Environmental Assessment for the Invasive Exotic Plant Management Program

Coronado National Forest; Cochise, Graham, Pima, Pinal and Santa Cruz Counties in Southeastern Arizona; and Hidalgo County in Southwestern New Mexico
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ABSTRACT

The Coronado National Forest proposes to develop and implement an Integrated Vegetation Management (IVM) program for the control of invasive exotic plants. The project area is located on National Forest lands in southeastern Arizona and southwestern New Mexico. This action is needed in order to meet the requirements of law, regulation and policy and because invasive exotic plants occur on and near the Coronado National Forest.

The proposed action would authorize the use of physical and cultural methods of invasive exotic plant removal as well as ground based application of chemical herbicides. In addition to the proposed action, the Forest Service also evaluated the following alternatives:

- All treatments recognized under IVM except for the use of herbicides
- No Action

Based upon the effects of the alternatives analyzed and disclosed in this EA, the Forest Supervisor will decide whether to implement the proposed management program, or to implement an alternative to the program. If the Forest Supervisor decides to implement all or part of the program, he or she will also decide when and under what terms and conditions the Forest would conduct such activities, and what measures would be needed to meet Forest Plan goals and standards and to provide adequate mitigation.

The Forest Service has prepared this Environmental Assessment in compliance with the National Environmental Policy Act (NEPA) and other relevant federal and state laws and regulations. This Environmental Assessment discloses the direct, indirect, and cumulative environmental impacts that would result from the proposed action and alternatives. The document is organized as follows:

Chapter 1, Purpose and Need for Action. This section includes information on the purpose of and need for the project, the agency’s proposal for achieving that purpose and need, public involvement and issued identified by the interdisciplinary team.

Chapter 2, Alternatives, Including the Proposed Action: This chapter provides a description of the agency’s proposed action as well as alternative methods for achieving the stated purpose. These alternatives were developed based on significant issues raised by the public and other agencies. This section also includes mitigation measures included in the proposed action.

Chapter 3, Affected Environment and Environmental Consequences: This section describes the affected environment and environmental consequences of implementing the proposed action and alternatives. The No Action Alternative provides a baseline for evaluation and comparison of the other alternatives.

Chapter 4, Consultation and Coordination: This section provides a list of preparers and agencies consulted during the development of the environmental assessment.

Appendices: The appendices provide more detailed information to support the analyses presented in the environmental assessment.

Additional documentation, including more detailed analyses of project-area resources, may be found in the project planning record located at the Coronado National Forest Supervisor’s Office in Tucson, Arizona.
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CHAPTER 1 – PURPOSE AND NEED FOR ACTION

Introduction

The Organic Act of 1897 provided for the establishment of National Forests, in part “…for the purpose of securing favorable conditions of waterflows…” The Forest Service Natural Resource Agenda for the 21st century clarified that statement to identify critical issues facing our watersheds and ecosystems including invasion of exotic species. Actions identified to implement this policy include preventing “…exotic organisms from entering or spreading in the United States”. Further, the Federal Noxious Weed Act (7 U.S.C. § 2801-2814) and Executive Order 13112 authorize federal agencies to initiate control and eradication actions against incipient infestations of invasive exotic species that are introduced into this country. Federal actions such as noxious weed and invasive species eradication or control projects must be analyzed to determine the potential environmental consequences (National Environmental Policy Act of 1969).

The term “noxious weed” has legal ramifications for states that have noxious weed laws or regulations. Noxious weeds in Arizona are those species that are “…liable to be, detrimental or destructive and difficult to control or eradicate…” (ARS § 3-201). New Mexico defines a noxious weed as “a plant species that is not indigenous to New Mexico and that has been targeted pursuant to the Noxious Weed Management Act for control because of its negative impact on economy or environment” (§ 76-7-1 to 76-7-22 NMSA 1978, Doc. 17). The term “noxious weed” has been selected for use in the Forest Service Region 3 Weed Management Strategy, issued in January 1999, to pertain to invasive exotic plants that will cause adverse environmental, social, and economic effects, altering management objectives for the Southwestern Region. Forest Service policy (Forest Service Manual 2080.5) defines noxious weeds as: “Those plant species designated as noxious weeds by the Secretary of Agriculture or by responsible state official. Noxious weeds generally possess one or more of the following characteristics: aggressive and difficult to manage, poisonous, toxic, parasitic, a carrier or host of serious insect or disease and being native or new to or not common to the United States or parts thereof.”

While small populations of designated noxious weeds occur on the Forest, a more significant problem is with invasive exotic species. Federal and state laws generally define noxious weeds in terms of interference with commodity uses and economic impacts; however, the impact of invasive exotic plants on ecosystem processes such as hydrology, fire frequency and plant productivity is a growing concern. Since the Coronado National Forest was established in 1908, invasive plants have increased in numbers and distribution across the Forest. This Environmental Assessment (EA) had been prepared to analyze and disclose the effects of a proposed integrated vegetation management program to eradicate and control invasive plants on the Forest. It provides general programmatic direction for weed and invasive species control. The guidance and analyses contained herein will be used to guide the development of annual operating plans throughout the Forest where invasive exotic plant management activities are proposed. Invasive exotic plants include noxious weeds (eg. yellow star thistle), but also
include numerous other plant species that cause detrimental changes to native ecosystems. In this analysis, the term “noxious weed” is used to refer to those species that are designated as such on a state or federal list. The terms “invasive exotic”, “invasive plant” or “weed” are used to refer to the broader category of invasive plant species included in the analysis.

**Purpose and Need for Action**

The spread of invasive species threatens the health of native ecosystems by causing changes in the composition and functioning of native plant communities that are the foundation for native ecosystems. Invasive plants have characteristics that permit them to rapidly invade and dominate new areas, out competing other vegetation for light, moisture and nutrients. Some of these characteristics include (Westbrooks 1998):

- Early maturation;
- Profuse reproduction by seeds and/or vegetative structures;
- Seed with long viability periods;
- Seed dormancy allowing periodic germination during favorable conditions;
- Adapted to spread via human and natural agents such as in contaminated gravel or crop seed, in tires, and on livestock, pets or clothing;
- Production of biological toxins that suppress the growth of other plants;
- Prickles, spines or thorns that can cause physical injury and repel animals;
- The ability to parasitize other plants;
- Seeds that are the same size and shape as crop seed, making cleaning difficult;
- Root structures with large food reserves;
- Able to survive and produce seed under adverse environmental conditions;
- High photosynthetic rates.

Invasive plants are often spread by human activities associated with vehicles and roads, agricultural practices, urban development, contaminated livestock feed, contaminated seed, and poor range management practices (Belsky and Gelbard 2000). Monocultures of noxious weeds such as yellow star thistle can become established in unmanaged lands and spread to adjacent rangeland, forests, and farmlands, causing great environmental and economic impacts. According to a recent survey by the U.S. Department of the Interior, noxious weeds have invaded over 17 million acres of public lands in the West, more than quadrupling their range from 1985-1995 (Westbrooks 1998). When invasive species such as cheatgrass, red brome and medusahead are included, there are 100 million acres of moderately to heavily infested land. Invasive species are expanding their range on public lands at the rate of approximately seven square miles per day (Westbrooks 1998). The public has become increasingly concerned as aggressive noxious weeds replace native plants, reduce access to recreational sites, and reduce forage for livestock and wildlife.
Noxious weeds and invasive species may have adverse health effects on humans by causing mechanical injuries and creating allergic reactions. A summary of adverse environmental impacts of invasive exotic species on public lands is presented below (Westbrooks 1998).

Wildlife, Plant Communities and Biodiversity: Solid stands of invasive plants can replace natural ecosystems and lead to extinction of native plant species, including threatened and endangered species. Invasive plants can impair soil and water resources, ruin fish spawning habitat by causing soil erosion, reduce the amount of cryptogamic ground crust which is important for nitrogen fixation and degrade wildlife habitat by simplifying plant communities and reducing available forage.

Cultural Resources: Plant species and populations traditionally used for religious and cultural practices by American Indians, Hispanics, Anglos, and others can be threatened by invasive plant species.

Recreation: Invasive plants can be a nuisance to hikers, campers, boaters, pets and rafters, and can reduce revenues from hunting, fishing, and tourism.

Forests: Invasive plants can increase the risk of fire hazards, are serious problems in forest nurseries and can reduce regeneration, growth and yield in plantations.

Wetlands and Waterways: Invasive aquatic plants slow water flow which results in more evaporation from ditches, reduce water intended for crops and can interfere with boat travel.

Rights-of-Way: Highway and Utility Corridors: Invasive weeds increase road maintenance costs by growing through cracks in asphalt, obscure vision at intersections and increase costs of vegetation management.

Rangeland and Pastures: Invasive plants can injure grazing animals and reduce forage and water available and can create or contribute to existing soil erosion problems.

The current cost to the U.S. economy is estimated at over $40 billion every year. This economic impact will increase without intervention (Griffith 1999). Invasive exotic plants do not require human disturbance to become established, and therefore pose an increasing threat to the integrity of wildland ecosystems (Olson 1999). These species are all introduced from other areas and have few natural, ecological controls to limit their spread. The increasingly devastating effects of weed invasion include reducing biological diversity, impacting threatened and endangered species and wildlife habitat, modifying vegetative seral stages, changing fire and nutrient cycles, and degrading soil structure (Olson 1999).

Existing Condition

While the Coronado National Forest does not have a severe problem with noxious weeds, there are small infestations of invasive exotic species in 7 of the 12 designated Ecosystem Management Areas (EMAs) that make up the Forest. The invasive exotic plant species included for analysis in this environmental assessment are those known to occur, suspected of occurring, or having the potential to occur on the Coronado National Forest. Species initially included for management consideration are listed in Table 1. Additional species that will be considered are any that are listed as a noxious weed in Arizona or New Mexico State regulations, identified as an invasive exotic species by the
Southwestern Region of the Forest Service, or are identified as a species of local concern to the Coronado National Forest.

Table 1. Species initially included in the management program

<table>
<thead>
<tr>
<th>Species Common Name</th>
<th>Scientific Name</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yellow starthistle</td>
<td>Centaurea solstitialis, Centaurea melitensis</td>
<td>AZ &amp; NM noxious weed, NM noxious weed</td>
</tr>
<tr>
<td>Malta starthistle</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Canada thistle</td>
<td>Cirsium arvense</td>
<td>AZ &amp; NM noxious weed</td>
</tr>
<tr>
<td>Texas blueweed</td>
<td>Helianthus ciliaris</td>
<td>AZ noxious weed</td>
</tr>
<tr>
<td>Sweet resin bush</td>
<td>Euryops subcarnosus</td>
<td>AZ noxious weed</td>
</tr>
<tr>
<td>Salt cedar</td>
<td>Tamarix spp.</td>
<td>Regional list</td>
</tr>
<tr>
<td>Bull thistle</td>
<td>Cirsium vulgare</td>
<td>Regional list</td>
</tr>
<tr>
<td>Tree of Heaven</td>
<td>Ailanthis altissima</td>
<td>Local concern</td>
</tr>
<tr>
<td>Pentzia</td>
<td>Pentzia incana</td>
<td>Local concern</td>
</tr>
<tr>
<td>Buffelgrass</td>
<td>Pennisetum ciliaris</td>
<td>Local concern</td>
</tr>
<tr>
<td>Fountain grass</td>
<td>Pennisetum setaceum</td>
<td>Local concern</td>
</tr>
<tr>
<td>Giant reed</td>
<td>Arundo donax</td>
<td>Local concern</td>
</tr>
<tr>
<td>Johnsongrass</td>
<td>Sorghum halepense</td>
<td>Local concern</td>
</tr>
<tr>
<td>Lehmann lovegrass</td>
<td>Eragrostis lehmanniana</td>
<td>Local concern</td>
</tr>
<tr>
<td>African sumac</td>
<td>Rhus lancea</td>
<td>Local concern</td>
</tr>
</tbody>
</table>

One invasive exotic, Lehmann lovegrass, occurs in all EMAs, often in extensive populations. Other than Lehmann lovegrass, no invasive exotic plants have been noted in the Galiuro, Dragoon, Whetstone, Winchester, or Santa Teresa EMAs. Many of the known locations were identified during a 1999 survey of primary roads, recreation areas, and administrative sites on the Douglas, Nogales, Sierra Vista, and Safford Ranger Districts (Doc. 6, project record). The initial survey for the Santa Catalina EMA is not complete, although several species invasive plants have been identified in this EMA. In addition to the survey information, there are other known populations. Occurrence of each species is shown for each EMA in Table 2 and the locations of known populations are shown on maps 2-8. Additional surveys are needed in all EMAs. All known populations occur at the lower elevations, with the exception of the populations of Canada thistle, which have been found in the Pinaleno EMA at elevations over 8500 feet. Eight designated wilderness areas occur on the Forest. Only the Pusch Ridge Wilderness in the Santa Catalina Mountains is affected by infestations of invasive plants to any significant degree. Buffelgrass and fountain grass are spreading throughout canyons at lower elevations.

Limited invasive plant management efforts have been undertaken on the Forest to date. These efforts have been generally confined to control activities. Mechanical treatment, including burning, has been used to manage some populations, but it does not appear to effectively control the overall expansion of weeds or prevent the introduction of new weed species. In general, treatment with mechanical methods has been proven to be labor intensive and expensive, even with small weed populations. Soil disturbance associated with mechanical weed control efforts has proven to increase seed germination of target weed species. There is a need for an integrated, environmentally safe and cost effective program to control existing populations of weeds and to prevent or reduce the potential
for future infestation on the Forest. Once weed populations become large, they can only be contained through constant, long-term intervention. Complete eradication once a species is well established is extremely difficult or impossible. Prevention of spread of weeds is the most cost effective and environmentally sound control method available.

Table 2. Presence of species by EMA

<table>
<thead>
<tr>
<th>Species</th>
<th>Chiricahua EMA</th>
<th>Peloncillo EMA</th>
<th>Pinaleño EMA</th>
<th>Huachuca EMA</th>
<th>Santa Rita EMA</th>
<th>Tumacacori EMA</th>
<th>Santa Catalina EMA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tree of Heaven</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bull thistle</td>
<td>X</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Texas blueweed</td>
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<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yellow or Malta starthistle</td>
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<td></td>
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<tr>
<td>Sweet resin bush</td>
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<tr>
<td>Pentzia</td>
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</tr>
<tr>
<td>Canada thistle</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Buffelgrass</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fountain grass</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Giant reed</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salt cedar</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Johnson grass</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lehmann lovegrass</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>African Sumac</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

**Tree of Heaven:** This species is native to central China. It was first introduced into the United States at Philadelphia, PA in 1784. It was introduced into California in the mid-1880s by Chinese immigrants, who valued the plant for its purported medicinal and cultural properties. It is now widely naturalized throughout the US. Tree of heaven occurs often on private land adjacent to the Forest, and there are small populations ranging from individual trees to small thickets on Forest lands in the Huachuca and Tumacacori EMAs. On the Forest, it is frequently found around abandoned mining settlements. Tree of heaven grows rapidly and is a prolific seed producer. Vegetative reproduction is by sprouting from stumps or root portions. It also appears to be somewhat allelopathic, that is, it produces a toxin that prevents the establishment of other plant species. Because of these characteristics, it can quickly take over a site and form an impenetrable thicket.

**Bull thistle:** There are approximately 40 acres in Chiricahua EMA infested with bull thistle. This area has been treated in the past with hand pulling and grubbing with limited success. It is a high priority for treatment.

**Texas blueweed:** The only population of Texas blueweed found is in the Peloncillo EMA. It is on private land but is adjacent to the Forest and poses a threat of infestation.

**Yellow and Malta starthistle:** There is an unconfirmed population of either Malta or yellow starthistle in the Peloncillo EMA on the Robertson allotment. There are populations on private land or lands of other jurisdiction adjacent to the Forest boundary. Both species are winter annuals that are members of the sunflower family (Asteraceae) and native to Europe. A single yellow starthistle plant can produce up to 150,000 seeds and the species has become a significant pest in some areas of the West. It currently infests millions of acres in Oregon, Idaho, Washington and California. As the plant invades sites, it displaces native species, reduces plant diversity and contributes to
accelerated soil erosion and surface runoff. Because of its highly invasive tendencies, yellow star thistle is a high priority to survey the National Forest and treat any plants that may be found.

**Sweet resin bush and Pentzia:** There are two populations of sweet resin bush in the Pinaleño EMA that cover approximately 100 acres. Much more extensive infestations occur on State land adjacent to the Forest on Frye Mesa. Additional, smaller populations are found in the Santa Catalina EMA in Sabino Canyon and Molino Basin. There is one population of Pentzia in the Pinaleño EMA as well as a mixed population of the two species in the Marijilda Creek area. These have been treated in the past using prescribed fire and hand-grubbing. A Weed Management Area has been established, of which the Coronado National Forest is a member. The Natural Resource Conservation Service (NRCS) is leading eradication efforts in the Safford area adjacent to the Forest boundary.

Sweet resin bush and Pentzia were introduced for erosion control and livestock forage during a period that began in 1935 (Pierson and McAuliffe 1995). These non-native plants were provided to Civilian Conservation Corps (CCC) work crews by the Soil Conservation Service (SCS) for use in erosion control projects and as landscaping for facilities on Forest Service land. The full extent of the infestation resulting from CCC projects is unknown, but there were as many as ten CCC camps and additional temporary spike camps on Coronado National Forest lands. CCC crews completed many erosion control and revegetation projects in the 1930s, and projects were located in most of the EMAs. Those completed after 1935 are likely to have resulted in the introduction of the sweet resin bush and pentzia, and possibly other species as well.

**Canada thistle:** There are small populations of Canada thistle at the Snowflat Campground, Hospital Flat, and Columbine Work Center in the Pinaleño EMA. These populations have been treated by grubbing with limited success, and are a high priority for further treatment.

**Buffelgrass:** This grass occurs in most canyons on the front range of the Santa Catalina EMA as well as in the Santa Rita EMA. It causes an unnatural buildup of fine fuel in the Sonoran desert ecosystem (Van Devender and Dimmitt 2000). The three populations in the Santa Rita EMA are fairly isolated and are a high priority for treatment.

**Fountain grass:** Fountain grass occurs along the Mt. Lemmon highway up to about 5,500 feet in elevation, in Sabino Canyon, and many other canyons on the front range of the Santa Catalina EMA. It is widely used as an ornamental grass and is spreading rapidly in the desert. There is also an isolated population in the Santa Rita EMA, which is a high priority for treatment.

**Giant reed:** This species occurs in the Van Horn exclosure in the Huachuca EMA and in Sabino and Bear Canyons on the front range of the Santa Catalina EMA. The Van Horn population is small and dense in the exclosure. The Sabino and Bear Canyon populations are more extensive but are currently restricted to the Canyon from the Forest boundary to Sabino Dam.

**Salt cedar:** There are scattered individuals of this species across the Forest. There are known populations in Robles Canyon and Bear Canyon (Santa Catalina EMA) and Stockton Pass Wash (Pinaleño EMA).

**Johnson grass:** Johnson grass occurs along most highways in southern Arizona. As such, it is a species that will easily spread to the Forest. There are several plants of
Johnson grass in the Falls exclosure in Redrock Canyon (Huachuca EMA). This exclosure protects an endangered native fish so the infestation of Johnson grass is a high priority for treatment.

**Lehmann lovegrass:** This species occurs throughout the Forest. In the past, Lehmann lovegrass was seeded in many areas to prevent erosion (Cox et al. 1984). The grass has extended in range far beyond the seeded areas (Cox and Ruyle 1986). Well-established populations are not a high priority for treatment, but new or small populations should be treated.

**African sumac:** This exotic tree has been identified in Pontatoc Canyon in the Santa Catalina EMA; however, the species is spreading rapidly in the foothills adjacent to the Forest near Tucson. The species is widely used in the Sonoran desert as an ornamental tree.

This list does not include all of the species on the noxious weed lists for Arizona and New Mexico (Doc. 17), nor does it include all species that Forest users may consider a problem. It is the best information available on the species posing the most immediate threat to the Coronado National Forest. Species occurring in other areas adjacent to or near the Forest can also pose a threat. Russian knapweed, spotted knapweed, and dalmation toadflax are some that could easily infest the Forest from existing populations in southern Arizona and New Mexico. Additionally, roadways connecting the United States and Mexico create a situation of high risk for transport of invasive exotic plants.

There is no coordinated noxious weed management plan for the Forest at this time. This EA will describe how the Forest proposes to control populations of exotic invasive plants that exist on the Forest or populations that may be introduced in the future. This EA will provide the analysis needed to evaluate and disclose the environmental effects of invasive plant management on the Forest.

**Desired Condition**

The following narrative was developed to describe the desired condition for the Forest at the end of 10-year term of the program:

Existing infestations of invasive exotic plants are eradicated or controlled through a coordinated Forest-wide approach to Integrated Vegetation Management. New populations are detected and treated as they become established. A Forest-wide approach is effective in controlling the spread of noxious weeds and invasive exotic plants, and is coordinated with the plans of other county, state and federal agencies. Treatment plans take into account the latest guidance regarding the protection of public health and ecosystem health as well as the protection and recovery of federally-listed wildlife and plant species.

**Proposed Action**

To meet the purpose and need, the Coronado National Forest proposes to implement an Integrated Vegetation Management (IVM) approach to the control of invasive exotic plant species on the Forest. The purpose of the proposed action is to protect native plant communities on the Forest by preventing the introduction of invasive exotic plant species, eradicating invasive plant species where possible and by controlling the spread
of established invasive plant species when eradication is not practicable. This action is needed because of the occurrence of invasive exotic plants on and adjacent to the Forest, and to meet the requirements of law, regulations and policy.

Integrated Vegetation Management is a decision-making and management process that uses a combination of expertise, treatment methods, monitoring, evaluation and education to achieve the following vegetation management goals (FSM 2080.2):

- Prevention of the introduction and establishment of invasive plant infestations.
- Containment and suppression of existing invasive plant and noxious weed infestations.
- Formal and informal cooperation with State agencies, landowners, weed control districts and boards and other Federal agencies in the management and control of invasive species.
- Education and awareness of employees, users of the Forest, adjacent landowners and State agencies about weed threats to native ecosystems.

The project area includes National Forest System lands in parts of Pinal, Pima, Santa Cruz, Cochise, and Graham Counties in southeastern Arizona and Hidalgo County in southwestern New Mexico on the Douglas, Nogales, Sierra Vista, Safford, and Santa Catalina Ranger Districts.

The proposed IVM approach would be divided into the four elements described below.

1. **Treatment of existing populations**

Implement an integrated vegetation management strategy using cultural, mechanical, biological, or chemical methods of control.

- **Cultural control methods** involve reducing disturbance, planting, fertilizing or generally encouraging desired native vegetation to limit the encroachment of invasive species.
- **Manual control methods** involve hand pulling, hand grubbing, clipping and burning.
- **Mechanical control** methods involve mowing, tilling and other mechanized means of removing plants.
- **Biological control methods** involve the release of insects or plant pathogens that impact invasive species by reducing the ability of the invasive plant to dominate native plant communities.
- **Chemical control methods** involve treatment with herbicides that selectively kill invasive species while maintaining desired native vegetation. There will be no aerial application of herbicides.

Depending on the extent of the infestation and the feasibility of treatment, weed populations will be proposed for eradication, or containment and control. Tables 3 and 4 show the specific treatment proposals for those populations to be eradicated and for those to be controlled or contained. Known populations to be treated are identified on the attached maps 2 - 8.
Where chemical treatment is considered warranted, the following herbicides are proposed for use: 2,4-D, Chlorsulfuron, Clopyralid, Dicamba, Glyphosate, Imazapic, Imazapyr, Metsulfuron, Picloram, Sulfometuron methyl (Sufometuron), Triclopyr, Tebuthiuron. Descriptions of each of these herbicides can be found in Appendix A.

Application of herbicides would be limited to spot treatment of individual plants or ground-based broadcast application on stands of weeds. Aerial application of herbicides is not being considered as an option for the IVM program.

The Regional Forester must approve all proposed herbicide uses on National Forest System lands. The Regional Forester may delegate this approval authority to other line officers on a case-by-case basis or by supplement to the Forest Service Manual (FSM 2151.04). Approval authority has not been delegated at this time (Doc. 74). Approval will be indicated by signing the Pesticide Use Proposal (PUP, Form FS-2100-2) as described under the Proposed Action (pp. 19-21, this EA). The approval of the use of herbicides in Wilderness Areas, Wilderness Study Areas or Research Natural Areas cannot be delegated. Any application of herbicides in these areas would require the approval of the Regional Forester on a case-by-case basis (FSH 2109.14 – Pesticide Use Management and Coordination Handbook).

2. Monitoring

The effectiveness of control methods will be monitored annually for a minimum of 5 years following treatment. Additional treatments will occur as necessary. All known populations of invasive plants will be monitored at least every 3 years noting density and area of infestation. Weed inventories on the Forest will be continued in order to detect new populations of invasive plants before they become well established and widespread.

3. Restoration

In areas where there are large concentrations of an invasive species, the area would be restored to native vegetation, if feasible, following treatment. Restoration efforts would mainly involve erosion control and the planting of native species. In those situations where conditions of the site, soils, competing vegetation or other factors make it unlikely that native species can be re-established in a timely manner, appropriate non-native, non-persistent species may be used for soil protection until native species can re-establish.

4. Prevention, coordination, cooperation and education


Continue on-going cooperation efforts with other agencies and landowners, and encourage new cooperative efforts as appropriate, especially the establishment of Cooperative Weed Management Areas. Opportunities exist to partner effectively with groups such as the Pima Invasive Species Council, other private organizations and public agencies to enhance invasive species control across landscapes with a mixture of public and private ownership. These efforts should include lands of all ownerships and jurisdictions to ensure overall control.

Partner with the State of Arizona and the State of New Mexico Departments of Transportation to cooperate on control of invasive exotic species and ensure mulches and
seed mixes are weed free, including coordination of this treatment plan with the on-going Region-wide plan for treatment of invasive exotic plants in highway rights-of-way.

Continue to develop and implement educational and public awareness materials.

Timely, site specific review of treatment areas will occur on the districts prior to control activities to ensure that impacts to rare plants, wildlife and cultural resources will not occur as a result of weed management activities. All herbicide application will be done in accordance with Environmental Protection Agency (EPA) label restrictions. If monitoring determines that treatment activities are ineffective and control beyond the scope of this analysis becomes necessary, further analysis under NEPA would be conducted.

Other actions may be taken to assure an integrated approach to control of invasive exotic plants. These will be analyzed in the context of the planned revision of the Forest Plan beginning in Fiscal Year 2004 and may include, but not be limited to the following:

- Expand the current policy regarding weed-free livestock feed in Wilderness Areas to the entire Forest.
- Require use of weed-free mulches and seed mixes Forest-wide. Use native plant species for all re-vegetation and stabilization work. If native species do not meet the objectives of the project, non-native species may be used but must be sterile seed stocks or non-invasive species.

**Consistency with Forest Plan Goals and Objectives**

This action responds to the following goals and objectives outlined in the Coronado National Forest Land and Resource Management Plan (LRMP, pages 9-11).

- Maintain or enhance the visual resource through sound landscape management principles.
- Increase the public’s awareness of their obligation to the resource and their responsibility in caring for it.
- Establish a dialogue with the public to gain their understanding of our goals and objectives and insure their informed participation in our management decisions.
- Develop Information Service Programs that will educate, inform, and involve people of southern Arizona and southwest New Mexico in management and enjoyment of the forest.
- Provide habitat for wildlife populations consistent with the goals outlined in the Arizona and New Mexico Department of Game and Fish Comprehensive Plans and consistent with other resource values.
- Provide for ecosystem diversity by at least maintaining viable populations of native and desirable nonnative wildlife, fish and plant species through improved habitat management.
- Improve the habitat of and the protection for local populations of Threatened and Endangered Species to meet the goals of the Endangered Species Act of 1973.
- To restore rangeland to at least a moderately high ecological condition (70% to 75% of potential production, fair range condition) with stable soil and a static or upward trend.
- Provide a favorable water flow in quantity and quality for off-Forest users by improving or maintaining all watersheds to a satisfactory or higher level.
In addition, the following Forest-wide standards and guidelines and Management Area direction will be met:

- “Coordinate, where needed, animal damage and plant control on Forest Service administered lands with the US Fish and Wildlife Service and State wildlife and plant agencies (LRMP, page 31-1).”
- “Safeguard water, people, animals, pets and property in connection with use of pesticides and fire retardants…(LRMP, page 45).”
- Conform to Department of Agriculture standards in the use of all pesticides and promote development of acceptable alternatives for the use of pesticides (LRMP, page 45).”
- “Chemicals may be used within guidelines approved by other agencies for the following purposes…Herbicides to control invading plants that reduce herbaceous forage. Not all of the control would be done by use of herbicides. Depending on individual site circumstances, the control might be by mechanical means, prescribed fire, fuelwood harvest, herbicides, or some combination (LRMP, pages 45-46).”
- “Maintain horizontal and vertical plant diversity…(LRMP, pages 48, 51, 63).”

**Consistency with Laws and Policies**

Noxious weeds and other invasive plant species have raised concerns about ecosystem health and economic impacts. These concerns have been translated into laws and policies relative to the management of our National Forests and Grasslands. The Federal Noxious Weed Act became law in 1974 and was updated in 1990 with the passage of the Food, Agriculture Conservation and Trade Act, commonly called the Farm Bill. The Farm Bill directed Federal agencies to coordinate with state and local governments to contain and control undesirable plant species by entering into Memorandums of Understanding and other agreements where appropriate. The Farm Bill also directed Federal agencies to develop policy direction, and Forest Service Manual 2080 was issued in November of 1995. In 1998, the Forest Service issued a National Strategy for weed management entitled “Stemming the Invasive Tide: Forest Service Strategy for Noxious and Nonnative Invasive Plant Management” (USDA Forest Service 1998). The President signed Executive Order 13112, addressing invasive species, in February 1999. This order directs federal agencies to prevent introduction and spread of invasive species, to cooperate with a newly created Invasive Species Council, and to produce and follow direction given in an Invasive Species Management Plan.

The Forest Service is also directed by Section 302(b) of the Federal Land Policy and Management Act of 1976 to “take any action necessary to prevent unnecessary or undue degradation of the [public] lands: (43 U.S.C. 1732).” Supplementing this mandate is Section 2(b)(2) of the Public Rangelands Improvement Act of 1978 in which Congress reaffirms a national policy and commitment to “manage, maintain, and improve the condition of public rangelands” (43 U.S.C 1711). The regulations for implementing the National Forest Management Act of 1976 (36 CFR Part 219.27 a.3.) also provide direction for controlling noxious weeds.

The Federal Plant Protection Act and implementing regulations and policies, requires the Forest Service to cooperate with State, county, and other Federal agencies in the application and enforcement of all laws and regulations relating to management and
control of noxious weeds. Forest Service policy in FSM 22.59.033 states: “Forest officers should place noxious weed management emphasis on those areas where cooperative efforts are underway, such as organized weed control districts. Within budgetary constraints, the Forest Service shall control, to the extent practical, noxious farm weeds on all National Forest System lands”.

The Wilderness Act (P.L. 88-577) mandates that wilderness be managed so its community of life is untrammeled by man, its primeval character is retained and its natural conditions are preserved. Forest Service policy direction is to maintain wilderness in such a manner that ecosystems are unaffected by human manipulation and influences so that plants and animals develop and respond to natural forces (FSM 2320.2). The Wilderness Act and its implementing regulations (36 CFR 293) do not preclude the use of herbicides in wilderness to maintain the natural ecosystem, and the Manual appears to anticipate such use by establishing approval standards at 2323.04c. In order to preserve natural conditions and processes in wilderness, it may become necessary to remove invasive exotic vegetation. Herbicides are a potential tool for controlling invasive species and may represent the appropriate “minimum tool” for accomplishing this objective.

The proposed action is responsive to these laws and policies. Lack of action against invasive plant species is clearly a violation of these laws and policies.

**Adaptive Management Strategy**

The proposed invasive plant management program provides direction for noxious weed management activities on the Forest for the next 10 years using an adaptive management approach. Adaptive management is a strategy that allows decision makers to take advantage of new information as it becomes available after a decision has been made. In other words, during the life of this project, invasive plants are likely to be introduced to new locations by vehicles, heavy equipment, livestock, wildlife, recreationists and all the usual vectors of spread, and will be detected through monitoring. It is also likely that additional species of invasive plants not identified in Table 1 may be discovered on the Forest over the term of the project. The Forest would respond to these new infestations by completing a site specific review to determine impacts to proposed, threatened, endangered and sensitive plants, wildlife and fish, as well as heritage resources or plant species of significance to local tribes. New populations will be treated as they are found as long as the conditions of this analysis and decision are met. Likewise, if implementation monitoring demonstrates that herbicides being used are not effective, and a new or improved product is available, the new product could be considered for use. An analysis would be accomplished to determine whether the effects of new treatments are similar to effects disclosed herein. As long as the new treatment activity fits within the range of effects analyzed and disclosed in the original EA, no further NEPA analysis will be performed. If monitoring determines that control beyond the scope of this analysis becomes necessary, further analysis under NEPA would be conducted.
Decision Framework

Given the purpose and need, the Forest Supervisor of the Coronado National Forest will review the proposed action and the other alternatives in order to make the following decisions:

- Whether the proposed action would result in significant environmental effects that would require the preparation of an Environmental Impact Statement, or if there is a finding of no significant impact.
- If significant impacts are not anticipated, the Forest Supervisor will determine whether the proposed action will proceed as described above and in Chapter 2, as modified by an alternative, or not at all.
- If it proceeds, the Forest Supervisor will determine the mitigation measures and monitoring requirements to be implemented by the Forest Service, and whether the project requires a Forest Plan amendment.

Public Involvement

The proposal was first provided to the public and other agencies for comment in a Scoping Report on March 23, 2000 (Doc. 13). Comments from this original scoping are being retained and included in the current analysis (Docs. 11-16). A revised public scoping notice was sent to 330 individuals and organizations on July 5, 2002 (Doc. 46). The proposal was posted on the Coronado National Forest internet site from July 2002 to May 2003. Approximately 18 comments were received (Docs. 48-65). Members of the interdisciplinary team attended a meeting of the Pima Invasive Species on August 13th, 2002. In addition, the agency has participated in the Euryops and Pentzia Weed Management Group since 1999 (Docs 3, 4 and 7).

In accordance with regulations at 36 CFR 215, a 30-day comment period was initiated on November 24, 2003 with the publication of a legal notice in the Arizona Daily Star and Tucson Citizen. The comment period ended on December 24, 2003. In addition to the legal notice, a detailed description of the proposed action was also sent to 55 individuals and groups and posted on the Forest’s web site. One response was received and the comments have been considered in developing the analysis (Doc. 73).

Issues

Using the comments from the public, tribes, organizations and other agencies, the interdisciplinary team developed a list of issues to address. The Forest Service separated the issues into two groups: significant and non-significant issues. Significant issues were defined as those directly or indirectly caused by implementing the proposed action. Non-significant issues were identified as those: 1) outside the scope of the proposed action; 2) already decided by law, regulation, Forest Plan, or other higher level decision; 3) irrelevant to the decision to be made; or 4) conjectural and not supported by scientific or factual evidence. The Council on Environmental Quality (CEQ) NEPA regulations require this delineation in Sec. 1501.7, “…identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental
review (Sec. 1506.3)…” A list of non-significant issues and reasons regarding their categorization as non-significant may be found at Doc. 65 in the project record.

As for significant issues, the Forest Service identified the following issues during scoping:

**Issue 1: Effects of the alternatives on non-target native vegetation, including threatened, endangered and sensitive species.** Effects will be described in narrative and tabular form through a wildlife specialist’s report, biological assessment and evaluation and analysis of effects on management indicator species (MIS) and other wildlife, fish and plants. Mitigation measures have been included in the design of all action alternatives to minimize exposure to non-target species.

**Issue 2: Effects of the alternatives on non-target terrestrial and aquatic wildlife, including threatened, endangered and sensitive species.** Wildlife exposure risks have been evaluated in a number of risk assessments, including the Risk Assessment for Herbicide Use in Forest Service Regions 1, 2, 3, 4 and 10 and on the Bonneville Power Administration Sites (USFS 1992), which is incorporated herein by reference. Effects will be described in narrative and tabular form through a wildlife specialist’s report, biological assessment and evaluation and analysis of effects on management indicator species (MIS) and other wildlife, fish and plants. Mitigation measures have been included in the design of all action alternatives to minimize exposure to non-target species.

**Issue 3: Effect of the alternatives on human health (public and workers).** Human exposure risks have been evaluated in a number of risk assessments, including the Risk Assessment for Herbicide Use in Forest Service Regions 1, 2, 3, 4 and 10 and on the Bonneville Power Administration Sites (USFS 1992), which is incorporated herein by reference. The evaluation criteria for these effects are the risks to human health of herbicide use, the predicted location and size of area to be treated, preferred treatment method, and identification of areas where no chemical treatments would be used. Two alternatives (No Action and No Herbicides) are responsive to this issue.

**Issue 4: Effects of the alternatives on soil and water quality and quantity.** Evaluation criteria used to analyze these effects are tabular and narrative specialists reports on water quality, soil quality, upland vegetation and riparian area condition. Protections for surface and ground water quality are included in the action alternatives through prescribed mitigation measures and label restrictions for herbicide use.

**Issue 5: Costs vs. benefits.** The proposed action includes activities that will be subsidized by taxpayers. Evaluation criteria for this issue will be the relative costs of treatments for each alternative.

**Issue 6. List of invasive species identified for treatment.** Some respondents suggested additions to the list of species proposed for treatments, notably African sumac and red brome. Others pointed out that species such as Buffelgrass and Lehmann lovegrass have value for soil stabilization and should not be considered for control.

**Issue 7. Vegetation treatments in wilderness.** Some respondents suggested that by excluding the use of herbicides in wilderness areas the Forest would significantly decrease its chances of success at controlling invasive species. One respondent questioned the compatibility and legality of herbicide use within wilderness in response to the 30-day opportunity to comment.
**Issue 8. Use interactions and prevention.** The proposed action does not adequately provide for prevention of the spread of invasive exotic plant populations. The evaluation criteria for this issue will be locations of invasive exotic plants in relation to permitted activities on the Forest, and a review of existing guidelines for noxious weed prevention.

**Issues and Concerns Addressed Through Project Design.**

In response to the scoping comments, the proposed action was modified to address some of the issues identified. African sumac (*Rhus lancea*) was added to the list of species to be controlled. Two respondents suggested that red brome (*Bromus madritensis* ssp. *rubens*) also be included. This aggressive, winter-spring growing exotic annual grass occurs at lower elevations on the Forest, but is not expected to spread into higher elevations. Effective control of existing populations would be difficult if not impossible and Forest efforts will focus on prevention of seed introduction through weed prevention practices described in Appendix C. No treatments are proposed, so the species is not listed in the tables of species identified for containment or eradication.

In response to comments that suggested that limiting herbicide treatments to non-wilderness areas would reduce the Forest’s ability to effectively control some invasive species, the proposed action has been modified to include limited herbicide treatments within wilderness areas and research natural areas (RNAs). No treatments are proposed in wilderness at this time, but it was deemed appropriate to widen the scope of the analysis to consider this potential, should the need arise. This is particularly true in the Santa Catalina EMA where the 2003 Aspen fire burned approximately 85,000 acres, including a large portion of the Pusch Ridge Wilderness. Several invasive species are found in or adjacent to the wilderness and are predicted to invade into burned areas.

With regard to objections to the consideration of herbicide use in wilderness, see **Consistency With Laws and Policies** on pages 12 and 13 of the EA.

The proposed action responds to the comments raised relative to use interactions and prevention by adopting an integrated vegetation management approach that incorporates several measures to prevent the introduction and spread of invasive plants on the Forest.

**Incorporation by Reference**

Regulations implementing the National Environmental Policy Act (NEPA) provide for the reduction of bulk and redundancy (40 CFR 1502.21) through incorporation by reference when the effect will be to reduce the size of documents without impeding agency and public review of the action. The following document is incorporated by reference and forms the basis for the conclusions related to human health and effects to non-target species.

- Risk Assessment for Herbicide Use in Forest Service Regions 1, 2, 3, 4 and 10 and on Bonneville Power Administration Sites (USFS 1992).

To insure that the most recent information is reflected in this EA, updated risk assessments for the following herbicides are also incorporated by reference. Copies of the assessments for 2,4-D, Clopyralid, Dicamba, , Imazapic, Imazapyr, Metsulfuron
Methyl, Picloram, Sulfometuron Methyl, Triclopyr, aquatic formulations of Glyphosate and surfactant effects on Glyphosate toxicity are available on the Forest Service web site at www.fs.fed.us/foresthealth/pesticide/risk.
CHAPTER 2 - ALTERNATIVES

This chapter describes and compares the alternatives considered for the Invasive Exotic Plant Management Program. It includes a description of each alternative considered. This section also presents the alternatives in comparative form, defining the differences between each alternative and providing a clear basis for choice among options by the decision maker and the public. Some of the information used to compare the alternatives is based upon the design of the alternative (i.e., use of herbicides versus the use of manual and cultural methods only) and some of the information is based upon the environmental, social and economic effects of implementing each alternative (i.e., the risk to humans and non-target species of using herbicides). Alternatives are also compared as to compliance with law, regulation and policy. Finally, this chapter describes mitigation measures developed to address significant issues.

Alternative 1 - No Action

Under the No Action alternative, current management plans would continue to guide management of the project area. A programmatic approach to Integrated Vegetation Management for controlling or eradicating invasive exotic plants and preventing new populations would not be taken. Individual populations of noxious weeds and invasive exotic plants may be treated by various methods, however each treatment would be authorized by a separate analysis. The No Action Alternative provides the baseline for comparison against all action alternatives. Under the No Action alternative, concerns for effects of herbicides on non-target species (Issues 1 and 2), effects of herbicides on human health (Issue 3), effects of treatments and re-vegetation on water quality (Issue 4), and the cost of action (part of Issue 5) are moot.

