Alien Plant Species Threat Assessment and Management Prioritization for Sequoia-Kings Canyon and Yosemite National Parks

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U.S. GEOLOGICAL SURVEY

Open-File Report 02-170

Carson City, Nevada
2003

U.S. DEPARTMENT OF THE INTERIOR
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Executive Summary

This document reports the results of alien species surveys at Sequoia-Kings Canyon and Yosemite national parks. It includes the findings of a comprehensive literature review of the biology and ecology of all alien plant species found during these surveys and the ranking of those species for prioritizing management and control programs. Surveys primarily targeted areas of human disturbance, such as campgrounds, corrals, developments, roads, trails and pastures. Alien species richness was compared across elevational gradients within the parks. To compare and contrast species composition among sites, an exploratory cluster analysis of the sites included in the species-richness-by-elevation figures was conducted using ordination techniques. All alien species discovered during the directed surveys were grouped into one of four management priority categories based on their attributes, potential impacts, and geographical extent (tables 6 and 7). **Category 1** species are aliens that are currently restricted to a relatively small number of sites in each park and have either been shown to greatly affect native vegetation or have a high probability of causing serious impacts. **Category 2** species are restricted to a relatively small number of sites and are ones that generally have a lesser effect on native vegetation. **Category 3** species are broadly distributed in the parks, are apparently increasing their ranges within the parks, and are those that have been shown to have a great impact on native vegetation. **Category 4** species are those that were detected by the surveys but not assigned to one of the three ranked categories and are considered low priority.

Acknowledgments

This project was funded by the U.S. Geological Survey, Weeds of the West Program. Additional funding for field surveys, data management, analysis and report generation on alien plants in Yosemite National Park were provided by the The Yosemite Fund, San Francisco, California (www.yosemitefund.org). The National Park Service was very responsive to surveys reporting satellite populations of highly invasive species. Botanists Justin Adams, Brad Jelinek, Aaron King and Melinda Schroeder provided invaluable field assistance. Judd Howell, Research Manager, USGS, Western Ecological Research Center, assisted in expediting the peer review and publishing of this report.

Preface

The introduction and establishment of nonnative plants and animals is a global environmental problem that has steadily worsened over the past few decades. Nowhere is the concern greater than in nature reserves designed to conserve examples of biodiversity and other unique landscape features. The U.S. National Park Service plays an important role as ecological steward over many highly prized and valuable remnants of the natural landscape of the United States. Invasive alien species pose threats to the maintenance of many of these ecosystems, both through their displacement of the native flora and fauna as well as upsetting natural ecosystem processes. Thus, it is vitally important that research be devoted to understanding the threat and means of eliminating these aliens, or in some cases learning how to mitigate their effect. This study is a first attempt at addressing the problem of nonnative plants in Sequoia-Kings Canyon and Yosemite national parks. The focus is on determining the extent and location of alien species, determining which of these pose the greatest threat, and evaluating the extent to which these problems are tractable. While this project focuses on a localized region of the Sierra Nevada Mountain Range of California, it is hoped that this approach may be of broader use in managing alien species problems in other regions as well.

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CONVERSION FACTORS

Multiply	By	To obtain
acre	4,047	square meters (m^2)
acre	0.4047	hectare (ha)
foot (ft.)	0.3048	meter (m)
mile (mi)	1.609	kilometer (km)
meter (m)	3.281	foot (ft)
kilometer (km)	0.6214	mile (mi)
square meter (m^2)	0.0002471	acre
hectare (ha)	2.471	acre

Alien Plant Species Threat Assessment and Management Prioritization for Sequoia-Kings Canyon and Yosemite National Parks

Part I. Introduction

In 1998, the U.S. Geological Survey began a project to describe the distribution and abundance of alien (nonnative) plants in disturbed areas of Yosemite, Sequoia and Kings Canyon national parks. In this report, and administratively, Sequoia National Park and Kings Canyon National Park are treated as a unit, referred to as Sequoia-Kings Canyon National Parks. Methods were standardized among the parks, thereby laying the groundwork for providing managers with information to assist in managing invasive nonnative plants in the Sierra Nevada national parks. Alien plants were mapped, site characteristics described and permanent records created for evaluating the current status of these plants in the parks, and to provide a basis for managers to decide on appropriate direction and levels of response.

This document reports the results of alien species surveys at Sequoia-Kings Canyon and Yosemite national parks, the findings of a comprehensive literature review of the biology and ecology of all alien plant species found during surveys in the parks, and the ranking of those species for prioritizing management and control programs. Surveys largely were aimed at capturing the distribution and abundance of alien plants, in areas of anthropogenic disturbance. They were designed to complement existing data sets available for each park that documented the distribution and abundance of all species at randomly located sites across broad elevational and latitudinal gradients. Areas of human disturbance targeted for surveys in Sequoia-Kings Canyon National Parks included campgrounds, corrals, developments, roads, trails and pastures. Surveys in Yosemite National Park focused on campgrounds, corrals, developments, roads and trails. Lower elevation riparian areas and sites of natural disturbance were targeted as well in Sequoia-Kings Canyon National Parks.

Disturbed areas were targeted for inventory because vascular plant surveys in undisturbed sites discovered few of the alien species found during casual observations of heavy use areas. A handful of alien species is well known and has been managed for years in these parks. However, there was clearly a need to document the pattern of alien plant establishment for all other alien species present and to predict those that could pose the greatest threats to the parks.

A comprehensive literature review was done for each species found during the surveys to derive detailed information on biological characteristics (seed production and viability, mode of reproduction, dispersal habits, etc.), on distribution patterns and known invasiveness and on control methods (effectiveness of mechanical, chemical or other treatments). Only a subset of information may be available for some species; no information may be available for others. Detailed and specific information is published for a few. Considered together, known characteristics can help managers compare the potential threat posed by species or categories of species.

The process of ranking alien species for management took into account many of the biological and control factors recommended in the invasive species literature (for examples see Hiebert and Stubbendieck 1993). It empirically blended those factors with local and regional information concerning the invasiveness and ecological impacts of each alien species. This qualitative approach was necessary because of the lack of published data concerning the biological and ecological characteristics of many of the alien species and because the parks encompass a wide range of habitats across an elevational gradient that runs from under 400 m (1,310 ft) to over 4,400 m (14,435 ft). Species and site information is provided in the summaries that were compiled from various sources (see Part III). Because of different sampling techniques and management needs, the alien species problems of Sequoia-Kings Canyon National Parks and Yosemite National Park are addressed in separate sections. However, the parks share many of the same problems, and the information for each of the

parks provides valuable information that can be used to help understand and manage alien plant species in all units of the National Park Service.

Background

Invasive alien plants can bring about significant changes in park ecosystems by changing structural attributes of native plant communities (physiognomy, species composition, genetic diversity) and the processes that support them (fire, nutrient cycling, hydrology, soil erosion, decomposition) (Macdonald et al. 1988). For instance, the establishment of *Tamarix ramosissima* (tamarisk) has dramatically altered stream geomorphology in southwestern riparian corridors including the Green River in Canyonlands National Park (Graf 1978) and reduced species richness along the Pecos River in New Mexico and Texas (Brock 1994). In Hawaii Volcanoes National Park, *Myrica faya* (fire tree) has been shown to profoundly alter nutrient cycling on early successional volcanic sites by increasing the amount of available nitrogen, resulting in further invasion by other nonnative plants (Vitousek and Walker 1989). In addition, annual nonnative grasses have caused an increase in fire frequency in some woodlands (D'Antonio and Vitousek 1992). These are just three of many examples detailing the effects introduced species have on native ecosystems.

Nonnative plants are most likely to establish in areas that have both a source of seeds and that undergo repeated disturbance. In parks and reserves these include developed areas, such as roads and trails, campgrounds, pack stations, water treatment facilities and residential areas (Macdonald et al. 1988, Cowie and Werner 1993). Viable plant parts are transported to these sites via clothing, animal fur and digestive systems, vehicle tires, heavy equipment, slope stabilization materials, and wind (Hodkinson and Thompson 1997, Ridley 1930, Schmida and Ellner 1983). In natural systems, river corridors and riparian areas are especially vulnerable (DeFerrari and Naiman 1994, and others) because: they are subject to regular disturbance, rivers are agents of propagule transport, and moisture is readily available throughout the year (Pyšek and Prach 1995). Alien plant propagules arrive in stream systems via many of the same vectors as those active in terrestrial sites with the addition of wading birds and water transport among stream reaches.

Although not all alien plants are immediately invasive, many nonnative plants appear to undergo a lengthy period of establishment, remaining restricted to roadsides and disturbed areas for years before invading adjacent native vegetation. Populations may then grow exponentially, and a species initially thought to pose little or no threat, as a roadside weed can become a serious pest. *Mimosa pigra* (catclaw mimosa), for example, was unrecognized as a serious weed in the Northern Territory of Australia until 80 years after it was introduced; it is now considered one of the most important wetland weeds in the region (Cowie and Werner 1993).

Invasive nonnative plants currently infest an estimated 2.8 million hectares (ha) of National Park System lands, costing millions of dollars annually in control efforts (National Park Service 1996). In Yosemite, approximately $17,500 is spent on control each year. This amount doubles when in-kind contributions are included (S. Fritzke, oral commun.). At Sequoia-Kings Canyon National Parks, a small volunteer program, under staff direction, has been relied on in the past to address alien plant management. However, in 2001, an alien management program invested significant funds in the control of alien populations. Inventories of the current distribution of alien species addresses the need of managers to have information on all potential invaders so that priorities can be established for monitoring and control.

Study Areas

Sequoia-Kings Canyon National Parks forms a contiguous reserve of 349,525 ha of land located on the western slope of the south-central Sierra Nevada of California. This reserve ranges in elevation from 400 m (1,310 ft) in the western foothills to 4,418 m (14,495 ft) on the crest of the Sierra Nevada and is composed of rugged, mountainous terrain; over 70 percent of parklands are above 2,500 m (8,200 ft) elevation. Three major river systems—the

Kings, Kern and Kaweah—originate within and drain the park; additionally, the northernmost boundary of Kings Canyon National Park includes a portion of the headwaters of the south fork of the San Joaquin River.

Yosemite National Park is a 302,768 ha reserve located in the central Sierra Nevada. It ranges in elevation from 640 m (2,100 ft) in the Merced River Canyon to 3,997 m (13,110 ft) atop Mt. Lyell. The park comprises two major watersheds, the Merced River in the south and the Tuolumne River in the north, and completely encompasses the headwaters of each. Two-thirds of Yosemite lies between 2,100 m and 3,050 m, resulting in a higher proportion of forested terrain than the southern parks and a lower proportion of alpine habitat.

The vegetation of all three parks is quite varied, reflecting the substantial environmental heterogeneity created by a large elevational gradient. Vegetation types include chaparral, oak woodland, upland hardwood forest, conifer forest and woodland, meadows, and alpine plant communities (Vankat 1982, Haultain et al. 1988, Moore 1993). The parks support rich and diverse vascular floras with nearly 1,500 taxa in both Sequoia-Kings Canyon and in Yosemite.

With the arrival of Europeans in the 1850s, livestock grazing became prevalent and intense throughout the region, continuing in the foothills until the parks were established in 1890 (Macdonald et al. 1988). Grazing was suppressed more slowly over the next two to three decades at the higher elevations. During this time, Mediterranean annual grass species became established in the lower elevations, marking a shift to dominance by nonnative species in the understory of the blue oak savannah and in foothill grassland sites, which persists throughout California (Rejmanek et al. 1991). Grazing is currently limited in the foothills to a government pasture at each park and in the montane and subalpine areas to recreational and administrative pack stock pastures.

Today, visitation has reached 1.4 million at Sequoia-Kings Canyon National Parks and nearly 4 million at Yosemite National Park. In 1998, an estimated 2.1 million visitors to Yosemite entered Yosemite Valley, over 90 percent of them in private vehicles (NPS 2000, IA:3-97). Commercial vehicles (vendors, contractors) travel from various parts of the region to support concession and administrative functions (P. Moore, personal observation). Pack stock animals are moved in and out of the parks seasonally to gain access to winter pastures. Native herbivores migrate into and around the parks to follow forage availability as well (S. Thompson, pers. commun.). Alien plants are faced with few barriers to their transport across parklands, but information is the first step toward addressing the issues.

Note: Because Sequoia National Park and Kings Canyon National Park are administered as a single unit (despite their legislative designations as individual national parks), a single team surveyed them. Therefore, they are referred to here as if they are a single unit and contrasted with Yosemite National Park approximately 40 km north. Alien species occurrence is presented for Sequoia-Kings Canyon National Parks as if they are one unit; however, species occurrence is documented by site and summary information could be derived for each park separately should the need arise.

Part II. Directed Survey Results

Sequoia and Kings Canyon National Parks

Survey and Quadrat Data Collection

Field Methods - In 1996, 1997, and 1998 directed surveys were conducted in Sequoia-Kings Canyon National Parks to assess the richness, distribution and abundance of alien plant species. The surveys consisted of complete inventories of all alien (nonnative) plant species present within the boundaries of the target site. These surveys were supplemented by quadrat-based sampling of some campgrounds, camps, developments and pack stations in 1998. Surveys were completed in areas where alien plant species are most likely to be introduced and dispersed. The sites surveyed included campgrounds, developed areas, trails, improved roads, dirt roads, pack stations, pastures and riparian zones. Developments and developed

areas refer to areas that are significantly altered by the installation of structures, utilities and pavement such as accommodations, visitor centers and offices. Surveys at Lodgepole Campground, Lodgepole Village and Ash Mountain developed areas, Wuksachi Village construction site, and along Generals Highway did not record all alien plant species due to logistical constraints. Also, at several sites, the surveys included portions of natural areas, trails, roads, and developments adjacent to the particular site. Except for the Ash Mountain Development survey, which identified 71 alien plant species, data from surveys that did not completely sample a well-defined site were not included in site-by-elevation figures or the cluster analyses described later in this report. The data for Grunnigan Ranch contain a large number of cultivated alien plants and is not included in the figures or cluster analyses. Additionally, a few sites were sampled using quadrat techniques but only the alien species richness data are presented in this report. However, all of the data collected during the surveys and quadrat sampling were considered in the alien species prioritization and recommendations sections of this report.

The Sequoia-Kings Canyon National Parks survey crews assigned each site to a particular site category, e.g. campground. However, the criteria they used to define site types were not the same as those used by the Yosemite crew. In general, the criteria used by the Yosemite crews produced smaller and more sharply defined survey areas. The extensive documentation of site characteristics in the Sequoia-Kings Canyon National Parks survey reports allowed the assignment of alien plant species to comparable site types based on the Yosemite site definitions. In a small number of cases an alien species could either not be assigned to a group other than "natural area" or was part of a very small supplemental survey such as an improved road adjacent to a campground. In those cases, the survey data were not included in the site-by-elevation figures or in the cluster analyses but have been included in the alien species prioritization and recommendations sections of this report. The alien species presence/absence survey data for the 55 km long Rae Lakes Loop Trail and the 19 km long Kern Canyon Trail were divided into 305 m (1,000 ft) elevational segments of undetermined lengths based on statements in the survey reports.

Survey reports were conducted throughout the sites. Environmental factors for each alien species found were recorded. Factors included elevation, slope, aspect, percent canopy closure, community type, associated species, abundance, and distribution. Abundance figures were taken according to a logarithmic scale (1-10, 11-100, 101-1000, and >1000). These figures reflect the number of individuals of a single species observed throughout the entire survey area. Distribution observations for each alien species were categorized as scattered individuals, scattered clumps of individuals, large clumps of many individuals, or widespread throughout the area. The survey crews also recorded brief written descriptions of each species found. Descriptions included additional environmental factors such as type and intensity of disturbance. Universal Transverse Mercator coordinates were recorded for each species. These coordinates were obtained from either a PLGR-type global positioning device or directly from USGS 7.5′ quadrangles. Hickman (1993) was used to determine which plant species were not indigenous to the parks.

The quadrat-based sampling method was conducted in 1998 only at campgrounds/camps, developments and pack stations. A baseline transect was first established along one edge of each patch, and a random number table was used to randomly place sampling transects perpendicularly along the length of the baseline. Quadrats (1 m^2) were placed randomly along the sampling transects until thirty quadrats had been sampled. When thirty quadrats were sampled before the end of a sampling transect, the remainder of the sampling transect was also sampled to avoid biasing the data toward the beginning of the transect. In each quadrat, the cover of nonnative and native plant species was estimated to the nearest one percent. While the cover of a particular species could not exceed 100 percent, the total of all species in the quadrat frequently exceeded 100 percent. Additionally, a natural vegetation control site was established in undisturbed vegetation 50 m from one of three site categories.

The sample sites frequently contained areas such as parking lots or tent pads that were inappropriate for sampling, so quadrats had to pass rejection criteria before field crews sampled them. Randomly placed quadrats were rejected if more than 50 percent of the cover was incapable of supporting plant life (pavement, dirt roads, large boulders and trampled areas within 1 m of a structure). Areas where alien plants were deliberately cultivated (lawns, flower pots and gardens) were also rejected. If the crews rejected several quadrats, they added additional transects until 30 quadrats were sampled. In areas that were sampled for cover, the canopy cover of shrubs and trees was also recorded. Shrub cover along the length of transects was measured using the line intercept method. At each site, 100 canopy points were distributed at regular intervals along the transect. Field crews used GRS brand densiometers to obtain canopy cover estimates. The quadrat sampling data were analyzed for alien species richness and are included in the richness-by-elevation figures below.

Decline of Alien Species Richness with Increasing Elevation

All sites - Graphs of alien species richness against site elevation indicate that alien species richness is strongly negatively correlated with elevation when all sites are pooled (fig. 1a). This negative correlation is evident for six of the seven site types when the graphs are restricted to particular site types (fig. 1b-1h). The site-restricted graphs also indicate that each site type is restricted to limited portions of the elevational gradient that runs from 425 m (1,400 ft) to 3,300 m (10,800 ft) and sampling effort varied with elevation and site type. These are unavoidable problems when only a limited number of discrete sites are available for sampling, and they affect the inferences that can be made from the data. On the positive side, for some site types, such as camps and pack stations, the entire population of sites was sampled so statistical models are not required to predict the number of alien species at another site that was not sampled.

Campgrounds/Camps – Alien species richness in campgrounds is likely due to differences in both the distribution of habitat types along the elevational gradient, as well as the location and types of disturbances. Potwisha Campground (645 m; 2,115 ft) with 44 species distributed over 48,000 m^2, lies on an ecotone between blue oak woodland and canyon live oak woodland vegetation types. While its location on an ecotone suggests that it may have a large number of alien species because of diverse habitats, almost all of the alien species present were either common in the blue oak woodland vegetation type or are soil disturbance specialists. Buckeye Campground (860 m; 2,820 ft) with 25 species distributed over 8,000 m^2, and South Fork Campground (1,140 m; 3,730 ft) with 15 species distributed over 9,000 m^2, are both located in canyon live oak. They contain many of the same alien annual grass species but Buckeye had a more diverse alien forb flora (e.g. nongrass, nongrasslike herbs).

Sheep Creek Campground (1,390 m; 4,565 ft) with 7 species distributed over 96,000 m^2, and Moraine Campground (1,450 m; 4,765 ft) with 3 species distributed over 106,000 m^2, are located in mixed conifer vegetation with broken canopies and sandy soil. The dominant alien species at both sites were *Bromus tectorum* (cheat grass) and *Vulpia myuros* (rattail fescue), both of which are short-lived annual grasses. Sheep Creek's greater species richness was due to a few perennial species that are restricted to areas that receive supplemental water such as ditches and drinking fountains.

Swale Administrative Campground (1,900 m; 6,225 ft), which had 6 species, distributed over 10,000 m^2, is located in mixed conifer vegetation. Atwell Mill Campground (1,955 m; 6,415 ft) is located in white fir/big tree vegetation and had 5 species distributed over 17,000 m^2. They had similar alien species compositions except that no grasses were present at Swale while all the alien species at Atwell Mill Campground were located in a single seep that is dominated by *Poa pratensis* (Kentucky bluegrass). Azalea Campground (1,970 m; 6,455 ft) with 16 species distributed over 76,000 m^2, Crystal Springs Campground (2,020 m; 6,630 ft) with 5 species distributed over 65,000 m^2, and Dorst Campground (2,050 m; 6,720 ft) with 19 species distributed over 140,000 m^2, are all located in white fir vegetation interspersed with montane meadow vegetation. The alien species at Azalea were

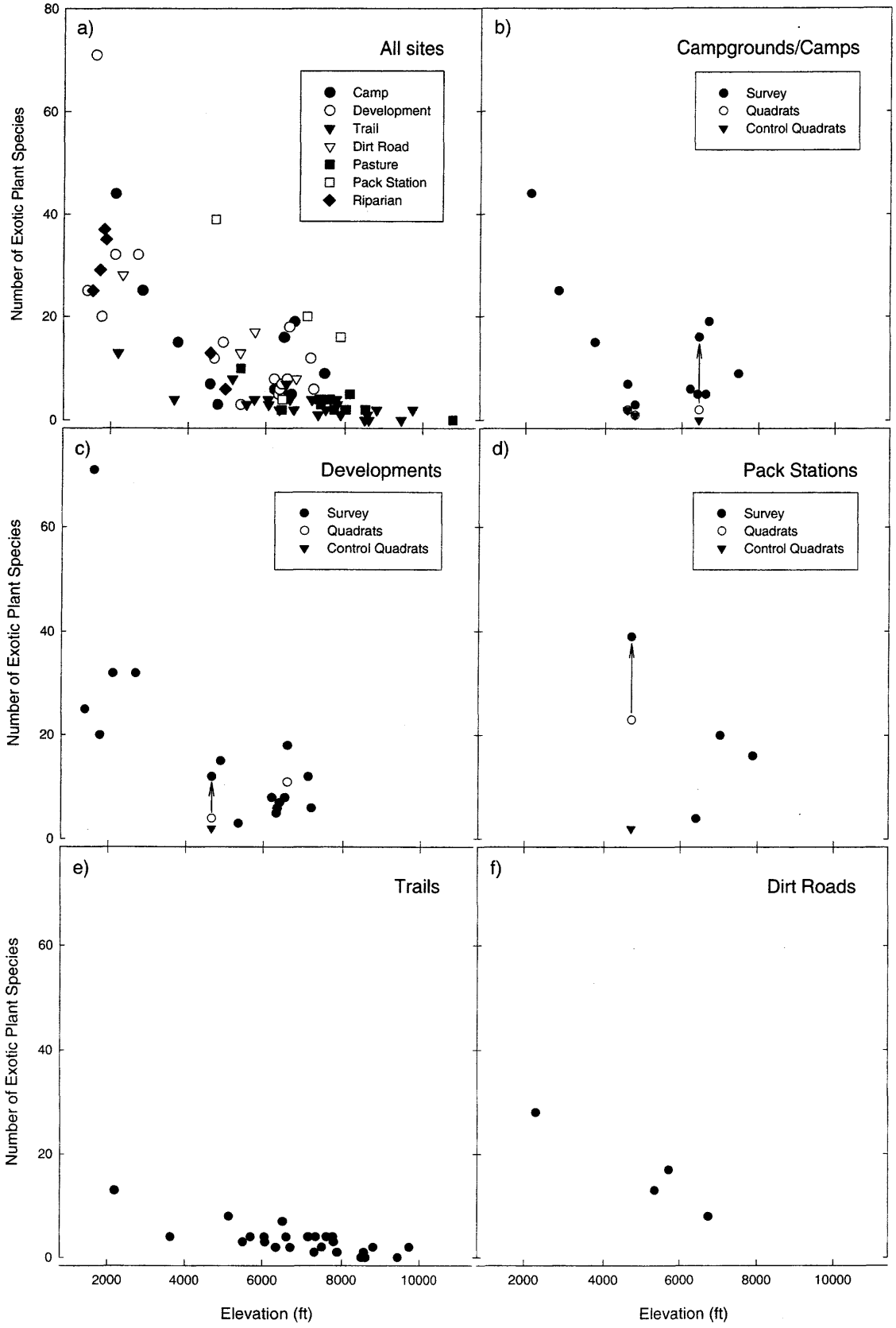

Figure 1. Sequoia-Kings Canyon National Parks alien species richness by elevation.

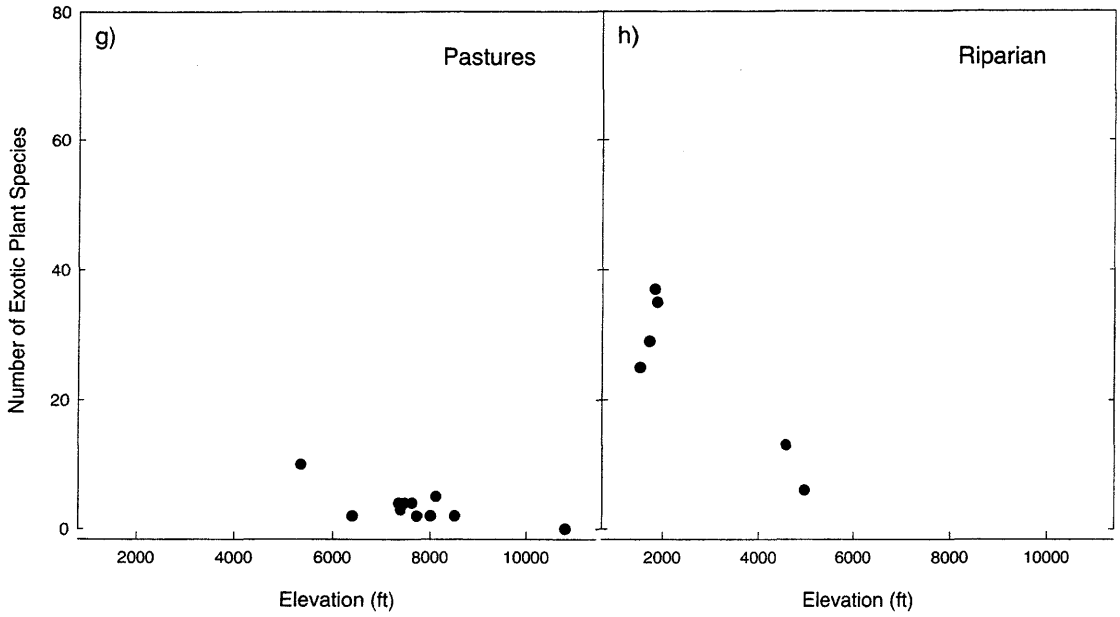

Figure 1. Sequoia-Kings Canyon National Parks alien species richness by elevation--Continued

found during the comprehensive survey primarily in a highly disturbed and trampled portion of a meadow at the southwest corner of the campground or in seeps and wet areas. Consequently, the quadrat-based sampling (2 species over 30 m^2 sampling area) missed most of the alien species (see arrow in fig. 1b). No alien species were found in the control quadrats outside of the campground. This suggests that the alien species in the campground are not invading adjacent undisturbed vegetation; however, no comprehensive survey was made of the control site and many of the alien species are restricted to wet microhabitats. The alien species at Crystal Springs Campground were primarily restricted to the margin of a relatively undisturbed meadow. In contrast, at Dorst Campground most of the alien species were found in disturbed soils near roads and structures. Cold Springs Campground (2,280 m; 7,475 ft) with 9 species discovered, is located in Jeffrey pine/fir vegetation and most of the alien species were found along moist roadsides or in dirt roadbeds.

Developments – There were clear changes in alien species richness and composition with changes in site elevation among developments (fig. 1c). Additionally, the type of development strongly influenced alien species richness and composition.

Ash Mountain Boundary Area (425 m; 1,400 ft) with 25 species distributed over 2,000 m^2, and North Fork Parking Lot (540 m; 1,775 ft) with 20 species distributed over 3,000 m^2, contained similar numbers of alien species that are typical of alien annual grassland. Ash Mountain Developed Area (490 m; 1,605 ft) with 71 species distributed over 110,000 m^2, had by far the richest alien species flora of any site. The species included typical annual grassland species, species that are lawn and disturbed soil specialists, horticultural species, and waifs. Middle Fork Flume (645 m; 2,110 ft) had 32 species and Hospital Rock (820 m; 2,695 ft) with 32 species distributed over 12,000 m^2 were similar to the Ash Mountain Boundary and North Fork Parking Lot sites except that they contained a richer annual grassland forb flora. The alien flora of Cedar Grove Market and Lodge (1,425 m; 4,670 ft), with 12 species distributed over 21,000 m^2, appeared to have lost most of the typical annual grassland alien species that were found at lower elevations and was a mixture of perennial grasses (*Poa pratensis* and *Poa bulbosa* [bulbous bluegrass]), species that specialize in disturbed soil, and short lived annual grasses (*Bromus tectorum* and *Vulpia myuros*).

The floras of Crystal Cave Parking Lot (1,490 m; 4,895 ft) with 15 species distributed over 4,000 m^2, and Milk Ranch Lookout (1,895 m; 6,210 ft) with 8 species distributed over 3,000 m^2, were very similar and contained many alien species that are typical of low elevation annual grassland, as well as *Bromus tectorum,* which is typical of mid-elevation sites. Oriole Lake Airstrip (1,630 m; 5,355 ft) had three species: two species of low elevation annual grasses and *Plantago lanceolata* (English plantain).

The Big Stump Picnic Area (1,925 m; 6,325 ft) flora, with 5 species distributed over 5,000 m^2, was dominated by *Bromus tectorum* and soil disturbance-adapted forbs. With the exception of *Bromus tectorum* at the Giant Forest Sewage Treatment Plant (1,935 m; 6,350 ft; 6 species distributed over 2,000 m^2) the flora of that site and of the Giant Forest Developed Area (1,960 m; 6,440 ft; with 6 species distributed over 95,000 m^2) consisted of species that were represented by few individuals. Columbine Picnic Area (1,990 m; 6,535 ft) with 8 species distributed over 5,000 m^2, and Grant Grove Developed Area (2,010 m; 6,595 ft) with 18 species distributed over 200,000 m^2, were noteworthy for their large populations of *Phalaris arundinacea*, *Poa pratensis* and *Trifolium repens* (reed canary grass, Kentucky bluegrass and white clover, respectively).

The floras of Red Fir Maintenance Yard (2,170 m; 7,120 ft) with 12 species over 20,000 m^2, and Wolverton Snow Play Area were dominated by forb species adapted to soil disturbance. Overall, annual grass species typical of low-elevation annual grassland tended to disappear at elevations between 3,000 and 4,000 feet except for very open or disturbed sites. With increasing elevation, the low elevation annual grasses were replaced by *Bromus tectorum* on dry, open sites and *Poa pratensis* on more mesic sites. Additionally, many of the annual forbs present in low elevation annual grassland were present in disturbed areas to elevations of 2,195 m (7,200 ft), but they were replaced by perennial forbs such as *Cirsium vulgare*, *Taraxacum officinale* and *Trifolium repens* (bull thistle, dandelion and white clover) on less disturbed mesic sites.

Pack Stations – The alien floras of the pack stations at Cedar Grove (1,435 m; 4,700 ft; with 39 species over 3,000 m^2), Grant Grove (1,955 m; 6,415 ft; with 4 species distributed over 3,000 m^2), Wolverton (2,145 m; 7,035 ft; with 6 species distributed over 64,000 m^2), and Mineral King (2,400 m; 7,880 ft; with 16 species over 13,000 m^2) were dominated by low- and mid-elevation annual grasses and forb species adapted to soil disturbance and dispersal by grazing animals. The quadrat-based survey (30 m^2) of Cedar Grove pack station detected only 23 alien species while the control, which was located in a ponderosa pine/incense-cedar forest, detected only 2 alien species (fig. 1d). Those species, *Bromus tectorum* and *Vulpia myuros*, were only present in 3 percent of the quadrats at 1 percent cover for each species. The very low species richness at the Grant Grove pack station was due to the fact that pack animals had been placed in the corrals prior to the survey and most plants had been eaten or trampled beyond recognition. The two higher elevation pack stations contained *Poa pratensis*, *Taraxacum officinale*, *Trifolium repens*, *Rumex acetosella* (sheep sorrel) and *Spergularia rubra* (sand-spurrey), all species that occur in mid- to high-elevation grazed meadows.

Trails – The trail floras were low in alien species richness, and alien species could be assigned to one of three categories based on elevation (fig. 1e). Between 610 m (2,000 ft) and 1,220 m (4,000 ft), the trails were lined with annual species that are typical of low elevation annual grassland. From 1,525 m (5,000 ft) to 2,440 m (8,000 ft), the trails were lined with *Poa pratensis*, *Bromus tectorum*, *Taraxacum officinale* and other forbs while *Cirsium vulgare* was common at stream crossings and in wet areas. Trails between 2,440 m (8,000 ft) and 3,050 m (10,000 ft) were lined only with *Poa pratensis* and *Taraxacum officinale.*

Dirt Roads – The alien flora of dirt roads was similar to that of the trail flora except for a greater number of forb species adapted to soil disturbance (fig. 1f). The flora of Colony Mill Road (705 m; 2,305 ft) with 28 species, was dominated by species typical of low elevation annual grassland and blue oak woodland. Cattle from an adjacent private inholding were seen

grazing along Oriole Lake Road (1,630 m; 5,340 ft), which probably accounts for the presence of *Trifolium repens* which is dispersed in dung. The flora was dominated by *Bromus tectorum*, *Bromus diandrus* (ripgut brome) and a few soil disturbance adapted forb species. *Bromus tectorum*, low elevation annual grasses and disturbance-adapted forbs were present along Mineral King Road (1,740 m; 5,720 ft, 17 species) and Camp Conifer Road (2,060 m; 6,755 ft, 8 species).

Pastures/Montane Meadows – Pastures were different habitats for alien species than all of the previous site types because they contained vegetation that is dominated by native species. Alien species that were established in pastures, all of which were identified as montane meadow vegetation, demonstrated their ability to invade those natural habitats. Oriole Lake Pasture (1,630 m; 5,355 ft) with 10 species, contained twice as many alien species as the other pastures (fig. 1g). The probable explanation is its proximity to a dirt road and increased seed dispersal and grazing disturbance by cows from a nearby private inholding. Many of the grasses and forbs in the pasture are known to be dispersed in horse and cow dung. Half of the pastures between 1,830 m (6,000 ft) and 2,745 m (9,000 ft) contained only two alien species, *Poa pratensis* and *Taraxacum officinale,* while the remainder contained those species plus one to three other species. The survey crew's notes indicate that dense populations of *Poa pratensis* appeared to be excluding native species at many higher-elevation sites.

Riparian Areas – The habitats of the streamside sites shared characteristics with both the pasture/montane meadow sites and the human-modified habitat sites. They resembled montane meadows because native plants were present in abundance along their banks, and they resembled human-modified habitats because some areas of their banks, and much of their beds, were periodically cleared of all vegetation. Vegetation clearing through either human modification or flooding creates bare ground that can allow for the establishment of alien plant propagules. Alien species richness was high, because moisture is available for much of the growing season and because the riparian sites that were completely sampled are at low- and mid-elevations (fig. 1h). The survey crews collected more data for riparian areas than were reported here. Except for the following six sites, most of the data were collected as part of broader surveys, and it was not clear from the survey notes how complete those surveys were (complete survey information is presented in species distribution maps 1--28). Additionally, the six riparian sites reported here are located between two very narrow elevational bands (460 m to 1,525 m; 1,500 to 5,000 ft).

The 25 alien plant species found in the drainage of the middle fork of the Kaweah River (470 m; 1,545 ft) included *Ficus carica*, *Morus alba*, and *Tamarix* (edible fig, white mulberry and tamarisk, respectively), all species that are highly invasive in riparian areas in California. *Rubus discolor* (Himalayan blackberry) and *Tamarix species* are invading the north fork of the Kaweah River (525 m; 1,725 ft, 29 species), and the survey crew noted the presence of some cows that had eaten and trampled most of the vegetation in the stream bed. Yucca Creek's (575 m; 1,880 ft) flora with 37 species contained actively invading populations of *Juglans regia* (English walnut), *Juglans californica* (California black walnut), *Ficus carica, Rubus discolor, Vitis vinifera* (cultivated grape). Additionally, the nearby Grunnigan Ranch site hosted *Carya, Diospyro, Nerium oleander, Punica granatum, Pyracantha angustifolia* and *Rubus discolor* (pecan, persimmon, oleander, pomegranate, firethorn and Himalayan blackberry, respectively), all species that are capable of rapidly expanding along riparian corridors and with fruit that may be dispersed over long distances by birds. *Nerium oleander,* a very toxic evergreen shrub species native to stream banks and stream beds in the Mediterranean region, is especially dangerous as its seed is dispersed by wind and water and its natural habitat is the same as that required by California's sycamores, alders, willows and cottonwoods (Keeley 1992). The Sycamore Creek (575 m; 1,880 ft) flora of 35 species was being invaded by *Arundo donax* (giant reed), *Pyracantha angustifolia*, and *Tamarix* species. The field survey crews observed evidence of recent attempts to eliminate the *Arundo donax* (giant reed) population. The survey crews noted

that *Malus sylvestris* (apple) appeared to be spreading in Trauger's Creek (1,395 m; 4,575 ft, 13 species total) and that the portion of the Kings River (1,515 m; 4,965 ft, 6 species total) near Zumwalt Meadow (Cedar Grove) contained populations of *Poa pratensis*, *Bromus tectorum*, and *Cirsium vulgare*.

Similarity of Alien Species Composition Among Sites

To compare and contrast species composition among sites, an exploratory cluster analysis of the sites included in the species richness by elevation figures was conducted using PC-ORD version 4 (fig. 2). Before the analysis was run, all species with occurrences at only one or two sites were excluded from the data matrix. In an analysis of sites with native species the low frequency species would have been left in the data matrix as indicator species. However, in the case of alien species, the low frequency species are typically species that have not been widely dispersed and not species that are limited to a narrow set of environmental conditions. A variety of distance measurements and group linkage methods were used to analyze the data and Euclidean distances combined with Ward's group linkage method produced the most interpretable clusters, which are presented in figure 2.

An ecological interpretation of the factors that significantly affected the clustering of the alien species is presented in table 1. Note that the sites with no alien species have been added to the table as an unnumbered cluster. The coarsest division of the sites can be attributed to the presence of high species richness of low-elevation species such as those commonly found in annual grasslands and blue oak woodlands. This result is expected because of the negative correlation between alien species richness and elevation. When Euclidean distances are used as a measure of resemblance between sites based on species abundance or presence/absence data, a problem known as the double-zero effect may occur (Legendre and Legendre 1998). The problem arises because the algorithm for calculating the resemblance value using the Euclidean distance method does not differentiate between sites that share the same species and sites from which the same species are absent. For this reason the Euclidean distance method is generally recommended for comparing sites based on environmental factors and not recommended for comparisons based on species abundance or presence/absence data (Legendre and Legendre 1998). However, on close examination, that recommendation assumes that the analysis is being conducted to compare the results against the expectations of ecological niche theory. That theoretical test is not the purpose of the parks' alien species surveys. The negative correlation of alien species richness with increasing elevation resulted in the double-zero effect that is manifested in the close resemblance between the clusters of high elevation, alien-species-poor sites in figure 2. Because Ward's method is an agglomerative hierarchical clustering technique, the first clusters are pair-wise mergers of the most similar sites. Hence, the shorter the initial "legs" of the dendrogram in figure 2, the more closely the site pairs resemble each other. Therefore, because there are only a few species found at higher elevations, the double-zero effect results in a tendency for the higher-elevation sites to resemble each other. The high-elevation sites lacked many of the same species and the lower elevation sites resemble each other because of the species they have in common. The next coarsest divisions are among xeric and mesic sites for sites rich in low-elevation species, sites that are dominated by mid- and high-elevation grass species with low forb diversity, and sites with a relatively high diversity of mid- to high-elevation forbs (table 1).

The interpretation of clusters 1 through 5, sites rich in low-elevation species, is straightforward as indicated in table 1. All of the sites in those clusters range in elevation from 395 m to 855 m (1,300 ft to 2,800 ft). The sole exception to this elevational range is the Cedar Grove Pack Station at an elevation of 1,435 m (4,700 ft) which is very rich in low-elevation species such as *Bromus diandrus*, *B. hordeaceus*, *B. madritensis*, *Erodium cicutarium* and *Lolium multiflorum* (ripgut brome, soft chess, red brome, red-stemmed filaree, and Italian ryegrass, respectively).

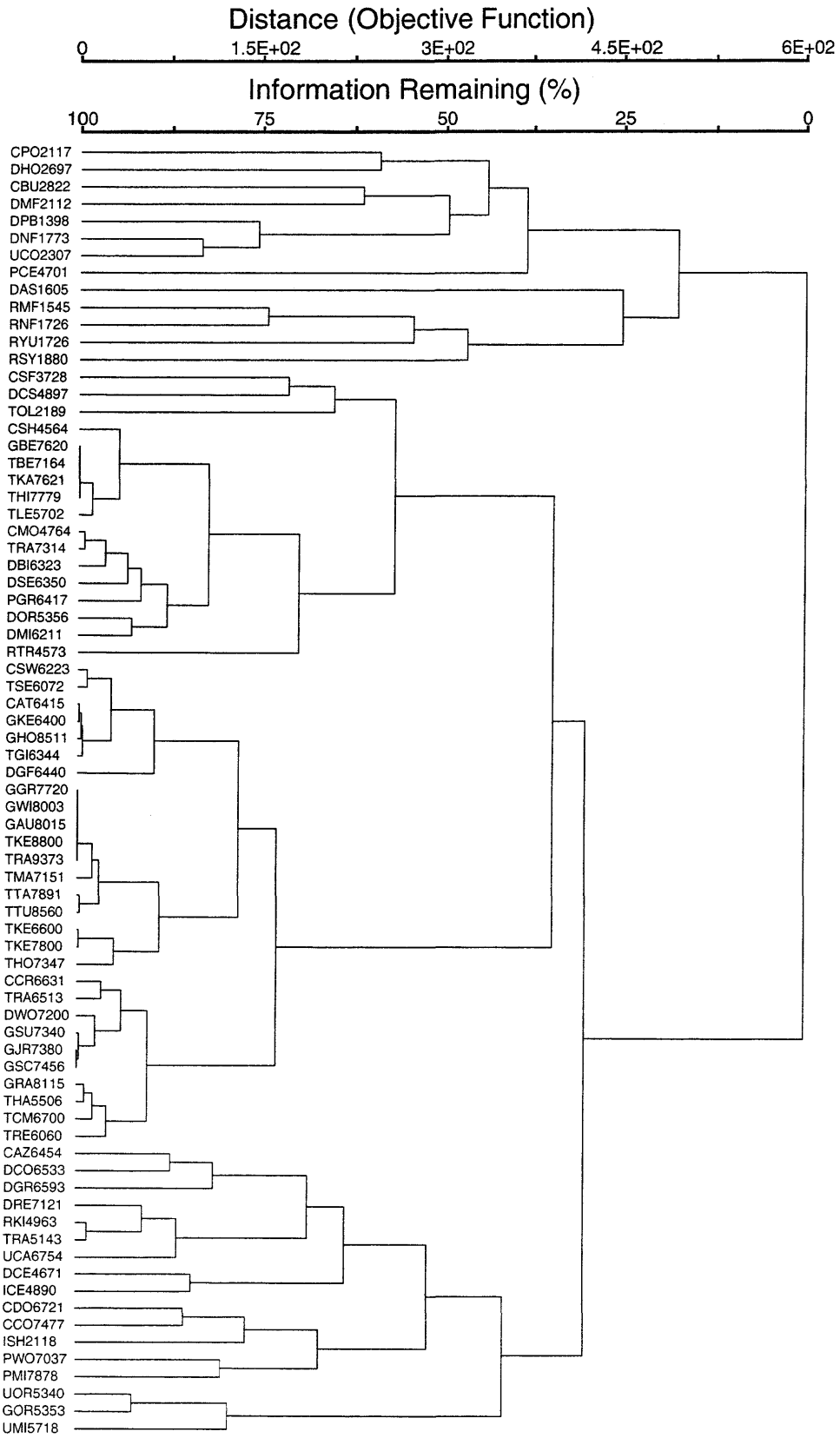

Figure 2. Sequoia-Kings Canyon National Parks cluster analysis.

Table 1. Interpretation of Sequoia-Kings Canyon National Parks cluster analysis.

Cluster Characteristics					Code	Site	Cluster
Low Elevation & High Richness	Xeric	High Forb Richness			CPO2117	Potwisha Campground	1
					DHO2697	Hospital Rock Picnic Area	
		Moderate Forb Richness			CBU2822	Buckeye Campground	2
					DMF2112	Middle Fork Flume	
					DPB1398	Ash Mountain Park Boundary	
					DNF1773	North Fork Parking Lot	
					UCO2307	Colony Mill Dirt Road	
		Low and Upper Elevation Spp.			PCE4701	Cedar Grove Pack Station	3
	Mesic	Irrigated – High Richness			DAS1605	Ash Mountain Headquarters	4
		Riparian			RMF1545	Middle Fork of Kaweah River	5
					RNF1726	North Fork of Kaweah River	
					RYU1829	Yucca Creek	
					RSY1880	Sycamore Creek	
Mid to High Elevation Species	Grass Dominated & Low Forb Richness	Predominantly Annual Grasses	Low Elevation Spp. Moderate Richness		CSF3728	South Fork Campground	6
					DCS4897	Crystal Cave Parking Lot	
					TOL2189	Old Hidden Springs Trail	
			Mid Elevation spp. /Low Richness	*Bromus tectorum* & *Vulpia myuros*	CSH4564	Sheep Creek Campground	7
					GBE7620	Bearpaw Meadow	
					TBE7164	Giant Forest to Bearpaw Meadow Trail	
					TKA7621	Bearpaw Meadow to Kaweah Gap Trail	
					THI7779	High Sierra Trail	
					TLE5702	Lewis Creek Trail	
					CMO4764	Moraine Campground	
					TRA7314	Rae Lakes Trail (7000 ft)	
					DBI6323	Big Stump Picnic Area	
					DSE6350	Giant Forest Sewage Treatment Facility	
					PGR6417	Grant Grove Pack Station	
					DOR5356	Oriole Lake Air Strip	
					DMI6211	Milk Ranch Lookout	
				Riparian	RTR4573	Trauger's Creek	8
		Poa pratensis	*T. officianale* or Low Frequency Forbs	Low Frequency Forbs	CSW6223	Swale Campground	9
					TSE6072	Sequoia Lake Trail	
					CAT6415	Atwell Mill Campground	
					GKE6400	Kern Canyon Ranger Station Pasture	
					GHO8511	Hockett Meadow	
					TGI6344	Giant Forest Trail	
					DGF6440	Giant Forest Developed Area	
				Forb Primarily *Taraxicum officianale*	GGR7720	Grasshopper Meadow	10
					GWI8003	Williams Meadow	
					GAU8015	Austin Meadow	
					TKE8800	Kern Canyon Trail (8000 ft)	
					TRA9373	Rae Lakes Trail (9000 ft)	
					TMA7151	Marvin Pass Trail	
					TTA7891	Tar Gap Trail	
					TTU8560	Tuohy Meadow Trail	
					TKE6600	Kern Canyon Trail (6000 ft)	
					TKA7800	Bearpaw Meadow to Kaweah Gap Trail	
					THO7347	Atwell Mill Cg. to Hockett Meadow Trail	
			Presence of *Rumex acetosella* & *Spergularia rubra*		CCR6631	Crystal Springs Campground	11
					TRA6513	Rae Lakes Trail (6000 ft)	
					DWO7200	Wolverton Snow Park	
					GSU7340	Sugarloaf Meadow	
					GJR7380	J. R. Meadow	
					GSC7456	Scaffold Meadow	
					GJU8115	Junction Meadow	
					THA5506	Hart Loop Trail	
					TCM6700	Crescent Meadow	
					TRE6060	Redwood Canyon Trail	
	Forbs	Miscellaneous Forbs			CAZ6454	Azalea Campground	12
					DCO6533	Columbine Picnic Area	
					DGR6593	Grant Grove Developed Area	
					DRE7121	Red Fir Maintenance Yard	
					UCA6754	Kings River	
					TRA5143	Rae Lakes Trail (5000 ft)	

Table 1. Interpretation of Sequoia-Kings Canyon National Parks cluster analysis--Continued

Cluster Characteristics			Code	Site	Cluster
Mid to High Elevation Spp.	Forbs	Miscellaneous Forbs	UCA6754	Camp Conifer Dirt Road	12
			DCE4671	Cedar Grove Market and Lodge	
			ICE4890	Cedar Grove Paved Road	
			CDO6721	Dorst Campground	
			CCO7477	Cold Springs Campground	
			ISH2118	Shepard Saddle Paved Road	
			PWO7037	Wolverton Pack Station	
			PMI7878	Mineral King Pack Station	
		Bromus tectorum, Poa pratensis Verbascum thapsus & Miscellaneous Forbs	UOR5340	Oriole Lake Dirt Road	13
			GOR5353	Oriole Lake Meadow	
			UMI5718	Mineral King Dirt Road	
No Alien Species			TBL5763	Old Black Oak Trail	None
			TEV8511	Evelyn Lakes Trail	
			TMI8100	Mitchell Pass Trail	
			TNE8840	New Army Pass Trail	
			TSI10800	Siberian Outpost Trails	
			TSU8511	Sunset Lakes Trail	

Code: First letter: C = Campground, D = Development, G = Pasture/Meadow, I = Paved Road, P = Pack Station, R = Riparian, T = Trail, U = Dirt Road. Second and third letters: Unique site ID. Numerals: #### = Elevation (ft).

Sites in cluster 6 are uniquely rich in low elevation annual grasses and also possess species that are common at mid-elevations. Old Hidden Springs Trail at an elevation of 670 m (2,190 ft) is rich in low elevation annual grasses as expected and there are also mid elevation forb species at seeps and at stream crossings. The small corral at South Fork Campground (1,135 m; 3,730 ft) may be responsible for the large number of annual grasses found at the site. There is also a large number of annual grass species along the edges of Crystal Cave Parking Lot (1,490 m; 4,895 ft).

Cluster 7 is composed of sites that range from 1,370 m to 2,285 m (4,500 ft to 7,500 ft) in elevation and are relatively poor in mid-elevation species and rich in annual grass species. *Bromus tectorum* and *Vulpia myuros* are constant annual grass species. The inclusion of Grant Grove Pack Station (1,955 m; 6,415 ft) in the low-species-richness cluster is an artifact of sampling difficulties. The survey of that site was conducted after stock animals were placed in the corrals and many of the plants were either eaten or trampled beyond recognition. Cluster 8, Trauger's Creek (1,395 m; 4,575 ft), is relatively rich in low-elevation species. However, neither *Bromus tectorum* nor *Vulpia myuros* are found at that site. That factor, in addition to the presence of mid-elevation species in seeps and at stream crossings, and the presence of *Malus sylvestris,* accounts for the site's distinct cluster.

Clusters 9, 10 and 11 are notable for the presence of *Poa pratensis*. Sites in cluster 9, which range in elevation from 1,830 m to 2,590 m (6,000 ft to 8,500 ft), are relatively low in forb richness, while *Taraxicum officinale* is characteristic of the sites in cluster 10, which range in elevation from 2,135 m to 2,745 m (7,000 ft to 9,000 ft). *Rumex acetosella* and *Spergularia rubra* are characteristic of sites in cluster 11, which range in elevation from 1,980 m to 2,285 m (6,500 ft to 7,500 ft). Hart Loop Trail (1,680m; 5,505 ft), a lower-elevation site, is included in this cluster because of the mid- and high-elevation species present at stream crossings and moist areas.

Clusters 12 and 13 are relatively rich in mid- and high-elevation forb species. The sites in cluster 12 ranges in elevation from 1,370 m to 2,440 m (4,500 ft to 8,000 ft). The low elevation Shepherd Saddle Road site is the only exception, and it appears to be rich in mid- and upper-elevation forb species due to its proximity to Ash Mountain Corrals, Ash Mountain Shooting Range and Sycamore Creek. The sites in cluster 13 are at an elevation of 1,675 m (5,500 ft) and include the adjacent Oriole Lake Dirt Road and Oriole Lake Meadow sites in addition to Mineral King Dirt Road. The forb species at these sites are species that are typically dispersed in the dung of stock animals. Trespassing cattle from a nearby inholding graze the sites near Oriole Lake, and the Mineral King Dirt Road site is adjacent to the Mineral King Pack Station.

Nearly all of the sites where no alien species were found are above 2,440 m (8,000 ft). The exception is Old Black Oak Trail at 1,755 m (5,765 ft), a trail that has not been maintained for years. It is not clear why there are no alien species present at the other five sites as *Poa pratensis* and *Taraxicum officinale* are present along the Rae Lakes Loop Trail to elevations of 2,865 m (9,400 ft) and 2,990 m (9,800 ft) respectively.

Yosemite National Park

Survey and Quadrat Data Collection

1998 Field Methods - During the summer of 1998, field crews began sampling three patch types (campgrounds, developments, and corrals) and two corridor types (trails and roads). Alien species presence and cover estimates of alien and native species were obtained from all patch types. While presence/absence data were recorded for each corridor type, cover along trails and roads were not estimated because the distribution of nonnative plants along these linear landscape features was very patchy.

To conduct a survey, field crews compiled a complete list of plants in the study site. After making the list, the field crew placed each species into distribution classes and estimated the abundance of species on a log scale (0-10, 11-100, 101-1000, 1001-10,000, >10,000). Additionally, the distribution of each alien species was characterized as scattered individuals, scattered clumps of individuals, large clumps of many individuals, or widespread throughout the area. Trail and road surveys sometimes continued for several kilometers and species presence data were recorded in 1 km segments along the length of each survey.

A baseline transect was established along one edge of each patch and a random number table was used to randomly place sampling transects perpendicularly along the length of the baseline transect. Quadrats (1-m^2) were placed randomly along the sampling transects until thirty quadrats had been sampled. When thirty quadrats were sampled before the end of a sampling transect, the remainder of the sampling transect was also sampled to avoid biasing the data toward the beginning of the transect. In each quadrat, the cover of nonnative and native plant species was estimated to the nearest one percent. The cover of a particular species could not exceed 100 percent, but the total of all species in the quadrat frequently exceeded 100 percent. Additionally, a natural vegetation control site was established in undisturbed vegetation 50 m from five of the campground sites.

As was the case in Sequoia-Kings Canyon National Parks, the sample sites frequently contained areas such as parking lots or tent pads that were inappropriate for sampling, so quadrats had to pass rejection criteria before field crews sampled them. Randomly placed quadrats were rejected if more than 50 percent of the cover was incapable of supporting plant life (pavement, dirt roads, large boulders and trampled areas within 1 m of a structure). Areas where alien species are deliberately cultivated (lawns, flower pots, gardens) also were rejected. If the crews rejected several quadrats, they added additional transects until 30 quadrats were sampled. In areas that were sampled for cover, the canopy cover of shrubs and trees was also recorded. Shrub cover along the length of transects was measured using the line intercept method. Tree canopy cover was estimated using GRS brand densiometers at 100 regularly distributed points along the same transect. The quadrat sampling data were analyzed for exotic species richness and are included in the richness by elevation figures below.

1999 Field Methods - The survey crews measured the distribution of alien species in three types of patches (campgrounds, developments, corrals) and two types of corridors (trails and roads). Ten 50 by 2 m transects were randomly placed in each patch by establishing a baseline transect along one border known as a patch length (fig. 3a). The width of the target area was measured as a line perpendicular to the length, and a second baseline transect was established along the width border. Sampling transects were placed randomly along the two baseline axes. Whenever a sampling transect reached the boundary of a disturbed area or structure, the remainder of its sampling length was continued at the same position on the first axis and from

the 0 position of the second axis (fig. 3a). At 10 m intervals beginning at meter 0, 2 m x 1 m quadrats were placed with the 2 m axis perpendicular to the sampling transect (fig. 3b). The cover of individual alien species and the total cover of all native species were estimated in each quadrat. The total numbers of alien and native species present in each sampling transect were also recorded. Canopy cover was measured every 5 m along each sampling transect using the point-intercept method with a GRS brand densiometer. Because some alien species did not fall within the sampling transects, the entire sampling area was surveyed to compile a complete list of all alien species present. Areas with high densities of buildings or very few plants were not sampled, but surveyed only. The abundance of species in each patch was estimated on a log scale after the patch was surveyed.

Trails in Yosemite were sampled based on levels of use by hikers and recreational stock. The Yosemite National Park Wilderness Office supplied data on the number of backpacking wilderness permits issued on each trail, and the trails were grouped into three categories: low use (0-50 people/year), moderate use (51-1100 people/year) and high use (1101-6900 people/year). Seven trails were randomly selected for sampling from each use category. The Wilderness Office also supplied data on the number of stock using the trails in categories of low (3-10/day), medium (11-25/day), and high (26+/day). The concession stables provided route information for their daily rides in Yosemite Valley. Stock are only allowed on certain trails, and all trails open to stock use were sampled. The high use backpacking permit category contained the fewest number of trails, and most of these popular trails also received medium-high stock use. By comparison, low use backpacking permit trails had no stock use. No records were available for day-use by private stock parties on trails, so Mirror Lake Pack Trail and Yosemite Falls Trail had higher stock-use levels than indicated by the Wilderness Office data. Therefore, those trails were placed in the next higher stock-use category. At each trailhead the survey crews placed the first of ten 50 m by 2 m transects on the right side of and parallel to the trail, one meter from the tread of the trail. Subsequent transects were placed on alternating sides of the trail and were begun across from the end of the previous transect. Transects were sampled using the same methods as were used to sample patches. After sampling within the transects, the field crews walked 3 km from the trailhead, recording all alien species that occurred within 2 m of the trail in each kilometer. Abundances of alien species were

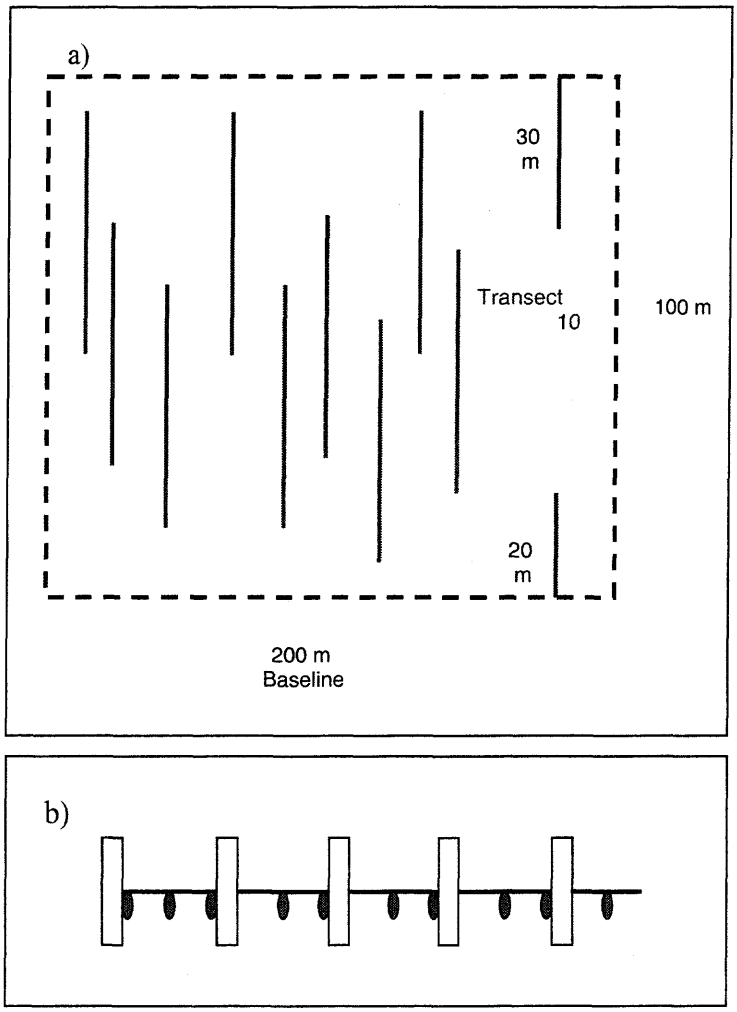

Figure 3. (a) Arrangement of 1999 transects in Yosemite National Park in campgrounds, developments and corrals that were sampled for alien species. Two dimensions of the sample site were measured, and the transects were arranged randomly along the two axes. When a transect ran outside of the sample area, as in Transect 10, it was continued at the same position on the first axis and from the 0 position of the second axis. **(b)** Sampling along 50 m transects. 1 by 2 m quadrats (rectangles) were placed every 10 m, and canopy cover was sampled every 5m (black points).

estimated in each trail segment on a log scale. Data from the quadrat-based sampling revealed little in the way of patterns among site types. However, results from the quadrat data are included in the richness-by-elevation figures and tables.

Roads were selected for sampling based on an elevational gradient. All roads in the park were categorized in 305 m (1,000 ft) intervals between 915 m (3,000 ft) and 2,440 m (8,000 ft), and 1-km segments of road were mapped within the intervals. Five segments within each interval were randomly selected for sampling. Field crews walked both sides of the road within the selected kilometer segments and recorded all alien species within 3 m of the road shoulder. Abundances of alien species were estimated in each road segment on a log scale. Coordinate locations for mapping survey areas and corridor segments were obtained from either a PLGR-type global positioning device or directly from USGS 7.5′ quadrangles. The Jepson Manual: Higher Plants of California (Hickman 1993) was used to determine which plant species were not indigenous to the park.

General Pattern

The total number of alien species found in Yosemite was 123. Species richness varied among 1 km road sections from 1 to 31, among 3 km trail segments from 1 to 26 and among corral/stable areas from 2 to 33 (table 2). There was a range in species richness from 1 to 56 among 19 developments and a range in species richness from 1 to 57 among 19 campgrounds. A total of 99 different species were found among developments and 68 different species among campgrounds. Species richness ranged from 52 to 62 for all roads, all trails or all corral/stable areas combined.

Decline of Alien Species Richness with Increasing Elevation

All sites – As was found for Sequoia-Kings Canyon National Parks, graphs of site alien species richness against site elevation indicate that alien species richness is strongly negatively correlated with elevation when all sites are pooled (fig. 4a). This negative correlation is evident for each of the five site types when the graphs are restricted to particular site types (fig. 4b-f). Additionally, the graph of all sites suggests that the factors controlling alien species richness change at an elevation of approximately 2,135 m (7,000 ft). The graph also suggests that the factors are different at elevations below 1,525 m (5,000 ft), but this pattern could be due to the large sampling effort at 1,220 m (4,000 ft) and the gap in target sites between 610 m (2,000 ft) and 1,220 m (4,000 ft).

Campgrounds/Camps – Alien species richness in campgrounds clearly is negatively correlated with elevation (fig. 4b). Additionally, the amount and type of use and site history apparently affect alien species richness in campgrounds and camps at an elevation of approximately 1,220 m (4,000 ft). The combined results of the 1998 and 1999 surveys recorded 56 alien species at Lower River Campground (1,175 m; 3,860 ft), which was closed after it flooded in 1997. This site had the largest number of alien species of any site surveyed in Yosemite and had 15 more alien species than Yosemite Lodge, which possessed the second highest alien species richness in Yosemite Valley. The high species richness at Lower River Campground could be due to a flush of germination from the soil seed bank, local seed dispersal, long distance seed dispersal, reduced mortality due to the elimination of trampling by campers and the longer two-year sampling period. Four high use campgrounds [Wawona (1,200 m; 3,930 ft) with 24 species, North Pines (1,240 m; 4,065 ft) with 24 species, Lower Pines (1,210 m; 3,970 ft) with 21 species, and Upper Pines (1,205 m; 3,950 ft) with 21 species] constitute the group of active campgrounds with the highest alien species richness. The three walk-in campgrounds [Hetch Hetchy (1,250 m; 4,100 ft) with 17 species, Backpackers (1,225 m; 4,020 ft) with 11 species, and Sunnyside (1,225 m; 4,020 ft)

Table 2. Alien plant species richness by survey type and by site, Yosemite National Park

Road Species Richness Summary – by Road Section

Road	Elevation (ft)	Alien Species Richness
Big Oak Flat Road	4661	16
Big Oak Flat Road	4946	18
Big Oak Flat Road	5272	16
Big Oak Flat Road	5902	8
Glacier Point Road	6179	1
Glacier Point Road	6440	4
Glacier Point Road	7176	1
Glacier Point Road	7704	1
Hetch Hetchy Road	5505	9
El Portal Road	3842	18
Northside Drive	3959	31
Southside Drive	3958	26
Tioga Road	6254	7
Tioga Road	7143	2
Tioga Road	7981	2
Tioga Road	8127	2
Tioga Road	8150	2
Tioga Road	8472	4
Tioga Road	8674	1
Wawona Road	3964	19
Wawona Road	5142	15
Wawona Road	6040	14
Wawona Road	6051	16
Yosemite West	5969	22
Roadside Species		**Total = 57**

Road Species Richness Summary - by Richness levels

Road	Elevation (ft)	Alien Species Richness
Northside Drive	3959	31
Southside Drive	3958	26
Yosemite West	5969	22
Wawona Road	3964	19
El Portal Road	3842	18
Big Oak Flat Road	4946	18
Big Oak Flat Road	4661	16
Big Oak Flat Road	5272	16
Wawona Road	6051	16
Wawona Road	5142	15
Wawona Road	6040	14
Hetch Hetchy Road	5505	9
Big Oak Flat Road	5902	8
Tioga Road	6254	7
Glacier Point Road	6440	4
Tioga Road	8472	4
Tioga Road	7143	2
Tioga Road	7981	2
Tioga Road	8127	2
Tioga Road	8150	2
Glacier Point Road	6179	1
Glacier Point Road	7176	1
Glacier Point Road	7704	1
Tioga Road	8674	1
Roadside Species		**Total = 57**

Trail Species Richness Summary – by Trail

Trail	Elevation (ft)	Alien Species Richness
Alder Creek	4557	7
Bridalveil Creek	6969	2
Bridalveil Falls	4035	7
Bridalveil-Inspiration Pt.	4036	6
Chilnaulna Falls	4417	6
Four Mile	3960	11
Glen Aulin	8686	3
Happy Isles	4959	12
Harden Lake	7821	4
Inspiration Pt.	4381	4
John Muir-Tuolumne	8675	2
Lukens Lake	7886	2
Mariposa Grove	5256	13
Meadow Loop	4053	32
Merced Grove	4771	2
Mirror Lake Pack	3931	14
Old Big Oak Flat Rd.	4770	9
Panorama	7243	4
Porcupine Creek	8100	1
Snow Creek	4100	9
Taft Point	7729	1
Tamarack Creek	6339	3
Yosemite Falls	4015	8
Yosemite Loop	3972	26
Young Lakes	8622	2
Trailside Species		**Total = 51**

Trail Species Richness Summary – by Richness Levels

Trail	Elevation (ft)	Alien Species Richness
Meadow Loop	4053	32
Yosemite Loop	3972	26
Mirror Lake Pack	3931	14
Mariposa Grove	5256	13
Happy Isles	4959	12
Four Mile	3960	11
Old Big Oak Flat Rd.	4770	9
Snow Creek	4100	9
Yosemite Falls	4015	8
Alder Creek	4557	7
Bridalveil Falls	4035	7
Bridalveil-Inspiration Pt.	4036	6
Chilnaulna Falls	4417	6
Inspiration Pt.	4381	4
Harden Lake	7821	4
Panorama	7243	4
Glen Aulin	8686	3
Tamarack Creek	6339	3
Bridalveil Creek	6969	2
John Muir-Tuolumne	8675	2
Lukens Lake	7886	2
Merced Grove	4771	2
Young Lakes	8622	2
Porcupine Creek	8100	1
Taft Point	7729	1
Trailside Species		**Total = 51**

Table 2. Alien plant species richness by survey type and by site, Yosemite National Park--Continued

Corral Species Richness Summary - by Site		
Corral/Stable Site	Elevation (ft)	Alien Species Richness
Concession Stables(YV)	4000	33
Glen Aulin High Sierra Camp	7832	2
Government Stables (YV)	4039	13
Government Corrals (Tuol)	8695	2
Harden Lake Corral	7496	8
Hetch Hetchy Corral	3960	32
McCauley Ranch	4093	33
Tuolumne Stables	8632	8
Wawona Stables	4001	20
White Wolf Corral	7967	10
Species of Corrals/Stables		Total = 63

Corral Species Richness Summary – by Richness level		
Corral/Stable Site	Elevation (ft)	Alien Species Richness
McCauley Ranch	4093	33
Concession Stables(YV)	4000	33
Hetch Hetchy Corral	3960	32
Wawona Stables	4001	20
Government Stables (YV)	4039	13
White Wolf Corral	7967	10
Tuolumne Stables	8632	8
Harden Lake Corral	7496	8
Government Corrals (Tuol)	8695	2
Glen Aulin High Sierra Camp	7832	2
Species of Corrals/Stables		Total = 63

with 4 species] possessed the lowest alien species richness. There were very few alien species at campgrounds or camps above an elevation of 1,830 m (6,000 ft), and no alien species were discovered in the control quadrats that were sampled outside the boundaries of five campgrounds. For Wawona Campground (see arrow in fig. 4b), this is a remarkable finding as the site lies within an elevational range that is highly invaded by alien species. The site notes indicate that the control site was located 50 m north of the campground in an open canopy *Pinus ponderosa* (ponderosa pine) forest with *Calocedrus decurrens* (incense-cedar) and scattered *Quercus kelloggii* (California black oak) and a ground cover of *Chamaebatia foliolosa* (mountain misery).

