

Signed:
January 17, 2003

Memorandum

From: Larry Turner, Ph. D. |s|
Environmental Field Branch
Field and External Affairs Division

To: Arthur-Jean Williams, Chief
Environmental Field Branch
Field and External Affairs Division

Subject: Analysis of potential effects of forestry herbicides on endangered and threatened plants

1. Introduction

The original analysis and resulting conclusions regarding the possibility of effects of forestry herbicides on T&E species was initially undertaken to address public concerns expressed in the controversy over Pacific Lumber Company's Habitat Conservation Plan (HCP) for the Headwaters redwood forest. We reviewed a draft of that HCP with particular respect to those aspects relating to herbicide use. We later learned that, for reasons unknown to us, the herbicides were removed from the HCP. However, we were working with the Fish and Wildlife Service (FWS) and the National Marine Fisheries Service (NMFS), and various California state agencies, who had to deal with public concerns. At their request, I analyzed the effects of the herbicides that had been removed from the HCP on T&E species in particular, but also for non-target species in general. In my memorandum of April 9, 1999 to you, I found no effect of these herbicides on any T&E species, and probably no effect on any non-target animal species, although we had insufficient data to make a firm conclusion regarding the terrestrial stages of amphibians. There are no T&E amphibians in the Headwaters area.

Following that initial effort for the Headwaters area, the Agency received a Notice of Intent to Sue from the Californians for Alternatives to Toxics, and their allies (CATS). In conjunction with that Notice of Intent, I analyzed the potential risks of forestry herbicides on all T&E plants in California, not just those in the Headwaters area. This analysis, dated November 27, 2000, considered the risks to these T&E plants, and was used in a request for informal consultation with the Fish and Wildlife Service in a letter of November 27, 2000. The Service declined to consult; in their response, they cited the scope of action as being insufficient.

Subsequently, a settlement was reached with CATS that, among other things, we would consult on the registration of eight

forestry use herbicides on 33 listed plants. This settlement was approved by the court as a "consent decree". In addition, OPP and FWS developed a consultation agreement, signed on February 13, 2002, on how we would address these and other species in the action area. This analysis on the effects of forestry herbicides on T&E plants in California is the first step in that effort.

The consultation agreement indicates that it applies to "eight pesticides for forest operation uses", but does not name them. The specific herbicides under consideration here are:

Hexazinone (Velpar, Pronone), PC code 107201
Atrazine (Aatrex, many other names), PC code 080803
Sulfometuron-methyl (Oust), PC code 122001
Imazapyr isopropylamine (Arsenal), PC code 128829
Glyphosate (Roundup, Accord, Rodeo), PC codes 103601, 103604
Triclopyr triethylammonium (Garlon 3A), PC code 116002
Triclopyr butoxyethanol ester (Garlon 4), PC code 116004
2,4-D, 2-ethylhexyl ester (LV4, Esteron, Al 2,4-D, others), PC code 030063

The consent decree identifies the "forest operation uses" as (in summary) use for (1) thinning of specific trees to promote the growth of desirable species, (2) thinning or control of trees and other vegetation to reduce fire fuel, (3) site preparation for replanting of desirable trees, (4) "conifer release" which involves spraying of areas after replanting to reduce competition, and (5) control of vegetation on highway, utility, and railroad rights-of-way in and adjacent to forests. Technically, this last use is not a "forestry" use, and therefore it was not considered in the previous analyses of herbicide forest use; nevertheless it is under consideration here, along with the more traditional forestry uses named in 1- 4 above.

The consent decree also identifies what are considered to be 33 forest plants. Actually, two of the named taxa are named at the species level and each of these have two listed subspecies. Therefore, there are 35 taxa evaluated. In addition, although the consent decree terms these as forest plants, not all occur in or near forests. Finally, the consent decree indicates that it applies to those species "where they occur in California."

II. Background on forests and herbicides

1. Forest herbicides are used for vegetation management in several ways. Top uses are for site preparation, conifer release, weeding, and thinning. Only a tiny fraction (~0.02%) of forests are treated with herbicides in any year. If initially treated properly, it is unusual for a coniferous forest to be

treated more than once in the 40-100 year cycle.¹

2. OPP's classification codes for pesticide use sites include somewhat more than 150 forestry "sites". About a dozen are forests of various types (e.g., western coniferous forest, eastern hardwood forest), but most of the codes are for particular forest tree species (e.g., ash, gum, white pine). Some of the use sites in the "forestry" category are not natural forests. Pesticides may be used in forest nurseries where seedlings are grown for transplant, in forest "orchards" where mature trees are maintained to provide seeds for the nurseries, in Christmas tree plantations that are often far removed from natural forests, or in shelterbelts which are completely away from natural forests.

3. Hardwood forests are seldom treated with herbicides, since most forest herbicides are for the promotion of coniferous forests, often by being specific for hardwood vegetation. Treatment of particular hardwood species in hardwood forests would have to be targeted towards specific trees and avoid exposure to the species being intentionally grown. In California, it would not be expected that oak woodlands, for example, would be treated with forestry herbicides. In the drier chaparral and scrub forests, the use of forestry herbicides to promote growth of harvestable timber would be economically adverse; the potential for subsequent growth of harvestable timber in these xeric or otherwise harsh areas would be none or negligible. There exists a remote possibility that scrub forests could be treated to reduce fire fuel. However, mechanical control is more likely.

4. Based upon a review of Federal Register Notices, most of the T&E plants in California have become reduced in numbers due either to development for urban/suburban housing uses or from conversion to agricultural (including grazing) uses. There are very few plants listed in coniferous forest environments, and a number of them are found in specialized soil types, such as serpentine outcrops.

5. Methods of application and terminology

- Conifer release - application made after conifers are planted on a site that had been harvested or burned. The purpose is to suppress other vegetation that could compete for sunlight, nutrients, or water. Depending upon the specific herbicide, applications may be broadcast over the entire treated area, but typically done only during the

¹ Information summarized from 1982 consultation request for forestry use pesticides.

dormant period from late fall to budbreak in the spring; otherwise the conifers may be adversely affected. For herbicides without residual activity, dormant T&E plants would not be susceptible.

- Site preparation - applications are made after harvesting/burning but before any conifers are planted. In California, forestry applications by air are only feasible by helicopter following clear cutting because state law limits clear cutting in private forests to 20 acres. National Forests are not subject to the 20 acre limit, but they generally adhere to these limits anyway. Applications by fixed wing aircraft might occur in large areas only in unusual circumstances, such as following an extensive wildfire.
- Tree injection - applications directly into the target tree. There is no exposure to non-target plants.
- Girdle, frill, cut stump, and "hack and squirt" treatments are all done by hand directly to target trees. Nontarget exposure is negligible, if any, because all of these methods involve some kind of penetration of the cambium layer. It is theoretically possible that some of the applied herbicide could run down the trunk of the treated tree and expose vegetation around its base.
- Basal and stem treatments involve directed sprays to target vegetation, typically with hand-held equipment or guns mounted on (typically) all-terrain vehicles. There is a potential for a small amount of exposure to nontarget species near the base of the target tree.

III. Preliminary considerations

Table 1 shows the statewide usage of forestry herbicides in the consent decree from 1996 until 2001. All data are from California's pesticide use reporting program which requires that all commercial and agricultural pesticide usage be reported; only use in and around homes by residents is exempted from the reporting requirement. Please note that imazapyr was not registered for forestry use in California in 1996 & 1997, and that sulfometuron-methyl had only a "special local need" registration for use in California. Both of these now have full registration for forestry uses in California.

