. Place seeds in a container (plastic bag) for safe disposal or into a burn barrel.
- If you burn weeds in a burn barrel be sure it is safe. Do not burn when fire danger is high. Place burn barrel in an area with no surrounding vegetation. Periodically check around the area to insure there is no weed establishment. Check with local fire prevention/fighting jurisdictions for rules on burning regulations.
- Plant areas around troughs, salt blocks, barnyards and roadsides. Move salt licks frequently and keep salt in a shallow container. These are high impact areas, it may be difficult to get vegetation established.
- Clean all farm equipment. Make sure equipment used in weed-infested pastures is cleaned before entering new pastures. Monitor cleaning areas for new weeds.
- Control weed seed spread through water. Weed seeds can float on water. Install seed screens on outlet pipes and control weeds near irrigation ditches.
- Reduce weed spread by growing your own hay if possible. Inspect stands and treat weeds early in the growing season, and inspect your field prior to harvest.
- Quarantine animals new to property or pastures. Animals can deposit weed seeds with their manure and start new infestations. If animals have been grazing a weed infested pasture, keep livestock in barnyard or small pasture for 7 days before moving them to a clean pasture.
- Try to avoid livestock grazing on newly planted dryland areas for at least one growing season in order to allow desirable plants to become established.
- On dry lands limit fertilizer use when reseeding, the fertilizer may favor weeds over the newly established perennial vegetation. Do a soil test before fertilizing irrigated areas.
- Before spreading manure, compost it to kill weed seeds.
- Eradicate small, new weed infestations.
- Contain/control/suppress large infestations.

Weed Control Methods

(Know your weed's biology and treat accordingly.)

- Weeds with horizontal underground roots such as Canada thistle are not controlled by tilling pastures. Tilling will cut up the creeping roots and spread the weed throughout the entire pasture. Plowing may be helpful if you have a taprooted plant and you till before the flowering stage.
- Mow annual weeds before they produce seed heads. Mowing will also reduce the spread of non-rhizomatous perennials.
- Burning weeds with dense thatch such as medusahead rye prior to herbicide treatment will increase effectiveness of control. A winter or spring burn paired with a fall herbicide treatment or a fall burn and spring chemical treatment can be effective.
- Use approved biocontrol agents, if available, for long-term weed control.

- Graze sheep and goats on weeds and brush. Be careful that they do not spread weed seed. They can do an excellent job of keeping the infestation in check, but will not eradicate the problem. Avoid overgrazing desirable vegetation. Make sure the weed target is not toxic to the livestock.
- Use recommended herbicides and always read and follow the label instructions. The label is a legal document and is the law.

APPENDIX H.

Appendix H. Herbicide and Ecological Terminology

Herbicide Terms

Selectivity - A *selective* herbicide kills weeds in a germinating or growing crop without harming the crop beyond the point of recovery. For example 2, 4-D is used to manage broadleaved weeds in a grass pasture. Some new herbicides will only damage certain broadleaved weeds.

A *non-selective* herbicide kills or damages all plant life in a treated area. An example would be glyphosate (Roundup)

Timing of Herbicide Application

Pre-planting soil incorporated herbicides are applied to the soil before the crop is sown.

Pre-emergent herbicides are applied to the soil prior to seeding or after the crop has been sown but before crop and weeds emerge.

Post emergent herbicides are sprayed directly on weeds after they are up and growing.

Mode of Action

Contact herbicides kill plant parts covered by the herbicide. There is little or no translocation and is most effective on annual weeds.

Systemic herbicides are absorbed by either the roots or the above ground parts. They then move (translocate). These herbicides often interfere with plant processes such as cell division, production of chlorophyll, photosynthesis, respiration, and enzyme activity.

When present in the soil, *soil sterilants* prevent growth of plant life for periods of a few months to a number of years

Resistance- The success of herbicides and other crop protection chemicals has revolutionized weed management, farm practices and food production. However, the utility of herbicides is being threatened by the appearance of herbicide resistant weeds. In any weed population, there are likely to be individual plants which are able to survive herbicide treatments which kill most of the population. This naturally occurring heritable characteristic enables these individuals to survive and reproduce, producing a population which becomes resistant to herbicides over time. To manage herbicide *resistance* do not use a long term residual herbicide continuously on an area, rotate crops and herbicides.

Spot Application is when you are treating individual weeds usually with a back pack sprayer.

Broadcast Application spraying herbicides over the entire area of the infestation.

Formulation refers to how the herbicide is packaged. An herbicide *formulation* consists of an active ingredient, an inert carrier, and possible *adjuvants.*

Adjuvants are substances added to the formulation to increase effectiveness of the active ingredient. These include surfactants, antifoaming agents, activators, drift control chemicals or dyes.

