MAINTENANCE SPECIFICATIONS

120-Day Container Plant Warranty Period

During the 120 days following the completion of container plant installation at restoration sites must be maintained regularly (e.g. once or twice a month) to ensure their successful establishment. At the end of the 120-day establishment period, a thorough inspection of the restoration areas shall be conducted by the Restoration Grantee and ANF Botanist, and a list of those container plants that are dead and/or dying shall be submitted to the ANF. The Restoration Grantee shall guarantee 75 percent survival of the plants during the warranty period. Throughout the 120 day warranty period the Restoration Grantee will likely need to monitor the restoration sites and make adjustments in order to ensure that the warranty period success criteria are met. This will most likely mean visiting the restoration sites as often as biweekly. Monitoring will consist of walking through all restoration sites and taking notes on restoration progress and/or setbacks.

Irrigation

Supplemental irrigation will be necessary during plant establishment to ensure successful establishment and growth of container plants. The frequency and amount of required watering depends on the type of irrigation utilized. This is described below for each watering method. The Restoration Grantee will verify that irrigation has been performed adequately (e.g. verifying that soil is moist to a minimum depth of 14 inches). The irrigation system installed by the Restoration Grantee is subject to the review and approval of the ANF Botanist. If container plantings are done at the incorrect time of year (outside of October 1 to February 1) irrigation rates may increase as much as threefold. Supplemental watering methods will vary based on site access and location but will typically consist of one of the following methods:

- Deep pipe watering: Deep pipes are vertical plastic pipes with holes drilled in them at different depths (typically 2 inches in width and 14 inches in depth) that are inserted next to container plants to allow irrigation water into the deep root zone. This improves water delivery to the plants roots and minimizes water evaporation and weed growth. A cap or screen is put over the top of the pipe to discourage wildlife and debris from entering. Deep pipes can be filled by a water truck hose, watering can, or a drip emitter with pulsed irrigation from a remote storage tank or water truck hookup. See the description of drip irrigation below on these specifics. It is expected that in the first year after planting, container plants will be watered (typically 1-2 liters) twice per month every month of the year if no rain event occurs. The rain event should measure at least 1 inch to obviate the need for supplemental water. In the second year after planting, container plants will be watered twice per month, if no rain event occurs, between May and October. In the third year after planting, container plants will be watered once every two months starting in June and ending in October. In the fourth year after planting, container plants should not need to be watered, unless it is an extremely dry year.

- Tree Shelter watering: If tree shelters are installed over plants, drip irrigation may also be funneled into the base of the tree shelter rather than using deep pipes. However, the tree shelter must be sufficiently buried into the soil to prevent water leakage. Watering schedules would be the same as described above for deep pipe watering.

- Surface watering: Container plants would be watered using a hose connected to water truck or water storage tank. Water is applied using a shower head-type nozzle capable of providing low – pressure application to prevent erosion or damage to the plantings and planting basins. It is expected that in the first year after planting, container plants will be deep watered (typically1 -2 gallons per plant) every 10 days to 2 weeks during the 120-day establishment period and every 2-3 weeks the remaining months of the year if no rain event occurs. The Restoration Grantee will monitor soil moisture and schedule irrigation to promote deeper rooting and plant acclimation. In the second year after planting, soil moisture will be monitored and container plants will be deep watered every 2-3 weeks to promote deeper rooting and plant acclimation between May and October. In the third year after planting, container plants will be deep watered once every two months starting in June and ending in October. In the fourth year after planting, container plants should not need to be watered, unless it is an extremely dry year. Surface watering can be combined with a main line irrigation system to bring water out along lengthy disturbance areas.

Weed Control (Outlined in greater detail in the ANF Herbicide Use and Guideline Document (Appendix A))

The Restoration Grantee shall remove all nonnative weeds from the restoration areas in order to help establish the developing plant community by reducing the competition for natural resources, including water, nutrients, and sunlight. Restoration areas will be subject to weed control efforts until the performance standards are met. A listing of the known non-native, invasive plant species on the ANF can be found in Appendix B. The amount of weeding required will be determined by the amount of weed seed in the soil, weather conditions, and the Restoration Grantee's diligence in removing the weeds, thereby reducing the weed seed bank. An annual pre-weed removal meeting will be held in December or early January between the ANF Botanist and Restoration Grantee to discuss weed control methods and schedules.

Following installation, weeds will be controlled through manual removal or herbicide use. These two methods are described in detail below. The control method used will depend on the weed species, location of weeds, and the time of year that weed operations occur. Installed plants and native vegetation shall not be damaged by weed control operations.

Regardless of the method of control, all weeds on site shall be removed prior to the development of seed to prevent the introduction of more weed seed into the soil seed bank. If weeds are not controlled before they reach a flowering or seeding stage they shall have these reproductive parts bagged in 3 mil or greater plastic, sealed to prevent seed dispersal and disposed of legally off site.

All equipment, tools, tires, and shoes should be cleaned by air, brush, or water before entering and after leaving the restoration site. Excess loose dirt and mud may spread noxious weed seeds from one area to another.

It is the responsibility of the Restoration Grantee to ensure that all restoration sites will have less than a 5% cover of all non-native species at the end of each growing season for the life of the contract.

Manual removal: Manual removal is the process of removing the entire portion (roots, stems, flowers, seeds) of a non-native species by hand. Hand removal of non-native species may include the use of small trowels, but not hoes unless approved by an ANF botanist, and care must be taken to ensure that the root systems of native plants are not damaged in the process.

Herbicide removal: All herbicides used will be applied by a qualified individual in accordance with the Herbicide Control Goals and Guidelines attached as Appendix A of this document. The Restoration Grantee will adhere to the ANF Herbicide Use and Guidelines (Appendix A) for allowed use of specific herbicides for site specific populations.

Herbicide Treatment Guidelines: In order to purchase herbicide, the Restoration Grantee must have a Pest Control Business License or be in possession of a Qualified Applicator's License (QAL). However in order to apply pesticides, a QAL is only necessary if restricted use pesticides are being utilized. In this project only general use herbicides are going to be utilized, therefore a Qualified Applicator is not required to be present when herbicides are being handled. Herbicide application will be limited to cutting and painting stumps, basal bark spray, or foliar or spot spray using backpack or ATV-mounted (for roads) sprayers. Herbicide will be applied according to the label instructions. A listing of the herbicides that are authorized for use and their effects on vegetation and wildlife is in Appendix A.

A brightly colored dye shall be used in all applications. The dye shall be a nontoxic, water-soluble, liquid material, such as "Blazon" by Milliken Chemicals or equivalent. The dye shall be mixed with the herbicide at no more than half the rate specified on the label (one-quarter the rate will usually suffice).

Spraying shall be conducted only when weather conditions are conducive to effective uptake of the herbicide by the targeted species (e.g., sunny, dry, and when plants are actively growing) and when wind conditions are such that herbicide drift is nonexistent. Applications of herbicide will not occur during or if a precipitation event is expected. During herbicide application, protection for non-targeted species is required. This is relevant to any native plants outside the restoration areas, as well as native plants within these areas. No herbicide will be stored on or near the ANF.

DECISION NOTICE/FINDING OF NO SIGNIFICANT IMPACT

ANGELES NATIONAL FOREST and
SAN GABRIEL MOUNTAINS NATIONAL MONUMENT
PLAN FOR INVASIVE PLANTS

U.S. FOREST SERVICE
Los Angeles and San Bernardino Counties, California

DECISION

Based upon my review of the Plan for Invasive Plants Project Environmental Assessment (EA), I have decided to implement Alternative 2, the Proposed Action which includes the eradication, control, containment, or suppression of existing and new infestations of invasive plant species that are undesirable, noxious, harmful, injurious, or poisonous. This Decision Notice/Finding of No Significant Impact covers all areas in the project except wilderness and Research Natural Areas. San Gabriel, Cucamonga, Sheep Mountain, Pleasant View Ridge and Magic Mountain Wildernesses and Falls Canyon Research Natural Area are not covered under this Decision Notice/Finding of No Significant Impact.

All proposed treatment methods including mechanical, manual, fire wilting, and herbicide, will be used. The specific herbicides included for use in this decision are listed in the EA (pg. 14). I am allowing the use of special chemicals called surfactants or adjuvants, which will increase the effectiveness of herbicides.

The project incorporates an adaptive management strategy that allows the project to be modified based on invasive plant expansion or new infestations of invasive plants. Prescriptions for treatment will follow integrated weed management, using site specific factors to find the treatment or combination of treatments that is most effective for each site. Monitoring and restoration are also key components of the proposed action. All monitoring data will be compiled through Forest Service Activity Tracking System (FACTS) and National Resource Information System (NRIS) corporate databases. Restoration activities will occur where needed to ensure treated areas are not re-colonized with invasive plant species. The EA summarizes and incorporates by reference a Monitoring Plan, and a Restoration Plan, and I am adopting the FY 2015 versions of each of these documents as part of my decision.

All the design features for the Proposed Action described in the EA will be implemented. Treatment may also occur on adjacent non-FS lands if landowners or managers wish to enter into participating agreements with the Forest Service. The annual treatment within the project area will not exceed 3000 acres.

DECISION RATIONALE

Invasive species are widely recognized by federal, state, and local governments, a variety of environmental and conservation groups and the scientific community as a primary threat to ecosystem health and function (EA pp. 4-5). Based on the Environmental Assessment, Alternative 2 best meets the purposes of and needs for the project while minimizing adverse effects to the environment. I based my conclusion on a review of the analysis showing the use of best available science. I selected Alternative 2 because it provides a variety of management tools to counteract the persistent and growing threats posed by invasive species.

Mechanical methods, without the use of herbicides, was analyzed and considered (Alternative 3). This alternative was not selected because it doesn't meet the purpose and need. Manual removal (no herbicide use) would have resulted in less efficiency, lower treatment acreages annually, and higher costs. While it is possible to contain and control spread of some invasive species using only manual or mechanical methods, several of the most damaging invasive species are known to persist and expand when treated

mechanically. Invasive species management is more feasible with herbicides in conjunction with other techniques, as in an integrated weed management system. A No Action Alternative was also considered. It would allow invasive species to continue to expand and spread both on and off NFS lands, which would not meet the project's purpose and need (EA, pp. 43).

Alternative 2 allows for and encourages cooperation with state and county agencies and private landowners in managing invasive plants on non-NFS lands, including treatments where authorized by agreement (EA, pg. 5).

Dense stands of tamarisk and arundo can reduce streamflow by direct water usage and can affect stream morphology by unnaturally stabilizing stream banks, islands, sandbars and floodplains. Tamarisk can increase salt buildup in soils, reducing soil productivity (EA, pg. 60). Treatment of invasive plants located in riparian habitat will improve aquatic habitat conditions and overall quality and quantity of water by eradicating or controlling these quick invaders from stream areas.

Treating invasive species, particularly those with potential to alter fire regimes, will also reduce the risk of increased fire severity and frequency of damaging fires in these drainages (EA, pg. 39).

I am making this decision with full recognition of the impacts and risks of using chemical herbicides. Alternative 2 will use an integrated weed management approach in which herbicide use is an option but is not intended to be the only or even the primary treatment for all invasive plants. The six herbicides I am allowing under Alternative 2 are approved for use by the Environmental Protection Agency (EPA), are the subject of detailed human health and ecological risk assessments, and are the safest chemicals that will accomplish the project's objectives. My decision does not allow broadcast spraying of any herbicides.

Numerous design features are incorporated into the alternative to manage impacts to populations of threatened, endangered, and Forest Service sensitive plant and wildlife species. Other design features are included to minimize impacts to the native riparian vegetation and provide for health and safety to humans (EA, pp. 19-32). I have determined that short term risks to wildlife, native plants, and human health and safety are effectively mitigated by the adoption of a thorough list of design features, and are outweighed by many long term benefits of aggressively treating invasive species with an integrated approach using a variety of treatment methods.

Based on the project including numerous design features, adverse impacts to resources have been managed. The Invasive Plant Treatment Project EA documents the environmental analysis and conclusions upon which this decision is based.

PUBLIC AND AGENCY INVOLVEMENT

This action was originally listed as a proposal on the Angeles National Forest (ANF) Schedule of Proposed Actions on April 1, 2015 and updated periodically during the analysis. A postcard was mailed to over 1000 interested parties on April 20, 2015 inviting their review on the draft EA and comments on the scope of the proposal. A legal notice was published in the LA Times Newspaper on April 22, 2015. Information about the project was also posted to the ANF Website under the SOPA category. The Team Leader responded to over 20 individual e-mails and phone calls during the scoping period.

A legal notice was published on April 22 in the LA Times Newspaper, starting the official 30-day public comment period required by 36 CFR 218. The Team Leader again responded promptly to several e-mail inquiries during this comment period. Throughout the entire process, the ID Team communicated with several key regulatory, partner, and otherwise interested public agencies (EA, pg. 74).

The Forest Service has documented, analyzed, and responded to the public comments received during the scoping and comment periods for the Plan for Invasive Plants EA.

Appendix A summarizes the comments received during the scoping/comment periods and provides the agency's response to those comments. I have reviewed and considered all public and agency viewpoints submitted. On the whole, the record reflects a strong support for the project's objectives and methods, with concerns over adverse impacts addressed through the application of design features.

FINDING OF NO SIGNIFICANT IMPACT

I have considered the significance of environmental impacts in terms of context and intensity. This means that the significance of an action must be analyzed in several contexts such as society as a whole (human and national), the affected region, the affected interests, and the locality. Significance varies with the setting of the proposed action. In the case of a site-specific action, significance usually depends upon the effects in the locale rather than in the world as a whole. Intensity refers to the severity or degree of impact (40 CFR 1508.27). The EA addresses the elements of significance in detail (EA pp. 69-74). I have reviewed these elements, and my consideration of them is summarized here.

CONTEXT

This project is located throughout the Angeles National Forest and San Gabriel Mountains National Monument. This Forest is an urban forest with large population centers nearby (e.g. Los Angeles). This project covers approximately 375,820 acres. The proposed action will provide long term benefits and will not have a significant adverse effect to society locally or regionally, short-term or long-term.

INTENSITY

The intensity of effects was considered in terms of the following:

1. **Impacts may be both beneficial and adverse. A significant effect may exist even if the Federal agency believes that, on balance, the effect will be beneficial.**

   Consideration of the intensity of environmental effects is not biased by beneficial effects of the action. Chapter 3 of the EA is the analysis of effects (pp. 37-74).

2. **The degree to which the proposed action affects public health or safety.**

   One of the objectives for this project is to provide for health and safety during implementation of the project. As noted in the human health and safety section in Chapter 3 of the EA, health and safety are broken into three main groups: fire and fuels, non-herbicide activities and herbicide use. Greatest risk to humans is from the use of triclopyr 3A. Design features are included in the proposed action to reduce potential health and safety risks from the use of this herbicide along with other potential health and safety risks from the implementation of this project. Based on the proposed action, including the design features, there will be no significant effects on public health and safety.

3. **Unique characteristics of the geographic area, such as proximity to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas.**

   There are special designations within the project area, including Big Tujunga Canyon Treasured Landscape and Critical Biological Land Use Zones designated in the Land Management Plan. The objectives of the project complement and enhance each of these unique areas. Many special historic or cultural resources also occur within the project area, they will be protected through the application of design features (EA, pg. 31). Consultation with the State Historic Preservation Office occurred, and the design features reflect their recommendations. There will be no significant effects to any unique characteristics of the project area.

4. **The degree to which the effects on the quality of the human environment are likely to be highly controversial.**

   A majority of the comments were in favor of the project and agreed with its objectives. The EA adequately analyzes the risks of herbicide to humans and makes comparisons to an alternative that would not use them. Based on the overall analysis in the EA and the public involvement, the effects of the proposed action are not likely to be highly controversial.

5. **The degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks.**

   The Forest Service has considerable experience with actions like the one proposed. The EA, the analysis for herbicide use focused on the detailed national risk assessments and potential effects are noted in Chapter 3 of the EA. Because all six herbicides have been approved by EPA and are certified for use by the State, it is unlikely the risks are highly uncertain or involve unknown risk. In addition, numerous design features have been incorporated into Alternative 2 to reduce potential risks to the environment caused by the use of herbicides. The analysis shows the effects are not uncertain, and do not involve unique or unknown risk.

6. **The degree to which the action may establish a precedent for future actions with significant effects, or represents a decision in principle about a future consideration.**

   Alternative 2 is project-specific and does not establish a precedent for future actions with significant effects. Any future actions not covered by this proposal would need to consider all relevant scientific, site-specific information available at that time, and an independent environmental analysis of environmental consequences. The project does not involve future connected actions.

7. **Whether the action is related to other actions with individually insignificant but cumulatively significant impacts.**

   Based on the cumulative effects analysis addressed for each resource, there would be no significant cumulative effects. The analysis determined that Alternative 2, when combined with other actions in the project area, would likely have beneficial cumulative effects related to reducing the spread of invasive plants. This would result from either expanding the capacity of other actions for control and eradication or by mitigating their potential for increasing invasive plant distribution and abundance in the project area.

8. **The degree to which the action may adversely affect districts, sites, highways, structures, or objects listed, or eligible for listing, in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources.**

   As noted in the third intensity factor above, Alternative 2, including the implementation of the heritage resource design features, is not expected to have direct or indirect adverse effects to cultural resource sites. By implementing the design features, which include pre-treatment surveying in areas and projects with potential effects, flag and avoidance, and monitoring protection measures effectiveness, Alternative 2 would have a less than significant effect to cultural and historic resources.

9. **The degree to which the action may adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act of**

The project area is occupied by or has habitat for twelve threatened or endangered species: Nevin's Barberry, slender-horned spineflower, thread-leaved Brodiaea, Braunton's milk-vetch, California condor, southwestern willow flycatcher, least Bell's vireo, coastal California gnatcatcher, arroyo toad, mountain yellow-legged frog, California red-legged frog and Santa Ana sucker. Critical habitat for the mountain yellow-legged frog, arroyo toad, Santa Ana sucker, southwestern willow flycatcher and coastal California gnatcatcher is also present. There are many design features to minimize impact to federally listed plant and wildlife species (e.g. pre-treatment surveys; restriction on herbicide use near known populations; possibly flag and avoid, seasonal restrictions; monitor where treatments occur near listed plant populations). Based on the EA, the impacts from Alternative 2 would be beneficial in the long run by countering threats invasive species pose to listed wildlife habitats. A Biological Assessment was submitted to the U.S. Fish and Wildlife Service (FWS) with a request to initiate consultation. On 11/17/2015 we received the letter of concurrence for federally endangered Braunton's milk-vetch (Astragalus brauntonii), Nevin's barberry (Berberis nevinii), slender-horned spineflower (Dodecahema leptoceras), southwestern willow flycatcher (Empidonax troillii extimus), least Bell's vireo (Vireo bellii pusillus), and mountain yellow-legged frog (Rana muscoso), the federally threatened thread-leaved brodiaea (Brodiaea filifolia), Santa Ana sucker (Catostomus santaanae), California red-legged frog, (Rona droytonii) (R. aurora d.), coastal California gnatcatcher (Polioptila californica californica). We have not yet received a biological opinion for the federally endangered arroyo toad [Anaryrus colifornicus (Bufo microscaphus c.)]. Work will not begin in occupied or critical habitat for the arroyo toad until we receive the biological opinion.

10. **Whether the action threatens to violate Federal, State, or local law or requirements imposed for the protection of the environment.**

The action will not violate Federal, State, and local laws or requirements for the protection of the environment. Applicable laws and regulations were considered in the EA and the action is consistent with the Angeles National Forest Land Management Plan (LMP). The EA contains a thorough review of all applicable goals, desired conditions, strategies and standards, and the design features represent consistency with all these LMP components.

After considering the effects of the actions analyzed, in terms of context and intensity, I have determined these actions will not have a significant effect on the quality of the human environment. Therefore, an environmental impact statement will not be prepared.

FINDINGS REQUIRED BY OTHER LAWS AND REGULATIONS

As noted above, this decision is consistent with LMP s required by the National Forest Management Act and does not violate Federal, State or local laws and regulations. Discussions of the various key laws and regulations and how the project complies with them are located on pages 4-5 of the EA.

Administrative Review Opportunities

This decision was subject to the pre-decisional objection process described in 36 CFR 218, Subparts A and B. The objection process allows those who have submitted substantive comments during an official comment period to request review of my decision by the Pacific Southwest Regional Office.

An objection period began on September 8, 2015 with the publication of a legal notice in the Los Angeles Times. Prior to the legal notice individuals were contacted who had submitted comments on the project, notifying them of the opportunity to file an objection. The period to file objections was 45

days, as specified in regulation, and ended on October 23, 2015. No objections were received.

Implementation Date

Implementation of this decision may occur on, but not before, the 5th business day following the close of the objection filing period.

Contact:

For additional information concerning this decision, contact:
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Jeffrey Vail
Forest Supervisor

12/02/15
Date

United States
Department of
Agriculture

Forest
Service

September 2015

Environmental Assessment

Angeles National Forest and San Gabriel Mountains National Monument

Plan for Invasive Plants

Los Angeles and San Bernardino Counties, California

For Information Contact: Janet Nickerman
Project Lead, Angeles National Forest
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CHAPTER 1 - INTRODUCTION

Background

Executive Order 13112 defines invasive plants as "non-native plants whose introduction does, or is likely to, cause economic or environmental harm or harm to human health" (http://ceq.hss.doe.gov/nepa/regs/eos/eo13112.html). Some invasive plants can change ecosystem processes such as hydrology, fire regimes, and soil chemistry. These invasive plants have a competitive advantage because they are no longer controlled by their natural predators, and can quickly spread out of control. They spread with no consideration for land ownership boundaries. Furthermore, invasive plants that grow along stream channels can easily and often increase their infestation because their seeds, effortlessly, are capable of traveling downstream. In California, approximately 3 percent of the plant species growing in the wild are considered invasive, but they inhabit a much greater proportion of the landscape (Cal-IPC).

The purpose of this environmental assessment is to assess the environmental effects of invasive weed treatment in Angeles National Forest and San Gabriel Mountains National Monument watersheds, both on and off Forest and Monument lands. This proposed action will address areas not previously covered by the Invasive Plant Treatment Project, Santa Clara Watershed, Santa Clara/Mojove River Ranger District (ANF 2013) or the Invasive Plant Treatment Project, San Gabriel District (ANF 2011). These decision documents have completed evaluation for invasive weed treatments on Forest Service lands in the Santa Clara Watershed: Gorman, Liebre Gulch, Piru, Castaic, Fish Canyon, Elizabeth Lake Canyon, San Francisquito, Bouquet, Mint Canyon, Agua Dulce, Sand Canyon, Arrastre, and Aliso. The Invasive Plant Treatment Project, San Gabriel District covers the majority of the main drainages on the San Gabriel River Ranger District and San Dimas Experimental Forest (i.e., San Gabriel, Big and Little Dalton, San Dimas drainages), 350ft to either side of the high-water mark.

If the invasive species are left unchecked, the ecosystems within the project area will dramatically change. Invasive plants create a host of adverse environmental effects, including displacement of native plants and reduction in habitat and forage for wildlife (including federally listed threatened and endangered, and Forest Service sensitive[1] species); reduction in water quantity; potential reduction in soil productivity; and potential increase in the intensity and frequency of wildfires. After wildfires, non-native plant species typically re-establish more rapidly than native plants, suppressing the recovery of the native vegetation and allowing the invasive plants to expand their range. In addition, when wildfires occur too frequently (tamarisk and arundo-dominated communities experience higher fire frequencies than native riparian communities), some native vegetation loses the ability to recover, effectively converting high diversity native plant communities into low diversity non-native plant communities.

The Angeles National Forest Land Management Plan (Forest Plan) states, "….some of the greatest threats to riparian and aquatic habitats are from the invasion of non-native plant species, particularly tamarisk, arundo, and cape ivy within the stream channels…." (Forest Plan, part 1, p. 41; USFS 2005).

The Federal Noxious Weed Act of 1974 (7 USC 214), Section 15, requires federal land management agencies to develop and establish a management program for control of undesirable plants that are classified under state or federal law as undesirable, noxious, harmful, injurious or poisonous on federal lands under the agency's jurisdiction (7 USC 2814[a]). The Act also requires the federal land management agencies to enter into cooperative agreements to coordinate the management of

undesirable plant species on federal lands where similar programs are being implemented on state and private lands in the same area (7 U.S.C. 2814[c]).

The Wyden Amendment (Public Law 105-277, Section 323 as amended by Public Law 109-54, Section 434) authorizes the Forest Service to enter into cooperative agreements to benefit resources within watersheds on National Forest System lands. Agreements may be with willing federal, tribal, state, and local governments, private and nonprofit entities, and landowners to conduct activities on public or private lands for the protection, restoration, and enhancement of fish and wildlife habitat and other resources; reduction of risk for natural disaster where public safety is threatened; or a combination of both.

Executive Order 13112 of February 3, 1999, Invasive Species, is intended to prevent the introduction of invasive species, provide for their control, and to minimize the economic, ecological, and human health impacts that invasive species cause. Agencies shall identify which actions could affect the status of invasive species; use an integrated weed management approach to managing invasive species; and not authorize, fund, or carry out actions that would likely cause or promote the introduction or spread of invasive species unless it can be shown the actions clearly outweigh the potential harm caused by invasive species.

The National Fire Plan 10-year Comprehensive Strategy Implementation Plan (USFS 2001) includes an action to eradicate or minimize the rate of spread of invasive species that negatively impact natural fire cycles and fire-adapted ecosystems.

Forest Service National Strategic Plan (USFS 2013) includes objectives to reduce adverse impacts from invasive and native species, pests, and diseases, and restore and maintain healthy watersheds and diverse habitats.

The Forest Plan (USFS 2005) has goals to reverse the trend of increasing loss of natural resource values due to invasive species (Goal 2.1), retain a natural evolving character within wilderness (Goal 3.2), improve watershed conditions through cooperative management (Goal 5.1), improve riparian conditions (Goal 5.2), and provide ecological conditions to sustain viable populations of native and desired non-native species (Goal 6.2). The Forest Plan Weed Management Strategy (appendix M in the Forest Plan, part 3) includes coordinating with the Los Angeles Weed Management Area (WMA) to continue controlling and/or removing tree-of-heaven, tamarisk, and arundo in San Gabriel, Big and Little Dalton, and San Dimas canyons. In the Forest Plan, Environmental Impact Statement, Table 463 prioritized the invasive weeds known to occur on the ANF. However, this table was only accurate until 2005. Surveys have shown new invasive species have been found and populations have grown over the last 10 years. Invasive species populations have changed so much that Table 463 is no longer helpful as a management tool.

The desired conditions for the project area are to have structure, function, and composition of plant communities and wildlife habitat unimpaired by the presence of invasive non-native plants (Forest Plan, part 1, p. 32; USFS 2005); to have the watercourses functioning properly with riparian vegetation consisting primarily of native species, with minimal or no presence of invasive non-native plants (Forest Plan, part 1, p. 41; USFS 2005); and to reduce and control exotic species over time to restore healthy riparian systems (Forest Plan, part 2, pp. 42, 66; USFS 2005).

Purpose and Need for Action

Based on national, agency, and forest direction, the needs for this project are to:

- Eradicate, control, contain or suppress existing invasive plant species through a combination of manual and herbicide removal in the Angeles National Forest and San Gabriel Mountains National Monument.

- Provide for aggressive treatment of new and existing infestations of invasive plants (in terms of new areas and new species) to allow for rapid treatment and containment of small infestations before they become established.
- Cooperate with state and county agencies and private landowners interested in managing invasive plants within the project area.

In meeting the needs for action, the following purposes (objectives) must be achieved:

- Improve riparian habitat, aquatic conditions, and the overall quality and quantity of water.
- Eradicate, control, contain, or suppress highly flammable and fire-adapted invasive plants as well as those negatively affecting ecosystems. Highly flammable and fire-adapted invasive plants can increase fire severity and increase the frequency in occurrence of damaging wildfires in these drainages. Invasive which damage ecosystems can permanently alter functional systems.
- Reduce adverse impacts from the project to populations of threatened, endangered, and/or Forest Service sensitive plant and wildlife species.
- Reduce adverse impacts to the native riparian vegetation within the project area.
- Provide for health and safety during implementation of the project to nearby residents, forest visitors, and project implementers.

Challenges in meeting the above direction given the current conditions:

- 375, 820 acres of the ANF do not have NEPA coverage for invasive species removal. That's 53.6% of the Forest.
- In some areas, manual removal is completed through the roadside maintenance CE. This is costly with higher land impacts for internal crews and external partners.
- The Santa Clara Watershed and parts of the San Gabriel Watershed have complete NEPA. Linear projects must start and stop depending on the project boundaries.
- Exclusive manual removal is difficult because is it physically demanding. Expensive because repeated trip are needed since mortality will take repeated removal efforts. This means more vehicle trips, more volunteer and staff time.
- It isn't possible to treat new infestations without current NEPA.
- It is problematic for our Cooperators such as Cal-Trans and LA County Public Works. They can't use all tools to remove invasive species unless they complete NEPA. This still requires FS staff time and can be a lengthy process.
-

Proposed Action

The proposed action includes the treatment of existing and new infestations of invasive plant species. The project area is outside the San Gabriel and Santa Clara projects. Specifically, treatment areas are 1) outside the Santa Clara Drainage and 2) above the high water mark in San Gabriel, San Dimas, Big and Little Dalton canyon drainages from the Forest boundary to their headwaters. For purposes of this document, treatment area is above 100 to 350 feet from the edge of the high water mark. Treatment areas would include non-National Forest System or non-National Monument lands if the landowners/managers would like to enter into an agreement authorized under the Wyden Amendment.

Each site will be adaptively managed for treatment effectiveness, design criteria compliance, and review of new information. These reviews will be conducted on an annual basis. Our prescriptions will follow the Forest Service Invasive Weed Framework (2013), of (1) **prevention**, (2) **detection**, (3) **control and**

management, and (4) **rehabilitation and restoration**. All four criteria will follow the Preventing the Spread of Invasive Plants: Best Management Practices for Land Managers 3rd Edition, California Invasive Plant Council. The project incorporates an adaptive management strategy that allows treatment areas to be modified based on invasive plant expansion, new infestations of invasive plants in the project area, and new and more effective treatment methods.

Design features for **prevention** of invasive weed expansion are currently incorporated into many projects, including techniques including vehicle washing, certified weed-free hay, and public education. And, design features for prevention will continue to be incorporated into projects and operating plans, as much as possible. As part of this document, new projects will follow, Cal Ipc's Check List E: Inspection and Cleaning checklist found in the Preventing the Spread of Invasive Plants: Best Management Practices for Land Managers 3rd Edition, California Invasive Plant Council.

Detection of invasive weeds is currently implemented with these actions: (1) Invasive species risk assessments are conducted for every project; (2) Plant surveys are conducted prior to implementation of projects; (3) Whenever possible, education of personnel and partners for detection of invasive weeds will be conducted. Proposed actions for detection (1) Include invasive weed information at pre-work meetings, whenever possible. (2) Evaluate areas and survey areas for high potential for invasive weeds, e.g., wilderness, Inventoried Roadless Areas, etc., as part of the program of work. Then, prescribe treatments for those surveyed sites. Areas will be targeted for survey and prescription during the annual review.

Control and management of invasive species will continue to concentrate on project areas and other sites with high-priority species, contingent upon funding. At a minimum, invasive weeds will be treated according to assigned annual targets for the Forest or Monument.

Prescriptions for treatment would follow integrated weed management (IWM) for each treatment site. Proposed treatment methods include manual/mechanical, fire-wilting, and herbicide. Depending on the size of the treated material (invasive plants), additional treatment of this activity-generated material (biomass) could be required.

Monitoring of **rehabilitation and restoration** are also key components to the proposed action. There would be two main types of monitoring: implementation monitoring and effectiveness monitoring. All monitoring would be similar to the information already compiled through Forest Service Activity Tracking System (FACTS) and National Resource Information System (NRIS) data collection. Monitoring is intended to compare baseline information with post treatment information, determine the effectiveness of treatment, and possibly provide adaptive management based on unanticipated effects, and monitor the restoration of treated sites. To ensure treated areas are not re-colonized with invasive plant species, restoration activities may be required. All surveys/monitoring would be documented.

No new permanent or temporary roads are being proposed with this action. Any access would be by foot or by vehicles using existing roads. Helicopters may be used for transportation in remote areas where access is difficult, including possibly the wilderness with the appropriate authorization.

A more detailed description of this proposal can be found in Chapter 2, Alternative 2 Proposed Action found in this document.

Decision Framework

The Angeles National Forest, Forest Supervisor, is the Responsible Official for this project. The Forest Supervisor will decide whether to approve the proposed action, approve a modification to the proposed action, or take no action on treating the vegetation related to this project at this time.

Public Involvement

The project manager has scoped this action with the Weed Management Area for Los Angeles County during four meetings throughout 2013 and 2014. This group is composed of concerned citizens, County representatives, USDI Park Service personnel, various State agency representatives, City representatives, and fire agencies. The project manager received comments regarding concerns about this proposed action at these meetings. The project manager met with representatives of tribes in a meeting on August 16, 2014. Internal scoping within the Forest Service was conducted as well.

The project is listed in the Schedule of Proposed Actions (SOPA) on the Angeles National Forest internet webpage. Scoping and public notification were conducted to inform the public of the proposal and provide them an opportunity to raise any issues associated with this invasive plant treatment proposal. A scoping notice and request for comments on the draft EA were included in the same request. More than 1000 notices were mailed to agencies, groups, and individuals on April 20, 2015. The mailing included the link to the project file and draft EA (http://www.fs.fed.us/nepa/nepa_project_exp.php?project=46486). Also stated is the number to call to receive a printed copy of the draft EA sent via US Postal Service. Comments from past invasive projects on the ANF and other Forest Service projects comments were also considered in guiding this EA.

Using the comments from the public and internal resource specialists concerns (see Issues section in this Chapter, below), the interdisciplinary team recommended a list of issues to be addressed.

Issues

The Forest Service received and reviewed comments from individuals/groups, both orally and in writing. The Forest analyzed past and current comments to determine what the issues were related to this project proposal. Issues are points of discussion, dispute, or debate about the environmental effects of proposed actions. Issues were separated into two groups: key or major issues, and those that are not. Key issues are defined as having a cause and effect relationship with the proposed action; are within the scope of the analysis; have not been decided by law, regulation, or previous decision; and produce conflicts that cannot be resolved through mitigation. Issues that were not determined to be key issues were identified as those that are outside the scope of the purpose and need; already decided by law, regulation, Forest Plan, or other higher level decision; irrelevant to the decision to be made; conjectural and not supported by scientific or factual evidence; or could be resolved through mitigation. A list of issues and reasons regarding their categorization are noted in appendix A in this document.

After careful analysis, two key issues that will be addressed in the analysis:

1. Herbicides are highly toxic to humans, including carcinogenicity, reproductive and developmental toxicity, neurotoxicity, and acute toxicity. (Measurement indicator is the threshold of concern for each herbicide proposed. Threshold of concern for humans is expressed as reference dose [RfD]).
2. Herbicides are toxic to aquatic organisms, mammals, and birds, including carcinogenicity, reproductive and developmental toxicity, neurotoxicity, and acute toxicity.

In addition, this document addresses the effects from this project for the following resources: invasive plants, special status plant and animal species (i.e., species protected under the Endangered Species Act and Forest Service sensitive), hydrology, special land designation areas (i.e., wilderness and research natural areas), recreation, and scenic resources.

CHAPTER 2 - ALTERNATIVES, INCLUDING THE PROPOSED ACTION

This Chapter describes the alternatives considered to achieve the purpose and need discussed in Chapter 1 of this document. Alternative 1 is the no action; Alternative 2 is the proposed action; and Alternative 3 was developed in response to the issues identified during scoping and noted above (i.e., herbicide toxicity). In addition, design features (protection measures) are incorporated into the alternative descriptions and are included in this chapter. The intent of these design features is to decrease potential adverse effects to people and the environment. This chapter also acknowledges alternatives considered but eliminated from detailed analysis. A table at the end of this chapter presents the alternatives in comparative form, defining the differences between the three alternatives and providing a basis for choice among options by the decision makers and the public.

Alternatives

Alternative 1, No Action

Under the no action alternative, none of the activities proposed from the action alternatives would be implemented. The no action alternative would not preclude invasive plant treatment activities from project areas as analyzed in separate documents. This alternative represents the existing condition and expected future conditions (in the absence of this project), against which the other alternatives are compared.

Alternative 2, Proposed Action

Proposed Action

The Angeles National Forest is proposing to treat invasive plant species. This includes treatment of existing and new infestations of invasive plant species. The treatment area is all of the Angeles National Forest and National Monument (drainages to uplands) not previously covered by the Invasive Plant Treatment Project, Santa Clara Watershed, Santa Clara/Mojave River Ranger District (ANF 2013) or the Invasive Plant Treatment Project, San Gabriel District (ANF 2011). Areas covered by these two documents will not be addressed because they are already covered. Treatment areas (Figure 1 and 2) would include non-National Forest System and non-National Monument lands if the landowners/managers would like to enter into a cost-share agreement authorized under the Wyden Amendment or some other available authority. San Gabriel, Sheep Mountain, Pleasant View Ridge, Cucuamonga, Magic Mountain Wildernesses and Falls Canyon Research Natural Area are also included in the project area. The project would be a long-term commitment for invasive plant management in the project area due to new species entering into the project area, re-colonization of treated species, and expansion of existing populations. The term of this project would be 15 years with the intent to review the project record periodically and if needed, update the project effects analysis and possibly purpose and need after 15 years of implementation. Fifteen years is the minimum amount of time needed for a consistent invasive species management program. However, this EA and specifically the effects analysis would be revisited if there is any new information.

Presently, invasive plant species known to exist within the project area include a large variety of species. Many of these species are quick invaders to new areas, including yellow-star thistle and tamarisk. It is anticipated even with early treatments, tamarisk and other invasive plants will continue to expand in the project area due to the proliferation of seed and seed dispersal by wind and water, or in the case of arundo, through rhizomes or stem segments. Expansion of invasive plants will vary depending on species, amount and proximity of vectors (e.g. roads, trails, flowing water) and amount of existing disturbance. It is anticipated invasive plants in the project area would generally expand at

a rate of approximately one to five percent annually but could easily range from one to 15 percent (Asher and Dewey 2005).

Adaptive Management Strategy

Invasive plant infestations constantly change and evolve, as do the infestations of individual invasive plant species and treatment methods, including herbicide use (i.e., concentrations of herbicide and application methods). For example, an invasive plant species that does not currently occur in the project area may be introduced and need to be treated at some future date. Also, an invasive species that may not be a current priority may become a priority in the future. Early detection and rapid eradication of invasive plants is the most efficient method for controlling their spread. Individual projects trying to address these changes could take a year or more for a decision. The adaptive management strategy addresses these types of changes over the life of this project to allow for a rapid response for control and/or containment. New treatment methods (including change in concentrations or application methods of approved herbicides analyzed and approved for use by the US Environmental Protection Agency and/or California Department of Pesticide Regulations), treatment of new species, and/or treatment of new areas within the project area would be part of the proposed action as long as the scope of the treatment and the effects are within those already addressed in this document.

Any new information would be reviewed by an appropriate interdisciplinary team; documented; and approved by the Forest Supervisor through a letter to the file. The documentation would be included in the project record available for public review.

New herbicides and treatment methods can be used but may require new analyses, public involvement, risk analysis, Hazard Quotient worksheets and documentation.

Annual Implementation Review Process

As part of the adaptive management strategy, the Forest will have an annual Invasive Species Management Implementation Review Meeting/Workshop. At this time, the proposed plan of work for the upcoming year will be reviewed, and any lessons learned from previous monitoring and implementation would be incorporated into the annual program of work.

Treatment Prescriptions

Prescriptions for treatment would follow integrated weed management (IWM) for each treatment site. No single management technique is perfect for all invasive plant treatment situations. Multiple management actions are required for effective treatment. Integrated weed management includes an approach for selecting methods for eradicating, containing, controlling, and/or suppressing invasive plants in coordination with other resource management activities to achieve optimum management goals and objectives. This approach uses a combination of treatment methods, that when taken together, would eradicate, contain, control, or suppress a particular invasive plant species or infestation efficiently and effectively, with minimum adverse impacts to non-target organisms. This approach contrasts with the traditional approach of using a single treatment type, such as applying herbicides, to treat all invasive plant problems. Herbicides are one useful technique, but they are not the only method to control invasive plants and may not always be the most effective. In addition, there are multiple herbicides that can treat a given invasive plant species. Integrated weed management is species-specific, tailored to exploit the weaknesses of a particular invasive plant species, site-specific, and designed to be practical with minimal risk to the organisms and their habitats (Colorado Natural Areas Program 2000).

Treatment Methods

Proposed treatment methods include manual/mechanical, fire wilting, and herbicide. These treatment methods are divided up further into specific types of treatment methods and are summarized in Table 1. The timing of herbicide treatments would be dependent on the invasive plant species, location of the population, temperature extremes, restrictions for species protection, as well as wind and rain restrictions (which vary by herbicide). The Regional Forester must pre-approve any herbicide treatment in any wilderness area (FSM 2150; FSH 2109.14, 13.4; USFS 1994a; FSM 2323.04c; USFS 2007b).

Removal and/or treatment of cut vegetation (biomass) will include placement of material away from stream channels and outside the area where there is potential for it to be introduced to the stream during high water flows. Treatment could include pile and burning adjacent to or at the treatment site (at a minimum, outside the 25-year floodplain), drag and remove off site (if vehicle access is adjacent to treatment area), or helicopter sling load material out of the treatment area for disposal off site (e.g. if the access is poor and pile and burning in place is not an option). Chipping and mowing are an option but will be used only if resprouting vegetation and seed head removal are part of the treatment plan. If the biomass material is minimal, the material could be scattered above the high waterline to dry and decompose. Sites where tamarisk plants receive herbicide treatment, biomass would not be burned, and treated plants would not be cut for two growing seasons after initial treatment because disturbing the treated plants can induce some to resprout.

The selection of treatment method would be dependent on time of year; severity of infestation; presence of sensitive resources (e.g. native plant and wildlife species, including protected species), degree of intermixing of invasive species with sensitive native habitats, access, proximity to surface water and budget.

Table 1. Summary of Proposed Treatment Methods.

