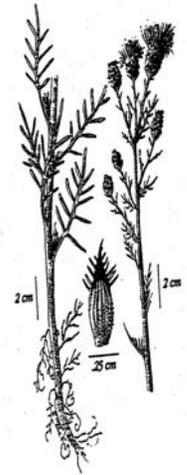
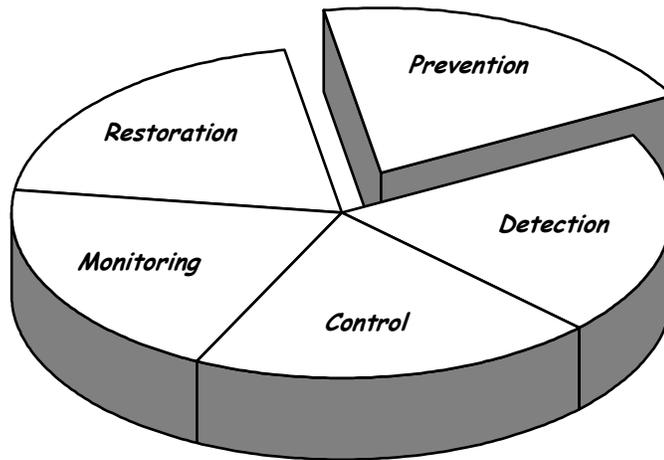
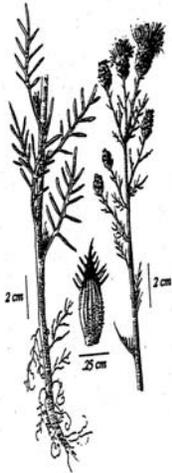


Appendix C.



USDA - FOREST SERVICE

Guide to Noxious Weed Prevention Practices

INDEX

Introduction.....	4
Supporting Direction.....	4
Using This Guide.....	5
General Weed Prevention Practices for Site-disturbing Projects and Maintenance Programs.....	6
Aquatic Weed Prevention Practices.....	8
Cultural Resources.....	10
Fire Management	
Pre-fire, Pre-incident Training.....	10
Plans.....	10
Wildfires-General.....	10
Prescribed Fire.....	11
Fire Rehabilitation.....	11
Forest Vegetation Management	
Timber Harvest Operations & Stewardship Contracting.....	12
Post Vegetation Management Operations.....	13
Grazing Management.....	13
Lands and Special Uses.....	15
Minerals.....	16
Recreation, Wilderness, and Special Management Areas.....	16
Research Activities.....	17
Road Management	
New and Reconstruction.....	17
Road Maintenance and Decommissioning.....	17

Watershed Management.....	18
Wildlife, Fisheries, and Botany.....	19
Appendix 1, Forest Service Timber Sale Contract Provisions.....	20
Appendix 2, Sample Special Use Supplemental Clause.....	23
Appendix 3, Example of a Closure Order.....	25

USDA-Forest Service

GUIDE TO

NOXIOUS WEED PREVENTION PRACTICES

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.

The Guide to Noxious Weed Prevention Practices provides a toolbox of ideas for use in mitigating identified weed risks in resource management operations. The Guide adds no new requirements or regulations.

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.

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.

- 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.

- 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.

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.

- 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”.

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.

APPENDIX 1

FOREST SERVICE TIMBER SALE

CONTRACT PROVISIONS

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.

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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.

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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
EFFECTIVE 02/08/2000**

**2709.11, 50
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

Date

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

Table of Contents

Introduction.....	2
Consultation History	3
Project Area Description.....	3
Existing Condition/Environmental Baseline	4
Description of the Proposed Action.....	7
Conservation Measures.....	12
Measures Common to All Actions	12
Measures Involving the Use of Herbicides	13
Species Identification.....	13
Species Evaluations	17
Plants.....	17
Threatened, Endangered and Proposed Species.....	17
Forest Service Sensitive Species	18
Terrestrial and Aquatic Wildlife and Invertebrate Species.	27
General Effects of the Proposed Action.....	27
Threatened, Endangered and Proposed Species.....	30
Forest Service Sensitive Species	34
Summary of Findings.....	40
Preparer/Reviewer.....	40
Literature Cited.....	41
Appendix A.....	44
MAP 1: PROJECT AREA	48
MAP 2: CHIRICAHUA E.M.A.....	49
MAP 3: PELONCILLO E.M.A.	50
MAP 4: PINALENO E.M.A.....	51
MAP 5: HUACHUCA E.M.A.	52
MAP 6: SANTA RITA E.M.A.	53
MAP 7: TUMACACORI E.M.A.....	54
MAP 8: SANTA CATALINA E.M.A.....	55

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 1. Species initially included in the management program

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

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

Species	Chiricahua EMA	Peloncillo EMA	Pinaleno EMA	Huachuca EMA	Santa Rita EMA	Tumacacori EMA	Santa Catalina EMA
Tree of heaven	X			X	X	X	
Bull thistle	X						
Texas blueweed		X					
Yellow or Malta starthistle		Potential					
Sweet resin bush			X				X
Pentzia			X				X
Canada thistle			X				
Buffelgrass					X		X
Fountain grass					X		X
Giant reed				X			X
Salt cedar	X	X	X	X	X	X	X
Johnson grass				X	X	X	
Lehmann lovegrass	X	X	X	X	X	X	X
African sumac							X

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 Pinaleno 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 Pinaleno 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 Pinaleno 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 enclosure 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 enclosure. 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 (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 enclosure in Redrock Canyon (Huachuca EMA). This enclosure 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, Metsufuron, Picloram, Sulfometron 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 to follow noxious weed prevention practices and incorporate guidance put forth in The Guide to Noxious Weed Prevention Practices (EA, Appendix C) in planning for any resource management activities.

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

Species common name	Growth habit	Proposed treatment
Tree of Heaven	Tree with prolific root and stump sprouting; not shade tolerant; allelopathic to other trees	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.
Yellow starthistle	Winter annual herbaceous species; prolific seed productions; spreads rapidly	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.
Malta starthistle	Winter annual herbaceous species; prolific seed productions; spreads rapidly. Small seed head formed in the center of rosettes makes hand pulling ineffective.	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.
Canada thistle	Aggressive perennial with creeping root system. Reproduces easily from roots.	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.
Buffelgrass (small population in the Santa Rita EMA)	Perennial with moderate spread by seed and slow spread vegetatively.	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.

