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Preliminary Environmental Assessment

Invasive Plant Treatment Project

San Gabriel River Ranger District, Angeles National Forest and San Dimas Experimental Forest, Pacific Southwest Research Station
Los Angeles and San Bernardino Counties, California

Portions of T1N, R8W, R9W, R10W, and R11W; T2N, R8W, R9W, R10W, and R11W; and T3N, R8W, R9W, and R10W, SBM

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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 update and expand the original project's purpose and need, project area, and approved activities. The San Gabriel River Ranger District (District) has been implementing an arundo (*Arundo donax*) eradication project since 1998. The District has been successful in controlling the expansion of the populations, but the invasive plant species has not been completely eradicated from the District and needs continued treatment. The original decision is over 10 years old.

This project 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). The project is located in portions of T1N, R8W, R9W, R10W, and R11W; T2N, R8W, R9W, R10W, and R11W; and T3N, R8W, R9W, and R10W, SBM in Los Angeles and San Bernardino Counties, California.

Since the 1997 Eradication of *Arundo donax* Environmental Assessment was published and Decision Notice was signed, several invasive plant species have invaded and/or expanded in the San Gabriel, Big and Little Dalton, and/or San Dimas drainages, including but not limited to: tamarisk (*Tamarix* spp.), tree-of-heaven (*Ailanthus altissima*), castorbean (*Ricinus communis*), Spanish broom (*Spartium junceum*), fountain grass (*Pennisetum* sp.), eupatory (*Ageratina adenophora*), English ivy (*Hedera helix*), cape ivy (*Delairea odorata*), periwinkle (*Vinca* sp.), tree tobacco (*Nicotiana glauca*), Himalaya blackberry (*rubus armeniacus*) and gorse (*Ulex europaeus*). Additionally, there are still small populations of arundo remaining in these drainages.

Other invasive plant species are anticipated to invade and/or expand into these drainages. One of the reasons is due to existing populations nearby (e.g. yellow star thistle [*Centaurea solstitialis*], Euphorbia [*Euphorbia* sp.], Canada thistle [*Cirsium arvense*]).

If the invasive species are left unchecked, the ecosystems in these drainages 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

[1] Forest Service sensitive species are those plant and animal species identified by the Regional Forest or which population vaibility is a concern (FSM 2670.5)

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 2007a) 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.

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, and/or suppress[2] existing invasive plant species in the San Gabriel, Big and Little Dalton, and San Dimas canyon drainages from the Forest boundary to their headwaters.
- Provide for aggressive treatment of new 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.
- Focus on invasive plant species that are classified as undesirable, noxious, harmful, injurious, or poisonous, including but not limited to State listed high priority noxious weeds (such as arundo, tamarisk, and tree-of-heaven).
- 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.
- Contain and/or eradicate highly flammable and fire-adapted invasive plant species (e.g. arundo, tamarisk) that have the potential to increase fire severity and increase the frequency in occurrence of damaging wildfires in these drainages.
- Minimize adverse impacts from the project to populations of threatened, endangered, and/or Forest Service sensitive plant and wildlife species.
- Minimize 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.

Proposed Action

The proposed action includes the eradication, control, containment, and/or suppression of existing and new infestations of invasive plant species that are undesirable, noxious, harmful, injurious, or poisonous, including but not limited to State listed high priority noxious weeds in the San Gabriel, Big and Little Dalton, and San Dimas canyon drainages from the Forest boundary to their headwaters. The width of the project area would include these channels and average 100 to 350 feet from the edge of the high water mark (with a few areas that go beyond a quarter mile from the edge of the high water mark). Treatment areas would include non-National Forest System lands if the landowners/managers would like to enter into an agreement authorized under the Wyden Amendment.

The term for this project would be 15 years with the intent to review and, if needed, update the project, effects analysis, and possibly purpose and need after 15 years of implementation. In general, the proposed action would cap the maximum treatment of the invasive plant species populations and future expansions of these species to 200 miles and/or 4,100 acres annually, depending on funding and staffing. High priority for treatment would be: arundo (*Arundo donax*), tamarisk (*Tamarix* spp.) and tree-of-heaven (*Ailanthus altissima*). Moderate priority invasive plants would be bigleaf periwinkle (*Vinca major*), cape-ivy (*Delairea odorata*), castorbean (*Ricinus communis*), crimson

[2] Eradicate is to totally eliminate an invasive plant species from the project area; control is to reduce the infestation over time but some level of infestation may be acceptable; contain is to prevent the spread of the invasive plants beyond the perimeter of patches or infestations presently existing; and, suppress is to prevent seed production throughout the target patch and reduce the area coverage, preventing the invasive species from dominating the vegetation in the area where low levels may be acceptable.

fountaingrass (*Pennisetum setaceum*), Eutopary (*Ageratina adenophora)*, English ivy, Algerian ivy (*Hedera* sp.), fennel (*Foeniculum vulgare*), French broom (*Genista monspessulana*), gorse (*Ulex europaeus*), Himalaya blackberry (*Rubus armeniacus*), Italian ryegrass (*Lolium multiflorum*), pampas grass (*Cortaderia* sp.), purple veldtgrass (*Ehrharta calycina*), Scotch broom (*Cytisus scoparius*), Spanish broom (*Spartium junceum*), spotted knapweed (*Centaurea maculosa*), tree tobacco (*Nicotiana glauca*) and yellow starthistle (*Centaurea solstitialis*).

The project incorporates an adaptive management strategy that allows the project to be modified based on invasive plant expansion, new infestations of invasive plants in the project area, and new and more effective treatment methods.

Prescriptions for treatment would follow integrated weed management (IWM) for each treatment site. Proposed treatment methods include biological control (e.g. insects, pathogens), 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 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 in the project files.

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 San Gabriel River District Ranger and Station Director for Pacific Southwest Research Station, Riverside Fire Lab (responsible official for San Dimas Experimental Forest) are the Responsible Officials for this project. The District Ranger and Station Director 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 was listed in the Schedule of Proposed Actions (SOPA) on the Angeles National Forest internet webpage beginning on October 1, 2008 and every quarter since. 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 letter was mailed out to approximately 240 agencies, groups, and individuals on May 15, 2009, 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 May 15, 2009, in the *Inland Valley Daily Bulletin*. The detailed purpose and need and proposed action document, map, and scoping letter were included on the Forest websites under "Projects and Plans" starting May 15, 2009 (http://www.fs.fed.us/r5/angeles/projects/). This internet site was referred to in both the legal notice and scoping letter.

Additional requests for input were sent to Native American groups. On June 29, 2009, the Forest tribal relations program manager sent an e-mail to six Native American "traditionalists" to ensure they were notified of the project. In addition, letters from the Forest Supervisor, dated October 19, 2009, were mailed to potentially interested groups requesting the identification of specific areas still being used by Tribal members for plant harvesting or collecting or which have other significance that would merit special consideration during project design and implementation.

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 with the responsible officials' agreement.

Issues

The Forest Service received and reviewed comments from five individuals/groups, both orally and in writing, during the scoping period. The Forest also received a concern from the forest tribal relations program manager. The Forest analyzed these 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.

The interdisciplinary team recommended and the responsible officials approved two key issues that would 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[3] for each herbicide proposed. Threshold of concern for humans is expressed as reference dose [RfD][4]).
2. Herbicides are highly toxic to aquatic organisms, mammals, and birds, including carcinogenicity, reproductive and developmental toxicity, neurotoxicity, and acute toxicity. (Measurement indicators are the toxicity index[5] for each herbicide proposed for each major wildlife category. Toxicity index is usually reported as no observable adverse effect level [NOAEL] but may be reported as lethal dose, 50 percent [LD50[6]; or a portion thereof] when data are lacking).

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.

[3] Threshold of concern is a level of exposure below which there is a low potential for adverse effects to humans.

[4] Reference dose (RfD) is a numerical estimate of a daily exposure to the human population, including sensitive subgroups such as children, that is not likely to cause harmful effects during a lifetime.

[5] The toxicity index is the dose of herbicide used to determine the potential for an adverse effect to wildlife. It is the lowest dose reported to cause the most sensitive effect in the greatest number of sensitive species tested.

[6] LD50 is a standardized measure for expressing and comparing the toxicity of chemicals and is the dose that kills half (50%) of the animals tested.

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 measures 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 the project area at some time in the future. 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

The Responsible Officials (San Gabriel River District Ranger and Pacific Southwest Research Station Director, Riverside Fire Lab) with the Forest Service are proposing the eradication, control, containment, and/or suppression of existing and new infestations of invasive plant species that are undesirable, noxious, harmful, injurious, or poisonous, including but not limited to State-listed high priority noxious weeds (such as arundo, tamarisk, and tree-of-heaven) in the San Gabriel, Big and Little Dalton, and San Dimas canyon drainages from the Forest boundary to their headwaters. The project is broken into 14 branches (see Figure 1 for a map of the project area and branch locations). The width of the project area would include these channels and all tributaries and average 100 to 350 feet from the edge of the high water mark (with some areas that go beyond a quarter mile from the edge of the high water mark). Treatment areas would include non-National Forest System lands if the landowners/managers would like to enter into a cost-share agreement authorized under the Wyden Amendment. 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 and, if needed, update the project, effects analysis, and possibly purpose and need after 15 years of implementation.

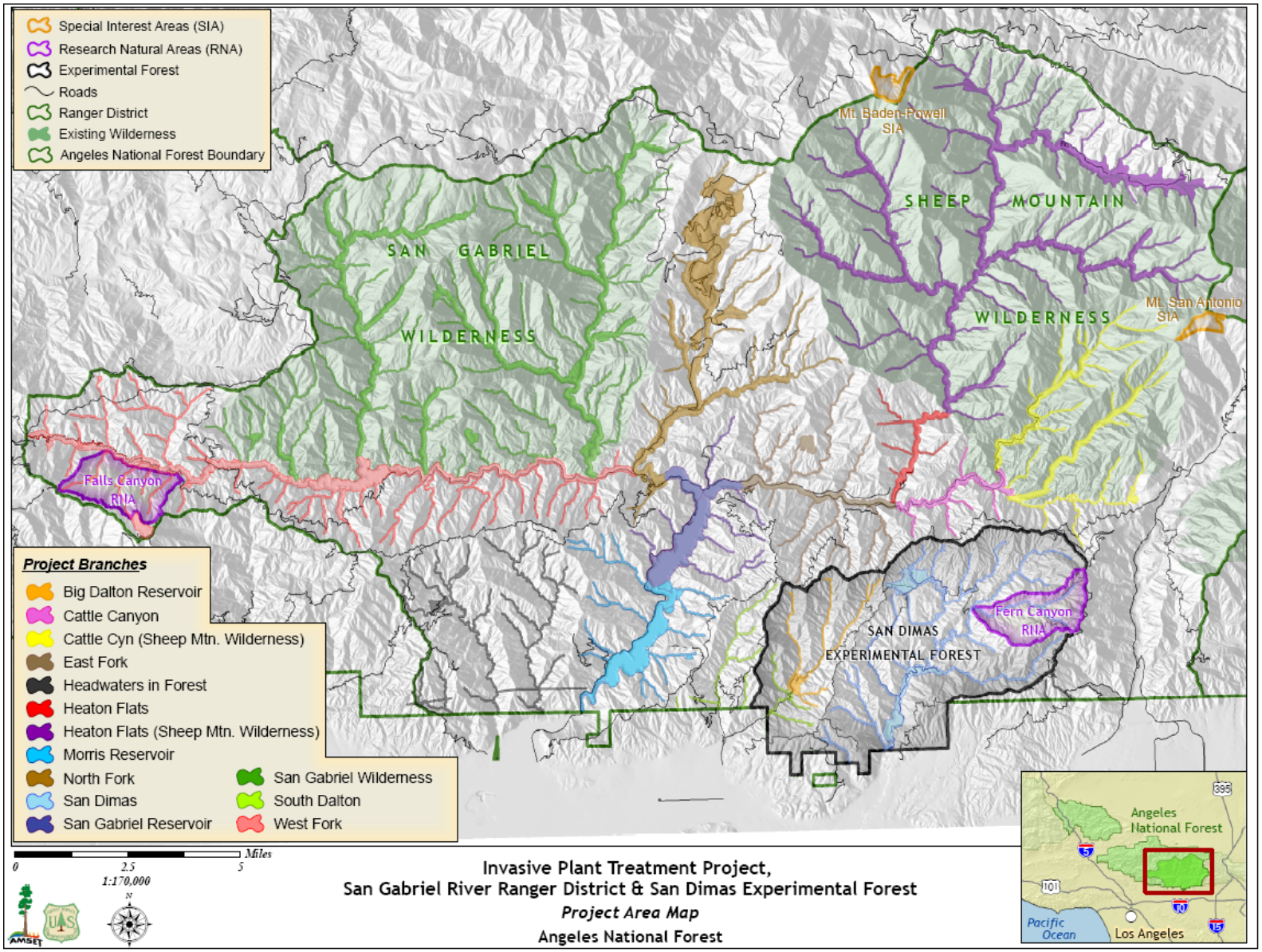

Figure 1. Project Area Map.

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). Early detection and rapid containment of invasive plants is the most efficient method for controlling their spread. A new project addressing these changes could take at least a year or more for a decision. The proposed action includes an adaptive management strategy that 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 and/or biological control agents analyzed and approved for use by the US Department of Agriculture, Agricultural Plant Health and Insect Services), 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 addressed in this document. Any new information would be reviewed by an appropriate interdisciplinary team; documented; and treatment approved by the appropriate Responsible Official through a letter to the files. The documentation would be included in the project record available for public review. This strategy would not allow for the use of new herbicides not addressed in this document; would not allow for "broadcast"[7] (including aerial) applications of herbicides; would not allow herbicide use during pre-emergence of vegetation (preventing the invasive plant from germinating); and would not allow large and heavy equipment into the treatment areas (e.g. large bull dozers). The use of any new herbicides, broadcast applications, pre-emergent herbicide application, or use of large and heavy equipment would require new National Environmental Policy Act (NEPA) analyses, public involvement, documentation and decision. Figure 2 provides a decision key that incorporates the adaptive management strategy approach.

	Decision Key
Step 1A	Determine the best treatment method based on the invasive plant species present, consider the size of the infestation, and the location of the population. Determine the treatment strategy (eradicate, control, contain, or suppress). Can the treatment strategy be achieved using non-herbicide treatment methods (i.e., can the treatment strategy be manual and/or mechanical, such as a chainsaw, or should biological control be considered)? Yes: Continue to Step 1B. No: Continue to Step 2.
Step 1B	Does the non-herbicide treatment method require some form of ground disturbance (e.g. manual and/or mechanical) Yes: Continue to Step 4. No: Continue to Step 9.
Step 2	Have any conditions within the treatment area changed from what is described in this EA? Does the treatment area have an invasive species not specifically addressed in the EA? Is the proposed herbicide use (i.e., concentration or application method) different than what was proposed in the EA? Yes: Continue to Step 3. No: Continue to Step 6.

[7] Broadcast spraying is defined as spraying via ground vehicles or aircraft with hose sprayers or booms using an array of spray nozzles. This method is not selective and all species, both native and non-native are sprayed.

Step 3	Is the herbicide treatment method analyzed in this EA (e.g. foliar herbicide application)? Yes: Continue to Step 4. No: Choose another treatment method OR conduct additional NEPA.
Step 4	Are there any unforeseen changed conditions (e.g. disturbance, new federal listing[8] of an animal and/or plant species) from what was addressed in this EA)? Yes: Conduct additional NEPA to address the area of change OR abandon treatment in that area. No: Continue to Step 5A.
Step 5A	Is the treatment site in a designated Wilderness Area? Yes: Continue to Step 5B. No: Continue to Step 6.
Step 5B	If action is not taken, would the natural processes of the Wilderness Area be adversely affected? Yes: Continue to Step 6. No: Continue to Step 5C.
Step 5C	Is there an imminent risk of invasive plants spreading outside the Wilderness Area? Yes: Continue to Step 6. No: Monitor invasive plant infestation.
Step 6	Are special status[9] fish, wildlife or plant species, designated critical and essential fish habitat, or cultural resources present? Yes: Use treatment methods that pose low to negligible risk to fish, wildlife, and plant species and cultural resources. Examples include use of selected herbicides (e.g. aquatic imazapyr, aquatic glyphosate or aquatic triclopyr), surfactants (e.g. methylated seed oil concentrates), manual or mechanical treatments, in conjunction with the appropriate design features and/or mitigation measures that are part of the NEPA decision for this document. Continue to Step 8. No: Continue to Step 7.
Step 7	Are additional surveys required for special status species? Yes: Conduct necessary surveys during the appropriate time of year prior. Evaluate results of surveys. If surveys illustrate a risk to the species surveyed, use treatment methods that pose low or negligible risk to fish, wildlife, and/or plant species. Examples include use of selected herbicides (e.g. aquatic imazapyr, aquatic glyphosate or aquatic triclopyr), manual or mechanical treatments, in conjunction with the appropriate design features and/or mitigation measures that are part of the NEPA decision for this document. Continue to Step 8. No: Continue to Step 8.
Step 8	Is this a heavy public-use area and an herbicide treatment method is proposed? Yes: Use an herbicide that poses low to negligible risk to the public. Continue to Step 9. No: Continue to Step 9.
Step 9	Is the proposed treatment within the maximum annual treatment acres for that branch? Yes: Continue to Step 10. No: Conduct additional NEPA on additional treatment areas OR abandon treatment for that year.
Step 10	Document treatment methods for each treatment area each year. If treatment is based on the adaptive management approach, prepare a document demonstrating how the change is within the scope of the NEPA decision for this document. Documentation would be a letter to the files and available for public review upon request. Continue to Step 11.

[8] Federal listed species is a threatened, endangered, proposed or candidate species protected under the Endangered Species Act.

[9] Special Status is defined as federally listed threatened, endangered, proposed and candidate species, and Forest Service sensitive species.

Step 11	Implement invasive plant treatment and all the appropriate design features and/or mitigation measures that are part of the NEPA decision. Is active restoration necessary? Yes: Implement appropriate restoration strategies as outlined in the proposed action. Continue to Step 12. No: Allow passive restoration to revegetate treatment site. Continue to Step 12.
Step 12	Implement monitoring framework as outlined in the proposed action. Are invasive plants present at the time the treatment area is monitored? Yes: Continue to Step 1. No: Continue to Step 13.
Step 13	Implement monitoring framework for restoration as outlined in the proposed action. Is the restoration strategy effective? Yes: Healthy, native plant communities and function have been restored. No: Continue to Step 11.

Figure 2. Decision key for invasive plant treatments.

Eradicate, Control, Contain, and/or Suppress

Presently invasive plant species known to exist within the project area include a large variety of species. This alternative divides invasive plant species into three categories: high, moderate, and low-priority species. Table 1 provides a summary of the high and moderate priority species that presently exist within the project area. There are 45 known low-priority invasive plants that are also located within the project area and 15 additional low-priority species within 0.5 miles of the project area. A table showing the full list of known invasive plant species is in appendix B in this document. It is anticipated these species cover approximately 4,100 acres within the project area along 200 miles of channel. Many of these species are quick invaders to new areas, including arundo 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, whether vectors are nearby (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).

Table 1. List of high and moderate priority invasive plants.

Common name	*Taxon name*
High Priority Invasive Plant Species	
Arundo, Giant Reed	*Arundo donax*
Saltcedar, Tamarisk	*Tamarix spp.*
Tree of Heaven	*Ailanthus altissima*
Moderate Priority Invasive Plant Species	
Eupatory	*Ageratina adenophora*
Spotted knapweed	*Centaurea maculosa*
Pampas Grass	*Cortaderia spp.*
Scotch Broom	*Cytisus scoparius*
Cape-ivy, German-ivy	*Delairea odorata*
purple veldtgrass	*Ehrharta calycina*
Fennel	*Foeniculum vulgare*

Common name	*Taxon name*
Moderate Priority Invasive Plant Species	
French broom	*Genista monspessulana*
English Ivy, Algerian ivy	*Hedera helix, H. canariensis*
Italian ryegrass	*Lolium multiflorum*
Tree Tobacco	*Nicotiana glauca*
Crimson Fountaingrass	*Pennisetum setaceum*
Castorbean	*Ricinus communis*
Himalayan Blackberry	*Rubus armeniacus (Rubus discolor)*
Spanish Broom	*Spartium junceum*
Gorse	*Ulex europaeas*
Bigleaf Periwinkle	*Vinca major*
Yellow starthistle*	*Centaurea solstitialis*

*yellow starthistle is not known to occur within the project area but there is a record of it occurring approximately 0.5 miles away.

Most treatment strategies would be intended to eradicate or control the high-priority invasive plant species. Dependent on location, invasive plant species, and potential vectors in the area, the strategy to manage the moderate and low-priority invasive plant species would consider containing and/or suppressing.

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).

Potential herbicide and manual/mechanical treatment prescription options for known and expected invasive plants are provided in appendix C.

Treatment Methods

Proposed treatment methods include biological control (e.g. insects, pathogens), manual/mechanical, fire wilting, and herbicide. These treatment methods are divided up further into specific types of treatment methods and are summarized in table 2. The timing of herbicide treatments would be dependent on the invasive plant species, location of the population, temperature extremes, as well as wind and rain restrictions (which vary by herbicide). The Regional Forester must pre-approve any

herbicide treatment in research natural and wilderness areas (FSH 2109.14, 13.4; USFS 1994a). This needed approval would occur before a decision in made on this project. In addition, should specific biological control agent(s) be considered as a viable treatment method and/or helicopter landings are needed in either or both wilderness areas during the term of the project, the Regional Forest must approve the biological control agent (e.g. insect) and helicopter landings prior to implementation (FSM 2323.04c; USFS 2007b).

Depending on the size of the activity generated material (invasive plants), treatment of this material (biomass) 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). 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 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 resource areas (e.g. native plants and wildlife species, including protected species); degree of intermixing of invasive species with sensitive native habitats; access; proximity to surface water; and budget.

Table 2. Summary of treatment methods proposed.

Method	Description
Biological Control Method	
Biological Control Agents	Biological control agents are normally insects or pathogens that attack specific invasive plant species. Prior to allowing use, US Department of Agriculture, Agriculture Plan Health and Insect Service (APHIS) is required to complete NEPA analysis and documentation. The current website of approved biological control agents is http://www.aphis.usda.gov/plant_health/plant_pest_info/weeds/enviro_docs.shtml Use of this method would comply with the APHIS NEPA document and decision. Advantages and disadvantages –suppresses the spread of infestations but would not likely eradicate the invasive plant populations. If successful, can provide permanent, widespread control with a favorable cost:benefit ratio.
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.

Method	Description
Manual/Mechanical Methods	
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 increases 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 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 (including basal bark) – These methods apply herbicide directly to the leaves and stems/trunk of a plant. 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.

Method	Description
	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 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 with little risk of drift of herbicide onto non-target species. Disadvantages include very 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, overtime, the amount and concentration of herbicide 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 needing treatment.

Herbicide Treatment Method

The five herbicides that are considered as treatment options in the proposed action include: aminopyralid, chlorsulfuron, glyphosate, imazapyr, and triclopyr. Table 3 provides a summary of the typical application rate and range planned for each herbicide.

Table 3. Summary of range of and typical application rates for each herbicide proposed.

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

Herbicides generally need to be applied with an adjuvant. There are several types of adjuvants including surfactants, non-foaming agents, and colorants.

A surfactant, or surface-acting agent, is any compound that is added to an herbicide formulation or tank mix to facilitate and enhance the absorbing, emulsifying dispersing, spreading, sticking, wetting, or penetrating properties of herbicides. Surfactants are similar to detergents in their action, reducing water surface tension to allow wetting and penetration of the plant tissues. The surfactant helps to achieve optimum herbicide absorption into and adherence from the herbicide onto the plant. Surfactants may also improve an herbicide's efficiency so that the concentration or total amount of herbicide required to achieve a given effect is reduced, sometimes as much as five or ten-fold (Tu et al. 2001). In this way, adding an appropriate surfactant can decrease the amount of herbicide applied and lower total costs for invasive plant control (Tu et al. 2001). In some cases, the herbicide would already have the surfactant included, but in other cases, it would be necessary to add one. This alternative designates a range of dilution rates for nonylphenol polyethoxylate (NPE) based surfactants of 0.25 to 2.5 percent and a typical dilution rate of one percent.

Defoamers are used to reduce the foaming that might occur during agitation of the spray mixture.

Colorants can be added to herbicide solutions to enable spray crews to see where they have sprayed after initial evaporation of the solution. This alternative would utilize Hi-Light Blue® dye or similar biodegradable colorant to facilitate visual control of application. This colorant is a water soluble dye and contains no listed hazardous chemicals. It is considered virtually non-toxic to humans (Bakke 2007).

