



Invasive Plant Species Early Detection in the San Francisco Bay Area Network

2010 Annual Report

Natural Resource Technical Report NPS/SFAN/NRTR—2011/494



ON THE COVER

San Francisco Area Network invasive plant interns, Kaitlyn Hacker and Jim Cartan, surveying a North Fork Chalone Creek tributary near the northern boundary of Pinnacles National Monument.

Photograph by: Robert Steers, NPS

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The National Park Service, Natural Resource Stewardship and Science office in Fort Collins, Colorado publishes a range of reports that address natural resource topics of interest and applicability to a broad audience in the National Park Service and others in natural resource management, including scientists, conservation and environmental constituencies, and the public.

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Data in this report were collected and analyzed using methods based on an established, peer-reviewed protocol. This report received informal peer review by subject-matter experts who were not directly involved in the collection, analysis, or reporting of the data.

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Executive Summary

In 2000, the National Park Service (NPS) created 32 networks of NPS units across the United States that were formed and funded to “improve the ability of the NPS to provide state-of-the-art management, protection, and interpretation of and research on the resources on the NPS... and to assure the full and proper utilization of the results of scientific studies for park management decisions” (NPS 1998). The San Francisco Bay Area Network (SFAN) is one of eight of these networks in the Pacific West Region of the NPS.

The San Francisco Area Network is composed of nine park units: Eugene O’Neill National Historic Site (EUON), Fort Point National Historic Site (FOPO), Golden Gate National Recreation Area (GOGA), John Muir National Historic Site (JOMU), Muir Woods National Monument (MUWO), Pinnacles National Monument (PINN), Point Reyes National Seashore (PORE), Port Chicago National Memorial (POCH), and the Presidio of San Francisco (PRSF). The network fosters collaboration and creates efficiencies of scale in designing and implementing a natural resource focused Inventory and Monitoring (I&M) program.

The network has identified many important vital signs or indicators of ecosystem health, which represent a broad suite of ecological phenomena operating across multiple temporal and spatial scales. Our intent has been to monitor a balanced and integrated “package” of vital signs that meets the needs of current park management but will also be able to accommodate unanticipated environmental conditions in the future. Invasive plants (see Glossary) represent a particularly high priority vital sign for SFAN because of the negative effects they have on the park resources, including altering landscapes and fire regimes, reducing native plant and animal habitat, and blocking views and increasing trail maintenance needs.

Parks need to know where incipient populations of highly invasive plants are becoming established, and protect the most critical areas from invasion. The results detailed in this report focus on surveying road- and trail-side plants in priority areas using volunteers, and is based on the SFAN I&M Network’s Early Detection Monitoring of Invasive Plant Species in the San Francisco Bay Area Network: A Volunteer-Based Approach (Williams et al. 2009).

In 2010, lands that were managed by Golden Gate National Recreation Area included 110 subwatersheds. Of these, 33 subwatersheds are deemed at high risk of invasion and/or harm to significant biological resources. There are also 25 significant-priority, 28 moderate-priority, 21 low-priority, and 3 subwatersheds that were not ranked. Five of the 110 subwatersheds are ranked but do not overlap with National Park Lands (15-2, ranked high; 28-4, ranked high; 19-3, ranked moderate; 19-4, ranked moderate; 19-5, ranked low). Searches were conducted by teams of two or three along the prioritized trails and roads in these subwatersheds looking for 179 invasive plant species, 84 of which were ranked (List 1, List 3.1, and List 5.1) as posing the greatest threat of invasion in these areas. In 2010, 469 target plant populations were mapped in the park. Of 63 subwatersheds searched in 2010, 25 were found to contain the highest ranked species. Nine of these 25 subwatersheds were high priority ones.

Lands that are managed by Point Reyes National Seashore overlap 124 subwatersheds. Of these subwatersheds, 25 are deemed at high risk of invasion and/or harm to significant biological

resources. There are also 27 significant-priority, 26 moderate-priority, 28 low-priority, and 18 subwatersheds that were not ranked because they only slightly overlap with National Park lands and/or were left out of the ranking process. Searches were conducted for 155 invasive species in PORE, 35 of which were ranked (List 1, List 3.1, and List 5.1) as posing the greatest threat of invasion in these areas. Five hundred and twelve target plant populations were mapped in the park. Of the 101 subwatersheds searched, 24 were found to contain the highest priority species. Four of these subwatersheds were high priority ones.

Pinnacles National Monument contains 18 regions or management units, none of which have been prioritized. In 2010, 33 occurrences of target invasive plant populations were mapped in two of the 18 management units.

Volunteers played an important role in the implementation of the field surveys at both GOGA and PORE. At GOGA, 38 volunteers assisted staff to conduct surveys, contributing 523 hours, worth \$9430.41. At PORE, 14 volunteers were trained over three months to conduct surveys, and 9 volunteers assisted staff to conduct surveys. These volunteers contributed 153 hours of their time, worth \$2,778.12. At PINN, volunteers contributed 53 hours performing surveys, worth \$956.12.

Maps were created of all areas surveyed in GOGA, PORE, and PINN as well as for priority plant species found. Web pages were continuously updated to educate the public about the project and provide support to existing volunteers. Additions to the web pages include survey maps, species lists, and data sheets. Collaborative efforts with staff at PORE, GOGA, Golden Gate National Parks Conservancy, and PINN continued to facilitate communication of findings and to broaden the early detection network.