Method	Description
Manual/Mechanical Methods	
Hand Pulling	Pulling or uprooting plants can be effective against some shrubs, tree saplings, and herbaceous invasive plants. Annuals and tap-rooted plants are particularly susceptible to control by hand pulling. It is not as effective against many perennial invasive plants with deep underground stems and roots that are often left behind to resprout. The advantages of pulling include its initial small ecological impact, minimal damage to neighboring plants, and little (or no) cost for equipment or supplies. Normally effective with small populations and/or where a large pool of volunteer labor is available. The key to effective hand pulling is to remove as much of the root as possible while minimizing soil disturbance. For many species, any root fragments left behind have the potential to re-sprout, and pulling is not effective on plants with deep and/or easily broken roots. Disadvantages are that this method is labor and time intensive. Often times there are low mortality rates, which require repeated re-treatments to be effective, which could increase the project cost and frequency of disturbance to the treatment area.
Pulling Using Tools	Most plant-pulling tools are designed to grip the plant stem and provide the leverage necessary to pull its roots out. Tools vary in their size, weight, and the size of the invasive plant they can extract. The Root Talon is inexpensive and lightweight, but may not be durable or effective as the all-steel Weed Wrench, which is available in a variety of sizes. Both work best on firm ground as opposed to soft, sandy, or muddy substrates and in small areas with easy access. Advantages are initial small ecological impact and minimal damage to neighboring plants. Normally effective with small populations and/or where a large pool of volunteer labor is available. Disadvantages include both tools can be cumbersome and difficult to carry to remote sites, this method can be labor and time intensive, often requires repeated re-treatments to be effective, which could increase the project cost and frequency of disturbance to the treatment area. Could spread invasive plants to other sites if equipment is not cleaned before leaving an infected site.
Clipping and Cutting	"Clipping and Cutting" requires cutting a portion of the invasive plant stem, generally cutting the bole of the tree/plant with cutting tools such as chainsaws, weed wacker/whip/eater. Advantages and disadvantages are similar to the "pulling using tools" method as noted above. Another disadvantage is that many species can resprout from the base.
Girdling	For trees (e.g. tamarisk), the main trunk of the trees would be stripped of the bark (consisting of secondary phloem tissue, cork cambium, and cork) around a tree's outer circumference, causing its death. Death occurs from the inability of the leaves to transport sugars (primarily sucrose) to the roots. Advantages to this treatment method are minimal ground disturbance and effective in killing larger sized trees. A disadvantage is that it takes time for the tree to die and during that time the tree can still produce seed. Another disadvantage is that some species can resprout from the base.
Tarping	Invasive plants would be cut back within inches of the ground and opaque thick tarps or pond liners would be staked or weighed down over the treatment area. The tarp(s) would be applied in late spring/early summer and remain for up to 5 months, usually from June to November. This treatment is best used in small areas (less than 0.25 acres) where there is not an intermix of native plants. Advantages to this treatment method are minimal ground disturbance and it has been known to be effective in small areas. Disadvantages are limited size of treatment area, could damage soil microorganisms, and high monitoring needs in high public use areas to ensure the tarp is left in place.
Fire-wilting Method	
Flaming Weed Torch	The weed torch is a treatment method that utilizes a propane torch to kill individuals but not ignite them This treatment is known as flaming, wilting, or blanching and the equipment can be carried by an indiviudal. The weed torch would only be used during times of low fire danger and in areas where there is low potential to carry fire. The most effective application is for the control of small diameter woody vegetation (one inch in diameter or less) such as

Method	Description
	French broom, other broom species and gorse, seedlings, and nonwoody grasses and forbs. To reduce potential for wildfire, 'flaming' is typically only undertaken when vegetation is very wet- either during or immediately after a rain event, or when vegetation is damp from fog and on low wind days (less than 5 mph is preferable). An advantage to this form of treatment is that it has very minimal environmental impact. A disadvantage is the limited window of opportunity for treatment.
Herbicide Methods	
Hand/Selective	Treatment of individual plants to avoid spraying other desirable plants. There is a low likelihood of drift or delivery of herbicides away from treatment sites. This method is used in sensitive areas, such as near water, to avoid getting any herbicide on the soil or in the water. Specific methods include: a) Foliar Application – These methods apply herbicide directly to the leaves. An adjuvant or surfactant is often needed to enable the herbicide to penetrate the plant cuticle, a thick, waxy layer present on leaves and stems of most plants. These applicators range from backpack sprayer, to hand-pumped spray or squirt bottles, which can target very small plants or parts of plants. b) Spot spraying – Spot spraying is similar to foliar spraying but would be for larger sized plants and/or population of plants. The focus still is on treating individual plants (instead of broadcast spraying) but over a larger area. Applicators would typically be backpack sprayers. Because of the potential to treat larger areas and larger sized vegetation, this method has a slightly higher potential for drift. c) Frill or Hack and Squirt – The frill method, also called the "hack and Squirt" treatment, is often used to treat woody species with large, thick trunks. The tree is cut using a sharp knife, saw, or ax, or drilled with a power drill or other device. Herbicide is then immediately applied to the cut with a backpack sprayer, squirt bottle, syringe, or similar equipment. d) Cut-Stump – This method is often used on woody species that normally resprout after being cut. Cut down the tree or shrub, and immediately spray or squirt herbicide on the exposed cambium (living inner bark) of the stump. The herbicide must be applied to the entire inner bark (cambium) within minutes after the trunk is cut. The outer bark and heartwood do not need to be treated since these tissues are not alive, although they support and protect the tree's living tissues. The cut stump treatment allows for a great deal of control over the site of herbicide application; therefore, has a low probability of affecting non-target species or contaminating the environment. It also requires only a small amount of herbicide to be effective. e) Cut, Resprout, and Spray or Paint/Daub – Cut 1-2 months prior to spraying. Apply herbicide when resprouts are 2-4 feet tall, but most effective in early fall through winter when plant chlorophyll is transferred to roots. Herbicide should be applied on dry days and during low winds. f) Stem Injection – Herbicides can be injected into stems using a needle, syringe, or special cutting tools, such as basal injectors or breast height injectors. g) Basal Bark Treatment - Herbicide is applied to the base of individual woody plants or stems - individual plant treatment. The herbicide penetrates through the bark to the cambium, where it translocates to roots and stems for complete control. Used for trees less than 6 inches in diameter and trees that are too tall for foliar application. h) Wicking application - applying a herbicide consists of a wick or rope soaked in herbicide from a reservoir attached to a handle. The wetted wick is used to wipe or brush herbicide over the weed. Advantages include little soil disturbance, highly selective and effective with little risk of drift of herbicide onto non-target species. Disadvantages include labor intensive and weather conditions must be suitable for herbicide application (and for stem injections, equipment could be expensive). For immediate herbicide treatment after cutting, coordinating cutting and herbicide application in a timely fashion would be difficult.

Depending on the invasive plant species, over time, the amount and concentration of herbicide needed would likely decrease and the amount of manual treatment could increase as the project enters into a

monitoring and management phase with only small pockets or individual scattered plants needing treatment.

Herbicide Treatment Method

Herbicides will be used as part of this proposed action. Over a 15 year period it's difficult to know which herbicides will be used because it is impossible to predict what invasive plant species may invade and what new herbicides will become available. Before a new herbicide is used in the proposed area, a risk assessment and effects analysis must be completed and added to the project file. A review of the BE/BA will be completed to ensure that any potential effects associated with the new herbicide are within the scope of what has already been analyzed. If necessary, an amendment to the BE/BA will be completed. Additional consultation with Fish and Wildlife Service may be necessary.

Six herbicides are currently considered as treatment options in the proposed action include: aminopyralid, chlorsulfuron, glyphosate, imazapyr, triclopyr and fluazifop-p-butyl. However any legally registered herbicide can be used if risk assessments, Pesticide Use Proposal forms, Hazard Quotient worksheet and NEPA analysis are completed.

Herbicide	Range of Application Rate (pounds of acid equivalent/acre [lb. a.e./acre])	Typical application rate (lbs a.e./acre)
Aminopyralid	0.03 to 0.11	0.078
Chlorsulfuron	0.0059 to 0.83	0.056
Glyphosate	0.5 to 8	3
Imazapyr	0.03 to 4	0.45
Triclopyr	0.05 to 10	3
Fluazifop	.25 to .375	.375

Treatment Areas

For analysis, planning and reporting purposes, the project area includes all areas of the Angeles National Forest/San Gabriel Mountains National Monument not included in the San Gabriel and Santa Clara Watershed Projects.

It is likely many of these areas would need multiple treatments to control invasive species from that site. It is anticipated 95 percent of the treatment acres would need annual retreatment until the invasive plant species are eradicated, controlled, contained, or suppressed. Depending on the method (e.g. "cut, resprout, and spray," manual/mechanical) treatments could require a minimum of two entries in any given year. Treatments should only be implemented under circumstances where future retreatments are feasible.

Project Area Map

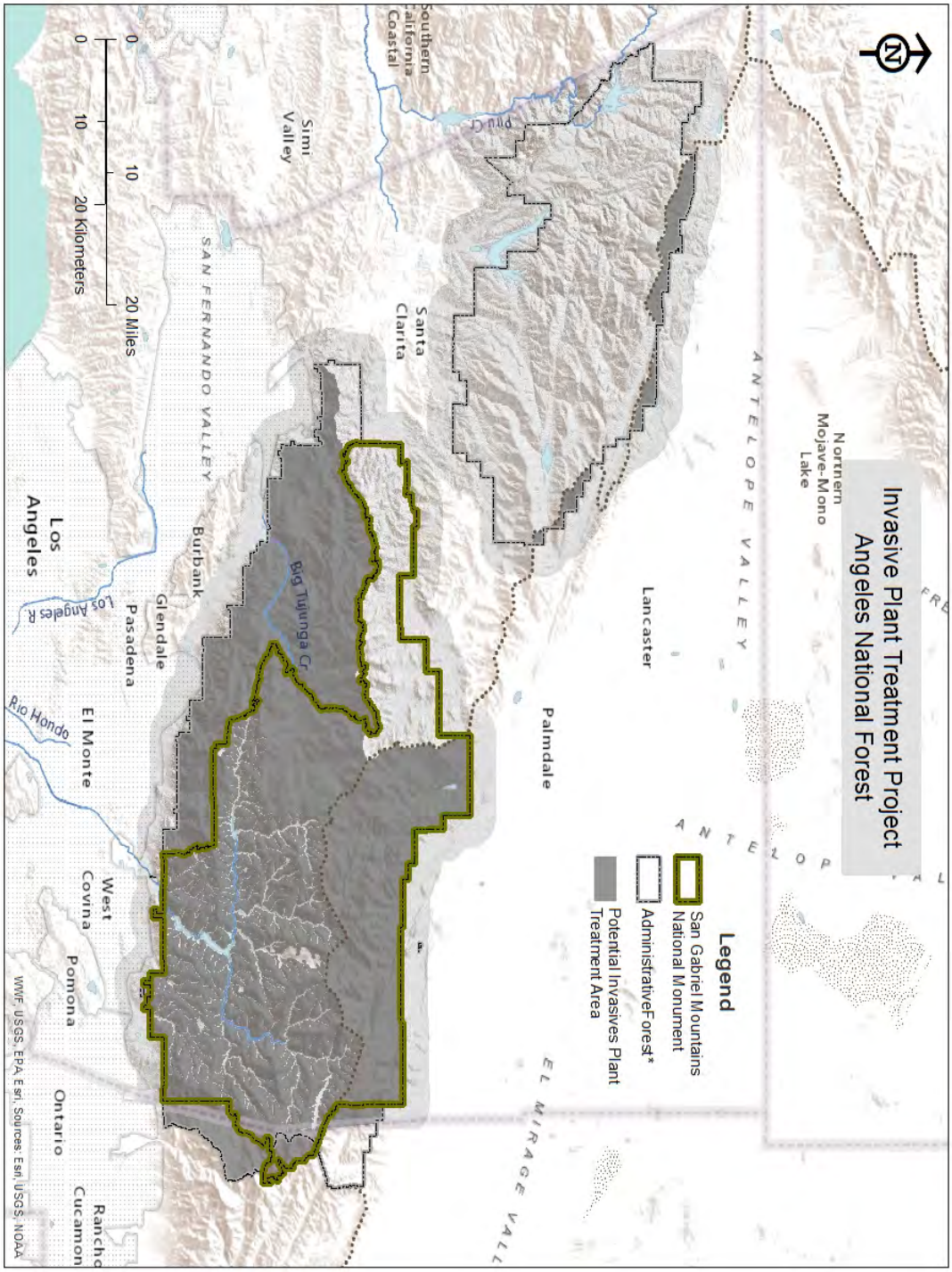

Table 2. Treatment Areas

Location and total number of acres in the Project Area	*Species Found on Site*	*Reason for Concern*	*Anticipated Treatment Areas*
New Infestations: Locations and # of acres are unknown at this time.	Unknown at this time.	Treating new infestations are the cheapest and easiest way to control invasive species. If a new infestation is eradicated through repeated treatment, it won't spread into a larger problem.	Immediately upon discovery. Unknown number of acres.
Ongoing project areas that may cause land disturbance.	All possible species (currently on forest and not found yet)	Project implementation will generally cause disturbance and bring new equipment on Forest lands. This creates an ideal situation for invasive species introduction and/or spread.	There are always ongoing projects so invasive treatment will be ongoing. Estimate is 300 acres.
Big Tujunga Canyon (Riparian and Uplands) and tributaries 21,745 acres Lower Big Tujunga 25,366 acres Upper Big Tujunga	Arundo, Tree of Heaven, Tamarisk, Spanish Broom, and Scotch Broom are dominant but others may be present.	Big Tujunga is heavily infested with invasive species but it also has one Federal Endangered toad (Arroyo Toad), one Federal Threatened fish (Santa Ana Sucker) and multiple Forest Service Sensitive fish, wildlife and plant species.	Grant funding and Partnerships have been secured for treatment of this area. Treatment will begin Summer of 2015. Approximately 1000 acres.
Little Tujunga Canyon (Riparian and Uplands) and tributaries 12,588 acres	Arundo, Tree of Heaven, Tamarisk, Spanish Broom and Yellow Star Thistle are dominant but others may be present.	Arundo is the most dominant species. Federal Listed Critical Habitat for Willow Flycatcher and multiple Forest Service Sensitive wildlife and plant species.	Grant funding and partnerships have been secured for treatment of this area. Approximately 500 acres.
Lower Little Rock and Tributaries 20,788 acres	Tamarisk is dominant but others may be present.	Tamarisk can easily spread and become dominant in the desert ecosystems. The canyons contains three Federal	No current plans due to lack of funding.

		Endangered species (Arroyo Toad, Mountain Yellow Legged Frog and Least Bell's Vireo) and multiple Forest Service Sensitive wildlife and plant species.	
Big Rock Creek and tributaries 17,153. Acres	Tamarisk and Spanish Broom are dominant but others may be present.	Big Rock Creek is mostly free of invasive species. With a few years of minor treatment, invasive species could be removed before they become a problem. The canyons contain one Federal Listed Endangered species (Mountain Yellow Legged Frog) and multiple Forest Service Sensitive wildlife and plant species.	No current plans
Pacoima Canyon and tributaries 18,149 acres Upper 3237 acres Lower	Tamarisk and Spanish Broom are dominant but others may be present.	Pacoima is a remote canyon with a heavily flowing river. Multiple Forest Service Sensitive wildlife and plant species.	No current plans due to lack of funding.
Arroyo Seco tributaries 14,308 acres	German and English Ivy and Spanish Broom are dominant but others may be present.	German and English Ivy are growing into trees and slowly killing them by shading them out. Multiple Forest Service Sensitive wildlife and plant species.	No current plans due to lack of funding.
Big Santa Anita Canyon and Tributaries 21,320. acres	Tree Euphorbia, German, English Ivy and Spanish Broom are dominant but others may be present.	German and English Ivy are growing into trees and slowly killing them by shading them out. Multiple Forest Service Sensitive wildlife and plant species. Tree Euphorbia is the most serious concern because they are new infestations.	No current plans due to lack of funding.

Restoration

To ensure invasive plant species within treated areas do not become re-established, restoration activities may be required. Restoration is a critical component to invasive weed management (Masters et al. 1996, Masters and Shelly 2001, Brooks et al. 2004), especially upland treatment areas where gaps and bare soil would be open and vulnerable to re-colonization of the same or other invasive plant species with no additional work. In addition, invasive plant removal on steep slopes without native species recovery or restoration could decrease slope stability.

Where invasive plant treatment occurs within the high water mark along the drainages, it is unlikely active restoration work would be required. Riparian vegetation, when given an opportunity, appears to re-establish in these areas without any additional work. Areas where flood waters do not exist, or where receding flood flows do not occur when short-lived riparian plant seed are produced, active restoration may be necessary. This could include seeding (with local native weed-free seed), planting (where the native plant seed or cuttings would be collected from a local source), and/or mulching (with weed-free material). Minimal site preparation would be expected (e.g. with seeding, use of a hand rake or similar tool would be used). Weed-free straw or other mulching may be applied. Any live vegetation would be planted with hand tools.

Restoration Strategies Considered

There are three major strategies for restoration of sites after treating invasive plant species (Polster 2004):

1. Successional advancement or assisted succession: This is a strategy where later successional species are planted (e.g. conifers, oaks, shrubs) to develop an adequate canopy cover to reduce light resources for invasive species and would likely require planting containerized plants or cuttings. This strategy is not likely to be successful with species like tree-of-heaven, English ivy and bigleaf periwinkle which are tolerant of shadier environments.
2. Modifying disturbance regimes: This strategy may be effective where the existing disturbance regime may be facilitating perpetuation of a specific species. This strategy could be useful with species like tamarisk which is observed in large numbers around reservoirs. Changing the flooding frequency may be enough of a change in disturbance regimes to eliminate it. This strategy is considered but changing the flooding frequency is dependent on outside agencies and may not be feasible.
3. Encouraging competition: The strategy is when desired native species are encouraged, through seeding, planting, or repeated treatment of an invasive plant species, the native seedbank or species already present will outcompete the invasive plant population. Seeding or planting desired native species is more successful in sites that have high levels of disturbance, and have little native cover remaining. Repeated removal of invasives at sites that still have a native component can facilitate release of the native seedbank or suppressed native plants.

The decision on which restoration strategy would be used on a given site would be dependent on site specific conditions (e.g. the location, size of area treated, invasive plant species treated). Monitoring would occur whether the restoration is active or passive and modifications made as needed. The proposed detailed Restoration Strategy is included in Appendix E.

Monitoring

Monitoring is an important aspect of Integrated Weed Management. Annual monitoring reports would be completed for the treatment sites (e.g. location [using a GPS], size of treatment area, method of treatment, season of treatment, and if herbicides were used, the name of the herbicide and the amount used in that treatment site). Treated sites would be reviewed annually to determine if re-treatment and/or restoration activities would be necessary. The individual monitoring reports for newly found

populations of invasive plant species that are classified as undesirable, noxious, harmful, injurious, or poisonous would be completed on the Natural Resource Information System (NRIS) Noxious Weed Inventory Form or modified to meet national monitoring data needs.

Monitoring would occur in sensitive environments (e.g. threatened, endangered and/or Forest Service sensitive species habitat, heritage resource sites) during herbicide applications or other treatment methods in order to detect and evaluate unanticipated effects (FSM 2150).

All surveys and monitoring would be documented in the project files. There would be two main types of monitoring: implementation monitoring and effectiveness monitoring. Purposes for monitoring include, but are not limited to, determine the effectiveness of treatment, quickly treat new populations, monitor and possibly provide adaptive management based on unanticipated effects, and monitor the restoration of treated sites. As noted earlier, all monitoring would complement data already compiled for FACTS and NRIS databases. Additional details are provided in the draft Monitoring Plan (appendix D) in this document. Monitoring results would be made available to interested publics.

Access

No new permanent (classified or System) or temporary (unclassified or non-System) roads are being proposed with this action. Any access would be by foot, or by vehicles using existing roads and trails.

Design Features

The following design features (protection/mitigation measures) were designed to reduce potential adverse effects from the action alternatives. This section displays those that are specific to Alternative 2 (i.e., specific to the use of herbicides) and those that would be applicable for both action alternatives (Alternatives 2 and 3), except where noted.

Alternative 2 Design Features (specific to herbicide use)

General

1. The Herbicide Transportation, Handling, and Emergency Spill Response Plan and spill kit will be on-site when herbicide treatment methods occur. This Plan will include reporting procedures, project safety planning, methods of clean-up of accidental spills, and information including a spill kit contents and location as noted in Forest Service Manual (FSM) 2150 (USFS 2013) and Pesticide-Use Management and Coordination Handbook (USFS 2013). At a minimum, the Plan will include:

a) No more than daily use quantities of herbicides will be transported to the project site. The exception is for crews staging in remote locations in wilderness areas. Under these circumstances, they can bring sufficient quantities of herbicides to last for the planned duration of the field work (i.e., multiple days). In these instances, the herbicides will be stored at sufficient distance away from any stream channel to prevent them from entering the water should a spill or leak occur.

b) Equipment used for transportation, storage, or application of herbicides will be maintained in a leak-proof condition.

c) Herbicide containers must be secured and prevented from tipping during transport.

d) To reduce the potential for spills, impervious material, such as a bucket or plastic, will be placed beneath mixing areas in such a manner as to contain any spills associated with mixing/refilling.

e) No herbicide application will occur if precipitation is occurring or is imminent within 24 hours or as required by the label. This restriction is increased to 48 hours for use of triclopyr BEE formulations.

f) Immediate control, containment, and cleanup of fluids and herbicides due to spills or equipment failure (broken hose, punctured tank, etc.) will be implemented. All contaminated materials will be disposed of promptly and properly to prevent contamination of the site. All hazardous spills will be reported immediately to the Forest Hazardous Spill Coordinator.

g) Herbicide spray equipment will not be washed or rinsed within 150 feet of any body of water or stream channel. All herbicide containers and rinse water will be disposed of in a manner that would not cause contamination of waters (Best Management Practices [BMP] 5-11). In arroyo toad and mountain yellow-legged frog occupied habitat, this distance is increased to 300 feet.

h) Mixing and loading of herbicide(s) will take place a minimum of 150 feet away from any body of water or stream channel unless prior approval is obtained from a Forest Service hydrologist or biologist. In arroyo toad and mountain yellow-legged frog occupied habitat, this distance is increased to 300 feet.

i) Wellhead Protection

a) Except as provided in subsection (b), the following activities shall be prohibited within 100 feet of a well (including domestic, municipal, agricultural, dry or drainage, monitoring, or abandoned wells):

1. mixing, loading, and storage of pesticides.
2. rinsing of spray equipment or pesticide containers.
3. maintenance of spray equipment that could result in spillage of pesticide residues on the soil.
4. application of preemergent herbicides.

b) Wells shall not be subject to the requirements in (a) if they are:

1. sited so that runoff water from irrigation or rainfall does not move from the perimeter of the wellhead toward the wellhead and contact or collect around any part of the wellhead including the concrete pad or foundation; or
2. protected by a berm constructed of any material sufficient to prevent movement of surface runoff water from the perimeter of the wellhead to the wellhead.

2. If foliar/spot spraying application is required, the following techniques will be used to minimize drift (BMP 5-13):

a) Label directions regarding wind speed and temperature will be followed.

b) Within 25 feet of occupied or designated critical habitat for Santa Ana sucker, California red-legged frog and arroyo toad and 300 feet of occupied or designated critical habitat for mountain yellow-legged frog, herbicides will not be ***sprayed*** when winds are greater than ***5*** miles per hour (mph) if label instructions do not address wind speed or allow application during higher wind velocities. In all other areas, spray applications up to 10 mph is acceptable as long as this is consistent with label directions.

c) Within Riparian Conservation Areas, herbicides will only be sprayed in a downward direction. If target plants are taller than three feet, the plants will be laid down and sprayed (bend and spray).

3. Only the aquatically labeled formulations of glyphosate, imazapyr, and triclopyr (e.g. Habitat,® Aquamaster,® Renovate 3®) and low-risk aquatically approved surfactants (e.g. Agri-Dex®, Class Act® NG®, Dyne-Amic®, Competitor®) will be allowed within 100 feet of the banks of ponds, flowing streams/rivers and tributaries. Chlorsulfuron can only be used beyond 25 feet from a water body or flowing stream edge to protect aquatic plants. Aminopyralid has no restriction in terms of a setback from water as long as treatment is completed outside of the Santa Ana sucker, arroyo toad and California red-legged frog spawning or breeding season and other design features are followed. Due to the potential

for impacts to aquatic species, triclopyr BEE (e.g. Garlon 4®) and Fluazifop (e.g. Fusilade®) will not be used within 500 feet of the active outside water channel of any perennial, ephemeral or intermittent stream. Fluazifop should only be applied to actively growing invasive plants. It should not be applied when grasses are in flowering or past-flowering stages or under conditions of high temperature, low humidity or where invasives are drought stressed.

Worker and Public Safety

4. Maintain a safety plan specific to this project that includes a job hazard analysis, including personal protective equipment/clothing (PPE) needs (FSH 6709.11; USFS 1999) and addresses risk and standard cleanup procedures (Forest Plan, part 2, p. 106; FSM 2153.3 [USFS 1994b]; FSH 2109.14,16 [USFS 1994b]).
5. Recently herbicide treated areas should not be reentered, at a minimum, until the herbicide has dried. If the herbicide label specifies a reentry period or restricted entry interval, treated areas must be posted with signs warning visitors and others not to enter the treated area. The signs should indicate that the area has been treated with an herbicide, what materials were used, and the name and telephone number of a contact person.
6. In foliar application treatment areas where members of the general public might consume vegetation/fruit growing on site, steps will be taken to avoid the potential for consumption of fruit exposed to herbicides. This may include cutting the edible vegetation/fruit prior to treatment, tarping or adjusting treatments to avoid fruiting time. No measures are needed if the foliar herbicide treatment is >10 feet away from a fruiting plant.
7. Triclopyr TEA formulation (e.g. Garlon 3®), will only be used in cases where there is no other approved herbicide that has been shown to be effective and efficient in treating a specific invasive plant species.

Biology Resources

Special Status Plant Species (Federally Listed Threatened, Endangered, Proposed, Candidate Species and Forest Service Sensitive Species)

8. For the known Nevin's barberry occurrence, no herbicide use will occur within 25 feet of the plants. In the area occurring between 25 to 100 feet from the plants, herbicide treatments are permitted with the exception of foliar and spot spraying. Manual applications are permitted throughout as long as soil compaction, modification to run-off and damage to the plant and its root system can be avoided. If any federal threatened, endangered, proposed or candidate plant location is found during pre-project surveys or while the project is being implemented, the same measures described for Nevin's barberry will be applied. The US Fish and Wildlife Service (USFWS) will be notified of any new listed plant occurrences.
9. All Forest Service sensitive plants located during treatment efforts will have a 5 to 70-foot buffer. The variable buffer size is intended to cover the wide range of sensitive plants potentially occurring in treatment areas. The buffer size will be determined based on: (1) phenology at time of treatment; (2) rareness and imperilment of species; (3) vulnerability to herbicide being used and method of application; (4) environmental conditions and terrain. Prior to project implementation, the Forest Botanist or Forest Service Project Botanist will review all information, including any new information, and develop buffers that will reduce effect to Forest Service sensitive plant species.

Special Status Wildlife Species (Threatened, Endangered, Proposed, Candidate and Forest Service Sensitive)

10. In Santa Ana sucker, arroyo toad, California red-legged frog or mountain yellow-legged frog occupied or critical habitat**:**
    a) During the Santa Ana sucker spawning season (typically March 1 to August 1), there is a primary and secondary buffer that applies to herbicide use. The primary buffer includes the first 30 feet from the streambank. The secondary buffer includes the area between 30 to 100 feet from the streambank. The March 1 to August 1 restriction period may vary if spawning is observed earlier or later in the season for this species. Within the primary buffer during the spawning period, no herbicide treatment is allowed. Within the secondary buffer during the spawning period, herbicide treatments are allowed but are limited to cut and daub or squirt and hack applications. No foliar spraying is permitted in the secondary buffer during the spawning season. Outside the primary and secondary buffer, there are no restrictions specific to the Santa Ana sucker spawning season.
    b) Herbicide treatment in occupied mountain yellow-legged frog habitat (including connected tributaries) is not allowed within 300 feet of streambank at any time. Activities in occupied MYLF habitat will be limited to hand pulling and manual restoration methods and would occur during the non-breeding season (July to February).
    c) Herbicide treatment in occupied California red-legged frog and arroyo toad habitat is not allowed within 100 feet of the streambank during the typical breeding/toadlet season. While occupied habitat for the arroyo toad is considered to extend to the 82 foot contour line, this will protect the area of most concentrated use. For the arroyo toad, this period is typically March 1-August 1. For the California red-legged frog, this period is typically February 1-October 31. Reproductive seasons can be highly variable depending on weather conditions and this restriction period may vary accordingly.
    d) In no case, shall herbicide drift be allowed to enter adjacent waters in these areas.
    e) At no time will mixing or loading of herbicides take place within 150 feet of any body of water or stream channel with Santa Ana sucker present. In arroyo toad, California red-legged frog and mountain yellow-legged frog occupied habitat, this distance is increased to 300 feet.
    f) At all times in occupied/critical habitat, glyphosate (e.g. Aquamaster®) and triclopyr TEA (e.g. Renovate 3®) application rates will not exceed 3 pounds a.e. per acre within 100 feet of the stream if surface water is present.
    g) Use of Triclopyr BEE formulation in upland areas will only be allowed if it is greater than 150 feet from occupied/critical habitat and more than 500 feet from the active outside water channel of any perennial, ephemeral or intermittent stream.
    h) In uplands directly upslope of occupied/critical habitat, where runoff would be delivered directly to the stream, no triclopyr BEE application will occur during the spawning/breeding season or (as noted in design feature 1e) if precipitation is occurring or imminent within 48 hours.
    i) Six pounds a.e. of triclopyr BEE formulation per acre is the maximum amount that can be used in foliar and spot spray applications in uplands adjacent to these species occupied or critical habitat.
    j) During invasive plant removal activities in these occupied or critical habitats, crew will not be allowed to make multiple stream crossings for the purpose of treating both streambanks simultaneously. For example, during a work period, an individual will conduct treatments along one streambank for the entire stretch before initiating

treatments on the opposing bank. As feasible, stream crossings will utilize existing features such as bridges, boulders and other similar features to avoid boots in the water.

k) If invasive plant removal is planned in areas of suitable California red-legged frog or trout-free suitable mountain yellow-legged frog habitat where presence/absence surveys have not been conducted, the following options will be implemented:
   - If habitat is suitable for CRLF or MYLF and surveys have not been conducted to confirm presence/absence, implement all design features that apply to occupied CRLF or MYLF habitat.
   - Conduct presence/absence surveys and if surveys confirm absence, implementation of design featues specific to CRLF or MYLF habitat is not necessary.
   - Conduct presence/absence surveys and if surveys confirm presence, notify USFWS immediately. Implement all design features that apply to occupied CRLF or MYLF habitat.

Hydrology Resource

11. Appropriate Best Management Practices (BMPs) will be followed to reduce or prevent negative impacts to non-target resources. Besides BMPs already addressed, other BMPs include:

a) Every effort will be made to prevent herbicide(s) from being introduced into water.
b) Herbicide usage will be limited to minimum amount required to be effective.
c) Herbicides will be applied according to label directions and applicable legal requirements (PRACTICE: 5-8).
d) Herbicide application will be monitored and evaluated (See Monitoring Plan Appendix D) (PRACTICE: 5-9).
e) Pesticide Spill Contingency Planning (PRACTICE 5-10). (See Design Feature 1).
f) Cleaning and Disposal of Pesticide Containers and Equipment (PRACTICE 5-11). (See Design Feature 1).
g) Streamside Wet Area Protection During Pesticide Spraying (PRACTICE: 5-12). (See proceeding Design Features).
h) Controlling Pesticide Drift During Spray Application (PRACTICE: 5-13). (See proceeding Design Features).

Additional Design Features

Design features were developed to decrease potential adverse impacts that either action alternative (Alternative 2, Proposed Action and Alternative 3, No Herbicides) may cause. The design features are applicable to either of the action alternatives (unless noted).

General

12. For prevention, planning and general guidance Cal-IPC's BMP for Land Managers 3rd Edition will be followed.
13. Ground disturbance will be limited to the absolute minimum necessary for effective treatments (Forest Plan, part 2, p. 100; USFS 2005).
14. An annual pre-operations briefing will be required prior to treatment between the project manager and personnel implementing the project. Additional staff will be invited such as Forest Supervisor, Forest/District Botanist, Forest/District Biologist, Forest Archeologist, District Recreation Officer and District Resource Officer. The briefing will include a review of sensitive resource locations, the identification characteristics of sensitive resources that could be found in the project area, and all operational details (including

safety issues, locations, timing, treatment methods, herbicides approved for use [for Alternative 2], law enforcement coordination needs, awareness of other project activities in the area, wilderness rules [e.g. Forest Plan, ANF S2, part 2, p. 79], etc.). For Alternative 2, protective measures (e.g. use of personal protective equipment, proper worker hygiene practices, proper handling of the herbicide, safety protocol in the event of a hazardous spill will be emphasized with the use of all herbicides, especially for women of child bearing age. If triclopyr is used, there will be an additional discussion on toxicity. Additional briefings will occur throughout the implementation period to ensure the treatments comply with the project design. Notes from the meeting(s) may be kept in the project file.

15. Where feasible, select existing hardened surfaces or disturbed sites for staging areas. Just prior to treatment, mark points of access, parking, and treatment areas in resource sensitive areas with signs, staking, and flagging to keep project activities confined to designated areas. Advise all project personnel to conduct work activities only within the defined work area when in these resource sensitive areas.
16. To maintain water quality, only small quantities (5 gallons or less) of fuel for gas-powered machinery will be allowed within 25 feet of any body of water or stream channel. All other fueling must occur at a minimum of 150 feet from any body of water or stream channel unless prior-approval has been granted by a Forest Service hydrologist or biologist.

Biology Resources

Special Status Wildlife and Plant Species

17. Prior to treatment, focused plant surveys will be conducted to determine presence or absence of specially listed plant species in the treatment area. Surveys will be conducted during a season when they are identifiable. For annual and geophytic plant species, surveys will ideally be conducted following a season with adequate precipitation to stimulate germination/flowering. Specifically for federally listed plant species where suitable habitat is present, protocol level plant surveys will be conducted prior to project implementation. These protocols can be found in the Draft Southern California Land Management Plan, Part 3, Appendix C – Species Habitat Suitability Survey Protocol
18. If any Forest Service sensitive plant species are present, protective measures may include, but are not limited to the following: (a) flag and avoid; (b) relocation; (c) seasonal restrictions; or (d) treatment methods will be designed to avoid negative impacts.

    Similar to design feature 8, if federally listed plant species are found before or during implementation, an appropriate buffer will be placed around the plants with a 25foot buffer prohibiting use of any herbicides and a 25-100 foot buffer restricting use of spot and foliar spraying. The US Fish and Wildlife Service (USFWS) will be notified of any new listed plant occurrences.
19. If Forest Service sensitive plant species are observed in the project area during implementation, work in the area should stop within 70 feet of the plant population and the Forest Service botanist or designee should be notified immediately to determine the appropriate action.
20. If invasive plant treatments are conducted within special status plant locations, Forest Service botanist will be notified. If necessary, a botanist or designee may be present during treatment.
21. Any restoration conducted in areas with known federally listed (threatened, endangered, proposed and candidate species) or Forest Service sensitive plant occurrences will be designed to avoid direct adverse impacts to individuals.

22. No greater than two years prior to the time of treatment, habitat surveys will be conducted by a qualified wildlife biologist to determine whether suitable habitat for threatened or endangered wildlife species is present in the treatment area. If suitable habitat is found, a literature search and/or additional surveys will be conducted to determine occupancy. If the suitable habitat is determined to be unoccupied, implementation of T&E specific design features is not required. If occupancy is confirmed, USFWS must be contacted and all species specific design features will be implemented. In the absence of surveys, the appropriate species specific design features will be implemented when conducting project activities in suitable unsurveyed habitat.
23. If suitable southwestern willow flycatcher or least Bell's vireo habitat is located in a project area, the suitable habitat will be excluded from treatment (including restoration activities) during the breeding season (March 15 to September 15 for the least Bell's Vireo and May 1 to September 1 for the southwestern willow flycatcher) unless USFWS protocol surveys have been conducted that year with negative results. If chainsaws or other noisy mechanical equipment is used during the breeding season, include a 500-foot buffer from suitable habitat or restrict activities to two hours or less within 500 feet of suitable habitat. This restriction is waived if USFWS protocol surveys have been conducted with negative results. Additionally, in areas where tamarisk is present and contributes to the suitability of nesting habitat for the southwestern willow flycatcher, treatments of these tamarisk occurrences will not result in a net reduction of more than 20 percent of the suitable habitat within the project area annually, unless USFWS protocol surveys have been conducted that year with negative results.
24. If suitable coastal California gnatcatcher habitat is located in a treatment area, the suitable habitat will be excluded from treatment (including restoration activities) during the breeding season (April 15 to August 15) unless USFWS protocol surveys have been conducted that year with negative results. Treatment activities are permitted in unsurveyed suitable habitat for the coastal California gnatcatcher outside the breeding season (April 15- August 15). Treatment activities that occur in suitable habitat outside the restriction period will require a qualified biological monitor. The biological monitor will search for coastal California gnatcatchers in the area where the crew is working and stay with them for the duration of their activities. If a coastal California gnatcatcher is detected, the biological monitor will determine the appropriate actions needed for avoidance of adverse impacts and the USFWS will be notified.
25. In areas that are known to be occupied by Santa Ana suckers, California red-legged frog, mountain yellow-legged frogs or arroyo toad, treatment of boots and equipment prior to entry into the area will be required to reduce the spread of chytrid fungus and other water-borne pathogens and non-native fauna. Disinfecting all boots and equipment will be done with quaternary ammonia compounds, a 10 percent bleach solution (or another generally accepted technique) or completely drying the equipment/boots before use in another unconnected water body (the Declining Amphibian Populations Task Force Fieldwork Code of Practice). Before entry into waterways, clothing, shoes and equipment must be inspected and cleaned to ensure they do not act as carriers of non-native organisms into treatment areas.
26. Mechanical/manual treatments (including restoration activities) are permitted year-round in occupied and critical habitat for Santa Ana sucker with the following restrictions:
    a) For manual treatments of arundo during the spawning season, a distance of 10 feet from the edge of the stream will be maintained. For manual treatment of all other invasive plants, removal activities can occur up to the edge of the stream as long

as emergent vegetation is not removed and plants are not removed from the streambank.

b) Crews, equipment and cut vegetation will not enter the water. Stream crossings will utilize bridges, boulders or other similar features to avoid boots in the water.

27. Treatments and restoration activities in known occupied mountain yellow-legged frog habitat will be limited to hand pulling and manual restoration methods during the non-breeding season (July to February). The restricted area includes a distance of 300 feet on either side from the occupied stream stretch.
28. Manual weed removal is permitted in occupied arroyo toad habitat when environmental conditions are such that breeding activities are completed, adult and juveniles have begun aestivation and field visits indicate the majority of toads have ceased their above ground daytime activities. Otherwise, manual treatments within 100 feet of the streambank are not permitted in occupied arroyo toad habitat during the reproductive season (typically March 1 – August 1).
29. Treatments that utilize a weed wrench require pulling plants or result in ground disturbance in arroyo toad occupied habitat will only occur when a biologist or other qualified individual is present. For consideration as a qualified individual, this person must obtain training on the identification and life history of the arroyo toad. All individuals participating in the removal of invasive species will be provided with information regarding the arroyo toad and other sensitive resources in the area. Photos and other information will be shared to ensure the greatest potential for detection of any arroyo toads that may be present in the project area.
30. For treatments that utilize a weed wrench, require pulling plants or result in ground disturbance in arroyo toad occupied habitat, crew size will not exceed five people/crew. This will allow for close supervision and reduce the potential for impacts to arroyo toads that may be in the area.
31. To reduce the amount of ground disturbance in arroyo toad occupied habitat, priority will be given to pulling smaller plants and leaving larger plants for treatments such as cutting or herbicide.
32. If arroyo toads are observed during project implementation, activities will cease until toads can relocate to adjacent suitable habitat. Sites for relocation will include the nearest area of suitable habitat. Based on the general conditions within the project area, relocation sites will typically be less than 50 feet from the area being treated. Toads will be allowed to leave the treatment area through their own efforts or can be moved by a qualified biologist. The US Fish and Wildlife Service will be notified when toads are moved.
33. In occupied arroyo toad habitat, ground tools such as shovels will not be used in the removal of invasive plants. Weed wrenches are permitted where it has been determined that other methods are not reasonable or effective. In all activities, every effort will be made to minimize ground disturbance.
34. The occurrence of federally listed (threatened, endangered, proposed and/or candidate) species that had not been identified and consulted with US Fish and Wildlife Service (USFWS) earlier, will require additional analysis, and consultation with USFWS will be reinitiated if appropriate.
35. Conduct training and on-site environmental training as needed to ensure workers are aware of special status species potentially occurring in the project area and how to

recognize and avoid individuals that might be present. Additionally, all crew members will be trained on the proper response to detection of T&E species in the project area.

36. In the event of a plant and/or wildlife species protection status changing to threatened, endangered, or Forest Service sensitive, additional analysis will be completed to determine potential impacts. Reinitiating US Fish and Wildlife Service consultation will occur, if applicable.
37. If invasive plant treatments are conducted within special status plant locations, the Forest botanist will be notified. If necessary, a botanist or designee may be present during treatment.
38. Any restoration conducted in areas with known federally listed (threatened, endangered, proposed and candidate species) or Forest Service sensitive plant occurrences will avoid direct impacts to individuals.
39. Avoid establishing staging areas or base camps within threatened, endangered, and/or Forest Service sensitive species suitable or occupied habitats and riparian areas.

Invasive Plant and Fauna Species

40. To reduce seed spread, disposal of invasive plants removed will be as follows: If flowers or seeds are present and have the potential for the seed to be widely dispersed during treatment (e.g. Spanish broom, eupatory), remove the flowering head and place in a container. Then treat and if necessary remove the plant, and place in an appropriate container for disposal.
41. Areas with bare soil, created by the treatment of invasive plants, will be evaluated for restoration to prevent further infestations by the same or new invasive plant(s) as noted in the restoration plan. Whenever possible, protect non-target vegetation in order to minimize the creation of exposed ground and the potential for re-colonization of invasive plants. A Forest Service botanist will be consulted prior to any restoration implementation.
42. Vehicles and all equipment must be washed before entering project sites. Should vehicles travel through or park in invasive plant infestations, the vehicle must be washed for a minimum of six minutes (USFS 2008) before entering the project area (e.g. at a car wash with the undercarriage option). This includes wheels, undercarriages, bumpers and all parts of the vehicle. Equipment must have all vegetation and seeds removed prior to entering and exiting project site (i.e., all tools such as chain saws, hand clippers, pruners, etc. must be visually inspected before entering and leaving all project sites) or placed in an enclosed area (e.g. back of an enclosed truck or a bag) and cleaned off-project site. All cleaning must take place where rinse water is collected and disposed of in either a sanitary sewer or a landfill.

    The field project manager will keep written logs. When vehicles and equipment are washed/cleaned, a daily log must be kept stating:

    - Location
    - Date and time
    - Methods used
    - Staff present
    - Equipment washed
    - Signature of responsible crew member

    These written logs will be turned in to the Forest Service Project Manager on a weekly basis.

43. Certified weed-free mulches (approved by a Forest Service botanist) and local weed-free seed sources will be used in restoration or soil stabilization efforts (Forest Plan S6, part 3, p. 5; USFS 2005).
44. Efforts will be made to insure that seeds and/or vegetative propagules of invasive plants will be removed from clothing and equipment prior to leaving treatment sites.
45. Transport of removed invasive plants with seeds or vegetative propagules will occur in enclosed disposal containers or in an enclosed vehicle.
46. Invasive plants to be disposed of off-site will be taken to a facility (i.e., landfill) that contains the disposed items.
47. If burning of removed invasive plants occurs, burn pile sites will be monitored the following year to assess potential needs for revegetation or additional invasive plant removal treatments.
48. All staging, parking, and burn pile areas will be located outside of noxious plant occurrences.
49. Where appropriate, barriers will be installed to limit illegal OHV activity after treatment is complete. Examples of barriers are large rocks, soil berms, and cut vegetation.

