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SECTION ONE

The intent of this document is to describe an integrated pest management (IPM) program for the Bureau of Reclamation's (Reclamation) Bonny Reservoir facility. Noxious weeds and various pest insect species are posing a problem around the reservoir's shoreline. A description for pest control and where appropriate eradication of these species.

Weed control programs are mandated by 609 Departmental Manual I - June 26, 1995. Under this mandate, it is the Department of the Interior (DOI) policy to control undesirable plants on the lands, waters, or facilities under its jurisdiction, to the extent economically practicable and as needed for resource/environmental protection and enhancement, as well as the accomplishment of resource management objectives and the protection of human health. *See Appendix A & B for "The revised Colorado Noxious Weed Act August 6, 2003" and "Colorado State revised Executive Order from the Governor of Colorado on noxious weeds on state ground Executive Order D 006 99" and Appendix C for Federal Pertinent Laws and Regulations.*

Background

Bonny Dam and Reservoir is located in the southeast corner of Yuma County, Colorado, on the south fork of the Republican River. The dam and reservoir are approximately 2 miles west of the town of Hale, 9 river miles upstream from the Colorado-Kansas state Line and 22 miles north of Burlington, Colorado. The Bonny Reservoir area is a Colorado State Park.

The dam and reservoir are owned and operated by Reclamation as part of the Armel Unit. The Armel Unit, formerly called the Saint Francis Unit, is part of Reclamation's Pick-Sloan Missouri Basin Program. The principal feature of the Armel Unit is Bonny Dam and Reservoir, which serves as an important flood control feature and provides recreation and fish and wildlife conservation and enhancement benefits. Originally, irrigation was to have been a part of the multiple-purpose benefits included in the unit plan; however, investigations have shown that an economically feasible plan for Federal

development could not be formulated within the 24,000 acre upland area considered for irrigation.



Figure 1. Bonny Dam and Reservoir

The primary purpose of Bonny Dam is to protect the lower South Fork of the Republican River Valley from recurring floods originating upstream of Hale, Colorado. The estimated frequency and magnitude of floods occurring upstream of Bonny Dam, which can be wholly or partially controlled, make this dam and reservoir one of the most important flood-control features in the Republican River Basin upstream of the U.S. Army Corps of Engineers' Harlan County Dam. The unit also provides regulation of the existing water supply to Hale Ditch, which serves 750 acres, 400 of which are owned by the State of Colorado. The reservoir and surrounding lands provide excellent recreation opportunities and fish and wildlife conservation.

Yuma County, located in the High Plains section of the Great Plains Physiographic Province of Colorado, is an eastward sloping, gently rolling plain. The land is drained primarily by the north and south forks of the Republican River and by the Arikaree River. Pierre Shale runs 90 to 150 feet below the surface inside the state park. Over time, Ogallala Formation silt, sand, gravel, caliches and clay beds were deposited over the shale by the river. The Ogallala Formation is capped by either loess or sand deposits. Pleistocene loess deposits, known as the Sanborn Formation, may range from a few inches to 85 feet thick, supporting prairie grasslands dominated by little bluestem (*A. scoparius*). Upland dune sands are deposited over the Sanborn Formation, the sand particles grading

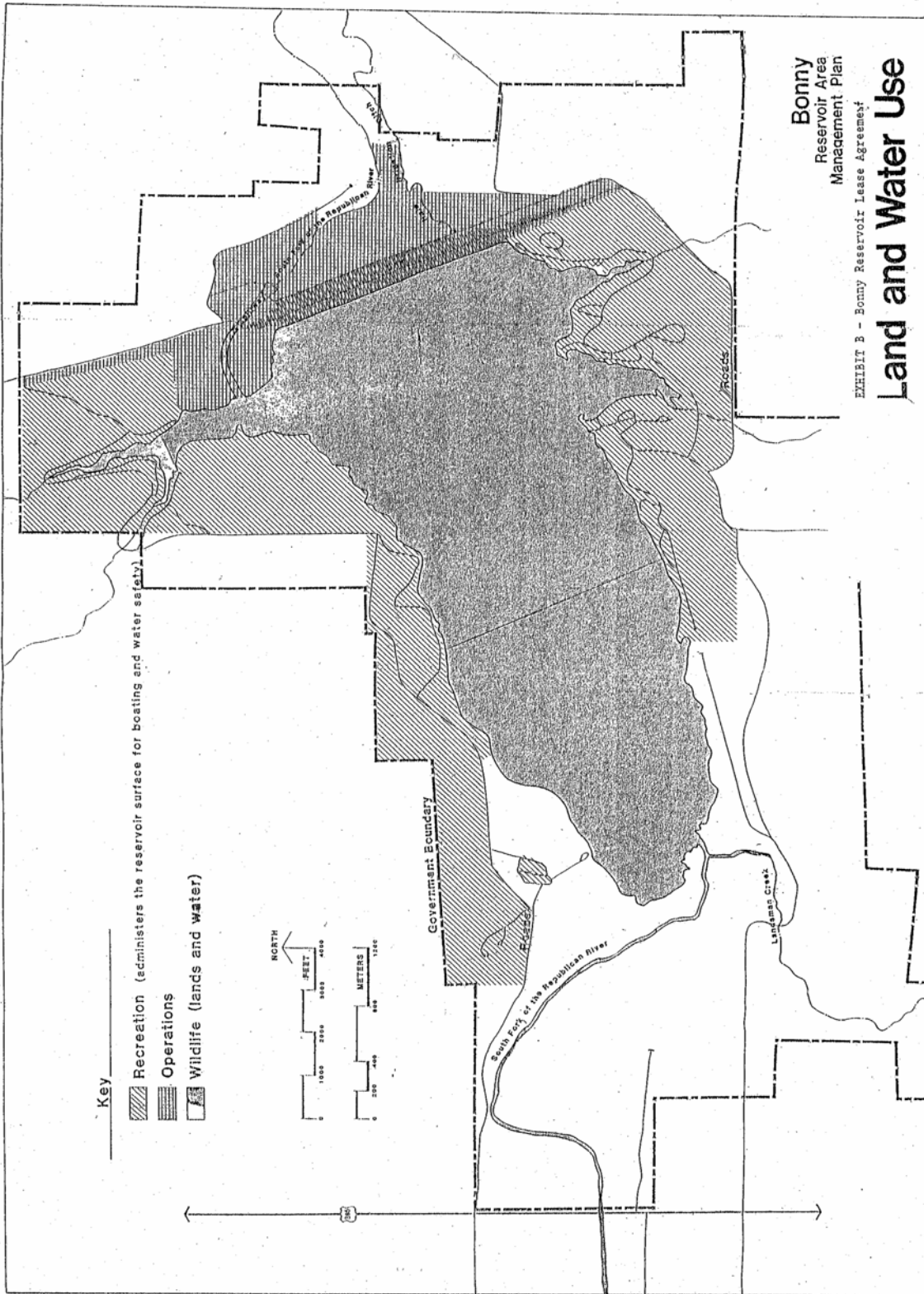
into the underlying loess deposits. Dune sands form a series of low hills and terraces up to 200 feet high that support sand sagebrush-dominated communities (DPOR, Wetland resources of Bonny State Park, 1995).