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Introduction

Background

Invasive plant species negatively affect park resources and visitor enjoyment in several ways, including altering landscapes and fire regimes, reducing native plant and animal habitat, and blocking views and increasing trail maintenance needs. Invasive species are second only to habitat loss as threats to global biodiversity (Scott and Wilcove 1998). Given the extraordinary biodiversity of the San Francisco Bay Area, and the development pressure on private lands in the area, SFAN parks serve as crucial habitat for native species. Over 100 rare plant species can be found in SFAN parks. Invasive plants threaten many of these rare species: in Golden Gate National Recreation Area (GOGA) alone, 25 species of non-native plants were noted as directly threatening rare plant populations (NPS 2004). Trails, roads, and waterways are the main routes of infestation of new invasive species. Monitoring these routes is the most effective way to prevent the spread of existing species and the infestation of new species (McNeely et al. 2001).

Inventory and Monitoring staff ranked both species and areas to prioritize search efforts for the invasive species early detection program (Williams et al. 2009). The management areas are divided based on geographical features (subwatersheds for GOGA and PORE, pre-existing management units similar to a watershed at PINN). Williams et al. (2009) contains maps of management areas. The invasive species (see glossary) found in GOGA, PORE, and PINN were ranked based on a species invasiveness score and the known spatial extent of a species (Williams et al. 2009). This process resulted in List 1, 2, 3, 4, and 5 early detection invasive plant species. List 1 species are highly invasive but not widespread. They require the most information on their abundance and environmental setting when recording data in the field. Lists 2 through 4 species are decreasingly invasive and/or increasingly widespread across each parks landscape. Also, Lists 3.1 and 3.2 species were created, which represent List 1 or 2 rated plants that were either never detected during initial surveys, may not be part of a park's flora, or are difficult to identify, yet are of high concern. List 3.1 and 3.2 species are treated as List 1 and 2, respectively, for data collection purposes. Lastly, List 5 species are dune and aquatic invasives that are not encountered often but are treated as List 1 species if found, unless otherwise noted. Each year, invasive species lists for each park are re-prioritized if necessary based on survey data (Williams et al. 2009). Appendix A contains the 2010 priority invasive species list by park.

Objectives

Objectives for the 2010 field season were based on the early detection protocol (Williams et al. 2009):

1. Within GOGA and PORE, identify and inventory all roads and trails in high-priority subwatersheds, and one-fifth of all other subwatersheds, noting presence and absence of priority weed species. Use visual assessment and GPS technology to detect and accurately map incipient populations of the top-priority plant species on the GOGA and PORE Invasive Plant lists.
2. Train volunteers to conduct early detection surveys for top-priority SFAN Invasive Plants in the high-priority areas.

3. Train GOGA and PORE staff and park-partner staff to identify top-priority SFAN Invasive Plants for opportunistic early detection of new populations during regular work activities.
4. Revise priority species list based on information acquired during the 2010 field season.
5. Survey select trail and stream corridors for priority species at PINN.
6. Conduct summer surveys at JOMU for non-native species of concern, like *Dittrichia graveolens* (stinkwort), and further develop the invasive plant species list for this park unit.

Methods

All methodology is based on the SFAN I&M Network's Early Detection Monitoring of Invasive Plant Species in the San Francisco Bay Area Network: A Volunteer-Based Approach (Williams et al. 2009). This program can be adapted to different person-hours and skill levels, allowing parks to maximize their effectiveness based on resources available. Engaging people in detection; giving them clear direction and a point person to answer questions and receive invasives reports; and following up with feedback on reports are essential components to a good program. The following section describes sampling methods, scheduling, data management and data collection.

Prioritization

Full prioritization methods can be found in the protocol and subsequent annual reports, but are summarized briefly here.

Species

The lists of target species for GOGA, PORE, and PINN were based on current knowledge and rankings, summing recognized invasiveness and biological ease of control and stratifying into priorities by feasibility of control based on categories of actual or estimated species' infested acreage in the park. A base list of all exotic species known or thought to occur in GOGA and PORE (~300 species in each park) was compiled from the National Park Service Species Database (NPSpecies). After removing known non-invasive exotic species, 175 species remained for GOGA and 142 remained for PORE. A similar selection process yielded 91 species for PINN. Species listed by the California Invasive Plant Council (Cal-IPC), California Department of Food and Agriculture (CDFA), The Nature Conservancy (TNC), and local Weed Management Areas received varying numbers of points for invasiveness, as did unlisted species which shared invasive characteristics with a listed congener. Based on best available knowledge, species also received points for altering ecosystems (affecting ecosystem processes, not just crowding out other plants) and for endangering rare plants in SFAN parks. Next, based on best available knowledge, species were ranked by ease of control independent of number of acres infested. All points were summed for the overall invasiveness score, then sorted according to feasibility of control based on number of acres infested with that species, cost for removal, politics, and access.

Areas

The list of priority areas for searches was made by ranking subwatersheds by number and degree of current infestations; risk of further infestation; and priority of resources present. Higher scores were received for low current infestation levels, high risk of further infestation based on presence of infrastructure or invadable vegetation type, and presence of rare plants or animals.

Subwatersheds were ranked, grouped along the most natural breaks, and assigned a score. Total score was obtained by adding risk to weighted (2x) rare species priority score and subwatersheds approximately quartered into high, significant, moderate, and low priority. High-priority subwatersheds are visited annually; significant, biennially; and moderate and low, once every five years.

Search Areas

GOGA manages all or part of 29 watersheds and 110 subwatersheds, based on topography. Thirty-three of these subwatersheds were deemed at high risk of invasion and/or harm to significant biological resources. Roads and trails within the high-priority areas of the park were the first places to be searched. For the purposes of this report, data collected in the Presidio of San Francisco and Muir Woods National Monument are included with GOGA.