Wildlife Species

50. All trash generated from this project will be collected and properly disposed of on a daily basis. Upon completion of the project, all unused material and equipment shall be removed from the site.
51. To avoid attracting opportunistic predators, such as black bear, coyotes, domestic and feral dogs and cats, opossums, skunks, and raccoons, all food and trash must be appropriately stored in closed containers and removed from the project site at the end of each day.
52. Avoid adverse impacts to nesting birds per Migratory Bird Treaty Act (MBTA), by avoiding treatment activities during bird breeding season (March 15 to September 15) whenever practicable. If work is performed during the breeding season and the biologist feels it is necessary, a walk through survey will be performed by a qualified biologist to identify obvious nests prior to undertaking work. If active nests are located, appropriate exclusionary buffers will be established around active nests.
53. In sensitive amphibian areas, vehicles and equipment will be parked or removed from the habitat before sunset.
54. Whenever possible, vegetation piled on site for later removal or burning should be treated as soon as possible after piling in order to minimize colonization by wildlife. Prior to removing or burning brush piles, disturb the piles of brush and pull them apart slightly to encourage animals to move out of the piles (e.g. salamanders, lizards, small mammals). Depending on the plant species, some of the cut vegetation could be used as vertical mulch to minimize illegal off-highway vehicle (OHV) activity.
55. Protect known active or inactive raptor nest areas from project activities. A no-disturbance buffer around active nest sites will be required from nest-site selection to fledging (Forest Plan S18, part 3, p. 7; USFS 2005).
56. Pets shall not be allowed on-site during treatment.

Hydrology Resource

57. Appropriate Best Management Practices (BMPs) will be followed throughout the project to reduce or prevent negative impacts to non-target resources. BMPs include the following:

a) Cut/pulled vegetation will not be allowed to enter the stream.
b) Hand crews will stay out of flowing or ponded water whenever possible.

c) If hand removal of invasive plants requires entry into flowing or ponded water, keep the time in the water to a minimum.
d) Revegetation of Surface Disturbed Areas (PRACTICE: 5-4).

58. If multiple, unconnected streams or springs are being walked or worked in by implementation crews on the same day, treatment of boots and equipment prior to entry into the new area will be required to reduce the spread of chytrid fungus and other water-borne pathogens. Treatment of boots and equipment would consist of cleaning with a quarternary ammonia compound (or another accepted technique). Avoid cleaning equipment in the immediate vicinity of a pond, wetland, or riparian area. (Declining Amphibian Task Force Code of Practice).

Special Land Designations

Wilderness Areas

59. The Regional Forester will approve appropriate locations for temporary remote base camps and helicopter drop-off and haul sites in the wilderness, if necessary, to facilitate invasive plant removal or treatment. Locations will be based upon concentrations of invasive plants, public use, natural resources and wilderness resource concerns.
60. Operation of work crews and equipment will be limited to weekdays (Monday-Friday) and non-holidays during daylight hours. Avoid other heavy use periods, such as spring breaks.
61. The wilderness manager, rangers and wilderness volunteers will be provided training to help them identify the most aggressive invasive species (e.g. tamarisk, arundo, tree-of-heaven, castorbean) and other species the Forest Botanist or Forest Service botanist determines to be of concern. This knowledge will provide increased information about the presence and distribution of these species so that treatment plans and/or actions can be taken or modified.
62. The Wilderness manager will be periodically consulted during the implementation of this project and will be adequately informed about the approved treatment actions. As feasible, the wilderness manager, rangers and volunteers will serve as observers, educators, and monitors for the implementation project manager.

Recreation Resource

63. Within areas of concentrated public use and developed recreation sites, implementation of this project will be limited to weekdays and non-holidays during daylight hours. Avoid other heavy use periods such as spring and summer school breaks.
64. Chipping activities will be located at least 500 feet from established recreation facilities during heavy use times such as weekends and holidays. The Forest Supervisor or recreation staff will determine appropriate locations of chipping sites within areas of concentrated public use.
65. Motorized equipment will be equipped with appropriate mufflers and spark arrestors in good working condition to minimize noise levels and fire risks.
66. Temporary public use closures are permitted in areas where the public and workers commingle and public safety is compromised because of operating equipment, hand tools, and/or, with alternative 2, the herbicide label requires it. The Forest Supervisor and/or District Ranger will monitor potential conflicts and act accordingly.
67. In advance of initiating treatment work, interpretive signing will be placed in developed recreation sites and areas of concentrated public use. Interpretation will be presented in English and Spanish and will focus on the purpose, need, and the environmental benefits of invasive plant treatments. For alternative 2 (proposed action), if herbicides are included as part of the treatment, a list of the herbicides to be used, treatment dates, and name and

phone number of Forest contact will be provided at appropriate sites, a minimum of one week in advance of herbicide treatment, along with other access points to these treatment areas and appropriate Forest offices.

68. Staging areas for equipment and crew congregation will be located in areas where there is minimum conflict with public use and other resources. These should not be within 150 feet of a stream channel (unless pre-approved by the Forest Supervisor), and in areas which are not highly visible or heavily used by the public. Each staging area should accommodate vehicle parking to minimize the impacts of work vehicles and equipment in developed recreation sites. Employees should be car pooled from off the Forest where practicable. The Forest staff will monitor these impacts and the Forest Supervisor will impose further restrictions if necessary.
69. When the Forest Supervisor or recreation staffs feel it necessary, temporary sanitary and trash facilities will be required to accommodate workers, and/or trash will be packed out after each work day. The purpose of this measure is to avoid adversely impacting public sanitary and trash collection facilities.
70. Off-highway motorized equipment use will be permitted only where there are existing roads/trails and implementation is not feasible otherwise. The Forest Supervisor and/or District Ranger will determine on a case-by-case basis where this use will be allowed.

71. In foliar application treatment areas where there are plants in fruit (with berries attached) such as blackberries or any native fruiting shrub that may be consumed by wildlife, steps will be taken to avoid exposure of the fruiting bodies to herbicides. This may include cutting the edible vegetation/fruit prior to treatment, tarping or adjusting treatments to avoid fruiting time. No measures are needed if the foliar herbicide treatment is >10 feet away from a fruiting plant.

Scenic Resource

72. Where practical, piles prepared for physical removal, burning, or chipping will be located away from established trails or highly visible areas, such as within areas of concentrated public use. If this is not practical, pile in the most suitable locations and complete the disposal phase at the earliest opportunity.
73. When lop and scattering large plants, place the material away from established trails or roads.
74. For those areas greater than one acre in size that do not naturally rehabilitate within one year, consider planting and/or seeding with native vegetation.

Land Use

75. In areas where treatment adjoins residential private lands, the use of equipment and work crews will be limited to weekdays (Monday to Friday) between the hours of 7:00 AM to 7:00 PM. Prior to project implementation, the project coordinator shall coordinate with the residents to inform them of the nature, amount and duration of increased activity and that minimum noise and disturbance measures were considered in these areas.
76. The District staff will make every reasonable effort to acquire voluntary written agreements with private land owners to access and treat invasive plants on these lands when the invasive plant species are a threat to the national forest. Agreements should ideally be for the duration of this project (15 years) to ensure its maximum effectiveness. If Agreements cannot be obtained, the District staff will take reasonable effort to reach an understanding with the private landowners regarding the locations of applicable private property boundaries. These boundaries will be flagged immediately prior to implementing project work to avoid possible trespass onto private lands. Surveying to cadastral survey standards is not planned.

Heritage Resources

77. Prior to treatments which could adversely affect cultural or historical values, archaeological surveys will be conducted to determine whether any cultural and/or historic resource sites are present in the treatment area.
78. If unanticipated heritage resource sites are found during implementation and ground disturbance is planned, all work shall stop in the area that could adversely affect the site(s). The Forest Heritage Program Manager will be contacted immediately and work will not precede in this area without his/her approval.
79. Protect the use of known sensitive traditional tribal use areas (Forest Plan S61, part 3, p. 13; USFS 2005).
80. All known historic properties within an Area of Potential Effect (APE) shall be clearly delineated with appropriate buffers prior to implementing any associated activities that have the potential to affect historic properties. All proposed ground disturbances shall avoid historic properties. Avoidance means that no activities associated with an undertaking that may affect historic properties shall occur within a historic property's boundaries, including any defined buffer zones [unless specifically identified in the First Amended Regional Programmatic Agreement among the U.S.D.A. Forest Service, Pacific Southwest Region California State Historic Preservation Officer, And Advisory Council on Historic Preservation (2001). Portions of undertakings may need to be modified, redesigned, or eliminated to properly protect historic properties.
81. Buffer zones may be established to ensure added protection where the Forest Heritage Program Manager or other professional archaeologist determines that they are necessary.
82. When any changes in proposed activities are necessary to avoid historic properties (e.g. project modifications, redesign, or elimination; removing old or confusing project markings within site boundaries; revising maps or changing specifications), these changes shall be completed prior to initiating any activities.
83. Heritage resource monitoring may be used to enhance the effectiveness of protection measures in conjunction with other measures.
84. The Forest Heritage Program Manager may provide written approval for any additional work within the boundaries of historic properties, under carefully controlled conditions.

Fire/Fuels Resource

85. Burn piles will be burned in compliance with Forest approved project specific Prescription Burn Plan(s).

86. To ensure it does not contribute to fuel loading, large cut vegetation will either be treated (chipped, bucked, scattered, etc…) or removed from site.

Air Quality Resource

87. Prior to prescribed fire activities, the Smoke Management Plan shall be prepared, approved by the South Coast Air Quality Management District (SCAQMD), and made part of the Prescription Burn Plan. Fire perimeter observers shall record smoke conditions during the burn. The weather observations used to establish the burn status prior to the burn shall be recorded and maintained. Signs and notices will be posted in areas near/in the potentially impacted urban interface and general public areas and shall be inspected, maintained and documented to assure proper notification to the public occurred. The Smoke Management Plan will, at a minimum, include the following:

a) Conduct a prescribed burn only when the meteorological conditions are expected to disperse the emissions away from urban areas and other sensitive receptors and only on approved burn days by the SCAQMD.

b) Visibility protection of the adjacent Class I and Class II wildernesses will be provided in part through its inclusion as a smoke sensitive area in the required Smoke Management Plan (which will be part of the Prescribed Burn Plan). Other smoke sensitive areas include private lands, occupied recreation sites, and highways.
c) Identify and address visible smoke column emissions and general smoke nuisance concerns from the public in a timely manner.
d) Visual smoke observations are monitored on site during burn implementation to insure that smoke dispersion remains within identified parameters as stated in the Smoke Management Plan.
e) Safety signing, lights, and other devices are employed along traffic routes if smoke may affect visibility on travel routes, as stated in a Smoke Management Plan.

88. Driving speeds on native surface roads will not exceed 15 miles per hour; native surfaced roadways will be watered to suppress dust when needed; and track-out onto public roadways will be monitored and controlled as necessary to meet public safety and SCAQMD Rule requirements.
89. Monitoring for air quality during prescribed fire activities will include the following measures:
    a) Fuel moisture evaluation of the proposed burn piles shall be performed and recorded by the Forest Service. Burning would not be scheduled or initiated unless fuel moisture content is within the parameters established in the burn prescription.
    b) A residual mop-up plan shall be incorporated with the burn prescription. An objective in this plan will be to stop all smoke and smoldering within eight hours of the completion of the burning phase.

Alternative 3, No Herbicides

Alternative 3 was developed in response to a comment received during scoping for the Santa Clara and San Gabriel Invasive NEPA projects. Alternative 3 addresses the concern that herbicides could have an adverse effect on aquatic organisms, humans, and animals in general. This alternative would be similar to Alternative 2, Proposed Action, but would remove herbicides as an option from the treatment methods.

Emphasis would be placed on using hand pulling and mechanical tools (e.g. hand pullers, chainsaws, girdling). The number of entries into the same area would vary by invasive plant species. The most difficult invasive plant species to treat without herbicides would likely be the larger sized plants such as arundo, tamarisk, tree-of-heaven, black locust and return treatments could be for the life of the project and beyond. Because of the intensity of effort required for treatment, not all invasive species or all occurrences would be treated. Removal efforts without the use of herbicides require longer periods of implementation and greater cost. As an example, Spanish Broom has been mowed along Highway 2 and manually removed along the Santa Clara Divide Road as an ongoing, yearly activity. Due to the non-herbicide method of treatment, these Spanish broom removal activities are recurring long term efforts. Although Spanish broom mowing along Highway 2 has occurred for decades, this effort has not resulted in eradication and has at best provided only for increased visibility and fuel hazard reduction. Spanish broom removal has occurred along the Santa Clara Divide Road since the 2009 Station Fire. On the Santa Clara Divide Road, the Forest Service estimate to remove 1 acre of moderately infested, 3 foot tall Spanish broom is $25,000. It would cost $1500 to remove the same population using herbicides. The large difference in cost can be attributed to the extremely labor intensive effort required to dig out the tap roots of individual plants.

The difficulty with Alternative 3 is that nearly all species would require years of retreatment of equal effort. Alternative 3 would also need large crews of both Forest Staff, contractors, cooperators and volunteers. Some species that could be eliminated with herbicides would be simply reduced in

numbers with Alternative 3. Some invasive plant areas would likely need to be treated annually and would not likely be eradicated (e.g. ivy). This alternative would likely result in the control rather than eradication of invasive plant species in the project area. This alternative would require more monitoring and restoration activities than Alternative 2 (except the amount of restoration in the wilderness would likely be the same for both alternatives).

Alternative 3 would require more entries over the long term to eradicate and/or control the species from the site. This alternative would also require more work-hours to complete the work in a given area when compared to the use of herbicides. Due to the additional work likely to be required in treating the invasive plants like arundo, tamarisk, and tree-of-heaven), other species such as forbs and woody plants may not receive treatment or receive very little treatment. In addition, not using herbicides could be less effective. The maximum number of acres treated would be reduced annually by at least 50%. Similar to Alternative 2, this alternative would not allow large and heavy mechanical equipment as a treatment method in the treatment areas.

The Monitoring Plan noted in appendix D was designed for Alternative 2 and would not be finalized until the decision. Should the decision be to implement Alternative 3, this plan would be modified appropriately.

Alternatives Considered but Eliminated from Detailed Study

Various Treatment Methods as Part of the Integrated Weed Management Prescription

A variety of treatment methods were considered to be included as part of the Integrated Weed Management Prescription but were removed from detailed analysis for various reasons. The following is a description of these treatment methods and why they were removed from detailed study.

Broadcast Prescribed Fire

Broadcast prescribed fire was considered as part of the integrated weed management prescription. The populations of most of the invasive plant species within the project area do not cover large monoculture areas (five or more acres) where broadcast prescribed fire could be effective. In addition, many invasive plant species are opportunistic after fire (e.g. tamarisk and arundo) and broadcast prescribed fire could encourage expansion of these species. Also, fire in mixed stands of natives and invasive plants tend to favor the invasives at the expense of the natives.

Grazing

None of the project area is within active grazing allotments and some areas are not suitable for grazing according to the Forest Plan (Appendix J, Part 3, p. 79; USFS 2005): Critical Biological Land Use Zones, specially designated forest system lands (e.g. wilderness areas, RNAs), San Dimas Experimental Forest). In addition, much of the project area would not be appropriate for grazing because treatment areas are within or directly adjacent to riparian habitat and/or located in narrow canyons.

Broadcast Spraying of Herbicides

Aerial and boom spraying of herbicides were discussed as optional treatment methods but given that most of the invasive plants are interspersed with native vegetation; presently do not grow in large sized monocultures; the terrain would be difficult to access mechanized wheeled and/or tracked equipment to the treatment sites; and broadcast spraying has the potential to be controversial, these treatment options were removed from detail analysis.

Large and Heavy Equipment

As noted above, in most of the project area it would be difficult to access treatment areas with mechanized wheeled and or tracked equipment. In addition, the majority of the treatment areas is within or directly adjacent to riparian areas and is comprised of mixed stands. Treatment with heavy equipment is not suited for mixed stands. The use of large and heavy equipment as a treatment method in the majority of the treatment areas would cause unreasonable environmental harm.

Organic Herbicides

One of the comments received during scoping was to consider the use of "safe, non-toxic" herbicides (e.g. Burnout II®, corn gluten, Repellex®, Organic and Natures®) to reduce adverse effects to the environment when compared with synthetic herbicides proposed for use. Repellex® products are intended to repel mammals from specific areas and are not within the scope of this project. Corn gluten is a pre-emergent treatment method this method was removed from consideration. This treatment has potential adverse effects to native vegetation. Based on researching information on "naturally organic herbicides", this treatment option was removed from detailed analysis because the effectiveness is dependent on plant species being treated (both size and species), the concentration used, season of treatment, and some of these herbicides can be a health risk to people (e.g. eye damage and skin irritant). Based on the research found, they would not be effective on the high

priority invasive plants proposed for treatment (i.e., arundo, tamarisk, tree-of-heaven) and would be marginally effective for the other species.

Herbicide, Only Proposed Treatment Method

An herbicide only treatment method was considered but was eliminated from detailed analysis. It has been found, the most effective treatment for a variety of invasive plant species is through an Integrated Weed Management approach which includes a toolbox of treatment methods (and mix of methods) available given the specific environmental conditions at the treatment site.

Biocontrol Agents

Biocontrol agents were considered but eliminated from detailed analysis. At this time, APHIS programmatic consultation with the USFWS does not cover all the biocontrol agents specific to the target invasive plant species found on the Forest or the specific threatened and endangered species potentially occurring in treatment areas. As a result, it is not feasible for the Forest to move forward with consultation that would include the use of biocontrol agents.

Comparison of Alternatives

This section provides a summary of the effects of implementing each alternative. Information in Table 3 focuses on activities and effects where different levels of effects or outputs can be distinguished quantitatively or qualitatively among alternatives.

Table 3. Comparison of alternatives.

	Alternative 1	Alternative 2	Alternative 3
Treatment Methods	manual removal	manual/mechanical fire wilting and herbicide	manual/mechanical and fire wilting
Maximum Annual Treatment (miles/acres)	50 acres	3000 acres	200 acres
Potential effect on invasive weeds	Special Use Permit projects will treat small areas	Focus on eradication and control of invasive species within target sites	Focus on control and possible containment of invasive species within target sites
Human Health and Safety Risks*			
Fire risk	low-moderate risk	negligible-low risk	negligible-low risk
Herbicide	no risk	negligible-moderate risk	no risk
Non-herbicide	no risk	negligible-low risk	negligible-moderate risk
Invasive Weed Trends by species priority			
High priority	increase in # of species/area	eradicated	no change or decrease in area
Moderate priority	increase in # of species/area	decrease in # of species/area	increase in # of species/area
Low priority	increase in # of species/area	no change in # of species/area	increase in # of species/area
Special Status Biology (long-term impact to habitat) _____			
Wildlife	decrease in habitat	increase/maintenance of habitat	increase/maintenance of habitat in areas w/ high priority spp, decrease in habitat other areas
	decrease in habitat	increase/maintenance of habitat	increase/maintenance of habitat in areas w/ high priority spp, decrease in habitat other areas
Hydrology/Soil (long-term impact)			
Water quality	water temp reduced	no change	no change
Water quantity	decrease in water quanjtity	increase in water quantity	increase in water quantity
Soil	chemistry change in soil	no change	no change

	Alternative 1	Alternative 2	Alternative 3
Wilderness (long-term)			
Experience	no impact	no impact or increasing positive experience	no impact or adversely impacting natural appearance
Character	adversely impacting natural appearance	increasing natural appearance	no impact or adversely impacting natural appearance
Research Natural Area (long-term) (maintain unmodified conditions/natural processes)	No	Yes	Partiallly
Recreation Experience			
Short-term	no impact	herbicide use could temporarily close rec areas	need for follow up treatments could adversely affect rec users
Long-term	reduced access to riparian area due to density of invasives	no restricted acces to riparian area that would have been caused by invasives	no restricted acces to riparian area that would have been caused by high priority invasives spp
Scenic Resources	Minor noticable difference	No noticable difference	Minor noticable difference

*In Chapter 3 of this EA, human health and safety was broken into three categories: fire and fuels (risk of wildfire), herbicides treatment (risk to applicators and pubic), and non-herbicide method.

CHAPTER 3 - AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter focuses on the environmental effects (direct, indirect, cumulative) and a brief summary of the affected environment (where applicable) for those resources that were concerns to the public and/or the interdisciplinary team during scoping. This chapter also provides a preliminary finding of no significant impact based on the definition of "significantly" provided by the Council of Environmental Quality (40 CFR 1508.27). Several specialist reports are referred to in this chapter and they are all incorporated by reference.

Impacts from Alternative 2 would be shorter term with intensity in the first year. Impacts from Alternative 3 would remain consistent each year.

The project area lies in the San Gabriel Mountains and the northern section of the Sierra Pelona mountains. The bulk of the project is in the San Gabriel Mountains. This is a watershed based approach so all areas are from ridge tops to riparian areas. The San Gabriel Mountains are part of the southern California Transverse Range, and are located primarily in Los Angeles County with the eastern edge in San Bernardino County. The San Gabriel River watershed drains the mountains to the south, eventually draining into the Pacific Ocean.

The physical and biological landscape is shaped by the dynamic nature of the Transverse Range. The elevation of the project area ranges from 1,400 to almost 9,000 feet near the highest point (Mount San Antonio) in the San Gabriel Mountains. The San Gabriel Mountains have a Mediterranean climate, which is marked by hot dry summers and cool wet winters. The climate is also characterized by wide variability in precipitation from year-to-year and storm-to-storm. Individual rainfall events can also vary widely with intense storms delivering substantial precipitation in a few hours' time. Other natural processes that have and will continue to influence the physical and biological landscape are fire and flooding, though the natural flooding regime has been greatly modified through the construction of dams.

The effects analysis focuses on the following areas:

- Human Health and Safety
- Invasive Plants and Native Vegetation
- Special Status Plants
- Special Status Wildlife
- Soils and Hydrology
- Special Land Designations (Wilderness and Research Natural Areas)
- Recreation and Scenic Resources
- Consequences Relative to Significance

Human Health and Safety

For the purpose of this analysis, human health and safety includes two primary areas of interest: 1) fire and fuels 2) health concerns related to project activities (exposure to herbicides, hazardous field conditions, etc.)

Fire and Fuels

Alternative 1, No Action Alternative

Direct, Indirect and Cumulative Effects

Invasive plants, such as arundo and tamarisk, generally, can increase the frequency, intensity and/or prolong the length of fire season. In addition, tamarisk typically produces a nearly continuous litter layer that is highly flammable (Brooks 2008). Fires that start in these surface fuels can easily carry through mature tamarisk up into the canopies of native riparian trees. This can change what was a fire regime of a low to moderate intensity surface fire regime to a frequent, high intensity crown fire regime (Brooks and Minnich 2006). Presently these highly fire-adapted invasive riparian plant species are not at critical populations within the project area, but if no action is taken to prevent the expansion of these two species, over the long-term, there is a risk of these two invasive plant species expanding in the riparian areas within the project area. This could change the fire regime to one of more frequent, higher intensity wildfire, with higher rates of spread. This could indirectly increase the risk to firefighter and public safety that may be in or near these riparian areas. Since the no action alternative does not propose any activities, there are no cumulative effects related to fire and fuels from Alternative 1.

Alternative 2, Proposed Action

Direct and Indirect Effects

While both action alternatives (Alternatives 2 and 3) consider treatment of invasive plant populations a high priority, Alternative 2 will have the highest level of effectiveness Use of herbicides and manual treatments will allow for removal of more species over a larger area within the shortest time frame. Fuel loads of highly flammable species such as Spanish broom and arundo will be reduced over the long term, but increased in the short-term until they decompose. As a result, the risk for high intensity wildfires and rate of wildfire spread will be reduced over the long term; and fire fighter and public safety will be increased.

Alternative 3, No Herbicides

Direct and Indirect Effects

Alternative 3 will rely on non-herbicide based treatments. Many invasive plant species are difficult to successfully eradicate without herbicides and may require a longer period of time before a decrease in the density or occupied area is achieved. Manual treatments are labor intensive and will focus on high priority species in high priority areas. As a result, some areas of highly flammable species such as Spanish broom and arundo will be left untreated and continue to create conditions where the potential for high intensity wildfires and rate of wildfire spread is elevated. Under these conditions, fire fighter and public safety is better than what exists under Alternative 1 but is less than what will be expected with implementation of Alternative 2.

Alternatives 2 and 3 Cumulative Effects

The project area includes areas of private inholdings and is surrounded by lands with many different landowners and levels of development from commercial to residential. Fuel conditions on these lands are highly variable and experience either periodic treatments or burns that change the vegetation structure. Additionally, these lands often harbor populations of invasive plants that are left untreated as a result of the effort and expense associated with their removal. Removal of invasive plants on the Forest will reduce the occurrence and distribution of highly flammable species such as arundo and Spanish broom. Cumulatively, this will help increase the ability of firefighters to safely and aggressively respond to wildfires that may occur on the Forest and spread to adjacent non-Forest

lands. Within the project area, other actions that may affect firefighter or public safety include fuelbreak treatment/maintenance projects, forest health projects and implementation of Defensible Space treatments. The intent of the fuels projects are to reduce fuels to reduce the risk of high fire severity and decrease health and safety risks to firefighters and the public. Recent fires have also reduced the fuels level in the area, further reducing health and safety risks from wildfire in the project area. The proposed action combined with fuel hazard reduction activities, forest health project and defensible space treatments will have a cumulative and beneficial effect to human safety in the project area as it relates to wildfire.

Human Health and Safety

Alternative 1, No Action Alternative

Direct, Indirect and Cumulative Effects

Since no activities are proposed with the no action alternative, there would be no direct, indirect, or cumulative effects to the health and safety of workers and the public.

Alternative 2, Proposed Action

Direct, Indirect and Cumulative Effects

Impacts to health and safety of workers and public would be associated with both manual treatments and herbicide applications. Invasive plant removal, restoration and monitoring activities would have typical field-going health and safety risks (direct and indirect adverse effects) to workers. Field going activities could have adverse impacts to workers due to extreme weather conditions (e.g. heat exhaustion, sun burns, dehydration, slippery areas due to rain/snow, hypothermia), injuries (e.g. car accident, back strain, sprained ankle), physical hazards (e.g. uneven terrain, steep slopes, poorly accessible areas), biological hazards (e.g. poison oak, ticks, rattlesnakes, bees, wasps), and poor communication (i.e., cell phone, radio reception). Design features, including maintenance of a safety plan (which would include job hazard analysis and need for personal protective equipment) and the annual pre-operation briefing, would reduce health and safety adverse risks from these activities to low by reminding workers of the safety risks they face.

The effects from the use of any herbicide depends on the toxic properties (hazards) of the herbicide, the level of exposure to the herbicide at any given time, and the duration of that exposure. The Forest Service conducts risk assessments independent from US Environmental Protection Agency (EPA) evaluations for herbicide registration, focusing specifically on the type of herbicide used in forestry applications. Forest Service contracted with Syracuse Environmental Research Associates (SERA) to complete risk assessments for all the herbicides proposed for this alternative. In addition to the analysis of potential hazards to human health from every herbicide active ingredient, SERA risk assessments evaluate any available scientific studies of potential hazards of these other substances associated with herbicide applications: impurities, metabolites, inert ingredients, and adjuvants. Papers addressing use of spray adjuvants with herbicides specific to conditions often used by the Forest Service are included in this analysis and they are incorporated by reference (Bakke 2003, Bakke 2007).

The risk assessments help rectify the often contradictory information about herbicides that can be found online and help make potential impacts of herbicide use in Forest Service projects more predictable. These risk assessment in concert with registration and label instructions will form the basis for the analysis of effects for all Forest Service activities that include the use of herbicides. This environmental assessment relies on six risk assessment documents; Glyphosate (*SERA 2011a*), Triclopyr (*SERA 2011c*), Imazapyr (*SERA 2011b*), Aminopyralid (*SERA 2007*) Fluazifop (SERA 2014) and one for surfactants commonly used with Glyphosate (*SERA 1997*).

The Risk Assessments also contain worksheets for modeling exposure scenarios and thresholds of concern for each of these chemicals at different application rates and application methods. These worksheets are based on real world application scenarios and rates that are commonly used in Forest Service programs. The worksheets ultimately determine a "hazard quotient" (HQ) for various exposure routes. The HQ is basically the expected exposure divided by the exposure determined to cause detrimental effects. Therefore a HQ of one indicates an exposure scenario where the subject may receive a dose equal to the highest does determined to have no observable health effect (NOEL's). HQ values exceeding 1 should be noted and care should be taken to determine if the risk can be lowered. All worksheets were completed specific the proposed action and are found in the project file. Twenty four worksheets were completed each being specific to treatment and herbicide formulations. If herbicides are applied following the proposed action design features, all HQs are below 1.

Table 4 and 5 summarize toxicity categories. All herbicides in Alternative 2 are in the Toxicity Category III (Caution) except Triclopyr 3A which is a Category I (Danger).

Table 4. Summary of hazard indicators and toxicity categories for pesticides.

Hazard Indicators	Toxicity Categories			
	I	II	III	IV
Oral LD_{50}*	Up to and including 50 mg/kg	50-500 mg/kg	500-5,000 mg/kg	Greater than 5,000 mg/kg
Inhalation LD_{50}	Up to and including 0.2 mg/L	0.2-2 mg/L	2 to 20 mg/L	Greater than 20 mg/L
Dermal (skin) LD_{50}	Up to and including 200 mg/kg	200-2,000 mg/kg	2,000-20,000 mg/kg	Greater than 20,000 mg/kg
Eye Effects	Corrosive; corneal opacity not reversible within 7 days	Corneal opacity reversible within 7 days; irritation persisting for 7 days	No corneal opacity; irritation reversible within 7 days	No irritation
Skin Effects	Corrosive	Severe irritation at 72 hours	Moderate irritation at 72 hours	Mild or slight irritation at 72 hours

*LD_{50} (letal dose, 50 percent) is the dose of a chemical calculated to cause death in 50 percent of a defined experimental animal population over a specified observation period. The observation period is typically 14 days. SERA risk assessments can be downloaded at http://www.fs.fed.us/foresthealth/pesticide/risk.shtml.

Table 5. Signal Word used for each acute toxicity category.

Toxicity Category	Signal Word
I	DANGER
II	WARNING
III	CAUTION
IV	None Required

Potential adverse direct and indirect impacts would be addressed for each herbicide and adjuvants if new herbicides are added. There would be indirect beneficial impacts by successfully removing invasive plants that could change the fire regime in the riparian areas (e.g. arundo, tamarisk). Cumulative effects are addressed for the herbicides generally based on projects that would utilize pesticides nearby and also for individuals that may be exposed to herbicides from other sources.

Numerous design features have been added to this alternative to manage risk and potential harm to human health and safety for workers and the public.

Non-herbicide treatment methods, restoration and monitoring activities should have little to no effect on the general public health and safety. The greatest potential harm, short-term, would be through the use of prescribed fire (smoke). Design features included in this alternative proposed to avoid treatments in concentrated public use areas during heavy use periods (e.g. holidays, weekends, school breaks), and propose temporary public use closures in areas where the public and workers co-mingle and safety is compromised. These measures would reduce public health and safety impacts to negligible.

Cumulative effects to health and safety of workers from non-herbicide activities would vary depending on their activities. The highest risk for Forest Service employees would entail taking an emergency response assignment (e.g. wildfire) with no rest from strenuous activities from this project. Additionally, volunteers and contractors are also vulnerable to over-extending their physical capabilities. There are safety guidelines to reduce risk to employees and volunteers. The Forest Service also provides general safety guidelines for contractors. All implementers of this project are personally responsible to ensure all their activities combined do not put themselves and their crew at risk.

Cumulative effects from the use of herbicides include the potential use of herbicides by landowners with private inholdings within or adjacent to the Forest; other pesticide projects proposed in the area (e.g. non-project area herbicide treatment in the Angeles National Forest/San Gabriel Mountains National Monument, the insecticide carbaryl on conifer trees in Charlton Day Use Area, Crystal Lake Recreation Area and Sierra Pelona Campground. Along with these activities, workers and the general public that are near the project area could use herbicides outside the project area for personal activities (e.g. treating weeds on their own property). There are many design features to manage risk to worker and public health and safety from the use of herbicides from this alternative; therefore, the risk cumulatively from these other activities and this alternative would be low to moderate.

Invasive Plants and Native Vegetation

Affected Environment

There are multiple vegetation types in the project area that include, but are not exclusive to: chaparral; coastal scrub; hardwood-oak woodland; riparian; lower montane forest; and montane forest.

Table 6. Approximate acres by vegetation type within project area

Vegetation Type	*Acres*
Barren	6277
Conifer	35,159
Hardwood	33,294
Herbaceous	1227
Shrub/Conifer Mix	42,193
Shrubs	257,670
TOTAL	**375,820**

Several invasive species are common throughout the project area. These include black mustard (*Brassica nigra*), short-pod mustard (*Hirschfeldia incana*), tocalote (*Centaurea melitensis*), ripgut brome (*Bromus diandrus*), red brome (*Bromus madritensis* var. *rubens*), soft brome (*Bromus*

hordeaceous), rattail fescue (*Vulpia myuros*), wild oats (*Avena* sp.), redstem filaree (*Erodium cicutarium*), and cheatgrass (*Bromus tectorum*). These species are most common in areas of high disturbance but are naturalized and are a common component of all vegetation types. Other invasive species that occur Forest wide but are strongly associated with riparian corridors include arundo, tamarisk, tree of heaven, white sweet clover and eupatorium. Species such as Spanish broom and tree tobacco are widespread and often found in proximity of roads, trails and other disturbance corridors such as distribution and transmission lines.

Areas with the highest levels of past and ongoing localized and landscape scale disturbances have the highest concentrations of invasive plant species. Additionally, recreation areas, dams and areas with roads open to the public are also areas where high concentrations of invasive plants occur. This is likely due to high levels of disturbance, high vehicle usage, recreational activities, altered habitat (e.g. private property, Forest administrative sites) and the open, vulnerable nature of the riparian corridor in this area.

Two important components related to invasive plant spread are their reproductive potential and mechanisms for distribution, including vectors for dispersal.

Environmental Consequences

Direct, Indirect and Cumulative Effects

Alternative 1, No Action Alternative

The no action alternative maintains the present course of no treatment of invasive plant species in the project area. The result of no action is that the populations of invasive plant species would continue to expand in and beyond the project area. Impact intensities can vary from site to site depending on the invasive species present, the densities and other biotic and abiotic interactions. It is assumed that the current populations of invasive species would continue to expand both in population size and population numbers with Alternative 1. If no treatments occur in the project area over the next 15 years, this would result in long-term, moderate to major, widespread impacts. Alternative 1 would likely have the greatest increase in invasive plant growth (both in terms of number of species and size of area) when compared with the other two alternatives.

With no action, the successful establishment of new invasive plant invaders, depending on how aggressive they are, could be a major, long-term, adverse impact. Research has shown, early detection and rapid containment of invasive plant species is the most effective method for controlling their spread.

There are no cumulative effects related to invasive plant species from the no action alternative since the no action alternative does not propose any activities.

Alternative 2, Proposed Action

Integrated weed management typically combines several treatment methods (e.g. cut and paint/spray, mechanical treatments, etc) and does not rely on herbicide treatment alone.

Herbicide treatment has the potential to be highly effective in treating specific invasive plants (Randall and Hoshovsky 2000), and far less environmentally toxic when combined with other manual treatment methods. Effectiveness varies based on the invasive plant species and treatment methods chosen. There is no known treatment method (including herbicides) that would eradicate tree-of-heaven in one treatment. Foliar/spot spraying can be used if the leaves are within reach, cut stump/paint, hack and squirt and stem injections also would kill aboveground parts of the plant. At least one secondary foliar/spot spraying application of herbicide is required to cause mortality (Pannill 2000). This is also true of other priority invasive plant species. It is anticipated, in many cases, multiple treatments, including herbicides, would be needed to be effective.

Direct effects to invasive plant species would be the removal of individuals and populations, which has a localized beneficial impact in the short-term, and is likely to be a beneficial impact over a widespread area in the long-term due to the reduction or removal of seed or propagule sources.

Indirect impacts to desirable native species are possible with the application of herbicides. As an example, during the maximum wind speed conditions of 15 mph, allowed under Forest Service regulations (Alternative 2 does not allow herbicide application treatment when winds are over 10 mph), backpack sprayer applications of Garlon 4® (triclopyr BEE) can drift as far as 68 feet. The individual sensitivity to the application of Garlon 4® has been found to vary across plant species with direct application (SERA 2003a).

The distribution of the invasive species across the landscape is generally not uniform and plants can occur in clusters or individually. This results in potential localized adverse impacts to non-target individual native plant species from the use of herbicides. This impact would vary, at a minimum, depending on native plant species involved, which of the six herbicides is used, the application rate, and herbicide treatment method (e.g. foliar spray, cut and daub). This impact has the greatest potential to occur with the broad-spectrum, nonselective herbicides such as glyphosate. Direct impacts could occur to native plants from drift or accidental direct application, injuring or killing individuals, and/or indirectly by the residual chemicals in the soil that could transfer to unintended roots or unexpressed bulbs. These impacts are anticipated to be adverse, but localized and short-term.

Manual and mechanical treatments physically remove and destroy, or interrupt the growth and reproduction of invasive species. These methods can be highly effective in small populations of species that can be easily pulled, or with adequate workforces on larger populations. These methods are not as effective on deep rooted perennials or rhizomatous species, where root fragments can be left in the ground to generate new plants (Tu et al. 2001).

One of the beneficial impacts of hand pulling, pulling with tools, and clipping is the ability for high selectivity, with limited damage to desired native species. This treatment has beneficial impacts at least in the short-term, by removing target or priority invasive plant species. If it does not result in mortality for the treated individuals it is likely to, at a minimum, adversely impact its growth and reproductive potential. Some species though, like arundo or English ivy, can be stimulated by this kind of disturbance as it can create numerous vegetative propagules, which are able to develop into individual plants. This could be an adverse, minor to moderate, long-term impact if follow up monitoring and treatment do not occur, as these vegetative propagules could be dispersed to colonize other localities. Arundo is known to disperse during flooding events, spreading rapidly (Cal-IPC DCCC) from these vegetative propagules.

Hand pulling tools (e.g. weed wrench), clipping, and pulling create localized soil disturbance both where the root unearths and where foot traffic occurs. The risk associated with this soil disturbance is recolonization by invasive plants. The degree of soil disturbance depends on the density and size of invasive plants being removed, varying from negligible where only a few individuals occur, to moderate, where high densities of individuals occur. Whether this impact is short or long-term is dependent on several factors. If the areas being treated have a high native plant component, it is likely that natural succession would occur and the disturbed area would be recolonized by native plant species. Adverse impacts in these areas would be short-term. If the areas have high densities of invasive species and a low native species component, restoration and monitoring may be necessary post-treatment for net reduction of invasive species cover.

Cutting and other methods of removing the aerial parts (e.g. chainsaw, weed-wack) can weaken the target plant or remove reproductive structures. If the target plant has underground reproductive structures that facilitate resprouting, this treatment would have only short-term beneficial impacts. Some species are stimulated to grow by the removal of the stems, and others if whacked back would

still grow and flower at a lower height (e.g. yellow star thistle). These treatment methods involve highly selective methods for removing target plants and are not likely to adversely impact the native vegetation beyond negligibly.

Tarping may be useful for small areas with low growing invasive plant species, such as bigleaf periwinkle or ivy. It rarely results in mortality of the target invasive, as many of these species have been known to regenerate repeatedly from underground parts. There is the potential that tarping could assist in reducing the vegetative cover, allowing for easier access to the rootballs and rhizomes. This technique could also assist in limiting spread. Independently this treatment has the potential for negligible to minor beneficial impacts, though adverse impacts could result if native vegetation was also tarped and no restoration occurs post-treatment.

Fire-wilting methods involve using a hand-held torch to burn individual plants. This method has been used with some success on thistles (Hoshovsky and Randall 2000) and to girdle scotch broom plants. It has the advantage in that it can to be used in wet weather, though may be limited in usefulness given the extended fire season experienced in the project area. This technique is beneficial as it has limited impacts to other desirable native plants, but is time consuming.

Invasive plant species trend for Alternative 2 would be an overall decrease of invasive plant growth over the 15-year term of the project (both in terms of number of species and size of area). Alternative 2 includes herbicides as one of the tools available in integrated weed management, which provides more opportunity for successful treatments at lower costs. Monitoring is required to determine effectiveness of treatments (appendix D) and modifications on treatment methods could occur based on the finding.

Many of the other actions in the project area contribute to an increase in invasive species distribution and abundance. This alternative provides measures to reduce these effects. The adaptive management strategy makes it possible to choose the most effective management strategy and treat new infestations as they arise. This is a beneficial strategy with the potential impacts that may result from climate change, wildfire events, and other land management activities. The restoration and monitoring strategy facilitates reducing the risk of new invasive plant species or expansion of existing ones in areas impacted by activities (e.g. recreation, wildfire) within the project area.

Alternative 2 would beneficially combine with several projects and restoration (requirement by Forest is that they conduct restoration after completion of their projects) as it can function as additional monitoring and invasive plant removal. Alternative 2 provides off-site mitigation to native vegetation, from maintenance of the fuelbreaks, by reducing the net invasive plant coverage in the analysis area and increasing healthy stands of native vegetation through active and passive restoration strategies. Fuelbreaks remove and suppress native stands of vegetation; this alternative helps mitigate the potential for fuelbreaks to facilitate the establishment and spread of invasive plants.

The Charlton Forest Health Improvement project falls within the project area. This project would allow for treatment of the invasive plants known to occur, reducing the risk for spread during project activities. The Mount Wilson Hazardous Fuels Reduction project would be removing Spanish broom and other invasives by hand or mechanical treatment. This alternative would allow for an increased IWM approach and would likely improve the efficacy of the treatments.

Alternative 2 combines with many of the cumulative effects beneficially, both widespread and locally, in the long-term by either expanding their capacity for control and eradication efforts, or by mitigating their potential for increasing invasive plant distribution and abundance in the project area. The intensity of the beneficial impacts are likely to be minor to moderate since there is the variable of year to year funding and because the project area is only a portion of the watershed.

Alternative 3:

Alternative 3, No Herbicides Manual and mechanical treatments physically remove and destroy, or interrupt the growth and reproduction of invasive species. These methods can be highly effective in small populations of species that can be easily pulled, or with adequate workforces on larger populations. These methods are not as effective on deep rooted perennials or rhizomatous species, where root fragments can be left in the ground to generate new plants (Tu et al. 2001).

One of the beneficial impacts of hand pulling, pulling with tools, and clipping is the ability for high selectivity, with limited damage to desired native species. This treatment has beneficial impacts at least in the short-term, by removing target or priority invasive plant species. If it does not result in mortality for the treated individuals it is likely to, at a minimum, adversely impact its growth and reproductive potential. Some species though, like arundo or English ivy, can be stimulated by this kind of disturbance as it can create numerous vegetative propagules, which are able to develop into individual plants. This could be an adverse, minor to moderate, long-term impact if follow up monitoring and treatment do not occur, as these vegetative propagules could be dispersed to colonize other localities. Arundo is known to disperse during flooding events, spreading rapidly (Cal-IPC DCCC) from these vegetative propagules.

Hand pulling tools (e.g. weed wrench), clipping, and pulling create localized soil disturbance both where the root unearths and where foot traffic occurs. The risk associated with this soil disturbance is recolonization by invasive plants. The degree of soil disturbance depends on the density and size of invasive plants being removed, varying from negligible where only a few individuals occur, to moderate, where high densities of individuals occur. Whether this impact is short or long-term is dependent on several factors. If the areas being treated have a high native plant component, it is likely that natural succession would occur and the disturbed area would be recolonized by native plant species. Adverse impacts in these areas would be short-term. If the areas have high densities of invasive species and a low native species component, restoration and monitoring may be necessary post-treatment for net reduction of invasive species cover.

Cutting and other methods of removing the aerial parts (e.g. chainsaw, weed-wack) can weaken the target plant or remove reproductive structures. If the target plant has underground reproductive structures that facilitate resprouting, this treatment would have only short-term beneficial impacts. Some species are stimulated to grow by the removal of the stems, and others if whacked back would still grow and flower at a lower height (e.g. yellow star thistle). These treatment methods involve highly selective methods for removing target plants and are not likely to adversely impact the native vegetation beyond negligibly.