Herbicide treatment would comply with local, state and federal pesticide laws and regulations, and would be applied strictly in accordance with the label directions (BMP 5-8). At a minimum, only certified personnel or those under the supervision of a certified applicator would be allowed to use restricted-use pesticides (FSM 2154.2; USFS 1994b). Table 4 summarizes the active ingredients, examples of brand names, properties, and general uses of the herbicides that are included as part of the proposed action. All herbicides considered under the proposed action have human health and ecological risk assessments that are posted on the Forest Service website (http://www.fs.fed.us/foresthealth/pesticide/risk.shtml).

Table 4. Herbicides considered for use, including examples of trade names, and how they affect plants.

Active Ingredient, examples of brand names, action	Properties	General uses/known to be effective on:
Aminopyralid (e.g. Milestone®, Milestone VM®) Mimics natural plant hormones.	Selective systemic herbicide.	Use for annual, biennial, and perennial broadleaf species.
Chlorsulfuron (e.g. Telar® DF, Glean®, Corsair ™ Inhibits amino acid synthesis.	Absorbed by the leaves and translocated throughout the plant.	Use for broadleaf species and grasses.

Active Ingredient, examples of brand names, action	Properties	General uses/known to be effective on:
Glyphosate (e.g. Accord®, Roundup®, Aquamaster®, Rodeo®) Inhibits 3 amino acids and protein synthesis.	A broad spectrum, non-selective, translocated herbicide. Translocates to roots and rhizomes of perennials. While considering non-selective, sensitivities do vary depending on species. Adheres to soil, which lessens or retards leaching or uptake by non-targets.	Most effective on perennial plants when applied in later summer and fall, when plants are entering dormancy (e.g. arundo). Some products have been approved for aquatic environments and can be used when surface water is present(e.g. Aquamaster®, Rodeo®).
Imazapyr (e.g. Aresenal®, Chopper®, Stalker®, Habitat®) Amino acid synthesis inhibitor.	Broad-spectrum, non-selective, pre- and post-emergent herbicide.* Most effective as a post-emergent. Low potential for leaching into ground water. Has low toxicity to invertebrates and is non-toxic to fish, mammals, and birds. It can damage non-target plants, by transfer between root networks.	Used for annual and perennial grasses, vines, brambles, and broadleaf species (e.g. tamarisk). Habitat® been approved for aquatic environments and can be used when surface water is present.
Triclopyr (e.g. Garlon®, Access®, Renovate 3®) Mimics the plant hormone auxin, causing uncontrolled plant growth.	Selective systemic herbicide.	Use to control woody and herbaceous broadleaf plants (e.g. tree-of-heaven). Has little or no impact on grasses. Product(s) has been approved for aquatic environments and can be used when surface water is present.

* Though imazapyr in general, can be used as pre-emergent herbicides, this treatment method would not be used for Alternative 2. As noted earlier, no herbicide would be used as a pre-emergent.

Treatment Areas

For analysis purposes, the project area has been divided into fourteen branches and maximum treatment acres and miles have been included in the project design. The branches include Morris Reservoir, San Gabriel Reservoir, West Fork, San Gabriel Wilderness, North Fork, East Fork, Heaton Flats, Heaton Flats-Sheep Mountain Wilderness, Cattle Canyon, Cattle Canyon-Sheep Mountain Wilderness, South Dalton, Big Dalton Reservoir, San Dimas, and Headwaters in Forest. Table 5 shows these branches and the total miles and acres in each branch. Figure 1, Project Area Map, shows the branches within the project area. In general, the proposed action would cap the maximum treatment of the invasive plant species populations and future expansions of these species to 200 miles and/or 4,100 acres annually, depending on funding and staffing.

Table 5. Distances (in miles) and acres by branch name.

Branch Name	Total Acres by Branch	Total Miles by Branch
San Gabriel Drainage		
Morris Reservoir	1,100	23
San Gabriel Reservoir	1,190	16
West Fork	2,690	64
San Gabriel Wilderness	4,720	123

Branch Name	Total Acres by Branch	Total Miles by Branch
North Fork	2,740	40
East Fork	820	24
Heaton Flats	310	7
Heaton Flats-Sheep Mountain Wilderness	3,970	88
Cattle Canyon	370	8
Cattle Canyon-Sheep Mnt Wilderness	1,210	34
Dalton Drainage		
South Dalton	290	13
Big Dalton Reservoir	260	11
San Dimas Drainage		
San Dimas	1,150	40
Headwaters in Forest		
Headwaters in Forest	830	35
TOTAL	**21,650 acres**	**526 miles**

It is likely many of these areas would need multiple treatments to eradicate the invasive species from that site. It is anticipated 95 percent of the treatment acres would need reentry for additional treatment annually 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.

Treatment Priorities and Maximum Annual Miles/Acres of Treatment by Branch

Table 5 provides the estimated amount (miles and acres) of invasive plants anticipated to occur by priority of treatment within each branch and the maximum annual treatment miles and/or acres (by treatment type) within each branch. The bottom row provides a total by each category. As noted earlier, high priority species are arundo, tamarisk, and tree-of-heaven. In table 6, moderate (and low) priority species are divided into woody and forb invasive plant species. It is assumed, with the successful treatment of the invasive plants, the maximum annual treatment acres would decrease over the life of the project, depending on funding.

Table 6. Summary of maximum annual treatment by branch and species.

BRANCH NAME (drainage; project miles; acres; % of overlap[10])	Treatment type[11]	Arundo		Tamarisk		Tree-of-Heaven		Woody Invasives		Forb Invasives	
		Approx. Infestation Size in miles/ acres[12]	Maximum miles/ acres treated/ year[13]	Approx. Infestation Size in miles/ acres[11]	Maximum miles/ acres treated/ year[12]	Approx. Infestation Size in miles/ acres[11]	Maximum miles/ acres treated/ year[12]	Approx. Infestation Size in miles/ acres[11]	Maximum miles/ acres treated/ year[12]	Approx. Infestation Size in miles/ acres[11]	Maximum miles/ acres treated/ year[12]
Morris Reservoir (San Gabriel; 23 mi; 1100 ac; 85%)	Herbicide	2/1	0	4/300	<1/50	/1	/<1	7/200	1/20	7/200	4/100
	Combination herbicide/hand/mech-anical treatments		2/1		3/200		/<1		5/150		<1/25
	Hand treatment		0		<1/50		/<1		1/30		2.5/75
San Gabriel Reservoir (San Gabriel; 16 mi; 1190 ac; 85%)	Herbicide	3/1	0	3.5/300	<1/50	/1	/<1	3.5/200	<1/20	3.5/200	2.25/100
	Combination herbicide/hand/mech-anical treatments		3/1		2.5/200		/<1		2.5/150		<1/25
	Hand treatment		0		<1/50		/<1		<1/30		1/75
West Fork (San Gabriel; 64 mi 2690 ac; 5%)	Herbicide	<1/1	0	0	0	0	0	3/100	/2	3/100	/2
	Combination herbicide/hand/mech-anical treatments		<1/1		0		0		/8		/8
	Hand treatment		0		0		0		/90		/<90
San Gabriel Wilderness (San Gabriel; 123 mi; 4720 ac; 100%)	Herbicide	0	0	0	0	0	0	<1/20	<1/5	1/20	<1/10
	Combination herbicide/hand/mech-anical treatments		0		0		0		<1/10		<1/5
	Hand treatment		0		0		0		<1/5		<1/5

[10] Percentage of overlap is the percentage of acres/miles in which 2 or more of the 5 invasive plant categories overlap within the infestation (e.g. 85% of the total acres within the Morris Reservoir Branch overlap and 15% of the infestation area has only one invasive plant category). Overall, overlap of invasive plant categories is estimated at approximately 85%.

[11] Biological control and fire wilting methods during this 15-year period would likely be minimal.

[12] Infestation areas are estimates based on local knowledge of the area.

[13] Should new infestations be found where none presently occur, a maximum of one mile annually (per branch) would be treated and is incorporated into this analysis. Acres and miles of proposed treatment can cover vast areas with wide dispersal of invasive plants (e.g. heavy densities to very sparse densities of invasive plant species)

BRANCH NAME (drainage; project miles; acres; % of overlap[14])	Treatment type[15]	Arundo		Tamarisk		Tree-of-Heaven		Woody Invasives		Forb Invasives	
		Approx. Infestation Size in miles/ acres[16]	Maximum miles/ acres treated/ year[17]	Approx. Infestation Size in miles/ acres[15]	Maximum miles/ acres treated/ year[16]	Approx. Infestation Size in miles/ acres[15]	Maximum miles/ acres treated/ year[16]	Approx. Infestation Size in miles/ acres[15]	Maximum miles/ acres treated/ year[16]	Approx. Infestation Size in miles/ acres[15]	Maximum miles/ acres treated/ year[16]
North Fork (San Gabriel; 40 mi; 2740 ac; 90%)	herbicide	/5	/1	/5	/1	1.5/5	<1/1	22/300	2/50	22/300	15/175
	Combination herbicide/hand/mechanical treatments		/4		/3		1.25/3		18/200		1/25
	Hand treatment		0		/1		<1/1		2/50		6/100
East Fork (San Gabriel; 24 mi; 820 ac; 95%)	herbicide	/5	/1	3/100	<1/25	0	0	3/200	<1/50	3/300	1.5/175
	Combination herbicide/hand/mechanical treatments		/4		2/50		0		1.5/100		<1/25
	Hand treatment		0		<1/25		0		<1/50		1/100
Heaton Flats (San Gabriel; 7 mi; 310 ac; 95%)	herbicide	0	0	3/150	<1/25	0	0	3/100	<1/25	3/100	1.5/50
	Combination herbicide/hand/mechanical treatments		0		1.5/75		0		1.5/50		<1/10
	Hand treatment		0		1/50		0		<1/25		1.25/40
Heaton Flats-Sheep Mountain Wilderness (San Gabriel; 88 mi; 3970 ac; 95%)	herbicide	0	0	34/500	10/150	0	0	15/200	3.5/50	15/200	9/125
	Combination herbicide/hand/mechanical treatments		0		17/250		0		8/100		<1/10
	Hand treatment		0		7/100		0		3.5/50		5.5/65

Should new infestations be found where none presently occur, a maximum of one mile annually (per branch) would be treated and is incorporated into this analysis. Acres and miles of proposed treatment can cover vast areas with wide dispersal of invasive plants (e.g. heavy densities to very sparse densities of invasive plant species)
stimated at approximately 85%.

[15] Biological control and fire wilting methods during this 15-year period would likely be minimal.

[16] Infestation areas are estimates based on local knowledge of the area.

[17] Should new infestations be found where none presently occur, a maximum of one mile annually (per branch) would be treated and is incorporated into this analysis. Acres and miles of proposed treatment can cover vast areas with wide dispersal of invasive plants (e.g. heavy densities to very sparse densities of invasive plant species)

BRANCH NAME (drainage; project miles; acres; % of overlap[18])	Treatment type[19]	Arundo		Tamarisk		Tree-of-Heaven		Woody Invasives		Forb Invasives	
		Approx. Infesta-tion Size in miles/ acres[20]	Maximum miles/ acres treated/ year[21]	Approx. Infesta-tion Size in miles/ acres[19]	Maximum miles/ acres treated/ year[20]	Approx. Infesta-tion Size in miles/ acres[19]	Maximum miles/ acres treated/ year[20]	Approx. Infesta-tion Size in miles/ acres[19]	Maximum miles/ acres treated/ year[20]	Approx. Infesta-tion Size in miles/ acres[19]	Maximum miles/ acres treated/ year[20]
Cattle Canyon (San Gabriel; 8 mi; 370 ac; 95%)	herbicide	0	0	2.5/125	<1/25	0	0	2.5/75	<1/25	2.5/75	1.5/50
	Combination herbicide/hand/mechanical treatments		0		1.5/75		0		1/25		<1/5
	Hand treatment		0		<1/25		0		<1/25		<1//20
Cattle Canyon-Sheep Mnt Wilderness (San Gabriel; 34 mi; 1210 ac; 95%)	herbicide	0	0	13/300	1/50	0	0	5/75	1.5/25	5/75	3/50
	Combination herbicide/hand/mechanical treatments		0		11.5/225		0		1.5/25		<1/5
	Hand treatment		0		<1/25		0		2/25		1.5/20
South Dalton (Dalton; 13 mi; 290 ac; 5%)	herbicide	1/100	0	4/20	1/5	/1	/<1	3/100	/25	3/100	/25
	Combination herbicide/hand/mechanical treatments		1/100		2/10		/<1		/25		/25
	Hand treatment		0		1/5		/<1		/50		/50
Big Dalton Reservoir (Dalton; 11 mi; 260 ac; 75%)	herbicide	<1/1	0	1/20	<1/5	/5	/1	5.5/100	1.5/25	5.5/100	3/60
	Combination herbicide/hand/mechanical treatments		<1/<1		<1/10		/3		3/55		1/10
	Hand treatment		0		<1/5		/1		1/20		1.5/30

[18] Percentage of overlap is the percentage of acres/miles in which 2 or more of the 5 invasive plant categories overlap within the infestation (e.g. 85% of the total acres within the Morris Reservoir Branch overlap and 15% of the infestation area has only one invasive plant category). Overall, overlap of invasive plant categories is estimated at approximately 85%.

[19] Biological control and fire wilting methods during this 15-year period would likely be minimal.

[20] Infestation areas are estimates based on local knowledge of the area.

[21] Should new infestations be found where none presently occur, a maximum of one mile annually (per branch) would be treated and is incorporated into this analysis. Acres and miles of proposed treatment can cover vast areas with wide dispersal of invasive plants (e.g. heavy densities to very sparse densities of invasive plant species)

BRANCH NAME (drainage; project miles; acres; % of overlap[22])	Treatment type[23]	Arundo		Tamarisk		Tree-of-Heaven		Woody Invasives		Forb Invasives	
		Approx. Infestation Size in miles/ acres[24]	Maximum miles/ acres treated/ year[25]	Approx. Infestation Size in miles/ acres[23]	Maximum miles/ acres treated/ year[24]	Approx. Infestation Size in miles/ acres[23]	Maximum miles/ acres treated/ year[24]	Approx. Infestation Size in miles/ acres[23]	Maximum miles/ acres treated/ year[24]	Approx. Infestation Size in miles/ acres[23]	Maximum miles/ acres treated/ year[24]
San Dimas (San Dimas; 40 mi; 1155 ac; 60%)	herbicide	1/100	0	2/40	<1/10	1.5/5	<1/1	25/300	4.5/50	25/300	16/200
	Combination herbicide/hand/mechanical treatments		1/100		1/20		1/3		16/200		4/40
	Hand treatment		0		<1/10		<1/1		4.5/50		5/60
Headwaters in Forest (misc. 35 mi; 830 ac; 95%)	herbicide	/1	0	/5	0	/5	/1	10/20	2/5	10/20	5/10
	Combination herbicide/hand/mechanical treatments		/1		/5		/3		5/10		1.5/3
	Hand treatment		0		0		/1		3/5		3.5/7
TOTALS (526 mi; 21650 ac;	**herbicide**	**<12/ 215**	**0**	**72/1865**	**16/ 395**	**8/23**	**<1/9**	**108.5/ 1990**	**19/375**	**108.5/ 1990**	**65/1132**
	Combination herbicide/hand/mechanical treatments		**<12/ 215**		**43/ 1115**		**3/14**		**64/1108**		**11/266**
	Hand treatment		**0**		**12/ 345**		**<1/3**		**20/420**		**27/737**

[22] Percentage of overlap is the percentage of acres/miles in which 2 or more of the 5 invasive plant categories overlap within the infestation (e.g. 85% of the total acres within the Morris Reservoir Branch overlap and 15% of the infestation area has only one invasive plant category). Overall, overlap of invasive plant categories is estimated at approximately 85%.

[23] Biological control and fire wilting methods during this 15-year period would likely be minimal.

[24] Infestation areas are estimates based on local knowledge of the area.

[25] Should new infestations be found where none presently occur, a maximum of one mile annually (per branch) would be treated and is incorporated into this analysis. Acres and miles of proposed treatment can cover vast areas with wide dispersal of invasive plants (e.g. heavy densities to very sparse densities of invasive plant species)

Restoration

To ensure treated areas are not re-established with invasive plant species, 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). Treatment areas with 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 could decrease slope stability.

Where invasive plant treatment occurs in the high water areas 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 have been eliminated or 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 modifies disturbance regimes, where the existing disturbance regime may be facilitating perpetuation of a specific species. This strategy could be useful with species like tamarisk that were observed in large numbers in the 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.

Plant and Seed Sources

All propagules for cuttings and seed shall be collected from the local genetic sources in the area. For widespread herbaceous species that are more likely to be genetically homogeneous, seed collection areas may include a broader geographic range. No commercial seed would be accepted unless the collection source is local to the project area and must be certified to be free of noxious weeds.

Willows and mulefat would be harvested as cuttings from existing plants under the direction and supervision of the Forest botanist, or designee, outside of the migratory bird nesting season (March to September). If the harvesting of cuttings is necessary during the nesting season, cuttings would be

harvested under the supervision of a District resource staff from a location at least 300 feet from any nesting special status birds. Willow cuttings would not be taken from habitat that is currently suitable for least Bell's vireo or southwestern willow flycatcher. Cuttings would be taken in such a manner as to not adversely affect the source plants.

The following guidelines may be used when collecting willow and mulefat cuttings:

- Collect the cuttings within 24 hours of anticipated planting. All cuttings shall be placed (the entire cutting) in water until planting time. Cuttings that are allowed to dry out shall not be used.
- Take cuttings only from healthy, vigorous plants that are in a dormant state.
- Do not collect from more than 25 percent of the plants in a given area and do not remove more than 25 percent of any individual plant.
- Cuttings shall be approximately 24 to 48 inches in length and would range from 0.5 to 1.0 inch in diameter. Cut the top of each cutting square above a leaf bud and cut the base below the node at an angle of approximately 45 degrees. Use only clean, sharp tools.
- Trim all leaves and branches from the cuttings flush with the stem.
- The cuttings would be harvested in quantity based on the type of habitat impacted and the area impacted through coordination with the Forest botanist. In some cases, cuttings may be rooted prior to planting to enhance planting success.

Active Restoration Activities

Seeding. Before broadcasting, the seed would be mixed with a seed dispersal agent such as rice hulls, bran, or some other acceptable medium that would aid in good seed dispersal and coverage. After evenly broadcasting the seed at the specified rate, the seed would be lightly raked into the soil surface to ensure good seed contact with the soil.

Container Plants. All plants shall be in a healthy growing condition and shall have good vigor, fully developed roots filling the container but showing no tendency toward being rootbound, and a good root-to-shoot ratio (approximately 2:1).

Spacing of the container plants would be no greater than eight feet on center and would be dependent on species planted. The Forest botanist would be consulted on appropriate spacing based on species and location. The plantings shall be spaced in natural-looking patterns to replicate the character of adjacent natural communities, with consideration for the microclimate requirements for each species. To add in monitoring success, pinflags could be used on subpopulation of the plantings.

All container plants may be planted in accordance with the following:

- All planting holes shall have vertical sides with roughened surfaces, and be one and one-half (1.5) times the diameter and twice the depth of the plant's container.
- Any roots wrapped around the sides of the containers shall be pulled loose from the root balls.
- Plants shall be planted with the roots untangled and laid out in the planting holes to promote good root growth and prevent the plants from becoming root bound.
- Roots shall be adequately protected at all times from the sun and/or drying winds.
- Plantings should occur when soil moisture is high (soil remains in a ball when squeezed together) or just before a predicted storm. If possible, after excavation and before planting, the planting holes shall be filled approximately half full with water, backfilled with thoroughly broken up native topsoil, and then completely filled with water to avoid soil

settling after plantings. Holes shall be allowed to drain thoroughly between fillings to reduce settling.

- Plants shall be set in the thoroughly drained planting holes so that the crowns of the root balls are 0.5 inch above finished grade when backfilled with soil. The crowns of the plants shall not be depressed below the surface grade.
- A watering basin 24 inches in diameter shall be constructed around each plant. The basin shall be constructed by creating a berm above grade. The soil inside and outside of the basin shall be at the same level. The basin shall not be a depression in the soil.
- If soil is not saturated and/or rainfall is not imminent, each plant shall be individually watered at the time of planting with sufficient water to reach the lower roots. Special care must be taken to prevent the soil from washing away from the roots and the root crown from being buried with soil.

Cuttings. Willow and mulefat cuttings may be installed according to the following specifications:

- A rooting hormone shall be applied to the base of each cutting prior to planting, in accordance with the manufacturer's instructions.
- Cuttings shall be planted in holes approximately 2 inches in diameter, with a minimum depth of 12 inches or a planting wedge made from a planting spade (e.g. hoedad). All planting holes shall have vertical sides with roughened surfaces.
- Each planting hole shall be filled with water, and the water would be allowed to absorb into the surrounding ground. Once the water has completely drained or been absorbed, the settled soil in the bottom of the planting hole should not be disturbed. This watering process shall be repeated once.
    - When most of the second application of water has soaked into the ground, a cutting shall be inserted into the hole with the angled end in the ground. The base of the cutting shall be a minimum of 12 inches deep and shall have three to five bud scars exposed aboveground.
- The hole shall be backfilled with excavated material. The material shall be distributed evenly throughout, without clods or air pockets, and filled in without damaging the bark of the cutting.
- The backfill shall be tamped down sufficiently to prevent easy removal of the cutting and to eliminate all air pockets.
- Immediately following installation, each cutting shall be deep-soaked twice with sufficient water to assist in settling the cutting.

Mulching. Weed-free straw or other mulching may be applied.

Timing

Depending on the restoration strategy, initiation of active restoration activities shall begin shortly after invasive plant treatment is completed, depending on the time of year. For those portions of the project that were treated and determined to need active restoration activities, they would receive restoration activities (i.e., seeding, planting) during the next planting season (i.e., September 1 to January1) after treatment subject to the availability of seed, plant material, and whether there would be a need to retreat for invasives. The timing of seeding or planting would be adjusted based on the seasonal weather patterns to increase the availability of water to these treatment areas.

The goal is to have all plant and seed installation occur before the rainy season. Actual initiation of revegetation may be delayed if precipitation appears to be inadequate.

Seeding shall occur immediately following installation of container plants (if planted) or after site preparation activities are completed (if no container plants are to be planted).

Fertilization

No chemical fertilizers shall be used within the restoration areas unless they are deemed potentially required as a remedial action and specified by the Forest Botanist or designee.

Maintenance

In most cases, plantings and germination of the seeded species would rely on natural rainfall. Maintenance to have successful restoration could include re-treatment of invasive plants, reseeding, replanting, and/or mulching. In some cases, watering of container stock the first season could be required.

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 in the Experimental Forest would occur to determine if the treatments have direct and or indirect adverse effects to on-going experiments that were unanticipated. If the effects are found to have, or potentially have, unacceptable impacts to such experiments, treatment in these areas would stop and only continue if the effects could be reduced to a level that is acceptable to the Experimental Forest Manager.

Monitoring would also 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; USFS 1994b).

All surveys and monitoring would be documented in the project files. There would be two main types of monitoring: implementation monitoring and effectiveness monitoring. Purposed 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 compliment data already compiled for FACTS and NRIS databases. Additional details are provided in the draft Monitoring Plan (appendix D) in this document.

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. Helicopters may be used for transportation in remote areas where access is difficult.

Alternative 3, No Herbicides

Alternative 3 was developed in response to a comment received during scoping. The individual was concerned that herbicides could have an adverse effect on aquatic organisms, humans, and animals in general. In addition, it is known by the Forest tribal relations program manager that Native American traditionalists generally do not like the use of herbicide treatments on national forest lands. The alternative is being considered in detail because it is a reasonable alternative to the proposed action, could possibly fulfill the purpose and need (dependent on staffing and funding), and addresses

unresolved conflicts related to the proposed action. This alternative would be similar to Alternative 2, Proposed Action, but would remove herbicides as an option from the treatment methods.

More 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 tamarisk and pockets of tree-of-heaven, and return treatments could be for the life of the project and beyond. Some species would likely need multiple treatments in one growing season for the larger sized invasive plants that have large root/rhizome structures (e.g. arundo, Himalayan blackberry). The number of entries in one growing season would depend on the size of the root/rhizome structures with the intent of weakening the plants root/rhizome structure to cause eventual death. 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).

This alternative 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 high priority invasive plants (i.e., arundo, tamarisk, and tree-of-heaven), the moderate/low priority invasive plants (i.e., 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 and miles treated (not including the need for multiple entries) would be reduced to 2,900 acres or 92 miles annually. Table 7 provides an estimate of the maximum treatment annually by branch. As with 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 decsion. Should the decision be to implement alternative 3, this plan would be modified appropriately.