Table 1. Total statewide use of subject forestry herbicides, 1996-2001

Herbicide	2001	2000	1999	1998	1997	1996
hexazinone	44,957	18,242	19,112	26,719	50,325	61,756
glyphosate	46,128	48,683	48,863	58,025	53,821	24,126

imazapyr	14,617	12,212	7868	1152	0	0
sulfometuron-methyl	908	131	1235	916	252	542
atrazine	29,774	20,495	29,352	15,847	15,876	11,061
triclopyr TEA	168	1301	3504	5292	7267	6932
triclopyr BEE	23,626	16,086	37,158	35,922	48,696	50,198
2,4-D 2-EHE	7,563	11,388	11,350	11,591	1313	0

In my previous analyses, I determined that there is essentially no use of forestry herbicides in coastal California south of Monterey County nor in inland counties south of the Sierra Nevada range. I have updated this information and presented it in Table 2, below. In these forests, standard timber harvesting is not done. There is negligible harvestable timber in this area outside of the National Forests, and the National Forests are generally not allowing any harvest. If these southern National Forests do allow harvest, (a) they consult with FWS on the timber sale should any listed species be potentially affected, and (b) they do not use herbicides following harvest. If they decide in the future to use herbicides, again they would consult if there was a potential effect on listed species.² For this reason, I believe that the continued registration of forestry herbicides is not likely to adversely affect the species in these counties; it seems most likely that there will be no use at all, and therefore, no effect at all.

Table 2. Pesticide use for forests in southern California counties (coastal, inland, but not including the Sierra Nevada range) with plants named by CATS. All figures are in pounds. The first column for each year includes all pesticide uses except herbicides; the second includes only the herbicides used in forests; all herbicides reported for forestry use are included, not just those named in the consent decree. All data are from California usage reporting.

² Telephone communication, Ann Bradley, USDA, Threatened and Endangered Species Plant Specialist

	2001		2000		1999		1998		1997		1996		1995	
County	ot he r	he rb	ot he r	he rb	ot he r	he rb	ot he r	he rb	ot he r	he rb	ot he r	he rb	ot he r	he rb
Los Angeles		0		0		0		0		0		0		0
Monterey		0	60	0	40	0		0	20	0	16	0		0
Orange		0		0		0		0		0		0		0
Riverside		0	22	0		0	0. 2	0	12	0		0		0
San Diego		0		0		0		0		0		0	6	0
San Luis Obispo		0		0		0		0		0		0		0
San Bernardino	8. 4	0	10 3	0	2	0	11 7	0	11 7	0	63	0	95	0
Santa Barbara		0		0		0		0		0		0		0
Ventura		0		0		0		0		0		0		0

IV. Plant analyses

The following accounts discuss the individual species named in the consent decree with particular emphasis on exposure to forestry herbicides as defined in the consent decree. Except as otherwise noted, information was taken from Federal Register Notices on proposed listings, final listings, and critical habitat designations. I also looked at species accounts and profiles posted on web-sites hosted by FWS field offices, California Department of Fish and Game (CDFG), CalFlora, and the Jepson Herbarium. Some information is from Recovery or draft Recovery plans.

Western Lily (Final listing: 59 FR 42171-42176, August 17, 1994)
- This is one of the few species that is certain to be associated with forests in areas where herbicide use could occur.

At the time it was listed, the western lily was known to occur in 31 small, widely separated populations in sphagnum bogs, coastal scrub and prairie, and other poorly drained soils within 2 miles of the coast from Hauser, Coos County, Oregon to Loleta, Humboldt County, California. It grows at the edges of sphagnum bogs and in forest or thicket openings along the margins of ephemeral

ponds and small channels. It also grows in coastal prairie and scrub near the ocean where fog is common. The CalFlora database also lists very old observations for Sonoma, Mendocino, Marin, and Siskiyou counties, but these were not mentioned by FWS, and it appears the species is unlikely to occur there now.

The species' habitat occurs on level marine terraces that are desirable for coastal development. In addition to development (e.g., roads, cranberry farms, buildings, and associated infrastructure), threats of concern to FWS include competition from encroaching shrubs and trees, bulb collecting, and grazing by livestock and deer. The species is known or assumed to be extirpated in at least nine historical sites, due to forest succession, cranberry farm development, livestock grazing, highway construction, and other development. Several historic sites above Humboldt Bay have been extirpated by encroachment of forests. Tree associates include coast pine, Sitka spruce, Port Orford cedar, and willow.

Based upon the above information, it appears that the lily is associated with forests, even if it is not found in the forests, per se. Personal experience indicates that Sitka spruce and Port Orford cedar are harvestable species. But I question whether there would be harvesting of these species along this coast area that would also be followed by herbicide use to control forest hardwood regrowth. If there are any harvestable trees left along the coast, the likelihood is that cleared areas would go into development, based upon the discussion in the listing *FR* Notice regarding the threats to the lily. Moreover, this species is included in a Humboldt County Bulletin distributed by California's DPR. The bulletin calls for, among other things, a buffer between herbicide use and occupied habitat of 40 yards for ground applications and 200 yards for aerial applications.

Because of the low likelihood of timber harvesting with subsequent forestry herbicide use in areas where the Western lily is known to occur, and because of the protection offered by DPR's Humboldt County Bulletin, forestry herbicides are not likely to adversely affect the western lily.

Pennell's Bird's-Beak (Final listing: 60 *FR* 6671-6685, February 3, 1995) - The listing *FR* Notice indicates that occurrences of this species are on serpentine outcrops which are being developed. Two occurrences are known in Western Sonoma County, and there is thought to be an additional one where permission to survey has been denied. The *FR* Notice indicates threats to be residential development, garbage dumping, and roadside maintenance. A county park is under consideration for part of the habitat. There is no mention of forests in the *FR* Notice. However, we have been informed that both redwood and Douglas fir are in the area and that one of the proposed uses in the vicinity

of the species is timber harvesting³. In addition, the on-line species account by the Sacramento field office of FWS indicates a concern for timber harvesting.

Development, rather than reforestation, is most likely to follow logging in this area, but it is remotely possible that forestry herbicides could be used.

The species is not currently in DPR's county bulletin for Sonoma county, but DPR has agreed to include it. This will provide, among other things, a 40 yard buffer from occupied habitat for ground applications and a 200 yard buffer for aerial applications. With its inclusion in the Sonoma County bulletin, there is sufficient protection such that forestry herbicides would be not likely to adversely affect the species.

Ben Lomond Spineflower and Ben Lomond Wallflower (Final listing: 59 *FR* 5499-5510, February 4, 1994) - These two species occur on outcrops of sandstone soils in the Santa Cruz Mountains from Big Basin State Park to the Felton area . These sandstone soils support several unique plant communities, including the ponderosa pine dominated Ben Lomond sandhills, referred to as "pine parklands". Although ponderosa pine is often a harvestable forest species, nothing in the listing *FR* Notice indicates that forestry is practiced in this area. Golf course herbicides are indicated as a threat relative to a golf course adjacent to the population.

Threats noted in the listing *FR* Notice are "habitat destruction due to residential and golf course development, agricultural land conversions, sand mining, military activities, and encroachment by alien plant species." Later, there is reference to "residential and golf course development, agricultural land conversion, recreational use, sand mining, dune stabilization projects, and military activities." The Santa Cruz County Agricultural Commissioners Office⁴ indicated that there is no forestry practiced in this part of Santa Cruz County. The "pine parklands" are highly valued for their aesthetic and recreational qualities, and there would be no harvesting of ponderosa pine in this area, except possibly an occasional individual tree (e.g., if diseased). There are three forestry areas in Santa Cruz County, all of which are many miles from these pine parklands. The primary threats to the pine parkland species are sand and

³ Telephone communication, Peter Warner, President, Milo Baker chapter of the California Native Plant Society, September 15, 2000.

⁴ Telephone communication, Rick Bergman, Santa Cruz County Agricultural Commissioner staff

gravel mining. By state law, all commercial pesticide use, including that by lumber companies, must be reported to the county agricultural commissioner. No forestry herbicide use has been reported even close to the general vicinity of these species.

Both of these species are already included in DPR's County Bulletins, thus providing protection from all herbicides. Even without their inclusion, there would be no effect from forestry herbicides because they are not used near the habitat of these species.

