RECLAMATION

Managing Water in the West

Environmental Assessment and Finding of No Significant Impact for

Integrated Pest Management, San Luis Valley Project Alamosa Field Division, Colorado

U. S. Department of the Interior
Bureau of Reclamation
Albuquerque Area Office
Environment Division
Albuquerque, New Mexico

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Front Cover Photo of Franklin Eddy Canal, Closed Basin Division; August 27, 2008
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U.S. Department of the Interior

BUREAU OF RECLAMATION
Albuquerque, New Mexico

Albuquerque Area Office

Finding of No Significant Impact

Environmental Assessment for
Integrated Pest Management,
San Luis Valley Project
Alamosa Field Division, Colorado

_____ _____
Manager, Environment Division Date

_____ _____
Area Manager, Albuquerque Area Office Date

AAO-09-005
FONSI Number

Background

This Environmental Assessment (EA) documents an analysis conducted by the Bureau of Reclamation to evaluate the effects of a proposal to (1) use manual, mechanical, and herbicide methods to control undesirable terrestrial and aquatic weeds; (2) use toxicants, shooting, and non-lethal methods to control problem/nuisance burrowing mammals; and (3) manual and commercially available pesticides and baits to control rodents and spiders in facilities and on lands managed by Reclamation on the Alamosa Field Division, Colorado. The purpose of the proposed action is to protect structures and facilities, provide for public safety, and enhance the health and safety of Reclamation employees, contractors, and cooperators. Proposed pest management objectives, strategies, methods, mitigations and best management practices, and an herbicide safety and spill plan, standing operating procedures for hantavirus, and control requirements for problem/nuisance burrowing mammals are documented in an Integrated Pest Management Plan, which is available for public review.

The San Luis Valley Project is in the south-central portion of Colorado. The project includes the Conejos Division, which regulates the water supply for 80,600 acres of land irrigated in the Conejos Water Conservancy District, and the Closed Basin Division of San Luis Valley, where shallow ground water is salvaged instead of being lost to evapotranspiration. The salvaged water is delivered to the Rio Grande for beneficial use in accordance with the Rio Grande Compact among the States of Colorado, New Mexico, and Texas. A small amount of water is also made available to the Alamosa National Wildlife Refuges and the Blanca Wildlife Habitat Area. The project was originally authorized by the Secretary of the Interior on February 1, 1940, under Section 9 of the Reclamation Act of 1939. A supplemental finding of feasibility and authorization for Platoro Dam and Reservoir was submitted by the Secretary on March 7, 1949.

The Closed Basin Division was authorized by Public Law 92-514, 92nd Congress, October 20, 1972, (86 Stat. 964). The authorizing act allows the Secretary of the Interior to operate and maintain the Closed Basin Division. The Closed Basin Division facilities provide a dependable source of water for stabilizing the storage level in San Luis Lake. The project includes a system of wells, pumping plants, laterals, and a canal to salvage groundwater within the Closed Basin for delivery to the Rio Grande. It further provides for the preservation and enhancement of existing wildlife habitat, desirable fishing and recreation benefits, and a stable water storage level for San Luis Lake.

This EA describes two alternatives:

- **Alternative 1.** No Action
- **Alternative 2**. Preferred alternative of Integrated Pest Management (IPM) using a Combination of Mechanical, Manual, and Chemical Methods

Under Alternative 1, No Action Alternative, no management actions would be taken to control plant and animal pests. The adverse effects associated with undesirable terrestrial and aquatic plants, problem/nuisance burrowing mammals, and rodents and arthropod pests on lands, waters, and facilities managed by Reclamation would be accepted. This alternative will serve as

a basis of comparison for the preferred alternatives to reduce the adverse effects of plant and animal pests and achieve Reclamation.

Goals and Objectives

Under Alternative 2, the preferred alternative, Reclamation proposes to use a combination of manual, mechanical, and chemical methods, under an IPM concept, to control plant and animal pests. Annual selection of a mix of methods would be based on effectiveness, efficiency, environmental acceptability, and compatibility with Reclamation goals and objectives.

The preferred alternative could involve using a combination of manual, mechanical, and chemical methods to treat terrestrial and aquatic weeds. Hand removal of terrestrial weeds by pulling or use of hand tools to treat small infestations of target species could be used when the cost that does not exceed that of other techniques. Mechanical methods involving heavy equipment, such as mowers or graders, could be used to control weeds where the equipment could safely operate without damaging desirable plant communities or structures. In limited situations, small patches of aquatic plants could be controlled by mechanical removal, such as common cattail. Herbicides would be considered for use they would provide the highest level of control at the lowest cost, especially when other methods would not provide adequate control of target plant species. Since sterile (triploid) grass carp (*Ctenopharyngodon idella*) were introduced into the lower reaches of Franklin Eddy Canal (hereafter referred to as the Canal) to help control aquatic vegetation, only aquatic herbicides that have little or no affects on fish will be considered for use.

Under the preferred Alternative, Reclamation would obtain the services of United States Department of Agriculture, Animal Plant and Health Inspection Service, Wildlife Services (APHIS/WS), or a contractor to remove problem/nuisance burrowing mammals that could threaten the structural integrity of canals or other water conveyance structures. Control could be achieved through the use of poisonous baits, fumigants in mammal burrows, shooting, and live trapping and relocation. Mammal Control at the San Luis Valley Project would be performed in accordance with a Statement of Work, General Provisions, Special Provisions, Division of wildlife State regulations, Colorado Small Game regulations, and a Request for Quotation. The project requires control and removal of problem/nuisance animals like beaver, skunk, raccoon, muskrat, badger, gopher, porcupine or prairie dog, although other infrequent mammal species may occur in the project area. Muskrats and prairie dogs are the primary species that will need to be controlled.

In facilities, mice could be controlled using commercially available traps, toxicants and baits, such as products that can be purchased by the general public from a nursery or garden store. These products could be used to control rodents that move into facilities or offices. Another approach that could be used would involve manual methods to seal various sites of entry (crevices, doors, etc.) at facilities to exclude rodents.

Finally, the preferred alternative could involve manual or insecticidal methods to remove spiders from facilities. The black widow spider, which is know to build webs in facilities and structures, poses a safety threat to employees, and they must be removed to comply with a

Reclamation safety policy. Manual removal of spiders and their webs could be done in some areas of facilities, but the use of an aerosol insecticide product could be used to control spiders where manual removal would not be possible.

Summary of the Proposed Action

The proposed actions are to authorize Reclamation employees, cooperators, and contractors to implement Integrated Pest Management using a combination of methods to control undesirable plant and animal pests. Manual methods would be considered for use in managing pest species when such methods are determined to the effective and not overly expensive to implement. Mechanical methods, such as grading and mowing, would occur on sites accessible to heavy equipment. Mowing of salt cedar, coyote willow, and other woody vegetation could be done annually. Grading could be done on a limited basis along roadways, at construction sites, and sites accessible to equipment to control invasive plants like wild mustard and kochia. However, mechanical measures could not be used to control plants on some structures, such as the inner faces of the Canal, due to the potential threat of damaging the Polyvinyl Chloride liner. For management of vegetation that cannot be effectively controlled by manual and mechanical means, herbicides are proposed for use to control vegetation that threatens water conveyance structures, such as the Canal, or adversely affects the adequate flow-carrying capacity in any water conveyance structure. This analysis will evaluate the use of herbicides to control exotic plant species to have the capacity to spread to adjacent lands of mixed ownership, and herbicides needed to control invasive native plants, such as gray rabbit brush and greasewood. Herbicides considered for use would include: Aminopyralid, chlorsulfuron, clopyralid, dicamba, glyphosate, imazapic, imazapy, methsulfuron methyl, oryzalin, pendimethalin, picloram, sulfometuron methyl, triclopyr, and 2,4-D. Aquatic weeds could be controlled using fluridone, and PAK27 could be used to control algae. These pesticides were evaluated with respect to effects upon human health, non-target vegetation, terrestrial and aquatic organisms, and water quality.

The proposed action would authorize Reclamation to use zinc phosphide baits, aluminum phosphide coated pellets, and various anticoagulants applied in burrows to produce a toxic fumigant to control problem/nuisance mammals burrowing in the canal structures. Mammals that construct burrows in canals can compromise their structural integrity, and control is needed to provide for pubic safety. Shooting mammals with a 22-caliber rifle also would be authorized. A non-lethal method, such as trapping and relocation of prairie dogs could be used, although this approach usually results in about 80 percent mortality of the removed animals by stress and predation.

Commercially available rodent traps, pesticide baits (containing warfarin), and other toxicants are proposed for use to control of rodents that enter offices and facilities to meet a Reclamation safety and health policy for employees.

Commercially available insecticide sprays (malathion and acephate) are proposed for use to control spiders in offices and facilities where manual removal is impractical. Again, the objective of the use of an insecticide would be to provide for the safety of employees, specifically the black widow spider.

Principles of adaptive management and managerial flexibility will be used for pesticide treatments to allow decision makers to take advantage of new information that becomes available after a decision has been made. It is possible that a new product, approved and labeled by the U.S. Environmental Protection Agency (EPA), could become available during implementation. If implementation monitoring shows that the herbicides/insecticides analyzed in the EA are not effective in meeting the purpose and need and a new or improved product is available, the new product could be considered for use without further analysis. This would be the case only if the new or improved product fits within the same effects analysis disclosure for the herbicides covered in this EA. A review would be completed and documented by Reclamation's Environment Division (ALB-150) to determine the similarities of effects and if the decision should be amended to include new herbicide product.

Alternative 1, No Action, was not selected. Reclamation could not achieve its mandate to safely operate water holding and water conveyance structures, provide for a safe and healthy environment for employees at the office and facilities, and enhance the visual quality of facilities without the ability to manage undesirable pest species.

Alternative 2, the proposed use of all effective IPM methods, was selected because it would meet Reclamation management goals and objectives. Control of terrestrial plants, aquatic plants, problem/nuisance burrowing mammals, rodents and spiders involve significantly different sites, techniques, and chemicals; thus, the various methods were analyzed separately under this alternative. Nevertheless, all of the control methods are incorporated under the umbrella of IPM. The preferred alternative was selected because it provides Reclamation managers with the full range of proven methods, including the use of herbicides, insecticides, mammal toxicants, to achieve effective and efficient Integrated Pest Management. Mitigation measures and Best Management Practices would be followed during implementation to mitigate the risk of adverse impacts to (1) humans; (2) non-target vegetation; (3) non-target terrestrial and aquatic animals, including threatened, endangered, and sensitive animals; and (4) water quality. Since the propose action would have no effect on threatened or endangered species, a Biological Assessment (BA) is not needed.

The potential environmental effects and risks associated with the proposed use of manual, mechanical, and pesticide methods for humans and the environment were considered.

Environmental Impacts Related to the Resources of Concern

Based on this environmental analysis, it was determined that the proposed use of manual and mechanical methods and pesticides is not a major federal action that will significantly affect the quality of the human environment; therefore, an Environmental Impact Statement will not be prepared. The determination is based on the following:

- **Human Health**
  The *risk to humans* associated with manual and mechanical methods and the toxic effects of herbicides, insecticides, and rodent baits would be negligible. Zinc phosphide and aluminum phosphide are highly toxic materials to humans and could pose a risk to applicators. These toxicants are Restricted Use materials that can only be applied by

certified applicators. The risk to applicators can be mitigated by following label requirements for transportation and application and using required personal protection equipment. Minor amounts (less than a pound of active ingredient per year) of these materials will be applied inside the burrows of problem/nuisance mammals along the Canal; thus, these materials would not pose a safety risk for Reclamation employees or the public.

The disclosure of effects of the IPM methods, including herbicides, insecticides, and toxicants, on the quality of the human environment nearly always generates some level of controversy. The concerns by the public over pesticide use will be considered, but the level of response is not expected to be substantial and the effects may not be *highly controversial.*

The possible effects of the methods described in the EA are not *highly uncertain* nor do they involve *unique or unknown risks.* The environmental effects are typical for this type of program using IPM methods to control unwanted pests. The analysis of possible effects is based on the best available information, science, and the judgment of pest management and land management specialists with Reclamation. The predicted environmental consequences are based on published information and each herbicide/insecticide, expected patterns of use, risk assessments developed for the United States Department of Agriculture Animal Plant Health Inspection Service for mammal toxicants and the Forest Service for herbicides, which were incorporated by reference and a summary of potential risks to humans, and non-target species (Chapter 4).

- **Non-target Vegetation**
  None of the methods, including the proposed use of herbicides, will have any significant affect (direct, indirect, or cumulative) on non-target vegetation. This action is limited to control vegetation and insect pests on Reclamation lands and at facilities.

- **Non-target Terrestrial and Aquatic Animals**
  The proposed actions with proposed mitigation measures identified in the IPM plans *will have no effect on any endangered, threatened, or proposed species; or designated or proposed critical habitat areas*; or nonessential experimental populations.

- **Water Quality**
  There would be no direct, indirect, or cumulative impacts to water quality form the proposed use of methods, herbicides, or insecticides.

- **Indian Trust Assets**
  There are no native American Indian Trust lands or assets in the vicinity of the proposed project area.

- **Environmental Justice**
  Implementing the preferred plan would result in no adverse effects to minority or low-income populations.

- **Irreversible and Irretrievable Commitment of Resources**
  No irreversible or irretrievable commitment of resources is expected by adopting Alternative 2, Proposed Action (IPM), including the use of herbicides and insecticides. Even under the worst-case scenario, the effects of the proposed use of herbicides and insecticides would be negligible.

- **Cumulative Impacts**
  The Council on Environmental Quality regulations (40 CFR Parts 1500-1508) implementing the procedural provision of National Environmental Policy Act of 1969 (NEPA), as amended (42 USC § 4321 et seq.), define cumulative effects as follows: "The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions." (40 CFR § 1508.7).

  The No Action and the Proposed Action have not, or will not, contribute significantly to any past, present, or reasonably foreseeable future actions known in the proposed action area. The actions do not collectively create any significant impacts to the resources of concern. Short term cumulative effects of the proposed activities would be small in the overall regional context and would be temporary in nature.

Measurement Parameters	Alternative 1 - No Action (No Use of IPM Methods)
Addresses the purpose and need?	No. Pest management and Reclamation's mission and policies could not be achieved by selecting this alternative. Failure to manage invasive plants, especially deep-rooted species, would pose an unacceptable risk for public safety and the protection of property due to the potential failure of canals and other structures. Also, exotic plant and invasive plant species in and around facilities and other sites on Reclamation lands would continue to expand and would subsequently spread onto nearby state, private, and federal lands and adversely affect native plant communities. Without control, aquatic plants would increase and inhibit water conveyance in structures like the Canal. Mammals that dig burrows in canals would compromise their structural integrity presenting a threat to public safety and to the consistent operation of the Project. Deer mice that can transmit Hantavirus and poisonous spiders that invade offices and facilities would pose a safety threat to Reclamation employees. In addition, the ability of the Project to assist in meeting downstream compact obligations could be threatened.

Measurement Parameters	Alternative 2 - Preferred Alternative (Use of Manual, Mechanical Methods, and Chemical Methods under an Integrated Pest Management Concept)
Addresses the purpose and need?	Yes. Allows for the selection of manual and mechanical methods to manage to control some plant and animal species. Mowers could be used to inhibit the growth of woody shrubs and trees. On roads and similar sites, undesirable annual plant species could be effectively managed by grading the upper few inches of soil. Small infestations of some species of invasive plants, one-tenth (1/10) acre or less, could be controlled by manual methods. In equipment storage yards and at facilities, undesirable plants, like kochia, could be effectively and economically managed by hand-grubbing or pulling of individual plants. However, manual and mechanical methods are ineffective in controlling deep-rooted, perennial plant species; and herbicides could be use to control such plants. Problem/nuisance burrowing mammals could be removed by non-lethal/lethal methods to protect water conveyance structures. Entry sites could be sealed to prevent rodents from entering offices and facilities, but the use of rodenticide baits and lethal traps could be necessary in facilities where rodents could not be excluded. Spiders invading facilities and buildings could be managed by manual and insecticidal methods. The ability of the Project to assist the State of Colorado in meeting Compact requirements would be greatly enhanced.

Measurement Parameters	Alternative 1 - No Action (No Use of IPM Methods)
Consistent with statutes, regulations, and other plans?	No. Not responsive to Reclamation policy to protect structures and facilities to provide for the protection of public safety and property. Also, the mission of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public would not be met.

Measurement Parameters	Alternatives 2 - Preferred Alternative (Use of Manual, Mechanical, and Pesticide Methods)
Consistent with statutes, regulations, and other plans?	Yes. Responsive to Reclamation's mission and policy to protect canal structures, and facilities to provide for the protection of public safety and property. Also, the mission of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public would be met. This alternative also would meet Reclamation's policy to protect the health and safety of employees.

Environmental Commitments

The application of pesticides is tightly controlled by state and federal agencies. Reclamation is required to follow all state and federal laws and regulations applicable to the application of pesticides. The mitigation measures listed in Chapter 5, Best Management Practices (Appendix A), and the Pesticide Safety and Spill Plan (Appendix B), and Prevention by Heavy Equipment Hygiene (Appendix C) would be followed when applying pesticides. An on-site annual review of pest management programs will be conducted by an IPM specialist from the Albuquerque Area Office to ensure compliance with IPM standards presented in Chapter 1. The review will be documented and comments shall be provided to the Alamosa Field Division for consideration and incorporation into the IPM plan and program for the following year.

Coordination

Reclamation has coordinated with all partners and cooperators in the preparation and approval of integrated pest management plans.

Conclusion

In accordance with NEPA, as amended, and based on the analysis in the EA, Reclamation has determined that implementing the preferred plan presented in the EA for integrated pest management would not result in a significant impact on the human environment and does not require preparation of an environmental impact statement.

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Chapter 1 - Purpose and Need

1.1. Introduction

The United States Department of the Interior, Bureau of Reclamation, Albuquerque Area Office, proposes to conduct annual management of native and non-native plants with manual and mechanical methods and herbicides on lands and facilities managed by Reclamation. The proposal also includes controlling problem/nuisance burrowing mammals by lethal and non-lethal methods. Reclamation also proposes to control rodent and spider pests that invade buildings, shops, salvage wells, and other facilities using insecticides and commercially available rodent traps and baits.

The San Luis Valley is located in south-central Colorado and provides drainage to an area of approximately 8,000 square miles. The San Luis Valley Project is separated into two divisions, the Closed Basin Division and the Conejos Division. The Closed Basin Division is located north and east of Alamosa in Alamosa and Saguache Counties, with the Conejos Division south and west of Alamosa in Conejos County. A unique feature of the Valley is the Closed Basin which is a large area in the northern part of the Valley that drains about 2,900 square miles and is separated from the rest of the valley by a low alluvial fan. There is no drainage from the basin and much of the water that flows into it is lost through evapotranspiration. The Closed Basin Division of San Luis Valley salvages water from the basin and the salvaged water is delivered to the Rio Grande for beneficial use in accordance with the Rio Grande Compact among the States of Colorado, New Mexico, and Texas, and the Treaty of 1906 with the Republic of Mexico. Project water is also made available to the Alamosa National Wildlife Refuge, Blanca Wildlife Habitat Area, and San Luis Lake for fish and wildlife enhancement purposes.

