PAONIA PROJECT
Integrated Pest Management (IPM) Plan
July 21, 2009

LAND STATUS: Fee title, withdrawn lands, and easements

I. Background and Purpose

Construction of the Paonia Project (Project) was authorized by the President under the Reclamation law on March 18, 1939. The revised plan was authorized by the Congress on June 25, 1947. The project was reauthorized as a participating project under the Colorado River Basin Act of September 30, 1968 (Public Law 90-537), as a participating project under the Colorado River Storage Project Act of April 11, 1956 (Public Law 84-485).

Project construction included the Paonia Dam and Reservoir and enlargement, and extension of the Fire Mountain Canal. The Project provides full and supplemental irrigation water supplies for approximately 15,300 acres of land in the vicinity of Paonia and Hotchkiss, Colorado.

II. Responsibility, Past Efforts and Results

Colorado Department of Parks and Outdoor Recreation (CDPOR)

In the Memorandum of Agreement, No. 3-LM-40-01000, dated September 23, 1994, between the United States of American and the State of Colorado (State) for the Management, Operation and Maintenance of Recreation at Paonia Reservoir, the State and the United States will, in cooperation with the District, take all reasonable measures necessary to minimize siltation and erosion; protect land and water resources; prevent and suppress fire; protect against introduction and spreading of noxious weeds and other pests detrimental to natural values, agriculture or public health and safety; and will cooperate in soil and water conservation, and fish and wildlife enhancement practices.

CDPOR developed a vegetative management plan in 1999. This plan covered Crawford, Paonia and Sweitzer Lake State Parks for the years 1999 through 2004. CDPOR is in the process of updating their plan.

Successful weed control for Paonia State Park may involve a combination of biological, mechanical, chemical and cultural methods. These various methods have been used for weed control. Mechanical weed control, like digging, pulling and mowing, are especially effective on annual and biennial weeds because these plants do not produce the underground root system that make perennial weeds difficult to control. Biological control (e.g., insects) has been considered but not implemented to date.

Herbicide spraying has been most effective during certain periods in the plant growth cycle. It has been found that spraying while the plant is in bud or prior to the plant going dormant are the two most effective times. Planting of desirable vegetation after a soil disturbance (such as backhoe work or trenching) has limited the invasion of weeds into the disturbed area.

The primary area for invasive species control will be in the developed recreation areas around Paonia Reservoir.

- Special areas of concern:
  - Because weed seed and plant parts can be spread by vehicles, visually inspect along the shoulder areas of all interior roads, parking areas, campsites, restrooms, etc. on a regular schedule;
  - Along the shoulder areas and pullouts on the state highway and county roads;
  - Chemical applications around campsites should be limited to chemicals that will minimize adverse exposure to the public preventing health issues; and
  - Providing a mow strip around the campsites and day use areas on a regular schedule will help reduce the spread of or eradicate invasive species in these areas.

North Fork Water Conservancy District (NFWCD)

NFWCD has an agreement dated September 8, 1999, with the Fire Mountain Canal and Reservoir Company (FMCRC) for the operation and maintenance of the Paonia Dam and Reservoir.

Past action taken by the FMCRC for control of invasive species and woody vegetation are as follows:

Prior to 2007, all pesticide use proposals (PUP) were sent to Reclamation stating that they do not use pesticides on project lands (e.g., reservoir, canals). In 2007, a PUP was received requesting the use of the following pesticides:

- Amine 2-4-D
- Escort
- Milestone
- Telar
- Tordon

FMCRC's weed/vegetation/varmint control will be required at any area where they may restrict the flow or delivery of irrigation water or endanger the facility within the primary jurisdiction area around Paonia Dam.

Guidelines for Vegetation Control on Reclamation Facilities

For earth dams, dikes and conveyance facilities Reclamation has guidelines for removal of vegetative growth. Control of trees and other significant vegetative growth should be prevented from becoming established for the following reasons:

1. To allow proper surveillance and inspection of structures and adjacent areas for seepage, cracking, sinkholes, settlement, deflection and other signs of distress.
2. To allow adequate access for normal and emergency O&M activities.
3. To prevent damage to the structures due to root growth, such as shortened seepage paths through embankments; voids in embankments from decayed roots or toppled trees; expansion of cracks or joints of concrete walls, canal lining or pipes; and plugging of perforated or open-jointed drainage pipes.
4. To discourage animal/rodent activity (by eliminating their food source and habitat), thereby preventing voids within embankments and possible shortened seepage paths.
5. To allow adequate flow-carrying capability of water conveyance channels (spillway inlet and outlet channels; open canals, laterals and drains).

These guidelines also suggest the following clearance zones and some criteria for removal of vegetation:

1. Trees and detrimental vegetation should be prevented from becoming established on the surface of all earth dam, dike and conveyance feature embankments.
2. Trees and detrimental vegetation should be cleared to 25 feet beyond each groin and toe for earth dam embankments and dikes.
3. Trees and detrimental vegetation should be cleared to 15 feet beyond the outside toe for all fill sections/embankments for open canals and laterals.
4. Earth dams, dikes and conveyance feature embankments with large trees and/or stumps should be removed in an approved manner, generally by grubbing out the stump and root system and replacing with compacted embankment material.
5. Spillway inlet and outlet channels, outlet works discharge channels and other open conveyance channels (open canals, laterals, and drains) should be free of vegetative growth that could significantly impede water flow or reduce design capacity.
6. Maintain a clearance zone of 25 feet adjacent to all concrete structures associated with these facilities.
7. Associated cut slopes adjacent to open canals and laterals should be kept clear of vegetation which if toppled and/or uprooted, could affect operations or O&M access.
8. For pipe conveyance systems (such as siphons, aqueducts, discharge lines, perforated or open-jointed drains etc), maintain a clearance zone of 15 feet on each side of the pipeline to prevent root encroachment and to provide O&M access.