Roads – The strong negative correlation between alien species richness and elevation is evident from the survey of roadsides (fig. 4c). Alien species richness also appears to be affected by site-specific characteristics. For example, the Yosemite Valley roads [Northside Drive adjacent to El Capitan Meadow and Southside Drive, 1,205 m (3,960 ft)] (YV symbol) may be rich in alien species because they contain both mesic and disturbed habitats while the Yosemite West (1,820 m; 5,970 ft) (YW symbol) site may be species rich because it is a 3 km segment through a developed section of Ponderosa Way. Alien species richness declined dramatically at elevations above 2,135 m (7,000 ft). All road corridor sites below 1,525 m (5,000 ft) were surveyed in 1998, road sites between 1,525 m (5,000 ft) and 1,830m (6,000 ft) were surveyed in 1998 and 1999, and road corridors above 1,830 m (6,000 ft) were surveyed in 1999. Therefore, differences between years may have been responsible for a minor part of the elevational effect. Additionally, there were no road surveys conducted at elevations below 1,220 m (4,000 ft). Appendix D contains a complete alien species list for all surveyed road segments.

Trails – The negative correlation between alien species richness and elevation is evident in the graph of the trail data (fig. 4d). However, the strength of the negative correlation is much reduced if the heavily used Meadow Loop Trail (1,235 m; 4,055 ft) with 31 species and Yosemite Loop Trail (1,210 m; 3,970 ft) with 25 species are excluded from the graph. A summary of the 1998 survey data for trails is presented in table 3, a summary of the 1999 quadrat and survey data is presented in table 4, and a list of all alien species discovered along trails is given in Appendix E. *Bromus tectorum* is clearly the most common alien species along trails in the park. While the level of trail usage appears to be important, it is not clear if alien species richness is correlated with the use level of a trail by either hikers or pack animals or is due to the combined effect of both uses (tables 3 and 4).

Developments – There is a very strong negative correlation between alien species richness and elevation among developments (fig. 4e). Additionally, length of growing season may also be important along with site history (such as the amount of disturbance, the amount of seed dispersal, or both). For example, the points plotted at an elevation of approximately 1,220 m

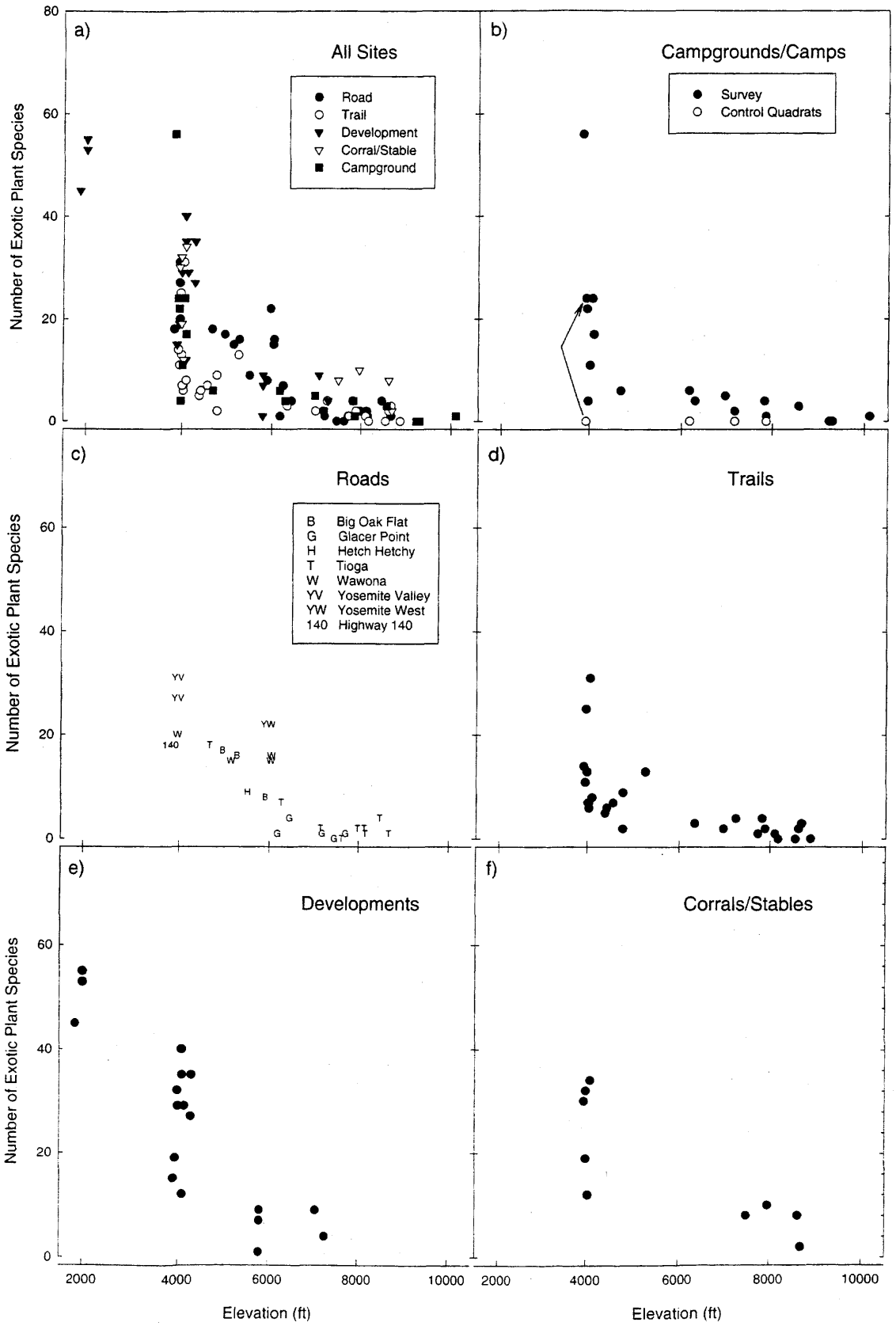

Figure 4. Yosemite National Park alien (exotic) species richness by elevation.

Table 3. Yosemite National Park 1998 trail survey data

Trail	Elevation (ft)	Richness	Abund.	Dist.	Human	Pack	Most Abundant Species
Four Mile	3960	11	1-4	1-2	High	Low	*B. tectorum, Rumex acetosella*
Bridalveil Falls	4035	7	2-4	1-3	High	0	*B. tectorum, Poa pratensis*
Bridalveil Falls/Inspiration Pt.	4036	6	1-3	1-2	Low	Low	*B. tectorum, Vulpia myuros*
Inspiration Point	4381	5	2-5	1-4	Mod.	Low	*B. tectorum, Silene latifolia*
Mariposa Grove	5256	13	1-5	1-3	Low	High	*B. tectorum, P. pratensis,*
Panorama	7243	4	2-4	2	Mod.	Low	*B. tectorum, Spergularia rubra*

Notes: **1)** Elevation is trailhead elevation in feet; **2)** Richness is alien species richness; **3)** Abund. is range of abundance with categories, 1 is 0-10, 2 is 11-100, 3 is 101-1,000, 4 is 1,001-10,000, 5 is >10,000; **4)** Dist. is the range of distributions of alien species where 1 is scattered individuals, 2 is scattered clumps of individuals, 3 is large clumps of many individuals, and 4 is widespread throughout the area; **5)** Human indicates human use level, Low (0- 50 people per year), Moderate (51-1,100 people per year), and High (1,101-6,900 people per year); **6)** Pack indicates pack animal use level, Low (3-10 animals per day), Moderate (11-25 animals per day, and High (>26 animals per day); **7)** Lists the two most common alien species with abundances greater than category 2.

(4,000 ft) comprise two groups. The species-rich sites (Foresta, Wawona, Yosemite Village, Yosemite Lodge, The Ahwahnee Hotel) have either broad westerly exposure (former two) or southerly exposure (latter three) which lengthen the growing season. The relatively species-poor sites (Curry Village, Housekeeping, Mirror Lake) are in narrow, heavily shaded sections of Yosemite Valley (due to canyon walls) with north to northwest exposures.

Corrals/Stables – The number of alien species found at corrals and stables is negatively correlated with elevation (fig. 4f) and also appears to be influenced by local factors. Three corral/stable sites with the largest number of alien species were, in descending richness, McCauley Ranch, Concession Stables (Yosemite Valley) and Hetch Hetchy Corral. Each is very close to 1,220 m (4,000 ft). The sampling at Hetch Hetchy Corral extended through an annual grassland pasture, and the alien species present were typical species found in annual grassland vegetation. However, McCauley Ranch and Concession Stables (Yosemite Valley) possessed a diverse assemblage of annual grassland species, forage species and forage weeds and meadow species. The habitats at both sites were more diverse than the Hetch Hetchy Corral site as the Concession Stables (Yosemite Valley) survey included Lamon Meadow, and the McCauley Ranch survey included a marshy area. It is not clear why Wawona Stables, the next most diverse site, had relatively fewer species as the survey of that site also included an adjacent meadow. Appendix F contains a complete alien species list for all surveyed corrals and stables.

The correlations between the alien species floras of corrals and stables and the alien species floras of the trails that lead from them are complex. The alien species present along the low elevation Mirror Lake Pack Trail (1,200 m; 3,930 ft) that begins at the Concession Stables (Yosemite Valley) all occurred in the first 500 m of the trail (table 3). The field description of the trail indicates that it runs through a shady stand of *Pinus ponderosa* and *Calocedrus decurrens* with little ground cover. The fact that the only alien species along the trail were present at the beginning of the trail suggests that aliens are not spreading from the Concession Stables (Yosemite Valley).

However, the species occurring along Snow Creek Trail, which runs through a stand of *Quercus chrysolepis* (canyon live oak) from the point where it connects with Mirror Lake Pack Trail, suggests that alien species are being dispersed by pack animals.

Table 4. Yosemite National Park 1999 trail transect and survey data

Trail	Elevation (ft)	Richness	Alien	Native	Human	Pack	Common Species
Mirror Lake Pack	3931	13/15	0-5/H**	0-5/H	High	High	*Bromus tectorum, Trifolium repens*
Yosemite Loop	3972	21/25	0-5/L	0-6/L	High	High	Many species
Happy Isles	4000	8/13	0-4/H**	0-5/H	High	High	*Marubium vulgare*
Yosemite Falls	4015	1/9	0-1/H	0-4/H	High	Low	None
Meadow Loop, Wawona	4053	14/31	0-4/L	0-4/L	Mod.	Mod.	*Rumex acetosella, Vulpia myuros*
Snow Creek	4100	2/8	0-1/H	0-3/H	Low	Low	None
Chilnualna Falls	4417	2/6	0-1/H	0-5/L	Low	Mod.	None
Alder Creek	4557	4/7	0-5/H	0-4/H	Low	High	*V. myuros, B. tectorum*
Merced Grove	4770	0/2	0	0-6/H	Low	Low	None
Old Big Oak Flat	4770	5/9	0-4/H	1-6/0	Mod.	0	*B. tectorum, V. myuros*
Tamarack Creek	6339	1/3	1/H	0-4/H	Low	0	None
Bridalveil Creek	6969	1/2	0	0-6/0	Low	Mod.	None
Taft Point	7729	0/1	0	0-5/L	Mod.	0	None
Harden Lake	7821	1/4	1-2/H	0-5/L	Low	Low	None
Lukens Lake	7886	2/2	0-1/H**	0-5/0	Low	High	None
Porcupine Creek	8100	0/1	0	0-4/H	Mod.	Low	None
Sunrise High Sierra Camp	8174	0/0	0	0-6/L	High	Mod.	None
Cathedral Lake	8552	0/0	0	0-5/L	High	High	None
Young Lake	8622	2/2	1/H	0-6/0	Mod.	High	None
John Muir Trail, Tuolumne	8675	2/2	1-2/H	1-6/L	Mod.	High	None
Glen Aulin	8686	1/3	1/H	0-6/0	High	High	None
May Lake	8881	0/0	0	0-6/L	High	Mod.	None

Notes: **1)** Elevation is trail head elevation in feet; **2)** Richness is alien species richness for Transect/Survey sampling methods respectively; **3)** Alien is range of cover in individual quadrats and patchiness among quadrats respectively. Cover categories for the lowest and highest value for any individual species are: 0 = no cover; 1 is < 5%; 2 is 5-10 %; 3 is 11-30 %; 4 is 31-70 %; 5 is 71-90 %; and 6 is 91-100 %. Patchiness categories for the lowest and highest value for any individual species were determined as: 0 indicates < 10 quadrats had 0 or < 5 % cover for any species; L indicates that between 10 and 24 quadrats had 0 or < 5 % cover for any species; and H indicates that 25 or more quadrats had 0 or < 5 % cover for any species. **, indicates that alien species were found only in the first 2 transects (100 m); **4)** Native values represent cover in individual quadrats/patchiness of all native species combined and the categories are the same as Alien; **5)** Human indicates human use level, Low (0- 50 people per year), Moderate (51-1100 people per year), and High (1101-6900 people per year) ; **6)** Pack indicates pack animal use level, Low (3-10 animals per day), Moderate (11-25 animals per day), and High (>26 animals per day); **7)** Common Species lists the 2 most common species with cover greater than category 2.

Three species that are commonly dispersed in horse dung: *Aira caryophyllea*, *Bromus sterilis*, *Poa pratensis* (silver European hairgrass, poverty brome, Kentucky bluegrass, respectively), and four species dispersed through stockyard activities are present along Snow Creek Trail (Appendix E and ESTA Species Microsoft® Access database file). White Wolf Corral (2,430 m; 7,970 ft) is a potential source of the dung-dispersed species (*Poa pratensis*, *Trifolium repens*, *Rumex acetosella*) present at Harden Lake Corral (2,285 m; 7,495 ft). However, the site history at Harden Lake Corral includes nearby homesteading and pasturing of pack-stock animals for lengthy periods to support nonrecreational wilderness trips. It is

interesting that only one of these species was discovered along Harden Lake Trail (*R. acetosella*) and none along Lukens Lake Trail when both trails begin at White Wolf. This is despite the occurrence of *Poa pratensis* at higher elevations on the Young Lakes and Glen Aulin Trails. A similarly complex situation existed for the trails that begin near Tuolumne Concessions Stable, which also supported *P. pratensis* and *T. repens*. Both of those species were present along Glen Aulin Trail and also at Glen Aulin High Sierra Camp. Only *P. pratensis* was found along the Young Lakes Trail, and neither species was found along either the section of the John Muir Trail that leads toward the Vogelsang High Sierra Camp or at the camp itself. These inconsistent patterns may indicate that alien plant establishment along trails leading from higher-elevation corrals and stables have been sporadic and opportunistic.

Similarity of Alien Species Composition Among Sites

To compare and contrast species composition among sites, an exploratory cluster analysis of the sites included in the species-richness-by-elevation figures was conducted using PC-ORD version 4. The same procedures were followed as those used to analyze the Sequoia-Kings Canyon National Parks data (fig. 5). An ecological interpretation of the factors that significantly affected the clustering of the alien species is presented in table 5. Note that the sites with no alien species have been added to the table as an unnumbered cluster. The coarsest division of the sites is due to sites with high alien species richness that are found at low-, mid-, and high-elevations versus sites with moderate to low species richness. The double-zero effect is even more pronounced in the Yosemite National Park analysis as the resemblance between pairs of sites increases consistently with elevation. The shorter the initial "legs" of the dendrogram in figure 5, the more closely the site pairs resemble each other. The next coarsest division among high-richness sites is between low-elevation sites (610 m; 2,000 ft) at Rancheria and Old El Portal and sites that are at an elevation of approximately 1,220 m (4,000 ft). For the moderate to low-richness sites, the next coarsest division is between mid-elevation sites 1,220-2,135 m (4,000-7,000 ft) with mixtures of low-, mid-, and high-elevation species and higher-elevation sites (1,830-3,050 m; 6,000-10,000 ft) with mixtures of mid- and high-elevation species. The sites between 1,220 m (4,000 ft) and 2,135 m (7,000 ft) can be divided into sites with a relatively high proportion of forb species and sites with a relatively high proportion of grass species.

Clusters 1 and 2 consist of high-richness sites with unique combinations of species at an elevation of approximately 1,220 m (4,000 ft). Cluster 1 sites are primarily in Yosemite Valley and appear to possess species characteristic of mesic habitats as well as species characteristic of disturbed habitats. Cluster 2 sites are primarily in Wawona and Foresta, and species adapted to mesic conditions appear to be less common at those sites. Cluster 3 consists of Yosemite Valley sites with *Rubus discolor* and a high proportion of alien perennial grasses. Cluster 4 sites are all low-elevation sites (610 m; 2,000 ft) located in Rancheria and El Portal. These three sites are rich in species characteristic of annual grassland vegetation as well as many other species.

Cluster 5 sites are typically mid-elevation trails (1,220-1,675 m; 4,000-5,500 ft) lined with *Bromus tectorum* and *Vulpia myuros* and dotted with low and mid elevation forb species (See Appendix E for trail species lists). Cluster 6 consists of mid-elevation sites (1,830-2,135 m; 6,000-7,000 ft) with a high proportion of mid elevation forb species that are adapted to disturbed areas. Some characteristic species are *Spergularia rubra*, *Plantago major* and *Polygonum arenastrum* (sand-spurrey, common plantain and common knotweed, respectively). Cluster 7 consists of mid-elevation sites (1,220-1,830 m; 4,000-6,000 ft) that are relatively rich in alien forb species. The ecological reason for the clustering of The Ahwahnee hotel and the Mirror Lake Pack Trail in this group is not clear except that they share several species in common with the other sites (*Poa pratensis* universally) and has a similar level of alien species diversity. Cluster 8 consists of mid-elevation sites (1,220-1,525 m; 4,000-5,000 ft) with a high proportion of grass species.

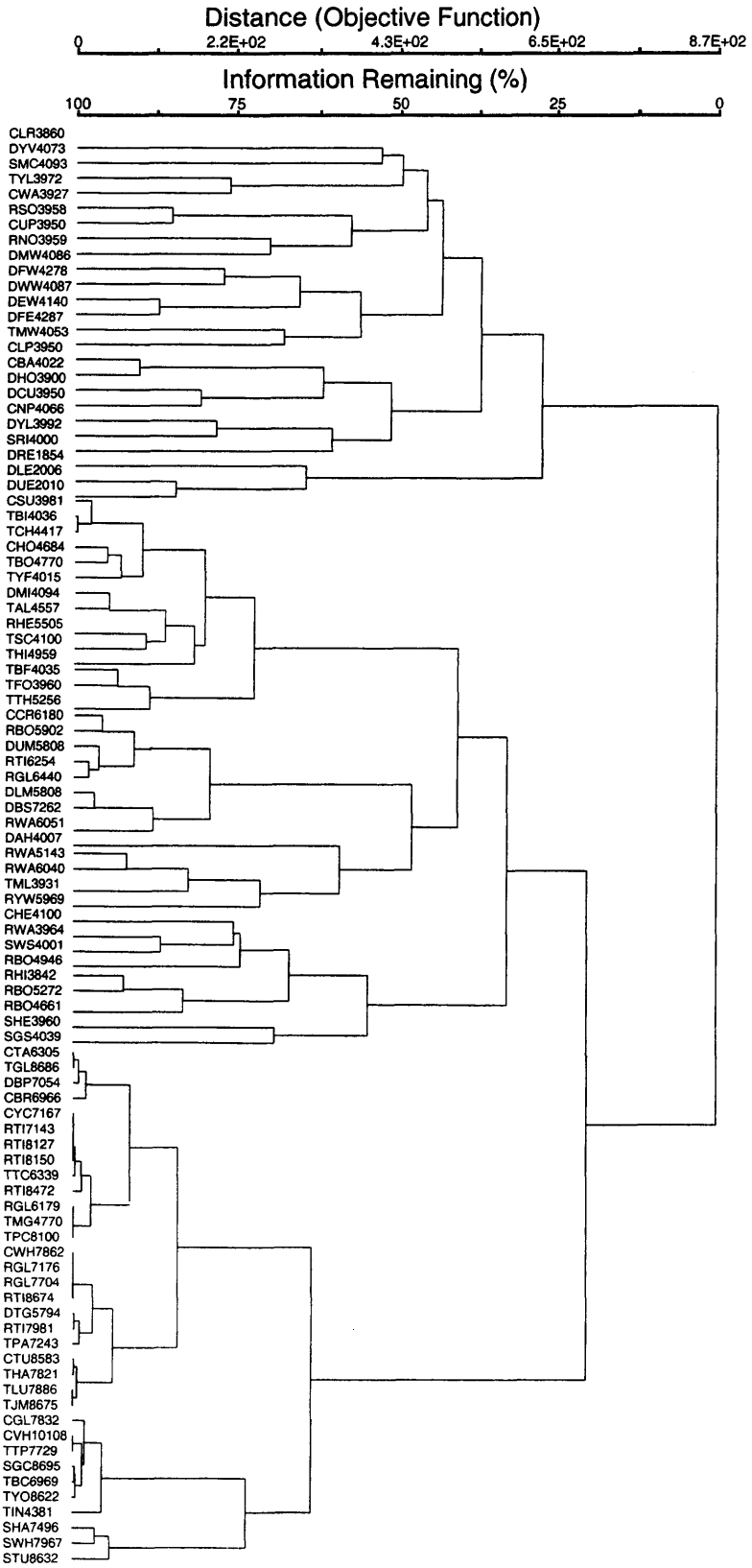

Figure 5. Yosemite National Park cluster analysis.

Table 5. Interpretation of Yosemite National Park cluster analysis

Cluster Characteristics				Code	Site	Cluster
High Richness of Low, Mid, and High Elevation Species	Not Upper Rancheria – Old El Portal Area	Unique Combinations of Species	Unique Combinations of Species	CLR3930	Lower River Campground	1
				DYV4073	Yosemite Village	
				SMC4093	McCauley Ranch	
				TYL3972	Yosemite Loop Trail	
				CWA3927	Wawona Campground	
				RSO3958	Southside Drive	
				CUP3950	Upper Pines Campground	
				RNO3959	Northside Drive	
			Wawona – Foresta Area	DMW4086	Middle Wawona	2
				DFW4278	Foresta West	
				DWW4087	West Wawona	
				DEW4140	East Wawona	
				DFE4287	Foresta East	
				TMW4053	Meadow Loop Trail, Wawona	
		Yosemite Valley Perennial Grasses and *Rubus discolor*		CLP3950	Lower Pines Campground	3
				CBA4022	Backpacker's Camp	
				DHO3900	Housekeeping	
				DCU3950	Curry Village	
				CNP4066	North Pines Campground	
				DYL3992	Yosemite Lodge	
				SRI4000	Concession Stables (YV)	
	Upper Rancheria – Old El Portal Area			DRE1854	Upper Rancheria – El Portal	4
				DLE2006	Lower Old El Portal	
				DUE2010	Upper Old El Portal	
Moderate to Low Richness	Mixtures of Low, Mid, and High Elevation Species	High Proportion of Forb Species	*Bromus tectorum* and *Vulpia myuros* With Mixtures of Low and Mid Elevation Species Typically Trails	CSU3981	Sunnyside Campground	5
				TBI4036	Bridalveil-Inspiration Pt. Trail	
				TCH4417	Chilnaulna Falls Trail	
				CHO4684	Hogdon Meadow Campground	
				TBO4770	Big Oak Flat Road Trail	
				TYF4015	Yosemite Falls Trail	
				DMI4094	Mirror Lake	
				TAL4557	Alder Creek Trail	
				RHE5505	Hetch Hetchy Road	
				TSC4100	Snow Creek Trail	
				THI4000	Happy Isles Trail	
				TBF4035	Bridalveil Falls Trail	
				TFO3960	Four Mile Trail	
				TTH5256	Two Hour Trail	
			High Proportion of Mid Elevation Forb Species	CCR6180	Crane Flat Campground	6
				RBO5902	Big Oak Flat Road (5902)	
				DUM5808	Upper Mariposa Grove	
				RTI6254	Tioga Road (6254)	
				RGL6440	Glacier Point Road (6440)	
				DLM5808	Lower Mariposa Grove	
				DBS7262	Badger Pass Ski Resort	
				RWA6051	Wawona Road (6051)	
			High Species Richness	DAH4007	The Ahwahnee	7
				RWA5143	Wawona Road (5143)	
				RWA6040	Wawona Road (6040)	
				TML3931	Mirror Lake Pack Trail	
				RYW5969	Yosemite West Road	
		High Proportion of Grass Species		CHE4100	Hetch Hetchy Backpacker's Camp	8
				RWA3964	Wawona Road (3964)	
				SWS4001	Wawona Stables	
				RBO4946	Big Oak Flat Road (4946)	
				RHI3842	El Portal Road	
				RBO5272	Big Oak Flat Road (5272)	
				RBO4661	Big Oak Flat Road (4661)	
				SHE3960	Hetch Hetchy Corral	
				SGS4039	Government Stables	

Table 5. Interpretation of Yosemite National Park cluster analysis--Continued

Cluster Characteristics			Code	Site	Cluster
Moderate to Low Richness (Continued)	Mixtures of Mid, and High Elevation Species	Relatively Higher Forb Richness *Rumex acetosella* and *Spurgularia rubra*	CTA6305	Tamarack Flat Campground	9
			TGL8686	Glen Aulin Trail	
			DBP7054	Badger Pass Parking Area	
			CBR6966	Bridalveil Campground	
			CYC7167	Yosemite Creek Campground	
			RTI7143	Tioga Road (7143)	
			RTI8127	Tioga Road (8127)	
			RTI8150	Tioga Road (8150)	
			TTC6339	Tamarack Creek Trail	
			RTI8472	Tioga Road (8472)	
			RGL6179	Glacier Point Road (6179)	
			TMG4770	Merced Grove Trail	
			TPC8100	Porcupine Creek Trail	
			CWH7862	White Wolf Campground	
			RGL7176	Glacier Point Road (7176)	
			RGL7704	Glacier Point Road (7704)	
			RTI8674	Tioga Road (8674)	
			DTG5794	Tuolumne Grove	
			RTI7981	Tioga Road (7981)	
			TPA7243	Panorama Trail	
			CTU8583	Tuolumne Meadows Campground	
			THA7821	Harden Lake Trail	
			TLU7886	Lukens Lake Trail	
			TJM8675	John Muir Trail, Tuolumne	
		Relatively Higher Proportion of Low, Mid, and High Elevation Grasses	CGL7832	Glen Aulin High Sierra Camp	10
			CVH10108	Vogelsang High Sierra Camp	
			TTP7729	Taft Point Trail	
			SGS8695	Government Corral, Tuolumne	
			TBC6969	Bridalveil Creek Trail	
			TYO8622	Young Lake Trail	
			TIN4381	Inspiration Point Trail	
			SHA7496	Harden Lake Corral	
			SWH7963	White Wolf Corral	
			STU8632	Tuolumne Concessions	
No Alien Species			CMA9307	May Lake High Sierra Camp	None
			CSU9240	Sunrise High Sierra Camp	
			RGL7450	Glacier Point Road (7450)	
			TCA8552	Cathedral Lake Trail	
			TMA8881	May Lake Trail	
			TSU8174	Sunrise High Sierra Trail	

Code: First letter: C = Campground, D = Development, R = Paved Road, S = Stock holding areas, T = Trail. Second and third letters - Unique site ID. Numerals: #### = Elevation (ft).

Cluster 9 consists of mid- to high-elevation sites (1,830-2,745 m; 6,000-9,000 ft) that possess *Rumex acetosella* and *Spergularia rubra* and have relatively high alien species richness. Merced Grove Trail (1,455 m; 4,770 ft) is an anomaly in this cluster, but the survey notes describe it as a combination dirt road and trail, and that may reflect differences in site history. Cluster 10 consists of high-elevation sites (2,285-3,050 m; 7,500-10,000 ft) that possess a relatively high proportion of low-, mid- and high-elevation grasses. Finally, the sites with no alien species are all high-elevation sites (2,285-2,895 m; 7,500-9,500 ft).

Part III. Alien Species Threat Assessment and Prioritization

Introduction

All alien species discovered during the directed surveys were grouped into one of four management priority categories based on their attributes, potential impacts and geographical extent (tables 6 and 7). **Category 1** alien species are currently restricted to a relatively small number of sites in each park and have either been shown to greatly affect native vegetation or have a high probability of causing serious

impacts. **Category 2** species are restricted to a relatively small number of sites and are ones that generally have a lesser effect on native vegetation. **Category 3** species are broadly distributed in the parks, are apparently increasing their ranges within the parks, and are those that have been shown to have a great impact on native vegetation. **Category 4** species are those that were detected by the surveys but not assigned to one of the three ranked categories and are considered low priority.

Complete listings of all priority alien species and their survey locations are given in Appendices A and B, and a complete listing of all alien species in each park with important biological information is provided in the ESTA Species Microsoft® Access database file. The field notes of the Sequoia-Kings Canyon National Parks directed-survey team are provided in Appendix C for all priority alien species. The assignments of alien species to management categories were based on field assessments, the distribution of each species inside and outside of the parks and information gleaned from the literature. In addition to considering all published sources specific to particular alien species, a large number of ecological, biological invasions, weed, botanical, agronomic, and range science sources were considered in the ranking of the alien species. The most relevant sources are included in the "ESTA Bibliography.enl" EndNote® database file that has also been converted to a ProCite® database file (USGS Research Office, Sequoia or Yosemite National Parks); either can be searched using the keyword field. Additionally, the "CalFlora Distribution Maps" directory contains all available statewide distributions by county saved as image files from the CalFlora web site (CalFlora 2000). CalFlora is a comprehensive, web based, publicly accessible database of plant distribution information for California based on over 600,000 specific plant observations from disparate sources. All available CalFlora distribution maps for priority alien species are included in Appendix G showing statewide distributions by county. Summaries were compiled from various sources regarding effective control measures for many of the exotic species found on surveys (The Nature Conservancy 2000, Peirce 1998). The synthesis of this information provided a frame of reference to rank species for which there is little published data and to anticipate synergistic responses between species such as occurs in mixed swards of legumes and grasses.

The ranking of the alien species into the four management categories provides general guidance for management prioritization in the parks. Category 1 species require immediate management action to isolate and eliminate their populations. In some cases the geographical distribution of a Category 1 species will dictate how management efforts are implemented. For example, in Yosemite National Park, a few Category 1 species are found in Yosemite Valley and also at Wawona and Foresta. The highest control priority selected by park managers might be to eliminate those species from Yosemite Valley and to implement a management plan to prevent their spread in Wawona and Foresta. Category 2 species are predicted to have a lesser impact in the parks, but those predictions are based on very little data. At some park locations, Category 2 species can be eliminated along with Category 1 species without expending significant additional park resources. Category 3 dicot species cannot be eliminated without expending a significant amount of park resources while Category 3 grass species will be impossible to eliminate, and management efforts should focus on sites of great importance and on reducing seed dispersal. There is insufficient evidence to indicate that Category 4 species should receive priority for management at this time.

Each alien species has been assigned to a particular tactical class (e.g. localized legumes) in addition to being ranked into the three management categories (tables 6 and 7). The tactical classes organize alien species with broadly similar ecological characteristics into classes that will require similar management techniques or approaches. There are other possible groupings of the alien species in addition to the management categories and tactical classes. Four of the most important additional groupings consist of species that have been introduced to California to provide forage for animals, species that have been introduced

Table 6. Priority alien species other than grasses

Class	Species	Category	S	Y	Dispersal Mechanisms	Seed Longevity
Broad Dist.	*Cirsium vulgare*	3	√	√	Adhesive, ant, hay, machinery, soil, stock yard, water	5 yrs
	Verbascum thapsus	3	√	√	Dung, water	> 35 yrs
Localized Wildland Species Moderate to High Impact	*Carduus pycnocephalus*	1	√	√	Adhesive, ant, hay, soil, vehicles, wind	> 10 yrs
	Centaurea maculosa	1		√	Adhesive, dung, hay, mud, machinery, vehicles, water	> 8 yrs
	Centaurea solstitialis	1	√	√	Adhesive, hay, machinery, soil, stock yard	> 10 yrs
	Convolvulus arvensis	1	√	√	Bird droppings, dung, hay, machinery, soil	> 20 yrs
	Erigeron strigosus	1		√	Adhesive, wind	
	Foeniculum vulgare	1		√	Adhesive, ant	
	Geranium robertianum	1		√	Adhesive	
	Hypericum perforatum	1		√	Adhesive, dung, machinery, vehicles, water	10 yrs
	Marrubium vulgare	1	√	√	Adhesive, dung, stockyard	10 yrs
	Mentha pulegium	1	√		Adhesive, dung, machinery, mud, vehicles	
	Mentha spicata	1	√	√		
	Oxalis pes-caprae	1	√		Ants, soil	
	Ranunculus parviflorus	1	√			
	Ranunculus testiculatus	1	√		Adhesive	
	Silybum marianum	1	√		Ant, dung, machinery, soil, stock yard, water, wind	
	Tamarix sp.	1	√		Water, wind	
	Tragopogon dubius	1	√	√	Water, wind	2 yrs
	Urtica urens	1	√	√	Dung, stock yard	5 yrs
	Verbascum virgatum	1	√			
Localized Legumes Mod. To High Impact	*Lathyrus latifolius*	1	√	√		
	Medicago sativa	1	√		Feed pellets, hay, dung, stock yard, water	20 yrs
	Melilotus alba	1	√	√	Adhesive, dung, water	> 20 yrs
	Melilotus indica	1	√	√	Stock yard	5 yrs
	Melilotus officinalis	1	√	√	Adhesive	> 20 yrs
	Trifolium repens	1	√	√	Adhesive, dung, mud, vehicles	30 yrs
	Vicia benghalensis	1	√	√		
	Vicia sativa	1	√			
	Vica villosa	1	√		Bird droppings, dung, mud	
Localized Fruit and Nut Species High Impact	*Carya sp.*	2	√		Animals, water	
	Diospyros sp.	2	√		Animals, water	
	Ficus carica	1	√		Bird droppings, water	
	Juglans californica	1	√		Animals, water	
	Juglans regia	1	√		Animals, water	
	Malus sylvestris	1	√	?	Animals, water	
	Morus alba	1	√		Bird droppings, water	
	Olea europaea	2	√		Bird droppings, water	
	Prunus persica	2	√		Animals	
	Punica granatum	2	√		Animals	
	Rubus discolor	1	√	√	Bird droppings, water	
	Rubus lacinatus	1		√	Bird droppings, water	
	Vitis vinifera	1	√	√	Bird droppings, water	

Table 6. Priority alien species other than grasses--Continued

Class	Species	Category	S	Y	Dispersal Mechanisms	Seed Longevity
Localized Ornamentals High Impact	*Ampelopsis arborea*	1	√		Bird droppings, water	
	Catalpa bignonioides	1	√		Wind, water	
	Cistus sp.	1	√			
	Coreopsis lanceolata	1		√	Adhesive, wind	
	Digitalis purpurea	1	√	√	Mud, vehicles, wind	> 5 yrs
	Eucalyptus citriodora	1	√		Wind	
	Genista monspessulana	1	√		Ant, bird droppings, explosive, mud, machinery, water	> 5 yrs
	Hedera helix	1	√	√	Bird droppings	
	Heteromeles arbutifolia	1	√		Bird droppings	
	Iris sp.	2	√			
	Leucanthemum vulgare	1		√	Adhesive, dung, hay, wildflower seed mix	39 yrs
	Leucojum aestivum	2	√			
	Ligustrum sinense	1	√		Bird droppings, water	
	Nerium oleander	1	√		Water, wind	
	Pyracantha angustifolia	1	√		Bird droppings, water	
	Rudbeckia hirta	1		√		
	Spartium junceum	1	√		Ants, water	> 5 yrs
	Tanacetum parthenium	1	√	√	Mud, vehicles	
	Vinca major	1	√	√		

Notes: Class = tactical class; # = Priority Category; S = Sequoia-Kings Canyon National Parks, Y = Yosemite National Park (? indicates present in flora but not found in directed surveys); seed longevity = viability under natural soil conditions.

and bred for use as turf-grasses, species that have evolved to invade grazing and forage-production systems and species intentionally introduced for horticultural reasons. Forage species and grazing and forage-production invasive species constitute 55 percent of the 89 priority alien species and other intentional introductions constitute another 39 percent for a total of 94 percent of all priority species. Certainly, many of the species in these three groupings are present in the parks because they have spread into the parks from their initial sites of introduction. Nevertheless, they illustrate the management importance of those groupings of species because controlled and uncontrolled access to the parks by domesticated grazing animals still occurs, and the introduction of additional horticultural species is still being considered.

Forage species represent a particularly important category of alien species. Because of their economic importance for livestock production, they are continually being imported from Eurasia, hybridized, and selected for particular important traits by geneticists and plant breeders working for the United States Department of Agriculture, Agricultural Research Service, Rangeland, Pasture and Forages Program as well as scientists at many academic institutions. Unlike most horticultural species, many forage species are selected for their ability to establish and persist in natural plant communities, as well as in human-modified environments. Many legumes and perennial grasses that have been introduced to increase forage production have become problem alien species (Anonymous 1972, Carrier and Bort 1916, Elliot 1949, Apfelbaum and Sams 1987, Tyser and Worley 1992, Grilz and Romo 1995, Blankespoor and May 1996, Harrison et al. 1996, Batcher 1999). Additionally, new varieties of alien species that are known to invade natural areas are continually being imported (Dewey and Plummer 1980), and existing varieties are being bred for increased resistance to pathogens and pests, as well as increased cold tolerance (Kehr et al. 1984, Asay et al. 1991, Rumbaugh et al. 1991). The continuous importation, breeding, varietal selection, seed certification and seed distribution programs that are related to the economic production of forage crop species may

Table 7. Priority alien grass species

Class	Species	Category	S	Y	Dispersal Mechanisms	Seed Longevity
Broad Dist.	*Bromus tectorum*	3	√	√	Adhesive, footwear, dung, hay, vehicles	5 yrs
	Poa pratensis	3	√	√	Adhesive, dung	4 yrs
Localized Wildland Species Moderate to High Impact	*Agrostis capillaris*	1	?	√		
	Agrostis gigantea	1	?	?	Dung, water	
	Arundo donax	1	√		Water	
	Bromus inermis	1		√		
	Dactylis glomerata	1	√	√	Adhesive, dung, water	5 yrs
	Echinochloa crus-galli	2	√		Dung, rice straw, stock yard, water	12 yrs
	Festuca arundinacea	1	√			2 yrs
	Festuca pratensis	2	√			
	Holcus lanatus	2	√	√	Adhesive, bird droppings, dung, mud, soil, stock yard	> 10 yrs
	Lolium perenne	2	√	√	Adhesive, dung, mud, stock yard, vehicles	4 yrs
	Phalaris arundinacea	1	√		Bird droppings, dung	
	Phalaris minor	2	√			
	Phalaris paradoxa	2	√		Stock yard	
	Phleum pratense	2	√	√		
	Piptatherum miliaceum	2	√		Bird droppings	
	Poa bulbosa	2	√	√		
	Poa compressa	2	√	√	Dung	
	Poa palustris	1	?	?		
	Polypogon australis	1	√			
	Polypogon interruptus	1	√			
	Polypogon monspeliensis	2	√	√	Dung, stock yard	
	Sorghum halepense	2	√		Bird droppings, dung, hay, machinery, stockyard	> 5 yrs
	Vulpia bromoides	2	√		Adhesive, dung	

Notes: Class = tactical class; # = Priority Category; S = Sequoia-Kings Canyon National Parks, Y = Yosemite National Park (? indicates present in flora but not found in directed surveys); seed longevity = viability under natural soil conditions.

lead to dramatic changes in the invasiveness and dispersal distances of a forage species in the year certified seed is released to the public. For example, interactions between selected traits such as disease resistance and environmental factors such as minimum winter temperatures may potentially allow some forage species to expand their range into colder climates (Myers and Chilton 1941).

Synergistic effects between forage species, such as legume and grass mixtures, may also lead to greater persistence of forage species in natural plant communities (Evans 1916, Looman 1976, Casler and Carlson 1995, Warren 2000). Also, under particular environmental conditions, many grass forage species may be toxic to herbivores due to endophytic *Clavibacter/Anguina* associations (McClay and Ophel 1993, Edgar 1994). Most scientific research on this issue has focused on domestic animal deaths but the toxin is known to greatly increase the frequency of abortions in sheep (McClay and Ophel 1993), and there is no information concerning its effects on wild herbivores. Finally, the climatic and geographical locations of the various forage species breeding programs in the western United States ensures that the parks are within the dispersal distance of forage species that are adapted to many different habitats and climates. Species adapted to northern-European-type climates are being bred in Oregon's Willamette Valley and near Pullman, Washington; species adapted to central Asian steppe and high altitude forest climates are being bred in Logan, Utah; and species adapted to Mediterranean-type climates are being bred in California. The distributions of adapted forage species are not random. Mediterranean type climate adapted forage species are grown west of the Sierra Nevada, steppe and high altitude forest adapted forage species are grown east of the Sierra

Nevada, and northern European type climate forage species are grown in meadows and lower elevation logged forests throughout the western United States.

Turfgrass species used for golf courses and lawns are often the same species used in forage production systems but bred for different characteristics. Currently, there are a number of notifications filed with USDA-APHIS to release transgenic *Agrostis stolonifera* (creeping bent) and *Poa pratensis* cultivars that have been modified for glyphosate and glufosinate resistance. The stated intent of the developers of these transgenic cultivars is to reduce the amount of herbicides necessary to keep golf courses free of undesirable grasses such as *Poa annua* (annual bluegrass) (Neal 2000, Wipff and Rose-Fricker 2000). However, there is concern among some scientists in the turfgrass industry that the continuous use of glyphosate will select for glyphosate resistant perennial grasses (Neal 2000). Additionally, the primary method for killing the resistant transgenic cultivars is to fumigate with methyl bromide, which will be banned after 2005 (Neal 2000).

Gene flow to closely-related species is also a serious concern as in one field test of transformed *A. stolonifera* where a marker gene was detected in untransformed plants at distances up to 298 m (980 ft), and gene flow was predicted to have occurred up to a distance of 1,310 m (4,300 ft) from the transgenic plants (Wipff and Rose-Fricker 2000). Those researchers noted that *A. canina*, *A. capillaris*, *A. castellana*, *A. gigantea*, *A. stolonifera* and *A. vinealis* (velvet bent, colonial bent, highland bent, giant bent grass, creeping bent and brown bent grass, respectively) freely hybridize and recommended that transgenic *A. stolonifera* seed not be produced until a male sterility system is developed (Wipff and Rose-Fricker 2000). The same company that sponsored the *A. stolonifera* transgenic research is now marketing glyphosate-resistant cultivars of *Festuca arundinacea* (tall fescue) and *Festuca trachyphylla* (hard fescue) that were developed through long-term herbicide selection experiments (Rose-Fricker 2000). The development of glyphosate-resistant cultivars of these known invaders of riparian habitats means that they will be resistant to Rodeo®, one of the very few herbicides registered for use near riparian areas and wetlands. It is therefore absolutely critical that these cultivars not be introduced into the parks.

Additionally, as *Poa pratensis* and *Agrostis gigantea* are dispersed in animal dung, all efforts should be made to stop seed dispersal into the parks by domestic animals. There are a number of other species that are now being promoted for use as turfgrass. The USDA-ARS at Logan, Utah, has released cultivars of *Agropyron cristatum* (crested wheatgrass) for turfgrass use in the Intermountain West; a European cultivar of *Koeleria macrantha* (junegrass) is being developed for dry and infertile soils and a European cultivar of *Festuca rubra* (red fescue) is being developed for damp and shady areas (Brede 2000). Cold-tolerant *Lolium perenne* (perennial ryegrass) is being bred to extend the climatic range of that turfgrass species (Ebdon 2000).

Priority Alien Species Other Than Grasses

Localized Wildland Species with Moderate to High Impact - Category 1 Species

Carduus pycnocephalus (Italian thistle) is 0.2 m to 2.0 m tall annual thistle that is ranked as a lesser invasive species by the California Alien Pest Plant Council (CalEPPC 1999). Its CalFlora distribution indicates that this species is widespread in California (Appendix G) and that its range in the Sierra Nevada appears to be increasing (Gerlach, personal observation). The distribution of *C. pycnocephalus* in the parks supports this observation. In Sequoia-Kings Canyon National Parks the only large population was discovered at the Ash Mountain Headquarters, and the remaining small populations are isolated and located in campgrounds, parking lots and in a streambed (Appendix A). In Yosemite National Park it is present only at the closed Lower River Campground which supports a large number of alien species (Appendix B). Unlike all other alien thistles that are invading California's wildlands, *C. pycnocephalus* forms dense populations under tree canopies and ultimately

excludes native species from those habitats. *C. pycnocephalus* seed is dispersed by adhering to animals and humans, by ants, as a contaminant in hay and soil, and by vehicles and wind (Ridley 1930, Evans et al. 1979, Pemberton and Irving 1990, Bossard and Lichti 2000). Its seed remains viable in the soil for more than 10 years (Parsons and Cuthbertson 1992).

Centaurea maculosa (spotted knapweed) is a 0.2 m to 1.2 m tall perennial thistle that is ranked as a red alert species by CalEPPC. Its CalFlora distribution indicates that numerous small populations exist in northern California (Appendix G). The directed surveys found it in Yosemite National Park at Foresta. *C. maculosa* has the potential to invade meadows and open forests to an elevation of 3,000 m. The *C. maculosa* seed is dispersed by adhering to animals and clothing, by ants, in dung, as a contaminant in hay and feed pellets, and by vehicles, mud, and water (Watson and Renney 1974, Pemberton and Irving 1990, Wallender et al. 1995, Sheley et al. 1999). The seed remains viable in the soil for more than 8 years (Davis et al. 1993).

Centaurea solstitialis (yellow star-thistle) is a 0.1 m to 2.0 m tall annual thistle that is ranked as one of the most invasive alien species by CalEPPC. It is widespread in California but the largest populations are in central and northern valleys and foothills (DiTomaso and Gerlach Jr. 2000). *C. solstitialis* is extending its range into the central Sierra Nevada (DiTomaso and Gerlach Jr. 2000) but the upper altitudinal limits of its range are not yet known. Active management programs are in place at all three parks. The directed surveys found this species in Sequoia-Kings Canyon National Parks along the Generals Highway and at Swale Campground and in Yosemite National Park at El Portal, Foresta, Hetch Hetchy Corral, McCauley Ranch and along Wawona Road. *C. solstitialis* seed is dispersed by adhering to animals and clothing, in contaminated hay and soil and on vehicles and machinery (DiTomaso and Gerlach Jr. 2000). Its seed remains viable in the soil for more than 10 years (Calihan et al. 1993).

Convolvulus arvensis (bindweed) is a twining perennial from deep, persistent roots that was considered but not listed as a serious invasive species by CalEPPC and is ranked as a lesser invasive species by the Pacific Northwest Alien Pest Plant Council (PNEPPC 1997). It is a noxious weed on arable lands and a problem alien species in Yellowstone National Park (Anonymous 1992). Its CalFlora distribution indicates that it is widely distributed in California (Appendix G). The directed surveys found it in Sequoia-Kings Canyon National Parks at Potwisha Campground and in Yosemite National Park at El Portal, McCauley Ranch and Yosemite Village. Its seed is dispersed in bird droppings, dung, hay and by machinery (Harmon and Keim 1934, Weaver and Riley 1982, Parsons and Cuthbertson 1992). Its seed remains viable in the soil for more than 20 years (Weaver and Riley 1982).

Erigeron strigosus (tall fleabane) is a 0.3 m to 0.8 m tall annual or biennial that has not been considered for ranking as an invasive species by CalEPPC. This species is native to the eastern United States and produces seeds asexually. Its CalFlora distribution indicates that there are only a few scattered populations in California (Appendix G), and the directed surveys found it in Yosemite National Park only at The Ahwahnee hotel.

Foeniculum vulgare (fennel) is a 1.0 m to 3.5 m tall perennial herb from a thick taproot and is ranked as one of the most invasive alien species by CalEPPC. Its CalFlora distribution indicates that it is widespread near the coast and suggests that it is invading the Central Valley and Mono County (Appendix G). The directed surveys found it in Yosemite National Park only at Lower River Campground. *F. vulgare* seed is dispersed by adhering to animals and clothing, by ants, on vehicles and by water (Ridley 1930, Klinger 2000). It is an extremely difficult species to eradicate once it has established due to its large taproot and its enormous and long-lived seedbank (Klinger 2000). *F. vulgare* also forms large, dense populations that drastically alter the species composition and structure of grassland, riparian and wetland communities (Klinger 2000).

Geranium robertianum (Robert's geranium) is a .01 m to 0.5 m tall annual or biennial that is ranked as a red alert species by the Pacific

Northwest Alien Pest Plant Council (PNEPPC). Its CalFlora distribution indicates that it is present in Alameda, Sonoma, and Napa counties (Appendix G), and the directed surveys found it in Yosemite National Park only at Lower River Campground. Its seed is adhesive (Ridley 1930) and is probably dispersed by adhering to animals, clothing and vehicles.

Hypericum perforatum (Klamathweed, St. John's wort) is a 0.3 m to 1.2 m tall perennial from a deep taproot and lateral rhizomes and is ranked as a lesser invasive species by CalEPPC. Its CalFlora distribution is primarily along the coast, in northwest California and in the northern Sierra Nevada (Appendix G). The directed surveys found this species only at a restricted number of locations in Yosemite National Park (Appendix B). Biological control efforts have greatly reduced the size of many California populations but in Idaho, Oregon and Washington populations are still increasing in size despite the presence of biological control agents (Piper 1999). Biological control agents have not been effective in controlling *H. perforatum* in Australia (Parsons and Cuthbertson 1992). Despite the success of the biological control program in California, sustaining current levels of control requires a good habitat match for the biological control agents, that the agents remain unaffected by parasites or pathogens and that *H. perforatum* not adapt to the agents by becoming more resistant through natural selection. For these reasons it seems prudent that the control of *H. perforatum* should not depend exclusively on biological control agents. *H. perforatum* seed is dispersed by adhering to animals, clothing, in dung, by machinery, vehicles and water. It also spreads vegetatively through the growth of rhizomes. Its seed remains viable in the soil for at least 10 years (Bellue 1945). *H. perforatum* is toxic to most herbivores (Fuller and McClintock 1986, Piper 1999).

Marrubium vulgare (horehound) is a 0.1 m to 1.0 m tall bushy perennial that was considered but not listed by the PNEPPC. It is one of the most widespread alien plant species in the Mediterranean-type climate areas of southern Australia (Parsons and Cuthbertson 1992). Its CalFlora distribution indicates that it is widespread in California and suggests that it is now invading the foothills of the Sierra Nevada (Appendix G). The small number of populations discovered by the directed surveys, Buckeye Campground and Potwisha Campground in Sequoia-Kings Canyon National Parks and El Portal, Happy Isles, and Lower River Campground in Yosemite National Park, also suggests that this species is just beginning to invade the Sierra Nevada. In Sequoia-Kings Canyon National Parks, park maintenance workers report a marked increase in population size in recent years (Appendix C). *M. vulgare* seed is dispersed by adhering to animals, clothing and by horse dung (Ridley 1930, St John-Sweeting and Morris 1990). Its seed remains viable in the soil for at least 10 years (Weiss and Sagliocco 2000).

Mentha pulegium (pennyroyal) is a 0.1 m to 0.9 m tall bushy, stoloniferous perennial that is ranked as one of the most invasive alien species by CalEPPC. Its CalFlora distribution indicates that is common in coastal areas and suggests that it is invading the Sierra Nevada along river drainages (Appendix G). It was found only in Sequoia-Kings Canyon National Parks in the riverbed of the North Fork of the Kaweah River. The notes of the survey team state that dozens of plants were found in partly shaded, rocky and sandy places in and adjacent to the floodplain of the Kaweah River (Appendix A). All parts of the plant are toxic, and it has been used as an insect repellant (Fuller and McClintock 1986, Hickman 1993). Its seed is dispersed by adhering to animals, clothing, in cow dung, in contaminated hay, mud, soil, by vehicles, machinery and water (Parsons and Cuthbertson 1992, Warner 2000). It is also spread by the fragmentation of stolons that are subsequently transported by vehicles and water (Warner 2000).

Mentha spicata (spearmint) is a 0.3 m to 1.2 m tall bushy, stoloniferous perennial that has not been considered for ranking as an invasive species by CalEPPC. Its CalFlora distribution indicates that it is common in California (Appendix G) but the directed-search data suggest that it may be invading the same habitats as *Mentha pulegium*. The directed surveys found it in Sequoia-Kings Canyon National Parks in

the riverbed of the North Fork of the Kaweah River and in Yosemite National Park at The Ahwahnee hotel and at El Portal.

Oxalis pes-caprae (Bermuda buttercup) is a 0.2 m to 0.4 m tall rhizomatous perennial that requires more study according to CalEPPC. It is considered a noxious weed in many parts of the world. Its CalFlora distribution indicates that it is mostly confined to coastal areas and suggests that it is now invading the Sierra Nevada (Appendix G). It was found only in Sequoia-Kings Canyon National Parks in the Ash Mountain Developed Area and along the Generals Highway. *O. pes-caprae* forms dense populations that spread from rhizomes and bulbs that are dispersed in contaminated soil and on machinery (Parsons and Cuthbertson 1992, Peirce 1997). Most populations do not produce viable seed. The failure to produce viable seed due to self-incompatibility has been overcome by extensive selfing in other self-incompatible species (Hiscock 2000). This characteristic should not be relied upon to limit the spread of alien species. *O. pes-caprae* is toxic to livestock (Fuller and McClintock 1986, Parsons and Cuthbertson 1992) and presumably to native herbivores also.

Ranunculus parviflorus (small flowered buttercup) is a 0.1 m to 0.8 m tall annual that has not been considered for ranking as an invasive species by CalEPPC. Its CalFlora distribution indicates that it is common in wet areas along the coast and suggests that it is now invading the Sierra Nevada (Appendix G). It is toxic although most herbivores will not eat it due to its bitter taste (Fuller and McClintock 1986).

Ranunculus testiculata (bur buttercup) is a 0.01 to 0.1 tall annual that has not been considered for ranking as an invasive species by CalEPPC. It is a widespread invasive species that has invaded *Bromus tectorum*-dominated grasslands throughout the Intermountain West, eastern Oregon, eastern Washington and Idaho (Young et al. 1992). Its CalFlora distribution indicates that it is present in Kern, Modoc, Mono and Lassen counties and strongly suggests that stock animals (Appendix G) are dispersing it. It was only found in Sequoia-Kings Canyon National Parks at Sentinel Campground. Its seed is dispersed by adhering to animals (Young et al. 1992), and all parts of the plant are toxic although most herbivores will not eat it due to its bitter taste (Fuller and McClintock 1986, Young et al. 1992). Because it has proven its ability to invade stands of *Bromus tectorum*, it is likely that *R. testiculata* is capable of invading many habitats in all three parks where *Bromus tectorum* currently exists.

Silybum marianum (milk thistle) is a 0.3 m to 2.5 m tall, annual or biennial thistle that requires more study according to CalEPPC. Its CalFlora distribution indicates that this species is widespread in coastal areas and suggests that it is invading the Sierra Nevada (Appendix G). The directed surveys found it in Sequoia-Kings Canyon National Parks along Old Hidden Springs Road and in nearby Yucca Creek. This species invades areas with bare soil and produces dense populations that crowd out all other species and ensures that there is bare soil for germination in subsequent years (Parsons and Cuthbertson 1992). Its seed is spread by ants, in hay, by machinery, water and wind (Pemberton and Irving 1990, Parsons and Cuthbertson 1992). The Sequoia-Kings Canyon National Parks survey notes indicate that seed of this species is also dispersed in cow dung. Its seed remains viable in the soil for at least 9 years (Parsons and Cuthbertson 1992).

Tamarix species (tamarisk, salt cedar) are 2.0 m to 6.0 m tall many-branched shrubs or trees that are ranked as some of the most invasive alien species by CalEPPC. The CalFlora distribution of *Tamarix* species indicates that they are expanding their ranges into riparian areas of the Central Valley (Appendix G). The directed surveys found these species only in Sequoia-Kings Canyon National Parks in the beds of the Kaweah River and Sycamore Creek. These species are dispersed by water and wind (Lovich 2000).

Tragopogon dubius (yellow salsify, goat's beard) is a 0.3 m to 1.0 m tall annual or biennial that is ranked as one of the most invasive alien species by PNEPPC. Its CalFlora distribution indicates that it is widespread in northeastern California and is present in a couple of counties along the coast and also in Mono County (Appendix G). It is found in all three parks. In

Sequoia-Kings Canyon National Parks, it is found in Halstead Meadow, Wolverton Pack Station, in developed areas and campgrounds and along the Generals Highway (Appendix A). In Yosemite National Park, it is found at McCauley Ranch and the Concession Stables (Yosemite Valley), in developed areas and campgrounds and along trails and roads (Appendix B). Its seed is dispersed by water and wind (Ridley 1930, Kelley and Bruns 1975) and probably by adhering to animals. Its seed is viable in the soil for at least 2 years (Clements et al. 1999).

Urtica urens (dwarf nettle, burning nettle) is a 0.1 m to 0.6 m tall annual stinging nettle that has not been considered for ranking by CalEPPC. Its CalFlora distribution indicates that it is widespread along the coast and in southern California and suggests that it is spreading in central California (Appendix G). The directed surveys found it in Sequoia-Kings Canyon National Parks at the Ash Mountain Slash Pit, Cedar Grove Pack Station, Grant Grove Pack Station, Mineral King Pack Station and at Potwisha Campground. In Yosemite National Park, it was found at the Government Stables (Yosemite Valley). Its seed is dispersed in the dung of many animals (Ridley 1930, Gray and Michael 1986, Malo and Suarez 1995) and is viable in the soil for over 5 years (Roberts and Feast 1972).

Verbascum virgatum (wand mullein) is a 0.6 m to 1.2 m tall biennial that has not been considered for ranking by CalEPPC. Its CalFlora distribution indicates that it has a widespread but very patchy distribution in California (Appendix G). It is present in Sequoia-Kings Canyon National Parks only at Azalea Campground, Lodgepole Developed Area, Red Fir Maintenance Yard, and Wuksachi. There is very little published information on this species but if it is similar to *V. thapsus* (woolly mullein) it will establish a large and long-lived seedbank.

Localized Legumes with Moderate to High Impact - Category 1 Species

Lathyrus latifolius (perennial sweet pea) is a robust sprawling or climbing perennial that has not been considered for ranking by CalEPPC. Its CalFlora distribution indicates that it is primarily distributed along the coast and suggests that it may be spreading in the Sierra Nevada (Appendix G). The directed surveys found it in Sequoia-Kings Canyon National Parks at the Ash Mountain Developed Area and in Traugers Creek and in Yosemite National Park at El Portal, Wawona and Yosemite Village. The field notes describing the Traugers Creek area suggest that *L. latifolius* is a serious threat to riparian areas as the survey crew stated: "[t]housands of individuals in large, dense colonies were observed at the junction of the Mineral King Road and Traugers Creek. A large colony is directly along the Mineral King Road and extends approximately fifty meters upstream from the road." From these statements it appears likely that the invasion began upstream of the road and has spread downstream. There is no published information about the ecology of this species in wildlands.

Medicago sativa (alfalfa, lucerne) is a 0.2 m to 0.8 m tall tap-rooted or rhizomatous perennial that has not been considered for ranking by CalEPPC. It has been identified as a priority species in the Yellowstone National Park area (Anonymous 1992). Its CalFlora distribution indicates that it is common along the coast and east of the Sierra Nevada and is sporadic in the Central Valley (Appendix G). It is certainly a common roadside plant along freeways and highways in the Central Valley (Gerlach, personal observation). The Central Valley populations are likely to be composed primarily of warm climate genotypes while the populations east of the Sierra Nevada are certainly composed of more cold tolerant and possibly stoloniferous genotypes that are a problem in the Yellowstone National Park area (Lowe et al. 1972). The directed surveys found this species only in Sequoia-Kings Canyon National Parks along the flume in the Ash Mountain Developed Area and along the road at Milk Ranch. *M. sativa* seed is dispersed in feed pellets, hay and horse dung and moves by water (Ridley 1930, Kelley and Bruns 1975, Zamora and Olivarez 1994). Its seed remains viable in the soil for more than 20 years (Lewis 1973).

Melilotus alba (white sweet clover) is a 0.5 m to 2 m tall annual or biennial that is considered to be a lesser invasive by the PNEPPC. Its CalFlora distribution indicates that it is common along the coast and east of the Sierra Nevada, sporadic in the Central Valley and perhaps invading the Sierra Nevada (Appendix G). The directed surveys found this species in Sequoia-Kings Canyon National Parks at the Cedar Grove Market and Lodge, Dorst Campground and Wuksachi. In Yosemite National Park, it was found at El Portal, Hetch Hetchy Backpacker's Camp and Lower River Campground. *M. alba* seed is dispersed by adhering to animals, clothing, in dung and by water (Harmon and Keim 1934, Kelley and Bruns 1975, Turkington et al. 1978). Its seed remains viable in the soil for more than 30 years (Turkington et al. 1978).

Melilotus indica (sourclover) is a 0.1 m to 0.6 m tall annual that has not been considered for ranking as an invasive species by CalEPPC. Its CalFlora distribution indicates that it is common in southern California, sporadic in the Central Valley, and perhaps invading the Sierra Nevada (Appendix G). The directed surveys found this species in Sequoia-Kings Canyon National Parks at the Ash Mountain Developed Area and along the Generals Highway and Sycamore Creek. It was found in Yosemite National Park at El Portal and Hetch Hetchy Backpacker's Camp. Its seed is viable in the soil for more than 5 years (Roberts and Feast 1972).

Melilotus officinalis (yellow sweetclover) is a 0.5 m to 2.0 m tall biennial that is considered to be a lesser invasive by the PNEPPC. It has been identified as a priority species in the Yellowstone area (Anonymous 1992). Its CalFlora distribution indicates that it is common along the coast and east of the Sierra Nevada, sporadic in the Central Valley, and perhaps invading the Sierra Nevada (Appendix G). The directed surveys found this species in Sequoia-Kings Canyon National Parks at Dorst Campground and in Yosemite National Park at El Portal. *M. officinalis* seed is dispersed by adhering to animals and clothing (Turkington et al. 1978) and is viable in the soil for more than 20 years (Turkington et al. 1978).

Trifolium repens (white clover) is a creeping perennial that roots from stolons and has not been considered for ranking as an invasive species by CalEPPC. Its CalFlora distribution indicates that it is present in most of California (Appendix G). The directed surveys found this species at several locations in both park areas, but the number of individuals in each population was relatively small. Its seed is dispersed by adhering to animals, clothing, in bird droppings, dung, in mud and by vehicles (Ridley 1930, Dore and Ranmond 1942, Gillham 1970, Welch 1985, Mt. Pleasant and Schlather 1994, Malo and Suarez 1995, Fischer et al. 1996, Hodkinson and Thompson 1997). Its seed is viable in the soil for more than 20 years (Toole and Brown 1946).

Vicia benghalensis (purple vetch) is a sprawling or climbing annual that has not been considered for ranking as an invasive species by CalEPPC. Its CalFlora distribution indicates that it is common along the coast and in some parts of the Sacramento Valley (Appendix G). The directed surveys discovered it in Yosemite National Park at El Portal and in Sequoia-Kings Canyon National Parks along Old Hidden Springs Road where a large population is spreading into the adjacent grassland.

Vicia sativa (common vetch) is a sprawling or climbing annual that has not been considered for ranking as an invasive species by CalEPPC. Its CalFlora distribution indicates that it is common along the coast and in some parts of the Sacramento Valley and suggests that it is spreading in the Sierra Nevada (Appendix G). The directed surveys discovered it in Sequoia-Kings Canyon National Parks at the Ash Mountain Developed Area and along the Generals Highway.

Vicia villosa (hairy vetch, winter vetch) is a sprawling or climbing annual that has not been considered for ranking as an invasive species by CalEPPC. Its CalFlora distribution indicates that it is widely distributed in California (Appendix G). The directed surveys discovered it in Sequoia-Kings Canyon National Parks along the Generals Highway. Its seed is dispersed in bird droppings, dung and mud (Aarssen et al. 1986).

Localized Fruit and Nut Species With High Impact - Category 1 and 2 Species

***Carya* sp.** (pecan) is a 20 m tall deciduous nut tree that has not been considered for ranking as an invasive species by CalEPPC. Animals and water probably disperse its seed. The directed surveys found one mature tree in Sequoia-Kings Canyon National Parks at Grunnigan Ranch in a field bordering Yucca Creek.

Diospyros sp. (persimmon) is a 10 m tall deciduous fruit tree that has not been considered for ranking as an invasive species by CalEPPC. Animals and water probably disperse its seed. The directed surveys found a stand of vegetatively reproducing trees in Sequoia-Kings Canyon National Parks at Grunnigan Ranch in a field bordering Yucca Creek.

Ficus carica (edible fig) is a 7 m tall deciduous fruit tree that is ranked as one of the most invasive alien species by CalEPPC. Its CalFlora distribution indicates that it is common in southern California and in the Sacramento and San Joaquin Valleys (Appendix G). The directed surveys found this species in Sequoia-Kings Canyon National Parks in the North and Middle Forks of the Kaweah River and in Yucca Creek. *F. carica* forms dense thickets in riparian forests and streamside habitats and is very difficult to eradicate (Randall 2000). Its seed is dispersed in bird droppings, dung (Debussche and Isenmann 1994, Lisci and Pascini 1994) and probably by water. The seed will germinate only after it has passed through the gut of an animal or has been abraded by washing over rough surfaces (Lisci and Pascini 1994).

Juglans californica (California black walnut) is a 20 m tall deciduous nut tree that is native to California but is not native to any of the parks. The directed surveys found this species in Sequoia-Kings Canyon National Parks in Yucca Creek. The notes of the survey crew suggest that a single tree from a residual planting is creating a population of seedlings in Yucca Creek. It is wind pollinated and animals and water disperse its seed. It is also known to hybridize with *Juglans regia* (English walnut) (Hickman 1993), which is also growing nearby Yucca Creek.

Juglans regia (English walnut) is a 20 m tall deciduous nut tree that has not been considered for ranking as an invasive species by CalEPPC. Its CalFlora distribution indicates a patchy distribution in southern and central California (Appendix G). The directed surveys found this species in Sequoia-Kings Canyon National Parks in Yucca Creek. The notes of the survey crew suggest that it exists as a single tree from a residual planting. It is wind pollinated and animals and water probably disperse its seed. It is also known to hybridize with *Juglans californica* (California black walnut) (Hickman 1993), which grows near Yucca Creek.

Malus sylvestris (apple) is a 7 m tall deciduous fruit tree that has not been considered for ranking as an invasive species by CalEPPC. Its CalFlora distribution indicates a patchy distribution in southern and central California (Appendix G). The directed surveys found this species in Sequoia-Kings Canyon National Parks along Traugers Creek. The notes of the survey crew suggest that a single tree from a residual planting is creating a population of seedlings in Traugers Creek. Animals and water disperse its seed.