Land Management

Reclamation owns 5,187 acres at Bonny Reservoir, Arnel Unit, Pick-Sloan Missouri Basin Program. The Eastern Colorado Area Office (ECAO) is responsible for resource management at Bonny Reservoir. This responsibility includes controlling noxious weeds, invertebrate pests, and other nuisance species causing property damage or posing a risk to public health or safety. The ECAO has entered into a Memorandum of Understanding with the Colorado Department of Natural Resources (Division of Wildlife and State Parks) for the recreation and wildlife management at Bonny Reservoir, as follows:

- Division of Wildlife: (3,452 acres) Wildlife Management Lands.
- Colorado State Parks: (1,300 acres) Bonny Reservoir State Park, developed recreation areas, maintenance and storage facilities including: parking area, roadways, campsites, pathways, picnic areas, fishing access areas, boat launching areas, and swim area.
- Reclamation Lands: (435 acres) Operations lands managed by Reclamation's Nebraska-Kansas Area Office for operations and maintenance functions associated with the Bonny Dam and associated outlet works facilities.

Figure 2. Management of lands at Bonny Reservoir



SECTION TWO

Section II will define the goals and objectives along with the current and proposed methods being used for control

Goal /Objectives

- 1. Control noxious weeds and prevent their establishment and spread on public and adjacent private lands.**
 - A. Initiate appropriate control measures on all identified high priority occurrences of noxious weed to contain and control them from spreading.
 - B. Monitoring of high priority weed by utilizing Geographic Position System (GPS) (if available), photographs and maps to determine if planned objectives such as eradication, control and containment measures are working.
 - C. Continue with park wide inspections to find new weed infestations. Eradicate any new noxious weed infestations in a timely manner before they get out of control.
- 2. Maintain compliance with the State and County Noxious weed laws and regulations.**
 - A. Use the IPM plan for Bonny Lake to identify all appropriate management control methods for noxious weeds.
 - B. To have Bonny Reservoir in compliance with Yuma County noxious weed resolution #3-17—89A and Colorado Noxious Weed Act CRS-35-5.5-110 through 111.
- 3. Eliminate competition of undesirable plants with native and/or planted vegetation.**
 - A. Initiate re-vegetation following chemical or mechanical control methods with competitive native weed free grass mixtures.
 - B. Initiate (if needed) chemical application to trees, shrubs, and irrigated grasses to control insect infestation and limit fungus growth.
- 4. Control vertebrate and invertebrate pests as necessary to protect the public's health and safety and to prevent or control damage to public and private property.**
 - A. Chemical control and/or mechanical removal of insects and their nests/burrows and breeding areas as needed.
 - B. Chemical control and/or mechanical removal of rodents and other vertebrates and their nests/burrows as needed.
 - C. Active enforcement of laws and regulations in prohibiting dogs and other pets within the boundaries of the designated swimming areas. Scaring and hazing of waterfowl as necessary to maintain water quality in swimming areas. Prohibiting horses from designated campgrounds and swim areas.
 - D. Administrative Directive No. B-303. An annual plan, which addresses mosquito management, will be developed. All plans will emphasize preventative measures and

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educational awareness of visitors and employed. These plans are due by the end of the first quarter of each calendar year.

Control Methods

The following information pertains to current IPM plan control strategies conducted around Bonny Reservoir. These control strategies used have been for a number of years. Also under the control, methods are proposed control strategies. Various control methods including biocontrol, chemical, cultural, and mechanical described in this section. (See Appendix E, Definition). No restricted use pesticides are used currently at Bonny Reservoir. Non-restricted pesticides used at Bonny Reservoir can be found in Appendix F.

Impact of various pesticides

When pesticides are used at the various sites around Bonny Reservoir the following information should be considered. Incomplete spraying may leave viable leaves and stems. Some off site pesticide movement could be expected which could potentially influence non-target plants depending on what pesticides are use. A buffer zone should be established for sensitive areas, non-target plants and water. Depending on the pesticide use there would be a waiting period for these pesticide to translocate to affect the entire plant. With imazapyr a waiting period could be between 18-24 month, triclopyr and 2,4-D approximately 8 months and glyphosate, approximately 6-8 months. Imazapyr and glyphosate are systemic non-selective pesticides so application needs to be applied carefully to targeted plants to avoid impact to non-targeted plants including grasses, broadleaf plants and desirable vegetation. Triclopyr and 2,4-D amine is systemic selective pesticides, which will affect broadleaf and woody species but generally do not kill grass species. Generally, trees are left to decompose and provide habitat and cover.

Division of Wildlife Sites

A. Management Sites: Riparian areas, along the Republican River below Bonny Reservoir, riparian areas of various manmade ponds/creek including Hoppers Ponds, Landsman Creek and upper portion of Hale Ditch. These areas may have a very high water table that is less than 6 feet below the surface during normal precipitation years along riparian areas and within 10-25 feet in the upland areas.

Pest Category- Annual weeds, noxious perennial/biennial broadleaf weeds and woody vegetation.

Target Species- Canada thistle, musk thistle, saltcedar and bindweed make up the majority of the perennial/biennial species found along riparian sites. Canada thistle is the most widely distributed species on the area and due to it insidious nature and ability to spread, it is the most difficult to control and most likely to spread.

Reasons to Control Weeds

To control noxious weeds and woody vegetation on these lands which:

1. Reduce the aesthetic value
2. Lower wildlife and recreational value
3. Reduce native vegetation
4. Increase risk for fire
5. May pose a danger and liability problem to day users
6. Increase soil degradation and reduce wildlife habitat
7. Weeds may have a negative impact to the visitor's recreational experience.