Table 7. Maximum annual treatment by branch and invasive plant species/type

BRANCH NAME (drainage; project miles; acres; % of overlap[26])	Treatment type[27]	Arundo		Tamarisk		Tree-of-Heaven		Woody Invasives		Forb Invasives	
		Approx Infesta-tion Size in miles/ acres	Maximum miles/ acres treated/ year[28]	Approx. Infesta-tion Size in miles/ acres	Maximum miles/ acres treated/ year[27]	Approx. Infesta-tion Size in miles/ acres	Maximum miles/ acres treated/ year[27]	Approx. Infesta-tion Size in miles/ acres	Maximum miles/ acres treated/ year[27]	Approx Infesta-tion Size in miles/ acres5	Maximum miles/ acres treated/ year[27]
Morris Reservoir (San Gabriel; 23 mi; 1100 ac; 85%)	Combination hand/mechanical treatments	2/1	2/1	4/300	4/300	/1	/1	7/200	/50	7/200	/35
San Gabriel Reservoir (San Gabriel; 16 mi; 1190 ac; 85%)	Combination hand/mechanical treatments	3/1	3/1	3.5/300	3.5/300	/1	/1	3.5/200	/50	3.5/200	/35
West Fork (San Gabriel; 64 mi 2690 ac; 5%)	Combination hand/mechanical treatments	<1/1	<1/1	0	0	0	0	3/100	/70	3/100	/70
San Gabriel Wilderness	Combination hand/mechan-ical treatments	0	0	0	0	0	0	<1/20	0	<1/20	0
North Fork (San Gabriel; 40 mi; 2740 ac; 90%)	Combination hand/mechan-ical treatments	/5	/5	/5	/5	1.5/5	1.5/5	22/300	/70	22/300	/45
East Fork (San Gabriel; 24 mi; 820 ac; 95%)	Combination hand/mechan-ical treatments	/5	/5	3/100	3/100	0	0	3/200	/125	3/300	/60

[26] Percentage of overlap is the percentage of acres/miles in which 2 or more of the 5 invasive plant categories overlap within the infestation (e.g. 85% of the total acres within the Morris Reservoir Branch overlap and 15% of the infestation area has only one invasive plant category). Overall, overlap of invasive plant categories is estimated at approximately 85%.

[27] Biological and fire wilting methods during this 15 year period would likely be minimal.

[28] Should new infestations be found where none presently occur, a maximum of one mile annually (per branch) would be treated and is incorporated into this analysis. Acres and miles of proposed treatment can cover vast areas with wide dispersal of invasive plants (e.g. heavy densities to very sparse densities of invasive plant species)

BRANCH NAME (drainage; project miles; acres; % of overlap[29])	Treatment type[30]	Arundo		Tamarisk		Tree-of-Heaven		Woody Invasives		Forb Invasives	
		Approx. Infesta-tion Size in miles/ acres	Maximum miles/ acres treated/ year[31]	Approx. Infesta-tion Size in miles/ acres	Maximum miles/ acres treated/ year[30]	Approx. Infesta-tion Size in miles/ acres	Maximum miles/ acres treated/ year[30]	Approx. Infestat-ion Size in miles/ acres	Maximum miles/ acres treated/ year	Approx. Infesta-tion Size in miles/ acres	Maximum miles/ acres treated/ year
Heaton Flats (San Gabriel; 7 mi; 310 ac; 95%)	Combination hand/mech-anical treatments	0	0	3/150	3/150	0	0	3/100	/95	3/100	/75
Heaton Flats-Sheep Mountain Wilderness (San Gabriel; 88 mi; 3970 ac; 95%)	Combination hand/mech-anical treatments	0	0	34/500	34/500	0	0	15/200	/50	15/200	/20
Cattle Canyon (San Gabriel; 8 mi; 370 ac; 95%)	Combination hand/mech-anical treatments	0	0	2.5/125	2.5/125	0	0	2.5/75	/25	2.5/75	/15
Cattle Canyon-Sheep Mnt Wilderness (San Gabriel; 34 mi; 1210 ac; 95%)	Combination hand/mech-anical treatments	0	0	13/300	13/300	0	0	5/75	/20	5/75	/5

[29] Percentage of overlap is the percentage of acres/miles in which 2 or more of the 5 invasive plant categories overlap within the infestation (e.g. 85% of the total acres within the Morris Reservoir Branch overlap and 15% of the infestation area has only one invasive plant category). Overall, overlap of invasive plant categories is estimated at approximately 85%.

[30] Biological and fire wilting methods during this 15 year period would likely be minimal.

[31] Should new infestations be found where none presently occur, a maximum of one mile annually (per branch) would be treated and is incorporated into this analysis. Acres and miles of proposed treatment can cover vast areas with wide dispersal of invasive plants (e.g. heavy densities to very sparse densities of invasive plant species)

BRANCH NAME (drainage; project miles; acres; % of overlap[32])	Treatment type[33]	Arundo		Tamarisk		Tree-of-Heaven		Woody Invasives		Forb Invasives	
		Approx. Infesta-tion Size in miles/ acres	Maximum miles/ acres treated/ year	Approx. Infesta-tion Size in miles/ acres	Maximum miles/ acres treated/ year	Approx. Infesta-tion Size in miles/ acres	Maximu m miles/ acres treated/ year	Approx. Infestat-ion Size in miles/ acres	Maximu m miles/ acres treated/ year	Approx . Infesta-tion Size in miles/ acres	Maximu m miles/ acres treated/ year
South Dalton (Dalton; 13 mi; 290 ac; 5%)	Combination hand/mechan-ical treatments	1/100	1/100	4/20	4/20	/1	/1	3/100	/25	3/100	/20
Big Dalton Reservoir (Dalton; 11 mi; 260 ac; 75%)	Combination hand/mechan-ical treatments	<1/<1	<1/<1	1/20	1/20	/5	/5	5.5/100	/30	5.5/100	/25
San Dimas (San Dimas; 40 mi; 1155 ac; 60%)	Combination hand/mechan-ical treatments	1/100	1/100	2/40	2/40	1.5/5	1.5/5	25/300	/150	25/300	/95
Headwater s in Forest (misc. 35 mi; 830 ac; 95%)	Combination hand/mechan-ical treatments	/1	/1	/5	/5	/5	/5	10/20	/5	10/20	/2
TOTALS (526 mi; 21650 ac)	**Combination hand/mechani-cal treatments**	**12/ 215**	**12/ 215**	**72/1865**	**72/ 1865**	**8/23**	**8/23**	**108.5/ 1990**	**/770**	**108.5/ 1990**	**/505**

[32] Percentage of overlap is the percentage of acres/miles in which 2 or more of the 5 invasive plant categories overlap within the infestation (e.g. 85% of the total acres within the Morris Reservoir Branch overlap and 15% of the infestation area has only one invasive plant category). Overall, overlap of invasive plant categories is estimated at approximately 85%.

[33] Biological and fire wilting methods during this 15 year period would likely be minimal.

Design Features

The following design features (protection/mitigation measures) were designed to reduce potential adverse affects 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 1994b), Pesticide-Use Management and Coordination and Handbook (FSH) 2109.14, and Pesticide-Use Management and Coordination Handbook (USFS 1994a). 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).
    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.
    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[34]).
    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.
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) Herbicides will not be applied when winds are greater than 10 miles per hour (mph) if label instructions do not address wind speed or allow application during higher wind velocities.

[34] Best Management Practices can be found on the internet at http://www.fs.fed.us/r5/publications/water_resources/waterquality/

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.

3. 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®)[35] will be allowed within 100 feet of the banks of rivers and tributaries.

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, 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 areas in which members of the general public might consume vegetation/fruit where herbicides are intended to be used, the edible vegetation/fruit will be cut prior to being treated with herbicide. The intent is to reduce the risk of the public consuming herbicide treated vegetation/fruit.
7. Triclopyr, should be the lowest priority herbicides applied. Triclopyr will only be used if the other approved herbicides are not effective in treating a specific invasive plant.

Biology Resources

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

8. No foliar or spot spraying will be allowed within 70 feet of threatened, endangered, proposed and candidate plant species; non-foliar and non-spot herbicide treatments (e.g. hack and squirt, cut stump) will be allowed no closer than 25 feet of these species if application rates are equal or lower than those levels known as on No Observed Effect Concentration (NOEC).[36] All Forest Service sensitive plants will have a 5 to 70-foot buffer. The buffer size will be determined based on: phenology at time of treatment; rareness and imperilment of species; vulnerability to herbicide being used; the concentration of herbicide used based on NOEC; and/or environmental conditions and terrain. Prior to project implementation, the Forest Botanist will review all information, including any new information, and develop buffers that will minimize effect to Forest Service sensitive plant species to negligible or minor. As an example, a treatment area using glyphosate near geophytes, such as slender mariposa lily that has gone to seed, does not need as large a buffer compared with a treatment area using triclopyr near a perennial shrub such as San Gabriel manzanita.

Table 8. NOEC application rates observed in terrestrial plants during field trials.[37]

Herbicide	NOEC application rates
Aminopyralid	0.0008 lb/acre (soybean)

[35] R-11 surfactant has a higher risk of adversely affecting aquatic wildlife species.

[36] NOEC is defined as no biologically or stratistically signifcant effects are attributable to treatment (SERA 2007)

[37] Application rates for NOEC are from SERA risk assessments given for most sensitive species at most sensitive stage (seedling, vegetative) during trials. Values are given for post emergence assays.

Herbicide	NOEC application rates
Glyphosate	0.035 lb/acre,
Triclopyr	TEA and BEE 0.0041 lb/acre
Chlorosulphuron	0.0000088 lb/acre (onion and sugarbeet)
Imazapyr	0.00049 lb/acre (beets)

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

9. In Santa Ana sucker, Santa Ana speckled dace and arroyo chub occupied habitat, herbicide treatment within 25 feet of the streambank will be restricted from March 1 to September 1 (typical spawning period). This restriction period may vary if spawning is observed later in the season for these fish species. In no case, shall herbicide drift be allowed to enter adjacent waters in these areas during these times. At all times in occupied habitat, Glyphosate application rates will not exceed 2 pounds a.e. per acre within 100 feet of the stream if surface water is present.

Hydrology Resource

10. 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.

Alternatives 2 and 3 Design Features

Design features were developed to decrease potential adverse impacts 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

11. Ground disturbance will be limited to the absolute minimum necessary for effective treatments (Forest Plan, part 2, p. 100; USFS 2005).
12. An annual pre-operations briefing will be required prior to treatment between the project manager and personnel implementing the project. 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) will be emphasized with the use of all herbicides, especially for woman 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.
13. 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 within the defined work area only in these resource sensitive areas.

14. To maintain water quality, small quantities (5 gallons or less) of fuel for gas-powered machinery will not occur 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-approved by a Forest Service hydrologist or biologist.
15. Biological control agents are permitted when their introductions will have no greater than minor adverse effects on the native plant and animal communities.

Biology Resources

Special Status Wildlife and Plant Species

16. 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[38] plant species, surveys will be conducted following a season with adequate precipitation to stimulate germination/flowering. If any specially listed plant species are present, protective measures may include, but are not limited to the following: flag and avoid; relocation; seasonal restrictions; or treatment methods will be designed to eliminate or minimize negative impacts.
17. Prior to treatment, habitat surveys will be conducted by a qualified wildlife biologist to determine whether habitat for threatened, endangered or sensitive wildlife species is present in the treatment area. If suitable habitat is found, protective measures may include, but are not limited to, the following: flag and avoid; seasonal restrictions; or treatment methods will be designed to eliminate or minimize negative impacts.
18. 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 during the breeding season (vireo March 15 to September 15 and flycatcher May 1 to August 31). If the removal of invasive plants from the suitable habitat will render the habitat unsuitable for a period of time, additional consultation with the US Fish and Wildlife Service (USFWS) will be required prior to treatment. If protocol surveys are conducted and confirm the species is not present, work can be implemented during the restricted period. To allow for this clearance, protocol surveys are required on an annual basis when work is occurring in these habitat areas.
19. Treatments in known occupied mountain yellow-legged frog areas will be limited to hand pulling during the non-breeding season (July to February). In areas that are known to be occupied by mountain yellow-legged frogs, 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 problems. Treatment of boots and equipment would be cleaning with a 10 percent bleach solution and completely drying the equipment/boots before use.
20. Seasonal restrictions on mechanical/manual treatments are not needed for occupied habitat for Santa Ana sucker, Santa Ana speckled dace and arroyo chub. However, during the spawning season, project personnel should avoid entering the stream, except for necessary crossings to access treatment areas, during the spawning season.
21. 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, may require additional analysis, and consultation with USFWS may be reinitiated.
22. Conduct on-site environmental training to aid workers in recognizing and avoiding special status species that may occur in the project area.

[38] A geophyte is an herbaceous plant with an underground storage organ. Storage organs are reserves of carbohydrates, nutrients, and water, and may be classified as bulbs, corms, tubers, rhizomes, tuberous roots, and enlarged hypocotyls.

23. If any unanticipated federally listed/protected or 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 appropriate action.
24. 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.
25. Biological control agents will not be allowed if they are known to target the genus of any special status plant species.
26. 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.
27. 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.
28. 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 Species

29. 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 container then pull the plant, and place in an appropriate container for disposal.
30. 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.
31. 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 project manager and Forest Botanist on a weekly basis.
32. Certified weed-free mulches (or rice straw and mulch) and local weed-free seed sources will be used in restoration or soil stabilization efforts (Forest Plan S6, part 3, p. 5; USFS 2005).

33. Efforts will be made to insure that seeds and/or vegetative propagules[39] of invasive plants will be removed from clothing and equipment prior to leaving treatment sites.
34. Transport of removed invasive plants with seeds or vegetative propagules will occur in enclosed disposal containers or in an enclosed vehicle.
35. Invasive plants to be disposed of off-site will be taken to a facility (i.e., landfill) that contains the disposed items.
36. 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.
37. All staging, parking, and burn pile areas will be located outside of noxious plant occurrences.
38. 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

39. 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.
40. To avoid attracting opportunistic predators, such as 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.
41. 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 District 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.
42. In sensitive amphibian areas, vehicles and equipment will be parked or removed from the habitat before sunset.
43. 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.
44. 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).
45. Pets shall not be allowed on-site unless properly restrained and approved by the Responsible Official.

Hydrology Resource

46. 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) Hand crews will stay out of flowing or ponded water whenever possible.
    b) If hand removal of invasive plants requires entry into flowing or ponded water, keep the time in the water to a minimum.

[39] A propagule is a structure (as a cutting, a seed, or a spore) that reproduces a plant sexually or asexually.

Special Land Designations

Wilderness Areas

47. District Ranger will recommend to the Regional Forester for approval 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 resource and wilderness resource concerns.
48. 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.
49. Prior to project implementation, the wilderness ranger and wilderness volunteers will be sufficiently trained to identify the most aggressive invasive species (e.g. tamarisk, arundo, tree-of-heaven, castorbean) and other species the Forest 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.
50. The Wilderness Ranger will be periodically consulted during the implementation of this project and will be adequately informed about the approved treatment actions. The Wilderness Ranger, in part, will serve as an observer, educator, and monitor for the implementation project manager.

Research Natural Areas

51. The PSW Station Director will be notified, via the Research Natural Areas Committee, before any eradication work begins within the boundaries of the Fern Canyon or Falls Canyon Research Natural Areas (RNA). The San Dimas Experimental Forest manager also will be notified before work begins in Fern Canyon RNA.
52. Staging of crews or materials will not occur within Research Natural Areas except in areas that are already developed (e.g. existing roadbeds) at the edges of the RNAs. No camping is allowed in Brown's Flat in the Fern Canyon RNA.
53. Minimal disturbance of native vegetation and riparian resources will occur within the RNAs so as to retain their value as undisturbed reference sites.

Special Interest Areas

54. Staging areas and overnight camping related to this project are not permitted within the Mt. Baden-Powell and Mt. San Antonio Special Interest Areas.

Recreation Resource

55. Within areas of concentrated public use and developed recreation sites, implementation of this project will be limited to weekdays and non-holidays (Monday to Friday) during daylight hours. Avoid other heavy use periods such as spring and summer school breaks.
56. Chipping activities will be located at least 500 feet from established recreation facilities during heavy use times. The District Ranger or recreation staff will determine appropriate locations of chipping sites within areas of concentrated public use.
57. Motorized equipment will be equipped with appropriate mufflers and spark arrestors in good working condition to minimize noise levels and fire risks.
58. If practical, treat invasive plants within the designated San Gabriel Off-Highway Vehicle (OHV) area during non-use days.
59. With approval from the District Ranger and if necessary, temporarily close the San Gabriel OHV area to public use to protect the safety of work crews. The closure period will be limited to the minimum time needed to treat the invasive plants or, with alternative 2, the period required in the label instructions, whichever is greater.

60. Work crews driving vehicles within the West Fork of San Gabriel Canyon (West Fork National Scenic Bikeway) will be specifically cautioned about combined bike and hiker use on this road and the need to drive slowly. District employees will monitor potential safety conflicts and act accordingly.
61. 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 District Ranger will monitor potential conflicts and act accordingly.
62. In advance of initiating treatment work, interpretive signing will be placed in developed recreation sites and areas of concentrated public use such as West Fork Trailhead, East Fork Trailhead, Oaks Picnic Area, Heaton Flats, San Gabriel OHV Area and other selected areas along the East Fork of San Gabriel River. 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.
63. 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 District Ranger), 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 such as the East Fork and West Fork Trailheads. Employees should be car pooled from off the Forest where practicable. The District staff will monitor these impacts and the District Ranger will impose further restrictions if necessary.
64. When District Ranger or recreation staff feels 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.
65. Off-highway motorized equipment use will not generally be permitted for implementing this project, except in the San Gabriel OHV Area. On a case by case basis, the appropriate Responsible Official will determine if other exceptions are needed in some special circumstances.

Scenic Resource

66. 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.
67. When lop and scattering large plants, place the material away from established trails or roads.
68. 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

69. In areas where treatment adjoins residential private lands such as in the East Fork of San Gabriel, 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 increased activity and that minimum noise and disturbance measures were considered in these areas.

70. 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

71. 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.
72. 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.
73. Protect the use of known sensitive traditional tribal use areas (Forest Plan S61, part 3, p. 13; USFS 2005).
74. 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.
75. Buffer zones may be established to ensure added protection where the Forest Heritage Program Manager or other professional archaeologist determines that they are necessary.
76. 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.
77. Heritage resource monitoring may be used to enhance the effectiveness of protection measures in conjunction with other measures.
78. 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

79. Burn piles will be burned in compliance with Forest approved project specific Prescription Burn Plan(s). No prescribed burning (burn piles) will occur in the wilderness.

Air Quality Resource

80. 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.

81. 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.
82. 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.

Alternatives Considered but Eliminated from Detail 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.

Pre-emergent Herbicides

Pre-emergent herbicides was discussed as an optional treatment method but was eliminated from consideration because the potential adverse effects on native plant species far outweighed any potential benefits.

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. It was determined 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 and as noted above, this method was removed from consideration. 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. Additional information regarding "naturally organic herbicides" can be found in the project file located at the San Gabriel River Ranger District Office.

Removal of Biological Control as a Treatment Method

There are concerns that biological control (biocontrol) agents could have adverse effects to non-targeted species and ecosystems. Biocontrol agents are themselves non-native introductions and in some cases the agents may carry additional non-native parasite and commensal species (Tu et al 2001). Biological control of invasive plants is the deliberate use of natural enemies (i.e., parasites, predators, pathogens) to reduce invasive plant populations. Natural enemies help prevent invasive plants from dominating native habitats. Biocontrol is often viewed as a progressive and environmentally friendly way to control pest organisms because it leaves behind no chemical residues that might have harmful impacts on humans or other organisms, and when successful, it can provide essentially permanent, widespread control with a very favorable cost-benefit ratio (Tu et al. 2001).

All biocontrol agents considered for use in the United States undergo rigorous host-specificity testing. These tests are designed to ensure that introduced biological control agents are limited in host range and do not threaten native, nursery, or crop plants. This testing limits the introduction of organisms

that will not survive or will not affect the target invasive plant, identifies non-target plants likely to become impacted, and examines the host-specificity of organisms closely related to the proposed agent. Testing also ensures that climatic and biotic constraints on the agent are considered.

The removal of this method of treatment was considered but because the use of biocontrols is an important tool in a complete program of Integrated Weed Management it was retained.

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.

Future Herbicides approved through Adaptive Management

Including herbicides that are not listed in the proposed action but could be State approved with Forest Service risk assessments in the future were considered as part of adaptive management but was eliminated from detail analysis. It was decided any new herbicides proposed as a treatment method not analyzed in this document would need to be analyzed with the opportunity for public comment before it/they could be approved for use.

Include San Antonio Drainage in the Project Area

Several individuals asked why San Antonio drainage was not included as part of the project area. It is the only remaining drainage within the District boundaries. District representatives felt the occurrences of invasive plant species are much lower in this drainage and is not as high a risk of adverse effects from invasive plants. Given the likely budget and staff constraints and the risks of invasives in the San Antonio drainage, this area was consciously eliminated from the project area and purpose and need.

Original Proposed Action

The proposed action was revised from when it was first scoped. Two herbicides were removed from consideration: sulfometuron methyl and hexazinone. After further analysis it was determined the remaining five herbicides could be effective for treating all the proposed invasive plants. Sulfometuron methyl and hexazinone were redundant and based on the review of the herbicides, they had potentially greater adverse effects than the comparable herbicides (e.g. glyphosate, imazapyr). Two herbicide backpack spraying methods were added (i.e., spot spraying, basal bark treatment). The intent of adding these herbicide treatment methods is to provide a wide variety of herbicide treatment methods that focus the treatment on target species. In addition, design features were deleted, modified, and/or added based on further analysis of specific resources. Several of the design features were not reducing effects but were ensuring coordination occurred and appropriate approvals were acknowledged. Many of these design features were incorporated into the proposed action description. Additional information was added to the proposed action including tables that provided more project description details. Detailed restoration activities were added to the project description. Since scoping occurred, a draft monitoring plan was developed for this alternative and is noted in appendix D. The original proposed action was removed from further analysis

Comparison of Alternatives

This section provides a summary of the effects of implementing each alternative. Information in table 9 focuses on activities and effects where different levels of effects or outputs can be distinguished quantitatively or qualitatively among alternatives. Detailed information on effects is located in chapter 3 of this document.

Table 9. Comparison of alternatives.

	Alternative 1	Alternative 2	Alternative 3
Treatment Methods	none	biological control manual/mechanical fire wilting and herbicide	biological control manual/mechanical and fire wilting
Maximum Annual Treatment (miles/acres)	0 miles/0 acres	200 miles/4,100 acres	92 miles/2,900 acres
Potential affect on invasive weeds	none	Focus on eradication and control of high and moderate priority species	Focus on control and containment of high priority species
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-low 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 quantity	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 increasing positive experience
Character	adversely impacting natural appearance	no impact or increasing natural appearance	no impact or slightly increasing natural appearance
Research Natural Area (long-term) (maintain unmodified conditions/natural processes)	No	Yes	Partiallly
Recreation Experience			
Short-term	no impact	herbicide use could 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. It also presents the scientific and analytical basis for comparison of alternatives presented in table 9. 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.

The project area lies in the San Gabriel watershed in the San Gabriel Mountains. The San Gabriel Mountains are a 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. There are five dams along its length, three within the project area.

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.

Human Health and Safety[40]

Fire and Fuels

Alternative 1, No Action Alternative

Direct, Indirect and Cumulative Effects

Based on the fuels report for this project,[41] 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

[40] This is a summary of human health and safety analysis. For further and more detailed information, the Human Health and Safety Specialist Report is on file in the project planning record located at the San Gabriel River Ranger District office at 110 N. Wabash Avenue, Glendora, CA 91741.

[41] Fuels Specialist Report for this project is on file in the project record at the San Gabriel River Ranger District office.

of spread. This could indirectly increase the risk to firefighter and public safety that may be in or near these riparian areas. There are no cumulative effects related to fire and fuels from the no action alternative since the no action alternative does not propose any activities.

Alternative 2, Proposed Action and Alternative 3, No Herbicides

Direct, Indirect and Cumulative Effects

Both action alternatives (alternatives 2 and 3) consider tamarisk and arundo as high priority invasive plants to treat. Both plant species are difficult to successfully eradicate without herbicides, but in alternative 3, where no herbicides are proposed, the focus would be on these species at the detriment of treating other invasive plant species. By treating these two high priority invasive plant species for both action alternatives, the natural fire regime of riparian habitat within the project area would be maintained. The likely long-term indirect beneficial effect by treating these plant species will be reducing the risk for high intensity wildfires and rate of wildfire spread in this habitat type; therefore, reducing the health and safety risks for firefighters and public that may be in or near these riparian areas.

