MESA COUNTY

NOXIOUS WEED MANAGEMENT PLAN

Definitions

1. **Act:** the Colorado Weed Management Act, Title 35, Article 5.5, C.R.S. as amended.

2. **Alien plant:** a non-native, exotic, introduced plant species.

3. **Annual weed:** a weed that lives for one year, then dies. Seeds are the primary dispersal mechanism for annual plants.

4. **Best Management Practices (BMP):** recommendations for the most reasonable, effective and economical but least harmful methods of weed control; may include mechanical, cultural, biological and chemical methods as well as prevention.

5. **Biennial weed:** a weed that has a two year life cycle. It germinates and grows leaves one year, then sends up a flower stalk and sets seed the following year. Seeds are the primary dispersal mechanism for annual plants.

6. **Biocontrol agent:** a living creature that is used to control undesirable pests. Includes insects, diseases, and vertebrate animals.

7. **Board:** Noxious Weed Advisory Board (NWAB).

8. **Bolting:** a stage in the life cycle of a plant when it sends up a flower stalk

9. **CDOT:** Colorado Department of Transportation

10. **Commissioners:** the Board of County Commissioners.

11. **County:** the unincorporated areas of Mesa County.

12. **Geographic Information Systems (GIS):** a method used to map weed infestations using satellite technology (**Geographic Positioning System or GPS**) coupled with on-the-ground observations and computer mapping programs to determine the extent and severity of an infestation and to track the effect of weed management practices.

13. **Inspector:** Mesa County Pest and Weed Inspector

14. **Integrated Weed Management (IWM):** the planning and implementation of a coordinated program that uses a variety of effective tools to manage noxious weeds. Elements of an IWM plan include weed identification, education, prevention, cultural practices, mechanical removal, chemical use, and biological control.

15. **Landowner:** any owner of record of state, federal, county, municipal, or private land, including owners of easements, irrigation canals and ditches, and rights-of-way.

16. **MCTD:** Mesa County Transportation Department

17. **Neighboring:** a property with a boundary immediately adjacent to the boundary of another property.

18. **Noxious weed:** an alien plant or parts of an alien plant that has been designated by State rule as being noxious or has been declared a noxious weed by a County Advisory Board, and meets one or more of the following criteria:
    A. are aggressive invaders, detrimental to agriculture or native plant communities,
    B. may be poisonous to livestock,
    C. may be carriers of or hosts to insects, diseases or parasites,
    D. are detrimental to sound management of native or agricultural ecosystems.

19. **Noxious Weed Advisory Board:** a panel of citizens appointed by the Board of County Commissioners to advise on management of noxious weeds in the County

20. **Noxious Weed List:** a list of noxious plant species recommended by the Noxious Weed Advisory Board and approved by the Board of County Commissioners that are to be managed by landowners within the County.

21. **Perennial weed:** a weed that lives for 3 or more years. These species usually spread by root systems or root pieces, as well as seeds.

22. **Pest and Weed Inspector or Inspector:** the agent or employee appointed by the Commissioners to fulfill the duties and functions designated under this Plan

23. **Plan:** Mesa County Noxious Weed Management Plan

24. **Propagules:** plant parts that have the ability to give rise to new plants, for example, seeds and root pieces

25. **Rosette:** a circular growth of leaves that forms after germination of some plants.

26. **ROW:** right-of-way

27. **State Noxious Weed:** any noxious weed identified by rule by the Commissioner of the Colorado Department of Agriculture. The current list of noxious weeds can be found at http://www.ag.state.co.us/DPI/programs/program.html#noxious

1.0 Authority: Colorado Weed Management Act: C.R.S. Title 35, Article 5.5, as amended

1.1 Purpose of C.R.S. Title 35, Article 5.5

Because certain undesirable plants, primarily aggressive non-native invaders, constitute a threat to the "continuous economic and environmental value of the lands of the state", these species must be managed on private and public lands, using integrated management techniques which are least damaging to the environment and which are practical and economically reasonable.

1.2 A Brief Abstract

As mandated by the Colorado Noxious Weed Act, all persons must control noxious weed on their property if such plants are a threat to neighboring landowners or natural ecosystems. Weed control programs should be integrated in their approach, using all available technologies for effective weed control.

To comply with the Law, the Board of County Commissioners must adopt a noxious weed management plan for all unincorporated lands within its jurisdiction. The Commissioners may use employees or contractors to enforce noxious weed control on county lands. Costs for said control on county property are to be paid from the county noxious weed management fund, if one exists. The Commissioners may enter into cooperative weed management agreements with other governmental agencies.

The Noxious Weed Advisory Board, a commission of resident private landowners, must develop a management plan to be reviewed at least once every three years. At least a majority of the members of the Board must own forty or more acres of property. The Board designates which species are to be managed within the County, thereby establishing the County Noxious Weed List. Additional plants can be added to the list, after a public hearing with 30 days prior notice. The Board can require identified landowners to submit weed management plans when species on the list are found on their property.

The County has the right to inspect premises under at least one of the following conditions:

(a) the landowner requests inspection

(b) a neighbor files a complaint or report

(c) the Pest Inspector made a visual observation of a weed infestation from a right of way (ROW) or a public area.

Before entering private property, the landowner or occupant must be notified of the problem by certified mail. If entry is refused, an inspection warrant may be obtained by the Pest and Weed Inspector. A landowner cannot deny entry to inspect if a warrant is secured. After inspection, a notice of the problem and control recommendations must be sent by mail. Within 10 days of notification, the landowner or occupant must comply with the recommendations, submit an acceptable weed management plan, or request an arbitration panel hearing. The county

has the authority to act in the case of failure to comply with the Act, with an assessment of the cost of control plus overhead expenses, up to 20%, charged against the land. Noxious weeds may be declared a public nuisance, subject to all applicable laws and remedies for abatement, including removal or destruction of the weeds.

The County cannot force a private owner to control weeds without first having equal or greater successful control measures on county-owned lands adjacent to the private property in question.

State agencies have the same responsibility as private landowners. Notification by the county is the same as for private landowners. The county has the power to enforce and charge state agencies for weed control on state lands. The county may enter into cooperative agreements for weed management with State and Federal agencies. Public rights-of-way (ROWs), easements, utilities, mining operations, etc., must be in compliance with the management plan and must bear the financial responsibility of weed control.

The Colorado Noxious Weed Act established a state weed coordinator position to oversee implementation of the Law. A State Noxious Weed Management Fund was established to fund grants or contracts for weed management practices, with procedures for allocation of funds to appropriate entities. The fund was broadened in 2000 to include grants for educational programs. Counties may levy a tax, upon voter approval, to fund noxious weed management programs.

1.3 Mesa County Noxious Weed List

Bull Thistle (*Cirsium vulgare*)
Canada Thistle (*Cirsium arvense*)†
Dalmation Toadflax (*Linaria dalmatica*)†
Diffuse Knapweed (*Centaurea diffusa*)
Dyer's Woad (*Isatis tinctoria*)
Hoary Cress/Whitetop (*Cardaria draba*)†
Houndstongue (*Cynoglossum officinale*)
Leafy Spurge (*Euphorbia esula*)†
Musk Thistle (*Carduus nutans*)
Oxeye Daisy (*Chrysanthemum leucanthemum*)
Plumeless Thistle (*Carduus acanthoides*)
Purple Loosestrife (*Lythrum salicaria*)
Russian Knapweed (*Centaurea repens*)†
Scotch Thistle (*Onopordum acanthium*)
Spotted Knapweed (*Centaurea maculosa*)
Tamarisk/Salt Cedar (*Tamarix parviflora, T. ramosissima*)*
Yellow Starthistle (*Centaurea solstitialis*)
Yellow Toadflax (*Linaria vulgaris*)†

* Tamarisk is a noxious weed "preferred to be controlled" rather than mandatory.

† These species are also mandatory for control in the Upper Grand Valley Pest Control District.

2.0 Goals for Noxious Weed Management In Mesa County

Prevention, early detection and early treatment are the most cost effective means for weed control, and are the ideal for preserving our agricultural production, recreational open space and natural environment.

2.1 Strive to identify and contain, reduce or eradicate current weed infestations and reduce or eliminate weed seed production in certain species.

2.2 Monitor for new infestations and new invasive species so as to prevent new encroachments on unincorporated lands in the County.

2.3 Develop and implement Integrated Weed Management Plans for noxious weeds on County owned property, easements, and rights-of-way.

2.4 Protect agricultural production, native plant ecosystems, watersheds, and recreational lands from degradation by noxious weeds by enforcing the Noxious Weed Act and working through cooperative agreements with city, state and federal agencies and adjacent counties and states.

2.5 Preserve the quality of life in urban areas of unincorporated Mesa County through desirable plant stewardship and noxious weed management to enhance human health aspects, land values and esthetics.

2.6 Provide technical support and recommendations for noxious weed management and work with landowners, including state and federal agencies, to develop their Integrated Weed Management Plans.