Management Goals - To control, contain or eradicate (as feasible) the above named weeds and monitor for the presence of other invasive species. These methods are intended to reduce seed production of Canada thistle by 30 percent, musk thistle seed production by 80 percent, and to

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stop the spread of bindweed and reduce ground cover for all species by 30 percent by the end of a specified five-year period. A goal is to reduce saltcedar populations around the reservoir by 80 percent and institute a maintenance program to include biological and chemical control to reduce the production of seed by 80 percent and limit the spread of occurring plants until total control around the reservoir can be accomplished

Management Alternatives - Management goals will be accomplished through integrated control strategies including chemical, biological, mechanical and cultural means, which may be used singly, or in combination.

Control Methods

Mechanical Controls

1) Limited mechanical control like mowing is used where necessary and compatible with wildlife management objectives. What mowing is done has been primarily in the open grass areas that are infested with thistle, primarily west of Foster Grove to the highway, and some in the Landsman Creek Area. This has not been so much for seed reduction, but to reduce cover and allow an even spraying application with better coverage after a regrowth period.

2) Mowing activities are done prior to development of seed heads on musk thistle and Canada thistle.

Cultural Controls

1) Planting of tall, cool season grasses like tall, pubescent wheatgrass or brome and legumes like alfalfa, Canada wildrye and green needlegrass to compete with weeds.

2) At this time it appears that a regime of high intensity, short duration grazing, followed by treatment with a Telar/2,4-D tank mixture application seems to have the greatest promise for thistle control where ever it is practical to implement.

Biological Controls

Biological controls will be most appropriate in isolated areas where other control methods are not possible or practical. In areas where biological controls are used, signs will be used to describe control agents and explain purpose. Biocontrol agents have been distributed all over the area on a yearly basis until 2003 at which time the drought in the area seems to have affected insect performance.

1) Since 1993, biocontrol agents have been released for musk thistle control including *Rhinocyllus conicus* and *Trichosirocalus horridus* while *Urophora cardui*, was released for Canada thistle control. These insects are mining the heads and decreasing seed significantly. Literature indicates that biological control is compatible with pesticide application if the life cycle of the plant is not changed to where it is not consistent with the life cycle of the weevil.

2) DOW is in the fifth year of a grazing plan involving short duration high intensity cattle grazing, used primarily to reduce cover in the areas infested with Canada and musk thistle, so that better pesticide coverage can be achieved. It has also been noted that the cows used have done a very effective job in eating both Canada and musk thistle as long as the plants have not matured, creating a definite reduction in seed production. Short term high density grazing is used to directly influence plants. Generally, cattle (up to 100) are introduced into an area with electrical fence and left for approximately 2 to 3 weeks. In one case, an area was grazed 2 of the last 3 years with good results. Due to drought conditions, grazing was suspended in 2003 after an abbreviated season in 2002. Weed conditions appear to have returned to pre-grazing conditions with spring precipitation in 2003 with increased visibility of Canada and musk thistle.

Chemical Controls

From 1996 to 2003 noxious weed treatments consisted of pesticides, using various brands of 2,4-D, picloram, glyphosate, Telar, and Curtail. Due to the recent drought in this area, riparian areas have been drying up, which allows application of these chemicals closer to the initial water line. For 2003 and 2004, DOW has applied a pesticide mixture of Telar at 1 ounce/acre plus 2,4-D (Amine 4) at 1 qt/acre. The time of application on Canada thistle and musk thistle has been at spring (May, June) spraying as soon as possible before full bloom. This has been extended in the areas where we are using a high intensity grazing rotation, as we are able to spray the plants after a regrowth period following the removal of the cattle. The DOW will apply fall applications as conditions permit, preferably after a light freeze. The DOW will not spray the same areas more than once a year due to the amount of acres they are trying to control.

1) Pesticide treatments around aquatic and riparian sites will be attempted in the spring and in the fall as conditions permit. The purpose of chemical spraying in the spring is to prevent seed production. It is felt that some weeds are resistant to Curtail. Based on past performance, amount of use, and probability of resistance by Canada thistle to Curtail, DOW is not planning to use Curtail again. The DOW main pesticide is Telar (chlorsulfuron) and they tentatively plan to rotate use with Overdrive (Diflufenzopyr) in the future to eliminate resistance. More recent a tank mixture of 2,4-D (amine)/Telar has been used to control musk thistle and Canada thistle.

2) A glyphosate formulation may be appropriate in areas of high-density thistle infestation followed by reseeding of desirable species.

3) As new chemicals become available for use, select suitable test sites for evaluation. Use signing to indicate and explain control methods. Potential, use of Garlon 4 and Arsenal for the control of saltcedar in riparian areas may be feasible.

B. Management Sites: Cultivated/uncultivated hayfields, alfalfa field, agricultural field, rangelands, grasslands.

Pest Category- Annual weeds, noxious perennial/biennial broadleaf weeds, and woody vegetation.

Target Species- Canada thistle, Musk thistle, saltcedar, and bindweed make up the majority of the perennial/biennial species. The priorities set down for control of noxious weeds are as follows: Canada thistle, saltcedar, musk thistle then bindweed. Canada thistle is the most widely distributed species on the area and due to its insidious nature and ability to spread, it is the most difficult to control and most likely to spread.

Reasons to Control Weeds

To control noxious weeds and woody vegetation on these lands which:

1. Reduce the aesthetic value
2. Lower wildlife and recreational value
3. Reduce native vegetation
4. Increase risk for fire
5. May pose a danger and liability problem to day users
6. Increase soil degradation and reduce wildlife habitat
7. Weeds may have a negative impact to the visitor's recreational experience.

Management Goals - To control, contain or eradicate (as feasible) the above named high priority weeds and monitor for the presence of other species not yet occurring. These methods are intended to reduce seed production of Canada thistle by 30 percent, musk thistle seed production

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by 80 percent and to stop the spread of bindweed and reduce ground cover for all species by 30 percent by the end of a specified 5-year period. A goal is to reduce saltcedar populations around the reservoir by 80 percent in two years and institute a maintenance program to include biological and chemical control to reduce the production of seed by 80 percent and limit the spread of occurring plants until total control around the reservoir can be accomplished

Management Alternatives - Management goals will be accomplished through integrated control strategies including chemical, biological, mechanical and cultural means, which may be used singly, or in combination.

Control Methods

Mechanical Controls

- 1) Limited mechanical control like mowing is used where necessary and compatible with wildlife management objectives.
- 2) To limit seed production and decrease plant density.
- 3) Mowing activities are done prior to development of seed heads on musk thistle and Canada thistle.

Cultural Controls

- 1) In cultivated fields use alfalfa where appropriate to compete with thistle.

Biological Controls

Biological control will be most appropriate in isolated areas where other control methods are not possible or practical. In areas where biological controls are used, signs will be used to describe control agents and explain purpose.