The project was originally authorized by the Secretary of the Interior on February 1, 1940, under Section 9 of the Reclamation Act of 1939. A supplemental finding of feasibility and authorization for Platoro Dam and Reservoir was submitted by the Secretary on March 7, 1949.

The Closed Basin Division was authorized by Public Law 92-514, 92nd Congress, October 20, 1972, (86 Stat. 964). The authorizing act allows the Secretary of the Interior to operate and maintain the Closed Basin Division. The project includes a system of wells, pumping plants, laterals, and a Franklin Eddy Canal (Canal) to salvage groundwater within the Closed Basin for delivery to the Rio Grande.

The early settlers in the San Luis Valley recognized the necessity for irrigation to sustain agriculture. They began to tap the rivers and creeks by means of small canals and ditches. After 1880, large canal construction increased rapidly, and by 1900 the greatest practicable amount of natural stream flow had been diverted. Water users then began to construct water storage facilities on the Rio Grande. Two reservoirs in the Upper Rio Grande watershed were completed in 1913 by private capital. These were the Rio Grande (Farmers Union) and the Santa Maria, with capacities of 51,000 and 43,500 acre-feet, respectively. The Continental Reservoir, on a tributary of the Rio Grande, with a capacity of 27,000 acre-feet, was completed in 1928. La Jara and Terrace Reservoirs on La Jara Creek and Alamosa River were completed in 1910 and 1912, respectively. These have a combined capacity of approximately 31,000 acre-feet. By 1910, a

rising water table was causing serious damage to the valley lands. This seeped condition was accelerated by large irrigation diversions. Drainage to reclaim seeped lands began about 1911, and by 1921 eight drainage systems serving about 90,000 acres of land had been constructed. These drainage systems have reclaimed a considerable amount of land in the western area of the Closed Basin, but large areas to the east remain to be reclaimed.

The Closed Basin is located in the northeast portion of the San Luis Valley in Alamosa and Saguache counties. The project area is 130,000 acres (Figure 1). Water is salvaged from 170 wells in the unconfined aquifer. The pumped water is carried through the 42 mile long canal and delivered to the Rio Grande in the Alamosa National Refuge. The Project also includes 132 monitoring wells in the unconfined and confined aquifers, and they are used to monitor water table fluctuations within and beyond the project area boundaries. The Project has never produced water to the full design potential (approximately 117,000 acre feet). The highest amount of water pumped was in 1997 for a total of 43,970 acre feet, which is about 43 percent of design capacity. On average, the Project pumps about 22 percent of capacity (Agro Engineering 2006).

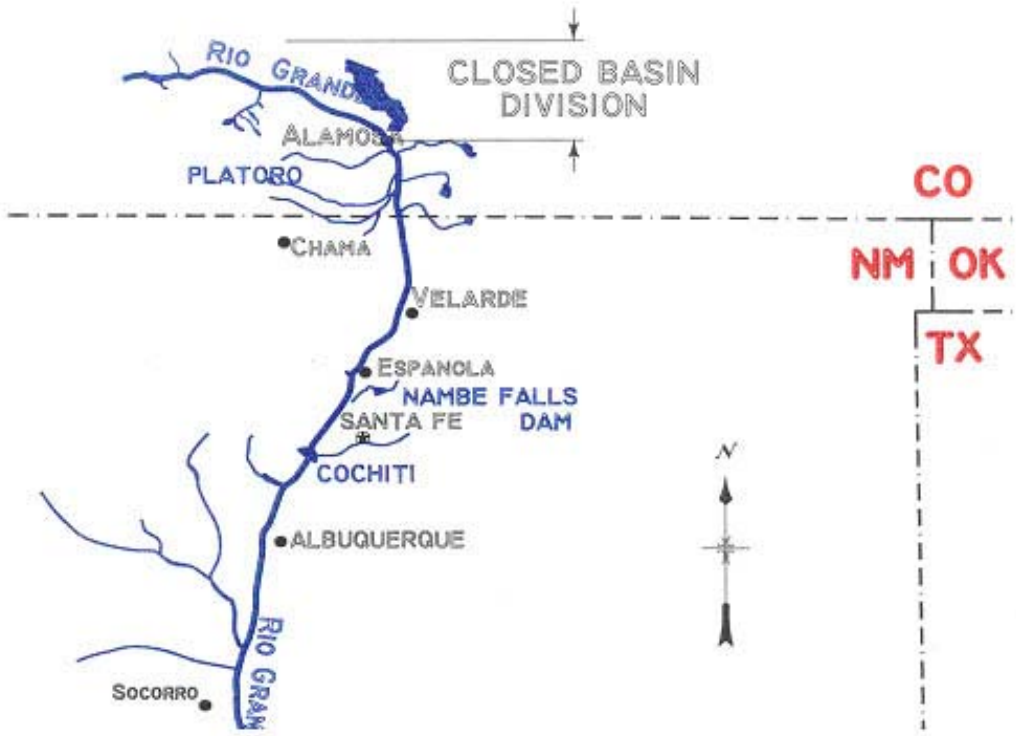

Figure 1 - Map of Closed Basin Division located near Alamosa, CO.

Benefits of the Closed Basin Division follow:

- **Irrigation.** The salvaged water assists the State of Colorado in meeting Rio Grande Compact requirements thus providing corresponding irrigation water available from the Rio Grande and the Conejos River. The increased water supply is of benefit to water

users on both rivers for the production of crops. Principal crops produced are alfalfa, wheat, oats, barley, potatoes, and vegetables.

- **Water Salvage.** The Closed Basin Division provides salvaged water to meet water deliveries as agreed to under the Rio Grande Compact, which benefits all three Rio Grande Compact States.

The purpose of this proposal is to outline the objectives, management alternatives, short- and long-term Integrated Pest Management (IPM) strategies, control techniques, effects of alternatives, mitigations, best management practices (BMPs), monitoring and follow-up actions to control the following: (1) undesirable plant species on the slopes of canals, access roadways, right-of-way and boundary fences, and around facilities; (2) floating and submerged aquatic vegetation, (3) problem/nuisance burrowing mammals that threaten the integrity of structures, (4) rodents invading facilities, and (5) spiders and other insects in facilities.

1. **Undesirable Terrestrial Plants.** Management of undesirable vegetation, which includes both exotic and native species, is necessary for the following reasons:

   - To allow for proper surveillance and inspection of the structures and adjacent areas for seepage, cracking, sinkholes, settlement, deflection, and other signs of distress.
   - To allow adequate access for normal and emergency Operation and Maintenance (O&M) activities.
   - Prevent the roots of woody plants from growing through the Polyvinyl Chloride (PVC) canal liner on the Canal.
   - To prevent damage to the structures due to root growth, such as shortened seepage paths through embankments; voids in embankments from decaying roots from dead or damaged trees; expansion of crack or joints of concrete walls, canal linings, or pipes; and plugging of perforated or open-jointed pipes.
   - To discourage animal/rodent activity on canal berm and lining, check structures, drum gates and other project features.
   - Prevent the spread of exotic species from federal property to adjacent land of mixed ownership.
   - Keep plants from overgrowing and obscuring equipment, structures, and facilities.
   - Maintain or enhance the visual quality of structures and facilities that are adjacent to recreation sites.
   - Prevent the risk of fire by controlling/removing vegetative growth.

2. **Aquatic Weeds.** Aquatic weeds must be controlled to allow adequate flow-carrying capacity of water conveyance, including spillway inlet and outlet channels; open canals, laterals, and drains. This is especially true regarding the Canal because of its slow velocity; the elevation of the canal drops only 16 feet over its 42 mile length.

Figure 2 - Some of the many aquatic weeds growing within the Franklin Eddy Canal

3. **Problem/Nuisance Burrowing Mammals.** Muskrats, prairie dogs, and other mammals can cause structural damage to canal banks and PVC linings, and their burrows can potentially lead to canal bank failure leading to a risk to public safety and damage of property. Control measures will be focused on problem/nuisance burrowing mammals.

4. **Rodents.** Deer mice nesting in well sites, vault interiors, elevation wells, flow meter locations, and stilling wells pose a safety threat to employees due to a viral disease known as Hantavirus Pneumonia Complex. Other species of nesting rodents in these facilities are considered to be nuisance pests requiring removal and clean up of animal waste.

5. **Spiders.** The black widow spider, which will build webs in well vaults, can pose a safety threat to employees. They must be removed to comply with a Reclamation safety policy

The objectives for management of pests for structures, facilities, and land managed by the Alamosa Field Division follow:

1. **Undesirable Terrestrial Plants.**

    - **Trees and shrubs.** The objective is to remove all plants that would interfere with the inspection or compromise the structural integrity of the canal.
    - **Invasive and noxious weeds.** The objective is to effectively reduce infestations on lands administered by Reclamation, and prevent spread of infestations to adjacent federal, state, and private lands.

- **Undesirable plants.** The objective is to control undesirable plants in maintenance yards and administrative sites that could obscure structures and pose a safety hazard, and to enhance visual quality of these sites.

2. **Aquatic Weeds.** The objective is to adequately control infestations of aquatic weed species that have the potential to restrict the flow of water in canals.

3. **Problem/Nuisance Burrowing Mammals.** The objective is to effectively control mammals that build burrows to prevent any structural damage that could lead to failure of the structures resulting in an unacceptable risk to the public safety /property and threaten the ability of the Project to assist in meeting downstream compact obligations and other obligations of the Project.

4. **Rodents**

   - **Deer mouse.** The objective is to prevent deer mice from invading structures and facilities to avoid the exposure of employees to health issues associated with Hantavirus.
   - **Other Rodents.** The objective is to prevent rodents from infesting structures and facilities and to reduce the nuisance and cost of having to remove nests and clean facilities or structures from rodent waste.

5. **Spiders.** The objective is to provide for the safety of employees conducting operation and maintenance activities at structures and facilities by controlling poisonous spiders.

The following IPM standards were established based on the assumptions that they are obtainable and measurable.

1. **Undesirable Terrestrial Plants.**

   - **Annual Control Standard.** Annual treatments must show a strong potential for success, i.e., 80 percent or higher control of selected plant species.
   - **Long-term Standard.** After two years of annual treatments, only one to four percent of the original number targeted plants will remain or invade treatment areas, which will require minimal follow-up maintenance control.

2. **Aquatic Weeds.** The standard is to show a strong potential for annual treatment success, i.e., 80 percent or higher control of selected plant species, without adversely affecting grass carp that are present in the lower reaches of the Canal.

3. **Problem/Nuisance Burrowing Mammals.** The standard is to remove all burrowing rodents, especially problem/nuisance mammals that build burrows in the inner/outer faces of canals.

4. **Rodents.** The standard is to prevent the invasion of all rodents from facilities and structures and control rodents inside of facilities.

5. **Spiders.** The standard is to eliminate all spiders and their webs from facilities and structures.

6. **Efficiency.** The standard will be to select control methods that provide the maximum level of control at the least cost.

7. **Environmental Acceptability.** The standard will be to prevent or mitigate any adverse environmental effects associated with implementation of IPM methods. Prior to any on-the-ground management, an environmental analysis must be completed and approved.

8. **Cooperation.** The standard is to obtain approval of cooperative agreements by all involved parties prior to implementing control treatments.

9. **Mitigations and BMPs.** The standard is to ensure that control activities, especially those involving the use of pesticides, are done in compliance with policy and law (Federal Insecticide, Fungicide, and Rodenticide Act) and the Colorado Pesticide Act. Applicators will be trained to ensure that they understand established mitigations and BMPs.

10. **Monitoring and Records.** The standard is to maintain adequate records to assess the effectiveness of treatments. Project records will include the following elements:

    - Date of application
    - Target pest(s)
    - Control technique(s) used
    - Common name of herbicide(s) used
    - Description of formulation or tank mix
    - Application method (aerial, backpack, etc.)
    - Quantity (ounces/pounds) of herbicide used
    - Weather conditions (highest temperature, average wind speed, precipitation, etc.)
    - Estimate of acreage treated
    - Estimate of annual treatment success

11. **Oversight.** The standard is to ensure that annual oversight of the IPM program is completed to assess if the management objectives were met; treatments complied with standards, mitigations, and BMPs; and actions were in compliance with policies and law.

Environmental concerns for the project area follow:

1. **Bald eagle (*Haliaeetus leucocephalus*) and Golden eagle (*Aquila chrysaetos*).** These large avian predators use the San Luis Valley from November through March for winter foraging.

2. **Waterfowl.** Several species of waterfowl use the 42-mile long Canal and the half mile long feeder canal to San Luis Lake for foraging, spring nesting, etc. Water if supplied to the conveyance channel from 170 salvage wells throughout the year at a temperature of

3. **Project water.** Water from the project flows to the Rio Grande for agricultural and residential uses, including consumption by livestock and humans. Project water is used also for drinking water in San Luis State Park, preventing stagnation of two lakes, and creating wildlife habitat in the Alamosa National Wildlife Refuge and the Blanca Wildlife Habitat Area.

4. **Agriculture.** The water made available by the Project is used in the San Luis Valley for production of alfalfa hay, potatoes, wheat, barley and other small grain crops.

1.2. Proposed Action.

Management actions can be optimized by adopting a systematic approach such as IPM. Successful managers choose a variety of pest management options including prevention, containment, and control of species that have proven to be effective, economical, and environmentally acceptable. However, repeated treatments would be necessary to manage undesirable plants species, including follow-up herbicide treatments, to prevent reinvasion. Follow-up maintenance treatments would require less effort each year they are implemented. By implementing a well planned strategic IPM approach, following two or possibly three years of treatment, additional maintenance treatments would be reduced and done less frequently. The standard for managing noxious weeds would be to reduce the extent and density, and eventually eliminate infestations after the seed bank in the soil is exhausted. Control of aquatic weeds might be required annually, although treatment would only be done when water flow was significantly inhibited by aquatic weeds. Non-lethal and lethal control measures (i.e. live trapping, shooting, toxicants, etc.) would be used on problem/nuisance burrowing mammals to protect water conveyance structures. The first line of defense would be to exclude rodents from facilities, but this is not always possible. When deer mice and other rodents have invaded facilities, control with baits and traps would be required to comply with Reclamation safety policy. Also, poisonous spiders would need to be controlled in facilities to provide for the safety of employees.

1.3. Need for the Action.

1. **Canal Structures.** Exotic and native woody shrubs and trees have invaded canal structures and the density of these plants is increasing. The roots of these trees and shrubs, can damage compromise the structural integrity of the canal (Figure 3). Dense stands of grasses, annual broadleaf weeds, and perennial plants cover portions of canal faces preventing the ability of inspectors to check for seepage, cracking, sinkholes, settlements, deflections, or other signs of distress. Dense stands of plants, especially trees and shrubs, may eventually prevent adequate access for O&M activities.

Land Use Type Legend
A. Submerged
B. Floating
C. Inner berm slope
D. Access Roadway
E. Outside slope
F. Right-of-way to Boundary fence
G. Boundary Fence

Figure 3 - Land use type.

2. **Franklin Eddy Canal and Feeder Canal (Figure 4).** This 42 mile long Canal and the half-mile long feeder canal have a PVC liner that can be penetrated by the roots of native and exotic species of trees and shrubs. Mammals that dig burrows into the earthen canal structures also can damage the PVC liner. The damage from these plant and animals pests could compromise the integrity of the canal structures. A breach of the canal could have serious consequences for public safety and public property could be damaged. In addition, the ability of the Project to assist in meeting downstream compact obligations as well as other Project obligations would be at risk.

Figure 4 - The Franklin Eddy Canal

3. **Riparian Sites.** Russian olive and salt cedar infestations are increasing along the sides of water courses and in wetlands. Unmanaged, these exotic species will continue to expand in area and density and aggressively out-compete native plants communities. Dense stands of these two exotic species will also increase the risk of wildfire, use more water than native species, reduce wildlife habitat, and narrow stream channels. Hoary cress, also known as whitetop, is an exotic herbaceous plant that is highly invasive in riparian sites.

4. **Maintenance Yards, Administrative Sites, and Roadways.** Stands of undesirable plants in maintenance yards and roadways can obscure structures and pose a safety hazard for Reclamation employees and the public. Weeds often adversely affect visual quality of administrative sites and offices. Deer mice, which can transmit Hantavirus, commonly invade offices and maintenance facilities. Poisonous spiders occurring in administrative sites and facilities pose a safety treat to Reclamation employees.

5. **Exotic Weeds on Terrestrial Sites.** Russian knapweed, kochia, wild mustard, and perennial pepperweed infestations are increasing in southern Colorado, including lands managed by Reclamation. These exotic plants pose a serious invasive threat to adjacent federal, state, and private lands.

6. **Aquatic Sites.** Several species of native aquatic weeds occur in the Canal. In natural areas, plants like pondweed species are considered to be a desirable component of aquatic communities, and they provide habitat for and are an important food source for wildlife. However, extensive colonies can be troublesome in drainage canals, irrigation ditches, and other controlled aquatic systems by restricting water flow. Also, the nutrient rich water favors blooms of blue-green algae, slowing water conveyance, and the decaying matter from these blooms can reduce oxygen levels in the Canal, which would seriously impact aquatic organisms, including the introduced grass carp.

1.4. Purpose for the Action

1. **Canal Structures.** The purpose of the proposed action is to protect the structural integrity of structures allowing for (1) proper surveillance and inspection activities, (2) allow adequate access for normal O & M operations, (3) prevent damage to structures from root growth of woodsy plants, (4) prevent damage to structures from burrowing mammals, and (5) allow adequate flow-carrying capacity of water conveyance. Breach of the Canal or failure of other structures could result in unacceptable loss of life and property.

2. **Canals, Laterals, and Well Pipes.** Aquatic weeds can inhibit the adequate flow-carrying capacity of water conveyance, including spillway inlet and outlet channels; open canals, laterals, and drains. This is especially the case for the Canal that has slow water velocity because it only drops 16 feet over a distance of 42 miles. Triploid grass carp, which are incapable of reproducing, have been introduced into this canal to help control aquatic weeds. They can eat up to three times their body weight daily. However, the slow moving water in the canal is subject to blue-green algae blooms that can inhibit water flow, reduce water quality, and deplete the oxygen level in the water, which could result in killing grass carp. Also, mammals digging burrows in the sides of canals can damage the PVC liner and weaken the structure.

3. **Maintenance Yards, Roadways, and other Terrestrial Sites.** Exotic weeds like Russian knapweed, hoary cress, and wild mustard have invaded lands managed by Reclamation and they have a tremendous capacity to spread to adjacent lands of mixed ownership. Species like hoary cress and wild mustard are prolific seed producers and a

single plant can produce thousands of seeds per year. Seeds are readily spread by wind, animals, and humans, and they remain viable in the soil for several years. Thus, exotic weeds pose a significant threat to native plant communities, agriculture areas, and communities where they are considered a nuisance.

4. **Facilities and Offices.** Deer mice nesting in well sites, vault interiors, elevation wells, flow meter locations, and stilling wells pose a safety threat to employees due to the Hantavirus health hazard. Other species of nesting rodents in these facilities are considered to be nuisance pests requiring removal and clean up. Also, the black widow spider, which will build webs in well vaults, can pose a safety threat to employees. Rodents and spiders must be removed to comply with a Reclamation safety policy.