2.7 Educate Mesa County citizens on the impact of noxious weeds on the economy and the environment and provide information on Best Management Practices for noxious weeds.

3.0 Duties of the Mesa County Pest and Weed Inspector

3.1 Mapping: At the County level, mapping provides valuable information on the mode of spread of weeds and the extent of each species present in the County, and provides a method to estimate the costs of controlling noxious weeds on County and other property. Noxious weeds are mapped wherever possible using GPS equipment and GIS technology. Information is shared with County, State and Federal agencies. Data collected conforms to the standards established by the North American Weed Management Association (Appendix A). The Pest and Weed Inspector provides this data to the Colorado Department of Agriculture for the state weed mapping program.

3.1.1 Roads: ROWs are inspected and weed infestations are mapped at least every three (3) years on County roads. In areas where activities have disturbed the ROW, mapping may occur more frequently. Responsibility of the counties for control of undesirable plants in public right-of-ways are stated in the Act. Because ROWs are the principle routes of introduction of weed

seed or propagative parts via movement of vehicles, hay, animals, etc., the Inspector works closely with the Mesa County Transportation Department (MCTD) and Colorado Department of Transportation (CDOT) to effectively control weeds on County, state and federal ROWs. Species identification and control recommendations are provided by the Inspector. Currently the County contracts with a private applicator for ROW noxious weed control on County and State roads. Weed control on other MCTD properties is performed by MCTD personnel.

3.1.2 Other County Properties: Weed control in Mesa County Parks are the responsibility of the Facilities and Maintenance Department. Undeveloped County properties are inspected and noxious weeds mapped by the Inspector as time allows. The Inspector then works with the appropriate County Department to develop an Integrated Weed Management Plan.

3.1.3 Private property: Noxious weeds that are reported or noticed by a property owner, the Inspector, a government employee, or a concerned citizen are located and mapped using Geographic Information Systems (GIS) technology. Pest Control Administration is on the list of review agencies for the Planning Department. Planners are encouraged, but not required, to include the Pest and Weed Inspector while processing land use applications. The Inspector reviews these documents and inspects properties as time allows. Major subdivisions, simple land divisions, commercial developments, and any land use changes that involve construction of new buildings are priorities for inspection. The location of noxious weeds and recommendations for control are provided to the Planning Department. In some instances, a letter is sent directly to the landowner.

3.2 Education

For a weed management program to be successful, the general public needs to be well informed. The public should be encouraged to take ownership of their weed problems and make the necessary effort to control weeds on their property. Once educated about noxious weeds and their impact, however, most landowners become actively involved.

Educational efforts include publishing articles in the local newspapers; holding interviews with local TV and radio stations; placing posters and displays in public places; assisting with weed projects in schools; holding public lectures and workshops; showing films and video tapes to public, private and community organizations; building cooperative local Weed Management Areas; and developing weed management partnerships with government agencies, community organizations, and private enterprises.

Educational efforts should:

- Assist the public with weed identification and mapping.
- Provide information on the Best Management Practices for weeds on the Mesa County Noxious Weed List.
- Explain the environmental impact of weeds on our quality of life, on agricultural production, and on native plants and wildlife.

- **!** Stress the economic impact of weeds on agricultural production and the cost of food, native plants and community ecology, wildlife habitat, real estate values, and recreational opportunities, among others.
- **!** Encourage and develop cooperative weed management efforts with irrigation districts, road departments, citizen groups, and federal and state agencies.

3.3 Enforcement

Enforcing control of noxious weeds on private property is currently done on a complaint basis where these plants are found to be threatening agricultural production or spreading to neighboring land, or are destructive to ornamental landscapes. Complaints are kept anonymous. Complaints that are deemed spurious or related to neighbor-to-neighbor feuds are not pursued.

Following a complaint, the County Inspector identifies the property and does a "drive-by" inspection, without entering the property, to see if the complaint is valid. The landowner is given notification of the problem in writing through certified mail. If the certified letter is returned, the landowner and address are checked and the letter is sent via regular mail. A copy of the letter, the envelope and the undelivered certified return postcard are retained by the Inspector. The letter explains the legal responsibility of landowners to control weeds on their property and keep said weeds from spreading to neighboring properties. Suitable control and management recommendations (Best Management Practices) for the weed(s) are stated. Within 10 days after receipt of notification, according to State Law, the owner must either:

1. comply with recommended control measures,
2. acknowledge notification and submit an alternative, acceptable weed control plan and schedule for completion of the plan,

OR

3. request an arbitration panel.

Refusal to cooperate results in a public hearing before the Commissioners to authorize hiring the work to be done at the landowner's expense. The landowner is notified of the hearing by certified and regular mail. An estimate of control costs must be obtained by a contractor before the public hearing. The landowner is encouraged to bring evidence of their weed control efforts to the hearing. After the Commissioners give approval, the contractor, accompanied by the Inspector and possibly by a sheriff's officer, performs the work. The County pays the bill and then bills the landowner. If the bill is unpaid after 30 days, the amount is added to the landowner's tax bill as a lien on the property. This results in one season's worth of control work and does not guarantee that the landowner will be more cooperative in the future. The process may need to be repeated every year until the weeds are eliminated.

Past experience in Mesa and other counties has shown that the majority of letters go unanswered. Follow-up letters and phone calls to the landowner are necessary but often equally as ineffective in eliciting a response. The landowner must be given every chance to comply with the recommendations. Field visits, changes in recommendations to suit the landowner's requirements and other remedies are provided.

3.3.1 Prioritizing Weed Enforcement Efforts

Because the number of properties infested with noxious weeds in Mesa County is remarkable, the Inspector prioritizes infestations in order to allocate time to the most critical weed problems. Infestations of some noxious weeds and infestations in certain areas are deemed to be more significant than others and are ranked accordingly.

Eradication is highly likely and highly desirable for weeds listed as high priority. They do not yet occur in Mesa County or do not yet occur in high numbers. The areas listed as high priority for control are those which are the most likely conduits for dispersal of noxious weeds. Species listed as medium priority weeds are known to occur in the County, sometimes in large but relatively isolated infestations. These species are candidates for suppression and control, but not necessarily eradication. Species listed in association with livestock are toxic to these animals and should be controlled where animals are grazing. Low priority weeds occur in large, widespread infestations or are widespread in certain parts of the County. At best these weeds can be prevented from spreading to uninfested areas and may be controlled or managed on a parcel-by-parcel basis.

3.3.1.1 High Priority: The goals for high priority noxious weed infestations are to stop the spread of noxious weeds in relatively uninfested parts of the County and to eradicate weeds that are not yet abundant in the County. These situations elicit a high level of response from the Inspector. All possible methods are used to get landowners to comply with control requirements. The County may choose to do the spraying for the landowner, if the infestation complies with the private land spraying policy explained in this Plan. The situations listed here are typically small infestations of noxious weeds that are rare in the county, isolated patches of weeds that are abundant elsewhere in the County, and weed patches that exist in areas where transportation of plant propagules is highly likely.

1. Any infestation of dyer's woad, leafy spurge, plumeless thistle, purple loosestrife, yellow starthistle, yellow and Dalmation toadflax, and diffuse and spotted knapweed.
2. Russian knapweed and hoary cress (whitetop) in the higher elevations of Mesa County.
3. Infestations of all weeds on the Mesa County Noxious Weed List on roadsides, in recreational areas, waterways and irrigation ditches, utility corridors, in gravel, sand and soil mining operations, and in disturbed and high traffic areas.
4. Isolated infestations of all County listed weeds where such are not yet abundant.

3.3.1.2 Medium Priority: The Inspector provides information to landowners and works with them on a noxious weed plan. Some of the weeds mentioned here are widespread in certain parts of the county and it is the situation in which they occur that is important. Uncooperative landowners will be reminded several times of their responsibility to control their weeds. If time allows, further enforcement will be done.

5. Infestations of Canada thistle, bull thistle, and oxeye daisy.

6. Russian knapweed in areas where horses are grazing, particularly areas where Russian knapweed appears to be the primary food source for the animals.
7. Hoary cress (whitetop) and houndstongue where livestock or wildlife are grazing.
8. Scotch thistle outside of the higher elevation areas of eastern Mesa County.

3.3.3.3 Low Priority: Enforcement in the following situations is unlikely to result in adequate control because infestations are very extensive. Upon receiving a complaint, landowners are notified of the problem and given recommendations for control. The Inspector works with landowners on a parcel by parcel basis. If time allows, further enforcement will be done.

9. Infestations of Scotch and musk thistle and houndstongue in high elevation areas of eastern Mesa County.
10. Hoary cress (whitetop) and Russian knapweed in lower elevation areas of Mesa County, primarily in the Lower Valley and along the Colorado and Gunnison Rivers.