Alternative 2 – Non-herbicide control combined with a program of monitoring, restoration and prevention

This alternative includes all IVM methods except for herbicide application. All other elements of the action would be identical to Alternative 3, the proposed action. Mechanical and cultural control methods would be used to manage existing invasive plant populations and to control new populations as they occur. Mechanical methods would include top-cutting plants, digging, pulling or burning of infested sites. Cultural control methods would be used to encourage occupation of the Forest by desired vegetation in order to reduce the vulnerability of sites to invasion by weeds. Monitoring would occur to detect the presence and spread of invasive species. Education, prevention and cooperation would occur as described under the proposed action. This action was formulated to address concerns for effects of chemical herbicides on non-target species (Issue 1 and 2) and human health (Issue 3).
Alternative 3 - Integrated Vegetation Management - The Proposed Action

This alternative includes a complete integrated vegetation management approach to the management of invasive species on the Forest. Mechanical, cultural, biological and chemical control methods would be available for use and would be tailored to fit each specific situation. Monitoring, prevention, education and cooperation are incorporated into this alternative, as described in Chapter 1. The Forest would use all methods to eradicate or contain and control populations of invasive species as described in Tables 3 and 4. If the use of herbicides is considered warranted, herbicides will be applied in compliance with their EPA approved label directions and restrictions.

<table>
<thead>
<tr>
<th>Species common name</th>
<th>Growth habit</th>
<th>Proposed treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tree of Heaven</td>
<td>Tree with prolific root and stump sprouting; not shade tolerant; allelopathic to other trees</td>
<td>Small trees, oil basal with 25% Garlon 4 (triclopyr); large trees, cut-surface application with 50% Garlon 3A (Triclopyr). This will be 70-80% effective and follow-up treatments will be necessary. Other effective herbicides are glyphosate, dicamba, metsulfuron methyl and imazapyr.</td>
</tr>
<tr>
<td>Yellow starthistle</td>
<td>Winter annual herbaceous species; prolific seed productions; spreads rapidly</td>
<td>Hand pull plants if only a few; ensure most of root is removed. Remove and burn pulled plants to destroy seed. If area is too large for effective hand pulling, apply herbicides. Effective herbicides are picloram, dicamba, 2,4-D, clopyralid, and glyphosate. Ensure good stand of native species; revegetate if necessary.</td>
</tr>
<tr>
<td>Malta starthistle</td>
<td>Winter annual herbaceous species; prolific seed productions; spreads rapidly. Small seed head formed in the center of rosettes makes hand pulling ineffective.</td>
<td>Hand grub, removing all of the root. Remove and burn pulled plants to destroy seed. If area is too large for effective hand pulling, apply herbicides. Effective herbicides are picloram, dicamba, 2,4-D, clopyralid, and glyphosate. Ensure good stand of native species; revegetate if necessary.</td>
</tr>
<tr>
<td>Canada thistle</td>
<td>Aggressive perennial with creeping root system. Reproduces easily from roots.</td>
<td>Repeated annual treatments of applied herbicides. Effective herbicides are 2,4-D, chlorsulfuron, dicamba, clopyralid, metsulfuron, glyphosate, alone or in mixes. Hand pulling not effective because of root system.</td>
</tr>
<tr>
<td>Buffelgrass (small population in the Santa Rita EMA)</td>
<td>Perennial with moderate spread by seed and slow spread vegetatively.</td>
<td>Hand pull plants in Santa Rita EMA; if this is not successful, apply herbicide; repeat pulling and/or herbicide use as necessary to prevent re-establishment. Effective herbicides are glyphosate, metsulfuron methyl and imazapic.</td>
</tr>
<tr>
<td>Fountain grass (small population in the Santa Rita EMA)</td>
<td>Perennial with slow spread by seed; generally does not spread vegetatively but there are non-seed producing cultivars.</td>
<td>Hand pull plants in Santa Rita EMA; if this is not successful, spot apply herbicide (glyphosate, metsulfuron methyl or imazapic); repeat pulling and/or herbicide use as necessary to prevent re-establishment.</td>
</tr>
<tr>
<td>Johnson grass (Redrock Canyon)</td>
<td>Perennial rhizomatous grass; spreads rapidly</td>
<td>Hand grub individuals in Redrock Canyon when ground is moist. Repeat as necessary to prevent re-establishment. Consider using herbicides (glyphosate labeled for wetland use) if grubbing causes too much soil disturbance, or if treatment is ineffective.</td>
</tr>
</tbody>
</table>
Complete eradication of existing populations may be difficult to achieve, so only invasive plant populations that are small and localized or that present significant risks to ecosystem health have been identified for eradication. Many populations are already well-established, but their spread can be contained through management activities. These species/populations are displayed in Table 4.

Table 4. Proposed containment and control of existing populations

<table>
<thead>
<tr>
<th>Species common name</th>
<th>Growth habit</th>
<th>Proposed treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bull thistle</td>
<td>Biennial thistle; establishes taproot but not creeping roots; prolific seed producer in open areas.</td>
<td>Apply herbicides on existing population followed by maintaining light to moderate grazing to ensure good cover by native species. Apply when plants are in rosette stage. Revegetate if necessary.</td>
</tr>
<tr>
<td>Buffelgrass</td>
<td>Perennial with moderate spread by seed and slow spread vegetatively.</td>
<td>Monitor populations; treat new populations with hand pulling and/or herbicides (see previous section).</td>
</tr>
<tr>
<td>Fountain grass</td>
<td>Perennial with slow spread by seed; generally does not spread vegetatively but there are non-seed producing cultivars.</td>
<td>Monitor populations; treat new populations with hand pulling and/or apply herbicides (see previous section).</td>
</tr>
<tr>
<td>Giant reed</td>
<td>Large bamboo like grass. Prolific shoot production; spreads rapidly vegetatively.</td>
<td>Treat individual plants by cutting then treatment of cut surface with glyphosate labeled for wetland use. Treat post-flowering and pre-dormancy. Treat in Sabino and Bear Canyons when dry if possible. Remove dead material in Sabino and Bear Canyons after 2-3 weeks.</td>
</tr>
<tr>
<td>Salt cedar</td>
<td>Woody shrub; reproduces by seed</td>
<td>Small trees, oil basal with 25% Garlon 4; large trees, cut-surface application with 50% Garlon 3A. This will be 70-80% effective and follow-up treatments will be necessary.</td>
</tr>
<tr>
<td>Johnson grass</td>
<td>Perennial rhizomatous grass; sprouts readily</td>
<td>Monitor populations; treat new populations by hand pulling when ground is moist and/or apply herbicides.</td>
</tr>
<tr>
<td>Lehmann lovegrass</td>
<td>Perennial bunchgrass; highly adaptable and spreads rapidly</td>
<td>If found in small populations, hand pull or treat with herbicide (glyphosate, metsulfuron methyl or imazapic) and revegetate as needed.</td>
</tr>
<tr>
<td>African sumac</td>
<td></td>
<td>Hand pull small plants; cut down and spot treat with herbicides if too large to effectively pull.</td>
</tr>
</tbody>
</table>

Each year before weed management activities begin, an annual operating plan shall be prepared by the District proposing plant treatments. If herbicides are proposed, a
Pesticide Use Proposal (PUP), Form FS-2100-2 (Appendix B), must be completed according to Forest Service policy (FSM 2100), and this proposal may be used as the annual operating plan. This plan will include a list of each site to be treated, method to be used, herbicide and rate of application if applicable, map of the site and legal description, and area to be treated. This plan will be reviewed by the District or Forest TEPS plant coordinator, wildlife biologist and heritage resource specialist to ensure that effects of that treatment are within the scope of this analysis. Site-specific mitigation measures and/or additional surveys and clearances may be specified at this time, should concerns with any of these resources arise. If herbicides are proposed, the Forest pesticide coordinator (or Regional Pesticide Coordinator in the absence of a Forest coordinator) will review site-specific operating plan. The PUP with associated supporting documentation will be forwarded to the Regional Forester for approval.

During the course of the season, it is likely that new infestations will be found and require quick action to control. The annual operating plan will be updated at this time, and signed off by the previously mentioned specialists and the Forest pesticide coordinator before treatment. Reviews must be timely to allow management of new weed infestations to minimize seed production and potential spread, but are important to prevent unintended impacts. The annual operating plan will be available to the public on request.

Mitigation Measures Common to All Action Alternatives

- Invasive species populations would be treated only after the area has been evaluated and surveyed for sensitive plant species listed in Table 7 and/or identified by the District Biologist. Field surveys will be conducted within occupied and potential habitat for sensitive species. The scope of the survey will be dependant on the type of treatment proposed, but will be sufficient to provide for the identification and protection of sensitive species within the project area. Individuals and populations of sensitive plants will be flagged or otherwise identified so that they can be avoided during treatment. If necessary, a buffer zone of sufficient size will be established to protect sensitive species from mechanical disturbance or spray drift.

- Heritage resources will be identified and protected from any ground disturbing activities.

- Spray trucks, all terrain vehicles (ATVs), tractor-mounted mowers and other equipment used for invasive plant management will not be used in such a way that would increase erosion. Steep or highly erodible slopes will be avoided, and soil disturbance will be minimized.

- Desirable vegetation in riparian zones will be retained.

- Heavy equipment will not be used within 30 feet of any stream bank. Handheld or ATV-mounted equipment will be used within this zone.

- Prevention measures prescribed in Appendix D will be followed during agency activities to the degree possible to minimize invasive plant introduction and
spread on the Forest. This is the single most effective and least expensive weed management option available.

- Education efforts to increase awareness of the public and agency personnel will be implemented.
- The only biological control agents that would be considered for use would be those selective to only the target species, and approved by the Animal Plant Health Inspection Service (APHIS) for use on that species. There are currently no biological control agents being considered for use on the Forest.
- If restoration of treated areas included establishing new plants, this would be accomplished by broadcast seeding of native species or non-persistent, non-native cover crops.

- All sites treated for invasive species will be monitored and retreated as necessary. A monitoring plan will be prepared as part of each treatment activity. Baseline monitoring to determine existing conditions will occur prior to treatment. Implementation monitoring will occur during treatments to insure design and safety standards are followed and that specified buffers for sensitive species or live water have been correctly established and enforced.
- Effectiveness monitoring will be conducted to aid in planning subsequent treatments and to determine target plant response to treatment; native plant community response to treatment; and whether there are any unforeseen adverse impacts to resources from invasive plant control actions.

**Mitigation Measures Involving the Use of Herbicides**

The application of herbicides is tightly controlled by state and federal agencies. The Forest Service is required to follow all state and federal laws and regulations concerning the use of herbicides. The following measures and design features are common to all alternatives involving the use of herbicides:

- Herbicides will only be used after it has been determined that they offer the most practical, timely and economical method for control.
- All applicable state and federal laws, including herbicide label requirements will be followed.
- Projects will be supervised by a Forest Service certified applicator who will be responsible for insuring safe storage, handling, application and disposal of herbicides.
- Herbicides will be applied only by ground-based equipment, including hand painting or daubing, backpack sprayers and spray units on ATV’s or trucks. In areas with sensitive vegetation, spot application will be used to treat individual weeds while protecting desired vegetation. Spot application requires that the site be revisited many times to treat plants that were missed or have grown since the previous application, making this method less effective than broadcast treatments. Spot application is not a good choice for all sites and situations but is useful when few weeds and sensitive vegetation are present.
Picloram will not be used where the water table is within 40 inches of the surface; where soil permeability would be conducive to water contamination.

Only herbicides labeled for aquatic use (ie. Rodeo (glyphosate) Renovate (triclopyr) and Weedar 64 (2,4-D amine)) will be used within 30 feet of streams and other bodies of water.

Persons involved in mixing, loading and applying herbicides will be required to wear appropriate personal protective equipment as required on the label.

Areas used for mixing herbicides and cleaning equipment shall be located where spillage will not run into surface waters or result in ground water contamination.

All requirements in a Safety and Spill Plan (Appendix D) will be followed.

Regional Forester approval of the Pesticide Use Proposal (Form FS 2100-2) will be necessary for the application of any herbicide, unless this authority is delegated to the Forest Supervisor. Approval for the use of herbicides in Wilderness cannot be delegated.

Treatment areas will be signed to alert the public of the herbicide application.

Landowners within ½ mile of the area to be treated with herbicide will be notified in writing before the project is undertaken.

Comparison of Alternatives

This section provides a summary of the effects of implementing each alternative. Information in Table 5 compares the alternatives in terms of project goals, regulations and policies. Information in Table 6 is displays levels of effects where different levels of effects can be distinguished quantitatively or qualitatively among alternatives.

<table>
<thead>
<tr>
<th>Table 5. Comparison of Alternatives in Terms of Project Goals, Law, Regulation and Policy</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Meets the purpose and need for action</strong></td>
</tr>
<tr>
<td>Alternative 1</td>
</tr>
<tr>
<td>Alternative 2</td>
</tr>
<tr>
<td>Alternative 3</td>
</tr>
</tbody>
</table>

**Consistent with Forest Plan**

| Alternative 1 | No. Allows for uncontrolled spread of invasive exotic plants |
| Alternative 2 | Yes. However, reliance on cultural and manual methods would result in result in a higher level of short-term degradation of visual resource, rangeland condition, wildlife habitat, and water quality when compared with alternatives 1 and 3. |
| Alternative 3 | Yes. Maintains or enhances the visual resource, increases the public’s awareness through dialog and education, provides habitat for wildlife including TES, maintains or enhances rangeland condition, provides a favorable water flow in quantity and quality by improving or maintaining all watersheds to a satisfactory or higher level. |

**Consistent with law, regulation and policy**

2080, the 1998 Forest Service National Strategy (Stemming the Invasive Tide), or Executive Order 13112.

<table>
<thead>
<tr>
<th>Alternative 2</th>
<th>No. Ineffective management results in dissatisfaction of cooperators and does not effectively prevent an increase in size of many invasive plant infestations (those that are not effectively treated by physical, cultural or biological methods). Not responsive to pertinent laws.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternative 3</td>
<td>Yes. Allows the agency to enter into cooperative weed management agreements, implement effective management strategies, and prevent the introduction and spread of invasive species as required in state and federal laws.</td>
</tr>
</tbody>
</table>

Table 6. Comparison of the Alternative in Terms of the Issues.

<table>
<thead>
<tr>
<th>Issue 1: Effect of the alternatives on non-target vegetation.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternative 1</td>
</tr>
<tr>
<td>Alternative 2</td>
</tr>
<tr>
<td>Alternative 3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Issue 2: Effect of the alternatives on wildlife.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternative 1</td>
</tr>
<tr>
<td>Alternative 2</td>
</tr>
<tr>
<td>Alternative 3</td>
</tr>
</tbody>
</table>
Invasive Exotic Plant Management Program  
CORONADO NATIONAL FOREST  

Environmental Assessment

<table>
<thead>
<tr>
<th>Issue 3: Effect of herbicide use on human health.</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Alternative 1</strong></td>
<td>Little effect on human health. Slight increase in wildfire potential which may lead to indirect effects from smoke.</td>
</tr>
<tr>
<td><strong>Alternative 2</strong></td>
<td>Effects similar to Alternative 1. Additional slight risk for injury to personnel performing plant treatments.</td>
</tr>
<tr>
<td><strong>Alternative 3</strong></td>
<td>Effects similar to Alternative 1 and 2. Risks associated with exposure to herbicide will be insignificant to the public at large. Some minor risk of exposure to workers, but minimized by the use of personal protective equipment.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Issue 4: Effects of the alternatives on soil and water quality.</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Alternative 1</strong></td>
<td>Increases in tap-rooted species increase surface runoff in some areas. Increased distribution of buffelgrass results in decreased runoff, but increases fire hazard and indirect effects from fire. No effects from herbicide use.</td>
</tr>
<tr>
<td><strong>Alternative 2</strong></td>
<td>Increases in tap-rooted species increase surface runoff in some areas. Increased distribution of buffelgrass results in decreased runoff, but increases fire hazard and indirect effects from fire. Spread of invasives will not be as rapid as under Alternative 1. Hand and mechanical treatment of weeds results in minor soil disturbance. No effects from herbicide use.</td>
</tr>
<tr>
<td><strong>Alternative 3</strong></td>
<td>Removal of invasive plans, combined with restoration will favor the establishment of native vegetation and more natural soil and water quality conditions. Use of herbicides will result in short-term presence of herbicides in soil. Mitigation measures will reduce the risk of water contamination.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Alternative 1</strong></td>
<td>No additional costs compared to current conditions.</td>
</tr>
<tr>
<td><strong>Alternative 2</strong></td>
<td>Greatest cost per acre, least effective.</td>
</tr>
<tr>
<td><strong>Alternative 3</strong></td>
<td>Cost per acre less than Alternative 2, most effective.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Issue 6. List of Invasive species identified for treatment</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Alternative 1</strong></td>
<td>Invasives would be identified and treated on a case-by-case basis, but a programmatic forest-wide approach would not be applied.</td>
</tr>
<tr>
<td><strong>Alternative 2</strong></td>
<td>This issue was resolved through changes in project design. Adaptive management provides for treatment of additional species as the need arises.</td>
</tr>
<tr>
<td><strong>Alternative 3</strong></td>
<td>This issue was resolved through changes in project design. Adaptive management provides for treatment of additional species as the need arises.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Issue 7. Vegetation Treatments in wilderness.</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Alternative 1</strong></td>
<td>Wilderness treatments would not be precluded, but very likely would not occur.</td>
</tr>
<tr>
<td><strong>Alternative 2</strong></td>
<td>This issue was resolved through changes in the proposed action. Hand removal of weeds will control some new populations, but extensive populations may not be contained.</td>
</tr>
</tbody>
</table>

26
### Issue 8. Use interactions and prevention.

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternative 1</td>
<td>No programmatic approach to prevention would occur.</td>
</tr>
<tr>
<td>Alternative 2</td>
<td>Integrated Vegetation Management incorporates prevention practices intended to minimize the establishment of invasive species.</td>
</tr>
<tr>
<td>Alternative 3</td>
<td>Integrated Vegetation Management incorporates prevention practices intended to minimize the establishment of invasive species.</td>
</tr>
</tbody>
</table>

### Alternatives Considered but Eliminated from Further Analysis

An original proposal to exclude the limited use of herbicides in wilderness areas was not considered in detail because it was determined that, given the nature and extent of existing weed infestations and the potential for spread into the Pusch Ridge Wilderness, hand methods alone may be insufficient to control populations of weeds before significant spread. The Regional Forester must approve all herbicide use in Wilderness and Research Natural Areas; however, it is appropriate to analyze the effects of such a proposal in the context of the EA. If the use of herbicides in these areas were entirely precluded, it would not be possible to achieve the stated purpose and need for the proposed action.
CHAPTER 3 – AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This section summarizes the physical, biological, social and economic environments of the affected project area and the potential changes to those environments due to implementation of the alternatives. It also presents the scientific and analytical basis for the comparison of alternatives presented in the chart above.

Project Area

The Coronado National Forest contains approximately 1,724,271 acres in 12 distinct blocks of land (Ecosystem Management Areas, EMAs) scattered across southeastern Arizona and into Southwestern New Mexico. The Forest consists of several mountain ranges within the Basin and Range Geographic Province that form an archipelago of “sky islands” connecting the Rocky Mountains to the Sierra Madre Occidental in Mexico. It is located on the border between the Sonoran and Chihuahuan deserts. Elevations range from 2,800 to 10,720 feet.

Geology is complex and has resulted in a highly variable and complex soil pattern. Climate varies depending on elevation. At lower elevations, summer temperatures can exceed 110° and annual precipitation ranges from 11 to 13 inches per year. Higher elevations are cooler and wetter with annual precipitation approaching 30 inches per year and significant snow accumulations.

As a result of these factors, the Forest supports a wide variety of biotic communities and a diverse assemblage of wildlife and plant species. Vegetation communities on the forest include over 1,000 plant species. Major vegetation types include desert scrub, desert grassland, broadleaf evergreen woodland, coniferous woodland, transition coniferous forest, mixed conifer forest, dry desert riparian areas and deciduous riparian areas. Almost 580 vertebrate species are found on the Forest. Many of these species are endemic to the highlands of Mexico and are found nowhere else in the United States.

Specific resource environments will be described in the appropriate sections that follow. Only those resources that would be potentially affected by this proposal or by the spread of invasive species are included in the analysis.

The analysis area for this environmental assessment (EA) is the entire Coronado National Forest (Map 1). However, the actual area of invasive plant infestation, excluding Lehmann lovegrass, is estimated to be less than 2000 acres. With the exception of Lehmann lovegrass, weed infestations on the Forest are generally localized rather than widespread. Nevertheless, weed infestations are found in 7 of the 12 EMAs that comprise the Forest and in a variety of vegetation types. Weed infestations often occur in previously disturbed areas, riparian corridors, along roadways or adjacent to private lands.

Invasive exotic plant infestations are generally located in the low to mid-elevations. The size of infestations are variable, from individual plants to infestations.
over about 100 acres. In riparian areas, infestations currently are at a low level, and only a few hundred plants are known to occur.

Vegetation – Forest Plant Communities (Issue 1)

Affected Environment – Forest Plant Communities

Vegetation on the forest is diverse, ranging from desert scrub to subalpine forests. Major vegetation units are described below.

Southwestern Desertscrub lands are found at elevations less than 4,200 feet. Mean annual air temperature ranges from about 62° to 72° F. Mean annual precipitation ranges from about 8 to 11 inches. The dominant native vegetation is sahuaro (Cereus giganteus), palo verde (Cercidium spp.), creosotebush (Larrea tridentata), ocotillo (Fouquieria splendens), mesquite (Prosopis juliflora), catclaw (Mimosa bifuncifera), and brittle bush (Encelia spp.).

Desert Grasslands are found at elevations of about 3,200 to 6,200 feet. Mean annual air temperature ranges from about 59° to 70° F. Mean annual precipitation ranges from about 11 to 14 inches. The dominant native vegetation are grasses including, but not necessarily limited to, bush muhly (Muhlenbergia porteri), Texas bluestem (Andropogon cirratus), tobosa (Hilaria mutica), curlymesquite (Hilaria belangeri), black grama (Bouteloua eripoda), sideoats grama (Bouteloua curtipendula), and hairy grama (Bouleloua hirsuta). Incidental to major overstory amounts of mesquite (Prosopis spp.) also occur. The exotic Lehmans lovegrass (Eragrostis lehmanniana) also is common.

Plains Grasslands are found at elevations of about 4,200 to 7,200 feet. Mean annual air temperature ranges from about 56° to 64° F. Mean annual precipitation is about 20 inches. The dominant native vegetation are grasses including blue grama (Bouteloua gracilis), plains lovegrass (Eragrostis intermedia), and wolf tail (Lycurus setosus).

Mountain Grassland/Meadows are found at elevations greater than 6,200 feet. Mean annual air temperature ranges from about 45° to 50° F. Mean annual precipitation is 25 inches or more. The dominant native vegetation are sedges (Carex spp.), fringed brome (Bromus ciliatus), wheat grasses (Elymus spp.), long tongue muhly (Muhlenbergia longiligula), deer grass (Muhlenbergia rigens), bullgrass (Muhlenbergia emersleyi), pine drop seed (Blepharoneuron tricholepis), and june grass (Koeleria macrantha).

Chaparral are found at elevations of about 4,200 to 7,200 feet. Mean annual air temperature ranges from about 52° to 58° F. Mean annual precipitation ranges from about 16 to 21 inches. The dominant native vegetation is mountain mahogany (Cercocarpus spp.), desert ceanothus (Ceanothus greggii), manzanita (Arctostaphylos spp.), tourney oak (Quercus toumeyi), emory oak (Quercus emoryi), silver leaf oak (Quercus hypoleucoides), Arizona white oak (Quercus grisea), and a scattering of Chihuahua pine (Pinus leiphylla), pinyon pine (Pinus cembroides), and ponderosa pine (Pinus ponderosa). Turbinella oak (Quercus turbinella) may also be present.

Broadleaf Evergreen Woodlands are found at elevations of about 4,200 to 7,200 feet. Mean annual air temperature ranges from about 52° to 58° F. Mean annual precipitation ranges from about 16 to 19 inches. The dominant native vegetation is emory oak
(Quercus emoryi), Arizona white oak (Quercus grisea), alligator juniper (Juniperus deppeana), manzanita (Arctostaphylos spp.), and (Juniperus erythrocarpa).

Coniferous Woodlands are found at elevations of about 4,200 to 7,200 feet. Mean annual air temperature ranges from about 50° to 58° F. Mean annual precipitation ranges from about 17 to 22 inches. The dominant native vegetation is pinyon pine (Pinus cembroides), emory oak (Quercus emoryi), Arizona white oak (Quercus grisea), alligator juniper (Juniperus deppeana), and Chihuahua pine (Pinus leiophylla).

Deciduous Forests are found at elevations of greater than 6,200 feet. Mean annual air temperature ranges from about 44° to 50° F. Mean annual precipitation is 25 inches or more. The dominant native vegetation is aspen (Populus tremuloides), Rocky Mountain maple (Acer glabrum), box elder (Acer negundo), ash (Fraxinus spp.), and New Mexican locust (Robinia neomexicana).

Coniferous Forests (transition) are found at elevations greater than 6,200 feet. Mean annual air temperature ranges from about 49° to 55° F. Mean annual precipitation ranges from about 20 to 26 inches. The dominant native vegetation is a mix of manzanita (Arctostaphylos spp.), Arizona white oak (Quercus grisea), silver leaf oak (Quercus hypoleucoides), alligator juniper (Juniperus deppeana), pinyon pine (Pinus cembroides), Chihuahua pine (Pinus leiophylla), and ponderosa pine (Pinus ponderosa).

Coniferous Forests (mixed conifer) are found at elevations greater than 7,200 feet. Mean annual air temperature ranges from about 45° to 52° F. Mean annual precipitation is about 30 inches. The dominant native vegetation is ponderosa pine (Pinus ponderosa), alligator juniper (Juniperus deppeana), gambel oak (Quercus gambelii), and Douglas-fir (Pseudotsuga menziesii).

Coniferous Forest (spruce-fir) are found at elevations greater than 8,200 feet. Mean annual air temperature ranges from about 45° to 52° F. Mean annual precipitation is about 35 inches. The dominant native vegetation is Engleman spruce (Picea engelmanii), corkbark fir (Abies lasiocarpa var. arizonica), Douglas-fir (Pseudotsuga menziesii), white fir (Abies concolor) and aspen (Populus tremuloides).

Dry Desert Riparian are found at elevations less than 5,200 feet. Mean annual air temperature ranges from about 66° to 72° F. Mean annual precipitation ranges from about 8 to 10 inches. The dominant native vegetation is mesquite (Prosopis spp.), desert willow (Chilopsis linearis), seep willow (Baccharis glutinosa), and desert broom (Baccharis sarothroides).

Deciduous Riparian areas are found at elevations greater than 4,200 feet. Mean annual air temperature ranges from about 56° to 64° F. Mean annual precipitation ranges from about 12 to 16 inches. The dominant native vegetation is Fremont cottonwood (Populus fremontii), and Arizona Sycamore (Platanus wrightii).

Evergreen Riparian (higher ecosystem extensions) areas are found at elevations greater than 4,200 feet. Mean annual air temperature ranges from about 54° to 58° F. The dominant native vegetation is Emory oak (Quercus emoryi) and alligator juniper (Juniperus deppeana).

Coniferous Riparian (combinations of riparian obligate species in both ponderosa pine/Douglas-fir forest and pine/oak/juniper woodland communities) areas are found at elevations greater than 5,200 feet. Mean annual air temperature ranges from about 46° to 52° F. The dominant native vegetation is Arizona sycamore (Platanus wrightii), Rocky
Mountain maple (Acer glabrum), aspen (Populus tremuloides), ash (Fraxinus spp.), Arizona alder (Alnus oblongifolia) and Arizona cyprus (Cupressus arizonica).

Environmental Consequences – Forest Plant Communities

Direct and Indirect Effects

Alternative 1: No Action

This alternative would not control invasive species above existing low levels. Populations of invasive species already present on the Forest would increase in size and density as well as spread to new locations through transportation of seed through the typical vectors of spread (vehicles, animals, wind, water, etc.). New species of invasive plants would likely be introduced to the Forest over the 10-year term of the analysis and would increase in population size and density, crowding out native plant communities. Low elevation disturbed sites would be most vulnerable to invasive species colonization, and these areas would be impacted earliest and most seriously. Based on past observed increases, sweet resinbush in particular is expected to increase in distribution. As sweet resinbush plants become established, they exclude nearly all species of native plants, forming a monoculture. Infestations of other invasive species would initially be introduced along roads and trails and in grazing allotments. Higher elevation sites with fewer disturbances and fewer vectors of spread (vehicles, hikers, livestock, etc.) would be less impacted by the spread of invasive species, although these vegetation types would not be unaffected over the long term.

The adverse impact on native plant communities would become increasingly apparent over the life of the analysis. In general, studies show that the cover and diversity of native plant species is reduced as invasive species spread (Belcher and Wilson 1989). Those plant communities dominated by exotic species would form a homogenous, monoculture-like habitat with reduced structural diversity (Belcher and Wilson 1989). The shifting dynamics and diverse habitats of riparian areas render them particularly susceptible to invasion by noxious weeds. Saltcedar and Johnson grass populations now found on the Forest would continue to produce seed in riparian zones. This seed would wash down stream during heavy rain events, causing populations to spread on to private lands and other state and federal lands. Disturbance from livestock grazing and hooves would facilitate germination of weed seeds and establishment of new infestations. Populations of Johnson grass would increase in riparian areas, shading out native species.

Key forage species would be reduced in rangelands on the Forest. Noxious weeds have little palatability, so forage losses would also adversely affect native ungulates. Non-infested vegetation would be subject to greater use by herbivores. This could increase removal of desirable vegetation and trampling of vegetation and soils.

Vegetation changes produced by invasive species would alter fire regimes at infested sites (Van Devender 1997). A greater quantity and continuity of fine fuel is produced by stands of exotic vegetation such as buffelgrass. Consequently there is a higher frequency of damaging fires during which native perennials may be negatively impacted. Fire frequency in Sonoran desert habitats invaded by buffelgrass would increase as fine fuels build. Most of the dominant plants in the desert communities (Saguaro, palo verde and brittle bush, for example) are readily killed by fire. The ecological result of the introduction of buffelgrass into fire-intolerant communities has been the conversion of
these communities to an African-like savannah with drastically reduced standing crop biomass and overall diversity (Van Devender 1997).

Predictions regarding the rate of spread of noxious weeds in the Forest cannot accurately be made. However, examples from other areas can provide indications. Leafy spurge was unreported in Montana in 1920. In 1990, there was an estimated 1.5 million acres infested. It has been estimated that in the western United States, the total area infested by noxious weeds is expanding by 14 percent annually (Westbrooks 1998).

**Alternative 2: Integrated Vegetation Management Excluding Herbicides**

This alternative would slow the rate of spread of some weed populations. However, because many infestations would not be completely controlled or eliminated through mechanical control (e.g. Canada thistle, Johnson grass), a long-term expansion of noxious weeds into suitable habitats may be expected. Past efforts at controlling sweet resinbush on the Safford Ranger District through a combination of hand removal and fire have proved to be largely unsuccessful. Over the long term, the spread of invasive species is expected to continue, contributing to changes in plant species diversity and fire regimes that may negatively impact native plant communities, including sensitive species.

**Alternative 3: Integrated Vegetation Management**

A fully integrated approach to prevention, early detection and eradication of early-detected invasive species represents the most efficient and cost effective weed control available (BLM 1996). Consequently this program would provide the greatest long-term protection to the integrity of the native plant communities. Range condition would also be protected most effectively with this alternative. Follow up treatments will be needed at infested sites, since application of herbicide or manual control methods will not generally eliminate target species in one effort, particularly if seed has been produced and is now present in the soil. Follow up treatments are generally not as intensive as initial treatments, but infestations will quickly return to fully occupy the site without them. It is necessary to continue to control weeds and prevent seed production until every seed on the site has either germinated or become non-viable. Complete recovery of reclaimed sites may require revegetation of desired plant species, either by natural regeneration of natives or by planting desirable species or non-viable cover crops.

Mechanical treatments that would occur with selection of this alternative may result in the removal or damage of some native vegetation. However these areas would be small and the impacts short-lived.

At herbicide treatment sites, non-target vegetation may be impacted. Herbicide selection will be made based on the site conditions and type of invasive species to be controlled. The most effective herbicide with the lowest impact on non-target vegetation will be selected. Application rates and the timing of applications will be selected to minimize effects to non-target species. With the most effective herbicides, some impacts to non-target vegetation are unavoidable with herbicide application. The proposed spot treatment of many weed populations and mitigation features included in the design will allow the Forest to minimize herbicide effects to vegetation outside of the immediate vicinity of target plants. Impacts to native plant communities would be vastly less than with selection of the first two alternatives.

Use of glyphosate and imazapyr will be minimized since these two chemicals are broad spectrum herbicides, killing almost all vegetation. Localized application of these two
herbicides can be a very effective tool within riparian zones and for treatment of cut stumps. Broadcast application of these chemicals will not be used.

The effectiveness of control treatments would be influenced by many factors including funding levels, the extent and success of repeat treatments, the effort exerted in mapping and monitoring of infestations, the extent of preventative measures implemented, the amount and degree of success of cooperative working agreements across multiple ownerships, and the amount of effort to search for and control new populations and species of invasive plants. Inventory and mapping of infestations would increase the chance of containing and confining weed infestations. Use of the preventive measures listed in Appendix C would reduce the influx of weeds, leaving fewer infestations to manage. Prevention of introduction and spread of invasive species is the single most effective and inexpensive method of invasive species management and is an important part of any integrated pest management strategy. Cooperative working agreements with adjacent landowners is critical to the success of weed management. Lands with unmanaged infestations become seed sources for dispersal to adjacent areas. As infestations increase on unmanaged lands, the influx of weed seed to neighboring areas becomes overwhelming.

**Threatened, Endangered and Sensitive Plants**

**Affected Environment – TEPS Plants**

A total of 93 Threatened, Endangered, Proposed or Forest Service Sensitive (TEPS) plant species occur or potentially occur on the Coronado National Forest. In order to determine which species may be potentially affected by the proposed action, all known sensitive plant species within one mile of any proposed weed treatment location were identified using the Forest Geographic Information System (GIS) database. Weed locations were derived from the 1999 survey of weeds on the Forest (Doc. 6). Realistically, since all proposed treatments will be targeted on individual weed plants at specific sites, effects to species not in the immediate vicinity of the treatment activity will likely be confined to the immediate treatment vicinity. Nevertheless, a one-mile radius was selected to ensure full consideration of species potentially in the area. Sensitive plants were identified within one mile of proposed treatment sites in five of the seven EMAs. These were Huachuca (Huac), Tumacacori (Tuma), Santa Catalina (Scat), Santa Rita (Srit) and Pinaleno (Pina). No species were identified within one mile of weed treatment sites in the Chiricahua and Peloncillo sites. The 30 species selected for analysis include 29 Forest Service Sensitive (S) species and one listed Endangered species, *Liliopsis schnaffneriana*, and are shown in Table 7.

<table>
<thead>
<tr>
<th>Species</th>
<th>Status</th>
<th>EMA of Occurrence</th>
<th>Associated Weeds</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Abuliton parishii</em></td>
<td>S</td>
<td>Scat, Srta</td>
<td>Bufflegrass, Fountain Grass</td>
</tr>
<tr>
<td>Pima Indian mallow</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Agave parviflora parviflora</em></td>
<td>S</td>
<td>Tuma</td>
<td>Tree of Heaven</td>
</tr>
<tr>
<td>Santa Cruz striped agave</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Amoreuxia gonzalezii</em></td>
<td>S</td>
<td>Srta</td>
<td>Bufflegrass</td>
</tr>
<tr>
<td>Saiya</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Anisonia grandiflora</em></td>
<td>S</td>
<td>Tuma</td>
<td>Tree of Heaven</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 7. Coronado National Forest sensitive plant species potentially affected by proposed noxious weed treatments.
<table>
<thead>
<tr>
<th>Species</th>
<th>Status</th>
<th>EMA of Occurrence</th>
<th>Associated Weeds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large-flowered blue star</td>
<td>S</td>
<td>Huac</td>
<td>Tree of Heaven</td>
</tr>
<tr>
<td><em>Astragalus hypoxylus</em> Huachuca milkvetch</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Carex ultra</em> Arizona giant sedge</td>
<td>S</td>
<td>Huac</td>
<td>Giant reed</td>
</tr>
<tr>
<td><em>Coryphantha recurvata</em> Santa Cruz beehive cactus</td>
<td>S</td>
<td>Tuma</td>
<td>Tree of Heaven</td>
</tr>
<tr>
<td><em>Erigeron arisilouis</em> Arid throne fleabane</td>
<td>S</td>
<td>Srtt</td>
<td>Tree of Heaven</td>
</tr>
<tr>
<td><em>Eupatorium bigelovii</em> Bigalow thoroughwort</td>
<td>S</td>
<td>Tuma</td>
<td>Tree of Heaven</td>
</tr>
<tr>
<td><em>Graptopterum bartramii</em> Bartrom stonecrop</td>
<td>LE</td>
<td>Huac</td>
<td>Giant reed</td>
</tr>
<tr>
<td><em>Hedeoma dentatum</em> Mock pennyroyal</td>
<td>S</td>
<td>Srtt, Huac, Sct</td>
<td>Tree of Heaven, Bufflegross</td>
</tr>
<tr>
<td><em>Heuchera glomerata</em> Arizona alum root</td>
<td>S</td>
<td>Pina</td>
<td>Salt cedar</td>
</tr>
<tr>
<td><em>Ipomeathurberi</em> Thuber’s morning glory</td>
<td>S</td>
<td>Tuma</td>
<td>Tree of Heaven</td>
</tr>
<tr>
<td><em>Laennecia eriophylla</em> Wooly fleabane</td>
<td>S</td>
<td>Srtt</td>
<td>Fountain grass</td>
</tr>
<tr>
<td><em>Lilaeopsis schnaffneriana ssp. recurvata</em> Huachuca water-umbel</td>
<td>LE</td>
<td>Huac</td>
<td>Giant reed</td>
</tr>
<tr>
<td><em>Lotus alamosanus</em> Alamos deer vetch</td>
<td>S</td>
<td>Tuma</td>
<td>Tree of Heaven</td>
</tr>
<tr>
<td><em>Macroptilium supinum</em> Supine bean</td>
<td>S</td>
<td>Tuma</td>
<td>Tree of Heaven</td>
</tr>
<tr>
<td><em>Manihot davisiae</em> Arizona manihot</td>
<td>S</td>
<td>Sct, Srtt</td>
<td>Bufflegross, Fountain grass</td>
</tr>
<tr>
<td><em>Metastelma mexicanum</em> Wiggins milkweed vine</td>
<td>S</td>
<td>Tuma</td>
<td>Tree of Heaven</td>
</tr>
<tr>
<td><em>Muhlenbergia duboides</em> Box canyon muhly</td>
<td>S</td>
<td>Sct</td>
<td>Bufflegross, Fountain grass</td>
</tr>
<tr>
<td><em>Pectis imberbis</em> Beardless cinch weed</td>
<td>S</td>
<td>Tuma</td>
<td>Tree of Heaven</td>
</tr>
<tr>
<td><em>Penstemon discolor</em> Catalina beardtongue</td>
<td>S</td>
<td>Sct</td>
<td>Bufflegross, Fountain grass</td>
</tr>
<tr>
<td><em>Penstemon ramosus</em> Branching penstemon</td>
<td>S</td>
<td>Pina</td>
<td>Sweet resin bush</td>
</tr>
<tr>
<td><em>Polemonium flavum</em> Pinaleno Jacob’s ladder</td>
<td>S</td>
<td>Sct</td>
<td>Bufflegross, Fountain grass</td>
</tr>
<tr>
<td><em>Potentilla albiflora</em> White-flowered cinquefoil</td>
<td>S</td>
<td>Pina</td>
<td>Canada thistle</td>
</tr>
<tr>
<td><em>Rumex orthoneurus</em> Blumer’s dock</td>
<td>S</td>
<td>Pina</td>
<td>Canada thistle</td>
</tr>
<tr>
<td><em>Stevia lemmonii</em> Lemmon’s stevia</td>
<td>S</td>
<td>Sct</td>
<td>Bufflegross, Fountain grass</td>
</tr>
<tr>
<td><em>Tephrosa thurberi</em> Thuber hoary pea</td>
<td>S</td>
<td>Huac</td>
<td>Tree of Heaven</td>
</tr>
<tr>
<td><em>Tragia laciniiata</em> Sonoran noseburn</td>
<td>S</td>
<td>Tuma, Huac</td>
<td>Tree of Heaven</td>
</tr>
<tr>
<td><em>Tumamoc mc dougalii</em> Tumamoc globeberry</td>
<td>S</td>
<td>Sct</td>
<td>Bufflegross, Giant reed</td>
</tr>
</tbody>
</table>
More detailed descriptions of the 30 species are found in the Biological Assessment and Evaluation for this analysis (Appendix E). For the purposes of this analysis of the potential effects of noxious weed control activities on the sensitive plant resource, the habitats, known occurrences and known weed infestations associated with each of the 30 species constitute the affected environment.

**Environmental Consequences – TEPS Plants**

The application of selective and non-selective herbicides can directly cause injury or death to non-target plant species. Mechanical disturbance of the plant community can also result in impacts to non-target plants through soil disturbance or trampling. Post-treatment changes in the plant composition at the site of herbicide application and across the broader landscape are a potential consequence of weed eradication. These changes are, for the most part, believed to be beneficial to the extent they result in reductions of weed species, but may result in the loss of vegetative cover unless revegetation action is taken. Environmental effects of the proposed action and alternatives analyzed for each of the sensitive plant species identified in Table 7. The analysis was based on the type of treatment and the proximity of TEPS plants to identified weed treatment sites. Two types of treatment are identified under the proposed action: Eradication of localized existing populations, and containment and control of more widespread populations. Effects to plant species are presumed to be similar for both types of treatments, so they are not broken out in the following analysis.

For all action alternatives mitigation measures identified in Chapter 2 of the EA will be followed.

**Direct and Indirect Effects**

**Alternative 1: No Action**

Under this alternative, there would be no direct effects on occupied or suitable habitats for TEPS plants on the Forest. Weed control practices would not change from current levels. The use of herbicides in administrative sites and developed recreation sites would continue at current levels. Because of the highly disturbed character of these sites, TEPS plants are not likely to occur.

The indirect effects of this alternative are related to the continued spread of weeds into the Forest and the effects of this infestation on sensitive plants and their habitats. Populations of invasive species would continue to expand into susceptible areas. The impacts to sensitive species would be dependant on the future dynamics of weed infestations, which are difficult to predict. In general, the effects described for this alternative in the preceding section are predicted to result in negative effects to sensitive species through loss of plant species diversity and cover and changes in fire regimes.