Species common name	Growth habit	Proposed treatment
Fountain grass (small population in the Santa Rita EMA)	Perennial with slow spread by seed; generally does not spread vegetatively but there are non-seed producing cultivars.	Hand pull plants in Santa Rita EMA; if this is not successful, spot apply herbicide (glyphosate, imazapic and metsulfuron methyl); repeat pulling and/or herbicide use as necessary to prevent re-establishment.
Johnson grass (Redrock Canyon)	Perennial rhizomatous grass; spreads rapidly	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.
Sweet resin bush	Low growing perennial shrub; reproduces by seed; expands slowly at first and then rapidly; replaces native vegetation.	Work with WMA to determine most effective treatment. Most likely will include burning, pulling, and ground-based broadcast application of herbicides (picloram or clopyralid).
Pentzia	Perennial shrub	Work with WMA to determine most effective treatment. Most likely will include burning, pulling, and spot applied herbicides (picloram and clopyralid).

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

Species common name	Growth habit	Proposed treatment
Bull thistle	Biennial thistle; establishes taproot but not creeping roots; prolific seed producer in open areas.	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.
Buffelgrass	Perennial with moderate spread by seed and slow spread vegetatively.	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.
Fountain grass	Perennial with slow spread by seed; generally does not spread vegetatively but there are non-seed producing cultivars.	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.
Giant reed	Large bamboo like grass. Prolific shoot production; spreads rapidly vegetatively.	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.
Salt cedar	Woody shrub; reproduces by seed	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.
Johnson grass	Perennial rhizomatous grass; sprouts readily	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.

Species common name	Growth habit	Proposed treatment
Lehmann lovegrass	Perennial bunchgrass; highly adaptable and spreads rapidly	If found in small populations, spot treat with herbicide (glyphosate, imazapic or mesulfuron methyl) and revegetate as needed.
African sumac		Hand pull small plants; cut down and spot treat with herbicides if too large to effectively pull.

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.

Species	Status	EMA of Occurrence	Associated Noxious Weeds
<i>Abutilon parishii</i> Pima Indian mallow	S	Scat, Srta	Buffelgrass Fountain Grass
<i>Agave parviflora parviflora</i> Santa Cruz striped agave	S	Tuma	Tree of Heaven
<i>Amoreuxia gonzalezii</i> Saiya	S	Srta	Buffelgrass
<i>Amsonia grandiflora</i> Large-flowered blue star	S	Tuma	Tree of Heaven
<i>Astragalus hypoxylus</i> Huacuca milkvetch	S	Huac	Tree of Heaven
<i>Carex ultra</i> Arizona giant sedge	S	Huac	Giant reed
<i>Coryphantha recurvata</i> Santa Cruz beehive cactus	S	Tuma	Tree of Heaven
<i>Erigeron arisolius</i> Arid throne fleabane	S	Srta	Tree of Heaven
<i>Eupatorium bigelovii</i> Bigalow thoroughwort	S	Pina	Canada thistle
<i>Graptopetalum bartramii</i> Bartrom stonecrop	S	Tuma	Tree of Heaven
<i>Hedeoma dentatum</i> Mock pennyroyal	S	Tuma, Huac, Scat	Tree of Heaven Buffelgrass
<i>Heuchera glomerata</i> Arizona alum root	S	Pina	Salt cedar
<i>Ipomea thurberi</i> Thuber's morning glory	S	Tuma	Tree of Heaven
<i>Laennecia eriophylla</i> Wooly fleabane	S	Srta	Fountain grass
<i>Lilaeopsis schnaffneriana ssp. recurvata</i>	LE	Huac	Giant reed

Species	Status	EMA of Occurrence	Associated Noxious Weeds
Huachuca water-umbel			
<i>Lotus alamosanus</i> Alamos deer vetch	S	Tuma	Tree of Heaven
<i>Macroptilium supinum</i> Supine bean	S	Tuma	Tree of Heaven
<i>Manihot davisiae</i> Arizona manihot	S	Scat, Srta	Buffelgrass Fountain grass
<i>Metastelma mexicanum</i> Wiggins milkweed vine	S	Tuma	Tree of Heaven
<i>Muhlenbergia dubioides</i> Box canyon muhly	S	Scat	Buffelgrass Fountain grass
<i>Pectis imberbis</i> Beardless cinch weed	S	Tuma	Tree of Heaven
<i>Penstemon discolor</i> Catalina beardtongue	S	Scat	Buffelgrass Fountain grass
<i>Penstemon ramosus</i> Branching penstemon	S	Pina	Sweet resin bush
<i>Polemonium flavum</i> Pinaleno Jacob's ladder	S	Pina	Canada thistle
<i>Potentilla albiflora</i> White-flowered cinquefoil	S	Pina	Canada thistle
<i>Rumex orthoneurus</i> Blumer's dock	S	Pina	Canada thistle
<i>Samolus vagans</i> Chiricahua brookweed	S	Huac	Giant Reed
<i>Stevia lemmonii</i> Lemmon's stevia	S	Scat	Buffelgrass Fountain grass
<i>Tephrosia thurberi</i> Thurber hoary pea	S	Huac	Tree of Heaven
<i>Tragia laciniata</i> Sonoran noseburn	S	Tuma, Huac	Tree of Heaven
<i>Tumamoca mcdougalii</i> Tumamoc globeberry	S	Scat	Buffelgrass Giant reed

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.

Species Name	Status	EMA of Occurrence	Associated Noxious Weeds	Comments
Mount Graham red squirrel <i>Tamiasciurus hudsonicus</i>	LE	Pina	Canada thistle	Occupied and potential habitats are found near Canada thistle sites, but the thistle occurs in open, disturbed sites that are not generally suitable as red squirrel habitat.
White-bellied long-tailed vole <i>Microtus longicaudus</i>	S	Pina	Canada Thistle	Species inhabits grassy alpine meadows and flats along streams, cienegas, roadsides and other

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

Species Name	Status	EMA of Occurrence	Associated Noxious Weeds	Comments
	Habitat			
Sabino Canyon damselfly <i>Argia sabino</i>	S	Scat Huac	Buffelgrass Giant reed Pentzia Tree of Heaven	Species and suitable habitats present in Sabino Canyon, Parker Canyon, Adobe Canyon and Walker Basin.
Mexican Meadowfly <i>Symphetrum signiferum</i>	S	Huac	Tree of heaven, Giant reed	Recorded in Parker Canyon and Bear Creek
Pinaleno mountainsnail <i>Oreohelix grahamensis</i>	S	Pina	Canada thistle	Found in leaf litter around rockslides. No suitable habitat present.
Pinaleno tallussnail <i>Sonorella grahamensis</i>	S	Pina	Canada thistle	Inhabits rockslides. No suitable habitat present.
Mimic tallussnail <i>Sonorella imitator</i>	S	Pina	Canada thistle	Inhabits rockslides. No suitable habitat present.