3.4 Interagency Projects

The law authorizes the County to enter into cooperative agreements with federal and state agencies for better integration of weed control within the County. Mesa County currently has Memoranda of Understanding with the Bureau of Land Management and the U.S. Forest Service. Other agencies with which the County may cooperate with on interagency projects include, but are not limited to, U.S. Fish and Wildlife Service, U.S. Bureau of Reclamation, Colorado National Monument, Natural Resources Conservation Service, Soil Conservation Districts, City of Grand Junction, Town of Fruita, Town of Palisade, Colorado Division of Wildlife, CSU Cooperative Extension, Western Colorado Research Centers, Biological Pest Control Section of the Colorado Department of Agriculture (Palisade Insectary), Irrigation and Drainage Districts, and Colorado State Parks.

Mesa County Pest Control Administration cooperates with other government agencies and private landowners to develop weed management projects on public and private land. Such cooperative efforts are usually grant funded and include contributions of funds or in-kind services (e.g. labor, equipment, education) from each partner. In 2001, Mesa County Pest Control Administration joined with the City of Grand Junction Public Works Department, the U.S. Forest Service, the Bureau of Land Management and private landowners in developing the Lands End Weed Management Area (LEWMA). A weed management area is planned for the Collbran/Plateau Valley area. The Inspector is actively involved in the Tamarisk Coalition which seeks funding to protect and restore riparian habitats on private and public lands on the Western Slope.

Mesa County Pest Control Administration also develops projects and administers grant funded weed management projects on private land. Grants secured from the Colorado State Noxious Weed Management Fund, the U.S. Fish and Wildlife Service, the Duck Stamp Program (Wetlands Initiative Program), and the Debeque-Plateau Valley Soil Conservation District have funded programs for control of purple loosestrife and yellow starthistle.

3.5 Funding of Weed Management Projects

Pursuant to C.R.S. 35:5.5:119 the County may establish a noxious weed management fund. Subject to approval of the voters, the County may levy a special tax for noxious weed control, up to 5 mils per year. No mil levied weed management fund exists nor is anticipated in Mesa County. Funding for noxious weed management is currently restricted to specific projects in cooperation with the agency partners described in section 3.4 above. Private landowners must either be involved in one of the projects, or must pay for weed management from their own funds.

3.6 Herbicide Application on Private Land

It is extremely important that small infestations of certain weeds in certain areas be eradicated as soon as possible. Herbicides are most effective when sprayed at specific stages during the life cycle of the weed. To insure that small infestations of noxious weeds are controlled or eradicated efficiently and effectively, it is extremely important that the Inspector be able to take immediate action on certain weed patches. The Inspector is a trained professional who can perform the work safely and effectively. The Inspector or trained technicians will only spray certain species on private land where they occur in low numbers or in small areas. Immediate attention ensures that the weeds do not become a widespread and costly problem.

When a significant weed patch is located, the Inspector contacts landowners and arranges for the application of herbicides. Spraying is done only where hand held or backpack sprayers can be used. It is not intended that Mesa County use motorized equipment or spray large infestations. The Inspector will not spray weeds in agricultural fields or other areas of crop production, or in landscaped areas.

Each situation is considered separately and the Inspector makes the final decision whether or not to spray a particular weed patch for the private landowner. A contract must be signed between the County and the landowner before the work is done. The contract can be FAXed between parties to expedite the process.

The noxious weeds listed in Mesa County covered under this policy are: Dyer's woad, Dalmation and yellow toadflax, diffuse and spotted knapweed, leafy spurge, oxeye daisy, plumeless thistle, purple loosestrife, and yellow starthistle. Canada, bull and musk thistles, houndstongue Russian knapweed, Scotch thistle, and whitetop will be considered only where they occur in isolated patches or at the extreme edges of their range within the County. New infestations of noxious weeds not currently on the County List are also included.

The following table lists the herbicides that may be used on the listed weeds. New herbicides will be added as they become available and new weeds will be added as they appear in the County or are added to the Mesa County Noxious Weed List.

Table 1. Noxious weeds and Effective Herbicides

Target Weed	**Preferred Herbicides**	**Other Herbicides**
Canada Thistle	picloram (Tordon); clopyralid (Transline, Curtail); clopyralid + triclopyr (Redeem R&P)	chlorsulfuron (Telar)
Dyer's Woad	metsulfuron (Escort, Ally); chlorsulfuron (Telar)	
Houndstongue	picloram (Tordon); dicamba (Banvel); metsulfuron (Escort, Ally)	3,6-dichloro-o-anisic acid (Clarity)
Knapweed, diffuse and spotted	dicamba (Banvel); picloram (Tordon); dicamba + 2,4-D; dicamba + picloram; triclopyr + clopyralid (Redeem R&P)	3,6-dichloro-o-anisic acid (Clarity); glyphosate (Roundup Ultra)
Knapweed, Russian	picloram (Tordon); clopyralid + 2,4-D* (Curtail); clopyralid (Stinger, Transline); triclopyr + clopyralid (Redeem R&P)	metsulfuron (Escort, Ally); chlorsulfuron (Telar); glyphosate (Roundup, Rodeo, where soil residual is a problem)
Leafy spurge	dicamba (Banvel); 2,4-D + triclopyr (Crossbow); picloram (Tordon); glyphosate(Roundup Ultra); imazapyc (Plateau)	Krenite S (around water)
Oxeye daisy	2,4-D*; picloram (Tordon); clopyralid + 2,4-D (Curtail); clopyralid (Stinger, Transline);	Arsenal (non-crop); Velpar (forest land)
Purple loosestrife	glyphosate (Rodeo) plus aquatic labeled 2,4-D*	triclopyr (Garlon 4)
Scotch Thistle	picloram (Tordon); clopyralid (Transline, Curtail); chlorsulfuron (Telar)	imazapyc (Plateau); dicamba (Banvel)+ 2,4-D*; 2,4-D* in the rosette stage
Toadflax, Dalmation	picloram (Tordon); metsulfuron (Escort, Ally);	3,6-dichloro-o-anisic acid (Clarity)
Toadflax, yellow	picloram (Tordon)	3,6-dichloro-o-anisic acid (Clarity)
Whitetop	metsulfuron (Escort/Ally); 2,4-D* + glyphosate (Roundup Ultra)	chlorsulfuron (Telar) + 2,4-D*

Mention of product names does not imply endorsement, but are given as examples.

* Use amine formulation wherever possible to avoid drift problems.

4.0 Integrated Weed Management Planning: a Guide for Landowners

The following discussion is intended to provide weed management recommendations to: resident and absentee landowners; government agencies, as fits with their respective agency mandates and regulations; companies causing large scale disturbances on County or private land; contractors and developers who are involved in development of private property; and any other citizen or organization in the County who desires to prevent or control noxious weeds.

4.1 Identification

The first and most important step in developing a plan of attack on noxious weeds is species identification. Misidentification of weed species leads to improper, costly, and ineffective control and management.

Newcomers and long-time residents may be familiar with a weed but each may call it by a different common name. For example, a weed commonly known as kochia (*Kochia scoparia*) by weed managers is called ironweed, fireweed, pigweed and Mexican fireweed by non-specialists. Weeds can be identified by CSU Cooperative Extension, 2775 Hwy. 50 or by the Mesa County Pest and Weed Inspector. Once the weed is identified, recommendations for control and management can be obtained from the CSU Extension Weed Specialist, the Natural Resources Conservation Service (NRCS), the Mesa County Pest and Weed Inspector or private contractors.

Proper identification of new noxious weed species is extremely valuable for eradication efforts. Any unusual or unfamiliar plant should be reported to the Mesa County Pest and Weed Inspector. A cluster or small infestation of unusual plants or plants that appear to be spreading rapidly should also be reported to the Inspector. If yellow starthistle had been reported when it first appeared in eastern Mesa County in about 1991, it could have been eradicated immediately and the area closely monitored. Left unreported, starthistle is now known to infest about 25 acres in eastern Mesa County. Eradication is still possible, but will be a costly endeavor.

4.2 Mapping

Marking out weed infestations on a map, whether it be by computer (GIS) or hand drawn methods, provides a landowner or weed manager with information about the extent of the infestation, possible modes for spread, potential uninfested areas to be protected and monitored, and the effectiveness of control methods. Over the long term maps provide historical evidence of the epicenter of an infestation and track its spread or decline.

4.3 Evaluation of Control Strategy

Once the weed has been identified and the infestation has been mapped, the weed manager must make a decision whether eradication, long term control, or containment should be the goal and what can be done to prevent reinfestation. Planting competitive species must be evaluated.

Small weed patches can be eradicated quickly if there is no source of continued reinfestation. Long term control plans for larger patches should include all possible aspects of integrated management. It is necessary to tolerate the presence of some weeds every year during a long term program, but seed production should be reduced or eliminated whenever possible.