Kneeland Prairie Pennycress (Final listing: 65 *FR* 6332-6338, February 9, 2000) - This species is found below the Headwaters forest and was mentioned in the public meetings regarding the Pacific Lumber Company's HCP. Critical Habitat was designated October 9, 2002. The single known population is found on serpentine outcrops on Ashfield Ridge in a coastal prairie in Humboldt County on private land immediately adjacent to the Kneeland Prairie Airport. The construction of this airport was the cause of significant reduction in the population, and expansion of the airport, an associated county road, fire, and chance occurrences associated with a single population are the threats identified by FWS in the listing *FR* Notice. Although the listing notice does not mention pesticides, the Critical Habitat Notice does state that the species is vulnerable to the "nearby uses of herbicides and pesticides", but the nature of such uses that could be a concern (e.g., forestry) is not mentioned. Since the Notice also notes the adjacent prairie grassland is both essential and could possibly invade the edges of the serpentine areas, it appears that there would be no forestry use of herbicides. Further, the area is described as a ridgetop; pesticide drift would be exceedingly unlikely unless applied to the surrounding grasslands, which would not occur with forestry herbicides.

The available information confirms that this plant is not associated with forests and therefore, there would be no effect from forestry herbicides. The species is not currently included in the Humboldt County Bulletin, but it will be added by DPR.

Yreka Phlox (final listing: 65 *FR* 5268-5275, February 3, 2000) - The primary threats identified in the *FR* Notice include urbanization, road maintenance, and extirpation from random events due to the small number of populations and limited range of the species. There are two known occurrences. One is on a 15 hectare open ridge in a juniper woodland within the city limits of Yreka. This population is threatened by development, with a majority of the sites already subdivided into lots for development. The second occurrence is a 65 hectare area southwest of Yreka along State Highway 3 in an open Jeffrey pine

forest. This has been disturbed in the past by logging and road construction. Approximately 50% of the occupied habitat for this occurrence is on land administered by the Klamath National Forest. The *FR* Notice states, "Although selective logging resulted in roads and bulldozer trails through the site, logging is probably not a threat to *P. hirsuta* at this time." The area along state highway 3 has been designated by the California Department of Transportation (CalTrans) as an Environmentally Sensitive Area and road maintenance crews are to be made aware that no new ground is to be disturbed along this stretch of highway. In addition, the CalTrans Landscape Architect for the district prepares an annual plan directing road maintenance crews to avoid spraying in specific sensitive areas, including the phlox habitat along highway 3⁵. There is also a concern for encroaching development for this population.

Based on (1) the existence of one population in Yreka, (2) the *FR* Notice stating that forestry operations are "probably not a threat" to the second population, (3) the avoidance of herbicide use by CalTrans along highway 3, and (4) that DPR will add it to the Siskiyou County Bulletin, the use of forestry herbicides is not likely to adversely affect this listed species.

McDonald's Rock Cress (Final listing: 43 *FR* 44810-44812, September 28, 1978) This species was listed at a time when little information was in listing *FR* Notices. According to the listing Notice, the species at that time was known from one location on Red Mountain in Mendocino County, and a serious threat was from potential mining activities. The World Wildlife Fund⁶ profile indicated that it occupied a 3.5 square mile area of serpentine soils at 3000-4000 feet elevation in yellow pine forests. These soils are rich in chromium and nickel and there was substantial mining that had already occurred in the vicinity. The profile stated, "While tree planting in the rock-cress colonies is not expected, plants could be adversely affected by windblown herbicides."

There has been taxonomic confusion about this species. Additional specimens were located in 1979 and 1980 from Del Norte County, California and Curry County, Oregon. However, these were subsequently considered to be *Arabis serpenticola*, and then again later as *A. macdonaldiana*. L. A.

⁵ Telephone Communication, Russell Urban, District 2, California Department of Transportation, February 13, 2003.

⁶ The Official World Wildlife Fund Guide to Endangered Species of North America, Vol. 1, J. R. Mathews and C. J. Mosely, editors. 1990. Beacham Publishing Company.

Vorobik⁷ is currently working on a taxonomic review of several *Arabis* species and believes that Macdonald's rock-cress is actually fairly abundant in Del Norte and Siskiyou counties, California, and into Oregon (and that it may warrant delisting). She considers the Red Mountain population to be very disjunct and not representative of the species as a whole. She also indicated that many of the populations, although all on serpentine soils, are quite near forested habitats where timber harvesting may occur, followed by associated forestry herbicide use to promote new growth.

It appears that forestry herbicide use could adversely affect this species if the locations are not included in DPR's county bulletins. DPR has agreed to include all known locations in county bulletins for northern California, which should result in no adverse effects for the species.

Water Howellia (Final listing - 59 FR 35860-35864, July 14, 1994)
- This species is an aquatic annual plant in the bellflower family (Campanulaceae) that has extensively branched, submerged or floating stems. It is predominately self-pollinating. It reproduces entirely from seeds and germinates only when the ponds dry out and the seeds are exposed to air. Population size varies with the amount of drying the previous season and can vary dramatically.

At the time of listing in 1994, it was considered extant in Montana, Washington, and Idaho, but was extirpated from Oregon and California, where it had been reported from Mendocino County. It typically occurs in ephemeral ponds of glacial pothole or river oxbow origin. These are wet in the spring following rains or snow melt, but dry to varying degrees during the growing season. The plant prefers shallow water or the edges of deeper ponds that are surrounded by deciduous trees.

There were 107 sites known at the time the species was listed, mostly in the vicinity of Spokane, Washington and in the Swan River drainage in northwestern Montana. The remaining

populations were near Vancouver, Washington. However, in 1996, the species was rediscovered on National Forest land in Mendocino County, California.⁸

⁷ Telephone communication, Linda A. Vorobik, Ph. D., Research Associate, Jepson Herbarium, University of California, Berkeley, January 14, 2003.

⁸ Isle, David W. 1997. Rediscovery of water howellia for California. *Fremontia* 25(3): 29-32.

In general, populations of this plant are threatened by altered hydrologic regimes in its ponds, disturbance of the wetland bottom habitat, and invasive species, especially reed canary grass. Logging in Montana and grazing have also contributed to the decline. It is thought that the original Mendocino County, California site was extirpated as a result of cattle grazing and trampling.

The species occurs in a National Forest where timber harvesting is likely. There were over 7,000 pounds of forestry herbicides used in Mendocino County in 2001, the last year for which data are available. Although recent information is not readily available, considering that the species was rediscovered by a Forest Service botanist on Forest Service land, it seems exceedingly unlikely that forestry herbicides would be used in any way that would affect the howellia. The species will be added to the Mendocino County Bulletin issued by DPR.

Santa Cruz Cypress (Final listing: 52 *FR* 675-679, January 8, 1987) - According to the 1987 *FR* Notice, this species occurs in five groves overlooking the ocean from 1000-2000 feet in elevation. The habitat is "closed-cone pine forest" and chaparral communities. Threats are primarily development (mostly residential), fire suppression (cones may require fire to release seeds), agricultural conversion, and logging. There are five known populations, four in Santa Cruz County, and one in San Mateo County where there is no commercial forestry⁹. The San Mateo County grove is now managed by BLM. In Santa Cruz County, the logging concern identified in the listing *FR* Notice was for cutting individual cypress trees, rather than for clear cutting the habitat; this would preclude the use of forestry herbicides for the regeneration of harvestable forest species. As noted above for the Ben Lomond Spineflower and Wallflower, with which the cypress occurs, there is no forestry practiced in its Santa Cruz County habitat¹⁰. Since this is a desirable timber species, it would seem that logging would be the problem, and not subsequent herbicide use, were it not a listed species. Indeed, subsequent herbicide use following logging would probably be directed at species that would compete with the cypress, and in a manner that would promote the growth of cypress, rather than adversely affect it.

This species is not currently in DPR's County Bulletins. Based

⁹ Telephone communication, Nancy Poss, biologist/standards specialist, San Mateo County Agricultural Commissioner's office, October 10, 2000.