In controlling animals that pose problems to Reclamation facilities, such as the dam, the NFWCD, or their representative, shall coordinate shooting and poisoning activities with the State Parks for reasons of public safety. It is recommended that all shooting of pests be performed during March and April when they come out of hibernation, select safe shooting angles, use only shotguns or small-bore rifles (.22 caliber or less), and post public closure signs in appropriate areas during this activity.

Also reference the Paonia Dam Standing Operating Procedures, Chapter II, Section B regarding vegetation and mammal control.

Please note that areas within the reservoir boundary that are disturbed for whatever purpose by either CDPOR, NFWCD or their representative (FMCRC), or Reclamation that entity is responsible for the reseeding of the disturbed area with an appropriate seed mix that is approved by Reclamation.

To control or eradicate invasive species (weeds, trees, pests) on Project lands is a shared responsibility for all individuals, organizations and agencies. As we work together, share our expertise and resources, the task ahead is not insurmountable.

III. Concerns/Activities

- Waterfowl Habitat: Protection of existing habitat from encroachment of invasive and other undesirable species.
- Project O&M (operation & maintenance): Protection of Project features so that proper O&M can be performed so that Project objectives can be met.
- Public Recreation: Limit the contact of pesticides near or around the campsites and other areas of use. Select a pesticide for use in public areas that is appropriate to use around people and pets. Monitor areas along vehicle routes for new invasive weed growth.
- Wildlife Habitat: The area is an important habitat for ducks, shore birds, and song birds, and other wildlife (e.g., deer, etc.). Habitat is used by both resident and migratory wildlife.
- Native Riparian Vegetation: Encourage the growth of native species while controlling/eradicating invasive species.

IV. Pertinent Laws and Regulations

- Clean Water Act
- Executive Order - Invasive Species February 3, 1999
- Colorado Undesirable Plant Management Act - House Bill 1175
- Colorado Weed Management Act - Statute 35-5.5-101 through 119, CR.S. (2000)
- National Environmental Policy Act (NEPA)
- Federal Insecticide, Fungicide and Rodenticide Act (FIFRA)
- Endangered Species Act (ESA)
- Delta and Gunnison Counties Noxious Weed Ordinance
- Bureau of Reclamation Directives and Standards (ENV 01-01) and Policy for Weed Management (ENV PO2)
- Federal Noxious Weed Act
- Federal Halogeton Weed Act

V. Invasive Weeds/Pests Identified

1. Canada Thistle (Cirsium arvense L.) Asteraceae
2. Houndstongue (Cynoglossum officinale L.) Boraginaceae
3. Russian Knapweed (Centaurea repens L.) Asteraceae
4. Yellow Toadflax (Linaria vulgaris Mill.) Scrophulariaceae

VI. Land Type

- Wetland, Riparian and Aquatic
  These plant communities have become established around the reservoir and below the dam, which includes plants such as cattails, cottonwood and willows.
- Mountain Shrubland
  This is a diverse community to include various shrubs such as mountain mahogany, Gambel oak and serviceberry.
- Upland Habitat (Forest & Grasslands)
  Areas are generally above the floodplain containing indicator species such as ponderosa pine and pinion-juniper woodland.
- Agriculture
  Irrigated lands along the Fire Mountain Canal are a combination of pasture and orchards.

VII. Pest Management Techniques

Cultural/Mechanical Control Methods

Mechanical techniques include mowing, tilling, clipping, hand digging, pulling trapping, and other activities which physically remove a pest species. Cultural control activities include prescribed burning, crop rotation, reseeding, and proper land management. Some cultural/mechanical control methods will not result in effective long-term control; however, they may present the most effective option on environmentally sensitive sites or public recreation areas. Cultural/Mechanical control methods can prove a short-term solution by preventing an invasive plant from setting seed until a long-term technique can be applied. They also may enhance the effectiveness of other techniques when integrated with chemical or biological control methods.

Supplemental feeding of livestock in grazing permits is permitted only with process feed supplements or certified weed-free-hay. This policy will help prevent spreading weed seed.

Biological Control Methods

Biological control includes the introduction of insects or other living organisms to consume, parasitize, or kill the identified pest species, thereby controlling the population. Most introduced biological control agents have been quarantined and tested prior to their release by APHIS to

ensure these agents will not adversely affect desirable species or carry harmful parasites. Reclamation will only use biocontrol agents that are sanctioned by APHIS or under the direct supervision of that agency.

Introduced biological control agents are usually specific to a single pest species or a closely related group of species. Releasing biological control agents is only practical if the are and density of the infested site is large enough and sufficient to support the establishment of the biological control agent. Introducing biological control agents does not often produce immediate results. Establishing a biocontrol population large enough to yield results may take several years. Biological control agents environmentally suited for all or a portion of the land use types may however have habitat requirements that are better met in certain land cover types. Establishment is more likely in these areas. Other factors which may affect successful introductions include proximity to agricultural or urban areas where insecticides or other chemicals are sprayed and site specific micro-climatic factors.

Using livestock grazing practices is another biological technique for managing invasive species. Timing and grazing intensity should be taken into account when using these methods.