Tarping may be useful for small areas with low growing invasive plant species, such as bigleaf periwinkle, ivy or Himalayan blackberry. It rarely results in mortality of the target invasive, as many of these species have been known to regenerate repeatedly from underground parts. There is the potential that tarping could assist in reducing the vegetative cover, allowing for easier access to the rootballs and rhizomes. This technique could also assist in limiting spread. Independently this treatment has the potential for negligible to minor beneficial impacts, though adverse impacts could result if native vegetation was also tarped and no restoration occurs post-treatment.

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Alternative 3 would not have an overall trend of controlling and containing the priority species populations with an overall increase of the other invasive plant species (in terms of number of species and size of area) over the term of the project. This alternative would focus treatments on a few species

such as Spanish broom which create a safety issue growing along roadways. This alternative would require a higher number of multiple treatments over a longer period of time when compared to Alternative 2. It would also likely require treatments to occur multiple times in a given year to have greater success in weakening the root structure of target plants. Minimal control of priority species is possible with manual and mechanical methods, but without a year-to-year sizable workforce, control and eradication is unlikely. Due to the level of treatments and monitoring needed for the targeted invasive plant species, less treatment would occur on the other invasive plant species. As with Alternative 2, monitoring would allow for changes in treatment (adaptive management) based on success.

Alternative 3 would have similar cumulative effects as Alternative 2. The main distinctive difference is that this alternative would not treat as many acres. The lower capacity for acreage treated would result in increases of the moderate and low priority species, which has cumulative long-term adverse impacts.

Alternative 3 interacts with the cumulative effects that increase invasive plants (e.g. fuelbreaks, recreation, private properties, vectors and pathways, ground disturbance from Forest projects) in a negligible to minor beneficial way by controlling a portion of the net invasive plant populations in the cumulative effects analysis area.

Adaptive Management

Alternatives 2 and 3

Adaptive Management or Early Detection and Rapid Response Strategy

The adaptive management strategy (also known as early detection and rapid response strategy) as explained in the project description, allows for detection and eradication of new invasive plant populations in the early stages of infestation. This strategy also allows for rapid response to species, which have previously been observed as relatively benign, but have become more invasive. Prime sites for early detection and rapid response include road corridors, burned areas, areas of high recreation usage, and wilderness areas where the ecological integrity is of highest value.

This strategy would result in beneficial impacts to the vegetation types locally and would be beneficial regionally in the long-term, as it prevents the spread of new invasive plant populations to other portions of the project area and beyond.

Restoration and Monitoring

Alternatives 2 and 3

Restoration and Monitoring

Invasive species are known to thrive in recently disturbed sites. The removal of invasive plants, even if soil disturbance is minimized, would still result in some disturbance. Many invasive plant species, such as annual grasses, red stem filaree and tocalote, are ubiquitous throughout the Forest; therefore, have high potential to invade the recently treated areas. The intensity of the restoration required would be dependent on the disturbance regime and site potential for reestablishing a native community. Active or assisted restoration of degraded sites would greatly reduce the potential for continued invasion, or replacement of the target species with other invasive plant species.

Monitoring is an important component in these action alternatives. This is especially important with invasive plant species that have long-lived seedbanks and persistent underground structures like rhizomes (appendix B, table 17). It also allows for the adaptive management strategy to be applied, allowing for the results to confirm or facilitate change in the treatment regime.

Restoration and monitoring have long-term, beneficial, localized impacts to regeneration of native habitat, and increase in invasive plant treatment success. Depending on the habitat connectivity, vectors, and pathways, there are potential beneficial widespread impacts as well, due to the reduction in seed source and propagules available to infest other sites.

Vectors Associated with Project Implementation

No new road construction would result from project implementation. The primary increases in vectors from this project are from foot and vehicle traffic. Seeds or vegetative parts of many invasive species are adapted to cling to fur, but they also cling to clothing. As project activities are concentrated in areas with infestations of invasive plant species, there is an increased risk for propagules or seeds adhering to the clothing of individuals and the tires and undercarriage of vehicles. Studies have found that an average of 33 percent of debris is left on machinery and vehicles even with this preventative action (USFS 2008). Washing vehicles for at least six minutes increased removal of debris to the 95 percentile. A design feature reduces this adverse risk by requiring vehicles be washed a minimum of six minutes after driving through or parking in invasive plant infestations. Another design feature requires efforts be made to remove invasive plant seeds and propagules from clothing, greatly reducing the risk for spread through this vector. Anticipated impacts associated with the risk of invasive plants spreading due to vectors associated with project implementation could be short or long-term (depending on the invasive plant species being spread), adverse and negligible.

Special Status Plants

As noted earlier, special status plant species are federally listed threatened, endangered, proposed and candidate plant species under the Endangered Species Act and Forest Service sensitive plant species.

Affected Environment

There is suitable habitat for the following four federally listed (threatened, endangered, proposed, candidate) plant species: thread-leaved brodiaea (*Brodiaea filifolia; federally threatened*); Braunton's milk-vetch (*Astragalus brauntonii; federally endangered*); Nevin's barberry (*Berberis nevinii; federally endangered*); and slender-horned spineflower (*Dodecahema leptoceras*; federally endangered). Nevin's barberry is the only federally listed species confirmed as occurring in the project area. In addition, the following 33 Forest Service sensitive plant species have suitable habitat within the project area: San Antonio milk-vetch (*Astragalus lentiginosus var. Antonius*); Scalloped moonwort (*Botrychium crenulatum*); Slender mariposa lily (*Calachortus clavatus var. gracilis*); Plummer's mariposa lily (*Calachortus plummerae*); Peirson's spring beauty (*Claytonia lanceolata var. peirsonii)*; San Fernando Valley spineflower (*Choriznthe parryi var. parryi*); San Gabriel River dudleya (*Dudleya cymosa ssp. Crebrifolia*); San Gabriel Mountain dudleya (*Dudleya densiflora*); Many stemmed dudleya (*Dudleya multicaulis*); San Gabriel bedstraw (*Galium grande*); Urn flowered alum root (*Heuchera elegans*); Mesa horkelia (*Horkelia cuneata ssp. puberula*); San Gabriel Mountain sunflower (*Hulsea vestita ssp. Gabrielensis*); California satintail (*Imperata brevifolia*); Fragrant pitcher sage (*Lepechinia fragrans*); Lemon lily (*Lilium parryi*); San Gabriel linanthus (*Linanthus concinnus*); Peirson's lupine (*Lupinus peirsonii*); Hall's monardella (*Monardella macrantha ssp. Hallii*); Rock monardella (*Monardella viridis ssp. Saxicola*); Baja navarretia (*Navarretia peninsularis*); Woolly mountain-parsley (*Oreonana vestita*); Rock Creek broomrape (*Orobanche valida ssp. Valida*); Fringed grass-of-parnassus (*Parnassia cirrata var. cirrata*); Transverse range phacelia (*Phacelia exilis*); Ewan's cinquefoil (*Potentilla glandulosa ssp. Ewanii*); Southern skullcap (*Scutellaria bolanderi ssp. Austromontana*); Parish's checkerbloom (*Sidalcea hickmanii ssp. Parishii*); Chickweed starry punturebract (*Sidotheca carphylloides*); Laguna mountain jewelflower (*Streptanthus bernardinus*); Southern jewelflower (*Streptanthus campestris*); San Bernardino aster (*Symphyotrichum defoliatum*); and Sonoran maiden fern (*Thelypteris puberula*).

Details on range and distribution, habitat requirements, threats and potential for occurrence within the project area for each of these species can be found in the biological evaluation and biological assessments completed for this project.

Environmental Consequences

Direct, Indirect and Cumulative Effects

Alternative 1, No Action Alternative

The no action alternative maintains the present course of no treatment of invasive plant species in the project area. Impact intensities to special status plants would vary from site to site depending on the invasive and special status plant species present, densities, and other biotic and abiotic interactions. It is assumed that the current populations of invasive species would continue to expand both in population size and population numbers with Alternative 1. If no treatments occur in the project area over the next 15 years (other than through other project activities), the resulting expansion and introduction of invasive plants could continue to adversely impact special status plants through increased competition for resources and by rendering currently suitable habitat, unsuitable. This has the potential for adverse long-term, minor to moderate, localized impacts.

As with all resources, no cumulative effects would occur with this alternative since no action is taken.

Alternative 2, Proposed Action

This section addresses direct and indirect effects to special status plants species specific to herbicide treatment, realizing herbicide treatment would likely involve other treatment methods (e.g. mechanical treatments).

The intent of this alternative is to improve, protect, and restore native habitat conditions. Though this is likely a long-term beneficial impact, there is the potential for adverse short-term impacts. Design features have been integrated into the proposed action to eliminate or minimize the potential adverse impacts from herbicide treatments.

Herbicide application effects to non-target plants (which includes special status species) are extrapolated from the SERA risk assessments (SERA 2003a, b; 2004 a, b; 2007b) and herbicide labeling. Generally, herbicides have been tested on only a limited number of plant species and mostly under laboratory conditions. While laboratory experiments can be used to determine acute toxicity, laboratory experiments do not account for plants in their natural environments, nor do they address the effects on the specific plant species being considered in this document. This leads to some level of extrapolation in the risk assessment analysis.

If unintentional application occurs, herbicides have potential to adversely impact special status plants. Though broadcast spraying would not be utilized in this alternative, foliar and spot spraying and some of the stump applications are generally conducted with a backpack sprayer, which can result in drift of the herbicide. Much of the herbicide application in the proposed action would be conducted by cut and daub, hack and squirt, and other localized application methods. This eliminates much of the risk associated with drift, and greatly reduces the amount of herbicide applied.

There is little available information on the impacts of adjuvants on terrestrial plants, other than on target species. In this analysis of Alternative 2, it is assumed that the proposed action including the design features for herbicide application will avoid unintentional impacts to special status plant species that may occur in proximity of treatments.

Currently, Nevin's barberry is the only federally listed plant species known to occur in the project area and from only one location. Additionally, the project area contains suitable habitat for thread-leaved brodiaea, Braunton's milk-vetch, Nevin's barberry and slender-horned spineflower. As noted

in the design features, pre-implementation plant surveys will be conducted to determine presence or absence of federally listed plant species. If federally listed plant species are found in the project area before or during implementation, a protective buffer will be placed around the plants and Fish and Wildlife Service will be contacted. Undetected plants could be subject to injury or mortality as a result of treatment activities, but pre-project surveys will reduce this risk. While removal of invasive plants may have short term impacts on habitat suitability, there will be an overall long term benefit for listed plants and their habitat. In summary, the proposed alternative may affect, but is not likely to adversely affect the Nevin's barberry, slender horned spineflower, three-leaved brodiaea and Braunton's milk-vetch.

The design feature for Forest Service sensitive species provides a buffer from 5 to 70 feet depending on various criteria, including the toxicity of the herbicide being considered for use near these plant species. The toxicity to various non-target species would be considered in determining the size of the buffer.

Other criteria noted in the design feature to determine buffer size are the concentration of herbicide used, phenology at time of treatment, and rareness and imperilment of the species. Larger (meta) populations of Forest Service sensitive plant occurrences that are also not highly rare or imperiled (e.g. Plummer's mariposa lily) could have a smaller buffer. Buffers can also be smaller around Forest Service sensitive plants if they are in the dormancy phase of their life cycle during herbicide treatment. By using these criteria, there is the potential of adversely affecting individual Forest Service sensitive plants but based on the criteria to determine buffer size, the direct adverse impacts are expected to be negligible to minor, localized and short-term.

Many of the other actions considered in the cumulative effects analysis area contribute to the increase in invasive species distribution and abundance. This alternative provides measures to reduce these effects. Beneficial effects include the reduction in potential resource competition, prevention of new invaders, and restoration of habitat.

Design features will avoid impacts to the one Federally listed plant known to occur in the project area and any others that might be detected during pre-implementation surveys. Implementation of design features and the low likelihood for listed plant occurrences in treatment areas will remove the potential for cumulative impacts to individual federally listed plants. Removal of invasives will decrease competition for resources and water, reduce crowding and allow for the establishment of native vegetation. While design features will protect individual T&E plants from direct impacts, there could be some short term impacts to the area in their proximity. Short term impacts may include changes in micro-site conditions such as increased sunlight exposure, decreased humidity, reduced ground cover and increased areas of bare soil. The long term benefit of removing invasive plants in proximity of federally listed plant occurrences outweighs the impacts associated with minor disturbance to individuals.

Alternative 3, No Herbicides

This section addresses direct and indirect effects to special status plant species related to the non-herbicide activities. These non-herbicide activities include mechanical treatments such as cutting, pulling, tarping and wilting.

Several design features are incorporated into both action alternatives to reduce potential adverse impacts to specials status plants (e.g. pre-treatment surveys, reinitiating consultation with US Fish and Wildlife Service if federally listed plants are found, flag and avoid, seasonal restrictions). With these design features, individuals would be protected from many of these potential direct impacts through avoidance. Potential adverse direct impacts to special status plant species are negligible to minor, localized and short-term.

Non-herbicide treatment methods have potential to reduce canopy closure, create ground disturbance and modify ground cover. The scope of the adverse impacts is likely to be negligible, as alterations such as changes in micro site climate and localized increases in erosion from the non-herbicide activities would be short-term and localized. Additionally, the reduction in populations of nearby invasive plant species and restoration efforts would improve habitat by reducing competition from non-natives and potentially reducing the risk of overly frequent fire regimes within riparian habitat that is caused by fire-adapted invasive plants (e.g. tamarisk, arundo). Under Alternative 3, the reduced level of treated acres and non-herbicide treatment methods (e.g. manual, mechanical) are likely to be less effective at reducing invasive plant populations and restoring habitat than Alternative 2. As a result, the overall contribution to habitat restoration and invasive plant control for Alternative 3 will be less than Alternative 2.

Alternative 3 is likely to have cumulative effects similar to Alternative 2. However, the focus on non-herbicide treatments and the limited number of target species included for treatment means that there will likely be an increase in the density and spread of invasive plants as a result of existing and future projects/activities in the project area. Additionally, not using herbicides would result in more ground disturbance and more entries than Alternative 2. This would reduce the potential beneficial cumulative effects and increase the potential cumulative adverse effects.

Wildlife

Affected Environment

Special Status Wildlife Species

There is occupied habitat within the project area for seven federally endangered (FE) and federally threatened (FT) wildlife species: Santa Ana sucker (*Catostomus santaanae)* FT, California condor (*Gymnogyps californianus*) FE, southwestern willow flycatcher (*Empidonax traillii extimus)* FE, least Bell's vireo (*Vireo bellii pusillus*) FE, mountain yellow-legged frog (*Rana muscosa)* FE,and arroyo toad (*Anaxyrus californicus*) FE. The project area also includes designated critical habitat for the Santa Ana sucker, southwestern willow flycatcher, coastal California gnatcatcher (*Polioptila californica californica*) FT, mountain yellow-legged frog and arroyo toad.

There is also suitable habitat for 19 Forest Service sensitive wildlife species: bald eagle (*Haliaeetus leucocephalus*), California spotted owl (*Strix occidentalis occidentalis*), gray vireo (*Vireo vicinior*), arroyo chub (*Gila orcutti*); Santa Ana speckled dace (*Rhinichthys osculus*), San Gabriel mountain slender salamander (*Batrachoseps gabrieli*), California legless lizard (*Anniella pulchra*),southwestern pond turtle (*Clemmys marmorata pallid*), coastal rosy boa (*Lichanura trivirgata*), San Bernardino ringneck snake (*Diadophis punctatus modestus*), San Bernardino mountain kingsnake (*Lampropeltis zonata parvirubra*),; two-striped Garter snake (*Thamnophis hammondii*), Nelson's bighorn sheep (*Ovis canadensis nelson*), pallid bat (*Antrozous pallidus*), Townsend's big-eared bat (*Corynorhinus townsendii*), fringed myotis (*Myotis thysanodes*), San Gabriel Mountains blue butterfly *(Plebejus saepiolus aureoles),* San Gabriel Mountains elfin *(Callophrys mossii hidakupa)* and San Emigdio blue butterfly *(Plebulina emigdionis)* .

Details on range and distribution, habitat requirements, threats and potential for occurrence within the project area for each of these species can be found in the Biological Evaluation (BE) and Biological Assessment (BA) completed for this project.

Environmental Consequences

Direct, Indirect and Cumulative Effects

Alternative 1, No Action Alternative

The no action alternative would result in the continuing survival, growth and spread of invasive plants throughout the project area. If the populations of invasive plants are left untreated, they would over time, degrade, alter and in some cases decrease the amount of suitable habitat available for both aquatic and terrestrial wildlife.

Existing invasive plant populations found in riparian areas would eventually take over drainages altering the vegetative composition and hydrology in those drainages. This would adversely affect aquatic species including, but not limited to, the mountain yellow-legged frog, arroyo toad, Santa Ana sucker, Santa Ana speckled dace, arroyo chub, southwestern pond turtle and two-striped garter snake. Changes in stream flow, depth and water availability would decrease the amount of suitable habitat that is available for these species. It would also likely affect riparian nesting species, such as the least Bell's vireo and southwestern willow flycatcher, due to the change in vegetative composition. This could lead to a degradation or loss of suitable nesting and foraging habitat.

For herbivores such as Nelson's bighorn sheep, the no action alternative would affect the availability of forage and water. Invasive plant species are generally unpalatable to bighorn sheep and as they continue to spread, they would degrade existing forage conditions potentially limiting the population distribution of bighorn sheep. As water amount and distribution is affected by the presence and spread of invasive plants, the availability of water for sheep during the warmer months and under drought conditions could be adversely affected. These changes would have a potentially detrimental effect on Nelson's bighorn sheep and their habitat within the project area.

As invasive populations get denser, they would change the habitat suitability for reptiles which need both shade and exposure to the sun for thermoregulation. Species such as the San Diego coast horned lizard, rely on openings for foraging and would be negatively impacted by dense infestations of invasive plants. The spread of invasive plants may also affect the availability of forage species which are associated with native plants. Over time, these conditions would lead to changes in populations. Severe infestations could affect distribution across the landscape.

The no action alternative would also affect bat species with the changes in water availability. Flat surface water is important for bats who rely on it daily for hydration. Additionally, many bat species forage over water where insects are plentiful. The changes in water flow caused by invasive plant populations would affect foraging habitat especially during the dry months, leading to a decrease in the amount of foraging habitat. Native insect production would be affected as the habitat composed of invasive nonnative species increased.

As with all resources, no cumulative effects would occur with this alternative since no action is taken.

Alternative 2, Proposed Action

This section addresses effects to general wildlife species from a combination of herbicide and manual treatments. One of the issues brought up during scoping was the potential impact from the use of herbicides to aquatic organisms, mammals, and birds.

Effects of herbicide use on wildlife are based primarily on the Forest Service Risk Assessments done by Syracuse Environmental Research Associates, Inc. (SERA) using peer-reviewed articles from the open scientific literature and current EPA documents. Information from laboratory and field studies of herbicide toxicity, exposure, and environmental fate was used to estimate the risk of adverse effects to non-target organisms. In addition, the Forest Service Region 6 Invasive Plant Toolbox (http://www.fs.fed.us/r6/invasiveplant-eis/Region-6-Inv-Plant-Toolbox/) was used to help analyze

effects and determine needed design features. The effects of any herbicide depends on the toxic properties (hazards) of that herbicide, the level of exposure to that herbicide at any given time and the duration of that exposure.

The risk assessments and herbicide program worksheets considered worst case scenarios including accidental exposures and application at maximum label rates. Although the risk assessments have limitations, they represent the best science available. The risk assessments may be accessed via the Forest Service website at: http://www.fs.fed.us/foresthealth/pesticide/index.shtml. These risk assessments and herbicide worksheets help identify areas of risk and help point out potential concerns needing mitigation to insure protection of human life and natural resources.

General Wildlife

Project activities will result in noise and disturbance as crews move through areas or implement removal treatments. Noise and disturbance can result in temporary displacement of individuals. Displaced individuals can be exposed to increased risk of predation if they are unable to locate proper cover. At the same time, displacement can be beneficial if these individuals move out of treatment areas and are then at less risk of direct impacts such as trampling, overspray, etc… Amphibians, reptiles and smaller size mammals are at risk of being trampled and crushed by crew or injured by equipment during project activities. Individuals that are buried or burrowed underground or under leaf litter can be crushed or injured by equipment such as weed wrenches, shovels or other digging instruments. All treatments for removal of invasive plants will have the effect of modifying canopy closure, vegetation structure and ground cover. In most cases, these effects will be short term and offset when the site experiences revegetation from native plants.

Direct effects associated with herbicide use may occur as the result of unintentional direct spray and accidental spills particularly in or near water. Although both unintentional direct spray and accidental spills have the potential to occur, stringent project design features have been incorporated to reduce the likelihood of these events. Unintentional direct spray would not likely occur because the presence of personnel applying herbicides in treatment areas would cause most wildlife to temporarily disperse from the area. Some reptile species, however, may remain in the area taking cover under vegetation leaving individuals at slight risk to direct spray. If direct spray to reptiles does occur, the vegetative cover would act as a barrier decreasing the amount of herbicide spray that comes in contact with reptiles. The risk of an accidental spill is also low due to the guidelines outlined in the herbicide transportation, handling, and emergency spill response plan which is part of the proposed action. If an accidental spill or unintentional direct spray occurs on wildlife, there is the potential of adverse effects occurring. Worst case, adverse effects could include, but are not limited to, changes in internal organ functions or complete shut-down of organs, offspring that develop physical abnormalities, and mortality of the individual exposed. Effects would vary based on the herbicide, amount and concentration of herbicide used, size of the animal exposed and in the case of an accident spill in water, how long it would take the herbicide to become diluted. The risks are low because of the project design and several design features (e.g. only target herbicide treatment methods would be use with no broadcast spraying, only daily use quantities of herbicides would be transported to the work site [except in wilderness areas], impervious material, such as a bucket or plastic, would be placed beneath mixing areas in such a manner as to contain any spills associated with mixing/refilling).

Indirect effects as a result of herbicide application are more likely to occur and are a higher risk to wildlife than direct effects. Indirect effects include consumption of contaminated vegetation and/or prey, contact with contaminated vegetation and soil, and consumption of contaminated water. All of these effects may occur to wildlife in the area after treatment. The effects of the herbicides varies based on the herbicide, the concentration of herbicide used, weight of the animal, amount of contaminated material consumed and duration of consumption, that is, consumption in a single incident or over multiple days. The risk to wildlife is based on the toxicity of the product and how it

affects the species. A summary of the risks for each of the proposed herbicides may have on terrestrial and aquatic wildlife can be found in the biological evaluation and biological assessment. All risk information is taken from the SERA Risk Assessments (SERA 2003 a-b, 2004 a-b, 2007b, 2007, 2010, 2011). A general summary of finding of potential impacts to major wildlife groups from the use of the herbicides is provided:

Mammals and Birds

- When herbicides pose a plausible risk, it is consistently to insectivorous and grass-eating animals because they are most likely to receive doses above the toxicity index.
- Fish-eating birds do not receive a dose above the toxicity index for any of the six herbicides at the application rates ranges.
- Consumption of contaminated water, even as the result of an accidental spill, results in doses well below the toxicity index for all six herbicides.
- Birds are less sensitive than mammals to acute exposures.

Reptiles

- There are no specific studies on reptiles for any of the herbicides proposed. Data on amphibians and fish are used as a reference. Based on this interpolation, toxicity levels to reptiles from direct spray or contact with treated plants are expected to be lower since reptile skin is less permeable than fish or amphibians.
- Risk of herbicide affecting reptiles can be through direct spray, contact with contaminated soil and vegetation, ingestion of contaminated prey.

Amphibians

- Less sensitive or about as sensitive as fish to some herbicides.
- There have been no separate dose-response assessments conducted; fish assessments apply.
- No data regarding toxicity for chlorsulfuron or imazapyr, however, data for other aquatic species shows low potential to cause adverse effects.
- Can reduce risk by applying during non-breeding season or not during larval development stages.

Fish

- To determine non-lethal effects a no observable effect concentration (NOEC) is given compared to no observable adverse effect levels (NOAEL) used for mammals and birds.
- Salmonids are generally more sensitive to herbicides than other fish species.
- Toxicity in fish is based on bioconcentration levels found in fish.
- Generally, surfactants added to glyphosate are more toxic than glyphosate itself.

Presently the project area does not have vast areas of invasive weeds and herbicide treatment is one of many options for this alternative. The herbicide that is typically higher risk to wildlife (i.e., triclopyr) has restrictions on use through various design features that were intended for human health and safety, but wildlife would also benefit: in areas where the public can consume vegetation where herbicides would be used, the vegetation would be cut prior to herbicide treatment, and triclopyr would be the lowest priority herbicide applied and would only be used if the other approved herbicides are not effective in treating a specific invasive plant.

Alternative 2, Proposed Action

Special Status Wildlife Species

In general, many of the effects described for general wildlife would apply to special status wildlife species. To address effects to special status species and their habitats, a Biological Assessment (BA)

for federally listed species has been prepared along with a Biological Evaluation (BE) for FS sensitive species. The following is a summary of the analysis included in the BA and BE.

Project activities will result in noise and disturbance as crews move through areas or implement removal treatments. Noise and disturbance can result in temporary displacement of individuals. Displaced individuals can be exposed to increased risk of predation if they are unable to locate proper cover. At the same time, displacement can be beneficial if these individuals move out of treatment areas and are then at less risk of direct impacts such as trampling, overspray, etc… Amphibians, reptiles and smaller size mammals are at risk of being trampled and crushed by crew or injured by equipment during project activities. Individuals that are buried or burrowed underground or under leaf litter can be crushed or injured by equipment such as weed wrenches, shovels or other digging instruments. All treatments for removal of invasive plants will have the effect of modifying canopy closure, vegetation structure and ground cover. In most cases, these effects will be short term and offset when the site experiences revegetation from native plants.

There are seven federally listed species with either occupied or designated critical habitat in the project area. Design Features have been developed for all species to avoid or minimize potential impacts associated with project implementation. Federally listed wildlife species included in the Biological Assessment include the following: Santa Ana sucker (FT), California condor (FE), southwestern willow flycatcher (FE), least Bell's vireo (FE), mountain yellow-legged frog (FE),and arroyo toad (FE). The project area also includes designated critical habitat for the Santa Ana sucker, southwestern willow flycatcher, coastal California gnatcatcher (FT), mountain yellow-legged frog and arroyo toad. The summary of effects for all of these species is included below.

California Condor Summary of Effects:

- No disturbance to nesting or night roosting will occur as a result of project implementation.
- Even if temporarily displaced by project activities, this would only affect loitering birds who can easily find other nearby areas to occupy. (Design Feature #35)
- Project design features require proper storage of herbicides. This will prevent accidental ingestion by condors. (Design Feature #1) (Design Feature #1, #2, #3, #10c, #10e, #10g, #10h, #10j, #13, #15, #29, #30, #31, #33, #39, #57, #58)
- Over the long term, the removal of invasive plants is expected to improve habitat conditions for this species. (Design Feature #41)

Coastal California Gnatcatcher Summary of Effects:

- No adverse effects to reproductive success will occur as a result of project implementation. (Design Feature #24)
- Potential disturbance outside of nesting period and consumption of herbicide exposed insects are expected to have negligible effects on these species. (Design Feature #1, #2, #3)
- Over the long-term, the removal of invasive plants is expected to improve habitat conditions for both species. (Design Feature #41)

Southwestern Willow Flycatcher and Least Bell's Vireo Summary of Effects:

- No adverse effects to reproductive success will occur as a result of project implementation. (Design Feature #23 and #24)
- Potential disturbance outside of nesting period and consumption of herbicide exposed insects are expected to have negligible effects on these species. (Design Feature #1, #2, #3)
- Except in situations where tamarisk contributes to suitable habitat conditions, proposed treatments will not adversely modify suitability of nesting habitat. Adverse impacts to the

quality of nesting habitat (where tamarisk is abundant) will be minor and short-term, with long-term improvements of habitat with restoration of native species. (Design Feature #41)
- Over the long-term, the removal of invasive plants is expected to improve habitat conditions for both species. (Design Feature #41)

Mountain Yellow-legged Frog Summary of Effects:

- No adverse effects to reproductive success. (Design Feature #10b and #27)
- Short term disturbance if frogs are present in areas where treatments are being implemented. (Design Feature #10b, #10j and #27)
- There will be no adverse effects to designated critical habitat or its primary constituent elements. Treatment activities will not adversely affect the overall hydrology of streams nor will it affect stream characteristics such as bank or substrate structure, presence of pools, or aquatic refugia. (Design Feature #1, #2, #3, #10b, #10e, #10g, #10h, #10j, #13, #15, #27, #39, #57, #58)
- If invasive plants are present, treatment activities may alter vegetation structure. Over the long term, the removal of invasive plants is expected to improve habitat conditions for the mountain yellow-legged frog including its primary constituent elements. (Design Feature #41)

California Red-legged Frog Summary of Effects:

- No adverse effects to reproductive success. (#3, #10c)
- Short term disturbance if frogs are present in areas where treatments are being implemented. (Design Feature #10c and #10j)
- There will be no adverse effects to designated critical habitat or its primary constituent elements. Treatment activities will not adversely affect the overall hydrology of streams nor will it affect stream characteristics such as bank or substrate structure, presence of pools, or aquatic refugia. (Design Feature #1, #2, #3, #10c, #10e, #10g, #10h, #10j, #13, #15, #39, #57, #58)
- If invasive plants are present, treatment activities may alter vegetation structure. Over the long term, the removal of invasive plants is expected to improve habitat conditions for the California red-legged frog including its primary constituent elements. (Design Feature #41)

Arroyo Toad Summary of Effects:

- No adverse effects to reproductive success. (Design Feature #10c, #28, #29)
- Short term disturbance or displacement if toads are present in areas where treatments are being implemented. (Design Feature #29, #30, #31, #32)
- Individuals may be unearthed as plants and their roots are pulled. (Design Feature #28, #29, #30, #31, #32, #33, #35)
- Individuals may be crushed by people working in the project area. (Design Feature #28, #29, #30, #31, #32, #33, #35)
- There is minor potential for ingestion of contaminated insects, but the risk is low and expected to have negligible effects. (Design Feature #1, #2, #3, #29, #30, #32)
- There will be no adverse effects to designated critical habitat or its primary constituent elements. Treatment activities will not adversely affect the overall hydrology of streams nor will it affect stream characteristics such as bank or substrate structure, presence of pools, or aquatic refugia. (Design Feature #1, #2, #3, #10c, #10e, #10g, #10h, #10j, #13, #15, #29, #30, #31, #33, #39, #57, #58)

- Removal of invasive plants is expected to improve habitat conditions for the arroyo toad including its primary constituent elements. (Design Feature #41)

Santa Ana Sucker Summary of Effects:

- No adverse effects to reproductive success. (Design Feature #10a, #26a and #26b)
- Short term disturbance or displacement if fish are present in areas where treatments are being implemented. (Design Feature #10a, #10j, #26)
- Disturbance related effects will be reduced by implementation of Design Features which restrict treatment of emergent vegetation and limit treatment of streambank vegetation during spawning season. (Design Feature #26)
- Potential for effects related to drift or accidental spills will be greatly reduced through implementation of Design Features that address application techniques, storage, and filling of equipment. (Design Feature #1, #2, #3, #10a, #10d, #10e, #11)
- There will be no long term adverse effects to designated critical habitat or its primary constituent elements. Treatment activities will not adversely affect the overall stream hydrology nor will it affect stream characteristics such as bank or substrate structure. Reduction in stream shade would be temporary and offset by the establishment of native vegetation. Increased water turbidity will be minimized by limiting crew entry into the stream. (Design Feature #1, #2, #3, #10c, #10e, #10g, #10h, #10j, #13, #15, #26, #39, #57, #58)
- Removal of invasive plants is expected to provide a long term benefit to habitat conditions for the Santa Ana sucker including its primary constituent elements. (Design Feature #41)

There is suitable habitat for 19 Forest Service sensitive wildlife species: bald eagle (*Haliaeetus leucocephalus*), California spotted owl (*Strix occidentalis occidentalis*), gray vireo (*Vireo vicinior*), arroyo chub (*Gila orcutti*); Santa Ana speckled dace (*Rhinichthys osculus*), San Gabriel mountain slender salamander (*Batrachoseps gabrieli*), California legless lizard (*Anniella pulchra*),southwestern pond turtle (*Clemmys marmorata pallid*), coastal rosy boa (*Lichanura trivirgata*), San Bernardino ringneck snake (*Diadophis punctatus modestus*), San Bernardino mountain kingsnake (*Lampropeltis zonata parvirubra*),; two-striped Garter snake (*Thamnophis hammondii*), Nelson's bighorn sheep (*Ovis canadensis nelson*), pallid bat (*Antrozous pallidus*), Townsend's big-eared bat (*Corynorhinus townsendii*), fringed myotis (*Myotis thysanodes*), San Gabriel Mountains blue butterfly *(Plebejus saepiolus aureoles),* San Gabriel Mountains elfin *(Callophrys mossii hidakupa)* and San Emigdio blue butterfly *(Plebulina emigdionis)*.

The proposed action includes project design features that will help reduce or avoid the potential for impacts to FS sensitive wildlife species. Where occupied habitat for FS sensitive species overlaps occupied habitat for threatened and endangered species, design features developed for protection of federally listed wildlife will provide benefits for all individuals present. While project activities may have some adverse impacts on individual Forest Service sensitive wildlife species, the project will not lead to a loss of viability or federal listing for any of these species. For all FS sensitive species, the project will have a beneficial impact through the enhancement and restoration of suitable habitat.

Within the project area, there are no nesting bald eagles and there is only one location where they are known to overwinter. Project activities are not expected to have any effect on bald eagles. Gray vireos could be impacted by project activities as a result of disturbance to foraging/nesting or ingestion of insects that have been exposed to project herbicides. The effect of this consumption is expected to be discountable. Given their distribution on the Forest, California spotted owl territories are often outside areas where target invasive plant populations occur and will not typically be included in treatment activities. If California spotted owls are present where treatment activities occur, they may be

temporarily displaced. Arroyo chub and Santa Ana speckled dace occur in the same stream stretches as the federally protected Santa Ana sucker. Based on this, no impacts to arroyo chub or Santa Ana speckled dace are expected. FS sensitive amphibians and reptiles occurring in the project area have the highest potential for impacts. This is based on their size and mobility which increase their potential for being exposed to overspray or for being trampled or crushed by crews and their tools. This is especially true for individuals that burrow or hide under leaf litter. Bats may day roost in areas where treatments occur and could be disturbed by project activities. Additionally, they could be impacted as a result of ingestions of insects that have been exposed to project herbicides. The effect of this consumption is expected to be discountable. Given their limited distribution and low likelihood of occurrence within treatment areas, FS sensitive butterflies are not expected to be impacted by project activities. Host plants are not targets for treatment and application methods will reduce potential for accidental exposure.

Alternative 2 will provide the most effective results and require fewer entries than Alternative 3. Because the method of treatment is more efficient, larger areas can be treated in a shorter period of time and habitat restoration will benefit a greater area. Since invasive plants can be most pervasive in riparian areas, aquatic species may receive the greatest benefit. All species will benefit from habitat restoration and reduced levels of highly flammable vegetation and their associated wildfire risks.

The proposed project would cumulatively increase adverse effects when reviewed with other projects/activities. Disturbance from treatment activities would be short-term and would be due to the presence of personnel in suitable habitat and the contamination of vegetation and soil from herbicide treatments. In the long-term, the proposed action would improve and maintain habitat conditions for wildlife. Implementation of the design features should result in very little effect on wildlife.

Activities such as recreation use and the presence of dams and reservoirs and road maintenance projects would have a continued impact on wildlife in the area. Activities on non-national forest lands could also impact wildlife. For some wildlife species, there is a level of habituation to the activities associated with recreation and road maintenance on non-national forest lands as they have been occurring for years and on a regular basis. The dams and reservoirs in the project area have been present for years and wildlife have adapted to the presence of these structures and the activities affecting them. Wildfires are also likely to occur over the next 15 years and would continue to impact wildlife species by altering and removing suitable habitat. This project would not contribute toward the cumulative impacts of wildfire to wildlife species. Other activities that involve vegetation management and the proposed project would cumulatively affect wildlife habitat as it would improve existing conditions in the future.

Alternative 3, No Herbicides

Alternative 3 would treat invasive plant species, but without the use of herbicides. Treatment would likely be less effective, require more effort and entries, and cost more. Without the use of herbicides, the risk of impacts associated with exposure to herbicides is eliminated. However, the need for an increased entries and potentially greater levels of ground disturbance would increase short term impacts. Long term benefits are decreased since only high priority invasive plants would be a priority for treatment and most low and moderate priority invasive plant species would continue to survive and spread similar to the no action alternative. However, since only high priority invasive plants would be a priority for treatment, most low and moderate priority invasive plant species would continue to survive and spread similar to the no action alternative. This would have a long-term adverse effect on native wildlife. Complete eradication of invasive plant populations is unlikely and spread of many invasive plants would be at a similar rate. This is especially true for those species in which herbicides have been found to be the one effective method of eradication. Other treatments would help to control the population, but the effect is temporary.

Alternative 3 would help to contain some populations of invasive plants (i.e., high priority species), but it would require more entries. This would lead to an increase of disturbance to wildlife species with the presence of personnel and vehicles in the area. The disturbance would be short-term, but at higher intervals than in the proposed action. Project activities will result in noise and disturbance as crews move through areas or implement removal treatments. Noise and disturbance can result in temporary displacement of individuals. Displaced individuals can be exposed to increased risk of predation if they are unable to locate proper cover. At the same time, displacement can be beneficial if these individuals move out of treatment areas and are then at less risk of direct impacts such as trampling, overspray, etc… Amphibians, reptiles and smaller size mammals are at risk of being trampled and crushed by crew or injured by equipment during project activities. Individuals that are buried or burrowed underground or under leaf litter can be crushed or injured by equipment such as weed wrenches, shovels or other digging instruments. All treatments for removal of invasive plants will have the effect of modifying canopy closure, vegetation structure and ground cover. In most cases, these effects will be short term and offset when the site experiences revegetation from native plants.

Under Alternative 3, treatments would not cumulatively increase adverse effects to any extent. There would be minor increases in human disturbance for the short time that the treatment takes place. The lack of herbicide use in Alternative 3 would decrease any risk to wildlife in the area and the adverse effects associated with herbicide risks. Lands adjacent to the project area may include treatment of invasive plants by a variety of methods. Treatment of these non-Forest lands along with Alternative 3, would cumulatively increase the beneficial effects of removing invasive plant populations. However, as described in the effects section for Alternative 3, the overall results will have limited benefits because only high priority invasive species would be included in the project treatments. Treatments which ignore moderate and low priority species would have decreased benefits in the long-term.

Soils and Hydrology

Affected Environment

The northern Sierra Pelona and San Gabriel Mountains are young mountain ranges which are still being affected by ongoing tectonic activity. Mountain slopes are generally steep with sharp ridges. Streams are in narrow canyons with steep gradients. Channels are carved into bedrock or lined with gravels, cobbles, and boulders. Occasional reaches with lower gradients may contain some sands. Periodic flooding after significant precipitation events is common. These floods move large volumes of sediments of all sizes down the stream channel. Channels are generally free of large vegetation due to these floods, which scour vegetation from the channel when they occur.

Few areas are wide enough to contain much of a floodplain and these are generally in the lower reaches of the drainages. Other reaches may have stream terraces which have been uplifted by tectonic forces beyond the reach of flood events. Floodplains and stream terraces are often the locations for denser stands of invasive plant species. Floodplains may be scoured clean of most vegetation during flood events, leaving little competition for invasive plant species which generally colonize disturbed areas rapidly. Floodplains and terraces also contain shallow groundwater which is readily available to invasive plant species.

Some perennial stream reaches, especially on the main channel of the Big Tujunga River, exhibit a wide, rocky channel. Normal stream flow does not occupy the entire width of the channel, leaving broad, rocky floodplains adjacent to the active channel. Floodplains, stream terraces, and exposed shorelines of reservoirs and lakes are also designated as wetlands by the US Fish and Wildlife Service. These areas often contain invasive plant species and are the primary focus of the proposed treatments.

The coarse nature of the channel substrate and adjacent floodplains and stream terraces allow rapid infiltration of precipitation or other fluids, such as herbicides.

Water quality in the various streams is generally good, except during high flows when turbidity and suspended sediment concentrations increase and in areas of heavy recreational use which may add trash and bacteria to the water.

The soil characteristics are generally shallow with moderately rapid infiltration. The Trigo, Stukel, and Caperton soil types cover the majority of the treatment areas. Precipitation would infiltrate rapidly but available storage in the soil is limited and surface runoff may start relatively quickly. Rock outcrops also cover a significant portion of the treatment areas. Rock outcrops are typically barren with soils capable of plant growth covering less than 15 percent of the area. Their runoff potential is typically very high.

Environmental Consequences

Direct, Indirect and Cumulative Effects

Alternative 1, No Action Alternative

Under this alternative, invasive plant species would continue to spread and increase occupation of riparian habitat and other areas. Tamarisk and arundo are especially invasive and can rapidly form dense stands along stream channels and on floodplains. Tamarisk species have very long tap roots which can access shallow groundwater. Dense stands of tamarisk can reduce streamflow by direct water usage and by lowering groundwater levels. Arundo also forms dense stands and uses large volumes of water to support its rapid growth rates. Unimpeded growth of tamarisk and arundo could result in a decrease of stream flows, especially in smaller drainages (Muzika 2005, Benton 2005).

Typical stream behavior in this area includes floods of various sizes which mobilize sediments and clear much of the vegetation from stream banks and floodplains. Dense stands of arundo or tamarisk can also affect stream morphology by unnaturally stabilizing stream banks, islands, sand bars, and floodplains. Tamarisk seeds and arundo roots/stalks (propagules) can also be transported downstream during flood flows to colonize other areas.

Water quality can be affected by these invasive plant species. A potential beneficial effect is that water temperature could be reduced as the increased shade from the invasive plant species provides shade. Tamarisk species have the ability to take up salts present in water and excrete it in their leaves. When these salts build in soils beneath tamarisk stands, soil productivity is reduced and growth of other plant species is suppressed. These salts can also reach surface and groundwater through runoff or infiltration.

Many of the invasive plant species are highly flammable, especially tamarisk and arundo. As these species increase, they can affect the wildland fire regime by increasing fire severity and decreasing the return interval. As noted earlier in this document, this has adverse impacts in riparian areas which generally burn at lower fire severity than upland areas. Increased fire severity has negative impacts on soils including hydrophobicity (water repellency), which reduces infiltration; changes in soil structure; and destruction of soil biota. Following wildfires, the first few years of rain would erode and transport ashes, nutrients, and sediments to the streams within the fire perimeter with a resultant decrease in water quality. This was seen in the areas burned by the Station and Morris fires. The reduced amount of vegetation on hillslopes allows more runoff and sediment transport which would increase water supply to the streams, with the potential for flooding and mud flows, which occurred in cities downstream of the Station fire after the January 2010 rains.

Excluding wildfire events, this alternative would result in long-term, adverse (reduction in water supply) and beneficial (maintenance of water quality) effects within riparian corridors in the San

Gabriel River watershed. Including wildfire effects, this alternative would result in adverse effects to water quality and quantity, soil structure, and the soil biological community.

There are no cumulative effects because there are no activities proposed with this alternative.

Alternative 2, Proposed Action

This section addresses direct and indirect effects to soils and hydrology specific to the use of herbicides. Herbicide treatment methods would likely include other treatment methods (e.g. cut and daub). Impacts from non-herbicide activities are addressed in the next section.

