

Guideline  
for the  
Management of Noxious Weeds  
on Coal Mine Permit Areas

I. Introduction

The infestation of noxious weeds on agricultural lands and rangeland is a serious problem in Colorado and other western states. Reduced productivity, loss of ecological diversity and wildlife habitat, and livestock health hazards can result from noxious weed infestation. Land disturbances associated with mining provide habitat conducive to the invasion and spread of a number of undesirable species. In recent years, infestations of noxious weeds including Canada thistle, leafy spurge, musk thistle, and Scotch thistle have been observed on coal mine disturbed areas in various regions of the state.

This guideline has been developed due to the potential deleterious impacts of noxious weeds on reclaimed areas and adjacent lands, and the lack of specific direction provided by the regulations. The purpose of the guideline is to set forth the operating policy based upon the regulations as applied to the operator's management of noxious weeds.

II. Applicable Regulations

Regulations referenced below reflect the consistent themes that operations and reclamation are to be conducted in such a way as to minimize adverse environmental impacts and ensure that reclaimed lands will support the approved postmining land use. References to noxious and poisonous plants and pest control measures reflect the fact that, in some instances, special management practices may be required to control undesirable plants or prevent their spread in order to minimize offsite impacts, and ensure that reclaimed lands will fully support the postmining land use.

A. Reclamation Plan

Rule 2.05.4(2)(e)(v) specifies that the revegetation plan contained within the mining and reclamation permit application contain a description of any "pest and disease control measures" to be employed.

B. Topsoil Storage

Rule 4.06.3(2)(a)(i) specifies that topsoil stockpiles be protected from erosion by the establishment of "An effective cover of non-noxious, quick growing annual and perennial plants ..."

C. Revegetation (General Requirements)

- (1) Rule 4.15.1 requires operators to establish on reclaimed lands "... species that support the approved postmining land use. This vegetation shall meet the requirements of Rule 4.15.2."
- (2) Rule 4.15.2 states "... Plant species may be approved for use only if the species meet the following criteria: ..." The species meet the requirements of applicable State and Federal seed or introduced species statutes and are not poisonous or noxious."

D. Revegetation Success Criteria

Rule 4.15.8(6) states, "The permittee shall be required to demonstrate, using techniques approved by the Division, that the vegetation on the reclaimed surface consists of a mixture of species of the same seasonal variety native to the area of disturbed land, or of species that support the approved postmining land use. The vegetation on the reclaimed surface must be of equal or superior utility for the approved postmining land use when compared with the utility of naturally occurring vegetation during each season of the year."

E. Postmining Land Use

Rule 4.16.1 states that, "All areas affected by surface coal mining operations shall be restored in a timely manner:

- (1) To conditions that are capable of supporting the uses which they were capable of supporting before any mining; or
- (2) To higher or better uses achievable under criteria and procedures of 4.16."

F. Protection of Fish, Wildlife, and Related Environmental Values

- (1) Rule 4.18(1) states, "Any person conducting surface coal mining operations shall, to the extent possible using the best technology currently available, minimize disturbances and adverse impacts of the operations on fish, wildlife, and related environmental values, and, where practicable, achieve enhancement of such resources."
- (2) Rule 4.18(5)(g) specifies that operations "... not use persistent pesticides on the area during surface mining and reclamation operations, unless approved by the Division."

### III. Operator Responsibility for Management of Noxious Weeds During Operations and Reclamation

It is the responsibility of the operator to monitor disturbed areas for noxious weed infestations. Weed control measures should be implemented whenever infestations of any of the noxious weed species listed occur on disturbed or reclaimed areas within the permit area (see Section V). Noxious weed management plans, although not required, are highly encouraged. Management plans should be developed in consultation with the appropriate state or county extension personnel or weed control district officials listed in Section VI. Once developed, the plans should then become part of the approved permit.