- 1) Currently, musk thistle and Canada thistle are infested by *Rhinocyllus conicus*, *Trichosirocalus horridus* and *Urophora cardui*. These insects are mining the heads and decreasing seed significantly. Literature indicates that biological control is compatible with pesticide application if the life cycle of the plant is not changed to where it is not consistent with the life cycle of the weevil.
- 2) Use additional biological controls as they become available and evaluate their effectiveness.

Chemical Controls

From 1996 to 2003, noxious weed treatments consisted of pesticides, using various brands of 2,4-D, picloram, glyphosate, Telar and Curtail. Due to the recent drought in this area riparian areas have been drying up which allows closer application of these chemicals to the normal water line.

- 1). The purpose of chemical spraying in the spring is to prevent seed production. For a number of years Curtail was initially used to control musk thistle and Canada thistle; however, it was believed that continual use of Curtail was leading to pesticide tolerance. Most recently, a tank mixture of 2,4-D (amine)/Telar has been used to control musk thistle and Canada thistle.
- 2) A glyphosate formulation may be appropriate in areas of high-density thistle infestation followed by reseeding of desirable species.

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- 3) As new chemicals become available for use, select suitable test sites for evaluation. Use signing to indicate and explain control methods.
- 4) In cultivated fields use approved pesticides (for spot spraying) around field borders to decrease seed production and decrease plant density.

C. Management Sites: Area below the high water mark at Bonny Reservoir

Pest Category- Noxious perennial/biennial broadleaf weeds and woody vegetation.

Target Species- Canada thistle, Musk thistle bindweed, Russian olive, saltcedar and bindweed make up the majority of the perennial/biennial species found below the high water mark due to drought conditions.

Reasons to Control Weeds - Some targeted plants species and other troublesome species are found around the perimeter of Bonny Reservoir below the high water mark at this current time. Woody vegetation like saltcedar can consume large quantities of water and have the potential to choke out native vegetation. Currently, cottonwood and saltcedar are intermixed in thick dog hair stands especially on the north shoreline of the reservoir. These thick stands of vegetation can reduce access for fish and other recreational activities. In addition, Russian olive has the potential to impact recreational use areas and native vegetation around the reservoir. Noxious weeds like Canada thistle cover large portion of area below the high water mark. Weeds may have a negative impact to the visitor's recreational experience.

Management Goals - These methods are intended to reduce seed production of Canada thistle by 30 percent, musk thistle seed production by 80 percent and to stop the spread of bindweed and reduce ground cover for all species by 30 percent by the end of a five-year period. A goal is to reduce saltcedar populations around the reservoir by 80 percent in two years and institute a maintenance program to include biological and chemical control to reduce the production of seed by 80 percent and limit the spread of occurring plants until total control around the reservoir can be accomplished

Management Alternatives - Management goals will be accomplished through integrated control strategies including chemical, biological, mechanical and cultural means, which may be used singly, or in combination.

Control Methods

Mechanical Controls

- 1) Wherever possible, park maintenance mows patches of Canada and musk thistle, between chemical treatments, each 21 to 28 days in order to apply additional stress to the plants and prevent them from producing seed.
- 2) Mowing limits seed production and decreases plant vigor.
- 3) Mowing activities are done prior to development of seed heads on musk thistle and Canada thistle.
- 4) Potentially, mowing is an option to use on the south side of Bonny Reservoir mowing and could be used to periodically reduce saltcedar stands of 50 percent coverage or stem diameters of 2 inches or less. However, frequent mowing would potentially cause saltcedar densities to become thicker due to lateral stem development since the apical tips are continually being cut.
- 5) Mowing the woody vegetation on the north side (below the high water mark) of Bonny Reservoir, could be labor intensive and costly. This mixed stand of vegetation is approximately

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12- 16 feet tall and stem diameters in this mixture could range from two to four inches in diameter or more. A larger heavy-duty mower, or dozer could be used to remove saltcedar densities of 50 to 100 percent. Once trees are removed, periodic control of resprouts would be necessary. This type of activity would be disturbing the soils in the area possibly allowing annual weeds and invasive species such as Canada thistle to establish.

6) Cut-stump/chemical control - This method in conjunction with pesticide spraying could be beneficial in controlling saltcedar (90 percent efficacy or better). This is a labor-intensive method for removal of saltcedar. Approximately, 1 acre of 50 percent saltcedar with stem diameters of 2-3 inches could be cut and treated with three teams of three individuals/ team each day. There are three different types of E.P.A approved pesticides potentially, that could be use for treating the cut-stumps including 2,4-D amine, Imazapyr, triclopyr and glyphosate. To effectively treat saltcedar (90 percent efficacy) stumps pesticides have to be applied within 5 minutes of being cut. Efficacy will significantly drop off if pesticides are applied later than five minutes. Some retreatment will be necessary 4 to 6 weeks later with this methods and semi-annual inspections necessary to determine if saltcedar is reestablishing.

7) Girdling of Russian olive trees is a potential labor-intensive control method on trees up to 12 inches in diameter. Requires that the entire circumferences be girdled to expose the water transport system of the tree.

Chemical Controls Methods

1) Ground Rig Application - Foliar methods following appropriate pesticide label requirement are generally very effective in controlling saltcedar. This method allows the applicator(s) to broadcast the pesticide mixture to cover foliage. The applicator must be very deliberate in making sure that every branch is sprayed, which can increase labor, equipment, and pesticide cost. A branch missed during spraying, will likely remain viable. The main objective of this method is for the applicator to spray every branch to wet, but not to dripping or pooling. It is advantageous to add a dye indicator to the spraying solution to aid the applicator in spraying the total plant. This method works very well, but is limited in its use, especially if trees are larger than 20 feet tall and if densities will not allow the applicator to reach the entire canopy. This method works very well along right-of-ways (photo 7) and in areas where vehicle access is possible or where densities and terrain allow passage of ground application equipment.

One disadvantage of this methods is that pesticide sprays can influence non-targeted plants (especially grasses) if sprayed from long distances, so the applicator must spray as close to the plants as possible while walking to cover the entire canopy.

2) Aerial Application (Canopy or Monoculture Application) - Aerial broadcast method (fixed-wing or helicopter) will be useful for covering remotely managed areas, small scattered or isolated areas where noxious weeds such as Canada thistle and saltcedar form a major percentage of established plants on the north and west side of Bonny Reservoir. Vegetation condition, topography, and accessibility are less constraining for aerial methods than other methods. Drift control adjuvant will be used to reduce any impact to non-targeted plants. Pesticides are applied to target vegetation using specially designed spray nozzles and booms. The special design of these booms minimizes air turbulence near the nozzle orifices, maintains a uniformly large droplet size, and minimizes the production of aerosols. In addition, buffer zones will be established to reduce any impact to non-target plants, sensitive areas and water.