The use of herbicides within riparian areas is of concern due to the potential introduction of toxic chemicals into streams. Nearly all of the treatment areas are in floodplains and along stream channels. Many of the invasive plant species grow along active channel banks and sometimes within flowing streams. Thus, herbicides may be applied where they can quickly enter streams. Streams in the project area are in narrow canyons with limited floodplains, where many of the invasive plant species grow. A design feature is included in this alternative that requires only aquatically registered herbicides would be allowed within 100 feet of banks of rivers and tributaries.

Herbicides are typically used with adjuvants, compounds which enhance the capability of the herbicide to stick and spread over vegetation and to penetrate into plant tissues. Adjuvants vary in toxicity and few studies have been conducted on their behavior in the environment. A design feature requires low-risk aquatically approved surfactants be used within 100 feet of the banks of rivers and tributaries. In addition, since any adjuvant used would be mixed as a small percentage of an herbicide, the effects on the environment, including soils and water quality would be considered the same as the herbicide (Bakke 2007).

Herbicide characteristics that affect their behavior and persistence in the environment include solubility in water, degradation rates in soils and water, leachability, and adsorption onto soils.

The primary method for avoiding potential adverse effects from herbicide treatment is to follow the manufacturer's label direction and implement all applicable design. Direct hand application in comparison to broadcast spraying minimizes the amount of herbicide needed to treat invasive plant species. Design features that would reduce impacts to soil and water quality include developing a herbicide transportation, handling, and emergency spill response plan, having a spill kit on site when herbicide treatment methods occur, measures to minimize drift, allowing only aquatically registered herbicides and low-risk aquatically approved surfactants within 100 feet of banks of rivers and tributaries, minimizing the amount of herbicides being introduced into the water, and limiting the amount of herbicide used to the minimum amount required to be effective. With these measures in place, the risk to water quality and soil is low.

Based on the projects, activities, and recent fires within the cumulative effects spatial area, along with the potential effects from Alternative 2, the cumulative impacts to soil and water quality would be negligible, localized, and short-term negative and long-term beneficial effects. Negative cumulative impacts to soils and water within the project area are primarily soil damage, erosion, and sediment transport to streams from the burned areas from the recent fires. These negative impacts would become reduced within the next few years as vegetation re-grows within the burned areas.

Alternative 3, No Herbicides

The non-herbicide treatments are analyzed together for both action alternatives since the effects are primarily limited to the physical impacts of personnel entry, changes in canopy closure and ground disturbance from removal activities. These techniques include hand pulling, pulling using tools, clipping and cutting, girdling, tarping, and fire wilting.

Hand pulling, pulling using tools, clipping and cutting, girdling, tarping and fire wilting have similar impacts including ground disturbance due to foot traffic, dislodging sediments into streams, creation of foot trails, and creating areas of bare, disturbed ground. Hand treatments typically require multiple entries, possibly several per year, increasing the potential for these effects. Hand pulling and pulling using tools, would result in the greatest amount of soil disturbance compared to clipping and cutting, girdling, tarping, or fire wilting. Tarping, girdling, clipping and cutting, and fire wilting would likely result in the least soil disturbance. Fire wilting would be conducted when the ground is damp and should result in few effects from burning.

Tarping may reduce the number of soil microorganisms near the ground surface due to the heat generated by the tarp. This effect would be confined to the upper one or two inches of soil because soil is a poor conductor of heat. The heated zone should re-colonize with microorganisms quickly from surrounding unaffected populations.

Areas of trampled or disturbed bare ground erode more readily than vegetated areas. Since most invasive species are relatively thin and scattered, it is anticipated that disturbed areas would be small and scattered so the overall adverse impacts to soils and water quality would be negligible to minor. The amount of soil disturbance generated by hand crews is negligible, very localized and short-term. Alternative 3 would have a greater impact on soil and water quality because the focus on treatment would be manual and mechanical treatment methods. This would likely require additional crews, more entries into the same area, and potentially more digging to remove root systems. Soil disturbance and potential erosion from Alternative 3 would be minor increases when compared with Alternative 2. This could result in slight increases in turbidity in nearby streams. To decrease impacts to water quality, the following design feature would be used for either of the action alternatives: hand crews would stay out of flowing or ponded water whenever possible and if hand removal requires entry into flowing or ponded water, crews would keep the time in the water to a minimum. Overall adverse impacts from non-herbicide treatment activities would be negligible to minor, short-term, and localized to soil and water quality.

Though no herbicides are proposed with this alternative, the cumulative effects would be similar to Alternative 2. The cumulative impacts to soil and water quality would be negligible, localized, and short-term negative and long-term beneficial effects.

Special Land Designations (Wilderness and Research Natural Areas)

Affected Environment

San Gabriel, Cucamonga, Sheep Mountain, Pleasant View Ridge and Magic Mountain Wildernesses and Falls Canyon Research Natural Area are all within the Project Areas.

San Gabriel Wilderness

The San Gabriel Wilderness area is 36,118 acres and entirely within the project area. The area encompasses some extremely rugged terrain, especially steep, fractured slopes. Elevations range from 1,600 to 8,200 feet. The predominant vegetation is chaparral, which covers about 75 percent of the wilderness in the lower elevations. Dense chaparral rapidly changes to pine and fir-covered slopes and majestic peaks, with glimpses of wildflowers and a variety of wildlife as you enter the upper elevations. The remainder of the vegetation is woodland, grasslands and mixed conifers.

Access is from Bear Creek Trail, an 11-mile trail, with trailheads near Rincon and Coldbrook Stations, both off Highway 39; the Mt. Waterman Trail, a ten-mile trail, from Three Points to

Buckhorn (with a one mile side trail to Twin Peaks Saddle); or Devils Canyon Trail, a four-mile trail down from the Devils Canyon trailhead on Highway 2. The riparian woodlands and streams located in canyon bottoms receive the most use. Much of the use is concentrated on the few trails within the wilderness. In 2009, the Station fire burned the western half of this wilderness, including the Devils Canyon drainage. The south facing slopes in the Upper West Fork of San Gabriel Canyon burned with a high severity, consuming most of the vegetation. The north slopes were not as heavily burned.

Cucamonga Wilderness

The name "Cucamonga" was derived from an old Spanish rancheria nearby. The meaning has been variously interpreted as "sandy place" or "place of many springs." That may describe the rancheria, but not the Cucamonga Wilderness, located at the east end of Southern California's San Gabriel range. The steep, rugged terrain rises abruptly from the urban San Bernardino Valley, ranging from approximately 5,000 feet to almost 9,000 feet. Most of the streams are intermittent and water is scarce, but the Wilderness offers a handy retreat to a beautiful sub-alpine setting on 18 miles of trails for the nearby suburban population. Numerous wildlife species do well in the area, including deer, bear, mountain lions, and bighorn sheep. The Cucamonga Wilderness is managed jointly by the Angeles and San Bernardino National Forests.

Sheep Mountain Wilderness

The Sheep Mountain Wilderness area is 44,000 acres and is mostly within the project area. This wilderness is rugged and not easily accessible. However, it can be accessed from the East Fork trailhead, Coldwater Canyon; California State Highway 2 at Vincent's Gap; and from the Pacific Crest Trail, a National Scenic Trail. Despite its difficult access, this wilderness is highly used; therefore, wilderness permits are required to manage this use. Popular recreation activities include hiking, water play, viewing scenery, recreational gold panning, and fishing. Elevations range from 2,400 to over 10,000 feet. Vegetation ranges from chaparral at the lower levels to mixed conifer at the higher elevations. Mining activities on non-national forest lands that pre-date 1964 are still present in the wilderness.

Pleasant View Ridge Wilderness

Pleasant View Ridge Wilderness, designated in 2009, has a total of 26,757 acres. This wilderness area is located roughly 30 miles northeast of La Canada, north of the Angeles Crest Highway where the San Gabriel Mountains slope north to meet the Mojave Desert. This area is known for its majestic peaks and spectacular views of the San Gabriels and desert basin.

Trails Burckhardt (10W02 High Desert National Recreation Trail), Islip Saddle (9W02), and the Pacific Crest Trail go through this wilderness.

In 2000, the entire wilderness system on the Angeles National Forest had 100,000 visits, which accounted for less than 3 percent of total forest recreation use.

Research Natural Areas (RNAs)

Along with five wilderness areas, the project area also includes one research natural areas (RNAs).

Falls Canyon RNA contains 1,440 acres and was established in 1998 to preserve the bigcone Douglas-fir (*Pseudotsuga macrocarpa*) and Canyon Live Oak (*Quercus chrysolepis*) woodland elements. Bigcone Douglas-fir grows in relatively dense stands on steep slopes in this RNA. The oldest trees have been determined to be over 350 years old and have survived several historic fires, including the Station fire. Falls Canyon is a tributary of the West Fork of the San Gabriel River on the north slopes of Mount Wilson. Elevations range from about 3,400 to 5,700 feet. Foot access is both

from various access trails and at the Mount Wilson road. Invasive plants are currently known along the edges of this RNA.

Environmental Consequences

Direct and Indirect Effects

Alternative 1, No Action Alternative

There would be no short-term direct or indirect effects to the special interest areas (e.g. wildernesses, RNAs) from implementing the no action alternative. Over time, no action would increase populations of invasive plant species, including fire-adapted species (i.e., tamarisk and arundo). In the short-term, the natural appearance would mostly be unnoticed. However, in the long-term, the spread of invasive plant species would adversely affect the natural appearance of wilderness by out-competing native plant communities. This would be most evident in riparian areas in the wilderness, where public use is the highest. Wildlife habitat and water resources would be negatively impacted. The opportunity for solitude or primitive and unconfined recreation would not be affected. Implementing this alternative would ultimately change ecosystems in a manner inconsistent with the 1964 Wilderness Act, Forest Plan, and the spirit and intent of wilderness areas where natural forces dominate change. This would result in adverse impacts in the San Gabriel and Sheep Mountain Wildernesses.

The impacts to native plant communities, wildlife habitat and water resources would also have long- term adverse effects to the RNAs. Should fire-adapted invasive plants invade areas that have historical low to moderate fire severity, more frequent and higher severity fires can affect those plant species that were intended for protection through the RNAs' establishment and would modify natural processes.

Alternative 2, Proposed Action (Adaptive Management Strategy – Herbicide Use)

Wilderness

The proposed action, including herbicide treatment, is designed to protect the wilderness character of the Wildernesses. Invasive plants detract from the natural beauty and naturally functioning ecosystems that are supposed to be represented in wilderness. This alternative would have no effect on the undeveloped character of either wilderness. Treatment and restoration activities are intended to control or eradicate priority invasive plant species. By removing or controlling priority invasive plant species, the proposed action would allow native plant communities to function and evolve naturally.

Some visitors may believe their wilderness experience is degraded when work crews are seen on the trail or at treatment areas in the wilderness. These temporary adverse impacts would vary depending upon the treatment method. Design features are included to limit work crew presence during high use times (e.g. weekends, holidays) and to inform wilderness users about the purpose and need to manage invasive plants inside wilderness. While there are temporary effects in wilderness using all treatment methods, in the long-term wilderness character and experiences would be enhanced and are best protected with this alternative.

Herbicide use, as with the other treatment methods, involves a temporary intrusion into the wilderness. It requires no ground disturbance, and individual plants are treated in minutes (dependent on size) and, generally, with a higher degree of effectiveness. Depending on the invasive plant species and size, repeat treatments in the wilderness with herbicide are expected to range between 10 to 20 percent. Access into some of the remote wilderness areas is difficult and beyond a practical distance to hike in and out each day. Trails into some areas do not accommodate equestrian access,

and other areas do not have existing trails. Remote areas would require temporary overnight campsites which may include helicopter transport. This could include the transport of equipment such as tents, sanitary facilities, cooking equipment, tools and equipment to support temporary crews. The number and locations of suitable campsites have not been identified, and safe helicopter drop sites have not been located. These sites would be identified during the implementation phase. With the use of herbicides, alternative 2 would require briefer stays and fewer overnight trips into the wildernesses when compared with alternative 3. This is because the ability to use herbicides in combination with other treatment methods would require less time (e.g. physical activities of digging out the root systems versus cutting and spraying or daubing), and herbicides are generally more effective than solely using manual and mechanical treatment methods. Adverse impacts with these design features would be low.

There would be no effects to scientific, educational or historic uses in the wilderness areas. Conservation use would be protected by reducing the level of invasive plant interference with growth of native vegetation in riparian areas and degradation of habitat for native fish and wildlife species.

Research Natural Areas (RNAs)

Alternative 2 would be the most effective action alternative in reducing the adverse effects invasive plants in the RNA. As noted in the wilderness section, by including herbicide treatment methods in integrated pest management, treatments would likely cause less physical disturbance (e.g. no digging of root systems) and are expected to be more effective. In addition, alternative 2 is intended to eradicate and control the high priority invasives and control the moderate invasive plant species, while alternative 3 would mainly focus on a few species. There are known populations of invasive plants along the boundary of Falls Canyon RNA. General effects to various resources from alternative 2 (e.g. biology, hydrology, soils) noted in this chapter are also applicable to the RNA. By eradicating and/or controlling priority invasive plants, the areas would maintain unmodified conditions and natural processes, therefore, having long-term beneficial effects.

Alternative 3, No Herbicides

Wilderness

Alternative 3 has similar effects as alternative 2. As noted earlier, without the use of herbicides as a treatment option, treatments are likely to be less effective and would take longer to apply. Some invasive plants are difficult to eradicate and control without the use of herbicides, especially the larger and more mature plants. They would require frequent follow-up treatment, which is more difficult in wilderness areas where access can be difficult. It would be more difficult to eradicate and control the high priority invasive plants in the wilderness areas for these reasons. In addition, digging out root systems would require more ground disturbance, which would have some adverse effects on the wilderness characteristics.

This alternative would have no effect on the undeveloped character of the wildernesses. No impacts would occur to the untrammeled nature of either wilderness under this alternative other than the likely continued presence of human-induced non- native plants and the potential temporary presence of helicopter transport. The natural character of each wilderness would be adversely affected by the expanding presence of invasive species. Despite efforts to control or eradicate invasive plants under this alternative, these plants are expected to effectively compete with native vegetative communities and diminish the natural character of each wilderness.

The outstanding opportunities for solitude or primitive and unconfined recreation would be negatively impacted by work crews. While design features are included to minimize these

impacts (e.g. restrict project activities in wilderness areas during low-use periods, education/interpretation), the effectiveness of this alternative would likely require a continuous and indefinite presence of work crews for the foreseeable future. The number of repeated treatments needed to eradicate and control the high and moderate priority invasive plant species and to achieve success is unknown; thus, an aggressive and continuous eradication program would be required. The short and long-term effects on the outstanding opportunities for solitude or primitive and unconfined recreation would be adversely affected. When compared with the proposed action, the work crew size and their continuing presence would interfere with these opportunities. Incorporating the design features to protect wilderness, adverse impacts would be low to moderate.

Research Natural Areas (RNAs)

As noted earlier, alternative 3 would not be as effective at treating priority invasive plant species. Fewer acres can be treated, and the focus of treatment would be only a few priority species. As with alternative 2, early detection and rapid containment is included in this alternative, which would aid in managing new invasive plants that are found in the RNAs during the term of the project. General effects to various resources from alternative 3 (e.g. biology, hydrology, soils) noted in this chapter are also applicable to the RNA. Long term, focusing on the priority invasive plants would have positive impacts of maintaining unmodified conditions and natural processes but would not be as effective as alternative 2.

Cumulative Effects

The cumulative effects spatial boundaries for the wildernesses and the RNA are their physical boundaries; temporal boundaries are the term of the project (15 years).

Alternative 1, No Action

Alternative 1 has no actions; therefore, there are no cumulative effects to special interest areas including wildernesses and the RNA.

Alternative 2, Proposed Action (Adaptive Management Strategy – Herbicide Use)

Recreation use data and experience shows use levels in the San Gabriel and Sheep Mountain Wildernesses currently approach the upper thresholds for protecting solitude and primitive experiences along established trails. The added crews to implement project activities in the wilderness would cumulatively affect this experience during the term of the project, but use would be planned outside of high visitor use periods to reduce this impact. It is not anticipated that the added visits from this alternative would push this threshold to significance. The Station fire burned the western portion of the San Gabriel Wilderness. Should invasive plants invade into these burned areas, this alternative would help reduce any potential adverse effects this could cause to the wilderness values.

There are no known present or proposed activities in the RNA that could have a cumulative effect on invasive plants. The Station fire did burn into the Falls Canyon RNA. As noted with wilderness, should invasive plants invade into the burned areas within this RNA, this alternative would help reduce any potential adverse effects this could cause to the RNA.

Alternative 3, No Herbicides

Similar to alternative 2, the solitude and primitive experiences along established trails would be cumulatively affected when combined with the wilderness users and the potential work crews during the term of this project. Alternative 3 would require more trips of longer duration than alternative 2; therefore, the impacts would be greater, but these added activities would not push the

threshold of cumulative effects to solitude and primitive experiences to significance largely due to scheduling the work during lower use periods. Alternative 3 would not be as effective at reducing any potential expansion of invasives into the San Gabriel Wilderness caused by the Station fire but would likely still have positive impacts.

When compared to Alternative 2, Falls Canyon RNA would receive fewer benefits because fewer species over a smaller area would be treated through strictly manual efforts. As a result, invasive plant species potentially invading after the Station Fire would experience greater expansion than under Alternative 2.

Recreation and Scenic Resources

Affected Environment

Recreation Users

Most use is oriented to the water and in the riparian vegetation where temperatures are cooler. Recreation use in these areas is highly concentrated in the form of family-based recreation. This concentrated use has led to chronic overuse where conflicts between user groups and with other resource values such as threatened, endangered, proposed, candidate and sensitive species. Chronic problems, such as trash, car dumping, graffiti, unauthorized OHV use, and maintaining closures exist and there is inadequate law enforcement coverage. While recreation use is highly concentrated in riparian areas such as the Arroyo Seco and Lower Big Tujunga Canyon, visitor use varies significantly throughout the project area.

Scenic Resources

The project area serves two distinct landscapes. From the urban areas in the immediate and surrounding communities, large portions of the project area serve as a front country and back country backdrop as seen from stationary locations or from urban streets and highways. The cultural landscape is noticeably prominent and diverse. Its diversity is reflected in its vegetative mixes, its substantial elevation ranges, its prominent landforms and its stark contrast with the immediate urban development.

Environmental Consequences

Direct, Indirect and Cumulative Effects

Alternative 1, No Action Alternative

Similar to the special interest areas, there would be no short-term direct or indirect effects to the scenic resources or to recreation use. Over time, implementing this alternative would increase populations of invasive plant species, including fire-adapted species (i.e., tamarisk, arundo). These invasive species could out-compete the native vegetation and could gradually change the ecosystems. Due to the typical density of these invasive native species, compared with native riparian vegetation, this would result in a gradual restriction of access along streams. It is unlikely the general public would notice a visual difference between native and non-native vegetation; therefore, there would likely be no long-term effect to the scenic resources. Over time, if the invasive plants are not controlled, there could be a simplification of the diversity of vegetation which could result in a degradation of scenic resources in the long-term.

There are no cumulative effects to recreation or scenic resources with the no action alternative.

Alternative 2, Proposed Action

Should piles be burned, smoke would have a direct adverse effect to recreation users and the scenic resource. This would be short-term, and with the design feature that avoids activities during heavy recreation use periods, the design feature would reduce the impact to these two resources.

Recreation Users

The herbicide use in Alternative 2 would cause minimal and temporary (short-term) displacements of forest visitors in treatment areas where there is concentrated or high public recreation use. Recreation users using vehicles along roads would not likely be affected as they travel through treatment areas. Trails that receive herbicide treatments would receive temporary closures, at a minimum, based on label requirements restricting access. Trail users in these areas would be adversely affected short-term. The design features that require avoiding high use periods, limiting temporary closures, and signage would reduce this impact. The stationary nature of water play, picnic, camping areas and areas of concentrated public use creates the most noticeable potential adverse impacts. To minimize impacts to these recreation users, several design features have been included with this alternative, including but not limited to: limiting activities to workdays and non-holidays, avoiding heavy recreation use periods; limiting the temporary closure of recreation areas and provide for appropriate signage and handouts; and providing interpretive information. The greatest short-term adverse impact to recreation users would likely occur in the Arroyo Seco, Big Tujunga Canyon, Little Rock Reservoir and San Antonio Canyon, and would have low to moderate impacts. In other locations within the project area, visitors may see treatments in progress; however, recreation use levels and patterns of use would not likely be affected by this alternative.

Scenic Resources

Herbicide treatment in all areas would have no effect on scenic resources except where numerous individual plants are spot sprayed in the same localized area of the immediate foreground. The visual effects of spot spraying within moist areas would remain brown temporarily (approximately one year) and would be replaced with native vegetation. On drier sites, the visual effects would be short-term (up to two to three years). Implementation of the design feature for considering restoration measures in areas greater than one acre that do not naturally rehabilitate within one year would minimize or eliminate the potential visual effects of spot spraying. There would no visual effects from spot spraying within the middle ground or background view areas. Localized spot spraying would meet the scenic integrity objectives within the project area as required in the Forest Plan. Application of herbicides would have no ground disturbance and the eventual browning of individual plants would duplicate the natural dying cycle of annual grasses and forbs which are widely spread throughout the project area. The design features would also ensure no adverse visual effects from the larger sized material by ensuring the treated material is located away from highly visible areas. As noted in Alternative 1, the general public would not notice the difference between native and invasive plant species in the forest environment. In the long-term, the diversity of vegetation which is important visually would continue with the treatment of invasive plants.

The cumulative effects to recreation users would be minor during the term of the project. In some cases, recreation areas may be temporarily closed during removal efforts or to facilitate post-treatment restoration. Closures may have the effect of shifting recreation use to other open areas on the Forest. As a result, treatment activities from this project could have minor short-term adverse cumulative effects on the recreation experience.

The cumulative effects to recreation users would be minor during the term of the project. In some cases, recreation areas may be temporarily closed during removal efforts or to facilitate post-treatment restoration. Closures may have the effect of shifting recreation use to other open areas on

the Forest. As a result, treatment activities from this project could have minor short-term adverse cumulative effects on the recreation experience.

Reviewing the cumulative activities that are occurring in the project area, the greatest short-term impact to the scenic resource was the Station Fire. Though wildfire is a natural occurrence, burned areas do have negative scenic impacts. The scenic resource is already beginning to heal from the fire and will continue to recover over the next couple of years. The other activities (e.g. fuelbreak and other fuels reduction activities) are minor in scope to the visual landscape and Alternative 2 has little effect to add to the cumulative effect to the scenic resource. Cumulative short-term adverse effects are moderate, mainly due to the Station Fire.

Alternative 3, No Herbicides

Should piles be burned, smoke would have a direct adverse effect to recreation users and the scenic resource. This would be short-term, and with the design feature that avoids activities during heavy recreation use periods, the design feature would reduce the impact to these two resources.

Recreation Users

Non-herbicide treatment methods and activities would have similar recreation user impacts as the herbicide treatment method. All adverse impacts (e.g. restricting access and use, noise) would be short-term and minor. These impacts would be reduced by implementing the design features for recreation. Besides those noted for herbicide treatment, an additional design feature, that would reduce impacts to recreation users, is to ensure that motorized equipment will be equipped with appropriate mufflers to minimize noise levels. The amount of disturbance from invasive treatment crews would be greater if herbicides are not used because of the increase in required follow-up treatments.

Scenic Resources

Several design features have been included to reduce the potential adverse impact to scenic resources from both action alternatives (i.e., piled material will be located away from highly visible areas and if this is not possible, the material will be disposed of at the earliest opportunity, large-sized lop and scattered material will be placed away from established trails and roads, and for those areas greater than one acre, if natural rehabilitation does not occur within one year, more active restoration methods will occur [e.g. planning native vegetation]). Based on the implementation of these design features, individual non-herbicide activities would have minor or no adverse effect on the visual resource. In areas of concentrated or high public use, some visitors may notice the ground disturbance of manual or mechanical at the time of individual plant removal but the scenic impact to these users would be minor. As noted, the casual visitor would not notice the visual loss of the invasive plants nor the improved landscape character. In the long-term, treating invasive plants would help maintain vegetation diversity which is important visually.

Cumulative effects to recreation users and the scenic resource are similar to Alternative 2. Under Alternative 3, there may be some additional cumulative impacts to recreation users because the exclusion of herbicide use would result in an increased amount of crew time to manually treat and retreat invasive plants.

Consequences Relative to Significance

Council on Environmental Quality regulations (40 CFR parts 1500-1508) for implementing the National Environmental Policy Act (NEPA) includes a definition of "significance." The elements of this definition are important for a finding of no significant impact. The elements of significance are discussed below in relation to all action alternatives. Specialist reports and required documents

needed for the environmental assessment analysis and compliance with law, regulation, or policy are located in the project file. Conclusions from these reports are discussed and referenced below. These reports are incorporated by reference.

Context

Context means that the significance of an action must be analyzed in several contexts (i.e., local, regional, worldwide) and over short and long timeframes. For site-specific actions, significance usually depends upon the effects in the locale rather than in the world as a whole (40 CFR 1508.27(a)). Both short-term and long-term effects are relevant.

This project is located in the northern portion of the Sierra Pelona and most of the San Gabriel Mountains. The Angeles National Forest/San Gabriel Mountains National Monument is an urban forest with large population centers nearby (e.g. Los Angeles). Though this project covers 375,820 acres, the entire project area would not be treated by either action alternative since the density of invasive plants in the project area at this time are scattered, in small pockets, or individuals. Both action alternatives would not have a significant affect to society locally or regionally, neither short-term nor long-term.

Intensity

Intensity refers to the severity of expected project impacts. The following ten factors and their expected impacts are considered below.

Beneficial and Adverse Impacts

Both beneficial and adverse effects have been taken into consideration and displayed in this chapter. Beneficial effects have not been used to offset or compensate for potential adverse effects. Singularly and collectively, the resources affected by the action alternatives are not likely to be exposed to significant impacts.

The adverse impacts associated with the action alternatives include:

- Human health and safety risks from the use of herbicides/adjuvants are negligible for aminopyralid; low for chlorsulfuron, glyphosate, fluazifop, imazapyr, adjuvants (in general); and moderate for triclopyr. Human safety risks from non-herbicide activities for workers are low for workers/crew members and negligible for the general public.
- Alternative 3 would have little effect on moderate and low priority invasive plant species trend on growth (in terms of number of species and size of area).
- Short-term adverse impacts to water quality and soil from the use of herbicides for Alternative 2 are low; for Alternative 3 adverse impacts to water quality and soil are negligible.
- Short-term adverse impacts from Alternatives 2 and 3 to wilderness experiences would be low.

Beneficial impacts include:

- Both action alternatives treat tamarisk and arundo (fire-adapted invasive plants) reducing the risk of higher severity fires and higher return intervals than what is typical in riparian habitat.
- Alternative 2 would have an overall trend of decreasing invasive plant growth (in terms of number of species and size of area); alternative 3 would have an overall trend of controlling or containing the high priority species.
- Both action alternatives allow for early detection and rapid response to newly found invasive plants within the project area; therefore, providing higher success in eradicating or controlling the species.

- Long-term, Alternative 2 would have a beneficial impact to special status plant and wildlife species by keeping invasive plants out of their habitat. Alternative 3 would be successful in preventing the expansion and possibly decrease the area of high priority invasive plants; therefore, having long-term beneficial effects to those species where these three high-priority species typically grow.
- There would be long-term beneficial impacts to wilderness experiences and wilderness character for Alternative 2 and to a lesser degree with Alternative 3 (where moderate and low priority species would likely continue to expand).
- There would also be long-term beneficial impacts to the RNAs by maintaining unmodified conditions and natural processes with Alternative 2 and to a lesser degree with Alternative 3.
- By retaining diversity of vegetation (versus more of a monoculture of invasive plants), Alternative 2, and to a lesser extent Alternative 3, would have a beneficial effect on the scenic resources.
- In addition, based on the analysis for Alternative 2, aminopyralid, chlorsulfuron, and imazapyr are generally below the level of concern for the major wildlife groups (i.e., birds, mammals, reptiles, amphibians, fish) at all the proposed application rate ranges.

The Degree of Effect to Public Health and Safety

As noted in the human health and safety section in this chapter, health and safety was broken into three main groups: fire and fuels; non-herbicide activities; and herbicide use. Both alternatives include design features to reduce potential human health and safety risks to below the level of concern. The highest potential human health risk is from the use of triclopyr around women of childbearing age for Alternative 2. An extra precaution is included in the design features specific to triclopyr to reduce these risks (e.g. requiring triclopyr use only if the other approved herbicides are not effective in treating a specific invasive plant species). In addition, along with the other herbicide design features (e.g. implementing an herbicide transportation, handling and emergency spill response plan and safety plan [including the need for personal protective equipment/clothing]; cutting vegetation that can be consumed by humans prior to herbicide treatment; signing and temporary closing areas based on label directions), the use of triclopyr is below the level of concern.

Unique Characteristics of the Geographic Area, including Historic and Cultural Sites

Unique characteristics for this project are defined as: proximity to historical or cultural sites, wilderness areas (including recommended), research natural areas, eligible wild and scenic rivers and critical biological land use zone.

There are eight design features that are incorporated in both action alternatives to reduce potential adverse effects to historic or cultural sites (e.g. pre-treatment surveys; when unanticipated sites are found that could be adversely affected) all work will stop and will not proceed in the area without approval from the Forest Heritage Program Manager; sites that could be potentially impacted by the project activities will be flagged and avoided). Based on these measures, no direct or indirect effects are anticipated to historical or cultural sites. In addition, a design feature to protect known sensitive traditional tribal use areas will minimize impacts to cultural sites.

Wilderness areas and research natural areas (RNA) are addressed in this Chapter. Based on the analysis, no significant impacts are expected to occur in the Wilderness Areas or the Fall Canyon RNAs.

Neither action alternative would have significant adverse effects to the eligibility or potential classification of river segments within the project area. Long-term effects would be beneficial by retaining the natural ecosystem in these areas (Alternative 2 would be more effective than Alternative

3). Impacts to the recommended wilderness areas would be similar to wilderness areas, none of which are significant.

The Degree to which the Effects on the Human Environment are likely to be Highly Controversial

Approximately 1060 postcards were mailed out to agencies, groups, and individuals which included a summarized description of the proposed action. A legal notice informing the public of this project proposal (with a 30-day scoping period) was published April 22, 2015 in the *LA Times*. The detailed purpose and need and proposed action document, map, and scoping letter were included on the Forest websites under "Projects and Plans" (http://www.fs.fed.us/nepa/nepa_project_exp.php?project=46486/). This internet site was referred to in both the legal notice and scoping postcard.

The Degree to which the Possible Effects on the Human Environment are Highly Uncertain or Involve Unknown Risks

Herbicide effects were mainly determined by the SERA risk assessments in which SERA collected various studies and data to come to their conclusions. They included studies that were not part of US EPA's review of the herbicides when they were available. Typically, studies on human health from the use of herbicides are not completed on humans. Assumptions are made and interpolated from various animal species studies. In addition, numerous design features have been incorporated into Alternative 2 to manage potential risks to the environment caused by the use of herbicides (e.g. reduce risks for spill, reduce the potential for drift, implement safety plans [including the need for personal protective equipment], allowing only aquatically registered herbicides and low-risk aquatically approved surfactants within 100 feet of the banks of rivers and streams, comply with federal, state, and local laws including complying with label instructions).

The Degree to which the Action may Establish a Precedent for Future Actions with Significant Effects or Represents a Decision in Principle about a Future Consideration

The action alternatives are project-specific and do not establish a precedent for future actions with significant effects. Any future actions not covered by this proposal would need to consider all relevant scientific, site-specific information available at that time, and an independent environmental analysis of environmental consequences. The project does not involve future connected actions.

Whether the Action is related to other Actions with Individually Insignificant but Cumulatively Significant Impacts

Based on the cumulative effects analysis addressed for each resource in this chapter, there would be no significant cumulative effects. The analysis determined both action alternatives, when combined with other actions in the project area, would likely have beneficial cumulative effects related to reducing the spread of invasive plant species by either expanding the capacity of the other actions for control and eradication efforts or by mitigating their potential for increasing invasive plant distribution and abundance in the project area (Alternative 3 having less beneficial effect).

The Degree to which the Action May Adversely Affect Districts, Sites, Highways, Structures, or Objects Listed in or Eligible for Listing in the National Register of Historic Places, or may cause Loss or Destruction of Significant Scientific, Cultural, or Historic Resources

As noted in the third intensity factor above, the action alternatives, including the implementation of the heritage resource design features, are not expected to have direct or indirect adverse effects to cultural resource sites. By implementing the design features, which include pre-treatment surveying,

flag and avoidance, and monitoring protection measures effectiveness, both action alternatives would have a less than significant effect to cultural and historic resources.

The Degree to Which the Action may Adversely Affect an Endangered or Threatened Species or its Habitat that has been Determined to be Critical under the Endangered Species Act of 1973

Federally listed Plants

It is our determination that the proposed Invasive Plant Removal may effect but is not likely to adversely affect Nevin's barberry. There may be some short-term disturbance to habitat as the invasive species are treated, but it should be insignificant and discountable because of the Nevin's barberry specific design features.

Federally listed Animals

It is our determination that the proposed project will have no effect on California condor or its designated critical habitat. The proposed project may affect, but is not likely to adversely affect the southwestern willow flycatcher, least Bell's vireo, coastal California gnatcatcher, mountain yellow-legged frog, and Santa Ana sucker, or their designated critical habitat.

It is our determination that the proposed project may affect and is likely to adversely affect the arroyo toad. The project may affect, but is not likely to adversely affect designated critical habitat for the arroyo toad.

There are many design features to minimize or avoid impacts to federally listed plant and wildlife species (e.g. pre-treatment surveys; restriction on herbicide use near known populations; possibly flag and avoid, seasonal restrictions; monitor where treatments occur near listed plant populations). Based on the analysis in this chapter, the impacts from both action alternatives would be below the level of significance.

Whether the Action Threatens a Violation of Federal, State, or Local Law or Other Requirements Imposed for the Protection of the Environment

The action alternatives are in compliance with federal, state, and local laws and other requirements imposed for the protection of the environment. Based on the project design (Chapter 2 of the EA) and effects analysis (summarized in this chapter and detailed in the various specialist reports), the action alternatives are in compliance with the National Environmental Policy Act, ESA, Clean Water Act, and National Forest Management Act (including compliance with the Forest Plan).

Several natural and social resources were not discussed in detail in this document because they were not addressed as a concern or issue from the public or the interdisciplinary team during scoping. Below are some of these applicable federal, state, and local laws and regulations with a brief compliance summary.

The action alternatives are also in compliance with California Code of Regulations, Title 17, Smoke Management Guidelines for Agricultural and Prescribed Burning, California Air Resources Board and South Coast Air Quality Management District regulations. Estimates of emissions produced from this project were calculated and they stay below the threshold of significance established by the air district; three air quality design features are included in both action alternatives. These design features would reduce the level of emissions either alternative could produce. By not exceeding the level of significance, the action alternatives would not impede the progress of the air district towards attainment of the National Ambient Air Quality Standards; therefore, they are compliant with the Clean Air Act.

As noted earlier, there would be minimal effect to heritage resource sites. By including protection measures in the outlined in the First Amended Regional Programmatic Agreement Among the USFS Forest Service Region 5, Pacific Southwest Region, the California State Historic Preservation Officer, and Advisory Council on Historic Preservation Regarding the Process for Compliance with Section 106 of the National Historic Preservation Act for Undertakings on the National Forests of the Pacific Southwest Region (1994c), both action alternatives are in compliance with the National Historic Preservation Act.

The action alternatives are in compliance with Executive Order 13186 (migratory birds). The action alternatives have a design feature that requires avoiding treatment activities during bird breeding season whenever practicable. If work is performed during the breeding season and the District biologist feels it is necessary, a walk through surveys would be performed to identify obvious nests prior to undertaking work. Appropriate exclusionary buffers will be established around active nests, if found. Some short-term adverse effects may occur, but in the long-term there would be substantial benefits to migratory birds and their habitat.

Executive Order 12898 relating to Environmental Justice requires an assessment of whether minorities or low-income populations would be disproportionately affected by any proposed action. In no case was the treatment prescription design based on the demographic makeup, public recreation use, occupancy, property value, income level or any other criteria reflecting the status of adjacent non-federal land or within nearby communities. Federally owned lands proposed for treatment are widely distributed throughout the project area and are intermixed with some non-federal lands. Reviewing the location of the proposed treatments in any of the alternatives in relationship to non-federal land, there is no evidence to suggest that any minority or low income neighborhood or recreation use patterns would be affected disproportionately. Conversely, there is no evidence that any individual, group or portion of the community would benefit unequally from any of the actions in the proposed alternatives.

For Alternative 2, only State approved herbicide and adjuvants would be used and treatment would comply with federal, state, and local law. The action alternatives are not in conflict with planning objectives for counties (Los Angeles and San Bernardino).

CHAPTER 4 – LIST OF AGENCIES AND PERSONS CONSULTED

The Forest Service consulted the following individuals, federal, state, and local agencies, tribes and non-Forest Service persons during the development of this environmental assessment:

INTERDISCIPLINARY (ID) TEAM MEMBERS:

Janet Nickerman, Forest Botanist
Jamie Uyehara, Resource Officer
Leslie Welch, Wildlife Biologist
Joanne Huckabee, Cultural Resources
LTanga Watson, Recreation Officer
Ron Ashdale, Safety Officer
Scott Lowden, Fuels Manager

FEDERAL, STATE, AND LOCAL AGENCIES:

US Fish and Wildlife Service is being consulted with on this project. In addition, many agencies were contacted during scoping; including, Los Angeles County Agricultural Commissioner/Weights and Measures, Metropolitan Water District, Los Angeles County Fire Department, Los Angeles and San Gabriel Watershed Counsel, Santa Monica Mountains National Park, Cal Trans and the California Native Plant Society, Lahontan, Los Angeles and Santa Ana Regional Water Quality Control Boards, and California Department of Fish and Wildlife. State Historic Preservation Officer was not consulted because the programmatic agreement was used to ensure heritage resource sites are protected.

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As noted in Chapter 1, Native Americans were contacted a variety of ways during scoping; including, being sent the scoping letter, emailing Native American traditionalists and attending one forest meeting to explain the project in person.