Containment may be the best choice for very large patches (several acres) of perennial weeds that are too costly or impractical to eradicate. Depending on the species present, the infestation can be contained by spraying herbicides on or tilling around the perimeter of the patch, mowing to prevent seed production, and focusing on eliminating the weeds in areas where they are most likely to spread such as roads, waterways, or animals. An integrated plan that combines the release of biological control agents in the central part of the infestation with chemical or mechanical control around the perimeter may be practical for large infestations. Consult with weed management specialist when making these decisions.

4.4 Preparing an Integrated Weed Management Plan

Once the weeds are identified, the size of the infestation is mapped, and a general strategy is chosen, information on specific control measures must be sought so that a plan can be formulated. Weed managers must ask a lot of questions, such as but not limited to: the amount of time and money that is available for control work; whether mechanical means can be used and if there is enough labor available; what type of herbicides are effective, available and appropriate for the land use and soil types on the property; if biological controls are available and effective; if and when seeding should be done, with native or non-native species, and what equipment or contractor is available to do the work; and whether control of sites of potential reinfestation are included in the plan or if other landowners must be recruited to assist in the program.

For infestations covering many properties and large areas, a Weed Management Area can be formed to coordinate control efforts. Contact the Mesa County Pest and Weed Inspector for more information.

Information on weed management can be found locally from CSU Cooperative Extension, the Mesa County Pest and Weed Inspector, and other local weed specialists. The Internet can be used to find general information on management techniques for a particular species, but local specialists should be contacted for appropriate herbicide rates and recommendations and seeding information.

4.5 Weed Control Principles

An integrated approach to weed management is extremely important because no single tool, such as herbicides, will do the entire job. Integrated Weed Management results in highly effective, affordable weed control. The five principles of IWM are:

4.5.1 Prevention: Prevention should always be practiced and is effective on all species of weeds. Prevention includes good land stewardship, planting weed free seed, avoiding planting invasive species, using weed seed free mulch and erosion control, using clean equipment, and legal measures such as quarantines and weed laws.

4.5.2 Cultural practices: Good stewardship of the land is essential in preventing as well as controlling weed infestations and is effective for all species of weeds. Cultural practices encourage competition from desirable plants through dense seeding, fertilization, mulching, careful irrigation practices, sensible grazing regimes, and improved land management practices.

4.5.3 Physical/mechanical methods: This includes hoeing, hand grubbing or rogueing, tillage, mowing, discing and plowing, solarization, burning, etc. The target of these methods is

primarily to prevent seed production. Weeds should be treated before flowers are in full bloom. In general, mechanical methods are very effective for control of annual and biennial weeds and less effective for perennials. Thoroughly cleaning equipment before moving to uninfested areas is essential to prevent the spread of weeds.

4.5.4 Biological control: Biocontrol is the introduction of living organisms that are detrimental to the noxious weed. This may be an insect, nematode, or bacterial, fungal or viral disease or the use of forage animals such as sheep, goats or cattle in controlled grazing. Biological control rarely provides 100% control and must be incorporated with other methods for successful management. Contact the Biological Control Section of the Colorado Department of Agriculture, Division of Plant Industry at 464-7916 for information on the availability of biocontrol agents.

4.5.5 Chemical control: The judicious use of the proper herbicides at the optimum time can be the most effective method of control for very persistent weeds. Not all herbicides are equally effective on all weeds nor can every herbicide be used in every situation. Noxious weeds, in particular, are often not controlled successfully with "garden type" products. **Read the label several times**, and consult weed manuals and experts for the most effective chemical to use. Wear all personal protective gear indicated on the label. Be sure to apply the herbicides at the proper stage of weed growth. Drought may cause plants to be less susceptible to herbicides; wait to apply herbicides until there is adequate soil moisture and the plants are actively growing again.

5.0 Best Management Practices for Noxious Weeds in Mesa County

Effective control of weeds requires persistence and vigilance as well as an understanding of weed management principles and the weed's life cycle. Choosing a method for weed control depends on many factors, including the weed species, proximity to water, presence of desirable vegetation, soil type, depth of the water table, growth stage of the weed, temperature, rainfall or lack thereof, and available labor, time, and money. The following recommendations are general in scope. Landowners should consult with weed management specialists, CSU Cooperative Extension personnel, or the Mesa County Pest and Weed Inspector while making plans to treat noxious weeds.

5.1 General Guidelines

- KNOW YOUR WEEDS! Identification is the first step in forming a weed management plan.
- Early detection is always the best defense against noxious weeds. Treat intensely when a new or small patch is found.
- Understand the biology of the weed to identify the best management practices and the target you are aiming to control.
- Know which growth stage to implement control measures so that control is most effective. For example, once a biennial or annual has gone to seed, it is too late to do

anything about it. Spraying a perennial in the rosette stage is often a waste of chemicals as the root system will send up new shoots.

- **!** Use weed free seed, hay, forage, and mulch.
- **!** Reseed site with competitive species. Grasses are often recommended so that broadleaf herbicides can be used to spot treat broadleaf weeds.
- **!** When tilling, till only in the weed patch so roots and seeds do not get spread. Always clean equipment and machinery after working in a weed patch to prevent spread.
- **!** Many biological control agents are available for control of extensive weed patches. This is a long-term process and not recommended for small patches. Biological control rarely provides 100% control and must be incorporated with other methods for successful management.
- **!** Weed management is a long term process and hence a long term commitment to the land. Weed seeds last 5-50 years in the soil and pieces of root as small as ½" can start a new plant and a new infestation.
- **!** Drought causes plants to shut down their growth process. Spraying weeds during dry periods is not recommended because effectiveness diminishes greatly. Treat after rainfall IF the weed is still in the proper stage for effective control.
- **!** Not all herbicides work equally on all weeds nor can every herbicide be used in every situation. Noxious weeds, in particular, are often not controlled successfully with products available at nurseries, garden shops and other retail markets. **Read the label**, and consult weed manuals and experts for the most effective chemical to use.
- **!** Developing a weed management plan depends on how much time and money is available and how much land is involved. If a landowner wants to do non-chemical control, they will not necessarily need a lot of money, but they will need a lot of time and energy. If they want fast action, herbicides can be the most efficient use of money and time, but not always. Annual weeds may be as effectively controlled with tillage or hoeing as with spraying if done properly and at the right time.

5.2 Control of Annuals & Biennials

Target: Prevent seed production; many seeds lay dormant in the soil for 3-10 years.

- **!** Hand grubbing (pulling), hoeing, tillage, cultivation in rosette stage and before flowering or seed maturity
- **!** Chop roots at least 2 inches below soil level
- **!** Herbicide treatment in rosette or bolting stage, before flowering
- **!** Mow biennials after bolting stage and before seed set; mowing annuals may not prevent the plants from flowering

5.3 Control of Perennials

Target: Deplete nutrient reserves in root system, prevent seed production. Seeds of many species lay dormant in the soil for 10 or more years. Root systems may reach 40 feet depth.

- **!** Allow plants to expend as much energy from root system as possible; do not treat when first emerging in spring but allow to grow to bud/bloom stage

- Herbicide treatment at bud to bloom stage or in the fall. In the fall plants draw nutrients into the roots for winter storage. Herbicides are drawn down to the roots more efficiently at this time. Spraying in the fall will kill the following year's shoots, which are being formed at this time. If the weed patch has been there a long time, another season of seed production is not as important as getting the herbicide into the root system.
- Mowing usually is not recommended because the plants will often flower anyway; seed production may be reduced, however. Many studies have shown that mowing perennials and spraying the regrowth is not as effective as spraying without mowing. The effect of mowing is species dependent so know what weed you are working with and consult the experts.
- Tillage may or may not be effective. Most perennial roots can sprout from pieces only ½" - 1" long. Clean machinery thoroughly before leaving the weed patch.
- Hand pulling is generally not recommended for perennial species unless you know the plants are new seedlings and not established plants. Hand pulling can be effective on small patches but is very labor intensive because it must be done repeatedly.

5.4 Integrated Pest Management Practices

No single method of weed control will provide 100% control. A combination of two or more of the following methods should be used. The following practices can be applied to all species of weeds.

5.4.1 Prevention: An ounce of prevention is worth a gallon of sweat, 100 gallons of herbicide spray, several shovels, several pounds of grass seeds, and a ton of money. Weed problems can be avoided by using simple precautions.

Hay for mulch or erosion control should be certified weed seed free. Using weed seed free hay is mandatory for feeding pack animals in the National Forest. A list of certified growers can be obtained from National Forest Ranger Districts or the Colorado Department of Agriculture.

When disturbing weed infested land for development (e.g. blading) or agriculture (e.g. tillage), clean machinery and equipment before moving between sites. Equipment should be thoroughly cleaned before coming into a new site and before moving out of a weed infested area. In industrial situations, power washing is a good way to clean equipment. DO NOT move soil from construction sites with known weed patches. Soil should be banked and used at the site. Emerging weeds should be treated accordingly.