Species Evaluations

Plants

Threatened, Endangered and Proposed Species.

Huachuca water umbel (*Lilaeopsis schnaffneriana* 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).

Data Sources: USFWS 1999, Johnson et al 1992.

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 enclosure 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 that 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, refugial 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 enclosure. 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 refugial 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 Affect, 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

Pima Indian mallow. (*Abutilon 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 desertscrub. 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 buffel grass 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 Enclosure 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 Pinaleno 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.

Woolly 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 woolly 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 (*Macropitilium 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 davisiae*).

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 desertscrub 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 one 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. discolor* occurs. The upper elevation range for buffelgrass is approximately 4,600 feet, with fountain grass potentially occurring somewhat higher. Known populations of *P. discolor* 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 lemmonii*)

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 buffelgrass 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 (*Tephrosia 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 mcdougali*). 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 one 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 1/2 LC50
High	EEC > 1/2 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.

Chemical	Flicker				Quail			
	LD ₅₀ (mg/kg)	1/5 LD ₅₀	Est. Exp.	Risk Asses.	LD ₅₀ (mg/kg)	1/5 LD ₅₀	Est. Exp.	Risk Asses
Glyphosate	Quail, >2000	400	58.7	Low	Quail, >2,000	400	5.1	Low
Dicamba	Pheasant, 673	135	6.1	Low	Bobwhite, >1,750	350	504	Low
Chlorsulfuron	Bobwhite, >5,000	1,000	0.1	Low	Bobwhite, >5,000	1,000	0.1	Low
Imazapic								
Imazapyr	Bobwhite, >2,150	430	3.2	Low	Bobwhite, >2,150	430	2.8	Low
Picloram	Pheasant, >2,000	400	5.7	Low	Pheasant, >2,000	400	4.9	Low
Clopyralid	Duck, 1,465	293	0.8	Low	Duck, 1,465	293	0.7	Low
Metsulfuron methyl	Mallard, >2150	502	0.1	Low	Mallard, >2150	502	0.1	Low
2,4-D	Chukar, 200	40	6.1	Low	Quail, 668	134	5.3	Low
Sulfometron methyl	Mallard, >5,000	1,000	0.4	Low	Mallard, >5,000	1,000	0.3	Low
Tebuthion	Chicken, >500	100	6.3	Low	Chicken, >500	100	5.5	Low
Triclopyr	Mallard, 1,698	340	11.6	Low	Mallard, 1,698	340	10.0	Low
	Western Kingbird				American Kestrel			
	LD ₅₀	1/5 LD ₅₀	Est. Exp.	Risk Asses.	LD ₅₀	1/5 LD ₅₀	Est. Exp.	Risk Asses
Glyphosate	Quail, >2,000	400	15.1	Low	Quail, >2000	400	10.7	Low
Dicamba	Pheasant, 673	135	15.4	Low	Pheasant, 673	135	11.0	Low
Chlorsulfuron	Bobwhite, >5,000	1,000	0.4	Low	Bobwhite, >5,000	1,000	0.3	Low
Imazapic								
Imazapyr	Bobwhite, >2,150	430	7.8	Low	Bobwhite, >2,150	430	5.6	Low
Picloram	Pheasant, >2,000	400	14.9	Low	Pheasant, >2,000	400	10.5	Low
Clopyralid	Duck, 1,465	293	2.0	Low	Duck, 1,465	293	1.4	Low
Metsulfuron methyl	Mallard, >2150	502	0.2	Low	Mallard, >2150	430	0.2	Low
2,4-D	Chukar, 200	40	15.3	Low	Chukar, 200	40	10.9	Low
Sulfometron methyl	Mallard, >5,000	1,000	1.0	Low	Mallard, >5,000	1,000	0.7	Low
Tebuthion	Chicken, >500	100	15.6	Low	Chicken, >500	100	11.3	Low
Triclopyr	Mallard, 1,698	340	30.1	Low	Mallard, 1,698	340	21.2	Low
	Whitetail Jackrabbit				Mule Deer			
	LD ₅₀	1/5 LD ₅₀	Est. Exp.	Risk Asses.	LD ₅₀	1/5 LD ₅₀	Est. Exp.	Risk Asses
Glyphosate	Rat, 3,800	760	2.1	Low	Rabbit, 4,320	864	0.2	Low
Dicamba	Rabbit, 566	113	2.3	Low	Rat, 757	151	0.3	Low
Chlorsulfuron	Rat, 5,545	1,109	0.06	Low	Rat, 5,545	1,109	0.01	Low
Imazapic								
Imazapyr	Rabbit, >4,800	960	1.2	Low	Mouse, 2,000	400	0.2	Low
Picloram	Rabbit, 2,000	400	2.0	Low	Sheep, 720	144	0.2	Low
Clopyralid	Rat, >4,300	860	0.3	Low	Rat, >4,300	860	0.04	Low
Metsulfuron methyl	Rat, 5,000	1,000	0.04	Low	Rat, 5,000	1,000	0.01	Low