Morus alba (white mulberry) is a 10 m tall deciduous fruit tree that is considered to be a lesser invasive by the PNEPPC. Its CalFlora distribution indicates a patchy distribution California (Appendix G). The directed surveys found *M. alba* in Sequoia-Kings Canyon National Parks along the Colony Mill Road in a streambed and in the streambed of the Middle Fork of the Kaweah River. The seed of this species is dispersed in bird droppings (Ridley 1930, Debussche and Isenmann 1994) and probably by water.

Olea europaea (olive) is a 7 m tall evergreen fruit tree that has not been considered for ranking as an invasive species by CalEPPC. It is a highly invasive species in the Mediterranean-type climate areas of Australia. Its CalFlora distribution indicates that it has escaped from cultivation in southern California and in the Sacramento and San Joaquin Valleys (Appendix G). The directed surveys found a stand of trees in Sequoia-Kings Canyon National Parks at

Grunnigan Ranch growing along Old Hidden Springs Road. The seed of *O. europaea* is dispersed in bird droppings (Ridley 1930, Debussche and Isenmann 1994).

Prunus persica (peach) is a 7 m tall deciduous fruit tree that has not been considered for ranking as an invasive species by CalEPPC. The directed surveys found this species in Sequoia-Kings Canyon National Parks in the Crystal Cave parking lot. The survey notes indicate that two trees were residual plantings and two were saplings from seed. Animals and humans probably disperse the seed of this species.

Punica granatum (pomegranate) is a 5 m tall deciduous fruit tree that has not been considered for ranking as an invasive species by CalEPPC. Its CalFlora distribution indicates that it has a patchy distribution in southern California and in the San Joaquin Valley (Appendix G). The directed surveys found it in Sequoia-Kings Canyon National Parks along a footpath leading from the Ash Mountain Developed Area to the Kaweah River and at Grunningan Ranch. Animals and humans probably disperse its seed.

Rubus discolor (Himalayan blackberry) is an arched bramble that is ranked as one of the most invasive alien species by CalEPPC. Its CalFlora distribution indicates that it is widely distributed in California (Appendix G). The directed surveys found it in Sequoia-Kings Canyon National Parks at the Giant Forest Sewage Plant, Grunningan Ranch, Potwisha Campground, Redwood Creek, Yucca Creek and the Kaweah River. In Yosemite National Park it was found at El Portal, McCauley Ranch, Wawona and multiple locations in Yosemite Valley. Its seed is dispersed in bird droppings, dung and water (Parsons and Cuthbertson 1992, Hoshovsky 2000).

Rubus laciniatus (cut-leaved blackberry) is an arched bramble that is considered to be a lesser invasive by the PNEPPC. Its CalFlora distribution indicates that it has a patchy distribution along the north coast and in the Central Valley (Appendix G). The directed surveys found this species in Yosemite National Park at Lower Pines Campground, North Pines Campground, Wawona Campground and along the Meadow Loop Trail in Wawona. The seed of this species is probably dispersed in bird droppings, dung and water.

Vitis vinifera (cultivated grape) is a woody vine that has not been considered for ranking as an invasive species by CalEPPC. Its CalFlora distribution indicates that it has escaped cultivation along the coast and in the Central Valley (Appendix G). The directed surveys found *V. vinifera* in Sequoia-Kings Canyon National Parks growing in frequent dense patches in Yucca Creek and in Yosemite National Park in Yosemite Village. *V. vinifera* seed is dispersed in bird droppings (Ridley 1930, Debussche and Isenmann 1994) and probably by water.

Localized Ornamentals With High Impact – Category 1 Species

Ampelopsis arborea (peppervine) is a climbing deciduous vine with twining tendrils that has not been considered for ranking as an invasive species by CalEPPC. This species is established at Ash Mountain in Sequoia National Park. Birds probably disperse its seed.

Catalpa bignoides (common catalpa, Indian bean) is a 10 m tall deciduous tree that has not been considered for ranking as an invasive species by CalEPPC. This species is an ornamental, not yet naturalized, at Ash Mountain in Sequoia National Park. Animals and water probably disperse its seeds.

Cistus sp. (rock-rose) is a 1 m tall evergreen shrub not yet considered for ranking as an invasive species by CalEPPC. This species is an ornamental, not yet naturalized, at Ash Mountain in Sequoia National Park.

Coreopsis lanceolata (garden coreopsis) is a 0.3 to 0.6 m tall perennial that has not been considered for ranking as an invasive species by CalEPPC. Its CalFlora distribution indicates that it has escaped cultivation in Butte, Santa Cruz, and Sonoma Counties (Appendix G). The directed surveys found this species at El Portal in Yosemite National Park. The description of the seeds of this species in Hickman (1993) suggests that its seed is dispersed by adhering to animals and clothing.

Digitalis purpurea (purple foxglove) is a 0.2 m tall perennial that is considered to be a lesser invasive by the PNEPPC. Its CalFlora distribution indicates that it has escaped cultivation along the coast and in the foothills bordering the Sacramento Valley (Appendix G). The directed surveys found this species in Sequoia-Kings Canyon National Parks at Cold Springs Campground, Giant Forest Developed Area in Eli's Paradise Meadow, Grant Grove Developed Area in the forest, Lodgepole Developed Area and at the former site of the Sunset Campground. This species was found in Yosemite National Park at Wawona. *D. purpurea* is extremely toxic (Fuller and McClintock 1986) and skin contact as well as smoke from burning leaves has caused injury to workers on control projects (Harris 2000). Its seed is dispersed in mud, wind, and vehicles (Hodkinson and Thompson 1997) and it remains viable in the soil for more than 5 years (Harris 2000).

Eucalyptus citriodora (lemon-scented gum) is a 30 m tall tree that has not been considered for ranking as an invasive species by CalEPPC. Its CalFlora distribution indicates that it has escaped from cultivation in San Diego County (Appendix G). This species is present in Sequoia-Kings Canyon National Parks at the Ash Mountain Park Boundary. The notes of the survey team indicate that the single tree at the site had been cut down but was stump sprouting. This seed of this species is dispersed by wind.

Genista monspessulana (French broom) is a 3 m tall evergreen shrub that is ranked as one of the most invasive alien species by CalEPPC. Its CalFlora distribution indicates that it is widespread along the coast and suggests that it is invading the areas around the Central Valley (Appendix G). The directed surveys found this species in Sequoia-Kings Canyon National Parks at the Ash Mountain Developed Area. The survey notes indicate that control efforts were in progress and that most plants appeared to be seedlings. All parts of this species are toxic (Hickman 1993). The seed of *G. monspessulana* is dispersed by ants, machinery, water, in bird droppings and mud (Pemberton and Irving 1990, Bossard 2000). Its seed remains viable in the soil for over 5 years (Bossard 2000).

Hedera helix (English ivy) is an evergreen woody vine or shrub that is ranked as a lesser invasive species by CalEPPC and is ranked as one of the most invasive alien species by the PNEPPC. Its CalFlora distribution indicates that it has escaped in many coastal counties and in the Sacramento Valley (Appendix G). The berries, leaves and sap of *H. helix* are toxic (Fuller and McClintock 1986). It is present in Sequoia-Kings Canyon National Parks at the Ash Mountain Developed Area and in Yosemite National Park at Yosemite Village. Its seed is dispersed in bird droppings (Gillham 1970, Debussche and Isenmann 1994).

Heteromeles arbutifolia (toyon) is a 5 m tall shrub or small tree that is native to California but is not native to the Kaweah River drainage. The notes of the survey crew indicate that it is naturalizing from plantings about the Ash Mountain Developed Area in Sequoia-Kings Canyon National Parks. Its seed is dispersed in bird droppings.

Iris sp. (iris) is an herbaceous perennial that spreads by seeds and vegetatively. The survey crew found a species of *Iris* escaping in the Lodgepole Developed Area of Sequoia-Kings Canyon National Parks. One plant was growing on the north side of the river on a steep slope adjacent to a large asphalt parking lot and another was found growing adjacent to a deserted government residence.

Leucanthemum vulgare (ox-eye daisy) is a 0.2 m to 0.5 m tall rhizomatous perennial that is ranked as a lesser invasive species by CalEPPC and is ranked as one of the most invasive alien species by PNEPPC. Its CalFlora distribution indicates that it is widespread in the northern half of the state (Appendix G). The directed surveys found it in Yosemite National Park at Foresta, North Pines Campground, Concession Stables (Yosemite Valley), Wawona, Yosemite West and Yosemite Lodge. *L. vulgare* seed is dispersed by adhering to animals, clothing, in dung, hay and wildflower seed mixes (Horthwath and Williams 1968, Fischer et al. 1996, Olsen and Wallander 1999). Its seed remains viable in the soil for at least 39 years (Toole and Brown 1946).

Leucojum aestivum (summer snowflake) is a 0.5 m tall perennial that has not been considered for ranking as an invasive species by CalEPPC. The partial information provided by an abstracting service (CAB Abstracts) suggests that it is escaping cultivation in the northeastern U. S. but the referenced source material was not available. A description in the Sunset Western Garden Book (Hogan 1992), states that *L. aestivum* naturalizes under deciduous trees, in orchards, and on cool slopes. The directed surveys discovered it escaping in Sequoia-Kings Canyon National Parks at the Ash Mountain Developed Area. The survey notes state: "[h]undreds of plants grew about the Research Center in unwatered flowerbeds and in adjacent unwatered grassy areas. This species appears to reproduce sexually and asexually in this area."

Ligustrum sinense (Chinese privet) is a 7 m tall shrub or tree that requires more study according to CalEPPC. It is widely naturalized across the central and eastern U. S. and is a problem species in many nature preserves (Batcher 2000). The directed surveys found dozens of *L. sinense* hedges in Sequoia- Kings Canyon National Park growing about the Ash Mountain Developed Area. The seed of this species is dispersed in bird droppings and by water (Batcher 2000).

Nerium oleander (oleander) is a 4 m tall evergreen shrub that was considered but not ranked as an invasive species by CalEPPC. The directed surveys found a residual planting of this species in Sequoia-Kings Canyon National Parks at the Grunnigan Ranch near Yucca Creek. In California there is a widespread misperception that this species is adapted to dry conditions. In its native Mediterranean region *N. oleander* is an obligate riparian species that establishes on stream banks and on sandbanks in streambeds (Herrera 1991). In some areas in Sacramento County roadside populations of *N. oleander* are colonizing drainage ditches (Gerlach, personal observation). All parts of this species are very toxic (Fuller and McClintock 1986). Its seed is dispersed by water and wind (Herrera 1991).

Pyracantha angustifolia (firethorn) is a 4 m tall evergreen, thorny shrub that requires more study according to CalEPPC. Its CalFlora distribution indicates that it is escaping in coastal areas north of the San Francisco Bay (Appendix G). The directed surveys found this species naturalizing in Sequoia-Kings Canyon National Parks at the Ash Mountain Developed Area, Grunningan Ranch, Middle Fork of the Kaweah River and Sycamore Creek. The seed of this species is dispersed in bird droppings and in water (Ridley 1930, Debussche and Isenmann 1994).

Rudbeckia hirta (bristly coneflower, black-eyed susan) is a 0.3 m to 0.8 m tall annual to short-lived perennial that has not been considered for ranking as an invasive species by CalEPPC. This species is native to the prairies of the Midwestern United States (Hickman 1993) and should be considered a threat should it escape and invade meadows in California. Its CalFlora distribution indicates that it is escaping from cultivation in the Central Valley (Appendix G). The directed surveys discovered this species in Yosemite National Park at The Ahwahnee hotel.

Spartinum junceum (Spanish broom) is a 5 m tall shrub or tree that is ranked as a lesser invasive species by CalEPPC. Its CalFlora distribution indicates that it has naturalized along the coast and in the Sacramento Valley (Appendix G). The directed surveys found this species in Sequoia-Kings Canyon National Parks at the Ash Mountain Developed Area, along the Generals Highway and in the Middle Fork of the Kaweah River. The survey notes indicate that the Kaweah River population is periodically cut back by Park personnel. Its seed is dispersed by ants and water and is viable in the soil for more than 5 years (Nilsen 2000).

Tanacetum parthenium (feverfew) is a 1.0 m tall perennial that is ranked as one of the most invasive alien species by the PNEPPC. Its CalFlora distribution indicates that scattered populations are widely distributed about the state (Appendix G). The directed surveys found this species in Sequoia-Kings Canyon National Parks at the Grant Grove Developed Area and in Yosemite National Park at Wawona. This species is probably toxic and may cause contact dermatitis. Its seed is dispersed in mud and on vehicles (Hodkinson and Thompson 1997).

Vinca major (greater periwinkle) is a sprawling shrub that roots at shoot nodes and has been ranked as a lesser invasive species by CalEPPC. Its CalFlora distribution indicates that it has escaped from cultivation along the coast and in the Sacramento Valley (Appendix G). The directed surveys found this species in Sequoia National Park at the Ash Mountain Developed Area, along the Generals Highway and in Potwisha Campground. It was discovered in Yosemite National Park at El Portal. This species is very difficult to eradicate and has caused problems in many natural areas and frequently invades moist, shady habitats (Bean and Russo 1988). In California it appears to be self-incompatible and to spread only from stem or root fragments (Bean and Russo 1988). The failure to produce viable seed due to self-incompatibility has been overcome by extensive selfing in other self-incompatible species (Hiscock 2000). This characteristic should not be relied upon to limit the spread of alien species.

Priority Alien Grass Species

Category 1 Species

The Pacific Northwest Alien Pest Plant Council (PNEPPC) ranked ***Agrostis gigantea*** as one of the most invasive alien species. Its CalFlora distribution is primarily along the north coast and northern Sierra Nevada. The outlier collections indicate that its can expand its range greatly in California (Appendix G). Currently, *A. gigantea* is known from Yosemite National Park, but survey notes indicate that it may also be present in Sequoia-Kings Canyon National Parks at the Columbine Picnic Area and in streams in the Grant Grove area near Wilsonia. In Yosemite National Park its distribution is limited to Yosemite Valley, Wawona and Foresta, although directed surveys of riparian areas might identify other populations. It is a 0.2 m to 1 m tall cool-season perennial grass with rhizomes up to 0.25 m long that forms an open sod over time. The typical habitats it invades are ditch banks, riparian areas and wet meadows, which it dominates through vegetative reproduction and seedling recruitment. It is dispersed in cow dung (Dore and Ranmond 1942, Welch 1985), probably in the dung of other animals and by water. The soil under established populations contains a large and moderately persistent seed bank (Bekker et al. 2000). The literature contains no control methods appropriate for natural riparian areas and wet meadows. However, because this is an important forage species there is quite a lot of information about its biology in the literature (Anonymous 1972, Fergus and Buckner 1973, Alderson and Sharp 1995). Mechanical eradication is likely to be difficult and because of its association with wet habitats herbicide choices are very limited. Flaming with backpack units may be an option because of the reduced fire hazard in wet areas. If the species morphology and phenology are similar to other alien perennial grasses then management treatments during the boot stage are likely to be the most successful.

Arundo donax (giant reed) is ranked as one of the most invasive alien species by the California Alien Pest Plant Council (CalEPPC) and in some counties the species occupies nearly every drainage system (Kelly 1999). Its CalFlora distribution is widespread in both southern and northern California. It is found primarily in the coastal ranges, the Sacramento Valley and the foothills of the Sierra Nevada (Dudley 2000) (Appendix G). Currently, it appears to be expanding its range in the foothills of the southern Sierra Nevada. During the directed surveys *A. donax* was found only in Sequoia-Kings Canyon National Parks at the Ash Mountain Developed Area and in Sycamore Creek. The notes of the survey crew indicate that some eradication work was being carried out on the Sycamore Creek population in 1997. *A. donax* is a 2 m to 5 m tall, erect, perennial cane- or reed-like grass, with creeping rhizomes that spread to form very dense stands (Dudley 2000). Interestingly, very little is known about the biology of this species, which has been used by humans for over 5,000 years (Hoshovsky 1986). As *A. donax* appears to reproduce only through the dispersal of rhizomes down stream or down slope, successful control requires that surveys be conducted upstream or up slope of all known populations to ensure that the site is not reinvaded (Stein and Vartanian 1997, Kelly 1999). The CalEPPC Team Arundo groups have developed control techniques. Team Arundo del Norte can be contacted through Tom Dudley, phone (510) 643-3021, or by email, tdudley@socrates.berkeley.edu.

Bromus inermis (smooth brome) is ranked as one of the most invasive alien species by the PNEPPC. Its CalFlora distribution is primarily in northeastern California, and it appears to be expanding its range in central California (Appendix G). Currently, *B. inermis* is found only in Yosemite National Park, and its distribution is restricted to the southwestern portion of the park, Curry Village and Crane Flat. Because this species has only recently extended its range to central California, there is no information about its ability to invade park plant communities. However, its ability to invade and dominate similar plant communities is well established (Sather 1987, Tyser and Worley 1992, Grilz and Romo 1995, Willms and Quinton 1995, Blankespoor and May 1996). Also, because it is an important forage species, its habitat requirements have been well documented (Oakley 1924, Newell 1973, Looman 1976, Miller and Krueger 1976, Dewey and Plummer 1980, Miller et al. 1981, Casler and Carlson 1995, Vogel et al. 1996). *B. inermis* is a 0.5 to 1 meter tall, dense sod-forming, perennial cool-season grass that spreads from seed and rhizomes. It is more drought tolerant than other alien cool-season grasses and is also more tolerant of higher summer temperatures (Jung and Baker 1973). Some populations of *B. inermis* may become sod bound, but, if the species is growing in a mixture with legumes such as *Medicago sativa* (alfalfa) or *Trifolium repens*, the population will remain highly productive indefinitely (Casler and Carlson 1995). In addition to its ability to dominate native vegetation, *B. inermis* also may be a threat to the genetic identity of native perennial *Bromus* species. *B. inermis* has been shown to form fertile hybrids with *B. pumpellianus* in the Rocky Mountains (Elliot 1949) and new introductions of diploid genotypes by the USDA (Dewey and Plummer 1980) might increase the risk of hybridization with native perennial *Bromus* species. Control of *B. inermis* can be very difficult once it has established within stands of native grasses. However, its populations can be reduced through close mowing in early spring and late fall (Casler and Carlson 1995). Additionally, its rhizomes are not perennial and new rhizomes are initiated each spring from over-wintering shoots which can be killed by cutting them just below the soil surface in late fall (Oakley 1924). This morphological peculiarity may also render it susceptible to flaming in late fall when fire hazards are low.

Dactylis glomerata (orchard grass) is considered to be a lesser invasive by the PNEPPC. However, the forage and rangeland literature suggests that it has not been sown as a mid elevation range forage as widely as other alien cool-season grasses (Jung and Baker 1973). Also, along with *Phleum pratense* (cultivated timothy), it is one of the most sought after grass species by cattle (Miller and Krueger 1976) and may be somewhat limited by preferential grazing. *D. glomerata* is a 1 m to 1.3 m tall, cool season, open sod forming, perennial grass that forms dense populations than can persist for at least 20 years in competition with *Poa pratensis* (Tsuyuzaki and Kanda 1996). It can also tolerate much lower light levels than other alien perennial grass species (van Santen and Sleper 1996). The phenologies of the two major genotypes, northern European and Mediterranean, are very different. The northern European genotype is winter dormant and summer active while the Mediterranean genotype is winter active and summer dormant (van Santen and Sleper 1996). All of these factors suggest that the range expansion of *D. glomerata* has been dispersal limited and that the species is capable of dominating mesic, mid-elevation habitats in the parks. Its CalFlora distribution indicates that it is widely distributed in California (Appendix G). In Sequoia-Kings Canyon National Parks it is found at the Ash Mountain Developed Area, at the Columbine Picnic Area on a stream bank, Giant Forest Developed Area, Eli's Paradise Meadow, Round Meadow and Lodgepole Developed Area. It is found in Yosemite National Park throughout the Yosemite Valley and also at Tuolumne Concessions Stables, Merced Grove, Foresta, Wawona, Big Oak Flat Road and Tioga Road. A directed search of meadows and riparian areas will probably locate more populations. Shady meadows or riparian areas may be particularly susceptible to invasion by the northern European genotype. This means that it is particularly important to prevent the introduction of seed from areas where the northern European genotype has been sown – irrigated pastures in the foothills of the Sierra (Raguse et al. 1967)

and rangeland and irrigated pastures in Idaho, Nevada, Oregon, and Washington. *D. glomerata* seed is dispersed by adhering to animals, floating on water, in cow dung (Ridley 1930, Kelley and Bruns 1975, Schmida and Ellner 1983, Mt. Pleasant and Schlather 1994, Fischer et al. 1996) and probably horse dung. *D. glomerata* is very responsive to increased levels of soil potassium and nitrogen and does especially well growing in mixtures with *Medicago sativa* or *Trifolium repens* (van Santen and Sleper 1996). *Festuca arundinacea* and *Poa pratensis* are only able to compete with it when nitrogen and potassium are limiting (Jung and Baker 1973). Its seed persists in the soil for at least 4 years (Lewis 1973). Its leaves support fungal endophytes (van Santen and Sleper 1996) but there are no reports in the literature implicating the alkaloids produced by the endophytes with animal health disorders as occurs when infected *Festuca arundinacea* is grazed. Nothing has been published on the control of *D. glomerata* and herbicide options will be very limited for populations growing in riparian areas.

Festuca arundinacea (tall fescue) is ranked as a lesser invasive species by CalEPPC. Its CalFlora distribution is primarily in coastal areas and in the Feather River and American River watersheds (Appendix G). It is found in Yosemite National Park at Lower River Campground and in Sequoia-Kings Canyon National Parks at the Ash Mountain Developed Area, Dorst Campground and along Cedar Grove Road. It appears to be expanding its range in the Sierra Nevada. *F. arundinacea* is an important forage species and has been sown extensively in irrigated pastures in California (Raguse et al. 1967) and rangeland and irrigated pastures in Idaho, Nevada, Oregon and Washington (Buckner and Cowan 1973, Sleper and West 1996). Many populations of this species host a fungal endophyte, which produces an alkaloid that causes severe health disorders in domestic grazing animals (Sleper and West 1996). Nothing is known about the effect of the toxin on wild herbivores. *F. arundinacea* is tolerant of wet soils and forms a dense turf (Buckner and Cowan 1973). Its seed persists in the soil for a short time, usually only one year (Lewis 1973). There is no information about control methods in the literature but there is a wealth of biological information in the agronomy and range literature (Buckner and Cowan 1973, Buckner and Bush 1979, Sleper and West 1996). Because this species is a common invader of riparian habitats herbicide options may be very limited.

Phalaris arundinacea (reed canary grass) is ranked as one of the most invasive alien species by the PNEPPC. Its CalFlora distribution is along the northern coast, the extreme northern portion of the state, the American River drainage and the San Joaquin Valley (Appendix G). This disjunct distribution suggests that *P. arundinacea* may be in the process of greatly expanding its range in California. *P. arundinacea* is found only in Sequoia-Kings Canyon National Parks at the Ash Mountain park boundary, Azalea Campground, Columbine Campground, along the Generals Highway, Grant Grove Developed Area (especially in the streams around Wilsonia) and Lodgepole Developed Area. Directed surveys along riparian areas in Yosemite National Park may discover populations in that park as well. There is some speculation that some native populations of *P. arundinacea* existed in the inland areas of the Pacific Northwest region, but this is now an academic issue due to extensive hybridization with introduced genotypes (Merigliano and Lesica 1998). In any case, it is clearly an alien species in the southern Sierra Nevada. *P. arundinacea* is a 0.8 m to 2 m tall perennial grass that spreads through seed and rhizomes and quickly forms a dense sod that eliminates all other species. There is no published data on the longevity of its seed in soil. The typical habitats it invades are ditch banks, riparian areas and wet meadows, which it dominates through vegetative reproduction and seedling recruitment. This species is dispersed in cow dung, bird droppings (Gillham 1970, Mt. Pleasant and Schlather 1994), probably also in the dung of other animals and by water. Control methods vary with habitat and co-occurring native species, and herbicide options are limited in riparian areas.

Polypogon australis (Chilean beard grass) is a 0.1 m to 1 m tall perennial grass that has not been considered for ranking as an invasive species by CalEPPC. It is native to South America and the CalFlora collection data indicates that it invades riparian areas and lakeshores. Its CalFlora distribution indicates that it can greatly increase its range and that it was collected in the Big Oak Flat area in Tuolumne County in 1935 (Appendix G). The only population detected by the directed surveys is located in Sequoia-Kings Canyon National Parks at the Cedar Grove Pack Station. There is no other information about this species.

Polypogon interruptus (ditch beard grass) is a 0.5 m to 0.9 m tall perennial grass that has not been considered for ranking as an invasive species by CalEPPC. It is native to South America, and the CalFlora collection data indicates that it invades riparian areas. Its CalFlora distribution indicates that it is widespread (Appendix G) but the only population detected by the directed surveys was in Sequoia-Kings Canyon National Parks on the banks of Yucca Creek 100 meters upstream of the Old Hidden Springs Road.

Category 2 Species

Less detailed information is presented for Category 2 species due to a paucity of available information; because of their lesser impacts; and given the large numbers of Category 1 species, because of the reduced likelihood that management efforts would be directed at them. These are species to monitor for changes in their distributions and ecological impacts. Their status should be reevaluated periodically as part of an adaptive management plan using data from the parks and data generated elsewhere.

Sequoia-Kings Canyon National Parks only: *Echinochloa crus-galli* (barnyard grass), *Festuca pratensis* (meadow fescue), *Phalaris minor*, *Phalaris paradoxa*, *Piptatherum miliaceum* (smilo grass), *Polypogon monspeliensis* (annual beard grass), *Sorghum halepense* (johnsongrass), and *Vulpia bromoides* (brome fescue).

Yosemite National Park only: None.

Both Yosemite National Park and Sequoia-Kings Canyon National Parks: *Holcus lanatus* (common velvet grass), *Lolium perenne*, *Phleum pratense*, *Poa bulbosa*, and *Poa compressa* (Canadian bluegrass).

Category 3 Species

Bromus tectorum (cheat grass) is a 0.05 m to 0.4 m tall annual grass that is ranked as one of the most invasive alien species by the CalEPPC. This species has caused extensive ecological harm in the Intermountain Basin and Range region of the western United States by reducing fire return intervals and creating a deep thatch (Upadhyaya et al. 1986, Billings 1990). Its CalFlora distribution indicates that *B. tectorum* is widely distributed across the state (Appendix G). It is widely distributed in both parks at altitudes between 609 and 2,438 m (2,000-8,000 ft). While many of the populations are restricted to roadsides, trailsides and disturbed areas, many other populations exist in undisturbed open areas on well-drained soils. Quadrat data from an undisturbed *Pinus ponderosa/Calocedrus decurrens* forest in Sequoia-Kings Canyon National Parks indicated that *B. tectorum* occurred in only 3 percent of the quadrats and its maximum cover was only 1 percent. This low level of cover in intact forest is similar to that reported for a *Pinus ponderosa* forest in eastern Washington where *B. tectorum* only attained high cover in canopy gaps, and the individuals outside of the gaps produced only 1 seed on average (Pierson and Mack 1990b, a). The authors of that study concluded that *B. tectorum* could not successfully invade those forests without a substantial increase in the size and frequency of canopy disturbance. The distribution of *B. tectorum* in the parks and the published studies suggest that *B. tectorum* is likely to have the greatest impact on native species that require persistent canopy gaps, on native ephemeral species that persist in the soil seed bank until a major disturbance occurs and on the seedlings of perennial and woody species. *B. tectorum* seed is adhesive and is dispersed on footwear and on fur. It is also dispersed in dung, in hay and on vehicles (Lehrer Jr. and Tisdale 1956, Schmida and Ellner 1983, Mosley et al. 1999). Its seed viability in soil is less than 5 years (Upadhyaya et al. 1986).

Poa pratensis (Kentucky bluegrass) is a 0.2 m to 0.7 m tall perennial grass that is ranked as one of the most invasive alien species by the PNEPPC and is considered to be invasive in wet to moist meadows in the Sierra Nevada (Menke et al. 1996). There is speculation that *P. pratensis* ssp. *agassizensis* may be a native species in the Rocky Mountains (Wedin and Huff 1996) and possibly in the Sierra Nevada, but the directed surveys at both parks detected only the alien *P. pratensis* ssp. *Pratensis,* which is also the only subspecies present in the park floras. Its CalFlora distribution indicates that it has a wide distribution in California (Appendix G). The directed-survey data indicate that this species is widely distributed in both parks and is displacing native species at some locations. A study in the Rocky Mountains found that *Poa palustris* (fowl bluegrass) is a more aggressive alien invader of ungrazed riparian areas and wet meadows and speculated that it may be frequently misidentified as *P. pratensis* (Schultz and Leininger 1990). Misidentification of the two species is also common in California (Menke et al. 1996). The CalFlora distribution indicates that *P. palustris* is widely distributed in the Sierra Nevada (Appendix G). *P. pratensis* seed is dispersed by adhering to animals and humans, in cow dung (Dore and Ranmond 1942, Welch 1985, Mt. Pleasant and Schlather 1994, Fischer et al. 1996), and probably in horse dung. Its seed is viable in soil for at least 4 years (Lewis 1973), and it forms a persistent seed bank (Tsuyuzaki and Kanda 1996). When grassland containing *P. pratensis* is grazed, the species responds with a 10-fold increase in seed production (Willms and Quinton 1995). *P. pratensis* spreads vegetatively by rhizomes to form a dense sod. It is more tolerant of continuous, close grazing than any other cool-season grass and is especially tolerant of close grazing by horses and sheep (Wedin and Huff 1996). In the mountains of Oregon it frequently invades lightly grazed meadows of native grasses and clear-cuts sown with various cool season perennial grass mixtures (Krueger and Winward 1974, Miller and Krueger 1976, Miller et al. 1981, Holecheck et al. 1982, Kauffman et al. 1983).

Part IV. Additional Recommendations

The field data and literature that were analyzed in producing this report suggest that both additional data and new park procedures are required for the effective management of alien species. These additional requirements can be grouped into three general categories.

Survey

1) Survey all low and mid elevation riparian areas in both parks and survey high elevation riparian areas near private inholdings or areas where domesticated grazing animals are either permitted or trespass.
2) Survey all meadows to determine the extent of the *Poa pratensis* invasion and the presence of *Poa palustris*.
3) Survey additional disturbed areas, including road and trail corridors, in all three parks to further document present distributions
4) Survey the Siberian Outpost and other dry meadows as well as the Big Whitney Meadow in Inyo National Forest periodically to ensure that alien species adapted to the Basin and Range region are not invading Sequoia National Park.
5) Survey the areas within 100 m of private inholdings, farther if alien species extend farther.
6) Survey roadsides and trails of National Forests and other areas with roads or trails that abut the parks.
7) Maintain all of the survey data in a Geographic Information System.

Research

1) Conduct research on the Category 3 species to determine their extent, growth rates, dispersal vectors and impacts on native species.
2) Model the invasion potential of Category 1 species.
3) Research on the impact of fire restoration to invasives, such as *Bromus tectorum*.

Procedural

1) Establish rapid response procedures for alien species management.
2) Establish procedures for managing areas of natural disturbances to ensure that they are not invaded by alien species.
3) Establish protocols for recording, mapping and monitoring disturbances caused by construction equipment, earth moving equipment, field crews, etc.
4) Require that all pack animals used in the parks be fed certified weed-free feed.
5) Eliminate the grazing by domestic animals of areas invaded by nonnative Kentucky bluegrass (*Poa pratensis ssp. pratensis*) to avoid contributing to its spread
6) Require the use of native grasses in lawns and prohibit the introduction of herbicide-resistant cultivars and invasive cultivars.

Part V. Literature Cited

Aarssen, L.W., Hall, I.V., and Jensen, K.I.N., 1986, The biology of Canadian weeds. 76. *Vicia angustifolia* L., *V. cracca* L., *V. sativa* L., *V. tetrasperma* (L.) Schreb. and *V. villosa* Roth. *Canadian Journal of Plant Science* **66**, p. 711-737.

Alderson, J., and Sharp, W.C., 1995, *Grass Varieties in the United States.* Lewis Publishers, New York.

Anonymous. 1992, *Guidelines for Coordinated Management of Noxious Weeds in the Greater Yellowstone Area.* U.S. Department of Interior and U.S. Department of Agriculture. Washington, D.C.

Anonymous. 1972, *Grass Varieties in the United States.* Agriculture Handbook No. 170. Agricultural Research Service, U.S. Department of Agriculture, Washington, D.C.

Apfelbaum, S.I., and Sams, C.E., 1987, Ecology and control of reed canary *grass (Phalaris arundinacea* L.). *Natural Areas Journal* **7**, p. 69-74.

Asay, K.H., Dewey, D.R., Horton, W.H., Jensen, K.B., Currie, P.O., Chatterton, N.J., Hansen, W.T., II, and Carlson, J.R., 1991, Registration of "Newhy" RS hybrid wheatgrass. *Crop Science* **31**, p. 1384-1385.

Batcher, M.S., 2000, *Element stewardship abstract for* Ligustrum *spp. (privet).* The Nature Conservancy, Arlington, Va.

Bean, C., and Russo, M.J., 1988, *Element stewardship abstract for* Vinca major *(periwinkle):* The Nature Conservancy, Arlington, Va.

Bekker, R.M., Verweij, G.L., Bakker, J.P., and Fresco, L.F.M., 2000, Soil seed bank dynamics in hayfield succession: *Journal of Ecology* **88**, p. 594-607.

Bellue, M.K., 1945, Weed seed handbook, series III: *California Department of Agriculture Bulletin* **34**, p. 116-123.

Billings, W.D., 1990, *Bromus tectorum*, a biotic cause of ecosystem impoverishment in the Great Basin, *in* Woodwell, G.M., ed. *The Earth in Transition: Patterns and Processes of Biotic Impoverishment.* Cambridge University Press, New York, NY, p. 301-322.

Blankespoor, G.W., and May, J.K., 1996, Alien smooth brome (*Bromus inermis* Leyss.) in a tallgrass prairie remnant: seed bank, seedling establishment, and growth dynamics: *Natural Areas Journal* **16**, p. 289-294.

Bossard, C.C., 2000, *Genista monspessulana* (L.) Johnson, *in* Bossard, C.C., Randall, J., and Hoshovsky, M., eds. *Invasive Plants of California's Wildlands:* University of California Press, Berkeley, Calif., p. 203-208.

Bossard, C.C., and Lichti, R., 2000, *Carduus pycnocephalus* L, *in* Bossard, C.C., Randall, J., and Hoshovsky, M., eds. *Invasive Plants of California's Wildlands:*University of California Press, Berkeley, Calif., p. 86-90.

Brede, D., 2000, Four unconventional grasses to know and love: *TurfGrass Trends* **8**, p. 9-14.

Brock, J.H., 1994, *Tamarix* spp. (Salt Cedar), An invasive exotic woody plant in arid and semi- arid riparian habitats of Western USA, *in* de Waal, L.C., Child, L.E., Wade, P.M., and others, eds. *Ecology and Management of Invasive Riverside Plants.* John Wiley and Sons Ltd., New York, NY, p. 27-44.

Buckner, R.C., and Bush, L.P., eds., 1979, *Tall Fescue.* Agronomy Monograph 20. American Society of Agronomy, Madison, Wis.

Buckner, R.C., and Cowan, J.R., 1973, The Fescues, *in* Heath, M.E., Metcalfe, D.S., and Barnes, R.F., eds. *Forages: The Science of Grassland Agriculture:* Iowa State University Press, Ames, Iowa, p. 297-306.

CalFlora, Information on California plants for education, research and conservation, 2000. [http://www.calflora.org/. Accessed: May 14, 2000 and Jan. 30, 2001] Berkeley, Calif.

CalEPPC, 1999, Exotic Pest Plants of Greatest Ecological Concern in California: California Exotic Pest Plant Council www.caleppc.org/info/plantlist.html.

Calihan, R.H., Prather, T.S., and Northam, F.E., 1993, Longevity of yellow starthistle (*Centaurea solstitialis*) achenes in soil: *Weed Technology* **7**, p. 33-35.

Carrier, L., and Bort, K.S., 1916, The history of Kentucky blue grass and white clover in the United States: *Journal of the American Society of Agronomy* **8**, p. 256-266.

Casler, M.D., and Carlson, I.T., 1995, Smooth bromegrass, *in* Barnes, R.F., Miller, D.A., and Nelson, C.J., eds., *Forages: An Introduction to Grassland Agriculture.* Iowa State University Press, Ames, Iowa, 313 p.

Clements, D.R., Upadhyaya, M.K., and Bos, S.J., 1999, The biology of Canadian weeds. 110. *Tragopogon dubius* Scop., *Tragopogon pratensis* L., and *Tragopogon porrifolius* L. *Canadian Journal of Plant Science* **79**, p. 153-163.

Cowie, I.D., and Werner, P.A., 1993, Alien plant species invasive in Kakadu National Park, tropical northern Australia. *Biological Conservation.* **63**, p. 127-135.

D'Antonio, C.M. and Vitousek, P.M., 1992, Biological invasions by exotic grasses, the grass-fire cycle and global change: *Annual Review of Ecology and Systematics* **23**, p. 63-87.

Davis, E.S., Fay, P.K., Chincoine, T.K., and Lacey, C.A., 1993, Persistence of spotted knapweed (*Centaurea maculosa*) seed in soil. *Weed Science* **41**, p. 57-61.

Debussche, M., and Isenmann, P., 1994, Bird-dispersed seed rain and seedling establishment in patchy Mediterranean vegetation: *Oikos* **69**, p. 414-426.

DeFarrari, C.M., and Naiman, R.J., 1994, A multi-scale assessment of the occurrence of exotic plants on the Olympic Peninsula, Washington: *Journal of Vegetation Science* **5**, p. 247-258.

Dewey, D.R., and Plummer, A.P., 1980, New collections of range plants from the Soviet Union: *Journal of Range Management* **33**, p. 89-94.

DiTomaso, J.M., and Gerlach, J.D., Jr., 2000, *Centaurea solstitialis* L, *in* Bossard, C.C., Randall, J., and Hoshovsky, M., eds. *Invasive Plants of California's Wildlands.* University of California, Berkeley, Calif., p. 101-106

Dore, W.G., and Ranmond, L.C., 1942, Pasture studies XXIV: viable seeds in pasture soil and manure. *Scientific Agriculture* **23**, p. 69-79.

Dudley, T.L., 2000, *Arundo donax* L., *in* Bossard, C.C., Randall, J., and Hoshovsky, M., eds., *Invasive Plants of California's Wildlands:* University of California Press, Berkeley, Calif., p. 53-58.

Ebdon, J.S., 2000, Freeze-stress resistance: *TurfGrass Trends* **8**, p. 1-8.

Edgar, J.A., 1994, Toxins in temperate grasses - implications and solutions: *New Zealand Journal of Agricultural Research* **37**, p. 341-347.

Elliot, F.C., 1949, *Bromus inermis* and *B. pumpellianus* in North America: *Evolution* **3**, p. 142-149.

Evans, M.W., 1916, Some effects of legumes on associated nonlegumes: *Journal of the American Society of Agronomy* **8**, p. 348-357.

Evans, R.A., Young, J.A., and Hawkes, R., 1979, Germination characteristics of Italian thistle (*Carduus pycnocephalus*) and slenderflower thistle (*Carduus tenuiflorus*): *Weed Science* **27**, p. 327-332.

Fergus, E.N., and Buckner, R.C., 1973, The bluegrasses and redtop, *in* Heath, M.E., Metcalfe, D.S., and Barnes, R.F., eds., *Forages: The Science of Grassland Agriculture:* Iowa State University Press, Ames, Iowa, p. 243-253.

Fischer, S.F., Poschlod, P. and Beinlich, B., 1996, Experimental studies on the dispersal of plants and animals on sheep in calcareous grasslands: *Journal of Applied Ecology* **33**, p. 1206-1222.

Fuller, T.C., and McClintock, E., 1986, *Poisonous Plants of California:* University of California Press, Berkeley, Calif.

Gillham, M.E., 1970, Seed dispersal by birds, *in* Perring, F., ed. *The Flora of a Changing Britain.* Classey, E.W., Ltd., Middlesex, UK.

Graf, W.L., 1978, Fluvial adjustments to the spread of tamarisk in the Colorado Plateau region: *Geological Society of America Bulletin* **89**, p. 491-501.

Gray, M., and Michael, P.W., 1986, List of plants collected at the old Flemington Saleyards, Sydney, New South Wales: *Plant Protection Quarterly* **1**, p. 135-143.

Grilz, P.L., and Romo, J.T., 1995, Management considerations for controlling smooth brome in fescue prairie: *Natural Areas Journal* **15**, p. 148-156.

Harmon, G.W., and Keim, F.D., 1934, The percentage and viability of weed seeds recovered in the feces of farm animals and their longevity when buried in soil: *Journal of the American Society of Agronomy* **26**, p. 762-767.

Harris, S.A., 2000, *Digitalis purpurea* L. *in* Bossard, C.C., Randall, J.A., and Hoshovsky, M., eds. *Invasive Plants of California's Wildlands:* University of California Press, Berkeley, Calif., p. 158-161.

Harrison, R.D., Page, C.N.J., Curto, R.J., Asay, N.K.H., Jensen, K.B., and Horton, W.H., 1996, *Competition, Biodiversity, Invasion, and Wildlife Use of Selected Introduced Grasses in the Columbia and Great Basins.* No. 155, Utah Experimental Station, Logan, Utah.

Haultain, S.A., Graber, D.M., and Heise, K., 1988, *Preliminary Descriptions of the Natural Plant Communities of Sequoia and Kings Canyon National Parks:* Unpublished Manuscript, National Park Service Files, Sequoia and Kings Canyon National Parks, Calif., 13 p.

Herrera, J., 1991, The reproductive biology of a riparian Mediterranean shrub, *Nerium oleander* L. (Apocynaceae): *Botanical Journal of the Linnean Society* **106**, p. 147-172.

Hickman, J.C., ed., 1993, *The Jepson Manual: Higher Plants of California:* University of California Press, Berkeley, Calif., 1400 p.

Hiebert, R.D., and Stubbendieck, J., 1993, *Handbook for Ranking Exotic Plants for Management and Control:* Department of Interior, National Park Service, Natural Resources Publication NPS/NRMWRO/NRR-93/08. Denver, Colo., 29 p.

Hiscock, S.J., 2000, Genetic control of self-incompatibility in *Senecia squalidus* L. (Asteraceae) a successful colonizing species: *Heredity* **85**, p. 10-19.

Hodkinson, D.J, and Thompson, K., 1997, Plant dispersal: the role of man: *Journal of Applied Ecology* **34**, p. 1484-1496.

Hogan, E.L., ed., 1992, *Sunset Western Garden Book:* Sunset Publishing Corporation, Menlo Park, Calif.

Holecheck, J.L., Vavra, M., and Skovlin, J., 1982, Cattle diet and daily gains on a mountain riparian meadow in northeastern Oregon: *Journal of Range Management* **35**, p. 745-747.

Horthwath, S.E., and Williams, J.T., 1968, Biological flora of the British Isles. *Chrysanthemum* [*Leucanthemum*] *leucanthemum L.* [vulgare Lam.]: *Journal of Ecology* **56**, p. 585-595.

Hoshovsky, M., 1986, *Element stewardship abstract for* Arundo donax *(giant reed):* The Nature Conservancy, Arlington, Va.

Hoshovsky, M., 2000, *Rubus discolor* Weihe & Nees, *in* Bossard, C.C., Randall, J., and Hoshovsky, M., eds. *Invasive Plants of California's Wildlands*: University of California Press, Berkeley, Calif., p. 277-281.

Jung, G.A., and Baker, B.S., 1973, Orchardgrass, *in* Heath, M.E., Metcalfe, D.S., and Barnes, R.F., eds. *Forages: The Science of Grassland Agriculture*: Iowa State University Press, Ames, IA, p. 285-296.

Kauffman, J.B., Krueger, W.C., and Vavra, M., 1983, Effects of late season cattle grazing on riparian plant communities: *Journal of Range Management* **36**, p. 685-691.

Keeley, J.E., 1992, *Nerium oleander* L. (Apocynaceae). *Madroño* 39, 157 p.

Kehr, W.R., Rumbaugh, M.D., Semeniuk, G., Barnes, D.K., Frosheiser, F.I., and Manglitz, G.R., 1984, Registration of Daneb I, Daneb II BW1, and Daneb I P2, alfalfa germplasm with multiple pest resistance: *Crop Science* **24**, 1001 p.

Kelley, A.D., and Bruns, V.F., 1975, Dissemination of weed seeds by irrigation water: *Weed Science* **23**, p. 486-493.

Kelly, M., 1999, Roundup of Arundo projects reveals commitment, strategic weaknesses: *CalEPPC News* **7**, p. 4-9.

Klinger, R., 2000, *Foniculum vulgare* Miller. *in* Bossard, C.C., Randall, J., and Hoshovsky, M., eds. *Invasive Plants of California's Wildlands:* University of California Press, Berkeley, Calif., p. 198-202.

Krueger, W.C., and Winward, A.H., 1974, Influence of cattle and big game grazing on understory structure of a douglasfir-ponderosa pine-Kentucky bluegrass community: *Journal of Range Management* **27**, p. 450-453.

Legendre, P., and Legendre, L., 1998, *Numerical Ecology,* 2nd English edition: Elsevier, New York, NY.

Lehrer, W.P., Jr., and Tisdale, E.W., 1956, Effect of sheep and rabbit digestion on the viability of some range plant seeds: *Journal of Range Management* **9**, p. 118-122.

Lewis, J., 1973, Longevity of crop and weed seeds: survival after 20 years in soil: *Weed Research* **13**, p. 179-191.

Lisci, M., and Pascini, E., 1994, Germination ecology of the druplets of the fig (*Ficus carica* L.): *Botanical Journal of the Linnean Society* **114**, p. 133-146.

Looman, J., 1976, Productivity of permanent bromegrass pastures in the parklands of the prairie provences: *Canadian Journal of Plant Science* **56**, p. 829-835.

Lovich, J., 2000, *Tamarix ramosissima* Ledeb., *Tamarix chinensis, Tamarix gallica, Tamarix parviflora, in* Bossard, C.C., Randall, J., and Hoshovsky, M., eds. *Invasive Plants of California's Wildlands:* University of California Press, Berkeley, Calif., p. 312-317.

Lowe, C.C., Marble, V.L., and Rumbaugh, M.D., 1972, Adaptation, varieties, and usage, *in* Hanson, C.H., ed. *Alfalfa Science and Technology:* American Society of Agronomy, Madison, Wis., p. 391-411.

Macdonald, I.A.W., Graber, D.M., DeBenedetti, S., Groves, R.H. and Fuentes, E.R., 1988, Introduced species in nature reserves in Mediterranean-type climatic regions of the world: *Biological Conservation* **44**, p. 37-66.

Malo, J.E., and Suarez, F., 1995, Herbivorous mammals as seed dispersers in a Mediterranean dehesa: *Oecologia* **104**, p. 246-255.

McClay, A.S., and Ophel, K.M., 1993, Toxigenic Calvibacter/Anguina associations infecting grass seedheads: *Annual Review of Phytopathology* **31**, p. 151-167.

Menke, J.M., Davis, C., and Beesley, P., 1996, *Rangeland assessment, in* Sierra Nevada Ecosystem Project: Final Report to Congress, Vol. III: University of California, Centers for Water and Wildlife Resources, Davis, Calif., p. 901-972.

Merigliano, M.F., and Lesica, P., 1998, The native status of reed canarygrass (*Phalaris arundinacea* L.) in the inland northwest, USA: *Natural Areas Journal* **18**, p. 223-230.

Miller, R.F., and Krueger, W.C., 1976, Cattle use on summer foothill rangelands in northeastern Oregon: *Journal of Range Management* **29**, p. 367-371.

Miller, R.F., Krueger, W.C., and Vavra, M., 1981, Deer and elk use on foothill rangelands in northeastern Oregon: *Journal of Range Management* **34**, p. 201-204.

Moore, P.E., 1993, *Preliminary Descriptions of the Terrestrial Natural Communities of Yosemite National Park, California.* Unpublished Manuscript, Yosemite Research Center Files, Yosemite National Park, Calif., 42 p.

Mosley, J.C., Bunting, S.C., and Manoukian, M.E., 1999, Cheatgrass, *in* Sheley, R.L., and Petroff, J.K., eds. *Biology and Management of Noxious Rangeland Weeds*: University of Oregon Press, Corvalis, Oreg., p. 175-188.

Mt. Pleasant, J., and Schlather, K.J., 1994, Incidence of weed seed in cow (*Bos* sp.) manure and its importance as a weed source for cropland: *Weed Technology* **8**, p. 304-310.

Myers, W.M., and Chilton, S.J.P., 1941, Correlated studies of winterhardiness and rust reaction of parents and inbred progenies of orchard grass and timothy: *American Society of Agronomy Journal* **33**, p. 215-220.

National Park Service, 1996, *Preserving Our Natural Heritage: A Strategic Plan for Managing Invasive Nonnative Plants on National Park System Lands:* U.S. Department of the Interior, National Park Service, Washington, D.C., 16 p.

National Park Service, 2000, *Final Yosemite Valley Plan Supplemental Environmental Impact Statement. Volume IA, Purpose and Need, Alternatives, Affected Environment:* U.S. Department of Interior, National Park Service, Yosemite National Park, Yosemite, Calif., 524 p.

APPENDICES

Schmida, A., and Ellner, S., 1983, Seed dispersal on pastoral grazers in open Mediterranean chaparral, Israel: *Israel Journal of Botany* **32,** p. 147-159.

Schultz, T.T., and Leininger, W.C., 1990, Differences in riparian vegetation structure between grazed areas and exclosures: *Journal of Range Management* **43**, p. 295-299.

Sheley, R.L., Jacobs, J.S., and C.M.L., 1999, Spotted knapweed, *in* Sheley, R.L., and Petroff, J.K., eds. *Biology and Management of Noxious Rangeland Weeds:* University of Oregon Press, Corvalis, Oreg.

Sleper, D.A., and West, C.P., 1996, Tall fescue, *in* Moser, L.E., Buxton, D.R., and Casler, M.D., eds. *Cool-Season Forages:* American Society of Agronomy, Madison, Wis., p. 471-502.

St John-Sweeting, R.S., and Morris, K.A., 1990, Seed transmission through the digestive tract of the horse, *in Proceedings of the 9th Australian Weeds Conference:* South Australia, Australia, p. 137-139.

Stein, E.D., and Vartanian, V., 1997, Killing the beast: a cooperative approach for control of *Arundo donax* in the Santa Ana River watershed: *CalEPPC News* **5**, p. 4-6.

Toole, E.H., and Brown, E., 1946, Final results of the Duvel buried seed experiment: *Journal of Agricultural Research* **72**, p. 201-210.

Tsuyuzaki, S., and Kanda, F., 1996, Revegetation patterns and seed bank structure on abandoned pastures in northern Japan: *American Journal of Botany* **83**, p. 1422-1428.

Turkington, R.A., Cavers, P.B., and Rempel, E., 1978, The biology of Canadian weeds. 29. *Melilotus alba* Desr. and *M. officinalis* (L.) Lam: *Canadian Journal of Plant Science* **58**, p. 523-537.

Tyser, R.W., and Worley, C.A., 1992, Alien flora in grasslands adjacent to road and trail corridors in Glacier National Park, Montana (U.S.A.): *Conservation Biology* **6**, p. 253-262.

Upadhyaya, M.K., Turkington, R., and McIlvride, D., 1986, The biology of Canadian weeds. 75. *Bromus tectorum* L.: *Canadian Journal of Plant Science* **66**, p. 689-709.

Vankat, J.L., 1982, A gradient perspective on the vegetation of Sequoia National Park, California: *Madroño* **29**, p. 200-214.

van Santen, E., and Sleper, D.A., 1996, Orchardgrass, *in* Moser, L.E., Buxton, D.R., and Casler, M.D., eds. *Cool-Season Forages:* American Society of Agronomy, Madison, Wis., p. 503-534.

Vitousek, P.M., and Walker, L.R., 1989, Biological invasion by *Myrica faya* in Hawaii: plant demography, nitrogen fixation, ecosytem effects: *Ecological Monographs* **59**, p. 247-265.

Vogel, K.P., Moore, K.J., and Moser, L.E., 1996, Bromegrasses, *in* Moser, L.E., Buxton, D.R., and Casler, M.D., eds. *Cool-Season Forages:* American Society of Agronomy, Madison, Wis., p. 535-567.

Wallender, R.T., Olson, B.E., and Lacey, J.R., 1995, Spotted knapweed seed viability after passing through sheep and mule deer: *Journal of Range Management* **48**.

Warner, P.J., 2000, *Mentha pulegium* L., *in* Bossard, C.C., Randall, J., and Hoshovsky, M., eds. *Invasive Plants of California's Wildlands:* University of California Press, Berkeley, Calif., p. 240-244.

Warren, J.M., 2000, The role of white clover in the loss of diversity in grassland habitat restoration: *Restoration Ecology* **8**, p. 318-323.

Watson, A.K., and Renney, A.J., 1974, The biology of Canadian weeds. 6. *Centaurea diffusa* and *C. maculosa: Canadian Journal of Plant Science* **54**, p. 687-701.

Weaver, S.E., and Riley, W.R., 1982, The biology of Canadian weeds. 53. *Convolvulus arvensis* L.: *Canadian Journal of Plant Science* **62**, p. 461-472.

Wedin, W.F., and Huff, D.R., 1996, Bluegrass, *in* Moser, L.E., Buxton, D.R., and Casler, M.D., eds. *Cool-Season Forage Grasses:* American Society of Agronomy, Madison, Wis., p. 665-690.

Weiss, J., and J. Sagliocco. 2000. Horehound (*Marrubium vulgare*): a comparison between European and Australian populations. *Plant Protection Quarterly* **15**:18-20.

Welch, D. 1985. Studies in the grazing of heather moorland in north-east Scotland. IV. Seed dispersal and plant establishment in dung. *Journal of Applied Ecology* **22**:461-472.

Willms, W. D., and D. A. Quinton. 1995. Grazing effects on germinable seeds on the fescue prairie. *Journal of Range Management* **48**:423-430.

Wipff, J. K., and C. Rose-Fricker. 2000. Determining gene flow of transgenic creeping bentgrass and gene transfer to other bentgrass species. *Diversity* **16**:36-39.

Young, J. A., E. Martens, and N. E. West. 1992. Germination of bur buttercup seeds. *Journal of Range Management* **45**:358-362.

Zamora, D. L., and J. P. Olivarez. 1994. The viability of seeds in feed pellets. *Weed Technology* **8**:148-153.

Appendix A. Sequoia-Kings Canyon National Parks - Priority alien species by species and by site.

Site	Alien Species
Ash Mountain Developed Area	*Ampelopsis arborea*
Ash Mountain Developed Area	*Arundo donax*
Sycamore Creek, M. F. Kaweah	*Arundo donax*
Sunset Campground	*Bromus tectorum*
Azalea Campground	*Bromus tectorum*
Big Stump Picnic Area	*Bromus tectorum*
Buckeye Campground	*Bromus tectorum*
Camp Conifer	*Bromus tectorum*
Cedar Grove Market and Lodge	*Bromus tectorum*
Cedar Grove Pack Station	*Bromus tectorum*
Cedar Grove Road	*Bromus tectorum*
Colony Mill Road	*Bromus tectorum*
Crystal Cave Parking Lot	*Bromus tectorum*
Giant Forest Sewage Plant	*Bromus tectorum*
High Sierra Trail	*Bromus tectorum*
Lewis Creek Trail	*Bromus tectorum*
Lodgepole Campground	*Bromus tectorum*
Middle Fork Flume	*Bromus tectorum*
Milk Ranch Lookout	*Bromus tectorum*
Moraine Campground	*Bromus tectorum*
Oriole Lake Meadow	*Bromus tectorum*
Oriole Lake Road	*Bromus tectorum*
Rae Lakes Loop Trail	*Bromus tectorum*
Red Fir Maintenance Area	*Bromus tectorum*
Redwood Creek, Mineral King	*Bromus tectorum*
Sheep Creek Campground	*Bromus tectorum*
Sugarbowl Trail	*Bromus tectorum*
Wuksachi	*Bromus tectorum*
Zumwalt Meadow Trail	*Bromus tectorum*
Ash Mountain Developed Area	*Carduus pycnocephalus*
Colony Mill Road	*Carduus pycnocephalus*
Elk Creek Trail, M. F. Kaweah	*Carduus pycnocephalus*
Hospital Rock	*Carduus pycnocephalus*
North Fork Parking Lot	*Carduus pycnocephalus*
Potwisha Campground	*Carduus pycnocephalus*
South Fork Campground	*Carduus pycnocephalus*
Sycamore Creek, M. F. Kaweah	*Carduus pycnocephalus*
Yucca Creek, N. F. Kaweah	*Carduus pycnocephalus*
Grunnigan Ranch	*Carya*
Ash Mountain Park Boundary	*Catalpa bignonioides*
Generals Highway	*Centaurea solstitialis*
Swale Campground	*Centaurea solstitialis*
Sunset Campground	*Cirsium vulgare*
Azalea Campground	*Cirsium vulgare*
Cedar Grove Road	*Cirsium vulgare*
Columbine Picnic Area	*Cirsium vulgare*
Crystal Springs Campground	*Cirsium vulgare*
Dorst Campground	*Cirsium vulgare*
Ferguson Creek Area	*Cirsium vulgare*
Giant Forest Sewage Plant	*Cirsium vulgare*
Grant Grove Developed Area	*Cirsium vulgare*
Lodgepole Developed Area	*Cirsium vulgare*
Marvin Pass Trail	*Cirsium vulgare*
Milk Ranch Road	*Cirsium vulgare*
Muir Grove	*Cirsium vulgare*
Old Hidden Springs Road	*Cirsium vulgare*
Rae Lakes Loop Trail	*Cirsium vulgare*
Red Fir Maintenance Area	*Cirsium vulgare*
Redwood Canyon Trail	*Cirsium vulgare*

Site	Alien Species	Site Type
Ash Mountain Developed Area	*Ampelopsis arborea*	Development
Ash Mountain Developed Area	*Arundo donax*	Development
Ash Mountain Developed Area	*Carduus pycnocephalus*	Natural
Ash Mountain Developed Area	*Cistus*	Development
Ash Mountain Developed Area	*Dactylis glomerata*	Development
Ash Mountain Developed Area	*Festuca arundinacea*	Development
Ash Mountain Developed Area	*Festuca pratensis*	Development
Ash Mountain Developed Area	*Genista monspessulana*	Development
Ash Mountain Developed Area	*Hedera helix*	Development
Ash Mountain Developed Area	*Heteromeles arbutifolia*	Development
Ash Mountain Developed Area	*Lathyrus latifolius*	Development
Ash Mountain Developed Area	*Leucojum aestivum*	Development
Ash Mountain Developed Area	*Ligustrum sinense*	Development
Ash Mountain Developed Area	*Medicago sativa*	Development
Ash Mountain Developed Area	*Melilotus indica*	Development
Ash Mountain Developed Area	*Oxalis pes-caprae*	Development
Ash Mountain Developed Area	*Poa bulbosa*	Development
Ash Mountain Developed Area	*Poa pratensis*	Development
Ash Mountain Developed Area	*Polypogon monspeliensis*	Development
Ash Mountain Developed Area	*Punica granatum*	Development
Ash Mountain Developed Area	*Pyracantha angustifolia*	Development
Ash Mountain Developed Area	*Spartium junceum*	Development
Ash Mountain Developed Area	*Trifolium repens*	Development
Ash Mountain Developed Area	*Verbascum thapsus*	Development
Ash Mountain Developed Area	*Vicia sativa*	Development
Ash Mountain Developed Area	*Vinca major*	Development
Ash Mountain Park Boundary	*Catalpa bignonioides*	Development
Ash Mountain Park Boundary	*Eucalyptus citriodora*	Development
Ash Mountain Park Boundary	*Melilotus indica*	Development
Ash Mountain Park Boundary	*Phalaris paradoxa*	Development
Ash Mountain Slash Pit	*Polypogon monspeliensis*	Development
Ash Mountain Slash Pit	*Urtica urens*	Development
Atwell Mill Campground	*Poa pratensis*	Campground
Atwell Mill Campground	*Trifolium repens*	Campground
Austin Meadow	*Poa pratensis*	Pasture
Azalea Campground	*Bromus tectorum*	Campground
Azalea Campground	*Cirsium vulgare*	Campground
Azalea Campground	*Holcus lanatus*	Campground
Azalea Campground	*Phalaris arundinacea*	Campground
Azalea Campground	*Poa bulbosa*	Campground
Azalea Campground	*Poa pratensis*	Campground
Azalea Campground	*Verbascum thapsus*	Campground
Azalea Campground	*Verbascum virgatum*	Campground
Big Stump Picnic Area	*Bromus tectorum*	Development
Big Stump Picnic Area	*Poa pratensis*	Development
Big Stump Picnic Area	*Tragopogon dubius*	Development
Buckeye Campground	*Bromus tectorum*	Campground
Buckeye Campground	*Marrubium vulgare*	Campground
Buckeye Campground	*Poa bulbosa*	Campground
Cahoon Meadow	*Poa pratensis*	Natural
Camp Conifer	*Bromus tectorum*	Road
Camp Conifer	*Poa compressa*	Road
Camp Conifer	*Verbascum thapsus*	Road
Cedar Grove Market and Lodge	*Bromus tectorum*	Development
Cedar Grove Market and Lodge	*Melilotus alba*	Development
Cedar Grove Market and Lodge	*Poa bulbosa*	Development
Cedar Grove Market and Lodge	*Poa pratensis*	Development
Cedar Grove Pack Station	*Bromus tectorum*	Corral
Cedar Grove Pack Station	*Phalaris minor*	Corral

Appendix A: (continued)

Site	Alien Species
Sequoia Lake Trail	*Cirsium vulgare*
South Fork Campground	*Cirsium vulgare*
Sugarbowl Trail	*Cirsium vulgare*
Swale Campground	*Cirsium vulgare*
Wuksachi	*Cirsium vulgare*
Zumwalt Meadow Trail	*Cirsium vulgare*
Ash Mountain Developed Area	*Cistus*
Potwisha Campground	*Convolvulus arvensis*
Sunset Campground	*Dactylis glomerata*
Ash Mountain Developed Area	*Dactylis glomerata*
Columbine Picnic Area	*Dactylis glomerata*
Dorst Campground	*Dactylis glomerata*
Generals Highway	*Dactylis glomerata*
Giant Forest Developed Area	*Dactylis glomerata*
Lodgepole Developed Area	*Dactylis glomerata*
Trail For All People	*Dactylis glomerata*
Cold Springs Campground	*Digitalis purpurea*
Giant Forest Developed Area	*Digitalis purpurea*
Grant Grove Developed Area	*Digitalis purpurea*
Lodgepole Developed Area	*Digitalis purpurea*
Sunset Campground	*Digitalis purpurea*
Grunnigan Ranch	*Diospyros*
Crystal Cave Road.	*Echinochloa crus-galli*
Middle Fork, Kaweah River	*Echinochloa crus-galli*
North Fork, Kaweah River	*Echinochloa crus-galli*
Rae Lakes Loop Trail	*Echinochloa crus-galli*
Sycamore Creek, M. F. Kaweah	*Echinochloa crus-galli*
Wuksachi	*Echinochloa crus-galli*
Ash Mountain Park Boundary	*Eucalyptus citriodora*
Ash Mountain Developed Area	*Festuca arundinacea*
Cedar Grove Road	*Festuca arundinacea*
Dorst Campground	*Festuca arundinacea*
Ash Mountain Developed Area	*Festuca pratensis*
Crescent Meadow Trail	*Festuca pratensis*
Middle Fork, Kaweah River	*Ficus carica*
Yucca Creek, N. F. Kaweah	*Ficus carica*
Ash Mountain Developed Area	*Genista monspessulana*
Ash Mountain Developed Area	*Hedera helix*
Ash Mountain Developed Area	*Heteromeles arbutifolia*
Azalea Campground	*Holcus lanatus*
Cedar Grove Road	*Holcus lanatus*
Grant Grove Developed Area	*Holcus lanatus*
Marvin Pass Trail	*Holcus lanatus*
Lodgepole Developed Area	*Iris*
Yucca Creek, N. F. Kaweah	*Juglans californica*
Yucca Creek, N. F. Kaweah	*Juglans regia*
Ash Mountain Developed Area	*Lathyrus latifolius*
Traugers Creek, E. F. Kaweah	*Lathyrus latifolius*
Ash Mountain Developed Area	*Leucojum aestivum*
Ash Mountain Developed Area	*Ligustrum sinense*
Cedar Grove Road	*Lolium perenne*
Hospital Rock	*Lolium perenne*
Traugers Creek, E. F. Kaweah	*Malus sylvestris*
Buckeye Campground	*Marrubium vulgare*
Potwisha Campground	*Marrubium vulgare*
Sycamore Creek, M. F. Kaweah	*Marrubium vulgare*
Ash Mountain Developed Area	*Medicago sativa*
Milk Ranch Road	*Medicago sativa*
Cedar Grove Market and Lodge	*Melilotus alba*
Dorst Campground	*Melilotus alba*

Site	Alien Species	Site Type
Cedar Grove Pack Station	*Poa bulbosa*	Corral
Cedar Grove Pack Station	*Polypogon australis*	Corral
Cedar Grove Pack Station	*Polypogon monspeliensis*	Corral
Cedar Grove Pack Station	*Trifolium repens*	Corral
Cedar Grove Pack Station	*Urtica urens*	Corral
Cedar Grove Road	*Bromus tectorum*	Road
Cedar Grove Road	*Cirsium vulgare*	Road
Cedar Grove Road	*Festuca arundinacea*	Road
Cedar Grove Road	*Holcus lanatus*	Road
Cedar Grove Road	*Lolium perenne*	Road
Cedar Grove Road	*Poa bulbosa*	Road
Cedar Grove Road	*Poa pratensis*	Road
Cedar Grove Road	*Tragopogon dubius*	Road
Cedar Grove Road	*Verbascum thapsus*	Road
Cherry Flat Trail	*Poa bulbosa*	Trail
Cold Springs Campground	*Digitalis purpurea*	Campground
Cold Springs Campground	*Poa pratensis*	Campground
Cold Springs Campground	*Verbascum thapsus*	Campground
Colony Mill Road	*Bromus tectorum*	Road
Colony Mill Road	*Carduus pycnocephalus*	Road
Colony Mill Road	*Morus alba*	Riparian
Columbine Picnic Area	*Cirsium vulgare*	Development
Columbine Picnic Area	*Dactylis glomerata*	Riparian
Columbine Picnic Area	*Phalaris arundinacea*	Development
Columbine Picnic Area	*Poa pratensis*	Development
Columbine Picnic Area	*Trifolium repens*	Development
Crescent Meadow Trail	*Festuca pratensis*	Natural
Crescent Meadow Trail	*Phleum pratense*	Natural
Crescent Meadow Trail	*Poa pratensis*	Natural
Crystal Cave Parking Lot	*Bromus tectorum*	Development
Crystal Cave Parking Lot	*Prunus persica*	Development
Crystal Cave Parking Lot	*Tragopogon dubius*	Development
Crystal Cave Parking Lot	*Vulpia bromoides*	Development
Crystal Cave Road.	*Echinochloa crus-galli*	Road
Crystal Springs Campground	*Cirsium vulgare*	Campground
Crystal Springs Campground	*Poa pratensis*	Campground
Deadman Canyon Trail	*Poa pratensis*	Riparian
Dorst Campground	*Cirsium vulgare*	Campground
Dorst Campground	*Dactylis glomerata*	Campground
Dorst Campground	*Festuca arundinacea*	Campground
Dorst Campground	*Melilotus alba*	Campground
Dorst Campground	*Melilotus officinalis*	Campground
Dorst Campground	*Poa pratensis*	Campground
Dorst Campground	*Tragopogon dubius*	Campground
Dorst Campground	*Trifolium repens*	Campground
Dorst Campground	*Verbascum thapsus*	Campground
Elk Creek Trail, M. F. Kaweah	*Carduus pycnocephalus*	Natural
Ferguson Creek Area	*Cirsium vulgare*	Natural
Generals Highway	*Centaurea solstitialis*	Road
Generals Highway	*Dactylis glomerata*	Road
Generals Highway	*Melilotus indica*	Road
Generals Highway	*Oxalis pes-caprae*	Road
Generals Highway	*Phalaris paradoxa*	Road
Generals Highway	*Sorghum halepense*	Road
Generals Highway	*Spartium junceum*	Road
Generals Highway	*Tragopogon dubius*	Road
Generals Highway	*Vicia sativa*	Road
Generals Highway	*Vicia villosa*	Road
Generals Highway	*Vinca major*	Riparian
Giant Forest Developed Area	*Dactylis glomerata*	Development