1.5. Relevant Statutes, Regulations, and other Plans.

Pertinent Laws and Regulations include:

- Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)
- Title 35, Article 9: Colorado Pesticide Act, Sections 35-10-101 to 35-10-128
- NEPA
- Endangered Species Act
- Migratory Bird Treaty Act
- Clean Water Act
- Any other pertinent state, local, or county regulations
- Issues, Public Scoping

1.6. Issues, Public Scoping.

The following issues are a concern to Reclamation:

- Issue 1. Potential effects of the alternative upon human health (public and workers)
- Issue 2. Potential effects of the alternative on non-target vegetation, including threatened, endangered, and sensitive plants
- Issue 3. Potential effects of the alternative on non-target terrestrial and aquatic animals, including threatened, endangered, and sensitive animals
- Issue 4. Potential effects of the alternative on water quality

A scoping letter and this Draft EA will be sent to public to enlist their input concerning the issues that need to be addressed in the final EA.

1.7. Issues beyond the Scope of this Document.

Vegetation management using biological methods will be analyzed under separate environmental analyses, and they will not be addressed in this EA.

1.8. Incorporation by Reference.

Regulations to implement NEPA provide for the reduction of bulk and redundancy (40 CFR 1502.21) through incorporation by reference when the effect will reduce the size of the document without impeding agency and public review of the action. With the exception of the 1992 risk assessment (item 1), the other risk assessments can be found at the following website: http://www.fs.fed.us/foresthealth/pesticide/safetydata/risk/html. A copy of the 1992 risk assessment will be available for review at the Albuquerque Area Office.

The following documents are incorporated by reference to ensure that the most recent information is reflected in this EA.

1. Risk Assessment for Herbicide Use in Forest Service Regions 1, 2, 3, 4, and 10 and on Bonneville Power Administration Sites (September 1992).
2. 2,4-D - WordPerfect Worksheets for Human Health and Ecological Risk Assessments. USDA Forest Service. November 24, 2001.
3. Selected Commercial Formulations of Glyphosate - Accord, Rodeo, Roundup, and Roundup Pro, Risk Assessment, Final Report. USDA Forest Service. April 25, 1999.
4. Effects of Surfactants on the Toxicity of Glyphosate, with specific Reference to Rodeo. USDA Forest Service. February 6, 1997.
5. Imazapyr - WordPerfect Worksheets for Human Health and Ecological Risk Assessments. USDA Forest Service. November 30, 2001.
6. Metsulfuron methyl - WordPerfect Worksheets for Human Health and Ecological Risk Assessments. USDA Forest Service. December 4, 2001.
7. Picloram - WordPerfect Worksheets for Human Health and Ecological Risk Assessments. USDA Forest Service. December 1, 2001.
8. Sulfometuron methyl (Oust) - WordPerfect Worksheets for Human Health and Ecological Risk Assessments. USDA Forest Service. November 23, 2001.
9. Triclopyr Acid (Garlon 3A) - WordPerfect Worksheets for Human Health and Ecological Risk Assessments. USDA Forest Service. November 23, 2001.
10. Triclopyr-Bee (Garlon 4) - WordPerfect Worksheets for Human Health and Ecological Risk Assessments. USDA Forest Service. November 23, 2001.
11. Neurotoxicity, Immunotoxicity, and Endocrine Disruption with Specific Commentary on Glyphosate, Triclopyr, and Hexazinone: Final Report. USDA Forest Service. February 14, 2002.
12. Vanquish (Dicamba) - WordPerfect Worksheets for Human Health and Ecological Risk Assessments. USDA Forest Service. November 27, 2001.
13. Sumner Dam Integrated Vegetation Management Plan - 2005-2010, Bureau of Reclamation.
14. Sumner Lake State Park Integrated Pest Management Plan - 2006-2011, March 2005, Bureau of Reclamation.
15. Brantley and Avalon Dams Integrated Vegetation Management Plan - 2005-2010, November 2005, Bureau of Reclamation.
16. Programmatic EA/BA of the Carlsbad Project Vegetation Management Program, Bureau of Reclamation, September 15, 2004.

17. Final Environmental Statement: Pecos River Basin Water Salvage Project, Bureau of Reclamation, February 26, 1979.
18. Final Environmental Impact Statement (FEIS), Animal Damage Control Program, Appendix P (Risk Assessment), April 1994.

Chapter 2 - Alternatives

2.1. Introduction.

The alternatives are the heart of this EA, and this chapter describes the activities of both the No Action and the Proposed Alternative to use IPM methods. These alternatives will be evaluated against the issues identified in Chapter 1, and those that will be later developed during public scoping, with respect to the affected environment described in Chapter 3, to provide a clear basis to choose among the options available for the decision maker and the public. This chapter displays the two alternatives developed in response to issues identified by Reclamation. Also, all practical alternatives were evaluated in the development of the IPM plans for the Alamosa Field Division. Additional alternatives were identified during the analysis process, but they were eliminated because they were outside the scope of the proposed action, irrelevant to the decision to be made, or conjectural and not supported by scientific or factual evidence.

2.2. Description of the Alternatives.

2.2.1. Alternative 1 - No Action. The intent of this alternative would be to eliminate any use of IPM methods to control undesirable plant and animal pest species on Reclamation lands and facilities managed by the Alamosa Field Division. All of the adverse safety, health, and environmental effects of plant and animal pests would have to be accepted. Under this alternative, Reclamation would not be able to meet its mission and management objectives. The alternative will serve as a basis of comparison for the proposed IPM alternatives.

2.2.2. Alternative 2. Integrated Pest Management using a Combination of Mechanical, Manual, and Chemical Methods

This alternative would involve the use of a combination of manual, mechanical, and chemical methods to control plant and animal pests to meet specific Reclamation objectives, which is defined as IPM. Annual selection of a mix of methods would be based on effectiveness, efficiency, environmental acceptability, and compatibility with Reclamation goals and objectives.

Different methods and strategies would be needed to address specific plant and animal pest problems. The following methods and strategies could be used under this alternative:

1. **Manual Removal of Undesirable Plants at Equipment Storage Maintenance and Yards, facilities, and Administrative Sites.** Manual vegetation control can involve the use of weed eaters, chain saws, small power mowers, as well as tools like hoes, shovels, and pruning shears. Manual control can be effective for shallow-rooted plants, but this approach may not be effective for controlling deep-rooted species like Russian knapweed. An advantage of manual control is that it can be performed selectively to remove target weeds, while preserving desirable plants. Disadvantages are that manual methods are labor-intensive and extremely expensive (Brown et al. 1999). The strategy for this method would be to annually remove individual plants or small patches of plants manually. If treatment was done before the plants set seed, some lasting control could be

expected in subsequent years. However, it is unrealistic to expect that species like wild mustard would be eliminated from Reclamation properties by manual removal. Annual management could be achieved, but it would not be possible during the timeframe of this analysis to achieve any meaningful control using manual methods.

2. **Mechanical Removal of Undesirable Terrestrial Plants.** Periodic removal of the aerial (above ground) portions of salt cedar, Russian olive, coyote willow, and other trees and shrubs by large mowers would suppress their growth and keep them from reaching their potential size. However, the root systems of the perennial species would not be removed and the plants would sprout. Some species, such as salt cedar, have the ability to grow up to six-feet or more in one growing season. Some plants could exceed 12-feet in height if they were mowed every third year. Therefore, the roots of such species could damage the levee and PVC liner from continual root growth. The use of rotary and flail mowers can provide another tool to assist mangers in maintaining vegetation height for visibility, fire protection, and appearance. A disadvantage of mowing is that it can scatter and transport of seeds and plant parts of invasive species to surrounding sites, holding areas, maintenance yards, and along roadways, thus, potentially increasing the spread of these undesirable plants. The strategy would be to annually remove the aerial portions of annual plants, grasses, or other species by mowing or removal by grading the soil with heavy equipment. Temporary management of such plants could be achieved, but it is highly unlikely that any lasting control could be achieved. The best timing to conduct such mechanical treatments would be when the plants are relatively small before they set seed. Refer to Appendix C for methods to prevent the spread of seeds and plant parts of exotic and invasive plant species.

3. **Mechanical Removal of Aquatic Weeds from the Canal.** When dense clumps of aquatic weeds impede the flow of water in canals, including stands of cattail, mechanical removal by of the clumps of weeds with excavating equipment would temporally allow for adequate water conveyance. However, this strategy would not provide any lasting control of aquatic weeds like sago pondweed, Northern watermilfoil, common waterweed, etc., that have rhizomes attached to the canal substrate. Furthermore, the PVC liner of the canal could be damaged by the mechanical removal of aquatic weeds.

4. **Use of Herbicides to Manage Salt cedar and Russian olive.** The treatment strategy is to remove all trees and shrubs on canal faces or on other structures that have the potential for their roots to weaken their structural integrity, penetrate the PVC canal liner, or interfere with inspection operations. Annual removal of woody species will protect the structures and reduce seed production, which will help to reduce treatment costs in future years. Also, removal of this vegetation will help to prevent problem/nuisance burrowing mammal and rodent activity by removing their food source. Re-vegetation of treatment sites will not be needed since the objective is to maintain the water conveyance structures free of all trees and shrubs. It will be necessary to achieve root-kill of these trees because they have the ability to sprout if the aerial portions are cut or burned. Therefore, herbicides will need to be used, singly or in conjunction with manual and mechanical methods, to achieve root-kill of these tree and shrub species. Selective mechanical removal of these trees on canal faces is not a viable option because the complete root

system must be excavated and removed, which could weaken the structure of a canal. Effective control of salt cedar and Russian olive can be achieved by foliar, cut-surface, and oil basal applications of an herbicide (Parker and Williamson 2003). Foliar applications of a mixture of imazapyr and glyphosate are effective when applied between June and September, but the best results can be achieved by applying these herbicides in late August and September when the trees are moving carbohydrate reserves to their root systems. However, imazapyr should only be used to control salt cedar, since it does not provide adequate control of Russian olive. An alternative method is to cut trees and immediately applying triclopyr. The cut-surface method will control both tree species. Also, small salt cedar and Russian olive saplings and regrowth (stems less than two to three inches in diameter at ground level and less than eight-feet tall) can be controlled by a basal application of triclopyr (ester formulation) mixed with vegetable oil or another proven carrier. Triclopyr applications can be done at any time of the year, although early fall or late spring applications are preferred. Since there are only a few salt cedar and Russian olive trees that must be controlled, the most effective and efficient approach is to apply triclopyr by the oil basal method where no spray will reach water or a cut-surface application of tricolpyr Renovate 3®, which is an aquatically labeled material, can be used immediately adjacent (within five-feet) to water.

5. **Use of Herbicides to Manage Coyote Willow.** As with other trees infesting canal faces, removal of all stands of coyote willows will be necessary. The following herbicides will provide effective control: 2,4-D, glyphosate, imazapry, methsulfuron, and triclopyr. Glyphosate and imazapyr are non-selective herbicides that will kill most plants. Triclopyr, metsulfuron, and 2,4-D are selective herbicides that will control woody plants, but they will have little or no effect on grasses. Since herbicides are registered by site, it will be necessary to select a product that has an aquatic label if there is a possibility of getting spray in water, which includes Rodeo® (glyphosate), Habitat® (imazapyr), and Renovate 3® (triclopyr). Elsewhere, the other herbicides could be an option. Since triclopyr will control salt cedar, Russian olive, and coyote willow, there is an advantage to use the same methods to control them.

6. **Use of Herbicides to Manage Gray Rabbitbrush and Greasewood.** These shrubs can be easily controlled by a water basal application of picloram (Tordon 22®) (Williamson and Parker 1995). However, picloram is a Restricted-Use herbicide that cannot be used where water is within six-feet of the soil surface or where surface movement from the inner slope of a canal bank could contaminate water. Also, applicators must be certified pesticide applicators to apply this product. When these two shrubs are close to water, a cut-surface application of glyphosate (Rodeo®) is the only option available, but this herbicide is not particularly effective against these shrubs and repeated treatments will be required to achieve total control. Aminopyralid, which is a general use product, may control these two shrubs, but field trials would need to be conducted to evaluate spray concentrations and efficacy. Treatments will need to be done annually to remove any trees or shrubs, especially those on the inner slopes of canals.

7. **Management of Invasive and noxious weeds.** The most effective strategy would be to treat entire infestations on lands managed by the Alamosa Field Division to control and

contain the invasive weeds and prevent their spread to adjoining lands of mixed ownership. However, a lack of sufficient funding often prevents the opportunity to control all infestations. Thus, it will probably be necessary to treat portions of infestations and to prioritize treatments by the species of most concern. The first priority should be to contain and control the smallest infestations. Treatment should begin at the outer perimeter and spot infestations to contain the outbreak, and then to work inward toward the most densely infested sites. Mangers often mistakenly begin treatments in the worst areas in the center of the infestation, but this approach is often the least effective and most costly approach to implement. The need to coordinate with landowners or managers on adjacent lands with contiguous infestations will be necessary to maintain the integrity of the program on Reclamation managed lands. IPM methods for management of specific plants follow:

- **Kochia**
    - **Hand-pulling and grubbing.** For small infestations (less than 1/10 of an acre), young plants can be easily removed by hand-pulling or by grubbing with a hoe or similar tool. Removal must be done when the plants are less than two feet tall before they set seed.
    - **Mechanical removal.** To be effective, mechanical treatments have to remove all kochia plants in a project area before they set seed. Since the majority of kochia seeds are not viable for more than one year, preventing seed production by mowing can substantially reduce infestations the following season. The best time to mow or surface scrape plants is before they exceed two-feet in height to reduce the amount of vegetative matter left on the ground. The combined biomass in treatment areas can present problems by clogging irrigation structures. Although it is not an option for the lands managed by the Alamosa Field Division, cutting kochia for feed can be a viable option for extensive infestations. Since each plant can produce up to 25,000 seeds, all plants on selected sites will need to be removed by mechanical means. In addition, consideration must be given to control of kochia infestations on adjacent sites to prevent wind dispersal of seeds into control sites.
    - **Herbicides. Several herbicides will effectively control kochia.** Glyphosate, imazapyr, dicamba, pendimethalin, metsulfuron methyl, sulfometuron methyl, and 2,4-D products will provide excellent control results if applied correctly. If desirable grasses are present, selective herbicides like Escort (metsulfuron), 2,4-D (Hardball®), or dicamba (Banvel®) will remove kochia and have little or no effect on the grasses. Arsenal® (imazapyr) or Accord XRT® (glyphosate) are broad spectrum herbicides that can be used where bare ground control would be acceptable. Glyphoste and 2, 4-D will likely be the most cost effective products to use. However, when glyphosate is used, ammonia sulfate (17 pounds/100 gallons of spray or equivalent rate) must be added to prevent any potential antagonism with divalent cations in alkaline water common in the Southwest. The herbicides can be applied by on-the-ground power sprayers or by backpack sprayers. Ground sprays work well on relatively flat ground where access is good and the equipment can operated. The key to success in applying herbicides is to

spray early when the kochia plants are small. This plant is the first to emerge in the spring and it is usually well advanced by the time other broadleaf weeds emerge. Good coverage is also important, and the more persistent products, such as Escort®, will provide extended results. However, if there are not desirable plant species present to occupy the site to prevent invasion by undesirable species, repeated treatments will need to be done.

- **Wild mustard**
  - **Hand removal.** Grubbing of small infestations (less than 10th acre) near structures or facilities can be the most efficient approach to control. This should be done in the early spring when the plants are rosettes or relatively small and have not set seed. This will help to reduce the seed bank in the soil.
  - **Mechanical removal.** For extensive infestations, mowing or plowing (surface removal) is an effective method where access is good. The key is to remove the plants in the spring before they set seed.
  - **Herbicides.** The following herbicides will provide effective and economical control of wild mustard: (1) glyphosate (Rodeo® on the inside face of canals and Accord XRT® or comparable product on other sites), (2) Curtail® (clopyralid and 2,4-D), and Plateau® (imazapic). Glyphoste and Curtail® will likely be the most cost effective products to use. Again, when glyphosate is used, ammonia sulfate (17 pounds/100 gallons of spray or equivalent rate) must be added. Treatment must be done early in the spring before the plants begin to set seed.

- **Russian knapweed**

Figure 5 - Photo of Russian knapweed taken in project area

  - **Hand removal.** Hand removal of Russian knapweed is ineffective due to the extensive root system that will readily produce sprouts if disturbed.
  - **Mechanical removal.** Mechanical options will not control Russian knapweed for the same reasons that hand removal does not work.
  - **Herbicides.** Herbicide use is the only current option available to control Russian knapweed. Effective control for two years after treatment of greater than 95 percent can be obtained with application of picloram, clopyralid, a combination of clopyralid plus 2,4-D plus picloram, and aminopyralid. Curtail® (clopyralid plus 2,4-D) also will provide effective control. Picloram alone or in combination with other herbicides will provide excellent results, but picloram should not be use near water or where ground water is within six-feet of the soil surface or on inside

faces of canals where surface flow could contaminate water. Curtail® is the best product to use on the inside faces of canals to control Russian knapweed. However, care must be taken to not get any spray in water. Aminopyralid, which is a relatively new product, has provided excellent control of Russian knapweed, but it cannot be applied directly to water or areas where surface water is present.

- **Perennial pepperweed**

Figure 6 - Photo of Perennial pepperweed taken in project area

  - **Hand removal.** Since perennial pepperweed is a deep rooted perennial, hand pulling or grubbing is not an effective method.
  - **Mechanical removal.** Mechanical control is not possible for the same reasons that hand removal does not work.
  - **Herbicides.** On roadsides, rangelands, and waste areas, metsulfuron applied to actively growing rosettes early in the spring will provide effective control. This herbicide also can be applied to the re-growth before the bud stage or fall re-growth before a killing frost. However, this product cannot be used where it could get into the water. Telar® (chlorsulfuron) is another sulfonylurea herbicide that can be used where water contamination will not occur. If plants are growing within five-feet of water, the best option is to use an aquatically label formulation of 2,4-D.
  - **Use of Herbicides to Manage Grasses and Herbaceous Weeds.** The strategy would be to use herbicides to control grasses and herbaceous plants in storage and maintenance yards, along roads, or canal faces when they present a safety risk for Reclamation employees, inhibit inspections, or provide food for some burrowing mammals. Spot application to individual plants or broadcast applications to patches of plants using glyphosate would provide acceptable annual control. Also, oryzalin could be added to the glyphosate spray mix to prevent plants from germinating from seeds in the soil. For weeds in the ornamental grass in front of the Alamosa Field Division Office, a 2,4-D product could be used to manage weeds. Pendimethalin would provide pre-emergent control of most annual grasses and certain broadleaf weeds as they germinate in any non-cropland site. The best treatment results with pendimethalin would be achieved when the plants are relatively small and before they begin to set seed. Since many of the seeds of undesirable species are dispersed by wind, annual treatments would likely be needed.

8. **Management of Aquatic weeds.** The strategy is to obtain the most effective long-term control aquatic plants in the conveyance and feeder canals to prevent infestations from becoming dense enough to restrict the flow of water.