For human safety, related to fire and fuels, the cumulative effects spatial boundary is the project area and temporal boundary is the term of the project. Cumulative effects related to fire regime include the existing condition, other vegetation treatments planned, and recent wildfires in the project area boundary. Three fuelbreak treatment/maintenance projects are proposed in the area: Tanbark, Glendora, and Monroe; and two other hazardous fuels projects in the area include Mount Wilson and Crystal Lake. In addition, the Station fire (2009) and Morris fire (2009) burned in portions of the project area. 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. The two recent fires have also reduced the fuels level in the area, further reducing health and safety risks from wildfire in the project area. Cumulatively, these fuels projects and recent fires, along with this project have a beneficial effect to human safety in the project area as it relates to wildfire.

Non-Herbicide Activities

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 due to non-herbicide project activities.

Alternative 2, Proposed Action and Alternative 3, No Herbicides

Direct, Indirect and Cumulative Effects

Impacts to health and safety of workers and public from non-herbicide project activities would be the same for both action alternatives. Non-herbicide treatment methods, 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.

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.

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 proposes 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. There would be no cumulative effects to the public health and safety related to non-herbicide treatment methods, restoration and monitoring activities.

Herbicide Treatment

One of the issues brought up during scoping was the potential human health risks associated with herbicide use. The effects analysis for alternative 2 addresses this issue.

Alternative 1, No Action Alternative and Alternative 3, No Herbicides

Direct, Indirect and Cumulative Effects

No herbicide treatments are proposed with alternatives 1 and 3; therefore, there would be no direct, indirect, or cumulative effects to human health and safety due to herbicide use.

Alternative 2, Proposed Action

Direct and Indirect Effects

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. With herbicide treatment methods proposed for alternative 2, similar worker and public safety risks would exist for field activities, in addition to the handling and use of herbicides. The Forest Service conducts risk assessments independent from US Environmental Protection Agency (EPA) valuations for herbicide registration, focusing specifically on the type of herbicide uses in forestry applications. Forest Service contracted with Syracuse Environmental Research Associates (SERA) to complete risk assessments for all the herbicides proposed for this alternative and they are incorporated by reference.[42] 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. In addition, 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).

Table 10 provides a summary of hazard indicators and toxicity[43] categories for pesticides, in general.

[42] SERA risk assessments can be downloaded at http://www.fs.fed.us/foresthealth/pesticide/risk.shtml.

[43] Toxicity is defined as the degree to which a substance is able to damage an organism

Table 10. Summary of hazard indicators and toxicity categories for pesticides.[44]

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.

Table 11 provides the Signal Word that is determined by the four acute toxicity categories.

Table 11. Signal Word used for each acute toxicity category.[37]

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

Five herbicides are proposed with alternative 2: aminopyralid, chlorsulfuron, glyphosate, imazapyr, and triclopyr. A summary of worker and public health and safety is provided for each herbicide. Detailed information can be found in the Human Health and Safety Specialist Report for this project along with the SERA risk assessments. Specific application rates would vary with site-specific considerations and would stay within the range analyzed.

Aminopyralid

Aminopyralid is registered by the US EPA for the control of invasive plants. The US EPA has judged that aminopyralid is a reduced risk herbicide.[45] It would also be applied at a lower rate when compared with other comparable herbicides.[46] Its residual action should reduce the need for repeat applications, resulting in a reduction in the amount of herbicides applied to the environment for the control of these invasive plants (OPP-EPA 2005a). The full range of the labeled rates (i.e., 0.03 to 0.11 pound of active acid equivalents[47] per acre [lb a.e./acre]) was considered as the lower and upper bounds on application rates in the SERA risk assessment (2007b) with the typical application rate at

[44] Tables 10 and 11 were taken from EPA's website at http://www.epa.gov/oppfead1/labeling/lrm/chap-07.htm

[45] A reduced risk herbicides is an herbicide that pose less risk to human health and the environment than existing conventional alternatives

[46] Comparable herbicides include picloram, clopyralid, 2,4-D, dicamba, monosodium methanearsonate, and metsulfuron methyl.

[47] Acid equivalent (a.e.) is the active part of the acid herbicide being used

0.078 lb a.e./acre or about 5 ounces formulation per acre. As noted in chapter 2, table 3, these rates would be used for this alternative.

Science indicates that aminopyralid has low toxicity via oral (mouth), dermal (skin), and inhalation (breathing) routes of exposure. The toxicity categories for all hazard indicators are IV (OPP-EPA 2005a). The weight-of-evidence suggests that aminopyralid may not have any remarkable systemic toxic effects.[48] The effects that are most commonly seen involve effects on the gastrointestinal tract after oral exposure and these may be viewed as portal of entry[49] effects rather than systemic toxic effects. Aminopyralid is rapidly absorbed and excreted and is not substantially metabolized in mammals.

The SERA risk assessment (2007b), along with US EPA, have determined there is no basis for asserting that aminopyralid is a carcinogen (and US EPA has classified aminopyralid as "not likely" to be carcinogenic to humans [OPP-EPA 2005a]). There is also no basis for asserting that aminopyralid would cause adverse effects on the nervous system, immune system or endocrine function. Based on studies completed on reproduction and development, US EPA concluded that there is no evidence of increased qualitative or quantitative susceptibility of the fetuses to aminopyralid (OPP-EPA 2005).

The Office of Pesticide Programs of the US EPA (US EPA/OPP) has derived a chronic (long-term) reference dose (RfD)[50] of 0.5 milligram of acid equivalent per kilogram body weight per day (mg a.e./ kg bw/day or mg/kg/day) for aminopyralid.[51] For incidental (acute, short-term and intermediate exposures), the US EPA has proposed an RfD of 1.0 mg a.e./kg bw/day or incident. Based on calculations completed for this project, at the highest application rate for the various scenarios analyzed in the risk assessment (USFS 2010a), no adverse effects are likely in either workers or members of the general public (SERA 2007b). All scenarios analyzed are below the level of concern.

The direct and indirect human health and safety hazard and risk for aminopyralid is negligible. This conclusion is based on the hazards (i.e., formulated end-use products highest toxicity category is IV; "not likely" to be carcinogenic; and no basis to assert aminopyralid would cause an adverse effect on nervous system, immune system, endocrine functions, reproduction and development) and dose response and risk characterization (i.e., all scenarios for workers and public, chronic and acute (longer-term and short-term) exposure calculations were below the level of concern). Complying with the label instructions and design features incorporated in alternative 2 would further lower these negligible risks.

Chlorsulfuron

The typical application rate of 0.056 pounds acid equivalent per acre (lbs a.e./acre or lbs/acre) would be used, with a range of 0.0059 to 0.083 lbs/acre. Alternative 2's maximum rate of 0.083 lbs/acre (1-1/3 ounces per acre) is the maximum rate for a given area in any given year.

Appropriate tests have provided no evidence that chlorsulfuron presents any reproductive risks or causes malformations. Results of all mutagenicity tests on chlorsulfuron are negative. No evidence of carcinogenic activity was found in any of the chronic toxicity studies conducted on chlorsulfuron. In

[48] Systemic effect refers to an adverse health effect that takes place at a location distant from the body's initial point of contact and presupposes absorption has taken place.

[49] Portal of entry is the route by which a pesticide enters the body, such as orally.

[50] Reference dose (RfD) is a numerical estimate of a daily exposure to the human population, including sensitive subgroups such as children, that is not likely to cause harmful effects during a lifetime. RfDs are generally used for health effects that are thought to have a threshold or minimum dose for producing effects

[51] As noted in chapter 1 of this document, RfD is the basis of measurement to determine whether the herbicide is above the level of concern.

addition, studies in rats show that chlorsulfuron, at exposure levels up to 250 mg/kg/day for 10 weeks, does not produce dominant lethal mutations. There are no studies to indicate chlorsulfuron as a direct neurotoxicant and there is also no evidence that chlorsulfuron would directly affect the endocrine system (SERA 2004a).

Chlorsulfuron is a moderate eye irritant (toxic category III: signal word caution) and is a non-irritant to the skin (toxic category IV). The highest toxicity signal word for chlorsulfuron is caution. Skin absorption is the primary route of exposure for workers. Mild irritation to the skin and eyes can result from exposure to relatively high levels of chlorsulfuron. Chlorsulfuron does not appear to concentrate or be retained in tissues following either single or multiple dose exposures. In all mammalian species studied, chlorsulfuron and its metabolites[52] are extensively and rapidly cleared by a combination of excretion and metabolism.

The risk assessment (SERA 2004a) used the lower and more recent RfD of 0.02 mg/kg/day to characterize all risks involving chronic or longer-term exposures and the RfD of 0.25 mg/kg/day to characterize all risks acute or short-term exposures. Calculations, to determine RfD values for this alternative, were made for the highest application rate at the upper level of exposure (USFS 2010b). For workers, all general and accidental exposure scenarios for chlorsulfuron (at the highest application rate proposed with this alternative) do not exceed a level of concern. For members of the general public there are two scenarios where the levels slightly exceed the level of concern. Chronic (long-term) consumption of contaminated vegetation[53] had an estimated value to 0.05 mg/kg/day (chronic RfD is 0.02 mg/kg/day). The likelihood of someone consuming treated vegetation for 90 days is low. In addition, the potential of this occurring is further reduced by implementing the design feature that requires in areas in which members of the general public might consume vegetation treated [accidentally or intentionally] with herbicides, the vegetation will be cut prior to treatment. Another scenario that slightly exceeds the level of concern involves a small child consuming contaminated water immediately after a spill in a pond.[54] The value was estimated at 0.3 mg/kg/day: the acute RfD is 0.25 mg/kg/day. Design features would minimize the risk of a spill and a spill of the size considered in the scenario (e.g. spill prevention design features; immediate control, containment, and cleanup of herbicides due to spills or equipment failure; mixing and loading of herbicides will take place a minimum of 150 feet from any body of water or stream channel; and limiting the amount of herbicide that can be on site at any given time). Public risk is highest in the East and West Fork branches where public use is the highest.

Based on this analysis, the human health and safety hazard and risk for chlorsulfuron is low. This conclusion is based on the hazards (i.e., formulated end-use products highest toxicity category is III, no basis to assert chlorsulfuron is carcinogenic or would cause an adverse effect on nervous system, endocrine functions, reproduction and development) and dose response and risk characterization (i.e., all scenarios for workers and public, short and longer-term exposures are below the level of concern based on this alternative, including the design features noted earlier). There are studies that suggest chlorsulfuron may impact the immune system. Complying with the label instructions and design features incorporated in alternative 2 would lower this risk. These design features include developing and implementing the herbicide transportation, handling, and emergency spill response plan, maintaining a safety plan that includes personal protective equipment/clothing needs, and providing an annual pre-operation briefing for personnel implementing the project.

[52] Metabolite is referring to a change in the chemical structure of the herbicide molecule. A metabolite is a compound formed as a result of the metabolism or biochemical change of another compound.
[53] Assumes a woman consumed herbicide treated vegetation for 90 days.
[54] Assumes a child immediately consumes contaminated water from a pond (0.25 acres in surface area and 1 meter deep) that had an accidental spill of 200 gallons of herbicide)

Glyphosate

There are currently 35 commercial formulations of glyphosate that are registered for forestry applications. The typical application rate would be about 3 lb a.e./acre, with application rates occurring over a range of 0.5 lbs a.e./acre to 8 lbs a.e./acre.

The available experimental studies indicate that glyphosate is not completely absorbed after ingestion and is poorly absorbed after skin exposure. But both glyphosate and the polyethoxylated tallow amine or polyoxyethyleneamine (POEA) surfactant used in Roundup® would damage mucosal tissue, although the mechanism of this damage is likely to differ for these two agents. Many of the effects of acute oral exposure to high doses of glyphosate or Roundup® are consistent with corrosive effects on the mucosa.

Glyphosate formulations used by the Forest Service are classified as either non-irritating or slightly irritating to the skin and eyes. Glyphosate is of relatively low oral and skin acute toxicity (OPP-EPA 1993). Potential human exposure to glyphosate is through skin absorption, inhalation, ingestion or the eye. The highest toxicity category for glyphosate proposed for this project is category III and the toxicity signal is caution. One of the more consistent signs of subchronic or chronic exposure to glyphosate is loss of body weight.

There is no clear pattern suggestive of a specific neurotoxic action for glyphosate or its commercial formulations. The weight of evidence suggests that any neurologic symptoms associated with glyphosate exposures are secondary to other toxic effects. No studies are reported that suggest an effect on the immune system. Glyphosate has not undergone an extensive evaluation for its potential to interact or interfere with the estrogen, androgen, or thyroid hormone systems but tests show no potential effects of glyphosate on the endocrine system. According to the risk assessment (SERA 2003a), there is no basis for asserting that glyphosate is likely to pose a substantial carcinogenic risk. Hardell and Erikson (1999a as referenced in SERA 2003a) reported an increased cancer risk of non-Hodgkin lymphoma (NHL) in individuals in Sweden who have a history of exposure to glyphosate. The US EPA - Office of Pesticides Programs Health Effects Division has reviewed the journal article entitled “A Case-Control Study of Non-Hodgkin Lymphoma and Exposure to Pesticides” and concluded that the study does not change EPA’s risk assessment for the currently registered uses of glyphosate. It was determined this type of epidemiologic evaluation does not establish a definitive link to cancer. Furthermore, the information had limitations because it is based solely on unverified recollection of exposure to glyphosate-based herbicides (OPP-EPA 2002 as referenced in SERA 2003a).

Various glyphosate formulations contain a Polyoxyethyleneamine (POEA) surfactant at a level of up to about 20 percent. POEA is more toxic than glyphosate (MMWD 2008) and is known to enhance the skin irritant properties of glyphosate. A design feature requires that only aquatically approved herbicides (e.g. Habitat®, Aquamaster®, Renovate 3®) and low-risk aquatically approved surfactants (e.g. Agri-Dex®, Class Act® NG®, Competitor®) will be allowed within 100 feet of the banks of rivers and tributaries. This feature would also reduce potential impacts from surfactants that have high levels of POEA (since high levels of this chemical also has adverse effects to aquatic wildlife species).

For the current SERA risk assessment (2003a), the RfD of 2 mg/kg/day is used as the basis for characterizing risk from longer-term (chronic) and short term (acute) exposures. Based on the highest application rate, the only scenarios applicable to this alternative that are above the level of concern relate to acute (3.2 mg/kg/day) and chronic (5.9 mg/kg/day) consumption of contaminated vegetation (USFS 2010c). As noted earlier it is unlikely that an individual would consume contaminated vegetation over a 90-day period within the project area (chronic scenario). The levels would be reduced below the level of concern by implementing the design feature that requires in areas in which

members of the general public might consume vegetation treated with herbicides, the vegetation will be cut prior to treatment. Public risk is highest in the East and West Fork branches where public use is the highest.

Based on this analysis, the human health and safety hazard and risk for glyphosate is low. This conclusion is based on the hazards (i.e., for the products proposed with this alternative, the highest toxicity category is III; no basis to assert glyphosate cause an adverse effect on nervous or immune systems, endocrine functions and reproduction; US EPA classified glyphosate as non-carcinogenicity for humans) and dose response and risk characterization (i.e., all scenarios for workers and public, chronic and acute exposures, were below the level of concern based on this alternative with the applicable design feature). There are studies that suggest POEA surfactant used with some glyphosate products have higher health and safety risks than glyphosate alone. Complying with the label instructions and design features incorporated in alternative 2 would lower the risks. These design features include the following measures: spill prevention; immediate control, containment, and cleanup of herbicides due to spills or equipment failure; mixing and loading of herbicides will take place a minimum of 150 feet from any body of water or stream channel; only aquatically registered herbicides and low-risk aquatically approved surfactants will be allowed within 100 feet of the banks of rivers and tributaries; minimize the amount of herbicide allowed on site at any given time; and safety measures for workers (e.g. personal protective equipment).

Imazapyr

The most common and effective applications for imazapyr are post-emergent when the vegetation to be controlled is growing vigorously. The typical application rate for imazapyr would be about 0.45 lb a.e./acre, with application rates occurring over a range of 0.03 lbs a.e./acre to 4 lbs a.e./acre.

Although the mode of action of imazapyr in humans or other mammals is unclear, this is partly due to the apparently low and essentially undetectable acute and chronic (short or longer-term) systemic toxicity of this compound. An adequate number of multi-generation reproductive and developmental studies have been conducted and the studies show no adverse effects on reproductive capacity or normal development. Tests of carcinogenic and mutagenic activity are consistently negative, and the US EPA has categorized the carcinogenic potential of imazapyr as Class E: evidence of non-carcinogenicity. There have been many long-term animal studies. Though none focused on the immune system, the results do not indicate imazapyr would adversely affect the immune system. The weight of evidence suggests that imazapyr is not directly neurotoxic, and the available data do not show systemic toxic effects after skin or inhalation exposures to imazapyr. While the available data are limited, there is no basis for asserting that impurities or adjuvants in or metabolites of imazapyr are likely to increase health risk. Based on inferences from standard toxicity studies reviewed in the SERA risk assessment (2004b), imazapyr may impact some aspects of endocrine function (Auletta 1988, Daly 1988 as referenced in SERA 2004b).

RfD of 2.5 mg/kg/day is used to characterize the risks of both short-term (acute) and longer-term (chronic) exposures and is the basis of determining the level of concern. Upper level exposures at the highest application rate estimated for alternative 2 do not lead to estimated doses that exceed a level of concern for workers (USFS 2010d). There is one scenario that is above the level of concern for the public (acute exposure due to consuming contaminated vegetation [5.4 mg/kg/day]). The other scenarios are below the level of concern. As with the other herbicides, this level can be reduced below the level of concern by implementing the design feature that requires cutting edible vegetation that has the potential of being treated with the herbicide prior to treatment. Public risk is highest in the East and West Fork branches where public use is the highest.

Imazapyr and imazapyr formulations can be mildly irritating to the eyes and skin. The highest toxicity signal category for imazapyr and imazapyr formulations proposed for this project is caution (Toxicity

Category III). Mild irritation to the eyes can result from exposure to relatively high levels of imazapyr. From a practical perspective, eye irritation is likely to be the only overt effect as a consequence of mishandling imazapyr. This effect can be minimized or avoided by prudent industrial hygiene practices (e.g. exercising care to reduce splashing and wearing goggles) during the handling of the compound. These measures are included in the design features for this alternative (e.g. personal protective equipment, spill kit).

Based on this analysis, the human health and safety hazard and risk for imazapyr is low. This conclusion is based on the hazards (i.e., formulated end-use products highest toxicity category is III (caution), no basis to assert imazapyr is carcinogenic or that it would cause an adverse effect on nervous system, reproduction and development) and dose response and risk characterization (i.e., all scenarios for workers and public, chronic and acute exposures were below the level of concern based on this alternative with the design feature). There are studies that suggest imazapyr may impact the endocrine function. Complying with the label instructions and design features incorporated in alternative 2 would lower the risks. Design features include those that minimize direct contact with imazapyr (e.g. developing and implementing the herbicide transportation, handling, and emergency spill response plan, maintaining a safety plan that includes personal protective equipment/clothing needs, and providing an annual pre-operation briefing for personnel implementing the project).

Triclopyr

Two forms of triclopyr are used commercially as herbicides: the triethylamine salt (TEA) and the butoxyethyl ester (BEE). The typical application rate is 3 lbs a.e./acre with a range of 0.05 lb a.e./acre to 10 lbs a.e./acre.

Studies regarding histopathology and clinical chemistry data on triclopyr suggest that the liver and kidney are the primary target organs. These studies found these impacts would be significant only at relatively high doses. Triclopyr is absorbed and excreted relatively rapidly, with half-times for oral absorption and urinary excretion of 3.6 hours and 1.1 hours, respectively.

There is no information suggesting that triclopyr causes direct adverse effects on the nervous system, endocrine system, or immune function (SERA 2003b). At doses, which do not cause maternal toxicity, there is no apparent concern for either reproductive or teratogenic effects. At substantially higher doses that are maternally toxic, triclopyr has been shown to result in birth defects. Most of the abnormalities have been indicative of delayed growth and have been associated with maternal toxicity. The US EPA/OPP has determined that the evidence for carcinogenicity is marginal and has not recommended as quantitative dose-response assessment for the carcinogenicity of triclopyr. US EPA has classified triclopyr as Group D (i.e., not classifiable as to human carcinogenicity: agents without adequate data either to support or refute human carcinogenicity [OPP-EPA 1998]).

The major metabolite of triclopyr in both mammals and the environment is 3,5,6-trichloro-2-pyridinol, commonly abbreviated as TCP. Although TCP does not have the phytotoxic potency of triclopyr, this compound is toxic to mammals as well as other species. Based on research provided to US EPA, there is no basis for asserting that the use of triclopyr would result in hazardous exposures of humans to TCP (SERA 2003b).

The triethylamine (TEA) salt used in Garlon 3A® has a low acute toxicity similar to that of Garlon 4 Ultra® (BEE), but differs in being substantially more irritating to the eyes and skin. Potential human exposure to triclopyr is through skin absorption, inhalation, ingestion, or the eye. Triclopyr BEE is of low acute toxicity to humans and is placed by the EPA in Category III, slightly toxic. The TEA salt in Garlon 3® is classified as Category I (highly toxic) because it is corrosive to the eyes in animal tests (MMWD 2008). The highest toxicity signal word for the triclopyr proposed for this project is danger.

The triclopyr RfD values vary for acute and chronic exposures, and male and female. The risk assessment (SERA 2003b) RfDs included: chronic RfD of 0.05 mg/kg/day; acute RfD of 1 mg/kg/day for the general population; and acute RfD for females between the ages of 13 to 50 years (i.e., females of child bearing age) of 0.05 mg/kg/day. For the risk assessment (SERA 2003b), the risk values used for risk characterization for TCP (the metabolite of triclopyr) are 0.025 mg/kg/day for acute exposures and 0.012 mg/kg/day for chronic exposures.

Based on calculations of the typical application rate of 3 lbs/acre and under the upper exposure conditions for this project (USFS 2010e; USFS 2010f), workers and public (both male and female) would be subject to exposure levels above the level of concern for several general and accidental exposure scenarios developed for the risk assessment (2003b). Public risk is highest in the East and West Fork branches where public use is the highest. For female workers of child-bearing age, all the worker (one general and four accidental) scenarios are above the level of concern; for the other worker population (i.e., males and woman of non-child bearing age) the backpack spraying is above the level of concern for both types of triclopyr (BEE and TEA); and for triclopyr BEE, the accidental exposure of contaminated gloves and accidental spill on lower legs are above the level of concern.

For workers who may apply triclopyr either once or repeatedly over a period of several weeks or longer (chronic), it is important to ensure that work practices involve reasonably protective procedures to avoid the upper extremes of potential exposure. Following label instructions and design features that are included in alternative 2 would address this need (e.g. personal protective equipment, proper worker hygiene practices, proper handling of the herbicide). Several design features are specific to triclopyr to reduce risk to workers (i.e., triclopyr should be the lowest priority herbicides applied and will only be used if the other approved herbicides are not effective in treating a specific invasive plant, and during the annual pre-operational briefing 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, especially for woman of child-bearing age).

Risk to workers includes skin exposure due to accidental spills. The risk is significantly greater for women of child-bearing age. Precautions should be taken to avoid spills to unprotected skin and eyes, including the use of goggles, double gloves, long-sleeved clothing, and closed shoes. Applicators should have extra clean gloves readily available, soap and water for washing off spills, and an eyewash bottle in their vehicle at all times. Rubber boots are highly recommended. These items will be included in the design features of personal protective equipment, in the herbicide transportation, handling, and emergency spill response plan, and provided for in the spill kit which is required on site.

For the public, children and woman are at greatest risk (above the level of concern) from skin exposure and consuming contaminated products (e.g. water, fruit, vegetation) for both acute and chronic exposure scenarios. Generally, triclopyr BEE have higher calculated exposure rates. To reduce these risks, design features have been incorporated into alternative 2 (e.g. minimize the amount of herbicide allowed at the site; spill prevention measures; immediate control, containment, and cleanup of herbicides due to spills or equipment failure, 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; mixing and loading of herbicide[s] will take place a minimum of 150 feet from any body of water or stream channel unless prior approval is obtained from a Forest Service hydrologist or biologist; techniques will be used to minimize drift; recently herbicide treated areas should not be reentered, at a minimum, until the herbicide has dried: if the herbicide label specifies a reentry period, treated areas must be posted with signs warning visitors and others not to enter the treated area; in areas in which members of the general public might consume vegetation treated with herbicides [accidentally or intentionally], the vegetation will be cut prior to treatment; and triclopyr should be the lowest priority herbicides

applied and will only be used if the other approved herbicides are not effective in treating a specific invasive plant). As noted earlier, public risk is highest in the East and West Fork branches where public use is the highest.