2,4-D	Rabbit, 424	85	2.2	Low	Mule deer, 400	80	0.3	Low
Sulfometron methyl	Rat, >5,000	1,000	0.1	Low	Rat, >5,000	1,000	0.02	Low
Tebuthiron	Rabbit, 286	57	2.38	Low	Mouse, >528	106	0.3	Low
Triclopyr	Rabbit, 550	110	4.0	Low	Guinea Pig, 310	62	0.4	Low
	Coyote				Cow			
	LD ₅₀	1/5 LD ₅₀	Est. Exp.	Risk Asses.	LD ₅₀	1/5 LD ₅₀	Est. Exp.	Risk Asses.
Glyphosate	Rat, 4,320	864	0.6	Low	Rabbit, 3,800	760	0.15	Low
Dicamba	Rat, 757	151	0.7	Low	Rat, 757	151	0.2	Low
Chlorsulfuron	Rat, 5,545	1,109	0.02	Low	Rat, 5,545	1,109	0.01	Low
Imazapic								
Imazapyr	Mouse, 2,000	400	0.4	Low	Mouse, 2,000	400	0.1	Low
Picloram	Mouse, 2,000	400	0.5	Low	Cattle, >750	150	0.1	Low
Clopyralid	Rat, >4,300	860	0.1	Low	Rat, >4,300	860	0.03	Low
Metsulfuron methyl	Rat, 5,000	1,000	0.01	Low	Rat, 5,000	1,000	0.003	Low
2,4-D	Dog, 100	20	0.7	Low	Cattle, 100	20	0.2	Low
Sulfometron methyl	Rat, >5,000	1,000	0.05	Low	Rat, >5,000	1,000	0.01	Low
Tebuthiron	Dog, >500	100	0.8	Low	Mouse, >500	100	0.2	Low
Triclopyr	Guinea Pig, 310	62	1.1	Low	Guinea Pig, 310	62	0.3	Low
	Long-tailed vole				Western yellow belly racer			
	LD ₅₀	1/5 LD ₅₀	Est. Exp.	Risk Asses.	LD ₅₀	1/5 LD ₅₀	Est. Exp.	Risk Asses.
Glyphosate	Quail, >2,000	400	39.1	Low	Quail, >2,000	400	0.3	Low
Dicamba	Rat, 757	151	39.5	Low	Pheasant, 673	135	0.7	Low
Chlorsulfuron	Rat, 5,545	1,109	0.9	Low	Bobwhite, 5,000	1,000	0.02	Low
Imazapic								
Imazapyr	Mouse, 2,000	400	19.9	Low	Bobwhite, >2,150	430	0.5	Low
Picloram	Mouse, 2,000	400	38.8	Low	Pheasant, >2,000	400	0.1	Low
Clopyralid	Rat, >4,300	860	5.0	Low	Duck, 1,465	293	0.1	Low
Metsulfuron methyl	Rat, 5,000	1,000	0.6	Low	Mallard, >2150	502	0.01	Low
2,4-D	Mouse, 368	74	39.4	Low	Chukar, 200	40	0.6	Low
Sulfometron methyl	Rat, >5,000	1,000	2.49	Low	Mallard, >5,000	1,000	0.06	Low
Tebuthiron	Mouse, >528	106			Chicken, >500	100		
Triclopyr	Mouse, 471	94	77.9	Low	Mallard, 1,698	340	0.4	Low

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.

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 yerbabuena*).

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 4,000 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 Saguaros 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 (Stefferd 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 in 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 Tumcacori 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. Johnsongrass 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. These 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 (*Sympetrum 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.

Species	Status	Effects Determination
Huachuca water-umbel <i>Lilaeopsis schnaffneriana</i> ssp. <i>recurvata</i>	Endangered	May Affect, Likely to Adversely Affect; Not likely to adversely affect critical habitat.
Mount Graham red squirrel (<i>Tamiasciurus hudsonicus</i> <i>grahamensis</i>)	Endangered	No Effect
Lesser long-nosed bat (<i>Leptonycteris</i> <i>curasoae yerbabuena</i>).	Endangered	No Effect
Mexican spotted owl (<i>Strix</i> <i>occidentalis lucida</i>).	Threatened	No Effect
Cactus ferruginous pygmy owl (<i>Glaucidium brasilianus</i> cactorum)	Endangered	No Effect
Bald eagle (<i>Haliaeetus</i> <i>leucocephalus</i>)	Endangered	No Effect
Chiricahua leopard frog (<i>Rana</i> <i>chiricahuensis</i>).	Threatened	No Effect
Gila topminnow (<i>Poeciliopsis</i> <i>occidentalis occidentalis</i>)	Endangered	May Effect, Not Likely to Adversely Affect
Gila chub (<i>Gila intermedia</i>).	Proposed Endangered	Not likely to jeopardize; no adverse modification of proposed critical habitat

Preparer/Reviewer

I prepared this Biological Assessment and Evaluation.

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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, chlosulfuron, clopyralid, dicamba, glyphosate, imazapic, imazapyr, metsulfuron, picloram, sulfometuron methyl, triclopyr or tebuthiuron 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, ½ 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, Reclaim*

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 (Polyganaceae). 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. These 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 a way that it 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*

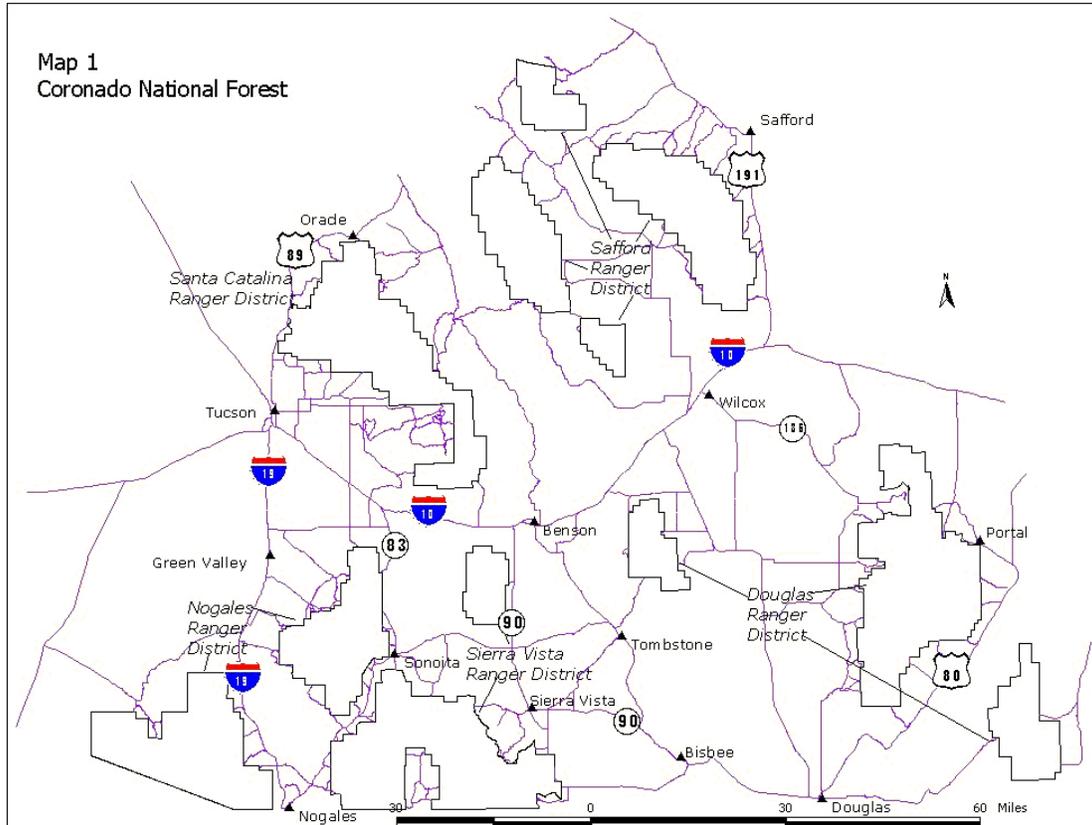
This herbicide is selective and it is especially useful for trees and woody shrubs such as saltcedar. It acts by mimicking the activity of auxin, a natural growth hormone. The active ingredient is readily absorbed by foliage. Average half-life in soil is 30 days (Ahern 1994). Triclopyr is also mixed with clopyralid and marketed under the product name of *Redeem*.