**Alternative 2: Integrated Vegetation Management Except for the use of Herbicides**

Weed treatment mitigation outlined in the proposed action would protect documented TEPS plant occurrences. On those few sites where weeds occur within the extent of a sensitive plant population, it is possible that some trampling of sensitive plants could occur during hand pulling of weeds. The effects to a very small number of individual plants will be localize and short-lived and are not expected to affect population viability for any of the species under consideration.
Over the long term, it is not likely that this alternative would be sufficient to contain or control existing populations of weeds where infestations are extensive. Mechanical removal of sweet resinbush on the Pinaleno EMA have not been shown to be effective at long-term control. Hand pulling of several species of weed in Sabino Canyon has been ongoing, but at best, it has only kept pace with the rate of weed expansion in the canyon. Prevention measures and education will help to reduce the rate of introduction of new populations; however it is likely that weed populations would continue to expand from existing source populations within the Forest.

**Alternative 3: Integrated Vegetation Management**

Direct effects of the proposed action on special status plants would be almost entirely related to the effects of herbicide application on non-target plant species. Direct effects could occur from the broad non-selective spraying over wide areas. However, under the proposed action, treatments are restricted to the spot treatment of individual plants so very little herbicide drift would be expected. Tree of heaven treatments would involve cutting or pulling of individual trees and painting stumps with glyphosate, a technique which will eliminate the potential for herbicide application to non-target species. Fourteen of the 30 species identified in Table 4 are associated with Tree of Heaven, and no direct effects are expected to these species. The greatest potential for effects to non-target plant species exists in the Pinaleno EMA where sweet resinbush occurs in stands covering hundreds of acres. Because treatments would cover a wide area, some mortality to non-target species is expected. However, there are no known records of TES plants within the treatment area and mitigation measures described in Chapter 3 are designed to minimize the effects.

Based on records available for the occurrence of TEPS plants associated with noxious weed locations, it is unlikely that sensitive plants will occur in close association with any weeds; however, in order to minimize effects, all treatment areas will be surveyed for sensitive plant species prior to treatment as described in the mitigation measures section in Chapter 3.

Other direct effects include possible trampling or other physical damage to TEPS plants occurring adjacent to weed treatment areas during cutting or pulling of weeds. The localized nature of these effects, combined with pre-treatment surveys for sensitive plants, should minimize mechanical effects. The effects to a very small number of individual plants are not expected to affect population viability for any of the species under consideration. Physical damage to plants is anticipated to be less than that expected under Alternative 2, since a greater percentage of plants would be treated with herbicides that require less ground disturbance.

Removal of noxious weeds through any of the proposed treatment methods is not expected to have a long-term adverse effect on any sensitive plant species’ habitat. Removal of competitive weed species should increase the potential for colonization of the site by native plants, including, potentially, sensitive species.

Containment of existing weed species could help prevent the spread of weeds further into more natural habitats. This would benefit individual species such as *Penstemon discolor* populations along the Catalina Highway where bufflegrass and fountain grass are increasing. Successful eradication or containment of invasive species would reduce the risk for catastrophic fires in fire-intolerant communities and help to perpetuate these natural communities, leading to overall greater plant community diversity on the Forest.
Successful eradication of small populations of tree of heaven, yellow starthistle, Canada thistle, buffelgrass, fountain grass and Johnson grass will eliminate source populations for the further spread of these species on to the Forest.

Cumulative Effects -Vegetation

A cumulative effect results from the effect of the proposed action when added to the effects of other past, present and reasonably foreseeable future actions (40 CFR 1508.7). The effects of Alternatives 1, 2 and 4, when added to the effects of the ongoing weed eradication efforts at administrative and recreational sites would represent a cumulative effect. It is unlikely that the sum of the effects of the treatment efforts would rise to the level of significance, although assuming successful treatment, the total amount of weeds treated would be greater than either of the two efforts taken individually. The possible future application of herbicides to public road rights of way within the Forest is currently being evaluated under a separate environmental analysis. Treatments will be confined to federal and state highway rights of way, which are limited on the Forest. Treatment of public roadways, if it occurs, may increase the amount of land treated on the Forest, but activities will be confined to roadsides. Very few sensitive plant species are known to occur in the highly disturbed areas adjacent to public roads where treatments will occur, so effects to sensitive native plants are expected to be negligible. However, these treatments, if they occur, would help to reduce the spread of invasive species from roadsides where they often first establish.

Other past, present and future activities that may contribute cumulative effects to vegetation and sensitive plants include recreation and grazing management activities. Recreation can disturb soils and create conditions to the introduction of invasive species. Recreationists, their vehicles and pets can act as vectors for the dispersal of weed seeds from other areas. Likewise, livestock grazing can contribute to the introduction and spread on nonindigenous plants by transporting seeds into uninfested sites, disturbing the soil and preferentially grazing native plants over weed species (Belsky and Gelbard 2000). On areas of the Forest where grazing occurs, livestock may continue to contribute to the spread of invasive species. Incorporation of the prevention measures outlined in alternatives 2 and 3 should provide some mitigation of this effect. Several of the known locations of invasive plants are currently ungrazed (Sabino Canyon and the front range of the Catalina Mountains) so livestock grazing is not expected to contribute cumulatively to the spread of weeds in these areas.

Wildlife (Issue 2)

Noxious weeds and exotic invasive plants provide little value as food or cover for native wildlife relative to native plant communities and often replace more valuable native plant species. The sites proposed for treatment are usually sites that have been disturbed by human activity (campsites, roadways and old home sites) and/or are subject to ongoing disturbance by human activity (e.g. Sabino Canyon). Nevertheless, a range of wildlife species may be present on or adjacent to sites proposed for treatment. Both aquatic and terrestrial species may be affected and effects may include the following:

- Changes in habitat composition and structure resulting from noxious weed treatments;
- Direct effects on wildlife from chemical treatments;
- Direct effects on wildlife from disturbance associated with treatments.

The scope of the analysis is influenced by the type of the treatment and the species being affected. For purposes of delineating the geographic scope of the analysis, all known TES species occurring within one mile of identified weed treatment sites were identified using the Forest GIS database. The habitats and known occurrences of wildlife species within one mile of treatment sites constitute the affected environment. In reality, weed treatments will be site-specific and effects are not expected to extend beyond the treatment site and the immediately adjacent area. Nevertheless, a one-mile buffer will insure consideration of a full range of species potentially affected by the proposed action.

The following analysis first describes the affected environment for Threatened, Endangered, Proposed and Sensitive (TEPS) aquatic wildlife, TEPS terrestrial wildlife and Management Indicator Species (MIS). Following that, the environmental effects of the proposed action and alternatives are described individually for both terrestrial and aquatic wildlife.

**Affected Environment**

**Threatened, Endangered, Proposed and Forest Service Sensitive aquatic organisms.**

Noxious weed infestations in aquatic habitats are restricted in size and distribution on the Forest. Identified species areas for priority treatment include Redrock Canyon (Johnson grass) and the Van Horn exclosure (giant reed) in the Huachuca EMA, and lower Sabino and Bear Canyons in the Santa Catalina EMA where populations of Giant reed, sweet resin bush, Buffleggrass and Pentzia are present. Aquatic vertebrate species present and potentially affected in Redrock Canyon include the Endangered Gila topminnow (*Poeciliopsis occidentalis occidentalis*) and Long-finned dace (*Agosia chrysogaster*), a Forest Service Sensitive species. In the Sabino Canyon area, occupied or potential habitats have been documented for the Proposed Endangered Gila chub (*Gila intermedia*), Lowland leopard frog (*Rana yavapaiensis*) and the Sabino Canyon damselfly (*Argia Sabino*), both Forest Service Sensitive species. Because of the potential for downstream transport of herbicides away from treatment sites, the affected environment for aquatic species includes species and habitats located downstream from treatment areas.

**Threatened, Endangered and Forest Service Sensitive terrestrial wildlife and invertebrates.**

Within the affected environment for the proposed action, occupied or potential habitats for 18 terrestrial TEPS species have been identified. These species are displayed in Table 8.

<table>
<thead>
<tr>
<th>Species Name</th>
<th>Status</th>
<th>EMA of Occurrence</th>
<th>Associated Noxious Weeds</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mount Graham red squirrel</td>
<td>LE</td>
<td>Pina</td>
<td>Canada thistle</td>
<td>Occupied and potential habitats are found near Canada thistle sites, but the thistle occurs in open, disturbed</td>
</tr>
<tr>
<td>Species Name</td>
<td>Status</td>
<td>EMA of Occurrence</td>
<td>Associated Noxious Weeds</td>
<td>Comments</td>
</tr>
<tr>
<td>--------------------------------------------------</td>
<td>--------</td>
<td>-------------------</td>
<td>--------------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>White-bellied long-tailed vole <em>Microtus longicaudus leucopheaus</em></td>
<td>S</td>
<td>Pina</td>
<td>Canada Thistle</td>
<td>Species inhabits grassy alpine meadows and flats along streams, cienegas, roadsides and other openings in the conifer forest on the Pinaleno Mountains.</td>
</tr>
<tr>
<td>Lesser long-nosed bat <em>Leptonycteris curasoae yerbabuenae</em></td>
<td>LE</td>
<td>Tuma</td>
<td>Tree of Heaven</td>
<td>Suitable habitats may be present near most weed treatment sites except for high elevation Canada thistle sites.</td>
</tr>
<tr>
<td>Mexican spotted owl <em>Strix occidentalis lucida</em></td>
<td>LT</td>
<td>Huac, Tuma, Scat, Pina, Chir</td>
<td>Tree of Heaven Canada thistle</td>
<td>Management territories mapped near Harshaw and on Mount Graham. Single bird observed in Sabino Canyon (Scat) in 1991; no occupied habitat.</td>
</tr>
<tr>
<td>Northern goshawk <em>Accipiter gentiles apache</em></td>
<td>S</td>
<td>Huac, Pina</td>
<td>Tree of Heaven Canada thistle</td>
<td>Occupied territories within one mile of treatment site.</td>
</tr>
<tr>
<td>American peregrine falcon <em>Falco peregrinus anatum</em></td>
<td>S</td>
<td>Scat</td>
<td>Buffelgrass Fountain grass</td>
<td>Nests throughout Forest in suitable habitat.</td>
</tr>
<tr>
<td>Cactus ferruginous pygmy owl <em>Galacucium brasilius cactorum</em></td>
<td>LE</td>
<td>Scat</td>
<td>Buffelgrass Giant reed Pentzia</td>
<td>A single record from 1976 in Sabino Canyon. No recent observations.</td>
</tr>
<tr>
<td>Western yellow-billed cuckoo <em>Coccyzus americanus occidentalis</em></td>
<td>S</td>
<td>Tuma, Huac</td>
<td>Tree of heaven</td>
<td>Occupied and potential habitats in vicinity.</td>
</tr>
<tr>
<td>Northern gray hawk <em>Asturina nitida maxima</em></td>
<td>S</td>
<td>Huac</td>
<td>Johnson grass</td>
<td>Nests within one mile of treatment site.</td>
</tr>
<tr>
<td>Mexican garter snake <em>Thamnophis eques megalops</em></td>
<td>S</td>
<td>Huac</td>
<td>Tree of Heaven</td>
<td>Suitable aquatic habitat not present at site.</td>
</tr>
<tr>
<td>Arizona ridge-nosed rattlesnake <em>Crotalus willardi willardi</em></td>
<td>S</td>
<td>Huac</td>
<td>Tree of Heaven</td>
<td>Documented within one mile. Suitable habitat not present at site.</td>
</tr>
<tr>
<td>Chiricahua leopard frog <em>Rana chiricahuensis</em></td>
<td>LT</td>
<td>Tuma, Chir</td>
<td>Tree of Heaven</td>
<td>Documented within one mile, but suitable aquatic habitat not present on site.</td>
</tr>
<tr>
<td>Lowland leopard frog <em>Rana yavapaiensis</em></td>
<td>S</td>
<td>Scat</td>
<td>Giant reed Buffelgrass Pentzia</td>
<td>Documented within one mile in Sabino Canyon in 1980. No recent records.</td>
</tr>
<tr>
<td>Western barking frog <em>Eleutherodactylus augusti cactorum</em></td>
<td>S</td>
<td>Tuma</td>
<td>Tree of Heaven</td>
<td>Old record from 1965 within one mile. No recent records; suitable habitat not present on site.</td>
</tr>
<tr>
<td>Gila chub <em>Gila intermedia</em></td>
<td>P</td>
<td>Huac, Scat</td>
<td>Buffelgrass Giant reed Pentzia</td>
<td>Occupied habitats in Sabino Creek and O’Donnell Creek.</td>
</tr>
<tr>
<td>Sabino Canyon damselfly <em>Argia Sabino</em></td>
<td>S</td>
<td>Scat</td>
<td>Buffelgrass Giant reed Pentzia</td>
<td>Species and suitable habitats present.</td>
</tr>
</tbody>
</table>
Species Name | Status | EMA of Occurrence | Associated Noxious Weeds | Comments
---|---|---|---|---
Pinaleno mountainsnail *Oreohelix grahamensis* | S | Pina | Canada thistle | Found in leaf litter around rockslides. No suitable habitat present.
Pinaleno tallussnail *Sonorella grahamensis* | S | Pina | Canada thistle | Inhabits rockslides. No suitable habitat present.
Mimic tallussnail *Sonorella imitator* | S | Pina | Canada thistle | Inhabits rockslides. No suitable habitat present.

**Management Indicator Species (MIS)**

The Forest Service Manual (FSM) defines management indicator as “plant and animal species, communities or special habitats selected for emphasis in planning, and which are monitored during forest plan implementation in order to assess the effects of management activities on their populations and the populations of other species with similar habitat needs which they may represent.” (FSM 2620.5). The Coronado National Forest Plan identifies 33 Management Indicator Species and one group (cavity nesters) to fill this role (Appendix F). By definition, MIS are species that represent a broader suite of species that share similar habitat affinities and for which the effects of the proposed action and alternatives are considered similar. The analysis area supports an abundance of species that may be affected by the proposed action and alternatives. For the purposes of this analysis, effects to MIS are presumed to be representative of effects to other species with similar habitat needs.

Several TES species discussed above are also MIS on the Forest. Those species are **northern gray hawk**, **American peregrine falcon**, **Mount Graham red squirrel**, **Arizona ridge-nosed rattlesnake**, **western barking frog**, **Gila topminnow** and **Gila chub**. The above-listed species are all included in the “threatened and endangered species” indicator group in the Forest Plan. In addition, the **gray hawk** is an indicator for riparian habitats. Suitable habitats for the following additional MIS have been identified as occurring within the analysis area.

- **Elegant Trogon**: Cavity nesters, Riparian, Species needing diversity, Special Interest Species, Threatened and Endangered Species.
- **Sulphur-bellied flycatcher**: Cavity nesters, Riparian, Species needing diversity, Special Interest Species, Threatened and Endangered Species.
- **Black Bear**: Riparian, Species needing diversity, Game Species.
- **White-tailed deer**: Species Needing Diversity, Species Needing Herbaceous Cover, Game Species.
- **Mearns’ quail**: Species Needing Herbaceous Cover, Game Species, Special Interest Species.

Forest-wide trends of all MIS have been assessed and are reported in the Forest-wide Status Report for Management Indicator Species (USFS 2002). The background information and conclusions of this report are incorporated by reference and the entire document is contained in the project record for this analysis (Doc.74). Project level impacts to selected MIS as a result of this proposal have been evaluated and are reported in the Wildlife Specialist’s Report, found in the project record (Doc. 67). Effects are summarized herein.
Environmental Consequences - Terrestrial Wildlife

This section evaluates the environmental consequences of all alternatives to terrestrial wildlife. The information included in the analysis is based on the Risk Assessment for Herbicide Use in Forest Service Regions 1, 2, 3, 4 and 10 and on Bonneville Power Administration Sites (USDA Forest Service 1992). Regulations to implement the National Environmental Policy Act (NEPA) provide for the reduction of bulk and redundancy through incorporation by reference when the effect will be to reduce the size of the document without impeding agency of public review of the action (40 CFR 1502.21). Portions of the Risk Assessment are displayed in the following analysis, but the entire document is incorporated by reference.

The majority of weed infestation sites on the Forest at this time do not provide high quality wildlife habitat. By their nature, most sites have undergone past physical disturbance or are subject to high human activity and disturbance levels (e.g. Sabino Canyon). Many sites are along well-traveled roadways. In some cases, the presence of the weeds themselves contributes to degraded site conditions and habitats would improve with the removal of weeds. Tree of Heaven is allelopathic (it suppresses the growth of nearby plants); sweet resin bush and bufflegrass tend to form extensive monocultures that reduce plant diversity and degrade habitat value for native species. In addition, most weed sites are very localized at present.

Direct and Indirect Effects

Alternative 1 - No Action

Under the No Action Alternative, there will be no direct effects to terrestrial wildlife species from treatment activities. Individual populations of noxious weeds may continue to be treated using a variety of methods, including herbicides. However, each treatment would be evaluated and authorized under a separate analysis. A strategic, programmatic approach to integrated vegetation management would not be taken. Given existing workloads, it is not likely that individual analyses and treatments would proceed with sufficient speed to have a significant effect on invasive plant infestations. Herbicides and other weed treatments may continue to be used in administrative sites and developed recreation areas, but would be insufficient to treat major areas of weed invasion.

It is likely that treatment activities will continue to remain at existing levels and that noxious weed populations will continue to expand on the Forest. This would result in a reduction of desirable native habitats. Monocultures of invasive species, especially sweet resinbush and buffelgrass would continue to expand and new populations of invasive plants would become established. Palatable forage for game and non-game species of wildlife would likely decrease. Natural habitat for wildlife would be lost as nesting and ground cover, grass production, seed producing food sources, and prey base would be reduced. Westbrook (1998) reported that stands of the Lehmann lovegrass were shown to have fewer quail, small mammals and seed-harvesting ants. Elk pellet-group densities averaged 81% lower in infested sites than in non-infested sites and biomass of key forage species was reduced from 77% to only 4% of total biomass in sites heavily infested with leafy spurge in a study in North Dakota (Trammell and Butler 1995). The continued spread of invasive species at lower elevations may contribute to increasing fire frequency.
in fire-intolerant Sonoran desert habitats, leading to a loss or degradation of these areas as wildlife habitat.

This alternative would cause the highest level of degradation of forage and habitat for wildlife species over time.

**Alternative 2: Integrated Vegetation Management excluding the use of Herbicides.**

The direct effects of cultural, physical and biological treatments to wildlife species are expected to be minimal, and confined to short-term displacement of individual animals. Manual and mechanical treatments will be of short duration and confined to relatively small areas. In the short term, some minor soil disturbance would be expected and in areas where weeds form a monoculture, removal of large amounts of plant cover may leave the soil surface susceptible to erosion. Site disturbance may be somewhat greater under this alternative, since manual treatment is more labor-intensive, and will probably result in greater disturbance of the soil on the site. Areas such as this would be revegetated under the integrated vegetation management approach, so the potential for soil loss would be minimized.

The indirect effects of treating vegetation under this alternative are expected to involve long-term changes in the plant community, but to a lesser degree than those described under either Alternatives 1 and 3. Where weeds can eliminated or controlled through manual or mechanical treatments, the potential will exist for the establishment of native wildlife habitats, especially in areas where restoration involves replanting of native species. There is a potential for increased soil disturbance under this alternative, since much of the work would involve cutting or grubbing of entire plants. Many of the species in this analysis have been shown to be resistant to mechanical treatments because they are prolific seed producers or are capable of spreading through rhizomes, thus requiring repeated treatments to be effective. Areas that require repeated treatments would result in long-term soil disturbance on the sites. The potential for successful treatment of invasive species is reduced under this alternative, compared to the proposed action.

Over the long term, areas of extensive weed infestations would persist because their size would preclude effective control using manual methods alone.

**Alternative 3: Integrated Vegetation Management.**

Wildlife exposure to herbicides can occur through direct skin contact (dermal exposure), ingestion of herbicide-contaminated forage, inhalation of aerial spray or a combination of the above routes. The USDA Forest Service Risk Assessment for Herbicide Use (Risk Assessment) evaluated the toxicity to terrestrial and aquatic wildlife and invertebrate species of 21 herbicides, 3 carriers and one additive proposed for use by the Forest Service in the Rocky Mountain Region. For the purposes of the Risk Assessment, all herbicide treatments were assumed to involve broadcast applications from aircraft. Ground-based, site specific applications, as proposed on the Coronado National Forest, were considered to have a very low potential to affect wildlife because of the reduced likelihood of an animal receiving a direct spray of herbicide and because of the much reduced size of the treatment area.

Because aerial application is not being proposed on the Coronado National Forest, the most likely exposure route for wildlife species will be from the ingestion of herbicide contaminated forage. Wildlife can ingest herbicides directly by consuming contaminated
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plants or indirectly through the consumption of a prey species that has eaten contaminated forage (such as an owl eating a mouse that has consumed treated plants).

The exposure risk to terrestrial and aquatic wildlife and invertebrates is a function of the toxicity of the herbicide to each organism and the exposure each organism is subjected to as a result of the treatment. Toxicity is expressed in terms of the LD$_{50}$s for different species. LD$_{50}$s are defined as the median lethal doses – the single oral or dermal doses calculated from a series of tests to be lethal to exactly 50% of a test animal group. In many cases, toxicity studies for specific wildlife species were lacking, so the results of studies using domestic laboratory animals were used in the Risk Assessment. To the greatest extent possible, toxicity data on the most closely related avian or mammalian species were used for the wildlife risk comparisons. The effects on domestic species are considered comparable to the effects that would occur in similar species in the wild (USDA 1992). In general, toxicity for rats, mice and rabbits were often used to represent effects to wild mammals; mallard duck, bobwhite quail, chicken and pheasant were used to determine toxicity for wild avian species and for reptiles. Table 9 displays calculated acute oral toxicity (LD$_{50}$) values for 21 herbicides on a variety of species used as wildlife toxicity surrogates in the toxicity and exposure analysis.

The other half of the risk equation – exposure – was calculated for a number of wildlife species for three major exposure routes: dermal, ingestion and inhalation. Because the herbicides degrade relatively rapidly and sites are normally treated once per year, no analysis of chronic exposure was performed. The herbicides show little tendency to bioaccumulate, so long term persistence in the food chain was not considered in the analysis (USDA 1992).

Two levels of exposure were analyzed: For typical doses, dermal exposures were based on levels of herbicide likely to be found on vegetation surfaces, assuming the animals would seek cover during a spraying operation. Ingestion doses were calculated assuming a percentage of the animals daily food intake was contaminated. The larger and more wide-ranging the animal, the lower the estimated percentage. Extreme doses were calculated assuming the animals did not seek cover and thus received a full dose of herbicide over their entire body surface. In the extreme ingestion case, animals were assumed to feed entirely on contaminated forage. Predators were assumed to receive the entire body burden that each prey species had received through oral, dermal and inhalation exposure. Inhalation doses were also calculated based on a hypothetical cloud of aerial spray, but are not considered in this analysis because no aerial application is proposed.

The Risk Assessment then compared estimated exposures to the acute toxicity levels determined for a variety of species through laboratory studies. The EPA assessed the risk of pesticide exposure according to the following criteria:

- Low: Expected Dose < 1/5 of LD$_{50}$
- Moderate: Expected dose between 1/5 LD$_{50}$ and LD$_{50}$
- High: Expected Dose > LD$_{50}$

Exposure doses below one fifth of the LD$_{50}$ level were assumed to present a low or negligible risk, doses between one fifth of the LD$_{50}$ and the LD$_{50}$ were assumed to present a moderate risk that may be mitigated through restrictions on the use and application of
the herbicide, and doses above the LD$_{50}$ are assumed to present an unacceptably high risk.

Table 9 displays the calculated LD$_{50}$s, estimated exposures and risk assessments for selected species and herbicides as presented in the Risk Assessment. The eight herbicides displayed in Table 9 are those considered most likely to be used in treatments on the Forest. As stated above, estimated exposures, both typical and extreme, are based on an assumed aerial application of herbicides, which is not proposed for the Forest. Herbicide exposures to wildlife on the Coronado National Forest are projected to be well below even that shown for the “typical” exposure calculated in the risk assessment. Even assuming aerial application, for all 21 herbicides and carriers/additives analyzed in the Risk Assessment, the typical dose estimates are below the EPA risk criterion of 1/5 LD$_{50}$ and are far below the laboratory LD$_{50}$s.

<table>
<thead>
<tr>
<th>Chemical</th>
<th>Flicker LD$_{50}$ (mg/kg)</th>
<th>1/5 LD$_{50}$ Est. Exp.</th>
<th>Risk Assess.</th>
<th>Quail LD$_{50}$ (mg/kg)</th>
<th>1/5 LD$_{50}$ Est. Exp.</th>
<th>Risk Assess.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glyphosate</td>
<td>Quail, &gt;2000</td>
<td>400</td>
<td>Low</td>
<td>Quail, &gt;2000</td>
<td>400</td>
<td>Low</td>
</tr>
<tr>
<td>2,4-D</td>
<td>Chukar, 200</td>
<td>40</td>
<td>Low</td>
<td>Quail, 668</td>
<td>134</td>
<td>Low</td>
</tr>
<tr>
<td>Tryclopyr</td>
<td>Mallard, 1,698</td>
<td>340</td>
<td>Low</td>
<td>Mallard, 1,698</td>
<td>340</td>
<td>Low</td>
</tr>
<tr>
<td>Western Kingbird</td>
<td>40</td>
<td>15.1</td>
<td>Low</td>
<td>Chukar, 200</td>
<td>40</td>
<td>Low</td>
</tr>
<tr>
<td>American Kestrel</td>
<td>340</td>
<td>30.1</td>
<td>Low</td>
<td>Mallard, 1,698</td>
<td>340</td>
<td>Low</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chemical</th>
<th>White-tailed Jackrabbit LD$_{50}$</th>
<th>1/5 LD$_{50}$ Est. Exp.</th>
<th>Risk Assess.</th>
<th>Mule Deer LD$_{50}$</th>
<th>1/5 LD$_{50}$ Est. Exp.</th>
<th>Risk Assess.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glyphosate</td>
<td>Rat, 3,800</td>
<td>760</td>
<td>Low</td>
<td>Rabbit, 4,320</td>
<td>864</td>
<td>Low</td>
</tr>
<tr>
<td>2,4-D</td>
<td>Rabbit, 424</td>
<td>85</td>
<td>Low</td>
<td>Mule deer, 400</td>
<td>80</td>
<td>Low</td>
</tr>
<tr>
<td>Tryclopyr</td>
<td>Rabbit, 550</td>
<td>110</td>
<td>Low</td>
<td>Guinea Pig, 310</td>
<td>62</td>
<td>Low</td>
</tr>
<tr>
<td>-------------------</td>
<td>------------------</td>
<td>-------</td>
<td>----------</td>
<td>-----------</td>
<td>-------------</td>
<td>-------</td>
</tr>
<tr>
<td>Glyphosate</td>
<td>Coyote</td>
<td>1,500</td>
<td>300</td>
<td>0.5</td>
<td>Low</td>
<td>60</td>
</tr>
<tr>
<td>Dicamba</td>
<td>Cow</td>
<td>1,500</td>
<td>300</td>
<td>0.5</td>
<td>Low</td>
<td>60</td>
</tr>
<tr>
<td>Imazapyr</td>
<td>Coyote</td>
<td>1,500</td>
<td>300</td>
<td>0.5</td>
<td>Low</td>
<td>60</td>
</tr>
<tr>
<td>Picloram</td>
<td>Cow</td>
<td>1,500</td>
<td>300</td>
<td>0.5</td>
<td>Low</td>
<td>60</td>
</tr>
<tr>
<td>Clopyralid</td>
<td>Coyote</td>
<td>1,500</td>
<td>300</td>
<td>0.5</td>
<td>Low</td>
<td>60</td>
</tr>
<tr>
<td>2,4-D</td>
<td>Cow</td>
<td>1,500</td>
<td>300</td>
<td>0.5</td>
<td>Low</td>
<td>60</td>
</tr>
<tr>
<td>Triclopyr</td>
<td>Coyote</td>
<td>1,500</td>
<td>300</td>
<td>0.5</td>
<td>Low</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td>Cow</td>
<td>1,500</td>
<td>300</td>
<td>0.5</td>
<td>Low</td>
<td>60</td>
</tr>
</tbody>
</table>

There would be a low or negligible risk of toxic effects on birds and terrestrial mammals, including livestock, from the application of the herbicides proposed for use.

No direct effects are expected to terrestrial wildlife species as a result of manual treatment (hand pulling or cutting) of noxious weeds. Manual methods are expected to be used in areas of very localized infestations or where the presence of other sensitive resources precludes the use of herbicides. Some minor displacement of wildlife species may occur during weed treatment activities, but this disturbance would be of short duration and no different than other human uses of the site.

The indirect effects of treating vegetation under the proposed action are expected to involve long-term changes in the plant community. Where weeds are eliminated or controlled, the potential will exist for the establishment of native plant species, especially in areas where restoration involves replanting of native species. Over the long term, the restoration of native plant communities would be expected to increase the capability of weed infested sites to support native wildlife species.

**Migratory Birds**

Executive Order 13186, of January 10, 2001 directs Federal agencies to support migratory bird conservation and to “ensure that environmental analyses of Federal actions required by the NEPA or other established environmental review processes evaluate the effects of actions and agency plans on migratory birds, with emphasis on species of concern.” Birds of Conservation Concern are identified by the U.S. Fish and Wildlife Service Office of Migratory Bird Management by Bird Conservation Region (USFWS 2002. Birds of Conservation Concern. Div. of Migratory Bird Management [http://migratorybirds.fws.gov/reports/bcc2002]). The Project area lies within the Sierra Madre Occidental Region. Thirty-nine birds of conservation concern are identified for
this region (Doc. 75). Effects to selected migratory bird species were analyzed in the Wildlife Specialist’s Report (Doc. 67), Biological Assessment and Evaluation (Doc. 76, Appendix E) by species and habitat type and are summarized above. Under all action alternatives including the proposed action, effects to migratory birds are anticipated to be insignificant or discountable. The design of the proposed action and mitigation features should preclude impacts as a result of herbicide exposure or disturbance. The effects of No Action are anticipated to be both positive and negative. Invasive species like buffelgrass can change the structure of shrub dominated drylands to a more savannah-like state, which may benefit some birds that require herbaceous cover. Alternatively, grass invaded desertscrub tends to have lower species diversity, lower productivity and lower standing crop biomass (Burquez-Montijo, et al 2002). Attendant changes in fire regimes will, over time, eliminate fire-intolerant native species with which native migratory birds evolved. In general, the continued spread of invasive plants will tend to eliminate habitats for native migratory birds.

Four officially identified important bird areas (IBA) are found on or near the Coronado National Forest (Doc. 75). These are California Gulch, the Chiricahua Mountains, the Santa Rita Mountains and Sycamore Canyon. Two additional areas, upper San Pedro River and Arivaca Cienega/Arivaca Creek are near the Forest. Invasive plant management activities may occur within IBAs, but should not affect migratory birds for the reasons described above.

Cumulative Effects: Terrestrial Wildlife

The effects of Alternatives 1, 2 and 3, when added to the effects of the ongoing weed eradication efforts at administrative and recreational sites would represent a cumulative effect. It is unlikely that the sum of the effects of the treatment efforts would rise to the level of significance, although assuming successful treatment, the total amount of weeds treated would be greater than either of the two efforts taken individually. The possible future application of herbicides to public road rights of way within the Forest is currently being evaluated under a separate environmental analysis. Treatments will be confined to state highway rights of way, which are limited on the Forest. Treatment of public roadways would increase the amount of land treated on the Forest, but activities will be confined to road sides. Very few sensitive plant species are known to occur in the highly disturbed areas adjacent to public roads where treatments will occur, so effects to sensitive native plants are expected to be negligible. However, these treatments, if they occur, would help to reduce the spread of invasive species from roadsides where they often first establish.

Other past, present and future activities that may contribute cumulative effects to vegetation and sensitive plants include recreation and grazing management activities. Recreation can disturb soils and create conditions to the introduction of invasive species. Recreationists, their vehicles and pets can act as vectors for the dispersal of weed seeds from other areas. Likewise, livestock grazing can contribute to the introduction and spread on nonindigenous plants by transporting seeds into uninfested sites, disturbing the soil and preferentially grazing native plants over weed species (Belsky and Gelbard 2000). On areas of the Forest where grazing occurs, livestock may continue to contribute to the spread of invasive species. Incorporation of the prevention measures outlined in alternatives 2 and 3 should provide some mitigation of this effect. Several of the known locations of invasive plants are currently ungrazed (Sabino Canyon and the front range of
the Catalina Mountains) so livestock grazing is not expected to contribute cumulatively to the spread of weeds in these areas.

Overall, cumulative effects are anticipated to be greatest to wildlife under the no action alternative because the spread of invasive species will continue unabated and will be combined with the future effects of recreation, cattle grazing and other activities that contribute to the spread of invasive plants. In addition, an IVM approach would not be adopted, so preventative and cooperative measures would not serve to mitigate the spread of invasive species to any appreciable degree.

Environmental Consequences - Aquatic Wildlife.

Direct and Indirect Effects

Alternative 1. No Action

Under the No Action Alternative, individual populations of noxious weeds may continue to be treated using a variety of methods, including herbicides. However, each treatment would be evaluated and authorized under a separate analysis. A programmatic approach to integrated vegetation management would not be taken. Given existing workloads, it is not likely that individual analyses and treatments would proceed with sufficient speed to have a significant effect on invasive plant infestations. Herbicides and other weed treatments would continue to be used in administrative sites and developed recreation areas.

No direct effects are anticipated as a result of not adopting a programmatic approach to weed management. With regard to indirect effects, it is likely that treatment activities will continue to remain at existing levels and that noxious weed populations will continue to expand within aquatic environments on the Forest. Three species, Johnson grass, giant reed and salt cedar, are currently found in or near aquatic sites. These species have the potential to develop large monocultures that could eventually affect the functioning of the aquatic systems. Johnson grass tends to shade out other native species and would reduce diversity in aquatic sites if left uncontrolled. Salt cedar in large stands can crowd out native vegetation, increase salinity in riparian soils, and increase water consumption through transpiration, leading to the drying of springs and streams. The de-watering of wet sites through additional transpiration may have significant effects on native fish in places like Redrock Canyon where Gila topminnow populations are often restricted to a handful of pools during the summer dry season.

Alternative 2: Integrated Vegetation Management excluding the use of herbicides.

The proposed manual control of weeds is not expected to directly affect aquatic organisms. The proposed methods consist of hand-pulling individual plants or using hand tools to cut the plants. The hand-pulling of weeds adjacent to streambeds will loosen the soil and may contribute sediment to the stream. This disturbance will be minimal and of short duration.

Because of the low probability of weed treatments in and adjacent to aquatic sites, no indirect effects are anticipated as a result of treatment activities. Other indirect effects would be related to the effectiveness of the treatments at removing invasive species from aquatic sites. If treatments are effective, few indirect effects are anticipated. If manual treatments are not effective to control the spread of invasive plants, effects similar to
those described under Alternative 1 would be expected. Three species included in the analysis, saltcedar, Johnson grass and giant reed, could potentially affect aquatic systems if allowed to spread. All three species are capable of reproducing vegetatively after cutting, so manual treatments alone may have limited success.

**Alternative 3: Integrated Vegetation Management.**

Herbicide applications provide perhaps the greatest risk to aquatic organisms. Herbicides can enter water sources through overspray, aerial drift, runoff after storm events and accidental spills. The degree of impact is influenced by the amount and type of herbicide being used, the volume of flow and the amount of mixing at the water source, and the type and abundance of organisms present in the aquatic site. The Risk Assessment (USDA 1992) analyzed potential impacts to fish and aquatic invertebrates using a process similar to that described above for terrestrial wildlife. For purposes of the assessment, it was assumed that a water body would receive a direct spray of herbicide in the course of an aerial application. Herbicide applications on the Coronado National Forest will be ground applications generally involving hand spraying of individual plants. Therefore, the potential that significant amounts of herbicide would enter water bodies is greatly reduced. Further, no locations for herbicide treatment of noxious weeds are currently proposed for aquatic sites. In the event that some herbicide use in or near aquatic environments becomes necessary in the future, buffers will be established as described in the mitigation features in Chapter 3. The following analysis is provided in the event that future treatments occur near aquatic sites.

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 on a National Forest. For this reason, biologists calculate a “No Observable Effect Level” (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. The only exceptions is triclopyr, 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. At typical application rates, the Rodeo formulation of Glyphosate was determined to be practically non-toxic to aquatic organisms (USDA 1992, SERA 1996).

While little or no herbicide spraying adjacent to aquatic sites is currently proposed, by limiting any future spraying to Rodeo or other herbicides approved for aquatic application, adverse direct effects to aquatic wildlife species will be minimized, if not entirely precluded. Since little or no on-site effects are anticipated, no downstream effects are expected as a result of the proposed action.
Herbicide applications near water will be by hand backpack applications, and this will result in minimal risk to contamination of surface water. With the exception of Picloram, leaching of herbicides through soil is not a significant process. Herbicides do have the potential for overland flow during heavy rainstorms, but the proposed application method of spraying individual plants makes water contamination unlikely. Mitigation measures will serve to reduce the potential for possible adverse effects to aquatic organisms. The adoption of management practices identified in the Safety and Spill Plan (Appendix D) will minimize the potential of spills.

The proposed manual control of weeds is not expected to affect aquatic organisms. The proposed methods consist of hand-pulling individual plants or using hand tools. Manual treatments will occur where weed densities are low or where the presence of rare plants would preclude the use of herbicides. The hand-pulling of weeds adjacent to streambeds will loosen the soil and may contribute sediment to the stream. This disturbance will be minimal and of short duration.

**Cumulative Effects –Aquatic Wildlife**

Other past, present and future activities that may contribute cumulative effects to aquatic resources include recreation and grazing management activities. Recreation can disturb soils and create conditions to the introduction of invasive species. Recreationists, their vehicles and pets can act as vectors for the dispersal of weed seeds from other areas. Likewise, livestock grazing can contribute to the introduction and spread on nonindigenous plants by transporting seeds into uninfested sites, disturbing the soil and preferentially grazing native plants over weed species (Belsky and Gelbard 2000).

Riparian areas on the Forest are often heavily used by both recreationists and livestock attracted by shade and water. Incorporation of the prevention measures outlined in alternatives 2 and 3 should provide some mitigation of this effect.

Overall, cumulative effects are anticipated to be greatest to aquatic organisms under the no action alternative because the spread of invasive species will continue unabated and will be combined with the future effects of recreation, cattle grazing and other activities that contribute to the spread of invasive plants. In addition, an IVM approach would not be adopted, so preventative and cooperative measures would not serve to mitigate the spread of invasive species to any appreciable degree.

**Water Quality (Issue 4)**

**Affected Environment - Water Quality and Quantity**

The analysis area for water for this project is the entire Forest. The Forest includes parts of the following 5th Code Watersheds: Altar Wash, Animas Creek, Aravaipa Creek, Canada del Oro, Cienega Creek, Cloverdale Creek, Lower Gila River, Lower San Pedro River, Lower Santa Cruz River, Middle San Pedro, Middle Santa Cruz, Rillito Creek, Rio Altar, San Bernardino Valley, San Simon Creek, Sonoita Creek, Upper San Pedro River, Upper Santa Cruz River, Whitewater Draw and Willcox Playa. Units of measure for this resource are change in water quality.

Water quality is assessed by comparing existing conditions with desired conditions that are set by the States under the authority of the Clean Water Act. Impaired waters are identified in the Patagonia Mountains in Harshaw, Alum and Three R Canyons (Arizona
Water Quality Assessment, ADEQ 2002). Pena Blanca Lake and Arivaca Lake are rated as Not Attaining. An Impaired water does not maintain surface water quality standards for its designated uses, a Not Attaining water does not maintain surface water quality standards for its designated uses and a TMDL is in place (ADEQ 2002). The absence of Impaired Water or Not Attaining designations infers that water quality is acceptable for designated uses in the project area. With the exceptions of the waters listed above, water quality on the Forest is generally satisfactory.

Surface water on the Forest is generally ephemeral and present only during storms and snowmelt. Few of the streams flow continuously, although they may have water in them for several months each year and support short stretches that remain perennial. There are five small to medium sized impoundments managed as recreational fisheries. These are Arivaca and Pena Blanca Lakes in the Tumacacori EMA, Rose Canyon Lake in the Santa Catalina EMA, Parker Canyon Lake in the Huachuca EMA, and Riggs Flat Lake in the Pinaleno EMA. Frye Mesa Reservoir in the Pinaleno EMA has been identified as having potential as a recreational fishery, but is not managed as such. Several small impoundments and numerous stock ponds are found throughout the Forest. There are no ground water basins on the Forest.

Environmental Consequences - Water Quality

**Alternative 1: No Action**

The No Action alternative would result in an increase in size and density of existing invasive plant populations. New populations and new species of invasive exotic plants would become established. Increases in tap-rooted species in the plant community result in increased surface runoff and sediment yield (Olsen 2001). This would adversely affect the quality of the surface water. Salt cedar populations, if allowed to expand, would potentially dry up springs and other riparian areas by lowering surface water tables through transpiration. In addition, salt cedar increases the salinity of surface soils, changing growing conditions for native plants.

In the group of plants identified for treatment in the proposed action, all are tap-rooted species except for the grasses (Lehmann lovegrass, buffelgrass, Johnson grass, giant reed). Lehmann lovegrass and buffelgrass have stabilized soils in areas where they have become established and have shown some utility for reclamation by decreasing surface flows and sediment yield. However, these grasses also increase fine fuels, making the occurrence of wildfire more frequent than in a native grass or desertscrub community. Soil stability may be temporary because increases in fire frequency may result in exposed soils following fires. Since these grasses aggressively reestablish after fire, the long-term effects would be to convert native desertscrub to grassland. The effects of this conversion, in combination with increasing fire frequency, on water quality are difficult to predict.

**Alternative 2: Integrated Vegetation Management Except for the use of Herbicides.**

Alternative 2 involves only non-chemical methods of plant control. This approach has been used to a minor degree on the Forest to date, with limited success. Effects to water from the non-herbicide weed control alternative would be similar to those displayed in Alternative 1. Weed populations would potentially spread more slowly than in Alternative 1, and hand pulling and grubbing activities would increase soil disturbance, increasing surface runoff and sediment yield to nearby streams in the short term. There
would be no impact to ground water with this alternative. Because this alternative does not include the use of herbicides, there will be no effects to water quality from herbicide use.

**Alternative 3: Integrated Vegetation Management.**

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 receive herbicide from spray, drift, or spills; or (2) Large-scale applications to impervious surfaces and compacted soils, combined with runoff, could transport 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 and safety practices (Chapter 3, Appendix D) will 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 Certified Pesticide Applicator.