The U.S. EPA has conducted extensive analyses of dietary exposure to TCP (the metabolite of triclopyr) for the use of triclopyr, as well as the aggregate risks from exposure to TCP from the use of triclopyr. As part of the current risk assessment, exposures to TCP based on modeling of water contamination from the application of triclopyr indicate that the peak exposure to TCP in water is below the concentration associated with the chronic risk value for TCP. Thus, the use of triclopyr would not result in hazardous exposures of humans to TCP (SERA 2003b).

Based on this analysis, the human health and safety risk for triclopyr is moderate, the highest of the five herbicides being considered in this alternative. This analysis rating is based on hazards (i.e., the highest Toxicity Category is I [danger] due to corrosive effect to the eye [TEA salt used in Garlon 3®]); potential effects to liver and kidney from high doses; doses that are maternally toxic, has been shown to result in birth defects; carcinogenicity is questionable (highest EPA classified triclopyr as Group D); and risk characteristics (i.e., acute effects based on the scenarios analyzed are above the level of concern for workers and at least one of the acute exposure scenarios and several of the chronic scenarios are above the level of concern for the general public). The general public is at lower risk than workers because it is less likely the public would come into direct contact with triclopyr from implementing this alternative. Complying with the label instructions and design features included in alternative 2 would reduce the risks.

Adjuvants

Adjuvants are solution additives that are mixed with an herbicide solution to improve performance of the mixture. Adjuvants can enhance activity of an herbicide's active ingredient (activator adjuvant) or offset any problems associated with spray application. Activator adjuvants include surfactants, wetting agents, sticker-spreaders, and penetrants. Surfactants, or surface-acting agents, facilitate and enhance the absorbing, emulsifying, dispersing, spreading, sticking, wetting, or penetrating properties of herbicides.

Adjuvants are not under the same registration guidelines as pesticides. US EPA does not register or approve the labeling of adjuvants. California Department of Pesticide Regulation does require the registration of those adjuvants that are considered to increase the action of the pesticide it is used with.

The following restrictions to surfactants is applicable to this alternative: must be State approved, only low-risk aquatically approved surfactants will be allowed within 100 feet of the water's edge and nonylphenol polyethoxylate [NPE]-based surfactants dilution rates will be between 0.25 and 2.5 percent..

NPE Surfactants

The primary active ingredient in many of the non-ionic surfactants used by the Forest Service when applying herbicides is a component known as nonylphenol polyethoxylate (NPE). NPE is found in these commercial surfactants at rates varying from 20 to 80 percent. Nonylphenol (NP) is a material recognized as hazardous by US EPA and based on research it appears NP could be an eventual degradation product of NPE. Both NP and NPE exhibit estrogen-like properties[55] (Bakke 2003). A risk assessment was completed on NPE surfactants in 2003 (Bakke). The risk assessment assumed

[55] In comparison to the natural estrogen 17-beta-estradiol, NP is approximately 1000 - 100,000 times weaker in eliciting estrogenic responses (Environment Canada 2001a; Giesy et al 2000; Moffat et al 2001; Muller and Schlatter 1998; Routledge and Sumpter 1996; Servos 1999; Sohoni and Sumpter 1998; US EPA 1996; White 1994 as referenced in Bakke 2003). NPE is less potent that NP.

(and this alternative restricts) commercial NPE-based surfactants mixed with herbicides and water carriers at dilution rates of 0.25 to 2.5 percent with a typical dilution rate of one percent.

Based on subchronic and chronic testing, it appears that the liver and kidney are the organs most likely to be affected by exposures to NPE and NP. No evidence of carcinogenicity has been reported. Values from various studies indicate that NPEs are in EPA toxicity category III or IV to the skin and toxicity category III to the eyes.

At present there are no existing state or federal human exposure guidelines for NPE or NP. US EPA has not established a RfD. A 10 mg/kg for NP has been established for no-observed-effect level (NOEL).[56] The risk assessment (Bakke 2003) extrapolated an RfD figure based on this value of 0.10 mg/kg/day. For ground-based, backpack applications, central estimates of worker exposure are 0.01 mg/kg/day. Based on the estimated levels of exposure and the criteria for acute and chronic exposures, typical exposures to NPE-based surfactants would not exceed the level of concern. For workers, only the upper levels of operational exposure result in estimates of absorbed doses that exceed the derived RfD by a modest amount. The levels would be reduced to below the level of concern through the design features that minimize exposure to herbicides (e.g. personal protective equipment, annual pre-operation meeting to discuss safety).

For members of the general public, the upper limits for chronic exposures are below a level of concern. There is no route of exposure or scenario suggesting that the general public would be at any substantial risk from longer-term exposure to NPE-based surfactants. None of the acute exposure scenarios represent a risk of effects to the public from NPE exposure except at typical rates of application, the drinking of contaminated water after a spill could present a risk of subclinical effects to the liver and kidney. This risk is reduced below the level of concern through the implementation of the design features (e.g. minimizing the risk for spills; restricting the amount of herbicide allowed on site at any given time; no mixing or loading of herbicides will occur within 150 feet from any body of water or stream channel unless approved by a hydrologist or biologist; herbicide spray equipment cannot be washed or rinsed within 150 feet of water; and implementation will be limited to weekdays and non-holidays when public use in the project area is lower).

From a practical perspective, eye irritation and skin sensitization are likely to be the more likely effects as a consequence of mishandling NPE and this risk would be reduced through design features (e.g. safety plan including the need for personal protective equipment, annual pre-operation briefing in which safety issues are discussed including proper worker hygiene practice).

Non-NPE surfactants/adjuvants
Adjuvants, including non-NPE surfactants, typically used by the Forest Service have acute toxicity categories III or IV (except Entry™ II and LI-700® have acute toxicity category I [signal word danger] for the eyes).[57] As with NPE surfactants, the more common risk factors for the use of these adjuvants are through skin or eye exposure. These adjuvants all have various levels of irritancy associated with skin or eye exposure; adverse impacts would be reduced with the design features (e.g. safety plan including the need for personal protective equipment [especially important during mixing], annual pre-operation briefing in which safety issues are discussed including proper worker hygiene practices [Bakke 2007]).

Based on the analysis for this alternative, including the design features, the risk of adjuvants (proposed at the application rates provided in alternative 2) would be low.

56 A no-observed effect level (NOEL) is the dose of a chemical at which no treatment-related effects were observed.
[57] Severely irritating or corrosive to the eyes

Cumulative Effects

Cumulative effects from the use of herbicides include the potential use of herbicides by non-national forest landowners in the area; other pesticide projects proposed in the area (e.g. spraying the insecticide carbaryl on approximately 350 conifer trees in Crystal Lake Recreation area and the proposed use of triclopyr on Spanish broom, tree tobacco, rockrose and eucalyptus invasive plant species in the Tanbark Fuelbreak Project). Along with these activities, workers and the general public that are in the project area could use some of these herbicides outside the project area for personal activities (e.g. treating weeds on their own property). Glyphosate likely has the highest risk of this cumulative effect (use on private property) because it is the most common herbicide sold to the general public to treat weeds. There are many design features to minimize 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.

Herbicide Treatment Conclusions

Herbicide use in alternative 2 has no direct beneficial effects to human health and safety from the use. Potential adverse direct and indirect impacts are addressed for each herbicide and adjuvants (generally). 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 minimize risk and potential harm to human health and safety for workers and the public.

Table 12 provides a summary of the ratings of risk to human health and safety based on this analysis.

Table 12. Rating of risk to human health and safety for each herbicide and adjuvants (in general) considered in alternative 1.

Rating of Risk		
Negligible	**Low**	**Moderate**
Aminopyralid	Chlorsulfuron Glyphosatei Imazapyr Adjuvants	Triclopyr

Invasive Plants and Native Vegetation[58]

Affected Environment

The project area focuses in and around drainages, but 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 13 provides a summary of approximate acres by vegetation types found within the project area.

Table 13. Approximate acres by vegetation type within project area

Vegetation Type	*Acres*
Annual Grasses and Forbs	15
Barren	300
Chaparral	9,280

[58] This is a summary of the invasive plant analysis. For further and more detailed information, the Invasive Plant and Native Vegetaton Specialist Report is on file in the project planning record located at the San Gabriel River Ranger District office

Vegetation Type	*Acres*
Coastal Scrub	200
Hardwoods- Oak Woodland	5,080
Riparian	840
Lower montane Forest	2,600
Montane Forest	2,115
Urban/Developed	180
Water (mostly from dams)	1,040
TOTAL	**21,650**

All three of the high priority and seventeen of the twenty-eight moderate priority invasive plant species are known to occur within 75 feet of the project area. Table 14 displays where each species is known to exist by branch. In addition, approximately 0.25 miles from the project area, there is a population of yellow star thistle (moderate priority species) which has been known to have adverse, regional long-term impacts. Those invasive species outside the project area have the potential for expanding into the project area during the term of the project. As shown in the table, there are also within the project area, species that occur in one area, but not in other portions of the project area (e.g. purple veldt grass is widespread in the San Dimas and Big Dalton watersheds, but has not yet moved in other portions of the San Gabriel watershed). Some species have been intentionally introduced (e.g. Caltrans seeding roadsides, Forest post-fire rehabilitation) and some have been introduced unintentionally due to human activities (e.g. escaped ornamentals).

Several invasive species are common throughout the San Gabriel Mountains. This includes 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 common component of all vegetation types.

Areas with the highest levels of past and ongoing localized and landscape scale disturbances have the highest concentrations of invasive plant species. Figure 3 displays these high concentration areas are located in the "front country" or urban interface which lies adjacent to the Los Angeles Basin. Additionally, the 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. Appendix B provides additional information on invasive plant species for this project. The appendix provides a table of high, moderate and low priority species presently considered for treatment; information that identifies reproductive mechanisms that have been identified (Cal-IPC 2003) to allow invasive species to rapidly spread and reproduce; a table of the typical dispersal vectors for each of the high and moderate priority invasive plant species; a map of anticipated pathways for invasive plant species to move from one suitable environment to another; and the vegetation type they are known to occur in.

Table 14. High and moderate priority invasive plant species that are known to occur within 75 feet of the project area

	Big Dalton Reservoir	Cattle Canyon	East Fork	Headwaters in Forest	Heaton Flats	Heaton Flats (SMW)*	Morris Reservoir	Cattle Canyon (SMW)	North Fork	San Dimas	San Gabriel Reservoir	San Gabriel Wilderness	South Dalton	West Fork
High Priority														
giant reedgrass (*Arundo donax*)	x		x	x			x		x	x	x		x	x
tree of heaven *(Ailanthus altissima)*	x			x			x		x	x	x		x	
tamarisk *(Tamarix sp.)*	x	x	x	x	x	x	x		x	x	x		x	
Moderate Priority														
bigleaf periwinkle *(Vinca major)*	x		x	x					x	x			x	x
cape-ivy, German-ivy *(Delairea odorata)*				x						x				
castorbean *(Ricinus communis)*	x		x	x			x			x	x		x	
crimson fountaingrass *(Pennisetum setaceum)*			x				x			x	x		x	
eutopary *(Ageratina adenophora)*	x		x	x	x		x		x	x	x	x	x	x
English ivy, Algerian ivy *(Hedera sp.)*	x			x	x		x		x	x			x	x
fennel *(Foeniculum vulgare)*	x						x			x				
French broom *(Genista monspessulana)*										x				
gorse *(Ulex europaeus)*									x					
Himalaya blackberry *(Rubus armeniacus)*	x		x	x	x				x	x				x
Italian ryegrass *(Lolium multiflorum)*	x			x							x			
pampas grass *(Cortaderia sp.)*				x			x			x				
purple veldtgrass *(Ehrharta calycina)*	x									x				
Scotch broom *(Cytisus scoparius)*	x									x				
Spanish broom *(Spartium junceum)*	x		x	x			x		x	x	x	x	x	x
spotted knapweed *(Centaurea maculosa)*	x									x				
tree tobacco (*Nicotiana glauca)*	x		x	x			x			x	x		x	

* SMW= Sheep Mountain Wilderness

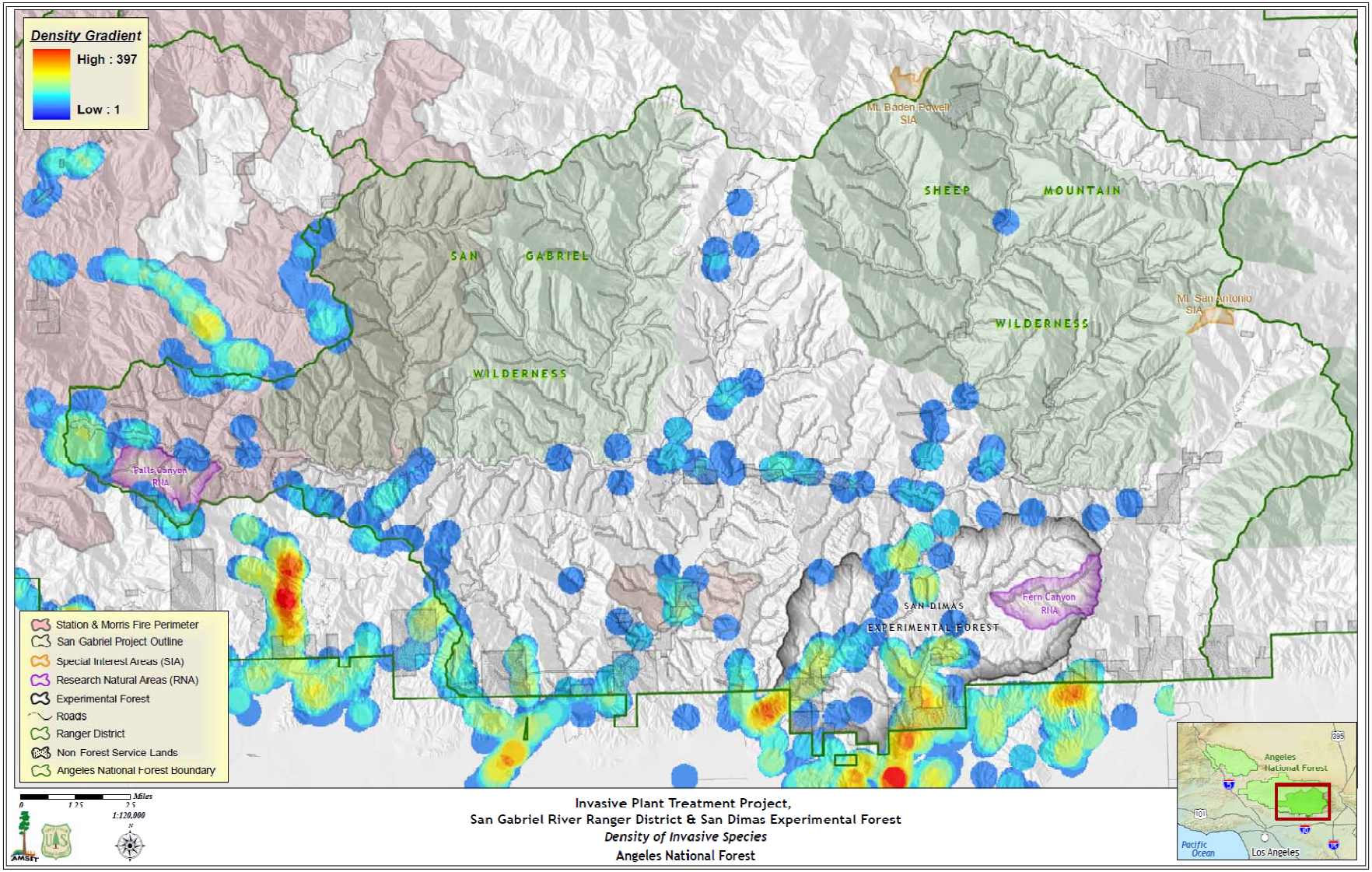

Figure 3. Map of known populations of invasive plant species densities.

Environmental Consequences

Direct and Indirect 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.

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.

Alternative 2, Proposed Action, Focus on Herbicide Treatment Methods

This section addresses direct and indirect effects to invasive plants and native vegetation specific to the use of herbicides. Integrated weed management typically combines several treatment methods (e.g. cut and paint/spray) and does not rely on herbicide treatment alone. This section focuses on herbicide treatment with the knowledge most herbicide treatments would be combined with other treatment methods. Impacts from using non-herbicide treatment methods, solely, and other activities are addressed in the next section.

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, but individuals occur in clusters, and on occasion, 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 five 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.

Alternative 2, Proposed Action and Alternative 3, No Herbicides Specific to non Herbicide Activities

This section addresses direct, indirect and cumulative effects to invasive plants specific from non-herbicide activities.

Mechanical and Hand Treatment Methods

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.

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.

Biological Control Agents

As noted earlier, biological control agents (biocontrols) for invasive plants are biological entities (e.g. insects, fungi) that are predators of the target plants (USFWS 2008). They are generally selected to control invasive plants population densities to below a damaging threshold (USFWS 2008). Biocontrols are reviewed and approved by APHIS, and must exhibit host specificity. There is a risk that an approved biocontrol agent could impact non-target species (USFWS 2008). Some of the risks of biocontrols include competition with native species, predation/herbivory/parasitism of non-target species, potential for increased impacts due to lack of co-evolution with environmental controls, dispersal to other regions where impacts could differ, and evolution of the biocontrol that changes target species (Simberloff and Stiling 1996).

Biocontrols require two to three years to become established and are thought to require ten to twenty years before they significantly affect the invasive plants populations (USFWS 2008). This has the advantage of providing a long-term solution for target invasive plants. It has been shown to be most effective when used in the context of an IWM approach. Biological controls have the advantage of requiring limited resources to deploy and have been found to be effective in control of some species, such as yellow star thistle (FICMNEW 2004) and tamarisk (Carpenter 1998). This strategy would be the most effective with widespread invasive plants (e.g. tocalote, cheatgrass) as other management options are unrealistic due to financial and workforce resources limitations.

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 for both action alternatives, 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

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 due to risk on 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.

General Effectiveness of Treatments

Alternative 1, No Action

As noted earlier, invasive plants would continue to enter into and expand within the project area with this no action alternative. 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.

Alternative 2, Proposed Action

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. This alternative has the greatest likelihood for success in eradicating and/or controlling high and moderate invasive plant species within the project area.

Alternative 3, No Herbicides

Alternative 3 would have an overall trend of controlling and containing the high 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 the three high priority species, all of which are difficult to eradicate with the treatment methods allowed. 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 these high priority plants. Control and containment of the high priority species is possible with manual and mechanical methods, but without a year-to-year sizable workforce, eradication is unlikely. Due to the level of treatments and monitoring needed for the high priority 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.

Cumulative Effects

The cumulative effects spatial boundary considered in this analysis is the San Gabriel River watershed within the confines of the Angeles National Forest. This boundary is based on the topographic separation from adjacent watersheds, limiting the amount of spread the target invasive plant species are capable of dispersing. The temporal boundary is 15years, the term of the project.

Alternative 1, No Action

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

Most 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. 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. The full extent of the Station and Morris fires and the San Dimas Experimental Forest experiments impacts from invasive plants are unlikely to be mitigated by this alternative, as the impact from these events/actions are at a landscape scale.

Alternative 2 would beneficially combine with several Caltrans 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 these actions.

Crystal Lake Recreation Area 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 in the headwaters of the West Fork of the San Gabriel River. 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, No Herbicides

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.

Special Status Plants[59]

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

Based on suitable habitat within the project area, the potential exists 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). 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 and Indirect 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

[59] This is a summary of the special status botany analysis. For further and more detailed information, the Biological Assessment and Biological Evaluation are on file in the project planning record located at the San Gabriel River Ranger District office.

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 indirectly impact special status plants through increased competition for resources and by rendering unoccupied suitable habitat, unsuitable. This has the potential for adverse long-term, minor to moderate, localized impacts.

Alternative 2, Proposed Action, Specific to Herbicide Treatment Methods

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. cut and daub).

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 plant species being considered in this document. This leads to uncertainty in the risk assessment analysis.

The five herbicides considered for use in alternative 2 have the potential to adversely impact special status plants, if unintentional application occurred. 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 almost eliminates 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. It is assumed in this analysis, that alternative 2, including the design features for herbicide application, are conservative enough to also insure protection of special status plant species from the potential adverse impacts of the various adjuvants.

To further reduce risk to federally listed/protected plant species, a design feature is included in this alternative that restricts the use of foliar/spot spraying herbicide application within 70 feet of known federally listed/protected plants. Cut and daub-type techniques would be allowed unrestricted no closer than 25 feet away if application rates are equal or below the NOEC levels (see table 8 in chapter 2). The buffer from this design feature also reduces potential of herbicides staying in the soil or moving through the soils and affecting these federally listed/protected plant species.

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. Table15 summarizes some of the toxicities to specific and general plant groups for each herbicide being considered for use. The toxicity to various non-target species would be considered in determining the size of the buffer.

Table 15. Highlighted specific toxicities to plants by herbicide.

Herbicide	Toxicity
Aminopyralid	Nontarget species of dicots are likely to evidence adverse effects over the range of application rates (SERA 2007).
Glyphosate	For relatively tolerant nontarget species of plants, there is no indication that glyphosate is likely to result in damage at distances as close as 25 feet from the application site. Nontarget terrestrial plants are not likely to be affected by runoff of glyphosate under any conditions (SERA 2004).
Triclopyr	Two forms of triclopyr could be used with differing degrees of effects. Triclopyr BEE (butoxyethyl ester) is more toxic to plants than triclopyr TEA (triethylamine salt). Triclopyr BEE formulations are more apt to damage plants from runoff than other formulations. Both formulations have been found to decrease the relative long-term abundance and diversity of lichens and bryophytes (SERA 2003).
Chlorosulphuron	More tolerant species are not expected to be at risk at distances of 25 feet or less. If chlorsulfuron is applied in the proximity of sensitive crops or other desirable plant species, site-specific conditions and anticipated weather patterns will need to be considered if unintended damage is to be avoided (SERA 2004a).
Imazapyr	Damage to non-target plants can occur by being absorbed through roots (Tu et al. 2001) and by being transfered between root networks (SERA 2004). Imazapyr can act as an unintended pre-emergent herbicide, which could impact ungerminated native and nonnative plants.

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. Table 8 in chapter 2 provides the NOEC application rates for each herbicide. 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.

Alternative 2, Proposed Action and Alternative 3, No Herbicides Specific to non Herbicide Activities

This section addresses direct and indirect effects to special status plant species related to the non-herbicide activities.

Several design features are incorporated into both action alternatives to reduce potential adverse impacts to specials status plants (e.g. pre-treatment surveys, 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.

The scope of the adverse indirect impacts is likely to be negligible, as the 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). The positive effects of reducing invasive plant populations and restoration in potential habitat for the special status species is less so for alternative 3 when compared with alternative 2. This is due to the reduced level of treated acres and non-herbicide treatment methods (e.g. manual, mechanical) are likely to be less effective.

Cumulative Effects

Alternative 1, No Action
As with all resources, no cumulative effects would occur with this alternative since no action is taken.

Alternative 2, Proposed Action
The cumulative effect actions other than the invasive plant removal, generally increase the potential for invasive plant distribution and abundance. This project interacts by mitigating these effects, which has long-term beneficial impacts to the special status plants. Beneficial effects include the reduction in potential resource competition, prevention of new invaders, and restoration of habitat.

The proposed action would potentially adversely interact cumulatively, by increasing disturbances in suitable habitat (potentially occupied). Through implementation of the design features, these impacts are likely to contribute cumulatively in a negligible to moderate intensity in the short-term. Suitable habitat for *Brodiaea filifolia* was identified in the Tanbark Fuelbreak Maintenance project, but design features were included to eliminate impacts. A prescribed fire treatment is planned in the Glendora *Brodiaea filifolia* occurrence, though the burning would occur during a time of year intended to reduce invasive annual grasses, and is anticipated to beneficially impact the population (Jan Beyers, personal communication 2010). A single planted *Berberis nevinii* has been identified at the Tanbark Flats housing compound in the San Dimas Experimental Forest, but no threats are identified at this site presently, and this project is not anticipated to contribute to threats to its persistence.

Alternative 3, No Herbicides
Alternative 3 is likely to interact with the cumulative effects similarly to alternative 2, though due to the reduction in the anticipated invasive treatment acres with this alternative, there is likely to be less positive effect from this alternative with the anticipated increases in invasives associated with other existing and future projects/activities in the project area. Not using herbicides would result in more ground disturbance than alternative 2. This would reduce the potential beneficial cumulative effects and increase the potential cumulative adverse effects.