The use of biological control agents on Reclamation lands will be documented. Release sites will be located on maps and the following information will be recorded: species, number released, date of release and legal description of release site. The release site will be documented by collecting Geographic Positioning System data, and/or identified on site with a fence post, and photographed or measured to record baseline conditions. Release sites shall be monitored annually for the presence of biological control agents and their effect on the pest species by Reclamation staff or designated representative.

Chemical Control Methods

Chemical control includes the use of any manufactured or extracted chemical compounds that are applied to control apes species. Herbicides, insecticides and rodent poisons are all considered chemical control methods or pesticides. The approved pesticides are listed in the section entitled SPECIES SPECIFIC PEST MANAGEMENT.

Listing these products does not, in any way, constitute an endorsement by the federal government of these chemical products or entities. These are chemical the have been used or requested to us by Reclamation's managing entity(s).

Rotating pesticides with different modes of action helps prevent the development of pesticide resistance in weed species. Timing of pesticide applications to coincide with the most vulnerable period of the pest's life cycle is critical to the success of control measure.

Application methods include but are not limited to portable sprayers, spray trucks, and all-terrain vehicles (ATVs) equipped with sprayers. Aerial spraying must be approved on a case-by-case basis with the Reclamation's Grand Junction office staff. Applicators will read the chemical

label and the material safety data sheet prior to preparing and applying chemicals and carry copies of these documents during application. Applicators will use pesticides in accordance with all provisions of the chemical labels, federal, and state pesticide laws to control undesirable insects and vegetation. Calibration of spraying equipment is important to ensure correct application rates and to prevent damaging desirable vegetation and other environmental resources. Applicators should consult NRCS county soil survey maps to determine the best pesticide to use for that soil type.

All ***restricted chemicals*** will still require approval from the Bureau of Reclamation=s Denver Office on an as needed basis. Read all pesticide labels; the label will state if a chemical is restricted.

Integrated Control Methods

Integrating several management techniques often results in more effective pest control. The use of mowing or burning to prevent seed production and to stimulate new growth often improves the effectiveness of herbicide application. Monitoring and treating invasive pests as they are discovered prevents the pests from reaching outbreak levels. It is more cost effective to prevent the establishment of invasive species by treating small populations or seedlings, rather than attempting to control an established infestation.

Newly disturbed areas are prime locations for invasive species to become established. These areas should be planted to desirable vegetation as soon as possible after being disturbed. Biological control agents often take several years to effectively reduce a large population of invasive species but may have appropriate uses at certain disturbed sites. There fore, chemical and other control measures are often necessary to prevent the encroachment and spread of a pest during the time required to reestablish desirable vegetation.

VIII. Species Specific Pest Management

Vegetation Control

Aquatic Vegetation

Cattail (Typha spp.)

Growth Habitat: Perennial, monocot wetland plant that may grow to 9 feet tall.
Leaves: Flat, erect, nearly linear, grayish green to bluish green.
Stems: Erect, stout.
Flowers: Green pistillate flowers, turning brown.
Roots: Stout, Rhizomatous.
Other: Forms dense colonies that may interfere with water deliver, recreational activities or wildlife habitat.

Threshold for Treatment: The threshold for initiating control actions for this species is when cattails restrict flows in channels, chokes wetland basins to the detriment of wildlife or causes problems around recreation area.

Cultural/Mechanical Control: Mechanical methods of controlling cattails include clipping the cattails over ice using a road grader or front end loader or burning them in dry wetland basins and then inundating the roots with several feet of water the following spring.

Biological Control: None known.

Chemical Control: Herbicide application is among the most effective eradication techniques.

Rodeo, AquaMaster, Aqua Neat (glyphosate)
Habitat (imazapyr)

Curly-leaf Pondweed (Potamogeton crispus)

Growth Habit: perennial, submersed aquatic plant that forms thick mats. Can colonize deep or show water.

Leaves: Blue-green, arranged alternately, 2-3 inches long and ¼ - ½ inch wide. The edges are wavy, fine-toothed, and have a red tinged midvein.

Stems: Branching, flattened and white in color.

Flowers: Small and occur on dense terminal spikes.

Roots: Rhizomes and stolons occur.

Seeds: Produces flat seeds, but most reproduction is through plant fragments and the production of hundreds of bur-like turions.

Other: Grows during the winter dies back in mid-summer.

Threshold for Treatment: One plant.

Cultural/Mechanical Control: Hand pulling or mechanical harvest will work with small infestations if completed before turion production takes place, but make sure to remove all vegetation from the water.

Wash all equipment and boats and allow them to dry for five days before moving to a difference body of water.

Biological Control: None known.

Chemical Control: Research has shown that treating curlyleaf pondweed with diquat when the water temperature is around 60 degrees has had positive results.

Weedtrine-D (diquat)
Sonar A.S. (fluridone)
Aquathol K (dipotassium salt)

Eurasion Water-milfoil (Myriophyllum spicatum)

Growth Habit: Rooted and submersed except short flowing spike.

Leaves: Whorled, black-green, usually 4 leaves per node, each leaf is divided into narrow linear segments.

Stems: Stems thickened below flowers, double the width of the lower stem, usually curved to lie parallel with the water surface.

Flowers: Reddish and very small, whorled and in spikes.

Roots: Floating.

Seeds: Produces a large quantity of seed but reproduction is primarily asexual by fragmentation and production of stolons.

Other: Thick mats may clog water intakes, can restrict boating, and shade out and outcompete desirable native species. Often spread by boat trailers.

Threshold for Treatment: One plant.