Appendix A: (continued)

Site	Alien Species
Wuksachi	*Melilotus alba*
Ash Mountain Developed Area	*Melilotus indica*
Ash Mountain Park Boundary	*Melilotus indica*
Generals Highway	*Melilotus indica*
Sycamore Creek, M. F. Kaweah	*Melilotus indica*
Dorst Campground	*Melilotus officinalis*
North Fork, Kaweah River	*Mentha pulegium*
North Fork, Kaweah River	*Mentha spicata*
Colony Mill Road	*Morus alba*
Middle Fork, Kaweah River	*Morus alba*
Grunnigan Ranch	*Nerium oleander*
Grunnigan Ranch	*Olea europaea*
Ash Mountain Developed Area	*Oxalis pes-caprae*
Generals Highway	*Oxalis pes-caprae*
Azalea Campground	*Phalaris arundinacea*
Columbine Picnic Area	*Phalaris arundinacea*
Grant Grove Developed Area	*Phalaris arundinacea*
Grant Grove Pack Station	*Phalaris arundinacea*
Lodgepole Developed Area	*Phalaris arundinacea*
Cedar Grove Pack Station	*Phalaris minor*
Ash Mountain Park Boundary	*Phalaris paradoxa*
Generals Highway	*Phalaris paradoxa*
Crescent Meadow Trail	*Phleum pratense*
Grant Grove Developed Area	*Phleum pratense*
Hockett Meadow and Pasture	*Phleum pratense*
Scaffold Meadow	*Phleum pratense*
Trail For All People	*Phleum pratense*
North Fork, Kaweah River	*Piptatherum miliaceum*
Ash Mountain Developed Area	*Poa bulbosa*
Azalea Campground	*Poa bulbosa*
Buckeye Campground	*Poa bulbosa*
Cedar Grove Market and Lodge	*Poa bulbosa*
Cedar Grove Pack Station	*Poa bulbosa*
Cedar Grove Road	*Poa bulbosa*
Cherry Flat Trail	*Poa bulbosa*
Giant Forest Developed Area	*Poa bulbosa*
Lodgepole Campground	*Poa bulbosa*
Milk Ranch Lookout	*Poa bulbosa*
Potwisha Campground	*Poa bulbosa*
Sheep Creek Campground	*Poa bulbosa*
Camp Conifer	*Poa compressa*
Sheep Creek Campground	*Poa compressa*
Sunset Campground	*Poa pratensis*
Ash Mountain Developed Area	*Poa pratensis*
Atwell Mill Campground	*Poa pratensis*
Austin Meadow	*Poa pratensis*
Azalea Campground	*Poa pratensis*
Big Stump Picnic Area	*Poa pratensis*
Cahoon Meadow	*Poa pratensis*
Cedar Grove Market and Lodge	*Poa pratensis*
Cedar Grove Road	*Poa pratensis*
Cold Springs Campground	*Poa pratensis*
Columbine Picnic Area	*Poa pratensis*
Crescent Meadow Trail	*Poa pratensis*
Crystal Springs Campground	*Poa pratensis*
Deadman Canyon Trail	*Poa pratensis*
Dorst Campground	*Poa pratensis*
Giant Forest Developed Area	*Poa pratensis*
Grant Grove Developed Area	*Poa pratensis*
Grasshopper Meadow	*Poa pratensis*

Site	Alien Species	Site Type
Giant Forest Developed Area	*Digitalis purpurea*	Development
Giant Forest Developed Area	*Poa bulbosa*	Development
Giant Forest Developed Area	*Poa pratensis*	Development
Giant Forest Developed Area	*Tragopogon dubius*	Development
Giant Forest Developed Area	*Verbascum thapsus*	Development
Giant Forest Sewage Plant	*Bromus tectorum*	Development
Giant Forest Sewage Plant	*Cirsium vulgare*	Development
Giant Forest Sewage Plant	*Rubus*	Development
Grant Grove Developed Area	*Cirsium vulgare*	Development
Grant Grove Developed Area	*Digitalis purpurea*	Development
Grant Grove Developed Area	*Holcus lanatus*	Development
Grant Grove Developed Area	*Phalaris arundinacea*	Development
Grant Grove Developed Area	*Phleum pratense*	Development
Grant Grove Developed Area	*Poa pratensis*	Development
Grant Grove Developed Area	*Tanacetum parthenium*	Development
Grant Grove Developed Area	*Trifolium repens*	Development
Grant Grove Developed Area	*Verbascum thapsus*	Development
Grant Grove Pack Station	*Phalaris arundinacea*	Corral
Grant Grove Pack Station	*Urtica urens*	Corral
Grasshopper Meadow	*Poa pratensis*	Pasture
Grunnigan Ranch	*Carya*	Development
Grunnigan Ranch	*Diospyros*	Development
Grunnigan Ranch	*Nerium oleander*	Development
Grunnigan Ranch	*Olea europaea*	Development
Grunnigan Ranch	*Punica granatum*	Development
Grunnigan Ranch	*Pyracantha angustifolia*	Development
Grunnigan Ranch	*Rubus discolor*	Development
Halstead Meadow	*Poa pratensis*	Natural
Halstead Meadow	*Tragopogon dubius*	Natural
High Sierra Trail	*Bromus tectorum*	Trail
High Sierra Trail	*Poa pratensis*	Trail
Hockett Meadow and Pasture	*Phleum pratense*	Trail
Hockett Meadow and Pasture	*Poa pratensis*	Pasture
Hospital Rock	*Carduus pycnocephalus*	Development
Hospital Rock	*Lolium perenne*	Development
Hospital Rock	*Poa pratensis*	Development
Hospital Rock	*Polypogon monspeliensis*	Road
JR Meadow	*Poa pratensis*	Pasture
Kern Ranger Station Pasture	*Poa pratensis*	Pasture
Lewis Creek Trail	*Bromus tectorum*	Trail
Lewis Creek Trail	*Poa pratensis*	Riparian
Lodgepole Campground	*Bromus tectorum*	Campground
Lodgepole Campground	*Poa bulbosa*	Campground
Lodgepole Campground	*Poa pratensis*	Campground
Lodgepole Developed Area	*Cirsium vulgare*	Development
Lodgepole Developed Area	*Dactylis glomerata*	Development
Lodgepole Developed Area	*Digitalis purpurea*	Development
Lodgepole Developed Area	*Iris*	Development
Lodgepole Developed Area	*Phalaris arundinacea*	Development
Lodgepole Developed Area	*Verbascum thapsus*	Development
Lodgepole Developed Area	*Verbascum virgatum*	Development
Marble Fork, Kaweah River	*Rubus discolor*	Riparian
Marvin Pass Trail	*Cirsium vulgare*	Trail
Marvin Pass Trail	*Holcus lanatus*	Trail
Marvin Pass Trail	*Poa pratensis*	Trail
Middle Fork Flume	*Bromus tectorum*	Development
Middle Fork, Kaweah River	*Echinochloa crus-galli*	Riparian
Middle Fork, Kaweah River	*Ficus carica*	Riparian
Middle Fork, Kaweah River	*Morus alba*	Riparian
Middle Fork, Kaweah River	*Polypogon monspeliensis*	Riparian

Appendix A: (continued)

Site	Alien Species
Halstead Meadow	*Poa pratensis*
High Sierra Trail	*Poa pratensis*
Hockett Meadow and Pasture	*Poa pratensis*
Hospital Rock	*Poa pratensis*
JR Meadow	*Poa pratensis*
Kern Ranger Station Pasture	*Poa pratensis*
Lewis Creek Trail	*Poa pratensis*
Lodgepole Campground	*Poa pratensis*
Marvin Pass Trail	*Poa pratensis*
Mineral King Pack Station	*Poa pratensis*
Oriole Lake Meadow	*Poa pratensis*
Oriole Lake Road	*Poa pratensis*
Potwisha Campground	*Poa pratensis*
Rae Lakes Loop Trail	*Poa pratensis*
Rae Lakes Loop Trail	*Poa pratensis*
Rae Lakes Loop Trail	*Poa pratensis*
Rae Lakes Loop Trail	*Poa pratensis*
Rattlesnake Creek Trail	*Poa pratensis*
Red Fir Maintenance Area	*Poa pratensis*
Redwood Creek, Mineral King	*Poa pratensis*
Scaffold Meadow	*Poa pratensis*
Sequoia Lake Trail	*Poa pratensis*
Sheep Creek Campground	*Poa pratensis*
Sugarloaf Meadow	*Poa pratensis*
Traugers Creek, E. F. Kaweah	*Poa pratensis*
Williams Meadow	*Poa pratensis*
Wolverton Snow Play Area	*Poa pratensis*
Yucca Creek, N. F. Kaweah	*Poa pratensis*
Zumwalt Meadow Trail	*Poa pratensis*
Cedar Grove Pack Station	*Polypogon australis*
Yucca Creek, N. F. Kaweah	*Polypogon interruptus*
Ash Mountain Developed Area	*Polypogon monspeliensis*
Ash Mountain Slash Pit	*Polypogon monspeliensis*
Cedar Grove Pack Station	*Polypogon monspeliensis*
Hospital Rock	*Polypogon monspeliensis*
Middle Fork, Kaweah River	*Polypogon monspeliensis*
North Fork, Kaweah River	*Polypogon monspeliensis*
Shepherd Saddle Road	*Polypogon monspeliensis*
Shepherd Saddle Road	*Polypogon monspeliensis*
Sycamore Creek, M. F. Kaweah	*Polypogon monspeliensis*
Yucca Creek, N. F. Kaweah	*Polypogon monspeliensis*
Crystal Cave Parking Lot	*Prunus persica*
Ash Mountain Developed Area	*Punica granatum*
Grunnigan Ranch	*Punica granatum*
Ash Mountain Developed Area	*Pyracantha angustifolia*
Grunnigan Ranch	*Pyracantha angustifolia*
Middle Fork, Kaweah River	*Pyracantha angustifolia*
Sycamore Creek, M. F. Kaweah	*Pyracantha angustifolia*
Potwisha Campground	*Ranunculus parviflorus*
Sentinel Campground	*Ranunculus testiculatus*
Giant Forest Sewage Plant	*Rubus*
Grunnigan Ranch	*Rubus discolor*
Marble Fork, Kaweah River	*Rubus discolor*
North Fork, Kaweah River	*Rubus discolor*
Potwisha Campground	*Rubus discolor*
Redwood Creek, Mineral King	*Rubus discolor*
Yucca Creek, N. F. Kaweah	*Rubus discolor*
Old Hidden Springs Road	*Silybum marianum*
Yucca Creek, N. F. Kaweah	*Silybum marianum*
Generals Highway	*Sorghum halepense*

Site	Alien Species	Site Type
Middle Fork, Kaweah River	*Pyracantha angustifolia*	Riparian
Middle Fork, Kaweah River	*Spartium junceum*	Riparian
Middle Fork, Kaweah River	*Tamarix*	Riparian
Milk Ranch Lookout	*Bromus tectorum*	Development
Milk Ranch Lookout	*Poa bulbosa*	Development
Milk Ranch Road	*Cirsium vulgare*	Road
Milk Ranch Road	*Medicago sativa*	Road
Mineral King Pack Station	*Poa pratensis*	Development
Mineral King Pack Station	*Trifolium repens*	Development
Mineral King Pack Station	*Urtica urens*	Corral
Mineral King Pack Station	*Verbascum thapsus*	Road
Moraine Campground	*Bromus tectorum*	Campground
Muir Grove	*Cirsium vulgare*	Natural
North Fork Parking Lot	*Carduus pycnocephalus*	Development
North Fork, Kaweah River	*Echinochloa crus-galli*	Riparian
North Fork, Kaweah River	*Mentha pulegium*	Riparian
North Fork, Kaweah River	*Mentha spicata*	Riparian
North Fork, Kaweah River	*Piptatherum miliaceum*	Riparian
North Fork, Kaweah River	*Polypogon monspeliensis*	Riparian
North Fork, Kaweah River	*Rubus discolor*	Riparian
North Fork, Kaweah River	*Tamarix*	Riparian
North Fork, Kaweah River	*Verbascum thapsus*	Riparian
Old Hidden Springs Road	*Cirsium vulgare*	Riparian
Old Hidden Springs Road	*Silybum marianum*	Trail
Old Hidden Springs Road	*Vicia benghalensis*	Road
Oriole Lake Airstrip	*Vulpia bromoides*	Development
Oriole Lake Meadow	*Bromus tectorum*	Pasture
Oriole Lake Meadow	*Poa pratensis*	Pasture
Oriole Lake Meadow	*Trifolium repens*	Pasture
Oriole Lake Meadow	*Verbascum thapsus*	Pasture
Oriole Lake Road	*Bromus tectorum*	Road
Oriole Lake Road	*Poa pratensis*	Road
Oriole Lake Road	*Trifolium repens*	Road
Oriole Lake Road	*Verbascum thapsus*	Road
Potwisha Campground	*Carduus pycnocephalus*	Campground
Potwisha Campground	*Convolvulus arvensis*	Campground
Potwisha Campground	*Marrubium vulgare*	Campground
Potwisha Campground	*Poa bulbosa*	Campground
Potwisha Campground	*Poa pratensis*	Campground
Potwisha Campground	*Ranunculus parviflorus*	Campground
Potwisha Campground	*Rubus discolor*	Campground
Potwisha Campground	*Urtica urens*	Campground
Potwisha Campground	*Vinca major*	Campground
Potwisha Campground	*Vulpia bromoides*	Dirt Road
Rae Lakes Loop Trail	*Bromus tectorum*	Trail
Rae Lakes Loop Trail	*Cirsium vulgare*	Trail
Rae Lakes Loop Trail	*Echinochloa crus-galli*	Trail
Rae Lakes Loop Trail	*Poa pratensis*	Natural
Rae Lakes Loop Trail	*Poa pratensis*	Pasture
Rae Lakes Loop Trail	*Poa pratensis*	Riparian
Rae Lakes Loop Trail	*Poa pratensis*	Trail
Rae Lakes Loop Trail	*Verbascum thapsus*	Riparian
Rattlesnake Creek Trail	*Poa pratensis*	Riparian
Red Fir Maintenance Area	*Bromus tectorum*	Development
Red Fir Maintenance Area	*Cirsium vulgare*	Development
Red Fir Maintenance Area	*Poa pratensis*	Development
Red Fir Maintenance Area	*Verbascum virgatum*	Development
Redwood Canyon Trail	*Cirsium vulgare*	Trail
Redwood Canyon Trail	*Trifolium repens*	Trail
Redwood Creek, Mineral King	*Bromus tectorum*	Development

Appendix A: (continued)

Site	Alien Species
Ash Mountain Developed Area	*Spartium junceum*
Generals Highway	*Spartium junceum*
Middle Fork, Kaweah River	*Spartium junceum*
Middle Fork, Kaweah River	*Tamarix*
North Fork, Kaweah River	*Tamarix*
Sycamore Creek, M. F. Kaweah	*Tamarix*
Grant Grove Developed Area	*Tanacetum parthenium*
Big Stump Picnic Area	*Tragopogon dubius*
Cedar Grove Road	*Tragopogon dubius*
Crystal Cave Parking Lot	*Tragopogon dubius*
Dorst Campground	*Tragopogon dubius*
Generals Highway	*Tragopogon dubius*
Giant Forest Developed Area	*Tragopogon dubius*
Halstead Meadow	*Tragopogon dubius*
South Fork Campground	*Tragopogon dubius*
Wolverton Pack Station	*Tragopogon dubius*
Wuksachi	*Tragopogon dubius*
Ash Mountain Developed Area	*Trifolium repens*
Atwell Mill Campground	*Trifolium repens*
Cedar Grove Pack Station	*Trifolium repens*
Columbine Picnic Area	*Trifolium repens*
Dorst Campground	*Trifolium repens*
Grant Grove Developed Area	*Trifolium repens*
Mineral King Pack Station	*Trifolium repens*
Oriole Lake Meadow	*Trifolium repens*
Oriole Lake Road	*Trifolium repens*
Redwood Canyon Trail	*Trifolium repens*
Redwood Creek, Mineral King	*Trifolium repens*
Ash Mountain Slash Pit	*Urtica urens*
Cedar Grove Pack Station	*Urtica urens*
Grant Grove Pack Station	*Urtica urens*
Mineral King Pack Station	*Urtica urens*
Potwisha Campground	*Urtica urens*
Sunset Campground	*Verbascum thapsus*
Ash Mountain Developed Area	*Verbascum thapsus*
Azalea Campground	*Verbascum thapsus*
Camp Conifer	*Verbascum thapsus*
Cedar Grove Road	*Verbascum thapsus*
Cold Springs Campground	*Verbascum thapsus*
Dorst Campground	*Verbascum thapsus*
Giant Forest Developed Area	*Verbascum thapsus*
Grant Grove Developed Area	*Verbascum thapsus*
Lodgepole Developed Area	*Verbascum thapsus*
Mineral King Pack Station	*Verbascum thapsus*
North Fork, Kaweah River	*Verbascum thapsus*
Oriole Lake Meadow	*Verbascum thapsus*
Oriole Lake Road	*Verbascum thapsus*
Rae Lakes Loop Trail	*Verbascum thapsus*
Swale Campground	*Verbascum thapsus*
Wuksachi	*Verbascum thapsus*
Zumwalt Meadow Trail	*Verbascum thapsus*
Azalea Campground	*Verbascum virgatum*
Lodgepole Developed Area	*Verbascum virgatum*
Red Fir Maintenance Area	*Verbascum virgatum*
Wuksachi	*Verbascum virgatum*
Old Hidden Springs Road	*Vicia benghalensis*
Ash Mountain Developed Area	*Vicia sativa*
Generals Highway	*Vicia sativa*
Generals Highway	*Vicia villosa*
Ash Mountain Developed Area	*Vinca major*

Site	Alien Species	Site Type
Redwood Creek, Mineral King	*Poa pratensis*	Development
Redwood Creek, Mineral King	*Rubus discolor*	Development
Redwood Creek, Mineral King	*Trifolium repens*	Development
Scaffold Meadow	*Phleum pratense*	Pasture
Scaffold Meadow	*Poa pratensis*	Pasture
Sentinel Campground	*Ranunculus testiculatus*	Campground
Sequoia Lake Trail	*Cirsium vulgare*	Trail
Sequoia Lake Trail	*Poa pratensis*	Riparian
Sheep Creek Campground	*Bromus tectorum*	Campground
Sheep Creek Campground	*Poa bulbosa*	Campground
Sheep Creek Campground	*Poa compressa*	Campground
Sheep Creek Campground	*Poa pratensis*	Campground
Shepherd Saddle Road	*Polypogon monspeliensis*	Development
Shepherd Saddle Road	*Polypogon monspeliensis*	Road
South Fork Campground	*Carduus pycnocephalus*	Campground
South Fork Campground	*Cirsium vulgare*	Campground
South Fork Campground	*Tragopogon dubius*	Campground
South Fork Campground	*Vulpia bromoides*	Campground
Sugarbowl Trail	*Bromus tectorum*	Natural
Sugarbowl Trail	*Cirsium vulgare*	Natural
Sugarloaf Meadow	*Poa pratensis*	Pasture
Sunset Campground	*Bromus tectorum*	Natural
Sunset Campground	*Cirsium vulgare*	Natural
Sunset Campground	*Dactylis glomerata*	Natural
Sunset Campground	*Digitalis purpurea*	Natural
Sunset Campground	*Poa pratensis*	Natural
Sunset Campground	*Verbascum thapsus*	Natural
Swale Campground	*Centaurea solstitialis*	Campground
Swale Campground	*Cirsium vulgare*	Campground
Swale Campground	*Verbascum thapsus*	Campground
Sycamore Creek, M. F. Kaweah	*Arundo donax*	Riparian
Sycamore Creek, M. F. Kaweah	*Carduus pycnocephalus*	Riparian
Sycamore Creek, M. F. Kaweah	*Echinochloa crus-galli*	Riparian
Sycamore Creek, M. F. Kaweah	*Marrubium vulgare*	Riparian
Sycamore Creek, M. F. Kaweah	*Melilotus indica*	Riparian
Sycamore Creek, M. F. Kaweah	*Polypogon monspeliensis*	Riparian
Sycamore Creek, M. F. Kaweah	*Pyracantha angustifolia*	Riparian
Sycamore Creek, M. F. Kaweah	*Tamarix*	Riparian
Trail For All People	*Dactylis glomerata*	Trail
Trail For All People	*Phleum pratense*	Trail
Traugers Creek, E. F. Kaweah	*Lathyrus latifolius*	Riparian
Traugers Creek, E. F. Kaweah	*Malus sylvestris*	Riparian
Traugers Creek, E. F. Kaweah	*Poa pratensis*	Riparian
Williams Meadow	*Poa pratensis*	Pasture
Wolverton Pack Station	*Tragopogon dubius*	Pack Station
Wolverton Snow Play Area	*Poa pratensis*	Development
Wuksachi	*Bromus tectorum*	Development
Wuksachi	*Cirsium vulgare*	Development
Wuksachi	*Echinochloa crus-galli*	Development
Wuksachi	*Melilotus alba*	Development
Wuksachi	*Tragopogon dubius*	Development
Wuksachi	*Verbascum thapsus*	Development
Wuksachi	*Verbascum virgatum*	Development
Yucca Creek, N. F. Kaweah	*Carduus pycnocephalus*	Riparian
Yucca Creek, N. F. Kaweah	*Ficus carica*	Riparian
Yucca Creek, N. F. Kaweah	*Juglans californica*	Riparian
Yucca Creek, N. F. Kaweah	*Juglans regia*	Riparian
Yucca Creek, N. F. Kaweah	*Poa pratensis*	Riparian
Yucca Creek, N. F. Kaweah	*Polypogon interruptus*	Riparian
Yucca Creek, N. F. Kaweah	*Polypogon monspeliensis*	Riparian

Appendix A: (continued)

Site	Alien Species
Generals Highway	*Vinca major*
Potwisha Campground	*Vinca major*
Yucca Creek, N. F. Kaweah	*Vitis vinifera*
Crystal Cave Parking Lot	*Vulpia bromoides*
Oriole Lake Airstrip	*Vulpia bromoides*
Potwisha Campground	*Vulpia bromoides*
South Fork Campground	*Vulpia bromoides*

Site	Alien Species	Site Type
Yucca Creek, N. F. Kaweah	*Rubus discolor*	Riparian
Yucca Creek, N. F. Kaweah	*Silybum marianum*	Riparian
Yucca Creek, N. F. Kaweah	*Vitis vinifera*	Riparian
Zumwalt Meadow Trail	*Bromus tectorum*	Riparian
Zumwalt Meadow Trail	*Cirsium vulgare*	Riparian
Zumwalt Meadow Trail	*Poa pratensis*	Riparian
Zumwalt Meadow Trail	*Verbascum thapsus*	Riparian

Appendix B. Yosemite National Park – priority alien species by species and by site.

Site	Alien Species
Backpacker's Camp	*Agrostis gigantea*
Concession Stables (YV)	*Agrostis gigantea*
Foresta East	*Agrostis gigantea*
Foresta West	*Agrostis gigantea*
Happy Isles	*Agrostis gigantea*
Housekeeping Camp	*Agrostis gigantea*
Lower Pines Campground	*Agrostis gigantea*
Lower River Campground	*Agrostis gigantea*
Meadow Loop Trail - Wawona	*Agrostis gigantea*
Mirror Lake	*Agrostis gigantea*
North Pines Campground	*Agrostis gigantea*
North Wawona-Central section	*Agrostis gigantea*
North Wawona-Western section	*Agrostis gigantea*
Old Big Oak Flat Rd. Trail	*Agrostis gigantea*
Snow Creek Trail	*Agrostis gigantea*
The Ahwahnee hotel	*Agrostis gigantea*
Upper Old El Portal	*Agrostis gigantea*
Wawona Road (6051)	*Agrostis gigantea*
Wawona Road 3 (6040)	*Agrostis gigantea*
Yosemite Lodge	*Agrostis gigantea*
Yosemite Loop Trail	*Agrostis gigantea*
Yosemite Village	*Agrostis gigantea*
Concession Stables (YV)	*Bromus inermis*
Curry Village	*Bromus inermis*
El Portal Road	*Bromus inermis*
Foresta East	*Bromus inermis*
Happy Isles	*Bromus inermis*
Hetch Hetchy Road (5505)	*Bromus inermis*
Housekeeping Camp	*Bromus inermis*
Lower Old El Portal	*Bromus inermis*
Lower River Campground	*Bromus inermis*
McCauley Ranch	*Bromus inermis*
Meadow Loop Trail - Wawona	*Bromus inermis*
North Pines Campground	*Bromus inermis*
North Wawona-Central section	*Bromus inermis*
North Wawona-Western section	*Bromus inermis*
Panorama Trail	*Bromus inermis*
The Ahwahnee hotel	*Bromus inermis*
Tioga Road (7981)	*Bromus inermis*
Tuolumne Grove	*Bromus inermis*
Upper Old El Portal	*Bromus inermis*
Upper Rancheria - El Portal	*Bromus inermis*
Wawona Road 2 (5143)	*Bromus inermis*
Wawona Road 3 (6040)	*Bromus inermis*
Yosemite Lodge	*Bromus inermis*
Yosemite Village	*Bromus inermis*
Alder Creek Trail	*Bromus tectorum*
Backpacker's Camp	*Bromus tectorum*
Big Oak Flat Road (4661)	*Bromus tectorum*

Site	Alien Species	Site Type
Alder Creek Trail	*Bromus tectorum*	Trail
Alder Creek Trail	*Holcus lanatus*	Trail
Alder Creek Trail	*Hypericum perforatum*	Trail
Alder Creek Trail	*Poa pratensis*	Trail
Backpacker's Camp	*Agrostis gigantea*	Campground
Backpacker's Camp	*Bromus tectorum*	Campground
Backpacker's Camp	*Cirsium vulgare*	Campground
Backpacker's Camp	*Holcus lanatus*	Campground
Backpacker's Camp	*Poa pratensis*	Campground
Backpacker's Camp	*Rubus discolor*	Campground
Backpacker's Camp	*Verbascum thapsus*	Campground
Badger Pass Parking Area	*Cirsium vulgare*	Development
Badger Pass Parking Area	*Poa pratensis*	Development
Badger Pass Parking Area	*Verbascum thapsus*	Development
Badger Pass Ski Resort	*Poa pratensis*	Development
Big Oak Flat Road (4661)	*Bromus tectorum*	Road
Big Oak Flat Road (4661)	*Holcus lanatus*	Road
Big Oak Flat Road (4661)	*Hypericum perforatum*	Road
Big Oak Flat Road (4661)	*Phleum pratense*	Road
Big Oak Flat Road (4661)	*Poa bulbosa*	Road
Big Oak Flat Road (4946)	*Bromus tectorum*	Road
Big Oak Flat Road (4946)	*Dactylis glomerata*	Road
Big Oak Flat Road (4946)	*Hypericum perforatum*	Road
Big Oak Flat Road (4946)	*Lathyrus latifolius*	Road
Big Oak Flat Road (4946)	*Phleum pratense*	Road
Big Oak Flat Road (4946)	*Poa bulbosa*	Road
Big Oak Flat Road (5272)	*Bromus tectorum*	Road
Big Oak Flat Road (5272)	*Holcus lanatus*	Road
Big Oak Flat Road (5272)	*Poa pratensis*	Road
Big Oak Flat Road (5902)	*Bromus tectorum*	Road
Big Oak Flat Road (5902)	*Cirsium vulgare*	Road
Bridalveil Campground	*Holcus lanatus*	Campground
Bridalveil Campground	*Poa pratensis*	Campground
Bridalveil Creek Trail	*Poa pratensis*	Trail
Bridalveil Falls – Inspiration Point	*Bromus tectorum*	Trail
Bridalveil Falls - Inspiration Point	*Cirsium vulgare*	Trail
Bridalveil Falls - Inspiration Point	*Holcus lanatus*	Trail
Bridalveil Falls Trail	*Bromus tectorum*	Trail
Bridalveil Falls Trail	*Poa bulbosa*	Trail
Bridalveil Falls Trail	*Poa pratensis*	Trail
Chilnualna Falls Trail	*Bromus tectorum*	Trail
Chilnualna Falls Trail	*Holcus lanatus*	Trail
Chilnualna Falls Trail	*Poa compressa*	Trail
Concession Stables (YV)	*Agrostis gigantea*	Stock
Concession Stables (YV)	*Bromus inermis*	Stock
Concession Stables (YV)	*Bromus tectorum*	Stock
Concession Stables (YV)	*Cirsium vulgare*	Stock
Concession Stables (YV)	*Dactylis glomerata*	Stock
Concession Stables (YV)	*Holcus lanatus*	Stock

Appendix B. (continued)

Site	Alien Species
Big Oak Flat Road (4946)	*Bromus tectorum*
Big Oak Flat Road (5272)	*Bromus tectorum*
Big Oak Flat Road (5902)	*Bromus tectorum*
Bridalveil Falls - Inspiration Point	*Bromus tectorum*
Bridalveil Falls Trail	*Bromus tectorum*
Chilnualna Falls Trail	*Bromus tectorum*
Concession Stables (YV)	*Bromus tectorum*
El Portal Road	*Bromus tectorum*
Foresta East	*Bromus tectorum*
Foresta West	*Bromus tectorum*
Four-mile Trail	*Bromus tectorum*
Government Stables	*Bromus tectorum*
Happy Isles	*Bromus tectorum*
Hetch Hetchy Backpacker's Camp	*Bromus tectorum*
Hetch Hetchy Corral	*Bromus tectorum*
Hetch Hetchy Road (5505)	*Bromus tectorum*
Inspiration Pt. Trail	*Bromus tectorum*
Lower Old El Portal	*Bromus tectorum*
Lower Pines Campground	*Bromus tectorum*
Lower River Campground	*Bromus tectorum*
Mariposa Grove Trail	*Bromus tectorum*
McCauley Ranch	*Bromus tectorum*
Meadow Loop Trail - Wawona	*Bromus tectorum*
Mirror Lake	*Bromus tectorum*
Mirror Lake Pack Trail	*Bromus tectorum*
North Pines Campground	*Bromus tectorum*
North Wawona-Central section	*Bromus tectorum*
North Wawona-Eastern section	*Bromus tectorum*
North Wawona-Western section	*Bromus tectorum*
Northside Drive	*Bromus tectorum*
Old Big Oak Flat Rd. Trail	*Bromus tectorum*
Panorama Trail	*Bromus tectorum*
Snow Creek Trail	*Bromus tectorum*
Southside Drive	*Bromus tectorum*
Sunnyside Campground	*Bromus tectorum*
The Ahwahnee hotel	*Bromus tectorum*
Tioga Road (8472)	*Bromus tectorum*
Upper Pines Campground	*Bromus tectorum*
Upper Rancheria - El Portal	*Bromus tectorum*
Wawona Campground	*Bromus tectorum*
Wawona Road (3964)	*Bromus tectorum*
Wawona Road (6051)	*Bromus tectorum*
Wawona Road 2 (5143)	*Bromus tectorum*
Wawona Road 3 (6040)	*Bromus tectorum*
Wawona Stables	*Bromus tectorum*
Yosemite Falls Trail	*Bromus tectorum*
Yosemite Lodge	*Bromus tectorum*
Yosemite Loop Trail	*Bromus tectorum*
Yosemite Village	*Bromus tectorum*
Yosemite West	*Bromus tectorum*
Lower River Campground	*Carduus pycnocephalus*
Concession Stables (YV)	*Hypericum perforatum*
Concession Stables (YV)	*Leucanthemum vulgare*
Concession Stables (YV)	*Lolium perenne*
Concession Stables (YV)	*Phleum pratense*
Concession Stables (YV)	*Poa bulbosa*
Concession Stables (YV)	*Poa pratensis*
Concession Stables (YV)	*Rubus discolor*
Concession Stables (YV)	*Tragopogon dubius*
Concession Stables (YV)	*Trifolium repens*
Concession Stables (YV)	*Verbascum thapsus*
Crane Flat Campground	*Cirsium vulgare*
Crane Flat Campground	*Phleum pratense*
Curry Village	*Bromus inermis*
Curry Village	*Cirsium vulgare*
Curry Village	*Dactylis glomerata*
Curry Village	*Holcus lanatus*
Curry Village	*Lolium perenne*
Curry Village	*Phleum pratense*
Curry Village	*Poa pratensis*
Curry Village	*Rubus discolor*
Curry Village	*Trifolium repens*
El Portal Road	*Bromus inermis*
El Portal Road	*Bromus tectorum*
El Portal Road	*Poa bulbosa*
El Portal Road	*Poa pratensis*
Foresta East	*Agrostis gigantea*
Foresta East	*Bromus inermis*
Foresta East	*Bromus tectorum*
Foresta East	*Centaurea maculosa*
Foresta East	*Centaurea solstitialis*
Foresta East	*Cirsium vulgare*
Foresta East	*Digitalis purpurea*
Foresta East	*Holcus lanatus*
Foresta East	*Lathyrus latifolius*
Foresta East	*Leucanthemum vulgare*
Foresta East	*Poa pratensis*
Foresta East	*Tragopogon dubius*
Foresta East	*Trifolium repens*
Foresta West	*Agrostis gigantea*
Foresta West	*Bromus tectorum*
Foresta West	*Cirsium vulgare*
Foresta West	*Holcus lanatus*
Foresta West	*Leucanthemum vulgare*
Foresta West	*Lolium perenne*
Foresta West	*Poa pratensis*
Foresta West	*Tragopogon dubius*
Foresta West	*Verbascum thapsus*
Four-mile Trail	*Bromus tectorum*
Four-mile Trail	*Holcus lanatus*
Four-mile Trail	*Poa bulbosa*
Four-mile Trail	*Poa pratensis*

Site Type
Stock
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Campground
Campground
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Trail
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Trail

Appendix B. (continued)

Site	Alien Species
Foresta East	*Centaurea maculosa*
Foresta East	*Centaurea solstitialis*
Hetch Hetchy Corral	*Centaurea solstitialis*
Lower Old El Portal	*Centaurea solstitialis*
McCauley Ranch	*Centaurea solstitialis*
Upper Old El Portal	*Centaurea solstitialis*
Upper Rancheria - El Portal	*Centaurea solstitialis*
Wawona Road 2 (5143)	*Centaurea solstitialis*
Backpacker's Camp	*Cirsium vulgare*
Badger Pass Parking Area	*Cirsium vulgare*
Big Oak Flat Road (5902)	*Cirsium vulgare*
Bridalveil Falls - Inspiration Point	*Cirsium vulgare*
Concession Stables (YV)	*Cirsium vulgare*
Crane Flat Campground	*Cirsium vulgare*
Curry Village	*Cirsium vulgare*
Foresta East	*Cirsium vulgare*
Foresta West	*Cirsium vulgare*
Glacier Point Road (6440)	*Cirsium vulgare*
Happy Isles	*Cirsium vulgare*
Hodgdon Meadow Campground	*Cirsium vulgare*
Housekeeping Camp	*Cirsium vulgare*
Lower Pines Campground	*Cirsium vulgare*
Mariposa Grove - Lower Grove	*Cirsium vulgare*
Mariposa Grove - Upper	*Cirsium vulgare*
Mariposa Grove Trail	*Cirsium vulgare*
McCauley Ranch	*Cirsium vulgare*
Meadow Loop Trail - Wawona	*Cirsium vulgare*
Mirror Lake	*Cirsium vulgare*
Mirror Lake Pack Trail	*Cirsium vulgare*
North Pines Campground	*Cirsium vulgare*
North Wawona-Central section	*Cirsium vulgare*
North Wawona-Eastern section	*Cirsium vulgare*
North Wawona-Western section	*Cirsium vulgare*
Old Big Oak Flat Rd. Trail	*Cirsium vulgare*
Panorama Trail	*Cirsium vulgare*
Southside Drive	*Cirsium vulgare*
Tioga Road (6254)	*Cirsium vulgare*
Upper Pines Campground	*Cirsium vulgare*
Wawona Campground	*Cirsium vulgare*
Wawona Road (6051)	*Cirsium vulgare*
Wawona Road 2 (5143)	*Cirsium vulgare*
Wawona Road 3 (6040)	*Cirsium vulgare*
Yosemite Lodge	*Cirsium vulgare*
Yosemite Loop Trail	*Cirsium vulgare*
Yosemite Village	*Cirsium vulgare*
Yosemite West	*Cirsium vulgare*
McCauley Ranch	*Convolvulus arvensis*
Upper Old El Portal	*Convolvulus arvensis*
Yosemite Village	*Convolvulus arvensis*
Lower Old El Portal	*Coreopsis lanceolata*
Big Oak Flat Road (4946)	*Dactylis glomerata*

Site	Alien Species	Site Type
Glacier Point Road (6440)	*Cirsium vulgare*	Road
Glen Aulin High Sierra Camp	*Poa pratensis*	Camp
Glen Aulin High Sierra Camp	*Trifolium repens*	Camp
Glen Aulin Trail	*Poa pratensis*	Trail
Glen Aulin Trail	*Trifolium repens*	Trail
Government Corrals - Tuolumne	*Poa pratensis*	Stock
Government Stables	*Bromus tectorum*	Stock
Government Stables	*Poa bulbosa*	Stock
Government Stables	*Urtica urens*	Stock
Happy Isles	*Agrostis gigantea*	Trail
Happy Isles	*Bromus inermis*	Trail
Happy Isles	*Bromus tectorum*	Trail
Happy Isles	*Cirsium vulgare*	Trail
Happy Isles	*Holcus lanatus*	Trail
Happy Isles	*Marrubium vulgare*	Trail
Happy Isles	*Poa pratensis*	Trail
Harden Lake Corral	*Poa pratensis*	Stock
Harden Lake Corral	*Trifolium repens*	Stock
Hetch Hetchy Backpacker's Camp	*Bromus tectorum*	Campground
Hetch Hetchy Backpacker's Camp	*Hypericum perforatum*	Campground
Hetch Hetchy Backpacker's Camp	*Melilotus alba*	Campground
Hetch Hetchy Backpacker's Camp	*Melilotus indica*	Campground
Hetch Hetchy Backpacker's Camp	*Poa bulbosa*	Campground
Hetch Hetchy Backpacker's Camp	*Poa pratensis*	Campground
Hetch Hetchy Backpacker's Camp	*Tragopogon dubius*	Campground
Hetch Hetchy Corral	*Bromus tectorum*	Stock
Hetch Hetchy Corral	*Centaurea solstitialis*	Stock
Hetch Hetchy Corral	*Poa bulbosa*	Stock
Hetch Hetchy Corral	*Poa pratensis*	Stock
Hetch Hetchy Corral	*Polypogon monspeliensis*	Stock
Hetch Hetchy Road (5505)	*Bromus inermis*	Road
Hetch Hetchy Road (5505)	*Bromus tectorum*	Road
Hetch Hetchy Road (5505)	*Hypericum perforatum*	Road
Hodgdon Meadow Campground	*Cirsium vulgare*	Campground
Hodgdon Meadow Campground	*Holcus lanatus*	Campground
Hodgdon Meadow Campground	*Phleum pratense*	Campground
Hodgdon Meadow Campground	*Poa pratensis*	Campground
Hodgdon Meadow Campground	*Tragopogon dubius*	Campground
Housekeeping Camp	*Agrostis gigantea*	Development
Housekeeping Camp	*Bromus inermis*	Development
Housekeeping Camp	*Cirsium vulgare*	Development
Housekeeping Camp	*Dactylis glomerata*	Development
Housekeeping Camp	*Holcus lanatus*	Development
Housekeeping Camp	*Lolium perenne*	Development
Housekeeping Camp	*Rubus discolor*	Development
Housekeeping Camp	*Verbascum thapsus*	Development
Inspiration Pt. Trail	*Bromus tectorum*	Trail
Lower Old El Portal	*Bromus inermis*	Development
Lower Old El Portal	*Bromus tectorum*	Development
Lower Old El Portal	*Centaurea solstitialis*	Development
Lower Old El Portal	*Coreopsis lanceolata*	Development

Appendix B. (continued)

Site	Alien Species
Concession Stables (YV)	*Dactylis glomerata*
Curry Village	*Dactylis glomerata*
Housekeeping Camp	*Dactylis glomerata*
Lower Pines Campground	*Dactylis glomerata*
Lower River Campground	*Dactylis glomerata*
Meadow Loop Trail - Wawona	*Dactylis glomerata*
Merced Grove trail	*Dactylis glomerata*
Mirror Lake	*Dactylis glomerata*
North Wawona-Central section	*Dactylis glomerata*
North Wawona-Eastern section	*Dactylis glomerata*
North Wawona-Western section	*Dactylis glomerata*
Northside Drive	*Dactylis glomerata*
Southside Drive	*Dactylis glomerata*
The Ahwahnee hotel	*Dactylis glomerata*
Tioga Road (6254)	*Dactylis glomerata*
Tuolumne Concessions Stables	*Dactylis glomerata*
Upper Old El Portal	*Dactylis glomerata*
Upper Pines Campground	*Dactylis glomerata*
Yosemite Lodge	*Dactylis glomerata*
Foresta East	*Digitalis purpurea*
North Wawona-Central section	*Digitalis purpurea*
North Wawona-Eastern section	*Digitalis purpurea*
North Wawona-Western section	*Digitalis purpurea*
The Ahwahnee hotel	*Erigeron strigosus*
Lower River Campground	*Foeniculum vulgare*
Lower River Campground	*Geranium robertianum*
Yosemite Village	*Hedera helix*
Alder Creek Trail	*Holcus lanatus*
Backpacker's Camp	*Holcus lanatus*
Big Oak Flat Road (4661)	*Holcus lanatus*
Big Oak Flat Road (5272)	*Holcus lanatus*
Bridalveil Campground	*Holcus lanatus*
Bridalveil Falls - Inspiration Point	*Holcus lanatus*
Chilnualna Falls Trail	*Holcus lanatus*
Concession Stables (YV)	*Holcus lanatus*
Curry Village	*Holcus lanatus*
Foresta East	*Holcus lanatus*
Foresta West	*Holcus lanatus*
Four-mile Trail	*Holcus lanatus*
Happy Isles	*Holcus lanatus*
Hodgdon Meadow Campground	*Holcus lanatus*
Housekeeping Camp	*Holcus lanatus*
Lower Pines Campground	*Holcus lanatus*
Lower River Campground	*Holcus lanatus*
Mariposa Grove - Lower Grove	*Holcus lanatus*
Mariposa Grove Trail	*Holcus lanatus*
McCauley Ranch	*Holcus lanatus*
Meadow Loop Trail - Wawona	*Holcus lanatus*
Mirror Lake	*Holcus lanatus*
Mirror Lake Pack Trail	*Holcus lanatus*
North Pines Campground	*Holcus lanatus*

Site	Alien Species	Site Type
Lower Old El Portal	*Marrubium vulgare*	Development
Lower Old El Portal	*Melilotus alba*	Development
Lower Old El Portal	*Melilotus indica*	Development
Lower Old El Portal	*Mentha spicata*	Development
Lower Old El Portal	*Rubus discolor*	Development
Lower Old El Portal	*Tragopogon dubius*	Development
Lower Old El Portal	*Trifolium repens*	Development
Lower Old El Portal	*Verbascum thapsus*	Development
Lower Old El Portal	*Vinca major*	Development
Lower Pines Campground	*Agrostis gigantea*	Campground
Lower Pines Campground	*Bromus tectorum*	Campground
Lower Pines Campground	*Cirsium vulgare*	Campground
Lower Pines Campground	*Dactylis glomerata*	Campground
Lower Pines Campground	*Holcus lanatus*	Campground
Lower Pines Campground	*Phleum pratense*	Campground
Lower Pines Campground	*Poa bulbosa*	Campground
Lower Pines Campground	*Poa pratensis*	Campground
Lower Pines Campground	*Rubus discolor*	Campground
Lower Pines Campground	*Rubus lacinatus*	Campground
Lower Pines Campground	*Trifolium repens*	Campground
Lower Pines Campground	*Verbascum thapsus*	Campground
Lower River Campground	*Agrostis gigantea*	Campground
Lower River Campground	*Bromus inermis*	Campground
Lower River Campground	*Bromus tectorum*	Campground
Lower River Campground	*Carduus pycnocephalus*	Campground
Lower River Campground	*Dactylis glomerata*	Campground
Lower River Campground	*Foeniculum vulgare*	Campground
Lower River Campground	*Geranium robertianum*	Campground
Lower River Campground	*Holcus lanatus*	Campground
Lower River Campground	*Hypericum perforatum*	Campground
Lower River Campground	*Lolium perenne*	Campground
Lower River Campground	*Marrubium vulgare*	Campground
Lower River Campground	*Melilotus alba*	Campground
Lower River Campground	*Poa bulbosa*	Campground
Lower River Campground	*Poa pratensis*	Campground
Lower River Campground	*Rubus discolor*	Campground
Lower River Campground	*Tragopogon dubius*	Campground
Lower River Campground	*Trifolium repens*	Campground
Lower River Campground	*Verbascum thapsus*	Campground
Mariposa Grove - Lower Grove	*Cirsium vulgare*	Development
Mariposa Grove - Lower Grove	*Holcus lanatus*	Development
Mariposa Grove - Lower Grove	*Poa pratensis*	Development
Mariposa Grove - Lower Grove	*Verbascum thapsus*	Development
Mariposa Grove - Upper	*Cirsium vulgare*	Development
Mariposa Grove - Upper	*Poa pratensis*	Development
Mariposa Grove Trail	*Bromus tectorum*	Trail
Mariposa Grove Trail	*Cirsium vulgare*	Trail
Mariposa Grove Trail	*Holcus lanatus*	Trail
Mariposa Grove Trail	*Poa pratensis*	Trail
McCauley Ranch	*Bromus inermis*	Stock
McCauley Ranch	*Bromus tectorum*	Stock

Appendix B. (continued)

Site	Alien Species
North Wawona-Central section	*Holcus lanatus*
North Wawona-Eastern section	*Holcus lanatus*
North Wawona-Western section	*Holcus lanatus*
Old Big Oak Flat Rd. Trail	*Holcus lanatus*
The Ahwahnee hotel	*Holcus lanatus*
Upper Pines Campground	*Holcus lanatus*
Wawona Campground	*Holcus lanatus*
Wawona Road (3964)	*Holcus lanatus*
Wawona Road (6051)	*Holcus lanatus*
Wawona Stables	*Holcus lanatus*
Yosemite Falls Trail	*Holcus lanatus*
Yosemite Lodge	*Holcus lanatus*
Yosemite Loop Trail	*Holcus lanatus*
Yosemite Village	*Holcus lanatus*
Alder Creek Trail	*Hypericum perforatum*
Big Oak Flat Road (4661)	*Hypericum perforatum*
Big Oak Flat Road (4946)	*Hypericum perforatum*
Concession Stables (YV)	*Hypericum perforatum*
Hetch Hetchy Backpacker's Camp	*Hypericum perforatum*
Hetch Hetchy Road (5505)	*Hypericum perforatum*
Lower River Campground	*Hypericum perforatum*
McCauley Ranch	*Hypericum perforatum*
Northside Drive	*Hypericum perforatum*
The Ahwahnee hotel	*Hypericum perforatum*
Wawona Road (3964)	*Hypericum perforatum*
Yosemite Falls Trail	*Hypericum perforatum*
Yosemite Loop Trail	*Hypericum perforatum*
Yosemite Village	*Hypericum perforatum*
Big Oak Flat Road (4946)	*Lathyrus latifolius*
Foresta East	*Lathyrus latifolius*
Meadow Loop Trail - Wawona	*Lathyrus latifolius*
North Wawona-Central section	*Lathyrus latifolius*
The Ahwahnee hotel	*Lathyrus latifolius*
Upper Old El Portal	*Lathyrus latifolius*
Upper Rancheria - El Portal	*Lathyrus latifolius*
Yosemite Village	*Lathyrus latifolius*
Concession Stables (YV)	*Leucanthemum vulgare*
Foresta East	*Leucanthemum vulgare*
Foresta West	*Leucanthemum vulgare*
North Pines Campground	*Leucanthemum vulgare*
North Wawona-Central section	*Leucanthemum vulgare*
North Wawona-Eastern section	*Leucanthemum vulgare*
Yosemite Lodge	*Leucanthemum vulgare*
Concession Stables (YV)	*Lolium perenne*
Curry Village	*Lolium perenne*
Foresta West	*Lolium perenne*
Housekeeping Camp	*Lolium perenne*
Lower River Campground	*Lolium perenne*
North Pines Campground	*Lolium perenne*
North Wawona-Central section	*Lolium perenne*
North Wawona-Eastern section	*Lolium perenne*

Site	Alien Species	Site Type
McCauley Ranch	*Centaurea solstitialis*	Stock
McCauley Ranch	*Cirsium vulgare*	Stock
McCauley Ranch	*Convolvulus arvensis*	Stock
McCauley Ranch	*Holcus lanatus*	Stock
McCauley Ranch	*Hypericum perforatum*	Stock
McCauley Ranch	*Phleum pratense*	Stock
McCauley Ranch	*Poa pratensis*	Stock
McCauley Ranch	*Rubus discolor*	Stock
McCauley Ranch	*Tragopogon dubius*	Stock
McCauley Ranch	*Trifolium repens*	Stock
McCauley Ranch	*Verbascum thapsus*	Stock
Meadow Loop Trail - Wawona	*Agrostis gigantea*	Trail
Meadow Loop Trail - Wawona	*Bromus inermis*	Trail
Meadow Loop Trail - Wawona	*Bromus tectorum*	Trail
Meadow Loop Trail - Wawona	*Cirsium vulgare*	Trail
Meadow Loop Trail - Wawona	*Dactylis glomerata*	Trail
Meadow Loop Trail - Wawona	*Holcus lanatus*	Trail
Meadow Loop Trail - Wawona	*Lathyrus latifolius*	Trail
Meadow Loop Trail - Wawona	*Phleum pratense*	Trail
Meadow Loop Trail - Wawona	*Poa bulbosa*	Trail
Meadow Loop Trail - Wawona	*Poa pratensis*	Trail
Meadow Loop Trail - Wawona	*Rubus discolor*	Trail
Meadow Loop Trail - Wawona	*Rubus laciniatus*	Trail
Meadow Loop Trail - Wawona	*Tragopogon dubius*	Trail
Meadow Loop Trail - Wawona	*Trifolium repens*	Trail
Meadow Loop Trail - Wawona	*Verbascum thapsus*	Trail
Merced Grove trail	*Dactylis glomerata*	Trail
Mirror Lake	*Agrostis gigantea*	Development
Mirror Lake	*Bromus tectorum*	Development
Mirror Lake	*Cirsium vulgare*	Development
Mirror Lake	*Dactylis glomerata*	Development
Mirror Lake	*Holcus lanatus*	Development
Mirror Lake	*Poa pratensis*	Development
Mirror Lake	*Rubus discolor*	Development
Mirror Lake Pack Trail	*Bromus tectorum*	Trail
Mirror Lake Pack Trail	*Cirsium vulgare*	Trail
Mirror Lake Pack Trail	*Holcus lanatus*	Trail
Mirror Lake Pack Trail	*Phleum pratense*	Trail
Mirror Lake Pack Trail	*Poa pratensis*	Trail
Mirror Lake Pack Trail	*Rubus discolor*	Trail
Mirror Lake Pack Trail	*Trifolium repens*	Trail
North Pines Campground	*Agrostis gigantea*	Campground
North Pines Campground	*Bromus inermis*	Campground
North Pines Campground	*Bromus tectorum*	Campground
North Pines Campground	*Cirsium vulgare*	Campground
North Pines Campground	*Holcus lanatus*	Campground
North Pines Campground	*Leucanthemum vulgare*	Campground
North Pines Campground	*Lolium perenne*	Campground
North Pines Campground	*Poa bulbosa*	Campground
North Pines Campground	*Poa pratensis*	Campground
North Pines Campground	*Rubus discolor*	Campground

Appendix B. (continued)

Site	Alien Species
North Wawona-Western section	*Lolium perenne*
Northside Drive	*Lolium perenne*
Southside Drive	*Lolium perenne*
Upper Old El Portal	*Lolium perenne*
Upper Rancheria - El Portal	*Lolium perenne*
Yosemite Lodge	*Lolium perenne*
Yosemite Village	*Lolium perenne*
Yosemite West	*Lolium perenne*
Happy Isles	*Marrubium vulgare*
Lower Old El Portal	*Marrubium vulgare*
Lower River Campground	*Marrubium vulgare*
Upper Old El Portal	*Marrubium vulgare*
Upper Rancheria - El Portal	*Marrubium vulgare*
Hetch Hetchy Backpacker's Camp	*Melilotus alba*
Lower Old El Portal	*Melilotus alba*
Lower River Campground	*Melilotus alba*
Hetch Hetchy Backpacker's Camp	*Melilotus indica*
Lower Old El Portal	*Melilotus indica*
Upper Old El Portal	*Melilotus indica*
Upper Rancheria - El Portal	*Melilotus officinalis*
Lower Old El Portal	*Mentha spicata*
The Ahwahnee hotel	*Mentha spicata*
Big Oak Flat Road (4661)	*Phleum pratense*
Big Oak Flat Road (4946)	*Phleum pratense*
Concession Stables (YV)	*Phleum pratense*
Crane Flat Campground	*Phleum pratense*
Curry Village	*Phleum pratense*
Hodgdon Meadow Campground	*Phleum pratense*
Lower Pines Campground	*Phleum pratense*
McCauley Ranch	*Phleum pratense*
Meadow Loop Trail - Wawona	*Phleum pratense*
Mirror Lake Pack Trail	*Phleum pratense*
North Wawona-Western section	*Phleum pratense*
Yosemite Loop Trail	*Phleum pratense*
Big Oak Flat Road (4661)	*Poa bulbosa*
Big Oak Flat Road (4946)	*Poa bulbosa*
Bridalveil Falls Trail	*Poa bulbosa*
Concession Stables (YV)	*Poa bulbosa*
El Portal Road	*Poa bulbosa*
Four-mile Trail	*Poa bulbosa*
Government Stables	*Poa bulbosa*
Hetch Hetchy Backpacker's Camp	*Poa bulbosa*
Hetch Hetchy Corral	*Poa bulbosa*
Lower Pines Campground	*Poa bulbosa*
Lower River Campground	*Poa bulbosa*
Meadow Loop Trail - Wawona	*Poa bulbosa*
North Pines Campground	*Poa bulbosa*
North Wawona-Central section	*Poa bulbosa*
North Wawona-Eastern section	*Poa bulbosa*
North Wawona-Western section	*Poa bulbosa*
Northside Drive	*Poa bulbosa*

Site	Alien Species	Site Type
North Pines Campground	*Rubus lacinatus*	Campground
North Pines Campground	*Verbascum thapsus*	Campground
North Wawona-Central section	*Agrostis gigantea*	Development
North Wawona-Central section	*Bromus inermis*	Development
North Wawona-Central section	*Bromus tectorum*	Development
North Wawona-Central section	*Cirsium vulgare*	Development
North Wawona-Central section	*Dactylis glomerata*	Development
North Wawona-Central section	*Digitalis purpurea*	Development
North Wawona-Central section	*Holcus lanatus*	Development
North Wawona-Central section	*Lathyrus latifolius*	Development
North Wawona-Central section	*Leucanthemum vulgare*	Development
North Wawona-Central section	*Lolium perenne*	Development
North Wawona-Central section	*Poa bulbosa*	Development
North Wawona-Central section	*Poa pratensis*	Development
North Wawona-Central section	*Verbascum thapsus*	Development
North Wawona-Eastern section	*Bromus tectorum*	Development
North Wawona-Eastern section	*Cirsium vulgare*	Development
North Wawona-Eastern section	*Dactylis glomerata*	Development
North Wawona-Eastern section	*Digitalis purpurea*	Development
North Wawona-Eastern section	*Holcus lanatus*	Development
North Wawona-Eastern section	*Leucanthemum vulgare*	Development
North Wawona-Eastern section	*Lolium perenne*	Development
North Wawona-Eastern section	*Poa bulbosa*	Development
North Wawona-Eastern section	*Poa pratensis*	Development
North Wawona-Eastern section	*Rubus discolor*	Development
North Wawona-Eastern section	*Trifolium repens*	Development
North Wawona-Eastern section	*Verbascum thapsus*	Development
North Wawona-Western section	*Agrostis gigantea*	Development
North Wawona-Western section	*Bromus inermis*	Development
North Wawona-Western section	*Bromus tectorum*	Development
North Wawona-Western section	*Cirsium vulgare*	Development
North Wawona-Western section	*Dactylis glomerata*	Development
North Wawona-Western section	*Digitalis purpurea*	Development
North Wawona-Western section	*Holcus lanatus*	Development
North Wawona-Western section	*Lolium perenne*	Development
North Wawona-Western section	*Phleum pratense*	Development
North Wawona-Western section	*Poa bulbosa*	Development
North Wawona-Western section	*Poa pratensis*	Development
North Wawona-Western section	*Tanacetum parthenium*	Development
North Wawona-Western section	*Trifolium repens*	Development
North Wawona-Western section	*Verbascum thapsus*	Development
Northside Drive	*Bromus tectorum*	Road
Northside Drive	*Dactylis glomerata*	Road
Northside Drive	*Hypericum perforatum*	Road
Northside Drive	*Lolium perenne*	Road
Northside Drive	*Poa bulbosa*	Road
Northside Drive	*Poa pratensis*	Road
Northside Drive	*Tragopogon dubius*	Road
Northside Drive	*Trifolium repens*	Road
Old Big Oak Flat Rd. Trail	*Agrostis gigantea*	Trail
Old Big Oak Flat Rd. Trail	*Bromus tectorum*	Trail

Appendix B. (continued)

Site	Alien Species
Southside Drive	*Poa bulbosa*
Sunnyside Campground	*Poa bulbosa*
Upper Pines Campground	*Poa bulbosa*
Wawona Campground	*Poa bulbosa*
Wawona Road (3964)	*Poa bulbosa*
Wawona Stables	*Poa bulbosa*
Yosemite Lodge	*Poa bulbosa*
Yosemite Loop Trail	*Poa bulbosa*
Yosemite Village	*Poa bulbosa*
Chilnualna Falls Trail	*Poa compressa*
Alder Creek Trail	*Poa pratensis*
Backpacker's Camp	*Poa pratensis*
Badger Pass Parking Area	*Poa pratensis*
Badger Pass Ski Resort	*Poa pratensis*
Big Oak Flat Road (5272)	*Poa pratensis*
Bridalveil Campground	*Poa pratensis*
Bridalveil Creek Trail	*Poa pratensis*
Bridalveil Falls Trail	*Poa pratensis*
Concession Stables (YV)	*Poa pratensis*
Curry Village	*Poa pratensis*
El Portal Road	*Poa pratensis*
Foresta East	*Poa pratensis*
Foresta West	*Poa pratensis*
Four-mile Trail	*Poa pratensis*
Glen Aulin High Sierra Camp	*Poa pratensis*
Glen Aulin Trail	*Poa pratensis*
Government Corrals - Tuolumne	*Poa pratensis*
Happy Isles	*Poa pratensis*
Harden Lake Corral	*Poa pratensis*
Hetch Hetchy Backpacker's Camp	*Poa pratensis*
Hetch Hetchy Corral	*Poa pratensis*
Hodgdon Meadow Campground	*Poa pratensis*
Lower Pines Campground	*Poa pratensis*
Lower River Campground	*Poa pratensis*
Mariposa Grove - Lower Grove	*Poa pratensis*
Mariposa Grove - Upper	*Poa pratensis*
Mariposa Grove Trail	*Poa pratensis*
McCauley Ranch	*Poa pratensis*
Meadow Loop Trail - Wawona	*Poa pratensis*
Mirror Lake	*Poa pratensis*
Mirror Lake Pack Trail	*Poa pratensis*
North Pines Campground	*Poa pratensis*
North Wawona-Central section	*Poa pratensis*
North Wawona-Eastern section	*Poa pratensis*
North Wawona-Western section	*Poa pratensis*
Northside Drive	*Poa pratensis*
Snow Creek Trail	*Poa pratensis*
Southside Drive	*Poa pratensis*
Tamarack Flat Campground	*Poa pratensis*
The Ahwahnee hotel	*Poa pratensis*
Tuolumne Concessions Stables	*Poa pratensis*

Site	Alien Species	Site Type
Old Big Oak Flat Rd. Trail	*Cirsium vulgare*	Trail
Old Big Oak Flat Rd. Trail	*Holcus lanatus*	Trail
Old Big Oak Flat Rd. Trail	*Tragopogon dubius*	Trail
Panorama Trail	*Bromus inermis*	Trail
Panorama Trail	*Bromus tectorum*	Trail
Panorama Trail	*Cirsium vulgare*	Trail
Snow Creek Trail	*Agrostis gigantea*	Trail
Snow Creek Trail	*Bromus tectorum*	Trail
Snow Creek Trail	*Poa pratensis*	Trail
Southside Drive	*Bromus tectorum*	Road
Southside Drive	*Cirsium vulgare*	Road
Southside Drive	*Dactylis glomerata*	Road
Southside Drive	*Lolium perenne*	Road
Southside Drive	*Poa bulbosa*	Road
Southside Drive	*Poa pratensis*	Road
Southside Drive	*Tragopogon dubius*	Road
Southside Drive	*Trifolium repens*	Road
Southside Drive	*Verbascum thapsus*	Road
Sunnyside Campground	*Bromus tectorum*	Campground
Sunnyside Campground	*Poa bulbosa*	Campground
Tamarack Flat Campground	*Poa pratensis*	Campground
Tamarack Flat Campground	*Trifolium repens*	Campground
The Ahwahnee hotel	*Agrostis gigantea*	Development
The Ahwahnee hotel	*Bromus inermis*	Development
The Ahwahnee hotel	*Bromus tectoum*	Development
The Ahwahnee hotel	*Dactylis glomerata*	Development
The Ahwahnee hotel	*Erigeron strigosus*	Development
The Ahwahnee hotel	*Holcus lanatus*	Development
The Ahwahnee hotel	*Hypericum perforatums*	Development
The Ahwahnee hotel	*Lathyrus latifolius*	Development
The Ahwahnee hotel	*Mentha spicata*	Development
The Ahwahnee hotel	*Poa pratensis*	Development
The Ahwahnee hotel	*Rubus discolor*	Development
The Ahwahnee hotel	*Rudbeckia hirta*	Development
The Ahwahnee hotel	*Trifolium repens*	Development
The Ahwahnee hotel	*Verbascum thapsus*	Development
Tioga Road (6254)	*Cirsium vulgare*	Road
Tioga Road (6254)	*Dactylis glomerata*	Road
Tioga Road (7981)	*Bromus inermis*	Road
Tioga Road (8472)	*Bromus tectorum*	Road
Tuolumne Concessions Stables	*Dactylis glomerata*	Stock
Tuolumne Concessions Stables	*Poa pratensis*	Stock
Tuolumne Concessions Stables	*Trifolium repens*	Stock
Tuolumne Grove	*Bromus inermis*	Development
Upper Old El Portal	*Agrostis gigantea*	Development
Upper Old El Portal	*Bromus inermis*	Development
Upper Old El Portal	*Centaurea solstitialis*	Development
Upper Old El Portal	*Convolvulus arvensis*	Development
Upper Old El Portal	*Dactylis glomerata*	Development
Upper Old El Portal	*Lathyrus latifolius*	Development
Upper Old El Portal	*Lolium perenne*	Development

Appendix B. (continued)

Site	Alien Species
Upper Pines Campground	*Poa pratensis*
Upper Rancheria - El Portal	*Poa pratensis*
Wawona Campground	*Poa pratensis*
Wawona Road (3964)	*Poa pratensis*
Wawona Road (6051)	*Poa pratensis*
Wawona Road 2 (5143)	*Poa pratensis*
Wawona Road 3 (6040)	*Poa pratensis*
Wawona Stables	*Poa pratensis*
White Wolf Corral	*Poa pratensis*
Yosemite Lodge	*Poa pratensis*
Yosemite Loop Trail	*Poa pratensis*
Yosemite Village	*Poa pratensis*
Yosemite West	*Poa pratensis*
Young Lake Trail	*Poa pratensis*
Hetch Hetchy Corral	*Polypogon monspeliensis*
Backpacker's Camp	*Rubus discolor*
Concession Stables (YV)	*Rubus discolor*
Curry Village	*Rubus discolor*
Housekeeping Camp	*Rubus discolor*
Lower Old El Portal	*Rubus discolor*
Lower Pines Campground	*Rubus discolor*
Lower River Campground	*Rubus discolor*
McCauley Ranch	*Rubus discolor*
Meadow Loop Trail - Wawona	*Rubus discolor*
Mirror Lake	*Rubus discolor*
Mirror Lake Pack Trail	*Rubus discolor*
North Pines Campground	*Rubus discolor*
North Wawona-Eastern section	*Rubus discolor*
The Ahwahnee hotel	*Rubus discolor*
Upper Old El Portal	*Rubus discolor*
Upper Rancheria - El Portal	*Rubus discolor*
Yosemite Lodge	*Rubus discolor*
Yosemite Loop Trail	*Rubus discolor*
Yosemite Village	*Rubus discolor*
Lower Pines Campground	*Rubus lacinatus*
North Pines Campground	*Rubus lacinatus*
Wawona Campground	*Rubus lacinatus*
Meadow Loop Trail - Wawona	*Rubus laciniatus*
The Ahwahnee hotel	*Rudbeckia hirta*
North Wawona-Western section	*Tanacetum parthenium*
Concession Stables (YV)	*Tragopogon dubius*
Foresta East	*Tragopogon dubius*
Foresta West	*Tragopogon dubius*
Hetch Hetchy Backpacker's Camp	*Tragopogon dubius*
Hodgdon Meadow Campground	*Tragopogon dubius*
Lower Old El Portal	*Tragopogon dubius*
Lower River Campground	*Tragopogon dubius*
McCauley Ranch	*Tragopogon dubius*
Meadow Loop Trail - Wawona	*Tragopogon dubius*
Northside Drive	*Tragopogon dubius*
Old Big Oak Flat Rd. Trail	*Tragopogon dubius*

Site	Alien Species	Site Type
Upper Old El Portal	*Marrubium vulgare*	Development
Upper Old El Portal	*Melilotus indica*	Development
Upper Old El Portal	*Rubus discolor*	Development
Upper Old El Portal	*Tragopogon dubius*	Development
Upper Old El Portal	*Trifolium repens*	Development
Upper Old El Portal	*Verbascum thapsus*	Development
Upper Old El Portal	*Vinca major*	Development
Upper Pines Campground	*Bromus tectorum*	Campground
Upper Pines Campground	*Cirsium vulgare*	Campground
Upper Pines Campground	*Dactylis glomerata*	Campground
Upper Pines Campground	*Holcus lanatus*	Campground
Upper Pines Campground	*Poa bulbosa*	Campground
Upper Pines Campground	*Poa pratensis*	Campground
Upper Rancheria - El Portal	*Bromus inermis*	Development
Upper Rancheria - El Portal	*Bromus tectorum*	Development
Upper Rancheria - El Portal	*Centaurea solstitialis*	Development
Upper Rancheria - El Portal	*Lathyrus latifolius*	Development
Upper Rancheria - El Portal	*Lolium perenne*	Development
Upper Rancheria - El Portal	*Marrubium vulgare*	Development
Upper Rancheria - El Portal	*Melilotus officinalis*	Development
Upper Rancheria - El Portal	*Poa pratensis*	Development
Upper Rancheria - El Portal	*Rubus discolor*	Development
Upper Rancheria - El Portal	*Tragopogon dubius*	Development
Upper Rancheria - El Portal	*Trifolium repens*	Development
Upper Rancheria - El Portal	*Verbascum thapsus*	Development
Upper Rancheria - El Portal	*Vicia benghalensis*	Development
Wawona Campground	*Bromus tectorum*	Campground
Wawona Campground	*Cirsium vulgare*	Campground
Wawona Campground	*Holcus lanatus*	Campground
Wawona Campground	*Poa bulbosa*	Campground
Wawona Campground	*Poa pratensis*	Campground
Wawona Campground	*Rubus lacinatus*	Campground
Wawona Campground	*Verbascum thapsus*	Campground
Wawona Road (3964)	*Bromus tectorum*	Road
Wawona Road (3964)	*Holcus lanatus*	Road
Wawona Road (3964)	*Hypericum perforatum*	Road
Wawona Road (3964)	*Poa bulbosa*	Road
Wawona Road (3964)	*Poa pratensis*	Road
Wawona Road (6051)	*Agrostis gigantea*	Road
Wawona Road (6051)	*Bromus tectorum*	Road
Wawona Road (6051)	*Cirsium vulgare*	Road
Wawona Road (6051)	*Holcus lanatus*	Road
Wawona Road (6051)	*Poa pratensis*	Road
Wawona Road (6051)	*Trifolium repens*	Road
Wawona Road 2 (5143)	*Bromus inermis*	Road
Wawona Road 2 (5143)	*Bromus tectorum*	Road
Wawona Road 2 (5143)	*Centaurea solstitialis*	Road
Wawona Road 2 (5143)	*Cirsium vulgare*	Road
Wawona Road 2 (5143)	*Poa pratensis*	Road
Wawona Road 3 (6040)	*Agrostis gigantea*	Road
Wawona Road 3 (6040)	*Bromus inermis*	Road

Appendix B. (continued)

Site	Alien Species
Southside Drive	*Tragopogon dubius*
Upper Old El Portal	*Tragopogon dubius*
Upper Rancheria - El Portal	*Tragopogon dubius*
Wawona Road 3 (6040)	*Tragopogon dubius*
Yosemite Loop Trail	*Tragopogon dubius*
Concession Stables (YV)	*Trifolium repens*
Curry Village	*Trifolium repens*
Foresta East	*Trifolium repens*
Glen Aulin High Sierra Camp	*Trifolium repens*
Glen Aulin Trail	*Trifolium repens*
Harden Lake Corral	*Trifolium repens*
Lower Old El Portal	*Trifolium repens*
Lower Pines Campground	*Trifolium repens*
Lower River Campground	*Trifolium repens*
McCauley Ranch	*Trifolium repens*
Meadow Loop Trail - Wawona	*Trifolium repens*
Mirror Lake Pack Trail	*Trifolium repens*
North Wawona-Eastern section	*Trifolium repens*
North Wawona-Western section	*Trifolium repens*
Northside Drive	*Trifolium repens*
Southside Drive	*Trifolium repens*
Tamarack Flat Campground	*Trifolium repens*
The Ahwahnee hotel	*Trifolium repens*
Tuolumne Concessions Stables	*Trifolium repens*
Upper Old El Portal	*Trifolium repens*
Upper Rancheria - El Portal	*Trifolium repens*
Wawona Road (6051)	*Trifolium repens*
White Wolf Corral	*Trifolium repens*
Yosemite West	*Trifolium repens*
Government Stables	*Urtica urens*
Backpacker's Camp	*Verbascum thapsus*
Badger Pass Parking Area	*Verbascum thapsus*
Concession Stables (YV)	*Verbascum thapsus*
Foresta West	*Verbascum thapsus*
Housekeeping Camp	*Verbascum thapsus*
Lower Old El Portal	*Verbascum thapsus*
Lower Pines Campground	*Verbascum thapsus*
Lower River Campground	*Verbascum thapsus*
Mariposa Grove - Lower Grove	*Verbascum thapsus*
McCauley Ranch	*Verbascum thapsus*
Meadow Loop Trail - Wawona	*Verbascum thapsus*
North Pines Campground	*Verbascum thapsus*
North Wawona-Central section	*Verbascum thapsus*
North Wawona-Eastern section	*Verbascum thapsus*
North Wawona-Western section	*Verbascum thapsus*
Southside Drive	*Verbascum thapsus*
The Ahwahnee hotel	*Verbascum thapsus*
Upper Old El Portal	*Verbascum thapsus*
Upper Rancheria - El Portal	*Verbascum thapsus*
Wawona Campground	*Verbascum thapsus*
Yosemite Lodge	*Verbascum thapsus*

Site	Alien Species	Site Type
Wawona Road 3 (6040)	*Bromus tectorum*	Road
Wawona Road 3 (6040)	*Cirsium vulgare*	Road
Wawona Road 3 (6040)	*Poa pratensis*	Road
Wawona Road 3 (6040)	*Tragopogon dubius*	Road
Wawona Stables	*Bromus tectorum*	Stock
Wawona Stables	*Holcus lanatus*	Stock
Wawona Stables	*Poa bulbosa*	Stock
Wawona Stables	*Poa pratensis*	Stock
White Wolf Corral	*Poa pratensis*	Stock
White Wolf Corral	*Trifolium repens*	Stock
Yosemite Falls Trail	*Bromus tectorum*	Trail
Yosemite Falls Trail	*Holcus lanatus*	Trail
Yosemite Falls Trail	*Hypericum perforatum*	Trail
Yosemite Lodge	*Agrostis gigantea*	Development
Yosemite Lodge	*Bromus inermis*	Development
Yosemite Lodge	*Bromus tectorum*	Development
Yosemite Lodge	*Cirsium vulgare*	Development
Yosemite Lodge	*Dactylis glomerata*	Development
Yosemite Lodge	*Holcus lanatus*	Development
Yosemite Lodge	*Leucanthemum vulgare*	Development
Yosemite Lodge	*Lolium perenne*	Development
Yosemite Lodge	*Poa bulbosa*	Development
Yosemite Lodge	*Poa pratensis*	Development
Yosemite Lodge	*Rubus discolor*	Development
Yosemite Lodge	*Verbascum thapsus*	Development
Yosemite Loop Trail	*Agrostis gigantea*	Trail
Yosemite Loop Trail	*Bromus tectorum*	Trail
Yosemite Loop Trail	*Cirsium vulgare*	Trail
Yosemite Loop Trail	*Holcus lanatus*	Trail
Yosemite Loop Trail	*Hypericum perforatum*	Trail
Yosemite Loop Trail	*Phleum pratense*	Trail
Yosemite Loop Trail	*Poa bulbosa*	Trail
Yosemite Loop Trail	*Poa pratensis*	Trail
Yosemite Loop Trail	*Rubus discolor*	Trail
Yosemite Loop Trail	*Tragopogon dubius*	Trail
Yosemite Loop Trail	*Verbascum thapsus*	Trail
Yosemite Village	*Agrostis gigantea*	Development
Yosemite Village	*Bromus inermis*	Development
Yosemite Village	*Bromus tectorum*	Development
Yosemite Village	*Cirsium vulgare*	Development
Yosemite Village	*Convolvulus arvensis*	Development
Yosemite Village	*Hedera helix*	Development
Yosemite Village	*Holcus lanatus*	Development
Yosemite Village	*Hypericum perforatum*	Development
Yosemite Village	*Lathyrus latifolius*	Development
Yosemite Village	*Lolium perenne*	Development
Yosemite Village	*Poa bulbosa*	Development
Yosemite Village	*Poa pratensis*	Development
Yosemite Village	*Rubus discolor*	Development
Yosemite Village	*Vitis vinifera*	Development
Yosemite West	*Bromus tectorum*	Road

Appendix B. (continued)

Site	Alien Species
Yosemite Loop Trail	*Verbascum thapsus*
Yosemite West	*Verbascum thapsus*
Upper Rancheria - El Portal	*Vicia benghalensis*
Lower Old El Portal	*Vinca major*
Upper Old El Portal	*Vinca major*
Yosemite Village	*Vitis vinifera*

Site	Alien Species	Site Type
Yosemite West	*Cirsium vulgare*	Road
Yosemite West	*Lolium perenne*	Road
Yosemite West	*Poa pratensis*	Road
Yosemite West	*Trifolium repens*	Road
Yosemite West	*Verbascum thapsus*	Road
Young Lake Trail	*Poa pratensis*	Trail

Appendix C. Field notes of Sequoia-Kings Canyon National Park survey crews.