   - **Biological Control.** Sterile (triploid) grass carp (*Ctenopharyngodon idella*) were introduced into the lower reaches of Canal to help control aquatic vegetation. The grass carp can reach weights of 40 to 50 pounds, and they can eat up to three times their body weight of vegetation per day.
   - **Use of Herbicides to Control Submersed plants (sago and American pondweed, northern watermilfoil, common waterweed, and white waterbuttercup).** The following herbicides are registered for control of these submersed and rooted floating aquatic plants: Aquathol® (endothol), Casoron® (dichlorbenil), Reward® (diquat), and Sonar® (fluridone). Aquathol® and Reward® must be applied directly to the vegetation, either by spot or whole-site treatments. These herbicides are fast acting and effects can be notice within a few days. However, Aquathol® has a restriction of seven to 25 days for water used for human and animal drinking and irrigation use for food crops. Reward® has a 14 day restriction for the same uses of water. As a result, they are not viable options. Casoron® and Sonar® can both be used as premergence treatments, but Casoron® cannot be used for crop irrigation, watering livestock, or for human consumption. Sonar® has fewer restrictions, but treated water cannot be used for irrigation for seven to 30 days depending on the situation and the product must not be applied within one-fourth mile of a potable water intake. Therefore, Sonar® is the only product that could be used, but it must be applied 30 days prior when the water will be used for irrigation of newly seeded forage or food crops. For established row crops, it is necessary to only wait 14 days before the water is used. Sonar® is slow acting and effects will not be observed for one to three months, but control results can last into a second or third year after application.
   - **Use Herbicides to Control Free Floating and Attached (periphyton) Algae.** These algae are present in the Canal and lateral well pipes throughout the year, and they present problems by increasing Total Dissolved Solids subsequently decreasing acceptable water deliveries to the Rio Grande. Chelated copper compounds are used to control most algae species. However, copper can be toxic to fish and aquatic animals at concentrations near levels used to control algae. Copper is a toxic metal that is long-lived (persistent) in the environment. Copper toxicity increases as water hardness decreases. Copper sulfate is not as safe to use as chelated copper compounds, and it should not be used in soft waters (alkalinity values less than 50 mg/L). No water-use restrictions are associated with copper compounds. Due to the presence of grass carp in the Canal, copper compounds were not considered for use. Trials to test the efficacy of PAK27, containing the active ingredient carbonate peroxhydrate, were conducted in 2007 and 2008. PAK27 is a pelleted contact herbicide for control of blue-green algae. The PAK27 Algaecide technical Data Sheet indicates the product could be considered a Restricted Use Herbicide in some states due to the Biological Oxygen Demand which results from decaying algae which deplete dissolved oxygen levels, especially if an entire body of water is treated. Fish kills could occur if the oxygen depletion is excessive. The U.S. Environmental

Protection Agency (EPA) granted expanded usage and an increased dosage rate for PAK27, but only a small portion of the Canal will be treated. This project was approved under another EA. Treatments will be done early in the day to allow eight to 10 hours of sunlight to mitigate the oxygen depletion activity of the compound. The treatment rate to be evaluated in June 2008 would be between 30 and 100 pounds of product per surface acre of water in the canal. Rhodamine WT dye will be used to mark the beginning and the end of the PAK27 treatment. The dye allows applicators to determine when hydrogen peroxide treated water passes through various sampling points for the collection of water samples. If adequate algae suppression is achieved in the June 2008 trials, PAK27 could be used in future years.

- **Common cattail.** Application of Sonar® for submersed and rooted floating aquatic plants will provide partial control of common cattail. Plants surviving the Sonar® treatment can be controlled with spot application of Rodeo®. An approved surfactant must be added to the Rodeo® to ensure foliage penetration. The only restriction with Rodeo® is that it cannot be used within half mile of potable water intakes.

9. **Management of Problem/Nuisance Burrowing Mammals.** The strategy would be to control problem/nuisance burrowing mammals to prevent them from constructing burrows into inner and outer faces of water conveyance structures by utilizing all lethal (pesticides and shooting) and non-lethal (live trapping and relocation) methods. Elimination or reduction of vegetation by manual, mechanical, and herbicide applications could help to prevent problem/nuisance burrowing mammal damage to, canals, and other water conveyance structures by reducing their food sources. However, since it would not possible or desirable to eliminate all vegetation, periodic control using other methods is expected to be needed. Although live trapping of some mammal species may be possible, such as for prairie dogs, the approach would neither be effective nor economical for other the removal of muskrats, which is the primary species that needs to be controlled. Managers must have the ability to use pesticides and shooting to control muskrats and prairie dogs. Even though trapping is known to be an effective method to control several species, this approach cannot be used. In 1996, Colorado voters approved a Constitutional Amendment banning the use of certain trapping methods in the state (i.e., leg-hold traps, lethal body gripping traps, etc.). Other trapping restrictions tend to limit this method of problem animal control. The project would involve trapping and removal of problem/nuisance animals like beaver, skunk, raccoon, porcupine muskrat, badger, gopher, or prairie dogs, although other infrequent mammal species may occur in the project area. An Animal Control Officer at the San Luis Valley Project would be performed by a contractor in accordance with a Statement of Work, General Provisions, Special Provisions, Division of Wildlife State regulations, Colorado Small Game regulations. Muskrats and prairie dogs are the primary species that would need to be controlled.

- **Muskrats**

    - **Cultural Methods and Exclusion.** The removal of aquatic vegetation by grass carp has reduced the potential food source for muskrats and reduced their numbers, but they still occur in the Canal. Exclusion is not a viable option.

- **Pesticides.** Zinc phosphide on baits, Aluminum phosphide (Phostoxin®) tablets, and anticoagulant baits can be used in Colorado. Zinc phosphide coated baits (two percent active ingredient) can provide effective control. Aluminum phosphide (four tablets per burrow) is another effective approach. Consultation with the state director of the APHIS/WS will be done prior to the use of toxicants.
- **Trapping.** Muskrats are one of the easiest mammals to trap, but state law in Colorado prohibits the use of certain trapping methods (leg-hold, lethal body gripping traps, etc.). Live traps could be used, but the trapped animals would be euthanized.
- **Shooting.** Shooting is a feasible method of control, but it is labor intensive.

- **Prairie Dogs**

  - **Cultural Methods and Exclusion.** There are no feasible cultural and exclusion methods along the Canal.
  - **Live Trapping and Relocation.** Live trapping can be useful for removing small populations, but it is labor intensive and expensive. Also, it has been found that about 50 percent of relocated animals usually die after relocation due to factors such as stress and predation (Personal communication with Robert Stevenson, Prairie Dog Pals, Albuquerque, New Mexico).
  - **Pesticides.** Baiting with toxicants is usually the most practical and economical method for eliminating prairie dog colonies. Zinc phosphide (at two percent oat bait) is the preferred material.
  - **Fumigant.** Aluminum phosphide comes in a tablet or pellet that can be applied in burrows with a dispenser or by hand with gloves. Holes are them plugged tightly with newspaper and soil. The tablets or pellets interact with soil moisture to release a toxic gas.
  - **Shooting.** This approach can be useful in removing small colonies, especially to remove a few individuals after other control techniques.

- **Other Mammal Species.** Excluding muskrats and prairie dogs, less than 10 other mammals have to be controlled annually; thus, the most practical approach is to remove individual problem/nuisance animals by shooting.

10. **Rodent Management.** The strategy would be to prevent rodents from being able to enter facilities and structures, and removing all mice that were able to enter such sites by trapping or the use of toxicants. The best and most permanent technique is to rodent-proof buildings and facilities by making modifications that make it impossible for rodents to enter. Sealing openings larger than one-fourth inch, plugging holes with concrete or heavy wire mesh, making doors and windows fit tightly will exclude mice. A solution of bleach and water will be used to decontaminate vaults that have nests or dead mice. The first line of defense would involve manual methods to seal various sites of entry. For mice that have entered facilities, control would be accomplished by using commercially available traps and baits (d-Con or similar products containing warfarin). These products can be purchased by the general public from a nursery or garden store.

Figure 7 - Well vault lid modified to prevent areas where mice can nest and hide.

11. **Removal of Poisonous Spiders from Facilities.** The preferred strategy would be to manually remove any spiders and their nests from structures or facilities. A fly swatter or broom could be used to effectively remove all spiders with minimal risk to Reclamation employees. The black widow spider, which is know to build webs in facilities and structures, poses a safety threat to employees, and they must be removed to comply with a Reclamation safety policy. If it is not possible to safely remove spiders and webs manually, an aerosol insecticide (malathion, acephate, or a comparable product) could be used for spider control. Again, these insecticides are available to the general public.

Table 1 - Comparison of Alternatives

Measurement Parameters	Alternative 1 No Action	Alternative 2 Preferred Alternative
Addresses the purpose and need?	No. Plant and animal pests would not be controlled. Public safety and protection of property would be at risk due to the potential failure of structures. Problem/nuisance burrowing mammals also could compromise the structural integrity of the Canal. Invasive exotic plant infestations would continue to increase and expand to adjacent lands. Weeds in administrative sites would obscure structures and equipment and present a safety hazard for Reclamation employees. Aquatic weeds would impair the delivery of salvaged water to the Rio Grande for beneficial use in accordance with the Rio Grande Compact among the States of Colorado, New Mexico, and Texas. Rodents and poisonous spider in facilities would present a safety hazard to Reclamation employees, which would conflict with Agency policy	Yes. Allows for the selection of a full range of Integrated Pest and Vegetation Management options, including the use of manual, mechanical, and chemical methods. Offers the best protection of the Canal and other structures by removing deep-rooted plants that could compromise the structural integrity and provides for the safety of the public and property. Removal of undesirable vegetations would allow adequate access for normal and emergency O&M activities and improve safety for Reclamation employees in Administrative sites. Control of undesirable plant infestations would provide an opportunity to protect native plant communities, and offer protection to adjacent lands of mixed ownership. Control of aquatic plants would allow the delivery of water in accordance with the Rio Grande Compact among the States of Colorado, New Mexico, and Texas. Prevention and control of rodents and spiders in facilities would meet Reclamation's safety policy

2.3. Alternatives Considered but Eliminated from Further Study

1. **Burning.** On sites where there are dense stands of exotic plants, fire could be used to remove the build up of dead vegetative material to avoid the potential problem of clogging water conveyance structures. However, since the plants would not burn until they begin to dry out, seed production would already have occurred, burning would not provide acceptable control the following season. Burning could be considered to remove the large amount of biomass, but would require obtaining all necessary environmental compliance and associated permits. Burning of dead exotic plants is not considered a viable vegetation management approach.

2. **Biological Control of Salt cedar.** Research is underway to evaluate the effectiveness of a leaf beetle, *Diorhabada elongata*, to control salt cedar on the Pecos River. However, it is not known if this method will address the management objectives for Reclamation. If

other biological control agents are or become available for use in managing the identified pests, a separate EA will be developed.

3. **Use of Organic Herbicides and Chemicals.** To be considered for use in managing or controlling a weed or other pest, chemicals must have a registration in compliance with FIFRA, as amended. So, it would be illegal to use any chemical like salt or diesel oil to kill plants. There are some products, such as vinegar, that will control some plants, but it was concluded that such products were not cost-effective and they were more toxic than the herbicides proposed for use. Thus, these organic compounds were eliminated from detailed consideration.

4. **Grazing with Goats or other Livestock.** Goats are being evaluated for their potential to manage weeds, such as salt cedar, but further study will be needed before this method will be considered as a viable method to achieve the management objectives identified for this analysis.

2.4. Herbicides to Control Undesirable Terrestrial Vegetation

Herbicides considered for use include aminopyralid, chlorsulfuron, clopyralid, dicamba, glyphosate, imazapic, imazapy, methsulfuron methyl, oryzalin, pendimethalin, picloram, sulfometuron methyl, triclopyr, and 2,4-D. With the exception of picloram, all of these herbicides are classified as general use products that can be purchased by the public. Piclorm is a "restricted use" herbicide, and applicators must be Certified Applicators to purchase and use this herbicide. These herbicides are marketed by a variety of trade names (Table 2).

Table 2 - Herbicide trade name list

Common Name	Trade Name
Aminopyralid	Milestone
chlorsulfuron	Telar
clopyralid	Reclaim or Curtail
Dicamba	Vanquish/Clarity/Banvel
Glyphosate	Accord XRL or similar products
Imazapic	Plateau
Imazapyr	Arsenal
Metsulfuron Methyl	Escort
Oryzalin	Surflan WDG
Pendimethalin	Pendulum
Picloram	Tordon 22K*
Sulfmeturon Methyl	Oust
Triclopyr	Garlon 3A, Garlon 4, or similar products
2,4-D	Hardball or similar products

***Restricted Use Product requiring certification**

Herbicides are categorized as selective and non-selective. Selective herbicides can kill certain groups of plants and have little or no effect on other plants. For example, 2,4-D is a selective that can kill certain broadleaf plants, but grass species are tolerant of this compound, unless it is

applied at a heavy level, which would exceed the recommendation on the pesticide label. So, certain herbicides can be selective depending on the amount and application technique used. For example, pinyon pine can be controlled more effectively with less picloram than is needed to achieve the same level of control of one-seed juniper. In this instance, the lower amount of picloram will have a lower level of potential effects on non-target plants growing immediately adjacent to the treated trees. Picloram, dicamba, and 2,4-D are all auxin-type compounds that affect the growth of plants and are selective for broadleaf plants, making them effective tools in some environments for manage difficult to control woody species while maintaining grasses. On the other hand, glyphosate and imazapyr are non-selective herbicides that can kill a broad spectrum of plants, including monocotyledons (grasses) and dicotyledons (broadleaf plants). Care must be taken when broad-spectrum herbicides are considered for use around desirable and other non-target plant species, especially those that are considered to be sensitive or rare.

There is considerable variation in the persistence of herbicides in the soil (Table 3). Some compounds can remain for over a year while other chemicals break-down in a few days. Long-term persistence in soil can be a beneficial trait for control of some plants, such as woody species like honey mesquite. Also, the residual herbicide in the soil can prevent development of the next generation of plants arising from seed. Glyphosate, 2,4-D, and dicamba are short-lived herbicides that remain in the soil for less than a month.

Table 3 - Persistence (average half-life) in soil for the herbicides proposed for use (Vencill 2002)

Herbicide	Persistence in Soil
Aminopyralid	35 Days
chlorsulfuron	40 Days
clopyralid	40 Days
Dicamba	Less than 14 Days*
Glyphosate	47 Days
Imazapic	120 Days
Imazapyr	25-142 Days*
Metsulfuron Methyl	30 Days
Oryzalin	20 Days
Pendimethalin	44 Days
Picloram	90 Days*
Sulfmeturon Methyl	2-28 Days
Triclopyr	30 Days
2,4-D	10 Days

***May persist significantly longer under conditions of low moisture, rainfall, and certain soil types.**

All of the herbicide proposed for use, except for 2,4-D, are classified by the EPA as being slightly toxic (Category III) to almost non-toxic to humans (Category IV). However, 2,4-D is rated moderately toxic (Category II), but the use of protective equipment and following safety procedures will reduce the risk to applicators. It should be understood that humans and plants have different metabolic pathways, and a compounds that is toxic to plants can be relatively non-toxic to humans (Table 4 and 5). The same concept applies to fish, birds, and species of wildlife.

Table 4 - Categories of acute pesticide toxicity and the associated signal word (Miller 1997)

Category	Signal Word Required on Label	Approximate Oral Dose That Can Kill an Average Person
I (Highly Toxic)	DANGER POISON!	A few drops to 1 teaspoon [or a few drops on the skin]
II (Moderately Toxic)	WARNING!	Over 1 teaspoon to I ounce
III (Slightly Toxic)	CAUTION!	Over 1 ounce to 1 pint or 1 pound
IV (Relatively Nontoxic)	CAUTION!	Over 1 pint or 1 pound

Table 5 - Relative acute toxicity and toxicity category of herbicides and common household compounds (Vencill 2002)

Common Name or Designation	Oral LD50 for Rats (mg/kg)	Toxicity category
Aminopyralid	>5,000	IV
Chlorsulfuron	>5,000	IV
Clopyralid	>5,000	IV
Dicamba	>5,000	IV
Glyphosate	>5,000	IV
Imazapic	>5,000	IV
Imazapyr	>5,000	IV
Metsulfuron Methyl	>5,000	IV
Oryzalin	>5,000	IV
Pendimethalin	>5,000	IV
Picloram	>5,000	IV
Sulfmeturon Methyl	>5,000	IV
Triclopyr	>1,500	III
2,4-D	375	II
Aspirin*	750	III
Caffeine*	200	II
Ethyl Alcohol*	13,700	III
Sugar*	30,000	IV
Table Salt*	3,320	IV

*** Provided only for comparison of toxicity to herbicides.**

A more detailed description of each herbicide proposed for use follows (See Table 1 for a listing of trade Names).

- **Aminopyralid.** A new herbicide available for selective control of susceptible broadleaf plants, including invasive and noxious species. It is an organic chemical that is a plant growth regulator used for controlling unwanted broadleaf vegetation. It has limited activity on woody species, including trees, when applied to the soil under the canopy. It is active at rates of application lower than other herbicides. The average half-life in soil is 35 days. This herbicide would not be used within a 10 foot buffer zone of water. The

herbicide is particularly effective in the control of knapweed species, especially Russian knapweed. The product name is Milestone.

- **Chlorsulfuron.** This is a sulfonylurea herbicide that is rapidly absorbed through the foliage and roots. It accumulates in meristematic (growth) areas in plants and interrupts a biological process necessary for plant growth. It is a dry flowable that is mixed with water and applied at very low rates (one to three ounces per acre) for control of a variety of weed species, including such difficult to control species as hoary cress (whitetop), *Cardaria draba*). It has an average half-life of 40 days in soil. The product name is Telar.
- **Clopyralid.** This is a selective, post-emergence herbicide that is mainly used to control broadleaf species in three plant families: composites (Asteraceae), leumes (Fabraceae), and buckwheates (Polyganaceae). Its selectiveness makes this herbicide a useful material for control of invasive plants like Russian knapweed, while preventing adverse effects to many native plant species. Grass species are especially tolerant to clopyralid. This herbicide is readily absorbed by roots and foliage and is readily transported to plant tissues. There is some information indicating that clopyralid may be more persistent in compost and soil, but there are no plans to use compost on the Alamosa Field Division where the herbicide could be used. This material has moderate persistent, high mobility, and high leaching potential. Thus, is would not be used near water in compliance with label requirements. This product is Reclaim and Curtail (mixture of clopyralid and 2,4-D).
- **Dicamba.** A broad spectrum herbicide used for control of broad-leaf plants. It is a growth-regulating herbicide readily absorbed and translocated from either root or foliage. This compound produces effects similar to 2,4-D. It has moderate persistence (half-life in soil under 14 days), high mobility, and high leaching potential. This herbicide would not be used within a 10-foot buffer zone of water or areas identified as shallow and sensitive aquifers. Since it can move in surface runoff, it would not be used where impervious surfaces (compacted earth) exist proximal to water. However, the use of vegetated buffer zones would mitigate the risk of runoff-related contamination to surface water sources. Vanquish, Clarity, and Banvel are products labeled for non-crop situations. Dicamba can be mixed with 2,4-D to increase its effect on certain plants.
- **Glyphosate.** This is a non-selective herbicide that controls virtually all annual and perennial weeds, but it is generally most phototoxic to annual grasses. It works by inhibiting amino acid pathways in plants. These amino acid pathways are not found in animals; thus, this herbicide has relatively low toxicity to humans. The compound is absorbed by foliage, but rainfall within six hours may reduce effectiveness. It has no soil activity. Persistence and mobility are low, and the compound tends to adhere to sediments when release into water. Roundup and Accord are commercial names of formulations registered for terrestrial applications, and Rodeo® is an aquatically labeled formulation. Since this herbicide kills a broad spectrum of plants, care is needed when it is to be applied to avoid adverse effects on adjacent non-target and desirable plant species.
- **Imazapic.** This herbicide also is considered to be non-selective, although the rate and timing of applications can provide some selectivity. It destroys weeds by blocking the pathways that produce branch chain amino acids in plants. As with glyphosate, humans and animals do not have such pathways, and the compound has low toxicity to humans.