Cultural/Mechanical Control: Hand pulling can be used to control small infestations , with care taken to remove the entire root crown and not create fragments, a diver may need to be used. After flowering the plants fragment easily.

Placing a fabric or plastic barrier on the bottom of the lake or canal for at least 3 weeks can be used to clean up small areas.

Mechanical harvesting does not work well because the plant grows back and fragments will cause the plant to spread.

Biological Control: *Euhrychiopsis lecontei* is a North American aquatic weevil that feeds on native and introduced watermilfoil. Both adult and larvae feed on the plant. The larvae feed in the stem and prevent nutrients from translocating to the roots. Up to 3 generations are produced a year, the last adult generation fly to show and overwinter in leaf litter.

Chemical Control:

2,4-D (labeled for aquatic use)
Magnacide H (acrolein) RESTRICTED
Weedtrine-D (diquat)
Hydrothol 191 (endothall) RESTRICTED
Sonar A. S. (fluridone)

Sago Pondweed (Potamogeton pedctinatus)

Growth Habit; Pernennial and aquataic.

Leaves: Up to 35 cm long an d2.5 mm wide.

Stems: Branching is dense near water surface, stem length determined by water depth and movement.

Flowers: Dull pink flower 4 mm wide on penducle from tip of leafy shoot, mid-May to mid-July.

Roots: Roots are proportionally small 2-4 cm long. Also has rhizomes that can bear 22 new shoots.

Seeds: Fruits form 3 weeks after flowering, inside the small pulpy frit is a stony walled seed. Also reproduces asexual by producing turions or from plant fragments.

Other: An important food source for waterfowl.

Threshold for Treatment: When the plant causes problems in recreation areas or restricts water distribution systems.

Cultural/Mechanical Control: Using mechanical harvesting does not work very well. Sago may need to be harvested every 2 to 8 weeks. Drying out a canal can suppress sago pondweed.

Biological Control: Triploid (sterile) grass carp *(Ctennopharyngodon idella0* has been used successfully to control sago pond weed and other aquatic vegetation. Certain precautions and conditions must be met. Approval from Reclamation is required before use.

The burying chrysomelid beetle *(Haemonia appendiculata)* causes great, but temporary, damage to sago pondweed.

Chemical Control:

Weedtrine-D (diquat)
Magnacide H (acrolein) RESTRICTED
Sonar A.S. (fluridone)
Hydrothol 191 (endothall) RESTRICTED

Herbaceous Vegetation

Canada Thistle (Cirsium arvense)

Growth Habitat: Perennial, forming dense colonies and may grow up to 5 feet tall. Optimizes divers habitat – cultivated fields, pastures, draws, rangelands, and shorelines.

Leaves: Alternate, blades simple. Lower stem blades are oblong to oblanceolate with spines, edges are serrated and ruffled.

Stems: Erect, branching above.

Flowers: Pink to purple florets.

Roots: Rhizomes fleshy, extensive, creeping. Underground parts survive with new shoots developing from lateral buds.

Other: Difficult to control and dense infestations in wetland areas and displace wildlife. It can also impede water flow in canals and ditches (Stubbendieck 2003)

Threshold for Treatment: Control actions will be initiated where Canada thistle is dominant on areas greater then 5 feet in diameter, or 20 plants per 1/10 acre.

Cultural/Mechanical Control:

- Mowing is a viable method of suppressing weeds around planted trees. Repeated mowing will help prevent seed production and dispersal. It will reduce thistle infestations, particularly of biennials. Mowing for several years reduces root vitality and inhibits spreading from lateral roots. Monitoring is needed to determine when mowing should be done. Most perennials will not be eliminated using only this method.
- Burning is not recommended as a method to control Canada thistle. Thistle populations usually increase after a spring burn.

Biological Control: The biological control agents described below have reduced thistle populations in some areas but they are slow to establish. It could take up to 10 years to build a large enough population to be an effective control method.

- Canada Thistle Stem Weevil *(Ceutorhynchus litura)* – Stem weevil larvae feed on the stem, root crown, and roots of the plant and weaken it to the point that it winter kills.
- Canada Thistle Bud Weevil *(Larinus planus)* – Bud weevil larvae feed on the seed heads, while the adults feed on the forage. This increases the stress on the plants.
- Thistle Crown Weevil *(Trichosirocalus horridus)* – Adults and the larva are most active on the rosette stage of thistles. The adults feed primarily on the underside of the leaves. While the larvae attack the rosette's grouping tip. This causes the thistle to provide multiple shoots which create a greater demand on the root system. The more seed heads produced, but they are smaller and produce fewer seeds.

- Grazing Management: Thistles and other noxious weeds often invade overused or disturbed land. Overgrazing weakens desirable plant species, making a pasture more susceptible to invasions of weed species. Pastures protected from overgrazing through proper grazing management and /or rotational grazing practices have fewer problems with thistle establishment.
- Chemical Control: Chemical application in the spring before bolting occurs or in the fall while plats are in their rosette growth form provides the most effective control of Canada thistle. If the timing for a spring application is missed, mowing can effectively prevent seed production (if completed before flowers start showing color) until a herbicide is applied in the fall. Rotation of chemicals will help prevent the development of herbicide resistance.

  2,4-D ester
  Escort (metsulfuron)
  Tordon 22K (picloram) RESTRICTED

Houndstongue (Cynoglossum officinale)

Growth Habitat: Biennial, spread by seed. Rosette is formed on ground first year, flowing stalk elongates second year. May grow up to 3 feet tall

Leaves: Alternate, surfaces rough to touch.