Ash Mountain Headquarters

Ampelopsis arborea - One population, apparently a residual planting, was found near house #97 in the headquarters area. This population of approximately a dozen individuals was growing near the foundation of an erstwhile structure, now an open grassy area.

Arundo donax - A large clump approximately 5 meters by 10 meters was observed along the far western edge of the large maintenance parking lot. A large, straggling colony grew on an exposed, grassy slope in the back yard of house #14.

Carduus pycnocephalus - Thousands of these plants grew in many places around Ash Mountain, especially in shaded or moist grassy areas.

***Cistus* sp.** - One planted population of approximately 10 individuals was observed adjacent to the Administration Building; this was the only population observed within the Ash Mountain area.

Dactylis glomerata - Thousands of plants grew in the shaded, unmowed lawn of Quarters 96. This is the only population observed in the Ash Mountain area in 1997 and 1998.

Eucalyptus citriodora - One plant was found on an exposed grassy slope bordering a dirt parking lot on the east side of Highway 198. This tree had been chopped down and was resprouting from the base.

Festuca arundinacea - Collected in lawn between the Research Office and the Sequoia Natural History Association Building in the Ash Mountain Headquarters. One colony, consisting of a few dozen plants, was found 50 meters north of the footbridge at the western edge of crescent meadow in a level, moist, shaded area.

Genista monspessulana - Thousands of these plants were scattered widely about Ash Mountain Headquarters. Very few individuals appeared more than a few years old, likely due to eradication efforts by park employees. One especially dense colony hosted over 1000 individuals and was located 15 meters northeast of the laundry room under a dense canopy of *Quercus wislizenii* var *wislizenii*. Most common in partly shaded grassy areas, this species appeared well dispersed around headquarters, but we did not see any outside of this developed area.

Hedera helix - Cultivated in several places about Ash Mountain Headquarters, this species does not appear to have naturalized.

Heteromeles arbutifolia - This species is native to much of California, but not to the Kaweah River drainage. It is widely planted and naturalized around Ash Mountain Headquarters, with thousands of plants sighted during the surveys. It was common in grassy areas in all sunlight regimes. Very few plants were seen outside of the developed areas.

Lathyrus latifolius - One colony of several dozen plants grew at headquarters in an open grassy field bounded on all sides by structures and roadways. This population was likely a residual planting.

Leucojum aestivum - Hundreds of plants grew about the Research Center in unwatered flowerbeds and in adjacent unwatered grassy areas. This species appears to reproduce sexually and asexually in this area. This is the first collection for Sequoia-Kings Canyon National Parks.

Ligustrum sinense - Dozens of privet hedges are cultivated in landscaped areas about Ash Mountain Headquarters. None appear to be naturalizing.

Melilotus indica - These plants grew in a few scattered populations, mainly along grassy roadsides in the Ash Mountain Complex. No more than a few dozen individuals were sighted in the entire survey area.

Poa bulbosa - Dozens of plants grew 15 meters northwest of Quarters 9 in an exposed, flat, disturbed, sandy parking lot. Thousands of plants grew throughout Ash Mountain in partly shaded, disturbed, grassy areas.

Poa pratensis - We found fewer than ten plants in an irregularly watered lawn near the Research Office, Ash Mountain Headquarters. Observed only in the headquarters area, this plant was seen by the hundreds in a watered lawn just north of the Administration Building.

Polypogon monspeliensis - Collected in the Ash Mountain Headquarters parking lot. It has been seen elsewhere in more naturalized areas such as Alder Creek and the Ash Mountain pastures.

Oxalis pes-caprae - Thousands of plants grew five meters southwest of the Research Center in a gently sloping, north-facing, grassy area around a concrete-lined pond. Colonies of this plant are common about the Ash Mountain developed area.

Punica granatum - One plant was found growing alongside a footpath leading down to the Middle Fork of the Kaweah River. It appeared to be more than 20 years old and had no offspring visible near it. It seems unlikely that this plant was intentionally cultivated.

Pyracantha angustifolia - Hundreds of individuals were scattered about the headquarters area in grassy places. This widely planted species appears to naturalize in watered and unwatered areas alike. Naturalized individuals observed during the Ash Mountain surveys were limited to the Headquarters area. Two other naturalized plants were seen in nearby riparian areas, one in Sycamore Creek and one in the Middle Fork of the Kaweah River, just upstream of headquarters (see associated survey reports).

Spartium junceum - This plant has several distinct populations throughout the Ash Mountain area as well as along the Middle Fork of the Kaweah near the park boundary. A single population of fewer than one hundred individuals was found along the north side of the Generals Highway on a steep road cut fifty meters west of the Alder Creek bridge. Another population was seen in the lower Ash Mountain housing area near residence #88's garage. One mature shrub with several smaller shrubs are here. Other scattered individuals are infrequent throughout the Ash Mountain survey area.

Trifolium repens - Thousands of plants grew in the watered lawn surrounding the Administration Building.

Vicia sativa - A single, small colony was observed near Cricket Hollow along an old asphalt use road that parallels the Generals Highway on the north side. Two other colonies were observed in the Ash Mountain area adjacent to the Generals Highway. Three populations of this plant were observed in the Ash Mountain area. All were on partly shaded, grassy slopes bordering roadways. There were hundreds of plants in each colony.

Vinca major - Numerous patches (on the order of several square meters each) of this plant were scattered about and restricted to the Ash Mountain Headquarters area. All appear to be either maintained or residual plantings.

Ash Mountain Entrance Station

Catalpa bignonioides - One tree grew alongside a road/parking area within 100 meters of the park boundary on the west side of the Kaweah River. It appeared to have been planted there; its trunk was about 50 centimeters in diameter at 1.7 meters above the ground.

Ash Mountain Flume

Medicago sativa - Three hardy, vegetative plants were observed within 200 meters of each other along the flume. All grew in shade on or alongside the footpath.

Ash Mountain Slash Pits

Urtica urens - Fewer than ten plants grew at the south end of the Ash Mountain Slash Pits on exposed, disturbed soil bordering human waste compost.

Atwell Mill Campground

Poa pratensis - Thousands of individuals were scattered throughout the campground in undisturbed, moist soils.

Trifolium repens - A population of greater than 1000 individuals was seen growing in a wet seep with a dense herbaceous layer in well developed, saturated soil. No other populations were observed throughout the campground.

Azalea Campground

Bromus tectorum - Several small populations, totaling fewer than 100 plants, grew in the southwest part of the campground in a disturbed, party shaded meadow margin.

Cirsium vulgare - Hundreds of rosettes were scattered in moist places throughout the campground.

Holcus lanatus - Thousands of plants grew in moist, disturbed places about the campground.

Phalaris arundinacea - A population of over 100 individuals was observed 20 meters west of the SW corner of Azalea Campground in the center of an undisturbed montane meadow. The population was growing out of a rotting fallen log that was in standing water. This is the wettest site that this species was observed growing in 1998. Scattered small patches were observed in moist sites within the campground as well. Dozens of plants grew in a level, sunny, disturbed seep in the middle of the campground.

Poa bulbosa - Fewer than ten plants grew in the southwest part of the campground in a disturbed, party shaded meadow margin.

Poa pratensis - Hundreds of plants were scattered in moist places about Azalea Campground.

Verbascum thapsus - We observed one population containing dozens of plants in a lush, disturbed, partly shaded seep.

Verbascum virgatum - Dozens of plants grew in a moist, flat, disturbed, sunny area near the middle of the campground.

Big Stump Picnic Area

Bromus tectorum - Thousands of plants grew throughout the parking area in sandy, disturbed soils.

Poa pratensis - Dozens of plants grew throughout the parking area in sandy, disturbed soils.

Tragopogon dubius - One plant grew near the entrance to the Big Stump Parking Area in sandy, disturbed soil.

Buckeye Campground

Bromus tectorum - Thousands of these plants grew in sunny areas on the east side of the campground.

Poa bulbosa - This species was widespread about the campground in disturbed and undisturbed, open areas. It was especially common around campground the perimeter where grassland began.

Marrubium vulgare - Thousands of these plants grew in dense patches in the southern part of the campground.

Cahoon Meadow

Poa pratensis - A small population of fewer than 10 individuals was seen growing in Calhoun Meadow adjacent to a 10 m deep, cut stream bank. No other populations were seen in this meadow.

Camp Conifer

Bromus tectorum - This was from a 1 x 2 square meter colony in a exposed roadside area on the old road leading up to Camp Conifer.

Poa compressa - This plant was part of a small colony that was growing on a moist, old dirt roadbed near Camp Conifer.

Verbascum thapsus - This plant was scattered sparsely in wet, old dirt roadbeds around Camp Conifer.

Cedar Grove Market and Lodge

Bromus tectorum - Tens of thousands of plants grew in open places throughout the market area. This species is abundant in the Cedar Grove Valley and does not appear to be restricted to human disturbance.

Melilotus alba - A single population consisting of fewer than 100 plants grew in exposed, sandy, trampled soil adjacent to the laundromat.

Poa bulbosa - Hundreds of plants grew about the market area in sandy soils. They appeared to be restricted to human disturbance.

Poa pratensis - We found one population containing hundreds of individuals near the laundromat in exposed, sandy soil. The soil appeared damp due to leaky plumbing.

Cedar Grove Pack Station

Bromus tectorum - Tens of thousands of these plants infested every habitable patch of soil in and around the pack station. They were abundant in many parts of the Cedar Grove area, apparently not restricted to human disturbance.

Phalaris minor - One plant grew alongside a corral in partly shaded, grassy, disturbed duff on a gentle, south-facing slope. First collection for Sequoia-Kings Canyon National Parks.

Poa bulbosa - Thousands of these plants grew on dirt roadbeds and margins of highly disturbed areas about the pack station. This species appeared restricted to the pack station complex.

Polypogon australis - Dozens of individuals grew in the silty manure of an exposed, unused corral 40 meters north of the tack shed.

Polypogon monspeliensis - There were a few small, scattered patches of this species in the less trampled areas of the pack station complex.

Trifolium repens - We found one plant at the south end of the pack station in shaded, trampled, mesic duff.

Urtica urens - We saw dozens of these plants is two small populations near the corral margins in manure-enriched soil. This species appeared restricted to the pack station complex.

Cedar Grove Road

Bromus tectorum - Thousands of plants grew in open, sunny places throughout the survey area. This species is abundant throughout the Cedar Grove Valley and does not seem restricted to human disturbance.

Cirsium vulgare - Dozens of plants grew in moist places along the Cedar Grove Road. They did not appear to be restricted to human disturbance.

Festuca arundinacea - Hundreds of plants grew along the south side of the Cedar Grove Road, two kilometers west of Road's End. They were restricted to the roadside and grew in moderately shaded, decomposed granite soil.

Holcus lanatus - A single, large colony stretched approximately 50 meters along the south side of the road. The population was growing in well-drained, disturbed, granitic soil. We did not observe any individuals further than 5 meters from the road.

Lolium perenne - Three clumps were observed within 25 meters of one another approximately 2 kilometers east of the Roaring River Bridge on the south side of the road. They were growing adjacent to the road in sandy, disturbed soil.

Poa bulbosa - We found one colony of hundreds of plants alongside a sunny parking lot in decomposed granite soil 100 meters northeast of the Roaring River Bridge.

Poa pratensis - Hundreds of plants grew in moist, shaded, well-vegetated, decomposed granite soil three kilometers west of Road's End.

Tragopogon dubius - We saw dozens of these plants scattered far and wide in many sunlight and moisture regimes. They did not appear to be restricted to human disturbance.

Verbascum thapsus - Hundreds of vegetative plants grew along the south side of the Cedar Grove Road in exposed, decomposed granite soil 300 meters east northeast of the Roaring River Bridge. This species appeared to be restricted to the road margin.

Cherry Flat Trail

Poa bulbosa - We found one population along the trail from Cherry Flat to Redwood Creek. Dozens of plants grew in a steep, partly shaded, sandy trailside area.

Cold Springs Campground

Digitalis purpurea - A population of fewer than 1000 individuals was observed growing on the north side of the bridge leading to the campground. Much of the population was growing in a watered, manicured lawn. Many individuals were scattered near the lawn in less disturbed, unwatered sites. The cabin next to the lawn had a wooden sign: "The Wollenmans".

Poa pratensis - Fewer than 1000 individuals were seen scattered throughout the campground in moist roadsides.

Verbascum thapsus - A single vegetative individual was seen on the west end of the campground adjacent to the walk-in campsite parking area. It was growing in moderately disturbed, well drained, granitic soil. No other individuals were observed throughout the campground.

Colony Mill Road

Bromus tectorum - Dozens of individuals growing directly on the roadbed near the gate that marks the Sequoia National Park Boundary. Several hundred individuals were observed scattered along the road corridor in open, disturbed, compacted soil.

Carduus pycnocephalus - Thousands of individuals growing directly on the roadbed near the gate that marks the Sequoia National Park Boundary.

Morus alba - One tree was growing in a stream alongside the lower end of the Colony Mill Road. The trunk diameter at 1.7 meters was approximately 60 centimeters.

Columbine Picnic Area

Cirsium vulgare - Hundreds of plants grew in a partly shaded ecotone between white fir forest and montane meadow. This area was moderately disturbed, gently sloping, west-facing, and well vegetated.

Dactylis glomerata - One colony of thousands of individuals grew on a stream bank in the Columbine Picnic Area.

Phalaris arundinacea - Hundreds of plants grew in the north edge of the picnic area in a well vegetated, partly shaded seep adjacent to a trail. This is likely *Agrostis gigantea* but we are unsure yet.

Poa pratensis - Thousands of plants grew in a partly shaded ecotone between white fir forest and montane meadow. This area was gently sloping, west-facing, and well vegetated. This plant was not restricted to disturbed places.

Trifolium repens - Hundreds of plants grew in a partly shaded ecotone between white fir forest and montane meadow. This area was moderately disturbed, gently sloping, west-facing, and well vegetated.

Crescent Meadow Trail

Festuca pratensis - One colony, consisting of a few dozen plants, was found 50 meters north of the footbridge at the western edge of crescent meadow in a level, moist, shaded area.

Phleum pratense - There were several individuals observed along the west edge of Crescent Meadow growing out of rock cracks and compacted disturbed soil. There are scattered individuals all throughout the meadow margin. Another small population was observed at Round Meadow. A single population of fewer than 10 individuals was observed on the west margin of Crescent Meadow in a moderately disturbed, moist, partly shaded area.

Poa pratensis - Thousands of individuals were observed throughout the meadow in both open and shaded areas.

Crystal Cave Parking Lot

Bromus tectorum - Fewer than 1000 individuals were found along the edges of the parking lot in disturbed, partly shaded soils.

Prunus persica - This is almost surely the cultivated peach. Four trees grew around the periphery of the parking lot. Two of the trees appeared to have been planted and the other two were saplings, growing near the mature ones.

Tragopogon dubius - Fewer than 100 individuals were seen growing near the entrance of the parking lot along the road.

Vulpia bromoides - Fewer than 1000 individuals were found growing along the edges of the parking lot in disturbed, partly shaded soils.

Crystal Cave Road

Echinochloa crus-galli - Along the north edge of the Crystal Cave road on a well-drained, south facing, sunny slope. This site burned in 1969.

Crystal Springs Campground

Cirsium vulgare - Hundreds of plants were scattered throughout Crystal Springs Campground, most commonly in moist, meadow margins.

Poa pratensis - Hundreds of plants grew throughout the campground in both moist, disturbed and moist, undisturbed areas.

Deadman Canyon Trail

Poa pratensis - Hundreds of plants grew on a sunny stream bank alongside a trail 150 meters southeast of the Roaring River Ranger Station.

Dorst Campground

Cirsium vulgare - A population of several hundred individuals was observed on a gently sloping, south-facing hillside with well drained, sandy, granitic soils with a moderately dense herbaceous layer. No other populations were observed growing in the survey area.

Dactylis glomerata - Six plants were found on the east side of the campground near the entrance/registration station. They were growing around the concrete base of a recreational vehicle dump station in disturbed, partly shaded, decomposed granite soil. They were clearly receiving anthropogenic water.

Festuca arundinacea - One clump was found along a well vegetated, partly shaded roadside near the middle of the campground. First collection for Sequoia-Kings Canyon National Parks.

Melilotus alba - Fewer than 100 mature plants were scattered throughout the campground in the late fall. The plants were observed in open areas with sparse herbaceous under story. There were numerous seedlings of this species scattered throughout the area.

Melilotus officinalis - A late-season survey revealed one plant growing in the partly shaded, gently sloping, east-facing, disturbed soil of a campsite near the Amphitheater. This is the first collection for Sequoia-Kings Canyon National Parks.

Poa pratensis - Two populations of fewer than 100 individuals were found growing along the edge of a wet montane meadow in moist, well developed soil.

Tragopogon dubius - Hundreds of individuals were seen scattered throughout the campground.

Trifolium repens - Fewer than 1000 individuals were seen scattered throughout the campground in open, dry, disturbed, sandy areas.

Verbascum thapsus - Fewer than 1000 individuals were encountered throughout the campground. Most of the plants were seen on disturbed soils adjacent to roads and trails.

Elk Creek Trail, Middle Fork Kaweah

Carduus pycnocephalus - This was collected from a 6 m x 10 m patch. The patch was located in an open area surrounded by dense Adenostoma faciculatum along the Chamise Creek Trail.

Eli's Paradise Meadow

Dactylis glomerata - In Giant Forest at Eli's Paradise Meadow (Sunset Campground).

Digitalis purpurea - Many hundreds of these plants grew in Eli's Paradise, a montane meadow about 500 meters northwest of Round Meadow. They were especially common along the broad southeast margin of the meadow, where there was little standing water.

Ferguson Creek Area

Cirsium vulgare - This montane meadow, which is 2.5 kilometers east of Sugarloaf Peak, had hundreds of plants scattered throughout it.

General's Highway

Centaurea solstitialis - Three plants grew along the east side of the Generals Highway one kilometer south of Potwisha Campground. About a dozen plants were eradicated between Potwisha Campground and Ash Mountain immediately following detection of these individuals. All grew along the east side of the road in fresh fill dirt, presumably imported during road construction in 1997. A follow-up survey of the entire road between Ash Mountain and Potwisha was done within the week by Resource Management staff. During their search, they encountered another six individuals scattered along the road. In December another individual was found at this location that had already set seed. There is a potential that there will be more individuals at this location and along the road for the next few years.

Dactylis glomerata - Two hundred meters west of The Wye along the Generals Highway; single population of 6 individuals adjacent to the south edge of the highway in sandy, well-drained soil.

Melilotus indica - Thousands of these plants grew throughout the road corridor in loose soil. They were not common in the surrounding undisturbed grassland.

Oxalis pes-caprae - Thousands of plants grew on a road-cut 125 meters north of the Ash Mountain Visitor Center. This 30 meter section of roadside was the only place we saw Oxalis between Ash Mountain and Potwisha Campground.

Phalaris paradoxa - Two distinct populations of approximately one hundred individuals each were observed adjacent to the Generals Highway in the vicinity of the Ash Mt. Entrance Station. Both populations are located adjacent to the roadway in open, moist seeps. A single individual was also observed between the Middle Fork Flume and the parking lot/staging area below the entrance station.

Sorghum halepense - Dozens of plants were seen in a colony on an exposed roadside area 1.5 kilometers south along the Generals Highway from Amphitheater Point.

Spartium junceum - Dozens of plants grew in one distinct colony about 75 meters north of the Ash Mountain Visitor Center. This roadside colony appears to have originated from Ash Mountain government housing, just upslope from the road.

Tragopogon dubius - One plant was found alongside the Generals Highway across from the former lodging area in a partly shaded dirt "pull-out". Five individuals were seen growing where the Generals Highway bisects Halstead Meadow in a sandy berm. All five plants were pulled up.

Vicia sativa - Several plants grew 125 meters north of the Ash Mountain Visitor Center along the west edge of the Generals Highway on a steep, east-facing road cut. We saw thousands more along the General's Highway.

Vicia villosa - One plant grew along the east side of the Generals Highway 1.5 kilometers south of Potwisha Campground. This roadside has been re-vegetated following last year's road construction. Another individual grew under similar conditions 1 kilometer north.

Vinca major - We saw one dense 75 square meter colony 100 meters north of the Ash Mountain Visitor Center. It grew along the shaded south bank of Alder Creek near the west margin of the Generals Highway.

Giant Forest Developed Area

Dactylis glomerata - A population of fewer than 10 individuals was observed growing along the road to Lower Kaweah Housing on the west side of the Giant Forest Lodge in partly disturbed, partly shaded, sandy, granitic soil. Other populations of this plant were seen in Giant Forest at Eli's Paradise Meadow (Sunset Campground) and at Round Meadow. Thousands of individuals were seen scattered throughout the meadow edge, primarily on the west and north edges along the "Trail for All People". The plants radiate into the adjacent Big Tree Forest for several meters. Other populations of this species were observed along the asphalt road to Lower Kaweah on the west side of the Giant Forest Lodge.

Digitalis purpurea - Many hundreds of these plants grew in Eli's Paradise, a montane meadow about 500 meters northwest of Round Meadow. They were especially common along the broad southeast margin of the meadow, where there was little standing water. A single plant was seen growing adjacent to the asphalt roadway leading to the Puzzle Tree on a steep road cut in well-drained, granitic soil with a sparse duff layer.

Poa bulbosa - A colony of fewer than 100 individuals was seen growing directly in front of the Giant Forest Lodge adjacent to a dirt footpath in moderately disturbed, partly shaded, well developed soil

Poa pratensis - A population of fewer than 100 individuals was seen growing in front of the Giant Forest Lodge adjacent to concrete steps in partly shaded ground. There are frequent populations throughout Giant Forest in moist, undisturbed sites.

Tragopogon dubius - One plant was found alongside the Generals Highway across from the former lodging area in a partly shaded dirt "pull-out".

Verbascum thapsus - A single rosette was seen growing in front of the Giant Forest Lodge in partly shaded, disturbed soil.

Giant Forest Sewage Plant

Bromus tectorum - Thousands of individuals were seen growing around the Giant Forest Sewage Treatment Facility in open, poorly developed and well developed soils. No other populations were seen in the Giant Forest area.

Cirsium vulgare - A single plant was observed near the Giant Forest Sewage Treatment Facility. There were abundant individuals scattered throughout Giant Forest in both disturbed and undisturbed sites.

***Rubus* sp.** - One robust colony grew at the base of a sewage treatment structure in 50% shade. It is likely a cultivated species dispersed by feces.

Grant Grove Developed Area

Cirsium vulgare - One rosette grew on a gently sloping, south-facing, disturbed meadow margin near the market.

Digitalis purpurea - Hundreds of plants grew in the housing area and in the adjacent forested areas in more mesic, undisturbed sites.

Holcus lanatus - A large colony of over 1000 individuals was observed approximately 50 meters north of Grant Grove Market in an open, moderately disturbed, level site between an asphalt road and moist montane meadow.

Phalaris arundinacea - Thousands of plants grew in a partly shaded stream 50 meters south of Wilsonia. These plants were abundant in many streams about Grant Grove, often dominating herbaceous cover. This appears to be Agrostis gigantea but final identification is pending. A large colony of several thousand individuals were observed along the north edge of the meadow behind the Grant Grove Market. The population was growing along the meadow margin in disturbed, sandy soil. This is the only population observed in this meadow. There are several other populations of this species throughout the Grant Grove Area. A small clump of three individuals was observed 40 meters east of the Maintenance Building/Fire House on a berm adjacent to the large parking lot. Thousands of plants grew in dense colonies in many wet areas about Grant Grove.

Phleum pratense - Hundreds of plants grew on the east edge of the market area on a trampled, partly shaded meadow margin.

Poa pratensis - Hundreds of plants grew on the east edge of the market area on a trampled, partly shaded meadow margin. This species was scattered throughout the survey area in moist places. Hundreds of plants grew about the housing area and they were common on meadow margins.

Tanacetum parthenium - A single plant was observed in an exposed, nearly flat clearing within the Wilsonia area in loose, disturbed soil.

Trifolium repens - Hundreds of plants grew throughout the Grant Grove developed area in clumps scattered about disturbed, moist places.

Verbascum thapsus - Dozens of plants were scattered throughout the housing area. Fewer than ten individuals were observed 40 meters east of the Maintenance Building/Fire House on a berm adjacent to the large parking lot.

Grant Grove Pack Station

Phalaris arundinacea - Dozens of plants grew at the northwest edge of the pack station in partly shaded duff and horse manure. They appeared to be restricted to anthropogenic disturbance. Dozens of plants grew at the south end of the pack station in a densely vegetated unused corral.

Urtica urens - Thousands of plants formed a dense colony in an unused corral at the south end of the corral complex. Others were scattered about the corral margins. A number of plants spilled down a south-facing, dry streambed at the south edge of the pack station as well. Other than the streambed individuals, *U. urens* appeared to be restricted to the pack station complex.

Grasshopper Meadow

Poa pratensis - Thousands of plants grew throughout Grasshopper Meadow, 1.5 kilometers southeast of Roaring River Ranger Station.

Grunnigan Ranch

Carya **sp.** - One tree was found at the edge of a field bordering Yucca Creek. This mature tree appeared to be a residual planting.

Diospyros **sp.** - A dense, 200-square-meter stand of trees up to 15 meters tall was observed along the eastern edge of a clearing within the Grunnigan Ranch site. The trees were apparently reproducing vegetatively. No additional populations were seen within the survey site nor in the adjacent Yucca creek.

Nerium oleander - This lone large shrub grew between Yucca Creek and the Old Hidden Springs Road near an old house foundation in a south facing, anthropogenic clearing. No other individuals were observed in the area. This is the first collection for Sequoia-Kings Canyon National Parks.

Olea europaea - Five mature trees bearing fruit were found approximately 200 m from Yucca creek along the Old Hidden Springs road. There are no apparent young saplings in the vicinity. There are, however, shoots growing from bases of the boles. First collection for Sequoia-Kings Canyon National Parks.

Punica granatum - One individual, almost surely a residual planting, was found. It was in a partly shaded grassy area, 100 meters east of where the Old Hidden Springs Road crosses Yucca Creek.

Pyracantha angustifolia - Several mature shrubs were observed in a 10-square-meter thicket along the western edge of a large clearing in the former Grunnigan Ranch site. No other populations were observed within the ranch area. This apparently was a residual planting.

Rubus discolor - There was a dense patch in an open field at the former site of the Grunnigan Ranch. The patch was oval in shape and was approximately 35 meters long by 24 meters wide. *R. discolor* was also abundant in nearby Yucca Creek between Grunnigan Ranch and the North Fork of the Kaweah.

Halstead Meadow

Poa pratensis - Thousands of individuals were observed 10 meters south of the Generals Highway on the west side of the meadow. The plants were growing in an open, wet meadow in well developed, moist soil. Scattered individuals were seen throughout the meadow, especially along the meadow edge.

Tragopogon dubius - Five individuals were seen growing where the Generals Highway bisects the meadow in a sandy berm. All five plants were pulled up.

High Sierra Trail

Bromus tectorum - Collected along trail approximately 1 km east of Bearpaw Ranger Station on the trail towards Kaweah Gap. There are scattered patches of Bromus tectorum all along the trail in this area. B. tectorum can be seen at least 100 m below the trail here. It would appears to be not dependent on the trail.

Poa pratensis - Collected alongside the trail growing with Bromus tectorum and Vulpia myuros ssp. hirsuta.

Hockett Meadow and Pasture

Phleum pratense - Fewer than 100 individuals were observed alongside the trail to Evelyn Lake approximately 0.5 km from Hockett Meadow. The population was growing in a wet lodgepole forest with a dense herbaceous understory. A few small populations of this plant species were seen in and about Hockett Meadow growing in disturbed, trailside areas as well as in relatively undisturbed, streamside areas. Phleum alpinum, the native timothy, was much more abundant than P. pratense.

Poa pratensis - Thousands of individuals were seen growing 150 meters southeast of the Hockett Meadow Ranger Station along the horse pasture fence.

Hospital Rock

Carduus pycnocephalus - One plant grew adjacent to the parking lot in a crack between a cement curb and some compacted soil.

Lolium perenne - Hundreds of plants grew in scattered clumps in grassy areas and asphalt cracks throughout the picnic area

Poa pratensis - Hundreds of plants were found beneath a mature Umbellularia californica.

Polypogon monspeliensis - Fewer than ten plants grew alongside the Generals Highway in a moist, disturbed ditch at the north edge of the survey area.

JR Meadow

Poa pratensis - Thousands of plants grew throughout J. R. Meadow, 300 meters northwest of the Roaring River Ranger Station. This meadow sees annual grazing.

Kern Ranger Station

Poa pratensis - Collected in the Kern Ranger Station Stock Pasture

Lewis Creek Trail

Bromus tectorum - Though not as abundant as on the floor of the Cedar Grove Valley, B. tectorum was still common in open patches in several places along the trail. The thousands of plants we saw were not restricted to areas of human disturbance.

Poa pratensis - Dozens of plants grew at a stream crossing several kilometers north of the trailhead. These plants grew in moderately disturbed, partly shaded, saturated, stream bank soil.

Lodgepole Campground

Bromus tectorum - Fewer than 1000 individuals were seen growing in the campground on the north side of the river in dry, open, granitic soils.

Poa bulbosa - Thousands of individuals were seen within the campground 50 meters south of the Marble Fork. They were in disturbed, sandy, well drained soil with a sparse herbaceous understory.

Poa pratensis - A population of fewer than one hundred individuals was observed within the campground on the south side of the river in a moist, partly disturbed area.

Lodgepole Developed Area

Cirsium vulgare - A population of fewer than 10 individuals was seen growing approximately 20 m west of the Lodgepole Visitor Center adjacent to a concrete walkway. The population was in moderately disturbed, well drained granitic soil.

Dactylis glomerata - Two individuals were seen 50 meters south of the Visitor Center adjacent to a dirt footpath in moderately disturbed, open, granitic soil. Another individual was seen on the north side of the river.

Digitalis purpurea - Two individuals were observed on the north side of the river adjacent to an asphalt road that leads to the Lodgepole Fire House. They grew in moderately disturbed, well-drained, granitic soils.

***Iris* sp.** - A single vegetative *Iris* species grew on the north side of the river on a steep slope adjacent to a large asphalt parking lot. Another individual was observed growing adjacent to a deserted government residence. These apparently were escaped cultivars.

Phalaris arundinacea - Forty meters west of the Lodgepole Visitor Center and adjacent to an asphalt parking lot in a nearly flat, open disturbed site with well-drained, granitic soil.

Verbascum thapsus - A population of three individuals was observed 20 meters south of the Lodgepole Fire Station adjacent to an asphalt parking lot. All three individuals were pulled up.

Verbascum virgatum - A single population of fewer than 10 individuals was observed on the north side of the river adjacent to an asphalt road that leads to the Lodgepole Fire House. The population was in moderately disturbed, well-drained, granitic soil. No other populations were seen throughout the survey area.

Marble Fork of the Kaweah River

Rubus discolor - A distinct patch of fewer than 100 individuals was caught growing in a three meter by three meter area on the banks of the Marble Fork of the Kaweah River near the Generals Highway bridge. The population was growing in partial shade.

Marvin Pass Trail

Cirsium vulgare - Hundreds of these plants grew in a small meadow three kilometers northwest of the Roaring River Ranger Station. They did not appear to be dependant on anthropogenic disturbance.

Holcus lanatus - Dozens of plants grew in the center of the Roaring River Trail three kilometers northwest of the Roaring River Ranger Station. They grew in a moderately sloping, southeast-facing, trampled, sunny seep.

Poa pratensis - Thousands of plants grew in Comanche Meadow, roughly 6 kilometers west-southwest of the confluence of Sugarloaf Creek and Roaring River.

Middle Fork Flume

Bromus tectorum - This plant was collected in a flat, open area directly adjacent to the concrete flume wall. It is abundant throughout the survey area. This is the lowest elevation that this plant has been observed this year.

Middle Fork of the Kaweah River

Echinochloa crus-galli - Fewer than ten plants grew along the moist, mossy, shaded, moderately sloping, north-facing east bank of the Kaweah River, 800 meters upstream of the park boundary.

Ficus carica - A single individual, approximately one meter tall, was seen on the south side of the river just below the Research Center in a rocky area. We attempted to pull the plant up but some of the roots remained.

Morus alba - A single individual approximately two meters tall was seen in a shaded, dry, cobbled swale on the north side of the river. No other individuals were seen in the survey area.

Polypogon monspeliensis - This population was growing in a moist, flat sandbar 100 meters upstream of where the trail from Ash Mountain Headquarters leads to the river. The population is along a natural diversion from the main water course on the W side of the river. There are frequent populations of this species throughout the corridor in perennially moist sites. A large, dense colony of over 10,000 individuals was observed on the south side of the river approximately 1 km E of Ash Mountain Headquarters. The population formed a dense colony in a area with well developed soil and very dense herbs with standing water in the center. Much of this population was growing directly out of standing water.

Pyracantha angustifolia - A few scattered mature shrubs were observed growing in a flat cobbled, floodplain 150 meters upstream of where the trail from Ash Mountain Headquarters leads to the river. There are individuals on both sides of the river.

Spartium junceum - Hundreds of plants were growing on the rocky floodplain on the west bank of the river. It appeared that most of the above-ground plant material was scoured off during winter flood events, but shoots were resprouting vigorously. This population is periodically cut back by park personnel.

***Tamarix* sp.** - A single vegetative seedling was found in a moist sand bar during the fall survey of the river.

Milk Ranch Lookout

Bromus tectorum - Over 1000 individuals were observed scattered throughout the open, disturbed, dirt parking area/clearing 15 m south of the Milk Ranch Fire Tower.

Poa bulbosa - Over 1000 individuals were observed scattered throughout the open, disturbed, dirt parking area/clearing 15 m south of the Milk Ranch Fire Tower.

Milk Ranch Road

Cirsium vulgare - Fewer than 1000 individuals of this plant were seen outside of the park boundary along the road to Milk Ranch scattered throughout a clearing/meadow along the west side of the road.

Medicago sativa - One plant was observed approximately 1 km south of Milk Ranch Lookout adjacent to the Milk Ranch road. It was growing in compact, well drained sandy soil within a moderately dense herbaceous layer. No other plants were observed nearby.

Mineral King Pack Station

Poa pratensis – This was found throughout the pack station complex along roadsides in less disturbed areas. It is present further from the complex further than other exotics. This plant was collected from a small colony in an undisturbed area of the meadow below the pack station.

Trifolium repens - This species grew in moist, disturbed places throughout the survey area.

Urtica urens - Scattered clumps were observed growing in disturbed soil directly next to the fence posts of the corral. No other vegetation was growing nearby.

Verbascum thapsus - This plant was collected from the roadside near the pack station.

Moraine Campground

Bromus tectorum - Thousands of these plants grew throughout Cedar Grove in open, sandy places. They were not restricted to human disturbance.

Muir Grove

Cirsium vulgare - Fewer than ten individuals were observed growing beneath the big trees of Muir Grove in loose duff.

North Fork of the Kaweah River

Echinochloa crus-galli - A single population of fewer than 10 individuals was observed along the bank of the river. No other individuals were seen within the survey area.

Piptatherum miliaceum - A single population of this plant was observed in the North Fork river corridor growing out of metasedimentary rock cracks.

Polypogon monspeliensis - Fewer than 100 vegetative plants were seen scattered in dry rock cracks adjacent to the river.

Mentha pulegium - Dozens of plants were found in partly shaded, rocky and sandy places in and adjacent to the floodplain of the Kaweah River along the lower end of the survey area. First collection for Sequoia-Kings Canyon National Parks.

Mentha spicata - A few small populations were found in well-shaded floodplains at the middle and upper reaches of the survey area. First collection for Sequoia-Kings Canyon National Parks.

Rubus discolor - Six populations, each with a diameter of two meters, were observed in the survey area.

Tamarix **sp.** - This vegetative plant appears to be a species of Tamarix, salt cedar. Two seedlings were seen in the North Fork, in a low, moist, sunny sand bar, at the park boundary. Seedlings were also seen in low moist sand bars in the Middle Fork of the Kaweah River, and in one of its tributaries, Sycamore Creek. No seedlings were over 15 centimeters tall, and all appeared to have established this season. It appeared very likely that all the seedlings sighted in the surveys were destined to be washed away in winter runoff, as all were in low, moist, recently deposited sandbars. This is the first collection for Sequoia-Kings Canyon National Parks.

Verbascum thapsus - Two vegetative rosettes were seen in a dry, sandy, open section of the riverbank approximately 150 m upstream of the confluence with Yucca creek.

North Fork Parking Lot

Carduus pycnocephalus - Fewer than 100 vegetative individuals were observed scattered along the lower parking lot margins in shaded, moderately disturbed sites.

Old Hidden Springs Road

Cirsium vulgare - Fewer than ten individuals were observed growing where a perennial stream crosses the road within a shaded, gently sloping, S-facing hillside. The site was less than one kilometer from Hidden Springs. No plants of this species were seen any closer to Hidden Springs.

Silybum marianum - This straggling rosette was growing out of cow manure in the shade of planted *Olea europaea* L. trees. Numerous flowering individuals of this species were subsequently found in nearby Yucca Creek.

Vicia benghalensis - One large colony was found nine kilometers up Old Hidden Springs Road in Blue Oak Woodland. In this area the road cuts across an open, grassy, moderately sloping, north-facing hillside. This colony measured 20x40 meters and constituted approximately 90% of the groundcover. The colony was centered on the roadbed, but also crept into adjacent undisturbed grassland. This is the first collection for Sequoia-Kings Canyon National Parks.

Oriole Lake Airstrip

Vulpia bromoides - Thousands of these plants were observed scattered throughout the western half of the Oriole Lake Airstrip growing in well-drained, granitic soils.

Oriole Lake Meadow

Bromus tectorum - Thousands of individuals were throughout a moderately disturbed wet montane meadow 200 m north of the Oriole Lake Airstrip. The meadow had signs of cattle grazing this year.

Trifolium repens - Fewer than 100 individuals grew in small colonies throughout a moderately disturbed wet montane meadow 200 meters north of the Oriole Lake Airstrip. The meadow had signs of recent cattle grazing. Thousands of individuals were observed along the north edge of the Oriole Lake Airstrip and along the dirt road 25 meters north of the airstrip. Fewer than 100 individuals in small colonies were observed in a moderately disturbed wet montane meadow 200 m north of the Oriole Lake Airstrip. The meadow had signs of cattle grazing this year.

Verbascum thapsus - Fewer than 1000 individuals were scattered throughout a moderately disturbed wet montane meadow 200 m north of the Oriole Lake Airstrip. The meadow had signs of cattle grazing this year.

Oriole Lake Road

Bromus tectorum - Thousands of individuals were observed 25 m north of the Oriole Lake Airstrip adjacent to a maintained dirt road in a moist, open, partly disturbed area.

Poa pratensis - Fewer than 1000 individuals were observed 25 m north of the Oriole Lake Airstrip adjacent to a maintained dirt road in a moist, open, partly disturbed area.

Trifolium repens - Thousands of individuals were observed along the north edge of the Oriole Lake Airstrip and along the dirt road 25 meters north of the airstrip

Verbascum thapsus - Fewer than 1000 individuals were observed 25 m north of the Oriole Lake Airstrip adjacent to a maintained dirt road in a moist, open, partly disturbed area.

Potwisha Campground

Carduus pycnocephalus - A single colony of several hundred individuals was sighted along the east edge of the campground. The colony was approximately 6 m by 2 m. No other individuals were observed throughout the survey area.

Convolvulus arvensis - One plant grew along the north side of the entrance to Potwisha Campground among annual grasses in partly shaded, sandy soil. First collection for Sequoia-Kings Canyon National Parks.

Marrubium vulgare - Thousands of these plants grew throughout the campground in open to partly shaded areas of moderate disturbance. In some places, dense colonies of hundreds of individuals excluded all other vegetation. Park maintenance workers report a marked increase in population size in recent years.

Poa bulbosa - Thousands of these plants were observed scattered throughout the entire campground in both disturbed and undisturbed sites.

Poa pratensis - A population of fewer than one hundred individuals were observed at the north-east edge of the campground. They were growing amidst annual grasses on a moderately steep hillside in the shade of Quercus wislizenii var. wislizenii. No other populations were observed within the survey area.

Ranunculus parviflorus - Thousands of these plants were seen in dense clusters in shaded areas throughout the campground.

Rubus discolor - One population consisting of fewer than ten individuals was recorded. It was in the northeast end of the campground growing in the middle of a very dense colony of *Marrubium vulgare* near campsite 29 in partial shade. There also were dozens of individuals growing in a three-square-meter area on the partly shaded west bank of the Kaweah River near the Marble Fork bridge.

Urtica urens - Hundreds of individuals were seen throughout the campground in scattered clumps in loose, recently disturbed mineral soil. No individuals were observed in undisturbed areas of the campground.

Vinca major - A single colony was observed in a nearly flat area along the western edge of the campground at the base of an interior live oak tree. The colony completely covered a 50-square-meter area. No other populations were observed in the campground. This appeared to be a residual planting.

Vulpia bromoides - A large colony of greater than 1000 individuals was seen at the end of the dirt road adjacent to the flume on the north side of the campground in sandy, compacted, open, moderately disturbed soil. No other populations were observed throughout the campground.

Rae Lakes Loop Trail

Bromus tectorum - Hundreds of plants grew 20 meters north of where the Mist Falls Trail crosses Bubb's Creek. They grew in patches on exposed, sandy soil and did not appear to be restricted to human disturbance. We saw hundreds of individuals growing in open patches along the Mist Falls Trail, they did not appear to be restricted to human disturbance. B. tectorum seemed less abundant here than farther down the valley nearer the developed areas. Dozens of plants grew along the trail in sandy soil among granite boulders. Thousands of plants grew along the Mist Falls Trail in open, sandy places. Hundreds of plants grew in a shaded, gently sloping, wooded area near the lower Paradise Valley Campground. Hundreds of plants grew along the Paradise Valley Trail in an exposed, recently burned area five kilometers north of Mist Falls. Thousands of plants grew on an exposed, sandy slope along the Bubb's Creek Trail three kilometers west of the Charlotte Creek Crossing. These plants were common along the switchbacks from the Sphinx Creek Crossing to the valley floor. SEE MAP we saw thousands of individuals along the Bubb's Creek Trail in sandy soil, they did not appear to be restricted to human disturbance. Hundreds of plants grew along the Bubb's Creek Trail in a partly shaded sandy area one kilometer north of Charlotte Creek. This was the highest population we saw on the Bubb's Creek Trail.

Cirsium vulgare - We saw dozens of plants at stream crossings, the plants seemed concentrated at areas of human disturbance. Hundreds of plants grew in a moist, shaded area alongside the Mist Falls Trail, three kilometers east of Road's End. Dozens of plants grew in a dry, sandy streambed along the Bubb's Creek Trail 100 meters east of its junction with the Mist Falls Trail. One vegetative individual grew on the partly shaded edge of a wet meadow. Hundreds of plants grew alongside the Bubb's Creek Trail on a steep, south-facing, sandy slope three kilometers west of the Charlotte Creek Crossing. Numerous plants grew in an adjacent stream.

Hundreds of plants grew in a stream near the Bubb's Creek Trail three kilometers west of Charlotte Creek. They were not restricted to the trailside.

Echinochloa crus-galli - Single plant was observed along the trail margin in a nearly flat site with sandy, well-drained, granitic soil.

Poa pratensis - Hundreds of plants grew along the Rae Lakes Loop Trail in a moist seep adjacent to a small, unnamed meadow above Vidette Meadow. Hundreds of plants grew in the heavily grazed stock camp at Junction Meadow. Dozens of plants grew in the open drier sites within Castle Domes Meadow. The meadow had signs of being grazed by stock this year. Thousands of plants grew in a grazed meadow near the Rae Lakes Trail in the vicinity of Woods Creek. Hundreds of these plants grew on stream banks along the first kilometer of the Mist Falls Trail. They did not appear restricted to areas of human disturbance. Hundreds of plants grew in a stream near the Bubb's Creek Trail three kilometers west of Charlotte Creek. They were not restricted to the trailside. Hundreds of plants grew adjacent to the trail on exposed, moist soil.

Verbascum thapsus - We saw dozens of plants at stream crossings, the plants seemed concentrated at areas of human disturbance.

Rattlesnake Creek Trail

Poa pratensis - This plant was collected at a stream crossing of a tributary of Rattlesnake Creek. This was on the trail between Franklin Pass and the Kern Canyon.

Red Fir Maintenance Area

Bromus tectorum - Thousands of individuals were observed growing throughout the survey area in open, well drained, sandy, granitic soils.

Cirsium vulgare - Fewer than 100 individuals were observed scattered throughout the spray field adjacent to a moderately used dirt road leading through the middle of the site. Several rosettes were observed outside of the radius of the sprinklers. Fewer than 1000 individuals were seen scattered throughout the survey area. A large population was observed in a small drainage east of the maintenance building.

Poa pratensis - Fewer than 10 individuals were seen growing between the two maintenance buildings adjacent to an asphalt parking lot in nearly flat, disturbed granitic soil.

Verbascum virgatum - Fewer than one hundred individuals were observed scattered along the west side of the lower maintenance building in small moist ditch. Other individuals were scattered throughout the survey area in open sandy soils adjacent to asphalt roadways.

Redwood Canyon Trail

Cirsium vulgare - Fewer than ten plants grew in shaded, well developed, moist soil alongside the Redwood Creek Trail 50 meters northeast of the junction with the Hart Loop Trail. One plant grew in an exposed, well-vegetated sand bar in Redwood Creek.

Trifolium repens - Dozens of plants grew in moist, moderately shaded, well-developed soil near the Redwood Creek Trail just below Redwood Saddle.

Redwood Creek

Bromus tectorum - Collected in a disturbed area near the Redwood Creek Parking area on the Mineral King Road.

Poa pratensis - Collected in a disturbed area near the Redwood Creek Parking area on the Mineral King Road.

Rubus discolor - A large, dense population was observed within the creek bed from the roadside to about 50 meters upstream. Two other patches were observed downstream of the Mineral King Road. One patch was directly below the road and covered an area of approximately 8m by 12m. The other patch was further downstream and was only 1m by 2m. Both populations were growing directly in the creek.

Trifolium repens - Several colonies were scattered in moist, disturbed areas.

Scaffold Meadow

Phleum pratense - Thousands of plants grew throughout scaffold Meadow, 300 meters north of Roaring River Ranger Station. This meadow receives heavy annual grazing from pack animals. The population often dominated the herb layer in several areas within the meadow. Phleum pratense was much more common than its native sympatric brother, P. alpinum.

Poa pratensis - Thousands of plants grew throughout Scaffold Meadow, 300 meters north of Roaring River Ranger Station. The plants were observed in both wet and dry sites in this meadow. Scaffold Meadow receives heavy annual grazing from pack animals.

Sentinel Campground

Ranunculus testiculatus - A single dense population of greater than 1000 individuals was observed in a moderately disturbed area on the east edge of the campground in well-drained, granitic soil. This is the only population of this species that we observed in 1998. First collection for Sequoia-Kings Canyon National Parks.

Sequoia Lake Trail

Cirsium vulgare - A single individual was observed adjacent to a small, flowing drainage in moist, well-developed soil. We pulled the plant up.

Poa pratensis - Dozens of plants grew in a steep, rocky streambed along the Sequoia Lakes Trail.

Sheep Creek Campground

Bromus tectorum - We saw thousands plants in sunny places about the campground. This species is abundant in the Cedar Grove Valley and does not appear to be dependant on human disturbance.

Poa bulbosa - We found one population in a dry, partly shaded, roadside ditch near campsite #13.

Poa compressa - A colony of fewer than 100 individuals was observed growing near the east edge of the campground in a moist, sandy swale, adjacent to a paved campground road. No other populations were observed within the survey area.

Poa pratensis - We saw two populations in the campground, neither contained more than 100 plants. One grew at the base of a water spigot and the other grew in a dry, roadside ditch.

Sheppard Saddle Road

Polypogon monspeliensis - 100 meters west of Ash Mountain Shooting Range in a roadside ditch. The population is emergent out of 5 cm of standing water.

South Fork Campground

Carduus pycnocephalus - A few individuals were found in the middle part of the campground in a partly shaded, moderately sloping, northwest-facing, grassy area.

Cirsium vulgare - Dozens of individuals were found in the middle part of the campground near campsite #5. They were growing in a partly shaded, moderately sloping, northwest-facing, grassy area. Last years flowering stalks were visible there, too. C. vulgare was not sighted elsewhere in the campground.

Tragopogon dubius - Eleven plants were found (and killed) in a partly shaded grassy area with a dry streambed running through it. They were in the western part of the campground. No other populations were found.

Vulpia bromoides - Hundreds of these plants were scattered throughout the campground in both moderately disturbed and undisturbed, grassy areas.

Sugar Bowl Trail

Bromus tectorum - Hundreds of plants grew among giant sequoia seedlings in well drained soil on an exposed, moderately sloping, east-facing, recently burned clearing.

Cirsium vulgare - One plant grew among giant sequoia seedlings in well drained soil on an exposed, moderately sloping, east-facing, recently burned clearing.

Sugarloaf Meadow

Poa pratensis - Thousands of plants grew around the meadow margin. This meadow sees heavy annual stock use.

Sunset Campground

Bromus tectorum - Fewer than 100 of these individuals were observed in dry, developed soil 5 m from the northwest edge of Eli's Paradise Meadow. This is the former site of Sunset Campground, which closed in the late 1960's.

Cirsium vulgare - Thousands of these individuals were seen growing throughout Eli's Paradise Meadow and radiating into the adjacent big tree forest in both disturbed and undisturbed sites in partial shade with well developed soils. This is the former site of Sunset Campground, which closed in the late 1960's.

Dactylis glomerata - Fewer than 1000 individuals were observed scattered along the margins of Eli's Paradise Meadow in partly shaded, moist soil with dense herbaceous understory. This is the former site of Sunset Campground, which closed in the late 1960's.

Digitalis purpurea - Many hundreds of these plants grew in Eli's Paradise, a montane meadow about 500 meters northwest of Round Meadow. They were especially common along the broad southeast margin of the meadow, where there was little standing water. This plant was documented in disturbed areas of both Lodgepole Pine and Big Tree Forest community types in 1997 surveys. This is the former site of Sunset Campground, which closed in the late 1960's.

Poa pratensis - Fewer than 1000 individuals were observed growing in small populations along the margins of Eli's Paradise Meadow in partly shaded, moist soil with dense herbaceous understory. This is the former site of Sunset Campground, which closed in the late 1960's.

Verbascum thapsus - Fewer than 100 individuals were seen growing where Eli's Paradise Meadow radiates into the adjacent Big Tree Forest. The individuals were growing in well developed soils with long-leaf pine litter in partial shade. This is the former site of Sunset Campground, which closed in the late 1960's.

Swale Administrative Campground

Centaurea solstitialis - Two plants observed. Both were collected.

Cirsium vulgare - Collected at Swale Campground along the edges of a moist roadbed. The density of plants along the roadside averaged approximately 2-3 plants per square meter. There is a patch in an adjacent meadow that is roughly 2 m by 5 m.

Verbascum thapsus - Hundreds of plants grew in moist, disturbed places about the campground.

Sycamore Creek

Arundo donax - An early season survey revealed a single population approximately 50 meters upstream of Highway 198 growing from a flat, wet sand bar directly in the creek bed. On a return visit in August, three small colonies were observed in the same area. No other populations were encountered within the Sycamore Creek survey area. There was evidence that somebody had been actively eradicating this population; large piles of uprooted shoots were scattered throughout the area.

Carduus pycnocephalus - Thousands of these plants grew near the crossing of Shepherd Saddle Road on the stream bank and in the neighboring grassland, often choking out all other vegetation and attaining enormous size (up

to 1.5m). Plants growing near the stream were bigger than plants in the adjacent grassland. Downstream of the crossing there were scattered plants in sunny areas but no colonies attained the size of the first.

Echinochloa crus-galli - This plant is very likely a species of Echinochloa, a late season, non-indigenous, annual grass. Fewer than ten plants were seen in Sycamore Creek growing in moist, well vegetated soil banks.

Marrubium vulgare - Fewer than 10 seedlings were observed on loose, sandy, well drained soils. Several mature plants were observed growing 10 meters west of the stream corridor along the Shepherd Saddle Road.

Melilotus indica - One small population of fewer than 100 individuals was observed on moist sand in deep shade. No other individuals were seen in the survey area.

Polypogon monspeliensis - Thousands of individuals were observed in small colonies throughout the survey area

Pyracantha angustifolia - One plant was found growing in the middle of the stream in a shady spot at the base of a mature *Platanus occidentalis*. This plant grew about 50 meters upstream of Buckeye Drive. This is the first collection for Sequoia-Kings Canyon National Parks.

***Tamarix* sp.** - Two seedlings were observed in a sand bar in the middle of the stream in deep shade. The plants were less than 10 centimeters tall and appeared to be first-year seedlings. Due to the immaturity of the seedlings, it was impossible to determine the species of *Tamarix* that was seen. Other sightings of *Tamarix* this year have occurred during surveys in the Middle and North Forks of the Kaweah River. See collection ASP #4350 PW for a voucher specimen from the North Fork.

Trail for All People

Dactylis glomerata - Thousands of individuals were seen scattered throughout the meadow edge, primarily on the west and north edges along the "Trail for All People". The plants radiate into the adjacent Big Tree Forest for several meters. Other populations of this species were observed at Eli's Paradise and along the asphalt road to Lower Kaweah on the west side of the Giant Forest Lodge.

Phleum pratense - Thousands of these plants grew around the margins of Round Meadow in partly shaded areas devoid of standing water.

Traugers Creek

Lathyrus latifolius - Thousands of individuals in large, dense colonies were observed at the junction of the Mineral King road and Traugers Creek. A large colony is directly along the Mineral King Road and extends approximately fifty meters upstream from the road.

Malus sylvestris - A mature, fruiting tree with several smaller trees nearby grew 20 meters upstream of the Mineral King Road. There were no other trees observed downstream of this population.

Poa pratensis - Fewer than 100 individuals were seen scattered throughout Trauger's creek in moist, shaded areas.

Williams Meadow

Poa pratensis - Tens of thousands of plants grew around the margins of this very expansive montane meadow.

Wolverton Pack Station

Tragopogon dubius - A single individual was found along the southern edge of the pack station complex in a mildly disturbed area. No other individuals were seen within the complex.

Wolverton Snow Play Area

Poa pratensis - Thousands of individuals growing in small populations were seen throughout the meadow in flat, wet, open areas with dense herbaceous layers and well developed, poorly drained soils.

Wuksachi

Bromus tectorum - Thousands of individuals were growing in large colonies throughout the Wuksachi Complex in open, undisturbed and moderately disturbed sites.

Cirsium vulgare - A population of 12 individuals was observed adjacent to the northeast corner of the Wuksachi Fire House in open, moderately disturbed, well-developed soils.

Echinochloa crus-galli - A large population of greater than 1000 individuals was observed in a strip of loose disturbed, bare soil between an asphalt road and a concrete sidewalk. The strip of dirt had rice straw laid down upon it. The population was approximately 20 m by 2 m. There was very little other vegetation growing there. No other populations were observed elsewhere in the survey area.

Melilotus alba - A single plant was seen growing 75 meters east of the Wuksachi Fire Station alongside an asphalt road.

Tragopogon dubius - Fewer than 100 individuals were seen scattered throughout the complex in open, partly disturbed areas with little herbaceous under story.

Verbascum thapsus - Three plants were seen on south side of the sewage treatment plant. Populations were observed scattered throughout the Wuksachi Complex.

Verbascum virgatum - Populations of this plant species grew in dry, exposed, roadside areas. One population was near the sewage treatment facility and one was alongside the entrance road to Wuksachi proper. These populations, numbering a few dozen plants each, contained first-year rosettes as well as blooming individuals. Fewer than 100 plants were observed two hundred meters southwest of the Wuksachi Fire Station in a flat, open area adjacent to the parking lot. The population was in decomposed granite and mulch laid down a previous year. Another population of fewer than twenty individuals was seen adjacent to the road leading to Wuksachi approximately one hundred meters north of the Generals Highway.

Yucca Creek

Carduus pycnocephalus - Fewer than 100 individuals were observed in small colonies scattered throughout the riparian zone in open, dry sand bars and rock cracks.

Ficus carica - This species has been noted in three different places in this area of Sequoia National Park. Two separate plants have been seen in the North Fork of the Kaweah River, upstream of Yucca Creek. The third and largest population grew in and along a lush, shady, rocky section of Yucca Creek about 100 meters upstream of the Kaweah River. There were a dozen or so individuals in this population, including one mature tree which had a trunk of 20 centimeters in diameter at 1.7 meters above the ground. The other members of this colony were but a few years old. Reproduction appeared to be of both sexual and vegetative nature. The entire colony occupied a space not bigger than 25 square meters. This is the first collection for Sequoia-Kings Canyon National Parks.

Juglans californica - These vegetative plants were likely a species of walnut native to the Great Valley and to western parts of California. What appeared to be one mother plant and ten or fifteen offspring grew along the north bank of Yucca Creek, about 350 meters upstream of the Old Hidden Springs Road crossing. The "mother" plant grew alongside the Old Hidden Springs Trail (residual planting?). The slope below it dropped into Yucca Creek. The several naturalized plants, ranging from about one to ten years old, were scattered upstream and downstream of the mature plant on the partly shaded, well-vegetated stream bank. What appeared to be *Juglans regia* (the walnut of commerce, not native to California) also grew nearby. These species are known to hybridize.

Juglans regia - Alongside the Old Hidden Springs Trail and about 350 meters upstream of the Old Hidden Springs Road crossing near a population of *Juglans californica* (see description above). Known to hybridize with *J. californica.*

Poa pratensis - Fewer than 1000 individuals were observed growing in scattered populations in partly shaded areas.

Polypogon interruptus - Fewer than ten of these plants were seen in Yucca Creek in shaded, moist, rocky, streamside areas. This is the first collection for Sequoia-Kings Canyon National Parks.

Polypogon monspeliensis - Fewer than 100 individuals were seen scattered throughout the creek in open sand bars and rock cracks.

Rubus discolor - Thousands of individuals growing in numerous large colonies were observed in shaded places throughout the survey area.

Silybum marianum - Two populations of this plant were seen along Yucca Creek. One population was on an exposed, rocky, grassy flood plain, two kilometers upstream of the Kaweah River. The other population was on an exposed sandy bank \ flood plain a few hundred meters downstream of the first. Each population contained a few dozen individuals and both were on the north side of Yucca Creek. This is the first collection for Sequoia-Kings Canyon National Parks.

Vitis vinifera - Frequent, dense patches of this plant are scattered throughout Yucca Creek. A native grape species, *Vitis californica* Benth. also occurs in the creek.

Zumwalt Meadow Trail

Bromus tectorum - We found fewer than 100 plants on the partly shaded, rocky, north bank of the Kings River 100 meters east of the trailhead parking lot.

Cirsium vulgare - We found fewer than 100 plants on the partly shaded, sandy, north bank of the Kings River 120 meters east of the trailhead parking lot.

Poa pratensis - We found fewer than 1000 plants on the partly shaded, sandy, north bank of the Kings River 120 meters east of the trailhead parking lot.

Verbascum thapsus - We found fewer than 100 plants on the partly shaded, rocky, north bank of the Kings River 100 meters east of the trailhead parking lot.

Appendix D: Yosemite National Park alien plant species along roadsides.