Herbicide: Tebuthiuron

Brand Name: *Spike*

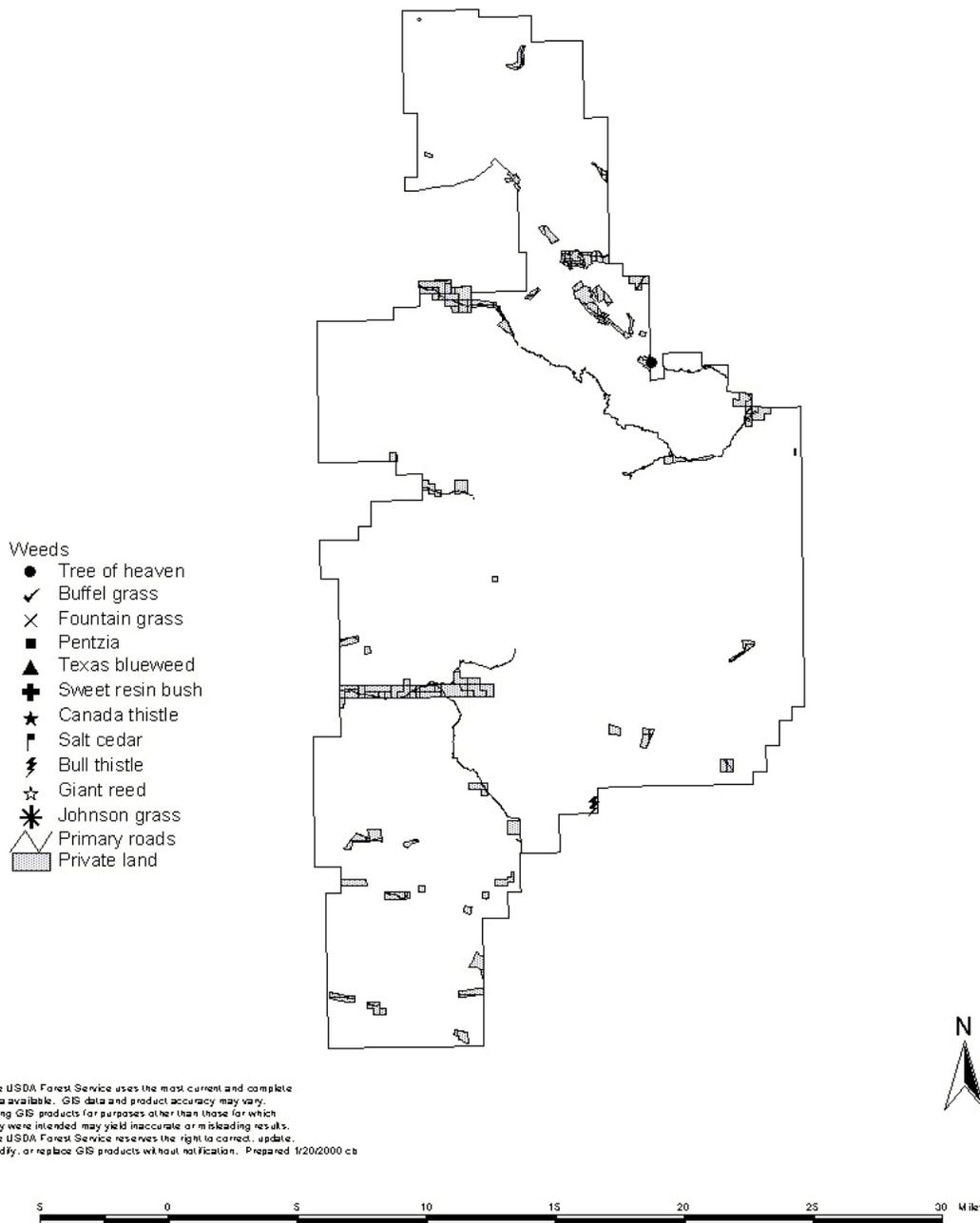
This herbicide can be used in pastures and rangelands, in non-crop situations, for control of certain broadleaf weeds and woody species. It is persistent in soil with a half-life of 12-15 months. This makes this compound particularly useful for difficult to control species like camelthorn.

MAP 1: PROJECT AREA



MAP 2: CHIRICAHUA E.M.A.