Basal – broad, lance-shaped. Upper – narrower, pointed, clasping stem.

Stems: Heavy, single erect and usually branching above.

Flowers: Reddish purple, 5 petals, ¼" diameter in terminal cluster.

Roots: Taproot thick and woody.

Seeds: Fruit consists of 3-4 flattened bur-like nutlets, each ¼" long with short barbed appendages.

Other: Burs attach to hair and fur or animals and are easily transported. Poisonous to livestock by affecting the liver. Contact dermatitis may occur in humans (Stubbendieck 2003).

Threshold for Treatment: Control should be implemented upon the first sighting of this noxious weed.

Cultural/Mechanical Control: Mechanical control (mowing, tillage, handpulling) is not available option due to the rhizomatous nature of t houndstongue (Larimer 2006).

Biological Control: A successful biocontrol agent has not yet been approved for release in the United States (Lym 2006).

Chemical Control: Follow the recommended application method for houndstongue on the chemical label.

2,4-D Amine
Banvel (dicamba + 2,4-D amine)
Curtail (clopyralid + 2,4-D)
Milestone (aminopyralid)
Transline (clopyralid)

Russian Knapweed (Centaurea repens)

Growth Habitat: Perennial herb, up to 3 feet tall, erect, grayish color. Reproduces from seeds and root buds.

Leaves: Alternate, simple, of several types. Upper leaves – small, narrow, unbroken edge, short stiff hairs; stem leaves – intermediate in size, slight toothed margins; basal leaves – deeply notched.

Stems: Numerous branches, each ending with a single flower, short stiff hairs.

Flowers: Pink to purple. Single, terminal.

Roots: Rhizomes spreading deep. Dark brown to black.

Seeds: Flattened, ivory colored, retained in cup-shaped seed heads.

Other: Has bitter taste. Toxic to horses. Forms dense stands and inhibits other plant growth by allelopathy (Stubbendieck 2003).

Threshold for Treatment: Control should be implemented upon the first sighting of this noxious weed.

Cultural/Mechanical Control: Mowing as a solitary control is not successful and may actually encourage expansion of the infestations (Beck 2004). Planting perennial grasses in the late fall along with an earlier chemical component has been a more successful management strategy (Beck 2004).

Biological Control: No biological control is currently available for this plant (Beck 2004)

Chemical Control: Curtail has been found to be successful in reducing Russian knapweed along with a fall planting of perennial sod-forming grasses. Glyphosate was not as successful (Beck 2004).

2,4-D ester
Curtail/Commando (clopyralid + 2,4-D)
Escort (metsulfuron)
Milestone (aminopyralid)
Plateau (imazapic)
Redeem (clopyralid + tricolpyr)
Telar (chlorsulfuron)
Tordon 22K (picloram) RESTRICTED

Yellow Toadflax (Linaria vulgaris)

Growth Habitat: Perennial, often 3 ft tall.

Leaves: Long and narrow, numerous, pale green, smooth and pointed, attached directly to the stem.

Stems: Smooth, erect, and sometimes branches.

Flowers: Snapdragon type, 1 to 1 ½ inches long with spur, bright yellow with deep orange center.

Roots: Woody, vigorous, well branched with many laterals.

Other: Spreads by seed and creeping rootstocks. Also called "Butter-and-eggs."

Threshold for Treatment: Control should be implemented upon the first sighting of this noxious weed.

Cultural/Mechanical Control: Hand pulling toadflax including the root prior to seed production eliminates seed production for that year and stresses the plant's root resources. Hand pulling often has to be done for multiple years until rood system reserves are depleted and dormant seeds have germinated and been eliminated. It may be labor intensive except on small infestations and often needs to be combined with other methods of treatment.

Mowing and tilling also helps to decrease seed production but may not be desirable for areas set aside as wildlife areas since they would impact desirable plant species and habitat. Mowing may also encourage dormant buds to grow and tilling may allow transport small root pieces that can sprout new plants in uninfested sites.

Burning is not considered viable option since it will not raise soil temperatures high enough to kill the roots. Natural competition by encouraging growth of native grass species can help deter toadflax infestation.

Biological Control:

- Stem Boring Weevil *(Mecinus janthinus)* – Larvae mine the stems with the adults feeding on the leaves and stems. The outcome is substantial damage to the plant's shoots and flowers.
- Toadflax Flower Beetle *(Brachypteroulus pulicarious)* – Larvae feed on reproductive parts of the plant and adults feed on the young tissues. These attacks cause increased branching and reduced see production.

Chemical Control: Follow the recommended application method for toadflax on the chemical label.

Banvel (dicamba)
Plateau (imazapic)
Tordon 22K (picloram) RESTRICTED

Broadleaf Weeds (Kochia, Pigweed, Dandelions, Poison Ivy, etc.)

Cultural/Mechanical Control: Mowing before seed is developed can be used to control most annuals.

Biological Control: Depending on the weed species some may be available.

Chemical Control:

2,4-D
Glyphosate
Remedy (triclopyr)
MCPA ester (2-methyl-4chlorophenoxyacetic acid)
MCPA amine (dimethylamine salt of 2-methl-4-chlorophenoxyacetic acid)

Grasses

Grasses are controlled around buildings, in parking lots, and in fields prior to being reseeded to a different species.