PORE manages all or part of 7 watersheds and 124 subwatersheds. Twenty five of these subwatersheds were deemed at high risk of invasion and/or harm to significant biological resources. These values include subwatersheds on adjacent GOGA lands that are managed by PORE (e.g. Bolinas Ridge). For the purposes of this report, data collected in those GOGA subwatersheds that are managed by PORE are included with PORE.

Maps have been made for the areas that need revisits and continued stewardship, and can be found online at http://science.nature.nps.gov/im/units/sfan/vital_signs/Invasives/maps.cfm and on park servers: at GOGA, on Inpgogamahe1\Divisions\Network I&M\Individual Vital Signs\Invasive Plants\spatial_information\EDsitemaps\2010edmaps; and at PORE on inppore04\Resources\Natural_Vegetation\Veg restoration team\Early detection\GIS\Finished Survey Maps\2010. These maps are available for staff and the volunteer stewards who will adopt an area to patrol for new invasions.

PINN is divided into 18 management units, none of which have been prioritized based on their risk of invasion and/or harm to significant biological resources. Surveys conducted at PINN are primarily during peak flowering season (April through May) and consist of one week spent surveying roads, trails, and riparian corridors that are of concern to the park botanist. PINN is relatively isolated and thus, does not have an active volunteer Weed Watcher program.

Lastly, JOMU contains a small amount of natural vegetation centered on Mount Wanda. This area is not subdivided into smaller subwatersheds/management units, although distinction is made between species found on Mt Wanda versus those found in the orchard and landscaped areas maintained at the historic Muir residence to the north. No active Weed Watcher volunteer program is in effect at JOMU primarily because of limited resources. 2010 was the second year of surveys at JOMU, which resulted in the detection of 22 new invasive plant occurrences. Data from 2009 and 2010 are being used to develop a priority list like those which exist for GOGA, PORE, and PINN. Information about these occurrences and any treatments performed on them has been communicated to JOMU park staff and will not be presented herein since they represent pilot data. However, the occurrences can be viewed through CalFlora: <http://www.calflora.org/cgi-bin/occform.cgi>

Field Methods

Searches were conducted by teams of one to four individuals along the 69 miles (GOGA) and 45 miles (PORE) of trails and roads within the high-priority areas of the parks. Teams usually covered no more than two to five survey miles per team per day, depending on target invasive plant densities, vegetation, and terrain. Each survey route was recorded both on a paper map of the area and digitized from a tracklog into a polyline layer using ArcMap (ESRI, Redlands, CA). Though survey areas were only limited by the visual range of the surveyor, the official search

area used for logging both positive (plant occurrence) and negative data (areas where target plants were not found) was restricted to five meters on either side of the route. Surveys for PINN were conducted using the same methods as PORE and GOGA; however, stream corridors were surveyed in addition to roads and trails.

Along the survey route observers recorded location and associated biological information (phenology, habitat, distribution) for all high-priority target plant populations encountered. Depending on their level of training, GOGA surveyors walked the routes looking for either the 12 highest-ranked target plant species (List 1 plants), the 22 highest-ranking plants (List 1 and 2 plants), or the 74 highest-ranking plants (List 1, 2, 3.1, 3.2, and 3 plants). At PORE, surveyors searched for either the 11 highest-ranked target plant species (List 1 plants), the 32 highest-ranking plants (List 1, and 2 plants), or the 98 highest-ranking plants (List 1, 2, 3.1, 3, 5.1, 5.2 and 5.3 plants).

The level of detail of data collection was dictated by the ranking of the plant on the priority list, and the extent of the infestation. This tiered approach to data collection reduces the time needed to collect standardized, detailed data in areas of high infestations as well as the amount of training needed for beginner surveyors (Figure 1).

For the initial survey of a route, point *occurrences* and polygon *assessments* were mapped for List 1 and 3.1 species; point *occurrences* and polygon *assessments* (if patch size is less than 100 m²) for List 2 and 3.2 species; presence/absence, or point *occurrences* (if patch size is less than 100 m²) for List 3 species; presence/absence recorded for List 4 species, along with the *survey area*. List 5 species were assigned different data collection levels in each park (Appendix B). For subsequent surveys most *occurrences* should already exist.

All data was collected on paper data sheets and then entered into the GOGA, PINN or PORE GeoWeed database and/or was captured in the field using hand-held GPS/PDA units installed with ESRI's Arc Pad software with the GeoWeed tool bar and then downloaded into the GeoWeed database. Downloaded and entered data were checked against field data sheets for correctness and completeness. Staff and long-term interns performed downloading and data-checking tasks.

Every mapping session (day/team) also included a new *survey area* to record absence data for species not seen. Assessments also included ancillary data on habitat, phenology and distribution. Species identifications for occurrences and surveys were given an associated confidence level to flag potential misidentifications.

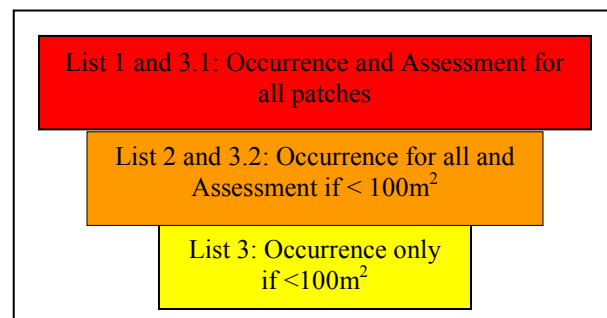


Figure 1. This protocol utilizes three tiered levels of data collection. List 1 and 3.1 species are treated similarly when encountered in the field; likewise, list 2 and 3.2 species are treated similarly. To save time, the least amount of information is recorded for list 3 species since they are much more widespread than species in the other two tiers.