¹⁰ Telephone communication, Rick Bergman, Santa Cruz County Agricultural Commissioner staff

upon the lack of commercial forestry in the vicinity of the Santa Cruz Cypress, there would be no effect of forestry herbicides

on this species even if it were not included in the Santa Cruz County Bulletin. However, DPR has agreed to include the species which will provide protection from additional herbicides also.

Gambel's watercress (Final listing: 58 *FR* 41378-41384, August 3, 1993) This small aquatic plant is an herbaceous perennial in the mustard family (Brassicaceae), found in freshwater or brackish marsh habitats at the margins of lakes and along slow-flowing streams. It grows in or just above the water level and requires a permanent source of water. Historically, Gambel's watercress occurred in interior wetland areas of San Diego, San Bernardino, and Los Angeles counties, as well as coastal wetland areas of San Luis Obispo and Santa Barbara counties. A population from Mexico is thought to be extirpated.

Of a dozen historical locations of Gambel's watercress in California, only two or three small populations remain. According to CDFG, there are two extant populations in San Luis Obispo County, one at Little Oso Flaco Lake and one at Oso Flaco Lake in dune areas near the ocean. Additionally there is one newly discovered population on Vandenberg Air Force Base in northern Santa Barbara County. These three populations support a total of approximately 700 plants. Although the 1998 Recovery Plan indicates that the species occurs at the Black Lake Canyon site, the CDFG website, dated 2000 but with status "in 1999", indicates that the Black Lake Canyon population has not been seen since 1997. Encroachment of non-native eucalyptus trees and drilling of water wells in the immediate watershed were threats to the habitat of this species in Black Lake Canyon. Conversely, the Recovery Plan seems to indicate that the Little Oso Flaco Lake site was dredged and no longer occupied, but CDFG includes that as an existing location. Encroaching sand dunes and agricultural use also appear to be threats to the species.

The only trees mentioned in the available material are willows at several sites, and myrtle and the nonnative eucalyptus at Black Lake Canyon. These are not "forestry" trees and forestry herbicides would have no effect on the species. This species is not in DPR's San Luis Obispo County Bulletin, but they will add it. This will provide protection from herbicides in general.

Slender Orcutt grass - (Final listing: 62 *FR* 14338-14352, March 26, 1997) - This species is a small annual grass about 2-6 inches in height. It occurs in the bottom of vernal pools associated with valley grassland, blue oak woodland, and lower montane conifer forest with Jeffrey pine. It germinates under water and matures as the water evaporates, flowering from May to June. It

has been reported from Lake, Lassen, Plumas, Sacramento, Shasta, Siskiyou, and Tehama counties. Federally listed plant species that may be associated with the slender orcutt grass at some sites include the hairy orcutt grass (*Orcuttia pilosa*), many-flowered navarretia (*Navarretia leucocephala plieantha*) and Greene's tuctoria (*Tuctoria greenei*).

There is some question as to the number of existing populations. The FWS Arcata website indicates the existence of 60 populations, with most occurring in Shasta and Tehama counties; the FWS Sacramento office indicates 59 populations. The Habitat Conservation Planning Branch of CDFG estimates 70 sites, while the Lassen National Forest website has an analysis indicating 79 known sites with 73 of these extant, with new sites being located at least as recently as 1998; 18 sites were identified as being in the Lassen National Forest. CalFlora lists 172 observations, but these do not represent independent sites and they obviously include extirpated sites; they may not include the most recently identified locations. We have been unsuccessful at locating information on more recent observations.

The slender orcutt grass is currently included in the relevant county bulletins distributed by DPR. This should provide it with adequate protection from herbicide use.

Greene's tuctoria (Final listing: 62 FR 14338-14352, March 26, 1997) - This species is a small annual grass restricted to small or shallow vernal pools or the early drying sections of large, deep vernal pools in the Central Valley. Like other annuals, especially those in vernal pools, numbers may fluctuate greatly from year to year. It has a fairly large historical range. Currently, it is found in Butte, eastern Merced, Shasta, and southern Tehama counties and is believed to be extirpated from Fresno, Madera, San Joaquin, Stanislaus, and Tulare counties. In some locations it is associated with other federally listed plant species, including hairy orcutt grass (*Orcuttia pilosa*), slender orcutt grass (*O. tenuis*), and San Joaquin Valley orcutt grass (*O. inaequalis*). Critical habitat was proposed in September, 2002 for this and 14 other vernal pool species.

It appears that there are 20 extant sites, although it has not been seen in a few years at several of these sites. Sixty percent are in Tehama and Butte counties, 30% in eastern Merced County, and the remaining in Shasta County. It was known in the early 1980s from 36 sites in eight different counties. Despite intensive surveys of vernal pools during the past 10 years, only five new occurrences have been located.

Populations of Greene's tuctoria have been eliminated by conversion of habitat to irrigated agriculture, by grazing, and by urbanization, all of which represent a continuing threat.

Even otherwise protected sites (e.g., Nature Conservancy sites) appear to be threatened by competition from the introduced annual grasses and other nonnative species. The threat from grazing is related to timing and intensity. As long as the land remains in dry pasture, moderate grazing regimes appear to have little impact.

Only the Shasta County population occurs anywhere in the vicinity of forests, where forestry herbicides could be used. It is not clear if the vernal pools where this species occurs in Shasta County are near areas where forestry herbicides could be used, but there were 25,000 pounds of pesticides used on timberland in Shasta County in 2001.

Greene's tuctoria is not currently listed in DPR's county bulletins, but DPR has agreed to include it in the four counties where it is extant. Inclusion will provide protection not only from forestry herbicides, but from other herbicides also.

Pallid manzanita (Final listing: 63 FR 19842-19850, August 2, 1995) - This species, also known as the Alameda manzanita or Oakland Hills manzanita, is an upright shrub in the heath family (Ericaceae) without a basal burl. It grows to 13 feet high and flowers from December to March. It commonly co-occurs with another manzanita species, brittle leaf manzanita, that does have a basal burl. The species is found from 656 to 1,460 feet in elevation, primarily on thin soils in manzanita chaparral habitat that is frequently surrounded by oak woodlands and coastal scrub. Some of the smaller populations are found in coastal scrub

Pallid manzanita is known from approximately 13 populations in Alameda and Contra Costa counties. The two largest populations, which are owned by the East Bay Regional Park District, are located at Huckleberry Ridge in Alameda and Contra Costa Counties and at Sobrante Ridge in Contra Costa County. Several other small, natural and planted populations occur in Alameda and Contra Costa counties. The two largest groups occupy an area of approximately 82 acres. These two populations are found in maritime chaparral, a habitat with mesic soil conditions and a maritime influence. Many smaller populations occur in coastal scrub.

The primary threats to the species are the effects of fire suppression, and shading and competition from native and alien plants. To a lesser extent, the species is threatened by fungal infection, herbicide spraying, hybridization, and the ongoing effects of habitat loss and fragmentation. Herbicides have been used to eradicate *Eucalyptus* associated with the pallid manzanita in many areas in the Oakland Hills. The exact effect herbicide spraying has on the plants has not been studied, however, roadside spraying has had negative effects on regeneration of the

pallid manzanita along Skyline Boulevard.

The species may be subject to herbicide impacts along roadside rights-of-way, but not in the context of forestry herbicides as defined in the Consent Decree. It is not currently included in DPR's county bulletins, but they will be adding it to the Alameda and Contra Costa County Bulletins, which will provide protection from forestry and other herbicides.

El Dorado Bedstraw (Final listing: 61 FR 54346-54358, October 18, 1996) - The El Dorado bedstraw is a small perennial, monoecious herb in the coffee family (Rubiaceae). It flowers from May to June. It occurs in the Sierra Nevada foothills at an elevation of 100-500 m. It is restricted to Pine Hill, in El Dorado County, and surrounding ridges to the west. Significant loss of habitat has already happened. Occurrences extend from the immediate vicinity of Pine Hill, south to the Highway 50 corridor around Cameron Park. The species grows in oak woodland areas, including sites with ponderosa pine and gray pine, on gabbro soils. Gabbro soils are volcanic in origin, and form a reddish soil when exposed. El Dorado bedstraw grows primarily in the duff beneath a forest canopy, where Ponderosa pine and black oak are common dominant associates. It is also found growing beneath old decadent chaparral, dominated by whiteleaf manzanita. Most of the plants are on private land, but the BLM and state manage two sites.