Cultural/Mechanical Control:

- Cultivation: Unwanted grasses in fields can be plowed to remove prior to seeding. Usually several treatments will be necessary until the seed source is exhausted.
- Burning: Some introduced and tame grasses can be controlled or decreased by burning. Usually several treatments are required.
- Fertilization: With appropriate nutrients fertilization may be added to encourage healthy grasses. Often these products are incorporated with broadleaf control products.

Biological Control: None available.

Chemical Control:

Pramitol 25E (prometon)
Roundup Ultra (glyphosate)
Embark (diethanolamine salt of mefluidide)
MCPP 4K (potassium salt of 2-(2-methyl-r-chlorophenoxy) propionic acid)
Confront (triclopyr)

Woody Vegetation

Saltcedar (Tamarix spp.)

Growth Habit: Perennial shrub or small tree, up to 20 feet tall. Often found near water sources like shores, wetlands, draws and stock ponds.

Leaves: Bluish green to grayish green. Alternate, overlapping 1 to 4 mm long with pointed tips and cedarlike.

Stems: Upright spreading, forming thicket. Bark smooth becoming ridged and furrowed with age.

Flowers: White to pink, five pedaled formed in fingerlike clusters.

Roots: Deep, extensive taproot.

Seeds: Minute seeds with tufts of hair at tip.

Other: Very aggressive, can infest large areas quickly. Saltcedar consumes a large amount of water and may change chemistry of soil to saline creating a monoculture (Stubbendieck, 2003).

Threshold for Treatment: One plant.'

Cultural/Mechanical Control: If saltcedar trees are small, they may be pulled by hand. The taproot is long and should be completely removed. Pulled plants must be picked up and disposed of by burning or burying in a pit. Cutting, burning, or removing with heavy equipment does not often provide long-term control because saltcedar resprouts vigorously (Lym 2003). Measures must be taken to perform mechanical control activities in the appropriate season and manner.

Biological Control: APHIS approved saltcedar leaf eating beetles (diorahbda elongate) are a potential biocontrol agent for saltcedar. These insects are typically 5-6 MM in length and 2-3 mm wide with females slightly larger than the males. The adults live an average of 18 days. The female averages about 30 eggs in her lifetime laying the eggs under a cluster of leaves at the base of the tree. After the eggs hatch, the larvae pupate at the base of the plant. Both the adult and larval stages feed on saltcedar with the last instar stage causing significant damage by defoliating plants (CORPS 2006).

Chemical Control: Chemical control of saltcedar may be by stump cut, basal bark treatment or foliar application. Foliar application requires that all branches and leaves of the plant are covered with herbicide.

Garlon 4 or Tahoe 4E (triclopyr)
Habitat and Arsenal (imazapyr)
Roundup or Rodeo (glyphosate)
2-4-D amine
Pathfinder (triclopyr)

Animal Control

Animals are potential vector for diseases in humans. When arbovirus or zoonotic disease is present or imminent for humans, the immediate control and reduction of the animals that carry the disease maybe necessary.

Insects (Family formicidae)

Ants may become aggressive and deliver rather painful bites. Buildings that are invaded by ants suffer damage from nests bored into wood structures.

Ants go through four live stages over a period of a month or two: eggs, larvae pupae, and then adults, which include male drones and female workers, sometimes soldiers, and one or more queens. New reproductive queens and males are produced by mature colonies, which are usually several years old. New colonies are started in one of two ways. In some species, the new reproductive swarm or leave the main next tin spring or early summer. After mating, the male dies and the queen finds a nest site and starts a new colony. The swarming period is in progress when large numbers of winged ants are visible. Alternatively, colonies bud when there are several queens and the extra queens move to new locations with some of the workers to start another nest (Washington DOE 1998).

Threshold for Treatment: Treat ant hills in developed recreation areas that are becoming a nuisance or where ants are invading structures.

Objective for Treatment: Control nuisance ants in recreation areas of high pubic use and structures.

Control/Mechanical: To exclude ants from buildings, caulk cracks and block other entrances whenever possible. Trim branches and limbs of trees and shrubs that touch the building to keep ants from gaining access to these routes. Eliminate food sources inside the building or prevent access to suitable food by keeping it in ant-proof containers. Use gravel or stones around the perimeter of the building to discourage nest building. Eliminate damp conditions that promote wood decay. Replace decaying or damaged wooed and correct problems that cause the decay, such as clogged rain gutters. Increase ventilation to damp areas beneath the building and in attics. Discourage ant colonies by storing firewood off the ground and several feet away from buildings. (Ohlendorf 2000)

Chemical Control: The chemical listed below are all granular application registered for use in public recreation areas. Use a disposable scoop for measuring or applying chemicals. Do not use kitchen utensils.

Award Fire Ant Bait (fenoxycarb)
Siege Pro Fire Ant Bait (hydramethylnon)
Amdro Pro (hydramethylnon)
AC Formula 90 (hydramethylnon)
Bonide

Mosquitoes (Family culicidae)

The life cycles of mosquitoes vary widely from species to species. Only the adult females bite. Some female mosquitoes lay single eggs on water surfaces; others lay single eggs on moist soil where later flooding is likely. Still other species lay batches of eggs, called rafts, 100 or more at a time on water surfaces. Eggs deposited on water surfaces usually hatch within a day or so, but eggs laid on soil surfaces do not hatch until flooding occurs, which may be months or even years later. Larvae, which are nearly invisible to the naked eye, hatch from eggs. Larvae molt three times to become 4th-stage larvae. Several days later, this larval form molts again to become a pupa. Adult mosquitoes emerge from the pupae 1 to 2 days after that, which male mosquitoes always emerging first. In summer the entire life cycle, from egg to adult, may be completed in a week or less. (Eldridge 1998)

Several genera may transmit diseases to humans such as encephalitis and West Nile disease. For example West Nile Virus will usually show up first in bird populations. Birds that appear to be weak, sick, unable to fly, stagger when walking or if there are unexpected bird deaths, especially among black birds, crows and ravens would be highly suspect. Birds found in this condition should be immediately reported to the state or county health department.