A detailed description of all field methodology can also be found in the Early Detection of Invasive Plants SOP 2: Mapping and SOP 3: Field Data Collection (Williams et al. 2009).

Trainings

A key element of the Weed Watcher program is engaging a maximum number of searchers in opportunistic sampling, both in incidental or passive searches, as well as directed active searching. Volunteers are solicited through various websites that serve the local communities (e.g. Marin Chapter of the California Native Plant Society and the Golden Gate Parks Conservancy). Participants must be trained to identify target species, then to communicate location, distribution, and biological attributes to the correct entities to ensure timely response. To this end, seven training sessions with a total of 25 participants were held in 2010 on weed identification, and invasive plant mapping.

The “WeedID” class defines the invasive species concept, how invasive species are moved around the park, how natural resources are affected, target invasive plant identification, and how to report target plant sightings. The classes are conducted through two hours of classroom instruction and one hour of field instruction. Classroom instruction relied on PowerPoint presentations, “Plant-out-of-Place” identification cards, and specimens of target species whenever possible. Power Point presentations can be found at:

inpgogamahe1:\Divisions\Network I&M\Shared\Vegetation\Invasive Plants\weedwatchers\training\plantid_train. The “Plant-out-of-Place” cards can be found at:

inpgogamahe1:\Divisions\Network I&M\Shared\Vegetation\Invasive Plants\Species\ID cards or online at http://science.nature.nps.gov/im/units/sfan/vital_signs/Invasives/ID_cards.cfm.

Analyses/GIS Manipulations

Data were examined for trends in occurrences by species type and location. Using the “filter” function, the number of occurrences for a species; total acreage for List 1 species; number of subwatersheds in which a species occurred; number of search hours and observers were also extracted.

Species List Revisions

This year was the second field season of data collection in PINN, the third in PORE, and the fourth in GOGA. The 2010 priority lists for each park were revised based on how widespread species are in each park based on previous field seasons. The number of occurrences, and number of subwatersheds in which species were found, were examined and compared to listing level for appropriateness. For example, in the past, some list 3 species were so ubiquitous that it became inefficient to map all occurrences. These species were moved to list 4 (presence/absence) for data collection purposes. List 1 and 2 species with no occurrences were thought too rare to be reliably identified by volunteers, and were moved to Lists 3.1 and 3.2 for advanced observers. Changes between the 2009 and 2010 species lists are explained in detail within the 2009 annual report (Williams et al. 2011).

Results

The miles of trails and roads covered, the number of persons trained and their hours spent actively searching, and the number of species of each priority type in each priority level subwatershed are presented below. All data on species occurrences are based on the species lists for each park for the 2010 field season. Species nomenclature follows The Jepson Manual (Hickman 1993) and the Jepson Online Interchange (Jepson Flora Project 2011), when recent taxonomic revisions apply. Links to online survey maps may be found in Appendix B.

GOGA

Search Effort

One hundred and three miles of trails and roadsides were surveyed within GOGA during the 2010 field season. Fifty-eight subwatersheds were surveyed, including 44 priority subwatersheds. In total, 40 people spent a total of 991 hours to complete these surveys; 913 of these hours were contributed by 38 volunteers. Two of the volunteers were interns who worked part time for the Weed Watchers program at both GOGA and PORE for five months.

Species Found

Twenty-five of the 63 subwatersheds surveyed contained List 1 species. Nine of these subwatersheds were high-priority, five were significant-priority, eight were moderate-priority, one was low priority and two were unranked subwatersheds. Fifty-four of the 63 subwatersheds were found to contain List 2 target species. Twenty-three of these subwatersheds were high-priority, 16 were significant-priority, 10 were moderate-priority, three were low-priority and two were unranked. Eleven subwatersheds were found to contain List 3.1 target species. Seven of these subwatersheds were high-priority, one was significant-priority, two were moderate-priority, and one was low-priority. Twenty-eight subwatersheds were found to contain List 3.2 target species. Fifteen of these subwatersheds were high-priority, seven were significant-priority, four were moderate-priority, and two were low-priority or unranked.

Four hundred and forty-one individual occurrences of target weed species were recorded in GOGA during early detection surveys and entered into the GOGA GeoWeed database, representing List 1, 3.1, 2, 3.2, and 3 species (Table 1). Fifty-one of these occurrences were List 1 species, 190 were List 2 species, 11 were List 3.1 species, 45 were List 3.2 species, and 144 were List 3 species.

The 441 individual occurrences of target weed species that were recorded during the GOGA surveys were represented by 37 plant species. Of the 37 species recorded, eight of the 12 List 1 and all 12 List 2 species were mapped, as well as three List 3.1 species, five List 3.2 species and nine List 3 species. No List 5 species were found because there were no aquatic or dune surveys.

Table 1. GOGA Occurrences and invaded subwatersheds based on 2010 field results. Percent values for the subwatersheds invaded are based on 58 subwatersheds searched.