Road	Elevation (ft)	Alien Species
Big Oak Flat Road	4661	*Aira caryophyllea*
Big Oak Flat Road	4661	*Avena fatua*
Big Oak Flat Road	4661	*Bromus diandrus*
Big Oak Flat Road	4661	*Bromus hordeaceus*
Big Oak Flat Road	4661	*Bromus tectorum*
Big Oak Flat Road	4661	*Chenopodium album*
Big Oak Flat Road	4661	*Chenopodium botrys*
Big Oak Flat Road	4661	*Cynosurus echinatus*
Big Oak Flat Road	4661	*Holcus lanatus*
Big Oak Flat Road	4661	*Hypericum perforatum*
Big Oak Flat Road	4661	*Lactuca serriola*
Big Oak Flat Road	4661	*Phleum pratense*
Big Oak Flat Road	4661	*Poa bulbosa*
Big Oak Flat Road	4661	*Polygonum arenastrum*
Big Oak Flat Road	4661	*Sonchus oleraceus*
Big Oak Flat Road	4661	*Vulpia myuros*
Big Oak Flat Road	4946	*Avena barbata*
Big Oak Flat Road	4946	*Bromus diandrus*
Big Oak Flat Road	4946	*Bromus hordeaceus*
Big Oak Flat Road	4946	*Bromus tectorum*
Big Oak Flat Road	4946	*Cerastium glomeratum*
Big Oak Flat Road	4946	*Cynosurus echinatus*
Big Oak Flat Road	4946	*Dactylis glomerata*
Big Oak Flat Road	4946	*Erodium cicutarium*
Big Oak Flat Road	4946	*Hypericum perforatum*
Big Oak Flat Road	4946	*Lactuca serriola*
Big Oak Flat Road	4946	*Lathyrus latifolius*
Big Oak Flat Road	4946	*Phleum pratense*
Big Oak Flat Road	4946	*Plantago lanceolata*
Big Oak Flat Road	4946	*Poa bulbosa*
Big Oak Flat Road	4946	*Polygonum arenastrum*
Big Oak Flat Road	4946	*Sisymbrium altissimum*
Big Oak Flat Road	4946	*Sonchus asper*
Big Oak Flat Road	4946	*Vulpia myuros*
Big Oak Flat Road	5272	*Avena fatua*
Big Oak Flat Road	5272	*Bromus diandrus*
Big Oak Flat Road	5272	*Bromus hordeaceus*
Big Oak Flat Road	5272	*Bromus tectorum*
Big Oak Flat Road	5272	*Chenopodium album*
Big Oak Flat Road	5272	*Chenopodium botrys*
Big Oak Flat Road	5272	*Cynosurus echinatus*
Big Oak Flat Road	5272	*Herniaria hirsuta*
Big Oak Flat Road	5272	*Holcus lanatus*
Big Oak Flat Road	5272	*Lactuca serriola*
Big Oak Flat Road	5272	*Plantago lanceolata*
Big Oak Flat Road	5272	*Poa pratensis*
Big Oak Flat Road	5272	*Polygonum arenastrum*
Big Oak Flat Road	5272	*Rumex acetosella*

Alien Species	Elevation (ft)	Road
Agrostis gigantea	6040	Wawona Road 3
Agrostis gigantea	6051	Wawona Road
Aira caryophyllea	3842	El Portal Road
Aira caryophyllea	3964	Wawona Road
Aira caryophyllea	4661	Big Oak Flat Road
Aira caryophyllea	5505	Hetch Hetchy Road
Aira caryophyllea	6040	Wawona Road 3
Aira caryophyllea	6051	Wawona Road
Amaranthus albus	3959	Northside Drive
Anthemis cotula	5969	Yosemite West
Avena barbata	3964	Wawona Road
Avena barbata	4946	Big Oak Flat Road
Avena barbata	5505	Hetch Hetchy Road
Avena fatua	4661	Big Oak Flat Road
Avena fatua	5272	Big Oak Flat Road
Bromus arenarius	3958	Southside Drive
Bromus diandrus	3842	El Portal Road
Bromus diandrus	3958	Southside Drive
Bromus diandrus	3959	Northside Drive
Bromus diandrus	3964	Wawona Road
Bromus diandrus	4661	Big Oak Flat Road
Bromus diandrus	4946	Big Oak Flat Road
Bromus diandrus	5143	Wawona Road 2
Bromus diandrus	5272	Big Oak Flat Road
Bromus hordeaceus	3842	El Portal Road
Bromus hordeaceus	3958	Southside Drive
Bromus hordeaceus	3959	Northside Drive
Bromus hordeaceus	3964	Wawona Road
Bromus hordeaceus	4661	Big Oak Flat Road
Bromus hordeaceus	4946	Big Oak Flat Road
Bromus hordeaceus	5272	Big Oak Flat Road
Bromus hordeaceus	5505	Hetch Hetchy Road
Bromus inermis	3842	El Portal Road
Bromus inermis	5143	Wawona Road 2
Bromus inermis	5505	Hetch Hetchy Road
Bromus inermis	6040	Wawona Road 3
Bromus inermis	7981	Tioga Road
Bromus secalinus	3959	Northside Drive
Bromus secalinus	3964	Wawona Road
Bromus sterilis	3959	Northside Drive
Bromus tectorum	3842	El Portal Road
Bromus tectorum	3958	Southside Drive
Bromus tectorum	3959	Northside Drive
Bromus tectorum	3964	Wawona Road
Bromus tectorum	4661	Big Oak Flat Road
Bromus tectorum	4946	Big Oak Flat Road
Bromus tectorum	5143	Wawona Road 2
Bromus tectorum	5272	Big Oak Flat Road

Appendix D: (continued)

Road	Elevation (ft)	Alien Species
Big Oak Flat Road	5272	*Sonchus asper*
Big Oak Flat Road	5272	*Vulpia myuros*
Big Oak Flat Road	5902	*Bromus tectorum*
Big Oak Flat Road	5902	*Cirsium vulgare*
Big Oak Flat Road	5902	*Herniaria hirsuta*
Big Oak Flat Road	5902	*Lolium multiflorum*
Big Oak Flat Road	5902	*Plantago lanceolata*
Big Oak Flat Road	5902	*Polygonum arenastrum*
Big Oak Flat Road	5902	*Rumex acetosella*
Big Oak Flat Road	5902	*Spergularia rubra*
El Portal Road	3842	*Aira caryophyllea*
El Portal Road	3842	*Bromus diandrus*
El Portal Road	3842	*Bromus hordeaceus*
El Portal Road	3842	*Bromus inermis*
El Portal Road	3842	*Bromus tectorum*
El Portal Road	3842	*Chenopodium album*
El Portal Road	3842	*Chenopodium botrys*
El Portal Road	3842	*Cynosurus echinatus*
El Portal Road	3842	*Galium parisiense*
El Portal Road	3842	*Herniaria hirsuta*
El Portal Road	3842	*Hordeum murinum*
El Portal Road	3842	*Lactuca serriola*
El Portal Road	3842	*Plantago lanceolata*
El Portal Road	3842	*Poa bulbosa*
El Portal Road	3842	*Poa pratensis*
El Portal Road	3842	*Polygonum arenastrum*
El Portal Road	3842	*Trifolium hirtum*
El Portal Road	3842	*Vulpia myuros*
Glacier Point Road	6179	*Rumex acetosella*
Glacier Point Road	6440	*Cirsium vulgare*
Glacier Point Road	6440	*Plantago lanceolata*
Glacier Point Road	6440	*Plantago major*
Glacier Point Road	6440	*Rumex acetosella*
Glacier Point Road	7176	*Spergularia rubra*
Glacier Point Road	7704	*Spergularia rubra*
Hetch Hetchy Road	5505	*Aira caryophyllea*
Hetch Hetchy Road	5505	*Avena barbata*
Hetch Hetchy Road	5505	*Bromus hordeaceus*
Hetch Hetchy Road	5505	*Bromus inermis*
Hetch Hetchy Road	5505	*Bromus tectorum*
Hetch Hetchy Road	5505	*Hypericum perforatum*
Hetch Hetchy Road	5505	*Rumex acetosella*
Hetch Hetchy Road	5505	*Spergularia rubra*
Hetch Hetchy Road	5505	*Vulpia myuros*
Northside Drive	3959	*Amaranthus albus*
Northside Drive	3959	*Bromus diandrus*
Northside Drive	3959	*Bromus hordeaceus*
Northside Drive	3959	*Bromus secalinus*
Northside Drive	3959	*Bromus sterilis*

Alien Species	Elevation (ft)	Road
Bromus tectorum	5505	Hetch Hetchy Road
Bromus tectorum	5902	Big Oak Flat Road
Bromus tectorum	5969	Yosemite West
Bromus tectorum	6040	Wawona Road 3
Bromus tectorum	6051	Wawona Road
Bromus tectorum	8472	Tioga Road
Centaurea solstitialis	5143	Wawona Road 2
Cerastium glomeratum	4946	Big Oak Flat Road
Cerastium glomeratum	5969	Yosemite West
Chamomilla suaveolens	3958	Southside Drive
Chamomilla suaveolens	3959	Northside Drive
Chamomilla suaveolens	3964	Wawona Road
Chenopodium album	3842	El Portal Road
Chenopodium album	3958	Southside Drive
Chenopodium album	3959	Northside Drive
Chenopodium album	4661	Big Oak Flat Road
Chenopodium album	5143	Wawona Road 2
Chenopodium album	5272	Big Oak Flat Road
Chenopodium album	5969	Yosemite West
Chenopodium album	6051	Wawona Road
Chenopodium botrys	3842	El Portal Road
Chenopodium botrys	3958	Southside Drive
Chenopodium botrys	3959	Northside Drive
Chenopodium botrys	4661	Big Oak Flat Road
Chenopodium botrys	5143	Wawona Road 2
Chenopodium botrys	5272	Big Oak Flat Road
Chenopodium botrys	5969	Yosemite West
Chenopodium botrys	6051	Wawona Road
Cirsium vulgare	3958	Southside Drive
Cirsium vulgare	5143	Wawona Road 2
Cirsium vulgare	5902	Big Oak Flat Road
Cirsium vulgare	5969	Yosemite West
Cirsium vulgare	6040	Wawona Road 3
Cirsium vulgare	6051	Wawona Road
Cirsium vulgare	6254	Tioga Road
Cirsium vulgare	6440	Glacier Point Road
Cynosurus echinatus	3842	El Portal Road
Cynosurus echinatus	3958	Southside Drive
Cynosurus echinatus	3959	Northside Drive
Cynosurus echinatus	3964	Wawona Road
Cynosurus echinatus	4661	Big Oak Flat Road
Cynosurus echinatus	4946	Big Oak Flat Road
Cynosurus echinatus	5272	Big Oak Flat Road
Dactylis glomerata	3958	Southside Drive
Dactylis glomerata	3959	Northside Drive
Dactylis glomerata	4946	Big Oak Flat Road
Dactylis glomerata	6254	Tioga Road
Erodium cicutarium	4946	Big Oak Flat Road
Galium parisiense	3842	El Portal Road

Appendix D: (continued)

Road	Elevation (ft)	Alien Species
Northside Drive	3959	*Bromus tectorum*
Northside Drive	3959	*Chamomilla suaveolens*
Northside Drive	3959	*Chenopodium album*
Northside Drive	3959	*Chenopodium botrys*
Northside Drive	3959	*Cynosurus echinatus*
Northside Drive	3959	*Dactylis glomerata*
Northside Drive	3959	*Herniaria hirsuta*
Northside Drive	3959	*Hordeum murinum*
Northside Drive	3959	*Hypericum perforatum*
Northside Drive	3959	*Lactuca serriola*
Northside Drive	3959	*Lolium perenne*
Northside Drive	3959	*Plantago lanceolata*
Northside Drive	3959	*Poa annua*
Northside Drive	3959	*Poa bulbosa*
Northside Drive	3959	*Poa pratensis*
Northside Drive	3959	*Polygonum arenastrum*
Northside Drive	3959	*Polygonum convolvulus*
Northside Drive	3959	*Rumex acetosella*
Northside Drive	3959	*Rumex crispus*
Northside Drive	3959	*Sisymbrium altissimum*
Northside Drive	3959	*Sonchus asper*
Northside Drive	3959	*Spergularia rubra*
Northside Drive	3959	*Taraxacum officinale*
Northside Drive	3959	*Tragopogon dubius*
Northside Drive	3959	*Trifolium repens*
Northside Drive	3959	*Vulpia myuros*
Southside Drive	3958	*Bromus arenarius*
Southside Drive	3958	*Bromus diandrus*
Southside Drive	3958	*Bromus hordeaceus*
Southside Drive	3958	*Bromus tectorum*
Southside Drive	3958	*Chamomilla suaveolens*
Southside Drive	3958	*Chenopodium album*
Southside Drive	3958	*Chenopodium botrys*
Southside Drive	3958	*Cirsium vulgare*
Southside Drive	3958	*Cynosurus echinatus*
Southside Drive	3958	*Dactylis glomerata*
Southside Drive	3958	*Galium parisiense*
Southside Drive	3958	*Hordeum murinum*
Southside Drive	3958	*Hypochaeris radicata*
Southside Drive	3958	*Lactuca serriola*
Southside Drive	3958	*Lolium perenne*
Southside Drive	3958	*Plantago lanceolata*
Southside Drive	3958	*Poa bulbosa*
Southside Drive	3958	*Poa pratensis*
Southside Drive	3958	*Polygonum arenastrum*
Southside Drive	3958	*Rumex acetosella*
Southside Drive	3958	*Silene latifolia*
Southside Drive	3958	*Sisymbrium altissimum*
Southside Drive	3958	*Taraxacum officinale*

Alien Species	Elevation (ft)	Road
Galium parisiense	3958	Southside Drive
Herniaria hirsuta	3842	El Portal Road
Herniaria hirsuta	3959	Northside Drive
Herniaria hirsuta	5272	Big Oak Flat Road
Herniaria hirsuta	5902	Big Oak Flat Road
Herniaria hirsuta	8472	Tioga Road
Holcus lanatus	3964	Wawona Road
Holcus lanatus	4661	Big Oak Flat Road
Holcus lanatus	5272	Big Oak Flat Road
Holcus lanatus	6051	Wawona Road
Hordeum murinum	3842	El Portal Road
Hordeum murinum	3958	Southside Drive
Hordeum murinum	3959	Northside Drive
Hypericum perforatum	3959	Northside Drive
Hypericum perforatum	3964	Wawona Road
Hypericum perforatum	4661	Big Oak Flat Road
Hypericum perforatum	4946	Big Oak Flat Road
Hypericum perforatum	5505	Hetch Hetchy Road
Hypochaeris radicata	3958	Southside Drive
Lactuca serriola	3842	El Portal Road
Lactuca serriola	3958	Southside Drive
Lactuca serriola	3959	Northside Drive
Lactuca serriola	3964	Wawona Road
Lactuca serriola	4661	Big Oak Flat Road
Lactuca serriola	4946	Big Oak Flat Road
Lactuca serriola	5143	Wawona Road 2
Lactuca serriola	5272	Big Oak Flat Road
Lactuca serriola	5969	Yosemite West
Lactuca serriola	6040	Wawona Road 3
Lactuca serriola	6051	Wawona Road
Lathyrus latifolius	4946	Big Oak Flat Road
Lolium multiflorum	5902	Big Oak Flat Road
Lolium multiflorum	5969	Yosemite West
Lolium perenne	3958	Southside Drive
Lolium perenne	3959	Northside Drive
Lolium perenne	5969	Yosemite West
Phleum pratense	4661	Big Oak Flat Road
Phleum pratense	4946	Big Oak Flat Road
Plantago lanceolata	3842	El Portal Road
Plantago lanceolata	3958	Southside Drive
Plantago lanceolata	3959	Northside Drive
Plantago lanceolata	3964	Wawona Road
Plantago lanceolata	4946	Big Oak Flat Road
Plantago lanceolata	5143	Wawona Road 2
Plantago lanceolata	5272	Big Oak Flat Road
Plantago lanceolata	5902	Big Oak Flat Road
Plantago lanceolata	5969	Yosemite West
Plantago lanceolata	6040	Wawona Road 3
Plantago lanceolata	6051	Wawona Road

Appendix D: (continued)

Road	Elevation (ft)	Alien Species
Southside Drive	3958	*Tragopogon dubius*
Southside Drive	3958	*Trifolium repens*
Southside Drive	3958	*Verbascum thapsus*
Tioga Road	6254	*Cirsium vulgare*
Tioga Road	6254	*Dactylis glomerata*
Tioga Road	6254	*Plantago lanceolata*
Tioga Road	6254	*Poa annua*
Tioga Road	6254	*Polygonum arenastrum*
Tioga Road	6254	*Polygonum arenastrum*
Tioga Road	6254	*Rumex acetosella*
Tioga Road	7143	*Rumex acetosella*
Tioga Road	7143	*Spergularia rubra*
Tioga Road	7981	*Bromus inermis*
Tioga Road	7981	*Spergularia rubra*
Tioga Road	8127	*Rumex acetosella*
Tioga Road	8127	*Spergularia rubra*
Tioga Road	8150	*Rumex acetosella*
Tioga Road	8150	*Spergularia rubra*
Tioga Road	8472	*Bromus tectorum*
Tioga Road	8472	*Herniaria hirsuta*
Tioga Road	8472	*Rumex acetosella*
Tioga Road	8472	*Spergularia rubra*
Tioga Road	8674	*Spergularia rubra*
Wawona Road	3964	*Aira caryophyllea*
Wawona Road	3964	*Avena barbata*
Wawona Road	3964	*Bromus diandrus*
Wawona Road	3964	*Bromus hordeaceus*
Wawona Road	3964	*Bromus secalinus*
Wawona Road	3964	*Bromus tectorum*
Wawona Road	3964	*Chamomilla suaveolens*
Wawona Road	3964	*Cynosurus echinatus*
Wawona Road	3964	*Holcus lanatus*
Wawona Road	3964	*Hypericum perforatum*
Wawona Road	3964	*Lactuca serriola*
Wawona Road	3964	*Plantago lanceolata*
Wawona Road	3964	*Poa bulbosa*
Wawona Road	3964	*Poa pratensis*
Wawona Road	3964	*Polygonum arenastrum*
Wawona Road	3964	*Rumex acetosella*
Wawona Road	3964	*Sonchus asper*
Wawona Road	3964	*Spergularia rubra*
Wawona Road	3964	*Vulpia myuros*
Wawona Road	6051	*Agrostis gigantea*
Wawona Road	6051	*Aira caryophyllea*
Wawona Road	6051	*Bromus tectorum*
Wawona Road	6051	*Chenopodium album*
Wawona Road	6051	*Chenopodium botrys*
Wawona Road	6051	*Cirsium vulgare*
Wawona Road	6051	*Holcus lanatus*

Alien Species	Elevation (ft)	Road
Plantago lanceolata	6254	Tioga Road
Plantago lanceolata	6440	Glacier Point Road
Plantago major	6051	Wawona Road
Plantago major	6440	Glacier Point Road
Poa annua	3959	Northside Drive
Poa annua	5143	Wawona Road 2
Poa annua	6040	Wawona Road 3
Poa annua	6051	Wawona Road
Poa annua	6254	Tioga Road
Poa bulbosa	3842	El Portal Road
Poa bulbosa	3958	Southside Drive
Poa bulbosa	3959	Northside Drive
Poa bulbosa	3964	Wawona Road
Poa bulbosa	4661	Big Oak Flat Road
Poa bulbosa	4946	Big Oak Flat Road
Poa pratensis	3842	El Portal Road
Poa pratensis	3958	Southside Drive
Poa pratensis	3959	Northside Drive
Poa pratensis	3964	Wawona Road
Poa pratensis	5143	Wawona Road 2
Poa pratensis	5272	Big Oak Flat Road
Poa pratensis	5969	Yosemite West
Poa pratensis	6040	Wawona Road 3
Poa pratensis	6051	Wawona Road
Polygonum arenastrum	3842	El Portal Road
Polygonum arenastrum	3958	Southside Drive
Polygonum arenastrum	3959	Northside Drive
Polygonum arenastrum	3964	Wawona Road
Polygonum arenastrum	4661	Big Oak Flat Road
Polygonum arenastrum	4946	Big Oak Flat Road
Polygonum arenastrum	5143	Wawona Road 2
Polygonum arenastrum	5272	Big Oak Flat Road
Polygonum arenastrum	5902	Big Oak Flat Road
Polygonum arenastrum	5969	Yosemite West
Polygonum arenastrum	6051	Wawona Road
Polygonum arenastrum	6254	Tioga Road
Polygonum arenastrum	6254	Tioga Road
Polygonum convolvulus	3959	Northside Drive
Raphanus raphanistrum	5969	Yosemite West
Raphanus sativus	5969	Yosemite West
Rumex acetosella	3958	Southside Drive
Rumex acetosella	3959	Northside Drive
Rumex acetosella	3964	Wawona Road
Rumex acetosella	5143	Wawona Road 2
Rumex acetosella	5272	Big Oak Flat Road
Rumex acetosella	5505	Hetch Hetchy Road
Rumex acetosella	5902	Big Oak Flat Road
Rumex acetosella	5969	Yosemite West
Rumex acetosella	6040	Wawona Road 3

Appendix D: (continued)

Road	Elevation (ft)	Alien Species
Wawona Road	6051	*Lactuca serriola*
Wawona Road	6051	*Plantago lanceolata*
Wawona Road	6051	*Plantago major*
Wawona Road	6051	*Poa annua*
Wawona Road	6051	*Poa pratensis*
Wawona Road	6051	*Polygonum arenastrum*
Wawona Road	6051	*Rumex acetosella*
Wawona Road	6051	*Spergularia rubra*
Wawona Road	6051	*Trifolium repens*
Wawona Road 2	5143	*Bromus diandrus*
Wawona Road 2	5143	*Bromus inermis*
Wawona Road 2	5143	*Bromus tectorum*
Wawona Road 2	5143	*Centaurea solstitialis*
Wawona Road 2	5143	*Chenopodium album*
Wawona Road 2	5143	*Chenopodium botrys*
Wawona Road 2	5143	*Cirsium vulgare*
Wawona Road 2	5143	*Lactuca serriola*
Wawona Road 2	5143	*Plantago lanceolata*
Wawona Road 2	5143	*Poa annua*
Wawona Road 2	5143	*Poa pratensis*
Wawona Road 2	5143	*Polygonum arenastrum*
Wawona Road 2	5143	*Rumex acetosella*
Wawona Road 2	5143	*Silene latifolia*
Wawona Road 2	5143	*Vulpia myuros*
Wawona Road 3	6040	*Agrostis gigantea*
Wawona Road 3	6040	*Aira caryophyllea*
Wawona Road 3	6040	*Bromus inermis*
Wawona Road 3	6040	*Bromus tectorum*
Wawona Road 3	6040	*Cirsium vulgare*
Wawona Road 3	6040	*Lactuca serriola*
Wawona Road 3	6040	*Plantago lanceolata*
Wawona Road 3	6040	*Poa annua*
Wawona Road 3	6040	*Poa pratensis*
Wawona Road 3	6040	*Rumex acetosella*
Wawona Road 3	6040	*Silene latifolia*
Wawona Road 3	6040	*Tragopogon dubius*
Wawona Road 3	6040	*Vulpia myuros*
Yosemite West	5969	*Anthemis cotula*
Yosemite West	5969	*Bromus tectorum*
Yosemite West	5969	*Cerastium glomeratum*
Yosemite West	5969	*Chenopodium album*
Yosemite West	5969	*Chenopodium botrys*
Yosemite West	5969	*Cirsium vulgare*
Yosemite West	5969	*Lactuca serriola*
Yosemite West	5969	*Lolium multiflorum*
Yosemite West	5969	*Lolium perenne*
Yosemite West	5969	*Plantago lanceolata*
Yosemite West	5969	*Poa pratensis*
Yosemite West	5969	*Polygonum arenastrum*

Alien Species	Elevation (ft)	Road
Rumex acetosella	6051	Wawona Road
Rumex acetosella	6179	Glacier Point Road
Rumex acetosella	6254	Tioga Road
Rumex acetosella	6440	Glacier Point Road
Rumex acetosella	7143	Tioga Road
Rumex acetosella	8127	Tioga Road
Rumex acetosella	8150	Tioga Road
Rumex acetosella	8472	Tioga Road
Rumex crispus	3959	Northside Drive
Silene latifolia	3958	Southside Drive
Silene latifolia	5143	Wawona Road 2
Silene latifolia	6040	Wawona Road 3
Sinapis arvensis	5969	Yosemite West
Sisymbrium altissimum	3958	Southside Drive
Sisymbrium altissimum	3959	Northside Drive
Sisymbrium altissimum	4946	Big Oak Flat Road
Sonchus asper	3959	Northside Drive
Sonchus asper	3964	Wawona Road
Sonchus asper	4946	Big Oak Flat Road
Sonchus asper	5272	Big Oak Flat Road
Sonchus oleraceus	4661	Big Oak Flat Road
Spergularia rubra	3959	Northside Drive
Spergularia rubra	3964	Wawona Road
Spergularia rubra	5505	Hetch Hetchy Road
Spergularia rubra	5902	Big Oak Flat Road
Spergularia rubra	5969	Yosemite West
Spergularia rubra	6051	Wawona Road
Spergularia rubra	7143	Tioga Road
Spergularia rubra	7176	Glacier Point Road
Spergularia rubra	7704	Glacier Point Road
Spergularia rubra	7981	Tioga Road
Spergularia rubra	8127	Tioga Road
Spergularia rubra	8150	Tioga Road
Spergularia rubra	8472	Tioga Road
Spergularia rubra	8674	Tioga Road
Taraxacum officinale	3958	Southside Drive
Taraxacum officinale	3959	Northside Drive
Tragopogon dubius	3958	Southside Drive
Tragopogon dubius	3959	Northside Drive
Tragopogon dubius	6040	Wawona Road 3
Trifolium hirtum	3842	El Portal Road
Trifolium repens	3958	Southside Drive
Trifolium repens	3959	Northside Drive
Trifolium repens	5969	Yosemite West
Trifolium repens	6051	Wawona Road
Triticum aestivum	5969	Yosemite West
Verbascum thapsus	3958	Southside Drive
Verbascum thapsus	5969	Yosemite West
Vulpia myuros	3842	El Portal Road

Appendix D: (continued)

Road	Elevation (ft)	Alien Species
Yosemite West	5969	*Raphanus raphanistrum*
Yosemite West	5969	*Raphanus sativus*
Yosemite West	5969	*Rumex acetosella*
Yosemite West	5969	*Sinapis arvensis*
Yosemite West	5969	*Spergularia rubra*
Yosemite West	5969	*Trifolium repens*
Yosemite West	5969	*Triticum aestivum*
Yosemite West	5969	*Verbascum thapsus*
Yosemite West	5969	*Vulpia myuros*

Alien Species	Elevation (ft)	Road
Vulpia myuros	3959	Northside Drive
Vulpia myuros	3964	Wawona Road
Vulpia myuros	4661	Big Oak Flat Road
Vulpia myuros	4946	Big Oak Flat Road
Vulpia myuros	5143	Wawona Road 2
Vulpia myuros	5272	Big Oak Flat Road
Vulpia myuros	5505	Hetch Hetchy Road
Vulpia myuros	5969	Yosemite West
Vulpia myuros	6040	Wawona Road 3

Species Richness Summary – by Road Section

Road	Elevation (ft)	Alien Species Richness
Big Oak Flat Road	4661	16
Big Oak Flat Road	4946	18
Big Oak Flat Road	5272	16
Big Oak Flat Road	5902	8
Glacier Point Road	6179	1
Glacier Point Road	6440	4
Glacier Point Road	7176	1
Glacier Point Road	7704	1
Hetch Hetchy Road	5505	9
El Portal Road	3842	18
Northside Drive	3959	31
Southside Drive	3958	26
Tioga Road	6254	7
Tioga Road	7143	2
Tioga Road	7981	2
Tioga Road	8127	2
Tioga Road	8150	2
Tioga Road	8472	4
Tioga Road	8674	1
Wawona Road	3964	19
Wawona Road	5142	15
Wawona Road	6040	14
Wawona Road	6051	16
Yosemite West	5969	22
Total Roadside Species		**Total = 57**

Species Richness Summary - by Richness levels

Road	Elevation (ft)	Alien Species Richness
Northside Drive	3959	31
Southside Drive	3958	26
Yosemite West	5969	22
Wawona Road	3964	19
El Portal Road	3842	18
Big Oak Flat Road	4946	18
Big Oak Flat Road	4661	16
Big Oak Flat Road	5272	16
Wawona Road	6051	16
Wawona Road	5142	15
Wawona Road	6040	14
Hetch Hetchy Road	5505	9
Big Oak Flat Road	5902	8
Tioga Road	6254	7
Glacier Point Road	6440	4
Tioga Road	8472	4
Tioga Road	7143	2
Tioga Road	7981	2
Tioga Road	8127	2
Tioga Road	8150	2
Glacier Point Road	6179	1
Glacier Point Road	7176	1
Glacier Point Road	7704	1
Tioga Road	8674	1
Total Roadside Species		**Total = 57**

Appendix E. Yosemite National Park alien plant species along trails.

Trail	Elevation (ft)	Alien Species
Alder Creek	4557	*Aira caryophyllea*
Alder Creek	4557	*Bromus tectorum*
Alder Creek	4557	*Holcus lanatus*
Alder Creek	4557	*Hypericum perforatum*
Alder Creek	4557	*Poa pratensis*
Alder Creek	4557	*Rumex acetosella*
Alder Creek	4557	*Vulpia myuros*
Bridalveil Creek	6969	*Poa annua*
Bridalveil Creek	6969	*Poa pratensis*
Bridalveil Falls	4035	*Bromus hordeaceus*
Bridalveil Falls	4035	*Bromus tectorum*
Bridalveil Falls	4035	*Poa bulbosa*
Bridalveil Falls	4035	*Poa pratensis*
Bridalveil Falls	4035	*Silene latifolia*
Bridalveil Falls	4035	*Stellaria media*
Bridalveil Falls	4035	*Vulpia myuros*
Bridalveil-Inspiration Pt.	4036	*Aira caryophyllea*
Bridalveil-Inspiration Pt.	4036	*Bromus tectorum*
Bridalveil-Inspiration Pt.	4036	*Cirsium vulgare*
Bridalveil-Inspiration Pt.	4036	*Holcus lanatus*
Bridalveil-Inspiration Pt.	4036	*Sonchus asper*
Bridalveil-Inspiration Pt.	4036	*Vulpia myuros*
Chilnualna Falls	4417	*Aira caryophyllea*
Chilnualna Falls	4417	*Bromus tectorum*
Chilnualna Falls	4417	*Holcus lanatus*
Chilnualna Falls	4417	*Poa compressa*
Chilnualna Falls	4417	*Sonchus asper*
Chilnualna Falls	4417	*Vulpia myuros*
Four Mile	3960	*Bromus tectorum*
Four Mile	3960	*Chenopodium botrys*
Four Mile	3960	*Erodium cicutarium*
Four Mile	3960	*Holcus lanatus*
Four Mile	3960	*Poa annua*
Four Mile	3960	*Poa bulbosa*
Four Mile	3960	*Poa pratensis*
Four Mile	3960	*Rumex acetosella*
Four Mile	3960	*Silene latifolia*
Four Mile	3960	*Taraxacum officinale*
Four Mile	3960	*Vulpia myuros*
Glen Aulin	8686	*Poa pratensis*
Glen Aulin	8686	*Spergularia rubra*
Glen Aulin	8686	*Trifolium repens*
Happy Isles	4959	*Agrostis gigantea*
Happy Isles	4959	*Bar[illegible]a vulgaris*
Happy Isles	4959	*Bromus inermis*
Happy Isles	4959	*Bromus tectorum*
Happy Isles	4959	*Cerastium glomeratum*
Happy Isles	4959	*Cirsium vulgare*

Alien Species	Elevation (ft)	Trail
Agrostis gigantea	3972	Yosemite Loop
Agrostis gigantea	4053	Meadow Loop
Agrostis gigantea	4100	Snow Creek
Agrostis gigantea	4770	Old Big Oak Flat Rd.
Agrostis gigantea	4959	Happy Isles
Aira caryophyllea	4036	Bridalveil-Inspiration Pt.
Aira caryophyllea	4053	Meadow Loop
Aira caryophyllea	4100	Snow Creek
Aira caryophyllea	4417	Chilnualna Falls
Aira caryophyllea	4557	Alder Creek
Aira caryophyllea	4770	Old Big Oak Flat Rd.
Aira caryophyllea	5256	Mariposa Grove
Avena barbata	4100	Snow Creek
Barbarea vulgaris	4959	Happy Isles
Bromus arenarius	5256	Mariposa Grove
Bromus diandrus	3931	Mirror Lake Pack
Bromus diandrus	3972	Yosemite Loop
Bromus diandrus	4053	Meadow Loop
Bromus diandrus	4100	Snow Creek
Bromus hordeaceus	3972	Yosemite Loop
Bromus hordeaceus	4035	Bridalveil Falls
Bromus hordeaceus	4053	Meadow Loop
Bromus inermis	4053	Meadow Loop
Bromus inermis	4959	Happy Isles
Bromus inermis	7243	Panorama
Bromus sterilis	4015	Yosemite Falls
Bromus sterilis	4100	Snow Creek
Bromus sterilis	4770	Old Big Oak Flat Rd.
Bromus tectorum	3931	Mirror Lake Pack
Bromus tectorum	3960	Four Mile
Bromus tectorum	3972	Yosemite Loop
Bromus tectorum	4015	Yosemite Falls
Bromus tectorum	4035	Bridalveil Falls
Bromus tectorum	4036	Bridalveil-Inspiration Pt.
Bromus tectorum	4053	Meadow Loop
Bromus tectorum	4100	Snow Creek
Bromus tectorum	4381	Inspiration Pt.
Bromus tectorum	4417	Chilnualna Falls
Bromus tectorum	4557	Alder Creek
Bromus tectorum	4770	Old Big Oak Flat Rd.
Bromus tectorum	4959	Happy Isles
Bromus tectorum	5256	Mariposa Grove
Bromus tectorum	7243	Panorama
Capsella bursa-pastoris	8622	Young Lake
Cerastium glomeratum	4053	Meadow Loop
Cerastium glomeratum	4100	Snow Creek
Cerastium glomeratum	4959	Happy Isles
Cerastium glomeratum	6339	Tamarack Creek

Appendix E. (continued)

Trail	Elevation (ft)	Alien Species
Happy Isles	4959	*Galium parisiense*
Happy Isles	4959	*Holcus lanatus*
Happy Isles	4959	*Lolium multiflorum*
Happy Isles	4959	*Poa pratensis*
Happy Isles	4959	*Sisymbrium altissimum*
Happy Isles	4959	*Vulpia myuros*
Harden Lake	7821	*Poa annua*
Harden Lake	7821	*Rumex acetosella*
Harden Lake	7821	*Spergularia rubra*
Harden Lake	7821	*Taraxacum officinale*
Inspiration Pt.	4381	*Bromus tectorum*
Inspiration Pt.	4381	*Chenopodium album*
Inspiration Pt.	4381	*Poa annua*
Inspiration Pt.	4381	*Silene latifolia*
John Muir-Tuolumne	8675	*Spergularia rubra*
John Muir-Tuolumne	8675	*Taraxacum officinale*
Lukens Lake	7886	*Spergularia rubra*
Lukens Lake	7886	*Taraxacum officinale*
Mariposa Grove	5256	*Aira caryophyllea*
Mariposa Grove	5256	*Bromus arenarius*
Mariposa Grove	5256	*Bromus tectorum*
Mariposa Grove	5256	*Cirsium vulgare*
Mariposa Grove	5256	*Festuca pratensis*
Mariposa Grove	5256	*Galium parisiense*
Mariposa Grove	5256	*Holcus lanatus*
Mariposa Grove	5256	*Lactuca serriola*
Mariposa Grove	5256	*Poa annua*
Mariposa Grove	5256	*Poa pratensis*
Mariposa Grove	5256	*Silene latifolia*
Mariposa Grove	5256	*Taraxacum officinale*
Mariposa Grove	5256	*Vulpia myuros*
Meadow Loop	4053	*Agrostis gigantea*
Meadow Loop	4053	*Aira caryophyllea*
Meadow Loop	4053	*Bromus diandrus*
Meadow Loop	4053	*Bromus hordeaceus*
Meadow Loop	4053	*Bromus inermis*
Meadow Loop	4053	*Bromus tectorum*
Meadow Loop	4053	*Cerastium glomeratum*
Meadow Loop	4053	*Cirsium vulgare*
Meadow Loop	4053	*Cynosurus echinatus*
Meadow Loop	4053	*Erodium cicutarium*
Meadow Loop	4053	*Galium parisiense*
Meadow Loop	4053	*Herniaria hirsuta*
Meadow Loop	4053	*Holcus lanatus*
Meadow Loop	4053	*Lathyrus latifolius*
Meadow Loop	4053	*Phleum pratense*
Meadow Loop	4053	*Plantago lanceolata*
Meadow Loop	4053	*Plantago major*
Meadow Loop	4053	*Poa bulbosa*

Alien Species	Elevation (ft)	Trail
Chenopodium album	3972	Yosemite Loop
Chenopodium album	4381	Inspiration Pt.
Chenopodium botrys	3960	Four Mile
Cirsium vulgare	3931	Mirror Lake Pack
Cirsium vulgare	3972	Yosemite Loop
Cirsium vulgare	4036	Bridalveil-Inspiration Pt.
Cirsium vulgare	4053	Meadow Loop
Cirsium vulgare	4770	Old Big Oak Flat Rd.
Cirsium vulgare	4959	Happy Isles
Cirsium vulgare	5256	Mariposa Grove
Cirsium vulgare	7243	Panorama
Cynosurus echinatus	3972	Yosemite Loop
Cynosurus echinatus	4053	Meadow Loop
Dactylis glomerata	4771	Merced Grove
Erodium cicutarium	3960	Four Mile
Erodium cicutarium	4053	Meadow Loop
Festuca pratensis	5256	Mariposa Grove
Galium parisiense	3972	Yosemite Loop
Galium parisiense	4015	Yosemite Falls
Galium parisiense	4053	Meadow Loop
Galium parisiense	4959	Happy Isles
Galium parisiense	5256	Mariposa Grove
Herniaria hirsuta	4053	Meadow Loop
Holcus lanatus	3931	Mirror Lake Pack
Holcus lanatus	3960	Four Mile
Holcus lanatus	3972	Yosemite Loop
Holcus lanatus	4015	Yosemite Falls
Holcus lanatus	4036	Bridalveil-Inspiration Pt.
Holcus lanatus	4053	Meadow Loop
Holcus lanatus	4417	Chilnualna Falls
Holcus lanatus	4557	Alder Creek
Holcus lanatus	4770	Old Big Oak Flat Rd.
Holcus lanatus	4959	Happy Isles
Holcus lanatus	5256	Mariposa Grove
Hordeum murinum	3931	Mirror Lake Pack
Hordeum murinum	3972	Yosemite Loop
Hypericum perforatum	4015	Yosemite Falls
Hypericum perforatum	4557	Alder Creek
Lactuca serriola	3931	Mirror Lake Pack
Lactuca serriola	3972	Yosemite Loop
Lactuca serriola	4015	Yosemite Falls
Lactuca serriola	4770	Old Big Oak Flat Rd.
Lactuca serriola	5256	Mariposa Grove
Lathyrus latifolius	4053	Meadow Loop
Lolium multiflorum	4959	Happy Isles
Phleum pratense	3931	Mirror Lake Pack
Phleum pratense	3972	Yosemite Loop
Phleum pratense	4053	Meadow Loop
Plantago lanceolata	3931	Mirror Lake Pack

Appendix E. (continued)

Trail	Elevation (ft)	Alien Species
Meadow Loop	4053	*Poa pratensis*
Meadow Loop	4053	*Polygonum arenastrum*
Meadow Loop	4053	*Rubus discolor*
Meadow Loop	4053	*Rubus laciniatus*
Meadow Loop	4053	*Rumex acetosella*
Meadow Loop	4053	*Sisymbrium altissimum*
Meadow Loop	4053	*Sonchus asper*
Meadow Loop	4053	*Sonchus oleraceus*
Meadow Loop	4053	*Stellaria media*
Meadow Loop	4053	*Taraxacum officinale*
Meadow Loop	4053	*Tragopogon dubius*
Meadow Loop	4053	*Trifolium repens*
Meadow Loop	4053	*Verbascum thapsus*
Meadow Loop	4053	*Vulpia myuros*
Merced Grove	4771	*Dactylis glomerata*
Merced Grove	4771	*Rumex acetosella*
Mirror Lake Pack	3931	*Bromus diandrus*
Mirror Lake Pack	3931	*Bromus tectorum*
Mirror Lake Pack	3931	*Cirsium vulgare*
Mirror Lake Pack	3931	*Holcus lanatus*
Mirror Lake Pack	3931	*Hordeum murinum*
Mirror Lake Pack	3931	*Lactuca serriola*
Mirror Lake Pack	3931	*Phleum pratense*
Mirror Lake Pack	3931	*Plantago lanceolata*
Mirror Lake Pack	3931	*Poa annua*
Mirror Lake Pack	3931	*Poa pratensis*
Mirror Lake Pack	3931	*Polygonum arenastrum*
Mirror Lake Pack	3931	*Rubus discolor*
Mirror Lake Pack	3931	*Trifolium repens*
Mirror Lake Pack	3931	*Vulpia myuros*
Old Big Oak Flat Rd.	4770	*Agrostis gigantea*
Old Big Oak Flat Rd.	4770	*Aira caryophyllea*
Old Big Oak Flat Rd.	4770	*Bromus sterilis*
Old Big Oak Flat Rd.	4770	*Bromus tectorum*
Old Big Oak Flat Rd.	4770	*Cirsium vulgare*
Old Big Oak Flat Rd.	4770	*Holcus lanatus*
Old Big Oak Flat Rd.	4770	*Lactuca serriola*
Old Big Oak Flat Rd.	4770	*Tragopogon dubius*
Old Big Oak Flat Rd.	4770	*Vulpia myuros*
Panorama	7243	*Bromus inermis*
Panorama	7243	*Bromus tectorum*
Panorama	7243	*Cirsium vulgare*
Panorama	7243	*Spergularia rubra*
Porcupine Creek	8100	*Rumex acetosella*
Snow Creek	4100	*Agrostis gigantea*
Snow Creek	4100	*Aira caryophyllea*
Snow Creek	4100	*Avena barbata*
Snow Creek	4100	*Bromus diandrus*
Snow Creek	4100	*Bromus sterilis*

Alien Species	Elevation (ft)	Trail
Plantago lanceolata	4053	Meadow Loop
Plantago major	4053	Meadow Loop
Poa annua	3931	Mirror Lake Pack
Poa annua	3960	Four Mile
Poa annua	3972	Yosemite Loop
Poa annua	4381	Inspiration Pt.
Poa annua	5256	Mariposa Grove
Poa annua	6969	Bridalveil Creek
Poa annua	7729	Taft Point
Poa annua	7821	Harden Lake
Poa bulbosa	3960	Four Mile
Poa bulbosa	3972	Yosemite Loop
Poa bulbosa	4035	Bridalveil Falls
Poa bulbosa	4053	Meadow Loop
Poa compressa	4417	Chilnualna Falls
Poa pratensis	3931	Mirror Lake Pack
Poa pratensis	3960	Four Mile
Poa pratensis	3972	Yosemite Loop
Poa pratensis	4035	Bridalveil Falls
Poa pratensis	4053	Meadow Loop
Poa pratensis	4100	Snow Creek
Poa pratensis	4557	Alder Creek
Poa pratensis	4959	Happy Isles
Poa pratensis	5256	Mariposa Grove
Poa pratensis	6969	Bridalveil Creek
Poa pratensis	8622	Young Lake
Poa pratensis	8686	Glen Aulin
Polygonum arenastrum	3931	Mirror Lake Pack
Polygonum arenastrum	3972	Yosemite Loop
Polygonum arenastrum	4053	Meadow Loop
Rubus discolor	3931	Mirror Lake Pack
Rubus discolor	3972	Yosemite Loop
Rubus discolor	4053	Meadow Loop
Rubus laciniatus	4053	Meadow Loop
Rumex acetosella	3960	Four Mile
Rumex acetosella	3972	Yosemite Loop
Rumex acetosella	4053	Meadow Loop
Rumex acetosella	4557	Alder Creek
Rumex acetosella	4771	Merced Grove
Rumex acetosella	6339	Tamarack Creek
Rumex acetosella	7821	Harden Lake
Rumex acetosella	8100	Porcupine Creek
Rumex crispus	3972	Yosemite Loop
Silene latifolia	3960	Four Mile
Silene latifolia	4035	Bridalveil Falls
Silene latifolia	4381	Inspiration Pt.
Silene latifolia	5256	Mariposa Grove
Sisymbrium altissimum	4053	Meadow Loop
Sisymbrium altissimum	4959	Happy Isles

Appendix E. (continued)

Trail	Elevation (ft)	Alien Species
Snow Creek	4100	*Bromus tectorum*
Snow Creek	4100	*Cerastium glomeratum*
Snow Creek	4100	*Poa pratensis*
Snow Creek	4100	*Vulpia myuros*
Taft Point	7729	*Poa annua*
Tamarack Creek	6339	*Cerastium glomeratum*
Tamarack Creek	6339	*Rumex acetosella*
Tamarack Creek	6339	*Spergularia rubra*
Yosemite Falls	4015	*Bromus sterilis*
Yosemite Falls	4015	*Bromus tectorum*
Yosemite Falls	4015	*Galium parisiense*
Yosemite Falls	4015	*Holcus lanatus*
Yosemite Falls	4015	*Hypericum perforatum*
Yosemite Falls	4015	*Lactuca serriola*
Yosemite Falls	4015	*Sonchus oleraceus*
Yosemite Falls	4015	*Vulpia myuros*
Yosemite Loop	3972	*Agrostis gigantea*
Yosemite Loop	3972	*Bromus diandrus*
Yosemite Loop	3972	*Bromus hordeaceus*
Yosemite Loop	3972	*Bromus tectorum*
Yosemite Loop	3972	*Chenopodium album*
Yosemite Loop	3972	*Cirsium vulgare*
Yosemite Loop	3972	*Cynosurus echinatus*
Yosemite Loop	3972	*Galium parisiense*
Yosemite Loop	3972	*Holcus lanatus*
Yosemite Loop	3972	*Hordeum murinum*
Yosemite Loop	3972	*Lactuca serriola*
Yosemite Loop	3972	*Phleum pratense*
Yosemite Loop	3972	*Poa annua*
Yosemite Loop	3972	*Poa bulbosa*
Yosemite Loop	3972	*Poa pratensis*
Yosemite Loop	3972	*Polygonum arenastrum*
Yosemite Loop	3972	*Rubus discolor*
Yosemite Loop	3972	*Rumex acetosella*
Yosemite Loop	3972	*Rumex crispus*
Yosemite Loop	3972	*Sonchus asper*
Yosemite Loop	3972	*Spergularia rubra*
Yosemite Loop	3972	*Taraxacum officinale*
Yosemite Loop	3972	*Torilis arvensis*
Yosemite Loop	3972	*Tragopogon dubius*
Yosemite Loop	3972	*Verbascum thapsus*
Yosemite Loop	3972	*Vulpia myuros*
Young Lakes	8622	*Capsella bursa-pastoris*
Young Lakes	8622	*Poa pratensis*

Alien Species	Elevation (ft)	Trail
Sonchus asper	3972	Yosemite Loop
Sonchus asper	4036	Bridalveil-Inspiration Pt.
Sonchus asper	4053	Meadow Loop
Sonchus asper	4417	Chilnualna Falls
Sonchus oleraceus	4015	Yosemite Falls
Sonchus oleraceus	4053	Meadow Loop
Spergularia rubra	3972	Yosemite Loop
Spergularia rubra	6339	Tamarack Creek
Spergularia rubra	7243	Panorama
Spergularia rubra	7821	Harden Lake
Spergularia rubra	7886	Lukens Lake
Spergularia rubra	8675	John Muir-Tuolumne
Spergularia rubra	8686	Glen Aulin
Stellaria media	4035	Bridalveil Falls
Stellaria media	4053	Meadow Loop
Taraxacum officinale	3960	Four Mile
Taraxacum officinale	3972	Yosemite Loop
Taraxacum officinale	4053	Meadow Loop
Taraxacum officinale	5256	Mariposa Grove
Taraxacum officinale	7821	Harden Lake
Taraxacum officinale	7886	Lukens Lake
Taraxacum officinale	8675	John Muir-Tuolumne
Torilis arvensis	3972	Yosemite Loop
Tragopogon dubius	3972	Yosemite Loop
Tragopogon dubius	4053	Meadow Loop
Tragopogon dubius	4770	Old Big Oak Flat Rd.
Trifolium repens	3931	Mirror Lake Pack
Trifolium repens	4053	Meadow Loop
Trifolium repens	8686	Glen Aulin
Verbascum thapsus	3972	Yosemite Loop
Verbascum thapsus	4053	Meadow Loop
Vulpia myuros	3931	Mirror Lake Pack
Vulpia myuros	3960	Four Mile
Vulpia myuros	3972	Yosemite Loop
Vulpia myuros	4015	Yosemite Falls
Vulpia myuros	4035	Bridalveil Falls
Vulpia myuros	4036	Bridalveil-Inspiration Pt.
Vulpia myuros	4053	Meadow Loop
Vulpia myuros	4100	Snow Creek
Vulpia myuros	4417	Chilnualna Falls
Vulpia myuros	4557	Alder Creek
Vulpia myuros	4770	Old Big Oak Flat Rd.
Vulpia myuros	4959	Happy Isles
Vulpia myuros	5256	Mariposa Grove

Appendix E. (continued)

Trail Species Richness Summary – by Trail

Trail	Elevation (ft)	Alien Species Richness
Alder Creek	4557	7
Bridalveil Creek	6969	2
Bridalveil Falls	4035	7
Bridalveil-Inspiration Pt.	4036	6
Chilnualna Falls	4417	6
Four Mile	3960	11
Glen Aulin	8686	3
Happy Isles	4959	12
Harden Lake	7821	4
Inspiration Pt.	4381	4
John Muir-Tuolumne	8675	2
Lukens Lake	7886	2
Meadow Loop	4053	32
Merced Grove	4771	2
Mirror Lake Pack	3931	14
Old Big Oak Flat Rd.	4770	9
Panorama	7243	4
Porcupine Creek	8100	1
Snow Creek	4100	9
Taft Point	7729	1
Tamarack Creek	6339	3
Mariposa Grove	5256	13
Yosemite Falls	4015	8
Yosemite Loop	3972	26
Young Lakes	8622	2
Trailside Species		**Total = 51**

Trail Species Richness Summary – by Richness Levels

Trail	Elevation (ft)	Alien Species Richness
Meadow Loop	4053	32
Yosemite Loop	3972	26
Mirror Lake Pack	3931	14
Mariposa Grove	5256	13
Happy Isles	4959	12
Four Mile	3960	11
Old Big Oak Flat Rd.	4770	9
Snow Creek	4100	9
Yosemite Falls	4015	8
Alder Creek	4557	7
Bridalveil Falls	4035	7
Bridalveil-Inspiration Pt.	4036	6
Chilnualna Falls	4417	6
Inspiration Pt.	4381	4
Harden Lake	7821	4
Panorama	7243	4
Glen Aulin	8686	3
Tamarack Creek	6339	3
Bridalveil Creek	6969	2
John Muir-Tuolumne	8675	2
Lukens Lake	7886	2
Merced Grove	4771	2
Young Lakes	8622	2
Porcupine Creek	8100	1
Taft Point	7729	1
Trailside Species		**Total = 51**

Appendix F. Yosemite National Park alien plant species in and around corrals and stables.

Site	Elevation (ft)	Alien Species
Concession Stables (YV)	4000	*Agrostis gigantea*
Concession Stables (YV)	4000	*Bromus diandrus*
Concession Stables (YV)	4000	*Bromus inermis*
Concession Stables (YV)	4000	*Bromus secalinus*
Concession Stables (YV)	4000	*Bromus tectorum*
Concession Stables (YV)	4000	*Cerastium glomeratum*
Concession Stables (YV)	4000	*Cirsium vulgare*
Concession Stables (YV)	4000	*Dactylis glomerata*
Concession Stables (YV)	4000	*Dianthus barbatus*
Concession Stables (YV)	4000	*Holcus lanatus*
Concession Stables (YV)	4000	*Hordeum murinum*
Concession Stables (YV)	4000	*Hypericum perforatum*
Concession Stables (YV)	4000	*Lactuca serriola*
Concession Stables (YV)	4000	*Leucanthemum vulgare*
Concession Stables (YV)	4000	*Lolium perenne*
Concession Stables (YV)	4000	*Lychnis coronaria*
Concession Stables (YV)	4000	*Phleum pratense*
Concession Stables (YV)	4000	*Plantago lanceolata*
Concession Stables (YV)	4000	*Poa annua*
Concession Stables (YV)	4000	*Poa bulbosa*
Concession Stables (YV)	4000	*Poa pratensis*
Concession Stables (YV)	4000	*Polygonum arenastrum*
Concession Stables (YV)	4000	*Rubus discolor*
Concession Stables (YV)	4000	*Rumex acetosella*
Concession Stables (YV)	4000	*Rumex crispus*
Concession Stables (YV)	4000	*Silene latifolia*
Concession Stables (YV)	4000	*Sonchus oleraceus*
Concession Stables (YV)	4000	*Stellaria media*
Concession Stables (YV)	4000	*Taraxacum officinale*
Concession Stables (YV)	4000	*Tragopogon dubius*
Concession Stables (YV)	4000	*Trifolium repens*
Concession Stables (YV)	4000	*Verbascum thapsus*
Concession Stables (YV)	4000	*Vulpia myuros*
Glen Aulin High Sierra Camp	7832	*Taraxacum officinale*
Glen Aulin High Sierra Camp	7832	*Trifolium repens*
Government Corrals (Tuol)	8695	*Bromus catharticus*
Government Corrals (Tuol)	8695	*Poa pratensis*
Government Stables (YV)	4039	*Bromus diandrus*
Government Stables (YV)	4039	*Bromus sterilis*
Government Stables (YV)	4039	*Bromus tectorum*
Government Stables (YV)	4039	*Capsella bursa-pastoris*
Government Stables (YV)	4039	*Chenopodium botrys*
Government Stables (YV)	4039	*Erodium cicutarium*
Government Stables (YV)	4039	*Hordeum murinum*
Government Stables (YV)	4039	*Lolium multiflorum*
Government Stables (YV)	4039	*Poa bulbosa*
Government Stables (YV)	4039	*Sisymbrium altissimum*
Government Stables (YV)	4039	*Stellaria media*

Alien Species	Elevation (ft)	Site
Agrostis gigantea	4000	Concession Stables (YV)
Aira caryophyllea	3960	Hetch Hetchy Corral
Aira caryophyllea	4001	Wawona Stables
Aira caryophyllea	4093	McCauley Ranch
Avena barbata	3960	Hetch Hetchy Corral
Bromus catharticus	8695	Government Corrals (Tuol)
Bromus diandrus	3960	Hetch Hetchy Corral
Bromus diandrus	4000	Concession Stables (YV)
Bromus diandrus	4001	Wawona Stables
Bromus diandrus	4039	Government Stables (YV)
Bromus diandrus	4093	McCauley Ranch
Bromus hordeaceus	3960	Hetch Hetchy Corral
Bromus hordeaceus	4001	Wawona Stables
Bromus hordeaceus	4093	McCauley Ranch
Bromus inermis	4000	Concession Stables (YV)
Bromus inermis	4093	McCauley Ranch
Bromus secalinus	4000	Concession Stables (YV)
Bromus sterilis	3960	Hetch Hetchy Corral
Bromus sterilis	4039	Government Stables (YV)
Bromus tectorum	3960	Hetch Hetchy Corral
Bromus tectorum	4000	Concession Stables (YV)
Bromus tectorum	4001	Wawona Stables
Bromus tectorum	4039	Government Stables (YV)
Bromus tectorum	4093	McCauley Ranch
Capsella bursa-pastoris	3960	Hetch Hetchy Corral
Capsella bursa-pastoris	4039	Government Stables (YV)
Capsella bursa-pastoris	7496	Harden Lake Corral
Capsella bursa-pastoris	7967	White Wolf Corral
Centaurea solstitialis	3960	Hetch Hetchy Corral
Centaurea solstitialis	4093	McCauley Ranch
Cerastium glomeratum	3960	Hetch Hetchy Corral
Cerastium glomeratum	4000	Concession Stables (YV)
Chamomilla suaveolens	3960	Hetch Hetchy Corral
Chamomilla suaveolens	4001	Wawona Stables
Chamomilla suaveolens	7967	White Wolf Corral
Chenopodium botrys	3960	Hetch Hetchy Corral
Chenopodium botrys	4039	Government Stables (YV)
Cirsium vulgare	4000	Concession Stables (YV)
Cirsium vulgare	4093	McCauley Ranch
Convolvulus arvensis	4093	McCauley Ranch
Cynodon dactylon	4093	McCauley Ranch
Cynosurus echinatus	3960	Hetch Hetchy Corral
Cynosurus echinatus	4001	Wawona Stables
Cynosurus echinatus	4093	McCauley Ranch
Dactylis glomerata	4000	Concession Stables (YV)
Dactylis glomerata	8632	Tuolumne Stables
Dianthus barbatus	4000	Concession Stables (YV)
Erodium cicutarium	3960	Hetch Hetchy Corral

Appendix F. (continued)

Site	Elevation (ft)	Alien Species
Government Stables (YV)	4039	*Urtica urens*
Government Stables (YV)	4039	*Vulpia myuros*
Harden Lake Corral	7496	*Capsella bursa-pastoris*
Harden Lake Corral	7496	*Herniaria hirsuta*
Harden Lake Corral	7496	*Poa annua*
Harden Lake Corral	7496	*Poa pratensis*
Harden Lake Corral	7496	*Rumex acetosella*
Harden Lake Corral	7496	*Spergularia rubra*
Harden Lake Corral	7496	*Trifolium repens*
Harden Lake Corral	7496	*Veronica persica*
Hetch Hetchy Corral	3960	*Aira caryophyllea*
Hetch Hetchy Corral	3960	*Avena barbata*
Hetch Hetchy Corral	3960	*Bromus diandrus*
Hetch Hetchy Corral	3960	*Bromus hordeaceus*
Hetch Hetchy Corral	3960	*Bromus sterilis*
Hetch Hetchy Corral	3960	*Bromus tectorum*
Hetch Hetchy Corral	3960	*Capsella bursa-pastoris*
Hetch Hetchy Corral	3960	*Centaurea solstitialis*
Hetch Hetchy Corral	3960	*Cerastium glomeratum*
Hetch Hetchy Corral	3960	*Chamomilla suaveolens*
Hetch Hetchy Corral	3960	*Chenopodium botrys*
Hetch Hetchy Corral	3960	*Cynosurus echinatus*
Hetch Hetchy Corral	3960	*Erodium cicutarium*
Hetch Hetchy Corral	3960	*Filago gallica*
Hetch Hetchy Corral	3960	*Galium parisiense*
Hetch Hetchy Corral	3960	*Herniaria hirsuta*
Hetch Hetchy Corral	3960	*Hordeum murinum*
Hetch Hetchy Corral	3960	*Lactuca serriola*
Hetch Hetchy Corral	3960	*Malva parviflora*
Hetch Hetchy Corral	3960	*Parapholis incurva*
Hetch Hetchy Corral	3960	*Poa annua*
Hetch Hetchy Corral	3960	*Poa bulbosa*
Hetch Hetchy Corral	3960	*Poa pratensis*
Hetch Hetchy Corral	3960	*Polygonum arenastrum*
Hetch Hetchy Corral	3960	*Polypogon maritimus*
Hetch Hetchy Corral	3960	*Rumex acetosella*
Hetch Hetchy Corral	3960	*Rumex crispus*
Hetch Hetchy Corral	3960	*Sonchus oleraceus*
Hetch Hetchy Corral	3960	*Stellaria media*
Hetch Hetchy Corral	3960	*Torilis arvensis*
Hetch Hetchy Corral	3960	*Vulpia myuros*
McCauley Ranch	4093	*Aira caryophyllea*
McCauley Ranch	4093	*Bromus diandrus*
McCauley Ranch	4093	*Bromus hordeaceus*
McCauley Ranch	4093	*Bromus inermis*
McCauley Ranch	4093	*Bromus tectorum*
McCauley Ranch	4093	*Centaurea solstitialis*
McCauley Ranch	4093	*Cirsium vulgare*
McCauley Ranch	4093	*Convolvulus arvensis*

Alien Species	Elevation (ft)	Site
Erodium cicutarium	4001	Wawona Stables
Erodium cicutarium	4039	Government Stables (YV)
Erodium cicutarium	4093	McCauley Ranch
Filago gallica	3960	Hetch Hetchy Corral
Galium parisiense	3960	Hetch Hetchy Corral
Galium parisiense	4093	McCauley Ranch
Herniaria hirsuta	3960	Hetch Hetchy Corral
Herniaria hirsuta	4001	Wawona Stables
Herniaria hirsuta	4093	McCauley Ranch
Herniaria hirsuta	7496	Harden Lake Corral
Herniaria hirsuta	8632	Tuolumne Stables
Holcus lanatus	4000	Concession Stables (YV)
Holcus lanatus	4001	Wawona Stables
Holcus lanatus	4093	McCauley Ranch
Hordeum marinum	4093	McCauley Ranch
Hordeum murinum	3960	Hetch Hetchy Corral
Hordeum murinum	4000	Concession Stables (YV)
Hordeum murinum	4001	Wawona Stables
Hordeum murinum	4039	Government Stables (YV)
Hordeum murinum	4093	McCauley Ranch
Hypericum perforatum	4000	Concession Stables (YV)
Hypericum perforatum	4093	McCauley Ranch
Hypochaeris glabra	4001	Wawona Stables
Lactuca serriola	3960	Hetch Hetchy Corral
Lactuca serriola	4000	Concession Stables (YV)
Lactuca serriola	4093	McCauley Ranch
Leucanthemum vulgare	4000	Concession Stables (YV)
Lolium multiflorum	4039	Government Stables (YV)
Lolium perenne	4000	Concession Stables (YV)
Lychnis coronaria	4000	Concession Stables (YV)
Malva parviflora	3960	Hetch Hetchy Corral
Parapholis incurva	3960	Hetch Hetchy Corral
Phleum pratense	4000	Concession Stables (YV)
Phleum pratense	4093	McCauley Ranch
Plantago lanceolata	4000	Concession Stables (YV)
Plantago lanceolata	4001	Wawona Stables
Plantago lanceolata	8632	Tuolumne Stables
Poa annua	3960	Hetch Hetchy Corral
Poa annua	4000	Concession Stables (YV)
Poa annua	4093	McCauley Ranch
Poa annua	7496	Harden Lake Corral
Poa annua	7967	White Wolf Corral
Poa annua	8632	Tuolumne Stables
Poa bulbosa	3960	Hetch Hetchy Corral
Poa bulbosa	4000	Concession Stables (YV)
Poa bulbosa	4001	Wawona Stables
Poa bulbosa	4039	Government Stables (YV)
Poa pratensis	3960	Hetch Hetchy Corral
Poa pratensis	4000	Concession Stables (YV)

Appendix F. (continued)

Site	Elevation (ft)	Alien Species
McCauley Ranch	4093	*Cynodon dactylon*
McCauley Ranch	4093	*Cynosurus echinatus*
McCauley Ranch	4093	*Erodium cicutarium*
McCauley Ranch	4093	*Galium parisiense*
McCauley Ranch	4093	*Herniaria hirsuta*
McCauley Ranch	4093	*Holcus lanatus*
McCauley Ranch	4093	*Hordeum marinum*
McCauley Ranch	4093	*Hordeum murinum*
McCauley Ranch	4093	*Hypericum perforatum*
McCauley Ranch	4093	*Lactuca serriola*
McCauley Ranch	4093	*Phleum pratense*
McCauley Ranch	4093	*Poa annua*
McCauley Ranch	4093	*Poa pratensis*
McCauley Ranch	4093	*Polygonum arenastrum*
McCauley Ranch	4093	*Rubus discolor*
McCauley Ranch	4093	*Rumex acetosella*
McCauley Ranch	4093	*Rumex crispus*
McCauley Ranch	4093	*Sisymbrium altissimum*
McCauley Ranch	4093	*Sonchus asper*
McCauley Ranch	4093	*Spergularia rubra*
McCauley Ranch	4093	*Stellaria media*
McCauley Ranch	4093	*Tragopogon dubius*
McCauley Ranch	4093	*Trifolium repens*
McCauley Ranch	4093	*Verbascum thapsus*
McCauley Ranch	4093	*Vulpia myuros*
Tuolumne Stables	8632	*Dactylis glomerata*
Tuolumne Stables	8632	*Herniaria hirsuta*
Tuolumne Stables	8632	*Plantago lanceolata*
Tuolumne Stables	8632	*Poa annua*
Tuolumne Stables	8632	*Poa pratensis*
Tuolumne Stables	8632	*Spergularia rubra*
Tuolumne Stables	8632	*Taraxacum officinale*
Tuolumne Stables	8632	*Trifolium repens*
Wawona Stables	4001	*Aira caryophyllea*
Wawona Stables	4001	*Bromus diandrus*
Wawona Stables	4001	*Bromus hordeaceus*
Wawona Stables	4001	*Bromus tectorum*
Wawona Stables	4001	*Chamomilla suaveolens*
Wawona Stables	4001	*Cynosurus echinatus*
Wawona Stables	4001	*Erodium cicutarium*
Wawona Stables	4001	*Herniaria hirsuta*
Wawona Stables	4001	*Holcus lanatus*
Wawona Stables	4001	*Hordeum murinum*
Wawona Stables	4001	*Hypochaeris glabra*
Wawona Stables	4001	*Plantago lanceolata*
Wawona Stables	4001	*Poa bulbosa*
Wawona Stables	4001	*Poa pratensis*
Wawona Stables	4001	*Polygonum arenastrum*
Wawona Stables	4001	*Rumex acetosella*

Alien Species	Elevation (ft)	Site
Poa pratensis	4001	Wawona Stables
Poa pratensis	4093	McCauley Ranch
Poa pratensis	7496	Harden Lake Corral
Poa pratensis	7967	White Wolf Corral
Poa pratensis	8632	Tuolumne Stables
Poa pratensis	8695	Government Corrals (Tuol)
Polygonum arenastrum	3960	Hetch Hetchy Corral
Polygonum arenastrum	4000	Concession Stables (YV)
Polygonum arenastrum	4001	Wawona Stables
Polygonum arenastrum	4093	McCauley Ranch
Polygonum arenastrum	7967	White Wolf Corral
Polypogon maritimus	3960	Hetch Hetchy Corral
Rubus discolor	4000	Concession Stables (YV)
Rubus discolor	4093	McCauley Ranch
Rumex acetosella	3960	Hetch Hetchy Corral
Rumex acetosella	4000	Concession Stables (YV)
Rumex acetosella	4001	Wawona Stables
Rumex acetosella	4093	McCauley Ranch
Rumex acetosella	7496	Harden Lake Corral
Rumex acetosella	7967	White Wolf Corral
Rumex crispus	3960	Hetch Hetchy Corral
Rumex crispus	4000	Concession Stables (YV)
Rumex crispus	4093	McCauley Ranch
Silene latifolia	4000	Concession Stables (YV)
Sisymbrium altissimum	4001	Wawona Stables
Sisymbrium altissimum	4039	Government Stables (YV)
Sisymbrium altissimum	4093	McCauley Ranch
Sonchus asper	4093	McCauley Ranch
Sonchus oleraceus	3960	Hetch Hetchy Corral
Sonchus oleraceus	4000	Concession Stables (YV)
Sonchus oleraceus	4001	Wawona Stables
Spergularia rubra	4001	Wawona Stables
Spergularia rubra	4093	McCauley Ranch
Spergularia rubra	7496	Harden Lake Corral
Spergularia rubra	7967	White Wolf Corral
Spergularia rubra	8632	Tuolumne Stables
Stellaria media	3960	Hetch Hetchy Corral
Stellaria media	4000	Concession Stables (YV)
Stellaria media	4039	Government Stables (YV)
Stellaria media	4093	McCauley Ranch
Stellaria media	7967	White Wolf Corral
Taraxacum officinale	4000	Concession Stables (YV)
Taraxacum officinale	7832	Glen Aulin High Sierra Camp
Taraxacum officinale	7967	White Wolf Corral
Taraxacum officinale	8632	Tuolumne Stables
Torilis arvensis	3960	Hetch Hetchy Corral
Tragopogon dubius	4000	Concession Stables (YV)
Tragopogon dubius	4093	McCauley Ranch
Trifolium repens	4000	Concession Stables (YV)

Appendix F. (continued)

Site	Elevation (ft)	Alien Species
Wawona Stables	4001	*Sisymbrium altissimum*
Wawona Stables	4001	*Sonchus oleraceus*
Wawona Stables	4001	*Spergularia rubra*
Wawona Stables	4001	*Vulpia myuros*
White Wolf Corral	7967	*Capsella bursa-pastoris*
White Wolf Corral	7967	*Chamomilla suaveolens*
White Wolf Corral	7967	*Poa annua*
White Wolf Corral	7967	*Poa pratensis*
White Wolf Corral	7967	*Polygonum arenastrum*
White Wolf Corral	7967	*Rumex acetosella*
White Wolf Corral	7967	*Spergularia rubra*
White Wolf Corral	7967	*Stellaria media*
White Wolf Corral	7967	*Taraxacum officinale*
White Wolf Corral	7967	*Trifolium repens*

Alien Species	Elevation (ft)	Site
Trifolium repens	4093	McCauley Ranch
Trifolium repens	7496	Harden Lake Corral
Trifolium repens	7832	Glen Aulin High Sierra Camp
Trifolium repens	7967	White Wolf Corral
Trifolium repens	8632	Tuolumne Stables
Urtica urens	4039	Government Stables (YV)
Verbascum thapsus	4000	Concession Stables (YV)
Verbascum thapsus	4093	McCauley Ranch
Veronica persica	7496	Harden Lake Corral
Vulpia myuros	3960	Hetch Hetchy Corral
Vulpia myuros	4000	Concession Stables (YV)
Vulpia myuros	4001	Wawona Stables
Vulpia myuros	4039	Government Stables (YV)
Vulpia myuros	4093	McCauley Ranch

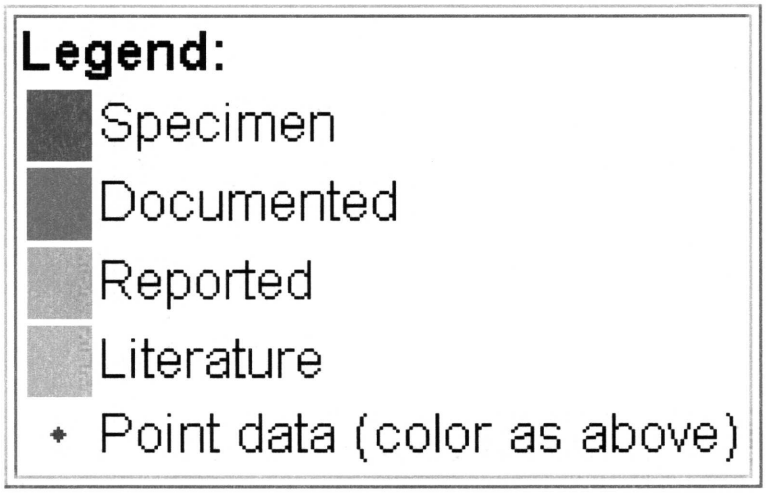
Species Richness Summary - by Corral/Stable Site

Site	Elevation (ft)	Alien Species Richness
Concession Stables (YV)	4000	33
Glen Aulin High Sierra Camp	7832	2
Government Stables (YV)	4039	13
Government Corrals (Tuol)	8695	2
Harden Lake Corral	7496	8
Hetch Hetchy Corral	3960	32
McCauley Ranch	4093	33
Tuolumne Stables	8632	8
Wawona Stables	4001	20
White Wolf Corral	7967	10
Species of Corrals/Stables		**Total = 63**

Species Richness Summary – by Richness level

Site	Elevation (ft)	Alien Species Richness
Glen Aulin High Sierra Cmp	7832	2
Government Corrals (Tuol)	8695	2
Harden Lake Corral	7496	8
Tuolumne Stables	8632	8
White Wolf Corral	7967	10
Government Stables (YV)	4039	13
Wawona Stables	4001	20
Hetch Hetchy Corral	3960	32
Concession Stables(YV)	4000	33
McCauley Ranch	4093	33
Species of Corrals/Stables		**Total = 63**

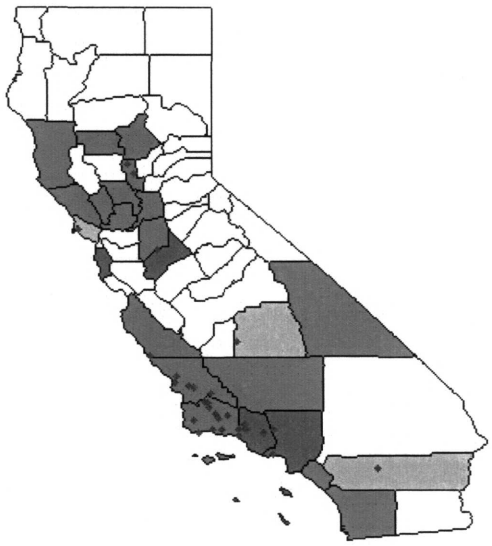
Appendix G. Statewide distributions of priority alien plant species.