D. Management Sites: Buildings, Facilities

Pest Category- Mice, rodents

Target Species- *Microtus* spp and *Peromyscus* spp

Reasons to Control Animal Pest - The DOW is not concerned with pests around the facilities with the exception of mice. Mice may pose a potential health hazard to the public as a vector for Hanti Virus.

Control Methods

Mechanical Control

1) Mechanical mousetraps are used

Chemical Control

Commercially available household bait (active ingredient Chlorophacinene and Indandione) is used in buildings.

E. Management Sites: Buildings, Facilities

Pest Category-Weeds around buildings, facilities

Target Species- Annuals weeds, perennial weed, broadleaf weeds and others

Reasons to Control Weeds - Weeds like puncture vine can cause injuries to visitors; weeds have the potential to provide habitat for animal pest like mice, which potentially could be a vector for Hanta virus.

Control Methods

Chemical Control

1) Currently, pesticides used by the DOW include Telar, 2,4-D(Amine 4) and Roundup for weed control around facilities. SALVO 2,4-D, SABRE 2,4-D (any of the amine 2,4-D's) are also suitable.

2) Garlon 4 and Curtail have both been used in the past but their future use may be limited due to newly developed pesticides.

Colorado State Parks Sites

A. **Management Sites:** Recreational areas including building facilities, trails, campgrounds, swim beach, two ski beaches, three boat ramps, and five major access fishing walk-in areas

Pest Category- Annual weeds, noxious perennial/biennial broadleaf weeds and woody vegetation.

Target Species - Canada thistle, Musk thistle, saltcedar and bindweed make up the majority of the perennial/biennial species found in these recreational riparian sites. In addition, puncture vine and sand bur are found in these areas.

Reasons to Control Weeds - Some targeted plants species and other troublesome species are found around the perimeter of Bonny Reservoir at the current time. The spines on the fruit of puncturevine and sandbur may cause mechanical injuries to animals who feed on hay containing the fruit. A photosensitizing agent in the plant of puncturevine causes poisoning in sheep when they eat flowering plants. The spiny fruits of puncturevine and sandbur are a problem in the areas in which they grown. In parking lots and campgrounds, these cause injury and punctures in some rubber tires and vinyl items. Weeds may have a negative impact to the visitor recreational experience.

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Management Goals - To control, contain or eradicate (as feasible) the above named high priority weeds and monitor for the presence of other invasive species. These methods are intended to reduce seed production of Canada thistle by 30 percent, musk thistle seed production by 80 percent and to stop the spread of bindweed and reduce ground cover for all species by 30 percent by the end of a five-year period. A goal is to reduce saltcedar populations around the reservoir by 80 percent in two years and institute a maintenance program to include biological and chemical control to reduce the production of seed by 80 percent and limit the spread of occurring plants until total control around the reservoir can be accomplished

Management Alternatives - Management goals will be accomplished through integrated control strategies including chemical, biological, mechanical and cultural means, which may be used singly, or in combination .

Control Methods

Mechanical Controls

- 1) Wherever possible, park maintenance mows patches of Canada and musk thistle, between chemical treatments, each 21 to 28 days in order to apply additional stress to the plants and prevent them from producing seed.
- 2) Mowing limits seed production and decreases plant vigor.
- 3) Mowing activities are done prior to development of seed heads on musk thistle and Canada thistle.

Cultural Controls

- 1) In cultivated fields use alfalfa where appropriate to compete with thistle.

Biological Controls

Biological control will be most appropriate in isolated areas where other control methods are not possible or practical. In areas where biological controls are used, signs will be used to describe control agents and explain purpose.

- 1) Currently, musk thistle sites are infested by *Rhinocyllus conicus*. These insects are mining the heads and decreasing infestations. Literature indicates that biological control is compatible with pesticide application if the life cycle of the plant is not changed to where it is not consistent with the life cycle of the weevil.
- 2) Use biological controls as they become available and evaluate their effectiveness.

Chemical Controls

In 1996, the park began contracting with Yuma County Pest Control District (YCPCD) for spraying the first priority species Canada and musk thistle and field bindweed. After plants have emerged in the Spring YCPCD, personnel, inspect the park property and flag areas where the target species are found. Chemical, mixtures, application dates and application methods are largely determined by YCPCD.

- 1). The objectives of chemical spraying around recreational facilities are for bareground control of troublesome species such as puncturevine and sandbur. Currently, Pendulem is used to control these troublesome weedy species at there commended label rates of 4 pints per acre or other

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specific recommended label rates.

2). Any musk and Canada thistle infestation are control using either Curtail at 96 oz/acre or Telar at 1-1 1/4 oz acre. These applications occur in the spring, during the rosette stage and again in the fall, preferably after a light frost

3) As new chemicals become available for use, select suitable test sites for evaluation. Use signs to indicate and explain control methods.

4) In cultivated fields use approved pesticides (for spot spraying) around field borders to decrease seed production and decrease plant density.

B. Management Sites: Areas below the high water mark of Bonny Reservoir

Pest Category- Noxious perennial/biennial broadleaf weeds and woody vegetation.

Target Species - Canada thistle, Musk thistle bindweed, Russian olive saltcedar and bindweed make up the majority of the perennial/biennial species found below the high water mark due to drought conditions.

Reasons to Control Weeds - Some targeted plants species and other troublesome species are found around the perimeter of Bonny Reservoir at the current time. Woody vegetation like saltcedar can consume large quantities of water and have the potential to choke out native vegetation. Currently, cottonwood and saltcedar are intermixed in thick doghair stands especially on the north shoreline of the reservoir. These thick stands of vegetation can reduce access for fish and other recreational activities. In addition, Russian olive has the potential to impact recreational use areas and native vegetation around the reservoir. Weeds may have a negative impact to the visitor's recreational experience.

Management Goals - These methods are intended to reduce seed production of Canada thistle by 30 percent, musk thistle seed production by 80 percent and to stop the spread of bindweed and reduce ground cover for all species by 30 percent by the end of a five-year period. A goal is to reduce saltcedar populations around the reservoir by 80 percent in two years and institute a maintenance program to include biological and chemical control to reduce the production of seed by 80 percent and limit the spread of occurring plants until total control around the reservoir can be accomplished

Management Alternatives - Management goals will be accomplished through integrated control strategies including chemical, biological, mechanical and cultural means, which may be used singly, or in combination.