2010 List	Scientific Name	Common Name	Number of occurrences	Number of subwatersheds	Percent subwatersheds with species
1	<i>Arctotheca calendula</i>	capeweed	0	0	0.0%
1	<i>Arctotheca prostrata</i>	creeping capeweed	27	10	15.8%
1	<i>Centaurea calcitrapa</i>	purple starthistle	0	0	0.0%
1	<i>Cortaderia selloana</i>	pampas grass	0	0	0.0%
1	<i>Cytisus scoparius</i>	Scotch broom	4	4	6.3%
1	<i>Cytisus striatus</i>	Portuguese broom	2	2	3.2%
1	<i>Digitalis purpurea</i>	purple foxglove	2	2	3.2%
1	<i>Euphorbia oblongata</i>	oblong spurge	1	1	1.6%
1	<i>Helichrysum petiolare</i>	licorice plant	5	4	6.3%
1	<i>Ilex aquifolium</i>	English holly	4	3	4.7%
1	<i>Ulex europaeus</i>	gorse	0	0	0.0%
1	<i>Vinca major</i>	periwinkle	6	5	7.9%
2	<i>Acacia melanoxylon</i>	blackwood acacia	12	9	14.2%
2	<i>Ageratina adenophora</i>	thoroughwort	15	8	12.6%
2	<i>Calendula arvensis</i>	Field marigold	4	4	6.3%
2	<i>Centaurea melitensis</i>	totalote	12	9	14.2%
2	<i>Delairea odorata</i>	cape ivy	15	11	17.4%
2	<i>Dipsacus fullonum</i>	Fuller's teasel	13	10	15.8%
2	<i>Eucalyptus globulus</i>	bluegum eucalyptus	2	2	3.2%
2	<i>Hedera helix</i>	English ivy	22	15	23.8%
2	<i>Leucanthemum vulgare</i>	ox-eye daisy	17	9	14.2%
2	<i>Mentha pulegium</i>	pennyroyal	11	9	14.2%
2	<i>Oxalis pes-caprae</i>	Bermuda buttercup	49	19	30.1%
2	<i>Rubus armeniacus</i>	Himalayan blackberry	18	14	22.2%
3	<i>Brassica rapa</i>	field mustard	0	0	0.0%
3	<i>Carpobrotus edulis</i>	freeway iceplant	8	4	6.3%
3	<i>Cortaderia jubata</i>	jubata grass	20	14	22.2%
3	<i>Cotoneaster franchetii</i>	orange cotoneaster	27	15	23.8%
3	<i>Cotoneaster pannosus</i>	silverleaf cotoneaster	19	13	20.6%
3	<i>Ehrharta erecta</i>	panic veldt grass	7	6	9.5%
3	<i>Foeniculum vulgare</i>	sweet fennel	0	0	0.0%
3	<i>Genista monspessulana</i>	French broom	31	14	22.2%
3	<i>Lathyrus latifolius</i>	everlasting pea	26	19	30.1%
3	<i>Phalaris aquatica</i>	harding grass	5	5	7.9%
3	<i>Pinus radiata</i>	Monterey pine	1	1	1.5%
3	<i>Schinus molle</i>	pepper tree	0	0	0.0%
3	<i>Tamarix chinensis</i>	saltcedar	0	0	0.0%
3	<i>Xanthium spinosum</i>	spiny cocklebur	0	0	0.0%
3	<i>Xanthium strumarium</i>	rough cocklebur	0	0	0.0%
3.1	<i>Ailanthus altissima</i>	tree-of-heaven	0	0	0.0%
3.1	<i>Albizia lophantha</i>	silk tree	0	0	0.0%
3.1	<i>Anthoxanthum odorata</i>	sweet vernal grass	0	0	0.0%
3.1	<i>Berberis darwinii</i>	Darwin's berberis	1	1	1.5%
3.1	<i>Carduus acanthoides</i>	plumeless thistle	0	0	0.0%
3.1	<i>Carthamus lanatus</i>	woolly distaff thistle	0	0	0.0%
3.1	<i>Centaurea solstitialis</i>	yellow starthistle	0	0	0.0%
3.1	<i>Cirsium arvense</i>	Canada thistle	0	0	0.0%
3.1	<i>Crataegus monogyna</i>	singleseed hawthorn	0	0	0.0%
3.1	<i>Cynara cardunculus</i>	artichoke thistle	0	0	0.0%
3.1	<i>Dittrichia graveolens</i>	stinkweed	0	0	0.0%
3.1	<i>Echium plantagineum</i>	salvation jane	0	0	0.0%
3.1	<i>Ehrharta calycina</i>	perennial veldt grass	0	0	0.0%
3.1	<i>Hedera canariensis</i>	Algerian ivy	0	0	0.0%
3.1	<i>Hypericum perforatum</i>	Klamath weed	0	0	0.0%
3.1	<i>Nicotiana glauca</i>	tree tobacco	0	0	0.0%
3.1	<i>Phalaris arundinacea</i>	reed canary grass	0	0	0.0%

Table 1. GOGA Occurrences and invaded subwatersheds based on 2010 field results. Percent values for the subwatersheds invaded are based on 58 subwatersheds searched. (continued)