The species is threatened by residential development, road construction, grazing by horses and irrigation, along with random, stochastic events related to the small numbers of individuals. The draft Recovery Plan calls for the establishment of a 5000 acre reserve for this and other species, including the Layne's butterweed which is also being discussed here. The Pine Hill Preserve included 2647 acres of publically owned land in June 2002¹¹, and now is said to consist of over 3500 acres¹². The habitat is fire-adapted, and as a result, controlled burns are proposed to aid in the species recovery. Despite the name, the Pine Hill formation is 66.3% chaparral, 16.9% grassland, and 17.6% woodland, and most of the latter consists of hardwood species. Oak may be harvested for firewood, but is unlikely to be followed by forestry herbicide use. In addition, there could be large scale clearing for fire fuel control, but indications are that this would be mechanical, rather than chemical.

¹¹ U.S. Fish and Wildlife Service. 2002. Recovery Plan for Gabbro Soil Plants of the Central Sierra Nevada Foothills.

¹² <http://www.co.el-dorado.ca.us/phpreserve/>, Information obtained January 15, 2003; site last updated September 18, 2002.

Ponderosa pine, the only typical "forestry" species may dominate some woodland patches, especially at higher elevations and on northern flanks. It is possible, but not very likely, that herbicides could be used for forestry purposes in this area. However, the Pine Hill area is bisected by Highway 50 and there are many other roads in the area where the subject herbicides could be used for control of rights-of-way vegetation.

The El Dorado Bedstraw is included in the El Dorado County Bulletin issued by DPR. Thus it is protected from all herbicide use, unless used in accordance with an organized recovery program. With this bulletin, it appears that forestry herbicides, and other herbicides, are not likely to adversely affect the species.

Layne's Butterweed (Final listing: 61 *FR* 54346-54358, October 18, 1996) - This threatened species, also known as Layne's ragwort, is a tall (up to two feet) perennial herb that flowers between April and June and dies back to the roots in winter. It is an early successional plant that grows on both gabbro and serpentine soils in chaparral communities in a limited area of the Sierra Nevada foothills. Occurrences are known primarily from the Pine Hill area of El Dorado County, but it also known away from the Pine Hill area in El Dorado National Forest, and occurs in Tuolumne and Yuba County. While many of the sites for this species are on private land, it appears that the sites in Tuolumne and Yuba counties are owned or managed by the BLM.

Much of the species habitat has been lost to residential and commercial development, which is a continuing threat. Road construction and maintenance, fire suppression, off-road vehicle use, competition with nonnative vegetation (especially the yellow star thistle), excessive horse paddocking, and mining, are also concerns. As noted for the El Dorado Bedstraw, the draft Recovery Plan calls for the establishment of a 5000 acre reserve for this and other species, including the El Dorado Bedstraw which is also being discussed here. The Pine Hill Preserve included 2647 acres of publically owned land in June 2002¹³, and now is said to consist of over 3500 acres¹⁴. The habitat is fire-adapted, and as a result, controlled burns are proposed to aid in the species recovery. Despite the name, the Pine Hill formation is 66.3% chaparral, 16.9% grassland, and 17.6%

¹³ U.S. Fish and Wildlife Service. 2002. Recovery Plan for Gabbro Soil Plants of the Central Sierra Nevada Foothills. Portland, Oregon. xiii + 220 pp.

¹⁴ <http://www.co.el-dorado.ca.us/phpreserve/>, Information obtained January 15, 2003; site last updated September 18, 2002.

woodland, and most of the latter consists of hardwood species. Oak may be harvested for firewood, but is unlikely to be followed by forestry herbicide use. In addition, there could be large scale clearing for fire fuel control, but indications are that this would be mechanical, rather than chemical. Ponderosa pine, the only typical "forestry" species may dominate some woodland patches, especially at higher elevations and on northern flanks. It is possible, but not very likely, that herbicides could be used for forestry purposes in this area. However, the Pine Hill area is bisected by Highway 50 and there are many other roads in the area where the subject herbicides could be used for control of rights-of-way vegetation. Information is not readily available regarding the specifics of the Yuba and Tuolumne County sites, but if they are under BLM management, herbicide use should be avoided where the butterweed occurs.

The Layne's Butterweed is not currently included in the El Dorado, Tuolumne, or Yuba County Bulletins issued by DPR, but DPR has agreed to include it. When this happens the plant will be protected from all herbicide use, not just forestry-use herbicides. While I consider that the use of the forestry herbicides is unlikely to occur except, as defined, for rights-of-ways, I consider that it will require inclusion the county bulletins to ensure that herbicides are not likely to adversely affect this species.

Springville Clarkia (Final listing: 63 *FR* 49022- 49035, September 14, 1998) - This species is an annual herb in the family Onagraceae. It is usually branched and can grow to 3 feet, flowering in May to July. It occurs on granitic soils in grassy openings in blue oak woodlands and on road banks between 1,200 and 3,000 feet in the Sierra Nevada foothills. There were 15 known populations at the time of listing, all in Tulare County; the Sacramento FWS profile now indicates only 10 populations. The Springville clarkia is threatened by urban development and roadway maintenance activities, especially grading and mowing to reduce fire potential. Because the plant blooms fairly late, the mowing often occurs before the plants can set seed, thus reducing the reproductive potential. It appears that lower elevation roadside populations may have been eliminated by herbicides, and the higher elevation roadside populations have been eliminated by grazing, leaving a fairly narrow band for the roadside populations. It also seriously threatened by heavy livestock grazing, although light grazing may be beneficial in reducing competition. The listing *FR* states that "logging does not pose a significant threat to *Clarkia springvillensis*".

This species is included in the Tulare County Bulletin distributed by DPR. As such, herbicides, including forestry herbicides, should not be causing an impact, even along the roadsides. The listing *FR* did note the past impact of herbicides

and indicated that applications of herbicides that are not in accordance with label restrictions could be an illegal take. It appears that inclusion in the county bulletins is necessary for there to not be likely adverse effects.

Hoover`s eriastrum (Final listing 55 *FR* 29361-29370, July 19, 1990) - This species, also known as Hoover's Woolly Star is a small annual herb belonging to the phlox family (Polemoniaceae). Its favored habitat is stabilized silty to sandy soils, covered by a non-vascular plant crust. It occurs in a variety of habitats, but typically in areas with less than 20 percent shrub cover. Seedlings emerge in January or February and flowering extends from March into June. As typical with annuals, populations can vary substantially from year to year.

Hoover's eriastrum was historically distributed in Kern, San Luis Obispo, Santa Barbara and Fresno counties; it is now known at many additional sites in those counties along with populations in Kings and San Benito. Several occurrences are threatened by commercial development. Additional threats noted in the listing *FR* include agricultural conversion, potential flooding, competition with nonnative vegetation, and heavy grazing. However, the plant was proposed for delisting in March, 2001 because additional populations had been found, the threats were not as pronounced as originally considered, and a number of the populations, especially new ones found on BLM land, are protected. Apparently, surveys indicating its rarity were conducted in a year too dry to be representative.

Nothing in the listing or proposed delisting *FR* Notices indicates that this species is associated in any way with forests or even rights-of-way though forests, and therefore forestry herbicides should have no effect. If the species were included in DPR's county bulletins, protection would be provided from other herbicides. However, because of the delisting proposal for this plant, it may not warrant inclusion in bulletins. OPP is willing to have DPR include it or not, at the discretion of the FWS. If it is to be included, help may be needed to ensure all occurrences are found.