Many native grasses and wildflowers are tolerant of this herbicide at lower rates of application, while annual weedy species are susceptible. The average half-life in the soil is 120 days. This herbicide is particularly effective for control of hoary cress. The product name is Plateau.

- **Imazapyr.** This herbicide is non-selective and it provides pre-emergence and post-emergence control, including residual control, of a variety of grasses, broadleaf weeds, and woody plants. Half-life in soil ranges from 25-142 days, depending on soil type and environmental conditions (Vencill 2002). Foliar absorption usually is rapid (within 24-hours). The product name is Arsenal. Habitat is an aquatic formulation.
- **Metsulfuron Methyl.** This is a sulfonylurea herbicide that is primarily absorbed through the foliage. It interrupts a biological process necessary for plant growth. It is a dry flowable that is mixed with water and applied at very low rates (one to three ounces per acre) for control of a variety of weed species, including such difficult to control species as hoary cress (whitetop, *Cardaria draba*) and perennial pepperweed (*Lepidium latifolium*). It is moderately residual in soil with a typical half-life of 30 days (Vencill 2002). The product labeled for non-crop areas is called Escort.
- **Oryzalin.** This herbicide should be applied to the soil prior to when undesirable plants develop from seeds. It is thought to be absorbed by roots. Most susceptible annual grasses and small-seeded broadleaf weeds fail to emerge. It is beneficial to have rain to increase the herbicidal properties of this compound, but wetting the soil by sprinkling would be worthwhile if there is no possibility of rain. This herbicide has a short to moderate residual in soil with a typical field half-life of 20 days. This compound has limited leaching under natural rainfall conditions. The trade name is Surflan WDG.
- **Pendimethalin.** This herbicide provides pre-emergent control of most annual grasses and certain broadleaf weeds as they germinate in any non-cropland site. The formulation is mixed with water and applied to the soil. The active ingredient is absorbed by roots, and it works by inhibiting polymerization of microtubles at the growth end of the tubule; thus preventing the alignment and separation of chromosomes during mitosis. It has little leaching potential and the soil half-life is about 44 days. The trade name is Pendulum.
- **Picloram**. An active ingredient in Tordon 22K, which is the trade name. It is an organic chemical that is a plant growth regulator used for controlling unwanted broadleaf vegetation. Grasses are generally not susceptible to this herbicide. Picloram is considered to be rate-selective, meaning that the plants that can be controlled are dependent upon the rate of application. At one pint per acre, picloram kills knapweeds while leaving many native species unharmed. At one quart per acre for leafy spurge control, this herbicide kills many more plant species. It is commonly use to control woody shrubs and trees by spot applications of a water solution applied to the base of target plants. This is the only "restricted use" herbicide proposed for use, and the purchase and application of this compound can only be done under the direction of a certified pesticide applicator with a valid license. The average field half-life is 90 days (Vencill 2002), although it can persist for a longer period of time. Its persistence makes it particularly useful for control of weeds, but it must be used in such a way that it does not contaminate water.
- **Sulfometuron Methyl.** This compound is another sulfonylurea herbicide that has broad spectrum properties. It is a dry flowable material that is mixed with water and is toxic to target plants at very low rates (one to three ounces per acre). The active ingredient is

- **Triclopyr.** This herbicide is selective and especially useful for controlling trees and woody shrubs. It acts by mimicking the activity of auxin, a natural growth hormone. The active ingredient is readily absorbed by foliage. Average half-life in soil is 30 days (Vencill 2002). Commercial formulations (*Garlon 3A*, *Garlon 4* (or similar products) and *Garlon 4 Ultra)* are used for vegetation management programs, and Renovate 3 is a new aquatic formulation.
- **2,4-D.** This is one of the most commonly used home and garden herbicides in the United States, and it is one of the most extensively studied. It is a selective, foliar absorbed, translocated, phenoxy herbicide used mainly in post-emergence applications. The action that kills plants mimics natural plant hormones. 2,4-D is effective against many annual and perennial broadleaf weeds. Plants are most susceptible when they are young and growing rapidly. The average field half-life is 10 days. An important utility of 2,4-D is in riparian areas for products with an aquatic label. There are many different brands for sale on the market, such as Hardball and Weed-Be-Gone, which can be purchased by the public in grocery stores, nurseries, etc.

Active ingredients in herbicide formulations are defined as the chemicals that actually control the weed. So, imazapyr, picloram, and the other herbicides discussed earlier in this chapter are active ingredients. Because the water solubility of the some of these active ingredients is too low to feasibly dissolve large amounts in water, other ingredients are mixed with them to create a formulation. Other active ingredients like ester formulations of triclopyr are mixed with vegetable oils and products like limonene, which is a compound needed to move the active ingredient through bark for oil-basal bark applications for plants like salt cedar. These additional chemicals are called “inert ingredients” because they are not toxic to weeds at the designated rates of application (Felsot 2001).

Inert ingredients are identified on the herbicide label as a percentage of the entire formulation weight or volume. For example, the formulation containing imazapyr is called Arsenal. Arsenal is composed of 28.7 percent imazapyr and 71.3 percent inert ingredients. Thus, the majority of this formulation is actually inert ingredients.

Under pesticide law, the specific chemicals and amounts in the inert ingredients is considered proprietary information and they do not have to be identified. However, some manufacturers have released the list of inert ingredients and they have been posted on the Internet.

The EPA has identified about 1,200 inert ingredients that are used in registered pesticides. The EPA reviews existing human health data for inert ingredients including common carriers. The existing data include laboratory studies, epidemiological studies, and activity and structure relationships. EPA categorized inert ingredients into one of four categories:

- **Level 1** includes inert ingredients of toxicological concern.
- **Level 2** inert ingredients are potentially toxic and considered of high priority for further testing.

- **Level 3** inert ingredients are considered of "unknown toxicity." For these chemicals, the data is insufficient to classify them at a higher level or at a lower level of concern. It must be understood, however, that the chemicals on this list do have some toxicity information, but EPA has not made a decision as to their classification. A number of chemicals on this list are also used in commonly sold consumer products without incident (Felsot 2001). Level 3 inert ingredients that may be used in herbicide formulations include borax, carbon dioxide, castor oil, jojoba bean oil, orange oil, and coconut oil soap. Bear in mind that inclusion of a chemical on the Level 3 list does not mean the chemical is hazardous when it would be used in a prudent manner.
- **Level 4** inert ingredients are regarded by the EPA as being generally innocuous. Thus, the EPA indicates there should be no concern relative to adverse effects on public health or the environment when Level 4 compounds are used in herbicide formulations.

Inert ingredients likely to be in herbicide formulations to be used in Colorado include water, ethanol, isopropanol, triethylamine, ethylenediaminetetracetic acid, polyglycol non-ionic surfactant, triisopropanolamine, and versene acid. None of these inert ingredients are listed as Level 1 or 2 compounds. The water and alcohols (ethanol and isopropanol) are Level 4 compounds, and all others are listed as Level 3.

The same method used to assess the risk of exposure and effects applied to herbicide active ingredients can be applied to the inert ingredients. The 1992 Risk Assessment for the Southwestern Region provided herbicide carrier profiles for diesel oil, limonene, kerosene, and mineral oil (III-C-90 to III-C-94), although diesel oil and other petroleum hydrocarbons will not be used as herbicide carriers added to tank mixes. However, some herbicide formulations may contain minor amounts of some petroleum hydrocarbons.

Herbicides are widely used for vegetation management because low hazard products are available, they can be safely applied in a variety of terrain, and they can effectively decrease the economic costs of management. Compared to other methods of control, herbicides can provide the highest level of control at the least cost. For example, a study of the cost and efficacy of spotted knapweed management with integrated methods in Montana provided the following results (Brown, et al. 1999): (1) Tordon 22K at one pint per acre, 95 percent control of plants at $30.75 per acre; (2) mowing, no plant control at $200.00 per acre; (3) hand-pulling, 25 percent control plants at $13,900.00 per acre.

2.5. Herbicides to Control Undesirable Aquatic Vegetation

Herbicides registered for control of these submersed and rooted floating aquatic plants include Aquathol® (endothol), Casoron® (dichlorbenil), Reward® (diquat), and Sonar® (fluridone). However, various restrictions would prevent the use of all but one of these aquatic herbicides. Fluridone is the only product that could be considered for use in the Canal. Fluridone will provide lasting control of all of the submersed aquatic plants. The herbicide is absorbed from water by plant shoots and from the hydorsoil by the roots of aquatic vascular plants. It is important to maintain the recommended concentration in contact with the target plants for as long as possible. This herbicide works by inhibiting the formation of carotene, which will cause chlorophyll to rapidly degrade in the plants. Symptoms can occur in a week or two, but it can

take one to three months before the desired level of control is achieved. It is slow acting and effects will not be observed for one to three months, but control results can last into a second or third year after application. However, fluridone must be applied 30 days prior to when the water will be used for irrigation of newly seeded forage or food crops. For established row crops, it is necessary to only wait 14 days before the water is used. Therefore, since the water is used on farms that produce feed, grain, and vegetable crops, the possibility of using fluridone is remote. Based on evaluation trials to be conducted in June 2008, PAK27 algaecide could be used in the Canal.

2.6. Pesticides Used to Control Problem/Nuisance Burrowing Mammals

Pesticides will be considered for use when problem/nuisance mammals cannot be controlled by alternative means, including lethal (shooting) and non-lethal means. The primary species that could be controlled with toxicants are muskrats and prairie dogs. A breakdown of the most recent control figures for123 animals are as follows: 104 muskrats, 15 prairie dogs, two rabbits, and two raccoons. The materials proposed for use are zinc phosphide (two percent coated baits), Phostoxin® (phosphine gas from tablets or pellets), and anitcoagulant baits. Zinc phosphide is an organic chemical that is use to control many rodents, including muskrats and prairie dogs. It is a Restricted Use Pesticide that may be purchased and used only by certified applicators. Some formulations are highly toxic (LD50 for the technical product is 45.7 mg/kg), but others are moderately to slightly toxic. For target mammals, zinc phosphide is an acutely toxic and fast-acting. Because target species can become bait shy when they consume a non-lethal dose, pre-baiting is usually performed by the applicator with untreated bait. Because treated areas may become repopulated, additional treatments may be required. Studies have shown that bait with a two percent concentration of zinc phosphide results in a 76 percent to 96 percent reduction in treated populations (APHIS, 1994). Phostoxin® (aluminum phosphide) is approved for use out-of-doors only for control of burrowing mammals, but the product may not be applied in a burrow system that is within 15 feet of a building occupied by humans and/or animals. Due to the high acute inhalation toxicity of phosphine gas, this material is a Restricted Use Pesticide. Also, Phostoxin® cannot be used in a manner that could kill or otherwise harm an endangered or threatened species, which is not a concern in the project area. Anticoagulant baits (warfarin) are another toxicant that could be used.

2.7. Rodenticide Used to Control Deer Mice and Other Rodents

When deer mice and other rodents cannot be excluded from facilities, the strategy would be to use baits with less the three percent warfarin to kill rodents. Warfarin is an anticoagulant that is highly effective in controlling mice and other rodents. It is odorless and tasteless and effective in very small dosages. Action is not rapid; usually about a week is required before a marked reduction in rodent numbers occurs. Warfarin is effective because mice do not become bait shy, and they continue to consume it until anticlotting properties have produced death through internal hemorrhage.

2.8. Insecticides to Control Spiders

The preferred alternative would include the use of two insecticides to control the black widow spider, including:

- **Malathion.** This insecticide is available to the general public and is commonly used to control a variety of insect pests. Malathion is a compound that kills arthropods that are directly sprayed or come in contact with it. It can be used to achieve effective control of aphids or caterpillars feeding on foliage. The Signal Word on the label is CAUTION, it is a TOXICITY CLASS III chemical, and the oral LD50 for rats is above 5,000 mg/kg. Malathion is a short-lived insecticide that degrades within a few hours of application when exposed to full sunlight.
- **Acephate.** A contact and systemic insecticide that also will provide effective control insects and spiders. This insecticide is another commonly used material that is available to the public to control pests that attack trees and shrubs. The Signal Word on the label is CAUTION, it is a TOXICITY CLASS III chemical, and the oral LD50 for rats ranges from 700 to 980 mg/kg.

The application of insecticides would be done by aerosol can purchased at a garden shop or grocery store. The aerosol spray would be directly applied to black widow spiders and their webs. The treated webs would not be removed until the following day to allow the material adequate time to kill the spiders.

Chapter 3 - Affected Environments

3.1. Introduction

This chapter summarizes human activities and existing environmental conditions within the facilities and on lands managed by Reclamation in the Closed Basin in the northeast portion of the San Luis Valley in Alamosa and Saguache counties, Colorado, as they pertain to the key issues identified in Chapter 1. Four initial issues were developed and evaluated by the Reclamation. Additional issues will be developed for this draft EA by requesting input from the public through scoping. Each issue will be addressed later in this chapter. The affected environment for each of the issues described in association with the actions is outlined in this EA.

Spanning 8,000 square miles, the San Luis Valley in southern Colorado is a large alpine valley. The average altitude is 7,500 feet. Mountains surround the Valley. Mt. Blanca is 14,345 feet in elevation. The valley sits atop the Rio Grande Rift, a split in the earth's crust where the sides are pulling away from each other. If the valley floor were excavated, bedrock would be down about 30,000 feet, making the actual bottom of the valley close to four miles below sea level. Over the millennia, the mountains surrounding the valley have erodes away, filling in the hole with rock, sand, and earth. Several streams flow out of the mountains into the valley, only to sink into the ground before they go very far. The only surface water to leave the Valley is the Rio Grande, flowing south along the crack named for it. There is a huge water aquifer under the valley. The valley floor is a high elevation, arid rangeland occupied by grasses and shrubs. Wet lands are present in the Alamosa National Wildlife Refuge and the Blanca Wildlife Habitat Area.

Reclamation prepared a FEIS for the project area in 1979, which predicted that pumping of groundwater at design capacity would result in an overall draw down of groundwater by at least eight-feet below the ground surface. It was concluded that this draw down in groundwater could possibly result in the loss or alternation of wetland vegetation by potential adverse effect on plant vigor, increased plant mortality, poor germination, and poor establishment of new plants. Also, changes in vegetation composition and species richness were expected, particularly in areas where the existing depth of water was less than five feet. These vegetation changes could further exacerbated by ongoing livestock grazing, and could affect wildlife populations, particularly waterfowl and shorebirds, which seasonally frequent the San Luis Valley. A vegetation monitoring program was recommended to measure actual changes in vegetation occurring throughout the life of the Project.

A Final Supplemental to the FEIS was prepared in 1982. This supplement specifically addressed the potential impact to vegetation posed by pumping of groundwater. It described the results of monitoring conducted by Reclamation indicating an apparent decline in production of greasewood, rabbitbrush, and baltic rush, but there was no obvious impact to inland saltgrass productivity, based on monitoring around a test well (Reclamation, 1982). It is significant to note that the apparent decline in vegetation production occurred before any stage of groundwater pumping. In 1984, Reclamation initiated an inventory to establish baseline conditions for vegetation. The results of two years of sampling indicated that foliar cover, annual production, and shrub density decreased from 1984 to 1985. Once again, these events occurred prior to any

Project pumping. The worst case result of the Project would involve the loss of or significant alternation of form 25,000 to 40,000 acres of ephemeral and seasonal wetlands. The FEIS indicated that 8,460 acres of wetlands would be affected. To offset this predicted loss of wetlands, mitigation water was provided to the Alamosa National Wildlife Refuge and the Blanca Wildlife Habitat Area and stabilization water was provided to the San Luis Lakes State Wildlife Area.

Annual sampling from 2000 to 2005 showed variable results with increases in vegetation at some sites and decreases at others (Agro Engineering 2005). Grass levels were higher during this period. Percent cover for shrubs increased slightly at some sites and decreased slightly in others. From 2002 to 2005, a decrease in vegetation was associated with low precipitation and very little artesian flow. There was an approximate decrease of 2,122 acres of wetlands, but a portion of this amount to due to other factors than project pumping. Nonetheless, this amount is far less that the 8,460 acres that were predicted in the FEIS.

3.2. Description of Affected Issues and Resources

3.2.1. Issue 1. Effect of the Alternative upon Human Health (Public and Workers)

1. **Manual Methods.** Hand-pulling, grubbing, or cutting of a relatively small number of plants or patches of weeds would be primarily done in storage and maintenance yards, and at administrative sites. In some cases, hand-held power tools could be used. There is always some risk of injury to employees operating chain saws, weed eaters, and power mowers, and care must to taken to properly train operators of such hand-held tools. Even though the use of safety equipment (chaps, eye protection goggles, hard hats, and steel toe boots) is mandatory for Reclamation employees when operating chain saws, there still would be some risk of injury. Therefore, this method will be evaluated with respect to the risk of injury to Reclamation employees compared with other IPM methods.

2. **Mechanical Methods.** There is always a safety risk for Reclamation employees and contractors who operate heavy equipment or who are working in the same area as the equipment. To reduce the risk, employees are required to wear safety vests, hard hats, and safety boots with steel toes. The use of heavy equipment is a routine and typical operation by Alamosa Field Division employees for many different operations, and employees are required to strictly follow safety requirements. The issue will be evaluated with respect to the relative risk to employees and contractors using of mechanical methods to treat vegetation.

3. **Pesticide Methods.** A considerable body of information from tests on laboratory animals is available for the herbicides considered for possible use in controlling noxious and invasive weeds and hazardous species. Most of these tests were conducted as a requirement of the EPA for the registration process. Only those herbicides approved by the EPA will be considered for use. In addition, all of the herbicides proposed for use have been subjected to long-term feeding studies that test for general systemic effects, such as kidney and liver damage. Also, tests of the effects on reproductive and developmental toxicity (birth defects), mutagenicity (permanent transmissible change in

genetic material), neurotoxicity (destructive or poisonous effect upon nerve tissue), carcinogenicity (ability or tendency to produce cancer), and immunotoxicity (poisonous to components of the entire immune system) have been conducted. No Observed Effect Levels (NOELs) are available for most types of these tests.