Wildlife[60]

Affected Environment

Special Status Wildlife Species
There is suitable habitat within the project area for three federally listed wildlife species: Santa Ana sucker (*Catostomus santaanae*; federally threatened); southwestern willow flycatcher (*Empidonax traillii extimus*; federally endangered); and mountain yellow-legged frog (*Rana muscosa*; federally endangered). There is also suitable habitat for 18 Forest Service sensitive wildlife species: bald eagle (*Haliaeetus leucocephalus*); Peregrine Falcon (*Falco peregrinus*); California spotted owl (*Strix occidentalis occidentalis*); Arroyo Chub (*Gila orcutti*); Santa Ana speckled dace (*Rhinichthys osculus*); San Gabriel mountain slender salamander (*Batrachoseps gabrieli*); yellow-blotched salamander (*Ensatina eschscholtzii croceater*); California legless lizard (*Anniella pulchra*); southwestern pond turtle (*Clemmys marmorata pallid*); San Bernardino ringneck snake (*Diadophis*

[60] This is a summary of the wildlife analysis. For further and more detailed information, the Biological Assessment and Biological Evaluation are on file in the project planning record located at the San Gabriel River Ranger District office.

punctatus modestus); San Bernardino mountain kingsnake (*Lampropeltis zonata parvirubra*)*;* San Diego horned lizard (*Phrynosoma coronatum blainvillii*); two-striped Garter snake (*Thamnophis hammondii*); Nelson's bighorn sheep (*Ovis canadensis nelson*); Pallid bat (*Antrozous pallidus*); Townsend's big-eared bat (*Corynorhinus townsendii*); and western red bat (*Lasiurus blossevillii*).

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 and Indirect 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, the 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 southwestern willow flycatcher, due to the change in vegetative composition. This would lead to a degradation of nesting habitat which could eventually result in a loss of suitable nesting habitat.

The no action alternative would affect the availability of forage and water for Nelson's bighorn sheep, which could be detrimental to the existing population. 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, these invasive plants would also affect the availability of water for sheep, especially during the warmer months and under drought conditions.

As invasive populations get denser, they would change the habitat suitability for reptiles which need exposure to the sun for thermoregulation. Some 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. Overtime, 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.

Alternative 2, Proposed Action, Specific to Herbicide Treatment Methods

This section addresses direct and indirect effects to general wildlife species specifically from herbicide treatment, realizing herbicide treatments would be used in combination with other treatment

methods. One of the issues brought up during scoping was the potential impact from the use of herbicides to aquatic organisms, mammals, and birds.

General Wildlife

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 (alternative 2). 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). Based on the risk assessment worksheets completed for the project, at the highest application rates, generally, all major wildlife groups would be impacted below the level of concern for aminopyralid, chlorsulfuron, and imazapyr. 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.[61]
- Fish-eating birds do not receive a dose above the toxicity index for any of the five herbicides at the application rates ranges.

[61] The dose of herbicide used to determine the potential for an adverse effect to wildlife. It is the lowest dose reported to cause the most sensitive effect in the most sensitive species tested, and is usually a reported NOAEL for a sub-lethal effect, but may be an LD_{50} (or a portion thereof) when data is lacking.

- Consumption of contaminated water, even as the result of an accidental spill, results in doses well below the toxicity index for all five 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 to fish is based on bioconcentration levels found in fish tissues.
- 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

Southwest Willow Flycatcher (Endangered)

Implementation of proposed treatment methods included in Alternative 2 would have no direct effects on southwestern willow flycatchers. Treatments will not occur in suitable habitat during the breeding season unless protocol surveys document that southwestern willow flycatchers are absent. This design feature would reduce the potential for project activities to result in direct effects to this highly migratory species. Southwestern willow flycatchers have not been documented as nesting on the Angeles National Forest. There are observations of willow flycatchers on the Forest during the early spring, but these birds have not been confirmed as southwestern willow flycatchers. Based on timing of these observations, it is believed these individuals are willow flycatchers and not the federally protected southwestern willow flycatcher.

For all proposed treatment methods, the potential for impacts exists only if southwestern willow flycatchers are present in the project area during treatment activities. As stated previously, restrictions on treatments in suitable habitat during the nesting season eliminates the potential for impacts to

breeding southwestern willow flycatchers. If a southwestern willow flycatcher were to utilize the project area during migratory movements, there is a small potential for their occupancy to overlap with project implementation. In that case, project activities could flush or displace roosting or foraging birds. If flycatchers consume glyphosate and/or triclopyr-contaminated insects at a high rate, they are susceptible to toxicity levels that exceed the level of concern. The highest application rate of glyphosate to be used for this project is 8 pounds per acre. This application rate may result in adverse affects to flycatchers if they consume large amounts of contaminated insects in a short period of time. The project proposes a typical application rate of 3 pounds per acre for glyphosate. At this rate, no adverse effects are expected to occur to flycatchers based on the glyphosate worksheets completed for this project (USFS 2010c). The same is also true when using triclopyr. Triclopyr BEE and triclopyr TEA pose a risk to insectivorous birds when used at the high application rate of 10 pounds per acre and at the upper level of exposure. If flycatchers consume large amounts of triclopyr-contaminated insects over a short period of time, mortality is likely to occur based on the triclopyr worksheets completed for this project (USFS 2010e and f). At the typical rate of 3 pounds per acre, no adverse effects are expected to occur. These potential adverse effects are unlikely because of the methods proposed for treatment activities and the lower application rates. Treatments would occur via a backpack sprayer for foliar/spot spraying applications or they would occur directly to the stumps of target species after they have been cut. No broadcast applications would occur, decreasing the amount of herbicides applied at the landscape level. Also, treatments to the high priority invasive plants found in riparian habitat would likely occur in late summer to early fall when flycatchers migrate to winter grounds. Based on the avoidance of treatments in suitable habitat during the nesting season and the low likelihood of migratory southwestern willow flycatchers in the project area, the above described impacts are not expected.

The removal of invasive plants through biological control methods, manual/mechanical treatments, fire wilting and herbicide treatments would alter vegetative structure in areas that are treated. Removal of invasive plants would prevent further spread, reduce the risk for new infestations and would allow native riparian species to become re-established. Removal or reduction of invasive plants in suitable southwestern willow flycatcher habitat would allow for native riparian communities to provide the best habitat conditions possible. Monitoring activities after initial treatments would determine if areas need additional treatment. This would prevent further spread of invasive plants and maintain treated areas. Removal of invasive species from suitable southwestern willow flycatcher habitat would improve habitat conditions for this species.

The proposed action (alternative 2) is not expected to adversely affect southwest willow flycatchers.

Mountain yellow-legged frog (endangered)
Currently, occupied mountain yellow-legged frog habitat areas do not have any known populations of invasive plant species present. If invasive plants are found, treatment would be limited to hand pulling of plants during the non-breeding season, which would minimize any risk to frogs. Direct effects resulting from hand pulling would be due to the presence of personnel conducting treatment activities. As personnel enter the area, this may cause frogs basking in the area to jump into nearby creeks. This effect is minimal, short-term and would not lead to abandonment of the site. Hand pulling of plants would not adversely affect the mountain yellow-legged frog.

There are no indirect adverse effects expected to occur in occupied habitat as a result of treatment activities. If invasive plants are found, design features for occupied habitat would allow for removal without altering important habitat features or indirectly affecting frogs in the area. Removal of invasive plants would have a beneficial impact by preventing further spread in these areas and would maintain existing habitat conditions in the future.

Within the project area, there is designated critical habitat that is not known to be currently occupied by mountain yellow-legged frogs. All treatment activities described in the proposed action may occur

in unoccupied critical habitat and would incorporate the protective design features for streams and surface water. Treatment activities in these areas would not result in direct effects to the mountain yellow-legged frog. Removal of invasive plants would have a beneficial impact by preventing further spread in these areas and maintaining suitable habitat conditions in the future.

Santa Ana sucker (threatened), Arroyo Chub (Forest Service sensitive) and Santa Ana Speckled Dace (Forest Service sensitive)
By avoiding stream entry wherever possible and restricting the use of herbicide treatments from March 1 to July 31, there would be no direct impacts to spawning and reproductive success. Hydrology design features that minimize impacts to streams and riparian habitat would also help protect fish. With the incorporation of all of these design features, Santa Ana suckers, arroyo chub, and Santa Ana specked dace occupying the stream are unlikely to be directly impacted by any of the methods listed in the proposed action. The worst case effects from accidental spills may result in mortality to individual fish or damage to the eggs or offspring, especially in areas where the fish or egg masses cannot escape exposure. The effects depend on many variables including, but not limited to, how much and which herbicide is spilled, the concentration of the herbicide, and how quickly the herbicide is diluted based on rates of flow and the gradient of the stream. There is a design feature that requires aquatically registered herbicides and low-risk aquatically approved surfactants within 100 feet of banks and tributaries. In addition, some concentrations of glyphosate are toxic to fish. A design feature restricts the amount of this herbicide to no greater than two pounds a.e. per acre. The same design feature also restricts all herbicide use from occurring in occupied habitat from March 1 to September 1. These design features would ensure the herbicide use near water is below the level of concern for fish species.

Biological control methods, manual/mechanical treatments, and fire wilting treatments are unlikely to indirectly affect the three special status fish species. Herbicide treatments, however, could indirectly adversely affect these fish as a result of herbicide spray drifting into the water during applications. Adverse effects include behavioral changes such as lethargic or hyperactive fish, and mortality due to behavioral changes in fish. Of the herbicides proposed for use, two pose this risk (i.e., pre-mixed glyphosate [e.g. Roundup®] and triclopyr BEE). Two design features prevent this from occurring. A design feature restricts the application of glyphosate within 100 feet from the surface of water if the application rate exceeds 2 pounds per acre. In addition, there is a design feature that only allows aquatically registered herbicides and low-risk aquatically approved surfactant be applied within 100 feet of banks of rivers and tributaries. There are no products for Triclopyr BEE and pre-mixed glyphosate that are aquatically approved. These design features would ensure the herbicide use near water is below the level of concern for fish species.

Surfactants are not expected to have adverse impacts to the three special status fish species. As noted earlier, a design feature requires only low-risk aquatically approved surfactants (e.g. Agri-Dex, ® Class Act NG, ® Dyne-Amic®, Competitor®) be used within 100 feet of the banks of rivers and tributaries. Surfactants that are higher risk to aquatic species (e.g. R-11®) would not be allowed in these areas.

The adverse impacts from implementing this alternative, including the design features, are low. A beneficial indirect effect with the eradication and control of invasive plants would be improved habitat conditions in the long-term. In some areas, invasive plants have overtaken waterways, and changed the hydrology of streams and creeks as previously described in this document. The eradication and decrease of invasive plants would allow native plants to re-populate especially in riparian areas which would help to restore streams to a natural state. Restoration and monitoring are also part of the proposed action and these activities would ensure invasive plants do not become re-established in treated areas.

California spotted owl (Forest Service Sensitive)
Biological control methods, manual/mechanical treatments, herbicide applications and fire wilting treatments are unlikely to directly affect California spotted owls. All activities would occur during the day when owls are roosting. Noise generated by project activities would consist mainly of personnel and vehicles entering and exiting the area. Treatments would occur in foraging habitat. Little to no treatment is expected to occur in roosting and nesting habitat, minimizing adverse impacts to owls. Pile burning associated with the removal of invasive plants would not be located in roosting or nesting habitat and is not likely to affect spotted owls. Some rodents that have consumed treated vegetation could be eaten by spotted owls, but the levels of herbicide should not adversely affect owls.

Biological control methods, manual/mechanical treatments, and fire wilting treatments would not indirectly affect spotted owls or their roosting and nesting habitat. It is expected that little to no treatment would occur in nesting or roosting habitat. In addition, based on the risk assessment worksheets prepared for this project, none of the herbicides applied at typical or high application rates are expected to result in an effect above the level of concern (USFS 2010a-f).

None of the proposed treatment activities would degrade suitable habitat for spotted owls. In the long-term, foraging habitat may be improved with the removal of invasive plants. Habitat conditions for some prey species of spotted owls may improve as invasive plants are eradicated, allowing native vegetation to become re-established. Restoration and monitoring activities would also determine if additional treatments are needed and would prevent invasive plants from re-colonize treated areas.

Bald Eagle and Peregrine Falcon (Forest Service Sensitive)
Herbicide treatments are unlikely to directly affect bald eagles or peregrine falcons. It is unlikely herbicide treatment activities would occur in areas where either species is typically found. Little to no herbicide treatment is expected to occur in roosting and nesting habitat, minimizing adverse impacts to bald eagles and peregrine falcons. Herbicide treatments would likely occur near bald eagle foraging habitat but not peregrine falcon foraging habitat. Herbicide treatments may affect foraging species for both birds of prey but ingestion of foraging species is not expected to adversely affect the bald eagle or peregrine falcon. Based on the risk assessment worksheets prepared for this project, none of the herbicides applied at typical or high application rates are expected to result in an effect above the level of concern (USFS 2010a-f).

Biological control methods, manual/mechanical treatments and fire wilting treatments are unlikely to directly affect bald eagles or peregrine falcons. It is unlikely these treatment activities would occur in areas where either species is typically found. Noise generated by project activities would consist mainly of personnel and vehicles entering and exiting the area and is expected to have little effect to either species. As with herbicide use, little to none of the other treatment methods are expected to occur in roosting and nesting habitat, minimizing potential adverse impacts to bald eagles and peregrine falcons. As with herbicide treatments, non-herbicide treatments would occur near bald eagle foraging habitat, but not near peregrine falcon foraging habitat.

None of the proposed treatment activities would degrade suitable habitat for either species. In the long-term, implementation of this alternative would likely benefit foraging species for both birds. This effect would help maintain the availability of prey for the bald eagle and peregrine falcon.

San Gabriel Mountain Slender Salamander, Yellow-Blotched Salamander, California Legless Lizard, San Bernardino Mountain Kingsnake. San Bernardino Ringneck Snake, San Diego Horned Lizard, Coastal Rosy Boa, Southwestern Pond Turtle and Two-striped Garter Snake (Forest Service sensitive)
Biological control methods, manual/mechanical treatments, fire wilting treatments, and herbicide application activities may affect individual amphibians and reptiles due to the presence of personnel

and vehicles in the area. Direct impacts may include injury or mortality as a result of vehicles and pedestrians crushing individuals within the project area. Short-term displacement and/or disturbance of feeding and breeding activities due to noise, vibration, and project associated activities are other possible direct effects.

The herbicide risk assessments do not include any specific data regarding the toxicity of herbicides to reptiles. The assessments use toxicity data for fish and amphibians as guidance for risks to reptiles. It is expected that the actual toxicity of direct contact to reptiles is lower than what is given for fish and amphibians since reptiles have skin that is less permeable. Based on the risk assessment worksheets for this project, two of the five herbicides proposed for use pose a risk to fish, amphibians and reptiles (USFS 2010a-f). The application of triclopyr BEE and pre-mixed glyphosate have a low risk of directly impacting amphibians and reptiles. Although most amphibians and reptiles would flee the area when personnel, vehicles and equipment are in the area, some may take cover and refuge under vegetation. Amphibians and reptiles under vegetative cover are at risk of being directly sprayed by herbicides. If this occurs, the vegetation would provide some protection and reduce the risk that 100 percent of any animal's body would be exposed to herbicide spray. If direct exposure does occur, it can result in mortality to adults and the offspring of exposed adults to produce young that have physical abnormalities. This risk is decreased through the application methods to be used. Spraying of herbicides would occur by focused treatment (e.g. cutting the plant and daubing the stump with the herbicide) or it would be applied to the foliage of target plants using a backpack sprayer. These techniques would decrease the amount of spray that may drift from the area, keeping the application localized to target plants. To further reduce potential drift a design feature restricts herbicide application when winds are greater than 10 miles per hour. No broadcast applications would be used in applying herbicides for this project. A design feature also restricts the use of triclopyr to occur only when other approved herbicides are not effective in treating a specific invasive plant species. Based on this analysis and the design features, the risk of direct exposure of triclopyr BEE and pre-mixed glyphosate to amphibians and reptiles is low.

Indirect effects of herbicide treatments may include, but are not limited to, the consumption of contaminated prey, and contact with contaminated vegetation and soil. All of these effects have a high probability of occurring in treatment areas. Indirect effects may have adverse impacts on reproduction, such as mortality of young, and the development of physical abnormalities as amphibian larvae mature. Reptiles in the project area may return shortly after treatment making them susceptible to exposure to herbicides. Two of the five herbicides proposed for use pose a risk if applied at a high application rate. Glyphosate would be applied at a typical rate of 3 pounds per acre with the highest application rate of 8 pounds per acre. Based on the project worksheets assessing risk, both rates with the pre-mixed glyphosate would exceed the level of concern for amphibians and reptiles (USFS 2010c) under short-term exposure. There is little risk the herbicide would cause adverse effects under long-term exposure. Triclopyr BEE poses a risk to amphibians and reptiles when applied at the highest rate of 10 pounds per acre and the typical rate of 3 pounds per acre under short-term exposure. There is little risk of adverse effects at the same rate under long-term exposure (USFS 2010e-f). As noted earlier, high and moderate priority invasive plants in the project area presently do not cover vast areas and there are other treatment methods besides herbicide treatment. The type of herbicide treatment methods would also help to minimize risk to amphibians and reptiles. Herbicide application would be localized, by treating target species using a backpack sprayer for foliar/spot spraying application or by focused treatment such as daubing the stumps of target species after they have been cut. No broadcast applications would occur, decreasing the amount of herbicides that may drift at the landscape level. A restriction on treatment during winds greater than 10 miles per hour would also reduce the risk for drift. Triclopyr will only be used if other approved herbicides are not effective in treating a specific invasive plant. The adverse indirect impacts to these species from the use of pre-mixed glyphosate and triclopyr BEE are low to moderate.

Pile burning may affect some amphibians and reptiles if they are using the piles as habitat. A design feature, which includes burning the piles as soon as possible and disturbing piles prior to igniting them would help decrease adverse effects to individuals.

Indirect effects due to manual/mechanical and fire wilting treatments would have little effect to reptiles in the area. The treatments would result in a change in vegetative structure, which may remove some cover for reptiles. At the same time, treatment activities may result in an increase in basking areas. There are areas where patches of invasive plant species are too dense for most animals including amphibians and reptiles, to move through, forage or thermoregulate. Removal of these patches of invasive plants would provide openings that are currently non-existent. Over time, it is anticipated native plants would become re-established in treated areas, which would provide natural structure and cover levels, a beneficial effect for reptiles.

Nelson's Bighorn Sheep (Forest Service sensitive)
Biological control methods, manual/mechanical treatments, fire wilting treatments, and herbicide application activities may affect individual Nelson's bighorn sheep due to the presence of personnel and vehicles in the area. Direct impacts may include short-term displacement and/or disturbance of feeding activities due to noise from project associated activities. Pile burning would not affect Nelson's bighorn sheep other than disturbance. As personnel arrive to begin lighting piles, it is likely bighorn sheep would flee the area and move into areas away from humans.

All of the treatment methods would result in a change in vegetation structure and composition. This would benefit sheep by improving forage conditions and the availability of water. One of the priority invasive plant species to be removed is tamarisk. This plant occurs along creeks and streams and once established would out-compete native plant species, including those that bighorn sheep utilize as forage. Tamarisk also consumes higher volumes of water than native vegetation, which may affect the availability of water for bighorn sheep, especially during drought conditions and the summer months (Zavaleta 2000). Removing tamarisk from bighorn sheep habitat would be beneficial to this species.

Herbicide treatments of glyphosate and triclopyr do pose potential risks to bighorn sheep. Exposure to two of the herbicides proposed for use may result in adverse effects. Based on the glyphosate project worksheet that assesses risks, consumption of contaminated vegetation at the high application rate (8 pounds per acre) over a short period of time exceeds the lowest observed adverse effect level (LOAEL); therefore, it is above the level of concern. Adverse effects in reproduction could occur to large herbivorous mammals at this application rate (USFS 2010c). These impacts include malformed fetuses due to toxic exposure of the herbicides to pregnant females and mortality of developing fetuses. The risk of adverse effects decreases if they are exposed to contaminated vegetation over a long period of time at the same application rate, but adverse effect may still occur. The herbicide triclopyr poses an even higher risk to bighorn sheep than glyphosate. It may result in adverse effects at the typical application rate for this project of 3 pounds per acre over short and long-term exposures (USFS 2010e-f). In both cases the risk would be due to the consumption of contaminated vegetation. Changes in weight, diarrhea, internal organ failure in young and adults, and reproduction are at risk to adverse effects. The following factors reduce the risk of bighorn sheep being exposed to large amounts of contaminated vegetation: the type of treatment methods that would be used to apply herbicides and the low density of high and moderate priority invasive plants in the project area, especially in bighorn sheep habitat. The highest densities of high and moderate priority invasive plants are in the southern portion of the project area where there is heavy human activity and little sheep use. Localized and targeted species herbicide application would reduce the potential for bighorn forage to be affected in large amounts. No broadcast spraying would occur and targeted species would be treated directly with herbicides. To decrease the risk of herbicide drift at the landscape level, spraying would only occur when the wind speed is 10 mph or less. In addition, triclopyr would only be allowed for use if other approved herbicides are not effective in treating

specific invasive plant species. Based on these factors, adverse impacts to bighorn sheep are expected to be low. The proposed action would benefit bighorn sheep in the long-term. Most invasive plant species are unpalatable to bighorn sheep. Removal of invasive plants would allow native vegetation (including forage species) to become re-established. Restoration and monitoring are also part of the proposed action and these activities would ensure invasive plants do not re-colonize in treated areas or expand into new areas. Monitoring activities would also be used to determine if additional treatments are necessary in the future.

Pallid Bat, Townsend's Big Eared Bat and Western Red Bat (Forest Service sensitive)
Biological control methods are unlikely to affect bats in the area. Other treatment activities such as manual/mechanical treatments, fire wilting treatments, and herbicide application activities may affect individual bats due to the presence of personnel and vehicles in the area. Western red bats utilize the foliage of riparian hardwood trees for roosting and pallid bats would sometimes roost in tree hollows. If individuals are roosting in the immediate vicinity of the treatment area they may be disturbed by the noise and human disturbance generated by project activities. This could result in temporary displacement of individuals. Impacts resulting from displacement would be greatest during the maternity and the winter roosting seasons.

There are historical records of western red bats roosting in tamarisk. Unpublished field notes by S. Benson, documented western red bats roosting at heights of 6 to39 feet in large tamarisk stands that were 39 to 49 feet in height (Pierson et al. 2006). Tamarisk is a high priority species targeted for removal in the project area. Pruning and cutting of this plant may adversely impact roosting bats, but it is more likely disturbance activities would cause bats to leave their roost before treatment activities begin. In addition, roosting habitat should not be a limiting factor in this watershed.

Biological control methods, manual/mechanical treatments, and fire wilting treatments would not indirectly affect bats or their roosts. Herbicide treatments may indirectly affect bats if they consume contaminated insects and may affect red bats with the potential loss of roosting habitat in areas where larger sized tamarisk are removed. However, native riparian vegetation would be available providing suitable roosting habitat for red bats that may be utilizing tamarisk as roost sites. If bats consume a large quantity of insects contaminated with glyphosate, imazapyr or triclopyr, it could result in adverse effects. The risk of glyphosate to bats may occur at the typical application rates proposed for this project. Short-term exposure would result in adverse effects. Imazapyr may cause adverse effects to bats if they consume a large quantity of contaminated insects at the high application rate (4 pounds per acre) over a short period of time. It is unknown if chronic exposure causes any risk because there are no studies documenting degradation of herbicides in insects. Therefore, there is no chronic exposure data available for insectivorous species. At the typical application rate proposed for this project, triclopyr may cause adverse effects (mainly diarrhea) if bats consume contaminated insects over a short period of time (USFS 2010e-f). Although there is a risk to bats, the risk would be low because bats tend to forage over large areas. It is unlikely that they would consume large quantities of herbicide-contaminated insects. In addition, high and moderate priority invasive plants presently do not cover vast areas of the project area and herbicide treatment is one of many methods being considered. The type of herbicide treatment (i.e., foliar or spot spraying and focused treatment) would further reduce the risk of accidentally treating insects. Triclopyr is also restricted for use only when other approved herbicides are found to be ineffective in treating specific invasive plant species. These factors along with the noted project design features would minimize the adverse impacts to bat species noted earlier and are anticipated to be low.

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 short-term risk to wildlife would decrease; however, for most low and moderate priority invasive

plant species, they would continue to survive and spread similar to the no action alternative. This would have a long-term adverse effect on native wildlife.

Alternative 3 would help to control 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. It is likely that some of the effects to wildlife that may occur with alternative 1 would also apply to alternative 3. 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.