Keck's checkermallow (Final listing: 65 *FR* 7757-7764, February 16, 2000) - This species is a small annual herb in the mallow family (Malvaceae) that grows to 14 inches tall, and blooms in April and early May. Its habitat is serpentine-derived clay soils in sparsely-vegetated grasslands at elevations between 400-1,400 feet in the foothills of California's central western Sierra Nevada range. Given the wide variation in above ground populations, it is probable that seeds in the ground remain viable for several years and respond to moisture or temperature cues. The species was thought to be extinct until rediscovered

in 1992. At present, there are three known locations in Fresno and Tulare counties. Critical Habitat has been proposed to include 1085 acres covering these three populations.

The primary threats for Keck's checkermallow are urban development, nonnative vegetation, and conversion of habitat to agriculture, most likely citrus, and competition from non-native grasses. As with many small annuals, light grazing may reduce competition, but heavy grazing or grazing just before seed set could be detrimental. Pesticides were not mentioned in the listing *FR*, but were indicated as a potential take issue in the proposed Critical Habitat Notice, both herbicides for effects on the plant and insecticides for effects on pollinators.

There is no evidence that the species occurs anywhere near forests, or possibly even trees. Thus forestry herbicides would have no effect. However, DPR will be including it in their county bulletins for Fresno and Tulare counties, and this will provide protection from all herbicides, not just those used in forestry.

Mariposa pussypaws (Final listing: 63 *FR* 49022-49035, September 14, 1998) - The Mariposa pussypaws is a small, compact annual herb belonging to the purslane family (Portulacaceae). It flowers between May and August. The plant grows in small, barren areas on decomposed granitic sands, between 1,500 and 3,600 feet in the annual grasslands and woodlands in the southwestern foothills of the Sierra Nevada Mountains.

Only seven populations in six locations in Fresno, Madera, and Mariposa counties were known at the time of listing. No other historic sites are known. Six populations occur on private land and the seventh is fenced on Sierra National Forest land to protect it from grazing. The primary threat is urbanization. Two populations are on lots in a subdivision; another is in an area zoned for commerce or residences; a fourth was, at the time of listing, on a ranch for sale. Four of the populations are less than 55 square feet in size and two others are about 5000 square feet. Because of the small size and low, the species is susceptible to extirpation from random events.

There is no indication that this species occurs where forestry is practiced and therefore forestry herbicides would have no effect. The species is included in DPR's County Bulletins for the three counties. These bulletins provide protection from both forestry herbicides and other herbicides.

Gowen's Cypress (Final listing: 63 *FR* 43100-43116, August 12, 1998) - Gowen's cypress is a small coniferous tree in the cypress family (Cupressaceae) generally reaching a height of 5-7 meters. It occurs in mixed conifer forest and maritime chaparral

habitats. Within the chaparral habitat, it grows in a dense, dwarf or pygmy forest made up of stunted Monterey pine, along with chaparral shrubs such as manzanita and huckleberry. It is a fire-adapted species where the seeds are released from the cone as a result of fire.

Only two natural stands of Gowen's cypress are known. The largest population is on Huckleberry Hill on the Monterey Peninsula, covering about 40 hectares. This stand is owned by the Pebble Beach Company and the Del Monte Forest Foundation; a large portion is within Samuel F.B. Morse Botanical Reserve. Scattered groups of trees are in isolated areas fragmented by golf courses and other development. Prior to its proposal for listing, large numbers of these trees were removed in the construction of the Poppy Hills Golf Course, and many additional trees were cut for posts. The second, smaller population occurs on a 60-hectare site largely in Point Lobos State Reserve, with a small portion on the western edge owned by the Big Sur Land Trust.

The listing *FR* Notice states that "the lands on which the majority of the remaining cypress grow will not be developed." However, the species is threatened by continued adjacent development and urbanization in Pebble Beach and to the disruption of natural fire cycles. The FWS profile posted by the Ventura field office on the internet states, "recent research indicates that management that mimics some effects of fire should allow for regeneration." Although this is not elaborated, it seems likely that this might include careful herbicide use, as could occur with site preparation by forestry herbicides.

Based upon the available information, it does not appear that forestry herbicides would be used where this species could be exposed unless they were used for management to promote the species recovery. No forestry herbicide use has been reported in Monterey County in recent years (Table 2). DPR should still add this species to the Monterey County Bulletin to protect it from herbicide use. This would not preclude the beneficial use of herbicides because the bulletins allow exceptions for "organized habitat recovery programs."

Hickman's potentilla (Final listing: 63 *FR* 43100-43116, August 12, 1998) - This species is a small perennial herb in the rose family (Rosaceae) that dies back to the root each year. It occurs on loamy sandy soils that support a wet meadow community, and appears to be most concentrated where it does not have to compete with non-native grasses and other non-native plants.

Two extant populations of this species are known today: one in the hills above Martini Creek adjacent to Montara State Beach in San Mateo County, and another at a picnic area on the Monterey Peninsula on lands owned by the Del Monte Forest Foundation. The

San Mateo County population occurs on 65-130 hectares of grassland slopes. It was presumed extirpated until it was rediscovered in 1995 by biologists from California Department of Transportation surveying for a highway project. The Monterey Peninsula population is very small and occurs in an area of about 280 square meters in a meadow opening within the Monterey pine forest.

At the time of its listing, Hickman's potentilla was threatened by a proposed residential development in the Del Monte Forest, but this development proposal is currently under redesign. An enclosure exists around most of the population but does not preclude competition with non-native grasses nor increased amounts of water run-off from adjacent lands. Mowing, recreational use, and herbivory are additional threats or impediments to expansion of this population. The San Mateo County site is threatened by road construction, non-native plants, grazing, and altered fire regimens.

Although Hickman's potentilla occurs near the Monterey pine forest, this is a coastal scrub forest managed for purposes other than timber harvesting. Loss of this habitat would typically be followed by residential or other development, rather than with continued "forestry" where forestry herbicides would be used. The Monterey County Agricultural Commissioner's office stated that there is no typical forestry practice occurring anywhere close to the habitat, and also that no commercial forestry herbicide use has been reported to them in years, as would be required by law¹⁵. There is no commercial forestry practiced, and therefore no forestry herbicide use, in San Mateo County¹⁶. As a result, forestry herbicides are not a threat even without inclusion in DPR's County Bulletins; inclusion in the bulletins will provide protection from other herbicide uses also.

Yadon's piperia (Final listing: 63 FR 43100-43116, August 12, 1998) - This orchid occurs as an understory plant within the Monterey pine forest and maritime chaparral communities in northern coastal Monterey County. In the pine forest habitat, the species grows through pine needle duff in filtered sunlight, and sometimes among dense stands of nonnative annual grasses. In maritime chaparral, it grows on sandstone and is found under the edges of prostrate mats of manzanitas, chamise and other species. Yadon's piperia is known only from within six miles of

¹⁵ Telephone communication, Bill Waddle, Monterey County Agricultural Commissioner's office

¹⁶ Telephone communication, Nancy Poss, biologist/standards specialist, San Mateo County Agricultural Commissioner's office, October 10, 2000.

the coast. By far, the majority of individuals are on Monterey Peninsula, with most of these being within the Monterey pine forest managed by the Pebble Beach Company or the Del Monte Forest, a preserve. Other populations occur in the northern part of the county in the vicinity of Los Lomos, in chaparral vegetation along the Big Sur Coast, and east of Point Lobos State Reserve.

Major threats to the species are continued fragmentation and destruction of the habitat due to urban and golf course development. As with all orchids, collection is considered a serious threat. Other threats include exclusion by alien species, roadside mowing, and potentially an increase in deer grazing on flowering stems.

Although Yadon's piperia occurs in "forests", these are coastal scrub forests that being managed for purposes other than timber harvesting. Loss of this habitat would typically be followed by residential or other development, rather than with continued "forestry" where forestry herbicides would be used. The County Agricultural Commissioner's office stated that there is no typical forestry practice occurring anywhere close to the habitat, and also that no commercial forestry herbicide use has been reported to them in years¹⁷. As a result, forestry herbicides are not a threat even without inclusion in DPR's County Bulletins; inclusion in the bulletins will provide protection from other herbicide uses also.