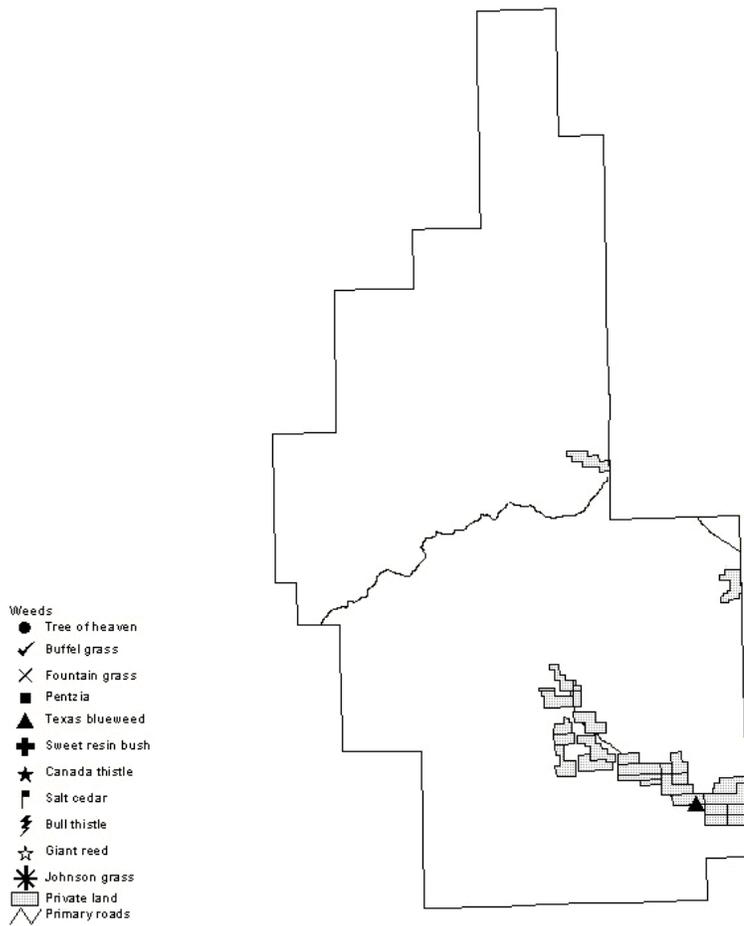
Map 2
Weed locations
Douglas Ranger District
Chiricahua EMA



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MAP 3: PELONCILLO E.M.A.

Map 3
Weed locations
Douglas Ranger District
Peloncillo EMA

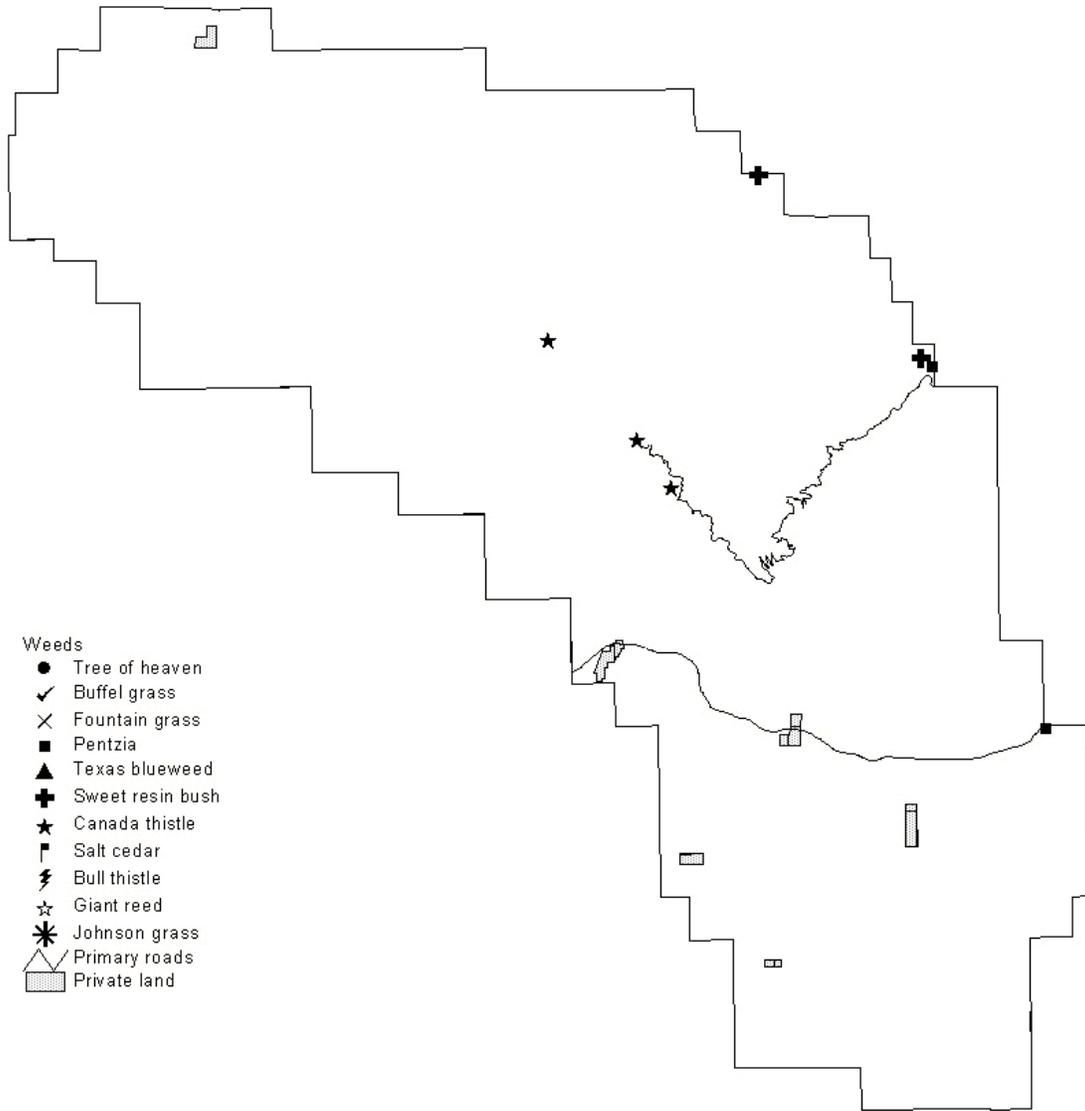


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MAP 4: PINALENO E.M.A.