In areas of shallow bedrock, the potential for herbicides leaching through the soil profile and reaching water is greatest. However, 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 (adhere to) 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 (Table 10). A soil monitoring study of soil leaching conducted in Montana supports this expectation. For two years, cloyralid and picloram were monitored for their presence in the soil. Clopyralid was applied at 37 sites. Clopyralid was not detected below five centimeters at any site 30 days after application. Picloram was also monitored at 42 sites and one year after application detected at 16 ppb (parts per billion) at 5.25 centimeters with a trace detected below 25 centimeters (Rice et al. 1992).

The design of this alternative includes streamside buffer zones, described in Chapter 2, in which only certain herbicides may be used. Herbicide applications will be limited to spot and small scale treatments and will exclude aerial applications. Aquatically labeled formulations of 2,4-D and glyphosate can be safely applied up to the edge of water. These herbicides are short-lived, are not translocated through soil, or have other properties that allow safe use within the riparian zone. Clopyralid, dicamba, imazapyr, metsulfuron, picloram and sulfometuron cannot be safely applied adjacent to water and will not be used within the streamside buffer zone.

The area infested with invasive plant species currently is less than 1% of the Forest. Consequently, the area treated with herbicides each year is expected to be low. This further reduces the risk of surface or ground water contamination. Most of the analysis area receives less than 20 inches of precipitation per year. Consequently the likelihood of herbicide translocation to ground water is less than in higher precipitation zones.
Table 10. Potential for surface runoff and leaching for proposed herbicides (Vencill 2002)

<table>
<thead>
<tr>
<th>Common Name of Herbicide</th>
<th>Solubility in Water (mg/L)</th>
<th>Half Life in Soil</th>
<th>Potential for Surface Runoff</th>
<th>Potential for Leaching</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,4-D</td>
<td>796 (salt)</td>
<td>10 Days</td>
<td>Low</td>
<td>Moderate</td>
</tr>
<tr>
<td>Chlorsulfuron</td>
<td>587 (pH 5) – 31,800 (pH 7)</td>
<td>40 Days</td>
<td>Low</td>
<td>Moderate at pH 7, but less at pH 6</td>
</tr>
<tr>
<td>Clopyralid</td>
<td>1,000 (acid) – 300,000 (salt)</td>
<td>40 Days</td>
<td>Low</td>
<td>Moderate</td>
</tr>
<tr>
<td>Dicamba</td>
<td>4,500 (acid) – 4,000,000 (salt)</td>
<td>Less than 14 Days*</td>
<td>Low</td>
<td>Low to Moderate</td>
</tr>
<tr>
<td>Glyphosate</td>
<td>15,700 (pH 7) – 900,000 (salt, pH 7)</td>
<td>47 Days</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Imazapic</td>
<td>2,200</td>
<td>120 Days</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Imazapyr</td>
<td>11,272 (pH 7)</td>
<td>25-142 Days*</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Metsulfuron methyl</td>
<td>548 (pH 5) – 2,790 (pH 7)</td>
<td>30 Days</td>
<td>Low</td>
<td>Moderate at pH 7, but less at pH 6</td>
</tr>
<tr>
<td>Picloram</td>
<td>430</td>
<td>90 Days*</td>
<td>Moderate</td>
<td>High</td>
</tr>
<tr>
<td>Sulfometuron methyl</td>
<td>10 (pH 5) – 300 (pH 7)</td>
<td>20-28 Days</td>
<td>Low</td>
<td>Moderate at pH 7, but less at pH 6</td>
</tr>
<tr>
<td>Tebuthiuron</td>
<td>2.57</td>
<td>Over 360 Days*</td>
<td>Small</td>
<td>High</td>
</tr>
<tr>
<td>Triclopyr</td>
<td>23 (ester) – 2,100,000 (salt)</td>
<td>30 Days</td>
<td>Not Available</td>
<td>Not Available</td>
</tr>
</tbody>
</table>

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

Under this alternative, hand-grubbing or pulling of weeds would occur, although to a lesser extent than under Alternative 2. Soil disturbance associated with this activity may contribute in the short term to sedimentation in water courses adjacent to the site of disturbance.

Changes in vegetative cover through the use of selective herbicides can have a substantial affect on protecting water quality. Removal of target noxious weeds and invasive plants, which are currently minor components of Forest vegetation, will favor establishment of native vegetation that will serve to intercept herbicide residues, other contaminants, and sediments.

**Cumulative Effects – Water Quality and Quantity**

Other past, present and future activities that would potentially contribute to cumulative effects to water quality in the project area include vegetation management, livestock grazing, off-road vehicle use and road maintenance. Selection of alternatives 1 and 2 would result in an increase in erosion and reduction in water quality. Whether this effect, in combination with other activities on the Forest, would result in significant effects is
not known. Since the herbicides considered for use are short-lived and degrade in the environment and mitigations and BMP’s will reduce the chances of herbicides moving into water, it is concluded that the typical application rates proposed under Alternative 3 will not contribute to any significant cumulative impacts to water quality.

**Soil Quality (Issue #2)**

**Affected Environment**

The analysis area for soils is the entire Forest. Units of measure for effects to soils are the degree to which each alternative increases or decreases soil quality.

Geology on the Forest is a highly diverse mixture of igneous rocks (granite), extrusive volcanics (rhyolite, basalt), metamorphic rocks (gneiss, schist, quartzite), and sedimentary rocks (limestone, shale, conglomerates). As a consequence, soils are highly diverse. In general, plant communities that have evolved on these soils are dominated by an understory of warm season bunchgrasses. Noxious weed infestations have been proven to increase soil erosion in bunchgrass ecosystems (Lacey 1989). However, because of the limited extent of invasive species on the Forest, soils on the Forest are not considered to be significantly affected by the presence of invasive species.

Soil quality is based on an interpretation of factors that affect the following three primary soil functions:

- **Soil Hydrologic Function.** This function is assessed by evaluating or observing changes in surface structure, surface pore space, consistence, bulk density, infiltration or penetration resistance using appropriate methods. Increases in bulk density or decreases in porosity results in reduced water infiltration, permability and plant available moisture.

- **Soil Stability.** Soil erosion is the detachment, transport, and deposition of soil particle by water, wind or gravity. Vascular plants, soil biotic crusts, and litter cover are the greatest deterrent to surface soil erosion. Visual evidence of surface erosion includes sheets, rills, and gullies; pedestalling, soil deposition, erosion pavement, and loss of the surface "A " horizon. Erosion models are also used to predict on-site soil loss.

- **Nutrient Cycling.** This function is assessed by evaluating the vegetative community composition, litter, coarse woody material, root distribution and soil biotic crusts. These indicators are considered an important source of soil organic matter, which is essential in sustaining long-term soil productivity. It provides a carbon and energy source for soil microbes, stores and provides nutrients which are needed for the growth of plants and soil organisms and by providing for cation and anion exchange capacities.

**Environmental Consequences**

*Alternative 1: No Action*

Conversion of native plant communities to invasive species monocultures results in simplification of ecosystems and replacement of fibrous-rooted native grasses with tap-
rooted exotic species. Selection of Alternative 1 would result in the continued spread of invasive species on the Forest over the next 10 years. Plant communities would likely become more simplified as native plant communities are replaced by less diverse stands of invasives. Soils would be more vulnerable to erosion during storm events.

One response to scoping indicated that Lehmann lovegrass and buffelgrass have been used effectively to stabilize soils in disturbed areas, decreasing surface flows and sediment yield. However, these grasses also increase fine fuels, making the occurrence of wildfire more frequent than in a native grass community. Soil stability improvement may be temporary because of increases in fire frequency resulting in a denuded soil and a simplified plant community because these plants aggressively reestablish after fire. Buffelgrass in particular is invading the Forest in Sonoran desert plant communities that are not adapted to fire.

**Alternative 2: Integrated Vegetation Management Excluding the Use of Herbicides.**

Alternative 2 involves only non-chemical methods of invasive plant control. This approach has been used on the Forest to some degree to date. A four-acre infestation of Euryops in the Sabino Canyon Recreation Area was intensively treated by hand-grubbing in 1996, with repeated treatment efforts of varying intensity in subsequent years. The treatment was initially effective in greatly reducing the population, however, the effort could not reasonably be applied to the large (100 acre) population of Euryops on Frye Mesa. While burning may be an option for treating large infestations of Euryops and Pentzia, it would not be effective for treating Lehmann lovegrass or buffelgrass, which are opportunistic invaders after fire.

Hand pulling or grubbing results in soil disturbance at each plant and also provides an effective seed bed for germination of weed seed. Species such as Johnson grass and Canada Thistle are present on the Forest at a number of locations. These species have rhizomes, which are creeping, horizontal roots. These roots sprout when broken or fragmented. Thus mechanical control methods as prescribed in this alternative will likely result in maintenance of populations of this species, or more likely, its continued spread. This means that erosion and soil impacts will be increased due to invasive plant control measures and increased invasive plant populations. This alternative would slowly increase soil erosion over the next 10 years, with some areas of dramatic soil erosion possible in conjunction with mechanical control treatments. Manual control treatments may also result in increased loss of desirable native plant species, which further increases soil erosion.

**Alternative 3: Integrated Vegetation Management.**

This alternative would create less soil disturbance because invasive plants would often be sprayed instead of hand pulled or grubbed. This alternative would result in the most effective means of invasive plant management available and would stop or reduce the rate of spread of invasive species on the Forest. Because of less frequent use of soil disturbing weed management techniques and because native ecosystems with complex, fibrous root structures would be maintained, this alternative results in the least impact to soils on the Forest. This alternative would create the least amount of soil erosion of the three alternatives. Assuming that native plant communities will replace tap-rooted invasives after treatment, soil protection and nutrient cycling should be enhanced as a result of treatments.
Effects to Human Health (Issue 3)

Affected Environment

The analysis area for this resource is the Forest. Human health may be directly influenced when people utilize the Forest, and indirectly influenced by activities on the Forest that have some affect on adjacent human inhabited areas. An example of a direct influence on human health would be contracting giardia from drinking contaminated water while hiking. An example of an indirect influence would be having an asthma attack while at home as a result of breathing smoke from a wildfire on the Forest. Human use of the Forest is mainly associated with recreation, firewood harvest, use of grazing allotments and gathering of traditionally used plants. Currently human health on the Forest is not influenced by either the spread of invasive plant species or efforts to control them. Minor skin irritation may result from contact with thorny species or those that bear milky sap such as leafy spurge. Though some people may be allergic to the pollen produced by invasive plants, it is unlikely that invasive plants have been the primary source of seasonal or long-term allergies.

Units of measure for effects to this resource are the degree to which human health is affected by implementation of the alternative.

Alternative 1: No Action

The primary effect of the no action alternative will be the spread of invasive plants into the Forest. This is expected to have little direct effect on human health and safety. In terms of indirect effects, a slight increase in the potential for wildfires can be predicted as buffelgrass continues to spread into the Pusch Ridge Wilderness in the Santa Catalina EMA. A more frequent fire occurrence would result in indirect human health effects in the form of smoke in the Tucson area.

Alternative 2: Integrated Vegetation Management Except for the use of Herbicides

Impacts to human health and safety from mechanical and cultural treatments are likely to be minor. Possible effects include cuts, burns, allergies and skin irritation to individuals performing the work. Skin irritations may result as a result of contact with the sap or spines on the plants. Due to the uneven terrain in the vicinity of many of the treatment sites, minor injuries or falls may result. The use of personal protective equipment such as gloves, long sleeves and boots should minimize this risk. The effects of smoke described under Alternative 1 would likely occur under this alternative.

Alternative 3: Integrated Vegetation Management

The Southwestern Region has analyzed the risk to humans of the use of twenty-one herbicides and four carriers (USFS 1992) and individual risk assessments for the Forest Service for five herbicides and surfactants in the aquatic herbicide Rodeo (Pesticide-Use Advisory Memorandum No. 473 1995). In addition, a specific risk assessment for the herbicide imazapic is available. A comparison of the risk analysis conclusions are basically the same for the herbicides covered in the various risk assessments. The risk assessments prepared since 1995 can be obtained on a Forest Service web site (www.fs.fed.us/foresthealth/pesticide/health.htm). All of these risk assessments are incorporated by reference.
The Risk Assessment (USFS 1992) displays estimated risks to the public and the applicators when selected herbicides are used. The assessments display risks from “routine typical” and “routine extreme” cases. Routine typical cases represent risks to workers, the public, and other organisms that may occur as a result of routine operations. The routine extreme approach is used to estimate doses that would occur under conditions of maximum use and maximum exposure.

The Risk Assessment has three parts:

- **The Exposure Analysis.** This analysis estimates the range of possible doses to workers, the general public, aquatic organisms, etc. A variety of scenarios and exposure pathways are examined that could result in dermal and oral exposures.

- **The Hazard Analysis.** Tests and data related to the toxicity of herbicides are reviewed under this analysis. Data are reviewed to indicate the doses at which toxic effects occur and, conversely, levels at which no toxic effects are seen. Of particular interest is a value known as the “No Observed Effect Level” or NOEL. NOEL is the highest dose at which no adverse effects were noted in test animals.

- **The Risk Analysis.** Under this analysis, the dose levels calculated in the exposure analysis are compared to the NOEL levels to determine the effects of herbicides.

A considerable body of information from tests on laboratory animals is available for the herbicides considered for possible use in controlling noxious weeds. Most of these tests were conducted as a requirement for the U.S. Environmental Protection Agency (EPA) for the registration process. All of the herbicides proposed for use have been subjected to long-term studies that test for general systemic effects, effects on reproductive and developmental toxicity (birth defects), mutagenicity (change in genetic material), neurotoxicity (effect upon nerve tissue), carcinogenicity (tendency to produce cancer) and immunotoxicity (effect on the immune system). NOEL’s are available for most types of these tests.

Extrapolating a NOEL from an animal study to humans is an uncertain process. The EPA compensates for the uncertainty by dividing NOEL’s from test animals by a safety factor, typically 100, to derive a Reference Dose (RfD). In other words, the human RfD is $1/100$ of the NOEL for an animal study. The RfD, also known as the Acceptable Daily Intake (ADI) is defined as the daily exposure over a human lifetime (assumed to be 70 years) at which there is a reasonable certainty of no harm. The dose is expressed as milligrams of herbicide per kilogram of body weight per day (mg/kg/day). Acceptable reference doses for herbicides in this analysis are displayed in Table 11. Toxicity categories are defined by the U.S. EPA as follows:

Category I – Highly Toxic
Category II – Moderately Toxic
Category III – Slightly Toxic
Category IV – Relatively Nontoxic
Table 11. Acceptable Daily Intake (mg/kg/day) for selected herbicides and other compounds

<table>
<thead>
<tr>
<th>Herbicide</th>
<th>Oral LD50 for rats (mg/kg)</th>
<th>ADI/RfD</th>
<th>Toxicity Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,4-D</td>
<td>375</td>
<td>0.3</td>
<td>II</td>
</tr>
<tr>
<td>Chlorsulfuron</td>
<td>&gt;5,000</td>
<td>0.05</td>
<td>IV</td>
</tr>
<tr>
<td>Clopyralid</td>
<td>&gt;5,000</td>
<td>0.5</td>
<td>IV</td>
</tr>
<tr>
<td>Dicamba</td>
<td>&gt;5,000</td>
<td>0.03</td>
<td>IV</td>
</tr>
<tr>
<td>Glyphosate</td>
<td>&gt;5,000</td>
<td>0.1</td>
<td>IV</td>
</tr>
<tr>
<td>Imazapic</td>
<td>&gt;5,000</td>
<td>0.5</td>
<td>IV</td>
</tr>
<tr>
<td>Imazapyr</td>
<td>&gt;5,000</td>
<td>**</td>
<td>IV</td>
</tr>
<tr>
<td>Metsulfuron methyl</td>
<td>&gt;5,000</td>
<td>0.25</td>
<td>IV</td>
</tr>
<tr>
<td>Picloram</td>
<td>&gt;5,000</td>
<td>0.07</td>
<td>IV</td>
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<tr>
<td>Sulfometuron methyl</td>
<td>&gt;5,000</td>
<td>0.02*</td>
<td>IV</td>
</tr>
<tr>
<td>Triclopyr</td>
<td>&gt;1,500</td>
<td>0.005</td>
<td>III</td>
</tr>
<tr>
<td>Aspirin*</td>
<td>750</td>
<td>**</td>
<td>III</td>
</tr>
<tr>
<td>Caffeine*</td>
<td>200</td>
<td>**</td>
<td>II</td>
</tr>
<tr>
<td>Ethyl alcohol*</td>
<td>13,000</td>
<td>**</td>
<td>III</td>
</tr>
<tr>
<td>Sugar*</td>
<td>30,000</td>
<td>**</td>
<td>IV</td>
</tr>
<tr>
<td>Table salt*</td>
<td>3,320</td>
<td>**</td>
<td>IV</td>
</tr>
</tbody>
</table>

* Included for comparison
** No reference dose is available or established.

In evaluating the potential impact of herbicides, it must be kept in mind the small amount that is typically used on National Forest System lands. This is normally less than 2 pounds per acre. Some products are applied at an ounce per acre.

Direct effects for workers are those that may occur from direct contact (dermal exposure) with a 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 the type of application. The proposed noxious weed treatments fall within the typical scenario for herbicide use considering the proposed application rates and acres treated per day per worker in the 1992 Risk Assessment. The conditions when a herbicide is applied will affect the exposure, and implementation of the mitigation measures covered in Chapter 2 will reduce possible exposures. Also, using personal protective equipment, as covered in the Safety and Spill Plan (Appendix D) will lower exposure of workers by as much as 68 percent (USFS 1992), since most application exposure is through the skin and not through the lungs by breathing vapors.

For the herbicides being considered for use, only 2,4-D poses a moderate risk of systemic effects for backpack applicators and ground mechanical applicator/mixer loader. In addition, dicamba has 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. The risks would be further reduced because the applicator would likely be exposed for a few days per year, at most. The RfD assumes a lifetime of daily doses.
There is the possibility that workers could receive dermal exposures from (1) the spill of a herbicide concentrate and (2) the spill of a herbicide mixture, including carriers. The risk to workers associated with accidental spills is expected to be low if they are trained, use required protective clothing and equipment, and follow steps outlined in the Safety and Spill Plan (Appendix D).

The Risk Assessment also evaluated the risk of exposure to common carriers used to apply herbicides. These include diesel oil, kerosene, limonene and mineral oil. The assessment determined that none of these carriers pose any risks to the public for systemic, reproductive or carcinogenic effects.

Concern has been raised about the collection and consumption of native herbs, medicinal plants, berries, etc., that could be inadvertently sprayed. The main concern appears to center on the increased risk of cancer that could result from exposure to low levels of a herbicide. All of the herbicides being considered for use have undergone testing for cancer. Clopyralid and dicamba tests have shown no evidence of cancer initiation or promotion. The evidence for 2,4-D and picloram has 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 probably of cancer increases with increased doses. Estimates of the probably 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 doses could be higher. 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. Nevertheless, studies by the California Environmental Protection Agency, Department of Pesticide Regulation, for tribal people who gather plant materials for food, medicinal, ceremonial, or basketry purposes show that herbicides were no longer detectable or plant materials were no longer available after 80 weeks (www.cdpr.ca.gov). As a result, if and when treatments are done, information on the timing and location of spraying will be provided upon request to individuals who want to avoid these areas.

There is the possibility that a small percentage or the population in Arizona will be hypersensitive or allergic to one or more of the herbicides proposed for use. 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. Allergic 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. In addition, signing of treatment sites and public notices would be done to allow concerned members of the public to avoid any possibility of exposure from the proposed herbicide applications.

In summary, the risk or probability of harm to humans is not zero, but it is reasonable to expect that the human health impacts from the proposed herbicides applications would be insignificantly small.
Costs vs. Benefits of Treatments (Issue 5)

The productive value of the land is decreased by weeds that detract from or limit its productively, or increase operating and management costs. Although it is difficult to assess such economic impacts and few good studies are available, some general observations can be made concerning potential economic impacts cause by weeds. Economic losses of livestock from poisonous noxious weeds can be important, but this loss is relatively insignificant compared with losses from non-poisonous weeds. Most noxious weeds have lower forage value than native plants, primarily because most animals avoid them. Grazing capacity for wildlife and livestock can be reduced as much as 75 percent (Bucher 1984, cited in Olsen 1999). Invasive plants like camelorn can grow up through cracks in asphalt causing increased maintenance costs. The loss of water in streams from heavy saltcedar infestations can have several impacts on downstream water users.

A study of the costs and efficacy of spotted knapweed management using integrated methods in Montana yielded the following results (Brown, et al 1998): (1) Tordon 22 at one pint per acre: 95 percent control of plants at $30.75 per acre; (2) Mowing: Zero percent plant control at $200 per acre; (3) hand-pulling: 25% plant control at $13,900 per acre. Data provided by the Arizona Department of Transportation for the Southwest Region’s Environmental Assessment for the treatment of noxious weeds and hazardous vegetation on public roads on National Forest lands in Arizona (USFS 2003) are shown in Table 12. Based on the data available, it is likely that, on a per acre basis, the costs of treatment will be highest for Alternative 2, followed by Alternative 3. Under the No Action Alternative (Alternative 1), invasive plant control efforts will continue at current low levels, often using volunteer labor.

<table>
<thead>
<tr>
<th>Activity Description</th>
<th>Cost per Acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Herbicide (off-road truck)</td>
<td>$37.83</td>
</tr>
<tr>
<td>Herbicide (off-road hand wand)</td>
<td>$87.03</td>
</tr>
<tr>
<td>Herbicide (hand application, liquid)</td>
<td>$151.95</td>
</tr>
<tr>
<td>Mechanical tree and brush removal</td>
<td>$177.23</td>
</tr>
<tr>
<td>Hand tree and brush removal</td>
<td>$195.84</td>
</tr>
</tbody>
</table>

The costs of treatments not only involve application costs, but according to comments received during scoping, potentially involve the costs of “contamination of water for human users and wildlife downstream, the degredation of fish habitat, clean up and remediation expenses in the event of a spill”. While there is a minor potential for a spill to result in expensive clean up costs, this potential is reduced through the use of practices described in Chapter 2 and in the Safety and Spill Plan (Appendix D). As stated in the mitigation measures, herbicides will be used after it has been determined that they offer the only practical method of control.
Wilderness (Issue 7)

Affected Environment
The analysis area for this resource is the Forest, which has eight designated wilderness areas. Units of measure are change to wilderness character and change to wilderness user experience. There are 338,249 acres of designated Wilderness on the Forest. Only the Pusch Ridge Wilderness in the Santa Catalina EMA is affected by infestations of invasive plants to any significant degree. Populations of buffelgrass and fountain grass are spreading throughout lower elevation canyons on the southern slopes of the range adjacent to Tucson. In addition to these two grasses, African sumac has been documented within the wilderness. This species, and fountain grass, are widely planted in Tucson as ornamental landscape plants. Because of its proximity to the City of Tucson, the Pusch Ridge Wilderness is susceptible to invasion by escaped ornamental plants. Buffelgrass, while not planted as a landscape plant, is widely established throughout the Tucson basin and is increasing in the wilderness where suitable growing conditions exist.

Environmental Consequences

Alternative 1: No Action
Selection of the no action alternative would result in the spread of invasive plant species across the Forest, including in wilderness. While selection of this alternative would not preclude the future treatment of invasive plant populations in Wilderness, it is unlikely that the small, localized efforts that have occurred to date would be sufficient to check the spread of invasive plants, especially buffelgrass, in the Push Ridge Wilderness. Size of infestations, density of plants, total number of infested sites and number of invasive species would all increase. Native plant communities provide an important aspect of wilderness character. As native plant communities are replaced by invasive plant species, wilderness character would be lost. Viewing of native wildflowers and other plants would be diminished and the conversion of a diverse native plant community to a monoculture of exotic grass would reduce the quality of the wilderness user experience. Buffelgrass has been shown to cause an unnatural buildup of fine fuels in Sonoran desert ecosystems that are not adapted to fire. The frequency and intensity of fires in infested sites is expected to increase over the term of the analysis. Buffelgrass reproduces rapidly following fires, so frequently occurring fires would only encourage the spread of this species.

Alternative 2: Integrated Vegetation Management Excluding the use of Herbicides.
Manual, mechanical control of invasive plant species will slow the rate of spread of some of invasive plant species in wilderness. As populations of invasive species become more common in the areas outside wilderness on federal and private lands, it will become increasingly difficult to prevent their introduction to wilderness. Control with manual and mechanical means will also become more difficult, time consuming and expensive. Increased new populations of invasive species will therefore tax Forest budgets and manpower. When species like buffelgrass and fountain grass are introduced to wilderness, non-chemical control methods will most likely fail to control them, since the species are prolific seed producers and can grow on steep, rocky slopes that are difficult to access on foot. Non-chemical control methods will also cause significant soil...
disturbance and loss of desirable native vegetation because of extensive digging during attempts to grub out roots of invasives. Disturbed soil will provide a seed germination surface that will encourage production of more of the problem species. Invasive plants would not be eliminated from wilderness, but rather become a permanent fixture there. Wilderness character and quality of the user experience would both be degraded by selection of this alternative, although the rate at which this change occurred would be slower than in alternative 1.

**Alternative 3: Integrated Vegetation Management**

Selection of the IVM alternative would allow the use of all available methods for management of invasive species. Some challenges will still occur under this alternative in that invasive plant populations must be detected before they may be controlled, and the remote character of the wilderness setting may make detection difficult. Training of volunteers and employees to quickly locate and report invasive species and quick management response would greatly improve the success of this alternative. Appropriate timing of treatments and careful selection of the best method will also be critical for this alternative to succeed. Use of herbicides in wilderness will require the FS-2100-2, or pesticide use proposal to be signed by the Regional Forester.

Some disruption of wilderness use while invasive plant control measures are implemented will occur. Presence of dead plants may reduce wilderness experience for some users in the short term. Long term protection of wilderness character and user experience would be optimized with this alternative.

Failure to protect wilderness character through lack of invasive plant management is inconsistent with the Wilderness Act of 1964 which designates that wilderness areas are “recognized as an area where the earth and its community of life are untrammeled by man” and is “protected and managed so as to preserve its natural conditions and which (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man’s work substantially unnoticeable.” Alternative 3 is consistent with this law in that it allows use of herbicides to control invasive plant species where appropriate as well as other methods. Non-chemical control methods may be used to effectively manage small infestations of some invasive species that don’t have extensive root systems that will sprout from remaining fragments, but will produce areas of bear disturbed soil which will readily provide a seed bed for invasive plant seed already on-site.

**Cumulative Effects -Wilderness**

Past, present and foreseeable future activities that may contribute to cumulative effects to wilderness include wildfire, increased wilderness use, construction of new trails and trail maintenance activities. Selection of alternatives 1 and 2 would contribute to cumulative effects to wilderness through failure to effectively manage invasive plant infestations. Impacts as a result of alternative 2 would occur more slowly than in alternative 1. Selection and implementation of alternative 3 would result in minor restrictions on wilderness use, but would not contribute to any cumulative effects on wilderness.
CHAPTER 4 - CONSULTATION AND COORDINATION

In addition to the numerous individuals and groups that participated in the review of various reports and drafts, the following individuals participated in the environmental analysis and preparation of the environmental assessment:

**Deciding Official**
Jeanine Derby, Forest Supervisor, Coronado National Forest

**Interdisciplinary Team**
Jim McDonald, Team Leader/Archeologist Coronado National Forest
Rick Gerhart, Team Leader/Wildlife Biologist, Coronado National Forest
Jennifer Ruyle, Land Management Planning Specialist: Soils/Watershed, Coronado National Forest
Tom Deecken, Wildlife Biologist, Coronado National Forest

**Specialist/Advisor**
Doug Parker, Regional Pesticide Coordinator, USDA Forest Service
Gene Onken, Regional Noxious Weed Coordinator, USDA Forest Service
REFERENCES AND ACRONYMS

References


**Acronyms Used in the Environmental Assessment**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Definition</th>
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</thead>
<tbody>
<tr>
<td>ADI</td>
<td>Acceptable Daily Intake</td>
</tr>
<tr>
<td>APHIS</td>
<td>Animal and Plant Health Inspection Service</td>
</tr>
<tr>
<td>ARS</td>
<td>Arizona Revised Statutes</td>
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<tr>
<td>ATV</td>
<td>All Terrain Vehicle</td>
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<td>Forest Service Manual</td>
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<td>Pesticide Use Proposal</td>
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<td>Research Natural Area</td>
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<td>Soil Conservation Service</td>
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<td>TEPS</td>
<td>Threatened, Endangered, Proposed and Sensitive (also TES)</td>
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</table>
TMDL: Total Maximum Daily Load
USC: United States Code
USDA: United States Department of Agriculture
USFS: United States Forest Service
WMA: Weed Management Area
MAPS

Map 1: Project area
Map 2: Chiricahua EMA

Map 2
Weed locations
Douglas Ranger District
Chiricahua EMA

Weeds
- Tree of heaven
- Buffel grass
- Fountain grass
- Pentzia
- Texas blueweed
- Sweet rain bush
- Canada thistle
- Salt cedar
- Bull thistle
- Giant reed
- Johnson grass
- Primary roads
- Private land

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Map 3: Peloncillo EMA

Map 3
Weed locations
Douglas Ranger District
Peloncillo EMA

The USDA Forest Service does not endorse and cannot
disapprove of, or determine accuracy for any
private GIS products used for any purpose other than those
for which they were intended. Any analysis of the GIS data
produced without attribution. Preceded 02/2002-ds
Map 4: Pinaleno EMA

Weeds:
- Tree of heaven
- Buffel grass
- Fountain grass
- Pencilla
- Texas blueweed
- Sweet resin bush
- Canada thistle
- Salt cedar
- Bull thistle
- Giant reed
- Johnson grass
- Primary roads
- Private land

The USDA Forest Service uses the most current and available data available. GIS data and products may vary.

Safford Ranger District
Pinaleno EMA

CORRODO NATIONAL FOREST

Invasive Exotic Plant Management Program

Map 4
Weed locations
Safford Ranger District
Pinaleno EMA

The USDA Forest Service reserves the right to correct errors and modify or replace GIS products without notification. For more information, please contact 855/232-7277.
MAP 5: HUACHUCA EMA

Map 5
Weed locations
Sierra Vista Ranger District
Huachuca EMA

Weeds:
- Tree of heaven
- Buffel grass
- Fountain grass
- Pentzia
- Texas blueweed
- Sweet resin bush
- Canada thistle
- Salt cedar
- Bull thistle
- Giant reed
- Johnson grass
- Private land
- Primary roads

The U.S. Forest Service uses the most current and accurate data available. (U.S. Forest Service)
Map 6: Santa Rita EMA

Map 6
Weed locations
Nogales Ranger District
Santa Rita EMA

Weeds:
- Tree of heaven
- Buffel grass
- Fountain grass
- Pentzia
- Texas blueweed
- Sweet resin bush
- Canada thistle
- Salt cedar
- Bull thistle
- Giant reed
- Johnson grass
- Primary roads
- Siltown ship

The USDA Forest Service uses the most current and complete data available. The data is subject to error and may be out of date. Please contact the National Forest for the most current information.
Map 7: Tumacacori EMA

Map 7
Weed locations
Nogales Ranger District
Tumacacori EMA

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Map 8: Santa Catalina EMA

Map 8
Weed locations
Santa Catalina Ranger District
Santa Catalina EMA

- Buffal grass, fountain grass, sweet resin bush, karoa bush and giant reed
- Buffal grass, fountain grass
- Salt cedar
- Primary Roads

The USDA Forest Service uses the most current & complete data available. USGS data & products accuracy may vary. Using USGS product for purposes other than those for which they were intended may yield inaccurate or misleading results. The USDA Forest Service reserves the right to correct, update, modify, or replace USGS products without notification. Prepared 4/26/02 ds.
APPENDICES.

Appendix A.

Herbicides proposed for use in the Coronado National Forest
Integrated Vegetation Management Program.

Herbicides proposed for use include those with 2,4-D, chlosulfuron, clopyralid, dicamba, glyphosate, imazapic, imazapyr, metsulfuron, picloram, sulfometuron methyl, triclopyr or tebuthiron as their active ingredients. These herbicides are marketed under a variety of trade names. The Environmental Protection Agency (EPA) has approved all of these herbicides for controlling noxious weeds and requires that any use restrictions be included in the product label.

Most of the products available for use are translocated, selective herbicides. They are absorbed into plant tissue through leaf, stem or bark surfaces and through the roots. These chemicals concentrate in the metabolically active tissues of the plant, altering plant growth. These selective herbicides kill broadleaved plants, or dycots, or a selection of plant families within the dycots, depending on the herbicide used and the rate at which it is applied. Glyphosate and imazapyr are non-selective herbicides, and will kill both dycots and monocots, which are grasses and parallel-veined plants like lilies and orchids. The chemical selected and the rate at which applied, as well as the timing of application all determine which species will be killed. Glyphosate is absorbed primarily through plant leaves and stems, rather than roots. This chemical bonds tightly to soils and is not available to plants in the rooting zone.

All of the herbicides proposed for use in this alternative, except 2,4-D, are rated by the EPA as slightly toxic (toxicity class III) to humans or almost non-toxic (toxicity class IV). 2,4-D is rated as moderately toxic (toxicity class II). Plants and humans have different metabolic pathways. Therefore, chemicals that have toxic properties to plants don’t have the same effects on humans. Insects and humans have similar metabolic pathways and many insecticides are also very toxic to humans. No insecticides are proposed for use in this project.

Each herbicide proposed for use is described in more detail below.

Herbicide: 2,4-D
Brand Name: Esteron 99C, Weedone LV4, Weedone LV6 and others
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 (leaf) absorbed, phenoxy herbicide that targets annual and perennial broadleaf weeds. This herbicide degrades quickly; the average field half-life is 10 days. This herbicide targets broadleaved vegetation, but usually requires several applications due to its short persistence. The action that kills plants mimics natural plant hormones. Plants are most susceptible when they are young and growing rapidly. An important utility of 2,4-D is in riparian areas for products with an aquatic label.
Herbicide: Chlorsulfuron.
Brand Name: Telar
This is a selective pre-emergence or early post-emergence herbicide used at very low rates, ½ to 3 ounces per acre. It is in a group of herbicides called sulfonylureas. Its action in plants is described as a rapid mitotic inhibitor. It is a dry flowable material that is mixed in water and applied as a spray to control many annual, biennial, and perennial weeds on non-crop sites. It is very soluble in water and mobile; thus, it will not be considered for use in buffer zones near water. It has a soil half-life of 30 days.

Herbicide: Clopyralid
Brand Name: Transline, Stinger, Reclain
This is a selective, post-emergence herbicide that is mainly used to control broadleaf species in three plant families: composites (Asteraceae), legumes (Fabaceae), and buckwheats (Polygannaaceae). Its selectiveness makes this herbicide a useful material for control of invasive plants like Pentzia and sweet resin bush while preventing adverse effects to many native species. Grass species are especially tolerant to clopyralid. This herbicide is readily absorbed by roots and foliage readily transported in plant tissues. The material has moderate persistence, high mobility, and high leaching potential. Thus, it will not be used within designated buffer zones along streams or near water in compliance with label requirements. It also can be purchased in mixtures with other herbicides: Curtail, clopyralid with 2,4-D; and Redeem, clopyralid and triclopyr. Mixing with other products decreases the selectivity of this herbicide.

Herbicide: Dicamba.
Brand Name: Vanquish, Weedmaster
Dicamba is a broad spectrum herbicide for broadleaved plants. It is a growth-regulating herbicide readily absorbed and translocated from either roots or foliage. This herbicide produces effects similar to 2,4-D. It has moderate persistence (half-life in soil of 14 days to 12 weeks, Ahrens et al 1994), high mobility, and high leaching potential. This herbicide would not be used within buffer zones near 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. Dicamba can be mixed with 2,4-D to increase its effect on certain plants.

Herbicide: Glyphosate.
Brand Name: Roundup, Rodeo
This is a non-selective herbicide that controls virtually all annual and perennial weeds, but it is generally most toxic to annual grasses. Since this herbicide kills a broad spectrum of plants, care is needed to limit adverse effects on non-target plants. It works by inhibiting amino acid pathways in plants. Theses amino acid pathways are not found in animals, which means that the 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 released into water. Rodeo is an aquatically labeled formulation considered safe for aquatics because toxic inert ingredients, such as surfactants have been left out of this formulation.
Herbicide: Imazapic
Brand Name: Plateau.
This herbicide also is considered to be non-selective, although the rate of application and
the timing of application can provide some selectivity. Many native grasses and
wildflowers are tolerant of this herbicide at lower rates of application, while annual
weedy species are susceptible. It destroys weeds by blocking the pathway which
produces branch chain amino acids in plants. As with glyphosate, animals do not have
such pathways, and the compound has low toxicity to humans. This herbicide is
particularly effective for control of leafy spurge and perennial pepperweed.

Herbicide: Imazapyr
Brand Name: Arsenal.
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. It is particularly useful for control of saltcedar. Half-life in soil ranges from 25-
142 days, depending on soil type and environmental conditions (Ahern 1994). Foliar
absorption usually is rapid (within 24 hours).

Herbicide: Metsufuron
Brand Name: Escort.
This is another sulfonyurea herbicide that is primarily absorbed through the foliage. It
interrupts a biological process necessary for plant growth. It is a powder that is mixed
with water and applied at very low rates (1-3 ounces per acre) for control of a variety of
weed species, including such difficult to control species as hoary cress (whitetop) and
perennial pepperweed. It is moderately residual in soil with a typical half-life of 30 days
(Ahern 1994).

Herbicide: Picloram
Brand Name: Tordon
Picloram is an organic compound that is a plant growth regulator used for controlling
unwanted broadleaf vegetation on rangelands and forested sites. Grasses are generally
not killed by this herbicide. The herbicide also is considered to be rate-selective,
meaning that the plant species killed varies with the rate of application. At one pint per
acre, picloram kills knapweeds while leaving many native species unharmed. At one
quart per acre, this herbicide kills many more plant species. 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 restriction is due to the persistence of this product, which has an average soil half-life
of 90 days (Ahern 1994), 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
as way that is does not contaminate water. This herbicide should not be applied to cobble
or gravel soils or to areas with a shallow water table.

Herbicide: Sulfometron methyl (Sufometuron)
Brand Name: Oust
This is another sulfonyurea herbicide that has broad-spectrum properties. It is a powder
that is mixed with water and it is toxic to target plants at very low rates. It is readily
absorbed by roots and foliage; thus, it is used as a pre-emergent and post-emergent herbicide.

**Herbicide: Triclopyr**  
**Brand Name:** *Garlon 3A* and *Garlon 4*  
This herbicide is selective and it is especially useful for trees and woody shrubs such as saltcedar. 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 (Ahern 1994). Triclopyr is also mixed with clopyralid and marketed under the product name of *Redeem.*

**Herbicide: Tebuthiuron**  
**Brand Name:** *Spike*  
This herbicide can be used in pastures and rangelands, in non-crop situations, for control of certain broadleaf weeds and woody species. It is persistent in soil with a half-life of 12-15 months. This makes this compound particularly useful for difficult to control species like camelthorn.
Appendix B.

Pesticide Use Proposal
### PESTICIDE-USE PROPOSAL

(Reference FSM 2150)

<table>
<thead>
<tr>
<th>1) OBJECTIVE</th>
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<td>a) Project No.</td>
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<td>b) Specific Target Pests</td>
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<tr>
<td>c) Purpose</td>
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<td>c) Diluent</td>
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| 4) | Lbs. AI Per Acre or Other Rate |

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<td>c) Number of Sites</td>
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<td>d) Specific Description of Sites</td>
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<td>b) States</td>
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<td>b) Areas to be Treated with Caution</td>
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<th>9) REMARKS</th>
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<td>b) Use of Trained / Certified Personnel</td>
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<td>c) State and Local Coordination</td>
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<tr>
<td>d) Other Pesticides Being Applied to Same Site</td>
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<td>e) Monitoring</td>
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<td>f) Other</td>
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| 10) Approval (Signatures of Approving Official) | Date: |
Instructions for Completing Form FS-2100-2, Pesticide Use Proposal

**Heading** - Provide requested information.

**OBJECTIVE** (Block 1)

a) Project Number - Assign in accordance with field IPMWG procedures.
b) Specific Target Pest - Identify the target pest by common and scientific name. Identify life cycle stage for animals or stage of growth for plants (e.g. emergent or pre-emergent, seedling, sapling, etc.)
c) Purpose - State exact purpose of pesticide use.

**PESTICIDE** (Block 2)

a) Common name of active ingredient(s) as indicated on the pesticide label. When a combination of pesticides is to be used on a single pest, use the word "AND" in listing the pesticide names. When alternate materials are proposed, use the word "OR" in listing the names.
b) Indicate product formulation (i.e., amine, ester, emulsifiable concentrate, granules, solution, etc.).
c) Percentage active ingredient, acid equivalent, or pounds per gallon (as indicated on the pesticide label).
d) List the EPA registration number from the pesticide label.

**PESTICIDE** - continued (Block 3)

a) Form Applied - e.g., dust, granule, emulsion, bait, solution, gas, etc.
b) Use Strength or Dilution Rate - List the quantity of concentrate mixed with the quantity of diluent or indicate the percentage strength of the formulation.
c) Diluent - Identify the pesticide carrier, i.e., water, oil, talc, kerosene, etc.

**PESTICIDE** - continued - (Block 4)

Pounds of Active Ingredient Per Acre or Other Rate - State pounds of active ingredient per acre to be applied, unless some other unit is indicated. If reporting in acreage is not appropriate, indicate units used. Indoor applications of residual sprays may be expressed as percent of actual ingredient in the prepared spray in gallons per M (1,000) square feet. Point of runoff, which may appear on a label, is generally considered to be 1 gallon per 1,000 square feet on most indoor surfaces. If dusts are used instead of sprays, express as ounces or pounds of prepared dust per M (1,000) square feet. Treatment of trees is listed by number of trees or is application is by hydraulic sprayer, is expressed as pounds or quarts of concentrate per 100 gallons of diluent - oil or water, whichever is used. If the pesticide for trees or brush is applied by air or mist blower, express as pounds of active ingredient per acre. Fumigants or inside aerosols are expressed as pounds of the fumigant or aerosol per M (1,000) cubic feet. Rodent baits should be listed as ounces or pounds of the prepared bait per bait station. Treatments in water may be expressed in parts per million (ppm) by weight or volume - specify. In spot applications, the rate of application is expressed in pounds or gallons per 1,000 square feet indoors or pounds per acre of active ingredient outdoors applied to the spot area treated.

**APPLICATION** - (Block 5)

Indicate as specifically as possible the method (i.e., aerial, ground, etc.) of application and the type of equipment such as helicopter, hand compression sprayer, mist-dust blower, hydraulic sprayer, injector, etc.