Appendix G. Statewide distributions of priority alien plant species.

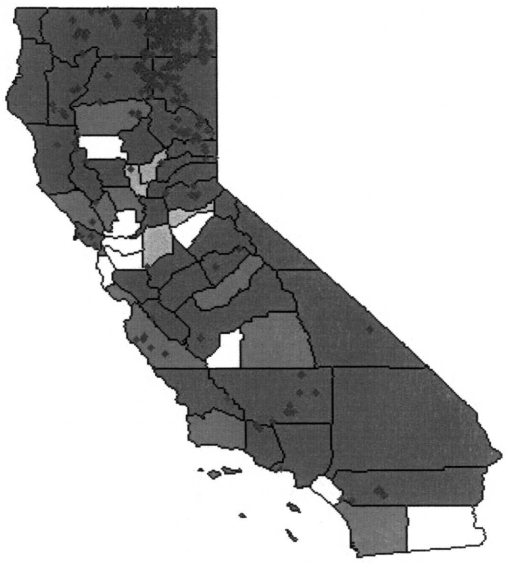
Agrostis capillaris

Agrostis gigantea



Arundo donax

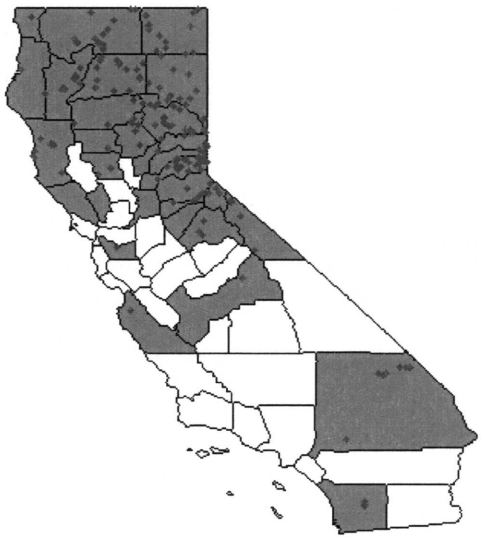
Bromus inermis



Bromus tectorum

Carduus pycnocephalus

Appendix G (Continued). Statewide distributions of priority alien plant species.



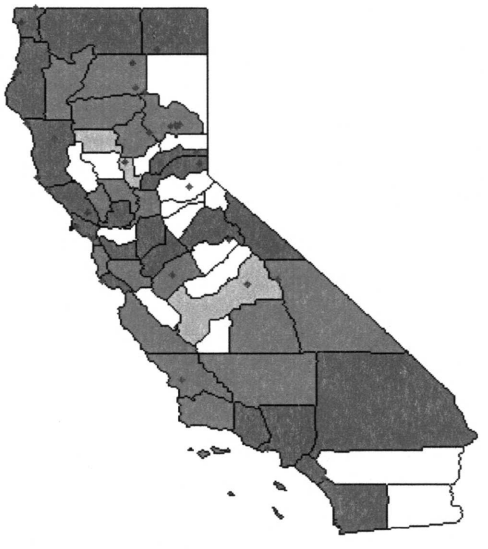
Centaurea maculosa

Centaurea solstitialis

Cirsium vulgare

Convolvulus arvensis

Coreopsis lanceolata



Dactylis glomerata

Appendix G (Continued). Statewide distributions of priority alien plant species.

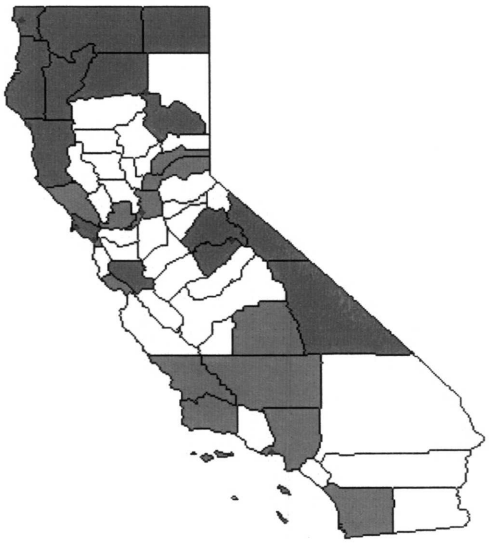
Digitalis purpurea

Echinochloa crus-galli

Erigeron strigosus

Eucalyptus citriodora

Festuca arundinacea



Festuca pratensis

Appendix G (Continued). Statewide distributions of priority alien plant species.

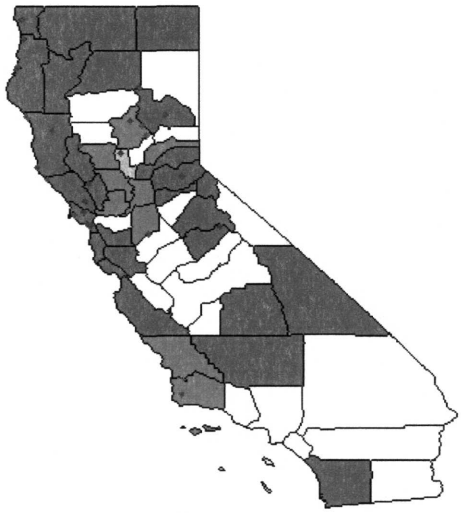
Ficus carica

Foeniculum vulgare

Genista monspessulana

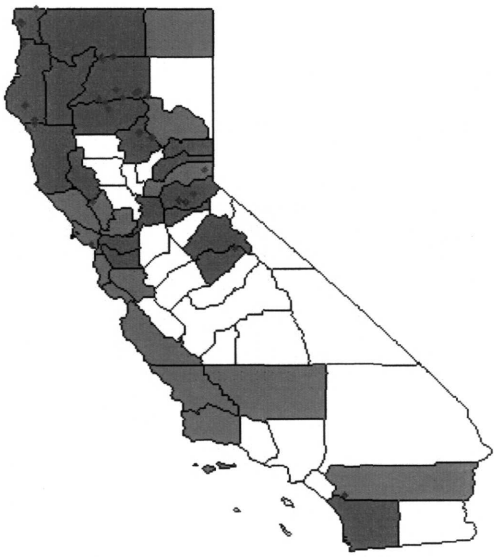
Geranium robertianum

Hedera helix



Holcus lanatus

Appendix G (Continued). Statewide distributions of priority alien plant species.



Hypericum perforatum

Juglans regia

Lathyrus latifolius

Leucanthemum maximum

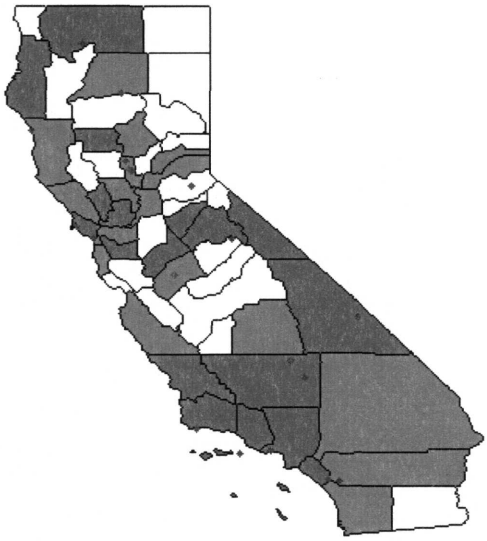
Leucanthemum vulgare

Lolium perenne

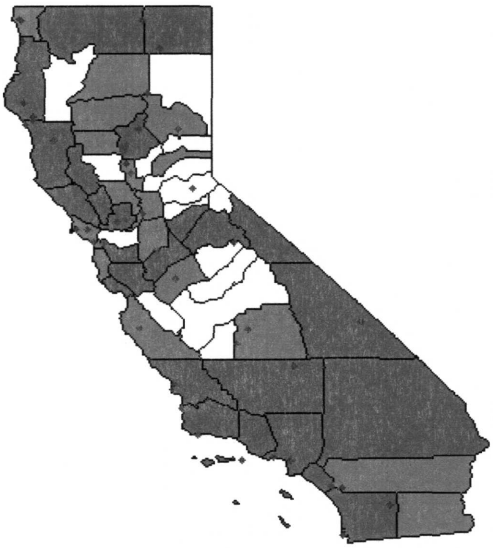
Appendix G (Continued). Statewide distributions of priority alien plant species.

Malus sylvestris

Marrubium vulgare



Medicago sativa



Melilotus alba

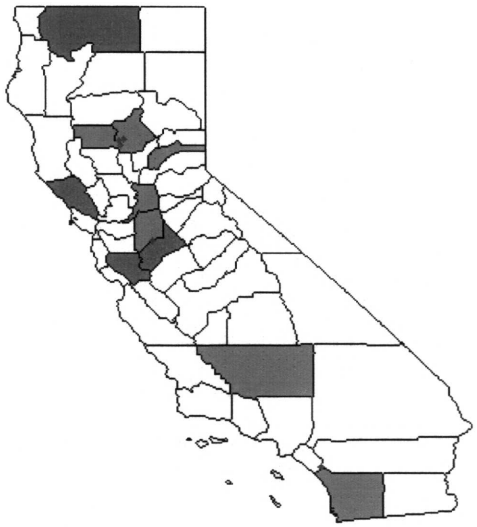
Melilotus indica

Melilotus officinalis

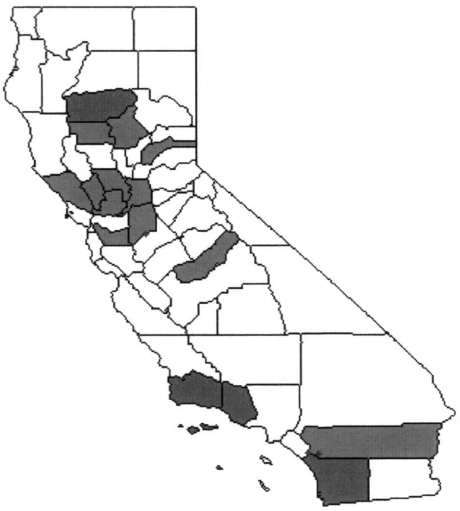
Appendix G (Continued). Statewide distributions of priority alien plant species.

Mentha pulegium

Mentha spicata



Morus alba



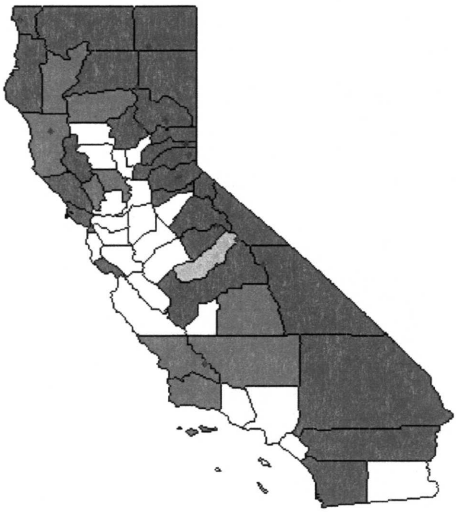
Olea europaea

Oxalis pes-caprae

Phalaris arundinacea

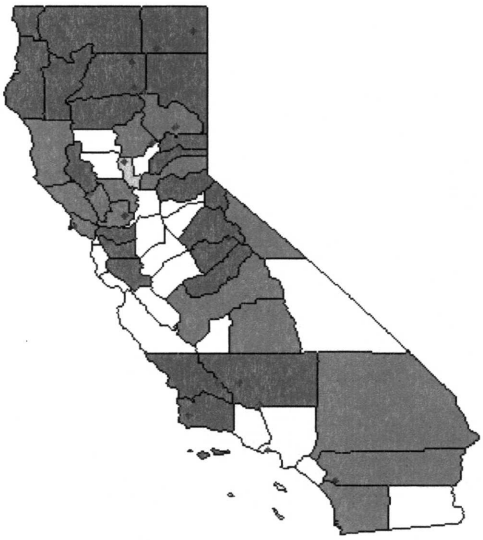
Appendix G (Continued). Statewide distributions of priority alien plant species.

Phalaris paradoxa

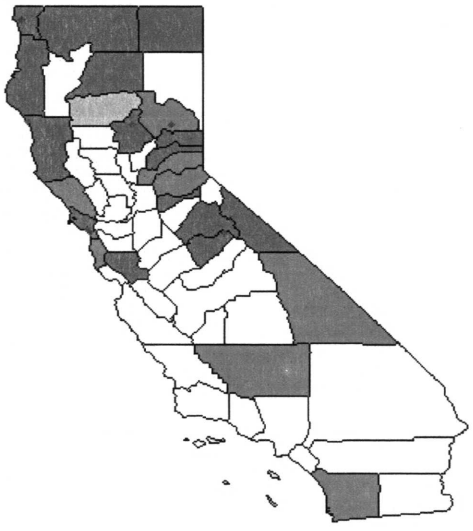


Phleum pratense

Piptatherum miliaceum



Poa bulbosa



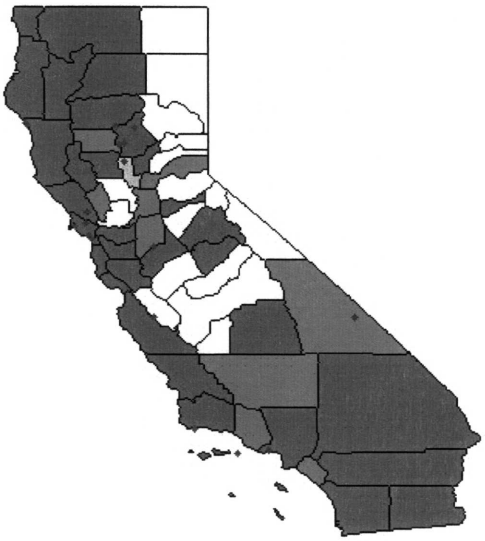
Poa compressa

Poa palustris

Appendix G (Continued). Statewide distributions of priority alien plant species.

Poa pratensis

Polypogon australis



Polypogon interruptus

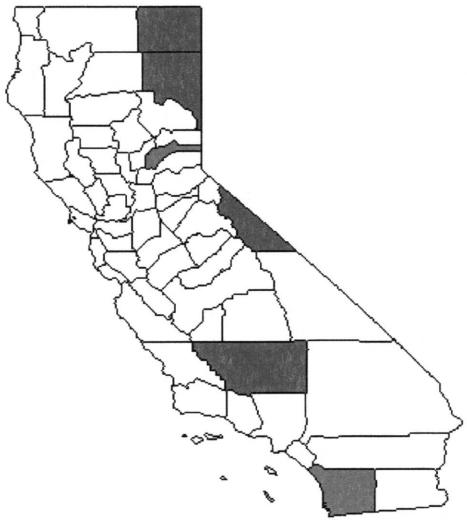
Polypogon monspeliensis

Punicia granatum

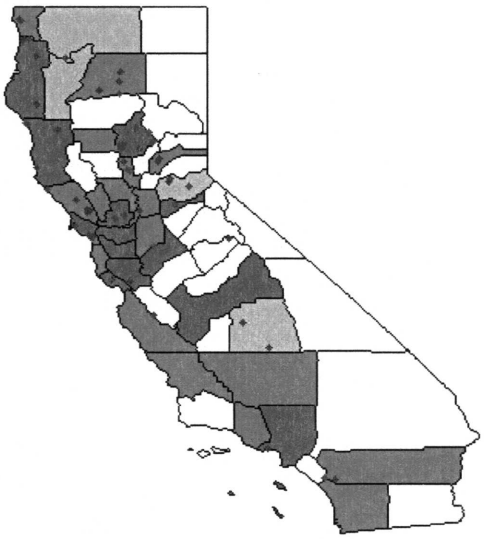
Pyracantha angustifolia

Appendix G (Continued). Statewide distributions of priority alien plant species.

Ranunculus parviflorus



Ranunculus testiculatus



Rubus discolor

Rubus lacinatus

Rudbeckia hirta

Scorzonera hispanica

Appendix G (Continued). Statewide distributions of priority alien plant species.

Silybum marianum

Sorghum halepense

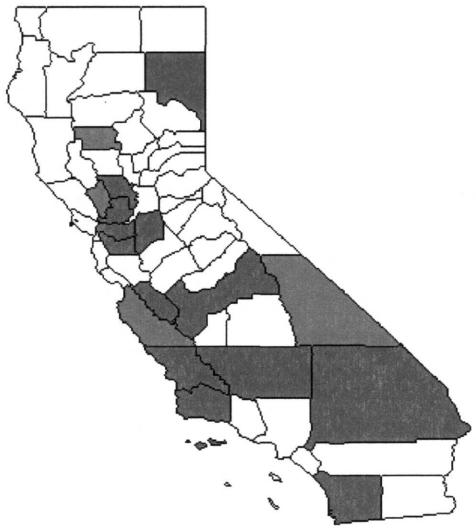
Spartium junceum

Tamarix aphylla

Tamarix chinensis

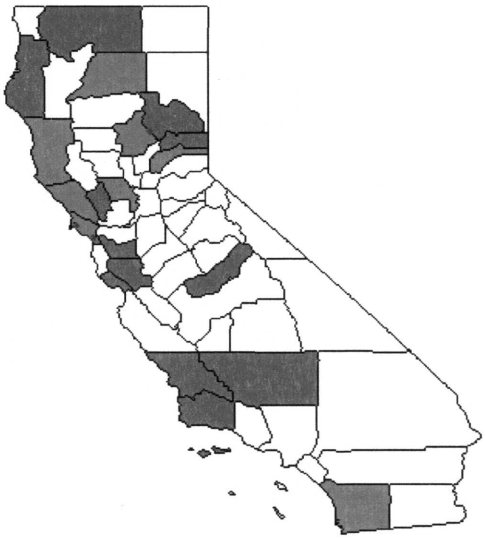
Tamarix gallica

Appendix G (Continued). Statewide distributions of priority alien plant species.

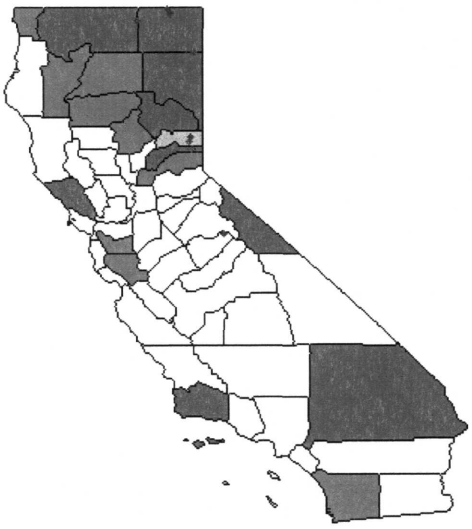


Tamarix parviflora

Tamarix ramosissima



Tanacetum parthenium

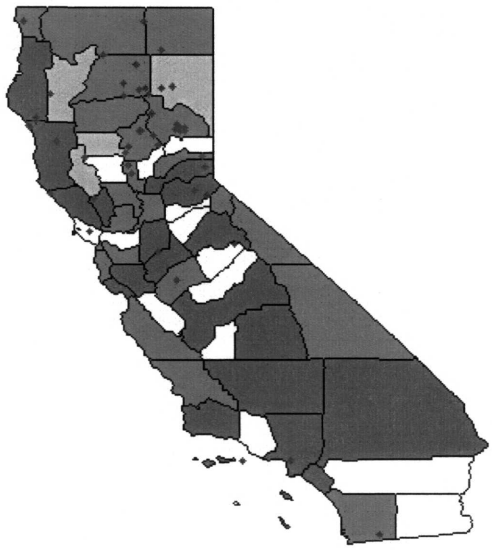


Tragopogon dubius

Trifolium repens

Urtica urens

Appendix G (Continued). Statewide distributions of priority alien plant species.



Verbascum thapsus

Verbascum virgatum

Vicia benghalensis

Vicia sativa

Vicia villosa

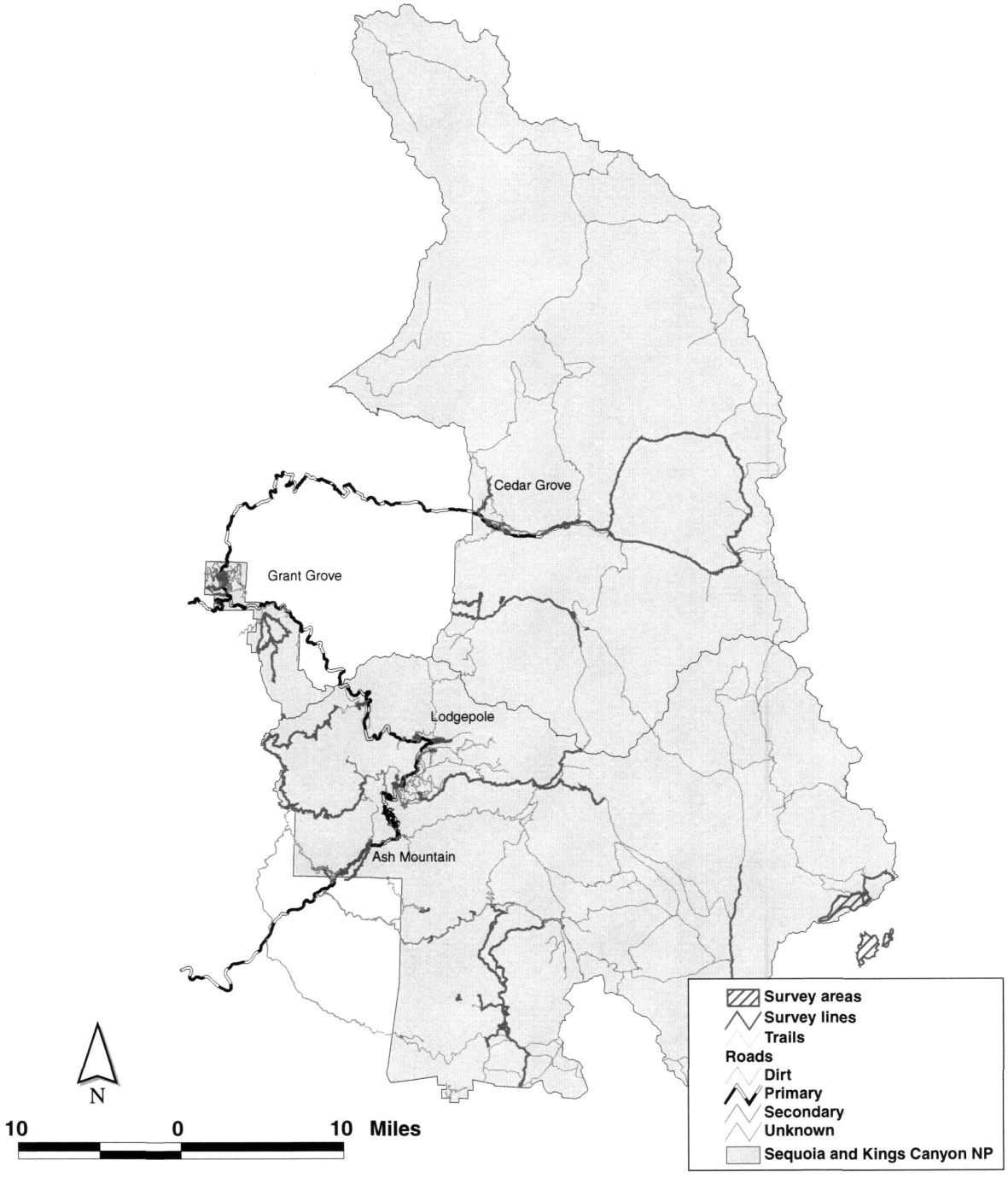
Vinca major

Appendix G (Continued). Statewide distributions of priority alien plant species.

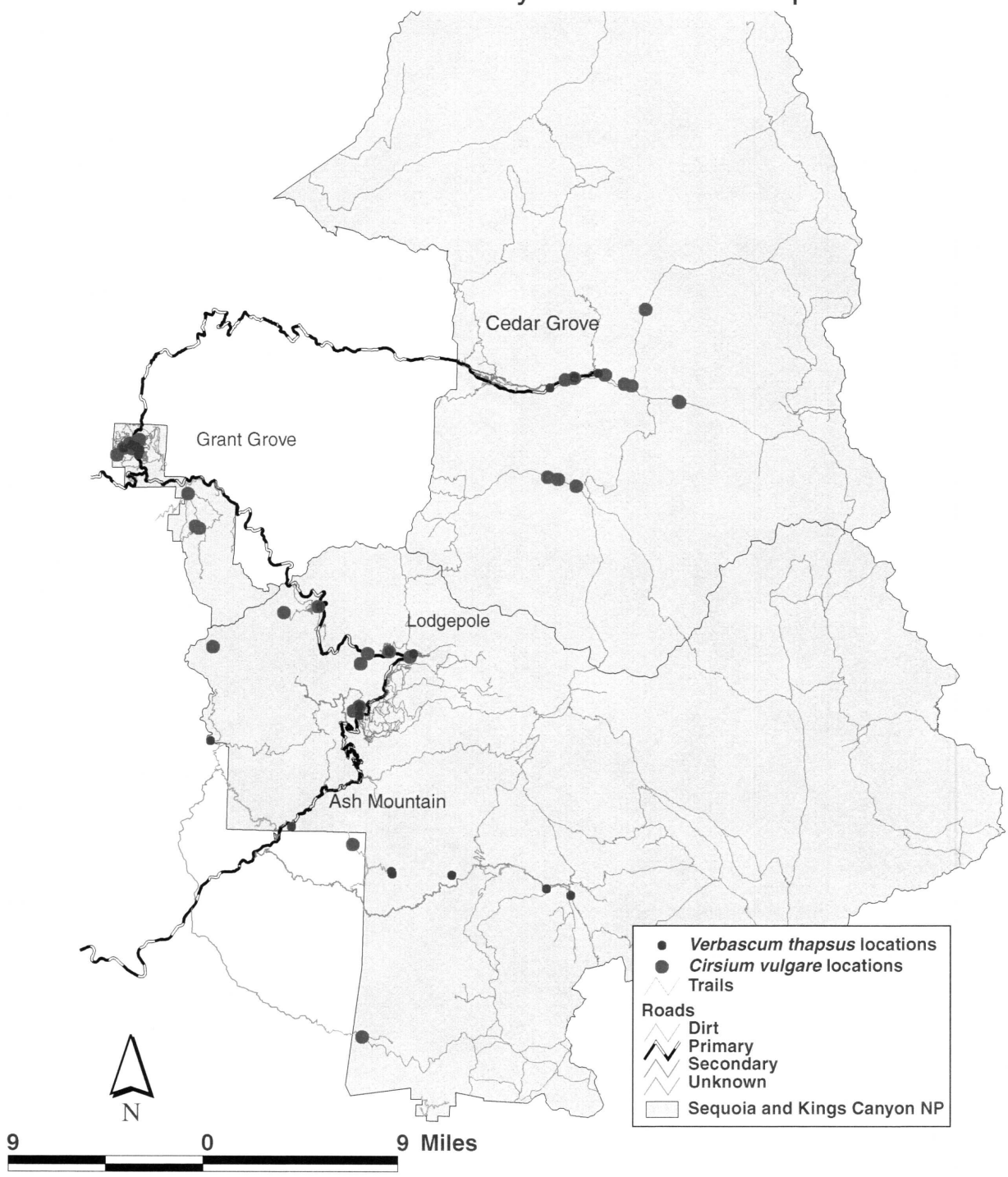
Vitis vinifera

Vulpia bromoides

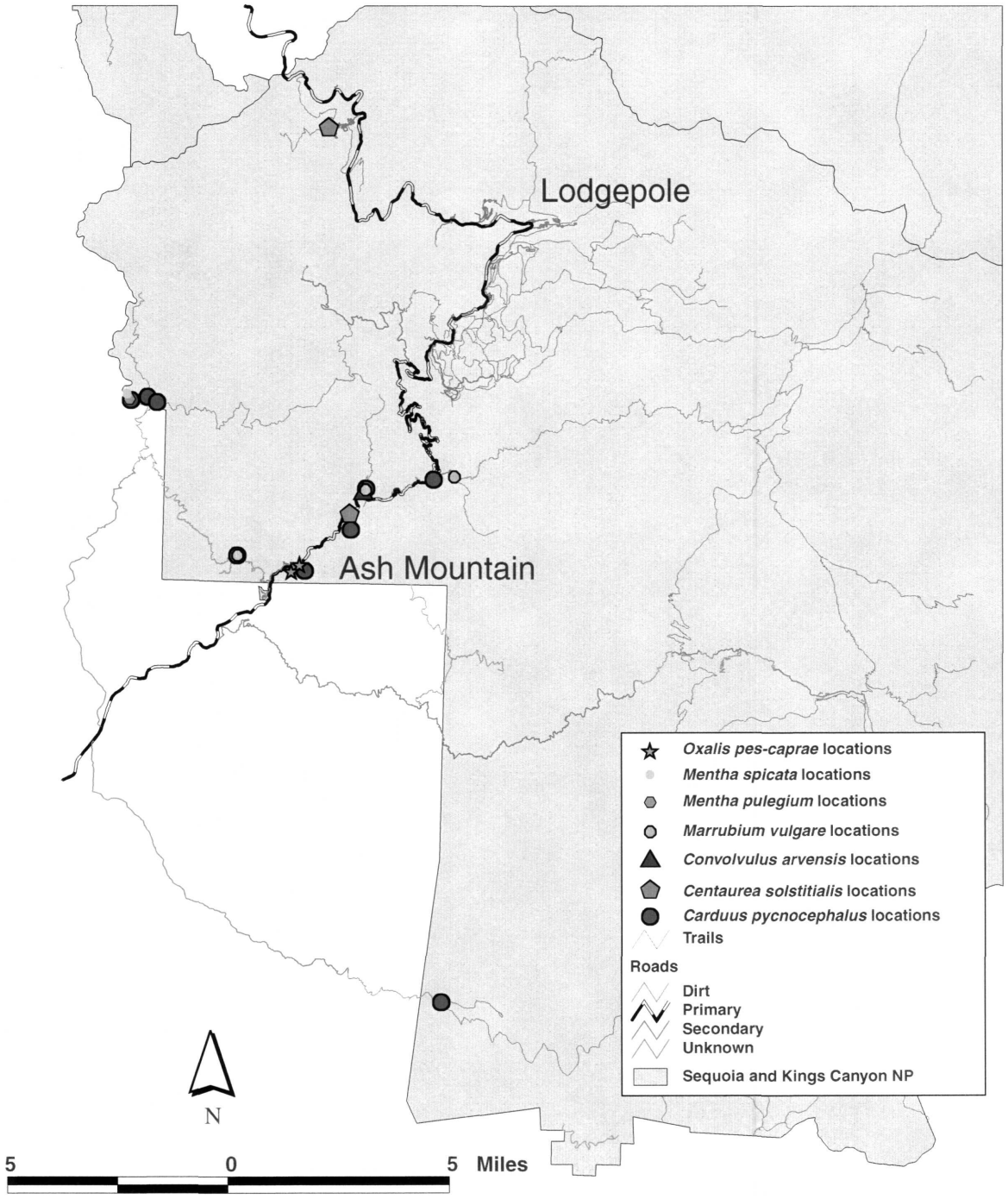
Sequoia and Kings Canyon National Parks Survey Areas



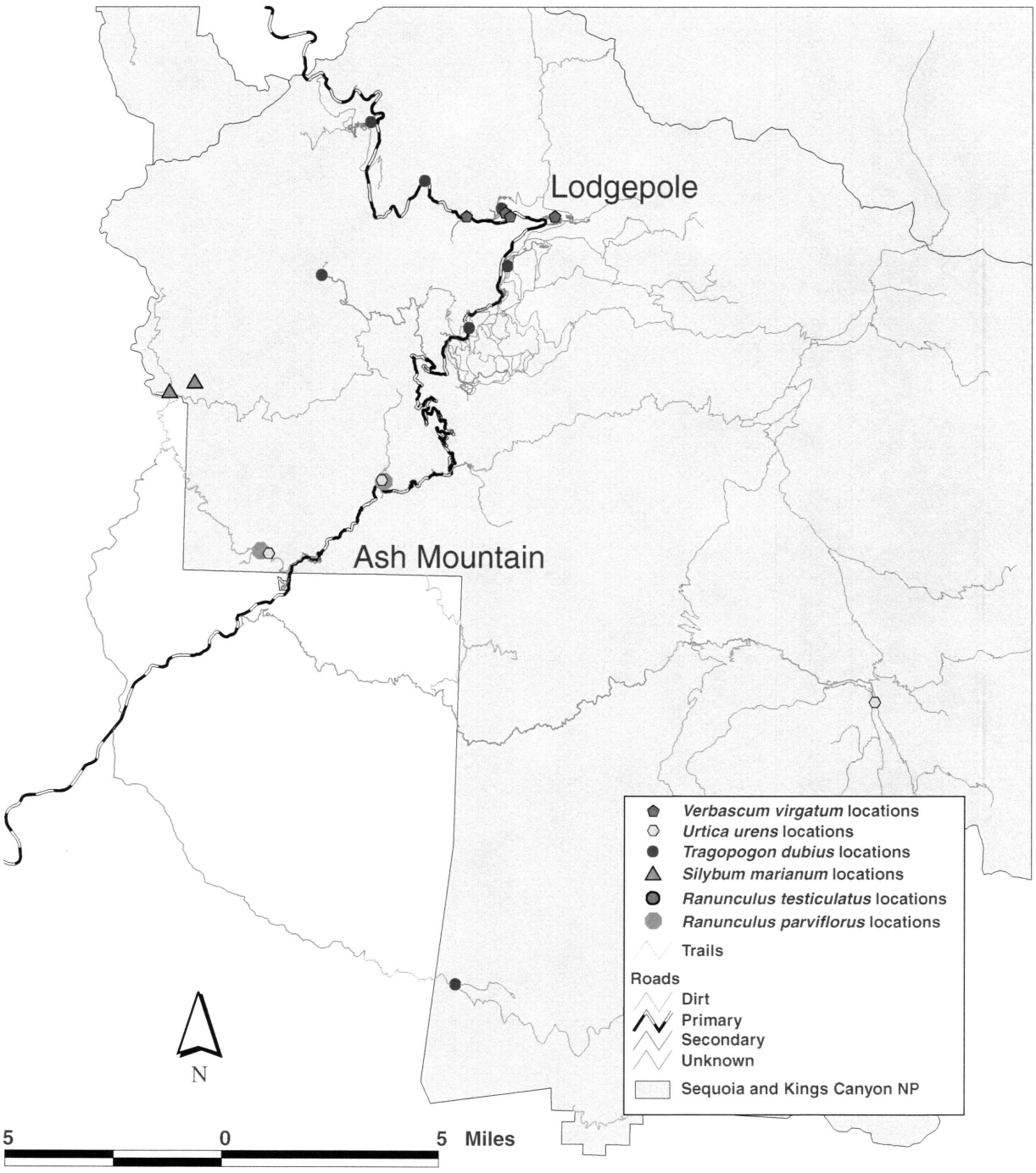
Map 1. Alien plant surveys of disturbed areas in Sequoia and Kings Canyon National Parks, 1996, 1997 and 1998.



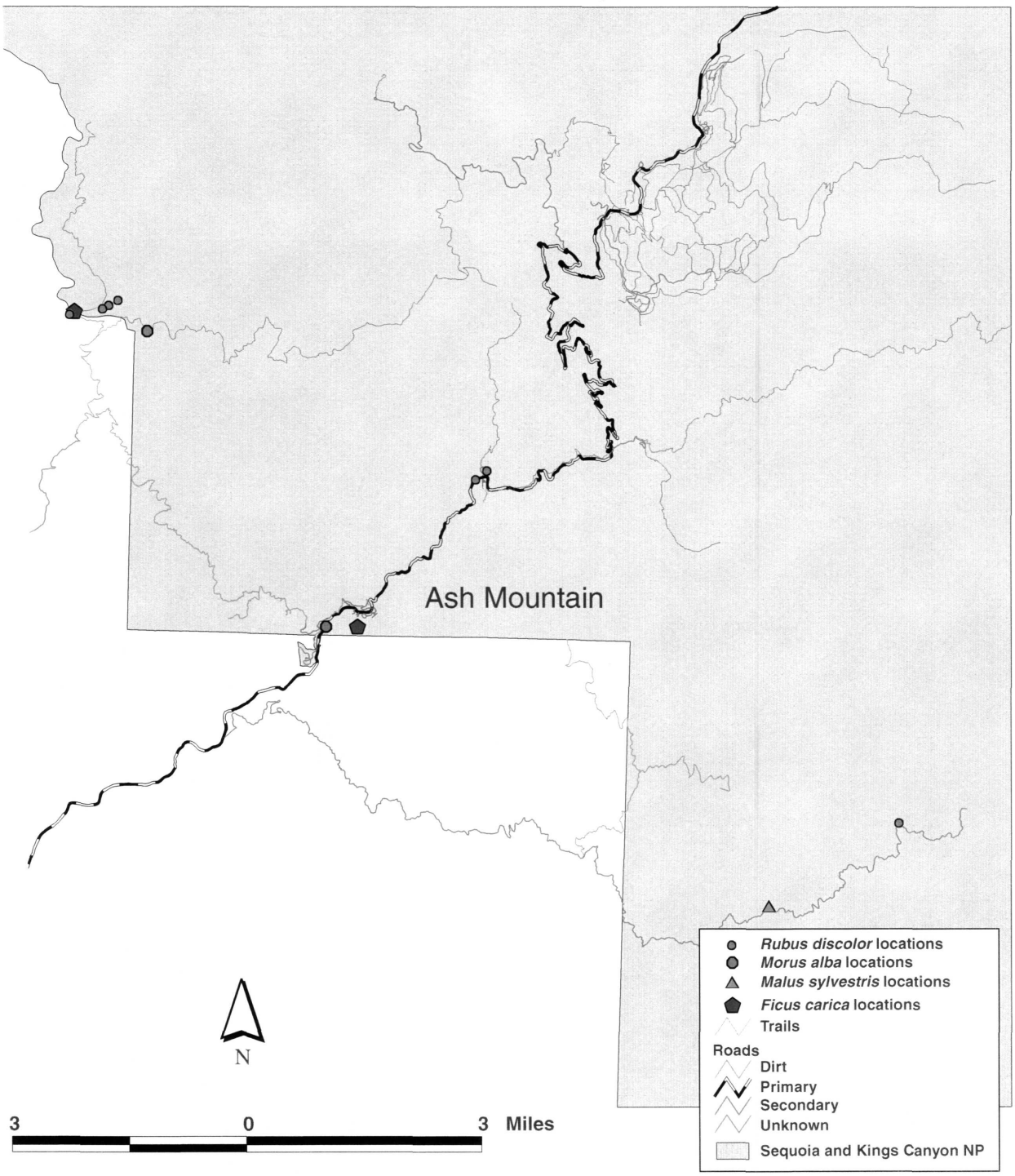
Map 2. *Cirsium vulgare* and *Verbascum thapsus* distributions based on alien plant surveys of disturbed areas in Sequoia and Kings Canyon National Parks, 1996, 1997 and 1998.



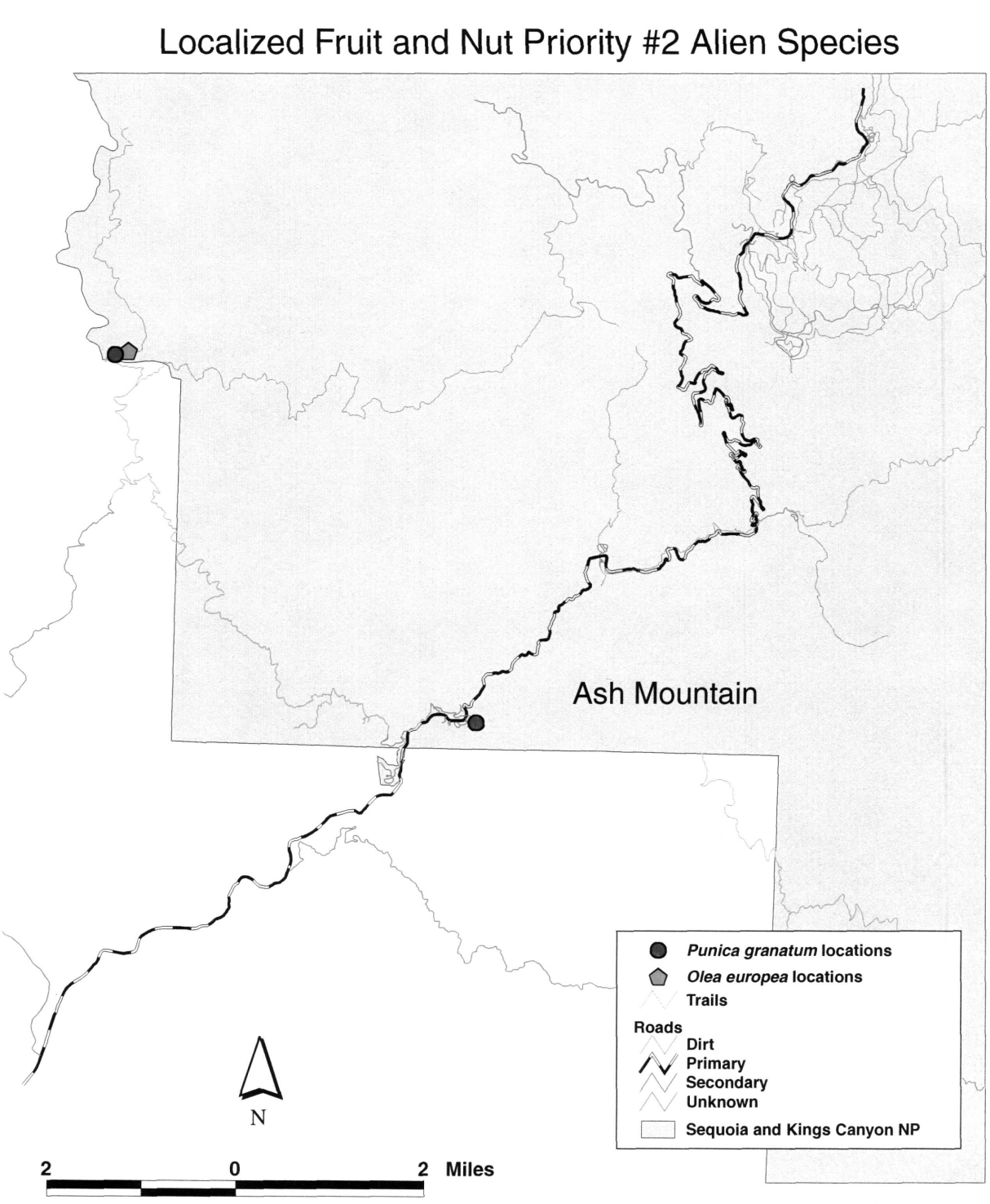
Map 3. *Carduus pycnocephalus*, *Centaurea solstitialis*, *Convolvulus arvensis*, *Marrubium vulgare*, *Mentha pulegium*, *M. spicata*, and *Oxalis pes-caprae* distributions based on alien plant surveys of disturbed areas in Sequoia and Kings Canyon National Parks, 1996, 1997 and 1998.



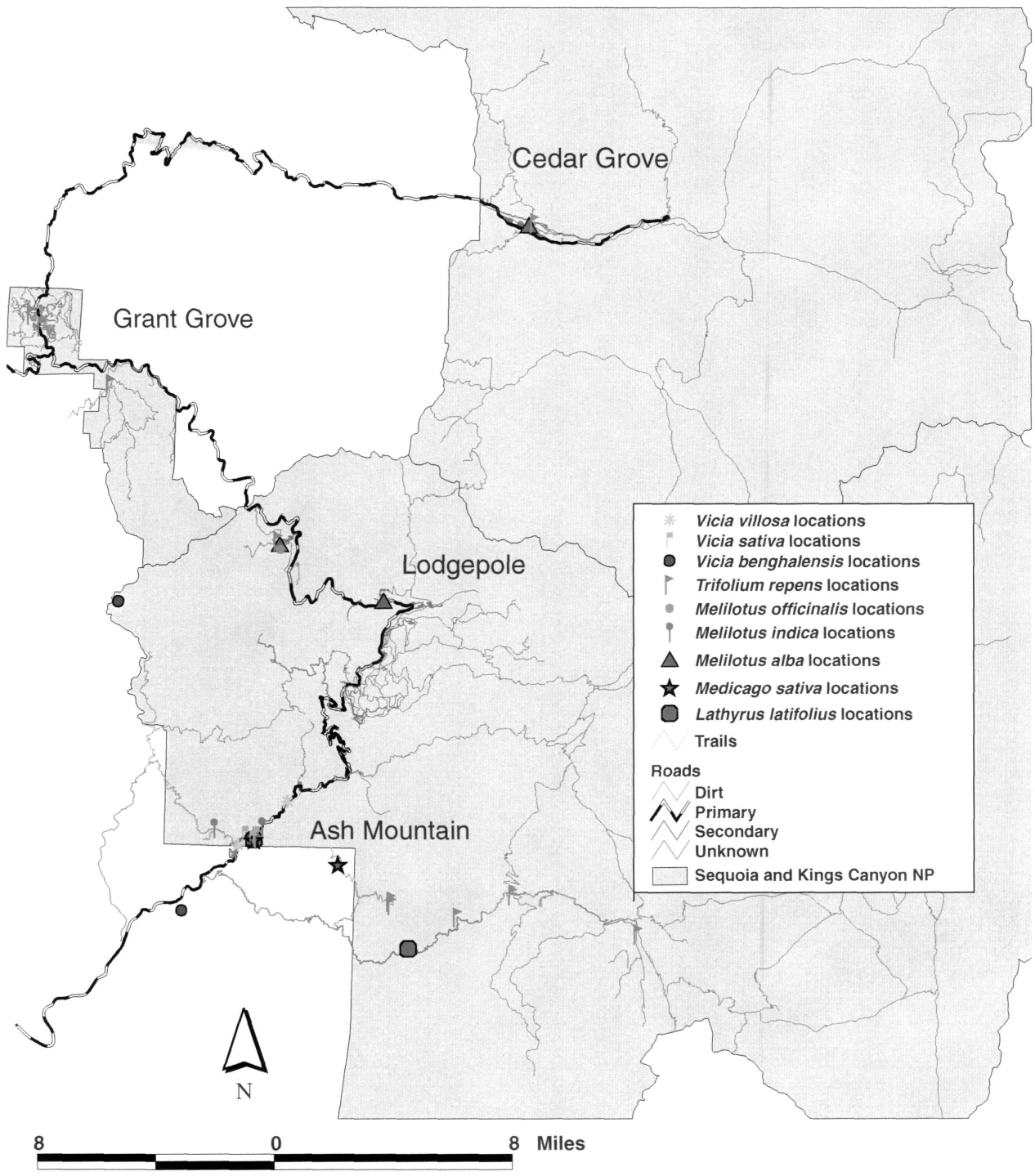
Map 4. *Ranunculus parviflorus*, *R. testiculatus*, *Silybum marianum*, *Tragopogon dubius*, *Urtica urens*, and *Verbascum virgatum* distributions based on alien plant surveys of disturbed areas in Sequoia and Kings Canyon National Parks, 1996, 1997 and 1998.



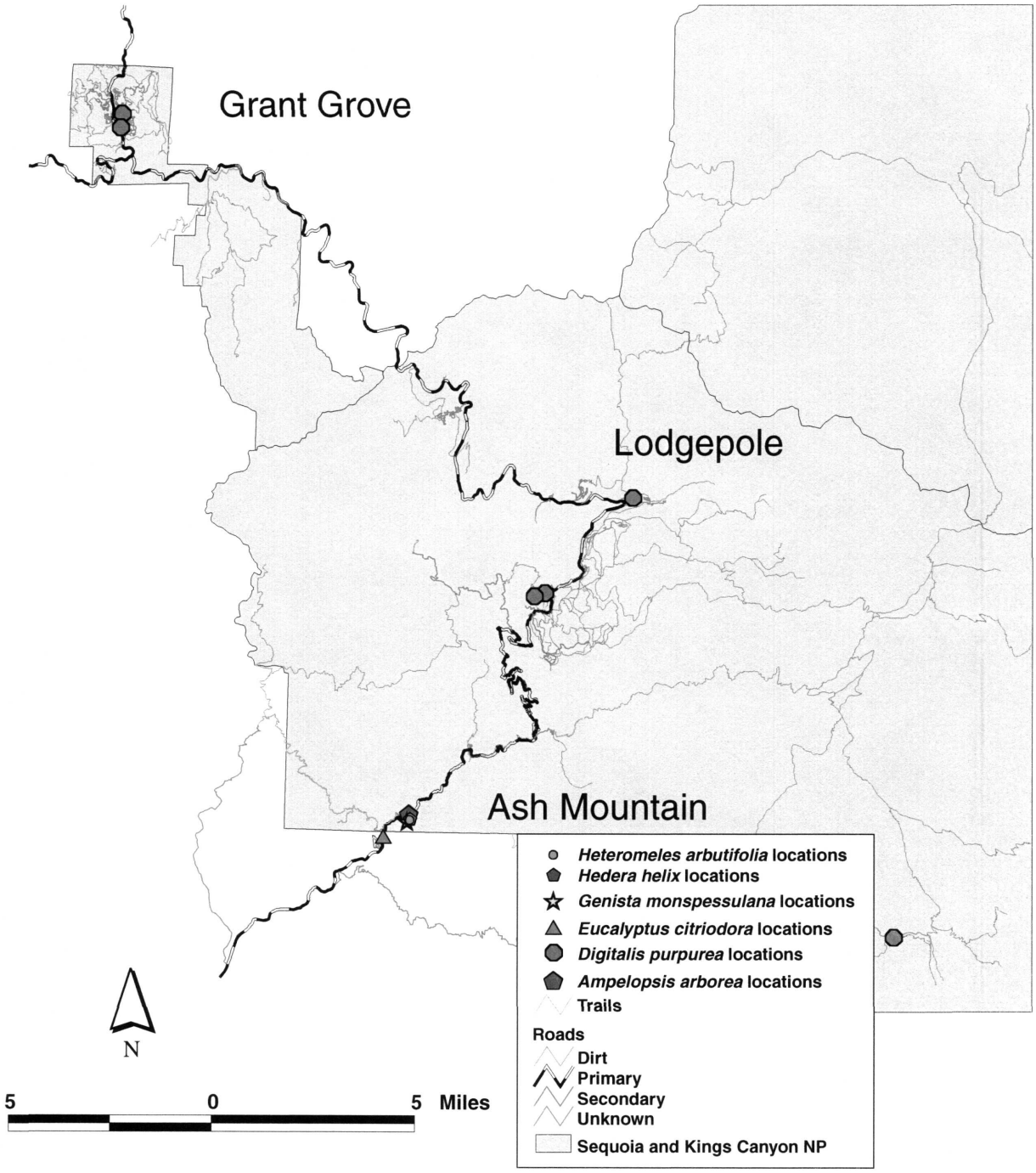
Map 5. *Ficus carica*, *Malus sylvestris*, *Morus alba*, and *Rubus discolor* distributions based on alien plant surveys of disturbed areas in Sequoia and Kings Canyon National Parks, 1996, 1997 and 1998.



Map 6. *Olea europea* and *Punica granatum* distributions based on alien plant surveys of disturbed areas in Sequoia and Kings Canyon National Parks, 1996, 1997 and 1998.

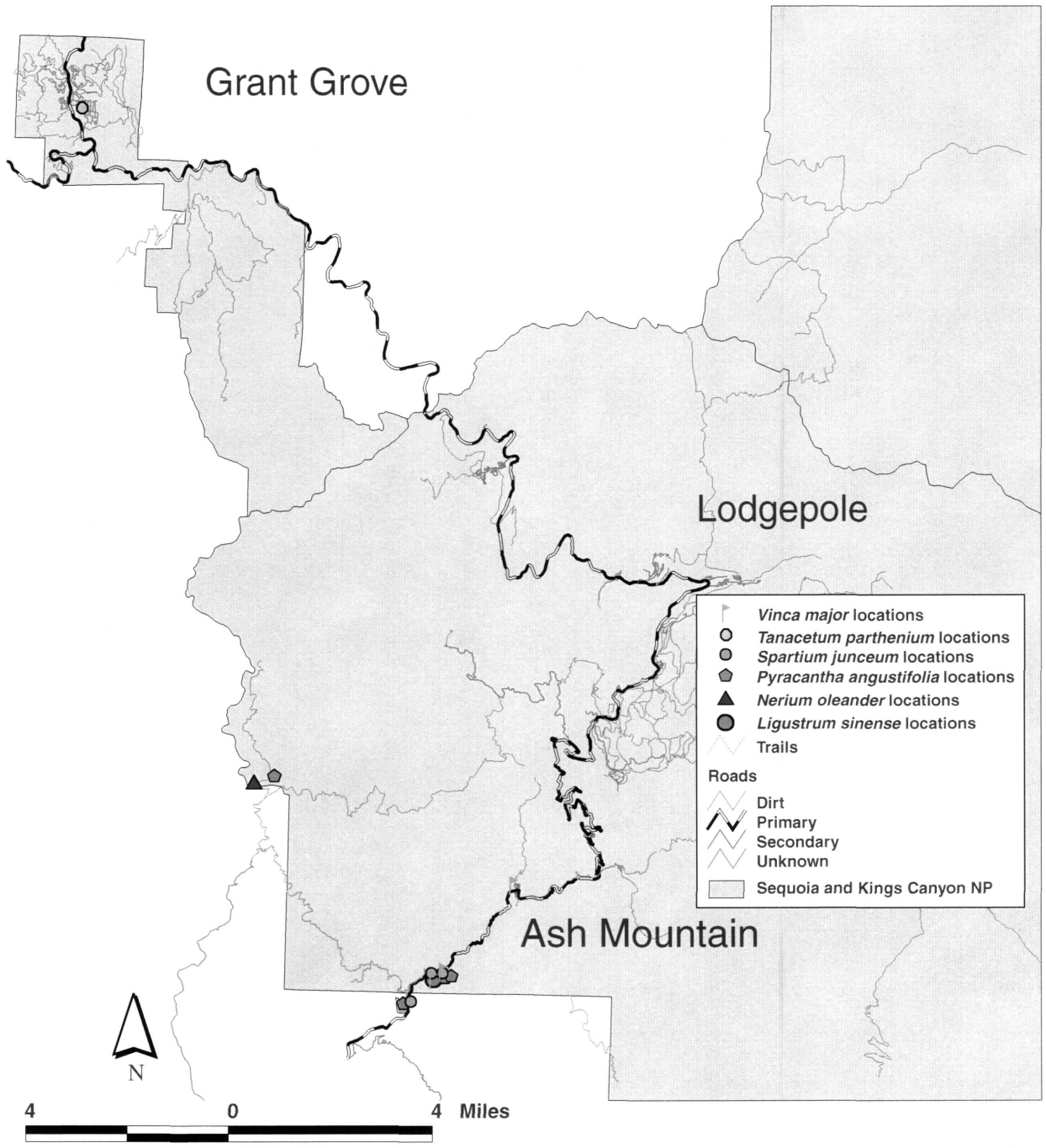


Map 7. *Lathyrus latifolius*, *Medicago sativa*, *Melilotus alba*, *M. indica*, *M. officinalis*, *Trifolium repens*, *Vicia benghalensis*, *V. sativa*, and *V. villosa* distributions based on alien plant surveys of disturbed areas in Sequoia and Kings Canyon National Parks, 1996, 1997 and 1998.



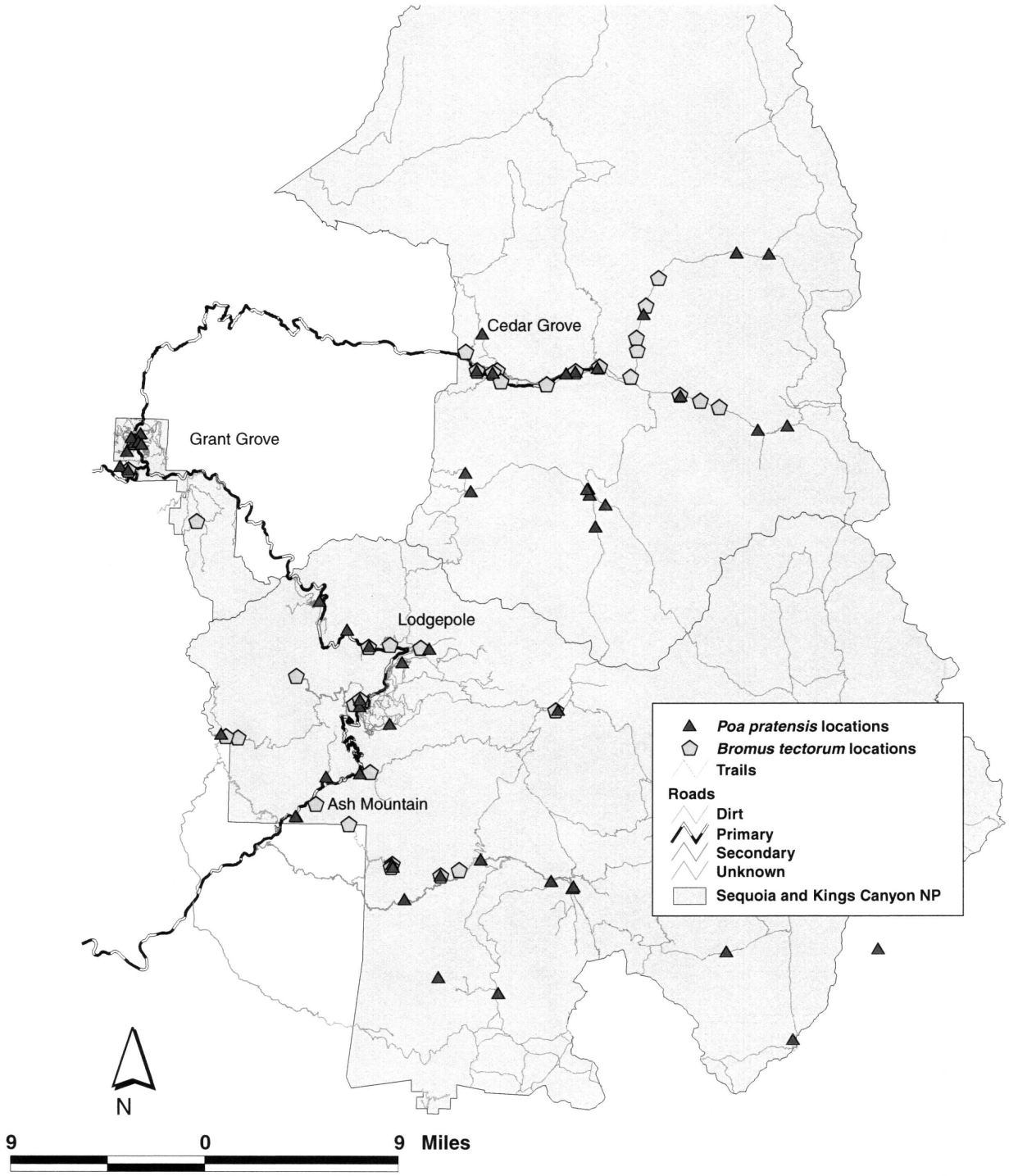
Map 8. *Ampelopsis arborea*, *Digitalis purpurea*, *Eucalyptus citriodora*, *Genista monspessulana*, *Hedera helix*, and *Heteromeles arbutifolia* distributions based on alien plant surveys of disturbed areas in Sequoia and Kings Canyon National Parks, 1996, 1997 and 1998.

Localized Ornamental Priority #1 Exotic Species - Map 2

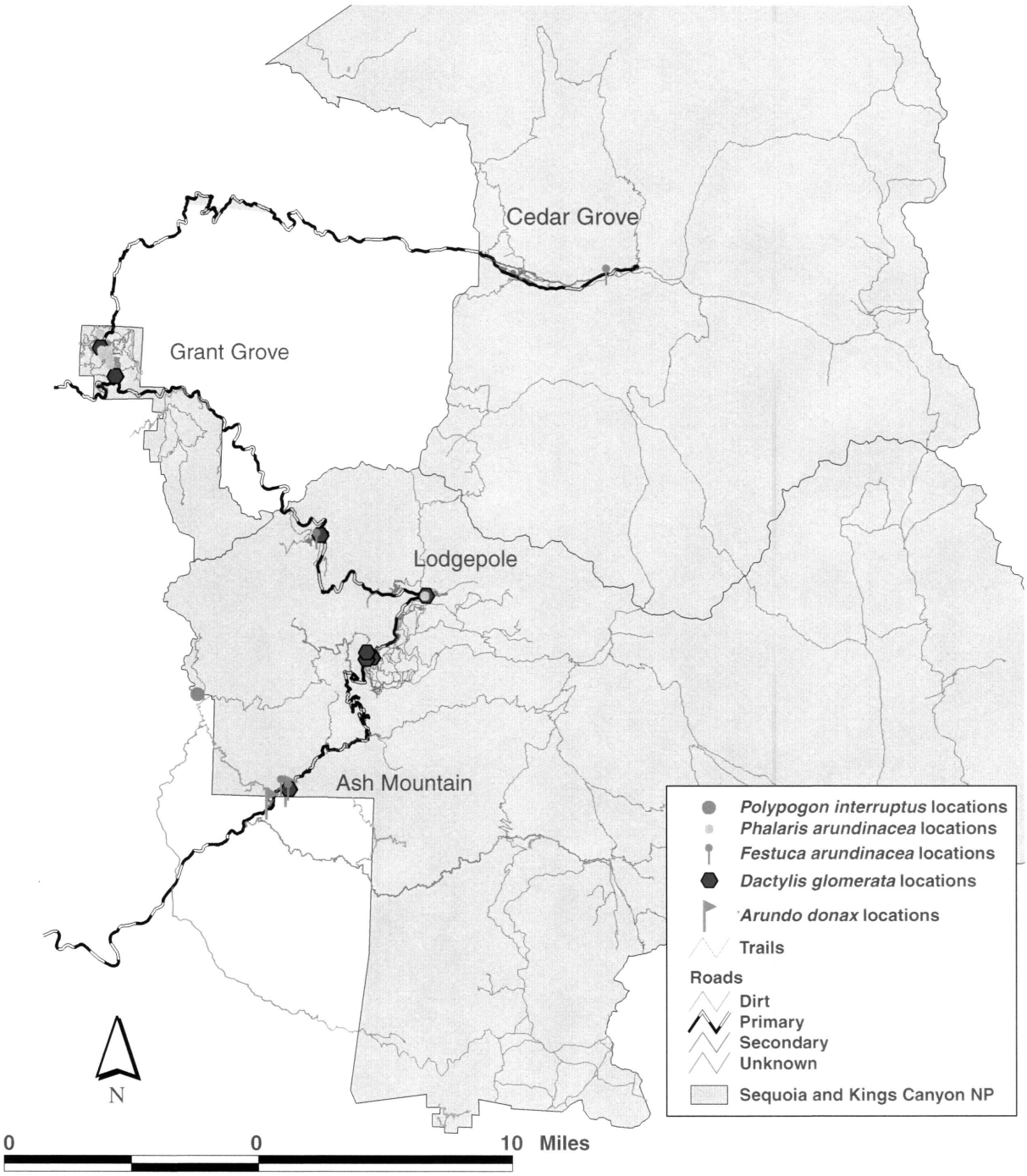


Map 9. *Ligustrum sinense*, *Nerium oleander*, *Pyracantha angustifolia*, *Spartium junceum*, *Tanacetum parthenium*, and *Vinca major* distributions based on alien plant surveys of disturbed areas in Sequoia and Kings Canyon National Parks, 1996, 1997 and 1998.