Threshold for Treatment: Recommended methods for determining mosquito populations that exceed thresholds include adult mosquito landing counts per minute and mosquito larvae dip counts. The Delta County Mosquito District can conduct this survey.

Objective for Treatment: To reduce mosquito populations in response to public complaints or mosquito born disease outbreak. Mosquito control measures are most effective in the larval life stage.

Mechanical/Cultural Control: In recreation areas and around structures, eliminate standing water in rain gutters, old tires, buckets, plastic covers, or any other container with mosquitoes can breed. Removal of human made mosquito habitat, where they live and breed, is beneficial in reducing the potential for adult mosquitoes.

Biological Control: Larvicides may greatly limit the number of adult mosquitoes by killing the eggs or larvae before they are hatched. This is a control option for mosquito breeding sites that are not fish bearing waters and impossible to alter or eliminate. Care must be taken to apply larvicides at the correct life stage. Generally, three or four treatments each season will be needed. Larvicides can be of two types, biologically based and chemical based insecticides.

Biologically Based: Vectolex CG

Introduction of bat boxes may encourage natural predators to help reduce number of mosquitoes.

Chemical Control: Chemical based larvicides, like K-Othrine, are considered more effective than adulticides for controlling mosquito populations at the earlier life stage. Mosquito adulticides provides temporary control of adult mosquitoes in recreation areas and facilities using a fogging machine or ultra-low volume (ULV) sprays.

Chemical Larvicides
Altrosid Briquets (s-methoprene)

Chemical Adulticides
Fyfanon (malathion)
Pyrethrins (prentox pyronyl oil Or-3610A)

Prior to applying any pesticide for mosquito control, with the exception of larvacide, a Pesticide Use Proposal (PUP) form must be completed and submitted to the Reclamation office in Grand Junction for approval. These applications will be evaluated on an annual basis. Please submit PUPs prior to March 1st to allow time to process and evaluate request. Allow 30 days for processing. Approval from Reclamation is required before use.

Rodents

The handbook "Prevention and Control of Wildlife Damage" is an excellent resource for rodent management. Many steps may be taken to manage rodent populations to decrease the possibility of rodent damage and influenced diseases.

The first step in successful control is good housekeeping and sanitation practices. Efforts must always include both the outside and inside of affected structures. Overgrown landscape plantings and other dense vegetation adjacent to structures provide rodents with food and cover, and therefore should be managed. Improper storage or cluttered areas create ideal rodent harborages. Water and food sources reduction is a very important element of rodent control program. Do not allow any standing water around the facility and repair any leaking or dripping water piping immediately. Pack all foods in rodent proof containers.

The second step is to rodent proofing a facility. Eliminate every possible access to the structure. All openings greater than ¼ inch should be sealed off. All utility penetrations should be sealed using steel wool packing secured into place. Mice can chew through caulking.

The third step is to assign surveillance responsibility and schedule for inspections.

The fourth step is to use control measures such as trapping and proper placement of rodenticides. When using baits, only tamper-resistant bait boxes should be used.

Beaver (Castor canadensis)

Beaver, in reservoir areas, often live in bank dens due to fluctuating water levels. Beavers are the largest rodent in North America. They have webbed feet, a broad, scaly flat tail and may grow to 46 inches in length. (Jones et al. 1985) If located near a tree planning or recreational area, beavers can do considerable damage by cutting down desirable trees. Beavers prefer aspen, willow, cottonwood and pine.

Threshold for Treatment: When there is damage to desirable trees and shrubs in and round public areas or potential to impact Reclamation facilities or operations, treatment should begin immediately.

Objectives for Control: Protect woodlands and planted trees near public areas from damage. Remove beaver and dams that are blocking water control structures and causing damage to road and facilities.

Management Alternatives: Physical removal of beavers by shooting and/or trapping will achieve management objectives. Use trap sets where the trap is placed completely underwater to avoid trapping pets. Cultural control methods, such as wrapping the base of trees with a barrier such as chain link fencing cloth, may deter beaver from harming desirable trees. There are no pesticides registered to control beavers.

Ground Squirrels (Spermophilus spp.)

Ground squirrels build extensive underground burrows. They primarily feed on seeds, grasses, forbs and roots and may also eat insects, carrion, eggs, etc. when available. The females may have one litter of two to ten young per year. They may be hosts for bubonic plague.

Threshold for Treatment: Ground squirrels that impact Reclamation facilities or have potential to expose the public to active plague.

Objectives for Treatment: To reduce impact on Reclamation facilities and any potential risk to human health and safety.

Mechanical/Cultural Control: Shooting of ground squirrels is often considered impractical and not cost effective when used as a single control method.

Biological Control: Introduction of raptor next boxes and perches may encourage natural predators to help reduce the colonies growth but it is not a reliable damage control method.

Chemical Control:

Zinc Phosphide Grain Bait

Mice

Mice, including house mice (Mus musculus) and deer mice (Peromyscus spp.), may be present in recreation and maintenance facilities. Control options are similar for both. Hantavirus is carried by the deer mouse, but the deer mouse itself is not attached by Hantavirus. The deer mouse might appear healthy, but be harboring active Hantavirus. Therefore, all signs of deer mouse activity inside building should be treated as infected by the Hantavirus.