Control Methods

Mechanical Controls

1) Wherever possible, park maintenance mows patches of Canada and musk thistle, between chemical treatments, each 21 to 28 days in order to apply additional stress to the plants and prevent them from producing seed.

2) Mowing limits seed production and decreases plant vigor.

3) Mowing activities are done prior to development of seed heads on musk thistle and Canada thistle.

4) Potentially, mowing is an option to use on the south side of Bonny Reservoir mowing and could be used to reduce periodically saltcedar stands of 50 percent coverage or stem diameters of

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2 inches or less. However, frequent mowing would potential cause saltcedar densities to become thicker due to lateral stem development since the apical tips are continually being cut.

5) Mowing the woody vegetation on the north side (below the high water mark) of Bonny Reservoir, could be labor intensive and costly. This mixed stand of vegetation is approximately 12-16 feet tall and stem diameters in this mixture could range from 2 to 4 inches in diameter or more. A larger heavy-duty mower, or dozer could be utilizing to remove this vegetation for saltcedar densities of 50 to 100 percent from this area. Once trees are removed than control of resprouts would be necessary. This type of activity would disturb the soils in the area possibly allowing annual weeds and invasive species such as Canada thistle to establish.

6) Cut-stump/chemical control - This method in conjunction with pesticide spraying could be beneficial in controlling saltcedar (90 percent efficacy or better). This is a labor-intensive method for removal of saltcedar. Approximately, 1 acre of 50 percent saltcedar with stem diameters of 2-3 inches could be cut and treated with three teams of three individuals/ team each day. Different types of E.P.A approved pesticides that could potentially be uses for treating the cut-stumps including 2,4-D amine, Imazapyr, triclopyr and glyphosate. To effectively treat saltcedar (90 percent efficacy) stumps pesticides have to be applied within five minutes of being cut. Efficacy will significantly drop off if pesticides are applied later than five minutes. Some retreatment will be necessary 4 to 6 weeks later with this methods and semi-annual inspections necessary to determine if saltcedar is reestablishing.

7) Girdling of Russian olive trees is a potential labor-intensive control method on trees up to 12 inches in diameter. Requires that the entire circumferences be girdled to expose the water transport system of the tree.

Chemical Controls

In 1996, the park began contracting with YCPCD for spraying the first priority species Canada and Musk thistle and field bindweed. After plants have emerged in the Spring YCPCD, inspect the Park property and flags areas where the target species are found. Chemical, mixtures, application dates and application methods are largely determined by YCPCD.

1) Ground Rig Application - Foliar methods following appropriate pesticide label requirement are generally very effective in controlling saltcedar. This method allows the applicator(s) to broadcast the pesticide mixture to cover foliage. The applicator must be very deliberate in making sure that every branch is sprayed, which can increase labor, equipment, and pesticide cost. A branch missed during spraying, will likely remain viable. The main objective of this method is for the applicator to spray every branch to wet, but not to drip or pooling. It is advantageous to add a dye indicator to the spraying solution to aid the applicator in spraying the total plant. This method works very well, but is limited in its use, especially if trees are larger than 20 feet tall and if densities will not allow the applicator to reach the entire canopy. This method works very well along right-of-ways (photo 7) and in areas where vehicle access is possible or where densities and terrain allow passage of ground application equipment.

One disadvantage of this methods is that pesticide sprays can influence nontargeted plants (especially grasses) if sprayed from long distances, so the applicator must spray as close to the plants as possible while walking to cover the entire canopy

2) Aerial Application (Canopy or Monoculture Application) - Aerial broadcast method (fixed-wing or helicopter) will be useful for covering remotely managed areas, small scattered or isolated areas where noxious weeds such as Canada thistle and saltcedar form a major percentage of established plants on the north and west side of Bonny Reservoir. Vegetation condition, topography, and accessibility are less constraining for aerial methods than other methods. Drift control adjuvant will be used to reduce any impact to non-targeted plants. Pesticides are applied to target vegetation using specially designed spray nozzles and booms. The special design of these

booms minimizes air turbulence approximately the nozzle orifices, maintains a uniformly large droplet size, and minimizes the production of aerosols. In addition, buffer zones will be established to reduce any impact to non-target plants, sensitive areas and water.

Biological Controls

Biological control will be most appropriate in isolated areas where other control methods are not possible or practical. In areas where biological controls are used, signs will be used to describe control agents and explain purpose.

1) Currently, musk thistle sites are infested by *Rhinocyllus conicus*. These insects are mining the heads and decreasing infestations. Literature indicates that biological control is compatible with pesticide application if the life cycle of the plant is not changed to where it is not consistent with the life cycle of the weevil.

2) Use biological controls as they become available and evaluate their effectiveness; potentially a biocontrol agent for salt cedar may become available in the future.

- C. **Management Sites:** Static water sites, including drainage area or where static water stands for long periods.

Pest Category: Mosquitoes

Target Species -Family: Culicidae

Reasons to control pest - Mosquitoes are a key part of any naturally functioning ecosystem. However, they also may carry diseases, which can pose serious health risks to humans as well as be an annoyance during many outdoor recreational activities. Mosquitoes may have a negative impact to the visitor's recreational experience.

Control Methods

Chemical Control

Larvicides

Various larvicides and adulticides will be evaluated to determine their effectiveness. Larvicides target larvae in the breeding habitat before they can mature into adult mosquitoes and disperse. Larvicides include the bacterial insecticides *Bacillus thuringiensis israelensis* and *Bacillus sphaericus*, the insect growth inhibitor methoprene, and the organophosphate insecticide temephos. Mineral oils and other materials form a thin film on the surface of the water, which causes larvae and pupae to drown. Liquid larvicide's products are applied directly to water using backpack sprayers and truck or aircraft-mounted sprayers. Tablet, pellet, granular, and briquet formulations of larvicides are also applied by mosquito controllers to breeding areas.

Adulticides

Adult mosquito control may be undertaken to combat an outbreak of mosquito-borne disease or a very heavy nuisance infestation of mosquitoes in a community. Pesticides registered for this use are *adulticides* and are applied either by aircraft or on the ground employing truck-mounted sprayers. State and local agencies commonly use the organophosphate insecticides malathion and naled and the synthetic pyrethroid insecticides permethrin, resmethrin, and sumithrin for adult mosquito control.

Mosquito adulticides are applied as ultra-low volume (ULV) sprays. ULV sprayers dispense very fine aerosol droplets that stay aloft and kill flying mosquitoes on contact. ULV applications involve small quantities of pesticide active ingredient in relation to the size of the area treated,

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typically less than 3 ounces per acre, which minimizes exposure and risks to people and the environment.