The *inert ingredient* or *carrier* is a solvent or dilatant that makes the active ingredient soluble and able to penetrate plant tissues. Water is the most commonly used carrier.

Active ingredient is the chemical which is primarily responsible for the herbicide's toxicity

Material Safety Data Sheet (MSDS). Each herbicide has *MSDS* information. The information discusses toxicity of the chemical. This can be located on the internet.

Ecological Terms

Adaptive Management- A learn by doing approach to test, compare and gain knowledge on ideas for managing natural resources on a landscape scale.

Ecological processes- these are cycles that occur in ecosystems, such as the water cycle, nutrient cycle, energy capture , and the events that can alter the cycling

Disturbance- A temporary change in the usual environmental conditions (for instances wildfire, flood, insect infestation or human disruption such as fire or land clearing,

Dispersal- The movement of propagules away from parent plant of population through time and space.

Propagules- any plant material, seeds, root fragments, etc., used for the process of reproduction.

Site Availability- One of the causes of succession and is most commonly associated with the process of disturbance. For a site to be available to incoming propagules, a specific set of conditions must be present to allow a seed to germinate and a seedling to establish

Species Availability – The presence or absence of viable propagules, reproductive or vegetative, brought in by dispersal or present in the soil seed bank.

Species Performance – A range of ecological processes that determine how a species captures and utilizes resources to maintain and increase population size.

APPENDIX I.

Appendix I. SAFETY CHECKLIST

1. Read and follow the pesticide label — it is the law! — Each time before using the pesticide. Always wear the specified protective clothing and equipment.
2. Keep children and unauthorized people away from where pesticides are being mixed, loaded, applied, or stored.
3. Keep your equipment clean, calibrated, and working properly.
4. Mix pesticides outdoors. If you must work indoors, make sure that the area you use is well ventilated and adequately lighted.
5. Measure materials correctly for recommended rate. Don't mix or pour chemicals at eye level. Pour liquid, powder, or dust slowly to avoid any splash, spill, or drift.
6. Always apply pesticides under appropriate weather conditions — and avoid drift.
7. Carry an adequate quantity of clean water on or with your application equipment for use in washing eyes and skin in case of emergencies.
8. Cover feed and water containers when treating around livestock or pet areas. Avoid contaminating fish ponds and water supplies.
9. Multiple-rinse empty containers (at least three times) until clean before disposing of them. Add the rinse to the spray tank, and dispose of the containers by recycling, if possible, and in accordance with local regulations to avoid hazard to humans, animals, and the environment.
10. Never leave pesticides unattended or unsecured in a truck, field, or operation site.
11. Store pesticides properly — in a correctly designed and maintained storage site, secured, and only in the original container, tightly closed.
12. After handling pesticides, always wash thoroughly before you eat, drink, smoke, or use the restroom.
13. If pesticides spill or splashes on you or your clothing, immediately remove contaminated clothing, thoroughly wash your skin with soap and water, put on fresh, clean protective clothing, and clean up the spilled material.
14. Plan ahead. Know the first aid listed on the label. If symptoms of illness occur, call a poison center or a physician or get the affected person to a hospital immediately. Always give medical personnel as much information as possible about the pesticide involved.

IN CASE OF EMERGENCY CONTACT YOUR

POISON CONTROL CENTER

1 (800) 222-1222

If the patient has collapsed or is not breathing, call

9-1-1

POISON CONTROL CENTERS

The American Association of Poison Control Centers has established a single number you can use to reach the poison control center that serves your area. When you call the number below, your call will be routed automatically to the appropriate center.

1 (800) 222-1222

If the patient has collapsed or is not breathing, call

9-1-1

Pesticide Information

National Pesticide Information Center (NPIC)
Oregon State University
333 Weniger Hall
Corvallis, OR 97331-6502
Tel. Toll-free: 1-800-858-7378
Web: http://npic.orst.edu/
Email: npic@ace.orst.edu

CHEMTREC

CHEMTREC, the Chemical Transportation Emergency Center, advises on emergencies involving chemicals or other hazardous materials.

The number **800-424-9300** (operates 24 hours a day) is for emergency use only.

APPENDIX J.

Appendix J. Integrated Weed Management Plan References

Creating an Integrated Weed Management Plan. A Handbook for Owners and Managers of Lands with Natural Values. March 2000. Caring for the Land Series IV. Colorado Natural Areas Program, Colorado State Parks, Colorado Department of Natural Resources. 115pp. http://www.parks.state.co.us/Natural Resources/CNAP/Publications

Seven Steps to Managing Your Weeds. A Manual for Integrated Weed Management in British Columbia. 2002. Open Learning Agency. 58pp.
http://www.weedsbc.ca

Find information on EBIPM at this website: http://www.ebipm.org/