Weed management plans should be implemented in the first appropriate season following approval of the plan. Management plans should include appropriate cultural, mechanical or physical, biological or herbicidal control methods. In some cases, only one control method may be warranted, while in other cases a combination of control methods may be appropriate. Control methods selected will be dependent on the species of concern and the location and extent of the infestation. Disturbed and reclaimed areas should be surveyed on an annual basis in order to detect any new infestations and monitor the response of previously treated infestations. If results of the survey dictate a modification to the existing plan is necessary, an appropriate minor revision approval should be obtained prior to March 31 of each year. Management plans will need to include a map or narrative which describes accurately the location and areal extent of any infestations and a narrative which details the nature and status of each infestation. Specific treatment and monitoring methodologies and timetables should be developed, based on the species of concern, the location and extent of the infestation(s), and other pertinent factors. Certain noxious weed species, notably leafy spurge and the knapweeds, spread very rapidly after initial colonization, and operators are strongly encouraged to initiate appropriate control measures as soon as possible if even one individual plant is observed on an affected area.

The Division may take an enforcement action using a combination of the above cited rules if:

- (1) the Division determines that an operator has not met the commitments of an approved weed management plan or shown good faith in implementing that plan; or
- (2) if no plan is in place, once identified, the Division determines a noxious weed infestation displays an increasing trend, due to a lack of effort by the operator to control the infestation.

For the purposes of this guideline, infestation is not defined. However, the following indicators of a possible infestation will serve as a guide to the inspector that a noxious weed problem may exist in a given area.

- (1) Relative cover contribution of one noxious weed species or a combination of noxious weed species exceeds three percent in a revegetated stand (a parcel of reclaimed land initially reseeded during the same season and year); or

- (2) A "patch" of any listed species in which the noxious weed component exceeds 25% relative cover and occupies an area larger than 100 square feet on any disturbed area.

Upon notifying the operator that a noxious weed problem does exist, it will be the operator's responsibility to implement control measures.

IV. The following plants are considered to be noxious weeds for the purposes of this guideline and the Coal Regulations.

	<u>Common Name</u>	<u>Scientific Name</u>
A.	Leafy spurge	<i>Euphorbia esula</i>
B.	Canada thistle	<i>Cirsium arvense</i>
C.	Musk thistle	<i>Carduus nutans</i>
D.	Plumeless thistle	<i>C. acanthoides</i>
E.	Scotch thistle	<i>Onopordum acanthium</i>
F.	Perennial Sow thistle	<i>Sonchus arvensis</i>
G.	Russian knapweed	<i>Centaurea repens</i>
H.	Spotted knapweed	<i>Centaurea maculosa</i>
I.	Diffuse knapweed	<i>Centaurea diffusa</i>
J.	Yellow toad flax	<i>Linaria vulgaris</i>
K.	Dalmation toad flax	<i>L. genistifolia dalmatica</i> or <i>L. dalmatica macedonia</i>
L.	Hoary cress (white top)	<i>Cardaria draba</i>
M.	Field bindweed	<i>Convolvulus arvensis</i>

V. List of Resource Agencies

Dr. George Beck  
Dr. Phil Westra  
Colorado State University  
Extension Weed Specialists  
Fort Collins, Colorado 80523

Archuleta County Extension Service  
455 San Juan Street  
P.O. Box 370  
Pagosa Springs, Colorado 81147

Delta County Extension Service  
Courthouse Annex  
5th and Palmer Streets  
Delta, Colorado 81416

Dolores County  
Dove Creek Weed Control District  
P.O. Box 527  
Dove Creek, Colorado 81324

Fremont County Extension Service  
7th and Macon Streets  
County Courthouse  
P.O. Box 590  
Cañon City, Colorado 81212

Garfield County Extension Service  
109 8th Street, Suite 307  
Glenwood Springs, Colorado 81601

Gunnison County Extension Service  
200 East Virginia  
County Courthouse  
Gunnison, Colorado 81230