OTHERS:

David Bakke, Pacific Southwest Region Pesticide Specialist and Invasive Plants Program Manager

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APPENDIX A, SUMMARY OF PUBLIC COMMENTS AND RESPONSES

Table 7:

Comment Number	Comment	Response/Resolution	Date and Name of Commenter
1	Supports the use of herbicides as a part of the overall integrated management approach outlined in the draft EA for the Plan for Invasive Plants. Responsible stewardship for our wild spaces requires that we use all of the tools available to us to help restore wild and riparian habitats that are being eroded by invasive plants. The use of herbicides by licensed applicators can be an important aspect of management.	The Forest agrees with Mr. Hartman's statement and included the best available science in the analysis (refer to in Chapter 3 of the EA).	4/20/2015; Jim Hartman, Deputy Agricultural Inspector; LA County Agriculture Office
2	Support Alternative 2 because invasive species are a threat to native plants	The Forest appreciates and thanks Ms. Dickson for her comments.	5/22/2015; Leslie Dickson, private citizen
3	Supports Alternative 2 because it's the appropriate choice	The Forest appreciates and thanks Mr. McReynold for his comments.	5/22/2015; Mark McReyolds, private citizen
4	Support Alternative 2 because invasive species are a threat to wildlife.	The Forest appreciates and thanks Ms. Whelan for her comments.	5/22/2015; Linda Cummings Whelan, private citizen
5	Support Alternative 2 but wants more emphasis on volunteer outreach. Also wants fire clearance that minimizes the risk to human life and property while maximizing the protection of native plants and their habitats	The Forest appreciates and thanks Ms. Tirrell and CNPS's for her comments. The Forest regularly includes volunteers with invasive projects and plans to continue in the future. Fire clearance isn't the focus of this project.	4/22/2015: Jane Tirrell, California Native Plant Society; San Gabriel Mountains Chapter
6	Supports the project and hopes we can get enough resources to move forward.	The Forest appreciates and thanks Mr Klemm for his comments.	5/22/2015; Roger Klemm, private citizen
7	Supports Alt 2 but wants priority placed on treating the Arroyo Seco.	The Forest appreciates and thanks Mr. Brick for his comments. The Forest place importance on treating the Arroyo Seco. It will be treated but due to funding, ongoing project and new infestations, other areas will be treated prior to treating the Arroyo Seco.	4/22/2015; Tim Brick, Managing Director Arroyo Seco Foundation
8	Supports removal of invasive species but not the use of herbicides. 1) herbicides are an expense to the gov't; 2) It's not safe or accurate to apply herbicides to a steep surface; 3) Chemical applications don't stay where they are applied, especially when it's in or near water; 4) Manual removal is the	The Forest agrees with Ms. Roberts about the importance of treating upper watersheds first, the importance of volunteers and we look forward to her involvement in removal efforts. The Forest regularly includes volunteers with invasive projects and plans to continue in the future. Alternative 3 was developed to address manual	5/22/2015; Corina Roberts, private citizen

	best option for eventual eradication; 5) Manual removal can be cost effective; 6) Wants to see invasive removal marketed to the public and the real restoration; 7) she wants to help remove invasive species; 8) Upper watersheds should be first.	removal only. Although herbicides are an initial expense to the government, certain weed species can resprout or have root systems difficult to remove from the ground. For those species, continued manual removal is prohibitive when trying to remove invasive weeds on a forest-wide scale. Where manual removal is cost-effective, we will continue to do so, but with species which persist with manual removal, we may decide that herbicide is the most effective initial treatment.	
9	Supports Alternative 2 with the addition of wanting the traditional Tataviam Band of Mission Indian Map in the EA. She also wants the Tribe notified if any archeological, cultural or tribal resources are discovered.	The Forest has design features if any cultural or tribal resources are found. Tribal maps are not included because they overlap with each other tribal maps and would be confusing for the public, implementation and other tribes.	5/19/15; Caitlin Gulley, Tataviam Band of Mission Indians
10	From Daun Jacobsen's email: Thank you for soliciting comments on the draft EA of the ANF Invasive Weed Management Plan. I would like to encourage you to not use any herbicides while removing invasive species in the National Forest. It is ultra difficult to confine such to only the targeted plant. All too often, herbicides end up affecting surrounding vegetation which is native and which you are trying to protect. And these chemicals can easily wash into other locations, again affecting the very plants that are expected to be saved. Also, herbicides can then easily end up in watershed streams and reservoirs which I'm sure is not something you want. Dealing with such poisons in a rugged is also a bit dangerous; spills are more likely and clean up of such would be very difficult. Even though some species can be very invasive, with concentrated effort, many places have been able to control such with manual removal. And given the interest in controlling invasives in our public lands by many individuals, I'm sure that you can get a good number to volunteer. Also, I believe that prison populations are sometimes used for public works and this could be a pool of labor that can work to remove invasives. Would be a good education for many of them too. Thank you for reading this and	The Forest appreciates and thanks Ms. Jacobsen for her comments. Alternative 2 includes the use of surfactants which allows the herbicide to stick to the leaf surface. No herbicide is expected to run off the leaves. There won't be any spraying in the water or any spraying under conditions which promote drift. If vegetation is submerged in water it will be manually removed. Design features were developed to manage the risk of all treatments including herbicide use on rough terrain. The ANF has treated invasive species manually. As an example, Spanish Broom has been mowed along Highway 2 and manually removed along the Santa Clara Divide Road as an ongoing, yearly activity. Due to the non-herbicide method of treatment, these Spanish broom removal activities are recurring long term efforts. Although Spanish broom mowing along Highway 2 has occurred for decades, this effort has not resulted in eradication and has at best provided only for increased visibility and fuel hazard reduction. Spanish broom removal has occurred along the Santa Clara Divide Road since the 2009 Station Fire. On the Santa Clara Divide Road, the Forest Service estimate to remove 1 acre of moderately infested, 3 foot tall Spanish broom is $25,000. It would cost $1500 to remove the same population using herbicides. The large difference in cost can be attributed to the extremely labor intensive effort required to dig out the tap roots of	5/22/2015; Daun Jacobsen

	for considering my input.	individual plants. The ANF does use inmate crews and volunteers for invasive weed removal and other projects, but the scale of weed infestation is presently beyond the capabilities of volunteers, inmate groups, and employees. With herbicide application, the number of visits to a site by a person is less.	
11	From Mr Steven Robins email: 1. I have personally seen the damage created by invasive species, i.e. Spanish Broom & Tamarisk, etc. My concern is for the insects and wildlife that have adapted to the invasive species that could be further harmed by the use of herbicides and defoliants. It is common knowledge that most herbicides (if not all) negatively affect wildlife environments. It is also well-known that our bee population has been decimated and is down 40% in population. Most new government and university studies point to Glyphosate based herbicides as being a likely contributing factor to bee colony demise. The other widely used herbicide used since the Vietnam war era in the 1970's is 2, 4-D which is moderately toxic to birds and fish. Both chemicals are usually combined with surfactants which are also known to be toxic to wildlife. I know Big Tujunga canyon is a particularly bad area for Spanish Broom and is also a watershed with year-round water. This will be a difficult area to treat regardless of the option chosen. I just can't imagine that any herbicide used would not have a negative affect on the bees, birds and the fish in this area. I strongly urge the USFS to continue their environmental impact study before proceeding with any of the herbicide options proposed in the Invasive Weed Management Program. 2. Are all the target areas for invasive species eradication shown within the outlined border in the management program map, or does program approval authorize the program to be used forest wide? 3. Will the areas bordering the Altadena Crest trail between Eaton, Rubio and Las Flores	The Forest appreciates and thanks Mr. Robins for his comments. 1) The Forest appreciates his comments and concern of effects to bees and wildlife. Alternative 2 and specifically the design features were included to manage risks to wildlife. We also agree that bees are an important pollinator for crops and vegetation. We will manage risks to bees by proper dilution. At regular rates of application, the application, the chemical is applied at 120 µgms/m², While it is true that 100 µgms is toxic to half the bees if applied directly on the bee, at regular dilutions, the solution would be applied to one square meter, an area much larger than a bee. So, the likelihood that a bee will get sprayed with that large of a dose is small (http://pods.dasnr.okstate.edu/docushare/dsweb/Get/Document-7902/PSS-2783.pdf), For bees drinking the pesticide, the likelihood of ingesting 10 µgms of the herbicide solution means that the bee would have to drink ~1/3 of its weight of herbicide solution which is also small The Forest Service also thanks for the website references. According to two websites, herbicides which are toxic to bees at low concentrations contain arsenicals and DNOSBP. Arsenicals and DNOSBP are not found in the proposed herbicides. One of the ways that chemicals affect bees and wildlife is when the chemicals dissolve in water. We have minimized this risk by not allowing herbicide application when rain is forecast, and by not applying herbicides near surface water. The herbicides here have been assessed for their effects to humans and have been selected as effective against plants and low risk to humans because of their specificity of actions to plants, their degradation in soil, and because we will manage drift or contact with water in which the herbicides can dissolve. Colony Collapse Disorder is affected by	5/22/2015; Steven Robin, private citizen

	Canyons be targeted for this program? If so authorized, when? 4. Are any areas of the front range foothills from Mount Lukens to Mt Wilson going to be targeted? It is hard to discern from the program map. 5. What about specifically Bailey Canyon and the Chantry Flats area above Sierra Madre? 6. If the management program includes areas near our properties, how do we protect ourselves, our livestock and our bee colonies from any chemical spraying? 7. If any herbicide options are approved, can we request ANF areas bordering trails and residences not be treated? (It is a known fact that these same chemicals are even more toxic to mammals, and therefore, could poison dogs and wildlife that frequent trails bordering the forest.	pesticides known as neonicotinoids. None of the proposed herbicides are neonicotinoids. 2,4D is also not one of the proposed pesticides. As with all proposed herbicides in Alternative 2, Forest Service completed a Risk Assessment for Glyphosate. The US EPA classifies glyphosate as a Group E (evidence of non-carcinogenicity for humans. The USFS defers to US EPA unless there is a compelling reason to do otherwise. Bee keepers will be notified prior to implementation. There are no permitted sites on the Forest for livestock and private land will only be treated if land owners agree through the Wyden agreement. 2) All target areas are shown within the map. 3), 4) and 5) All the mentioned areas will are included in this project. Only Chantry Flat parking lot area has any proposed treatment. Tree euphorbia (*Euphorbia dendroides*) is starting to grow out of control starting in the parking lot. None of the other areas have any immediate plans for treatment due to a lack of known treatable invasive species or other priorities such as new infestations, specially listed species. There is also no current funding to treat any of these sites. 6) Bee keepers with permits on forest will be notified prior to treatment. There is no design features for notification prior to treatment of livestock. If Mr Robin wants to be notified prior to any treatment near his property this can be arranged. We are not ruling out treatment near private land but we don't have any immediate plans or any foreseeable funding sources for treatment.	
12	From Ms. Tamara Hanson's email: I have concerns about the use of glyphosate for killing weeds. Here is why: **First Study to Confirm Glyphosate Levels in Breast Milk of American Moms** In the first ever testing for glyphosate in the breast milk of American women, Moms Across America and Sustainable Pulse found high levels in 30 percent of	The Forest appreciates and thanks Ms. Hanson for her comments. As with all herbicides in Alternative 2, Forest Service completed a Risk Assessment. The Proposed Action is designed to keep all herbicides out of waterways and off of edible fruit and food plants. Once in the soil, glyphosate degrades rapidly by microbial action (Schuette, 1998). But in waterways it does not degrade as quickly, so minimization measures include no spraying near open waterways. It is a concern of Forest Service if toxicity of herbicides were very	5/20/15; Tamara Hanson, private citizen

	the samples tested.[1, 2] This strongly suggests that glyphosate levels build up in your body over time, despite claims to the contrary. Breast milk levels were found to be 76 to 166 ug/l, which is 760 to 1,600 times higher than the European Drinking Water Directive allows for individual pesticides. Glyphosate has also been found in Americans' urine and drinking water. In those samples, levels were found to be more than 10 times higher than those tested in the EU in 2013. This is presumably due to the fact that the EU is now backing away from glyphosate usage and GE crops, whereas the US ignorantly races full speed ahead. **By Dr. Mercola**:The true toxicity of glyphosate—the active ingredient in Monsanto's broad-spectrum herbicide Roundup—is becoming increasingly clear as study after study is published demonstrating its devastating effects. In June, groundbreaking research was published detailing a newfound mechanism of harm for Roundup. This was immediately followed by tests showing that people in 18 countries across Europe have glyphosate in their bodies, [1] while yet another study revealed that the chemical has estrogenic properties and drives breast cancer proliferation in the parts-per-*trillion* range.[2] This finding might help explain why rats fed Monsanto's maize developed massive breast tumors in the first-ever lifetime feeding study published last year. Other recently published studies demonstrate glyphosate's toxicity to cell lines, aquatic life, food animals, and humans.	high. Risk analysis showed that glyphosate and surfactant had low risk. Accidental exposure did not cause any symptoms in 6 cases (Talbot et al, Ecotocicology,1991. The chemical pathway that glyphosate affects is one pathway found in plants, and not a biochemical pathway in mammals. Additionally, the plan is to treat invasive species and return only for maintenance where less or no herbicide will be applied. The herbicide application method only includes targeted spraying onto plants' leaves or cut stumps. No aerial application is allowed because this allows for drift and greater environmental effects. Application will not be allowed during conditions which increase potential risk to applicators or other wildlife, e.g., no spraying allowed during extremely hot weather. The glyphosate that might be applied to Forest invasive weeds will minimize drift, will not be sprayed near surface water, and will not be applied to crops in the concentrations that are used in commercial agricultural applications. Glyphosate can kill native plants as well as invasive weeds so will only be sprayed on invasive weeds in an area, and not broadcast sprayed. These measures will minimize risk to people and wildlife, and likely has minuscule effects when compared to agricultural applications in higher concentrations and broadcast sprayed.	
13	Questions if poison oak will be removed. Wants fire road near her house repaired.	The Forest appreciates and thanks Ms. Brenner for her comments. Poison Oak is a native plant and will not be removed. Fire road repair is not part of this project.	5/9/2015; Abbye Brenner, private citizen
14	1) Wants Santa Ana sucker, least Bell's vireo and southwestern willow flycatcher, critical habitat for California red-legged frog and slender horn spineflower	The Forest appreciates and thanks Ms. Schmoker for her comments. Her comments were incorporated.	6/1/2015; Kelly Schmoker, California Department of Fish and Wildlife

	added to the discussion points for Table 2; 2) Wants locally collected seed use for propagation; 3) wants pre-project surveys done in the appropriate time of year for full detection of species; 4) wants CNDDB forms filled out when rare plants are discovered; 5) she would appreciate coordination when rare plants and wildlife are discovered.		
15	Wants invasive species such as Spanish broom removed. Also wants an educational component	The Forest appreciates and thanks Ms. Denning for her comments. A mitigation measure was added to address the educational component.	5/22/2015; Alison Denning, private citizen
16	Wants invasive species removed esp. Scotch Broom. Doesn't want pesticide should be used in or near the watershed. Wants manual removal	The Forest appreciates and thanks Ms. Sked for her comments. Alternative 3 was designed for dedicated manual removal.	5/22/2015; Karen Sked, private citizen
17	Does not want Scotch Broom removed. Is concerned about dead plants not being removed and left standing dead.	The Forest appreciates and thanks Ms. DeBonis for her comments. Most dead specimens will be removed or mowed. When appropriate and when funds allow, replanting can also be done in those areas that do not naturally regenerate back to native plants.	5/22/2015; Cindy DeBonis, private citizen
18	Wants Spanish broom removed	The Forest appreciates and thanks Ms. Tange for her comments. Spanish broom is an invasive plant and will be removed throughout implementation projects.	5/22/2015; Sue Cate Tange, private citizen
19	Does not want Scotch Broom removed; Does not want pesticides spread around Mt Baldy community.	The Forest appreciates and thanks Mr Hannosh for his comments. Alternative 2 addresses the concerns about herbicides. Much of the Mt Baldy community is private land so it won't be treated unless the land owner agrees through a Wyden Agreement.	5/17/15; Paul Hannosh, private citizen
20	Doesn't want Scotch Broom removed	The Forest appreciates and thanks Ms. Fehlman for her comments.	5/18/2015; Sharon Fehlman, private citizen
21	Does not want Scotch broom removed	The Forest appreciates and thanks Ms. Wingate for her comments.	5/18/2015; Sheryl Wingate, private citizen
22	Doesn't want Scotch broom removed	The Forest appreciates and thanks Ms. Monterrelli for her comments.	5/18/2015; Dona Monterrelli, private citizen
23	Forwarded Cindy DeBonis's email chain	The Forest appreciates and thanks Ms. Jones for her comments.	5/18/2015; Ann Jones, private citizen
24	Forwarded Cindy DeBonis's email chain	The Forest appreciates and thanks Ms. Flickinger for her comments.	5/17/2015; Gloria Flickinger, private citizen

APPENDIX B - ADDITIONAL INVASIVE PLANT INFORMATION

Two of the important components of understanding the potential of invasive plant spread are their reproductive potential and mechanisms for distribution, including vectors for dispersal. The mode of dispersal is the physical characteristics that individual species have evolved to aid in the dispersal of their reproductive parts (e.g. seed, propagules) to colonize new areas. Reproductive potential is consider high when the species is able to have some combination of the following: reach reproductive maturity quickly (less than 2 years), produces prolific quantities of viable seed, has a long lived seedbank, viable seed production with self-pollination and cross pollination, has quickly spreading vegetative structures, ability to reproduce clonally, and/or resprouts readily when above ground portions of the plant are removed. Table 18 identifies the priority species reproductive mechanisms that have been identified (Cal-IPC 2003) to allow invasive species to rapidly spread and reproduce.

Dispersal vectors (table 19) involve the environmental factors that aid dispersal of species' reproductive parts. For example, some species (e.g. Spanish broom) have fat bodies on their seeds that attract ants, which haul the seeds off, and aid in dispersal. Abiotic factors can aid as vectors for dispersal, like water assisting in dispersing vegetative propagules of arundo downstream or wind blowing the light seeds of tamarisk both up and downstream. Humans and human activities have been identified as the greatest vectors associated with the spread of invasive species.

Another component of the mechanisms of plant invasion intrinsically related to vectors is suitable pathways for invasive plant species to move from one suitable environment to another. Important pathways applicable in the project area include roads, water course ways, private property, water inputs (dams), and hiking trails. Figure 4 provides a map of the project area and the potential vectors and pathways that invasive plant species may spread or be spread by. For example, roads are thought to promote invasive plant distribution and abundance due to two important mechanisms: the creation of suitable habitat (road maintenance disturbance and reduced competition from native plants) and the increase in vectors (e.g. vehicles, animals) (Hastings et al. 2004). These pathways are often the sites of greatest vegetation invasion, as they often combine high risk factors for invasion, such as continuous disturbance and higher frequencies of vectors.

The ecological amplitude, or range of ecological conditions a species can tolerate, can determine the distribution of a species. The greater the ecological amplitude, the broader the range of habitat an invasive species can invade. Table 20 shows the known habitats for the high and moderate priority invasive plant species that are in California and other places with analogous climate and habitats to that found in California. The more a species is a habitat generalist, the greater its chances of survival and perpetuation, due to the reduction of habitat barriers.

Table 8. Invasive plants known to occur in and near the project area.

Common name (Cal-IPC, Calflora)	Taxon name
Eupatory	*Ageratina adenophora*
Creeping bentgrass	*Agrostis stolonifera*
Tree of Heaven	*Ailanthus altissima*
Giant reed	*Arundo donax*
Wild oats	*Avena sp.*
Black mustard	*Brassica nigra*
Ripgut brome	*Bromus diandrus*
Soft brome	*Bromus hordeaceous*
Redbrome	*Bromus madritensis var. rubens*
Cheatgrass	*Bromus tectorum*
Hoary cress	*Cardaria draba*
Hairy whitetop	*Cardaria pubescens*
Italian thistle	*Carduus pycnocephalus*
Iceplant	*Carpobrotus chilensis*
Spotted knapweed	*Centaurea maculosa*
Tocolote	*Centaurea melitensis*
Bull thistle	*Cirsium vulgare*
Rockrose	*Cistus sp.*
Pampas grass	*Cortaderia jubata*
Pampasgrass	*Cortaderia selloana*
Bermudagrass	*Cynodon dactylon*
Scotch broom	*Cytisus scoparius*
Orchardgrass	*Dactylis glomerata*
Cape-ivy, German-ivy	*Delairea odorata*
Purple veldt grass	*Ehrharta calycina*
Red stem filaree	*Erodium cicutarium*
Tasmanian blue gum, or red gum	*Eucalyptus globulus, or Eucalyptus camauldulensis*
Edible fig	*Ficus carica*
Fennel	*Foeniculum vulgare*
French broom	*Genista monspessulana*
English Ivy, Algerian ivy	*Hedera helix, H. canariensis*
Velvet grass	*Holcus lanatus*
Smooth cats ear	*Hypochaeris glabra*
Rough cats ear	*Hypochaeris radicata*
Italian ryegrass	*Lolium multiflorum*
White horehound	*Marrubium vulgare*
California burclover	*Medicago polymorpha*
Myoporum	*Myoporum laetum*
Tree tobacco	*Nicotiana glauca*
Yellow oxalis	*Oxalis pes-caprae*
Crimson fountaingrass	*Pennisetum setaceum*
Hardinggrass	*Phalaris aquatica*
Bristly oxtounge	*Picris echiodes*
Smilograss	*Piptatherum miliaceum*
Kentucky bluegrass	*Poa pratensis*
Radish	*Raphanus sativus*
Castorbean	*Ricinus communis*
Black locust	*Robinia pseudoacacia*
Himalayan blackberry	*Rubus armeniacus (Rubus discolor)*
Curly dock	*Rumex crispus*
Peruvian pepper tree	*Schinus molle*
Mediterranean grass	*Schismus barbatus*
Blessed milkthistle	*Silybum marianum*
Wild mustard	*Sinapsis arvensis*
London rocket	*Sisymbrium irio*
Johnsongrass	*Sorghum halepense*
Spanish broom	*Spartium junceum*
Saltcedar, Tamarisk	*Tamarix ramosissima*

Common name (Cal-IPC, Calflora)	Taxon name
Hedgeparsley	*Torillis arvensis*
Puncture vine	*Tribulus terrestris*
Gorse	*Ulex europaeas*
Woolly mullein	*Verbascum thapsus*
Big periwinkle	*Vinca major*
Rattail fescue	*Vulpia myuros*
Mexican fan palm	*Washingtonia robusta*
English plantain	*Plantago lanceolata*
Foxtail	*Setaria faberi*
Artichoke thistle	*Cymara cardunculus*
Canary Island date palm	*Phoenix canariensis*
Crown daisy	*Chrysanthemum coronarium*
Eurasian watermilfoil	*Myriophyllum spicatum*
Japanese brome	*Bromus japonicus*
Kikuyugrass	*Pennisetum clandestinum*
Rose clover	*Trifolium hirtum*
Sheep sorrel	*Rumex acetosella*
silverleaf cotoneaster	*Cotoneaster pannosus*
Yellow starthistle[2]	*Centaurea solstitialis*
Canada thistle	*Cirsium arvense*
Olive tree	*Olea europaea*
Parney's cotoneaster	*Cotoneaster lacteus*
Petty spurge	*Euphorbia peplus*
Pride-of-Madeira	*Echium candicans*
Russian olive	*Elaeagnus angustifolia*

Table 9. Some invasive species reproductive mechanisms and dispersal mechanisms (Warner et al. 2003).

Common name (Species name)	Reaches Sexual Maturity in up to 2 Yrs	Infestations have High Seed Density	Populations Produce Seed Every Yr	Seed Production Sustained Over 3 Mo/Yr	Viable in Soil for 3+Yrs	Self & Cross-Pollination (or No Fertilization)	Vegetative Structures Root at Nodes	Easy to Fragment & Establish	Resprouts when Cut/Grazed/ Burned
giant reedgrass *(Arundo donax)*	X						x	x	x
tamarisk*(Tamarix ramosissima, T. gallica, T. parviflora)*	x	X	X	X		X	x	x	x
Tree-of-Heaven *(Ailanthus altissima)*		X	X				x		x
alligator weed *(Alternanthera philoxeroides)*	X						x	x	x
pampas grass *(Cortaderia jubata)*	X	X	X	X		X			x
bigleaf periwinkle *(Vinca major)*	X						x	x	x
Cape-ivy, German-ivy *(Delairea odorata)*	X		X				x	x	x
capeweed -sterile and fertile *(Arctotheca calendula)*	X	X	X				x	x	x
castorbean *(Ricinus communis)*	X		X	X	X	X	x	x	x
crimson fountaingrass *(Pennisetum setaceum)*	X		X	X	X	X			x
croftonweed, eupatorium *(Ageratina adenophora)*		X	X		X	X		x	x
English ivy *(Hedera*			X		x	x	x		x

Common name (Species name)	Reaches Sexual Maturity in up to 2 Yrs	Infestations have High Seed Density	Populations Produce Seed Every Yr	Seed Production Sustained Over 3 Mo/Yr	Viable in Soil for 3+Yrs	Self & Cross-Pollination (or No Fertilization)	Vegetative Structures Root at Nodes	Easy to Fragment & Establish	Resprouts when Cut/Grazed/ Burned
helix)									
erect veldtgrass *(Ehrharta erecta)*	X	X	X	X			x		x
fennel *(Foeniculum vulgare)*	X	X	X	X	X				x
French broom *(Genista monspessulana)*	X	X	X	X	X	X			x
gorse *(Ulex europaeus)*	X		X	X	X		x		x
Himalaya blackberry *(Rubus armeniacus)*		X	X	X	X	X	x		x
Italian ryegrass *(Lolium multiflorum)*	X	X	X			X			
onionweed *(Asphodelus fistulosus)*	X	X	X	X	X				
pampasgrass *(Cortaderia selloana)*	X	X	X	X		X			x
Portuguese broom *(Cytisus striatus)*		"unknown"	X		X				x
purple veldtgrass *(Ehrharta calycina)*	X	X	X	X		X	x		x
Russian knapweed *(Acroptilon repens)*	X	X	X		X	X	x	x	x
Scotch broom *(Cytisus scoparius)*		X	X	X					x
Spanish broom *(Spartium junceum)*	X	X	X	X	X				x
spotted knapweed *(Centaurea maculosa)*	X	X	X		X	"unknown"			x
yellow starthistle *(Centaurea solstitialis)*	X	X	X	X	X				

Dispersal vectors for some invasive plants.

Common Name (Taxon Name)	Non-Human/ Natural Seed Dispersal	Long Distance Dispersal (1+ Km)	Human Dispersal Mechanisms and Vectors
giant reed *(Arundo donax)*	water	x	boats, water tools, water recreation, water movement/management horticultural use, historic use as roofing material and fodder
tamarisk (saltedar, French, and smallflower) *(Tamarix ramosissima, T. gallica, T. parviflora)*	wind, water	x	fire management (resprouts), water management (irrigation, dams, river diversions, plow flood plains), grazing near riparian areas, horticultural use, erosion control, wind breaks
tree of heaven *(Ailanthus altissima)*	wind, water, animals	x	road maintenance, travel corridors, travel near/to water sources inc. springs, urban areas, horticultural use, logging activities, revegetate mine spoils
alligator weed *(Alternanthera philoxeroides)*	water	X	boats, water tools, water recreation, drawdown for waterfowl, irrigation ditches and ponds; historic use aquarium trade
pampas grass *(Cortaderia jubata)*	wind, animals	X	historical accounts of vehicle travel, logging, railroads, horticultural use
big periwinkle *(Vinca major)*	water	X	road side equipment; horticultural use
cape-ivy, German-ivy *(Delairea odorata)*	wind, water	X	vehicle travel, road side equipment
capeweed -sterile and fertile *(Arctotheca calendula)*	wind, water, animals		vehicle travel, road side equipment, stock fodder, livestock fur/hair/hooves, horticultural use
castorbean *(Ricinus communis)*	water, animals	X	vehicle travel, road side equipment, drainage ditches, railroads
crimson fountaingrass *(Pennisetum setaceum)*	wind, water, animals	X	vehicle travel, road side equipment/maintenance, cut and fill slopes, livestock, railroads, horticultural use
croftonweed, eupatorium *(Ageratina adenophora)*	wind, water, animals	X	travel of humans, livestock, vehicles, & equipment, intensive grazing, horticultural use, Agricultural contaminant in road construction & agricultural equipment
English ivy *(Hedera helix)*	wildlife	X	horticultural use, recent archeological/homestead sites
erect veldtgrass *(Ehrharta erecta)*	water	Rare	sticks to clothing/boots, equipment, roadside maintenance and mowing
fennel *(Foeniculum vulgare)*	water, animals	Rare	roadside travel and equipment, farm equipment, earth-moving machinery, agricultural produce, livestock, clothing
French broom *(Genista monspessulana)*	water, animals	possible/rare	roadside travel and equipment, pastureland, road construction, feral pig rooting, fire management (sprouter), soil contaminated with seed, road grading equipment, maintenance machinery, human footwear, horses and other domestic animals and animal pathways/tracks, lumber activities and roads
gorse *(Ulex europaeus)*	insects, wildlife, water	x	land management like gravel bars, fence rows, overgrazed pastures, logged areas, and fire management (post-burn sprouter); horticultural use
Himalaya blackberry *(Rubus*	water,	x	agriculture activities, human spread by ingestion of

Common Name (Taxon Name)	Non-Human/ Natural Seed Dispersal	Long Distance Dispersal (1+ Km)	Human Dispersal Mechanisms and Vectors
armeniacus)	wildlife		seeds, planting of canes for fruit production, used for erosion control; spread by land clearing and debris disposal
Italian ryegrass *(Lolium multiflorum)*	seed only		seed dispersal by roadside travel and equipment, management of fields, orchards and vineyards; cultivated for erosion control; horticultural use
onionweed *(Asphodelus fistulosus)*	water, animals	x	seeds dispersed on vehicles, machinery (road works), clothing and farm produce, pastureland, fire management (post burn colonizer)
pampasgrass *(Cortaderia selloana)*	wind, animals	x	horticultural use, seeds dispersed via humans use to "decorate", vehicle travel and roadsides
Portuguese broom *(Cytisus striatus)*	seed, rain		road and home construction; timber harvest; road side machinery and equipment
purple veldtgrass *(Ehrharta calycina)*	wind, water, soil	rare/no	fire management (resprouter), grassland management, roadside travel and maintenance
Russian knapweed *(Acroptilon repens)*	water, wildlife	x	transportation corridors, management of rangeland, grazed areas, riverbanks, irrigation ditches, pasture, and cropland
Scotch broom *(Cytisus scoparius)*	seeds, insects	rare	roadside maintenance and equipment, fire management (resprouter), management of pastureland, forest borderland, soil or vegetation disturbing management activities (burning, herbicides)
Spanish broom *(Spartium junceum)*	seeds, insects, water	x	roadside planting, roadside travel, maintenance, and equipment, vegetation management (old fields, road banks, land slides, river islands and post-burn sites)
spotted knapweed *(Centaurea maculosa)*	seeds, animals	x	roadside maintenance and travel, logging activities and vehicles, undercarriage and doors of recreational vehicles, trains, light aircraft landing at infested air strips, heavy machinery, florists, hay, log cabin kits, mud caked items like shoes and hooves, rangeland management, livestock activities
tree tobacco *(Nicotiana glauca)*	animals, water	x	spreads in disturbed soils, vacant lots, roadsides (maintenance and travel), streamsides, other riparian areas, and recently burned sites, horticultural use, recent archeological/homestead sites
yellow starthistle *(Centaurea solstitialis)*	wind, animal	rare	spread by vehicles, machinery, road building and maintenance, rangeland and grassland management, livestock, any soil disturbance such as orchards, vineyards, pastures, movement of contaminated hay and uncertified seed, farm equipment (tractors), suburban development, ranching industry

APPENDIX C POTENTIAL TREATMENT PRESCRIPTION OPTIONS

Table 10. Treatment prescription herbicide and manual options to consider in integrated weed management for known and expected invasive plants

Species	Herbicide Rx1	Herbicide Rx2	Herbicide Rx3	Cultural Rx
Arundo donax (giant reed)	If plants are too tall to effectively spray from ground, cut them and use either a cut stump treatment of undiluted glyphosate (e.g. AquaMaster®) immediately after cutting, or allow for resprouting (3-6 weeks) and apply foliar or spot spraying application glyphosate (e.g. AquaMaster®) at 2-3% (at 25-40 gpa)and 0.5% of a non-ionic surfactant (e.g. Agri-Dex®). Otherwise treat with 3% glyphosate (e.g. AquaMaster®) plus 0.5% surfactant (at 60-100 gpa). Bending over tall plants prior to spraying can also be used on tall plants. Treatments later in summer or early fall are most effective.	Low volume foliar or spot spraying application of 5% imazapyr (e.g. Habitat®) plus 5% MSO surfactant applied in spring to 20-25% of leaf surfaces. Wait at least 6 months before considering retreatment.		Cutting is not effective.
Tamarix spp. (tamarisk, saltcedar)	Foliar or spot spraying application of imazapyr (e.g. Habitat®) at 1% in water with non-ionic surfactant (e.g. LI-700) at 0.25%. Late summer, early fall. Spray to wet (25-50 gpa). Imazapyr is slow acting (allow 2 seasons before considering retreating).	A tankmix of imazapyr (e.g. Habitat®) at 1% solution plus 3% solution glyphosate (e.g. AquaMaster®) plus 1% MSO surfactant, applied in fall, high volumes (spray to wet). Imazapyr is slow acting (allow 2 seasons before considering retreating).	If trees too tall to safely foliar or spot spray, cut stump with diluted imazapyr (e.g. Habitat ®) at 6 ounces/gallon water - 5% solution; or undiluted triclopyr ester (e.g. Garlon 4 Ultra®), or basal bark with triclopyr ester (25%) in MSO or basal oil surfactant in fall (only to smooth-barked younger trees).	Handpulling smaller plants is effective, with some root removal.

Species	Herbicide Rx1	Herbicide Rx2	Herbicide Rx3	Cultural Rx
Ailanthus altissima (tree-of-heaven)	Different treatments depending on size of target. For small seedlings or sprouts (less than 4-5 feet tall), foliar or spot spraying application with 1-2% glyphosate (e.g. Accord Concentrate®) with 0.5% non-ionic surfactant, even coverage (10-30 gpa). For small saplings (trees with smooth bark), basal bark application with triclopyr ester (e.g. Garlon 4 Ultra®) at 25% mixed with a methylated seed oil (MSO) or basal oil surfactant, applying to lower 1-2 feet of stem, spray to wet in summer or fall. Larger trees without smooth bark, hack and squirt or frill then apply undiluted imazapyr (e.g. Arsenal AC®) or triclopyr amine (e.g. Garlon 3A®) in the summer or fall. Imazapyr is slow to act so don't expect fast changes (about a year).	If trees cannot be left in place to die (after hack and squirt or frill), then use a cut stump method; applying undiluted triclopyr ester (e.g. Garlon 4 Ultra®) or diluted imazapyr (e.g. Arsenal AC®) (6 ounces Arsenal AC® per gallon water) to the stump surface within minutes of cutting stem.		Hand cutting is ineffective. Young seedlings (not root suckers) can be pulled by hand but the roots must be removed or they will resprout.
Alternanthera philoxeroides (alligator weed)	Triclopyr amine (e.g.. Garlon 3A®) applied at rate of 1 lb ae/acre (2-3 pints/acre) mixed with 1% non-ionic surfactant applied at 20 gpa 2-4 times/year.	2% glyphosate solution (e.g. Accord Concentrate®) plus 0.5% non-ionic surfactant at 50 gpa.		Digging can be effective on very small populations, but care must be taken to remove all pieces, as rooting from fragments can occur.
Cortaderia jubata (jubata grass)	Glyphosate (e.g.. Accord Concentrate®) as a 2% solution plus 0.5% non-ionic surfactant applied at 50-100 gpa foliar spot spraying application in summer or fall (July – October)	Wicking application, using 30% glyphosate (e.g. Accord Concentrate®) plus 10% surfactant in water in early summer or fall.		Digging can be effective tool although very labor intensive for larger clumps.
Cortaderia selloana (pampas grass)	Glyphosate (e.g., Accord Concentrate®) as a 2% solution plus 0.5% non-ionic surfactant applied at 50-100 gpa foliar or spot spraying application in summer or fall (July - October).	Wicking application, using 30% glyphosate (e.g. Accord Concentrate®) plus 10% surfactant in water in early summer or fall.		Digging can be effective tool although very labor intensive for larger clumps.
Vinca major (big periwinkle)	Foliar or spot spraying application with 2% solution of glyphosate plus 0.5% non-ionic surfactant in water in the spring.	Foliar or spot spraying application with 2% solution of triclopyr amine (e.g. Garlon 3A®) plus 0.5% nonionic surfactant in water in the spring.		

Species	Herbicide Rx1	Herbicide Rx2	Herbicide Rx3	Cultural Rx
Delairea odorata (cape ivy, German ivy)	0.5% glyphosate (e.g. Roundup Pro®) plus 0.5% triclopyr ester (e.g. Garlon 4 Ultra®) plus 0.1% silicone surfactant (e.g. Sylgard®) applied as foliar or spot spraying spray, spray to wet (70 gpa), late spring, early summer.			Hand pull in small areas and remove all fragments of stems and roots. Brush blade larger areas and follow up with manual or herbicide treatment.
Arctotheca calendula (capeweed)	Glyphosate at 2-3% (e.g. Roundup Pro®) (or 1.5% - 2.25% Accord Concentrate® plus 0.5% non-ionic surfactant) applied during flowering but before seed set.	Triclopyr ester (e.g. Garlon 4 Ultra® (4 lb ae/gallon)) at 2% solution plus surfactant. Applied during flowering.		Small, younger patches can be hand pulled, make sure bulk of roots are removed. Once stolons form do not attempt pulling as vegetative spread would be likely result.
Ricinus communis (castor bean)	Chlorsulfuron (e.g. Telar XP®) at 1 1/3 ounces of product per acre plus 0.25% non-ionic surfactant applied in late winter or early spring. Don't exceed 1 1/3 ounces of Telar XP® per acre.	Glyphosate at 8 qts or 2% (e.g. Roundup Pro®) applied in late winter or early spring at 100 gpa.	For larger plants, cut stump with 50% glyphosate (e.g. Accord Concentrate®) or 30% solution of triclopyr ester (e.g. Garlon 4 Ultra®), immediately after cutting plant	Handpull and remove root systems in small infestations. Make sure workers are wearing gloves.
Pennisetum setaceum (crimson fountaingrass)	Glyphosate (e.g. Accord Concentrate®)at 2% applied as a foliar or spot spray in spring and summer, including 0.5% nonionic surfactant.			Small infestations can be removed by uprooting or cutting with weed eaters. Larger plants will require picks or mattocks. If seed is present, seed heads should eb cut and bagged for off-site disposal.
Ageratina adenophora (croftonweed, eupatorium)	Glyphosate (e.g. Accord Concentrate®) applied as a 1% solution plus 0.5% non-ionic surfactant, spray to wet, in late summer or fall when actively growing.	Triclopyr ester (e.g. Garlon 4 XRT®) at 0.5% (2 qts/100 gallons water), high volume, in late summer or fall when actively growing. Throughly wet, especially at base.	Wicking application, using 30% glyphosate (e.g. Accord Concentrate®) plus 10% surfactant in water in early summer or fall.	Handpull and remove root systems in small infestations.
Hedera helix (English ivy)	From summer to fall, apply 3% solution of triclopyr ester (e.g. Garlon 4 Ultra®) with non-ionic surfactant. Thoroughly wet the foliage but not to point of runoff.	Some control may be achieved with glyphosate (e.g. Accord Concentrate®) as a 3% solution with 0.5-1% non-ionic surfactant, but repeat applications are necessary.		Handpull and remove root systems in small infestations. Solarization (i.e., tarping) can also be effective.

Species	Herbicide Rx1	Herbicide Rx2	Herbicide Rx3	Cultural Rx
Ehrharta erecta (erect veldtgrass)	2% glyphosate (e.g. Accord Concentrate®), with added 0.5-1% nonionic surfactant, applied when plant is actively growing and green, in spring/early summer. Will likely require at least two years of chemical control followed by manual control of new seedlings.			Small areas can be handpulled.
Ehrharta *calycina (purple* veldtgrass)	2% glyphosate (e.g. Accord Concentrate®), with added 0.5-1% nonionic surfactant, applied when plant is actively growing and green, in spring/early summer. Will likely require at least two years of chemical control followed by manual control of new seedlings.			Small areas can be handpulled.
Foeniculum vulgare (fennel)	Triclopyr (either amine [e.g.. Garlon 3A®] or ester [e.g. Garlon 4 XRT®]) applied in spring/summer as a 2% solution (95 to 100% mortality).	Glyphosate (e.g. Accord Concentrate®) in late spring/summer as a 2% solution plus 0.5-1% non-ionic surfactant. (75-80% reduction in cover)		Hand pull or cut above-ground portions using handtools (small or diffuse populations only). For large areas, brush blade and follow-up with herbicide.
Genista monspessulana (French broom)	Triclopyr ester (e.g. Garlon 4 Ultra®) as a 2% solution plus 0.5-1% non-ionic surfactant applied to foliage in spring; even coverage is important. .	Glyphosate (e.g. Accord Concentrate®) as a 3% solution 0.5-1% non-ionic surfactant in spring or fall as foliar or spot spraying application.	Basal bark application using imazapyr (e.g. Stalker®) in a 6-10% solution or triclopyr ester (e.g. Garlon 4 Ultra®) in a 10-20% solution mixed with MSO (e.g. Hasten® or Competitor®) or a basal oil, applied in fall. Or a tankmix of the two - 3-5% imazapyr (e.g. Stalker®), 15-20% triclopyr ester (e.g. Garlon 4 Ultra®) in a basal oil or MSO.	Hand pull seedlings when soil is moist and infestation is small or scattered. Larger plants can be removed with a weed wrench.
Cytisus striatus (Portuguese broom)	Triclopyr ester (e.g. Garlon 4 Ultra®) as a 2% solution plus 0.5-1% non-ionic surfactant applied to foliage in spring; even coverage is important.	Glyphosate (e.g. Accord Concentrate®) as a 3% solution 0.5-1% non-ionic surfactant in spring or fall as foliar or spot spraying	Basal bark application using imazapyr (e.g. Stalker®) in a 6-10% solution or triclopyr ester	Hand pull seedlings when soil is moist and infestation is small or scattered. Larger plants can be

Species	Herbicide Rx1	Herbicide Rx2	Herbicide Rx3	Cultural Rx
		application.	(e.g. Garlon 4 Ultra®) in a 10-20% solution mixed with MSO (E.g. Hasten® or Competitor®) or a basal oil, applied in fall. Or a tankmix of the two - 3-5% imazapyr (e.g. Stalker®), 15-20% triclopyr ester (e.g. Garlon 4 Ultra®) in a basal oil or MSO.	removed with a weed wrench.
Cytisus scoparius (Scotch broom)	Triclopyr ester (e.g. Garlon 4 Ultra®) as a 2% solution plus 0.5-1% non-ionic surfactant applied to foliage in spring; even coverage is important.	Glyphosate (e.g. Accord Concentrate®) as a 3% solution 0.5-1% non-ionic surfactant in spring or fall as foliar or spot spraying application.	Basal bark application using imazapyr (e.g. Stalker®) in a 6-10% solution or triclopyr ester (e.g. Garlon 4 Ultra®) in a 10-20% solution mixed with MSO (e.g. Hasten® or Competitor®) or a basal oil, applied in fall. Or a tankmix of the two - 3-5% imazapyr (e.g. Stalker®), 15-20% triclopyr ester (e.g. Garlon 4 Ultra®) in a basal oil or MSO.	Hand pull seedlings when soil is moist and infestation is small or scattered. Larger plants can be removed with a weed wrench.
Ulex europaeus (gorse)	Triclopyr ester (e.g. Garlon 4 Ultra®) as a 2% solution plus 0.5-1% non-ionic surfactant applied to foliage in spring; even coverage is important.	Imazapyr (e.g. Arsenal AC®) as a 2% solution plus 0.5% non-ionic surfactant applied to foliage in spring or summer	10-15% triclopyr ester (e.g. Garlon 4 Ultra®) in water plus an acidifier as a cut stump treatment.	
Rubus armeniacus (Himalayan blackberry)	Best if vegetation is cut first and then resprouts treated. Triclopyr ester (e.g. Garlon 4 Ultra®) using a 2% solution plus 1% non-ionic surfactant applied at flowering to green berry stage (late spring/early summer). Repeat as needed.	Glyphosate (e.g. Accord Concentrate®) applied as a 3 or 4% solution plus 0.5-1% non-ionic surfactant, to the foliage during flowering stage.		Handpull seedlings making sure to remove root system. Cut larger canes and remove root crown. Mow or brush blade larger infestations before hand removal.

Species	Herbicide Rx1	Herbicide Rx2	Herbicide Rx3	Cultural Rx
Lolium multiflorum (Italian ryegrass)	Glyphosate (e.g. Accord Concentrate®) as a 2% solution plus 0.5-1% non-ionic surfactant appied when the boot to head stage is reached.			
Asphodelus fistulosus (onionweed)	Glyphosate (e.g. Accord Concentrate®) as a 5% solution plus 0.5-1% non-ionic surfactant applied in spring during flowering	Chlorsulfuron (e.g. Telar XP®) at 1 1/3 ounces product/acre applied as a foliar or spot spray plus 0.25% non-ionic surfactant.		manual removal before seeds develop can control small populations, however partially buried plants can survive.
Acroptilon repens (Russian knapweed)	Chlorsulfuron (e.g. Telar XP®) at 1-3 ounces/acre plus 0.25% surfactant applied in fall to rosette. Spray to wet (20-40 gpa).	Aminopyralid (e.g. Milestone®) 5-7 oz/acre in spring plus 0.25 - 0.5% of non-ionic surfactant, applied in spring (eraly bud to flowering) or in the fall to dominant plants	Glyphosate (e.g. Accord Concentrate®) applied as a foliar or spot spray (3 lb ae/ac) at bud stage.	
Centaurea maculosa (spotted knapweed)	Aminopyralid (e.g. Milestone®) 5-7 oz/acre in spring plus 0.25% of non-ionic surfactant, applied from the rosette to the bolting stage.			
Centaurea solstitialis (yellow starthistle)	Aminopyralid (e.g. Milestone®) 4 oz/acre plus 0.25% of non-ionic surfactant, applied from the rosette to the bolting stage (November thru April). .			
Nicotiana glauca (tree tobacco)	Cut stump treatment with glyphosate (at 50% dilution or undiluted), imazapyr (8 ounces Arsenal AC®/gallon water or 16 ounces Stalker®/gallon water), or triclopyr ester at 30% dilution or undiluted. Glyphosate diluted with water, triclopyr and imazapyr diluted with MSO (e.g. Hasten®) or a basal oil.	Basal bark application using 20% imazapyr (eg Stalker®) in MSO or basal oil, applied in summer/fall.	Foliar or spot spraying application with glyphosate (eg Roundup Max®) at 2-3%. Provides partial control, at best.	Manual removal using weed wrench can be effective if most of major roots are removed. Cutting is inefefctive.

APPENDIX D –MONITORING PLAN

Invasive Plant Treatment Project

Monitoring Plan

UDSA Forest Service

Version 1.1

FY 2015

1 Introduction

The Invasive Plant Treatment Project Monitoring Plan is designed to be an iterative process. This plan will be updated periodically based on continued scientific and peer review and lessons learned from monitoring as it is conducted. This plan will stay in effect throughout e implementation.

A team of resource specialists using an interdisciplinary process developed this Plan. Implementation and effectiveness monitoring conducted in association with management activities authorized by the Decision Notice, provides opportunity for adapting management techniques as needed to better meet the intent of the selected alternative as planned and approved. In some cases this may involve minor modifications to project activities or changes to the restoration and monitoring methods. These types of corrections or adjustments would be implemented as needed.

Changes to monitoring methods typically do not require authorization under NEPA, as they are primarily associated with data gathering. Project monitoring could result in the need to propose changes to authorized project actions. Changes to the project actions will be subject to the requirements of the NEPA and other laws concerning such changes. In determining whether and what kind of further NEPA action is required, the Responsible Official will consider the criteria in Forest Service Handbook 1909.15, sec. 18. In particular (s)he will need to consider whether the proposed change is a substantial (significant) change to the selected alternative as planned and already approved, and whether the change is relevant to environmental concerns.

The Plan acknowledges the need to collect baseline data prior to implementation of the treatment sites. Baseline data will characterize the existing conditions (e.g. invasive species identification, invasive plant location) to determine appropriate treatment methods, to provide comparison to post project conditions, and to provide a basis for effectiveness monitoring.

This plan also establishes monitoring objectives and a framework protocol for implementation and effectiveness monitoring.

> **Project Implementation monitoring** will track the entire overall project through treatment selection, treatment implementation, and restoration to ensure that it is implemented as planned. This asks, "Did we do what we said we were going to do as outlined in the Decision Notice?"
>
> **Project effectiveness monitoring** will determine if the project activities specifically in the Project Design Criteria were effective in achieving the stated goals and objectives based on comparison of pre (baseline) and post project conditions. It will also determine whether or not the treatment methods and restoration activities were effective. Effectiveness monitoring asks, "Was the result of the project(s) as we had planned?"