**APPLICATION** - (Block 6)

a) Acres or Other Unit to be Treated. State in terms of acres, unless otherwise indicated. Some projects may require repeat applications. Report only the units to be treated for the first application.
b) Number of Applications - For projects that require repeat applications to the same area, indicate their estimated number and their timing.
c) Number of Sites - If the reported figures are a consolidation from several locations, indicate the number of locations.
d) Specific Descriptions of Sites - Indicate the type of area and pertinent portion of the area to be treated; such as ditchbank, rangeland, powerline right-of-way, tree nursery, etc. Specify if pesticide is to be applied in or around water and whether it will be applied directly to water or to the shore. Where applicable, indicate the slope of the treated area. For aquatic use, indicate water quality (hardness and pH) if available or applicable.
APPLICATION (Block 7)

a) Month(s) of Year - State month(s) of year.
b) State(s) - Indicate State and other designation that identifies the area geographically.

SENSITIVE AREAS (Block 8)

a) Areas to be Avoided - Identify sensitive areas to be avoided. Indicate if the area is subject to inadvertent treatment as a result of drift. Describe fully in "remarks" (Block 9) what protective measures are to be taken.
b) Areas to be Treated with Caution - Identify sensitive areas to be treated with special precautions to avoid contamination.

REMARKS (Block 9)

Use this line for information, which will be helpful to the field IPMWG in evaluating the project.

a) Precautions to be Taken - Describe specific precautions be taken to protect sensitive areas; for example, no application within 100 feet of streams.
b) Use of Trained / Certified Personnel - Provide information on the status of training and/or certification of personnel doing the actual work and of those supervising. Has project been reviewed by a field biologist, agronomist, entomologist, or other appropriate subject matter specialist?
c) State and Local Coordination - Indicate coordination on the project at a State or local level.
d) Other Pesticides Being Applied to Same Site - Indicate what other pesticides are being or will be applied on the same site within the year.
e) Monitoring - Describe any monitoring of the operation be to conducted. Indicate effectiveness of prior projects and mention undesirable side effects observed.
f) Other - Indicate if the project is to be accomplished by contract.

Environmental analyses (EA’s and/or EIS’s) may be referred for additional information.

APPROVAL (Block 10)

a) Signature of Approving Official
b) Date of Signature

ATTACHMENTS

a. Maps. Attach maps showing location of the proposed pesticide use project.
b. Labels and MSDS. Attach copies of label(s) and MSDS. Keep copies of label and MSDS with pesticide during transportation, storage, and application. This is especially important after mixing when the original labeled container is not transported with the mixture.
Appendix C.

Guide to Noxious Weed Prevention Practices
Appendix C.

USDA - Forest Service

Guide to Noxious Weed Prevention Practices
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Version 1.0, Dated July 5, 2001
INTRODUCTION
Preventing the introduction and spread of noxious weeds is one objective of Integrated Weed Management Programs on National Forest System lands throughout the United States. This Guide to Noxious Weed Prevention Practices (Guide) provides a comprehensive directory of weed prevention practices for use in Forest Service planning and wildland resource management activities and operations. This Guide will help National Forest and Grassland managers and cooperators identify weed prevention practices that mitigate identified risks of weed introduction and spread for a project or program.

This Guide uses the term “weed” to include all plants defined as “noxious weeds” by Forest Service policy:

“...plants designated as noxious weeds by the Secretary of Agriculture or by the responsible State official. Noxious weeds generally possess one or more of the following characteristics: aggressive and difficult to manage, poisonous, toxic, parasitic, a carrier or host of serious insects or disease, and being native or new to or not common to the United States or parts thereof.” (FSM 2080.5)

For National Forests and Grasslands that use a State-defined noxious weed list, the listed weed species are the priority for implementing weed prevention practices in cooperation with neighbors and partners. National forests and grasslands that do not have a State-defined noxious weed list need to determine local weed prevention priorities using weed lists created by other State or local organizations. At line officer’s discretion, the practices described in this Guide may also be applied to non-native invasive plants that are not defined as “noxious”.

SUPPORTING DIRECTION

This Guide to Noxious Weed Prevention Practices supports implementation of the February 3, 1999 Executive Order on Invasive Species. Federal agencies are expected to follow the direction in the Executive Order.

Development of weed prevention practices is supported by Forest Service noxious weed policy and strategy. Forest Service policy identifies prevention of the introduction and establishment of noxious weed infestations as an agency objective. This policy directs the Forest Service to: (1) determine the factors that favor establishment and spread of noxious weeds, (2) analyze weed risks in resource management projects, and (3) design management practices to reduce these risks. The Forest Service Noxious Weed Strategy identifies development of practices for prevention and mitigation during ground-disturbing activities as a long-term emphasis item. The February 1999 Executive Order on Invasive Species requires Federal agencies to use relevant programs and
authorities to prevent the introduction of invasive species and not authorize or carry out actions that are likely to cause the introduction or spread of invasive species unless the agency has determined, and made public, documentation that shows that the benefits of such actions clearly outweigh the potential harm, and all feasible and prudent measures to minimize risk of harm will need to be taken in conjunction with the actions.

Using This Guide
All resource management projects need to analyze weed risks in the planning stage. Risk includes identifying the likelihood of weeds spreading to the project area and determining the consequence of weed establishment in the project area. Resource programs undertaking maintenance operations need to analyze weed risks when preparing operating plans. A finding of risk is the basis for identifying the appropriate weed prevention practices from the Guide, which are likely to be effective in a particular project situation.


In 2001 two weed prevention practices are required by Forest Service policy:

1. For forested vegetation management operations, use equipment cleaning contract provisions WO-C/CT 6.36 (see Appendix 1)

2. Post and enforce weed-free feed orders, where they exist. (FSM 2081.03).

All other weed prevention practices in this Guide are optional for use based upon an analysis of weed risks. This list of practices, if applied, is considered to be good overall direction, however, not all of these practices can be implemented in every project.

When considering the use of a weed prevention practice for a specific project or resource program, evaluate the efficacy of the weed prevention practice to meet the goal, its feasibility to implement in the specific situation, and its cost-effectiveness. A determination of cost-effectiveness may consider the probability and cost of weed control if a weed prevention practice is not used and the relative contribution of the project or activity to the overall weed risk at the site.

The Guide identifies weed prevention practices that can be applied to specific site-disturbing projects and that may also be applicable for maintenance activities. These weed prevention practices are listed in the first section: “General Weed Prevention Practices for Site-disturbing Projects and Maintenance Activities.” The remaining sections list weed prevention practices that are more uniquely applicable to particular resource management programs, listed by type of resource activity. The intent of this Guide is for managers to first identify and apply the General Weed Prevention practices and then supplement those practices with the appropriate resource activity specific guidance.

Version 1.0, Dated July 5, 2001
General Weed Prevention Practices for Site-disturbing Projects and Maintenance Programs

Goal 1: Incorporate weed prevention and control into project layout, design, alternative evaluation, and project decisions.

- **Practice 1**: Environmental analysis for projects and maintenance programs will need to assess weed risks, analyze potential treatment of high-risk sites for weed establishment and spread, and identify prevention practices. Determine prevention and maintenance needs, to include the use of herbicides, if needed, at the onset of project planning.

Goal 2: Avoid or remove sources of weed seed and propagules to prevent new weed infestations and the spread of existing weeds.

- **Practice 2**: Before ground-disturbing activities begin, inventory and prioritize weed infestations for treatment in project operating areas and along access routes. Identify what weeds are on site, or within reasonably expected potential invasion vicinity, and do a risk assessment accordingly. Control weeds as necessary.

- **Practice 3**: After completing “Practice 2” above, to reduce risk of spreading weed infestations, begin project operations in uninfested areas before operating in weed-infested areas.

- **Practice 4**: Locate and use weed-free project staging areas. Avoid or minimize all types of travel through weed-infested areas, or restrict to those periods when spread of seed or propagules are least likely.

- **Practice 5**: Determine the need for, and when appropriate, identify sites where equipment can be cleaned. Clean equipment before entering National Forest System lands; a Forest Officer, in coordination with the Unit Invasive Species Coordinator, needs to approve use of on-Forest cleaning sites in advance. This practice does not apply to service vehicles traveling frequently in and out of the project area that will remain on the roadway. Seeds and plant parts need to be collected when practical and incinerated. Remove mud, dirt, and plant parts from project equipment before moving it into a project area.

- **Practice 6**: Clean all equipment, before leaving the project site, if operating in areas infested with weeds. Determine the need for, and when appropriate, identify sites where equipment can be cleaned. Seeds and plant parts need to be collected when practical and incinerated.

- **Practice 7**: Workers need to inspect, remove, and properly dispose of weed seed and plant parts found on their clothing and equipment. Proper disposal means bagging the seeds and plant parts and incinerating them.

- **Practice 8**: Coordinate project activities with any nearby herbicide application to maximize cost effectiveness of weed treatments.

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Practice 9. Evaluate options, including closure, to regulate the flow of traffic on sites where desired vegetation needs to be established. Sites could include road and trail rights-of-way, and other areas of disturbed soils.

Goal 3. Prevent the introduction and spread of weeds caused by moving infested sand, gravel, borrow, and fill material in Forest Service, contractor and cooperator operations. For practices 10 through 12 below, work with the responsible transportation agencies to voluntarily adopt these practices where county and state governments have responsibility for maintenance of roads that cross National Forest System lands.

Practice 10. Inspect material sources on site, and ensure that they are weed-free before use and transport. Treat weed-infested sources for eradication, and strip and stockpile contaminated material before any use of pit material.

Practice 11. Inspect and document the area where material from treated weed-infested sources is used, annually for at least three years after project completion, to ensure that any weeds transported to the site are promptly detected and controlled.

Practice 12. Maintain stockpiled, uninfested material in a weed-free condition.

Goal 4. In those vegetation types with relatively closed canopies, retain shade to the extent possible to suppress weeds and prevent their establishment and growth.

Practice 13. Retain native vegetation in and around project activity to the maximum extent possible consistent with project objectives.

Goal 5. Avoid creating soil conditions that promote weed germination and establishment.

Practice 14. Minimize soil disturbance to the extent practical, consistent with project objectives.

Goal 6. Where project disturbance creates bare ground, consistent with project objectives, re-establish vegetation to prevent conditions to establish weeds.

Practice 15. Revegetate disturbed soil (except travelways on surfaced projects) in a manner that optimizes plant establishment for that specific site. Define for each project what constitutes disturbed soil and objectives for plant cover revegetation.

Practice 16. Revegetation may include topsoil replacement, planting, seeding, fertilization, liming, and weed-free mulching as necessary. Use native material where appropriate and feasible. Use certified weed-free or weed-seed-free hay or straw where certified materials are required and/or are reasonably available. Always use certified materials in areas closed by administrative order; refer to Appendix 3 for a sample closure order. Where practical, stockpile weed-seed-free topsoil and replace it on disturbed areas (e.g. road embankments or landings).

Practice 17. Use local seeding guidelines to determine detailed procedures and appropriate
mixes. To avoid weed-contamination, a certified seed laboratory needs to test each lot against the all-State noxious weed list to Association of Seed Technologists and Analysts (AOSTA) standards, and provide documentation of the seed inspection test. There are plant species not on State and Federal noxious weed lists that the Forest Service would consider non-native invasive weeds. Check State and Federal lists to see if any local weeds need to be added prior to testing. Seed lots labeled as certified weed free at time of sale may still contain some weed seed contamination. Non-certified seed should first be tested before use.

- Practice 18. Inspect and document all limited term ground-disturbing operations in noxious weed infested areas for at least three (5) growing seasons following completion of the project. For on-going projects, continue to monitor until reasonable certainty is obtained that no weeds have occurred. Provide for follow-up treatments based on inspection results.

**Goal 7.** Improve effectiveness of prevention practices through weed awareness and education.

- Practice 19. Provide information, training and appropriate weed identification materials to people potentially involved in weed introduction, establishment, and spread on National Forest System lands, including agency managers, employees, forest workers, permit holders, and recreational visitors. Educate them to an appropriate level in weed identification, biology, impacts, and effective prevention measures.

- Practice 20. Provide proficient weed management expertise at each administrative unit. Expertise means that necessary skills are available and corporate knowledge is maintained.

- Practice 21. Develop incentive programs encouraging weed awareness detection, reporting, and for locating new invaders.

**Goal 8.** Set the example; maintain weed-free administrative sites.

- Practice 22. Treat weeds at administrative sites and use weed prevention practices to maintain sites in a weed-free condition.

### Aquatic Weed Prevention Practices

**Goal 1.** To prevent new weed infestations and the spread of existing weeds, avoid or remove sources of weed seed and propagules.

- Aquatic 1. Provide outreach to state fish and game departments, counties, and other agencies concerning the unique prevention measures and control practices associated with aquatic weeds.

- Aquatic 2. Inspect boats (including air boats), trailers, and other boating equipment and remove any visible plants, animals, or mud before leaving any waters or boat launching facilities. Drain water from motor, live well, bilge, and transom wells while on land before
leaving the vicinity. Wash and dry boats, tackle, downriggers, anchors, nets, floors of boats, props, axles, trailers, and other boating equipment to kill weeds not visible at the boat launch.

- **Aquatic 3.** Before transporting to new waters, rinse boat and boating equipment with hot (40°C or 104°F) clean water, spray boat or trailer with high-pressure water, or dry boat and equipment for at least 5 days.

- **Aquatic 4.** Inspect seaplanes and remove weeds from floats, wires, cables, water rudders, and pump floats; wash with hot water or spray with high-pressure water, or dry for at least 5 days.

- **Aquatic 5.** Before take-off – avoid taxiing through heavy surface growths of weeds before takeoff; raise and lower water rudders several times to clear off plants. If weeds were picked up during landing, clean off the water rudders before take-off and leave the water rudders up during take-off. After take-off – if water rudders were down during take-off, raise and lower water rudders several times to free weed plant fragments while over original body of water or over land. If weeds remain visible on floats or water rudders, the pilot may return to flight origin and remove plants if an extra landing and takeoff is not a safety concern.

- **Aquatic 6.** Maintain a 100 feet buffer of aquatic weed-free clearance around boat launches and docks.

- **Aquatic 7.** Promptly post sites if aquatic invasives are found. Confine infestation; where prevention is infeasible or ineffective, close facility until infestation is contained.

- **Aquatic 8.** Wash and dry tackle, downriggers, float tubes, waders, and other equipment to remove or kill harmful species not visible at the boat launch.

- **Aquatic 9.** Avoid moving weed plants from one body of water to another.

- **Aquatic 10.** Avoid running personal watercraft through aquatic plants near boat access locations. Instead, push or winch watercraft onto the trailer without running the engine. After the watercraft is out of the water, start the engine for 5-10 seconds to blow out any excess water and vegetation. After engine has stopped, pull weeds out of the steering nozzle. Inspect trailer and any other sporting equipment for weed fragments and remove them before leaving the access area. Wash or dry watercraft before transporting to another body of water.

- **Aquatic 11.** Waterfowl hunters may use elliptical, bulb-shaped, or strap anchors on decoys, because these types of anchors avoid collecting submersed and floating aquatic plants. Inspect waders and hip boots, removing any aquatic plants, and where possible, rinse mud from them before leaving the water. Remove aquatic plants, animals, and mud attached to decoy lines and anchors.

- **Aquatic 12.** Construct new boat launches and ramps at deep-water sites. Restrict motorized boats in lakes near areas that are infested with weeds. Move sediment to upland
or quarantine areas when cleaning around culverts, canals, or irrigation sites. Clean equipment before moving to new sites. Inspect and clean equipment before moving from one project area to another.

**Cultural Resources**

- Use the General weed prevention practices.

**Fire Management**

*Pre-fire, Pre-incident Training*

**Goal 1.** Improve effectiveness of prevention practices through weed awareness and education.

- **Fire 1.** Increase weed awareness and weed prevention in all fire training.
- **Fire 2.** Include weed risk factors and weed prevention practices in Resource Advisor duties on all Incident Management Teams and Burn Rehabilitation Teams.

*Plans*

**Goal 2.** Improve effectiveness of prevention practices through weed awareness and education.

- **Fire 3.** Assign a local weed specialist or include in Resource Advisor duties to the Incident Management Team when wildfire or control operations occur in or near a noxious weed area.
- **Fire 4.** Resource Advisors need to provide briefings that identify operational practices to reduce weed spread, (for example: avoiding known weed infestation areas when locating fire lines). Include this information in shift briefings.
- **Fire 5.** Provide weed identification aids to Field Observers.

*Wildfires – General*

All wildfire weed prevention goals apply except in instances where human life or property is at risk.

**Goal 3.** Avoid or remove sources of weed seed and propagules to prevent new weed infestations and the spread of existing weeds.

- **Fire 6.** Ensure that rental equipment is free of weed seed and propagules before the contracting officers representative accepts it.

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- **Fire 7.** Maintain a network of airports, helibases, camps, and staging areas in a noxious weed-free condition.

- **Fire 8.** Coordinate with local weed specialists to locate and treat practice jump areas to make them weed-free.

- **Fire 9.** Inspect and treat weeds that establish at equipment cleaning sites after fire incidents.

**Goal 4.** Avoid creating soil conditions that promote weed germination and establishment.

- **Fire 10.** Use appropriate suppression tactics to reduce suppression-induced disturbances to soil and vegetation while minimizing seedbed creation due to disturbance from fire effects.

- **Fire 11.** Avoid moving water buckets from infested lakes to lakes that are not infested prior to inspection and cleaning. There is no hazard in using water infested with aquatic weeds on terrestrial sites.

**Prescribed Fire**

**Goal 5.** To prevent new weed infestations and the spread of existing weeds, avoid or remove sources of weed seed and propagules or manage fire as an aid in control of weeds.

- **Fire 12.** Ensure that rental equipment is free of weed seed and propagules before the contracting officers representative accepts it.

- **Fire 13.** Avoid ignition and burning in areas at high risk for weed establishment or spread due to fire effects. Treat weeds that establish or spread because of unplanned burning of weed infestations.

- **Fire 14.** When possible use staging areas and helibases that are maintained in a weed-free condition.

- **Fire 15.** Pre-inventory project area and evaluate weeds present with regard to the effects on the weed spread relative to the fire prescription.

**Goal 6.** Avoid creating soil conditions that promote weed germination and establishment.

- **Fire 16.** Use appropriate preparation and suppression tactics to reduce disturbances to soil and vegetation.

**Fire Rehabilitation**

**Goal 7.** Incorporate weed prevention into project layout, design, alternative evaluation, and decisions.

- **Fire 17.** Evaluate weed status and risks in Burned Area Emergency Rehabilitation plans.
When appropriate, apply for Burned Area Emergency Rehabilitation and restoration funding.

**Goal 8.** To prevent conditions favoring weed establishment, re-establish vegetation on bare ground caused by project disturbance as soon as possible using either natural recovery or artificial techniques as appropriate to the site objectives.

- **Fire 18.** To prevent weed spread, treat weeds in burned areas as part of the Burned Area Emergency Rehabilitation plan. For known infestations that will likely increase, the first preference is prevention, such as planting species to compete with unwanted plants.

- **Fire 19.** Inspect and document weed establishment at fire access roads, cleaning sites, all disturbed staging areas, and within burned areas; control infestations to prevent spread within burned areas. If you suspect the presence of noxious weeds, request BAER funds to inspect and document for emergence in the spring. Request BAER funds for control if noxious weeds are present and NEPA has already been approved.

- **Fire 20.** Seed and straw mulch to be used for burn rehabilitation (for wattles, straw bales, dams, etc.) all need to be inspected and certified that they are free of weed seed and propagules.

- **Fire 21.** Regulate human, pack animal, and livestock entry into burned areas at risk for weed invasion until desirable site vegetation has recovered sufficiently to resist weed invasion.

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**Forest Vegetation Management**

**Timber Harvest Operations & Stewardship Contracting**

**Goal 1.** Avoid or remove sources of weed seed and propagules to prevent new weed infestations and the spread of existing weeds.

- **Forest Veg 1.** Treat weeds on projects used by contractors, emphasizing treatment of weed infestations on existing landings, skid trails, and helibases before activities commence.

- **Forest Veg 2.** Train contract administrators to identify noxious weeds and select lower risk sites for landings and skid trails.

- **Forest Veg 3.** Encourage operators to maintain weed-free mill yards, equipment parking, and staging areas.

- **Forest Veg 4.** Use standard timber sale contract provisions such as WO-C/CT 6.36 to ensure appropriate equipment cleaning (reference Appendix 1).
Goal 2. To prevent weed germination and establishment, retain native vegetation in and around project activity and keep soil disturbance to a minimum consistent with project objectives.

- Forest Veg 5. Minimize soil disturbance to no more than needed to meet project objectives. Logging practices to reduce soil disturbance include, but are not limited to:
  - Over-snow logging
  - Skyline or helicopter logging
  - Reuse landings, skid trails and helibases when they are weed free

- Forest Veg 6. Minimize period from end of logging to site preparation, revegetation, and contract closure.

Post Vegetation Management Operations

Goal 3. To prevent weed germination and establishment, retain native vegetation in and around project activity and keep soil disturbance to a minimum consistent with project objectives.

- Forest Veg 7. Minimize soil disturbance to no more than needed to meet vegetation management objectives. Prevention practices to reduce soil disturbance include, but are not limited to:
  - Treating fuels in place instead of piling
  - Minimizing heat transfer to soil in burning
  - Minimizing fireline construction

Goal 4. To prevent favorable conditions for weed establishment, re-establish vegetation on bare ground caused by project disturbance.

- Forest Veg 8. For long-term restoration and weed suppression where forested vegetation management has created openings, recognize the need for prompt reforestation.

Grazing Management

Goal 1. Consider noxious weed prevention and control practices in the management of grazing allotments.

- Grazing 1. Include weed prevention practices, inspection and reporting direction, and provisions for inspection of livestock concentration areas in allotment management plans and annual operating instructions for active grazing allotments.

- Grazing 2. For each grazing allotment containing existing weed infestations, include prevention practices focused on preventing weed spread and cooperative management of weeds in the annual operating instructions. Prevention practices may include, but are not limited to:
- Altering season of use
- Exclusion
- Activities to minimize potential ground disturbance
- Preventing weed seed transportation
- Maintaining healthy vegetation
- Weed control methods
- Revegetation
- Inspection
- Reporting
- Education

**Goal 2.** Avoid or remove sources of weed seed and propagules to prevent new weed infestations and the spread of existing weeds. Minimize transport of weed seed into and within allotments.

- **Grazing 3.** If livestock are potentially a contributing factor to seed spread, schedule use by livestock in units with existing weed infestations which are known to be susceptible to spread by livestock, to be prior to seed-set or after seed has fallen.

- **Grazing 4.** If livestock were transported from a weed-infested area, annually inspect and treat allotment entry units for new weed infestations.

- **Grazing 5.** Close pastures to livestock grazing when the pastures are infested to the degree that livestock grazing will continue to either exacerbate the condition on site or contribute to weed seed spread. Designate those pastures as unsuitable range until weed infestations are controlled.

**Goal 3.** Maintain healthy, desirable vegetation that is resistant to weed establishment.

- **Grazing 6.** Through the allotment management plan or annual operating instructions, manage the timing, intensity (utilization), duration, and frequency of livestock activities associated with harvest of forage and browse resources to maintain the vigor of desirable plant species and retain live plant cover and litter.

- **Grazing 7.** Manage livestock grazing on restoration areas to ensure that vegetation is well established. This may involve exclusion for a period of time consistent with site objectives and conditions. Consider practices to minimize wildlife grazing on the areas if needed.

**Goal 4.** Minimize disturbed ground conditions favorable for weed establishment in the management of livestock grazing.

- **Grazing 8.** Include weed prevention practices that reduce ground disturbance in allotment management plans and annual operating instructions. Consider for example: changes in the timing, intensity, duration, or frequency of livestock use; location and changes in salt grounds; restoration or protection of watering sites; and restoration of yarding/loafing areas, corrals, and other areas of concentrated livestock use.

- **Grazing 9.** Inspect known areas of concentrated livestock use for weed invasion.
Inventory and manage new infestations.

**Goal 5.** Improve effectiveness of weed prevention practices through awareness programs and education. Promote weed awareness and prevention efforts among range permittees.

- **Grazing 10.** Use education programs or annual operating instructions to increase weed awareness and prevent weed spread associated with permittees’ livestock management practices.

- **Grazing 11.** To aid in their participation in allotment weed control programs, encourage permittees to become certified pesticide use applicators.

### Lands and Special Uses

**Goal 1.** Avoid or remove sources of weed seed and propagules to prevent new weed infestations and the spread of existing weeds.

- **Lands 1.** Consider weed status of lands when making land adjustment decisions.

- **Lands 2.** Conduct weed inventories of all lands considered for acquisition.

- **Lands 3.** As a condition of land adjustment decisions, the Forest Service may require the nonfederal proponent to treat weeds, to federal standards, on the land proposed for federal acquisition.

- **Lands 4.** Include a weed prevention and control provision in all new special-use authorizations such as, permits, easements or leases involving ground-disturbing activities when authorized activities present a high risk for weed infestation or the location of the activity is vulnerable to weed introduction or spread. Include a weed prevention and control provision in existing authorizations that authorize ground-disturbing activities when the authorization is amended for other reasons; consider the need to amend an authorization directly, when ground-disturbing activities are involved. These provisions can be accomplished through the development and incorporation of a supplemental clause (reference sample clause R1-D4 in Appendix 2) or as a requirement in an associated operation and maintenance plan.
Minerals

**Goal 1.** Incorporate weed prevention into project layout, design, alternative evaluation, and decisions.

- **Minerals 1.** Include weed prevention measures, including project inspection and documentation, in operation and reclamation plans.

**Goal 2.** To prevent conditions favoring weed establishment, minimize bare soil conditions and re-establish vegetation on bare ground caused by project disturbance.

- **Minerals 2.** Retain bonds until reclamation requirements are completed, including weed treatments, based on inspection and documentation.

Recreation, Wilderness, and Special Management Areas

**Goal 1.** To prevent new weed infestations and the spread of existing weeds, avoid or remove sources of weed seed and propagules.

- **Recreation 1.** Encourage public land users before recreating on public lands, to inspect and clean motorized and mechanized trail vehicles of weeds and their seeds.

- **Recreation 2.** On designated public lands, issue closure orders that specify the use of weed free or weed-seed-free feed, hay, straw, and mulch. Refer to 36 CFR 251.50 and Appendix 3. Cooperate with State, County, Tribal governments, and other agencies to develop and support publicly available weed-free materials.

- **Recreation 3.** Where they exist, post and enforce weed-free feed orders. (FSM 2081.03)

- **Recreation 4.** Encourage backcountry pack and saddle stock users to feed stock only weed-free feed for several days before travel on National Forest System lands.

- **Recreation 5.** Inspect, brush, and clean animals, especially hooves and legs before entering public land. Inspect and clean tack and equipment.

- **Recreation 6.** Tie or hold stock in ways that minimize soil disturbance and avoid loss of desirable native vegetation.

- **Recreation 7.** Annually inspect all campgrounds, trailheads, and recreation areas that are open to public vehicle use for weeds; treat new infestations.

- **Recreation 8.** Maintain trailheads, boat launches, outfitter and public camps, picnic areas, airstrips, roads leading to trailheads, and other areas of concentrated public use in a weed-
free condition. Consider high use recreation areas as high priority for weed eradication.

- **Recreation 9.** Consider seasonal or full time closure to campgrounds, picnic areas, and other recreation use areas until weeds are reduced to levels that minimize potentials for spread.

- **Recreation 10.** In areas susceptible to weed infestation, limit vehicles to designated, maintained travel routes. Inspect and document inspections on travelways for weeds and treat as necessary.

**Goal 2.** Improve effectiveness of prevention practices through weed awareness and education.

- **Recreation 11.** Post weed awareness messages and prevention practices at strategic locations such as trailheads, roads, boat launches, and forest portals.

- **Recreation 12.** In weed-infested areas, post weed awareness messages and prevention practices at roadsides.

**Research Activities**

**Goal 1.** Incorporate weed prevention into research project design, layout, installation, and decisions.

- **Research 1.** Address weed establishment risk and spread in research project study plans and decisions.

**Road Management**

**New and Reconstruction**

**Goal 1.** Incorporate weed prevention into project layout, design, alternative evaluation, and decisions.

- **Road 1.** For timber sale purchaser road maintenance and decommissioning, use standard timber sale contract provisions such as WO-C/CT 6.36 to ensure appropriate equipment cleaning (reference Appendix 1).

- **Road 2.** For road new and reconstruction conducted as part of public works (construction) contracts and service contracts include contract language for equipment cleaning such as is in WO-C/CT 6.36 (Appendix 1).

**Road Maintenance and Decommissioning**

**Goal 2.** Minimize roadside sources of weed seed that could be transported to other areas.

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Road 3. Periodically inspect system roads and rights-of-way for invasion of noxious weeds. Train road maintenance staff to recognize weeds and report locations to the local weed specialist. Inventory weed infestations and schedule them for treatment.

Road 4. Schedule and coordinate blading or pulling of noxious weed-infested roadsides or ditches in consultation with the local weed specialist. Do not blade or pull roadsides and ditches that are infested with noxious weeds unless doing so is required for public safety or protection of the roadway. If the ditch must be pulled, ensure the weeds remain on-site. Blade from least infested to most infested areas. When it is necessary to blade noxious weed-infested roadsides or ditches, schedule activity when seeds or propagules are least likely to be viable and to be spread. Minimize soil surface disturbance and contain bladed material on the infested site.

Road 5. Avoid acquiring water for dust abatement where access to the water is through weed-infested sites.

Road 6. For timber sale purchaser road maintenance and decommissioning, use contract provisions for equipment cleaning such as WO-C/CT 6.36 (Appendix 1).

Road 7. For road maintenance and decommissioning conducted as part of public works (construction) contracts and service contracts include contract language for equipment cleaning such as is in WO-C/CT 6.36 (Appendix 1).

Road 8. Treat weeds in road decommissioning and reclamation projects before roads are made impassable. Reinspect and follow-up based on initial inspection and documentation.

Watershed Management

Goal 1. Avoid or remove sources of weed seed and propagules to prevent new weed infestations and the spread of existing weeds.

Watershed 1. Inspect and document for early detection of noxious weed establishment and spread in riparian areas and wetlands. Eradicate new infestations before they become established.

Watershed 2. Address noxious weed risks in watershed restoration projects and water quality management plans.

Watershed 3. Pay particular attention to practices listed under “General Weed Prevention Practices for Site-disturbing Projects and Maintenance Programs” and Aquatic Weed Prevention Practices”.

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Wildlife, Fisheries, and Botany

**Goal 1.** Avoid creating soil conditions that promote weed germination and establishment.

- **Wildlife 1.** Periodically inspect and document those areas where wildlife concentrate in the winter and spring resulting in overuse or soil scarification.

- **Wildlife 2.** Use weed-free materials at big game baiting stations.

- **Wildlife 3.** For wildlife openings and habitat improvement projects, follow the practices outlined in General Weed Prevention Practices--Goal 4; Forest Vegetation Management, Timber Harvest Operations & Stewardship Contracting.
WO-C6.36

C6.36 – EQUIPMENT CLEANING. (5/01) Unless the entire Sale Area is already infested with specific noxious weed species of concern, Purchaser shall ensure that prior to moving on to the Sale Area all off-road equipment, which last operated in areas known by Forest Service to be infested with specific noxious weeds of concern, is free of soil, seeds, vegetative matter, or other debris that could contain or hold seeds. Purchaser shall certify in writing that off-road equipment is free of noxious weeds prior to each start-up of timber sale operations and for subsequent moves of equipment to Sale Area. The certification shall indicate the measures taken to ensure that off-road equipment is free of noxious weeds will be identified. “Off-road equipment” includes all logging and construction machinery, except for log trucks, chip vans, service vehicles, water trucks, pickup trucks, cars, and similar vehicles. A current list of noxious weeds of concern to Forest Service is available at the Forest Supervisor’s Office.

Purchaser must clean off-road equipment prior to moving between cutting units on this timber sale that are known to be infested with noxious weeds and other units, if any, that are free of such weeds. Sale Area Map shows areas, known by Forest Service prior to timber sale advertisement, that are infested with specific noxious weed species of concern.

Purchaser shall employ whatever cleaning methods are necessary to ensure that off-road equipment is free of noxious weeds. Equipment shall be considered free of soil, seeds, and other such debris when a visual inspection does not disclose such material. Disassembly of equipment components or specialized inspection tools is not required.

Purchaser shall notify Forest Service at least 5 days prior to moving each piece of off-road equipment on to the Sale Area, unless otherwise agreed. Notification will include identifying the location of the equipment’s most recent operations. If the prior location of the off-road equipment cannot be identified, Forest Service may assume that it was infested with noxious weed seeds. Upon request of Forest Service, Purchaser must arrange for Forest Service to inspect each piece of off-road equipment prior to it being placed in service.

If Purchaser desires to clean off-road equipment on National Forest land, such as at the end of a project or prior to moving to a new unit that is free of noxious weeds, Purchaser and Forest Service shall agree on methods of cleaning, locations for the cleaning, and control of off-site impacts, if any.

New infestations of noxious weeds, of concern to Forest Service and identified by either Purchaser or Forest Service on the Sale Area, shall be promptly reported to the other party. Purchaser and Forest Service shall agree on treatment methods to reduce or stop the spread of noxious weeds when new infestations are found. In the event of contract modification under this Subsection, Purchaser shall be reimbursed for any additional protection required, provided that any work or...
extra protection required shall be subject to prior approval by Forest Service. Amount of reimbursement shall be determined by Forest Service and shall be in the form of a reduction in stumpage rates, unless agreed otherwise in writing. However, in no event may stumpage rates be reduced below Base Rates.

INSTRUCTIONS: Include in all new contracts.

The Forest Service must identify on the sale area map units that are infested with specific noxious weeds species of concern.

The prospectus for the sale must notify prospective purchasers that maps of these known locations are available from the local Forest Supervisor’s Office or District Ranger Station. A list of noxious weeds of concern to the Forest Service (normally included in the Noxious Weed Program Guide) must be available for the purchaser's inspection. The current National Forest Noxious Weed Program Guide, noxious weed atlas, or other data sources, as needed, will be used to determine locations of known infestation.

Significant changes in the status of noxious weed infestations on the sale may require contract modifications to deal with changed conditions. An example might be where new noxious weed infestations are discovered after contract award, which require costly additional methods to prevent the spread of such infestations.

**WO-CT6.36**

CT6.36 – EQUIPMENT CLEANING. (5/01) Unless the entire Sale Area is already infested with specific noxious weed species of concern, Purchaser shall ensure that prior to moving on to the Sale Area all off-road equipment, which last operated in areas known by Forest Service to be infested with specific noxious weeds of concern, is free of soil, seeds, vegetative matter, or other debris that could contain or hold seeds. Purchaser shall certify in writing that off-road equipment is free of noxious weeds prior to each start-up of timber sale operations and for subsequent moves of equipment to Sale Area. The certification shall indicate the measures taken to ensure that off-road equipment is free of noxious weeds will be identified. “Off-road equipment” includes all logging and construction machinery, except for log trucks, chip vans, service vehicles, water trucks, pickup trucks, cars, and similar vehicles. A current list of noxious weeds of concern to Forest Service is available at the Forest Supervisor’s Office.

Purchaser must clean off-road equipment prior to moving between cutting units on this timber sale that are known to be infested with noxious weeds and other units, if any, that are free of such weeds. Sale Area Map shows areas, known by Forest Service prior to timber sale advertisement, that are infested with specific noxious weed species of concern.

Purchaser shall employ whatever cleaning methods are necessary to ensure that off-road equipment is free of noxious weeds. Equipment shall be considered free of soil, seeds, and other such debris when a visual inspection does not disclose such material. Disassembly of equipment components or specialized inspection tools is not required.

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Purchaser shall notify Forest Service at least 5 days prior to moving each piece of off-road equipment on to the Sale Area, unless otherwise agreed. Notification will include identifying the location of the equipment's most recent operations. If the prior location of the off-road equipment cannot be identified, Forest Service may assume that it was infested with noxious weed seeds. Upon request of Forest Service, Purchaser must arrange for Forest Service to inspect each piece of off-road equipment prior to it being placed in service.

If Purchaser desires to clean off-road equipment on National Forest land, such as at the end of a project or prior to moving to a new unit that is free of noxious weeds, Purchaser and Forest Service shall agree on methods of cleaning, locations for the cleaning, and control of off-site impacts, if any.

New infestations of noxious weeds, of concern to Forest Service and identified by either Purchaser or Forest Service on the Sale Area, shall be promptly reported to the other party. Purchaser and Forest Service shall agree on treatment methods to reduce or stop the spread of noxious weeds when new infestations are found. In the event of contract modification under this Subsection, Purchaser shall be reimbursed for any additional protection required, provided that any work or extra protection required shall be subject to prior approval by Forest Service. Amount of reimbursement shall be determined by Forest Service and shall be in the form of a reduction in stumpage rates, unless agreed otherwise in writing. However, in no event may stumpage rates be reduced below Base Rates.

INSTRUCTIONS: Include in all new contracts.

The Forest Service must identify on the sale area map units that are infested with specific noxious weeds species of concern.

The prospectus for the sale must notify prospective purchasers that maps of these known locations are available from the local Forest Supervisor’s Office or District Ranger Station. A list of noxious weeds of concern to the Forest Service (normally included in the Noxious Weed Program Guide) must be available for the purchaser's inspection. The current National Forest Noxious Weed Program Guide, noxious weed atlas, or other data sources, as needed, will be used to determine locations of known infestation.

Significant changes in the status of noxious weed infestations on the sale may require contract modifications to deal with changed conditions. An example might be where new noxious weed infestations are discovered after contract award, which require costly additional methods to prevent the spread of such infestations.
APPENDIX 2

SAMPLE SPECIAL USE SUPPLEMENTAL CLAUSE
USDA-FOREST SERVICE
NORTHERN REGION

Include a weed prevention and control provision, such as the following supplemental clause example, in all new special-use authorizations such as, permits, easements, and leases, or when those authorizations are amended, when there are ground-disturbing activities.

The following is a weed prevention and control supplemental clause approved for use in Region 1. (Reminder: Supplemental clauses used in a special use authorization must be reviewed and approved by the Regional Forester, after review by the local Office of the General Counsel.)

R1 SUPPLEMENT 2709.11-2000-1 2709.11, 50
EFFECTIVE 02/08/2000 Page 31 of 41

R1-D4 - Noxious Weed/Exotic Plant Prevention and Control. Use this clause in all authorizations involving ground disturbance which could result in the introduction or spread of noxious weeds and/or exotic plants. This clause may also be used where cooperative agreements for noxious weed control are in place with state and local governments.

The holder shall be responsible for the prevention and control of noxious weeds and/or exotic plants of concern on the area authorized by this authorization and shall provide prevention and control measures prescribed by the Forest Service. Noxious weeds and exotic plants of concern are defined as those species recognized by (insert county weed authority and/or national forest) in which the authorized use is located.

The holder shall also be responsible for prevention and control of noxious weed and exotic plant infestations which are not within the authorized area, but which are determined by the Forest Service to have originated within the authorized area.

When determined to be necessary by the authorized officer, the holder shall develop a site-specific plan for noxious weed and exotic plant prevention and control. Such plan shall be subject to Forest Service approval. Upon Forest Service approval, the noxious weed and exotic plant prevention and control plan shall become a part of this authorization, and its provisions shall be enforceable under the terms of this authorization.

With respect to the second paragraph of the above provision, the intent is to apply this
provision only for a well defined confined area such as a narrow linear right-of-way where it can be determined without a doubt that the noxious weeds resulted from the activities of the holder.
APPENDIX 3
Example of a Closure Order

Closure Order

SPECIAL ORDER
OCCUPANCY AND USE
ON NATIONAL FOREST SYSTEM LANDS
IN THE STATE OF MONTANA

Pursuant to the Regulations of the Secretary of Agriculture, Title 36 CFS 261.50 (a) and (b), the following acts are prohibited within all National Forest System lands within the State of Montana.

These restrictions are in addition to those enumerated in Subpart A, part 261, Title 36 of the Code of Federal Regulations and will remain in effect from October 6, 1997, until rescinded or revoked.

1. The possession or storage of hay, grain, straw, cubes, palletized feed or mulch that is not certified as being noxious weed free or noxious weed seed free by an authorized State Department of Agriculture official or designated county official; each individual bale or container must be tagged or marked as weed free and reference the written certification (36 CFR 261.58 (t)).

Pursuant to 36 CFR 261.50 (e), the following are exempt from this Order:

A. Persons with a permit specifically authorizing the action or omission.

B. Transporting feeds, straw, or hay on Federal, State, and county roads that are not Forest Development Roads or Trails.

The above restrictions are necessary to prevent the spread of noxious weeds on National Forest Systems lands (16 USC 551). Upon issuance of this order, all previous orders requiring the use of certified noxious weed free or noxious weed seed free forage on NFS lands in Montana shall be superceded.

Violation is punishable by a fine of up to $5,000 and/or up to six months imprisonment (16 U.S.C. 551 and 18 U.S.C. 3571 (b) (6).

/S/ Kathleen A. McAllister 10-8-97

HAL SALWASSER
Regional Forester
Northern Region

Version 1.0, Dated July 5, 2001
Appendix D.

Safety and Spill Plan

The following information will be reviewed by all workers who handle herbicides.

Information and Equipment

A copy of the Labels and Material Safety Data sheets for herbicides being used will be available at all times during project operations. All personnel involved in the handling of pesticides will review and be familiar with relevant Material Safety Data Sheets.

Required Personal Protective Equipment (PPE) will be worn at all times when herbicides are being mixed and applied. Label requirements for specific herbicides will be followed. Applicators and handlers must wear the maximum PPE required by the labels of each herbicide being applied.

An emergency spill kit, with directions for use, will be available when herbicides are being mixed, transported 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:

- Shovel
- Broom
- Ten pounds of absorbent material
- Box of large plastic garbage bags
- Safety goggles
- Rubber gloves

Procedures for Mixing, Loading and Disposing of Chemicals

The following procedures will apply to all herbicide applications:

1. Mixing of herbicides will occur at least 100 feet from well heads or surface waters.
2. Dilution water will be added to the spray container prior to addition of the spray concentrate.
3. Hoses used to add dilution water to spray containers will be equipped with a device to prevent back-siphoning, or a minimum 2-inch air gap.
4. Only those quantities of herbicides needed for one day’s use will be mixed.
5. Those workers mixing chemicals will wear personal protective equipment required by the label.
6. Empty containers will be triple rinsed. Rinsate will be added to the spray mix or disposed of at the application site at rates that do not exceed those on the label.
7. Unused herbicides will be stored in a locked building in accord with herbicide storage instructions provided by the manufacturer and in accordance with Arizona Structural Pest Control Commission Regulations.
8. Empty and rinsed herbicide containers will be punctured and disposed of according to label directions.