Map 4
Weed locations
Safford Ranger District
Pinaleno EMA

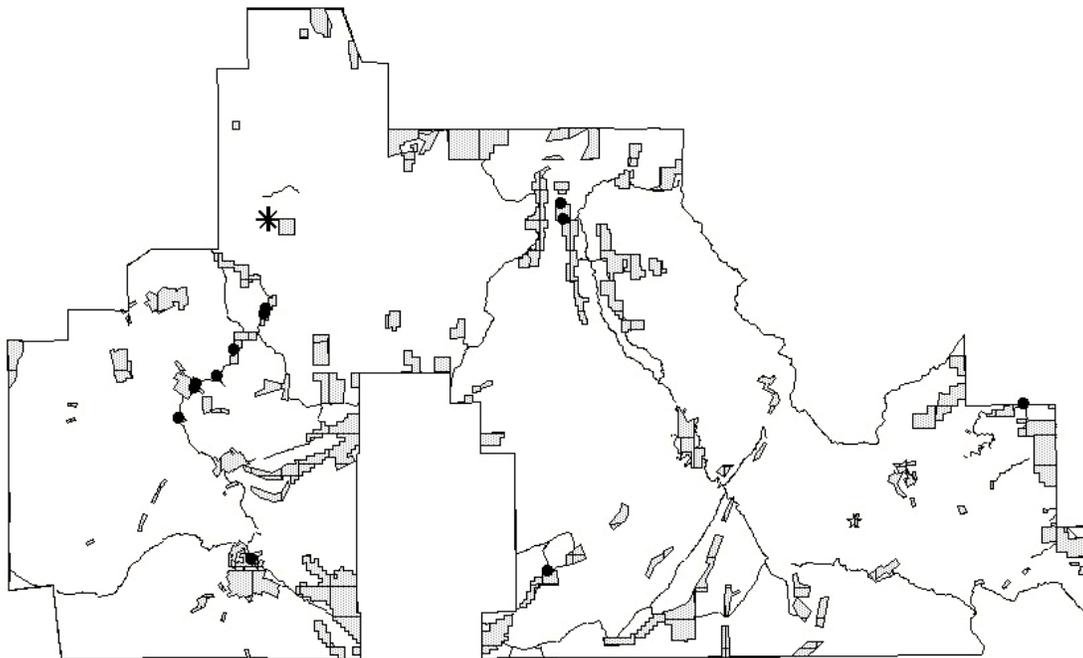


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MAP 5: HUACHUCA E.M.A.

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



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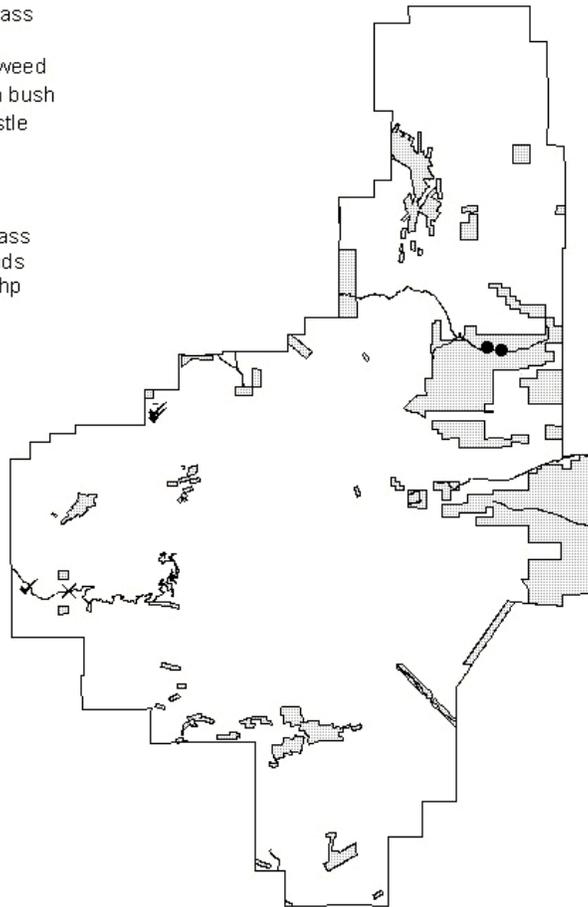


MAP 6: SANTA RITA E.M.A.

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
- ▭ Sritowner.shp

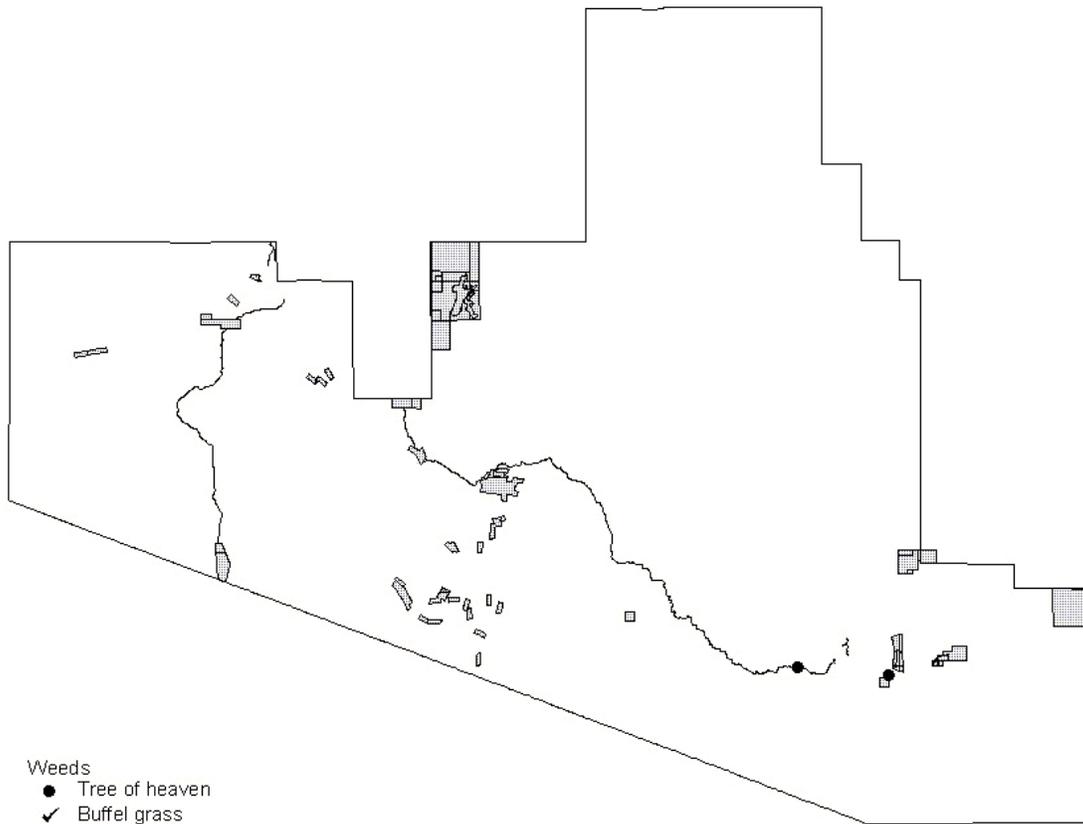


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MAP 7: TUMACACORI E.M.A.