Buy and plant noxious weed free seed. Laws require that containers (lots) of seed state the kind and percentage of noxious and other weed seed, and there are restrictions on the amount and kinds of weed seeds that are allowed in a lot. Over half of the weeds on the Colorado Noxious Weed List are escaped ornamentals. Do not buy ornamental seed mixes that do not give the scientific name of all the species in the mix. Check the scientific names against the list of noxious weeds. If the package just says "toadflax" you don't know whether or not you are buying a noxious species.

Eradicating single plants or small patches of weeds as soon as possible prevents their spread. In areas where the weeds are not yet present or are not very abundant, proper land management is necessary to keep the weeds out.

5.4.2 Cultural Practices: Cultural methods work on all species of weeds and are simply described as methods of sensible land management. Methods include improved land management practices, dense seeding with competitive species, careful irrigation practices, fertilization, and sensible grazing regimes.

New property owners should have their property assessed by a specialist. Growing conditions and land management practices in Western Colorado are very different from other regions of the country. Obviously, pasture and range lands are treated differently from lawn and garden areas. The intended use of the property will determine the best management practices for weed control. Even if you have owned your property for a long time, improvements probably can be made. Technical assistance is available from the Natural Resources Conservation Service or the CSU Cooperative Extension Office.

Competition with desirable plants can keep weeds suppressed and prevent weeds from becoming a problem. Plants compete for light, moisture and nutrients. Some weed species emerge early in the season to take advantage of these resources before natives or desirables. The choice of species used to provide competition for weeds depends on the intended use of the land, the types of weeds present, availability of irrigation water, soil types, and accessibility to the property. Native or non-native species can be used. In general, use a combination of species that will provide the best competition for the weeds that are present. It is generally better to plant grasses in broadleaf weed infestations so that a broadleaf herbicide can be used to treat the weeds if necessary. Some species of desirable plants are tolerant to herbicides. If irrigation water is not available, dryland species must be used. Seeding must be timed to take advantage of natural rain patterns to improve seed germination. Weed control will take much longer in dryland situations.

Proper water and fertility regimens are necessary to keep weeds from taking over. Over watering as well as under watering can lead to weed problems. Appropriate levels of fertilizer must be applied at optimal times in order to enhance desirable plant growth. Some species of weeds, such as Russian knapweed, diminish when water and fertilizer are properly managed.

Other management practices currently used on the property, such as grazing, may need to be adjusted to allow the desirable species to gain a foothold. Avoid overgrazing by livestock. When land is stripped of all plants by overgrazing, weeds are given the opportunity to move in. Because weeds are often undesirable as feed, they are sometimes the only plants left after livestock have overgrazed an area. Overgrazing gives them the light, space, water and nutrients they need to give them a competitive edge over desirable species. Do not allow overgrazing to happen. Be sure you have enough land for the number of grazing animals. Move livestock frequently to fresh pastures and allow pastures enough time to recover from grazing. Dividing up a pasture into three sections and moving animals between the sections can greatly improve conditions in an overgrazed pasture. Use a combination of perennial and annual, and warm and cool season pasture grasses to provide a diversity of plant types. Plant broadleaf pasture species only after broadleaf weeds are under control.

5.4.3 Mechanical Control: Mechanical control includes hoeing, tillage, hand grubbing or pulling, mulching, burning, grazing, and mowing. Labor costs can be considerable for large weed patches. Mechanical methods are more practical for small patches or scattered plants.

Mechanical control works well on annual and biennial weeds, but is much less effective on perennial species, unless they are in the seedling stage. Mechanical control is most effective when done before the plants have flowered. Annuals and biennials can be removed by severing

the root at least 2 inches below the soil level. If flowers and seeds are mature, cut off flower heads and carefully place them in contractor's heavy duty black plastic bags. Setting bags in the hot sun for several hours will help destroy seeds. Burning the cut material works if the fire is hot enough to totally destroy the seeds. Check the ashes for intact seeds. For perennial species, mechanical means are not very effective unless you are sure that the plant is a young seedling and all the root system can be removed. Digging up perennial plants may cut the roots into small pieces that can sprout new plants.

When using machinery to till the land, till within the weed patch and then clean the equipment before moving to uninfested areas. Avoid tilling when the soil is wet. Mud sticking to the machinery will make cleaning difficult and will likely carry weed seeds to other areas.

Mulching works by killing seeds or smothering emerging weeds. Grass clipping, leaves, hay, seed hulls from industrial applications, plastic and many other materials can be used as mulch. Organic mulch must be weed seed free. Apply and maintain organic mulch several inches deep. Solarization, the application of clear plastic to damp ground and left for several weeks, can kill weed seeds and roots and some plant pathogens to 3 inches depth. This method also kills soil micro-organisms and insects that may be beneficial. Solarization works best on annual and biennial weeds. Reseeding with competitive species must follow mulching, regardless of the material or method used.

Burning standing dead weeds generally does not totally destroy weed seeds and may actually benefit some weed species. Burning newly emerging annual weeds may be effective but the flame must be hot enough and applied long enough to cause the plant cells to burst. Some species may recover from burning by putting out new shoots. Burning is not effective on perennial species because the root system is not affected.

Grazing and mowing can be used successfully with some noxious weed species, primarily to reduce seed production. Mowing usually must be done several times per season. Both grazing and mowing should be combined with other methods, usually herbicide application. However, some species will flower at the grazed or mowed height. Grazing must be carefully timed for best results. Sheep, goats, and cattle can be used. Grazing is also considered a biological control method. Consult with an expert if you intend to use these methods.

5.4.4 Biological Control: Biocontrol agents, such as herbivorous insects, vertebrate predators, and plant diseases, are not available for every weed species, nor are they effective in every situation. Generally, the weed patch must be large enough to sustain multiple generations of the agent. Effects may not be seen for several years, so the presence of the weed must be tolerated. Seed prevention methods may need to be combined with biocontrol to keep the weed from reproducing.

Biocontrol agents can be obtained from mail order sources or Biological Control Section of the Colorado Department of Agriculture, Division of Plant Industry in Palisade. You should consult with a biocontrol or weed specialist before buying or releasing biocontrol agents.

Sheep and goats are used to manage some weed species and can be quite effective when used properly. Animals can be trained or conditioned to eat specific weeds and often leave desirable grasses alone. There are several grazing regimes that can be used, each with varying levels of intensity and duration. Grazing animals remove above ground growth and do not directly affect roots. However, repeated grazing will stress the root system of perennials. Grazing in combination with herbicide application can be very effective. In areas where dense weed

infestations prohibit the entry of spray equipment, grazing can open up the area to allow equipment in after some regrowth of the weeds has occurred.

5.4.5 Chemical Control: Herbicides must be used with extreme caution. They are poisons and should be treated with respect. Most herbicides can be purchased without an applicator license. The label is a legal document that outlines the uses and restrictions of the chemical. READ THE LABEL before buying, before applying and again after using an herbicide. READ THE LABEL before buying to determine if the herbicide is the right one for your situation, if it is labeled for the weeds you are trying to control, for information on the addition of adjuvant or surfactants, and for other restrictions, such as for grazing and planting. READ THE LABEL before applying to get the correct rate to use, how to mix and apply the product, what personal protection you may need while mixing and applying the herbicide, and for information on how to dispose of left over mix. READ THE LABEL after applying to check reentry intervals, to check planting and grazing restrictions, and for disposal and clean-up information.

Never use more than the recommended rate on the label. Higher rates will cause the tops of the plants to burn down quickly. The herbicide may not have the chance to move into the root zone and the weed may sprout again. And you are wasting money!

Pre-emergent herbicides prevent the germination of seeds and do not work on established perennial weeds. Application timing of pre-emergents is critical; they are usually applied in the spring. Precipitation or irrigation may be needed to move the chemical into the germination zone (the top 3-5 inches of soil).

Post-emergent herbicides work on the growing parts of the weed, including roots. Therefore post-emergent herbicides work on annuals, biennials, and perennials. Drought and heat may reduce the effectiveness of these herbicides.

The use of herbicides may be the only effective control method for some species. However, herbicides should be used in conjunction with other methods for the highest level of control.

Herbicide use is determined by restrictions and instructions on the product label. Materials or products mentioned in this Plan are based on experience in Mesa County or recommendations of Colorado State University Cooperative Extension Service and should not be construed as endorsement by Mesa County.

6.0 Noxious Weeds of Mesa County: A Management Guide

Bull Thistle (*Cirsium vulgare*)

Identification: A tap rooted, biennial, spiny leaved thistle with large dark purple flowers clustered at the ends of branches. First year growth is a low growing rosette of leaves. In the second year it blooms from June through the summer. The vase shaped flowerheads are 1½"-2" in diameter. Bull thistle grows 2-5 feet tall and has very green leaves with pointed lobes. Leaves have a cottony underside.

Similar Species: The rosette of musk thistle is similar but not as green as bull thistle. Flowers of other thistle are not vase shaped, but more open and less compact.