2010 List	Scientific Name	Common Name	Number of occurrences	Number of subwatersheds	Percent subwatersheds with species
3.1	<i>Pittosporum crassifolium</i>	stifleaf cheesewood	0	0	0.0%
3.1	<i>Pyracantha angustifolia</i>	narrowleaf firethorn	3	3	4.7%
3.1	<i>Robinia pseudoacacia</i>	black locust	0	0	0.0%
3.1	<i>Scabiosa atropurpurea</i>	mourningbride	7	6	9.5%
3.1	<i>Spartium junceum</i>	Spanish broom	0	0	0.0%
3.2	<i>Bromus madritensis ssp. rubens</i>	red brome	13	9	14.2%
3.2	<i>Bromus tectorum</i>	cheat grass, downy brome	0	0	0.0%
3.2	<i>Cestrum aurantiacum</i>	orange jessamine	0	0	0.0%
3.2	<i>Cynodon dactylon</i>	Bermudagrass	0	0	0.0%
3.2	<i>Dactylis glomerata</i>	cocksfoot	16	11	17.4%
3.2	<i>Festuca arundinacea</i>	tall fescue	8	7	1.1%
3.2	<i>Hirschfeldia incana</i>	shortpod mustard	0	0	0.0%
3.2	<i>Leptospermum laevigatum</i>	Australian teatree	5	3	4.7%
3.2	<i>Pennisetum clandestinum</i>	Kikuyu grass	0	0	0.0%
3.2	<i>Rosa eglanteria</i>	sweetbriar rose	3	3	4.7%
3.2	<i>Solanum laciniatum</i>	New Zealand nightshade	0	0	0.0%
5.1	<i>Ammophila arenaria</i>	Euro beachgrass	0	0	0.0%
5.1	<i>Ammophila breviligulata</i>	American beachgrass	0	0	0.0%
5.1	<i>Aptenia cordifolia</i>	heartleaf iceplant	0	0	0.0%
5.1	<i>Arundo donax</i>	giant reed	0	0	0.0%
5.1	<i>Cakile maritima</i>	European searocket	0	0	0.0%
5.1	<i>Carpobrotus chilensis</i>	sea fig	0	0	0.0%
5.1	<i>Conicosia pugioniformis</i>	narrow-leaved iceplant	0	0	0.0%
5.1	<i>Drosanthemum floribundum</i>	showy dewflower	0	0	0.0%
5.1	<i>Eichhornia crassipes</i>	water hyacinth	0	0	0.0%
5.1	<i>Lepidium latifolium</i>	perennial pepperweed	0	0	0.0%
5.1	<i>Mesembryanthemum crystallinum</i>	ice plant	0	0	0.0%
5.1	<i>Myriophyllum aquaticum</i>	parrot's-feather	0	0	0.0%
5.1	<i>Myriophyllum spicatum</i>	Eurasian watermilfoil	0	0	0.0%
5.1	<i>Spartina alterniflora</i>	Atlantic or smooth cordgrass	0	0	0.0%

PORE

Search Effort

Two hundred and thirty-three miles of trails and roadsides were surveyed during the 2010 field season at PORE, including GOGA property managed by PORE. In total, 23 people spent 394 hours to complete these surveys, 153 of those hours were contributed by nine volunteers. Included in this 9 were two interns who worked part time for the Weed Watchers program at both GOGA and PORE for five months.

During the 2010 field season at PORE, a total of 89 subwatersheds (62 subwatersheds belonging to PORE and 27 that belong to GOGA but are managed by PORE) were partially to entirely surveyed. Twenty-one of the 89 subwatersheds were found to contain List 1 species (13 PORE subwatersheds and 11 GOGA subwatersheds). Four (3 PORE; 1 GOGA) of these subwatersheds were high priority, five (3 PORE; 2 GOGA) were significant priority, seven (5 PORE; 2 GOGA) were moderate priority, and five (1 PORE; 4 GOGA) were low priority. Fifty-four of the 89 subwatersheds were found to contain List 2 target species (14 PORE, and 45 GOGA). Fifteen of these subwatersheds (11 PORE; 4 GOGA) were high priority subwatersheds, 15 (12 PORE; 3 GOGA) were significant priority subwatersheds, 14 (11 PORE; 3 GOGA) were moderate priority, and ten (7 PORE; 3 GOGA) were low priority.

Species Found

Five hundred and fifty-four individual occurrences of target weed species (List 1, 2, 3.1, or 3) were recorded in PORE during early detection surveys and entered into the PORE GeoWeed database (Table 2). Thirty-four of these occurrences were List 1 species, 314 were List 2 species, 198 were List 3 species, three were List 3.1 species, and five were List 5 species.

Thirty-five plant species contributed to the 554 occurrences that were recorded during the 2010 PORE surveys. Of the 35 plant species, six of the 10 List 1 species and 18 of the 22 List 2 species were mapped, as well as 20 of the 38 List 3 species, one of the 14 List 3.1 species, and four of the 14 List 5 species.

Table 2. PORE Occurrences and invaded subwatersheds based on 2010 field results. Percentages based on 89 subwatersheds searched.

2010 List	Scientific Name	Common Name	Number of occurrences	Number of subwatersheds	Percent subwatersheds with species
1	<i>Carduus acanthoides</i>	plumeless thistle	0	0	0.0%
1	<i>Carthamus lanatus</i>	woolly distaff thistle	1	1	1.1%
1	<i>Centaurea calcitrapa</i>	purple starthistle	0	0	0.0%
1	<i>Centaurea melitensis</i>	toçalote	5	5	5.6%
1	<i>Centaurea solstitialis</i>	yellow starthistle	5	2	2.2%
1	<i>Cotoneaster franchetii</i>	orange cotoneaster	4	4	4.5%
1	<i>Cotoneaster pannosus</i>	silverleaf cotoneaster	16	14	15.7%
1	<i>Euphorbia oblongata</i>	eggleaf or oblong spurge	3	3	3.4%
1	<i>Helichrysum petiolare</i>	licorice plant	0	0	0.0%
1	<i>Ulex europaea</i>	gorse	0	0	0.0%
2	<i>Acacia melanoxylon</i>	blackwood acacia	0	0	0.0%
2	<i>Arctotheca calendula</i>	capeweed	10	8	9.0%