Map 7
Weed locations
Nogales Ranger District
Tumacacori 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

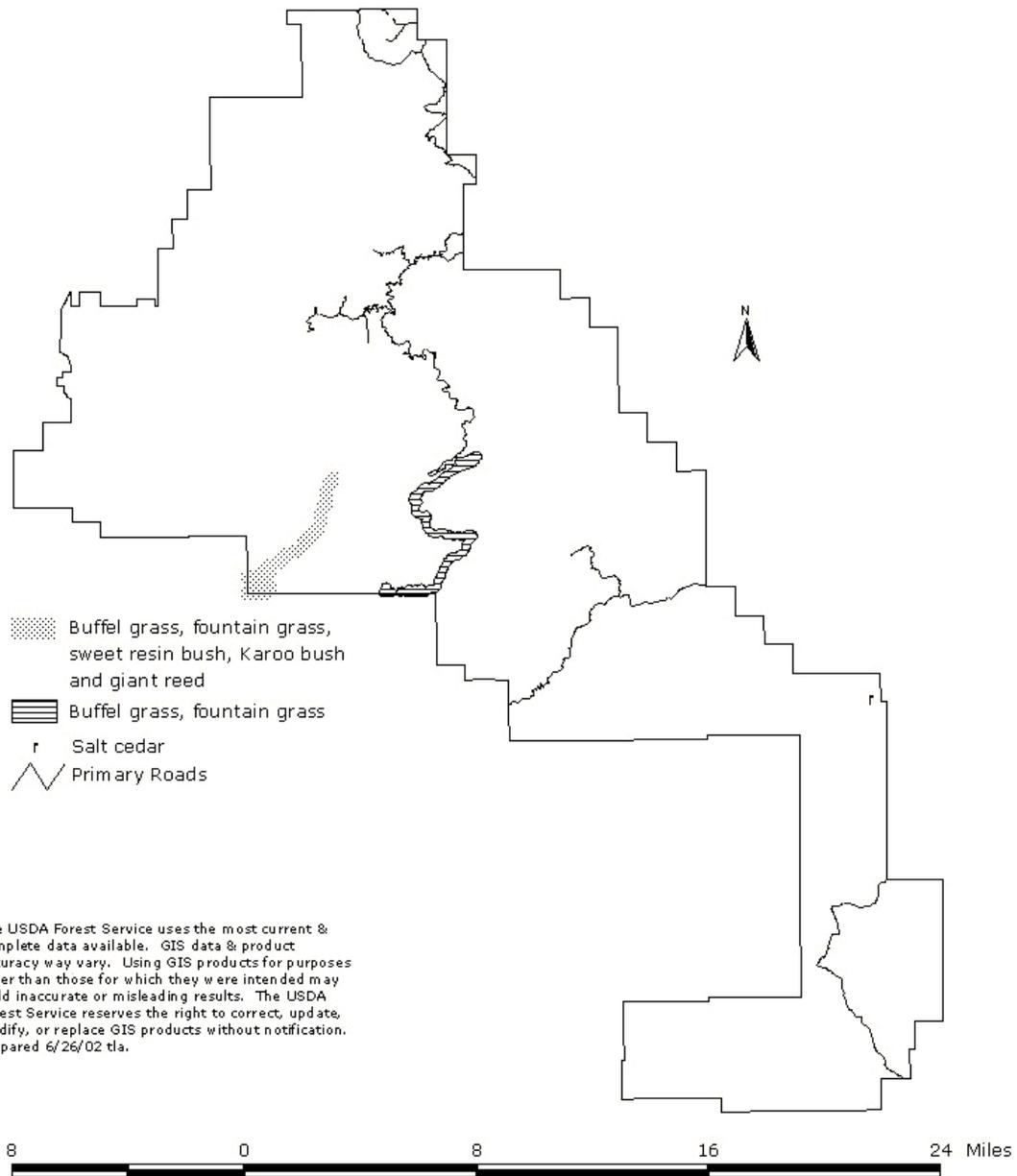


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MAP 8: SANTA CATALINA E.M.A.

Map 8
Weed locations
Santa Catalina Ranger District
Santa Catalina EMA



Appendix G

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Appendix H. Acronyms Used in the Environmental Assessment

ADI:	Acceptable Daily Intake
APHIS:	Animal and Plant Health Inspection Service
ARS:	Arizona Revised Statutes
ATV:	All Terrain Vehicle
BLM:	Bureau of Land Management
CCC:	Civilian Conservation Corps
CEQ:	Council on Environmental Quality
CFR:	Code of Federal Regulations
EA:	Environmental Assessment
EMA:	Ecosystem Management Area
EPA:	Environmental Protection Agency
FSH:	Forest Service Handbook
FSM:	Forest Service Manual
GIS:	Geographic Information System
IBA:	Important Bird Area
IVM:	Integrated Vegetation Management
LC ₅₀ :	Lethal Concentration
LD ₅₀ :	Lethal Dose
LRMP:	Land and Resource Management Plan
MIS:	Management Indicator Species
NEPA:	National Environmental Policy Act
NMSA:	New Mexico Statutes Annotated
NOEL:	No Observable Effect Level
NRCS:	Natural Resources Conservation Service
PL:	Public Law
PPE:	Personal Protective Equipment
PR:	Project Record
PUP:	Pesticide Use Proposal
RfD:	Reference Dose
RNA:	Research Natural Area
SCS:	Soil Conservation Service
TEPS:	Threatened, Endangered, Proposed and Sensitive (also TES)
TMDL:	Total Maximum Daily Load
USC:	United States Code
USDA:	United States Department of Agriculture
USFS:	United States Forest Service
WMA:	Weed Management Area