Extrapolating a NOEL from an animal study to humans is an uncertain process. No one can predict a safe exposure to any substance, natural or synthetic, unless the specific situation or context of exposure and dose are known. In other words, the risk or probability of harm from any substance or activity is never zero, but it can be so low as to be negligible. The EPA compensates for the uncertainty by dividing NOELs from test animals by a safety factor, typically 100, to derive a Reference Dose (RfD). Thus, the RfD is defined as the dose to humans at which there is a reasonable certainty of no harm. The factor of 100 is a risk management device that allows extrapolation of the data from animals to humans under the assumption that animals are less sensitive than humans. The factor also allows the data to be applicable to the most vulnerable members of the population, including children and senior citizens. Because the NOEL is mostly based on animal lifetime exposure tests, the RfD actually represents the tolerable daily exposure over a lifetime (assumed to be 70 years for humans).

The 1992 risk assessment (USDA, Forest Service) is comprised of three parts: The exposure analysis, the hazard analysis, and the risk analysis. In the exposure analysis, a range of possible doses to the public and workers is estimated. A variety of scenarios and exposure pathways are examined that could result in dermal and oral doses. In general, the exposure analysis assumes that the more a person is exposed to a particular compound, the higher the dose will be. All herbicide application scenarios for Reclamation workers, cooperators, or contractors and the public would be at or below the routine typical application rates. These estimated rates assume a minimal exposure to workers and an even lower exposure of the general public. In the hazard analysis, tests and data related to the toxicity of the various compounds are reviewed. These results are comparable to the risk assessments incorporated by reference in Chapter 1. Data indicated the doses at which toxic effects are seen and, conversely, dose levels at which no toxic effects are observed. To deal in part with incomplete information, a margin of safety, which is 100 times less than the NOEL is used. The hazard analysis also reviews the data on the possible carcinogenicity of the herbicides. This analysis assumes that any dose of a carcinogen has some probability of causing cancer and that the higher dose, the greater the probability of cancer. The third part of the risk analysis involves the analysis and characterization of risk. In this section, dose levels calculated in the exposure analysis are compared to determine the non-carcinogenic, systemic, and reproductive effects of herbicides. The risk analysis also indicates the probability of developing cancer based on a projection of the doses received over a lifetime (assumed to be 70 years for humans). Certain baseline criteria are set to evaluate the possible risk to humans. Cancer risk is set at a benchmark value of one in one million, which is commonly accepted by the scientific community as representing a negligible addition to the current United States cancer rate. Evaluation of systemic and reproductive health risk is based on the NOEL). In evaluating the potential impact to humans, it must be kept in mind the small amount that is typically used.

Direct effects for workers are those that may occur from direct contact (dermal exposure) with an herbicide. Potential applications will be by backpack and ground based mechanical methods, and the area treated per day will be dependent on the specific site and type of application. It is

determined that the proposed vegetation treatments fall within the typical scenario for herbicide use considering the proposed application rates (Table 3-B-1, Page 3-B-3) and acres treated per day per worker (Table 3-D-8, Page 3-D-23) in the 1992 risk assessment. It is determined that it is very unlikely that a project would include all of the conditions that exist in the routine extreme scenario (Table 3-D-6, Page 3-D-20; Table 3-B-2, Page 3-B-4; Table 3-D-8, Page 3-D-23, 1992 risk assessment). The conditions of herbicide application will affect the exposure; thus, implementation of the mitigation measures and Best Management Practices, covered in Chapter 2 (page 28), will reduce possible exposures. Also, using personal protective equipment, as covered in a Safety and Spill Plan (Appendix C) will lower exposure of workers by as much as 68 percent, since most application exposure is through the skin and not through the lungs by breathing vapors. Proper training and certification of applicators on mixing, loading, and application is essential to reduce the risks to workers.

For the herbicides being considered for use, 2,4-D and triclopyr pose a moderate risk of systemic effects for backpack applicators and ground mechanical applicator/mixer loader (Table 3-E-13, Page 3-E-17, 1992 risk assessment). In addition, 2,4-D and dicamba have a moderate risk for reproductive effects. These risks would be mitigated by measures covered in the preceding paragraph and by limiting maximum exposure to these herbicides. Worker doses for the remaining herbicides proposed for use are likely to be well below the RfD if reasonable safety precautions are followed. There is the possibility that workers could receive dermal exposures from the spill of an herbicide concentrate and/or the spill of an herbicide mixture, including carriers. Table 3-E-14 (Page 3-E-18), 1992 risk assessment, for right-of-way sites, displays the risks associated with accidents (assuming a 2,000-gallon tank spill). The risk to workers associated with accidental spills is expected to be negligible if they are trained, use required protective clothing and equipment, and follow steps outlined in the Safety and Spill Plan (Appendix C).

Concern has been raised about the increased risk of cancer that could result from exposure to low levels of an herbicide. All of the herbicides being considered for use have undergone testing for cancer. Tests for dicamba have shown no evidence of cancer initiation or promotion. The evidence for 2,4-D and picloram have been debated. Nevertheless, the 1992 risk assessment assumes that the various herbicides are carcinogens. The analyses also assume that any dose of a carcinogen could cause cancer and the probability of cancer increases with increased doses. Estimates of the probability of developing cancer from exposure to these compounds are based on a conservative extrapolation from cancer rates in animals subjected to the chemical for a lifetime. The projected cancer rates are highest for workers since their dose could be higher. Even for the workers, the risks seem relatively low compared to other commonly encountered risks. For example, one round-trip transcontinental aircraft trip carries with it an increased risk of cancer from cosmic rays in the order of one in a million. Smoking two cigarettes increases the risk of cancer by one in a million as does eating six pounds of peanut butter due to aflaxtoxin. Cancer probabilities would increase by one in a million after spraying 2,4-D for 137 days or spraying picloram for about 11,000 days. Since the average American has about a one in four chance of developing cancer in his or her lifetime, the cumulative impact from spraying herbicides at the proposed rates is considered to be insignificant.

There is the possibility that a small percentage of the population in south central Colorado will be hypersensitive or allergic to any one or more of the herbicides proposed for use. Well-known allergenic substances include common foods, pollen, bacterial and fungal toxins, insect bites and stings, etc. Less frequent are hypersensitivities to certain fragrances and solvents. Allergies and hypersensitivities are atypical reactions exhibited by very few individuals in any population (Felsot 2001). Typical allergic symptoms include runny nose, watery eyes, swelling, and hives. Symptoms exhibited by allergic individuals are caused by specific immunological reactions of the body that are triggered by exposure to very low doses of allergens. Allergic reactions result when the body's normal immune system defenses overproduce antibodies to specific foreign substances. Allergenic and hypersensitive reactions occur by different mechanisms than toxicity. Toxic reactions result when chemical doses become high enough to interfere with normal physiological functions of cells and tissues. Individuals who have allergic reactions or hypersensitivity are generally aware of their sensitivities and such people would not be permitted to work on spray crews. The public would be excluded from treatment sites.

Some formulations of zinc phosphide are classified as having high acute human toxicity and these products could pose a risk to applicators. They can only be applied by well trained and certified applicators. If proper label and safety procedures are followed by applicators, the acute toxicity risk would be at a low enough level to be of any concern (APHIS 1994). The risk to employees relating to the use of zinc phosphide as a burrowing mammal control measure are likely to be negligible, given the small amount (less than one pound of active ingredient per year) use along the 42-mile long canal, infrequency of use, and the inability of the substance to persist in the environment. Phostoxin® produces phosphine gas that has high acute inhalation toxicity, and it must not be applied within 15 feet of any structure (building, well vault, etc.) to avoid any phosphine gas from getting in the facility and affecting employees. Any other risks associated with prairie dog control measures with toxicants may be mitigated through proper planning and implementation. No adverse effects are anticipated if label specifications are followed (APHIS, 1994).

Rodent baits using warfarin and insecticides (malathion or acephate) used to control the black widow spider are available to the general public for use in homes. Therefore, the potential risk of using of these materials in Reclamation facilities is expected to be so exceedingly low as to be negligible.

In summary, the risk or probability of harm to humans from the proposed application of herbicides/Toxicants is not zero, but it is reasonable to expect that the human health impacts from the proposed herbicide/Toxicant applications would be insignificantly small. The process for evaluating the risk associated with the application of insecticides would be the same as for herbicides. Nevertheless, the issue of human safety will be evaluated by the potential for exposure of applicators, employees, and the public.

3.2.2. Issue 2. Effect of the Alternative on Non-target Vegetation

1. **Manual Methods.** Used to control individual plants or small patches of plants are highly selective; thus, the use of such methods would not have any significant effect on non-target plants.

2. **Mechanical Methods.** Controlling undesirable plants with heavy equipment could have associative effects to non-target vegetation. However, this method will be only used on sites that have undergone substantial disturbance, such as along roadways, canal faces, and construction sites. Therefore, such sites are mostly invaded by invasive species like Russian thistle, wild mustard, kochia, and other invasive species. Since there are no threatened, endangered, or sensitive plant species in the project area, there would be no restrictions for controlling stands of undesirable plants that are assessable to operation of heavy equipment. This issue will be evaluated on the possibility of adversely affecting desirable plant communities in Reclamation lands and adjoining sites.

3. **Pesticide Methods.** Control of woody shrubs and trees on Reclamation lands and at facilities would be accomplished by spot applications with triclopyr, imazapyr, or picloram. Foliar applications to woody species could be done with imazapry, glyphosate, metsulfuron, or 2,4-D. Foliar applications with aminopyralid, chlorsulfuron, dicamba, imazapic, imazapyr, glyphosate, metsulfuron methyl, and sulfometuron methyl would be done to remove patches of vegetation that could inhibit the inspection along the Canal, around structures, or at facilities. Since the objective on canal faces would be keep them free vegetation, affects on non-target plants would not be a concern. Thus, there would be minimal if any effect to non-target plant communities. The advantage of controlling exotic tree species with herbicides is that the roots are killed and long-term control results would be achieved. Mechanical treatments, such as mowing, do not kill the roots of exotic trees and they readily sprout and can produce more stems than prior to treatment. The effect of using the proposed herbicides will be evaluated with respect to their potential to damage or kill non-target vegetation. The proposed use of rodent and mammal toxicants and baits and insecticides and baits to control poisonous spiders would not have any adverse effect on non-target vegetation.

3.2.3. Issue 3. Effects of the Alternative on Non-target Terrestrial and Aquatic Animals, including Threatened and Endangered (T&E) species

1. **Manual Methods.** Selective control of individual plants or patches of undesirable plants in maintenance yards, around buildings, at facilities, and on lands managed by Reclamation is not expected to have any adverse effect on terrestrial or aquatic animals. The majority of the manual control would occur on disturbed areas like a maintenance yard and administrative sites.

2. **Mechanical Methods.** The use of mechanical methods would have negligible effects on non-target terrestrial and aquatic animals. Mechanical treatments would be done on disturbed sites like along roadways, such as mowing stands of grasses and other plants around structures and at administrative sites. Another method that could be used is grading. Grading is accomplished by scraping of the soil surface with ridged blades to remove exotic and invasive species, such as Russian thistle and wild mustard, or to move soil. Grading is not commonly used by Reclamation to control undesirable plants, but it could be an option, especially when grading is being done to achieve other objectives. Grading could be done along roadways, at construction sites, and other sites assessable to where such equipment can safely operate. Since terrestrial animals mostly do not occupy

such sites; the affects would be expected relatively minor. Removal of clumps of common cattail by excavating equipment with buckets might be needed occasionally to remove a constriction that would slow water conveyance, but this would not be done on the Canal to avoid damage to the PVC liner. Removal of common cattail would involve spot applications on an infrequent basis, which is not expected to have an affect on aquatic organisms. This issue will be evaluated with regard to the possibility of the affects on terrestrial and aquatic animals.

3. **Pesticide Methods.** Herbicides have the potential of impact terrestrial animals and wildlife either directly through toxicities to animals, or indirectly through manipulation of habitat. Ground-based applications were not specifically analyzed in the 1992 risk assessment because they have a very low potential to affect wildlife. The likelihood of terrestrial animals receiving a direct spray of herbicide from ground applications or coming in contact with vegetation treated with ground application equipment is significantly lower than the exposure potential from aerial applications, which was the basis of analysis in the 1992 risk assessment. Consequently, the potential risks from ground applications would likely be much lower than the risks associated with aerial applications. In addition, for the herbicides proposed for use, there is little chance of bioaccumulation through the consumption of treated vegetation or prey species. The risk from herbicide use to T&E species is no greater than that posed to other terrestrial animals. However, the EPA has set a standard twice as stringent as the "no observed effect level" for non-category animals. Habitat manipulations as a result of proposed herbicide applications would benefit some animals and potentially harm others. For example, the reduction of coyote willow along waterways could lead to a decline, albeit small, of species that depend on such shrubs for nesting or cover, but the reduction in shrubs could cause a slight increase in numbers of grass-adapted species. In general, the impact on terrestrial animals would depend on the herbicides used, their specific characteristics, and how and when they were used.

The potential impact of herbicides proposed for use on fish and other aquatic organisms is a function of three factors: 1) toxic characteristics of the active ingredient; 2) amount of the active ingredient in the water where aquatic organisms live, and 3) length of time an organism is exposed to the active ingredient.

Whether an organism is affected by an herbicide/insecticide is generally measured in a laboratory using a "LC50" test. The LC50 is the herbicide concentration that is lethal to 50 percent of the organisms exposed to the active ingredient for a given time. Although the LC50 is frequently used as a toxicity standard, 50 percent mortality of fish or other aquatic organisms would not be acceptable under any circumstance in waters managed by Reclamation. For this reason, biologists calculate a NOEL. This is the amount of active ingredient that would have no measurable effects on test organisms after several days of exposure.

The herbicides proposed for use are all characterized by relatively low aquatic toxicity under typical case water concentrations (Table 3-H-6, Page 3-H-13, 1992 Risk Assessment). The only exceptions are for triclopyr and limonene, which may present a high risk for trout in streams and a moderate risk for trout in lakes. Picloram, dicamba, and 2,4-D may present a moderate risk

under extreme water concentration, but this case seems highly unlikely under the conditions of proposed application. Dicamba and glyphosate are roughly 1/5 to 1/50 as toxic to various aquatic organisms.

In regard to the risk to T&E species or sensitive aquatic organisms, triclopyr products not labeled for aquatic use may present an unacceptable risk to T&E cold water fish under the typical case scenario. Likewise, 2,4-D not labeled for aquatic use may present an unacceptable risk to T&E aquatic invertebrates. It must be noted that the assessment was made using aerial application as the treatment approach. A ground-based application would reduce the risk. Also, it does not appear that any proposed applications will occur where these organisms are present; however, to mitigate the concern, triclopyr products not labeled for aquatic use will not be sprayed within the high water zone of any stream or water course were cold water T&E or sensitive fish are present. In addition, 2,4-D products not labeled for aquatic use will not be sprayed in any location where there are T&E or sensitive aquatic invertebrate species.

The majority of herbicide applications near water will be by hand backpack or truck mounted hand wand applications, and this will result in an exceedingly low risk of contamination of surface water. Leaching of herbicides through soil is not a significant process. Herbicides do have the potential for overland flow during heavy rainstorms, but the likelihood of such movement on infiltration-dominated sites makes water contamination unlikely. Mitigation measures and Best Management Practices will serve to reduce the potential for possible adverse effects to aquatic organisms.

As indicated in the PAK27 Technical Data Sheet, if oxygen depletion is excessive, fish kills could occur, especially if an entire body of water was treated in one application. As a precaution, treating one-third to half of a water system to control an algae bloom and waiting two to three days before treating the remaining portion of the system to prevent an unacceptable loss of fish. Only a small portion of the Canal will be treated during the June 2008 application trail, and the continuous flow of water should significantly reduce the possibility of excessive oxygen depletion.

Zinc phosphide is highly toxic to wild birds, fish, and non-target mammals. Zinc phosphide reacts in the stomach and intestines with water and hydrochloric acid to liberate phosphine gas. However, secondary toxicity to predators is low because the compound does not significantly accumulate in the muscles of target species, and predators often do not eat the digestive tract of prey mammals (Johnson and Fagerstone, 1992). Under field conditions most of the toxic effects to non-target wildlife were due to misuse or misapplication of this material. Through proper application and oversight by Reclamation managers, the potential for adverse effects to non-target animals is expected to be negligible. Also, less than a pound of active ingredient will be applied annually over a large area, which is further diminishes the potential for adverse effects. Zinc phosphide would be applied as a two percent coating on a bait, and soil moisture and acidity tends to break the compound down liberating phosphine gas. Decomposition of zinc phosphide depends on soil moisture and acidity, and this can take up to 30 days. The compound transforms into inorganic phosphate.

Phostoxin® is also very toxic to wildlife. It reacts with water in burrows sealed with paper and soil to produce phosphine gas; thus, the effects will be limited to animals in the burrow system. Phosphine gas transforms into inorganic phosphate. There are no endangered or threatened species in the project area that could be killed or harmed by the proposed application of this product. This compound cannot be applied directly to water. The analysis of effects will be based on the inherent toxicity of pesticides and the potential exposure of terrestrial animals.

For aquatic organisms, the analysis will be based on the concentration of pesticides that could be delivered to water and the length of time of the exposure. The use of insecticide and rodent baits in buildings and facilities would not have any potential to affect terrestrial or aquatic animals other than the target species.

3.2.4. Issue 4. Effects of the Alternative on Water Quality

1. **Manual Methods.** Would be mainly use in maintenance and storage yards and at administrative sites; thus, there would be no likelihood of any adverse effect on water quality.

2. **Mechanical Methods.** Mechanical treatments of vegetation could adversely affect water quality. However, it must be understood that the Canal and lateral well pipes are man-made structures that are inherently subject to erosion and disturbance. Mowing of vegetation along the edge of the canal would increase the possibility of erosion and sedimentation, but it would be difficult to estimate the actual amount contributed by mechanical treatments compared to other factors. Also, the excavation of clumps of common cattail along waterways could increase sedimentation in the water, albeit to a relatively small extent. The analysis of effects will be based on possible increase of erosion and sedimentation that could result from the use of heavy equipment, and the effect on water quality.

3. **Pesticide Methods.** Pesticide treatment impacts on water quality could occur by either direct or indirect means. Direct impacts would result from the introduction of compounds directly into water from spray drift, runoff, or leaching. Indirect impacts would result if vegetative cover was reduced to the degree that wind or water erosion would result in increased sedimentation of water. This issue will be evaluated by how and where herbicides/insecticides/rodenticides will be applied and the mitigation measures and BMPs will be utilized to reduce the potential contamination of water.

3.3. Indian Trust Assets (ITA)

ITAs or resources are defined as legal interests in assets held in trust by the Federal government for Native American Indian tribes or individual tribal members. Examples of ITAs are lands, minerals, water rights, other natural resources, money, or claims. An ITA cannot be sold, leased, or otherwise alienated without approval of the Federal government.

3.4. Environmental Justice

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, requires that the effects on minority and low-income populations within a project area be given special consideration to determine if the proposed action would result in disproportionate adverse effects to their communities. According to the most recent data from the U.S. Bureau of Economic Accounts, the annual per capita income for the State of Colorado in 2001 was $33,470.00.

3.5. Irreversible and Irretrievable Commitment of Resources of the Proposed Actions

This section describes unavoidable impact to the resources discussed within the EA that would occur with the implementation of the proposed actions. Unavoidable adverse impacts are impacts that are unavoidable and unmitigable.