Hantavirus Pulmonary Syndrome (HPS) is a zoonotic disease in humans that is caused by Hantavirus and vectored by the deer mouse. Inhalation of infected aerosolized mouse feces, urine, and other mouse waste or contaminated dust is the primary route of human infections.

Threshold for Treatment: Any evidence of mice inhabiting buildings.

Objectives for Treatment: The objective is to control mice inside buildings, to prevent rodent damage and to protect the public and employees form rodent carried diseases such as Hantavirus.

Management Alternatives: When cleaning up areas that have or had rodent activity use the following worker protection practices and personal protective equipment (PPE). PPE includes rubber boots, rubber gloves, disposable coveralls, respirator with a N-100 filter or better, safety glasses/goggles, face shield and an air monitor. (CCD 2004) Spray dead rodents with disinfectant (chlorine solution (1 ½ cups of household bleach in 1 gallon of water) (CCD 2004), then double-bag along with all cleaning materials and bury or burn. Chlorine solution may also be used to the soak the nesting materials.

Mechanical Control: Snap traps, sticky traps or multiple catch traps will be used to kill mice. Check traps periodically to remove dead mice, re-bait and/or reset traps.

Biological Control: A resident cat may help to control mice.

Chemical Control: There are many formulations of poison bait registered to control mice.

Mollusks

Zebra Mussel (Dressina polymorpha)
Quagga Mussel (Dressina polymorpha)

There have been reports of zebra mussel found at the Pueblo Reservoir in Pueblo Colorado. Therefore, all cautions need to be taken to prevent their spreading to other Colorado reservoirs.

For more information regarding these invasive species and control methods, contact the Colorado Division of Wildlife.

Threshold for Treatment: Any sign of zebra or quagga mussel infestation.

Objectives for Treatment: The objective for treatments is to reduce impacting Reclamation's ability to deliver water and also to protect the existing aquatic habitat.

Mechanical/Cultural Control: Preventing introduction of invasive mussels into Reclamation reservoirs and irrigation facilities is the best approach for this invasive species. Educating the public is a proactive method and may be done by posting information at park kiosks or at boar ramps to encourage the public on practices to prevent introduction of invasive mussels.

Biological Control; None available at this time.

Chemical Control: There are many chemical control treatments for zebra mussel control. Some of the methods include: ozone, chlorination methods and potassium ions. Use of these methods will be coordinated with Reclamation.

Note: See attached talking points as of July 2009.

IX. Terms

This IPM Plan (Plan) will be reviewed and revised, as necessary, at the end of the five-year period beginning at the date it was executed. However, if a new invasive species appears on the Paonia Project lands or an additional pesticide is required, an addendum may be added to this Plan. For a new pesticide, you would submit a PUP then, after it is approved, it will be added to this Plan.

Attachment I

List of Noxious (Invasive) Species

Species	Entity
Identified on the Project lands	
Canada Thistle	C, S, F
Houndstongue	C, S, F
Russian Knapweed	C, S, F
Yellow Toadflax	C, S, F

The following refers to which entity list the species is on for priority control: C=Delta & Gunnison Counties, G=Gunnison County, S=State of Colorado, F=Federal (Reclamation/BLM)

Note: This list is not inclusive.

Additional References:

- **Mr. Webb Callicutt is the Delta County Weed Coordinator. Work with Mr. Callicutt for advice and to coordinate with adjacent landowners to control invasive species on their property. He may be reached at (970) 872-3794.**
- **Rick Yegge is the Gunnison County Weed Coordinator. Work with Mr. Yegge for advice and to coordinate with adjacent landowners to control invasive species on their property. He may be reached at (970) 641-4393.**
- **Colorado State Parks and Recreation Weed Management Plan for Paonia State Park.**
- **Biological Pest Control, Palisade Colorado 970 464-7916**
- **Delta County Mosquito District 970 874-4325**
- **Center for Disease Control** www.cdc.gov/
- **Colorado Division of Wildlife**
  Elizabeth Brown, Invasive Species Coordinator, 303-291-7362.
- **Websites:**
  www.coopext.colostate.edu/TRA/weedhp.html
  www.cdms.net/manuf/manuf.asp
  www.plants.usda.gov
  www.tamariskcoalition.org

REFERENCES SITED

Beck, K. G. 2004. *Biology and Management of the Toadflaxes* – no 3.114. Colorado State University Extension

Center for Disease Control (CDC). 2004 All *About Hantaviruses*

Eldridge, B. 1998 *Howe to Manage Pest: Mosquitoes – Publication 7451*. University of California Statewide IPM Program.

Jones Jr., J. K., D. M. Armstrong, and J. R. Choate. 1985 *Guide to Mammals of the Plains States.* University Nebraska Press

Lym, R. G. 2006. *Houndstongue (Cynoglossum officinale) – Identification and Control. NDSU Department of Plant and Sciences.*

Lym, R. G. 2003. *Saltcedar (Tamarix spp.) – Identification and Control. NDSU Department of Plant and Sciences.*

Ohlendorf, B. Editor. 2000. *Pest Notes: Carpenter Ants – Publication 7416.* Universidty of California Statewide IPM Program.

Stubbendieck, J. L., M. J. Coffin, L. M. Landholdt. 2003. *Weeds of the Great Plains.* Nebraska Department of Agriculture. Lincoln, Nebraska