**Procedures for Herbicide Spill Containment**

In the event of a spill, immediately notify the project supervisor. Identify the nature of the incident and extent of the spill, including the product name(s) and chemical registration number(s).

Remove any injured or contaminated person to a safe place. Remove contaminated clothing and follow MSDS guidelines for emergency first aid procedures following exposure. Obtain medical help for any injured employee.

**Minor Spills (Less than 1 gallon of herbicide formulation or less than 10 gallons of herbicide mixture).**

Areas where chemicals are spilled will be roped off or flagged to warn people and restrict entry. Qualified personnel will always be present on the site to confine the spill and warn of danger until it is cleaned up. The spill will be confined with earthen or sand dikes if the chemical starts to spread. The spill will be soaked up with absorbent material such as sawdust, soil, or clay. Contaminated material will be shoveled into a leak proof container for disposal and labeled. Contaminated material will be disposed of using the same method as for herbicides. The spill area will not be hosed down.

**Major Spills (More than one gallon of herbicide formulation or more than 10 gallons of herbicide mixture).**

Areas where chemicals are spilled will be roped off or flagged to warn people and restrict entry. Qualified personnel will always be present on the site to confine the spill and warn of danger until it is cleaned up. The spill will be confined with earthen or sand dikes if the chemical starts to spread. The spill will be soaked up with absorbent material such as sawdust, soil, or clay.

The local fire department and State pesticide authorities will be notified. Follow their instructions for further action.

If the spill occurs on a highway, the highway patrol or sheriff will be notified. Whenever possible, someone familiar with the situation will remain at the site until help arrives. Emergency phone numbers will be carried by the herbicide applicators.

**Reporting**

Spills should be reported following procedures outlined in FSH 2109.14, Pesticide Use Management and Coordination Handbook. The following list is a guide for the information regarding spills that should be reported. Incidents should be reported even if there is doubt as to whether the spill is an emergency or whether someone else has reported it.

Date:  
Time of Release:  
Time Discovered:  
Time Reported:
Duration of Release:
Location: (State, county, route, milepost)
Chemical name:
Chemical identification number:
Chemical data:
Known health risks:
Precautions to be taken:
Cause and source of release:
Estimated quantity (gallons) released:
Quantity (gallons) which has reached water:
Name of affected watercourse:
Number and type of injuries:
Potential future threats to environment or health:
Your name:
Telephone numbers:
Address:
Name and address of the carrier:
Truck or vehicle number:
Appendix E.

Biological Assessment and Evaluation
Biological Assessment and Evaluation

Coronado National Forest Invasive Exotic Plant Management Program

Coronado National Forest: Cochise, Graham, Pima, Pinal and Santa Cruz Counties in southeastern Arizona; and Hidalgo County in southwestern New Mexico.

October 2003

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Introduction

The spread of invasive species threatens the health of native ecosystems by causing changes in the composition and functioning of native plant communities that are the foundation for native ecosystems. According to a recent survey by the U.S. Department of the Interior, noxious weeds have invaded over 17 million acres of public lands in the West, more than quadrupling their range from 1985-1995 (Westbrooks 1998). When invasive species such as cheatgrass, red brome and medusahead are included, there are 100 million acres of moderately to heavily infested land. Non-native species pose an ongoing threat to nearly two thirds of all endangered species. Only direct habitat destruction poses a greater threat to listed species (Westbrooks 1998).

Invasive plants have characteristics that permit them to rapidly invade and dominate new areas, out competing other vegetation for light, moisture and nutrients. Invasive plants are often spread by human activities associated with vehicles and roads, agricultural practices, urban development, contaminated livestock feed, contaminated seed, and poor range management practices (Belsky and Gelbard 2000).

The Coronado National Forest is proposing to implement a 10-year Forest-wide invasive exotic plant management program. The purpose of the proposed action is to protect native plant communities on the Forest by preventing the introduction of invasive exotic plants and controlling or eliminating existing populations of invasive exotic plants. This action is needed because of the occurrence of invasive exotic plants on and adjacent to the Forest, and to meet the requirements of law, regulations and policy.

Legal and Regulatory Framework.

The Federal Noxious Weed Act (7 U.S.C. § 2801-2814) and Executive Order 13112 authorize Federal agencies to initiate control and eradication actions against incipient infestations of invasive exotic species that are introduced into this country. Further, the Endangered Species Act of 1973 (ESA) requires Federal agencies to utilize their authorities to conserve endangered and threatened species and to insure that any action authorized, funded or carried out is not likely to jeopardize the continued existence of listed species (ESA Section 7(a)(1) and 7(a)(2)). Federal actions such as noxious weed and invasive species eradication or control projects must be analyzed to determine the potential environmental consequences (National Environmental Policy Act of 1969). An Environmental Assessment (EA) for this program has been prepared. This Biological Assessment and Evaluation (BAE) addresses the effects of the EA proposed action on Federally listed and proposed threatened and endangered species and Forest Service Sensitive Species.

This action responds to the following goals and objectives outlined in the Coronado National Forest Plan.

- Maintain or enhance the visual resource through sound landscape management principles.
- Increase the public’s awareness of their obligation to the resource and their responsibility in caring for it.
- Establish a dialogue with the public to gain their understanding of our goals and objectives and insure their informed participation in our management decisions.
- Develop Information Service Programs that will educate, inform, and involve people of southern Arizona and southwest New Mexico in management and enjoyment of the forest.
- Provide habitat for wildlife populations consistent with the goals outlined in the Arizona and New Mexico Department of Game and Fish Comprehensive Plans and consistent with other resource values.
- Improve the habitat of and the protection for local populations of Threatened and Endangered Species to meet the goals of the Endangered Species Act of 1973.
• To restore rangeland to at least a moderately high ecological condition (70% to 75% of potential production, fair range condition) with stable soil and a static or upward trend.
• Provide a favorable water flow in quantity and quality for off-Forest users by improving or maintaining all watersheds to a satisfactory or higher level.

In addition, the following Forest-wide standards and guidelines and Management Area direction will be met:

• “Coordinate, where needed, animal damage and plant control on Forest Service administered lands with the US Fish and Wildlife Service and State wildlife and plant agencies (Plan, page 31-1).”
• “Safeguard water, people, animals, pets and property in connection with use of pesticides and fire retardants...(Plan, page 45).”
• Conform to Department of Agriculture standards in the use of all pesticides and promote development of acceptable alternatives for the use of pesticides (Plan, page 45).”
• “Chemicals may be used within guidelines approved by other agencies for the following purposes…Herbicides to control invading plants that reduce herbaceous forage. Not all of the control would be done by use of herbicides. Depending on individual site circumstances, the control might be by mechanical means, prescribed fire, fuelwood harvest, herbicides, or some combination (Plan, pages 45-46).”
• “Maintain horizontal and vertical plant diversity…(Plan, pages 48, 51, 63).”

The term “noxious weed” is generally used in state or Federal laws to identify plants that interfere with commodity uses or cause economic impacts. The term “invasive exotic plant” used in this analysis includes both noxious weeds and the broader category of invasive plants that impact ecosystem processes such as hydrology, fire frequency and plant productivity, but are not classified by law as noxious weeds.

Consultation History
A Scoping Report was provided to the U.S. Fish and Wildlife Service (Service), other agencies and interested members of the public in March, 2002. Because of delays in the project analysis, a second Scoping Report was prepared and provided to the Service and others in July 2003. In December 2002, Forest Wildlife Biologist Rick Gerhart met with Ms. Mima Falk of the Service’s Tucson office to discuss an initial draft of this BAE.

Project Area Description
The analysis area for the assessment is the entire Coronado National Forest (Map 1). The area includes National Forest System lands in parts of Pinal, Pima, Santa Cruz, Cochise, and Graham Counties in southeastern Arizona and Hidalgo County in southwestern New Mexico on the Douglas, Nogales, Sierra Vista, Safford, and Santa Catalina Ranger Districts.

The Forest contains approximately 1,724,271 acres in 12 distinct blocks of land (Ecosystem Management Areas or EMA) scattered across southeastern Arizona and into Southwestern New Mexico. Each EMA corresponds roughly to one of several mountain ranges within the Basin and Range Geographic Province that form an archipelago of “sky islands” connecting the Rocky Mountains to the Sierra Madre Occidental in Mexico. The Forest is situated on the border between the Sonoran and Chihuahuan deserts. Elevations range from 2,800 to 10,720 feet.

Geology is complex and has resulted in a highly variable and complex soil pattern. Climate varies depending on elevation. At lower elevations, summer temperatures can exceed 110° and annual precipitation ranges from 11 to 13 inches per year. Higher elevations are cooler and
wetter with annual precipitation approaching 30 inches per year and significant snow accumulations.

As a result of these factors, the Forest supports a wide variety of biotic communities and a diverse assemblage of wildlife and plant species. Vegetation communities on the forest include over 1,000 plant species. Major vegetation types include desert scrub, desert grassland, broadleaf evergreen woodland, coniferous woodland, transition coniferous forest, mixed conifer forest, dry desert riparian areas and deciduous riparian areas. Almost 580 vertebrate species are found on the Forest. Many of these species are endemic to the highlands of Mexico and southeastern Arizona and are found nowhere else in the United States.

**Existing Condition/Environmental Baseline**

Invasive exotic plant species initially included for management consideration are listed in Table 1. The species identified for treatment are those known to occur, suspected of occurring, or having the potential to occur on the Coronado National Forest. This list does not include all of the species on the noxious weed lists for Arizona and New Mexico, nor does it include all species that Forest users may consider a problem. It is the best information available on the species posing the most immediate threat to the Coronado National Forest. Species occurring adjacent to or near the Forest can also pose a threat. Russian knapweed, spotted knapweed, and dalmation toadflax are species that could easily infest the Forest from existing populations in southern Arizona and New Mexico. Additionally, roadways connecting the United States and Mexico create a situation of high risk for transport of invasive exotic plants.

Additional species may be added to this list over the life of this project under the Adaptive Management Strategy described on page 12.

<table>
<thead>
<tr>
<th>Species Common Name</th>
<th>Scientific Name</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yellow starthistle</td>
<td>Centaurea solstitialis,</td>
<td>AZ &amp; NM noxious weed</td>
</tr>
<tr>
<td>Malta starthistle</td>
<td>Centaurea melitensis</td>
<td>NM noxious weed</td>
</tr>
<tr>
<td>Canada thistle</td>
<td>Cirsium arvense</td>
<td>AZ &amp; NM noxious weed</td>
</tr>
<tr>
<td>Texas blueweed</td>
<td>Helianthus ciliaris</td>
<td>AZ noxious weed</td>
</tr>
<tr>
<td>Sweet resin bush</td>
<td>Euryops subcarnosus</td>
<td>AZ noxious weed</td>
</tr>
<tr>
<td>Salt cedar</td>
<td>Tamarix spp.</td>
<td>Regional list</td>
</tr>
<tr>
<td>Bull thistle</td>
<td>Cirsium vulgare</td>
<td>Regional list</td>
</tr>
<tr>
<td>Tree of Heaven</td>
<td>Ailanthus altissima</td>
<td>Local concern</td>
</tr>
<tr>
<td>Pentzia</td>
<td>Pentzia incana</td>
<td>Local concern</td>
</tr>
<tr>
<td>Buffelgrass</td>
<td>Pennisetum ciliaris</td>
<td>Local concern</td>
</tr>
<tr>
<td>Fountain grass</td>
<td>Pennisetum setaceum</td>
<td>Local concern</td>
</tr>
<tr>
<td>Giant reed</td>
<td>Arundo donax</td>
<td>Local concern</td>
</tr>
<tr>
<td>Johnsongrass</td>
<td>Sorghum halepense</td>
<td>Local concern</td>
</tr>
<tr>
<td>Lehmann lovegrass</td>
<td>Eragrostis lehmanniana</td>
<td>Local concern</td>
</tr>
<tr>
<td>African sumac</td>
<td>Rhus lancea</td>
<td>Local concern</td>
</tr>
</tbody>
</table>

Weed infestations often occur in previously disturbed areas, riparian corridors, along roadways or adjacent to private lands. The sizes of infestations are variable, from individual plants to infestations over about 100 acres. Currently, the total area infested by invasive plants, excluding Lehmann lovegrass, is estimated to be less than 2000 acres.
Lehmann lovegrass occurs in all EMAs, often in extensive populations. Other than Lehmann lovegrass, no invasive exotic plants have been noted in the Galiuro, Dragoon, Whetstone, Winchester, or Santa Teresa EMAs. Many of the known locations were identified during a 1999 survey of primary roads, recreation areas, and administrative sites on the Douglas, Nogales, Sierra Vista, and Safford Ranger Districts (USFS 1999). The initial survey for the Santa Catalina EMA is not complete, although several species invasive plants have been identified in this EMA. In addition to the survey information, there are other known populations. Occurrence of each species is shown for each EMA in Table 2 and the locations of known populations are shown on maps 2-8. Additional surveys are needed in all EMAs. Eight designated wilderness areas occur on the Forest. Only the Pusch Ridge Wilderness in the Santa Catalina Mountains is affected by infestations of invasive plants to any significant degree. Buffelgrass and fountain grass are spreading throughout canyons at lower elevations.

Limited invasive plant management efforts have been undertaken on the Forest to date. These efforts have been generally confined to control activities. Mechanical treatment, including burning, has been used to manage some populations, but it does not appear to effectively control the overall expansion of weeds or prevent the introduction of new weed species. In general, treatment with mechanical methods has been proven to be labor intensive and expensive, even with small weed populations. Soil disturbance associated with mechanical weed control efforts has proven to increase seed germination of target weed species. There is a need for an integrated, environmentally safe and cost effective program to control existing populations of weeds and to prevent or reduce the potential for future infestation on the Forest. Once weed populations become large, they can only be contained through constant, long-term intervention. Complete eradication once a species is well established is extremely difficult or impossible. Prevention of spread of weeds is the most cost effective and environmentally sound control method available.

### Table 2. Presence of species by EMA

<table>
<thead>
<tr>
<th>Species</th>
<th>Chiricahua EMA</th>
<th>Peloncillo EMA</th>
<th>Pinaleño EMA</th>
<th>Huachuca EMA</th>
<th>Santa Rita EMA</th>
<th>Tumacacori EMA</th>
<th>Santa Catalina EMA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tree of heaven</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Bull thistle</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Texas blueweed</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yellow or Malta starthistle</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sweet resin bush</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pentzia</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Canada thistle</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Buffelgrass</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fountain grass</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Giant reed</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Salt cedar</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Johnson grass</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lehmann lovegrass</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>African sumac</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Invasive species descriptions and known distributions (Maps 2-8).

**Tree of Heaven:** This species is native to central China. It was first introduced into the United States at Philadelphia, PA in 1784. It was introduced into California in the mid-1880s by Chinese immigrants, who valued the plant for its purported medicinal and cultural properties. It is now widely naturalized throughout the US. Tree of heaven occurs often on private land adjacent to the Forest, and there are small populations ranging from individual trees to small thickets on
Forest lands in the Huachuca and Tumacacori EMAs. On the Forest, it is frequently found around abandoned mining settlements. Tree of heaven grows rapidly and is a prolific seed producer. Vegetative reproduction is by sprouting from stumps or root portions. It also appears to be somewhat allelopathic, that is, it produces a toxin that prevents the establishment of other plant species. Because of these characteristics, it can quickly take over a site and form an impenetrable thicket.

**Bull thistle:** There are approximately 40 acres in Chiricahua EMA infested with bull thistle. This area has been treated in the past with hand pulling and grubbing with limited success. It is a high priority for treatment.

**Texas blueweed:** The only population of Texas blueweed found is in the Peloncillo EMA. It is on private land but is adjacent to the Forest and poses a threat of infestation.

**Yellow and Malta starthistle:** There is an unconfirmed population of either Malta or yellow starthistle in the Peloncillo EMA on the Robertson allotment. There are populations on private land or lands of other jurisdiction adjacent to the Forest boundary. Both species are winter annuals that are members of the sunflower family (Asteraceae) and native to Europe. A single yellow starthistle plant can produce up to 150,000 seeds and the species has become a significant pest in some areas of the West. It currently infests millions acres in Oregon, Idaho, Washington and California. As the plant invades sites, it displaces native species, reduces plant diversity and contributes to accelerated soil erosion and surface runoff. Because of its highly invasive tendencies, yellow star thistle is a high priority to survey the National Forest and treat any plants that may be found.

**Sweet resin bush and pentzia:** There are two populations of sweet resin bush in the Pinaleño EMA that cover approximately 100 acres. Much more extensive infestations occur on State land adjacent to the Forest on Frye Mesa. An additional population of approximately five acres is in the Santa Catalina EMA (Sabino Canyon). There is one population of pentzia in the Pinaleño EMA as well as a mixed population of the two species in the Marijilda Creek area. These have been treated in the past using prescribed fire and hand-grubbing. A Weed Management Area has been established, of which the Coronado National Forest is a member. The Natural Resource Conservation Service (NRCS) is leading eradication efforts in the Safford area adjacent to the Forest boundary.

Sweet resin bush and Pentzia were introduced for erosion control and livestock forage during a period that began in 1935 (Pierson and McAuliffe 1995). These non-native plants were provided to Civilian Conservation Corps (CCC) work crews by the Soil Conservation Service (SCS) for use in erosion control projects and as landscaping for facilities on Forest Service land. The full extent of the infestation resulting from CCC projects is unknown, but there were as many as ten CCC camps and additional temporary spike camps on Coronado National Forest lands. CCC crews completed many erosion control and revegetation projects in the 1930s, and projects were located in most of the EMAs. Those completed after 1935 are likely to have resulted in the introduction of the sweet resin bush and pentzia, and possibly other species as well.

**Canada thistle:** There are small populations of Canada thistle at the Snowflat Campground, Hospital Flat, and Columbine Work Center in the Pinaleño EMA. These populations have been treated by grubbing with limited success, and are a high priority for further treatment.

**Buffelgrass:** This grass occurs in most canyons on the front range of the Santa Catalina EMA as well as in the Santa Rita EMA. It causes an unnatural buildup of fine fuel in the Sonoran desert ecosystem (Van Devender and Dimmitt 2000). The three populations in the Santa Rita EMA are fairly isolated and are a high priority for treatment. There is a high potential for this grass to expand into the Pusch Ridge Wilderness as a result of disturbance caused by the 2003 Aspen Fire.
**Fountain grass:** Fountain grass occurs along the Mt. Lemmon highway up to about 5,500 feet in elevation, in Sabino Canyon, and many other canyons on the front range of the Santa Catalina EMA. It is widely used as an ornamental grass and is spreading rapidly in the desert. There is also an isolated population in the Santa Rita EMA, which is a high priority for treatment.

**Giant reed:** This species occurs in Miller Canyon and the Van Horn exclosure in the Huachuca EMA and in Sabino and Bear Canyons on the front range of the Santa Catalina EMA. The Van Horn population is small and dense in the exclosure. The Sabino and Bear Canyon populations are more extensive but are currently restricted to the Canyon from the Forest boundary to Sabino Dam.

**Salt cedar:** There are scattered individuals of this species across the Forest. There are known populations in Robles Canyon, Bear and Sabino Canyons (Santa Catalina EMA) and Stockton Pass Wash (Pinaleno EMA).

**Johnson grass:** Johnson grass occurs along most highways in southern Arizona. As such, it is a species that will easily spread to the Forest. There are several plants of Johnson grass in the Falls exclosure in Redrock Canyon (Huachuca EMA). This exclosure protects an endangered native fish so the infestation of Johnson grass is a high priority for treatment.

**Lehmann lovegrass:** This species occurs throughout the Forest. In the past, Lehmann lovegrass was seeded in many areas to prevent erosion (Cox et. al. 1984). The grass has extended in range far beyond the seeded areas (Cox and Ruyle 1986). Well-established populations are not a high priority for treatment, but new or small populations should be treated.

**African sumac:** This exotic tree has been identified in Pontatoc Canyon in the Santa Catalina EMA; however, the species is spreading rapidly in the foothills adjacent to the Forest near Tucson. The species is widely used in the Sonoran desert as an ornamental tree.

**Description of the Proposed Action**

The desired condition for the Forest is to have existing infestations of invasive exotic plants eradicated or controlled and to restrict the establishment of new populations. A Forest-wide approach is effective in controlling the spread of noxious weeds and invasive exotic plants, and is coordinated with the plans of other State and Federal agencies. Treatment plans take into account the latest guidance regarding the protection of public health and ecosystem health well as the protection and recovery of Federally-listed wildlife and plant species.

To achieve the desired condition, the Coronado National Forest proposes to implement an Integrated Vegetation Management (IVM) approach to the control of invasive exotic plant species on the Forest. The purpose of the proposed action is to protect native plant communities on the Forest by preventing the introduction of invasive exotic plant species, eradicating invasive plant species where possible and by controlling the spread of established invasive plant species when eradication is not practicable. This action is needed because of the occurrence of invasive exotic plants on and adjacent to the Forest, and to meet the requirements of law, regulations and policy.

Integrated Vegetation Management is a decision-making and management process that uses a combination of expertise, treatment methods, monitoring, evaluation and education to achieve the following vegetation management goals (FSM 2080.2):

- Prevention of the introduction and establishment of invasive plant infestations.
- Containment and suppression of existing invasive plant and noxious weed infestations.
- Formal and informal cooperation with State agencies, landowners, weed control districts and boards and other Federal agencies in the management and control of invasive species.
• Education and awareness of employees, users of the Forest, adjacent landowners and State agencies about weed threats to native ecosystems.

The proposed IVM approach would be divided into the four elements described below.

1. **Treatment of existing populations**

Implement an integrated vegetation management strategy using cultural, mechanical, biological, or chemical methods of control.

- **Cultural control methods** involve reducing disturbance, planting, fertilizing or generally encouraging desired native vegetation to limit the encroachment of invasive species.
- **Manual control methods** involve hand pulling, hand grubbing, clipping and burning.
- **Mechanical control** methods involve mowing, tilling and other mechanized means of removing plants.
- **Biological control methods** involve the release of insects or plant pathogens that impact invasive species by reducing the ability of the invasive plant to dominate native plant communities.
- **Chemical control methods** involve spot treatment with herbicides that selectively kill invasive species while maintaining desired native vegetation. There will be no aerial application of herbicides.

Depending on the extent of the infestation and the feasibility of treatment, weed populations will be proposed for either eradication or containment and control. Tables 3 and 4 show the specific treatment proposals for those populations to be eradicated and for those to be controlled or contained.

Where chemical treatment is considered warranted, the following herbicides are proposed for use: 2,4-D, Chlorsulfuron, Clopyralid, Dicamba, Glyphosate, Imazapic, Imazapyr, Metsulfuron, Picloram, Sulfometuron methyl (Sufometuron), Triclopyr and Tebuthiuron. Descriptions of each of these herbicides can be found in Appendix A.

Application of herbicides would be limited to spot treatment of individual plants or ground-based broadcast application on stands of weeds. Aerial application of herbicides is not being considered as an option for the IVM program.

The use of herbicides in Wilderness areas or other specially designated areas (ie. Research Natural Areas, Zoological/Botanical Areas, Wilderness Study Areas, and potential Wild and Scenic Rivers) would be subject to approval by the Regional Forester.

2. **Monitoring**

The effectiveness of control methods will be monitored annually for a minimum of 5 years following treatment. Additional treatments will occur as necessary. All known populations of invasive plants will be monitored at least every 3 years noting density and area of infestation. Weed inventories on the Forest will be continued in order to detect new populations of invasive plants before they become well established and widespread.

3. **Restoration**

In areas where there are large concentrations of an invasive species, the area would be restored to native vegetation following treatment. Restoration efforts would mainly involve erosion control and the planting of native species.

4. **Prevention, coordination, cooperation and education**

Continue on-going cooperation efforts with other agencies and landowners, and encourage new cooperative efforts as appropriate, especially the establishment of Cooperative Weed Management Areas. Opportunities exist to partner effectively with groups such as the Pima Invasive Species Council, other private organizations and public agencies to enhance invasive species control across landscapes with a mixture of public and private ownership. These efforts should include lands of all ownerships and jurisdictions to ensure overall control.

Partner with the State of Arizona and the State of New Mexico Departments of Transportation to cooperate on control of invasive exotic species and ensure mulches and seed mixes are weed free, including coordination of this treatment plan with the on-going Region-wide plan for treatment of invasive exotic plants in highway rights-of-way.

Continue to develop and implement educational and public awareness materials.

The Forest would use all methods to prevent, eradicate, contain or control populations of invasive species as described in Tables 3 and 4. If the use of herbicides is considered warranted, herbicides will be applied to individual plants rather than broadcast, wherever possible. There are currently few areas requiring broadcast application of herbicides. As stated above, aerial application of herbicides is not being considered.

Table 3. Proposed eradication of existing populations

<table>
<thead>
<tr>
<th>Species common name</th>
<th>Growth habit</th>
<th>Proposed treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tree of Heaven</td>
<td>Tree with prolific root and stump sprouting; not shade tolerant; allelopathic to other trees</td>
<td>Small trees, oil basal with 25% Garlon 4 (triclopyr); large trees, cut-surface application with 50% Garlon 3A (Triclopyr). This will be 70-80% effective and follow-up treatments will be necessary. Other effective herbicides are glyphosate, dicamba, metsulfuron methyl and imazapyr.</td>
</tr>
<tr>
<td>Yellow starthistle</td>
<td>Winter annual herbaceous species; prolific seed productions; spreads rapidly</td>
<td>Hand pull plants if only a few; ensure most of root is removed. Remove and burn pulled plants to destroy seed. If area is too large for effective hand pulling, spot apply herbicides. Effective herbicides are picloram, dicamba, 2,4-D, clopyralid, and glyphosate. Ensure good stand of native species; revegetate if necessary.</td>
</tr>
<tr>
<td>Malta starthistle</td>
<td>Winter annual herbaceous species; prolific seed productions; spreads rapidly. Small seed head formed in the center of rosettes makes hand pulling ineffective.</td>
<td>Hand grub, removing all of the root. Remove and burn pulled plants to destroy seed. If area is too large for effective hand pulling, spot apply herbicides. Effective herbicides are picloram, dicamba, 2,4-D, clopyralid, and glyphosate. Ensure good stand of native species; revegetate if necessary.</td>
</tr>
<tr>
<td>Canada thistle</td>
<td>Aggressive perennial with creeping root system. Reproduces easily from roots.</td>
<td>Repeated annual treatments of spot applied herbicides. Effective herbicides are 2,4-D, chlorsulfuron, dicamba, clopyralid, metsulfuron, glyphosate, alone or in mixes. Hand pulling not effective because of root system.</td>
</tr>
<tr>
<td>Buffelgrass (small population in the Santa Rita EMA)</td>
<td>Perennial with moderate spread by seed and slow spread vegetatively.</td>
<td>Hand pull plants in Santa Rita EMA; if this is not successful, spot apply herbicide; repeat pulling and/or herbicide use as necessary to prevent re-establishment. Effective herbicides are glyphosate, imazapic and metsulfuron methyl.</td>
</tr>
</tbody>
</table>
Complete eradication of existing populations may be difficult to achieve, so only invasive plant populations that are small and localized or that present significant risks to ecosystem health have been identified for eradication. Many populations are already well-established, but their spread can be contained through management activities. These species/populations are displayed in Table 4.

Table 4. Proposed containment and control of existing populations

<table>
<thead>
<tr>
<th>Species common name</th>
<th>Growth habit</th>
<th>Proposed treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bull thistle</td>
<td>Biennial thistle; establishes taproot but not creeping roots; prolific seed producer in open areas.</td>
<td>Spot apply herbicides on existing population followed by maintaining light to moderate grazing to ensure good cover by native species. Apply when plants are in rosette stage. Revegetate if necessary. Use biological methods if become available.</td>
</tr>
<tr>
<td>Buffelgrass</td>
<td>Perennial with moderate spread by seed and slow spread vegetatively.</td>
<td>Monitor populations; treat new populations with hand pulling and/or spot apply herbicides (see previous section). Use biological control methods on large infestations if they become available.</td>
</tr>
<tr>
<td>Fountain grass</td>
<td>Perennial with slow spread by seed; generally does not spread vegetatively but there are non-seed producing cultivars.</td>
<td>Monitor populations; treat new populations with hand pulling and/or spot apply herbicides (see previous section). Use biological control methods on large infestations if they become available.</td>
</tr>
<tr>
<td>Giant reed</td>
<td>Large bamboo like grass. Prolific shoot production; spreads rapidly vegetatively.</td>
<td>Treat individual plants by cutting then treatment of cut surface with glyphosate labeled for wetland use. Treat post-flowering and pre-dormancy. Treat in Sabino and Bear Canyons when dry if possible. Remove dead material in Sabino and Bear Canyons after 2-3 weeks.</td>
</tr>
<tr>
<td>Salt cedar</td>
<td>Woody shrub; reproduces by seed</td>
<td>Small trees, oil basal with 25% Garlon 4; large trees, cut-surface application with 50% Garlon 3A. This will be 70-80% effective and follow-up treatments will be necessary.</td>
</tr>
<tr>
<td>Johnson grass</td>
<td>Perennial rhizomatous grass; sprouts readily</td>
<td>Monitor populations; treat new populations by hand pulling when ground is moist and/or spot apply herbicides; use biological control methods on large infestations if they become available.</td>
</tr>
<tr>
<td>Species common name</td>
<td>Growth habit</td>
<td>Proposed treatment</td>
</tr>
<tr>
<td>--------------------</td>
<td>------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Lehmann lovegrass</td>
<td>Perennial bunchgrass; highly adaptable and spreads rapidly</td>
<td>If found in small populations, spot treat with herbicide (glyphosate, imazapic or mesulfuron methyl) and revegetate as needed.</td>
</tr>
<tr>
<td>African sumac</td>
<td>Hand pull small plants; cut down and spot treat with herbicides if too large to effectively pull.</td>
<td></td>
</tr>
</tbody>
</table>

Each year, before weed management activities begin, an annual operating plan shall be made by the District proposing plant treatments. If herbicides are proposed, a pesticide use proposal (PUP), form FS-2100-2 (Appendix B), must be completed according to Forest Service policy (FSM 2100), and this proposal may be used as the annual operating plan. This plan will include a list of each site to be treated, method to be used, herbicide and rate of application if applicable, map of the site and legal description, and area to be treated. This plan will be reviewed by the District or Forest TEPS plant coordinator, wildlife biologist and heritage resource specialist to ensure that effects of that treatment are within the scope of this analysis. In addition to the general mitigation measures described below, site-specific mitigation measures may be specified at this time, should concerns with any of these resources arise. The Forest pesticide coordinator will approve this site-specific operating plan.

Timely, site specific review of treatment areas will occur on the districts prior to control activities to ensure that impacts to rare plants, wildlife and cultural resources will not occur as a result of weed management activities. All herbicide application will be done in accordance with Environmental Protection Agency (EPA) label restrictions.

During the course of the season, it is likely that new infestations will be found and require quick action to control. The annual operating plan will be updated at this time, and signed off by the previously mentioned specialists and the Forest pesticide coordinator before treatment. Reviews must be timely to allow management of new weed infestations to minimize seed production and potential spread, but are important to prevent unintended impacts. The annual operating plan will be available to the public on request.

**Adaptive Management.**

The proposed invasive plant management program document provides direction for noxious weed management activities on the Forest for the next 10 years using an adaptive management approach. In other words, during the life of this project, invasive plants are likely to be introduced to new locations by vehicles, heavy equipment, livestock, wildlife, recreationists and all the usual vectors of spread, and will be detected through monitoring. It is also likely that additional species of invasive plants not identified in Table 1 may be discovered on the Forest over the term of the project. For example, a small population of Medusahead (*Taeniatherum caput-medusae*) has been recently reported, but not confirmed on the Santa Catalina Ranger District. The Forest would respond to these new infestations by completing a site specific review to determine impacts to proposed, threatened, endangered and sensitive plants, wildlife and fish, as well as heritage resources or plant species of significance to local tribes. New populations will be treated as they are found as long as the conditions of this analysis and decision are met.

Likewise, if implementation monitoring demonstrates that herbicides being used are not effective, and a new or improved product is available, the new product will be considered for use. As long as the new treatment activity fits within the range of effects analyzed and disclosed in the original EA, no further NEPA analysis will be performed. If monitoring determines that treatment activities are ineffective and control beyond the scope of this analysis becomes necessary, further analysis under NEPA would be conducted.
Other actions that assure an integrated approach to invasive species management may be identified in the context of the planned revision of the Forest Plan beginning in Fiscal Year 2004.

**Conservation Measures**

The following measures and design features are part of the proposed action and will be incorporated into all invasive species treatments.

**Measures Common to All Actions**

- Invasive species populations would be treated only after the area has been evaluated and surveyed for sensitive plant species listed in Appendix C and/or identified by the District Biologist. Field surveys will be conducted within occupied and potential habitat for sensitive species. The scope of the survey will be dependant on the type of treatment proposed, but will be sufficient to provide for the identification and protection of sensitive species within the project area. Individuals and populations of sensitive plants will be flagged or otherwise identified so that they can be avoided during treatment. If necessary, a buffer zone of sufficient size will be established to protect sensitive species from mechanical disturbance or spray drift. When invasive plants are within 3 feet of a sensitive species, herbicides will not be used.

- Heritage resources will be identified and protected from any ground disturbing activities.

- Spray trucks, all terrain vehicles (ATVs), tractor-mounted mowers and other equipment used for invasive plant management will not be used in such a way that would increase erosion. Steep or highly erodible slopes will be avoided, and soil disturbance will be minimized.

- Desirable vegetation in riparian zones will be retained.

- Heavy equipment will not be used within 30 feet of any stream bank. Handheld equipment for control of invasive species will be used within this zone.

- Prevention measures prescribed in EA Appendix D will be followed during agency activities to the degree possible to minimize invasive plant introduction and spread on the Forest. This is the single most effective and least expensive weed management option available.

- Education efforts to increase awareness of the public and agency personnel will be implemented.

- The only biological control agents that would be considered for use would be those selective to only the target species, and approved by the Animal Plant Health Inspection Service (APHIS) for use on that species. There are currently no biological control agents identified and approved for use on the Forest.

- If restoration of treated areas included establishing new plants, this would be accomplished by mulching, broadcast seeding of native species or non-persistent non-native cover crops.

- All sites treated for invasive species will be monitored and retreated as necessary. A monitoring plan will be prepared as part of each treatment activity. Baseline monitoring to determine existing conditions will occur prior to treatment. Implementation monitoring will occur during treatments to insure design and safety standards are followed. Monitoring will be designed to insure that surveys for occupied and potential habitats for sensitive plants and animals have been conducted prior to weed treatment.
activities, and that specified buffers for sensitive species or live water have been correctly established and enforced.

- Effectiveness monitoring will be conducted to aid in planning subsequent treatments and to determine target plant response to treatment, native plant community response to treatment, and whether there are any unforeseen adverse impacts to resources from invasive plant control actions.

**Measures Involving the Use of Herbicides**

The application of herbicides is tightly controlled by state and federal agencies. The Forest Service is required to follow all state and federal laws and regulations concerning the use of herbicides. The following measures and design features are common to all actions involving the use of herbicides:

- Herbicides will only be used after it has been determined that they offer the only practical method for control.
- All applicable state and federal laws, including herbicide label requirements will be followed.
- Projects will be supervised by a Forest Service Certified applicator who will be responsible for insuring safe handling, application and disposal of herbicides.
- Herbicides will be applied only by ground-based equipment, including hand painting or daubing, backpack sprayers and spray units on ATV’s or trucks. In areas with sensitive vegetation, spot application will be used to treat individual weeds while protecting desired vegetation. Spot application requires that the site be revisited many times to treat plants that were missed or have grown since the previous application, making this method less effective than broadcast treatments. Spot application is not a good choice for all sites and situations but is useful when few weeds and sensitive vegetation are present.
- Picloram will not be used where the water table is within 40 inches of the surface; where soil permeability would be conducive to water contamination.
- Only herbicides labeled for aquatic use (ie. Rodeo (glyphosate) Renovate (triclopyr) and Weedar 64 (2,4-D amine)) will be used within 30 feet of streams and other bodies of water.
- Persons involved in mixing, loading and applying herbicides will be required to wear appropriate personal protective equipment as required on the label.
- Areas used for mixing herbicides and cleaning equipment shall be located where spillage will not run into surface waters or result in ground water contamination.
- All requirements in a Safety and Spill Plan (EA, Appendix D) will be followed.
- Treatment areas will be signed to alert the public of the herbicide application.
- Landowners within ½ mile of the area to be treated with herbicide will be notified in writing before the project is undertaken.
- Regional Forester approval of the Pesticide Use Plan will be necessary for the application of any herbicide in designated or proposed wilderness areas and research natural areas.

**Species Identification**

Approximately 175 Threatened, Endangered, Proposed or Forest Service Sensitive (TEPS) plant and wildlife species occur or potentially occur on the Coronado National Forest. The scope of the
analysis is influenced by the type of the treatment and the species being affected. For purposes of delineating the geographic scope of the analysis, all known TES species occurring within one mile of identified weed treatment sites were identified using the Forest geographic information system database and information on species occurrence contained in the Arizona Heritage Data Management system. The habitats and known occurrences of wildlife species within one mile of treatment sites constitute the affected environment. In reality, weed treatments will be site-specific and effects are not expected to extend beyond the treatment site and the immediately adjacent area. Nevertheless, a one-mile buffer insures consideration of a full range of species potentially affected by the proposed action.

Using a one-mile buffer around all proposed treatment sites, sensitive species were identified in six of the seven EMAs. These were Chiricahua (Chir), Huachuca (Huac), Tumacacori (Tuma), Santa Catalina (Scat), Santa Rita (Srit) and Pinaleno (Pina). No species were identified within one mile of weed treatment sites in the Peloncillo EMA. The species selected for analysis are shown in Table 4 (plants) and Table 5 (wildlife).

**Threatened, Endangered and Forest Service Sensitive Plant Species**

A total of 31 TEPS plant species have been identified as occurring within one mile of proposed weed treatment areas (Table 4).

### Table 4. Coronado National Forest sensitive plant species potentially affected by proposed noxious weed treatments.

<table>
<thead>
<tr>
<th>Species</th>
<th>Status</th>
<th>EMA of Occurrence</th>
<th>Associated Noxious Weeds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abutilon parishii</td>
<td>S</td>
<td>Scat, Srta</td>
<td>Buffelgrass, Fountain Grass</td>
</tr>
<tr>
<td>Pima Indian mallow</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agave parviflora parviflora</td>
<td>S</td>
<td>Tuma</td>
<td>Tree of Heaven</td>
</tr>
<tr>
<td>Santa Cruz striped agave</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amoreuxia gonzalezii</td>
<td>S</td>
<td>Srta</td>
<td>Buffelgrass</td>
</tr>
<tr>
<td>Saiya</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amsonia grandiflora</td>
<td>S</td>
<td>Tuma</td>
<td>Tree of Heaven</td>
</tr>
<tr>
<td>Large-flowered blue star</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Astragalus hypoxylus</td>
<td>S</td>
<td>Huac</td>
<td>Tree of Heaven</td>
</tr>
<tr>
<td>Huacuca milkvetch</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carex ultra</td>
<td>S</td>
<td>Huac</td>
<td>Giant reed</td>
</tr>
<tr>
<td>Arizona giant sedge</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coryphantha recurvata</td>
<td>S</td>
<td>Tuma</td>
<td>Tree of Heaven</td>
</tr>
<tr>
<td>Santa Cruz beehive cactus</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Erigeron arisolius</td>
<td>S</td>
<td>Srta</td>
<td>Tree of Heaven</td>
</tr>
<tr>
<td>Arid throne fleabane</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eupatorium bigelovii</td>
<td>S</td>
<td>Pina</td>
<td>Canada thistle</td>
</tr>
<tr>
<td>Bigalow thoroughwort</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Graftopetalum bartramii</td>
<td>S</td>
<td>Tuma</td>
<td>Tree of Heaven</td>
</tr>
<tr>
<td>Bartrom stonecrop</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hedeoma dentatum</td>
<td>S</td>
<td>Tuma, Huac, Scat</td>
<td>Tree of Heaven, Buffelgrass</td>
</tr>
<tr>
<td>Mock pennroyal</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heuchera glomerata</td>
<td>S</td>
<td>Pina</td>
<td>Salt cedar</td>
</tr>
<tr>
<td>Arizona alum root</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ipomea thurberi</td>
<td>S</td>
<td>Tuma</td>
<td>Tree of Heaven</td>
</tr>
<tr>
<td>Thuber’s morning glory</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Laennecia eriophylla</td>
<td>S</td>
<td>Srta</td>
<td>Fountain grass</td>
</tr>
<tr>
<td>Wooly fleabane</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lilaeopsis schnaffneriana ssp. recurvata</td>
<td>LE</td>
<td>Huac</td>
<td>Giant reed</td>
</tr>
<tr>
<td>Species Name</td>
<td>Status</td>
<td>EMA of Occurrence</td>
<td>Associated Noxious Weeds</td>
</tr>
<tr>
<td>--------------------------------------</td>
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<td>--------------------------------</td>
</tr>
<tr>
<td>Huachuca water-umbel</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Lotus alamosanus</em></td>
<td>S</td>
<td>Tuma</td>
<td>Tree of Heaven</td>
</tr>
<tr>
<td>Alamos deer vetch</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Macroptilium supinum</em></td>
<td>S</td>
<td>Tuma</td>
<td>Tree of Heaven</td>
</tr>
<tr>
<td>Supine bean</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Manihot davisiae</em></td>
<td>S</td>
<td>Scat, Srta</td>
<td>Buffelgrass, Fountain grass</td>
</tr>
<tr>
<td>Arizona manihot</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Metastelma mexicanum</em></td>
<td>S</td>
<td>Tuma</td>
<td>Tree of Heaven</td>
</tr>
<tr>
<td>Wiggins milkweed vine</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Muhlenbergia dubioides</em></td>
<td>S</td>
<td>Scat</td>
<td>Buffelgrass, Fountain grass</td>
</tr>
<tr>
<td>Box canyon muhly</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Pectis imberbis</em></td>
<td>S</td>
<td>Tuma</td>
<td>Tree of Heaven</td>
</tr>
<tr>
<td>Beardless cinch weed</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Penstemon discolor</em></td>
<td>S</td>
<td>Scat</td>
<td>Buffelgrass, Fountain grass</td>
</tr>
<tr>
<td>Catalina beardtongue</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Penstemon ramosus</em></td>
<td>S</td>
<td>Pina</td>
<td>Sweet resin bush</td>
</tr>
<tr>
<td>Branching penstemon</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Polemonium flavum</em></td>
<td>S</td>
<td>Pina</td>
<td>Canada thistle</td>
</tr>
<tr>
<td>Pinaleno Jacob’s ladder</td>
<td></td>
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</tr>
<tr>
<td><em>Potentilla albiflora</em></td>
<td>S</td>
<td>Pina</td>
<td>Canada thistle</td>
</tr>
<tr>
<td>White-flowered cinquefoil</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Rumex orthoeurus</em></td>
<td>S</td>
<td>Pina</td>
<td>Canada thistle</td>
</tr>
<tr>
<td>Blumer’s dock</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Samolus vagans</em></td>
<td>S</td>
<td>Huac</td>
<td>Giant Reed</td>
</tr>
<tr>
<td>Chiricahua brookweed</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Stevia lemmonii</em></td>
<td>S</td>
<td>Scat</td>
<td>Buffelgrass, Fountain grass</td>
</tr>
<tr>
<td>Lemmon’s stevia</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Tephrosa thurberi</em></td>
<td>S</td>
<td>Huac</td>
<td>Tree of Heaven</td>
</tr>
<tr>
<td>Thuber hoary pea</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Tragia laciniata</em></td>
<td>S</td>
<td>Tuma, Huac</td>
<td>Tree of Heaven</td>
</tr>
<tr>
<td>Sonoran noseburn</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Tumamocia mcdougalii</em></td>
<td>S</td>
<td>Scat</td>
<td>Buffelgrass, Giant reed</td>
</tr>
<tr>
<td>Tumamoc globeberry</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Threatened, Endangered and Forest Service Sensitive wildlife and invertebrates.**

Within the affected environment for the proposed action, occupied or potential habitats for 22 terrestrial or aquatic TES species have been identified. These species are displayed in Table 5.