Herbicides do pose a risk of adverse effects occurring to wildlife species as described in the wildlife effects section for alternative 2. Since alternative 3 does not propose herbicide treatments, alternative 3 would have less potential adverse impacts to wildlife in comparison to alternative 2.

Overall, alternative 3 would help to remove invasive plants, however, over time, low and moderate priority populations would continue to spread leading to adverse effects to suitable habitat for many wildlife species.

Cumulative Effects

The cumulative effects spatial boundary considered in this analysis is the San Gabriel watershed within the confines of the Angeles National Forest. The temporal boundary is 15 years, the life of the project.

Alternative 1, No Action

As with all resources, there would be no cumulative effects from alternative 1 to wildlife.

Alternative 2, Proposed Action

The proposed project would cumulatively increase adverse effects when reviewed with other projects/activities. Invasive plant removal on the San Gabriel River Ranger District has been focused on the removal of arundo. The proposed project would expand the number of priority species to be removed and as a result would also increase the amount of area to be treated. 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. Wildlife is use 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 is use 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

Cumulative effects for alternative 3 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. These areas, 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 results in controlling moderate priority species would likely not be effective in the long-term.

Soils and Hydrology[62]

Affected Environment

The project area includes the major drainages in the San Gabriel River, Big and Little Dalton Canyons, Van Tassel, Fish, and Roberts Canyons, and San Dimas Canyon watersheds. Subwatersheds in the project area include: Upper West Fork San Gabriel River, Middle West Fork San Gabriel River, North Fork San Gabriel River, East Fork San Gabriel River, Lower San Gabriel River, Prairie Fork, Cattle Canyon, San Dimas Canyon, Dalton Canyon, and Headwaters.

The San Gabriel Mountains are a young mountain range which is 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 San Gabriel 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. None of the reaches of the San Gabriel River watershed within the Forest are included on the US EPA Clean Water Act 303(d) list of streams with impaired water quality (USEPA 2006).

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.

[62] This is a summary of the soils and hydrology analysis. For further and more detailed information, the Hydrology/Soils Specialist Report is on file in the project planning record located at the San Gabriel River Ranger District office.

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 and Indirect 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.

Alternative 2, Proposed Action, Specific to Herbicide Treatment Methods

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 along stream channels and many of the invasive plant species grow along active channel banks or even 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. Table 16 shows the proposed herbicides and pertinent physical and chemical characteristics. The information provided in table 16 was taken from the SERA human health and ecological risk assessments (SERA 2003a, b; 2004 a, b; 2007b) and other sources.

Table 16. Herbicide Behavior in the Environment.

Chemical and Product Names	Suitable for Aquatic Use?	Fate in the Environment	Hazards	Leaching Potential	Solution Runoff Potential	Adsorbed Runoff Potential
Aminopyralid	No	Highly soluble in water and mobile in soils. Degrades rapidly in water. Relatively stable in soils. Unknown if toxic to soil microorganisms.	New herbicide, limited toxicity information available. Can leave residues in soil. May leach to groundwater.	High	Low	Low
Chlorsulfuron	No	Microbial and chemical degradation are relatively rapid. Potential for offsite movement through drift, runoff, or wind erosion. Relatively non-toxic to soil microorganisms.	Can leave residues in soil for several weeks. May leach to groundwater.	High	High	Intermediate
Glyphosate	Yes (Aquamaster® formulation only)	Adsorbs tightly to soils. Subject to rapid microbial degradation. Non-toxic to soil microorganisms. Low drift potential.	Should not be used prior to predicted rainfall. May require re-treatment.	Very low	Low	High
Imazapyr	Yes (Habitat® formulation only)	Highly mobile in sandy soils. Potential for offsite movement through drift, runoff, or wind erosion. Degrades rapidly in water and slowly in soils. Relatively non-toxic to soil microorganisms.	Can leave residues in soil. May leach to groundwater.	High	High	Intermediate
Triclopyr	Yes (triclopyr triethylamine salt formulation only [TEA])	One formulation very persistent in the environment. Other formulation degrades rapidly. Potential for off-site movement through drift, runoff, and wind erosion. Relatively non-toxic to soil organisms.	One formulation may leave residues in soils. Either formulation may leach to groundwater. Ethyl ester formulation may contain kerosene as an adjuvant.	High	Intermediate	Intermediate

Overuse or careless use of herbicides can produce short to long-term impacts to soils and ground water quality as well as short-term impacts to surface water quality. Risk assessments prepared for the Forest Service on the designated herbicides indicate that some herbicides can affect the biological community in soils, potentially reducing its productivity (SERA 2003a, b; 2004 a, b; 2007b). Some herbicides dissolve readily in surface runoff and can flow to nearby streams, impacting surface water quality. Herbicides can also dissolve in infiltrating rainwater and impact groundwater, which could flow into streams and impact surface water. Herbicides applied with backpack sprayers can be transported by even low velocity winds to non-target soils and streams. Design features have been built into the proposed action to reduce the potential impacts from herbicides to an acceptable level.

Substances introduced into flowing streams are quickly diluted and transported downstream in turbulent stream flow, making effective water quality monitoring very difficult (Tchobanoglous 1987). Even small streams can quickly dilute small quantities of herbicides to low concentrations (SERA 2003a, b; 2004 a, b; 2007b). However, stable dissolved herbicides in eddies or pools could remain for weeks.

The primary method of control of potential adverse effects from herbicide treatment is the use of design features and following manufacturer's directions on the labels. 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.

Alternative 2, Proposed Action and Alternative 3, No Herbicides Specific to non Herbicide Activities

The non-herbicide treatments are analyzed together for both action alternatives since the effects are primarily limited to the physical impacts of personnel entry. These techniques include biological control agents, hand pulling, pulling using tools, clipping and cutting, girdling, tarping, and fire wilting.

As noted earlier, biological control agents are introduced to control targeted plant species. Biological control agents are typically released from one location near heavy infestations of the selected invasive plant. Repeat entries for additional releases are limited. Use of biological control agents is not currently planned, but the potential for their use exists. They are unlikely to have any direct effects on soils or water quality. Indirectly they can improve the native plant component of the ecosystem over time and avoid the water and soil problems associated with invasive plants such as arundo and tamarisk.

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.

Cumulative Effects

Alternative 1, No Action

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

Alternative 2, Proposed Action

The soil and water quality cumulative effects spatial boundary considered in this analysis is that portion of the fifth Hydrologic Unit Code (HUC) level San Gabriel River watershed within the Angeles National Forest boundaries. The effects would be scattered throughout the various sixth and seventh level subwatersheds that make up this watershed. The temporal boundary is 2005 to 2025, from five (5) years past to 15 years in the future. The previous five years are included to capture the effects of recent fires and various hazardous fuels treatments and fuelbreak management. The next 15 years includes the duration of the proposed project. Projects would occur throughout this time at unknown intervals and durations.

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

Though no herbicides are proposed with this alternative, the cumulative effects, including this alternative, 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)[63]

Affected Environment

Wilderness

Both the San Gabriel and Sheep Mountain Wilderness areas are part of the project area.

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.

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.

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 two wilderness areas, the project area also includes two 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 to this RNA begins at the Mount Wilson road and from various trails that border and traverse the area. Invasive plants are currently known along the edges of this RNA.

[63] This is a summary of the wilderness and RNA analysis. For further and more detailed information, the Visual Resouces, Recreation, Wilderness and Special Areas Specialist Report is on file in the project planning record located at the San Gabriel River Ranger District office.

Fern Canyon RNA contains 1,400 acres and was established to protect the target elements of chamise (*Adenostoma fasciculatum*) chaparral and canyon live oak (*Quercus chrysolepis*) woodland. A relict stand of low-elevation ponderosa pine (*Pinus ponderosa*) also occurs in the RNA at Brown's Flat, a shallow 80-acre bowl created by an ancient land slump. The RNA ranges in elevation from 2,592 to 5,512 feet and falls entirely within the San Dimas Experimental Forest. The entire Experimental Forest is closed to public use, but non-Forest Service researchers can gain access via a special use authorization. The entire RNA was affected by the 2002 Williams fire; however, burned and partially burned vegetation is recovering naturally. No known population of invasive plants has been noted in 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

Wilderness

The proposed action, including herbicide treatment, is designed to protect the wilderness character of the San Gabriel and Sheep Mountain 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 the high priority invasive plant species and control the moderate priority invasive plant species, thereby reducing or eliminating their effect on each wilderness. By removing or controlling high and moderate 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.

The use of biological control agents is included in this alternative. A design feature requires that their introductions would have no greater than minor adverse effects on the native plant and animal communities. Though this design feature reduces risks to the natural ecosystem, this treatment method does require the introduction of a non-native species into the project area, including potentially the wilderness. As noted in chapter 2, the Regional Forester must approve implementing this portion of the alternative in the two wilderness areas (FSM 2323.04c; USFS 2007).

There would be no effects to scientific, educational or historic uses in either wilderness. 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 have in the two RNAs. 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 the high priority species. Presently there are no known invasive plant populations in Fern Canyon RNA, but this alternative allows for early detection and rapid containment. As noted earlier, 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 RNAs. By eradicating and/or controlling the high and moderate 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 either wilderness. 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 the high and moderate priority invasive plant species. Fewer acres can be treated, and the focus of treatment would be the high 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 RNAs. Long term, focusing on the high 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 wilderness and RNAs 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 RNAs.

Alternative 2, Proposed Action

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 affects this could cause to the wilderness values.

There are no known present or proposed activities in the two RNAs 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 affects this could cause to the RNA. The cumulative effects to the Fern Canyon RNA would be the same as alternative 2 alone (since no known activities exist or are proposed in this area).

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.

As with the San Gabriel Wilderness, Falls Canyon RNA would not receive as great a benefit to controlling the moderate invasive plant species potentially invading after the Station fire as alternative 2. It can be expected that the high priority species would be eradicated or controlled in the Falls Canyon RNA. As with alternative 2, the cumulative effects to the Fern Canyon RNA would be the same as alternative 2 alone (since no known activities exist or are proposed in this area).

Recreation and Scenic Resources[64]

Affected Environment

Recreation Users

San Gabriel Canyon is the portal to this portion the Angeles Forest front country, high country and to the project area. While there are a few roads and trails into this portion of the Forest, State Highway 39 provides the vast majority of access. From the National Forest boundary to the East Fork, most visitors view scenery, occasionally stopping in one of several unimproved turnouts. At the junction of Highway 39 and the East Fork, several recreational activities begin. Many visitors travel the East Fork Road where picnicking, water play, recreational gold panning, fishing, viewing scenery, hiking, or target shooting at Burro Canyon are the predominant activities.

Many other visitors continue on Highway 39 to the San Gabriel OHV areas or continue further to the West Fork Trailhead. Activities along the West Fork are similar to the East Fork, except for the additional bike use on the West Fork Scenic Byway. Hiking into the San Gabriel Wilderness from the West Fork Trailhead or into the Sheep Mountain Wilderness from the East Fork Trailhead is extremely popular.

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

[64] This is a summary of the recreation use and scenic resource analysis. For further and more detailed information, the Visual Resouces, Recreation, Wilderness and Special Areas Specialist Report is on file in the project planning record located at the San Gabriel River Ranger District office.

and there is inadequate law enforcement coverage. While recreation use is highly concentrated in the East and West Forks of the San Gabriel River, 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.

The second cultural landscape is viewed as visitors travel from Glendora heading north on State Highway 39 which is the primary gateway into the project area. Once visitors leave the urban area and away from the residential and commercial development, there is an immediate and profound change in the landscape character. While some of the same landscape features are present as seen from the urban area, these features are seen in a lot greater detail as the visitor travels Highway 39. The magnitude of the San Gabriel Mountain Range becomes very evident, along with the rich diversity of ecosystem plant communities. Steep to very steep slopes with sharp to rounded summits and narrow riparian canyons are the dominant landforms of this landscape.

The yearlong running water in the San Gabriel River with its three forks is the most noticeable key focal point and where most visitors would likely stop. Some would continue up Highway 39 en route to the Crystal Lake area where viewing scenery is an important activity during their travels. This travel would begin in an urban landscape with dams and reservoirs near the National Forest boundary and gradually shift to a modified, then a natural appearing, and finally with primitive landscapes in the San Gabriel and Sheep Mountain Wildernesses. Human influences are most apparent in developed and dispersed recreation areas and paths along the San Gabriel River leaving the larger landscape to ecological change. Human impacts that create strong visual contrast in this landscape include, intensive use areas, graffiti, litter, utility corridors, reservoirs and dams, borrow sites, sediment placement sites, water retention basins, and road cuts.

The scenic integrity objectives (SIOs) are very high in the two wilderness areas, while the areas outside wilderness are primarily high with minor exceptions of moderate SIOs scattered throughout the project area (Forest Plan; USFS 2005).

Environmental Consequences

Direct and Indirect 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.

Alternative 2, Proposed Action, Specific to Herbicide Treatment Methods

This section addresses direct and indirect effects to the recreation and scenic resources specific to the use of herbicides. Impacts from non-herbicide activities are addressed in the next section.

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 such as the San Gabriel Canyon OHV area 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 East and West Fork branches and would have low to moderate impacts. In all other branches 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 middleground 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.

Alternative 2, Proposed Action and Alternative 3, No Herbicides Specific to non Herbicide Activities

This section addresses direct and indirect effects to recreation users and scenic resources specific to non herbicide activities.

Should piles be burned by implementing either alternative, 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

The cumulative effect spatial boundary is the Forest, east of State Highway 14, and the temporal boundary is the 15-year term for this project.

Alternative 1, No Action Alternative

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

Alternative 2, Proposed Action

Recreation Users

The cumulative effects to recreation users would be minor during the term of the project. The greatest impact to recreation users is likely from the closure order caused by the recent wildfire on the Forest. The Station fire recovery area covers the northwestern portion of the project area and further west outside the project area (approximately 200,000 acres). This area is temporarily closed, including recreation use areas that include trails, day use areas and campgrounds. Portions of this area have recently opened, including the West Fork of the San Gabriel River. Due to the closure, it is likely recreation users would be focusing access in areas that are open, including the project area. Due to this action, increased recreation activities in the project area, along with the short-term closures due to treatment activities from this project, could have minor short-term adverse cumulative effects on the recreation experience.

Scenic Resources

Reviewing the cumulative activities that are occurring in the eastern portion of the Forest, the greatest short-term impacts to the scenic resource is 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 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

Cumulative effects to recreation users and the scenic resource are the same as alternative 2. There may be some additional cumulative impacts to recreation users under this alternative because not using herbicides would result in increased amount of crew time treating and retreating invasive plants.

Consequences Relative to Significance

Council on Environmental Quality regulations (40 CFR part 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 eastern portion of the Angeles National Forest. This Forest is an urban forest with large population centers nearby (e.g. Los Angeles). Though this project covers 22,000 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, 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).
- Glyphosate with pre-mixed surfactants (e.g. Roundup®) at the highest application rate are above the level of concern for insect-eating small mammal species.

- Typical application rates of triclopyr are above the level of concern for large birds and mammals consuming treated vegetation over a long period of time.
- 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.[65] 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 San Gabriel and Sheep Mountain Wildernesses or the Fern and Fall Canyon RNAs.

The project area has both eligible wild and scenic rivers (East, West, and North Forks of the San Gabriel River) and recommended wilderness areas (an extension of Sheep Mountain). Both action alternatives would not have significant adverse effects to the eligibility or potential classification of these river segments. 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.

This project includes the West Fork San Gabriel River critical biological zone (classified under the Forest Plan). The primary species to protect is the Santa Ana sucker, a threatened species under the Endangered Species Act. In addition, this area is currently managed as a wild trout stream and has numerous other species that are rare and unique. The greatest risk in this biological zone from the proposed project is from the use of herbicides with alternative 2. Design features have been included in minimize impacts to the sucker and other species(e.g. no herbicide applications can occur in occupied habitat from March to September 1; if glyphosate is applied near surface water, the rate cannot exceed 2 pounds a.e. per acre. In addition, only aquatically registered herbicides and low-risk aquatically approved surfactants will be allowed within 100 feet of the banks of rivers and tributaries. These measures would also protect the wild trout populations in this area. Based on the action alternatives descriptions, including design features, adverse effects are expected to be below the level of significance. Controlling and containing invasive plants in the West Fork would help maintain the unique values that resulted in the area being designated as a critical biological zone.

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

Approximately 240 scoping letters 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 May 15, 2009 in the *Inland Valley Daily Bulletin*. The detailed purpose and need and proposed action document, map, and scoping letter were included on the Forest websites under "Projects and Plans" starting May 15, 2009 (http://www.fs.fed.us/r5/angeles/projects/). This internet site was referred to in both the legal notice and scoping letter.

[65] The Heritage Resource Report is on file in the project planning record located in the San Gabriel River Ranger District office.

Additional requests for input were sent to Native American groups and included: on June 29, 2009, the Forest tribal relations program manager sent an e-mail to six Native American "traditionalists" to ensure they were notified of the project, and letters from the Forest Supervisor, dated October 19, 2009, were mailed to potentially interested groups requesting the identification of specific areas still being used by Tribal members for plant harvesting or collecting or which have other significance that would merit special consideration during project design and implementation.

Only five comments were received with one opposing the use of herbicides. Based on the level of outreach and the response, it is unlikely the effects to the human environment from this project would be highly controversial. Activities were designed to minimize or eliminate potential effects on the human environment.

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. Because all five herbicides have been approved by US 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 (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

The project has potential habitat for two threatened species: thread-leaved brodiaea (*Brodiaea filifolia)* and Santa Ana sucker (*Catostomus santaanae*) and five endangered species: Brauton's milkvetch (*Astragalus brauntonii*), Nevin's barberry (*Berberis nevinii*), slender-horned spineflower (*Dodecahema leptoceras*), southwestern willow flycatcher (*Empidonax traillii extimus*), and mountain yellow-legged frog (*Rana muscosa*). 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 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.

Based on the air quality specialist report,[66] 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

[66] Air Qualtiy Specialist Report is located in the project planning record located at the San Gabriel River Ranger District Office.

season whenever practicable. If work is preformed 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:

Gail Bakker, Hydrologist, Adaptive Management Services Enterprise Team (AMSET)
Wendy Boes, Botanist, AMSET
Chris Clervi, GIS Specialist, AMSET
Marian Kadota, ID Team Leader, AMSET
Teresa Sue, Wildlife Biologist, AMSET
Janelle Walker, Archaeologist, Angeles National Forest
Erwin Ward, Recreation and Land Use Consultant, AMSET

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, US Army Corp of Engineers, Lahontan Regional Water Quality Control Board, California Fish and Game and CALFIRE, County of Los Angeles (including the Department of Public Works, Water Resources), Cities of Glendora, La Verne, Duarte, Azusa, and San Gabriel. State Historic Preservation Officer was not consulted because the programmatic agreement was used to ensure heritage resource sites are protected.

TRIBES:

As noted in Chapter 1, Native Americans were contacted a variety of ways during scoping; including, being sent the scoping letter, emailing six Native American traditionalists and mailing specific letters to potentially interested groups requesting the identification of specific areas still being used by Tribal members for plant harvesting or collecting and asking for any concerns related to the project.

OTHERS:

David Bakke, Pacific Southwest Region Pesticide Specialist and Invasive Plants Program Manager
Jan Beyers, Pacific Southwest Region, Plant Ecologist and Resource Natural Area Committee Member, Pacific Southwest Research Station
Esmeralda Bracamonte, Acting Resource Officer, San Gabriel River Ranger District, Angeles National Forest
Janet Nickerman, Forest Botanist, Angeles National Forest
Mike Oxford, San Dimas Experimental Forest

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APPENDIX A, SUMMARY OF PUBLIC COMMENTS

Comment	Determination of an issue	Explanation	Letter/comment and date
Concerned with using extremely toxic herbicides close to fish bearing streams	Non- key issue	Though this was not considered a key issue, an alterantive was developed that does not include herbicides	Richard Artly, retired Nez Perce Forest Planner (email dated 5/19/09)
Each herbicide being considered is highly toxic to aquatic organisms	Non-key issue	The analysis addresses potential adverse impacts to aquatic organisms. This analysis is addressed in chapter 3	Richard Artly, retired Nez Perce Forest Planner (email dated 5/19/09)
Glysophate, chlorsulfuron, aminopyralid are considered highly hazardous to the health of mammals	Non-key issue	The analysis addresses potential adverse impacts from glysophate, chlorsulfuron, and aminopyralid. This analysis is documented in chapter 3	Richard Artly, retired Nez Perce Forest Planner (email dated 5/19/09)
Each herbicide being considered is toxic to humans and animals	Key issue	This issue was followed through in the analysis, including designing an alternative without the use of herbicides	Richard Artly, retired Nez Perce Forest Planner (email dated 5/19/09)
Aminopyralid, glysophate, imazapyr are banned from the European Union	Non-key issue	Not all of these herbicides are banned and this statement does not play a role in this analysis. None are banned in US.	Richard Artly, retired Nez Perce Forest Planner (email dated 5/19/09) Repeated statement in email dated 5/31/09
Demands no use of herbicides to kill invasive plants	Non-key issue	Though this was not considered a key issue, an alterantive was developed that does not include herbicides	Richard Artly, retired Nez Perce Forest Planner (email dated 5/19/09)
Wants the safety and toxicity conclusions from PANNA data rather than the manufacturer' data	Non-key issue	The Forest Service hired a consulting firm (SERA) that reviewed studies on each herbicide and made independent conclusions on safety and toxicity. These risk assessments were used as a basis for the analysis	Richard Artly, retired Nez Perce Forest Planner (email dated 5/31/09)
Do not consider any of the "dirty dozen" chemicals listed by PANNA as part of the project. Also provides concern for atrazine, glufosinate, paraquat, nitrofen	Non-key issue	None of these chemicals are proposed for the project	Richard Artly, retired Nez Perce Forest Planner (email dated 5/31/09)

Comment	Determination of an issue	Explanation	Letter/comment and date
Provides a UK reference on potential adverse impacts of Roundup (glysophate product)	Non-key issue	The analysis acknowledges some surfactants have higher toxicity than glysophate. Roundup is an example of where this occurs. Chapter 3 addresses impacts from glysophate generally and pre-mixed products.	Richard Artly, retired Nez Perce Forest Planner (email dated 5/31/09)
Provides a reference on potentail adverse impacts of imazapyr to humans (eyes, skin); breaksdown slowly, persistent in soil and water	Non-key issue	Chapter 3 addresses potential adverse impacts from imazapyr	Richard Artly, retired Nez Perce Forest Planner (email dated 5/31/09)
Suggests the use of non-toxic herbicides	Non-key issue	This alternative was considered but eliminared from detial analysis. The reasoning is explained in chapter 2	Richard Artly, retired Nez Perce Forest Planner (email dated 5/31/09)
99% of commercial herbicides are toxic, they may be lethal poisons to mammals, birds, and fish	Non-key issue	This is a general statement. Chapter 3 addresses potential impacts the 5 proposed herbicides would have on the environment	Richard Artly, retired Nez Perce Forest Planner (email dated 5/31/09)
Concerned w / protecting cultural resource sites from this project	Non –key issue; will be resolved through design features	Design features are included in the project to protect any known sites	Freddy Romero from the Santa Ynez Band of Chumash (phone call 5/27/09)
Thought this project had heavy equipment use (i.e., excavating, constructing).	Non –key issue; outside the scope of the project	No heavy equipment is proposed	Art Zuniga from the Gabrielino Indians (phone call 6/1/09)
Wants to assure that all artifacts and or remains discovered all get handled and reburied with dignity & respect	Non-key issue; will be resolved through design features	Design features are included in the project to protect any known sites	Andrew Salas and Ernest Salas from the Gabrielino Indians (email dated 6/1/09
Asked why we did not include San Antonio Crk in the project area	Non-key issue, outside the scope of the project	Outside the scope of the project. District chose to not include this area in this project and is discussed in chapter 2 as an alternative considered but not analyzed	Bill Reeves of Fisheries Resource Volunteer Corps (phone call 6/2/09)
Report on tamarisk in the east fork of the San Gabriel River (dated 3/15/10)	Non-key issue	This information was used in defining the scope of the project in this branch	Tom Walsh of Fisheries Resource Volunteer Corps (via Esmeralda Bracamonte, SGRRD resource staff)

APPENDIX B - ADDITIONAL INVASIVE PLANT INFORMATION

Table 17 provides a list of invasive plant species that are presently known to occur within or near the project area. The list shows which plants are presently within the project area, and 300, 1,500 and 3,000 feet from the project area; Cal-IPC inventory categories; CDFA ratings; and the San Gabriel River Ranger District (SGRRD) priority.

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 17. Invasive plants known to occur in and near the project area. Cal-IPC inventory categories, CDFA ratings, and the San Gabriel River Ranger District (SGRRD) priority.