Monterey Clover (Final listing: 63 FR 43100-43116, August 12, 1998) - This species is a small, low growing legume that can have branches as long as 8-12 inches under optimum conditions. It is a classic fire successional plant, often precluded from germinating by competing vegetation a few years after a fire. Recent studies indicate that light is the only specific germination requirement. Soil seedbanks persist in forest communities, and it may germinate whenever the loss of canopy allows. Most Monterey clover occurs on slopes ranging from 15 to 30 percent grade on poorly drained loamy sand.

Monterey clover is found in only one area within the central portion of the Monterey Peninsula, within the Del Monte Forest at Huckleberry Hill in an area covering about 16 hectares. Only scattered individuals were seen in the openings or edges in the 1970s; it is presumed that many were lost when Poppy Hills Golf Course was developed in 1980. The other plants were located within the boundaries of the Samuel F.B. Morse Botanical Reserve.

¹⁷ Telephone communication, Bill Waddle, Monterey County Agricultural Commissioner's office

The major threat is the loss of potential habitat from residential and golf course development. Fire suppression precluding adequate sunlight for germination and growth is also a serious concern. Surveys after fires have revealed larger plant populations than those where fires have not been recent. The seeds appear to last in the soil long enough to take advantage of irregular fires.

There is essentially no probability that this species would be affected by forestry herbicides in its current habitat. The Monterey pine forest habitat is not managed as a "forestry" resource. The County Agricultural Commissioner's office stated that there is no typical forestry practice occurring anywhere close to the habitat, and also that no commercial forestry herbicide use has been reported to them in years¹⁸. As a result, forestry herbicides are not a threat even without inclusion in DPR's County Bulletins; inclusion in the bulletins will provide protection from other herbicide uses also.

It is possible that herbicides that do not affect seeds could be used to open up canopies and eliminate competing herbaceous growth. DPR's bulletins allow for the use of herbicides for organized habitat recovery programs.

Lompoc yerba santa (Final listing: 65 *FR* 14888-14898, March 20, 2000) - This species is an evergreen shrub in the waterleaf family (Hydrophyllaceae). It occurs in chaparral, coastal sage-scrub, and Bishop pine communities in small populations at about 10 sites, according to CDFG, in Santa Barbara County. The listing *FR* published after the 1999 status report by CDFG indicates only four known populations, but then refers to "groups" within populations. At least three sites occur on Vandenberg Air Force Base; the rest are on private lands. None are protected.

The maritime chaparral communities have been largely converted to other land uses. Development, habitat fragmentation, and invasive plants, especially ice plant and veldt grass are threats. Fire may also be a threat if it occurs outside of normal fire season when the plants are not adapted to it; this appears to inhibit Lompoc yerba santa reproduction. Fire is also a threat if not followed by control of the invasive plants that compete with the yerba santa..

The habitat is not the kind of habitat where forestry is practiced in the sense that forestry herbicides would be used to promote further forest growth. However, other herbicide uses are

¹⁸ Telephone communication, Bill Waddle, Monterey County Agricultural Commissioner's office

possible. The species is not currently in DPR's Santa Barbara County bulletin, but it will be added to it, thus providing protection from herbicides.

Purple amole (Final listing: 65 FR 14878-14888, March 20, 2000) - This species, a low growing member of the lily family, consists of two subspecies, one of which is confusingly known as the purple amole, and the other known as the Camatta Canyon amole. It reproduces primarily by seed, but the seedlings are rather slow growing. The purple amole variety (*Chlorogalum purpureum* var. *purpureum*) occurs on two military bases in southern Monterey County and northern San Luis Obispo County. The Camatta Canyon amole variety (*Chlorogalum purpureum* var. *reductum*) occurs on both public and private land in one region of the La Panza Range of San Luis Obispo County. The species is endemic to clay soils in the coast ranges of these counties, especially soils with a cryptogamic plant crust that may aid in nutrition and in reducing competition. Both forms flower early in the year and go dormant in the early summer. Known populations exist primarily within an open grassland community, with some individuals found in open oak woodland or savannah communities. A very low amount of cover by other herbaceous grasses and herbs is present where the species exists.

The purple amole variety occurs at both Fort Hunter Liggett and Camp Roberts military installations on flat areas with clay soils. The Camatta Canyon amole variety occurs on red serpentine soils at only two sites in central San Luis Obispo County. The larger site, located near Camatta Canyon, occurs along a state highway, designated as a Botanical Management area by CalTrans, within the Los Padres National Forest. The population continues north of the highway on private lands. Based on the habitat and survey work, it is likely that both forms occur elsewhere. Critical habitat was designated in October, 2002, and includes approximately 5900 acres of land.

Threats include habitat alteration of lands, construction, road widening, competition with nonnative plants, heavy or early grazing, and potentially, alteration of fire cycles. Military activities on the bases or off-road vehicle use in the National Forest may also impact the species.

Although the species occurs in woodlands and on National Forest lands, it would not be impacted by forestry herbicides. The rights-of-way use as defined in the consent decree could be a concern were it not for it's the habitat's designation by CalTrans as a management area. The species is not yet included in DPR's County Bulletins, but it will be added. This will provide protection from other herbicides in addition to the forestry herbicides.

Marcescent and Santa Monica Mountains dudleya (Final listing: 62 FR 4172-4183, January 29, 1997) - All of the dudleyas occur on volcanic or sandstone rock outcrops. The marcescent dudleya occurs on the lower reaches of sheer volcanic rock surfaces and canyon walls adjacent to perennial streams. In most locations, the topographic relief has precluded soil formation; therefore, the dudleya may be the only vascular plant occurring in a microhabitat which is otherwise dominated by mosses and lichens. The species is known from seven occurrences in the Santa Monica Mountains, from Hidden Valley to Malibu Creek State Park. The total number of individuals in all of the populations is estimated to be less than 1,000. The microhabitat requirements of the plant limit the possibility that any additional large populations will be found. Half the populations occur on public lands, but may be threatened by recreational activities on these lands; the remaining populations are on lands in private ownership.

The Santa Monica Mountains dudleya is found scattered along exposed north-facing, rocky slopes of the Santa Monica Mountains and in deep canyon bottoms along lower Malibu Creek and Topanga Creek. Less than ten occurrences have been reported, each consisting of no more than several hundred individuals. Some botanists consider that this taxon actually consists of two separate subspecies, but they are considered as a single taxon by FWS, at least for the purposes of listing and recovery.

These habitats are considered sensitive by the botanical community in California. The marcescent dudleya is threatened from fire, collection and recreation. Rock climbing or "boulder hopping" is a particular threat in the two state park locations. The Santa Monica Mountains dudleya is more threatened by development on private lands and adjacent to its occurrences on public lands. It is also impacted by road maintenance activities.

Neither of these plants occur in areas where typical forestry occurs and thus would not be impacted by forestry herbicides. The Recovery plan does not indicate any herbicide use impacting the roadside population of the Santa Monica Mountains dudleya; rather these are mechanical activities. Neither of these taxa are currently in DPR's County Bulletins, but they will be added. Inclusion should protect them from herbicide uses.

Encinitas baccharis (Final listing: 61 FR 52370-52384, October 7, 1996) - This species is a recently described, dioecious shrub in the sunflower family (Asteraceae) that grows to a little over 3.5 feet tall. This plant occurs on steep slopes in the southern maritime chaparral and mixed chaparral communities of central San Diego County. It is known from fewer than 20 occurrences; 14

populations were extant at the time of listing plus one isolated individual; most of these are on private land.

This species has undergone rapid habitat loss due to residential development and agricultural conversion, and the decline continues. San Diego County has been undergoing rapid development and much of the inland development is occurring in the chaparral communities. At the time of listing, 7 of the 14 populations were threatened by development; it is likely that additional development could threaten additional populations. The species is included in the San Diego Multiple Species Conservation Program and many other Habitat Conservation Plans. The San Diego MSCP includes about 70% of the species populations and will protect about 45% of the populations. While these plans should provide protection to the species, they may also allow for some take which could change the numbers or populations from those known at the time of listing.