Biocontrol Control

Encouraging natural predation can be accomplished by building bat houses throughout the park to encourage bats to establish. This approach will help impact the mosquito populations in areas, which are heavily used such as campgrounds, and swimming areas.

Mechanical Control

Since mosquitoes must have water to breed, methods of prevention may include controlling water levels in lakes, marshes, ditches, or other mosquito breeding sites, eliminating small breeding sites if possible.

D. Management Sites: Bonny Prairie Natural Area

Pest Category- Annual weeds, noxious perennial/biennial broadleaf weeds.

Target Species - Canada thistle, sweet clover, muellin, and cheatgrass cover large areas and require the greatest effort to control.

Reasons to Control Weeds - For most weed infestations the goal of the weed management program will be to reduce weeds to a level that can be contained with minimal annual treatments. Annual management needs will vary depending on growing conditions, amount of disturbance in a given area, previous treatments, condition of the native community, and biology of the weed species.

Management Goals - The goal of exotic plant species management for Bonny Prairie Natural Area is manageable levels or eliminating them from the flora in favor of native loess that will require annual attention. The Bonny IPM plan will provide the best control. Within that context, manual and mechanical control is preferable to chemical control. Pesticide applications should be limited to species that cannot be controlled by other means.

Management Alternatives - Management goals will be accomplished through integrated control strategies including, biological, mechanical, manual removal, mowing or using a string-trimmer, controlled burning and or pesticide application.

Control Methods

Manual Controls (Hand control)

Manual or hand-control of exotic plant species requires a site visit in early summer before seed set and a follow-up in mid-August to pull late-flowering individuals. In Areas 2, 3 and 4 volunteers led by the experienced botanist can control exotic species by pulling white and yellow sweet clover, mullein, sow-thistle (*Sonchus* spp.), kochia (*Kochia* spp.) and Russian-thistle (*Salsola collina*).

Mowing or Trimming

Mowing large areas to control seed production from exotic plant species also reduces seed-set by native species. A more selective type of mowing using gasoline-powered string trimmers can also be used. Persistent mowing, as occurs on the short nature trail and around the picnic table/shade shelter, favors the reproduction of the shortgrasses, blue grama and western wheatgrass. Warm-season bunchgrasses such as little bluestem are reduced in these regularly mown sites. On the

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other hand, natural disturbances such as pocket gopher burrowing activity and sloughing of soils along drainage edges, apparently favors establishment of little bluestem.

Mowing and haying have been used on the tallgrass at Konza Prairie in Kansas to simulate burning. At Konza, a July harvest has been most effective; harvesting later in the season may reduce cover by warm-season perennial grasses and increase the abundance of weedy species (Launchbaugh and Owensby 1978). Mowing is also much less effective than burning for eliminating weedy species such as sweet clover.

Biological Controls

Biological control agents may be appropriate for some exotic species. Their disadvantages should be evaluated before they are used as part of the weed control program.

Chemical Application

Application of pesticides will be used when necessary to control populations of exotic plants. Because of the potential dangers of chemical pesticide use (especially in a windy area like Bonny where chemical drift is a constant possibility), because of the presence of a rare plant on site, and because more natural methods are more appropriate for natural area management, pesticides are considered as the method of last resort in exotic species management for the prairie grasslands. Choice of pesticides will be at the discretion of the Bonny State Park manager or weed control officer for Yuma County. Should chemical application be required, a hand-held wick-type applicator is desirable for maximum control during placement of pesticide. Pesticides should be applied by a certified pesticide applicator. Pesticide application may be necessary, but not necessarily sufficient, to control populations of Canada thistle. It may be necessary to weaken plants by trimming 2 to 3 times before applying pesticide (Tamara Naumann, personal communication).

Reclamation Sites

A. Management Sites:

Dam sites include: The upstream side of the dam crest (1,800 feet) and downstream side of the dam crest (approximately 350 feet x 9,000 feet) to the Hale Ditch pipeline and toe of dam. Also included are riparian sites which include: the grassed area downstream of the Hale Ditch pipe line where the sub surface drains are located from the spillway side of the dam to the Hale Canal south side (right side if looking down stream) downstream area (this area is approximately 3,930 feet in length and 300 feet downstream). Also included is the Hale Ditch pipeline, the River Outlet pipeline, the fenced in area around the river.

Pest Category-Annual weeds, noxious perennial/biennial broadleaf weeds and woody vegetation.

Target Species- Willows, cottonwood and yucca

Reasons to Control Weeds - The above-mentioned plants occur at Bonny Reservoir: some of these woody plants may have the potential to cause structural damage to the upstream and downstream side of Bonny Dam if they become established.

Management Goals -Management goal is to control all vegetation growing on the upstream and downstream side of the crest which may obstruct view of damage caused by burrowing animals or which may cause damage to the dam by extensive root systems. To control, contain or eradicate (as feasible) the above named high priority weeds and monitor for the presence of other species not yet occurring.

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Management Alternatives - Management goals will be accomplished through integrated control strategies including chemical, biological, mechanical and cultural means, which may be used singly, or in combination.

Control Methods

Mechanical Control

Hoe, spade or machete are used to remove vegetation as needed. Yucca is mowed when grass in the vicinity is mowed; this helps grass to encroach into areas previously occupied by yucca.

Chemical Control

Roundup Low Vol 6 Ester Weed Killer (2, 4-D) and Spike 20 granulated pesticides are used for willow and cottonwood control. Spike 20 is not applied to the upstream face of the dam. In perimeter areas away from water, Spike 20P is used for yucca control. Label requirements are followed when applying these pesticides especially near water to prevent any contamination of water or non-target effect to desired vegetation. Roundup is used to control willow and is applied by backpack sprayer one time per year to a 200 foot by 30-foot wide infestation.

Biological Control

Cattle are used at the toe of the dam to control all weeds. The attempt is made to minimize the use of pesticides. If cattle cannot be used then weeds are mowed before seed heads develop.

B. Management Sites:

Road Right-of-Way sites include: The guardrail on both side of the dam crest, which is 9,000 feet long on each side of the road for a total of 18,000 feet.

Pest Category-Annual weeds, noxious perennial/biennial broadleaf weeds and woody vegetation.

Target Species- Sunflower, Russian thistle (tumbleweed-specified as fireweed)

Reasons to Control Weeds - The above-mentioned plants are weed species occurring at Bonny Reservoir, some of these weeds may be invasive species listed on the Yuma County Noxious Weed List.