Materials, such as fossil fuels, labor and various products (e.g., pesticides) would be needed to accomplish the proposed work. Generally, these materials are not retrievable, but are not considered in short supply. Their use would not have an effect on the continued resource availability. Federal public funds, which are not retrievable, would be utilized for the proposed work.

3.6. Cumulative Impacts

The Council on environmental Quality regulations (40 CFR Parts 1500-1508) implementing the procedural provisions of NEPA, as amended (42 USC∫4321 et seq.), define cumulative impacts as follows:

> "The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such actions " (40 CFR∫1508.7).

The No Action and the Proposed Action have not, or will not, contribute significantly to any past, present, or reasonably foreseeable future actions known in the proposed action area. The actions do not collectively create any significant impacts to the resources of concern. Short term cumulative effects of the proposed activities would be small in the overall regional context and would be temporary in nature.

Chapter 4 – Environmental Consequences

4.1. Introduction. This chapter describes the potential consequences or effects of the two alternatives related to management concerns and public issues.

4.2. Predicted Effects on Each Relevant Issue and Resource

4.2.1. Issue 1. Effects of the alternative upon human health (public and workers)

- **Alternative 1 - No Action.** Since there would be no action taken to manage plant and animal pests on lands and facilities managed by the Alamosa Field Division, neither workers nor the public would be at risk from injury due to using manual and mechanical methods. In addition, workers and the public would not be subjected to any pesticide exposure. On the other hand, the public would be at risk from the potential failure of water storage or conveyance structures as a result of plant roots or problem/nuisance burrowing mammals compromising their structural integrity and such as failure could result in a loss of life and substantial damage to public property. Furthermore, Reclamation employees would be subjected to health and safety risks by selection of this alternative. Allowing weeds to develop unchecked would obscure structures and equipment at equipment and maintenance yards, which would pose a safety risk through the operation of heavy equipment. In addition, the health and safety of employees would be compromised by not controlling rodents and poisonous spiders in facilities. Rodents are known to transmit diseases, such as Hantavirus, and the black widow poses a safety risk for Reclamation employees.

Hantavirus pulmonary syndrome (HPS) is a deadly disease from rodents. Humans can contract the disease when they come into contact with infected rodents or their urine and droppings. HPS was first recognized in 1993 and has since been identified throughout the United States. Although rare, HPS is potentially deadly. Rodent control in and around the home remains the primary strategy for preventing hantavirus infection.

Under the No Action Alternative, the cumulative effects from the spread and intensification of weeds would prevent Reclamation from achieving the objectives of inspecting and protecting the integrity of Canal, of other water storage and conveyance structures. Also, infestations of noxious weeds like Russian knapweed and hoary cress would continue to increase and threaten native plant and animal communities. Unchecked, aquatic weeds could clog the Canal and reduce the amount of salvaged water delivered to the Rio Grande for beneficial use in accordance with the Rio Grande Compact among the States of Colorado, New Mexico, and Texas.

- **Alternative 2.** Preferred Alternative of Integrated Pest Management using a Combination of Mechanical, Manual, and Chemical Methods

1. **Manual Methods.** Hand-pulling, grubbing, or cutting of a relatively small number of plants or patches of weeds would be primarily done in storage and maintenance yards, around buildings. In some cases, hand-held power tools could be used, and this method would pose some risk, albeit small, of injury to employees. The use of a firearm by people does pose a safety risk. A more significant risk would involve operating chain saws, weed eaters, and power mowers. Employees must be properly trained to safely operate hand-held power tools, especially chain saws. Also, employees are required to use safety equipment (chaps, eye protection goggles, hard hats, and steel toe boots) when operating chain saws. Although training and use of safety equipment will mitigate the risk of employee injury, Reclamation managers will need to accept that a few employees could be injured using manual methods.

2. **Mechanical Methods.** The use of heavy equipment is a routine and typical operation by Alamosa Field Division employees for many different operations, and employees strictly follow safety requirements. Manual and mechanical methods are not expected to be used extensively to manage vegetation; thus, using heavy equipment for vegetation management is not expected to significantly increase the rate of accidents or injury to employees or contractors.

3. **Pesticide Methods.** No toxic effects to public health are expected to occur from the proposed use of pesticides if applicators follow proper procedures and comply with the pesticide label and related aspects. Also, complying with Best Management Practices (Appendix A) and adhering to the Pesticide Safety and Spill Plan (Appendix B) would reduce the possibility of a pesticide misuse, which could result in the exposure of applicators and the public.

Routes and duration of exposure are important factors determining effect of 16 herbicides to human health. Exposure to the public would mainly come from skin contact with sprayed vegetation. The chance of this type of exposure is low since individuals would not frequent potential treatment sites, especially when spraying operations are being done. However, if an individual did enter a spray area, the skin is a protective barrier that slows movement of a material into the body, and studies show that about 10 percent or less of a chemical applied to skin is absorbed (Felsot 2001). Importantly, herbicide labeling requires low application rates for such terrestrial applications. In addition, the target for spraying would involve individual plants or scattered patches of weeds, especially at the base of woody plants that would not be contacted by people. Importantly, spraying would take place no more than once in any one site in a season. Thus, potential exposure levels to the general public, those who might have dermal contact with a dilute concentration of a small quantity of herbicide, would be well below a threshold of concern. Exposure levels of workers could be of concern in extreme scenarios without protective clothing and equipment. Therefore, it is important for workers to mitigate this concern through the proper use of protective clothing and personal protective equipment (PPE) and through careful handling of herbicide concentrates.

With respect to the herbicides identified for potential use, none pose a risk to public health for systemic or reproductive effects. None of the herbicides were found to pose greater than one in

one million risk of causing cancer. The various risk assessments (Chapter 1, Incorporated by Reference) indicate all of the herbicides analyzed show little tendency for bioaccumulation and the small amounts that could be absorbed through the skin are readily and completely eliminated from the body (Felsot 2001).

The risk to workers is low for all herbicides being considered, other than 2,4-D and dicamba, but this risk would be mitigated by limiting exposure as identified in Chapter 2, page 27 (1992 Risk Assessment, Table 3-E-4, Page E-3-8, 1992 Risk Assessment). In any 24-hour period, workers using backpacks will not be allowed to apply more than 0.9 pounds of 2,4-D or 2.3 pounds of dicamba (1992 Risk Assessment, Table 3-E-21, Page 3-E-45).

As a general rule, the inert ingredients in the herbicide formulations proposed for use are less acutely toxic than the active ingredients (1992 Risk Assessment, Table 3-F-1, Pages 3-F-2-3). Diesel oil, kerosene, and mineral oil are considered to be in the EPA Toxicity Category of "very slightly toxic," and limonene is considered "slightly toxic." In addition, exposure to any one inert ingredient is significantly lowered due to the large amount of dilution for spray mixes. For example, one pint of Tordon 22K containing 75.6 percent inert ingredients is mixed with 35 gallons of water for every acre sprayed during ground applications. Thus, the concentration of the inert ingredients would be diluted with water approximately 370 fold prior to spraying, and the Tordon would constitute about 0.09 percent of the total volume of spray. After spraying, the inert ingredients will dry on plant surfaces or deposit in the soil, where they would be subject to plant and microbial metabolism just like the active ingredient.

The aquatic herbicide fluridone is a Toxicity Category 3 for acute dermal and eye irritation, and a Toxicity Category 4 for acute oral, acute inhalation and dermal irritation. It is not a dermal sensitizer. There is no indication of reproductive or neurotoxicant effects in the literature. Fluridone is classified as not likely to be carcinogenic to humans. Thus, at labeled application rates, the herbicide would not pose a significant risk to humans. The active agent in PAK27 is hydrogen peroxide. This chemical is not expected to pose any health or safety risk to applicators or the public.

The use of a zinc phosphide and Phostoxin® will cause no adverse effects to public health for use as proposed. Employees applying the product will follow proper procedures and comply with application instructions on the label of toxicant. Employees will mitigate any exposure to the toxicant through the proper use of PPE and through careful handling of toxicant. The risk to humans is low if label specifications are followed (APHIS, Appendix P, Risk Assessment, 1994). People who have hypersensitive or allergic reactions to herbicides/toxicants are generally aware of their sensitivities and they would be informed and excluded from treatment sites during operations.

With respect to cumulative effects, the probability of Reclamation applicators (including cooperators and contractors) or the general public being exposed simultaneously to other herbicide/insecticide/rodenticide applications would be very remote. Once the spray mixture dries on plants or moves into plant tissues, the risk of exposure is very small. Likewise, the risk of exposure to herbicides applied in the previous year is even less likely. Most of the herbicides being considered for use do not persist for very long in the environment, since they are degraded

by sunlight and soil microbes. Some compounds only remain in the soil for a few hours or days while others may be present for a few months. Exposure from the various programs done in the past, and the possible exposure from proposed operations, would not likely approach the acceptable daily intake for any of the proposed herbicides.

The pesticides proposed for use in facilities and offices are the same products that the general public can buy at grocery or other stores and use inside of their homes. Such products are considered to be relatively safe and would not pose a risk to Reclamation employees. In addition, no cumulative effects would be expected to occur from the use of insecticides and rodent baits proposed to manage spiders and rodents.

4.2.2. Issue 2. Effects of the Alternative on Non-target Vegetation

- **Alternative 1 - No Action.** Selection of this alternative would pose a serious threat to native plant communities in southern Colorado. Noxious weed infestations would expand and result in significant reductions to native plant communities on Reclamation lands and adjacent federal, state, and private lands. Exotic species like salt cedar, Russian olive, Siberian elm, Russian knapweed, and hoary cress have the capacity to dominate sites and exclude native species. These invasive plants were introduced into the North American continent without their component of natural enemies. Thus, they are able to out-compete native species, especially on disturbed sites like riparian habitats and adjacent land of mixed ownership.

  Over the long term, there would be serious cumulative effects from selection of the No Action Alternative resulting in increasing expansion of exotic plant infestations, which would significantly reduce desirable native plant communities. The loss of plant species needed by local and migratory animals would result in population reductions. The economic consequences associated with noxious weed infestations would be enormous, possibly totaling tens of millions of dollars.

- **Alternative 2 - Preferred Alternative of Integrated Pest Management using a Combination of Mechanical, Manual, and Chemical Methods.**

  1. **Manual Methods.** Highly selective and would have little unintended effects on non-target vegetation. However, manual methods are extremely expensive and can cost from a few hundred dollars per acre for scattered infestations to several thousand dollars per acre to treat dense infestations. Manual methods would be used in storage and maintenance years to control individual plants or small patches of plants; thus, the use of such techniques would not have any significant effect on non-target plants.

     No cumulative impacts to non-target vegetation could be expected over the long-term from implementation of the proposed manual methods to control undesirable plants.

2. **Mechanical Methods.** Such as mowing and grading, are much less selective than manual and chemical methods and adverse effects to non-target plants would occur. However, the adverse effects could be mitigated by restricting the use of mechanical methods where there are mostly undesirable species and a minimal number of native species. Nevertheless, the expanded use of mechanical methods for this alternative would have a greater potential to adversely effect non-target vegetation than through the use of manual methods or the use of selective herbicides.

   Grading or disking would involve disturbance of the soil surface, providing a favorable substrate for seed of undesirable species, especially noxious weeds, to thrive. Significantly, equipment can transport seeds and other plant parts capable of establishment on invasive species on disturbed soil surfaces and other sites. Undesirable vegetation is expected to continue to flourish on disturbed sites, and invasive species would probably spread to adjacent sites and lands of mixed ownership.

   Mowing can be an effective means of controlling vegetation where there is access. Mower height can be adjusted to minimize disruption of plant roots and the soil surface to encourage successful competition by preferred ground cover species. However, some weed species, like sprouting shrubs, are adaptive to mowing regimes, and will overcome the adverse pressure of mowing, and this adaptive ability would effectively minimize the positive results achieved by mowing. If exotic weeds are present in an area treated mechanically, equipment would need to be cleaned of plant materials before moving to uninfested areas (Appendix C).

   No cumulative effects would be expected over the long term. Undesirable vegetation would not be controlled through the exclusive use of mechanical methods. Controlling undesirable plants with heavy equipment will have associative effects to non-target vegetation. However, this method would be used primarily on sites that have already undergone substantial disturbance, such as along roadways, canal faces, and construction sites. Therefore, such sites are mostly invaded by invasive species like kochia, wild mustard, and other exotic species. Since there are no known threatened or endangered, or sensitive plant species in the project area, there would be no restrictions for controlling stands of undesirable plants that are assessable to operation of heavy equipment.

3. **Pesticide Methods.** The use of herbicides can greatly impact non-target plant populations if the herbicide being used would kill the species of concern in occupied habitat. Several of the herbicides being considered for use are selective, meaning they can kill the species of concern while causing little or no effect to non-target plants. The impacts of treatment with selective herbicides would vary depending on how closely the target and non-target plant species are related and the rate of application. However, a selective method of application could be used to keep broad spectrum herbicides away from species of concern if the species

could be impacted. Broadcast applications of glyphosate, a broad spectrum herbicide, would not be used where desirable plant species are known to occur.

Annual plants are generally more sensitive to herbicides, and annuals would be expected to be affected to a greater degree than perennial plants, especially if they are treated before seed production. Annual and perennial weed species growing at a site for more than a few years often have large seed reserves in the upper soil horizons. Infested sites could require repeated treatment until the majority of the seeds have germinated and the plants killed. Repeated applications of broad-leaf selective herbicides could lead to grass-dominated areas.

To protect native plant communities, broadcast applications of herbicides would only be authorized by Reclamation if a selective herbicide is applied that will not harm desirable plant species. In the event that harm could occur from broadcast applications of the herbicides being considered, spraying would be limited to individual target plant applications, such as with backpack sprayers, or by truck-mounted hand wands. However, there are no known populations of threatened or endangered plants occurring in the sites being considered for possible application of herbicides. Zinc phosphide, Phostoxin®, insecticides, and anticoagulant rodent baits would have no effect on non-target vegetation in the project area.

In general, the proposed alternative would provide the best long-term management of perennial species, noxious weeds, and hard-to-control invasive plants utilizing herbicidal and other methods, under an IPM approach. If the proper IPM strategies would be implemented, noxious and invasive plant species would be effectively controlled, which would provide the best option to protect and restore desirable plant communities on Reclamation as well as adjacent lands of mixed ownership.

No cumulative impacts to native plant communities would be expected from the proposed use of the various herbicides proposed for use over the life span of this EA. Rather, selection of this alternative would offer the best protection of non-target vegetation.

None of the insecticide or rodent baits proposed for use will have any significant affect (direct, indirect, or cumulative) on non-target vegetation.

4.2.3. Issue 3. Effects of the alternative on non-target terrestrial and aquatic animals, including T&E species

- **Alternative 1 - No Action.** Failure to control vegetation on canals, roadways, and other disturbed sites on lands managed by Reclamation would have little, if any significant positive or negative effects, on non-target animals in southern Colorado. Likewise, control of problem/nuisance burrowing mammals and control of rodents in Reclamation facilities would not reduce their populations to a point of any concern. However, in the Canal, an increase in aquatic plants, especially algae, would inhibit the flow and delivery

of water critically needed by animals in the lower reaches of the Rio Grande system, such as designated habitat for the endangered Southwestern willow flycatcher (*Empidonax trailii extrimus*). Also, failure to control the expansion and intensification of invasive plant species like Russian knapweed, hoary cress, Russian olive, and salt cedar, which are capable of forming monotypic stands, would result in the progressive reduction of native plant communities, which would subsequently reduce the habitat for animals that rely on native plants for food and cover. Over time, the direct, indirect, and cumulative effects for this alternative would be greater than for the proposed alternative.

- **Alternative 2 - Preferred Alternative of Integrated Pest Management using a Combination of Mechanical, Manual, and Chemical Methods.**

1. **Manual Methods.** The majority of the manual control would be done near facilities. Selective control of individual plants or patches of undesirable plants in maintenance yards, around buildings, at facilities, and on lands managed by Reclamation is not expected to have any adverse effect on terrestrial animals and aquatic animals. Animals are not present on such sites.

2. **Mechanical Methods.** The use of mechanical methods is not likely to significantly affect terrestrial or aquatic animals. Mowing and grading are not commonly used by the Alamosa Field Division to control undesirable plants. Mowing would not remove plants just reduce their height to allow for proper inspections and to improve safety for employees. Grading is accomplished by scraping of the soil surface with ridged blades to smooth roads, etc., but it also would help to remove some species of weeds like kochia. Grading could be done on roads, at construction sites, and other sites assessable to where such equipment. Since, terrestrial animals mostly do not occupy such sites; no effects would be expected. Removal of clumps of common cattail for waterways by equipment with buckets might be needed occasionally to remove a constriction that would slow water conveyance. This would involve spot applications on an infrequent basis, and treatments would not be expected to affect either aquatic or terrestrial animals.

3. **Pesticide Methods.** Impacts of herbicidal vegetation control to terrestrial and aquatic organisms include direct toxicological effects and indirect effects from habitat alternation.

   Risk assessments reviewed for this analysis identify the toxicity levels nine of the 16 herbicides being considered for use. Comparisons of the expected environmental concentrations with the toxic levels of these herbicides indicate that adverse effects on birds, rodents, and grazing animals are not expected. Levels to which the organisms would be exposed would be hundreds to thousands of times lower than the levels that would cause toxic effects. All of the herbicides being considered are quickly excreted by exposed animals and do not accumulate in body tissues or organs. Thus, secondary effects on predators, such as coyotes or raptors, are not reasonably expected.

The direct, indirect, and cumulative impacts to animals, including insects, from herbicide applications are expected to be negligible. Since these herbicides do not bioaccumulate and they are degraded in the environment, the cumulative effects of the proposed use of herbicides would be insignificant. In addition, the proposed herbicides kill weeds by a mode of action that is unique to plants, and the toxic effects to animals, especially for dilute solutions, is relatively low or negligible.

As previously discussed, the invasion of exotic weeds into native habitats has the potential to seriously degrade them and make them unsuitable for native wildlife.

The potential impact of herbicides proposed for use on fish and other aquatic organisms is a function of three factors: 1) toxic characteristics of the active ingredient; 2) amount of the active ingredient in the water where aquatic organisms live, and 3) length of time an organism is exposed to the active ingredient.

Whether an organism is affected by an herbicide is generally measured in a laboratory using a "LC50" test. The LC50 is the herbicide concentration that is lethal to 50 percent of the organisms exposed to the active ingredient for a given time. Although the LC50 is frequently used as a toxicity standard, 50 percent mortality of fish or other aquatic organisms would not be acceptable under any circumstance for a Reclamation project. For this reason, biologists calculate a NOEL, which is the amount of active ingredient that would have no measurable effects on test organisms after several days of exposure.

The herbicides proposed for use are all characterized by relatively low aquatic toxicity under typical case water concentrations (Table 3-H-6, Page 3-H-13, 1992 Risk Assessment). The only exceptions are for triclopyr and limonene, which may present a high risk for trout in streams and a moderate risk for trout in lakes. Picloram, dicamba, and 2,4-D may present a moderate risk under extreme water concentration, but this case seems highly unlikely under the conditions of proposed application. Dicamba and glyphosate are roughly 1/5 to 1/50 as toxic to various aquatic organisms.