Table 2. PORE Occurrences and invaded subwatersheds based on 2010 field results. Percentages based on 89 subwatersheds searched.(continued)

2010 List	Scientific Name	Common Name	Number of occurrences	Number of subwatersheds	Percent subwatersheds with species
2	<i>Arctotheca prostrata</i>	creeping capeweed	5	1	1.1
2	<i>Berberis darwinii</i>	Darwin's berberis	2	2	2.5%
2	<i>Cytisus scoparius</i>	Scotch broom	14	8	9.0%
2	<i>Datura stramonium</i>	jimsonweed	0	0	0.0%
2	<i>Delairea odorata</i>	cape ivy	7	5	5.6%
2	<i>Echium candicans</i>	pride of Madeira	4	4	4.5%
2	<i>Genista monspessulana</i>	French broom	27	18	20.2%
2	<i>Hedera helix</i>	English ivy	54	31	34.8%
2	<i>Ilex aquifolium</i>	English holly	8	6	6.7%
2	<i>Lathyrus latifolius</i>	perennial pea	41	12	13.5%
2	<i>Leucanthemum vulgare</i>	oxeye daisy	41	20	22.5%
2	<i>Linaria vulgaris</i>	butter and eggs	17	12	13.5%
2	<i>Oxalis pes-caprae</i>	Bermuda buttercup	0	0	0.0%
2	<i>Paspalum dilatatum</i>	dallis grass	11	7	7.9%
2	<i>Pennisetum clandestinum</i>	kikuyu grass	3	3	3.4%
2	<i>Pittosporum undulatum</i>	Victorian box	1	1	1.1%
2	<i>Rubus armeniacus</i>	Himalayan blackberry	40	22	24.7%
2	<i>Tetragonia tetragonioides</i>	New Zealand spinach	1	1	1.1%
2	<i>Vinca major</i>	periwinkle	28	15	16.8%
2	<i>Xanthium spinosum</i>	spiny cocklebur	0	0	0.0%
3	<i>Acacia longifolia</i>	Sydney golden wattle	0	0	0.0%
3	<i>Acacia verticillata</i>	prickly Moses	0	0	0.0%
3	<i>Allium triquetrum</i>	Three corner leek	14	11	12.4%
3	<i>Carpobrotus chilensis</i>	sea fig	3	2	2.2%
3	<i>Carpobrotus edulis</i>	freeway iceplant	24	13	14.6%
3	<i>Cortaderia jubata</i>	jubata grass	6	6	6.7%
3	<i>Cortaderia selloana</i>	Uruguayan pampas grass	2	2	2.2%
3	<i>Conium maculatum</i>	poison hemlock	17	15	16.8%
3	<i>Cotoneaster lacteus</i>	milkflower cotoneaster	3	2	2.2%
3	<i>Crataegus monogyna</i>	singleseed hawthorn	0	0	0.0%
3	<i>Cupressus macrocarpa</i>	Monterey cypress	0	0	0.0%
3	<i>Cynodon dactylon</i>	Bermuda grass	0	0	0.0%
3	<i>Digitalis purpurea</i>	purple foxglove	48	20	22.5%
3	<i>Dipsacus sativus</i>	Indian teasel	0	0	0.0%
3	<i>Dipsacus fullonum</i>	Fuller's teasel	3	3	3.4%
3	<i>Drosanthemum floribundum</i>	showy dewflower	0	0	0.0%
3	<i>Echium plantagineum</i>	salvation jane	0	0	0.0%
3	<i>Ehrharta erecta</i>	panic veldt grass	12	10	11.2%
3	<i>Eucalyptus globulus</i>	bluegum eucalyptus	1	1	1.1%
3	<i>Euphorbia lathyris</i>	gopher plant, caper spurge	6	4	4.5%
3	<i>Festuca arundinacea</i>	tall fescue	0	0	0.0%
3	<i>Foeniculum vulgare</i>	sweet fennel	4	3	3.4%

Table 2. PORE Occurrences and invaded subwatersheds based on 2010 field results. Percentages based on 89 subwatersheds searched. (continued)