**Table 5. Coronado National Forest Threatened, Endangered Proposed and Sensitive terrestrial species potentially affected by proposed noxious weed treatments.**
<table>
<thead>
<tr>
<th>Species Name</th>
<th>Status</th>
<th>EMA of Occurrence</th>
<th>Associated Noxious Weeds</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>leucophaeus</em></td>
<td></td>
<td></td>
<td></td>
<td>openings in the conifer forest on the Pinaleno Mountains.</td>
</tr>
<tr>
<td>Lesser long-nosed bat <em>Leptonycteris curasoe</em></td>
<td>LE</td>
<td>Tuma</td>
<td>Tree of Heaven</td>
<td>Suitable habitats may be present near most weed treatment sites except for high elevation Canada thistle sites.</td>
</tr>
<tr>
<td><em>yerbabuenae</em></td>
<td></td>
<td></td>
<td></td>
<td>Management territories mapped near Harshaw and on Mount Graham. Single bird observed in Sabino Canyon (Scat) in 1991; no occupied habitat.</td>
</tr>
<tr>
<td>Mexican spotted owl <em>Strix occidentalis lucida</em></td>
<td>LT</td>
<td>Huac, Tuma, Scat, Pina, Chir</td>
<td>Tree of Heaven Canada thistle</td>
<td></td>
</tr>
<tr>
<td>Bald eagle <em>Haliaeetus leucocephalus</em></td>
<td>LE</td>
<td>All</td>
<td>All</td>
<td>Winters in low numbers near lakes on the Forest. No nesting records.</td>
</tr>
<tr>
<td>Northern goshawk <em>Accipiter gentiles apache</em></td>
<td>S</td>
<td>Huac, Pina</td>
<td>Tree of Heaven Canada thistle</td>
<td>Occupied territories within one mile of treatment site.</td>
</tr>
<tr>
<td>American peregrine falcon <em>Falco peregrinus anatum</em></td>
<td>S</td>
<td>Scat</td>
<td>Buffelgrass Fountain grass</td>
<td>Nests throughout Forest in suitable habitat.</td>
</tr>
<tr>
<td>Cactus ferruginous pygmy owl <em>Glaucidium brasilianus cactorum</em></td>
<td>LE</td>
<td>Scat</td>
<td>Buffelgrass Giant reed Pentzia</td>
<td>A single record from 1976 in Sabino canyon. No recent observations.</td>
</tr>
<tr>
<td>Western yellow-billed cuckoo <em>Coccyzus americanus occidentalis</em></td>
<td>S</td>
<td>Tuma, Huac</td>
<td>Tree of heaven Johnsongrass</td>
<td>Occupied and potential habitats in vicinity. Noted from Parker Canyon in 2002.</td>
</tr>
<tr>
<td>Northern gray hawk <em>Asturina nitida maxima</em></td>
<td>S</td>
<td>Huac</td>
<td>Johnson grass Tree of Heaven</td>
<td>Nests adjacent to treatment site. Documented in Parker Canyon and Redrock Creek.</td>
</tr>
<tr>
<td>Mexican garter snake <em>Thamnophis eques megalops</em></td>
<td>S</td>
<td>Huac</td>
<td>Tree of Heaven</td>
<td>Suitable aquatic habitat present at Turkey Creek site.</td>
</tr>
<tr>
<td>Arizona ridge-nosed rattlesnake <em>Crotalus willardi willardi</em></td>
<td>S</td>
<td>Huac</td>
<td>Tree of Heaven</td>
<td>Documented within one mile. Suitable habitat not present at site.</td>
</tr>
<tr>
<td>Chiricahua leopard frog <em>Rana chiricahuensis</em></td>
<td>LT</td>
<td>Tuma, Chir</td>
<td>Tree of Heaven</td>
<td>Documented within one mile, but suitable aquatic habitat not present on site.</td>
</tr>
<tr>
<td>Lowland leopard frog <em>Rana yavapaiensis</em></td>
<td>S</td>
<td>Scat</td>
<td>Giant reed Buffelgrass Pentzia</td>
<td>Documented within one mile in Sabino Canyon in 1980. No recent records.</td>
</tr>
<tr>
<td>Western barking frog <em>Eleutherodactylus augusti cactorum</em></td>
<td>S</td>
<td>Tuma, Huac</td>
<td>Tree of Heaven</td>
<td>Old record from 1965 within one mile (Tuma). No recent records. Recorded in 2003 in Harshaw Canyon (Huac).</td>
</tr>
<tr>
<td>Gila topminnow) <em>Poeciliopsis occidentalis occidentalis</em></td>
<td>E</td>
<td>Huac</td>
<td>Johnson grass</td>
<td>Redrock Canyon</td>
</tr>
<tr>
<td>Gila chub</td>
<td>Proposed E with Critical</td>
<td>Huac</td>
<td>Tree of heaven</td>
<td>Proposed critical habitat at treatment site; species not observed in last few years.</td>
</tr>
<tr>
<td>Species Name</td>
<td>Status</td>
<td>EMA of Occurrence</td>
<td>Associated Noxious Weeds</td>
<td>Comments</td>
</tr>
<tr>
<td>------------------------------</td>
<td>--------</td>
<td>-------------------</td>
<td>--------------------------</td>
<td>--------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Sabino Canyon damselfly</td>
<td>S</td>
<td>Scat Huac</td>
<td>Buffelgrass Giant reed</td>
<td>Species and suitable habitats present in Sabino Canyon, Parker Canyon,</td>
</tr>
<tr>
<td><em>Argia sabino</em></td>
<td></td>
<td></td>
<td>Pentzia Tree of Heaven</td>
<td>Adobe Canyon and Walker Basin.</td>
</tr>
<tr>
<td>Mexican Meadowfly</td>
<td>S</td>
<td>Huac</td>
<td>Tree of heaven, Giant reed</td>
<td>Recorded in Parker Canyon and Bear Creek</td>
</tr>
<tr>
<td><em>Syringoptera signiferum</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pinaleno mountainsnail</td>
<td>S</td>
<td>Pina</td>
<td>Canada thistle</td>
<td>Found in leaf litter around rocksides. No suitable habitat present.</td>
</tr>
<tr>
<td><em>Oreohelix grahamensis</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pinaleno tallussnail</td>
<td>S</td>
<td>Pina</td>
<td>Canada thistle</td>
<td>Inhabits rocksides. No suitable habitat present.</td>
</tr>
<tr>
<td><em>Sonorella grahamensis</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mimic tallussnail</td>
<td>S</td>
<td>Pina</td>
<td>Canada thistle</td>
<td>Inhabits rocksides. No suitable habitat present.</td>
</tr>
<tr>
<td><em>Sonorella imitator</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Species Evaluations**

**Plants**

**Threatened, Endangered and Proposed Species.**

**Huachuca water umbel** (*Lilaeopsis schnuffneriana ssp. recurvata*). This species is the only listed Endangered plant considered in the analysis. The species was listed as Endangered in 1997 and critical habitat was designated in 1999 (64 FR 37441-37453).


**Affected Habitat Distribution**: This species occurs in shallow, slow moving water and saturated, highly organic soil near perennial seeps and springs between 4,000 and 6,500 feet elevation in the Huachuca EMA. Essential habitat characteristics include a stable riparian plant community that is not dominated by non-native plants, a stable stream channel and a substrate that is permanently wet, or nearly so (USFWS 1999). *Lilaeopsis* appears to be vulnerable to scouring floods and appears to survive best in low gradient streams with stable soils and little bank disturbance. However, it also seems to need some amount of disturbance in order to reduce surrounding competitive vegetation. Populations of giant reed and potential treatment sites exist within designated critical habitat for *Lilaeopsis* in Bear Canyon in the Huachuca EMA. Populations of *Lilaeopsis* are found immediately downstream from the Van Horn exclosure where giant reed grows.

The primary constituent elements identified in the final rule listing critical habitat include:

1) Sufficient perennial base flows to provide a permanently or nearly permanently wetted substrate for growth and reproduction of Huachuca water umbel;

2) A stream channel that is relatively stable, but subject to periodic flooding that provides for rejuvenation of the riparian plant community and produces open microsites for water umbel expansion;

3) A riparian plant community the is relatively stable over time and in which nonnative species do not exist or are at a density that has little or no adverse effect on resources available for water umbel growth and reproduction; and
4) In streams and rivers, refuge sites in each watershed and in each reach, including but not limited to springs or backwaters of mainstem rivers, that allow each population to survive catastrophic floods and recolonize larger areas.

Direct and indirect effects: Known populations of *Lilaeopsis* occur in close proximity downstream of giant reed in Bear Creek. *Lilaeopsis* is found in saturated soils in the streambed, while giant reed occurs on adjacent stream banks. Treatments for giant reed will involve cutting individual plants followed by daubing or spraying of the cut surface with glyphosate labeled for wetland use. Treatments will occur during periods of low flow, if possible, to minimize effects to other wetland species and soils. Some trampling of individual plants would likely occur during treatments if *Lilaeopsis* were to be growing in the immediate vicinity. In accordance with the identified conservation measures, pre-treatment surveys will be conducted to identify and protect sensitive species and workers will be briefed on how to identify and avoid *Lilaeopsis* in the project area. In addition, herbicides will not be used within 3 feet of any sensitive plant.

The wetland formulation of glyphosate (Rodeo) is rapidly dispersed in water or sorbed by soils. In addition, no direct spraying of the water surface is anticipated, so downstream drift of contaminated water is not anticipated. Because glyphosate binds strongly to soils, it is unlikely to enter waters through surface runoff, unless the soil itself is washed away. However, even in water, the herbicide remains bound to soil particles and is generally unavailable to plants. The soil particles themselves precipitate to the bottom sediments where the herbicide is degraded by microbial action. Even when free, glyphosate is not readily absorbed by plant roots (Tu, et al 2001). The properties of the herbicide and the use of mitigation measures described under the proposed action will restrict any effects to the immediate vicinity of the treatment area. Nevertheless, based on the juxtaposition of invasive plants and *Lilaeopsis*, there remains a minor potential for disturbance to the species as a result of trampling or minor spray drift. Some plants will be impacted with any treatment to permanently remove exotic species from exclosure. Effective control of invasive species may require more than one treatment over consecutive years, so short-term direct effects may occur more than once. Over the long term, the removal of an invasive exotic species should result in the maintenance of more natural conditions conducive to the survival of *Lilaeopsis*.

With regard to critical habitat constituent elements, the proposed action should not reduce perennial base flows, but may contribute to increased base flows over the long term by removing competing exotic plants that remove water from the stream through transpiration. Stream channel stability may be effected by disturbance resulting from treatment activities, but effects will be limited in duration and extent. Nonnative species will be eliminated or reduced as a result of the proposed action, reducing their effect on resources necessary for water umbel. No effects to refuge sites are anticipated.

Cumulative effects. Areas with perennial water are of high attraction to recreationists. There are foreseeable adverse impacts to riparian areas, some of which support water umbel, as a result of disturbance caused by campers and vehicles. These impacts are not expected to increase significantly over current levels, but may continue to contribute to degradation of localized riparian areas.

Determination of effects. The proposed action *May Effect, Likely to Adversely Affect* Huachuca water-umbel. The proposed action *May Affect, but is Not Likely to Adversely Affect* designated critical habitat for the species.

**Forest Service Sensitive Species**

*Plima Indian mallow. (Abuliton parishii)*
Affected Habitat Description: This plant grows in mesic sites in shallow soils and a variety of substrates in full sun within higher elevation Sonoran deserts. It occurs both on rocky hillsides and on secondary terraces in riparian zones, but typically not in canyon bottoms. It is often found near trails, probably due to the influence of the trail on the plant’s micro-habitat (AGFD 1997a). The plant occurs in the vicinity of infestations of buffelgrass and fountain grass in Sabino Canyon and along the Catalina Highway in the Santa Catalina EMA and in the vicinity of buffelgrass infestations in the Santa Rita EMA near Montosa Canyon. In Sonoran desert habitats, increasing buffelgrass density may contribute to the accumulation of fine fuels that carry destructive fires in suitable habitats.

Analysis of Effects: Herbicide treatments could kill individuals of this species if the plant were sprayed directly. Mechanical treatments could result in the trampling or accidental killing of individuals. However, weed populations will be treated only after being surveyed for sensitive species and herbicide treatments will be directed at individual plants.

Determination of Effect: The proposed action may impact individuals of Pima Indian mallow, but is not likely to result in a trend toward federal listing or a loss of viability for the species.

Santa Cruz striped agave (*Agave parviflora parviflora*).

Affected habitat description: This plant occurs in rocky and gravelly slopes and ridges in desert grassland and oak woodland at elevations of 3,900 to 4,800 feet. It prefers open sites where grass and shrubs are sparse. Threats to the species include herbivory by livestock and collecting. Permanent monitoring plots established in the Atascosa Mountains in 1992 (Malusa 1993). Mortality reported as low from 1992-1998 (AGFD 1998a).

Analysis of effects: Herbicide treatments could kill individuals of this species if the plant were sprayed directly. Mechanical treatments could result in the trampling or accidental killing of individuals. Weed treatments in the vicinity of agaves are confined to cutting and hand application of herbicide to individual tree of heaven plants. Populations of the plant occur within one mile of proposed treatment sites for tree of heaven in the Tumacacori EMA, but have not been documented in the immediate vicinity of individual trees.

Determination of Effect: The proposed action will have no impact on Santa Cruz striped agave.

Saiya (*Amoreuxia gonzalezii*).

Affected habitat description: This plant is known only from two or three populations in the Santa Rita EMA. Habitat is rocky limestone hillsides between 4,200 and 4,500 feet (AGFD 1995).

Analysis of effects: Herbicide treatments could kill individuals of this species if the plant were sprayed directly. Mechanical treatments could result in the trampling or accidental killing of individuals. Known locations are nearly one mile away from proposed treatment sites for buffelgrass and fountain grass in Montosa Canyon. Proposed treatments will be confined to hand pulling or, if necessary, spot-treating individual plants with herbicide, so effects are not anticipated beyond the immediate treatment area.

Determination of effects: The proposed action will have no impact on Saiya.

Large-flowered blue star (*Amsonia grandiflora*).

Affected habitat description: This suffrutescent perennial occurs in canyon bottoms in oak woodlands dominated by Emory oak and Mexican blue oak at elevations of 3,900 to 4,500 feet. Preferred substrates are rocky alluvial soils. A total of 15 to 20 populations distributed throughout the Tumacacori and Huachuca (Patagonia Mountains) EMAs comprise the entire known distribution of the species. Populations appear relatively stable with low mortality and recruitment (AGFD 1998b).
Analysis of effects: Populations of the plant occur within one mile of proposed treatment sites for tree of heaven in the Tumacacori EMA. Herbicide treatments could kill individuals of this species if the plant were sprayed directly. Mechanical treatments could result in the trampling or accidental killing of individuals. Weed treatments in the vicinity of the species are confined to cutting and hand application of herbicide to individual tree of heaven plants, so impacts will be very localized and are not expected to affect the species.

Determination of effects: The proposed action will have no impact on Large-flowered blue star.

**Huachuca milkvetch (Astragalus hypoxylus).**

Affected habitat description: This herbaceous perennial inhabits open rocky clearings in limestone in pinyon-juniper woodlands at elevations of 5,300 to 6,200 feet. It is generally found in unshaded clearings in loosely consolidated, gravelly soils. Monitoring plots established in the Huachuca and Patagonia Mountains (Malusa et al 1992). Populations appear to undergo large fluctuations in numbers in response to precipitation and habitat degradation caused by livestock grazing and recreation disturbance (Arizona Rare Plant Committee 2001, AGFD 1999a).

Analysis of effects: Populations are found in proximity to tree of heaven treatment sites in the Huachuca EMA. Treatments in the vicinity of the species are confined to cutting and hand application of herbicide to individual tree of heaven plants, so impacts will be very localized and are not expected to affect the species.

Determination of effects: The proposed action will have no impact on Huachuca milkvetch.

**Arizona giant sedge (Carex ultra).**

Affected habitat description: This herbaceous perennial is found in aquatic sites in riparian woodlands and pine-oak woodlands. It grows in moist soil near perennial springs and streams at several sites within the Forest. Populations are small and widely separated, confined to isolated wetlands. Surveys for the species were completed by J. Malusa in 2001 (Malusa 2001). Populations are known from Sycamore Creek (Tumacacori EMA), Big Casa Blanca Canyon (Santa Rita EMA) and the Dragoon Mountains. It potentially occurs in the Van Horn Exclosure in the Huachuca EMA.

Analysis of effects: A single population has been documented to occur approximately one mile downstream of a giant reed treatment site in Bear Creek, Huachuca Mountains (AGFD 2000a), but this site was not visited in 2001. Herbicide treatments could kill individual Carex if the plant were sprayed directly. Mechanical treatments could result in the trampling or accidental killing of individuals, but known populations of Carex are not found in the immediate vicinity of giant reed. Proposed treatments involve cutting plants then treating cut stems with Rodeo, an aquatically labeled formulation of glyphosate. Treatments will be accomplished when Bear Canyon is dry, if possible. Glyphosate concentrations in water are rapidly reduced by microbial degradation, dispersion and binding to soils and other particulates, so little movement of the herbicide downstream is expected if water is present (Risk assessment).

Determination of effects: The proposed action may impact individuals of Arizona giant sedge, but is not likely to result in a trend toward federal listing or loss of viability.

**Santa Cruz beehive cactus (Coryphantha recurvata).**

Affected habitat description: This cactus occurs in alluvial soils in grassland and oak woodland, usually on rocky hillsides or in rock crevices from 3,500 to 5,500 feet (AGFD 1998c). Populations are known from the Tumacacori, Atascosa and Pajarito Mountains in the Tumacacori EMA.

Analysis of effects: Individuals have been mapped close to tree of heaven treatment sites along the Ruby Road. Treatments in the vicinity of the species are confined to cutting and hand
application of herbicide to individual tree of heaven plant stumps, so impacts will be very localized and are not expected to affect the species.

**Determination of effects:** The proposed action will have no impact on Santa Cruz beehive cactus.

**Arid throne fleabane (Erigeron arisolius).**

**Affected habitat description:** This fleabane is an annual to short-lived perennial herbaceous forb occurring in semi-desert grasslands or in grassy openings and along roadsides in oak woodland. It is usually found in moist rocky soils from 4,200 to 5,400 feet (AGFD 2000b).

**Analysis of effects:** A single occurrence is mapped approximately one mile west of a tree of heaven treatment site on Box Canyon Road in the Santa Rita EMA. Tree of heaven treatments will be confined to hand cutting of individual plants and hand-treatment of stumps with herbicide, so effects will be limited to the immediate vicinity of the target plants.

**Determination of effects:** The proposed action will have no impact on arid throne fleabane.

**Bigalow thoroughwort (Eupatorium bigelovii).**

**Affected habitat description:** This herbaceous shrub grows at high elevations (8,600-9,100 feet) in the Pinaleño EMA. It is found in rocky terrain, among shrubs near water, growing on rock outcrops and walls (AGFD 2000c).

**Analysis of effects:** Two populations are known from Mount Graham within one mile of proposed treatment sites for Canada thistle; however, the two species have different habitat requirements and do not grow in proximity to one another. Further, Canada thistle treatments will be confined to spot application of herbicides on individual plants, so the potential for significant aerial spray drift will be minimal.

**Determination of effects:** The proposed action will have no impact on Bigalow thoroughwort.

**Bartram stonecrop (Graptopetalum bartramii).**

**Affected habitat description:** This small succulent perennial grows as solitary rosettes or in clumps on ledges or slopes of steep-walled canyons. It prefers cracks in rocky outcrops in shrub live oak-grassland communities from 3,900 to 6,700 feet (AGFD 1997b). It is usually found with heavy litter cover and shade on north-facing slopes where moisture drips from rocks. Selected known populations of the species were surveyed by J. Malusa in 2001.

**Analysis of effects:** Populations occur in the Tumacacori, Santa Rita, Huachuca, Dragoon and Chiricahua EMAs. The only population within one mile of a proposed treatment site is found in the Tumacacori EMA over a mile west of a tree of heaven site. The species do not occur in close proximity, nor do they share habitat affinities. Tree of heaven treatments will be confined to hand cutting of individual plants and hand-treatment of stumps with herbicide, so effects will be limited to the immediate vicinity of the target plants.

**Determination of effects:** The proposed action will have no impact on Bartram’s stonecrop.

**Mock pennyroyal (Hedeoma dentatum).**

**Affected habitat description:** This small perennial herb occurs primarily in Madrean evergreen woodland communities between 4,000 and 7,500 feet. It can be found in open road cuts, steep rocky outcrops and gravelly slopes in wooded canyons with full sunlight, typically on shallow, well-drained soils (AGFD 1999b). The total range of the species is southeastern Arizona and northern Sonora, Mexico. However, it is documented from numerous sites on nearly every EMA on the Forest. The species may be sensitive to competition from grasses invading its rocky habitat (AGFD 1999), and buffelgrass expansion may impact this species.
Analysis of effects: Mapped populations occur near treatment sites for buffelgrass in the Santa Catalina EMA and near Tree of heaven sites in the Tumacacori and Huachuca EMAs. Tree of heaven treatments will be confined to hand cutting of individual plants and hand-treatment of stumps with herbicide, so effects will be limited to the immediate vicinity of the target plants. Buffelgrass treatments in the Santa Catalina EMA will involve spraying of plant populations. No pennyroyal plants are known to be closely associated with buffelgrass infestations, but the potential exists that individual plants may be growing within or near treatment areas. Mock pennyroyal is becoming widespread in areas where it occurs, so there is a slight chance that buffelgrass spraying may affect undetected pennyroyal.

Determination of effects: The proposed action may impact individuals of mock pennyroyal, but is not likely to result in a trend toward federal listing or loss of viability.

Arizona alum root (*Heuchera glomerata*).

Affected habitat description: This herbaceous, deciduous perennial forb is found on shaded rocky slopes in humus soil, near seeps and streams in riparian areas in pine-oak woodland, Ponderosa pine and mixed conifer forests. It occurs from 4,000 to 9,000 feet. Malusa (2001) visited known sites for the species in 2001, including Wet Canyon, but was able to locate only one population in the vicinity of Frye Mesa Reservoir.

Analysis of effects: One population is mapped within one mile of a salt cedar eradication site near the Arcadia campground on Mount Graham, but is not known from the immediate vicinity. This site was surveyed by J. Malusa, but no plants were found. Proposed treatments for salt cedar involve spot treatment of individual plants, including both cutting and hand application of herbicide to stumps. Effects of the treatment are not expected to extend beyond the immediate vicinity of the treatment area. The Frye Mesa population is within one mile of a proposed treatment site for sweet resin bush. Proposed treatments for this species include hand pulling, burning and ground-based broadcast herbicide application. Considering the distance between the treatment site and the known population of Arizona alum root, no effects are anticipated from herbicide or hand treatments. Some potential exists for prescribed fire to affect the species, if the fire is not properly controlled. Pre-treatment surveys should provide for the identification and protection of affected plants.

Determination of effects: The proposed action will have no impact on Arizona alum root.

Thurber’s morning glory (*Ipomea thurberi*).

Affected habitat description: *I. thurberi* is a perennial herbaceous vine that grows in rock hillsides and canyon slopes in Madrean evergreen woodland and semi-desert grassland between 3,800 and 5,100 feet (AGFD 2000d). On the Forest, it occurs in the Tumacacori and Huachuca EMAs.

Analysis of effects: The species is mapped as occurring within one mile of a tree of heaven site near the Ruby Road, but is not documented to occur in close proximity. Tree of heaven treatments will be confined to hand cutting of individual plants and hand-treatment of stumps with herbicide, so effects will be limited to the immediate vicinity of the target plants.

Determination of effects: The proposed action will have no impact on Thurber’s morning glory.

Wooly fleabane (*Laennecia eriophylla*).

Affected habitat description: This white woolly composite grows on gravelly soil of rocky slopes and ridges in semi-desert grassland and oak woodland between 4,200 and 5,600 feet. Dense perennial grass cover appears to be important in creating suitable site conditions for this species. Populations are typically small and restricted almost entirely to portions of the Forest within Santa Cruz County (AGFD 1999c).
Analysis of effects: A single population is mapped approximately one mile southeast of a Fountain grass treatment site in the Santa Rita EMA, but the two species are not known to occur in association with each other. Proposed treatments for fountain grass involve hand pulling and spot application of herbicides to individual plants, so treatment effects are expected to be very localized.

Determination of effects: The proposed action will have no impact on wooly fleabane.

Alamos deer vetch (*Lotus alamosanus*).  

Affected habitat description: This herbaceous perennial grows in wetland sites in mud, damp to wet soil near springs, seeps and streams at elevations between 3,400 and 5,500 feet. On the Forest, populations are restricted to two known locations in the Tumacacori EMA in Sycamore Canyon and the Pajarito Mountains (AFGD 1999d).

Analysis of effects: A population is mapped within one mile of a tree of heaven treatment site near Pena Blanca Lake, but the species are not known to occur in close proximity. Tree of heaven treatments will be confined to hand cutting of individual plants and hand-treatment of stumps with herbicide, so effects will be limited to the immediate vicinity of the target plants.

Determination of effects: The proposed action will have no impact on Alamos deer vetch.

Supine bean (*Macroptilium supinum*).  

Affected habitat description: This herbaceous perennial grows on ridge tops and gentle rolling slopes in semi-desert grassland and grassy openings in oak woodland (AGFD 1999e). It has a creeping, prostrate growth form that makes it relatively easy to identify. Populations are found at elevations from 3,600 to 4,900 feet in Santa Cruz County. J. Malusa (2001) surveyed three known populations in the Tumacacori EMA last year. He identified 93 plants growing in a 20 meter radius around the center of the population on a ridge above Alamo Canyon.

Analysis of effects: One of the populations identified by Malusa is located within a few hundred yards of a tree of heaven site on a ridge above Alamo Canyon. *M. supinum* is not known or suspected to occur in association with Tree of heaven as the habitat affinities of the two species are different. Tree of heaven treatments will be confined to hand cutting of individual plants and hand-treatment of stumps with herbicide, so effects will be limited to the immediate vicinity of the target plants.

Determination of effects: The proposed action will have no impact on supine bean.

Arizona manihot (*Manihot davisiæ*).  

Affected habitat description: This perennial shrub occurs most commonly in dry rocky slopes in foothills and mountains in the semi-desert grassland and upper Sonoran desertsrub communities (AGFD 1999f). It is found on shallow soils of basalt or limestone origin, often among rocks. Within the analysis area, it is found in the Santa Catalina and Santa Rita EMAs. Populations are known from Sabino canyon, Molino Basin and the Pusch Ridge Wilderness.

Analysis of effects: In both EMAs, noxious weed associated with occupied and potential sites are buffelgrass and fountain grass. Proposed treatment for buffelgrass and fountain grass include hand pulling and spot application of herbicides on individual plants. No manihot plants are known to be closely associated with buffelgrass or fountain grass infestations, but the potential exists that individual plants may be growing within or near treatment areas. There is a slight chance that spraying may affect undetected manihot plants or that some plants may be damaged during hand removal of weeds. Provided treatments are directed at individual weed plants, this risk is thought to be minimal.

Determination of effects: The proposed action may impact individuals of Arizona manihot, but is not likely to result in a trend toward federal listing or loss of viability.
Wiggin’s milkweed vine (*Metastelma mexicanum*).

**Affected habitat description:** This species is a perennial vine that occurs on open slopes within oak woodland and on granitic soils at elevations from 3,500 to 5,100 feet (AGFD 2000e). Plants are often found growing under shrubs that are used for twining (Ariz. Rare Plant Committee 2001).

**Analysis of effects:** A population of *M. mexicanum* is mapped approximately one quarter mile south of a tree of heaven treatment site in the Tumacacori EMA; however, because of the different habitat affinities for the two species, they are not expected to be growing in close association. Tree of heaven treatments will be confined to hand cutting of individual plants and hand-treatment of stumps with herbicide, so effects will be limited to the immediate vicinity of the target plants.

**Determination of effects:** The proposed action will have no impact on Wiggin’s milkweed vine.

Box canyon muhly (*Muhlenbergia duboides*).

**Affected habitat description:** This species is a perennial warm season grass that grow in rocky canyon slopes or cliffs in canyon bottoms in grassland, Madrean evergreen woodland and riparian forest communities from 2,900 to 6,000 feet elevation. It often occurs in riparian communities with cottonwood, willow and ash and evergreen riparian communities. Within the analysis area, the species occurs in Sabino and lower Bear Canyons in the Santa Catalina EMA (AGFD 1999g).

**Analysis of effects:** Occupied and potential habitats are associated with buffelgrass and fountain grass infestations and proposed treatments. Because this species is a grass occurring in sites identified for treatment of exotic grasses, some effects would be expected from broad scale herbicide or mechanical treatments of buffelgrass or fountaingrass. However, proposed treatments for these species will involve spot treatments of individual plants, so the potential for effects to *Muhlenbergia* are minimal and would only occur if individual undetected plants were inadvertently treated during weed eradication.

**Determination of effects:** The proposed action may impact individuals of Box Canyon muhly, but is not likely to result in a trend toward federal listing or loss of viability.

Beardless cinch weed (*Pectis imberbis*).

**Affected habitat description:** This species is a very slender, branching herbaceous perennial that occurs on eroded granite substrate in open situation in grassland and oak/grassland. It is adapted to disturbance and often grows along road cuts (AGFD 1998d). Elevations for the species range from 3,600 to 5,600 feet.

**Analysis of effects:** Populations of the species occur in the Huachuca, Santa Rita and Tumacacori EMAs, but only those in the Tumacacori EMA are potentially affected by noxious weed treatments. A population of the species is mapped approximately on mile west of a tree of heaven site along Ruby Road, but the two species are not known to occur in close proximity. Tree of heaven treatments will be confined to hand cutting of individual plants and hand-treatment of stumps with herbicide, so effects will be limited to the immediate vicinity of the target plants.

**Determination of effects:** The proposed action will have no impact on beardless cinch weed.

Catalina beardtongue (*Penstemon discolor*).

**Affected habitat description:** This herbaceous perennial shrub occurs on bare rock outcrops, bare soil ledges and bedrock openings in chaparral and pine-oak woodlands from 4,100 to 7,600 feet. It is most often found in crevices on granitic bedrock and boulders. It is also found in volcanic rock outcrops in the Atascosa Mountains (AGFD 1999h). Malusa (2001) surveyed known populations in the vicinity of upper Bear Canyon and Lizard Rock adjacent to the Catalina
Highway and found all populations remaining extant. Populations appear to have increased since they were originally discovered in 1992.

**Analysis of effects:** Populations of the plant in the Santa Catalina Mountains are included in the analysis area where they occur within one mile of populations of buffelgrass and fountain grass. Both grasses, however, are not cold tolerant and are found at lower elevations than where *P. discolar* occurs. The upper elevation range for buffelgrass is approximately 4,600 feet, with fountain grass potentially occurring somewhat higher. Known populations of *P. discolar* are found at approximately 6,900 feet, well above the elevation where the grasses are known or expected to occur. No weed treatments are expected in the vicinity of the known populations.

**Determination of effects:** The proposed action will have no impact on Catalina beardtongue.

**Branching penstemon (*Penstemon ramosus)*.**

**Affected habitat description:** This deciduous perennial forb grows in rocky mountain canyons between 4,000 and 5,600 feet in disclimax semidesert grasslands/upper Chihuahuan desertscrub in the Pinaleno and Chiricahua EMAs. A 1935 collection of *P. ramosus* from Frye Mesa is recorded in the GIS database, but the current status of the population is unknown (AGFD 1999i). Habitats on Frye Mesa have been substantially modified since 1935 as a result of grazing and the invasion of the noxious weed sweet resin bush, which is associated with potential occupied habitat.

**Analysis of effects:** The last known specimens of *P. ramosus* in the state were collected in 1975. As noted above, the species has not been documented from the analysis area for almost 70 years, but more thorough surveys are needed. Treatments for sweet resin bush will likely involve burning, hand-pulling and ground-based broadcast application of herbicides. Any of these treatments could impact the penstemon, but the potential is low based on the absence of recent observations of the species.

**Determination of effects:** The proposed action may impact individuals of branching penstemon, but is not likely to result in a trend toward federal listing or loss of viability.

**Pinaleno Jacob’s ladder (*Polemonium flavum)*.**

**Affected habitat description:** This plant is an herbaceous perennial that grows at high elevations (6,700-9,000 ft.) in the Pinaleno Mountains. Its habitat is shaded sites and drainages in canyons with rich, moist soil in coniferous and oak forests. It is known only from the Pinaleno EMA (AGFD 2000f). Known sites were visited by J. Malusa in 2001 and the presence of the species was confirmed in all sites (Malusa 2001).

**Analysis of effects:** Occupied and potential habitats are within one mile of known sites for the noxious weed Canada thistle. However, because of its preference for moist canyon bottoms, *P. flavum* is not known to occur in close proximity to populations of Canada thistle, which prefers more xeric sites.

**Determination of effects:** The proposed action will have no impact on Pinaleno Jacob’s ladder.

**White-flowered cinquefoil (*Potentilla albiflora)*.**

**Affected habitat description:** This is a white-flowered perennial herb resembling a strawberry restricted to Mount Graham in the Pinaleno EMA. It grows on rocky slopes and in open coniferous forests and open meadows in Ponderosa pine and mixed conifer forests (AGFD 1999j). J. Malusa surveyed several known sites for the species in 2001 and found all populations to be extant. Three new populations were also found during surveys and other sites at higher elevations are known but not recorded in the HDMS database (Malusa 2001).

**Analysis of effects:** The species appears to be well distributed in suitable habitats on the Mountain. The noxious weed associated with occupied or potential habitats is Canada thistle.
Although the two species appear to share similar habitat affinities, the two species are not known to occur in close proximity. The proposed treatment for Canada thistle will involve repeated annual spot treatments of individual plants. There is a slight potential for herbicide drift or inadvertent spray to affect individual cinquefoil plants, if they are undetected in pre-treatment surveys. In light of the relatively wide distribution of the species in the Pinaleno Mountains, no impacts to populations would be expected.

Determination of effects: The proposed action may impact individuals of white-flowered cinquefoil, but is not likely to result in a trend toward federal listing or loss of viability.

Blumer’s dock (*Rumex orthoneurus*).

**Affected habitat description:** *R. orthoneurus* is a robust herbaceous perennial up to one meter tall that grows in high elevation riparian and Cienega habitats in moist soils or shallowly inundated areas. It is found at elevations from 6,500 to 9,200 feet (AGFD 1998e).

**Analysis of effects:** Within the analysis area it is found in the Pinaleno EMA where a population is mapped within one mile of a Canada thistle treatment site. The two species are not known to occur in close proximity to each other, nor do they share habitat affinities. Proposed Canada thistle treatments will involve spot treatment of individual plants and *Rumex* is a very distinctive plant that is easily identified and avoided.

Determination of effects: The proposed action will have no impact on Blumer’s dock.

Lemmon’s stevia (*Stevia leononii*).

**Affected habitat description:** This woody perennial shrub grows in rocky canyon slopes, ravines and streambeds in pine-oak woodlands from 3,000 to 5,500 feet. On the Coronado Forest it occurs in the Santa Rita and Santa Catalina EMAs (AGFD 1999k).

**Analysis of effects:** Populations in the Santa Catalina EMA fall within the analysis area for the project. Noxious weeds potentially associated with occupied or potential habitats are buffalo grass and fountain grass. Proposed treatments for these species involve spot-application of herbicide and hand pulling of individual plants, so impacts will be confined to small areas. As outlined under the mitigation measures, new weed populations would be surveyed for TEPS species prior to any treatments.

Determination of effects: The proposed action will have no impact on Lemmon’s stevia.

Thurber hoary pea (*Tephrosa thurberi*).

**Affected habitat description:** This is an erect herbaceous perennial forb that grows on dry rocky slopes among oaks and pines, junipers, manzanitas and grasslands. The Arizona Game and Fish Heritage Database plant abstract lists “roadsides” as habitats for the species (AGFD 1999l). The plant is found between 3,500 and 7,000 feet, generally on south or south facing exposures.

**Analysis of effects:** The species has been found on the Tumacacori, Santa Rita, Huachuca and Chiricahua EMAs, but occurs in proximity to noxious weeds only in the Patagonia Mountains on the Huachuca EMA where a population is mapped approximately one mile from three Tree of heaven locations. Tree of heaven treatments will be confined to hand cutting of individual plants and hand-treatment of stumps with herbicide, so effects will be limited to the immediate vicinity of the target plants.

Determination of effects: The proposed action will have no impact on Thurber hoary pea.

Sonoran noseburn (*Tragia laciniata*).

**Affected habitat description:** This is an herbaceous perennial nettle-like plant found along streams and canyon bottoms, on shaded hillsides and in open woodland between 3,500 and 5,600 feet.
It is usually found on granitic soils, but may also occur in limestone. The species distribution is confined almost entirely to mountain ranges within Santa Cruz County (AGFD 2000g).

Analysis of effects: Within the analysis area, occupied or potential habitats are mapped within one mile of tree of heaven treatment sites in the Tumacacori EMA and in the Patagonia Mountains of the Huachuca EMA. Tree of heaven treatments will be confined to hand cutting of individual plants and hand-treatment of stumps with herbicide, so effects will be limited to the immediate vicinity of the target plants.

Determination of effects: The proposed action will have no impact on Sonoran noseburn.

Tumamoc globeberry (Tumamoca mcdougalii) where

Affected habitat description: This is a slender perennial vine that bears bright red berry-like fruit. It grows below 3,000 feet in elevation in a variety of desertscrub vegetation types. It grows in the shade of a variety of nurse plants along washes. The species was listed as Endangered between 1986 and 1993, but the large range and extreme remoteness of much of the species habitat suggest that the species is secure over significant portions of its range (AGFD 2000h). Because of the species’ affinity for desertscrub habitats, its distribution is limited on the Forest. A single population is found in lower Sabino Canyon.

Analysis of effects: Occupied and potential habitats occur in the vicinity of proposed treatment areas for buffelgrass, pentzia and giant reed in Sabino Canyon. The single population in lower Sabino Canyon is well known and can be easily avoided during any weed treatments. It is not known to occur within close proximity to any invasive plants. No effects to the species are anticipated.

Determination of effects: The proposed action will have no impact on Tumamoc globeberry.

Terrestrial and Aquatic Wildlife and Invertebrate Species.

General Effects of the Proposed Action.

The proposed action could potentially affect wildlife in three main ways: 1) Treatment activities may temporarily disturb resident species through human presence and increased activity levels on the treatment site, 2) wildlife could be directly exposed to herbicides as a result of the treatment, and 3) treatments may change the physical characteristics of habitats through changes in vegetation composition and structure.

Manual methods are expected to be used in areas of very localized infestations or where the presence of other sensitive resources precludes the use of herbicides. Chain saws and other power tools may create temporary high levels of noise at some sites, so some minor displacement of wildlife species may occur during weed treatment activities, but this disturbance would be of short duration and no different than other human uses of the site.

Wildlife exposure to herbicides can occur through direct skin contact (dermal exposure), ingestion of herbicide-contaminated forage, inhalation of aerial spray or a combination of the above routes. The USDA Forest Service Risk Assessment for Herbicide Use (Risk Assessment) evaluated the toxicity to terrestrial and aquatic wildlife and invertebrate species of 21 herbicides, 3 carriers and one additive proposed for use by the Forest Service in the Rocky Mountain Region. For the purposes of the Risk Assessment, all herbicide treatments were assumed to involve broadcast applications from aircraft. Ground-based, site specific applications, as proposed on the Coronado National Forest, were considered to have a very low potential to affect wildlife because of the reduced likelihood of an animal receiving a direct spray of herbicide and because of the much reduced size of the treatment area.
The risk to terrestrial and aquatic wildlife and invertebrates is a function of the toxicity of the herbicide to each organism and the exposure each organism is subjected to as a result of the treatment. For terrestrial organisms, toxicity is expressed in terms of the LD50s for different species. LD50s are defined as the median lethal doses – the single oral or dermal doses, expressed in milligrams per kilogram (mg/kg) calculated from a series of tests to be lethal to exactly 50% of a test animal group. For aquatic species, toxicity is expressed in terms of the LC50 – the median lethal concentration – expressed in milligrams per liter (MG/L) in the water.

The other half of the risk equation – exposure – was calculated for a number of wildlife species for three major exposure routes: dermal, ingestion and inhalation. Because the herbicides degrade relatively rapidly and sites are normally treated once per year, no analysis of chronic exposure was performed. The herbicides show little tendency to bio-accumulate, so long term persistence in the food chain was not considered in the analysis (USDA 1992).