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

Common name (Cal-IPC, Calflora)	Taxon name	Cal-IPC	CDFA	SGRRD Priority
Wild mustard	*Sinapsis arvensis*	Limited		Low
London rocket	*Sisymbrium irio*	Moderate		Low
Johnsongrass	*Sorghum halepense*	listed	C	Low
Spanish broom	*Spartium junceum*	High	C	Moderate
Saltcedar, Tamarisk	*Tamarix ramosissima*	High	B	High
Hedgeparsley	*Torillis arvensis*	Moderate		Low
Puncture vine	*Tribulus terrestris*	Not listed	C	Low
Gorse	*Ulex europaeas*	High		Moderate
Woolly mullein	*Verbascum thapsus*	limited		Low
Big periwinkle	*Vinca major*	Moderate		Moderate
Rattail fescue	*Vulpia myuros*	Moderate		Low
Mexican fan palm	*Washingtonia robusta*	Moderate		Low
300 feet from project area				
English plantain	*Plantago lanceolata*	Limited		Low
Foxtail	*Setaria faberi*	Not listed	B	Low
1,500 feet from project area				
Artichoke thistle	*Cymara cardunculus*	Moderate		Low
Canary Island date palm	*Phoenix canariensis*	Limited		Low
Crown daisy	*Chrysanthemum coronarium*	Moderate		Low
Eurasian watermilfoil	*Myriophyllum spicatum*	High		Low
Japanese brome	*Bromus japonicus*	Limited		Low
Kikuyugrass	*Pennisetum clandestinum*	Limited	C	Low
Rose clover	*Trifolium hirtum*	Moderate		Low
Sheep sorrel	*Rumex acetosella*	Moderate		Low
silverleaf cotoneaster	*Cotoneaster pannosus*	Moderate		Low
Yellow starthistle[67]	*Centaurea solstitialis*	High		Moderate
3,000 feet from project area				
Canada thistle	*Cirsium arvense*	Moderate	B	Low
Olive tree	*Olea europaea*	Limited		Low
Parney's cotoneaster	*Cotoneaster lacteus*	Moderate		Low
Petty spurge	*Euphorbia peplus*	Not listed		Low
Pride-of-Madeira	*Echium candicans*	Limited		Low
Russian olive	*Elaeagnus angustifolia*	Moderate		Low

[67] There is some doubt as to whether this occurrence is a misidentified tocolote population.

Table 18. High and moderate priority species reproductive mechanisms that have been identified (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
High Priority									
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
Moderate Priority									
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)									
Moderate Priority									
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				

Table 19. Dispersal vectors for high and moderate priority invasive plants.

Common Name (Taxon Name)	Non-Human/ Natural Seed Dispersal	Long Distance Dispersal (1+ Km)	Human Dispersal Mechanisms and Vectors
High Priority			
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
Moderate Priority			
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,	x	land management like gravel bars, fence rows, overgrazed pastures, logged areas, and fire

Common Name (Taxon Name)	Non-Human/ Natural Seed Dispersal	Long Distance Dispersal (1+ Km)	Human Dispersal Mechanisms and Vectors
	water		management (post-burn sprouter); horticultural use
Himalaya blackberry *(Rubus armeniacus)*	water, wildlife	x	agriculture activities, human spread by ingestion of 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

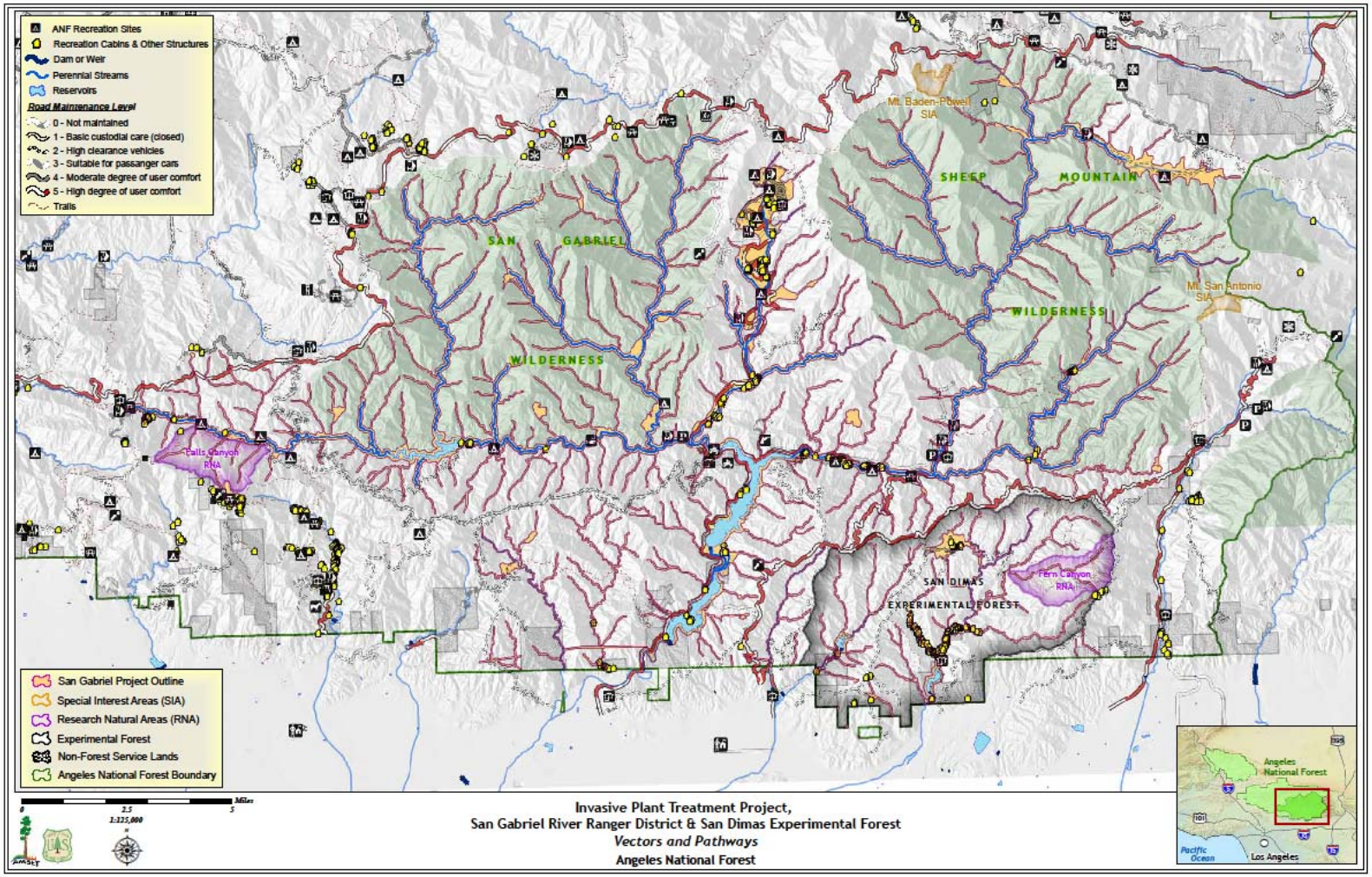

Figure 4. Map showing potential vectors and pathways in and near project area.[68]

[68] These pathways are often the sits of greatest vegetation invasion, as they often combine high risk factors for invasion, such as continuous disturbance and higher frequency of vectors.

Table 20. Vegetation type high and moderate priority invasive plant species are known to occur in.

Common name (Species name)	coniferous forest	oak woodland	chaparral	coastal sage scrub	riparian/wetland
High Priority					
giant reedgrass *(Arundo donax)*		x			x
tamarisk (saltedar, French, and smallflower) *(Tamarix ramosissima, T. gallica, T. parviflora)*					x
tree of heaven *(Ailanthus altissima)*	lower montane coniferous forest	x		x	x
Moderate Priority					
alligator weed *(Alternanthera philoxeroides)*					x
Andes grass, purple pampas grass *(Cortaderia jubata)*	x				x
big periwinkle *(Vinca major)*	x	x		x	x
Cape-ivy, German-ivy *(Delairea odorata)*	x	x		x	x
capeweed -sterile and fertile *(Arctotheca calendula)*				x	x
castorbean *(Ricinus communis)*					x
crimson fountaingrass *(Pennisetum setaceum)*			x	x	x
croftonweed, eupatorium *(Ageratina adenophora)*	x			x	x
English ivy *(Hedera helix)*	x	x		x	x
erect veldtgrass *(Ehrharta erecta)*		x		x	x
fennel *(Foeniculum vulgare)*			x	x	x
French broom *(Genista monspessulana)*	x	x			x

Common name (Species name)	coniferous forest	oak woodland	chaparral	coastal sage scrub	riparian/wetland
gorse *(Ulex europaeus)*	x	x	x	x	x
Himalaya blackberry *(Rubus armeniacus)*	x	x			x
Italian ryegrass *(Lolium multiflorum)*		x	x		x
onionweed *(Asphodelus fistulosus)*			x	x	
pampasgrass *(Cortaderia selloana)*			x	x	x
Portuguese broom *(Cytisus striatus)*		x	x		
purple veldtgrass *(Ehrharta calycina)*		x	x	x	
Russian knapweed *(Acroptilon repens)*	lower montane coniferous forest	x	x	x	x
Scotch broom *(Cytisus scoparius)*	x	x	x		x
Spanish broom *(Spartium junceum)*			x	x	x
spotted knapweed *(Centaurea maculosa)*	x	x	x	x	x
yellow starthistle *(Centaurea solstitialis)*		x		x	

APPENDIX C POTENTIAL TREATMENT PRESCRIPTION OPTIONS

Treatment prescription herbicide and manual options to consider in integrated weed management for known and expected invasive plants[69]

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[70] (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.

[69] Any herbicide/surfactant planned for use within 100 feet of the waters edge must be aquatically approved.
[70] No tricopyr esters have been approved for aquatic use. When using this herbicide, treated areas must be a minimum of 100 feet from the banks of rivers and tributaries.

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
San Gabriel Ranger District, Angeles National Forest
San Dimas Experimental Forest, Pacific Southwest Research Station

Version 1.1

FY 2011

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 the implementation of the 2010 decision.

Version 1.1 of this Monitoring Plan was developed during the environmental analysis process. 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

3.1 Decision Key

3.1.1 Implementation Evaluation Question

Was the decision key used to determine appropriateness of the treatments based on the Environmental Assessment (EA)?

3.1.2 Approach

The completed decision key for treatment areas is documented and attached to this plan.

Decision Key	
Step 1A	Determine the best treatment method based on the invasive plant species present, the size of the infestation, and the location of the population. Determine the treatment strategy (eradicate, control, contain, or suppress). Can the treatment strategy be achieved using non-herbicide treatment methods (i.e., can the treatment strategy be manual and/or mechanical, such as a chainsaw, or should biological control be considered)? Yes: Continue to Step 1B. No: Continue to Step 2.
Step 1B	Does the non-herbicide treatment method require some form of ground disturbance (e.g. manual and/or mechanical) Yes: Continue to Step 4 No: Continue to Step 9
Step 2	Have any conditions within the treatment area changed from what is described in this EA? Does the treatment area have an invasive species not specifically addressed in the EA? Is the proposed herbicide use (i.e., concentration or application method) different than what was proposed in the EA? Yes: Continue to Step 3. No: Continue to Step 6.
Step 3	Is the herbicide treatment method analyzed in this EA (e.g. foliar herbicide application)? Yes: Continue to Step 4. No: Choose another treatment method OR conduct additional NEPA.
Step 4	Are there any unforeseen changed conditions (e.g. disturbance, new federal listing[71] of an animal and/or plant species) from what was addressed in this EA,)? Yes: Conduct additional NEPA to address the area of change OR abandon treatment in that area. No: Continue to Step 5A.
Step 5A	Is the treatment site in a designated Wilderness Area? Yes: Continue to Step 5B. No: Continue to Step 6.
Step 5B	If action is not taken, would the natural processes of the Wilderness Area be adversely affected? Yes: Continue to Step 6. No: Continue to Step 5C.
Step 5C	Is there an imminent risk of invasive plants spreading outside the Wilderness Area? Yes: Continue to Step 6. No: Monitor invasive plant infestation.
Step 6	Are special status[72] fish, wildlife or plant species, designated critical and essential fish

[71] Federal listed species is a threatened, endangered, or proposed species protected under the Endangered Species Act.

	habitat, or cultural resources present? Yes: Use treatment methods that pose low to negligible risk to fish, wildlife, and plant species and cultural resources. Examples include use of selected herbicides (e.g. aquatic imazapyr, aquatic glyphosate or aquatic triclopyr), surfactants (e.g. methylated seed oil concentrates), manual or mechanical treatments, in conjunction with the appropriate design features and or mitigation measures that are part of the NEPA decision for this document. Continue to Step 8. No: Continue to Step 7.
Step 7	Are surveys required for special status species? Yes: Conduct necessary surveys during the appropriate time of year prior. Evaluate results of surveys. If surveys illustrate a risk to the species surveyed, use treatment methods that pose low or negligible risk to fish, wildlife, and/or plant species. Examples include use of selected herbicides (e.g. aquatic imazapyr, aquatic glyphosate, aquatic triclopyr), manual or mechanical treatments, in conjunction with the appropriate design features and/or mitigation measures that are part of the NEPA decision for this document. Continue to Step 8. No: Continue to Step 8.
Step 8	Is this a heavy public-use area and an herbicide treatment method is proposed? Yes: Use an herbicide that poses low to negligible risk to the public Continue to Step 9 No: Continue to Step 9
Step 9	Is the proposed treatment within the maximum annual treatment acres for that branch? Yes: Continue to Step 10. No: Conduct additional NEPA on additional treatment areas OR abandon treatment for that year.
Step 10	Document treatment methods for each treatment area each year. If treatment is based on the adaptive management approach, prepare a document demonstrating how the change is within the scope of the NEPA decision for this document. Documentation would be a letter to the files and available for public review upon request. Continue to Step 11.
Step 11	Implement invasive plant treatment and all the appropriate design features and/or mitigation measures that are part of the NEPA decision. Is active restoration necessary? Yes: Implement appropriate restoration strategies as outlined in the proposed action. Continue to Step 12. No: Allow passive restoration to revegetate treatment site. Continue to Step 12.
Step 12	Implement monitoring framework as outlined in the proposed action. Are invasive plants present at the time the treatment area is monitored? Yes: Continue to Step 1. No: Continue to Step 13.
Step 13	Implement monitoring framework for restoration as outlined in the proposed action. Is the restoration strategy effective? Yes: Healthy, native plant communities and function have been restored. No: Continue to Step 11.

[72] Special Status is defined as threatened, endangered, and proposed species, Forest sensitive species, management indicator species, or other rare or endemic species of concern.

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 14 branches addressed in the Environmental Assessment (EA). Should there be a need for treatment by a branch to go over 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.

Annual Treated Acres by Branch: Year_____

BRANCH NAME (drainage; project miles; acres; % of overlap[73])	Treatment type[74]	Arundo		Tamarisk		Tree-of-Heaven		Woody Invasives		Forb Invasives	
		Actual treatment each year (mi/acres)	Maximum miles/ acres treated/ year[75]	Actual treatment each year (mi/acres)	Maximum miles/ acres treated/ year[4]	Actual treatment each year (mi/acres)	Maximum miles/ acres treated/ year[4]	Actual treatment each year (mi/acres)	Maximum miles/ acres treated/ year[4]	Actual treatment each year (mi/acres)	Maximum miles/ acres treated/ year[4]
Morris Reservoir (San Gabriel; 23 mi; 1100 ac; 85%)	Herbicide		0		<1/50		/<1		1/20		4/100
	Combination herbicide/hand/mech-anical treatments		2/1		3/200		/<1		5/150		<1/25
	Hand treatment		0		<1/50		/<1		1/30		2.5/75
San Gabriel Reservoir (San Gabriel; 16 mi; 1190 ac; 85%)	Herbicide		0		<1/50		/<1		<1/20		2.25/100
	Combination herbicide/hand/mech-anical treatments		3/1		2.5/200		/<1		2.5/150		<1/25
	Hand treatment		0		<1/50		/<1		<1/30		1/75
West Fork (San Gabriel; 64 mi 2690 ac; 5%)	Herbicide		0		0		0		/2		/2
	Combination herbicide/hand/mech-anical treatments		<1/1		0		0		/8		/8
	Hand treatment		0		0		0		/90		/<90
San Gabriel Wilderness (San Gabriel; 123 mi; 4720 ac; 100%)	Herbicide		0		0		0		<1/5		<1/10
	Combination herbicide/hand/mech-anical treatments		0		0		0		<1/10		<1/5
	Hand treatment		0		0		0		<1/5		<1/5

[73] Percentage of overlap is the percentage of acres/miles in which 2 or more of the 5 invasive plant categories overlap within the infestation (e.g. 85% of the total acres within the Morris Reservoir Branch overlap and 15% of the infestation area has only one invasive plant category). Overall, overlap of invasive weed categories is estimated at approximately 85%.

[74] Biological and fire wilting methods during this 15 year period would likely be minimal.

[75] Should new infestations be found where none presently occur, a maximum of 1 mile annually (per branch) would be treated and is incorporated into this analysis. Acres and miles of proposed treatment can cover vast areas with wide dispersal of invasive plants (e.g. heavy densities to very sparse densities of invasive plant species)

BRANCH NAME (drainage; project miles; acres; % of overlap)	Treatment type	Arundo		Tamarisk		Tree-of-Heaven		Woody Invasives		Forb Invasives	
		Actual treatment each year (mi/acres)	Maximum miles/ acres treated/ year	Actual treatment each year (mi/acres)	Maximum miles/ acres treated/ year	Actual treatment each year (mi/acres)	Maximum miles/ acres treated/ year	Actual treatment each year (mi/acres)	Maximum miles/ acres treated/ year	Actual treatment each year (mi/acres)	Maximum miles/ acres treated/ year
North Fork (San Gabriel; 40 mi; 2740 ac; 90%)	herbicide		/1		/1		<1/1		2/50		15/175
	Combination herbicide/hand/mechanical treatments		/4		/3		1.25/3		18/200		1/25
	Hand treatment		0		/1		<1/1		2/50		6/100
East Fork (San Gabriel; 24 mi; 820 ac; 95%)	herbicide		/10		<1/25		0		<1/50		1.5/175
	Combination herbicide/hand/mechanical treatments		/4		2/50		0		1.5/100		<1/25
	Hand treatment		0		<1/25		0		<1/50		1/100
Heaton Flats (San Gabriel; 7 mi; 310 ac; 95%)	herbicide		0		<1/25		0		<1/25		1.5/50
	Combination herbicide/hand/mechanical treatments		0		1.5/75		0		1.5/50		<1/10
	Hand treatment		0		1/50		0		<1/25		1.25/40
Heaton Flats-Sheep Mountain Wilderness (San Gabriel; 88 mi; 3970 ac; 95%)	herbicide		0		10/150		0		3.5/50		9/125
	Combination herbicide/hand/mechanical treatments		0		17/250		0		8/100		<1/10
	Hand treatment		0		7/100		0		3.5/50		5.5/65
Cattle Canyon (San Gabriel; 8 mi; 370 ac; 95%)	herbicide		0		<1/25		0		<1/25		1.5/50
	Combination herbicide/hand/mechanical treatments		0		1.5/75		0		1/25		<1/5
	Hand treatment		0		<1/25		0		<1/25		<1//20

BRANCH NAME (drainage; project miles; acres; % of overlap)	Treatment type	Arundo		Tamarisk		Tree-of-Heaven		Woody Invasives		Forb Invasives	
		Actual treatment each year (mi/acres)	Maximum miles/ acres treated/ year	Actual treatment each year (mi/acres)	Maximum miles/ acres treated/ year	Actual treatment each year (mi/acres)	Maximum miles/ acres treated/ year	Actual treatment each year (mi/acres)	Maximum miles/ acres treated/ year	Actual treatment each year (mi/acres)	Maximum miles/ acres treated/ year
Cattle Canyon-Sheep Mnt Wilderness (San Gabriel; 34 mi; 1210 ac; 95%)	herbicide		0		1/50		0		1.5/25		3/50
	Combination herbicide/hand/mechanical treatments		0		11.5/225		0		1.5/25		<1/5
	Hand treatment		0		<1/25		0		2/25		1.5/20
South Dalton (Dalton; 13 mi; 290 ac; 5%)	herbicide		0		1/5		/<1		/25		/25
	Combination herbicide/hand/mechanical treatments		1/100		2/10		/<1		/25		/25
	Hand treatment		0		1/5		/<1		/50		/50
Big Dalton Reservoir (Dalton; 11 mi; 260 ac; 75%)	herbicide		0		<1/5		/1		1.5/25		3/60
	Combination herbicide/hand/mechanical treatments		<1/<1		<1/10		/3		3/55		1/10
	Hand treatment		0		<1/5		/1		1/20		1.5/30
San Dimas (San Dimas; 40 mi; 1155 ac; 60%)	herbicide		0		<1/10		<1/1		4.5/50		16/200
	Combination herbicide/hand/mechanical treatments		1/100		1/20		1/3		16/200		4/40
	Hand treatment		0		<1/10		<1/1		4.5/50		5/60
Headwaters in Forest (misc. 35 mi; 830 ac; 95%)	herbicide		0		0		/1		2/5		5/10
	Combination herbicide/hand/mechanical treatments		/1		/5		/3		5/10		1.5/3
	Hand treatment		0		0		/1		3/5		3.5/7
TOTALS (526 mi; 21650 ac;	**herbicide**		**0**		**16/ 395**		**<1/6**		**19/375**		**65/11032**
	Combination herbicide/hand/mechanical treatments		**<12/ 215**		**43/ 1115**		**3/14**		**64/1180**		**11/266**
	Hand treatment		**0**		**12/ 345**		**<1/3**		**20/420**		**27/737**

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 the District 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 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 the District 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 such as in the East Fork of San Gabriel, 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 Botanist determines to be of concern? And were they trained on how to complete			

	YES	NO	N/A
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 Fern Canyon or Falls Canyon Research Natural Areas (RNA). Was the San Dimas Experimental Forest manager also notified before work begins in Fern Canyon RNA.			
If any spills occurred from this project, was it reported to the Forest Hazardous Spill Coordinator?			
Did the Regional Forester pre-approved all biological control treatments in Wilderness Areas and RNAs related to this project If temporary remote base camps and /or helicopter drop-off and haul sites are needed in Wilderness Areas, did the recommendations go to the Regional Forester for prior approval?			

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			

	YES	NO	N/A
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 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? Were 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).		
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 clean up 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 within the West Fork of San Gabriel Canyon (West Fork National Scenic Bikeway) 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			

	YES	NO	N/A
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 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[76] 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? 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?			

[76] A geophyte is an herbaceous plant with an underground storage organ. Storage organs are reserves of carbohydrates, nutrients, and water, and may be classified as bulbs, corms, tubers, rhizomes, tuberous roots, and enlarged hypocotyls.

	YES	NO	N/A
If a biological control agent is being considered for use, was it determined whether or not the target genus of the invasive plant being treated is the same genus of any special status plant species? If yes, was the decision made to not consider this option?			
For biological control agents being considered for this use: Does the APHID NEPA analysis document minor or less adverse impacts to the native plant and animal communities? If no, was the decision made to not consider this option?			
If any restoration was conducted in special status plant occupied habitat, were direct impacts to these protected plants avoided?			
Prior to treatment were habitat surveys conducted to determine if special status wildlife species suitable habitat is present in the treatment areas? If suitable habitat was found, what measures were taken to eliminate or minimize adverse impacts? Is 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 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			

	YES	NO	N/A
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?			
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			

	YES	NO	N/A
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? 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[77] 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?			

[77] A propagule is a structure (as a cutting, a seed, or a spore) that reproduces a plant sexually or asexually.

	YES	NO	N/A
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? 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

	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?		
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
Were staging areas and overnight camping related to this project not permitted within the Mt. Baden-Powell and Mt. San Antonio Special Interest Areas?			

	YES	NO	N/A
Were 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 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)? 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? Was the District Ranger or recreation 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?			

	YES	NO	N/A
Did treatment of invasive weeds within the designated San Gabriel Off-Highway Vehicle (OHV) area occur during non-use days, whenever feasible? When this was not feasible, was the area temporarily closed during treatment to ensure worker safety? Was this period the minimum time needed to treat the invasive weeds?			
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 the following developed and concentrated recreation sites, was interpretive signing installed: West Fork Trailhead, East Fork Trailhead, Oaks Picnic Area, Heaton Flats, San Gabriel OHV Area and other selected areas along the East Fork of San Gabriel River? 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 accommodated 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 workers car pool from off the Forest? Did the District staff monitored potential impacts and the Ranger imposed 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 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			

	YES	NO	N/A
(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 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			

	YES	NO	N/A
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? Was the results on 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: _____**