Control Timing: Control plants before plants bolt. Rosettes should be killed manually or with herbicides in the spring or fall. Plants that are bolting should be removed manually or sprayed as soon as possible. Flowering plants should be removed manually and mature flowerheads bagged to prevent seed spread.

Control target: Prevent seed production.
Control Methods: Severing the tap root at least 2" below the soil line before flowering is very effective. Herbicides can be used in the rosette to early bolting stage. Flowering plants should be chopped and bagged to prevent spread of seeds.
Status in Mesa County: Scattered and occasional; in higher altitude pastures and disturbed sites.

Canada Thistle (*Cirsium arvense*)
Identification: A deeply rooted, perennial weed that spreads from rhizomatous roots and also produces large numbers of seeds. Leaves are alternate on the stem and are spined along the edges. The purple flowers are small, about ½" to 3/4" in diameter, and grow in a cluster at the branch tips. Flowers may have a sweet smell and are visited by bees and other pollinators. Plants grow 1-4 feet tall and are usually found in large clumps.
Similar Species: Several species of native thistles are mistaken for Canada thistle. Identification by a professional is essential. A rare native species, *Cirsium perplexans*, is similar but is a tap rooted, not rhizomatous, perennial. Flowers are borne singly rather than in clusters. Plants do not typically grow in clumps like Canada thistle. *Cirsium traceyi* (formerly *C. undulatum* and called wavy leaf thistle), another native thistle often confused with Canada thistle, has larger, paler purple flowers and silver gray leaves.
Control Timing: Spring and fall.
Control target: Prevent seed production and stress root system.
Control Methods: Control of Canada thistle is difficult. Herbicides are most effective, often in combination with mowing to reduce seed production. Mechanical methods are ineffective and may cause the plant to spread or produce more stems. Seeding with competitive desirable grasses is highly recommended. See CSU Extension Service Fact Sheet No. 3108 for more information on control methods. Biocontrol agents are available.
Status in Mesa County: Problem in higher elevation forest lands, high country meadows, and along drainages.

Dalmation Toadflax (*Linaria dalmatica*):
Identification: A perennial plant growing 1-3 feet tall with showy snapdragon-like flowers. Leaves are very waxy, heart shaped and the upper leaves clasp the stem. Flowers arise in the axils of the leaves and have a yellow spur and fuzzy orange throat. Seed production is very high.
Similar Species: Many ornamental snapdragons look like toadflax, since it is in the same family. Yellow toadflax has linear leaves. Our native toadflax has blue flowers. Yellow toadflax has paler flowers and linear leaves.
Control Timing: During summer when flowerheads are first appearing.
Control Target: Prevent seed production and stress root system**.**
Control Methods: Repeated hand grubbing can be effective for small infestations. Large infestations require herbicide use and competitive planting. A surfactant or adjuvant must be added to the herbicide mix to break through the waxy leaf surface. Several biocontrol agents are available but need large infestations and a long establishment time. This is a difficult weed to control via any method. CSU Extension Service Fact Sheet No. 3.114 has more details on control of Dalmation and yellow toadflax.

Status in Mesa County: Found in high numbers on Mormon Mesa, near Molina, and on surrounding road rights-of-way. A few plants have been found on I-70 from the Grand Mesa exit to the Utah State line. A small infestation exists on Glade Park but is being controlled and does not appear to be spreading.

Diffuse Knapweed (*Centaurea diffusa*)

Identification: An annual or short lived perennial weed that is profusely branched and grows to 2 feet tall. Rosette and stem leaves are deeply lobed. Produces numerous white to pale lavender flowers that bloom in early to mid summer. Bracts below the petals are spine tipped, with comb-like spines and are prickly to the touch. Plants break off at the base and become tumbleweeds, facilitating seed spread.
Similar Species: Russian knapweed leaves are not lobed and its flowers are darker purple. Spotted knapweed has spots on the bracts below the flowers.
Control Timing: In the rosette or early bolting stages.
Control target: Prevent seed production.
Control Methods: Mechanical removal is effective on rosettes and plants in the early bolting stage. Herbicides are effective tools if applied before flowering. Once the plants have flowered, they should be removed manually and bagged to prevent seed spread.
Status in Mesa County: A large infestation exists at the Garfield/Mesa County line on I-70. Scattered plants may exist along I-70 throughout Mesa County. A large infestation exists in the Bookcliffs on Bureau of Land Management land; it is being treated. A large infestation was found in 1998 on property owned by Public Service Company located east of 34 Road on C Road. This patch is being controlled with herbicides and is being monitored by the Mesa County Pest and Weed Inspector. A few dozen plants were found and removed in 2001.

Dyers Woad (*Isatis tinctoria*)

Identification: Woad is an annual or short lived, tap rooted perennial mustard growing up to 48 inches high. The tap root may reach to a 5 foot depth. Leaves are bluish-green, lanceolate (strap shaped) and are connected to the stem by a petiole. The leaf has a whitish nerve or vein visible on the upper surface. Flowers are numerous, yellow and very small. The seed pods are very diagnostic, being extremely large for a mustard, flattened and very dark. Each pod contains a single seed.
Similar Species: Many mustards have yellow flowers and similar leaf structure. The seed pods are the best way to tell this from other mustards.
Control Timing: During the rosette stage (fall or spring) and before flowering.
Control Target: Prevent seed production.
Control Methods: Manual removal is usually a good method for annual plants. However, dyer's woad will regenerate from its tap root if the root is not completely removed. Rosettes should be killed manually or with herbicides in the spring or fall. Plants that are bolting should be removed manually or sprayed as soon as possible.
Status in Mesa County: This weed has not yet been found in Colorado. It is a serious and expanding problem in Utah.

Hoary Cress or Whitetop (*Cardaria draba*)

Identification: A perennial mustard with an extensive root system and growing up to 2 feet tall. Plants form a dense, contiguous patch. Leaves are slightly toothed, with upper leaves clasping

the stem. Numerous small white flowers form a flat-topped flowerhead. Seed pods are heart shaped and contain 2 seeds each.
Similar Species: There are many white flowered mustards in our area. None of them have a dense, flat topped flowerhead, however. Perennial pepperweed, or tall whitetop, is much taller, the flowerheads are less dense than hoary cress, and it blooms in mid to late summer.
Control Timing: Before or at very early bloom.
Control target: Prevent seed production.
Control Methods: Herbicide applications can be very effective on hoary cress when applied at the proper time. Tillage or hand grubbing break up root pieces, which can sprout into new plants. No biocontrol agents are available.
Status in Mesa County: Widespread in lower elevations of Mesa County but spreading to higher area such as Collbran. Hoary cress and Russian knapweed are the County's two most abundant noxious weeds.

Houndstonque (*Cynoglossum officinale*)
Identification: Houndstongue is a biennial plant with rough hairy leaves that can be 1-12 inches long and 1-3 inches wide. Flowers can be maroon or white, are about 1/4" in diameter, and appear bell shaped. The seed pods (nutlets) are covered with hooked spines and provide a mechanism for dispersal on clothing and fur. The pods are flattened and somewhat heart shaped. A common name locally is beggar's lice.
Similar Species: Other plants with sticky seeds, such as nodding beggar's tick, western sticktight and catchweed bedstraw, can be confused with houndstongue. The shape of the seeds and/or the presence of stout straight spines can distinguish these from houndstongue.
Control Timing: In the rosette or early bolting stage.
Control target: Prevent seed production.
Control Methods: Mechanical removal is very effective for small infestations, particularly after plants have bolted, when herbicides may not be as effective. Rosettes should be killed manually or with herbicides in the spring or fall. Plants that are bolting should be removed manually or sprayed as soon as possible. Flowering plants should be removed manually and mature flowerheads bagged to prevent seed spread. Beware to remove all seeds from clothing, shoes, shoelaces, etc.
Status in Mesa County: Found in pastures and roadsides, higher elevations, primarily in higher elevations of eastern Mesa County.
Toxicity: Houndstongue is extremely toxic to cattle and horses, less so to sheep. It produces alkaloids that cause liver damage.

Leafy Spurge (*Euphorbia esula*)
Identification: A perennial with extensive, deep, creeping rootstocks. Roots are dark brown with pink shoot buds. Leaves are linear and about 1-1½ inches long. Flowers are inconspicuous and green. At the base of the true flowers, and emerging before them, are bright yellowish-green bracts that are often mistaken for the flowers. It is very important to distinguish these two stages for timing control work. Seeds are in a pod, which when dry expels the enclosed seeds up to 15 feet. The plants have a milky latex sap which is very toxic.
Similar Species: Leaves are similar to yellow toadflax. Other spurges in our area are either low growing (prostrate spurge) or have broad, toothed leaves (toothed spurge). Many plants have milky sap so this is not a good diagnostic tool.