Two levels of exposure were analyzed: For typical doses, dermal exposures were based on levels of herbicide likely to be found on vegetation surfaces, assuming the animals would seek cover during a spraying operation. Ingestion doses were calculated assuming a percentage of the animals daily food intake was contaminated. The larger and more wide-ranging the animal, the lower the estimated percentage. Extreme doses were calculated assuming the animals did not seek cover and thus received a full dose of herbicide over their entire body surface. In the extreme ingestion case, animals were assumed to feed entirely on contaminated forage. Predators were assumed to receive the entire body burden that each prey species had received through oral, dermal and inhalation exposure. Inhalation doses were also calculated based on a hypothetical cloud of aerial spray, but are not considered in this analysis because no aerial application is proposed.

The Risk Assessment then compared estimated exposures to the acute toxicity levels determined for a variety of species through laboratory studies. The EPA (1986) assessed the risk of pesticide exposure for terrestrial species according to the following criteria:

- Low: Expected Dose < 1/5 of LD50
- Moderate: Expected dose between 1/5 LD50 and LD50
- High: Expected Dose > LD50

Exposure doses below one fifth of the LD50 level were assumed to present a low or negligible risk, doses between on fifth of the LD50 and the LD50 were assumed to present a moderate risk that may be mitigated through restrictions on the use and application of the herbicide and doses above the LD50 are assumed to present an unacceptably high risk.

For aquatic species, the Risk Assessment determined the risk of exposure for aquatic organisms according to the following criteria:

- Low: Estimated environmental concentration (EEC) < 1/10 LC50
- Moderate: EEC between 1/10 LC50 and ½ LC50
- High: EEC > ½ LC50

Table 6 displays the calculated LD50s, estimated exposures and risk assessments for selected species and herbicides as presented in the Risk Assessment. The eight herbicides displayed in Table 6 are those considered most likely to be used in treatments on the Forest. As stated above, estimated exposures, both typical and extreme, are based on an assumed aerial application of herbicides, which is not proposed for the Coronado. Herbicide exposures to wildlife on the Coronado National Forest are projected to be well below even that shown for the “typical” exposure calculated in the risk assessment. Even assuming aerial application, for all 21
herbicides and carriers/additives analyzed in the Risk Assessment the typical dose estimates are below the EPA risk criterion of 1/5 LD50, or 1/10 LC50 and are far below the laboratory LD50s.

Based on the foregoing, there would be a low or negligible risk of toxic effects terrestrial and aquatic wildlife and invertebrates from the application of the herbicides proposed for use.

Table 6. Estimated lethal doses (LD50s), estimated exposures and risk assessments for selected herbicides and representative wildlife species based on the 1992 Risk Assessment for Herbicide Use in Regions 1, 2, 3, 4 and 10 (USDA 1992). Estimated exposures are based on a combination of oral, dermal and inhalation exposures resulting from a hypothetical aerial application of herbicide at typical rates.

<table>
<thead>
<tr>
<th>Chemical</th>
<th>Flicker LD50 (mg/kg)</th>
<th>1/5 LD50</th>
<th>Est. Exp.</th>
<th>Risk Asses.</th>
<th>Quail LD50 (mg/kg)</th>
<th>1/5 LD50</th>
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<td>1.2</td>
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<td>Rat, 5,000</td>
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### Threatened, Endangered and Proposed Species.

**Mount Graham red squirrel (Tamiasciurus hudsonicus grahamensis)**

**Affected habitat description:** This relatively quiet and secretive red squirrel is found in high elevation spruce-fir and mixed conifer forests in the Pinaleno Mountains (Mount Graham). They occur primarily in closed canopy forests. Surveys are conducted in spring and fall to monitor population levels.

**Analysis of effects:** Occupied and potential habitats are found near Canada thistle treatment areas, but thistle infestations are not known to occur in close proximity to any active middens. Proposed treatments for Canada thistle involve spot treatment of individual plants with herbicide. Disturbance will be minor and since squirrels are not known to forage on Canada thistle, no herbicide effects would be anticipated. Since no direct or indirect effects are identified, no cumulative effects are anticipated.

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<tr>
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</table>
Determination of effects: The proposed action will have *No Effect* on the Mount Graham red squirrel or its habitat.

**Lesser long-nosed bat (Leptonycteris curasoae yerbabuenae).**

**Affected habitat description:** The Lesser long-nosed bat (LLNB) resides on the Forest from April to late October. It feeds on the nectar and pollen of paniculate agaves (*Agave palmeri, A. parryi* and *A. deserti*). Several bat roosts are known to exist on the Forest, but none are in within one mile of weed treatment areas. Listed as Endangered without critical habitat on September 30, 1988 (53 FR 38456). A recovery plan was completed in 1995. Roost surveys are conducted annually and the Forest has supported research into the relationship between the bat and its primary food plant, Palmer agave.

**Analysis of effects:** In general, project impacts that would potentially affect lesser long-nosed bat are those that would significantly reduce the abundance or availability of paniculate agaves. Direct application of herbicide to agaves could kill or injure individual plants, as could mechanical treatments. Agaves potentially occur in the proximity of weed treatment sites at lower elevations on the Forest; however, proposed treatments will be directed at individual weed plants. Agaves are conspicuous and can be easily avoided. Indirect exposure to bats as a result of consuming accidentally treated plant parts is unlikely, because flowers and fruits are borne at the tips of the flowering stalks, well above the ground. The only large scale weed treatments proposed will occur in the Pinaleno EMA on Frye Mesa where populations of pentzia and sweet resin bush are found. While some agaves potentially occur in this area, records of long-nosed bats are largely absent from this EMA. No disturbance effects to LLNB are anticipated as a result of the proposed action. Since no direct or indirect effects are identified, no cumulative effects are anticipated.

Determination of effects: The proposed action will have *No Effect* on the Lesser long-nosed bat.

**Mexican spotted owl (Strix occidentalis lucida).**

**Affected habitat description:** The Mexican Spotted owl (MSO) nest in forested canyons and mountains from southern Utah and Colorado south through Arizona and New Mexico to Central Mexico. Preferred habitats are typically uneven aged, multi-storied mixed conifer with canopy closures greater than 50%. On the Forest, MSO are found in Madrean pine-oak forests and steep rock-walled canyons, sometimes with little tree cover. MSO management territories are found near tree of heaven and Canada thistle sites on the Huachuca and Pinaleno EMAs, and a single bird was observed in Sabino Canyon in 1991, but no treatment sites are close to known nest locations.

**Analysis of effects:** The potential herbicide exposure scenario for MSO would involve an owl consuming a prey species that had previously consumed treated vegetation. No risk assessment has been accomplished for MSO, but the Risk Assessment calculated the potential exposure for American kestrel, another bird of prey. The estimated exposure for all herbicides in the risk assessment was well below the low risk threshold of 1/5 of the LD50 (Table 6). As stated above, the herbicides evaluated show little tendency to bio-accumulate, so long-term persistence in the food chain is not considered to be a significant potential effect. Disturbance associated with weed treatments is not expected to disturb nesting owls as no sites are located within protected activity centers. Since no direct or indirect effects are identified, no cumulative effects are anticipated.

Determination of effects: The proposed action will have *No Effect* on Mexican spotted owl based on the fact that no activities will occur in close proximity to PACs and the potential for toxic effects from herbicides is negligible.

**Cactus ferruginous pygmy owl (Glaucidium brasilianus cactorum)**
Affected habitat description: The owl is found at elevations below 4,00 feet in Sonoran desert scrub, mesquite woodlands and semidesert grasslands in southern Arizona. Vegetation needs to be fairly dense to provide sufficient cover and the presence of Saguaro or large trees to support cavity nesting is important. The cactus ferruginous pygmy owl (CFPO) was listed as Endangered on March 10, 1997. Surveys for breeding birds are conducted annually in suitable habitats on the Forest, but resident birds have not been documented. On the Forest, potential habitats are limited to lower elevation sites on the Santa Catalina and Tumacacori EMAs. No CFPO are known to be currently nesting on the Forest, although they nest in the Tucson basin and likely use suitable habitats on the edge of the Forest to a limited degree. A single record of the species was recorded in 1976 from Sabino Canyon.

Analysis of Effects: Weed treatments in or near potential habitats propose to contain existing populations in Sabino Canyon and to eradicate new populations by hand pulling or spot application of herbicides. Potential effects from the proposed weed treatment involve herbicide exposure risk or changes in the owl’s habitat as a result of weed treatments. Similar to MSO, the exposure scenario would involve an owl feeding on a prey species that had previously fed on herbicide-treated vegetation. The Risk Assessment conclusions for American kestrel, another small raptor with similar food habits, were that herbicide exposures would be well below the level of 1/5 of the LD50 under the typical exposure scenario (Table 6). Weed eradication will target individual plants or small populations and will not be of sufficient scope to impact owl habitats either through disturbance or changes in plant community composition. Over the long term, control of invasive grasses should contribute to the restoration and preservation of desert scrub conditions that provide potential habitats for the owl. Since no direct or indirect effects are identified, no cumulative effects are anticipated.

Determination of effects: Based on the apparent absence of the CFPO from the project area, the negligible risk of herbicide exposure and projected minor and potentially beneficial effects to CFPO habitats, the proposed action is expected to have No Effect on cactus ferruginous pygmy owl.

Bald Eagle (*Haliaeetus leucocephalus*)

Background: The bald eagle was listed as Endangered in 1967 (32 FR 4001) and reclassified as Threatened in July 1995 (60 FR 36000). No critical habitat is designated. A recovery plan was completed in 1982. In 1999, the FWS proposed delisting the bald eagle throughout the lower 48 states, but a final rule has not been published. There are no known nesting records from the Coronado National Forest, but wintering birds are regularly reported from a variety of locations on the Forest.

Affected habitat description: Bald eagles nest on cliff ledges and in live trees and snags along the Salt, Verde and Bill Williams Rivers and Tonto creek in central Arizona. Nest sites are nearly always near large bodies of water that support the aquatic prey species preferred by eagles. On the Forest, they are relatively common winter residents in the vicinity of lakes that provide a source of fish prey. There are no records of bald eagles within one mile of any of the proposed weed treatment areas, but since they are wide-ranging raptors, they could be found potentially anywhere on the Forest during the winter.

Analysis of effects: Bald eagles are largely piscivorous although they may opportunistically feed on carrion. The potential exposure scenario would involve an eagle feeding on a fish that had previously been exposed to herbicide. No treatments are proposed in the vicinity of large water bodies where eagles would be found, so this risk is not significant. Further, herbicide spraying is expected to occur during the spring and summer when weeds are actively growing. Bald eagles are not on the forest during this time. Since no direct or indirect effects are identified, no cumulative effects are anticipated.
Determination of effects: The proposed action will have No Effect on Bald eagle.

**Chiricahua leopard frog (Rana chiricahuensis).**

**Background and data sources:** The Chiricahua leopard frog was listed as Threatened in June 2002 (67 FR 40790). The Chiricahua leopard frog is found in central and southeastern Arizona, west-central and southwestern New Mexico and northern Mexico. The species was historically widely distributed on the Coronado, Gila, and Apache-Sitgreaves National Forests. The largest number of extant localities is on the Coronado National Forest. On the Coronado National Forest, this species occurs at elevations of 3,281-6,600 ft (1,000-2,013 m). According to records available through the Arizona Game and Fish Department Heritage Data Management System, frogs have been documented within one mile of tree of heaven treatment sites in the Chiricahua and Tumacacori EMAs.

**Affected habitat description:** Leopard frogs as a group are habitat generalists that can adapt to a variety of wetland situations. Suitable habitats include lakes, streams springs, ponds and man-made structures such as reservoirs and stock tanks. Habitat for the species is found in Parker, Harshaw and Redrock Canyons adjacent to treatment sites for Johnson grass and tree of heaven.

**Analysis of effects:** Tree of heaven treatments will be confined to hand cutting of individual plants and hand-treatment of stumps with herbicide, so effects will be limited to the immediate vicinity of the target plants. Tree of heaven locations are not adjacent to wetlands or other aquatic sites that provide suitable CLF habitats, so no impacts to the species would be expected. Treatment locations for Johnson grass occur close to suitable habitats. The proposed treatment is to hand grub individual plants. Herbicide use would only be considered if hand treatments cause significant soil disturbance or are determined to be ineffective. Treatments will be very localized and the potential for introduction of herbicide into aquatic habitats is very small. Further, only an aquatic formulation of glyphosate, which is relatively nontoxic to aquatic organisms, would be used adjacent to aquatic sites. Since no direct or indirect effects are identified, no cumulative effects are anticipated.

**Determination of effects:** Based on the fact the proposed weed treatments will not occur in or near suitable CLF habitats, the proposed action will have No Effect on Chiricahua leopard frog.

**Gila topminnow (Poeciliopsis occidentalis occidentalis)**

**Affected habitat description:** Gila topminnows occupy headwater springs and backwater areas of intermittent and perennial streams. They prefer shallow warm water in a moderate current with dense aquatic vegetation. Gila topminnows were once the most common fish in southern Arizona. They have declined to only 12 naturally occurring populations (AGFD 2001c). The only population of Gila topminnows on the Forest is restricted to Redrock Canyon. Populations in Redrock Canyon have been monitored annually since 1989 (Stefferud 2001).

**Analysis of effects:** A Johnson grass eradication site is located within the Redrock Canyon drainage near adjacent to the streambed. The proposed treatment is to hand grub individual plants. Herbicide use would only be considered if hand treatments cause significant soil disturbance or are determined to be ineffective. Because of the distance between the treatment site and known populations of Gila topminnow, only minor effects are anticipated as a result of any of the treatments. Disturbance on the stream bank may result in short-term contribution of sediments to the stream. If the use of herbicides is required, plants will be treated with an aquatic formulation of glyphosate, which does not contain a surfactant and is considered moderately toxic to fish. Because spraying will not occur adjacent to water, the chances of spray being introduced to the stream are very small. Further, glyphosate binds strongly with soil particles and would not be expected to wash into the stream during runoff. Mitigation features incorporated into the proposed action should prevent or minimize the introduction of herbicides into aquatic habitats.
Determination of effects: The proposed action May Affect, but is Not Likely to Adversely Affect Gila topminnow.

Gila Chub (Gila intermedia).

Affected habitat description: Gila chub are found in smaller headwater streams, cienegas and springs or marshes. On the Forest they occur only in Sabino Creek in the Santa Catalina EMA and in O’Donnell Creek in the Huachuca EMA. Recent efforts to remove exotic green sunfish from both of these streams have been successful at restoring suitable habitats for the chub. Gila chub populations in Sabino Canyon are monitored annually by Arizona Game and Fish and Forest Service biologists. Proposed critical habitat occurs in Turkey Creek. This is a treatment site for tree of heaven. Recent surveys in this area have not recorded the species.

Analysis of effects: Proposed weed treatments in Sabino Canyon involve the spot application of herbicides on populations of buffelgrass, fountain grass and giant reed. Only giant reed grows in close proximity to aquatic sites, but the treatment area is downstream from known populations of Gila chub. In accordance with the mitigation measures, the only herbicide proposed for use near aquatic sites is Rodeo formulation of glyphosate, which has very low toxicity to fish. Herbicide will be sprayed directly on plants, so there is little potential for the introduction of significant amounts of spray into the water.

Gila chub are also found in O’Donnell Creek within one mile of tree of heaven treatment sites near Canelo. Tree of heaven treatments involve the cutting of individual plants and treating the cut stumps with herbicide. No off-site effects to aquatic resources are anticipated.

Determination of effects: The proposed action will have no effect on Gila chub. The proposed action will not result in the adverse modification or destruction of proposed critical habitat for Gila chub.

Forest Service Sensitive Species

White-bellied long-tailed vole (Microtus longicaudus leucophaeus).

Affected habitat description: This vole occurs only on the Pinaleno Mountains. It inhabits alpine meadows and flats, along stream sides, cienegas and openings in coniferous forests where it builds runways through the thick grass. Its food consists of a variety of plant parts and species, but grasses form a major component of the diet.

Analysis of effects: Occupied and suitable habitats may occur in proximity to Canada thistle treatment sites. No direct exposure to herbicides is anticipated from the proposed treatment since treatments will involve spot treatment of individual plants rather than broadcast spraying. The potential for indirect exposure to herbicide exists, assuming a vole may forage on sprayed plant material. The risk assessment determined that the risk of exposure under the typical scenario is well below the level of 1/5 of the LD50, and is therefore negligible. Disturbance effects are anticipated to be minor. No significant changes in the plant community are expected as a result of the proposed action; however, eradication of localized populations of invasive Canada thistle is expected to reduce the risk of future wide-spread infestation that could potentially degrade meadow habitats used by voles.

Determination of effects: The proposed action will have no impact on the white-bellied long-tailed vole.

Apache northern goshawk (Accipter gentilis apache)

Affected habitat description: Nesting habitat includes closed-canopied Madrean oak woodland and Mexican pine-oak woodlands. Occupied territories are mapped within one mile of tree of heaven and Canada thistle sites in the Huachuca and Pinaleno EMAs. Goshawk territories are mapped and monitored throughout the forest. Forest Plan standards and guidelines for goshawk
call for management that results is uneven age conditions to sustain a mosaic of vegetation densities (overstory and understory), age classes and species composition well distributed across the landscape. Human disturbance during the breeding season (March 1-September 30) should be limited in or near nest sites and PFAs.

Analysis of effects: The typical herbicide exposure scenario would involve a hawk feeding on a prey species that had previously fed on herbicide-treated vegetation. No risk assessment has been accomplished for Goshawk, but the Risk Assessment calculated the potential exposure for American kestrel, another bird of prey. The estimated exposure for all herbicides in the risk assessment was well below the low risk threshold of 1/5 of the LD50 (Table 6). All herbicides evaluated show little tendency to bio-accumulate, so long-term persistence in the food chain is not considered to be a significant potential effect. Since treatments for both Canada thistle and tree of heaven involve spot-treating individual plants, potential herbicide exposures are expected to be less than that projected in the Risk Assessment. Disturbance associated with weed treatments is expected to be minor and of short duration and no large-scale changes in the plant communities are expected.

Determination of effects: The proposed action will have no impact on the Apache northern goshawk.

American Peregrine falcon (*Falco peregrinus anatum*).

Affected habitat description: The species is a wide-ranging predator that nests on cliff faces throughout the Forest. This species was previously listed as Endangered but was delisted in 1999 when it was determined that recovery goals had been met. Twenty-nine peregrine falcon eyries are identified on the Forest. Selected eyries are monitored annually on the Forest and populations have increased since 1986 (USFS 2002). Statewide, more than 200 breeding pairs have been documented and populations have increased substantially over the past 20 years (Glinski 1998).

Analysis of effects: The primary threat to this species is disturbance at nest sites through ground disturbing or loud activities that take place during the nesting season (March 1 to July 15). The only eyrie within one mile of weed treatment areas is in the Santa Catalina mountains in Sabino Canyon. This area receives the highest level of recreational activity on the forest and weed treatment activities are not expected to increase disturbance over the level that currently occurs. Herbicide toxicity effects are projected to be similar to those identified for goshawk and Mexican spotted owl.

Determination of effects: The proposed action will have no impact on the American peregrine falcon.

Western yellow-billed cuckoo (*Coccyzus americanus occidentalis*).

Affected habitat description: This species is closely tied to riparian habitat, specifically mesquite bosques adjacent to riparian gallery forests. Occupied and potential habitats occur in the vicinity of tree of heaven and Johnson grass eradication sites in the Huachuca and Tumacacori EMAs, but are not immediately adjacent to treatment sites. Information available through Forest files and the Arizona HDMS indicates that the species occurs in riparian habitats in several locations on the forest. The treatment sites in Parker and Redrock Canyons are immediately adjacent to nest sites. No trend data are available.

Analysis of effects: Tree of heaven treatments will be confined to hand cutting of individual plants and hand-treatment of stumps with herbicide, so effects will be limited to the immediate vicinity of the target plants. Johnsonsggrass treatments would involve hand grubbing of plants or spot treatment with herbicide sprayed directly on target plants. The potential herbicide exposure scenario would involve a cuckoo feeding on insects that previously fed on treated vegetation. The estimated exposure for insectivorous birds for all herbicides in the risk assessment was well
below the low risk threshold of 1/5 of the LD50 (Table 6). Disturbance associated with weed eradication may occur, but is not expected to be of sufficient intensity or duration to affect the species to a significant degree.

**Determination of effects:** The proposed action will have may impact individuals of the western yellow-billed cuckoo but is not likely to result in a trend toward federal listing or a loss of viability.

**Northern gray hawk (Asturina nitida maxima)**

**Affected habitat description:** Preferred habitats are well-developed lower elevation deciduous riparian deciduous woodlands of mesquite and hackberry bordering strands of cottonwood and willow. Surface water is often available nearby. Gray hawks nest in very low number on the Forest. No organized survey protocol is in place, but known nest sites are visited annually and nesting activity is reported and tracked through the Arizona HDMS. Since 1999, an estimated 4-6 nests have been documented on the Tumacacori and Huachuca EMAs. The species nest immediately adjacent to the Johnson grass site in Redrock Canyon and the tree of heaven site in Parker Canyon.

**Analysis of effects:** A gray hawk nest site is documented adjacent to a Johnson grass treatment site in the Huachuca EMA. The proposed treatment strategy for Johnson grass involves hand grubbing plants. Herbicides would only be used if grubbing causes too much soil disturbance or if it proves to be ineffective. If herbicides are used, the herbicide exposure scenario would be similar to that described for other birds of prey. No toxicity effects are expected as a result of herbicide treatments. Because of the proximity of the treatment location to a known nest site, some short-term disturbance would be anticipated. This disturbance is not expected to be of sufficient intensity or duration to affect the species to a significant degree.

**Determination of effects:** The proposed action may impact individuals of the Northern gray hawk, but is not likely to result in a trend toward federal listing or a loss of viability.

**Mexican garter snake (Thamnophis eques megalops)**

**Affected habitat description:** This species occupies riparian, Cienega and marsh areas in desert grasslands and lower oak woodlands (AGFD 2001). The species has been documented from aquatic sites within one half mile of tree of heaven treatment sites in the Huachuca EMA but suitable habitats do not exist in the immediate area. Suitable habitat exists at the tree of heaven site in Turkey Creek.

**Analysis of effects:** Tree of heaven treatments will be confined to hand cutting of individual plants and hand-treatment of stumps with herbicide, so effects will be limited to the immediate vicinity of the target plants. No effects are expected to aquatic resources.

**Determination of effects:** The proposed action will have no impact on Mexican garter snake.

**Arizona ridge-nosed rattlesnake (Crotalus willardi willardi)**

**Affected habitat description:** The species is found in broadleaf evergreen woodland, deciduous and evergreen riparian and mixed coniferous forest. Microsites within the broader habitats include leaf litter, rock crevices and bunchgrasses. The Arizona ridge-nosed rattlesnake is found in the Huachuca, Santa Rita, Patagonia and whetstone Mountains and the Canelo Hills. On a global scale, the species is considered demonstrably secure with more than 100 occurrences. On a state scale, the species is apparently uncommon or restricted, with 21 to 50 occurrences (AGFD 2001a).

**Analysis of effects:** The species has been documented within one mile of tree of heaven treatment sites in the Huachuca EMA, but suitable habitats are not present in the immediate vicinity. Tree of heaven eradication activities will be confined to the location of individual plants
and are not expected to extend into occupied or potential rattlesnake habitats. Secondary herbicide effects (a snake eating contaminated prey) are not anticipated since treatments will not involve spraying.

**Determination of effects:** The proposed action will have no impact on the Arizona ridge-nosed rattlesnake.

**Lowland leopard frog (Rana yavapaiensis)**

**Affected habitat description:** The species is found in aquatic environments from desert grasslands to pinyon juniper. They are habitat generalist and are found in a variety of natural and man-made aquatic sites including springs, streams and stock tanks (AGFD 2001b). On the Forest, it occurs in a variety of sites on the Santa Catalina, Tumacacori, Santa Rita and Huachuca EMAs.

**Analysis of effects:** A 1980 record of the species is documented from Sabino Canyon within one mile of weed treatment sites. No recent records exist and it is likely that the species is no longer extant in Sabino Canyon as the canyon has been intensively searched during green sunfish renovation activities over the past two years. The presence of non-native predaceous bull frogs and green sunfish may have contributed to the apparent loss of the population. Proposed weed treatments in Sabino Canyon will be confined primarily to upland sites, so no effects to suitable habitats are anticipated.

**Determination of effects:** The proposed action will have no impact on lowland leopard frog.

**Western barking frog (Eleutherodactylus augusti cactorum)**

**Background and data sources:** On a global scale, the western barking frog is considered apparently secure with more than 100 occurrences, though it could be quite rare in some areas. The subspecies, cactorum, however, is considered uncommon or restricted with 21 to 100 occurrences. On a state scale, the species is very rare with 1 to 5 occurrences in Arizona or very few individuals or acres (AGFD 2001d). Goldberg and Schwalbe studied various aspects of population ecology for the species on the nearby Coronado National Memorial during 5 years of work up to 2000. At 2 sites, densities of 27 and 5 frogs per 2 hectares areas were recorded. Those densities were based on capture and recapture ratios over the study period on isolated limestone outcrops. Little is known about population trends on the CNF.

**Affected habitat description:** The western barking frog often frequents crevices in limestone or rhyolite rock outcrops on hillsides within the Madrean evergreen woodlands. Elevations range from 5,200 to 6,200 feet. Within the CNF, they have been documented in the Huachuca, Pajarito and Santa Rita Mountains. The Forest Plan shows 891 acres of occupied habitat for the species in broadleaf evergreen woodlands and evergreen riparian vegetation types. The species was recorded this year in Harshaw Canyon (Caren Goldberg, pers. comm.). Suitable habitat is adjacent to tree of heaven sites. There is one old record from 1965 of a western barking frog within one mile of a tree of heaven site in the Tumacacori EMA.

**Analysis of effects:** Project impacts will be confined to the location of individual plants. Suitable rocky habitats occur in the vicinity of the Harshaw Canyon site, but potential disturbance resulting from treatment activities is expected to be insignificant. The herbicide exposure scenario would involve a frog eating a prey item that had previously fed on treated vegetation. This exposure is highly unlikely, because herbicide treatments will be generally confined to hand treatment of cut stumps of tree of heaven.

**Determination of effects:** The proposed action will have no impact on western barking frog.

**Sabino Canyon damselfly (Argia sabino)**

**Affected habitat description:** The species is found only in Sabino Canyon and populations are closely related to flowing water. Larvae inhabit stream pools during the spring-early summer dry
season and adults emerge generally after summer rains (AGFD 2001e). All of lower Sabino Creek is considered suitable habitat. The species has been recorded in Walker Basin and Big Casa Blanca Canyons in the Santa Rita Mountains, also.

Analysis of effects: Damselflies may be affected by weed treatments in the following ways. Aquatic larvae could be exposed to herbicides that are accidentally sprayed on the water surface during treatments. Adult damselflies are known to perch on boulders or plants away from the stream surface while searching for mates. Individuals could be exposed to herbicides if they perch on weed species being treated. Manual or mechanical treatments could injure individuals that are trapped in vegetation being treated. The USDA Risk Analysis determined that the possible risks to aquatic invertebrates was low for all herbicides being considered for use. Further, two of the species being treated, pentzia and buffelgrass, grow primarily in uplands away from the water’s edge, so the potential for contamination of the water would be slight. Giant reed grows close to the water surface in Sabino Creek, but treatment will be timed to coincide with low water to minimize the potential for introduction of spray into the stream.

Determination of effects: The proposed action may impact individuals of Sabino damselfly, but is not likely to result in a trend toward federal listing or loss of viability.

Mexican Meadow Fly (*Sympertrum signiferum*)

Affected habitat description: Habitat includes slow flowing creeks and vegetated stream pools. (AGFD 2001g) in herbaceous wetlands. This species has recently been recorded at Parker Canyon and at least one of the tree of heaven sites. It was recorded downstream of the Van Horn Exclosure. Suitable habitat is found at the exclosure. The species was not described until 1991 and new populations are still being discovered.

Analysis of effects: Effect to the species would be similar to those described for damselfly, above.

Determination of effects: The proposed action may impact individuals of Mexican meadowfly, but is not likely to result in a trend toward federal listing or loss of viability.

Mimic talussnail (*Sonorella imitator*), Pinaleno talussnail (*Sonorella grahamensis*) and Pinaleno mountainsnail (*Oreohelix grahamensis*)

Affected habitat description: All three snail species are inhabitants of wet mountain slopes above 6,000 feet in the Pinaleno Mountains. *Sonorella* species are normally found in deep, steep limestone rockslides (talus). *Oreohelix* are associated with talus, but are typically found in leaf litter within and around the talus (Hoffman 1990).

Analysis of effects: All three species of snails have been documented within one mile of Canada thistle sites, but are not found outside of the immediate vicinity of rockslides. Canada thistle is found in open meadows and disturbed sites with sufficient soil to support the plant, it is not known to be growing adjacent to suitable talussnail habitat. Treatments for Canada thistle will involve spot-treating individual plants with herbicide and effects are anticipated to be confined to the immediate vicinity of target plants. There is no apparent risk to the snails from the proposed treatment.

Determination of effects: The proposed action will have no impact on Mimic talussnail, Pinaleno talussnail or Pinaleno mountainsnail.

Longfin dace (*Agosia chrysogaster*).

Affected habitat description: This is a small, wide-ranging fish that inhabits low-desert streams to clear mountain brooks at higher elevations. Longfin dace tend to occupy relatively small streams with a sand or gravel substrate (AGFD 2001f). A population is known from Redrock
canyon within one mile of a Johnson grass treatment site. It occurs at the Parker Canyon tree of heaven site and just below the Van Horn Exclosure as well.

**Analysis of effects:** The proposed treatment is to hand grub individual plants. Herbicide use would only be considered if hand treatments cause significant soil disturbance or are determined to be ineffective. Because of the distance between the treatment site and known populations of longfin dace, no effects are anticipated as a result of any of the treatments.

**Determination of effects:** The proposed action will have no impact on longfin dace.
Summary of Findings

Table 7. Summary of effects determinations on threatened, endangered and proposed species.

<table>
<thead>
<tr>
<th>Species</th>
<th>Status</th>
<th>Effects Determination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Huachuca water-umbel Lilaeopsis schnaffneriana ssp. recurvata</td>
<td>Endangered</td>
<td>May Affect, Likely to Adversely Affect; Not likely to adversely affect critical habitat.</td>
</tr>
<tr>
<td>Mount Graham red squirrel (Tamiasciuris hudsonicus grahamensis)</td>
<td>Endangered</td>
<td>No Effect</td>
</tr>
<tr>
<td>Lesser long-nosed bat (Leptonycteris curasoae yerbabuenae).</td>
<td>Endangered</td>
<td>No Effect</td>
</tr>
<tr>
<td>Mexican spotted owl (Strix occidentalis lucida).</td>
<td>Threatened</td>
<td>No Effect</td>
</tr>
<tr>
<td>Cactus ferruginous pygmy owl (Glaucidium brasilius cactorum)</td>
<td>Endangered</td>
<td>No Effect</td>
</tr>
<tr>
<td>Bald eagle (Haliaeetus leucocephalus)</td>
<td>Endangered</td>
<td>No Effect</td>
</tr>
<tr>
<td>Chiricahua leopard frog (Rana chiricahuensis).</td>
<td>Threatened</td>
<td>No Effect</td>
</tr>
<tr>
<td>Gila topminnow (Poeciliopsis occidentalis occidentalis)</td>
<td>Endangered</td>
<td>May Effect, Not Likely to Adversely Affect</td>
</tr>
<tr>
<td>Gila chub (Gila intermedia).</td>
<td>Proposed Endangered</td>
<td>Not likely to jeopardize; no adverse modification of proposed critical habitat</td>
</tr>
</tbody>
</table>

Preparer/Reviewer

I prepared this Biological Assessment and Evaluation.

Richard A. Gerhart, Wildlife Biologist/Team Leader
Coronado National Forest Supervisor’s Office
Tucson, Arizona
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Appendix A.
Herbicides proposed for use in the Coronado National Forest Integrated Vegetation Management Program.

Herbicides proposed for use include those with 2,4-D, chlorsulfuron, clopyralid, dicamba, glyphosate, imazapic, imazapyr, metsulfuron, picloram, sulfometuron methyl triclopyr or tebuthion as their active ingredients. These herbicides are marketed under a variety of trade names. The Environmental Protection Agency (EPA) has approved all of these herbicides for controlling noxious weeds and requires that any use restrictions be included in the product label.

Most of the products available for use are translocated, selective herbicides. They are absorbed into plant tissue through leaf, stem or bark surfaces and through the roots. These chemicals concentrate in the metabolically active tissues of the plant, altering plant growth. These selective herbicides kill broadleaved plants, or dycots, or a selection of plant families within the dycots, depending on the herbicide used and the rate at which it is applied. Glyphosate and imazapyr are non-selective herbicides, and will kill both dycots and monocots, which are grasses and parallel-veined plants like lilies and orchids. The chemical selected and the rate at which applied, as well as the timing of application all determine which species will be killed. Glyphosate is absorbed primarily through plant leaves and stems, rather than roots. This chemical bonds tightly to soils and is not available to plants in the rooting zone.

All of the herbicides proposed for use in this alternative, except 2,4-D, are rated by the EPA as slightly toxic (toxicity class III) to humans or almost non-toxic (toxicity class IV). 2,4-D is rated as moderately toxic (toxicity class II) (Cite). Plants and humans have different metabolic pathways. Therefore, chemicals that have toxic properties to plants don’t have the same effects on humans. Insects and humans have similar metabolic pathways and many insecticides are also very toxic to humans. No insecticides are proposed for use in this project.

Each herbicide proposed for use is described in more detail below.

Herbicide: 2,4-D
Brand Name: Esteron 99C, Weedone LV4, Weedone LV6 and others
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 (leaf) absorbed, phenoxy herbicide that targets annual and perennial broadleaf weeds. This herbicide degrades quickly; the average field half-life is 10 days. This herbicide targets broadleaved vegetation, but usually requires several applications due to its short persistence. The action that kills plants mimics natural plant hormones. Plants are most susceptible when they are young and growing rapidly. An important utility of 2,4-D is in riparian areas for products with an aquatic label.
**Herbicide: Chlorsulfuron.**
**Brand Name:** Telar
This is a selective pre-emergence or early post-emergence herbicide used at very low rates, \( \frac{1}{2} \) to 3 ounces per acre. It is in a group of herbicides called sulfonyureas. Its action in plants is described as a rapid mitotic inhibitor. It is a dry flowable material that is mixed in water and applied as a spray to control many annual, biennial, and perennial weeds on non-crop sites. It is very soluble in water and mobile; thus, it will not be considered for use in buffer zones near water. It has a soil half-life of 30 days.

**Herbicide: Clopyralid**
**Brand Name:** Transline, Stinger, Reclain
This is a selective, post-emergence herbicide that is mainly used to control broadleaf species in three plant families: composites (Asteraceae), legumes (Fabaceae), and buckwheats (Polygonaceae). Its selectiveness makes this herbicide a useful material for control of invasive plants like Pentzia and sweet resin bush while preventing adverse effects to many native species. Grass species are especially tolerant to clopyralid. This herbicide is readily absorbed by roots and foliage readily transported in plant tissues. The material has moderate persistence, high mobility, and high leaching potential. Thus, it will not be used within designated buffer zones along streams or near water in compliance with label requirements. It also can be purchased in mixtures with other herbicides: Curtail, clopyralid with 2,4-D; and Redeem, clopyralid and triclopyr. Mixing with other products decreases the selectivity of this herbicide.

**Herbicide: Dicamba.**
**Brand Name:** Vanquish, Weedmaster
Dicamba is a broad spectrum herbicide for broadleaved plants. It is a growth-regulating herbicide readily absorbed and translocated from either roots or foliage. This herbicide produces effects similar to 2,4-D. It has moderate persistence (half-life in soil of 14 days to 12 weeks, Ahrens et al 1994), high mobility, and high leaching potential. This herbicide would not be used within buffer zones near 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. Dicamba can be mixed with 2,4-D to increase its effect on certain plants.

**Herbicide: Glyphosate.**
**Brand Name:** Roundup, Rodeo
This is a non-selective herbicide that controls virtually all annual and perennial weeds, but it is generally most toxic to annual grasses. Since this herbicide kills a broad spectrum of plants, care is needed to limit adverse effects on non-target plants. It works by inhibiting amino acid pathways in plants. Theses amino acid pathways are not found in animals, which means that the 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 released into water. Rodeo is an aquatically labeled
formulation considered safe for aquatics because toxic inert ingredients, such as surfactants have been left out of this formulation.

**Herbicide: Imazapic**  
**Brand Name:** *Plateau.*  
This herbicide also is considered to be non-selective, although the rate of application and the timing of application can provide some selectivity. Many native grasses and wildflowers are tolerant of this herbicide at lower rates of application, while annual weedy species are susceptible. It destroys weeds by blocking the pathway which produces branch chain amino acids in plants. As with glyphosate, animals do not have such pathways, and the compound has low toxicity to humans. This herbicide is particularly effective for control of leafy spurge and perennial pepperweed.

**Herbicide: Imazapyr**  
**Brand Name:** *Arsenal.*  
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. It is particularly useful for control of saltcedar. Half-life in soil ranges from 25-142 days, depending on soil type and environmental conditions (Ahern 1994). Foliar absorption usually is rapid (within 24 hours).

**Herbicide: Metsufuron**  
**Brand Name:** *Escort.*  
This is another sulfonyurea herbicide that is primarily absorbed through the foliage. It interrupts a biological process necessary for plant growth. It is a powder that is mixed with water and applied at very low rates (1-3 ounces per acre) for control of a variety of weed species, including such difficult to control species as hoary cress (whitetop) and perennial pepperweed. It is moderately residual in soil with a typical half-life of 30 days (Ahern 1994).

**Herbicide: Picloram**  
**Brand Name:** *Tordon.*  
Picloram is an organic compound that is a plant growth regulator used for controlling unwanted broadleaf vegetation on rangelands and forested sites. Grasses are generally not killed by this herbicide. The herbicide also is considered to be rate-selective, meaning that the plant species killed varies with the rate of application. At one pint per acre, picloram kills knapweeds while leaving many native species unharmed. At one quart per acre, this herbicide kills many more plant species. 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 restriction is due to the persistence of this product, which has an average soil half-life of 90 days (Ahern 1994), 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 as way that is does not contaminate water. This herbicide should not be applied to cobble or gravel soils or to areas with a shallow water table.
**Herbicide: Sulfometuron methyl (Sufometuron)**  
**Brand Name: Oust**  
This is another sulfonyurea herbicide that has broad-spectrum properties. It is a powder that is mixed with water and it is toxic to target plants at very low rates. It is readily absorbed by roots and foliage; thus, it is used as a pre-emergent and post-emergent herbicide.

**Herbicide: Triclopyr**  
**Brand Name: Garlon 3A and Garlon 4**  
This herbicide is selective and it is especially useful for trees and woody shrubs such as saltcedar. 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 (Ahern 1994). Triclopyr is also mixed with clopyralid and marketed under the product name of Redeem.

**Herbicide: Tebuthiuron**  
**Brand Name: Spike**  
This herbicide can be used in pastures and rangelands, in non-crop situations, for control of certain broadleaf weeds and woody species. It is persistent in soil with a half-life of 12-15 months. This makes this compound particularly useful for difficult to control species like camelthorn.
MAP 1: PROJECT AREA

Map 1
Coronado National Forest
MAP 2: CHIRICAHUA E.M.A.

Map 2
Weed locations
Douglas Ranger District
Chiricahua EMA

Weeds
● Tree of heaven
✓ Buffalo grass
× Fountain grass
■ Pentzla
▲ Texas blueweed
★ Sweet resin bush
☆ Canada thistle
♀ Salt cedar
♂ Bull thistle
★ Giant reed
☆ Johnson grass
▲ Primary roads
■ Private land

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Prepared 1/25/2000 by

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MAP 5: HUACHUCA E.M.A.

Map 5
Weed locations
Sierra Vista Ranger District
Huachuca EMA
Appendix F.

Management Indicator Species on the Coronado National Forest

<table>
<thead>
<tr>
<th>Group</th>
<th>Species</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Cavity Nesters</td>
<td>Coppery-tailed (Elegant) Trogon, Sulphur-bellied Flycatcher, Other primary and secondary cavity nesters*</td>
</tr>
<tr>
<td>2 Riparian Species</td>
<td>Gray hawk, Blue-throated hummingbird, Coppery-tailed (elegant) trogon, Rose-throated becard, Thick-billed kingbird, Sulphur-bellied flycatcher, Northern Beardless tyrannulet, Bell’s vireo, Black bear</td>
</tr>
<tr>
<td>3 Species Needing Diversity</td>
<td>White-tailed deer, Merriam’s turkey, Coppery-tailed (elegant) trogon, Sulphur-bellied flycatcher, Buff-breasted flycatcher, Black bear</td>
</tr>
<tr>
<td>4 Species Needing Herbaceous Cover</td>
<td>White-tailed deer, Mearns quail, Pronghorn antelope, Desert massassauga, Baird’s sparrow</td>
</tr>
<tr>
<td>5 Species Needing Dense Canopy</td>
<td>Bell’s vireo, Northern beardless tyrannulet, Gray hawk</td>
</tr>
<tr>
<td>6 Game Species</td>
<td>White-tailed deer, Mearns quail, Pronghorn antelope, Desert bighorn sheep, Merriam’s turkey, Black bear</td>
</tr>
<tr>
<td>7 Special Interest Species</td>
<td>Mearns quail, Gray hawk, Blue-throated hummingbird, Coppery-tailed (elegant) trogon, Rose-throated becard, Thick-billed kingbird, Sulphur-bellied flycatcher, Buff-breasted flycatcher, Northern beardless tyrannulet, Five-striped sparrow</td>
</tr>
<tr>
<td>8 Threatened and Endangered Species</td>
<td>Desert bighorn sheep, Gray hawk, Peregrine falcon, Blue-throated hummingbird, Coppery-tailed (Elegant) trogon, Rose-throated becard, Thick-billed kingbird, Sulphur-bellied flycatcher, Buff-breasted flycatcher, Northern beardless tyrannulet, Bell’s vireo, Baird’s sparrow, Five-striped sparrow, Mexican stoneroller, Arizona (Apache) trout, Gila topminnow, Gila chub, Sonora chub, Spikedace, Desert massassauga, Twin-spotted rattlesnake, Arizona ridge-nosed rattlesnake, Huachuca (Sonora) tiger salamander, Tarahumara frog, Western barking frog, Arizona treefrog, Mt. Graham spruce (red) squirrel, Gould’s turkey</td>
</tr>
</tbody>
</table>