The chaparral habitat is not a forestry area, and as a result forestry herbicides will not be used and there would be no effect on the plant. In the listing *FR*, it was noted that herbicide applications (of an unidentified nature, but apparently associated with development), along with fire and clearing, had removed some plants. The San Diego County Bulletin distributed by DPR includes the Encinitas baccharis which now provides protection from herbicides in general, not forestry herbicides alone.

Thread-leaved Brodiaea (Final listing: 63 *FR* 54975-54994, October 13, 1998) - This species is a perennial herb in the lily family (Liliaceae) with scapes that grow to about 16 inches in height. This species typically occurs on gentle hillsides, valleys, and floodplains in mesic, grassland communities on clay, loamy sand, or alkaline silty-clay soils. Sites occupied by this species are frequently intermixed with, or near, vernal pools.

The historical range of the species extends from the San Gabriel Mountains at Glendora to western foothills of the San Bernardino Mountains, and south through eastern Orange and western Riverside Counties to Carlsbad in northwestern San Diego County. Thirty-seven populations are presumed extant, with almost half clustered in San Diego and Riverside counties, and the remaining 22 populations scattered in Orange, Los Angeles, Riverside, San Bernardino, and San Diego counties. Most populations are on private land, but others are on federal, state, or county public land. This species is covered in the San Diego Multiple Species Conservation Plan

The most significant threat to this species is urbanization, conversion to farming, and discing for fire and weed control. There is little indication that it occurs near enough forested

habitats for forestry herbicides to be a threat. It is included in DPR's county bulletins, which does provide protection from rights-of-way herbicides as well as others.

San Bernardino Mountains bladderpod (Final listing: 59 FR 43652-43664, August 24, 1994) - This plant is a small (4-8 inch), short-lived perennial member of the mustard family (Brassicaceae). It is generally found on dry soils derived from dolomite and may be within singleleaf pinyon-mountain juniper, white fir forest, Jeffrey pine-western juniper woodland, or subalpine forest vegetation communities, and occasionally on old unpaved roads. It prefers areas with an open canopy cover and little leaf litter on the surface.

At the time listing the bladderpod was known from two populations in the Big Bear area on either side of Bear Valley. One population is on the north side of Big Bear Lake adjacent to Big Bear City, and the other population is south of Bear Valley, approximately 6 miles south of the first population. The latter area is on a downhill run of a ski slope. The NDDDB identifies four element occurrences, and the Forest Service has mapped 22 localized occurrences within these populations. This species has the smallest known range of the five listed carbonate plants and it occupies the narrowest elevational range. Critical Habitat was designated in December, 2002 and includes 1025 acres for the bladderpod, with only 20 acres on private land.

The primary threat to this group of carbonate plants is mining for limestone, including the extraction areas, the disposal areas for the overburden, and the roads to reach them. The northern population of the bladderpod is also threatened by urbanization and the southern population by the ski run.

The bladderpod occurs primarily in open areas, but is associated with forests and also with roads, at least old dirt roads. There could be a concern for forestry herbicides, except they have not been used in the area for many years (Table 2). The species is not in the San Bernardino County Bulletin, but DPR will be adding it, thus providing protection from herbicides in general.

Ash-gray Indian paintbrush (Final listing: 63 FR 49006-49022, September 14, 1998) - This species, a member of the figwort family (Scrophulariaceae), is a semi-parasitic perennial that grows to 8 inches tall, flowering primarily in June and July. It occurs primarily on "pebble plain" habitat which consists of flat, treeless openings within the surrounding montane pinyon-juniper woodland or coniferous forest, at elevations between 6,000 and 7,500 feet.

This paintbrush is known from fewer than 20 localities at the eastern end of the San Bernardino Mountains. Although most

populations occur on pebble plains, it is also found in pine forest habitats near the Snow Valley Ski Area, along Sugarloaf Ridge, and in the vicinity of Lost Creek. It occurs on private lands, CDFG land, and Forest Service land including that leased for vacation homes and a ski area.

This species is threatened by trampling, exotic plants, off-road vehicle activity, urbanization, and grazing. Timber harvesting was a significant factor in its decline, but is not currently considered a threat.

With no forestry herbicide use in southern California in recent years, forestry herbicides would not affect this species. It is included in DPR's San Bernardino County Bulletin, which will provide protection from other herbicide uses.

Southern Mountain wild buckwheat (Final listing: 63 FR 49006-49022, September 14, 1998) - This species is a woody-based perennial in the buckwheat family (Polygonaceae). It is restricted to "pebble plain" habitats which are flat, treeless openings within the surrounding montane pinyon-juniper woodland or coniferous forest, at elevations between 6,000 and 7,500 feet. It is known from seven pebble plain complexes in the San Bernardino Mountains, where it occurs on Forest Service, CDFG, and private lands.

All of the sites supporting this taxon are threatened by trampling, exotic plants, off-road vehicle activity, and urbanization. Timber harvesting was a significant factor in its decline, but is not currently considered a threat.

With no forestry herbicide use in southern California for the last decade, forestry herbicides would not affect this species. It is included in DPR's San Bernardino County Bulletin, which will provide protection from other herbicide uses.

California dandelion (Final listing: 63 FR 49006-49022, September 14, 1998) - This plant, also euphemistically called the California Taraxacum, is a perennial herb in the sunflower family (Asteraceae) that grows to 8 inches tall and flowers from May to August. Although it is readily distinguishable, it resembles the common introduced dandelions. It occurs at the open edges in moist meadow habitats in the San Bernardino Mountains at elevations from 6,700 to 9,000 feet and is often associated with the San Bernardino bluegrass. The perimeter of such meadows often intergrades with sagebrush scrub or pine forests.

It is known to occur on Forest Service, CDFG, municipal, and private lands. About 20 occurrences of the species are currently known, with population sizes ranging from 2 to 300

individuals. About half of these occurrences are located within, or adjacent to, urbanized areas such as Big Bear City, Big Bear Lake Village, and Sugarloaf in San Bernardino County, California. All of these occurrences are threatened by urbanization. Other threats include trampling, exotic plants, off-road vehicle activity, urbanization, and grazing. Timber harvesting was a significant factor in its decline, but is not currently considered a threat.

With no forestry herbicide use in southern California in recent years, forestry herbicides would not affect this species. It is included in DPR's San Bernardino County Bulletin, which will provide protection from other herbicide uses.

San Bernardino bluegrass (Final listing: 63 *FR* 49006-49022, September 14, 1998) - This species is a dioecious, perennial grass in the family Poaceae. It flowers from early May to June or July; the flowering scapes can reach a height of 18 inches. It occurs in montane meadows in the Big Bear region of the San Bernardino Mountains, as well as in meadows in the Laguna Mountains and Palomar Mountains of San Diego County at elevations of 6,000 to 7,500 feet. It tends to occur near the drier margins of meadows that are typically wet in the spring. The San Bernardino Mountains populations appear to be typically dioecious in that both sexes need to be present for seed production. However, most of the San Diego County plants are females, suggesting that seeds may be set in these populations without cross-fertilization.

At the time it was listed, 11 population centers of the San Bernardino Bluegrass were known to exist in the San Bernardino Mountains, often at meadow sites with the California dandelion. These sites are owned by the Forest Service, CDFG, and private entities. There are fewer than 100 acres of bluegrass habitat remaining in these mountains. Additional bluegrass populations are found in seven meadows in the Laguna and Palomar Mountains of San Diego County. Some, perhaps all of these are on Forest Service land.

This species is threatened by trampling, exotic plants, off-road vehicle activity, urbanization, and grazing. Timber harvesting was a significant factor in its decline, but is not currently considered a threat.

With no forestry herbicide use in southern California in recent years, forestry herbicides would not affect this species. It is included in DPR's San Bernardino and San Diego County Bulletins, which will provide protection from other herbicide uses.