Control Timing: When bracts are present but before true flowers emerge and in the fall.
Control target: Prevent seed production and stress root system**.**
Control Methods: Herbicides are the most effective method of control for leafy spurge. Small infestations should be sprayed immediately and repeatedly after allowing regrowth to occur. CSU Extension Fact Sheet No. 3.107 details control methods. Grazing by goats has worked well in some situations. Several species of *Apthona* flea beetles have proved to be very effective in some parts of the country. Large infestations are the best candidates for release of biocontrol agents. Application of herbicide to the perimeter of a infestation may be necessary to keep the weed from spreading while the beetles establish and build their numbers.
Status in Mesa County: Current infestation is in the Plateau Valley area. A small infestation was found in 2001 west of the town of Mesa. A small, dwindling population also occurs in Unaweep Canyon, near the Divide Road turnoff.
Toxicity: The milky sap of leafy spurge can cause skin and eye irritation in humans and other animals. It can cause death of livestock. The toxicity remains even after the plants are dried. Caution must be taken when handling this weed.

Musk Thistle (*Carduus nutans*)
Identification: A bushy biennial plant that grows to 6 feet tall. The dark green leaves have spined edges and are lobed and wavy. Rosette leaves are spiny with a white central vein that is very visible on the underside. The leaves clasp the stem and form "wings" along the stem below the leaf. Flowers are borne singly on long spineless stems. The flowers are deep pink to magenta and 1½ to 3 inches in diameter with very broad green bracts below the petals. When mature, the flowers "nod", hence the other common name, nodding thistle.
Similar Species: Plumeless thistle, another noxious species, has spined wings along the stem under the flowerhead and the flowers may occur in clusters of 2-5 flowers. Bull thistle, another noxious species, is shorter and the lobes of the leaves are pointed at right angles to the main vein. None of our native thistles are similar to musk thistle.
Control Timing: In the rosette and early bolting stage.
Control target: Prevent seed production.
Control Methods: Severing the tap root at least 2" below the soil line before flowering is very effective. Herbicides can be used in the rosette to early bolting stage. Flowering plants should be chopped and bagged to prevent spread of seeds. Several insects species are available for biological control.
Status in Mesa County: Widespread in higher elevations of eastern Mesa County on roadsides and in pastures. Rarely found in lower elevations in Mesa County.

Oxeye Daisy (*Chrysanthemum leucanthemum*)
Identification: A perennial, white flowered daisy with creeping roots growing to 2 feet tall. Leaves have toothed edges and are 2-5 inches long, getting smaller toward the top of the plant. The flowers are 1½ inches in diameter and borne singly on the ends of branches.
Similar Species: Shasta daisy is a common ornamental daisy with larger leaves and flowers. Two noxious weeds, scentless and Mayweed chamomile have fern-like leaves and have flowers with an inflated disk (central part of the flower).
Control Timing: In the spring before flowers appear and in the fall.
Control target: Prevent seed production and stress root system.

Control Methods: Herbicides have been shown to be the most effective control method. Mechanical removal may stimulate shoot production from the rhizomatous roots. No biocontrol agents are available for this weed.
Status in Mesa County: Fairly common in pastures in higher elevations of Mesa County, and in some flowerbeds in lower elevations. Oxeye daisy may still be found for sale as seed, in wildflower seed mixes, or as bedding plants. It is illegal to sell this species in Colorado.

Plumeless Thistle (*Carduus acanthoides*)
Identification: An annual, highly branched, tap rooted biennial thistle growing up to 4 feet tall. Rosette leaves are 4 to 8 inches long, green, with spined lobes. Stem leaves have "wings" that grow to the stems. Flower stems also winged. The purple flowers are either solitary or in a cluster of 2-5. Flowers rarely white or yellowish. Bracts under the petals are hairy and narrow.
Similar Species: Musk thistle has larger bracts and flowers, and the flower stems are not winged. Bull thistle is shorter and not as spiny with more compact flowers. Flowers of the rare native species, *Cirsium perplexans*, are borne singly rather than in clusters and the stems are not profusely winged. *Cirsium traceyi* (formerly *C. undulatum* and called wavy leaf thistle), another native thistle, is not profusely branched, has silver gray leaves and the stems are not winged.
Control Timing: In the rosette and early bolting stages.
Control target: Prevent seed production**.**
Control Methods: Severing the tap root at least 2" below the soil line before flowering is very effective. Herbicides can be used in the rosette to early bolting stage. Flowering plants should be chopped and bagged to prevent spread of seeds. Several insects species are available for biological control.
Status in Mesa County: Infestations have been found in Devil's Canyon near Fruita and in Rifle (Garfield County). Otherwise it is not widespread in Mesa County.

Purple Loosestrife (*Lythrum salicaria*)
Identification: A perennial with creeping, rhizomatous roots that grows up to 10 feet tall. A wetland invader, it thrives in moist conditions. Leaves are lance shaped with veins that do not reach the edge of the leaf but parallel the edge. The very showy purple to magenta flowers grow on long stalks and have 5-7 petals each. The ribbed stems are square or 6-sided. Also called purple lythrum.
Similar Species: An uncommon native loosestrife is shorter and more delicate, with fewer flowers. Gayfeather or blazing star, a native plant, has coarse, more linear leaves that are much narrower than loosestrife. Fireweed, a common native plant, has only 4 petals per flower, a round stem and the flower heads form an elongated triangle.
Control Timing: Before flowering in the spring, and in the fall. Mature flowerheads must be removed before the first frost.
Control target: Prevent seed production and stress root system**.**
Control Methods: Mechanical control can be effective for small infestations but must be repeated, often for five years or more. Timing of herbicide applications is important. Spring applications should be done just before flowering, to prevent flowering and seed set. Fall applications can be done anytime before a hard freeze, but flowerheads must be removed to prevent spread of seeds. Formulations of the herbicides glyphosate and 2,4-D that are labeled for aquatic use are effective. An adjuvant or surfactant should be added for better penetration of the

chemical. Several biocontrol agents are available but establishment is dependant on proper regulation of water levels, and may work better in drier habitats.
Status in Mesa County: Large infestations occur along Tiara Creek on the Redlands. Smaller infestations occur along Goat Draw on Redlands Parkway, and on two private properties north of Fruita. Over 70 plants or small infestations were found on the Colorado River in 2001. The spread of the weed to riparian areas along the River are of extreme concern to public lands managers.

Russian Knapweed (*Acroptilon* [*Centaurea*] *repens*)
Identification: A rhizomatous perennial weed with a silvery green appearance, growing up to 3 feet tall. Rosette leaves are lobed and about 3-5 inches long. Stem leaves are linear, not toothed, and about 1 to 2 inches long. Flowers appear in May to June and occasionally late summer. They are purple and about ½ inch in diameter. The bracts below the petals are soft and greenish tan. Roots are black and scaly. Leaves of Russian knapweed release an allelopathic chemical to the soil, which prevents any other species from germinating from seed.
Similar Species: Diffuse and spotted knapweed have similar flowers, but both have fern-like leaves throughout and the bracts under the flowers differ from Russian knapweed. Purple aster (*Aster macaeranthera*) has very green leaves and the flowers have a yellow center. This plant blooms in the late summer and early fall.
Control Timing: In the bud to bloom stage and in the late summer and during the fall.
Control target: Prevent seed production and stress root system**.**
Control Methods: Herbicides are the only method known that provides good control results. Repeated pulling or digging may work for very small or new infestations, but must be done over a long period of time. Tillage, other than that necessary for seeding competitive plants, spreads small root pieces that can then sprout into new plants, resulting in a denser infestation. Planting competitive plants is necessary following herbicide application. The soil must be tilled and left for a week or two before planting to allow the knapweed's allelopathic chemical to dissipate. CSU Extension Service Fact Sheet No. 3.111 details control methods and seeding recommendations.
Status in Mesa County: Widespread in lower elevations of Mesa County. Some patches are beginning to show up in higher elevations. Very abundant on the Dolores, Gunnison and Colorado Rivers. Occurs on roadsides, in degraded pastures and range, on neglected farmland, and in disturbed sites. Hoary cress and Russian knapweed are the County's two most abundant noxious weeds.
Toxicity: Russian knapweed is toxic to horses, causing nigropallidial encephalomalacia, a Parkinson's-like neurological disease, that results in the inability to chew followed by starvation. Although toxicity to humans is undocumented, cases of tumors, illness from burning plants, and a garlic-like taste in the mouth have been reported. It is essential to wear gloves when working with this plant.

Scotch Thistle (*Onopordum acanthium*)
Identification: A biennial, tap rooted weed that grows to 12 feet. Rosette leaves are very large (1 to 2 feet long and 6 to 12 inches wide), spined and with a dense coating of white hairs that give the leaves a silvery green appearance. The numerous flowers are magenta and 2 inches or more in diameter. Stems are winged, including those under the flowerheads. Truly an enormous plant.