The lessons learned from observation, monitoring, data collection, and reporting will be useful for modifying project plans to better meet the project goals and objectives. If monitoring indicates laws, regulations, standards or critical objectives are not being met, the project will be modified as necessary and appropriate.

Monitoring and evaluation are separate, sequential activities that provide information to determine whether projects and activities are meeting goals and objectives. Monitoring collects information, on a sample basis, from project activities. Evaluation of monitoring results is used to determine the effectiveness of project activities and the need for change.

When designing a monitoring plan, a full spectrum of techniques and methods should be used to evaluate the results obtained from monitoring. Evaluation techniques for the Invasive Plant Treatment Project could include, but are not limited to:

- Site-specific observations by on-site resource specialists.
- Field assistance trips by other technical specialists.
- On-going accomplishment reporting processes.
- Discussions with other agencies and various public users.
- Interdisciplinary team reviews of monitoring results.
- Involvement with existing research activities.
- Review and analysis of records documenting monitoring results.
- Measuring and re-measuring permanent inventory plots.

2 BASELINE DATA COLLECTION

2.1 Populations and/or Invasive Species

2.1.1 Evaluation Question

What are the invasive plant species and where are the populations of these species within the project area?

2.1.2 Approach

To track and monitor populations of invasive plants found within the project area data will be collected to input it into the Forest Service Natural Resource Information System (NRIS) database (http://www.fs.fed.us/emc/nris/products/invasives/index.shtml). The following inventory form will be completed for populations of invasive plant species found in the project area. The completed forms will be attached to this plan and the data input into the NRIS database.

INVASIVE PLANT INVENTORY FORM

General Information

NRIS ID:	***DATE:***
FACTS ID:	**Occurrence Number:**
Scientific Name:	
Common Name:	
Project Name and which Branch:	**Examiner(s):**
District:	**Ownership:**
County:	**Job Code:**
Forest Quad Name and Number:	**Legal Location: Township/Range, ¼, ¼, Section**
GPS reading (NAD83):	
Plant Community / Dominant Habitat Type:	
Site Description:	
Phenology: _____% vegetative _____ % flowering _____ % fruiting	
Total (Gross) Area:	**Canopy Cover % (% Infested):**
Distribution:	**Horizontal Distance to Water:**

Narrative (detailed description of location, direction to site and map location).

_____
_____
_____
_____
_____
_____
_____
_____

Site Record Information

Photo Number: Photo Date:	**GPS: Y___, N___ , Name:**
Date added to GIS layer:	**Date added to Atlas:**
Date Entered into NRIS:	

Comments (Include Slope and Aspect if appropriate):

Sketch of Infestation

Comments related to sketch:

3 PROJECT IMPLEMENTATION MONITORING

3.2 Miles and/or Acres Treated Annually and Treatment Method Used

3.2.1 Implementation Evaluation Question

What is the extent of the miles and/or acres treated annually and were they in accordance with the Decision Notice?

3.2.2 Approach

According to the project description, the maximum treated area annually is 200 miles and/or 4,100 acres. Table 1 will be completed on an annual basis to track acres actually treated in the project area as addressed in the Environmental Assessment (EA). Should there be a need for treatment within any area that would be in excess off the maximum miles and/or acres analyzed in the EA, additional analysis would be necessary. This could be an amendment to the EA with an updated decision.

4 PROJECT IMPLEMENTATION AND EFFECTIVENESS MONITORING

This section of the Monitoring Plan addresses both implementation and effectiveness of the project.

4.1 Project Design and Design Features

This section of the Monitoring Plan addresses both implementation and effectiveness of the project. The intent is to review whether the project design, including the design features were implemented and also on whether they were effective.

4.1.1 Coordination and Additional Approval Design Features

4.1.1.1 Implementation Evaluation Question

Have the coordination design features been carried forward?

4.1.1.2 Approach

Complete the check list annually to validate steps have been taken to ensure coordination measures were followed

4.1.1.2.1. FOR ALL TREATMENT AREAS:

	YES	NO	N/A
Did Forest Staff make every reasonable effort to acquire voluntary written agreements with private land owners to access and treat invasive weeds on these lands when the invasive plant species are a threat to the National Forest or National Monument? If agreements were signed, were they for the duration of this project (15 years) to ensure its maximum effectiveness? If Agreements were not obtained, did Forest Staff make reasonable efforts to reach an understanding with the private landowners regarding the locations of applicable private property boundaries? And were these boundaries flagged immediately prior to implementing project work to avoid possible trespass onto private lands?			
In areas where treatment adjoins residential private lands, was the use of equipment and work crews limited to weekdays (Monday-Friday) between the hours of 7:00AM to 7:00 PM? Prior to project implementation, did the project coordinator coordinate with the potentially impacted residents to prepare them for the increased activity and ensure minimum noise and disturbance levels were considered?			
Two weeks in advance of initiating treatment work, did the Forest Service project supervisor/manager contact and coordinate with the Forest Law Enforcement Officer to ensure that the treatment work would not interfere with on-going law enforcement activities or endanger work crew safety?			
One week in advance of initiating treatment work, did the Forest Service project supervisor/manager coordinate with the District Staff to avoid inadvertent conflicts with other on-going or scheduled agency or permitted projects in the area?			
Prior to project implementation, were the Wilderness Ranger and wilderness volunteers sufficiently trained to identify the most aggressive invasive species (e.g. tamarisk, arundo, tree-of-heaven, castorbean) and other species as the Forest			

	YES	NO	N/A
Botanist or Forest Service project botanist determines to be of concern? And were they trained on how to complete the Inventory form?			
Was the wilderness ranger(s) periodically consulted during the implantation of this project and adequately informed about the approved treatment actions?			
Was the PSW Station Director notified, via the Research Natural Areas Committee, before any eradication work begins within the boundaries of the Falls Canyon Research Natural Areas (RNA).			
If any spills occurred from this project, was it reported to the Forest Hazardous Spill Coordinator?			
If temporary remote base camps and /or helicopter drop-off and haul sites are needed in Wilderness Areas, did the Forest Supervisor or District Ranger approve the sites?			

4.1.1.2.2. If herbicide treatments took place

	YES	NO	N/A
Has the Regional Forester pre-approved all herbicide treatments in Research Natural Areas and Wilderness Areas related to this project			

4.1.1.3 Effectiveness Evaluation Question and Approach

Were the coordination design features effective in reducing impacts or assisting in the success of the project? If not, were they modified and if so, how?

4.1.2 General Design Features

4.1.2.1 Implementation Evaluation Question

Have the general design and design features been carried forward?

4.1.2.2 Approach

Complete the check list annually to validate steps have been taken to ensure general design features were followed

4.1.2.2.1. FOR ALL TREATMENT AREAS:

	YES	NO	N/A
Was ground disturbance limited to the absolute minimum necessary for effective treatments (Forest Plan, Part 2, p. 100)?			
Was an annual pre-operations briefing completed prior to treatment between the project manager and personnel implementing the project? Did the briefing included a review at a minimum Sensitive resource locations, the identification characteristics of sensitive resources that could be found in the project area. On-site environmental training occurred to aid workers in recognizing and avoiding special status species and heritage resource sites that may			

	YES	NO	N/A
occur in the project area. All operational details (e.g. safety plan, safety issues, locations, timing, treatment methods, herbicides approved for use, vehicle/equipment cleaning, no pets on site, remove all project generated trash at end of day) Herbicide Transportation, Handling and Emergency Spill Response Plan Protective measures (e.g. use of personal protective equipment, proper worker hygiene practices, proper handling of the herbicide) will be emphasized with the use of triclopyr, if applicable. Driving speeds on native surface roads will not exceed 15 MPH			
Did additional briefings occur throughout the year to ensure the treatments comply with the project design?			
Where feasible, were existing hardened surfaces or disturbed sites selected for staging areas? We're staging areas for equipment and crew congregation located in areas where there was minimum conflict with public use and other resources (e.g. special status species suitable/occupied habitat, outside invasive plant populations, RNAs, Special Interest Areas)? Were they 150' from a stream channel (unless pre-approved by the Ranger) and in areas which are not highly visible or heavily used? Did each staging area accommodate vehicle parking to minimize the impacts of work vehicles and equipment in developed recreation sites such as the East Fork and West Fork Trailheads? Did employees car pool to the work sites from off the Forest? Just prior to treatment, were points of access, parking, and treatment areas in resource sensitive areas marked with signs, staking, and flagging to keep project activities confined to designated areas? Were all project personnel advised to conduct work activities within the defined work area only in these resource sensitive areas?			
If treatments occurred in the Experimental Forest, did the treatments affect on-going experiments? If yes, did the treatments stop and only continued if the effects were at a level that are acceptable to the Experimental Forest Manager?			

4.1.2.2.2. IF HERBICIDE TREATMENT TOOK PLACE:

	YES	NO
At sites where tamarisk was initially herbicide-treated and later retreated by burning or cutting, were these additional treatments a minimum of two growing seasons after initial treatment? (disturbing treated plants can induce resprouting).		

	YES	NO
If a NPE surfactant was used with an herbicide, did the dilution rate range from 0.25 to 2.5 percent?		
Was Hi-Light Blue® dye or similar biodegradable colorant used to facilitate visual control of herbicide application?		
Was a Herbicide Transportation, Handling, Emergency Spill Response Plan completed, approved, and on-site for reference?; Did it include at a minimum the following: Application of herbicides will follow all local, state and federal laws/regulations and all labels will be read and obeyed No more than daily use quantities of herbicides will be transported to the project site Equipment used for transportation, storage, or application of herbicides will be maintained in a leak-proof condition Herbicide containers must be secured and prevented from tipping during transport Impervious material, such as a bucket or plastic, will be placed beneath mixing areas in such a manner as to contain any spills associated with mixing/refilling No herbicide application will occur if precipitation is occurring or is imminent within 24 hours Immediate control, containment, and cleanup of fluids and herbicides due to spills or equipment failure will be implemented. All contaminated materials will be disposed of promptly and properly to prevent contamination of the site Herbicide spray equipment will not be washed or rinsed within 150 feet of any body of water or stream channel. All herbicide containers and rinse water will be disposed of in a manner that will not cause contamination of waters. For small quantities (≤ 5 gallons) fueling of gas-powered machinery will not occur within 25 feet of any body of water or stream channel unless prior-approved by a Forest Service hydrologist or biologist. If foliar/spot spray application is required, herbicides will not be applied when winds are greater than 10 miles per hour (mph). All hazardous spills will be reported immediately to the Forest Hazardous Spill Coordinator.		

4.1.2.3 Effectiveness Evaluation Question and Approach

Were the general design features effective in reducing impacts or assisting in the success of the project? If not, were they modified and if so, how?

4.1.3 Health and Safety Design Features

4.1.3.1 Implementation Evaluation Question

Have the health and safety design features been carried forward?

4.1.3.2 Approach

Complete the appropriate check lists annually to validate steps have been taken to ensure health and safety for implementers and the public

4.1.3.2.1. FOR ALL TREATMENT AREAS:

	YES	NO	N/A
Is a Safety Plan for this project on file and Does it include a job hazard analysis, including personal protective equipment/clothing (PPE) needs (FSH 6709.11)? Does it address risk and standard cleanup procedures (Forest Plan, Part 2, p. 106; FSM 2153.3; FSH 2109.14,16)? Does it include the need for work crews driving vehicles on roads open to bicyclists or hikers to be cautious and drive slowly with the combined bike and hiker use on this road?			

4.1.3.2.2. IF HERBICIDE TREATMENT TOOK PLACE:

	YES	NO	N/A
Were only certified personnel or those under the supervision of a certified applicator allowed to use restricted-use pesticides (FSM 2154.2)?			
Were spill kits available for on-site use throughout the treatment period?			
Were herbicide treated areas not allowed to be reentered, at a minimum, until the herbicide had dried or label instructions, whichever was the greater time period?			
If the herbicide label specifies a reentry period, were treated areas posted with signs warning visitors and others not to enter the treated area? Did the signs indicate that the area had been treated with an herbicide, what materials were used, and the name and telephone number of a contact person?			
6. In areas in which members of the general public might consume vegetation where herbicides are intended to be used, was the edible vegetation/fruit cut prior to being treated with herbicide. The intent is to reduce the risk of the public consuming herbicide treated vegetation/fruit.			

4.1.3.3. Effectiveness Evaluation Question and Approach

Were the health and safety design features effective in reducing impacts or assisting in the success of the project? If not, were they modified and if so, how?

4.1.4 Biological Resources Design Features

4.1.4.1 Implementation Evaluation Question

Have the biological resource design features been carried forward?

4.1.4.2 Approach

Complete the check list annually to validate steps have been taken to ensure biological protection measures were followed

4.1.4.2.1. FOR ALL TREATMENT AREAS:

	YES	NO	N/A
Prior to treatment, were ***focused plant*** surveys conducted to determine whether any specially listed plant species were present in the treatment area? Were surveys conducted during a season when they were identifiable? For annual and geophytic[3] plant species, were surveys conducted following a season with adequate precipitation to stimulate germination/flowering? If any specially listed plant species were present, protective measures included, but were not limited to the following: (a) flag and avoid; (b) relocation; (c) seasonal restrictions; or (d) treatment methods will be designed to eliminate or minimize negative impacts. Was the Forest botanist notified prior to treatment about the work that would occur in these areas? ***With the exception of the known Nevin's barberry occurrence, if federally listed plant species were found before or during implementation, was a 100-foot buffer implemented around the plants and was USFWS contacted immediately?*** If special status species were found, what protective measures were implemented (also see Treatment Form):			
Were any unanticipated special status plants observed in the project area during implementation? Did work stop within 70 feet of the plant population and the Forest botanist or designee notified immediately to determine appropriate action? ***If the species was/were federally listed was USFWS contacted?***			
Notes:			
If any restoration was conducted in special status plant occupied habitat, were direct impacts to these protected plants avoided?			
No greater than two years from treatment were habitat surveys conducted to determine if special status wildlife species suitable habitat is present in the			

	YES	NO	N/A
treatment areas? If suitable habitat was found, what measures were taken to eliminate or minimize adverse impacts? If there is suitable habitat for southwestern willow flycatcher or least Bell's vireo what protection measures were taken (e.g. LOP, protocol surveys)? (also see Treatment Form) -			
If treatments occurred in known occupied mountain yellow-legged from areas, were the treatments limited to hand pulling and only during the non-breeding season (July to February)? Were boots and equipment treated (e.g. cleaned with 10% bleach sol'n ***(or other generally accepted technique)*** and completed dried prior to use) prior to entry into the area to reduce the spread of chytrid fungus and other water-borne problems			
During spawning season and in occupied habitat for Santa Ana sucker, Santa Ana speckled dace and arroyo chub did project personnel avoid entering the stream except for necessary crossings to access treatment areas during the spawning season? During spawning season were only non-herbicide treatment methods were used?			
The occurrence of federally listed (threatened, endangered, and/or proposed) species that had not been identified and consulted with US Fish and Wildlife Service (USFWS) earlier during the analysis, may require additional analysis, and consultation with USFWS may be reinitiated. Were any T&E species not analyzed found? Was UFSWS contacted?			
Additional analysis was completed to determine potential impacts of new TES plants and/or wildlife species that were not analyzed and protected during the initial analysis. Were there any new TES species that were not protected during the initial analysis that have the potential of being impacted by the project? Did reinitiating US Fish and Wildlife consultation occur?			
If any special status wildlife species were observed in the project area during implementation: Did work in the area stop in that area if potentially adversely affected? Was the Forest Service biologist or designee notified immediately to determine appropriate action?			
Was all food and trash appropriately stored and removed from the project site at the end of each day?			

	YES	NO	N/A
Were treatment activities during bird breeding season (March 15 – September15) avoided whenever practicable? When work was performed during the breeding season, was a walk through, performed by a biologist, completed to find obvious nests needing protection prior to undertaking work? Were appropriate exclusionary buffers established around nests, if present?			
In sensitive amphibian areas, were vehicles and equipment parked or removed from the habitat before sunset?			
If vegetation was piled on site for later removal or burning, was it treated as soon as possible after piling in order to minimize colonization by wildlife? Prior to removing or burning brush piles, were the piles disturbed and/or pulled apart slightly to encourage animals to move out of the piles?			
Were known active or inactive raptor nest areas protected from project activities? Were no-disturbance buffers around active nest sites required from nest-site selection to fledging (Forest Plan S18, Part 3, p. 7)?			
Were workers pets prevented on-site unless properly restrained and approved by the Responsible Official?			
Were staging areas or base camps avoided within wildlife threatened, endangered, and/or Forest Service sensitive suitable or occupied habitats and riparian areas?			
To reduce seed spread, did disposal of invasive weeds removed follow: If no flowers or seeds are present, the weed was pulled and placed on the ground to dry out only if species was not rhizomatous and there was no potential for re-sprouting. If flowers or seeds are present and had the potential for the seed to be widely dispersed during treatment (e.g. Spanish broom, eupatory), the flowering head was removed and placed in container; then the weed was pulled, and placed in an appropriate container for disposal			
Were areas with bare soil created by the treatment of noxious weed evaluated for restoration to prevent further infestations by the same or new invasive weeds as noted in the restoration plan (see treatment form)? Whenever possible, were non-target vegetation protected in order to minimize the creation of exposed ground and the potential for re-infestation? Was a Forest Service botanist consulted prior to any restoration implementation?			
Were vehicles and all equipment washed a minimum of 6 minutes before entering project site if coming from other sites with weed infestations? Did the washing include wheels, undercarriages, bumpers and all parts of the vehicle?			

	YES	NO	N/A
In addition, were all tools such as chain saws, hand clippers, pruners, etc. cleaned of vegetation and seeds prior to entering and all project sites? If not, were they placed in an enclosed area (e.g. bag, enclosed truck) and cleaned off site? When vehicles and equipment were washed/cleaned, was a daily log completed and attached to this plan, stating: Location Date and time Methods used Staff present Equipment washed Signature of responsible crew member			
Was certified weed-free mulches (or rice straw and mulch), and local weed-free seed sources used in restoration or soil stabilization efforts (Forest Plan S6, Part 3, p. 5)?			
Were efforts made to insure that seeds and/or vegetative propagules of invasive weeds were removed from clothing and equipment prior to leaving treatment site?			
Was transport of removed invasive weeds with seeds or vegetative propagules in enclosed disposal containers or in an enclosed vehicle?			
Were invasive weeds to be disposed of off-site taken to a facility (i.e., landfill) that contains the disposed items?			
If burning of removed noxious weeds occurred, were burn piles monitored the following year to assess potential needs for revegetation or additional weed removal treatments?			
Were all staging, parking and burn pile areas located away from known areas with invasive plant occurrences?			
Where appropriate, were barriers installed to limit illegal OHV activity after treatment was complete? Examples of barriers are large rocks, soil berms, cut vegetation			

4.1.4.2.2. IF HERBICIDE TREATMENT TOOK PLACE:

	YES	NO
Was foliar and spot spraying herbicide application methods not allowed within 70 feet of threatened, endangered, proposed or candidate plant species? If non foliar and non-spot spraying herbicide methods (e.g. hack and squire, cut stump) were used in these sites, were treatments no closer than 25 feet of species and the application rates were equal or lower than the NOEC? ?		
For all known Forest Service sensitive plant species, was there a buffer provided to minimize potential impact to the plants?		

	YES	NO
What was the buffer size and for which species? How was that buffer size determined?		
Did all herbicide treatments occur outside March 1 and July 31 in Santa Ana sucker, Santa Ana speckled dace and arroyo chub occupied habitat? Within 100' from surface water in occupied habitat, was the use of glyphosate application rate limited to less than 2 pounds a.e. per acre? Did any herbicide drift enter occupied habitat waters?		

4.1.4.3 Effectiveness Evaluation Question and Approach

Were the biology design features effective in reducing impacts or assisting in the success of the project? If not, were they modified and if so, how?

4.1.5 Hydrology Design Features

4.1.5.1 Implementation Evaluation Question

Have the hydrology resource design features been carried forward?

4.1.5.2 Approach

Complete the check list annually to validate steps have been taken to ensure hydrologic protection measures were followed

4.1.5.2.1. FOR ALL TREATMENT AREAS:

	YES	NO	N/A
Did hand crews stay out of flowing or ponded water whenever possible?			
If hand removal of invasive plants required entry into flowing or ponded water, was the time in the water kept to a minimum?			

4.1.5.2.2. IF HERBICIDE TREATMENT TOOK PLACE:

	YES	NO
Were only aquatically registered herbicides (e.g. Habitat®, Aquamaster®, Renovate 3®) and low-risk aquatically approved surfactants (e.g. Agri-Dex®, Class Act® NG®, Dyne-Amic®, Competitor®) used within 100 feet from banks of rivers and tributaries?		
Did mixing and loading of herbicides occur a minimum of 150 feet from any body of water or stream channel, unless approved by a Forest Service hydrologist or biologist?		
Was every effort made to prevent herbicide(s) from being introduced into water?		

	YES	NO
Were herbicides colored with a biodegradable dye to facilitate visual control of application?		
Was herbicide usage limited to the minimum amount required to be effective?		

4.1.5.3 Effectiveness Evaluation Question and Approach

Were the hydrology design features effective in reducing impacts or assisting in the success of the project? If not, were they modified and if so, how?

4.1.6 Special Land Designations Design Features

4.1.6.1 Implementation Evaluation Question

Have the special land designation design features been carried forward?

4.1.6.2 Approach

Complete the check list annually to validate steps have been taken to ensure special land designation protection measures were followed

4.1.6.2.1. FOR ALL TREATMENT AREAS:

	YES	NO	N/A
We're staging areas outside the RNA's? If no, were they in already developed areas (e.g. existing roadbeds) at the edges of the RNAs?			
Did RNAs receive minimal disturbance of native vegetation and riparian resources so as to retain their value as undisturbed reference sites?			
Within wilderness areas: Did the Forest Supervisor or District Ranger recommend the appropriate locations for temporary remote base camps and helicopter drop-off and haul sites to the Regional Forester, if necessary, to facilitate invasive plant removal or treatment? and if yes, did the Regional Forester approve? Were the operation of work crews and equipment limited to weekdays (Monday-Friday) and non-holidays during daylight hours? Was the wilderness areas avoided other heavy use periods, such as spring breaks? Were open campfires and glass containers prohibited within the designated wilderness areas related to this project (Forest Plan, ANF S2, Part 2, p. 79)?			

	YES	NO	N/A
Was the Wilderness Ranger periodically consulted during the implementation of this project and adequately informed about the approved treatment actions? Was prescribed burning (burn piles) avoided/prohibited in the wilderness?			

4.1.6.3 Effectiveness Evaluation Question and Approach

Were the special land designations design features effective in reducing impacts or assisting in the success of the project? If not, were they modified and if so, how?

4.1.7 Scenic Resources Design Features

4.1.7.1 Implementation Evaluation Question

Have the scenic resource design features been carried forward?

4.1.7.2 Approach

Complete the check list annually to validate steps have been taken to ensure scenic resource protection measures were followed

4.1.7.2.1. FOR ALL TREATMENT AREAS:

	YES	NO	N/A
Where practical, were piles prepared for physical removal, burning, or chipping located away from established trails or highly visible areas, such as within areas of concentrated public use? If this was not practical, were disposed of at the earliest opportunity?			
When lop and scattering large plants, was the material placed away from established trails or roads?			
Were those areas greater than one acre in size that have not naturally rehabilitated within one year, planted and/or seeded with native vegetation? If not, why not?			

4.1.7.3 Effectiveness Evaluation Question and Approach

Were the scenic resource design features effective in reducing impacts or assisting in the success of the project? If not, were they modified and if so, how?

4.1.8 Recreation Design Features

4.1.8.1 Implementation Evaluation Question

Have the recreation design features been carried forward?

4.1.8.2 Approach

Complete the check list annually to validate steps have been taken to ensure recreation protection measures were followed

4.1.8.2.1. FOR ALL TREATMENT AREAS:

	YES	NO	N/A
Within areas of concentrated public use and developed recreation sites, was implementation of this project limited to weekdays and non-holidays (Monday – Friday) during daylight hours? Were other heavy use periods such as spring and summer school breaks avoided?			
Were chipping activities located at least 500 feet from established recreation facilities during heavy use times? Were the appropriate staff (recreation, Ranger, fuels, etc…) staff consulted on the appropriate locations of chipping sites within areas of concentrated public use?			
Were motorized equipment equipped with appropriate mufflers and spark arrestors in good working condition to minimize noise levels and fire risks?			
Were there any temporary public use closures in areas where the public and workers commingle and public worker safety could have been compromised?			
In advance of initiating treatment work in developed and concentrated recreation sites, was interpretive signing installed? Was interpretation presented in English and Spanish and focused on the purpose, need and the environmental benefits of invasive weed treatments? Did the interpretation material include a list of the herbicides to be used, treatment dates, and name and phone number of Forest contact? Was it provided at appropriate sites, a minimum of one week in advance of herbicide treatment, along with other access points to these treatment areas and appropriate Forest offices?			
Were staging areas for equipment and crew congregation located in areas where there was minimum conflict with public use and other resources? Were these areas beyond 150 feet of stream channels and in areas which were not highly visible or heavily used? Did each staging area accommodate vehicle parking to minimize the impacts of work vehicles and equipment in developed recreation sites? Did workers car pool from off the Forest? Did the appropriate staff monitor potential impacts and the Forest Supervisor			

	YES	NO	N/A
impose further restrictions as necessary? If yes, what were the additional restrictions?			
Were temporary sanitary and trash facilities required to accommodate workers and/or was trash packed out after each work day to avoid adversely impacting public sanitary and trash collection facilities?			
Were off-highway motorized equipment used for implementing this project? And if yes, under what circumstance?			

4.1.8.3 Effectiveness Evaluation Question and Approach

Were the recreation design features effective in reducing impacts or assisting in the success of the project? If not, were they modified and if so, how?

4.1.9 Heritage Resources Design Features

4.1.9.1 Implementation Evaluation Question

Have the heritage resources design features been carried forward?

4.1.9.2 Approach

Complete the check list annually to validate steps have been taken to ensure heritage resources protection measures were followed

4.1.9.2.1. FOR ALL TREATMENT AREAS:

	YES	NO	N/A
Prior to treatments which could adversely affect cultural or historic values, were archaeological surveys conducted to determine whether any cultural and/or historic resource sites were present in the treatment area?			
If unanticipated heritage resource sites were found during implementation and ground disturbance was planned, did all work stop in the area that could adversely affect the site(s)? Was the Forest Heritage Program Manager contacted immediately and work not preceded in this area without his/her approval?			
Were all known sensitive traditional tribal use areas protected for the continued use (Forest Plan S61, Part 3, p. 13)?			
Did all proposed activities and disturbances that could adversely affect avoid historic properties? Avoidance means that no activities associated with the project that may affect historic properties shall occur within a historic property's boundaries, including any defined buffer zones [unless specifically identified in			

	YES	NO	N/A
the First Amended Regional Programmatic Agreement among the U.S.D.A. Forest Service, Pacific Southwest Region California State Historic Preservation Officer, and Advisory Council on Historic Preservation (2001)]. Were portions of the project modified, redesigned, or eliminated to properly protect historic properties? Did the Forest Heritage Program Manager provide written approval for any work within the boundaries of historic properties and if so, was this approval attached to this Plan?			
Were all known historic properties within an Area of Potential Effect (APE) clearly delineated, including appropriate buffers, prior to implementing any associated activities that have the potential to adversely affect historic properties?			
If any changes in proposed activities were necessary to avoid historic properties (e.g. project modifications, redesign, or elimination; removing old or confusing project markings within site boundaries; revising maps or changing specifications), were these changes completed prior to initiating any activities?			
Were monitors used to enhance the effectiveness of heritage resource protection measures in conjunction with other monitoring needs?			

4.1.9.3 Effectiveness Evaluation Question and Approach

Were the heritage resource design features effective in reducing impacts or assisting in the success of the project? If not, were they modified and if so, how?

4.1.10 Fire/Fuels and Air Quality Design Features

4.1.10.1 Implementation Evaluation Question

Have the fire/fuels and air quality design features been carried forward?

4.1.10.2 Approach

Complete the check list annually to validate steps have been taken to ensure fire/fuels and air quality protection measures were followed

4.1.10.2.1 FOR ALL TREATMENT AREAS:

	YES	NO	N/A
Were burn piles burned in compliance with Forest approved project specific burn plan(s)?			
If prescribed fire was used, was the Smoke Management Plan prepared, approved by the SCAQMD, and made part of the Prescription Burn Plan? Did the Smoke Management Plan, at a minimum, include the following and were they carried out Conduct a prescribed burn only when the meteorological conditions are expected to disperse the emissions away from urban areas and other sensitive receptors and only on approved burn days by the SCAQMD. Visibility protection of the adjacent Class I and Class II wildernesses will be provided in part through its inclusion as a smoke sensitive area in the			

	YES	NO	N/A
required Smoke Management Plan (which will be part of the Prescribed Burn Plan). Other smoke sensitive areas include private land, occupied recreation sites, and highways Identify and address visible smoke column emissions and general smoke nuisance concerns from the public on a site and time specific manner Visual smoke observations are monitored on site during burn implementation to insure that smoke dispersion remains within identified parameters as stated in the smoke management plan Safety signing, lights, and other devices are employed along traffic routes if smoke may affect visibility on travel routes, as stated in a smoke management plan			
During implementation: Did fire perimeter observers record smoke conditions during the burn? Is yes, are they documented and attached to the Smoke Management Plan? Were weather observations used to establish the burn status prior to the burn and were they recorded and maintained? Was there a deployment of posted signs and notices to the potentially impacted urban interface and general public and was it inspected, maintained, and documented to assure proper notification to the public?			
Were the following implemented: On native surfaced roadways travel speeds did not exceed 15 MPH Track-out onto public roadways were monitored and controlled as necessary to meet public safety and SCAQMD Rule requirements.			
Did monitoring for air quality during prescribed fire activities include the following measures and were they complied with: Fuel moisture evaluation of the proposed burn piles were performed and recorded by the Forest Service. Burning was not be schedule or initiated unless fuel moisture content was within the parameters established in the burn prescription. A residual mop-up plan was incorporated with the burn prescription. All smoke and smoldering was stopped within eight hours of the completion of the burning phase.			

4.1.10.3 Effectiveness Evaluation Question and Approach

Were the fire/fuels and air quality design features effective in reducing impacts or assisting in the success of the project? If not, were they modified and if so, how?

4.2 Treatment Implementation and Effectiveness Information

4.2.1 Treatment Implementation and Effectiveness Evaluation Question

How were these areas treated and retreated (if applicable) and what type of restoration activities occurred (if any)? How effective were the treatments and restoration activities? Were the results at the treatment sites as we planned?

4.2.2Approach

To track and monitor treatment(s) and restoration activities (if applicable) of invasive plants found within the project area, data will be collected to input into the Forest Service Natural Resource Information System (NRIS) and Forest Service Activity Tracking System (FACTS) databases. The following treatment and monitoring forms will be completed and updated for populations of invasive plant species found within the project area. The completed forms will be attached to applicable inventory form for the specific invasive plant population and the data input into the NRIS database.

INVASIVE PLANT TREATMENT FORM
(Attach to applicable Invasive Plant Inventory Form)

General Information

FACTS ID:	**NRIS Occurrence Number:**
Scientific Name:	
Project Name and which branch:	
GPS: Yes _____ File Name or coordinates (NAD83): _____	

Pre-Treatment

Were surveys completed for the following resources? **Botany TES_____ Wildlife TES_____ Heritage Resources_____**

Treatment

Date(s) of treatment:	**Treatment Person(s):**
Phenology: _____% vegetative _____ % flowering _____ % fruiting	
Count of Stems _____ OR Count of Plants _____	
Distribution:	**Canopy Cover % or Code:**
Total Acres Treated (Gross):	**Methods:**
If herbicide used, name of herbicide and dose	**Herbicide method and amount of herbicide used (if applicable)**
Labor:	**Job Code:**
Were any resource sensitive areas (e.g. TES species, arch sites) found at treatment site and if so, what were they and what protective measures were taken:	
Treatment Efficacy (if retreatment**):**	**Restoration activities needed (Y or N)?**
Recorded PDR: Inventory_____	**Added to NRIS: Date: _____**

Retreatment

Date(s) of retreatment:	**Treatment Person(s):**
Phenology: _____% vegetative _____ % flowering _____ % fruiting	
Count of Stems _____ OR Count of Plants _____	
Distribution:	**Canopy Cover % or Code:**
Total Acres Treated (Gross):	**Methods:**
If herbicide used, name of herbicide and dose	**Herbicide method and amount of herbicide used (if applicable)**
Labor:	**Job Code:**
Were any resource sensitive areas (e.g. special status species) found at treatment site and if so, what were they and what protective measures were taken:	
Treatment Efficacy (if retreated**):**	**Restoration activities needed (Y or N)**
Recorded PDR: Inventory_____	**Added to NRIS: Date: _____**

General Information (treatment form cont'd)

FACTS ID:	**NRIS Occurrence Number:**
Scientific Name:	
Project Name and which branch:	
GPS: Yes _____ File Name or coordinates (NAD 83): _____	

Retreatment

Date(s) of retreatment:	**Treatment Person(s):**
Phenology: _____% vegetative _____ % flowering _____ % fruiting	
Count of Stems _____ OR Count of Plants _____	
Distribution:	**Canopy Cover % or Code:**
Total Acres Treated (Gross):	**Methods:**
If herbicide used, name of herbicide and dose	**Herbicide method and amount of herbicide used (if applicable)**
Labor:	**Job Code:**
Were any resource sensitive areas (e.g. special status species) found at treatment site and if so, what were they and what protective measures were taken:	
Treatment Efficacy:	**Restoration activities needed (Y or N)**
Recorded PDR: Inventory_____	**Added to NRIS: Date: _____**

Retreatment

Date(s) of retreatment:	**Treatment Person(s):**
Phenology: _____% vegetative _____ % flowering _____ % fruiting	
Count of Stems _____ OR Count of Plants _____	
Distribution:	**Canopy Cover % or Code:**
If herbicide used, name of herbicide and dose	**Herbicide method and amount of herbicide used (if applicable)**
Total Acres Treated (Gross):	**Methods:**
Labor:	**Job Code:**
Were any resource sensitive areas (e.g. special status species) found at treatment site and if so, what were they and what protective measures were taken:	
Treatment Efficacy:	**Restoration activities needed (Y or N)**
Recorded PDR: Inventory_____	**Added to NRIS: Date: _____**

INVASIVE PLANT RESTORATION FORM
(Attach to applicable Invasive Plant Inventory Form)

General Information

FACTS ID:	**NRIS Occurrence Number:**
Project Name and which branch:	
GPS: Yes _____ File Name: _____	**Added to NRIS: Date: _____**

Restoration Treatment Activities

Date of restoration:	**Restoration Person(s):**
Seeded (Y or N)_____ Planted containerized (Y or N)_____ Planted cuttings (Y or N)_____	
Name of Plant species used in restoration:	
If planted, estimated spacing and total # planted on site:	
Total Acres Treated (Gross):	
Labor:	**Job Code:**
Treatment Efficacy (if retreatment**):**	
Comments:	
Recorded PDR: Inventory_____	**Added to NRIS: Date: _____**

Restoration Retreatment Activities

Date of retreatment:	**Restoration Person(s):**
Seeded (Y or N)_____ Planted containerized (Y or N)_____ Planted cuttings (Y or N)_____	
Name of Plant species used in restoration:	
If planted, estimated spacing and total # planted on site:	
Total Acres Treated (Gross):	
Labor:	**Job Code:**
Treatment Efficacy (if retreated**):**	
Comments:	
Recorded PDR: Inventory_____	**Added to NRIS: Date: _____**

Appendix E – Projects, Activities, and Factors Considered in Cumulative Effects

Table E.1 provides a list of present and reasonably foreseeable actions, activities and factors considered in determining cumulative effects. Below the table is a description for each of these actions, activities and factors along with recent past fire history.

Table 11. Present and Reasonably Foreseeable Actions, Activities, and Factors Contributing to Cumulative Effects

Agency	Present or On-going Project/ Activity	Foreseeable Future Project	Fire and Fuels	Special Status Plants	Invasive weeds	Special Status Wildlife	Hydrology
US Forest Service	Fuelbreak Maintenance Projects			X	X	X	X
US Forest Service	WUI Fuel Treatment Projects		X	X	X	X	X
US Forest Service	Forest Health Projects (e.g. plantations)		X	X	X	X	X
US Forest Service	Recreation Use and Facilities			X	X	X	
US Forest Service	Non-Recreation Use and Facilities			X	X	X	
US Forest Service	Travel Management						X
US Forest Service		Invasive Plant Treatment Projects	X	X	X	X	
US Forest Service		Fuelbreak Maintenance Projects		X	X	X	X
US Forest Service		WUI Fuel Treatment Projects	X	X	X	X	X
LA County	Firewise landscaping and structures		X	X			X
Private	Fire Safe Council Projects		X				
Private	Defensible Space on non-NFS lands		X	X	X	X	
Private	Development adjacent to NFS lands		X	X	X	X	
Private		Development adjacent to NFS lands	X	X	X	X	
N/A	Climate change and pollution		X	X	X	X	

Descriptions of Past, Present and Reasonably Foreseeable Actions, Activities, and Factors Contributing to Cumulative Effects

Fuelbreak maintenance
The Forest has a network of fuelbreaks to aid in fire suppression efforts. Many of these fuelbreaks are being maintained or are going through the environmental planning process to allow for maintenance in the reasonably foreseeable future.

WUI Fuel Treatment Projects
There are WUI fuel treatment projects around communities and/or facilities that have received approval and are being implemented or are in the environmental planning process to allow for maintenance in the reasonably foreseeable future. A complete list of these projects can be found in the project planning record located at the Forest Headquarters.

Invasive Plant Treatment Projects
The San Gabriel River Ranger District and the Santa Clara/Mojave Rivers Ranger District both have invasive plant treatment projects they are actively working on.

Forest Health Projects
Several restoration projects are being implemented or planned that include tree plantation planting and maintenance.

Recreation Use and Facilities
The Forest experiences high levels of developed and dispersed recreation. Recreation use includes hiking, fishing, camping, OHV use as well as other forms of outdoor recreation. Recreation is expected to continue to occur across the Forest and will likely increase as population in the Los Angeles area continues to grow.

Non- Recreation Use and Facilities
There are a multitude of special use activities occurring across the Forest. Examples of special use permits include, but are not limited to: power lines, apiary sites, communication sites, recreation residence cabins, county roads, filming permits and forest product collection. Special use permits that include facilities are required to reduce fuels around their structures for protection from wildfire.

Travel Management
Travel management includes roads and trails on national forest lands.

Firewise Landscaping and Structures
Communities in the urban interface are being encouraged by the state, counties, and fire safe councils to construct firewise landscaping and structures where they are vulnerable to wildfires. The Forest Service actively participates in these programs by making information available at front desks and on agency websites.

Fire Safe Council Projects
Individual fire safe councils have been applying for grants to complete work that will minimize risk to communities. This includes things, such as building fuelbreaks, road clearances, and water developments on non-National Forest System (NFS) lands.

Defensible Space on non-National Forest System lands
The state and counties have fire codes that require defensible space around structures in the urban interface that involve individually owned properties.

Development Adjacent to National Forest System lands
The project area is within the urban interface where homes and infrastructure exist along with daily human activities. Occupancy and maintenance of the residences around the project area have created baseline levels of disturbance affecting both private and adjacent national forest lands.

Climate Change/Pollution

Models for climate change predict an increase in nonnative plant species invasions and habitat invisibility (Janetos et al. 2008). It is thought that climate change is likely to increase the ranges and abundances on invasive, nonnative species as they are not as limited by dispersal and pollination limitations as are native plants (Janetos et al. 2008, Dukes and Mooney 1999). It is thought that initially the impacts of climate change are direct in the expansion of ranges and abundances, though this effect is incremental and generally only observable over several years. Longer term impacts will be indirect, impacting the various trophic relationships. Invasive plants may also be able to migrate more effectively than native plants, as they are not generally dependent on specific pollinator or biotic dispersal agents (Janetos et al. 2008).

The impacts of climate change on vegetation types found in the project area are still poorly understood, though simulations of fire regimes in chaparral have found that there is a potential for an increase in the duration of the fire season which could lead to changes in plant community composition (Stephenson and Calcerone 1999).

The impacts of pollution are due to the deposition of nitrogen and ozone from the atmosphere. The impacts of nitrogen deposition include increased fertilization, which can alter community composition, soil acidification and decrease mycorrhizal symbiosis (Stephenson and Calcerone 1999). Ozone has been found to reduce the vigor of certain tree species.

Past Fires

Though this is a past factor that is considered in the affected environment, recent fires have played a key role on the Forest and are noted in the cumulative effects. The largest wildfire to occur on the Forest is the 2009 Station fire, which burned over 161,000 acres in the San Gabriel Mountains. The majority of the acreage is located within the Forest boundary. The fire burned with high severity in many places leaving some areas completely void of vegetation. Portions of the area are being re-planted while areas where brush once occurred are slowly recovering naturally. Other recent wildfires include the Morris fire, which also occurred in 2009. This fire impacted the areas between the San Gabriel and Morris Reservoirs. This fire resulted in a low to moderate severity burn across the area burning on the terraces by the river, and moderate to high severity burning on the hillslopes above the reservoirs. The 2008 Marek fire and 2008 Sayre fire burned areas in Little Tujunga Canyon, Pacoima Canyon and Lopez Canyon. Other large wildfires to occur on the Forest include: the 2007 Buckweed fire which burned near Sierra Pelona and Bouquet Canyon; the 2007 Ranch fire which burned on the southwest portion of the Forest west of Interstate 5; and, the 2006 Day fire which also burned west of Interstate 5 and south of Pyramid Lake. All of these fires had various burn severities, which left some areas completely void of vegetation. Vegetation in these areas consisted mainly of brush and natural recovery of these areas is evident since the incidents occurred.

The Forest has had many smaller fires across the area every year. Some areas are more prone to frequent fires than others due to proximity to developed areas and major roadways.

Horticultural Guidelines for Species Commonly Used for Restoration Projects in Southern California Chaparral

Evan Meyer and Billy Sale
Rancho Santa Ana Botanic Garden

Prepared for USDA Forest Service Region 5
2/25/14

ERIODICTYON CRASSIFOLIUM Benth. (felt leaved yerba santa, thick leaved yerba santa)

Summary and Distribution:
Eriodictyon crassifolium (Boraginaceae) is a shrub that occurs in the southwestern United States and Baja California, Mexico. In California it is found in the Tehachapi Mountains, outer south Coast Ranges, south coast region, Transverse Ranges, and Peninsular Ranges (Baldwin et al. 2012, CCH 2013, SEInet 2013). It occurs at elevations below 2500 m and grows up to 3m in height (Baldwin et al. 2012).

Seed Collecting:
Eriodictyon crassifolium flowers from March to June, with the bulk of fruit typically ripening from August to September depending on climate, elevation, precipitation and other factors (RSABG herbarium). The fruit is a dehiscent capsule which generally contains 8-14 seeds (Baldwin et al. 2012). Seeds are 0.8-1.2mm, dark brown, elliptic and shallowly ridged along the surface (Wall and Mcdonald 2009).

Seed Cleaning:
To process the fruits and clean seeds of *E. crassifolium,* floral material should be threshed over a small screen and sorted through standard soil sieve sizes #20 and #45. Once sorted, seeds should be blown in an aspirator, which will separate the hollow, sterile seed from viable seed. Remaining seeds should be sieved thorough a #18 several times to remove any remaining chaff. Cleaning of *E. crassifolium* seed is classified as easy (Wall and Macdonald 2009).