Rio Blanco County Weed Control  
P.O. Box 579  
Meeker, Colorado 81641

San Miguel-West Montrose County  
Extension Service  
P.O. Box 130  
Norwood, Colorado 81423

Huerfano County Extension Service  
Main Street  
County Courthouse  
Walsenburg, Colorado 81089

Jackson County Extension Service  
5th and Logan Streets  
P.O. Box 1077  
Walden, Colorado 80480

La Plata County Extension Service  
25th and Main Streets  
P.O. Box 2607  
Durango, Colorado 81302

Las Animas County Extension Service  
Room 101  
County Courthouse  
Trinidad, Colorado 81082

Mesa County  
Grand Valley Pest Control District  
P.O. Box 2000-5028  
Grand Junction, Colorado 81502

Moffat County Extension Service  
200 West Victory Way  
County Courthouse  
Craig, Colorado 81625

Montrose County  
Uncompahgre Pest Control District  
1577 Pennsylvania  
Montrose, Colorado 81401

Routt County Extension Service  
P.O. Box 772380  
Steamboat Springs, Colorado 80477

Weld County Extension and  
Pest and Weed Department  
425 North 15th Avenue  
Greeley, Colorado 80631

## VI. Weed Management Considerations

This section was included to assist mine operators with developing a noxious weed management plan and implementing noxious weed control practices on permitted lands. It is not meant to be used as the single source for noxious weed control. Local sources such as county extension agents, weed district supervisors or the Soil Conservation Service should be consulted when developing and implementing a weed management plan. Noxious weeds are designated as such because they are very difficult to control and generally are aggressive invaders of disturbed and sometimes undisturbed lands. They are usually perennial or biennial and often reproduce by rhizomes as well as seed. Due to their persistence and aggressive nature, this guideline for reclaimed lands will reduce the possibility of these lands being infested by and contributing to the spread of noxious weeds.

This guide is written with a broad spectrum of weed infestations and control situations in mind. Almost all situations are unique in that they can present different combinations of problems associated with the type, size, and location of weed infestations. Some examples of this are perennial versus biennial, broadleaf versus grasses, noxious weeds interspersed with desirable vegetation, large patches requiring broadcast applications, or small patches requiring spot treatment, infestations located near bodies of water, infestations located near desirable plant species, infestations located on topsoil piles, or on rough, steep, or nearly inaccessible terrain.

The narrative following is divided into three sections:

- A. Developing a workable plan;
- B. Types of control measures; and
- C. Control measures for selected weed species and locations.

### A. Developing a Workable Management Plan

There are many things to consider when developing a weed management plan. This section discusses some options that will help to prevent costly mistakes and aid mine operators in developing a successful program.

Probably the most important step to take when developing a management plan is to inventory all the noxious weed species on site. This includes positive identification of noxious weed species, accurate estimation of infestation size, and detailed location information. The importance of this cannot be over-emphasized. Knowing exactly what species are on site is paramount in choosing the right control methods and developing a strategy for control. In conjunction with this the weed infestations should be mapped in sufficient detail to locate for treatment and monitoring purposes. Mapping details the location of infestations, alerting you to potential problems which may be encountered when control measures are implemented. Mapping may eliminate certain control measures before implementation, by virtue of location. Mapping also assists in estimating the acres of

infestation for proper planning. Finally, annual mapping allows one to monitor and evaluate results of the management plan.

After these initial steps are taken it is possible to develop a plan based on the type, size, and location of the weed infestation. Remember to set realistic goals and be prepared to persist. Noxious weeds are a problem because they are hard to control and even harder to eliminate. Do not expect to eliminate your problem after one treatment or one year, even if the initial results look fantastic. Successful management and eradication plans include several years of follow up work. Do not plan a one time treatment and expect good long term results. The site will need to be monitored and reinventoried each year following the initial inventory and subsequent treatments.