Management Goals - To control, contain or eradicate (as feasible) the above named high priority weeds and monitor for the presence of other invasive species. Management goal is to have a clear visibility on the dam crest.

Management Alternatives - Management goals will be accomplished through integrated control strategies including chemical, biological, mechanical and cultural means, which may be used singly, or in combination.

Control Methods

Mechanical Control

Hoe, spade or machete to remove vegetation as needed. Mowing is used to control weeds along right-of-way access roads, roadside and ditches.

Chemical Control

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Weeds including sunflower and Russian thistle are controlled 3 feet on the outside and one foot on the inside of the guardrail (towards the center foot of the road). Buccaneer (active ingredient-glyphosate) and Roundup pesticide are used to control annual weeds along the guardrail. Pesticides are applied along the road right-of-way using a sprayer mounted on a pick-up.

Biological Control

Cattle are used at the toe of the dam to control all weeds. The attempt is made not to use pesticides. If cattle cannot be used then weeds are mowed to before seed head develop.

C. Management Sites:

Facilities and houses include: the Conduit Access house, River Outlet Valve house, River Outlet House, and the Hale Ditch Gate Valve house.

1. Pest Category-Annual weeds and noxious perennial/biennial broadleaf weeds

Target Species-- Canada thistle, Musk thistle, sunflower, tumbleweed, yucca and others

Reasons to Control Weeds - The above-mentioned plants are weed species occurring at Bonny Reservoir; some of the weeds are invasive species listed on the Yuma County Noxious Weed List.

Management Goals - To control, contain or eradicate (as feasible) the above named high priority weeds and monitor for the presence of other invasive species. To control unwanted vegetation growing around facilities as it may pose a fire hazard, and provide habitat for mammals such as mice and rodents.

Management Alternatives - Management goals will be accomplished through integrated control strategies including chemical, biological, mechanical and cultural means, which may be used singly, or in combination.

Control Methods

Mechanical Control

Personnel use, hoe, spade or machete to remove vegetation as needed. Sandburs are pulled around facilities as needed. Mowing of buffalo grass is done frequently but is dependant on rainfall or drought.

Chemical Control

Various types of application equipment are used to apply pesticides including tractor-mounted sprayer, backpack sprayer, pick-up mounted sprayer unit. Pesticides that are used include: Buccaneer, Roundup (both with the active ingredient glyphosate), Low Vol 6 Ester Weed Killer (2, 4-D) and Spike 20P for yucca control. Label requirements are followed when applying these pesticides especially near water to prevent any contamination of water or non-target effect to desired vegetation.

2. Pest Category- Various mammals and invertebrates

Target Species - Rodents including mice, packrats and invertebrates (including hornets).

Reasons to Control Weeds - The above-mentioned pests are found at Bonny Reservoir. Some of these pests present potential health problems such as potential vectors for Hanta Virus, and painful stings.

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Management Goals - To control, contain or eradicate (as feasible) the above named pests, , and monitor for the presence of other species as needed.

Management Alternatives - Management goals will be accomplished through integrated control strategies including pesticides, mechanical and cultural means that may be used singly or in combination.

Control Methods

Cultural Control

Removal of debris, and stacked material around facilities to reduce habitat for mammals and invertebrates.

Chemical Control

Use of D-Conan for mice and packrats; this product is used throughout the year around these facilities. Hornets are controlled using commercial "wasp spray" products. Label requirements are followed when applying these products.

Documenting and Monitoring

Documenting and Monitoring of noxious and invasive weed and pest infestations is the only means of measuring the effectiveness of the program. Without adequately documenting the location, size or extent, and efforts to control noxious weed infestations, it will be difficult to determine the results of treatments, or evaluate costs and benefits. Documenting will also aid in locating infestations for future treatments and monitoring. Current control techniques will be monitored to find out whether a given treatment has adequately controlled an infestation.

- X **SPECIES** - Common name and/or scientific name, if known.
- X **DATES** - The date the plant or infestation was first discovered at a particular site.
- X **LOCATION** - Legal description of the site and a map or Farm Service Agency aerial photo locating the site of invasive weeds found on or near reservoir lands. Locations of new and older weed infestations can be determined by utilizing a relatively inexpensive GPS. Weed locations determined in 1999-2002 are contained in the Noxious Weed Inventory of Reclamation Lands around Bonny Reservoir, which will be contained in the IPM plan of Bonny Reservoir.
- X **DESCRIPTION** - A brief narrative describing the location of the site (include size and/or extent of the infestation).
- X **TREATMENTS** - Initial and subsequent treatments used to eradicate or control invasive, include the date, time, treatment(s) applied, and application rates, if applicable.
- X **PHOTOS** - Photos of the site would be useful to document the effectiveness of treatments. This is especially useful for documenting the effects of biological controls or trials for new techniques. Remember to label photos with date and locations; a digital camera with a date function would be able to accomplish this. Photo points of sites with high priority weeds should be taken at each monitoring time to determine the effectiveness of weed control measures.

Prevention and Early Detection of Invasive Plants

Preventing the establishment of invasive plants is an essential part of the IPM. The ability to correctly identify new weeds is an important skill for early detection. The State provided website and publications/brochures describing identification characteristics and control measures for Colorado noxious weeds are valuable tools. Similar brochures for other invasive plants may be obtained from other state or federal agencies. Copies of these brochures may be kept on file to assist in identifying these weeds should they be found on or near reservoir lands. The land manager and his staff should watch for these plants while working and collect samples of plants, which may fit the descriptions. Early detection assistance may also be obtained by working cooperatively with permittees, recreational users and adjacent landowners. Potential projects or activities, which may facilitate cooperation in monitoring for new invasive plants, include the following.

- Provide annual training for seasonal employees working at the reservoir to insure their ability to identify invasive plant species. Potentially, Yuma County may be able to assist Reclamation with this training if requested.
- Buy copies of pertinent reference materials such as the **“Weeds of the West”** and distribute so that staff from each agency can see good pictures of problematic weeds.
- Posting photos and information on kiosks in areas of high public use. Provide set of weed postcards of key noxious weed species to be kept in the glove compartment of agency vehicles.
- Identify a weed person within Reclamation, Colorado State Parks, and the DOW who will be responsible for processing reports of new weeds.
- Annual recertification training for applicators (example Colorado Weed Management Agency training should be encouraged)
- Site visits to all reported locations of noxious or new invasive weeds on the reservoir lands. Document the location and extent of the infestation with GPS unit. Reclamation may be able to assist in mapping noxious weed infestations using a geographic information system database. Conduct an annual inventory of roadsides around the reservoir to find new weed infestations.

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