Broad Distribution Priority #3 Alien Grass Species

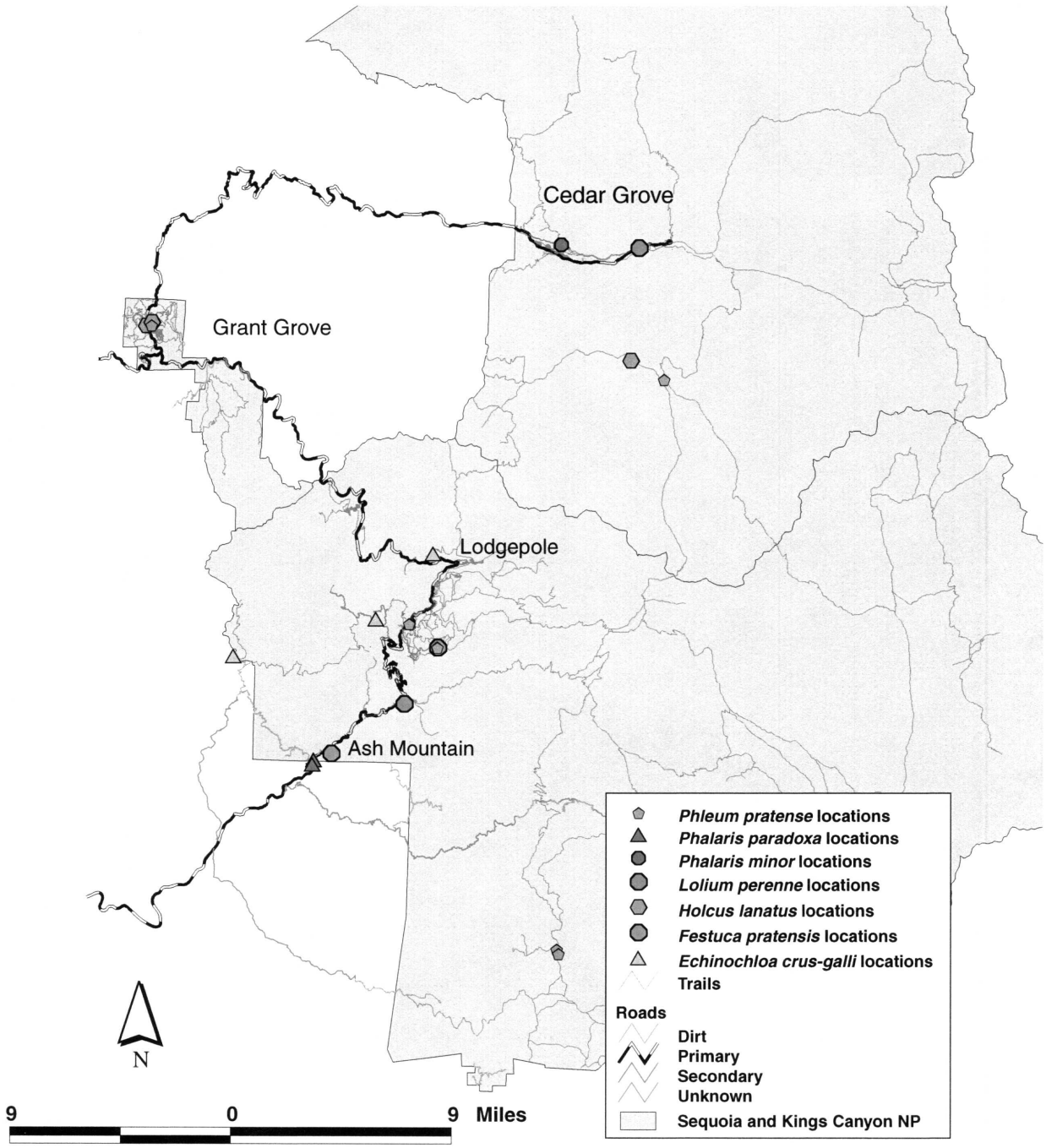


Map 10. *Poa pratensis* and *Bromus tectorum* distributions based on alien plant surveys of disturbed areas in Sequoia and Kings Canyon National Parks, 1996, 1997 and 1998.



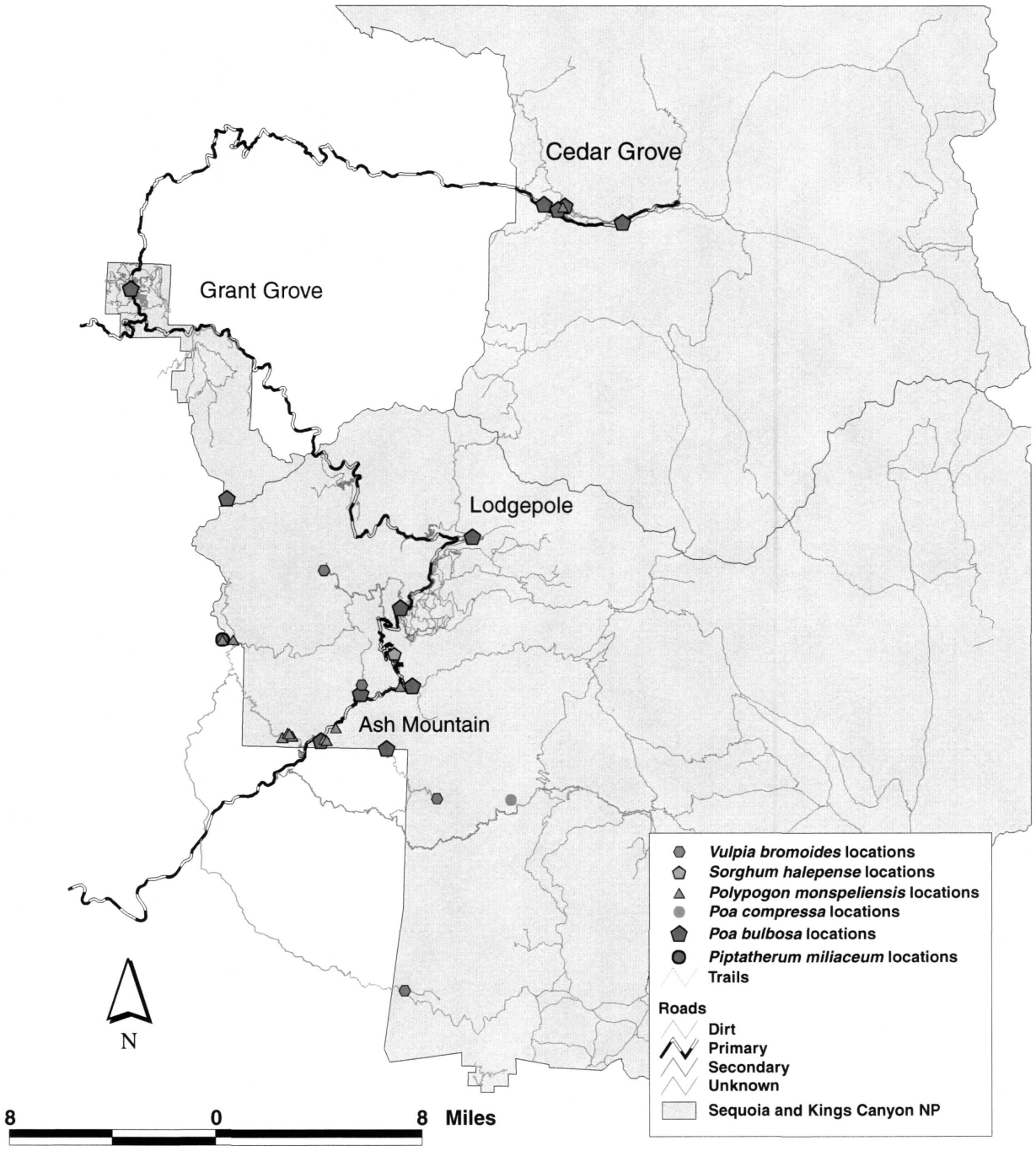
Map 11. *Arundo donax*, *Dactylils glomerata*, *Festuca arundinacea*, *Phalaris arundinacea*, and *Polypogon interruptus* distributions based on alien plant surveys of disturbed areas in Sequoia and Kings Canyon National Parks, 1996, 1997 and 1998.

Localized Wildland Priority #2 Alien Grass Species - Map 1

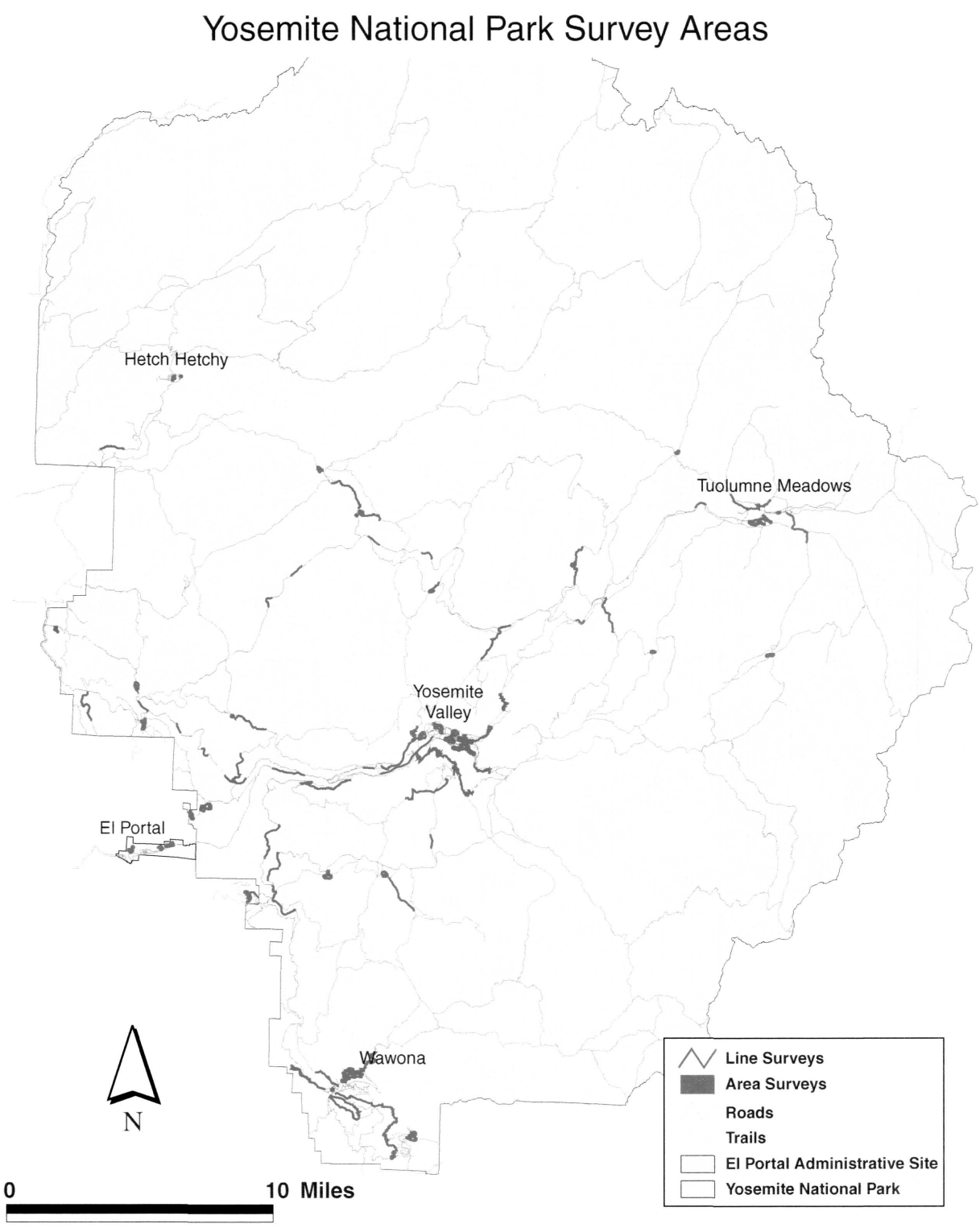


Map 12. *Echinochloa crus-galli*, *Festuca pratensis*, *Holcus lanatus*, *Lolium perenne*, *Phalaris minor*, *P. paradoxa*, and Phleum pratense distributions based on alien plant surveys of disturbed areas in Sequoia and Kings Canyon National Parks, 1996, 1997 and 1998.

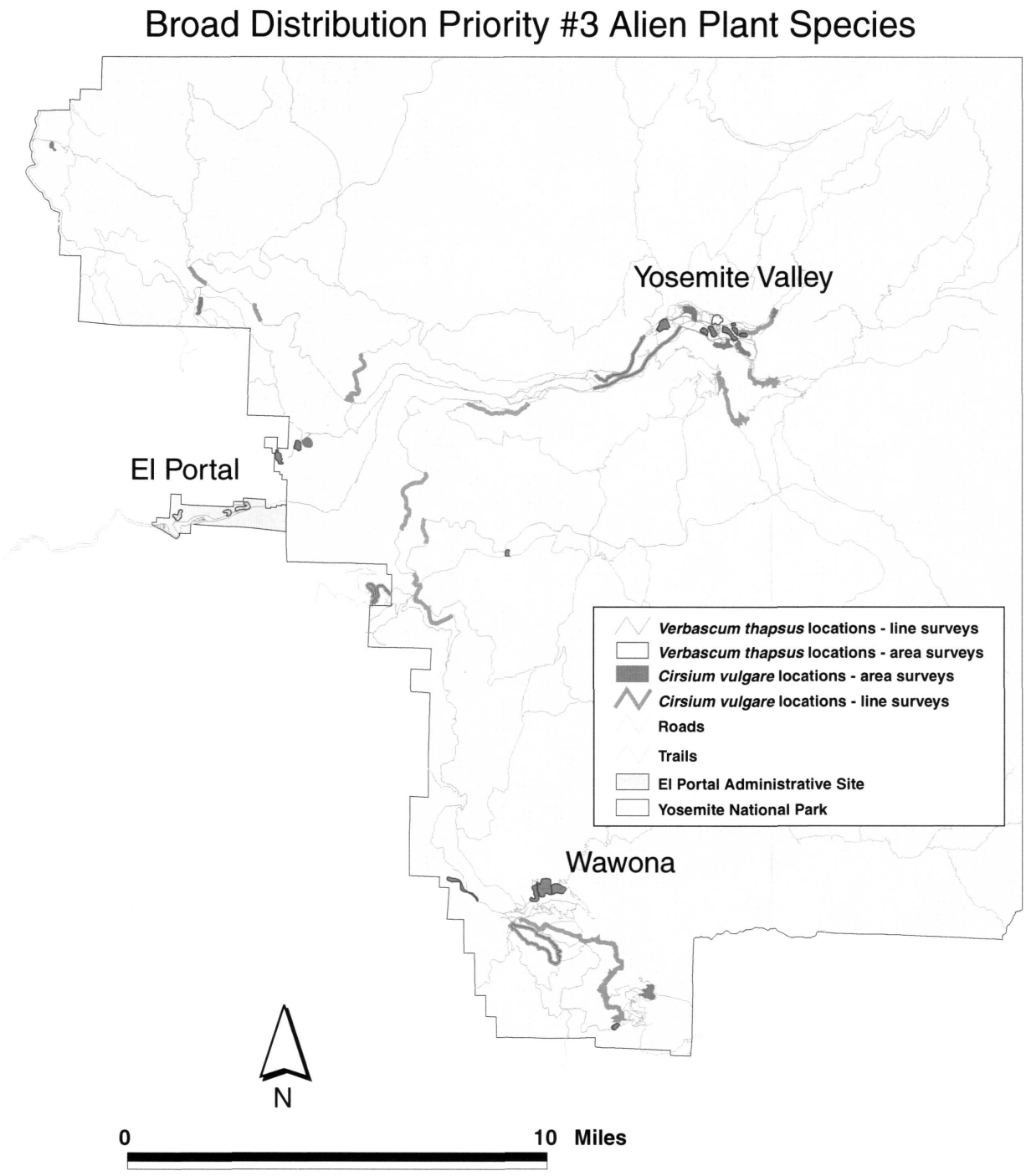
Localized Wildland Priority #2 Alien Grass Species - Map 2



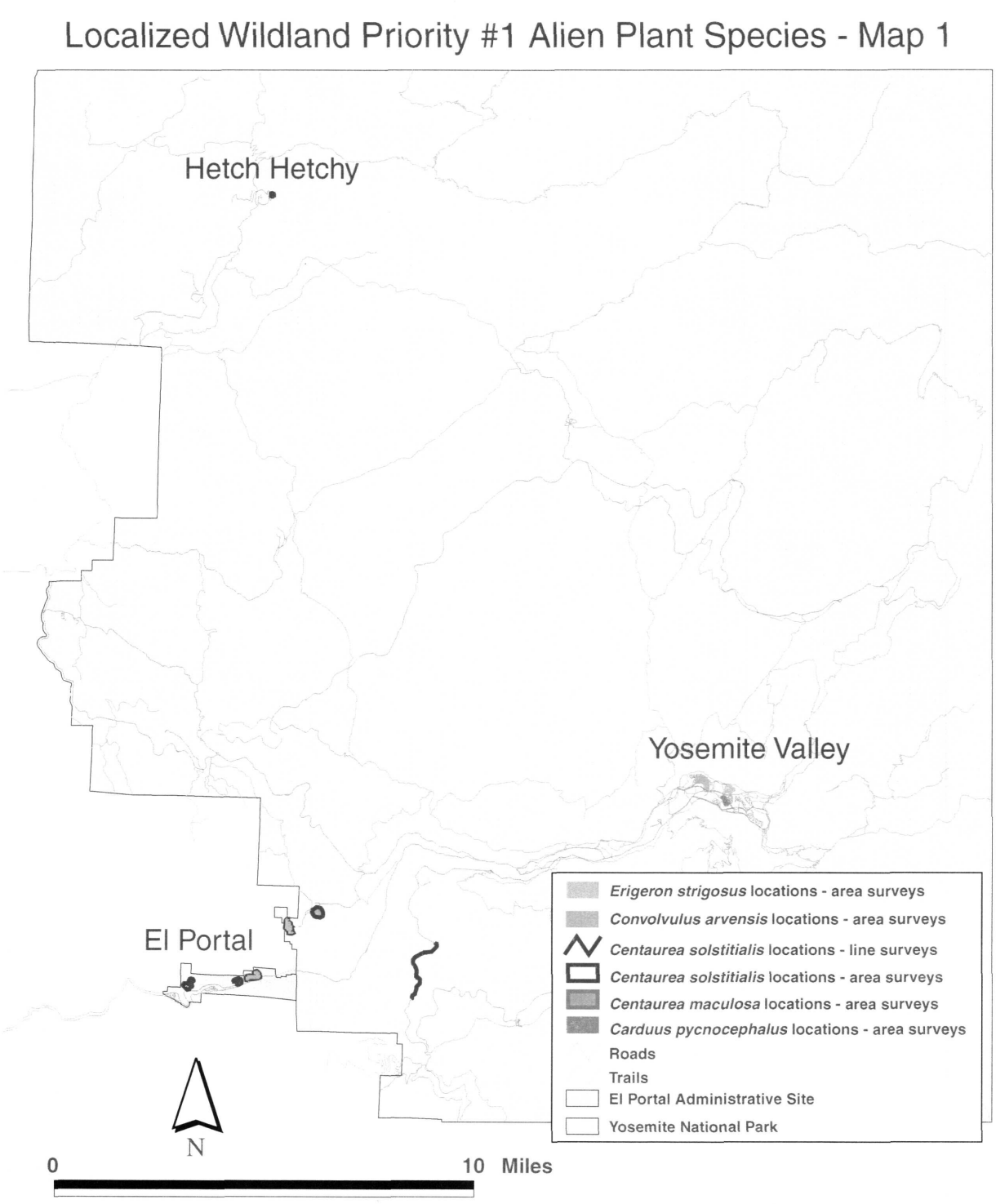
Map 13. *Piptatherum miliaceum*, *Poa bulbosa*, *P. compressa*, *Polypogon monspeliensis*, *Sorghum halepense*, and *Vulpia bromoides* distributions based on alien plant surveys of disturbed areas in Sequoia and Kings Canyon National Parks, 1996, 1997 and 1998.



Map 14. Alien plant surveys of disturbed areas in Yosemite National Park, 1998 and 1999.

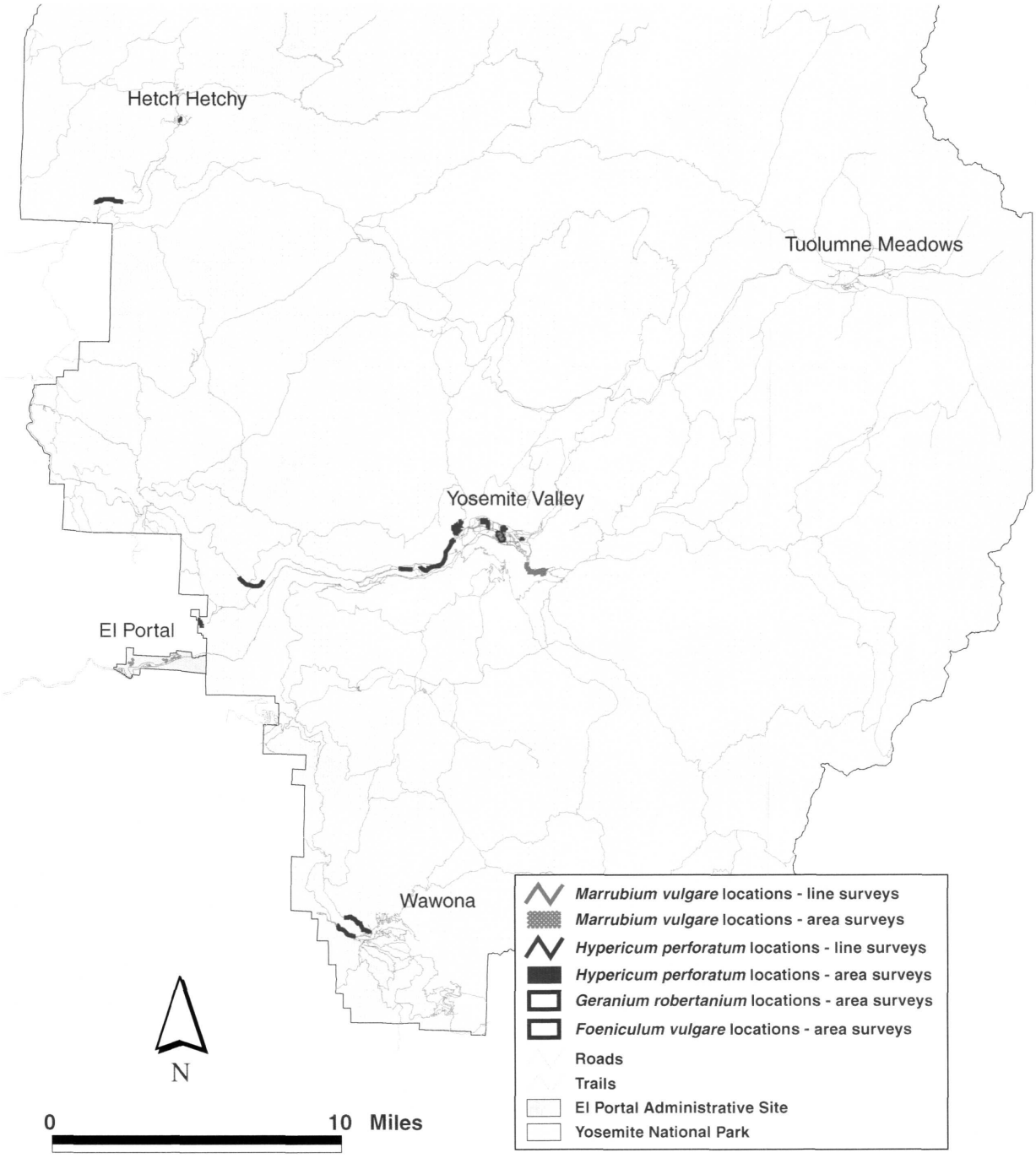


Map 15. *Cirsium vulgare* and *Verbascum thapsus* distributions based on alien plant surveys of disturbed areas in Yosemite National Park, 1998 and 1999.

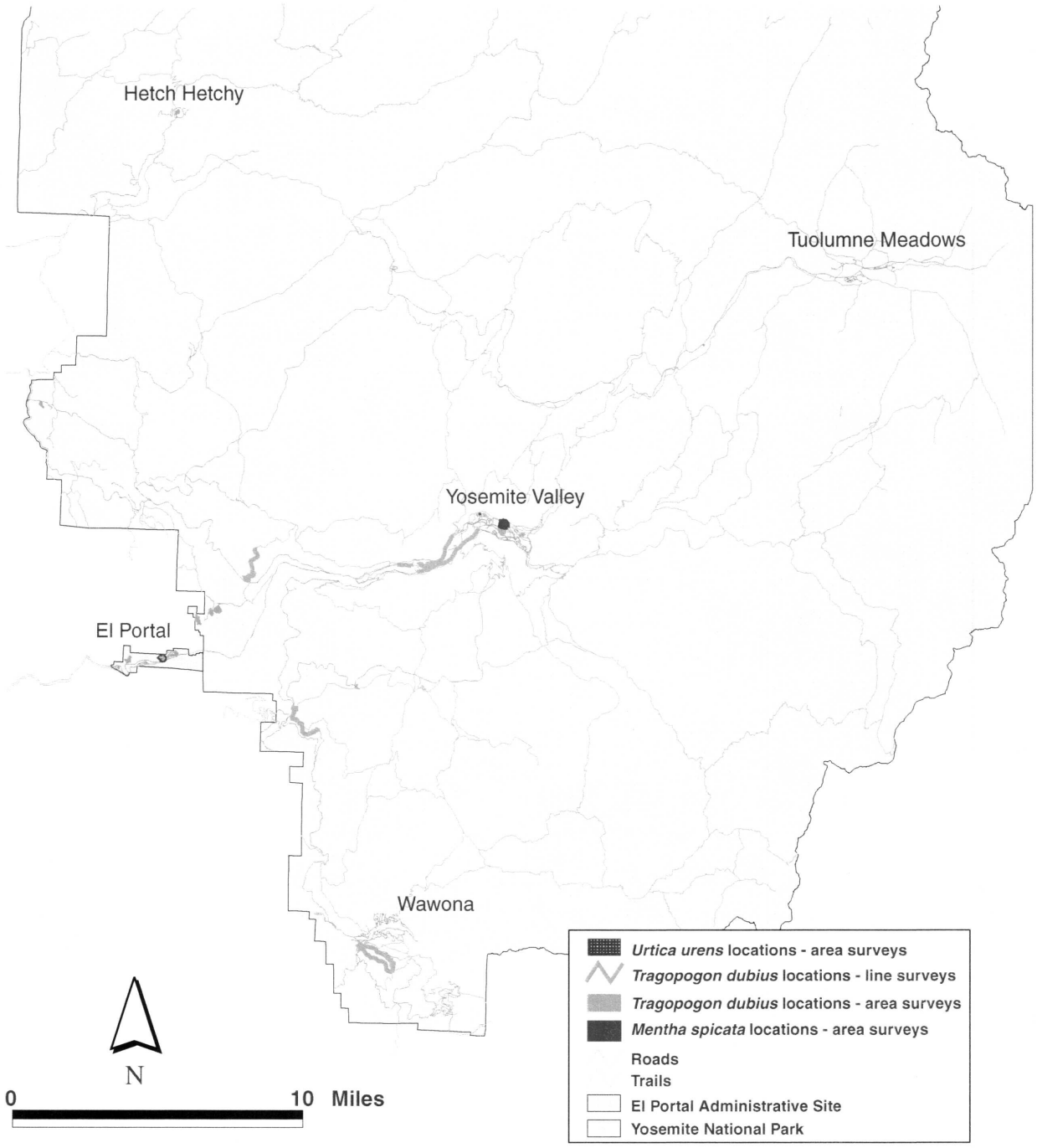


Map 16. *Carduus pycnocephalus*, *Centaurea maculosa*, *C. solstitialis*, *Convolvulus arvensis*, and *Erigeron strigosus* distributions based on alien plant surveys of disturbed areas in Yosemite National Park, 1998 and 1999.

Localized Wildland Priority #1 Alien Plant Species - Map 2

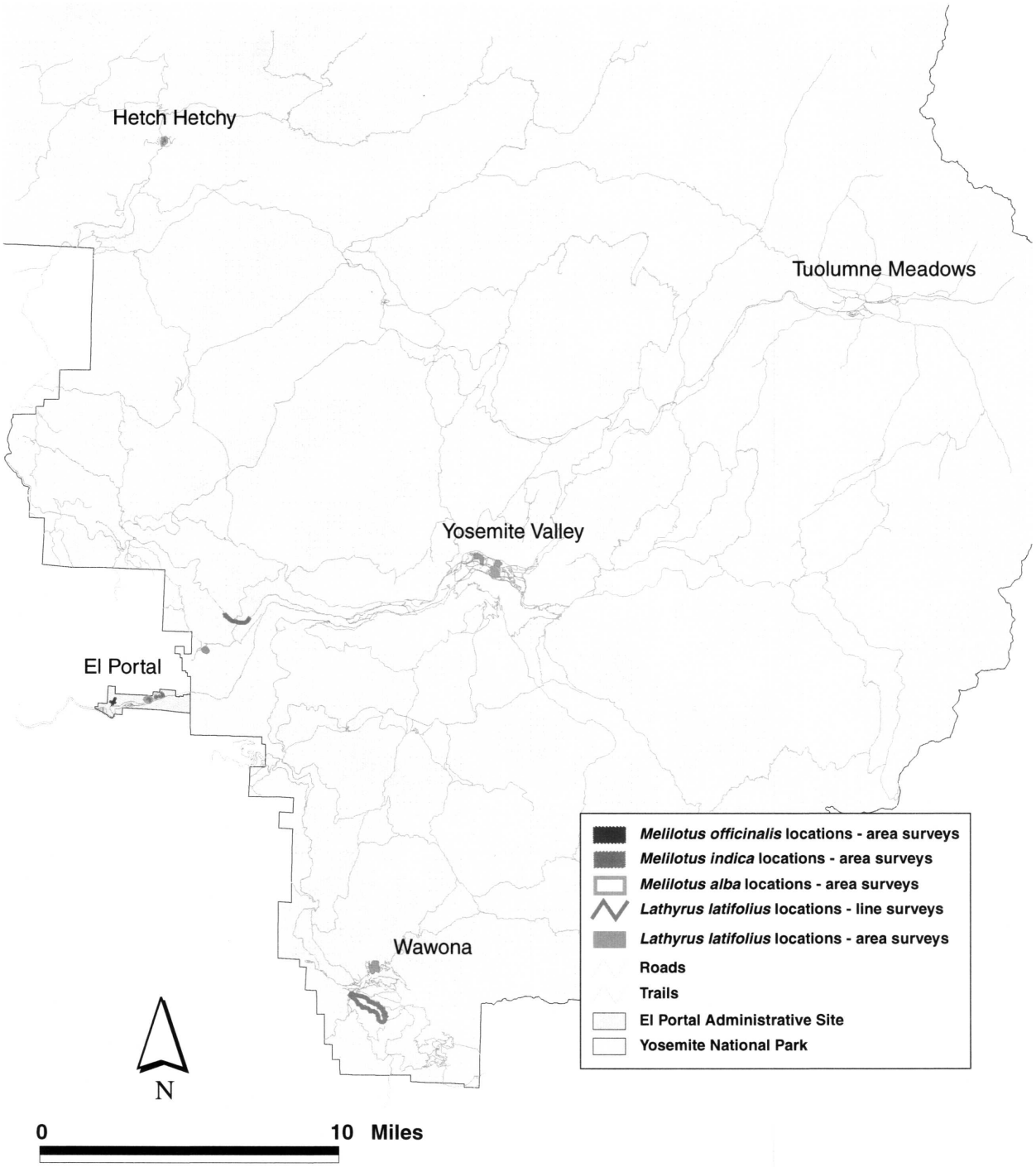


Map 17. *Foeniculum vulgare*, *Geranium robertanium*, *Hypericum perforatum*, and *Marrubium vulgare* distributions based on alien plant surveys of disturbed areas in Yosemite National Park, 1998 and 1999.



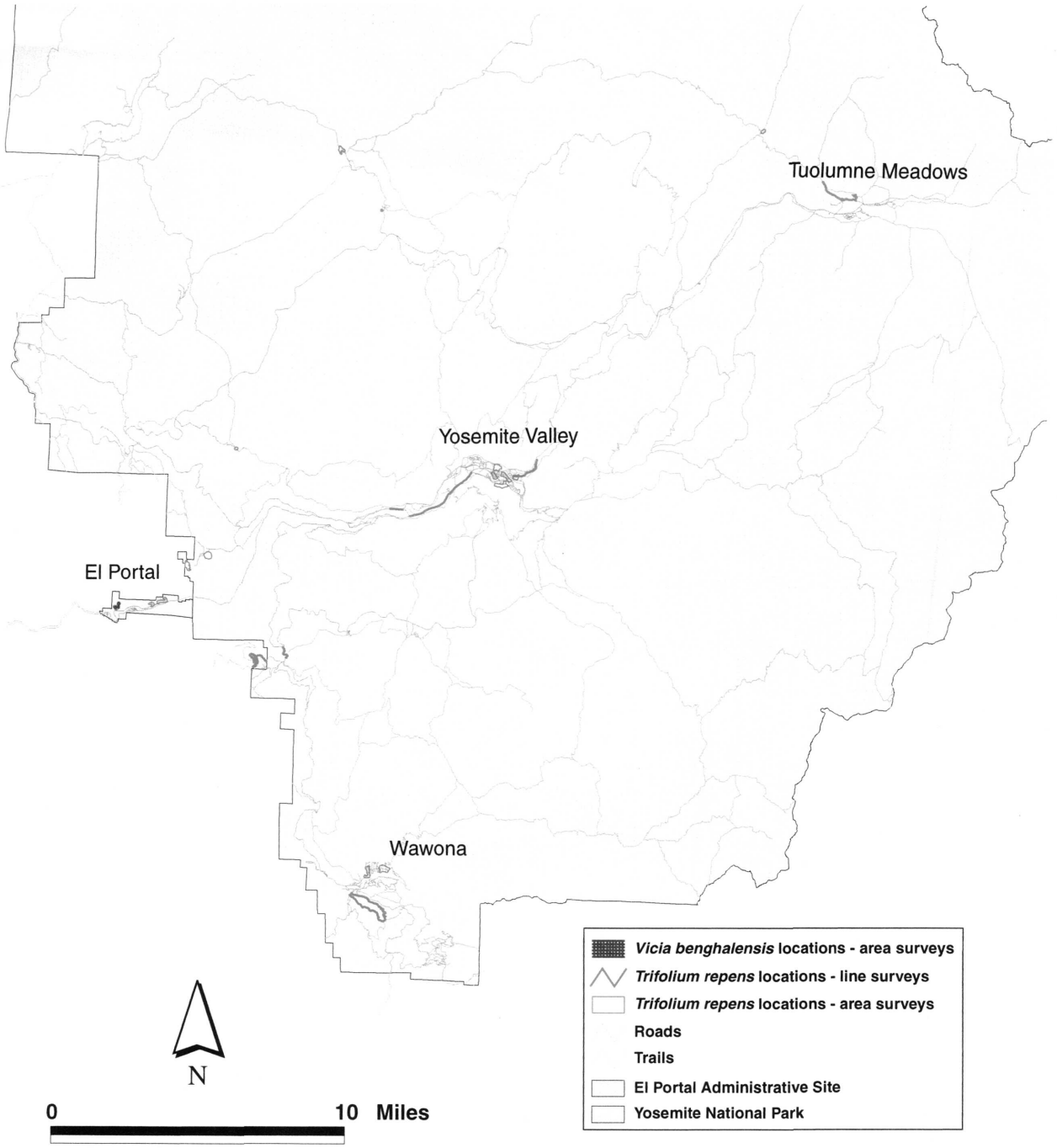
Map 18. *Mentha spicata*, *Tragopogon dubius*, and *Urtica urens* distributions based on alien plant surveys of disturbed areas in Yosemite National Park, 1998 and 1999.

Localized Wildland Priority #1 Alien Legume Species - Map 1

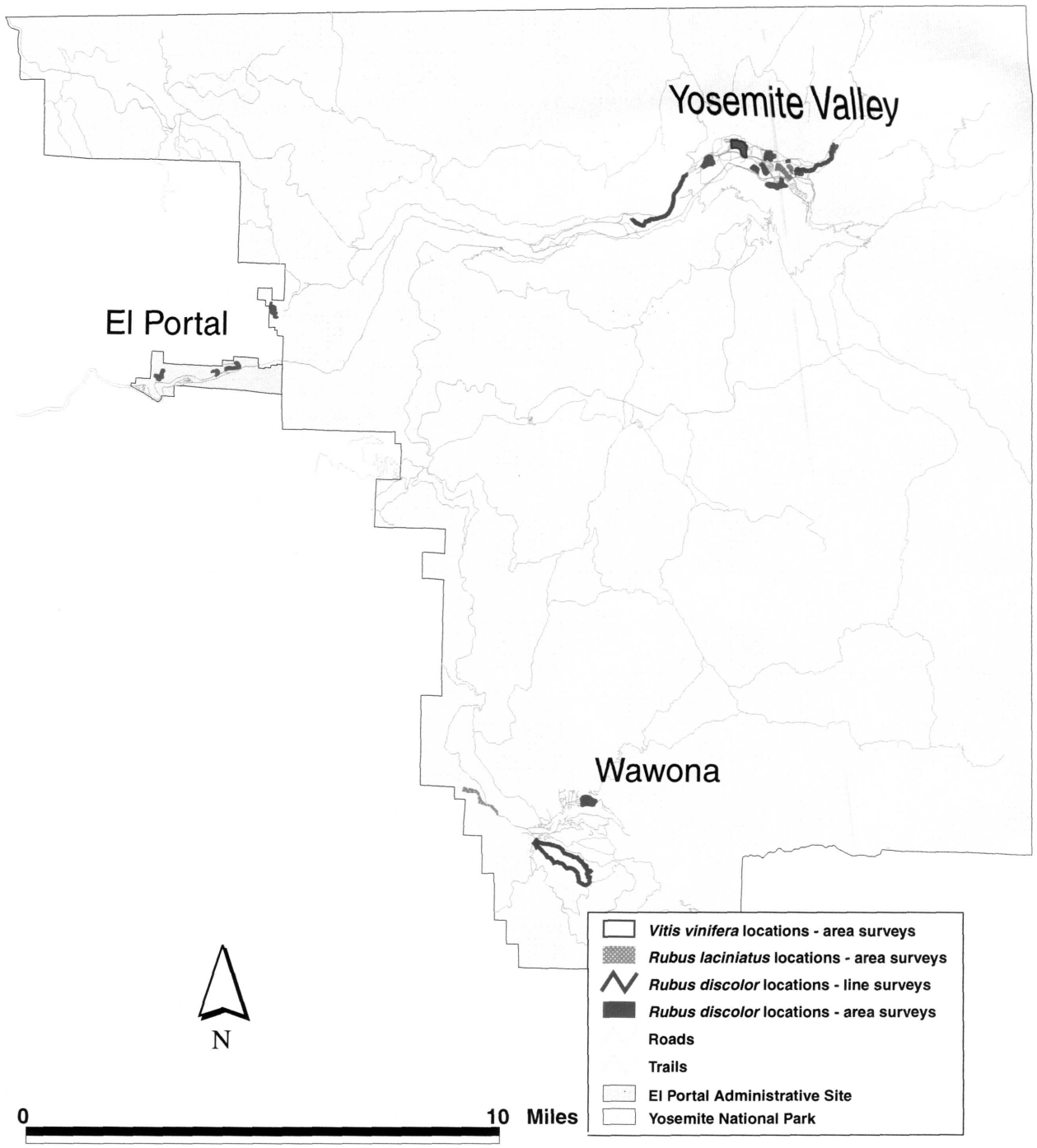


Map 19. *Lathyrus latifolius*, *Melilotus alba*, *M. indica*, and *M. officinalis* distributions based on alien plant surveys of disturbed areas in Yosemite National Park, 1998 and 1999.

Localized Wildland Priority #1 Alien Legume Species - Map 2

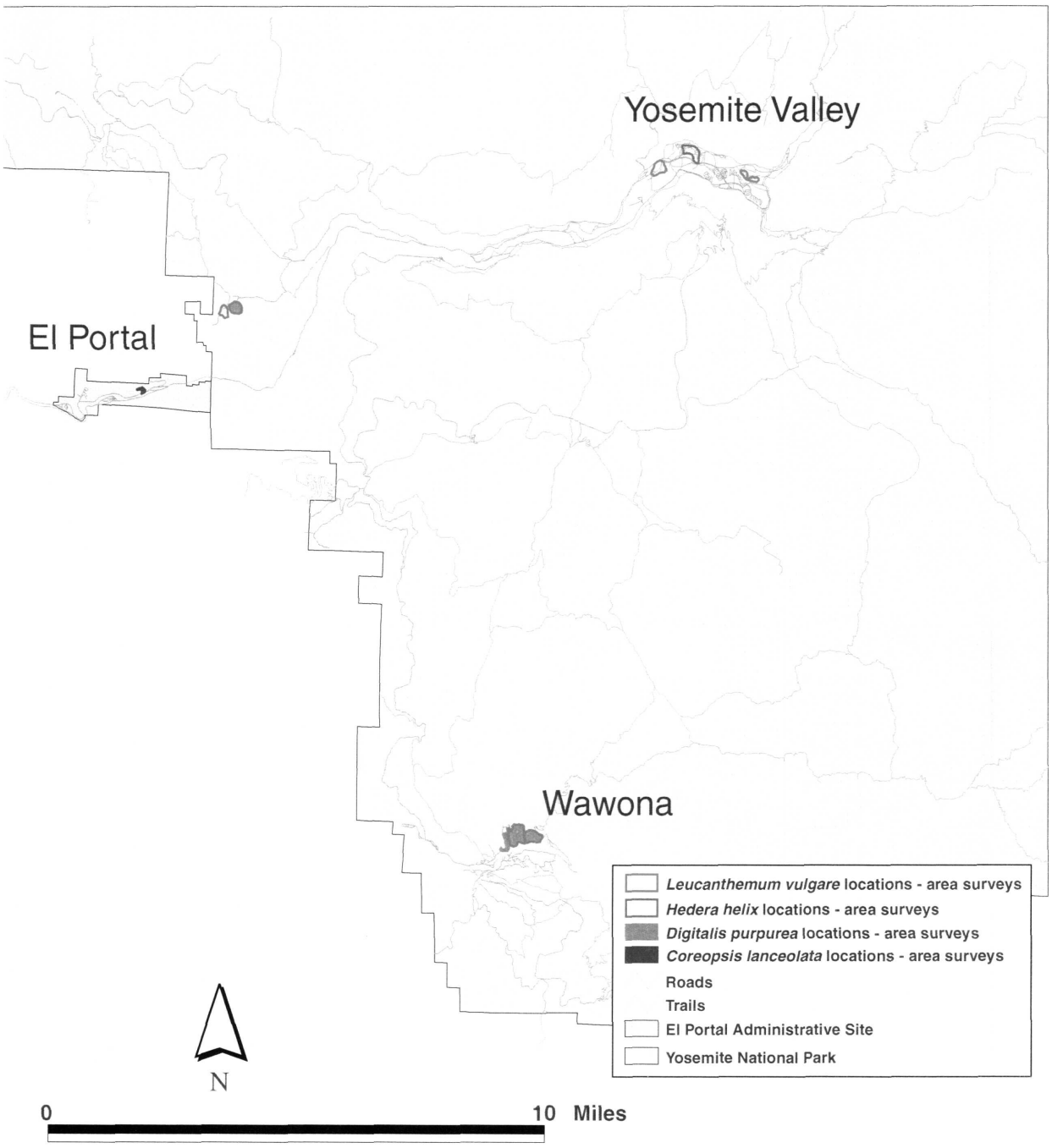


Map 20. *Trifolium repens* and *Vicia benghalensis* distributions based on alien plant surveys of disturbed areas in Yosemite National Park, 1998 and 1999.



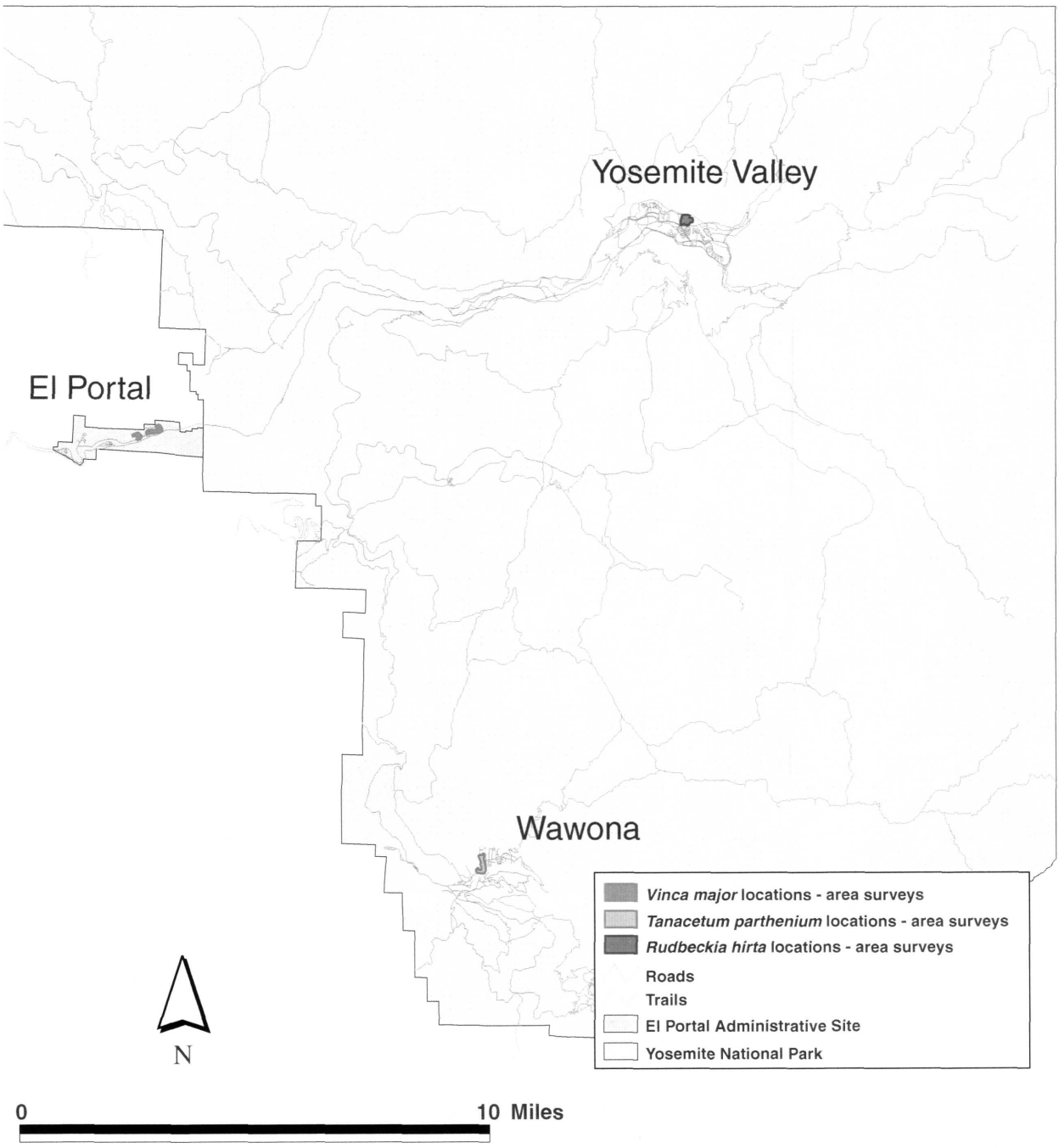
Map 21. *Rubus discolor*, *R. laciniatus*, and *Vitis vinifera* distributions based on alien plant surveys of disturbed areas in Yosemite National Park, 1998 and 1999.

Localized Ornamental Priority #1 Alien Species - Map 1



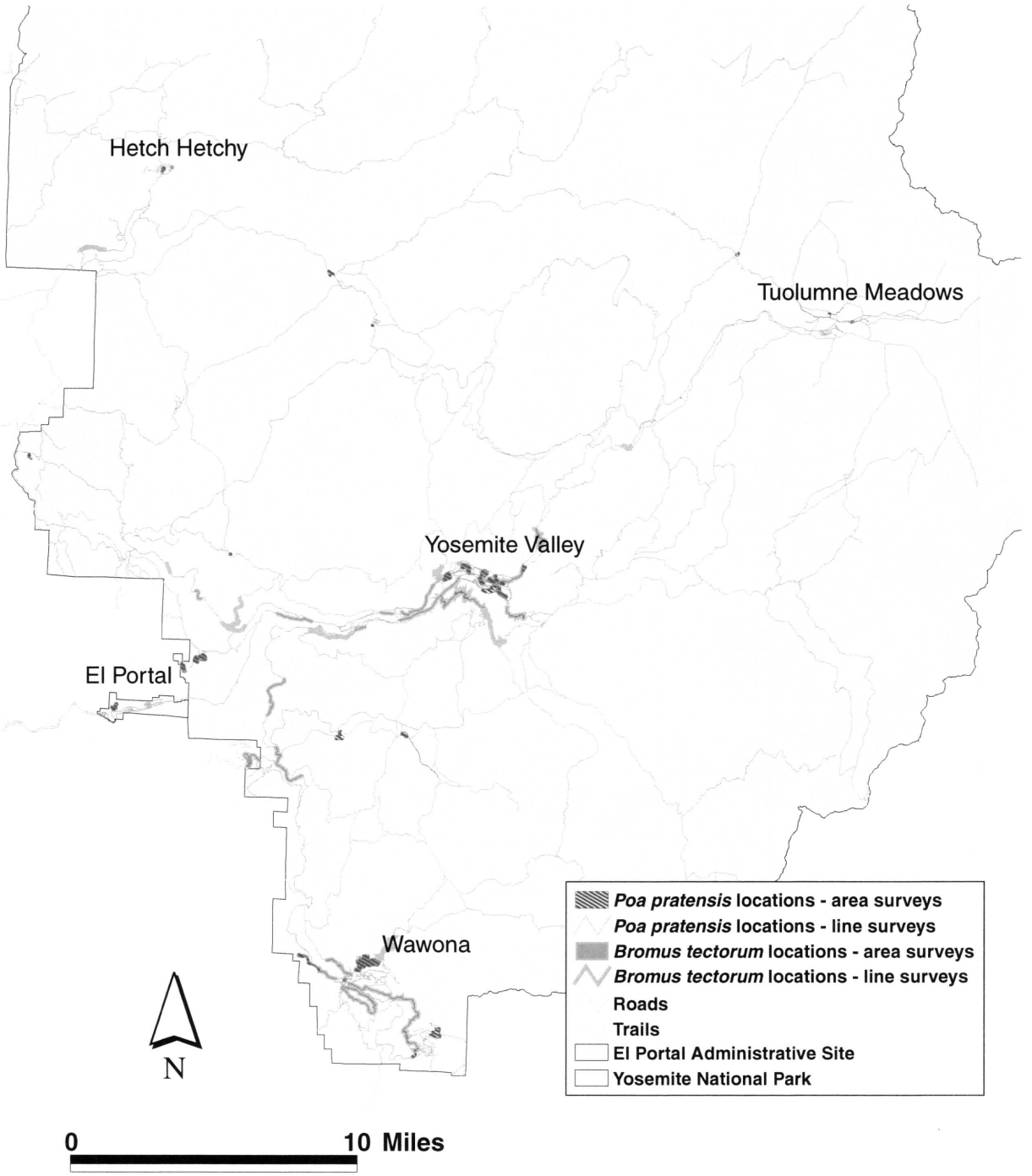
Map 22. *Coreopsis lanceolata*, *Digitalis purpurea*, *Hedera helix*, and *Leucanthemum vulgare* distribution based on alien plant surveys of disturbed areas in Yosemite National Park, 1998 and 1999.

Localized Ornamental Priority #1 Alien Species - Map 2



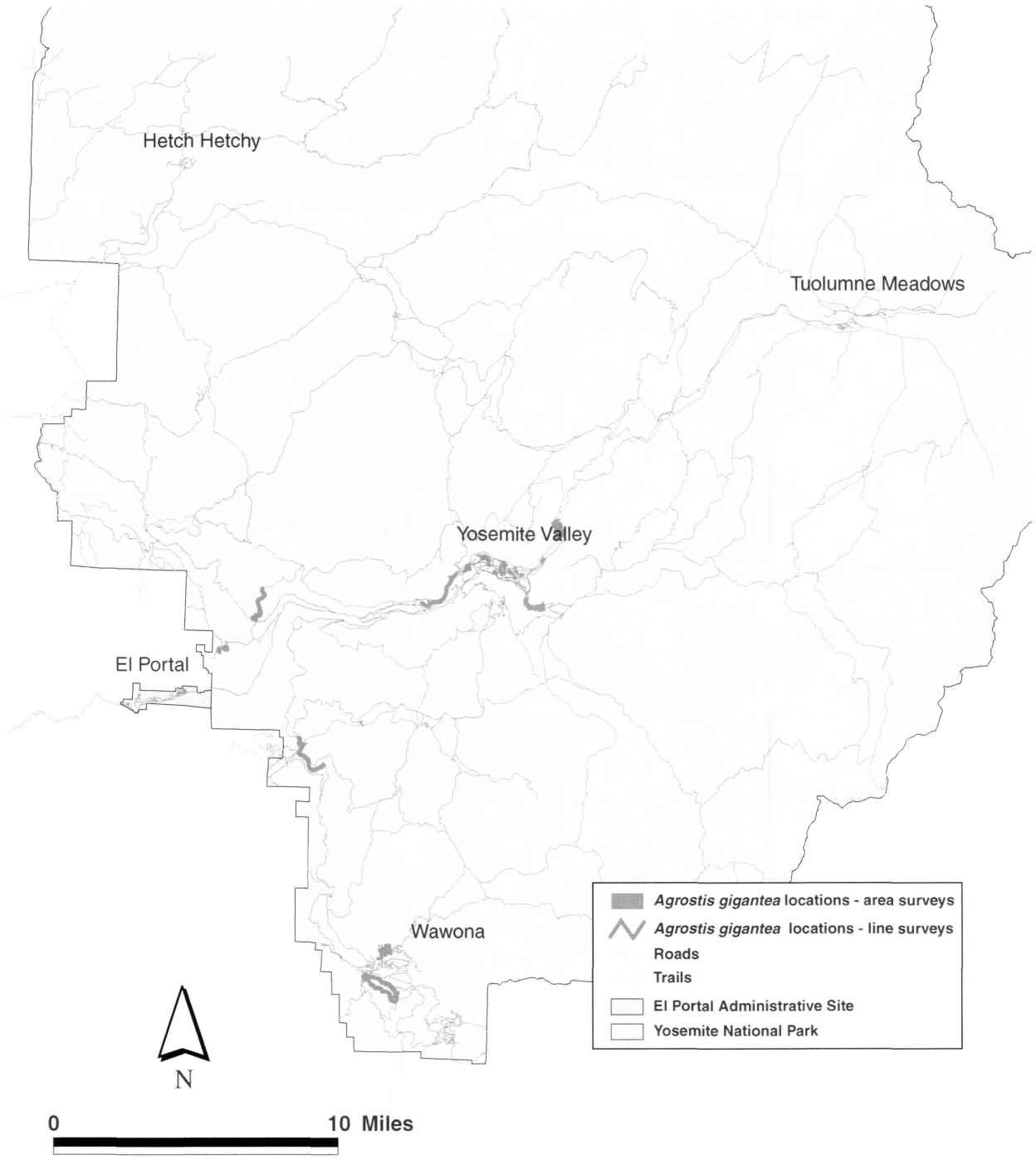
Map 23. *Rudbeckia hirta*, *Tanacetum parthenium*, and *Vinca major* distributions based on alien plant surveys of disturbed areas in Yosemite National Park, 1998 and 1999.

Broad Distribution Priority #3 Alien Grass Species

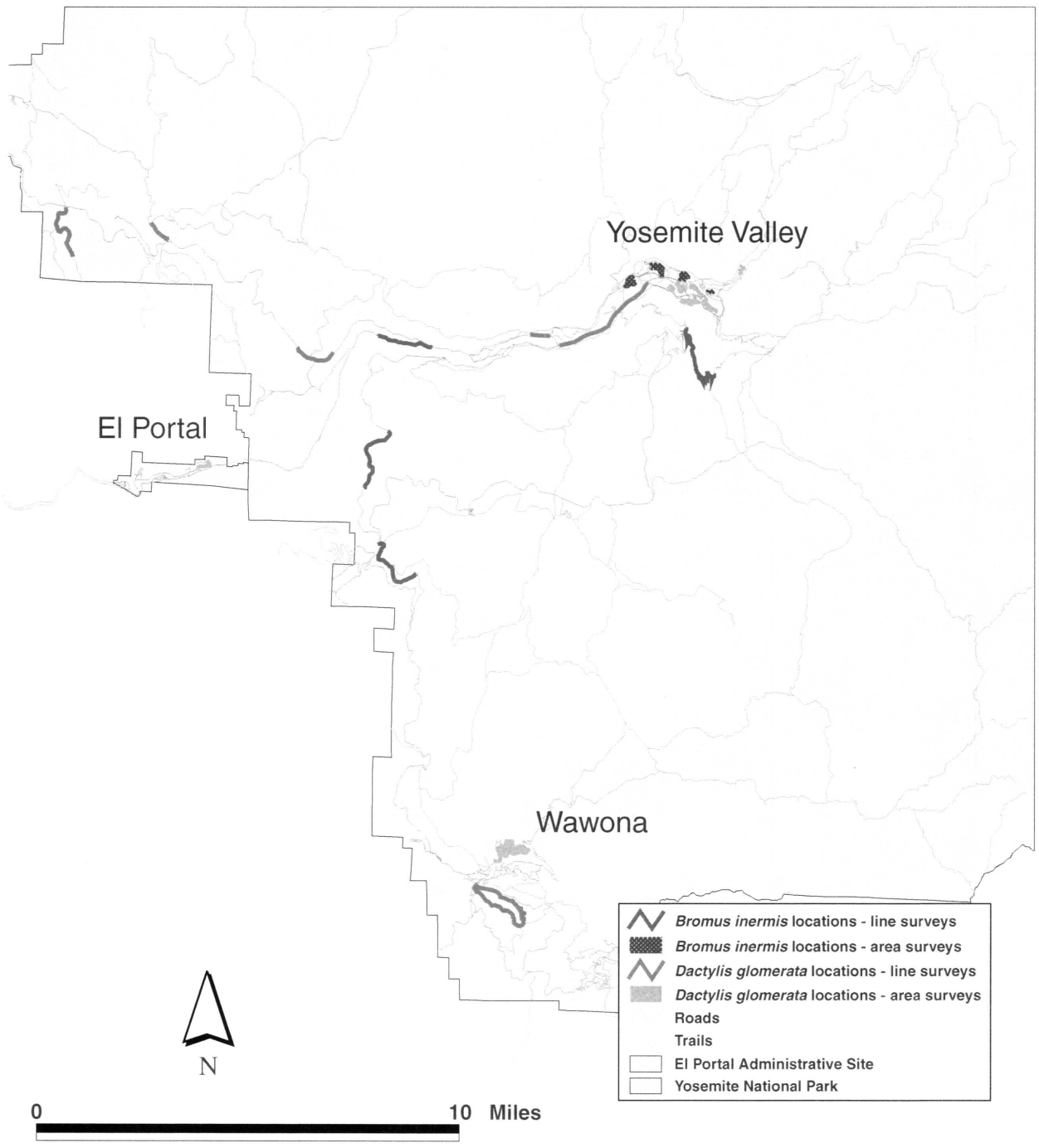


Map 24. *Bromus tectorum* and *Poa prantensis* distributions based on alien plant surveys of disturbed areas in Yosemite National Park, 1998 and 1999.

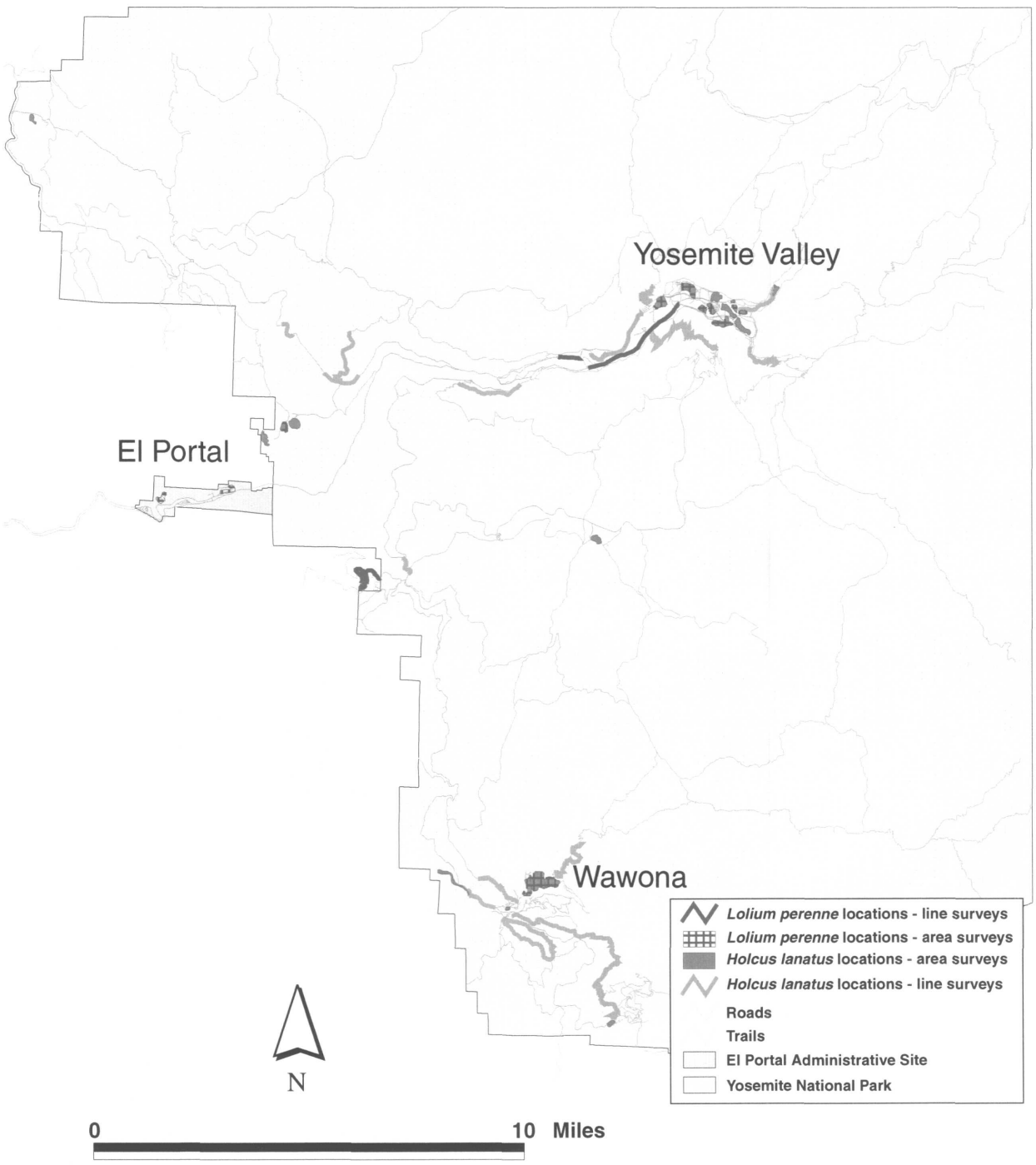
Localized Wildland Priority #1 Alien Grass Species - Map 1



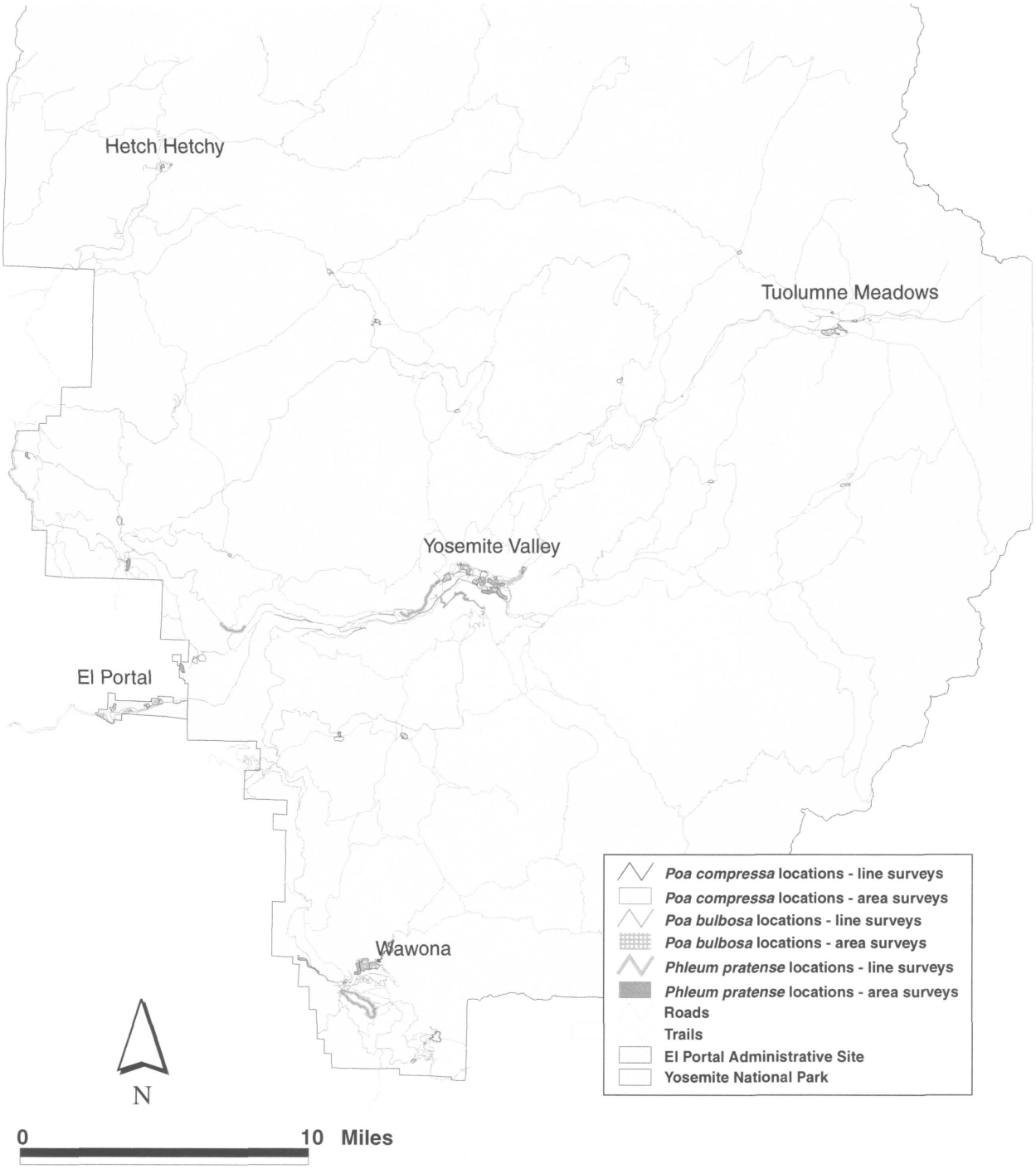
Map 25. *Agrostis gigantea* distribution based on alien plant surveys of disturbed areas in Yosemite National Park, 1998 and 1999.



Map 26. *Bromus inermis* and *Dactylis glomerata* distributions based on alien plant surveys of disturbed areas in Yosemite National Park, 1998 and 1999.



Map 27. *Holcus lanatus* and *Lolium perenne* distributions based on alien plant surveys of disturbed areas in Yosemite National Park, 1998 and 1999.



Map 28. *Phleum pratense*, *Poa bulbosa*, and *Poa compressa* distributions based on alien plant surveys of disturbed areas in Yosemite National Park, 1998 and 1999.