All possible control measures which may apply to your situation should be researched and the ones that will not work should be eliminated. It often requires an integrated management approach to achieve success. For instance, it may be necessary to use a total vegetation control herbicide on a small area followed by reseeded to the desired vegetation. Another example of integrated management is mowing or cultivating in spring or early summer followed by chemical treatment in the fall after regrowth has occurred. Infested areas may be inaccessible with large equipment and only mechanical or chemical control by hand may be possible. It is important to consider all the alternatives before relying on one or more control measures.

Depending on the type of control selected it may be necessary to acquire specialized equipment and materials. This may include tillage equipment, mowers, chemical applicators, or biological control agents. It is a good practice to procure quality equipment that will work properly for extended periods of time since successful plans require follow up treatments. In the case of chemical application equipment it is important to get even, comprehensive coverage at the proven treatment rates. Information on various equipment should be available through local weed district or extension service personnel as well as the Division.

The next step is extremely important and involves setting up treatment windows (opportune time periods) based on the control methods chosen and the noxious weeds present. The best time to treat perennial noxious weeds is in the spring or fall during their active growth phase. Different species will have different optimum treatment times even with the same type of control. Perennial weeds usually grow vegetatively in the spring, flower and seed in late spring and early summer, enter dormancy during the summer and actively grow again in the fall. The treatment windows selected will depend on the species present, geographic location, elevation, and control measures selected. For instance a broadleaf chemical control may be used to control both weed A and weed B which are both in an area you wish to treat.

However, the best control may occur on weed A at early vegetative growth which occurs in mid-May and on weed B at full bloom which occurs in mid-June. In order to cut down costs and save time, a one time application could be planned for the spring in late May or early June to provide effective control on both weed types. At higher elevations weeds may

grow actively throughout the entire growing season providing a wide treatment window. Chemical treatments often contain strict application windows pertaining to the target species stage of growth. Mechanical treatment also requires proper timing to prevent seed formation and obtain optimal results. Biological control methods will require proper timing for optimal results as well.

The final preparatory step is to determine the priority for areas to be treated. Due to certain constraints it may not be possible to treat all infested areas every year. Therefore, a priority list should be utilized. Prioritization ensures that the most important areas are dealt with at the most effective times. One of the major areas of concern is topsoil, both prior to stripping and stockpiling and prior to redistributing on reclamation areas. When noxious weeds are stripped with topsoil and stockpiled it is highly likely that weeds will infest the topsoil stockpile. When a topsoil stockpile is heavily infested with weeds and is redistributed, what originally was a small localized problem becomes a more widespread problem. Treatment of topsoil will be addressed in more detail later in this section.

Other high priority areas to be considered are major traffic areas, road cuts and embankments, and non-use areas around buildings. Ditches and pond embankments should be considered priority treatment areas to prevent offsite contamination by water transported seeds. Large monoculture patches are of concern wherever they occur and should always be prime targets. Also, small patches of weeds should always be treated to prevent expansion of the infested area. It takes less input in labor, time, and materials and can prevent a small problem from becoming a major infestation in a very short time.

The final step is to implement your plan. Experiment with different control plans to find out what works best for your situation. Keep good records of these treatments to measure success and failure, and to eliminate unsuccessful treatments. To quickly recap the major points; identify, map, research control measures, secure equipment, set up treatment windows, prioritize and implement.

## B. Methods of Weed Control

When determining which weed control strategies to employ it is appropriate to learn about the different types of weed control. There are basically four different types of weed control: mechanical, biological, chemical, and cultural. As previously mentioned, a combination of these controls usually gives better and longer lasting results. Once it is determined why weeds are occurring in the first place, strategies can be developed not only to eliminate the existing problem, but also to prevent future problems. The following is a brief description and some examples of each weed control type.

1. Mechanical control is the physical removal of weeds from the soil medium and includes tilling, mowing, cutting, or burning undesirable plant species (weeds). Tillage is most effective prior to seeding and establishment of desirable vegetation. The tillage method of weed control can be effective in eliminating noxious perennial weeds when repeated at short intervals (every 1-2 weeks) throughout the growing season.