The majority of herbicide applications near water will be by hand backpack or truck mounted hand wand applications, and this will result in minimal risk to contamination of surface water. Leaching of herbicides through soil is not a significant process, such as on canal faces. Herbicides do have the potential for overland flow during heavy rainstorms, but the likelihood of such movement on infiltration-dominated sites makes water contamination unlikely. Mitigation measures (Chapter 5) and Best Management Practices (Appendix A) will serve to reduce the potential for possible adverse effects to aquatic organisms. These measures include establishing a buffer area next to bodies of water for broadcast applications of herbicide products that do not have aquatic labels. Glyphosate, 2,4-D, imazapyr, triclopyr formulations are labeled for aquatic use and would be the herbicides used next to bodies of water. Spot applications of terrestrial labeled materials like triclopyr, glyphosate, and imazapyr would occur to the edge of some bodies of waters in compliance with label

requirements. Through the use of these resource protection measures and following herbicide label restrictions, the potential for adverse effects to aquatic organisms and habitats would be negligible. For all of the herbicides being considered, it does not appear that an observed level of effect would occur.

The use of insecticides and rodenticides is not likely to significantly impact wildlife and their associated habitat. The effects will be measurable but localized within a small area or in the location of the problem/nuisance burrowing mammals. While the mortality of individual species may potentially occur, the viability of the wildlife populations would not be compromised and the community would recover if left alone. Impacts to wildlife populations, their habitat, and to natural processes sustaining them would be short-term and within the range of natural variability. The application methods that would be used would limit exposure of non-target species, and the minor amount that would be used (less than a pound of active ingredient per year).

Directly, indirectly, and cumulatively, this alternative provides the greatest protection for terrestrial and aquatic animals, while achieving Reclamation goals and objectives. The exception is the control of woody species with basal or cut-surface applications of triclopyr to salt cedar, Russian olive, and other shrubs and trees. Also, only those products registered for use on the inner face of the canal would be used, such as aquatically labeled products.

The use of insecticide to control spiders and rodent baits in buildings or facilities would not affect terrestrial or aquatic animals.

Directly, indirectly, and cumulatively, this alternative provides the greatest protection for terrestrial and aquatic animals. Aggressively managing noxious and invasive plants will provide the best protection of native plant communities that animals need as habitat.

4.2.4. Issue 4 - Effects of the Alternative on Water Quality

- **Alternative 1 - No Action.** No significant adverse effect to water quality would be expected by selection of the no action alternative.
- **Alternative 2 - Preferred Alternative of Integrated Pest Management using a Combination of Mechanical, Manual, and Chemical Methods.**

  1. **Manual Methods.** No effect would be expected by using manual methods, especially since they would mainly be undertaken in maintenance and storage yards.

  2. **Mechanical Methods.** The potential impact to water quality would involve mechanical treatment conducted near or along the edges of streams, canals, and other water conveyance structures. Impacts of mechanical methods would include increased runoff, soil erosion, and sedimentation. Frequent use of heavy equipment for mechanical management of vegetation could result in slight soil disturbance or

compaction, although extensive use of this method is not expected. Mowing, cutting, and trimming of vegetation may temporarily reduce the ability of vegetation to protect soil surfaces from erosion and to filter pollutants from water produced during storms. Adverse effects on water quality would result from the transport and deposition of eroded sediments that would include nutrient enrichment, increased turbidity, and decreased oxygen levels if nutrient concentrations sufficiently stimulate algae blooms. On the other hand, careful mechanical treatments like mowing, in some areas, could improve the vegetative cover along waterways and these areas would help to intercept sediments and contaminants. However, in other areas, repeated mowing pressure on native grasses reduces their vigor and leads to an increase in brush and annual weed species, which do not bind the soil and cause an increase in soil erosion from water and wind.

The greater the precipitation, the greater the likelihood would be for experiencing runoff in water. Runoff is defined as the movement of water across the soil surface until it reaches a defined natural stream channel. If the soil surface is disturbed during construction or maintenance, the infiltration capacity may be significantly reduced and runoff may occur. Grasses are particularly effective in intercepting sediments and filtering pollutants. However, where woody vegetation moves onto sites and out-competes grasses, a decrease in filtration could occur. Likewise, exotic weed infestations would reduce grasses and increase the potential for runoff. In general, the absence of any vegetation management could increase the risk of erosion of soils and decrease soil stability, thereby reducing the ability of vegetation to filter sediments from storm water before it reaches nearby streams.

Management practices that lead to a decrease in grass and other plant species that have good soil binding root systems could result in a slight adverse effect on water quality. Nevertheless, it is not likely that water quality would be substantially impacted on these sites through selection of this alternative. It must be understood that the Canal is a man-made structure and it is inherently subject to erosion during rain storms. The increase of sedimentation from mechanical treatments is not expected to cause any substantial increase in water quality.

Cumulatively, this alternative would not be as effective in controlling undesirable vegetation and erosion leading to sediments in water on the Canal and other structures would increase if invasive plant infestations continue to expand over the long term.

3. **Chemical Methods.** Impacts of herbicidal vegetation control to terrestrial and aquatic organisms include direct toxicological effects and indirect effects

Both direct and indirect water quality impacts can result from the use of herbicides to control vegetation. Direct adverse effects could result from improper applications for the following situations: (1) waters receiving herbicide from spray, drift, or spills; or (2) the possibility of large-scale applications to impervious and compacted soils, combined with runoff, transporting herbicides to water resources. However, the herbicides proposed for use are expected to have little to no negative impact on water

quality if they are applied in accordance with registered label directions. Utilization of mitigation measures (Chapter 5) and Best Management Practices (Appendix A) would further reduce the potential adverse effects. To ensure proper application and to avoid problems related to runoff, all herbicide applications would be conducted by or under the supervision of a trained pesticide applicator.

Several mechanisms prevent or retard the migration of herbicides through the soil profiles. These mechanisms include chemical precipitation, chemical degradation, volatilization, physical and biological degradation, biological uptake, and adsorption. Clays and organic matter in the soil adsorb certain organic compounds like herbicides (e.g. glyphosate). As a result, the ability of herbicides to leach through the soil column for entry to ground water would be reduced significantly. However, some herbicides have some soil activity, that is, they can dissolve in water and move down the soil column. An example would be picloram. An extensive study of the environmental fate of picloram determined that, at normal application rates, picloram was not detectable in surface or groundwater over a 445-day study (Watson et al. 1989). Nevertheless, where soil permeability could be conducive to water contamination, picloram and other water-mobile compounds will not be used where the water table is within six-feet of the surface. Also, a buffer of 10-feet would be imposed for herbicides that could move over the surface and contaminate water sources. Aquatically labeled formulations of imazapyr, 2,4-D, glyphosate, and triclopyr can be safely applied up to the edge of water sources. These herbicides have a short half-life, do not move readily through soil, have low toxicity to aquatic organisms, and have other properties that allow for their safe use near water. Imazapyr and triclopyr can be applied up to the edge of non-irrigation water sources, but they cannot be applied to water. The other materials considered in this analysis should not pose any significant threat to water quality as long as they are not applied within the buffer zone established for surface water sources.

Table 6: Potential for surface runoff and leaching for proposed herbicides (Vencill 2002)

Common Name of Herbicide	Solubility in Water (mg/L)	Half Life in Soil	Potential for Surface Runoff	Potential for Leaching
Aminopyralid	205,000	35 Days	Low	Low
Chlorsulfuron	587 (pH 5) 31,800 (pH 7)	40 Days	Low	Moderate at pH 7, but less at pH 6
Clopyralid	1,000 (Acid) 300,000 (salt)	40 Days	Moderate	Moderate
Dicamba	4,500 (acid) 4000,000 (salt)	Less than 14 Days*	Low	Low to Moderate
Glyphosate	15,700 (pH 7) 900,000 (salt, pH 7)	47 Days	Low	Low
Imazapyr	11,272 (pH 7)	25-142 Days*	Low	Low
Metsulfuron methyl	548 (pH 5) 2,790 (pH 7)	30 Days	Low	Moderate at pH 7, but less at pH 6
Oryzalin	5,420 at 7 pH	20 Days	Low	Low
Pendimethalin	0.275	44 Days	Low	Low
Picloram	430	90 Days*	Moderate	High
Sulfometuron methyl	10 (pH 5) 300 (pH 7)	20-28 Days	Low	Moderate at pH 7, but less at pH 6
Triclopyr	23 (ester) 2,100,000 (salt)	30 Days	Not Available	Not Available
2,4-D	796 (salt)	10 Days	Low	Moderate

***May persist significantly longer under conditions of low soil moisture and rainfall and soil types.**

Since the herbicides considered for use are short-lived and degrade in the environment and mitigations and BMPs will reduce the chances of herbicides moving into water, it is concluded that the typical application rates will not contribute to any significant cumulative impacts to water quality.

The potential degradation of water quality due to rodenticide (zinc phosphide and Phostoxin®) application as a control measure would cause short-term, negligible, and adverse impacts. Phosphine gas quickly degrades in the soil. Furthermore, because zinc phoshpide is non-persistent under most environmental conditions, opportunities for transport into any nearby tributaries would be limited given the generally low precipitation amounts experienced in central Colorado. Zinc phosphide and any associated byproducts are regarded as having a low potential for contamination to groundwater or surface water features (Toxnet, 1992).

Burrowing mammal toxicants, rodent baits (warfarin), and insecticides (malathion and acephate) proposed for use in facilities are far enough away from water to prevent any reasonable possibility of contamination.

If proper herbicide procedures and policies are followed, there would be not direct, indirect, or cumulative impacts to water quality.

No direct, indirect, or cumulative effects to water quality would occur from the proposed use of pesticides.

Chapter 5 – Environmental Commitments

5.1. Introduction. The application of pesticides is tightly controlled by state and federal agencies. Reclamation is required to follow all state and federal laws and regulations applicable to the application of herbicides.

5.2. Mitigations. The following mitigation measures will be followed when applying herbicides:

- All pesticide label requirements will be followed.
- All BMPs will be followed.
- Pesticides will not be directly applied to water, except aquatically labeled herbicides.
- Spot applications of triclopyr and glyphosate can be done to the edge of some bodies of water in compliance with label requirements, but spot applications will not be done within five-feet of water being used for irrigation.
- Ester formulations of triclopyr (Garlon 4 and Tahoe 4) will not be applied in the summer when high temperatures are present (over 85 degrees Fahrenheit) since this can cause volatilization.
- Applications of insecticides/rodenticides will not be done by any water sources.
- Applicators will be required to wear long-sleeved shirts and long pants, boots plus socks, and other PPE as required on the label.
- All requirements in the attached Safety and Spill Plan will be followed (see Appendix C).
- Pesticides will be secured (lock and key) at all times.
- Pesticides will be transported according to safety requirements.

Chapter 6 – Consultation and Coordination

Reclamation has coordinated with the Bureau of Land Management, U.S. Fish and Wildlife Services, and the public in the preparation of this plan. The Document was discussed with _____. In addition, this draft EA was posted on Reclamation's internet web sit from _____ to _____ for review and comment.

Chapter 7 – List of Prepares

Name	Responsibility	Qualifications	Participation
Doug Parker	Contract Specialist	M.S. Forest Entomology, 39 years professional experience with USDA Forest Service as Pest Management and Pesticide Specialist	NEPA, IPM, Pesticides
Nancy Umbreit	Environmental Protection Specialist, Integrated Pest Management Coordinator, and NEPA Project Manager	B.S. Biology; 30 years professional experience.	NEPA, IPM

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Appendix A – Best Management Practices

Pre-spray BMPs

- Comprehensive project files will be maintained.
- Non-chemical techniques will be evaluated for use when they are known to provide acceptable control (over 80 percent) at a reasonable cost.
- Pesticides will only be used when they provide the most effective control relative to cost and do not present unacceptable environmental or safety risk.
- Pesticides will be selected based on their ability to provide the most effective control and least cost.
- Applicators will be required to read and understand the label and Material Data Safety Sheet for all pesticides being used.
- The lowest effective rate for pesticides will be used.
- Treatment sites will be checked to ensure they are not occupied by threatened, endangered, or sensitive species.

Herbicide Spraying BMPs

- Application of Tordon® 22K (picloram), which is a Restricted Use herbicide, will be applied or under the direct supervision of a State of New Mexico certified applicator.
- Individuals applying pesticides will receive safety and application training prior to doing any treatment.
- Spraying will not be done when the average wind speed exceeds eight miles per hour or as indicated on the label.
- Applications will not be done when there is a threat of rain or snow.
- Treatment areas will be posted with information signs to inform the public that pesticides are being used and the date of application.
- Mixing of herbicides will not be done near water, recreation sites, residences, or areas frequented by the public.
- Daily pesticide treatment records will be kept. Note that daily use records for picloram must be kept for at least three years.
- Applicators will use appropriate PPE.

Pesticide post-spray BMPs

- Treatments will be checked to assess efficacy.
- Application records will be maintained in the project file.
- Managerial oversight will be done annually to ensure compliance with all requirements.

Appendix B – Pesticide Safety and Spill Plan

Information and Equipment

- All individuals applying pesticides will be required to receive adequate training on safety and application procedures prior to spraying. Proper state certification, within the proper categories is required when restricted use pesticides are being applied.
- A copy of pesticide labels and Material Safety Data Sheet (MSDS) will be available at all times during project operations, and applicators will be completely familiar these documents.
- Required PPE will be worn at all times when pesticide are being mixed and applied.
- An emergency spill kit, with directions for use, will be present when pesticide are being transported, mixed and applied.
- Employees will be trained in the use of the spill kit prior to initiation of operations.
- The spill kit will contain the following equipment:
  - Clean water and soap
  - Shovel
  - Broom
  - 10 pounds of absorbent material, such as kitty litter
  - Box of plastic bags
  - Nitrile gloves

Procedures for Pesticide Spill Containment

Information in this section is derived from the EPA document "Applying Pesticides Correctly: A Guide for Private and Commercial Applicators," and the rules and regulations for the Colorado Pesticide Control Act administered by the Colorado Department of Agriculture, Pesticide Management Bureau. The following information will be reviewed by workers who handle pesticides:

- Immediately notify the direct supervisor of an incident or spill. Identify the nature of the incident and extent of the spill, including the product and chemical names and the EPA registration number(s).
- Remove any injured or contaminated person to a safe area. Remove contaminated clothing and follow MSDS guidelines for emergency first aid procedures regarding exposure. Do not leave an injured person alone. Obtain medical help for any injured employee.
- Contain the spilled herbicide as much as possible on the site. Prevent the herbicide from entering ditches, gullies, wells, or water systems.
- Small Spills (Less than one gallon of herbicide formulation or less than 10 gallons of herbicide mixture)
  - Qualified employees will be present to confine a spill.
  - Follow MSDS guidelines for emergency first aid procedures in the event of an accidental exposure.
  - Restrict entry to the spill area.
  - Contain the spread of the spill with earthen dikes.

  - Cover the spill with absorbent material.
  - Place contaminated materials into leak-proof container(s) and label.
  - Dispose of contaminated material according to label instructions and State Requirements.
- Large Spills (More than one gallon of herbicide formulation or more than 10 gallons of herbicide mixture).
  - Keep people away from the spill.
  - Follow MSDS guidelines for emergency first aid procedures in the event of an accidental exposure.
  - Contain the spread of the spill with earthen dikes.
  - Cover the spill with absorbent material.
  - Spread the absorbent material around the perimeter of the spill and sweep toward the center.
  - Call the direct supervisor and the local fire department, and follow their instructions for further actions.

Procedures for Herbicide Mixing, Loading, and Disposal

- Mixing of herbicides and adjuvants will be done at least 100 feet from well heads or surface waters.
- Dilution water will be added to the spray container prior to the addition of the herbicide concentrate.
- Hoses used to add dilution water to spray containers shall be equipped with a device to prevent back-siphoning, or a minimum two-inch air gap.
- Workers mixing herbicide will wear the maximum personal protective equipment required by the label.
- Empty containers will be triple rinsed. Rinsate will be added to the spray mix or disposed of on the application site at a rate that does not exceed amounts addressed on the label.
- Unused herbicide will be stored in a locked facility in accordance with herbicide storage instructions provided by the manufacturer, and in accordance with the Colorado Department of Agriculture regulations.
- Empty and rinsed herbicide containers will be punctured and disposed of according to label instructions.

Transportation and Security

- Transport only the quantity of herbicide needed for the day's operation.
- Do not leave vehicles being used to transport pesticides unattended unless the herbicides are secured in a locked area.
- Keep herbicides separated from drivers and passengers when they are being moved from storage sites to field locations
- Do not transport open container with herbicides.
- Make sure all lids or bungs are tight on pesticide containers prior to transport.
- Maintain security of pesticides s at field sites.

Appendix C - Prevention by Heavy Equipment Hygiene

Introduction

Construction equipment hygiene and clean-down procedures is necessary to prevent the spread and development of noxious weeds and invasive plants.

- The Issue. Relocating construction equipment from project to project, or from one site to another, is a significant factor in the spread of weeds and development of weed infestations.
- Contaminants Causing Spread. The most common contaminants on equipment are weed seeds and plant debris or plant parts that can result in vegetative reproduction. Some seeds are small and they can be difficult to remove, especially when they penetrate deep into mechanical parts of the equipment.

Initial Preventive Measures

An effective and economical preventive approach is for equipment operators to avoid contamination of machinery. This approach can reduce or eliminate the need to clean equipment. Some useful practices include:

- Work from non-infested areas into infested areas.
- Strategically designate equipment wash-down sites at each project to minimize weed spread.

Machinery Most at Risk

The types of machinery and equipment that are of concern in the spread of weeds follow:

- Track Equipment (dozer, excavator, crane, mulcher, etc.).
- Pneumatic Wheel Equipment (loader, grader, scraper, backhoe, chipper, etc.).

Critical Contamination Areas

When decontaminating equipment and attachments, there are certain areas of the machine that require particular attention. These areas of critical contamination generally come into contact with the soil or plant material when the equipment is in use.

Clean-Down Options

The following are effective methods to remove weed seeds and plants:

- Wash-down can be achieved by applying water to the equipment at high pressure using a pressure cleaner or spray tank and pump. The critical areas on equipment must be rigorously targeted and thoroughly washed clean.

- Air blast assists decontamination of machinery, especially for those hard-to-reach areas such as cavities and joints. A compressor with hose and suitable nozzles is required.
- Physical removal with hand-held tools is an option that is most appropriate for contaminants that adhere to equipment. Physical removal is often undertaken prior to or as a follow up procedure to both water and/ or air blast clean-down. This may be labor intensive, but it will ensure that contaminants are removed and disposed of correctly. Brooms, brushes, shovels, and scraping tools can help with clean down procedures.

Clean-Down Considerations

When implementing hygiene protocols a number of considerations need to be addressed to minimize further infestations and achieve maximum hygiene standards. These include:

- Whether to clean the equipment on or off project site.
- Whether to utilize companies that provide portable equipment cleaning facilities.
- Whether to use existing equipment wash bay facilities located at local commercial enterprises.

Important Consideration

When engaging contractors, verify that they implement equipment hygiene protocols as a standard practice. Undertake physical inspections of their equipment to confirm weed free status, before and after the job is undertaken.

General Movement of Equipment

Everyone has a responsibility to ensure that they check their equipment for possible weed seed and plant part contaminants and implement appropriate clean down procedures.