Seed Propagation:
Eriodictyon crassifolium seed has strong dormancy mechanisms, and untreated seeds have low (0-3%) germination rates. Ten year old frozen seed germinated at 18% (9 of 50) after 5 minutes of exposure to 200° temperatures followed by 20 minute exposure to cold smoke. In a trial using fresh seed, burning of pine needles over seed flats had a germination percentage of 16 % (16 of 100) (RSABG internal data). Heating seeds in an oven at a temperature of 194° F for 5 minutes has been recommended as a method to break dormancy (Went el al. 1952). Another dormancy breaking strategy is one year of burial in soil followed by smoke treatment (pers. com. Arlee Montalvo).

Once treated, seeds can be directly sown onto seed flats with a soil mixture of peat moss, perlite, and dolomite limestone (e.g. sunshine mix #5). Seedlings should be transplanted to two inch pots when they are approximately one inch in height.

Vegetative Propagation:
Eriodictyon crassifolium is difficult to propagate from cuttings. It can be successfully propagated by division, although losses should be expected. Once plants are established they are very durable and spread rapidly.

The optimal time to propagate plants by divisions is in the winter after natural rain events. In the absence of natural precipitation, plants can be hand watered prior to

propagation by division. The tops of the plants should be cut back and as much as possible of the root system and surrounding soil should be salvaged. Divisions should be made on an area of the plant that has new shoots. They should be planted in well drained potting soil in a deep container. Once the roots have filled the pot, they can be outplanted.

Nursery Maintenance:
Plants should be checked weekly and watered at most once a week, with care given not the overwater the plant, which will result in rotting. Plants will take approximately a year of nursery growth to be ready for outplanting.

Field Planting:
Plants should be sited in full sun, in well drained soils. Once established, plants do not need summer watering. Plants can be planted in late fall through early spring. If possible they should be watered immediately after planting and once a week for 2-3 months. If planting occurs in the late spring, watering should continue for the entire summer. Establishment is unreliable, and losses of 50% or more should be expected. A large planting of bare rooted plants in Santa Ana, California showed heavy losses in the first year, with little loss after that (50 of 356 surviving in total through the first season). Once established, the plants produced many suckers and spread vigorously (Everett 1957).

ACMISPON GLABER (Vogel) Brouillet [*Lotus scoparius* (Torr. & A. Gray) Ottley] (deervetch, deerweed)

Summary and Distribution:
Acmispon glaber (Fabaceae) is a drought tolerant perennial herb native to California, Arizona, and Northern Mexico (Seinet 2013). In California it is found in the northern Coast Ranges, northern Sierra Nevada Foothills, northern, central and southern coastal regions, San Francisco Bay area, Transverse Ranges, Peninsular Ranges, and Sonoran Desert. It is found below 1500m and can reach 1.5m in height. Two intergrading varieties (var. *brevialatus* and var. *glaber*) are currently recognized (Baldwin et. al 2012). This taxon may hybridize with *Acmispon cytisoides* (Benth.) Brouillet and *Acmispon junceus* (Benth.) Brouillet (Baldwin et al. 2012).

Seed Collecting:
The fruits of *A. glaber* are indehiscent legumes generally containing two seeds. Seeds are 2.0-3.0mm, curved, greenish with black mottling (Wall and Mcdonald 2009). *Acmispon glaber* generally flowers from March through August (RSABG herbarium). Pods ripen in 4-6 weeks and are brown and dry at maturity.

Collection times range widely with collections at RSABG being made from May through November with the bulk of collections occurring in July and August (RSABG internal data). Mature fruits can be easily stripped from branches into a collecting vessel by pinching fingers along the fruiting branch and moving pinched fingers up to branch tip.

Seed cleaning:
Floral material should be threshed with a wooden block over a medium screen or standard soil sieve #16 sieve. Seeds should be resieved several times through a #12 sieve to separate the seeds from floral parts. Once sorted, seeds should be blown in an aspirator, which will separate the hollow, sterile seed from viable seed. Remaining seeds should be sieved again through a #12 and # 16 sieve several times to remove any further chaff. Caution should be given when threshing as seeds can be broken during this process. Cleaning *A. glaber* seed is classified as moderate difficulty (Wall and Mcdonald 2009).

Seed Propagation:
Several sources report that hot water or other heat treatments induce optimal germination (Emery 1988, Keeley 1987). A germination percentage of 48% (12 of 25 seeds) was achieved at RSABG after pretreatment with boiling water. A different seed lot which received no pretreatment germinated at 79% (41 of 52 seeds) (RSABG internal data). Kurner (2011) reports 90% germination in 30 days with no pretreatment. Many legumes require scarification of the seed coat, which is often achieved by mechanical or chemical methods or exposure to hot water. The high germination rates with no pretreatment that have been recorded for this taxon are unexpected.

For nursery production, seeds should be sown in a flat of sunshine mix, placed in full sun and watered approximately twice a week. Flats should be covered with a mesh screen to prevent bird predation.

Vegetative Propagation:
Cuttings should be taken from long branches when they are still green and semi woody. Each branch should allow for multiple cuttings ranging in size from 1-3 inches. A few leaves should be left on the top of each cutting. Cuttings should be placed in 100% perlite and watered once a week. Cuttings typically root in 1-3 months. New growth and/or roots protruding from the flat indicate that the cuttings are ready to shift up to 2 inch containers,

Nursery Maintenance:
Once plants have filled the circumference of a 2 inch container, they should be transplanted to gallon containers and placed in a shaded area for 1-3 months. Plants should be watered approximately 1-2 times a month in the winter and approximately 1-2 times a week in the summer.

Field Planting:
Plants should be sited in full sun and planted in late fall or early winter, preferably during cool, wet weather. The plants should be watered immediately after planting and if possible be watered every other week for 2-3 months. Observations of individuals planted in Santa Ana and Claremont California showed short life spans, with all plants dying within six years (Everett 1957, Everett 2012).

Montalvo & Ellstrand (2001) found that progeny derived from parental crossing from divergent populations showed lower fitness than hybrids derived from closer populations. Due to the regional variability, seed or vegetative collections for restoration projects are recommended from as close to the restoration site as possible.

SALVIA LEUCOPHYLLA Greene (purple sage)

Summary and Distribution:

Salvia leucophylla (Lamiaceae) is a drought tolerant shrub which occurs in California in the south central and southern coast regions, the outer south Coast Ranges, and Transverse Ranges in California and Baja California, Mexico (Baldwin et al. 2012, CCH 2013). It grows at elevations ranging from 30-1250 m and can reach heights of 1.5 m (Baldwin et al. 2012).

Seed Collecting:

Seeds are enclosed within an indehiscent nutlet that is brown or dark gray and 2-3 mm (Baldwin et al. 2012). *S. leucophylla* typically flowers from April to June (RSABG herbarium), with seeds ripening throughout the summer. Seed collection dates for RSABG accessions range from June- October, with the majority of collections being made in July (RSABG internal data). Like many other species of the genus *Salvia*, *S. leucophylla* produces a very low proportion of viable seed (Wall and Macdonald 2009). Dissection under magnification reveals many seemingly normal looking seeds to be hollow and non-viable. In order to ensure sufficient viable seed, large quantities of fruiting material should be collected. In order to stay under the advised annual collection limit of 10%, large, healthy populations should be targeted for seed collection.

Seed Cleaning:

Seed Propagation:

No pretreatment is necessary for successful germination of *S. leucophylla* (Emery 1988, Everett 2012), although cold stratification may increase the germination rate. Fourteen year old frozen seed stored at the RSABG seed bank had a germination rate of 37% (18 of 49) (RSABG internal data).

For nursery production, seeds should be sown in a seed flat and placed in a sunny area. Sunshine mix amended with perlite or pumice is a recommended seed germination media.

Vegetative Propagation:

Salvia leucophylla can be propagated vegetatively with a high success rate. Cuttings of green semi-woody material taken before flowering are the most reliable. Depending on precipitation, a second flush of growth can occur after flowering and this can be used as well. Care should be taken to keep the cutting trays and propagation area from excessive moisture and humidity, as this will cause the cause the cuttings to rot and die.

Ideal collection time of cuttings is dependent on elevation and location, but generally they can be taken from December through June. Kurner (2011) reports a 75% success rate with cuttings taken from winter through early spring. If cuttings are taken outside of the ideal range, they can in some cases be successfully propagated, but will take a longer time to develop roots, and nursery losses will likely be higher.

Nursery Maintenance:
For nursery production, the tops of plants should be pruned off while in 2 inch containers. This will induce branching and produce a fuller form. Plants that are left unpruned will typically produce a long single shoot which is susceptible to mechanical damage. Once roots have filled 2 inch pots, the plants can be transplanted into larger containers. Plants should be kept in a shaded area and watered approximately twice a month. *Salvia leucophylla* is a very durable container plant once established. They develop quickly and can get pot bound if not shifted up at the appropriate times. This will lower success rates with outplanting. In order to avoid this problem, nursery plants should be checked regularly for root development.

Plants grown from cuttings will take approximately 6 months to reach outplanting size, while seed grown plants will take slightly longer (6-8 months) to be ready for outplanting.

Field Planting:

Plants should be sited in sunny, open areas and planted in the fall or winter. If possible, each plant should be watered at the time of planting and every other week for the first two months. *Salvia leucophylla* typically performs well during outplanting. Established plants generally will not have many recruits, but will fill out and become very wide. Seedlings planted directly from flats or 2 inch pots and watered several times established well and quickly covered road cuts and provided erosion control in Santa Ana, CA. (Everett 1957).

CEANOTHUS LEUCODERMIS Greene (chaparral whitethorn)

Summary and Distribution:
Ceanothus leucodermis (Rhamnaceae) is a thorny shrub native to California and northern Baja California. This species is found in the Sierra Nevada foothills, Coast Ranges, Transverse Ranges, and Peninsular Ranges in California and northern Baja California Mexico, between 270-2150m in elevation. *Ceanothus leucodermis* can reach a height of 4m (Baldwin et al. 2012).

Seed Collecting:
Ceanothus leucodermis generally flowers from April through June, with seeds dispersing between July and August. *Ceanothus leucodermis* fruits are dehiscent capsules containing 3 seeds (Baldwin et al. 2012). Seed is generally 2.0-3.0mm, ovoid, convex, dark brown, smooth, and shiny (Wall and McDonald 2009). Keely (1977) reported seed viability of 53% and 44% in two consecutive years. He attributed this variability to precipitation, with high precipitation years likely producing higher percentages of viable seed.

Seed Cleaning:
Fruits should be threshed over a medium screen, and sorted through standard soil sieve sizes #8 and #18 to separate the seeds from fruiting chaff. Once sorted, seeds should be blown in an aspirator, which will separate the hollow, sterile seed from viable seed. A high percentage of hollow seed is common and can be sorted using higher aspirator speeds. Remaining seeds can be placed in water to separate filled from hollow seeds. Filled, viable seeds will sink while hollow, non viable seed will float. Cleaning of *C. leucodermis* seed is classified as being moderately easy (Wall and Macdonald 2009).

Seed Propagation:
In general seeds are easy to germinate, and seedlings grow vigorously with minimal trouble, although untreated seeds produce low germination rates. A hot water treatment and 1-3 months cold stratification is recommended for optimal germination (Emery 1988). This is supported by germination trials done at RSABG. The highest germination rate of 87% (87 of 100 seeds) occurred with a combination of boiling water treatment and 24 hour soak followed by a two month cold stratification. Trials on the same seed lot with only a boiling water treatment and a 24 hour soak (no cold stratification) had germination percentages of 23% and 38% (RSABG internal data). Kurner (2011) reported a 60% germination rate occurring within 30 days using a pretreatment of burning seeds flats and mixing ash into the potting mix. Keely (1987) and Sampson (1944) report similar germination ranges using heat treatments. Everett (Everett 1957) reported high germination rates occurring in 19-145 days for nine of eleven accessions. The other two accessions failed to germinate entirely.

Vegetative Propagation:
Ceanothus leucodermis can be propagated vegetatively, but is somewhat difficult. Cuttings should be taken from January through April, of new growth only. A 15% concentration of rooting hormone should be applied and the bottom third of the cutting should be scabbed to increase root growth. Cuttings should be checked for rooting after

one month of growth in cutting flats. Once sufficient roots have developed the plants can be potted into two inch containers.

Nursery Maintenance:
Nursery plants should be grown under shade cloth and watered approximately twice a month. *Ceanothus leucodermis* will produce roots quickly in this setting, and plants should be checked regularly and repotted as necessary to avoid them getting root bound. Plants will be ready for outplanting after approximately one year of nursery growth.

Field Planting:
Plants should be outplanted between November and February, ideally during periods of cool, damp weather. If possible, plants should be watered immediately after planting and every other week for 2-3 months.

Everett (2012) observed flowering and seeding during the third year of growth for plants cultivated in Claremont, CA. Within 10-15 years, plants grew to a size of 5-17' X 10-36'. He described this plant as "A very hardy species of *Ceanothus* with less root rot issues than other related species."

HESPEROYUCCA WHIPPLEI (Torr.) Trel. [*Yucca whipplei* Torr.] (chaparral yucca, our Lord's candle)

Summary and Distribution:
Hesperoyucca whipplei (Agavaceae) is a shrub native to California and northern Baja California. It is found in southwestern California in the south Coast Ranges, southern Sierra Nevada, Transverse Ranges and Peninsular Ranges, and the western edge of the Mojave Desert. It occurs at elevations below 2500m and is monocarpic, bearing fruit only once before dying (Baldwin et al. 2012).

Seed Collecting:
Hesperoyucca whipplei typically flowers from April through May. Seeds ripen from June through August, and are found in tardily dehiscent fruit capsules in two rows per chamber (Baldwin et al. 2012). Seeds are 6.0mm, spherical, thin, black, and smooth (Wall and Mcdonald 2009). Once seeds have turned black they are ready for collection. A fruit picker or other long mechanical clipping tool is recommended for safe collection of this species in order to access the fruits which occur on long stalks which can be difficult to reach (pers. com. Naomi Fraga).

Seed Cleaning:
Hesperoyucca whipplei seeds should be removed from their fruit by hand, to avoid damage to seeds and reduce production of chaff. After the seed has been extracted, an aspirator can be used to separate small quantities of chaff as well as any parasitized or hollow seed. The seeds are often heavily parasitized and care should be given to check for damaged seed and insect larvae. The cleaning of *H. whipplei* seeds is classified as moderately difficult (Wall and Mcdonald 2009).

Seed Propagation:
Hesperoyucca whipplei is easy to grow from seed, and no pretreatment is required for successful germination (Emery 1988). Seeds should be sown in well drained media. The flat should be kept moist until germination, after which watering should be cut back so that the seedlings do not rot. Kurner (2011) reports 99% germination after 30 days with no pretreatment.

The germination rate of 16 year old frozen seed stored at RSABG was 55% (28 of 51 seeds). A different accession of 26 year old frozen seed had a germination percentage of 28% (7 of 25 seeds). Germination rates for fresh seed varied from 43% to 78%. No pretreatment other than 10% bleach surface sterilant was used in any of these germination tests (RSABG internal data).

Vegetative Propagation:
Hesperoyucca whipplei cannot be grown from cuttings but young seedlings or pups can be successfully dug up and transplanted. This is best done in the rainy season, when plants can be transplanted directly to a new site. If holding salvaged pups in the nursery is necessary, plants should be potted in the smallest container they can fit in. They can be outplanted once roots have grown enough to fill the pots.

Nursery Maintenance:
Plants are slow growing and can take more than six months to fill the 2in before being transplanted to gallon containers. Excess irrigation will cause plants to rot off and die, so care should be taken when watering.

Field Planting:
Reliable germination without pretreatment indicates success in broadcast seeding, but seeds are papery and thin and could easily be damaged in a hydroseeding application.

Planting of container plants should be done during the winter, and if possible plants should be watered immediately after planting, after which establishment is generally good (Everett 1957). Everett (1957) observed flowering and fruiting within 4 to 8 years of planting in Santa Ana, CA. Occasional plants produced offshoots which grew into large clumps several feet across. Many volunteer seedlings occurred in and around garden plantings.

PRUNUS ILICIFOLIA (Nutt. ex Hook. & Arn.) D. Dietr. (hollyleaf cherry)

Summary and Distribution:
Prunus ilicifolia (Rosaceae) is a shrub or small tree found in California and Baja California, Mexico. In California it is found in the Coast Range, southern coastal basin regions, Transverse Ranges, and Peninsular Ranges. It occurs at elevations below 1600 meters and can reach heights of 15m (Baldwin et al. 2012).

Seed Collecting:
Prunus ilicifolia flowers from April to May (Baldwin et al. 2012). Seed of *P. ilicifolia* is found in a red to blue-black fleshy drupe containing one seed (Baldwin et al. 2012). Seeds are generally 11.0-25.0mm, ovoid to spherical, and smooth (Wall and Macdonald 2009). Fruits should be collected when they are dark, and stored in plastic bags which are kept cool. Ripe fruits are quickly eaten by birds, so collecting should be done as early in the ripening process as possible.

Seed Cleaning:
Prunus ilicifolia fruits should be soaked in water for 1 hour to soften the fleshy fruit coat. Fruits that float likely contain seeds which are hollow, parasitized and non-viable and should be discarded. The fruits which sink should be rubbed with a wood block over a medium screen to remove the outer fruit. Cleaning of *P. ilicifolia seed* is classified as being moderately difficult (Wall and Macdonald).

Seed Propagation:
Prunus ilicifolia is easy to grow from fresh seed. Fresh seeds can be sown with no treatment, while stored seed benefit from 1-3 months of cold stratification (Emery 1988). Untreated seeds typically germinate within 20-40 days (Everett 1957, Everett 2012).

Four year old seed stored under refrigeration had a germination rate of 6% (3 of 50 seeds). Dissection of ungerminated seeds showed many to be filled with mushy brown endosperm, indicating that the seeds were not viable (RSABG internal data). It is likely that this species cannot be stored for more than a few years using traditional methods.

Vegetative propagation:

Nursery Maintenance:
Prunus ilicifolia seedlings quickly develop a deep tap root. Confining this tap root early on in nursery production will inhibit the plant's development. In order to avoid this, plants should be germinated and transplanted into a deep pot (1 foot to 18 inches) as quickly as possible. Plants are slow growing for the first few years as the root system is established.

Field Planting:
Container plants should be sited in full sun to partial shade and outplanting should be done in late fall to early winter. If possible, plants should be watered immediately after

planting and then watered every other week for 6 months. Plants can be established from direct seeding if there is sufficient precipitation or watering.

Outplantings in Santa Ana, CA produced plants which began setting seed within two years of planting. Many volunteer seedlings were observed amongst these plantings. Seeds planted directly into the garden or in the nursery without protection were highly predated by rodents (Everett 1957). Outplantings in Claremont, CA produced plants which flowered and set fruit within the second or third year of growth. Plants would not tolerate dense clay soils that retained water, but thrived in rocky, well drained soils (Everett 2012).

CORETHROGYNE FILAGINIFOLIA (Hook. & Arn.) Nutt. [*Lessingia filaginifolia* (Hook. & Arn.) M. A. Lane] (common sandaster)

Summary and Description:
Corethrogyne filaginifolia (Asteraceae) is a perennial herb that is native to and widespread throughout California and also occurs in southwest Oregon and northern Baja California. It occurs at elevations below 2600m and is less than 1m in height (Baldwin et al. 2012).

Seed Collecting:
Corethrogyne filaginifolia flowers from July through November (Baldwin et al. 2012). Seed collection dates for accessions at RSABG range from July-October, with the majority of collections being made in September (RSABG internal data). Seeds disperse quickly after ripening, and maturation of fruit is staggered within populations. Several sites visits may be required to collect an adequate amount of material. Like many asters, whole seed heads can be collected slightly immature and will after ripen. In this case, seeds should be stored in paper bags at low humidity until they have ripened.

Seed Cleaning:
Seeds of *C. filaginifolia* are found at the base of the receptacle of the inflorescence and develop from the disk flowers. Each inflorescence generally contains 12-120+ disk flowers. Achenes are red-brown < 5.0mm, cylindric to ovoid, with pappus bristles (Baldwin et al. 2012). Separation of seeds from chaff can be difficult using an aspirator, and care should be taken to minimize floral chaff when removing seeds from the inflorescences. Cleaning seeds to a high level of purity is labor intensive, requiring considerable amounts of re-sieving and hand sorting.

Seed Propagation:
Corethrogyne filaginifolia is an easy plant to grow from seed with no pretreatment necessary for high germination rates (Emery 1988). Germination rates for trials ran at RSABG ranged from 82%-94% with no treatment of seed (RSABG internal data).

Vegetative Propagation:
Vegetative propagation of this species is easy. Cuttings can be taken from February through July. They should be taken from new growth and be cut into three inch sections, planted in a flat of perlite and watered once a week until roots develop.

Nursery Maintenance:
Corethrogyne filaginifolia is easy to mantain in the nursery. When they have reached sufficient size, seedlings or cuttings should be transferred from propagation flats to 2 inch pots. Once the plants have filled 2 inch pots, they should be transplanted gallon or other large sized containers to develop further. Plants can be pruned back to produce fuller growth. Plants grown from seed or cuttings will be ready for outplanting in approximately 3 months.

Field planting:
Reliable germination without any treatment indicates success in broadcast seeding applications. Container plants should be outplanted from November through April and watered several times in order to establish reliably.

POA SECUNDA J. Presl (One sided blue grass)

Summary and Distribution:
Poa secunda (Poaceae) is a perennial herb found throughout California and is widespread outside of California occurring throughout western North America, through the western great plains and northwestern Mexico (SEInet 2013). This common plant is found in many habitats from sea level to elevations of 3800m and reaches heights of 10dm. Two subspecies are currently recognized in California (subsp. *junicifolia*, and subsp. *secunda*). These subspecies intergrade, and additional ecological forms without formal taxonomic rank are noted (Baldwin et al. 2012).

Seed collecting:
Ripening of fruit and collection time varies with elevation. Seed collection dates at RSABG range from May through August, with the majority of collections being made in May (RSABG internal data). Collection may be done by pinching fingers and sliding them up the flower stalk or the entire stalk can be cut and allowed to mature in the bag.

Seed of *P. secunda* is enclosed in the caryopsis (one seeded, indehiscent fruit where the seed coat is fused to the fruit wall) fruit and is enclosed within the lemma (lowermost bract) and palea (uppermost bract) of the floret. The fruit is 2.5-4.0mm, narrow, and reddish tan (Wall and Macdonald 2009).

Seed cleaning:
Rub floral material gently on a rubber mat to separate florets from stems, then sort through standard soil sieve #18 to further separate the seeds from floral parts. Once sorted, seeds should be blown in an aspirator, which will separate the hollow, sterile seed from viable seed. Cleaning of *P. secunda* is classified as moderate difficulty. (Wall and Macdonald 2009).

Seed propagation:
Like many grasses, *P. secunda* germinates readily from seed with no pretreatment. Seed can be sown directly into into 2 inch pots or onto landscapes.

Vegetative propagation:
Poa secunda can be successfully propagated from divisions. Large plants may be divided into smaller clumps containing root and leaf material. These divisions can be planted into four inch pots and watered immediately after dividing.

Plant maintenance:
Plants are easy to maintain in the nursery. Plants are fast growing and will typically fill a four inch pot within 3 to four months. If being stored for more than one season, plants may be cut back during fall to remove dried leaf material and flush new growth.

Field planting:
Rodent predation is a problem and if possible, seedlings should be caged in order to prevent loss. High germination percentages and fast growth indicate that this species would be an excellent candidate for direct seeding.

MALACOTHAMNUS FREMONTII (Torr. ex A. Gray) Greene (Fremont's bushmallow)

Description:
Malacothamnus fremontii (Malvaceae) is a drought tolerant shrub native to California and found in the high North Coast Ranges, inner North Coast Ranges, Sierra Nevada foothills, Tehachapi Mountain area, east San Francisco Bay area, Transverse Ranges, San Jacinto Mountains, east of Sierra Nevada, and Desert Mountains (Panamint Mountains). It is found at elevations ranging from 600-1300m and reach heights of 3m (Baldwin et al. 2012).

Seed collecting:
Malacothamnus fremontii flowers from May through July (Baldwin et al. 2012). Ripening of seed varies with location and specific weather conditions, but plants should be checked starting in July for mature fruit. Segments should split easily when ready of collection. Seeds are often highly parasitized, and large quantities of fruiting material may produce few viable seeds.

Seed cleaning:

Floral material can be threshed through a medium screen. Chaff and sterile and/or parasitized seed can be removed using an aspirator.

Seed propagation:

Data for this specific species does not exist in the RSABG seed bank or other seed germination references, but seed propagation results with other *Malacothamnus* species are highest with scarification of the thick seed coat. This can be achieved by rubbing seeds with sandpaper to allow water to imbibe. For larger batches of seed, treatment with boiling water can be used, but germination rates will typically be lower. Many *Malacothamnus* species are known to reseed heavily after wildfire, and treatment of seeds with heat may increase germination.

Vegetative propagation:
Cuttings should be taken between January and July. Cutting should be taken from semi woody material in larger sections that can be cut down in the nursery to three inche cuttings. High quality material will root quickly, while poor material will take much longer, but can sometimes be rooted. Cuttings should be stuck in flats of perlite and watered once a week, checking for dryness or wilting. Cutting flats should be kept moist but not wet, and overhead misting should be kept to a minimum. Once roots are present plant in two inch pots and place outside in a shaded area.

Plants can also be propagated by division. Divisions can be made from January – May. When making root divisions, one should wait for after a rainfall, or water plants prior digging up. The top part of the plant should be cut back and a hole dug as deep as possible around the base of the plant to obtain as much root as possible. The division should be made on an area of the plant that has new shoots and all soil around the roots

should be kept. Each division should be planted with well-draining potting soil in a deep container such as a tree tube. Once potted it can be placed outdoors in a shaded area and water approximately 1-2 times a week. After two months of growth, plants should be checked and once the roots have filled the pot, they can be outplanted.

Plant maintenance:
Malacothamnus fremontii is an easy plant to grow in the nursery. Tall plants can be pruned in the nursery, which creates a bushier form and promotes better root growth.

Field planting:
Plants establish well after planting, forming colonies which act as a good soil stabilizer. Plants should be sited in sunny areas and planted in the late fall through early spring, preferably during times when cool weather and precipitation is forecasted. If possible, plants should be thoroughly watered at the time of planting and every other week for 1-2 months.

ADENOSTOMA FASCIULATUM Hook & Arn. (CHAMISE)

Description:

Adenostoma fasciculatum (Rosaceae) is a large shrub with a distribution that encompasses the north Coast Ranges, Sierra Nevada foothills, and central and south western California, including the Channel Islands, and Baja California, MX (Jones 2012). This drought tolerant species is found in chaparral habitat along dry slopes and ridges at elevations below 1600m. It is often the dominant component of chaparral vegetation, forming dense, nearly impenetrable stands. *Adenostoma fasciculatum* is adapted to wildfire, with fire triggering seed germination and production of new basal shoots. Because of this, it is one of the first shrub species to recolonize after wildfire events. Three varieties of *A. fasciculatum* are currently recognized, with *A. fasiculatum var. fasciculatum* being the most common variety, and the one that is found in the Angeles National Forest (Jones 2012).

Seed collecting:

Depending on elevation and other environmental conditions, flowers bloom from February through July (Fig. 1), with seeds ripening in summer (CCH 2013). Seeds will persist on the plant for quite some time after ripening, and have been collected as late as October by RSABG collectors. Ripened achenes (Fig. 2) can be found within the floral cup (hypanthium) and are generally 2-3mm, reddish, ribbed and obovate (inversely ovate). In many collections, a significant percentage of seeds of *A. fasciculatum* are sterile. This percentage can approach 100% depending on the population and environmental conditions. In order to ensure adequate viable seeds, a large amount of fruiting material (a half gallon or more) should be collected.

Figure 1. *Adenostoma fasciculatum* flowers

Figure 2. *Adenostoma fasciculatum* achenes

Seed cleaning:

Fruits should be threshed over a medium screen, and sorted through standard soil sieve sizes #10 and #18 to separate the seeds from floral parts. Once sorted, seeds should be blown in an aspirator, which will separate the lighter hollow, sterile seed from heavier viable seed.

Seed propagation:

Untreated seed of *A. fasciculatum* are highly dormant and will yield very low (<5%) germination rates.The highest germination rates are achieved with some sort of fire treatment. Perhaps the best fire treatment method for larger scale production is application of charate to seed flats. Charate is produced by leaching water through burned wood of chaparral tree or shrub species. Other fire treatment options include watering with smoked water, smoking of seeds/growing media, and burning of seed flats. Another method for breaking dormancy is chemical scarification. Seeds can be pretreated in a 10% sulfuric acid solution and left to soak for 15 minutes.

Once treated, seeds can be directly sown onto seed flats with a soil mixture of peat moss, perlite, and dolomite limestone (e.g. sunshine mix #5). Seedlings can be transplanted to two inch pots once they are approximately one to two inches in height.

Vegetative Propagation:

Cuttings should be taken from semi-woody material before or after the plant flowers, generally from January – June, depending on elevation, rain and other environmental factors. Typically, only one cutting of this material will be available per shoot, but occasionally long shoots can be found that will yield multiple cuttings. Cuttings of the semi-woody greenish material will take approximately three months to root. Hardwood cuttings can be rooted, but take much longer to root, and have lower success rate.

Cuttings should be placed in a flat of 100% perlite and watered once or twice a week in summer and once a week in winter. Check for roots after one month and continue on a monthly basis. Root growth is best detected by the appearance of new leaf growth, roots penetrating the bottom of the tray, and resistance felt when tugging on a stem. Cuttings that have produced roots should be transferred to two inch pots in a soil mixture that contains two parts peat moss, two parts perlite, one part cement sand, and fertilizer. Place newly planted cuttings back in the greenhouse for one to two weeks, before moving them to an outdoor shaded area to harden off.

Nursery Production:
Allow plants to grow in 2 inch containers for two-three months or until the root ball has filled the circumference of the pot. Plants can then be transplanted to deep skinny pots which will allow development off a deep root system, which will help the plant survive once outplanted. A typical nursery mix for *A. fasciculatum* is one part peat moss, two parts perlite, one part cement sand, and slow release fertilizer. Throughout the nursery production, watering should be based on periodic monitoring for dryness or wilting. Plants are generally mature enough to be planted after approximately 8 months of nursery growth.

Field planting:
Adenostoma fasciculatum should be planted during the rainy season (November-February) to minimize losses due to drought. After planting, all plants should immediately be watered in around the base. If possible, watering should continue every week for 1 – 2 months and once new leaves emerge every month.

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Table 4-2. Weed Treatment Methods for Noxious Weeds Identified in the Weed Inventory and Initial Mapping (or not yet identified but with the Potential to Occur in the Project Area

Scientific Name	Common Name	Cal-IPC List Ranking*	Treatment Method(s)
Ageratina adenophora	Throughwort, Eupatory	Moderate	Pull when the plant is in flower, but before its gone to seed, when soils are damp or loose, and dig out remaining roots; brush cut on steep slopes, and dig up roots or apply herbicide to cut stems; apply herbicide to tops and undersides of leaves just before or after budding. To effectively treat must use herbicides. Herbicides: triclopyr (Garlon 3A), glyphosate (Rodeo/Aquamaster)
Ailanthus altissima	Tree-of-heaven	Moderate	Pull small saplings; cut larger trees as low to the ground as possible in late-Spring and apply herbicide to cut stumps; basal bark treatment; hack and squirt. Herbicides: triclopyr (Garlon 3A(near H20) or 4(upland), Pathfinder II(upland))
Arundo donax	Giant reed grass	Severe	Pull or dig plants after heavy rains loosen the soil; cut the stems and dig up the roots using hand tools or heavy equipment(only works on seedling/sapling sprouts in isolated conditions); apply herbicide (foliar spray) after the plant has flowered but before summer dormancy; cut and treat the cut stems with herbicide. Herbicides: triclopyr (Garlon 3A), glyphosate (Aquamaster/Rodeo)
Bromus diandrus/hordeaceus/ madritensis/tectorum	Ripgut brome	Severe	Pull in early spring before seeds are ripe; (February to early-April).
Carduus pycnocephalus	Italian thistle	Moderate	Pull; dig out roots; cut off 4 inches belowground level;apply herbicide during the bolting phase (only apply herbicides on populations over 50ftx50ft). Herbicides: clopyralid (Transline), glyphosate, (Rodeo/Aquamaster(near H20), Roundup Pro(upland))
Centaurea maculosa	Spotted knapweed	Severe	Pull or dig plants out by hand in May-June, and pull resprouts through late-summer; ; apply herbicide during the bolting phase (only apply herbicides on populations over 50ft x 50ftx50ft). Herbicide: clopyralid (Transline)
Centaurea melitensis	Tocalote	Moderate	Pull; dig out roots (Feb-April); cut off four inches below ground level; apply herbicide during the bolting phase (only apply herbicides on populations over 50ftx50ft). Herbicide: clopyralid (Transline), glyphosate (Roundup Pro)
Centaurea solstitialis	Yellow star thistle	Severe	Pull or dig plants out by hand in May-June, and pull resprouts through late-summer; apply herbicide during the bolting phase (only apply herbicides on populations over 50ft x 50ftx50ft). Herbicide: clopyralid (Transline), glyphosate (Roundup Pro)
Cirsium arvense	Canada thistle	Moderate	Same as bull thistle.
Cirsium vulgare	Bull thistle	Moderate	Pull prior to flowering; cut off 1-2 inches below ground;apply herbicide during the bolting phase or at the onset of flowering (only apply herbicides on populations over 50ftx50ft).Herbicide: clopyralid (Transline)

Scientific Name	Common Name	Cal-IPC List Ranking*	Treatment Method(s)
Cistus creticus	Rockrose	Limited	Cut, and pull or dig out roots; cut and treat cut stems with herbicide. Herbicides: triclopyr (Garlon 3A(near H20) or 4(upland), Pathfinder II(upland))
Cnicus benedictus	Blessed thistle	Not ranked	Pull prior to flowering; apply herbicide during the bolting phase (only apply herbicides on populations over 50ftx50ft). Herbicide: clopyralid (Transline), glyphosate (Roundup Pro),
Cynara cardunculus	Artichoke thistle	Moderate	Pull and/or dig out roots; foliar herbicide application; cut stems and apply herbicide to cut stems. Herbicide: glyphosate (Roundup Pro), clopyralid (Transline) on rosettes
Cytisus scoparius	Scotch broom	High	Same as Spanish broom.
Descurania sophia	Tansy mustard	Limited	Pull before seed pods develop; dig out roots, if necessary; cut off just below the root crown.
Eucalyptus globulus	Tasmanian blue gum	Moderate	Pull small saplings; cut larger trees as low to the ground as possible and apply herbicide to cut stumps;basal bark treatment. Herbicides: triclopyr (Garlon 3A(near H20) or 4(upland), Pathfinder II(upland))
Euphorbia dendroides	Tree spurge	Not ranked	Cut close to the ground and treat cut stems with herbicide Herbicides: triclopyr (Garlon 3A(near H20) or 4(upland), Pathfinder II(upland)).

Scientific Name	Common Name	Cal-IPC List Ranking*	Treatment Method(s)
Ficus carica	Fig	Moderate	Pull small saplings; pull larger plants with weed wrench; cut larger trees as low to the ground as possible and apply herbicide to cut stumps. Herbicides: triclopyr (Garlon 3A(near H20) or 4(upland), Pathfinder II(upland))
Foeniculum vulgare	Fennel	Severe	Pull small saplings; pull larger plants with weed wrench;cut as low to the ground as possible and apply herbicide to cut stumps. Herbicides: triclopyr (Garlon 3A(near H20) or 4(upland), Pathfinder II(upland))
Hedera helix	English ivy	Severe	Cut stems and apply herbicide to cut stems. Herbicides: triclopyr (Garlon 3A(near H20) or 4(upland), Pathfinder II(upland))
Hirschfeldia incana	Shortpod mustard	Moderate	Pull before seed pods develop;; apply herbicide to leaves before flowering (herbicide use only with ANF approval). Herbicide: glyphosate(Roundup pro)
Hordeum murinum ssp. *leporinum*	Foxtail barley	Moderate	Pull before flowering.
Lactuca serriola	Prickly lettuce	Limited	Pull when soils are moist/loose.
Marrubium vulgare	Horehound	Limited	Pull when soils are moist/loose; spot herbicide application. Herbicide: glyphosate(Roundup pro), triclopyr (Garlon 3A(near H20) or 4(upland), Pathfinder II(upland))
Melilotus indicus/officinalis/alba	Sweetclover	Moderate	Pull when soils are moist/loose; foliar herbicide application (herbicide use only with ANF approval). Herbicide: glyphosate (Aquamaster/Rodeo)
Nicotania glauca	Tree tobacco	Moderate	Pull seedlings by hand;weed wrench larger plants; cut stems close to the ground surface and apply herbicide to cut stems. Herbicide: triclopyr (Garlon 3A(near H20) or 4(upland), Pathfinder II(upland))
Pennisetum setaceum	Fountain grass	Moderate	Cut close to the ground, and dig up tufts using hand tools or heavy equipment; foliar herbicide application. Herbicide: glyphosate, (Rodeo/Aquamaster(near H20), Roundup Pro(upland))
Piptatherum miliaceum	Smilo grass	Limited	Foliar herbicide application; cut and treat cut stems with herbicide. Herbicide: glyphosate, (Rodeo/Aquamaster(near H20), Roundup Pro(upland))
Poa bulbosa	Bulbous bluegrass	Limited	Pull/dig up when soils are moist/loose
Polypogon monospeliensis	Rabbitfoot grass	Moderate	Pull/dig up when soils are moist/loose.
Raphanus sativus	Wild radish	Limited	Pull before seeds mature.
Ricinus communis	Castorbean	Moderate	Pull when soils are moist/loose; cut near the crown and treat cut stems with herbicide; foliar herbicide application. Herbicide: glyphosate, (Rodeo/Aquamaster(near H20), Roundup Pro(upland))
Robinia pseudoacacia	Black locust	Moderate	Pull seedlings by hand; cut close to the ground, followed by treatment with herbicide. Herbicide: triclopyr (Garlon 3A(near H20) or 4(upland), Pathfinder II(upland))
Rosemarinus officianalis	Rosemary	Limited	Pull; cut close to the ground; foliar herbicide application; cut and treat cut stems with herbicide. Herbicide: glyphosate, (Rodeo/Aquamaster(near H20), Roundup

Scientific Name	Common Name	Cal-IPC List Ranking*	Treatment Method(s)
			Pro(upland))
Rubus discolor	Himalayan blackberry	Severe	Cut stems close to the ground just after commencement of flowering, and dig up rootball; cut stems close to the ground surface and apply herbicide to cut stems. Herbicide: triclopyr (Garlon 3A)
Salsola tragus	Russian thistle	Limited	Pull; dig out roots; cut off just below the root crown; apply herbicide while plant is in its early growth stages, preferably the early seedling stage (only apply herbicides on populations over 50ft x 50ftx50ft). Herbicide: glyphosate, (Roundup Pro), clopyralid (Transline)
Schinus molle	Peruvian pepper tree	Limited	Pull small saplings; cut larger trees as low to the ground as possible and apply herbicide to cut stumps. Herbicide: triclopyr (Garlon 3A(near H20) or 4(upland), Pathfinder II(upland))
Silybum marianum	Milk thistle	Limited	Pull when soils are moist/loose; foliar herbicide application (only apply herbicides on populations over 50ftx50ft). Herbicide: clopyralid (Transline), glyphosate (Roundup Pro),
Sisymbrium altissimum	Tumble mustard	Moderate	Pull beforeflowering; dig out roots, if necessary; cut off four inches belowground level .
Sisymbrium oriental	Hedge mustard	Moderate	Pull beforeflowering; dig out roots, if necessary; cut off four inches belowground level.
Spartium junceum	Spanish broom	Severe	Pull when soils are moist/loose; cut stems close to the ground, and weed wrench rootball; cut stems to 1-foot above ground surface and apply herbicide to cut stems; pull seedlings. Herbicide: triclopyr (Garlon 3A(near H20) or 4(upland), Pathfinder II(upland))
Tribulus terrestris	Puncture vine	Limited	Pull when soils are moist/loose; hoe to cut the plant off at its taproot; repeat throughout the late spring and into the summer.
Vicia villosa	Hairy vetch	Not ranked	Pull prior to flowering; cut off 1-2 inches below ground;.
Vinca major	Periwinkle	Moderate	Pull very small, isolated populations; apply herbicide to leaves or cut the plant close to the ground and apply herbicide to cut stems. Herbicide: glyphosate (Aquamaster/Rodeo)
Washingtonia robusta	Mexican fan palm	Limited	Pull /dig up saplings; cut larger trees as low to the ground as possible and apply herbicide to cut stumps. Herbicide: triclopyr (Garlon 3A(near H20) or 4(upland), Pathfinder II(upland))

* See Section 1.6.4 of this document for definitions of the Cal-IPC List Rankings.

Note: Some species listed in this table were not observed, or observed but not mapped (because of the population size), during the weed inventory but are included because they were specifically referenced in MM-3b (Table 1-1).

USDA Forest Service

Weed Occurrence Form

Region_5_ Forest: Angeles District: _____

Species:_____ **Date**: _____ ID confidence___% ID Auth: Hickman et al., 1993

Project	Current land use:
Surveyor	Current/potential threats:
Directions to site:	
	Other biota: None
	Existing EO? Yes No #_____.
	Entire extent of pop mapped? Y N
	Photographer
Site descrip:	Repository
	Vouch spec # Repository
	Look-alike species: None
	Research needs
(circle) **Point Polygon Line**	
GPS Unit: XT GeoEx3 Ipaq1 Ipaq2 Mag # __ Thales Other	Conserv/Mngt concerns
GPS Staff ID:	# _____ **individuals, genets** est, precise
Unique ID #: #____pts/poly4EO	Vigor? vfeeble feeble normal vigor exvirg N/A Method:
Northing: Easting:	(circle) Disease Predation Herbivory None Explain
Elevation (feet):	
Quad name:	Distribution/Density: prominent common scattered patchy rare
T-R-S: T R S ¼ of ¼ of	**Gross (Total) area:** est, precise **Infested** (Weed cover only) **area** :
Slope Min. ____% Max ____%	**Cover: Sp**._____% Grd_____%
Aspect (°):	
Substrate:	**Phenology** method: est, count
Soil text: Creek, loam, silt, clay, other	% seedlings % leaf % bud
Moisture regime: mesic xeric hydric	% flwr %immat frt % mature frt
Soil moisture: dry moist saturated inundated seasonal seepage other	% dispersing seed % senescent
	Treated before: Y N
Horz dist. to H2O vert.	**Method of treatment:**
Light expos: full sun part shade full shade	Fr suc: Exlt Gd Marg Pr Unkn Fair None
Veg series:	Germ suc: Exlt Gd Marg Pr Unkn Fair None
Ass. tree/shrubs:	Repro: Exlt Gd Marg Pr Unkn Fair None
Canopy: _____% Shrub: _____% Forb: _____%	Dispersal: Exlt Gd Marg Pr Unkn Fair None
Assoc plants (include other non-natives):	Estab: Exlt Gd Marg Pr Unkn Fair None
	Veg suc: Exlt Gd Marg Pr Unkn Fair None
	Fl suc: Exlt Gd Marg Pr Unkn Fair None
	General observations
Disturbance:	Condition: Exlt Gd Marg Pr Unkn Fair None
	Quality: Exlt Gd Marg Pr Unkn Fair None
	Defense: Exlt Gd Marg Pr Unkn Fair None
	Rank: Exlt Gd Marg Pr Unkn Fair None
	Viability: Exlt Gd Marg Pr Unkn Fair None