However, tillage can prove to be a time consuming control method. It also has the drawback of indiscriminately impacting all vegetation interspersed with weeds in established areas. Thus, tillage can eliminate competitive, desirable vegetation leaving behind a prime seed bed for weeds to reinvade. Mowing can be an effective method for controlling the spread of an infestation and preventing the formation and dispersal of seeds. Mowing is most effective on weeds which spread solely or primarily by seed. In order to achieve this, it must be repeated at least twice during the growing season prior to, or shortly after bloom. Also, even the most intense mowing treatment will not kill hardy perennial weeds. Burning or cutting performs essentially the same function as mowing.

2. Biological control consists of pest specific insects and pathogens, intensive grazing methods, and maintaining desirable competitive vegetation. This method can be a very effective control and is gaining in popularity due to potential undesirable environmental side effects associated with chemical control and the obvious disturbances created by conventional tillage methods. The method of control utilizing pest specific insects and pathogens to adequately control noxious weeds is really in its infancy. Many of our worst weed species have been introduced from foreign lands where most if not all of their natural enemies were left behind. Recently, many of these natural predators have been introduced into this country in an attempt to reduce unchecked weed infestations. One of the more successful examples of biological control involves Musk Thistle (*Carduus nutans*) and an insect called *Rhinoculus conicus* whose larva feed on the seeds of the Musk Thistle. When introduced into a infestation of thistle this insect has proven very effective in reducing the plant populations over time. Other plant specific insects are currently in the preliminary stage of testing and availability. Another biological control is the use of animals (primarily sheep and goats) to graze noxious weeds which are generally unpalatable to cattle and wildlife. This performs essentially the same function as mowing which is to prevent the formation of seeds, however, as with mowing, this method will generally not eliminate tough perennial weeds. One of the best biological controls is to establish competitive desirable vegetation before noxious weeds have a chance to become established and especially after a stand of noxious weeds has been treated. This is often overlooked, but it is an important follow up step in preventing reestablishment of noxious weeds.
3. Chemical control consists mostly of selective and non-selective herbicides. When properly executed, chemical control provides rapid results which can be quite effective. Plant growth regulators are also included in the chemical control category, but they generally are not used on the noxious weed species of concern in a control and eventual eradication scheme.

Since the list of herbicides is so extensive it is suggested that the local Weed District, Extension Service, Soil Conservation Service or the Division be contacted to provide input in choosing the right products for the job. There are literally hundreds of herbicides to choose from. They range from narrow to wide control

spectrums, soil active to foliar active or both, translocated or non-translocated, residual and non-residuals, etc. In treating perennial noxious weeds it is a good practice to use a herbicide which has some ability to translocate since the main target of treatment is the unseen and extensive root system. Using a herbicide that works well on the above ground vegetative growth but does not translocate into the root system is basically a chemical mowing action. These herbicides offer good short term control but may require many retreatments before long term control is realized. An important point about herbicide use is that although they provide especially good visual results, follow up work is required even with the best products. Total control is almost never achieved with one herbicidal application. Therefore, areas of infestation usually require treatment in two successive years at a minimum in order to provide acceptable control.

In reclamation situations, the integrated approach of using herbicides in conjunction with establishing desirable vegetation will work better than using chemicals alone. This approach provides both cover to compete with seedlings of noxious weeds and competition for the weakened "escapees."

Some products which are used in noxious weed control are "restricted use pesticides." In order to purchase and apply these products it is mandated by law that the applicator be certified through the Colorado Department of Agriculture, Division of Plant Industries. If the operator intends to use any of these products, the Division of Plant Industries should be contacted for information pertaining to certification. Always remember to read the label, follow directions and heed the cautions and warning which may be posted on or come with the container. Safety equipment should always be available and utilized when handling or applying herbicides.