Similar Species: No other thistles reach this size or have leaves or flowers this large.
Control Timing: In the rosette stage.
Control target: Prevent seed production.
Control Methods: Mechanical control is very effective in the rosette stage, if the root is severed at least 2 inches below the soil line. Roots are very thick and may need to be chopped. Herbicides can be effective but must be applied to the rosette. The older the plant gets, the more difficult it is to control with herbicides because the hairiness of the leaves prevents the herbicide from landing on the leaf surface. The addition of a surfactant or adjuvant is recommended. No biocontrol agents are available at this time.
Status in Mesa County: A serious problem in the Collbran area. A small infestation was found on Glade Park. A few plants are found occasionally in lower elevations of Mesa County.

Spotted Knapweed (*Centaurea maculosa*)
Identification: A biennial or short lived perennial weed that is profusely branched and grows to 3 feet tall. Plants have a stout tap root. Rosette leaves strongly lobed or not and 3 to 6 inches long. Flowers are pink to magenta, rarely white, and occur singly on the tips of branches. Bracts below the flower petals have dark, toothed margins that look like spots.
Similar Species: Diffuse knapweed has a comb-like fringe on the bracts and no spots. Russian knapweed has soft, greenish-tan bracts without a fringe or spots.
Control Timing: In the rosette or early bolting stage.
Control target: Prevent seed production.
Control Methods: Mechanical control may work for small infestations, but must be repeated because shoots can arise from the tap root. Digging up the entire root is preferable but labor intensive. Tillage at the rosette stage can be effective. Herbicides are effective is applied to the rosette stage. Mature flowers should be removed and bagged to prevent seed spread. Some biocontrol agents are available, including seed and stem feeders.
Status in Mesa County: Very small infestations exist in Mesa County on Glade Park, on Silt Divide Road, on Lands End Road, and Highway 65 north of Powderhorn.

Tamarisk or Salt Cedar (*Tamarix parviflora, T. ramosissima*)
Identification: A small tree or shrub growing up to 20 feet tall, with feathery leaves and tiny purple to white flowers. May be deciduous or evergreen, but mostly deciduous in our area. This plant grows in riparian areas and wetlands, often depleting surface water and lowering ground water levels. Salt is released from the leaves when they drop in the fall, making the soil in the understory highly alkaline.
Similar species: No other shrub is similar in appearance to these *Tamarix* spp.
Control timing: Year round, with best success in fall and winter with cut-stump and basal spray treatments.
Control target: Prevent seed production and stress root system**.**
Control methods: Brush hogging, pulling out by the roots, and burning lead to less successful control due to the vigorous regrowth that occurs. Cutting down the shrub or tree and painting the stump surface immediately afterward with an herbicide (cut stump treatment) is the most effective control method. Herbicide must be applied within 10-15 minutes of cutting to prevent excessive resprouting from the stump. Follow up herbicide application is needed to treat sprouts from the root system. This usually will only be necessary for 2-4 years. All branches and trunk

pieces must be removed from the site to prevent sprouting. Tamarisk branches touching wet ground have been known to sprout and send down new roots. Chipping or burning the slash is recommended. The cut stump method is best done in the fall or winter after the tamarisk leaves have fallen, to make removal of the slash easier. The basal 12-18 inches of the trunks of small plants with smooth bark can be sprayed with herbicide (basal bark treatment). Rough barked plants should get the cut stump treatment. Foliar sprays during the growing season must cover the entire leaf surface to be effective and will take 3-4 years of repeated treatment to be successful. Two predatory insects have been evaluated and one of them is in the experimental release stage as of 2001. A leaf feeding beetle is currently under experimental release near Pueblo, Colorado, and other sites in the West. Future releases on the Colorado River near Grand Junction are expected. Several years of defoliation by the insects is necessary to kill the plant.
Status in Mesa County: Tamarisk is a plant that is preferred to be controlled, rather than mandatory for control, in Mesa County. It is widespread throughout the county in most riparian zones of permanent and ephemeral streams. Although thought to be a lower elevation plant, tamarisk has been found on Douglas Pass in Garfield County and near McClure Pass in Gunnison County.

Yellow Starthistle (*Centaurea solstitialis*)
Identification: A tap rooted annual weed growing to 2 feet tall. The rosettes are 6 to 8 inches across and look very similar to a dandelion rosette. Rosette leaves have a distinct triangular tip. The yellow flowers are about ½ wide and bloom throughout the summer. Seed production is very high. Bracts at the base of the petals are armed with stout spines up to 1½ inch long. No other part of the plant has spines. Leaves are reduced and grayish green. Plants are much branched and spindly looking.
Similar Species: Curlycup gumweed is much greener, rosette leaves are less lobed, and the flower bracts are not armed with spines, but have curled bract tips. Buffalo bur, a native weedy species, is often confused with starthistle. Buffalo bur has spines allover the leaf and stem surfaces, and has yellow bell shaped flowers. The leaves are broad and deeply lobed. Several other species in the aster family, such as wild lettuce, sowthistles, and dandelions, have yellow flowers but none are spined.
Control Timing: In the rosette to early bolting stage.
Control target: Prevent seed production.
Control Methods: Mechanical control works well on small infestations but is labor intensive for large infestations. Herbicides can be applied during the rosette to early bolting stage. Repeat applications are necessary because the seeds germinate over the entire summer. A seedhead fly, accidentally introduced to California, feeds on seeds but is currently not available. Good pasture management is necessary to keep starthistle populations from exploding.
Status in Mesa County: There is a large infestation south of the town of Mesa in the Coon Creek Estates area. A smaller infestation occurs on Glade Park on DS Road. Mesa County is actively involved in monitoring infestations and working with landowners on eradication of these patches.

Yellow Toadflax (*Linaria vulgaris*)
Identification: A creeping perennial that grows to 2 feet tall and is often profusely branched. The flowers look like typical snapdragons, with a pale yellow spur and darker yellow to orange

throat. The numerous leaves are linear and pointed. Also called butter and eggs, this is a very persistent plant.
Similar Species: Dalmation toadflax has heart-shaped leaves and the stems that are not branched. Many ornamental snapdragons look like toadflax, since it is in the same family. Yellow toadflax has linear leaves. Our native toadflax has blue flowers.
Control Timing: Before flowering and in the fall.
Control target: Prevent seed production and stress root system**.**
Control Methods: This is a very difficult plant to eradicate. The extensive root system must be stressed continually. Mechanical control is often not effective on larger patches, and may spread root pieces. Herbicides are effective but choice of product and control timing is very important. CSU Extension Service Fact Sheet No. 3.114 has more details on control of Dalmation and yellow toadflax.
Status in Mesa County: A few small infestations occur at Vega State Park. One small patch was eradicated at the County owned boat take-out on the Gunnison River near Whitewater. A small patch was found on Skipper's Island in 2001.

APPENDICES

Appendix A: GPS Data Dictionary

Mapping standards were developed by the North American Weed Management Association. The following data are collected and reported to the State Weed Mapping Team and used for County mapping efforts. Data followed by an asterisk (*) are collected in the field, other data are added at the time of processing the information. Data followed by a dagger (†) are collected only for County use.

Data Field	Explanation
Collection date*	
Examiner	person collecting the data
Quarter quad number	based on USGS quadrangle maps
Site ID	unique number for each patch mapped
Plants code	standard code of plant name
Genus	
Species	
Authority	person who described the species
Common name*	
Radius of patch	for point data
Length of patch*†	for line data
Width of patch*†	for line data
Infested area	number of acres, for area data
Infested unit	acres
Gross area	estimate of area
Gross unit	acres
Coverage percent*	how much of the land is covered by the weed
US owner	federal land owner
Local owner	private or local land owner
Data source	other than collected by County, e.g. USFS, BLM, DOW
Country	USA
State	CO
County FIPS	unique county number
HUC number	watershed number
Quad#	USGS quadrangle number
Quad name	USGS quadrangle name
Datum	GPS zone
Longitude	
Latitude	
Road†	road where data is taken
Land use†	e.g. private, industrial, public, etc.
Sensitivity†	indicates if the area is in an herbicide sensitive, e.g. irrigation ditch

Appendix B: Resources for Control of Noxious Weeds

Mesa County Pest and Weed Inspector
P.O. Box 20,000-5028
Grand Junction, CO 81502-5028
970-255-0795
FAX: 970-244-1700

Colorado Department of Agriculture
Division of Plant Industry
Biological Control Section
Palisade Insectary
P.O. Box 400
Palisade, CO 81526
970-464-7916

State Weed Coordinator
Colorado Department of Agriculture
Division of Plant Industry
700 Kipling St., Suite 400
Lakewood, CO 80215-5894
303-239-4182

Colorado State University Cooperative Extension Service
2775 Hwy. 50
Grand Junction, CO 81503
970-244-1834

Natural Resource Conservation Service
2754 Compass Dr., Suite 170
Grand Junction, CO 81506
970-242-4511