4. Cultural control is probably the most important control to utilize in preventing infestation and reducing spread once weeds are present. Cultural control employs common sense to prevent formation and spread of infestations. Some forms of this control include: using weed free seed and mulch when planting; cleaning tillage and cutting/harvesting equipment before moving from a weedy area to a non-weedy area; making sure topsoil is not harboring noxious weeds before stripping, stockpiling and reapplying; education to be able to identify noxious weeds, becoming familiar with their life cycles, and mapping infestations, and determining how an infestation got started, why it still exists, and how to remove it with the least impact to the surrounding environment including plants, animals, water, etc. while simultaneously altering the habitat to prevent future infestations. A final important aspect of cultural control is that everyone must work to control noxious weeds, or the effort put forth by some people is lost by the lack of effort by other people.

#### C. General Control Measures for Selected Weeds and Locations

This section briefly describes some proven control measures for a few noxious weed species in the state of Colorado. Agricultural extension services, SCS, or weed district personnel in your area should always be contacted for more detailed information and they should always

be consulted for assistance in selecting appropriate chemical herbicides and treatment rates. Since these individuals are constantly updated on new products and weed control methods, it is a good practice to consult with them even after initial recommendations. Also included in this section are some locations of general concern to the Division.

1. Leafy Spurge - *Euphorbia esula*

- a. Mechanical Control - Tillage is very effective in controlling leafy spurge as is demonstrated by the fact that leafy spurge is not a problem on land under cultivation. Mowing may be effective in reducing infestations but generally will not eliminate the weed even under the most intensive mowing schedule.
- b. Chemical Control - A variety of herbicides have been proven to be effective in controlling leafy spurge. Recommended types depend on a variety of factors including location, cost, timing, etc. It is best to consult a local expert to assist in deciding what type and application rate to use.
- c. Biological Control - Sheep have been shown to effectively graze on leafy spurge especially in the spring before the spurge blooms. Once again this is similar to mowing and generally will not eradicate the infestation. However, combined with a follow-up herbicide program, this can be very effective. Another biological control which is quite new to Colorado is the leafy spurge hawk moth (*Hyles Euphorbine*). Control occurs when the larvae of the hawk moth feed on the leaves of the spurge plant.

2. Canada Thistle - *Cirsium arvense*

- a. Mechanical Control - Canada Thistle can be controlled by repeated cultivation although it may take up to two years of cultivation at 10-15 day intervals to eliminate an infestation of thistle. Mechanical control is probably best when used in conjunction with herbicide treatments. Mowing is effective in reducing the spread of thistle and may reduce but not eliminate infestations. Mowing should be performed prior to or very shortly after bloom and repeated (at the same stage of growth) throughout the growing season.
- b. Chemical Control - The two most effective times for control of Canada Thistle with herbicides are at the bud to early bloom stage in early summer and during regrowth in the fall. A variety of products are available for use on thistle. An important point to keep in mind is that no matter what product is used, retreatment will be necessary. Once again a local consultant should be contacted for product and rate recommendations.

3. Musk Thistle - *Carduus nutans L.*

- a. Musk thistle can be cultivated for control. Repeated mowing prior to

flowering will reduce seed production, and since the plant is a biennial, it will eventually reduce stands.

- b. Chemical control is effective when applied to the rosette form of the plant. This occurs in the fall or early spring. Herbicides lose their effectiveness once the plant bolts. As before, local consultants should be contacted for product and rate recommendations.
- c. Biological control - As previously mentioned, musk thistle has provided one of the great success stories associated with biological control on noxious weeds. The musk thistle seed weevil, *Rhinocyllus conicus*, was introduced into the United States in 1969. These weevils overwinter as adults. In May to July the adults congregate on bolting musk thistle plants, feed, mate, and deposit eggs. The larvae feed at the base of the flower and interfere with seed production and viability. It may take several years for noticeable decline to occur. If this control is utilized other control methods should not be employed on the musk thistle in the insect release area.

4. Russian Knapweed - *Centaurea repens*

- a. Mechanical control is possible but may take two to three years of intensive cultivation. Best results occur with cultivation after 5-10 days of green regrowth.
- b. Chemical control provides the best option for controlling Russian Knapweed. Several products are available with some of the newer herbicides providing excellent control. As before, local consultants should be consulted for product and rate recommendations.

5. Spotted Knapweed - *Centaurea maculosa*

- a. Cultivation will be effective with spotted knapweed in an intensive management program. The seeds of this plant remain viable in the soil for up to 12 years after seed production is stopped. Therefore, although cultivation may remove the plant, it also creates ideal seed beds for viable seeds in the soil.
- b. Chemical control is presently the best treatment for spotted knapweed. Excellent control can be achieved with several different herbicides. Follow up measures are required for successful eradication.

6. Diffuse Knapweed - *Centaurea diffusa*

- a. Presently the best control for this knapweed is chemical treatment. Once again a variety of herbicides are available and the appropriate authorities should be contacted for recommendations.

## 7. Locations

There are also several locations which may create special problems which the Division would like to address. The main one is topsoil. As previously mentioned, topsoil, both prior to stripping/stockpiling and prior to redistribution, is an area that should receive top priority for noxious weed control. However, the use of some herbicides on topsoil may create a problem due to their residual effects. For instance, if one of these herbicides is applied to a topsoil stockpile at rates lethal to various weeds and the topsoil is redistributed before the herbicide has broken down, problems may arise with germination and establishment of desirable vegetation after seeding this soil. The same problem might arise if a soil is treated prior to stockpiling. If the treated soil is near the surface of the stockpile it may inhibit the germination and establishment of a stabilizing non-noxious cover on the pile.

Another problem can arise due to the mobility of some herbicides through soil. If a mobile soil residual herbicide is used over an entire topsoil pile the entire pile may become contaminated. If this soil is then redistributed over a set area, before the herbicide has broken down, this entire area may exhibit problems involving germination and establishment. To prevent these potential problems it is suggested that both residual and mobile residual herbicides not be used on topsoil for a minimum of six months prior to stripping/stockpiling and 12 months prior to redistributing from a stockpile. If noxious weeds are present and require treatment within 18 months of these operations a non-soil active, non-residual herbicide such as glyphosate should be employed. This treatment would allow reseeding to occur immediately.

Another area of concern is the use of herbicides around desirable vegetation (for instance trees and shrubs). Precautions should always be taken to prevent damage to non-target species and product labels should be read thoroughly before applying any herbicide. Desirable broadleaf vegetation is usually very sensitive to most herbicides and the slightest amount of herbicidal drift on the leaves or leaching of a herbicide into the root system may cause significant damage.

One final area that requires special consideration is that of aquatic environments, both surface and groundwater. Several products are specifically labeled for use around water. Other products should never be used around water. Once again, always read the label and follow the recommendations carefully. It is against the law to use any product off label. Your local extension agent or Weed District personnel should be able to help choose the proper product for the intended job and advise against misuse.

Part VII of this document has provided insight into control of a few of the more serious weeds in Colorado and precautions to be taken with respect to various sites. Specific herbicide recommendations have not been included so as to not promote any specific products. Also, the Division would prefer that the local agricultural

extension service, weed district personnel or the Soil Conservation Service make recommendations based on their site inspections. The Division will provide specific recommendations upon request after reviewing weed management plans and inspecting infested sites.

## VII. Conclusions

This document was written to clarify the Division's policy on noxious weed control and to assist coal operators with developing a weed management plan. The Division recognizes that many operators already have a plan implemented at their sites. We encourage suggestions and comments pertaining to successes and failures encountered with noxious weed control. The Division has attempted to tailor this guide to mine sites as much as possible. While many of the basic principles apply to any weed control situation, this is not meant to be a comprehensive guide to weed control. Please consult with the appropriate local authorities as their knowledge can be very helpful in developing a successful plan. A statewide list of contacts has been included. For more information concerning this guideline, please contact the Division.

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