2010 List	Scientific Name	Common Name	Number of occurrences	Number of subwatersheds	Percent subwatersheds with species
3	<i>Hypericum calycinum</i>	Aaron's beard	2	2	2.2%
3	<i>Lythrum hyssopifolia</i>	hyssop loosestrife	0	0	0.0%
3	<i>Mentha pulegium</i>	pennyroyal	17	12	13.5%
3	<i>Myoporum laetum</i>	myoporum	0	0	0.0%
3	<i>Phalaris aquatica</i>	Harding grass	15	8	9.0%
3	<i>Pinus radiata</i>	Monterey pine	0	0	0.0%
3	<i>Populus alba</i>	white poplar	0	0	0.0%
3	<i>Pyracantha angustifolia</i>	narrowleaf firethorn	0	0	0.0%
3	<i>Rosa eglanteria</i>	sweetbriar rose	1	1	1.1%
3	<i>Scabiosa atropurpurea</i>	mourningbride	0	0	0.0%
3	<i>Sorghum halepense</i>	Johnson grass	0	0	0.0%
3	<i>Sparaxis tricolor</i>	Harlequin flower	4	3	3.4%
3	<i>Tanacetum parthenium</i>	feverfew	0	0	0.0%
3	<i>Verbascum blattaria</i>	moth mullein	0	0	0.0%
3	<i>Watsonia meriana</i>	bulbil bugle-lily	2	2	2.2%
3	<i>Zantedeschia aethiopica</i>	calla lily	14	12	13.5%
3.1	<i>Acroptilon repens</i>	Russian knapweed	0	0	0.0%
3.1	<i>Aegilops triuncialis</i>	barbed goatgrass	0	0	0.0%
3.1	<i>Ageratina adenophora</i>	thoroughwort	0	0	0.0%
3.1	<i>Albizia lophantha</i>	silk tree, cape wattle	0	0	0.0%
3.1	<i>Anthoxanthum odoratum</i>	sweet vernalgrass	3	3	3.4%
3.1	<i>Brachypodium distachyon</i>	purple false brome	0	0	0.0%
3.1	<i>Centaurea iberica</i>	Iberian star thistle	0	0	0.0%
3.1	<i>Dittrichia graveolens</i>	stinkweed	0	0	0.0%
3.1	<i>Ehrharta calycina</i>	perennial veldt grass	0	0	0.0%
3.1	<i>Hypericum perforatum</i>	Klamath weed	0	0	0.0%
3.1	<i>Marrubium vulgare</i>	horehound	0	0	0.0%
3.1	<i>Robinia pseudoacacia</i>	black locust	0	0	0.0%
3.1	<i>Salsola soda</i>	oppositeleaf Russian thistle	0	0	0.0%
3.1	<i>Senecio jacobaea</i>	tansy ragwort, stinking willie	0	0	0.0%
5.1	<i>Alisma lanceolatum</i>	water plantain	0	0	0.0%
5.1	<i>Arundo donax</i>	giant reed	1	1	0.9%
5.1	<i>Conicosia pugioniformis</i>	Narrow-leaved iceplant	0	0	0.0%
5.1	<i>Egeria densa</i>	Brazilian waterweed	0	0	0.0%
5.1	<i>Iris pseudacorus</i>	yellow flag	0	0	0.0%
5.1	<i>Lepidium latifolium</i>	perennial pepperweed	0	0	0.0%
5.1	<i>Ludwigia hexapetala</i>	sixpetal water-primrose	0	0	0.0%
5.1	<i>Ludwigia peploides</i>	water primrose	1	1	0.9%
5.1	<i>Myriophyllum aquaticum</i>	Parrot's-feather	2	2	1.8%
5.1	<i>Phalaris arundinacea</i>	Reed canary grass	0	0	0.0%
5.1	<i>Spartina alterniflora</i>	Smooth cordgrass	0	0	0.0%
5.3	<i>Ammophila arenaria</i>	European beachgrass	0	0	0.0%

Table 2. PORE Occurrences and invaded subwatersheds based on 2010 field results. Percentages based on 89 subwatersheds searched. (continued)

2010 List	Scientific Name	Common Name	Number of occurrences	Number of subwatersheds	Percent subwatersheds with species
5.2	<i>Cakile edentula</i>	European searocket	0	0	0.0%
5.4	<i>Cakile maritima</i>	European searocket	1	1	0.9%

PINN

Search Effort

Eleven miles of trails, roadsides and drainages were surveyed during the 2010 field season at PINN. In total, six people spent 133 hours conducting surveys, 52 of which were volunteer hours.

Species Found

Seven subwatersheds were surveyed in 2010. No List 1 species were found in any of the subwatersheds. Four subwatersheds contained List 2 species. In addition, one subwatershed contained a List 3.1 species and six subwatersheds contained List 3 species. No List 5 species were found in any subwatersheds.

Twenty-six occurrences of target weed species were found. None of these occurrences were List 1, seven were List 2, eighteen were List 3, and one was List 3.1 (Table 3).

Five species were recorded during surveys, including none of the nine List 1 species, one of seven List 2 species, three of 16 List 3 species, one of 15 List 3.1 species and none of six List 5 species (Table 3).

Table 3. PINN Occurrences based on 2010 field results. Percentages based on seven subwatersheds searched.

2010 List	Scientific Name	Common Name	Number of occurrences	Number of subwatersheds	Percent subwatersheds with species
1	<i>Acroptilon repens</i>	Russian knapweed	0	0	0.0%
1	<i>Lepidium latifolium</i>	perennial pepperweed	0	0	0.0%
1	<i>Cnicus benedictus</i>	blessed thistle	0	0	0.0%
1	<i>Melilotus alba</i>	white sweetclover	0	0	0.0%
1	<i>Nicotiana glauca</i>	tree tobacco	0	0	0.0%
1	<i>Rubus armeniacus</i>	Himalayan blackberry	0	0	0.0%
1	<i>Salsola tragus</i>	prickly Russian thistle	0	0	0.0%
	<i>Taeniatherum caput-medusae</i>	Medusahead	0	0	0.0%
1	<i>Verbascum thapsus</i>	woolly mullein	0	0	0.0%
2	<i>Carduus pycnocephalus</i>	Italian thistle	7	5	71.4%
2	<i>Carduus tenuiflorus</i>	slender-flowered thistle	0	0	0.0%
2	<i>Conium maculatum</i>	poison hemlock	0	0	0.0%
2	<i>Cynodon dactylon</i>	Bermudagrass	0	0	0.0%
2	<i>Marrubium vulgare</i>	horehound	0	0	0.0%
2	<i>Veronica persica</i>	birdseye speedwell	0	0	0.0%
2	<i>Vinca major</i>	periwinkle	0	0	0.0%
3	<i>Amaranthus albus</i>	tumbleweed	0	0	0.0%
3	<i>Brassica nigra</i>	black mustard	0	0	0.0%
3	<i>Brassica rapa</i>	field mustard	0	0	0.0%
3	<i>Centaurea melitensis</i>	tochalote	10	5	71.4%
3	<i>Centaurea solstitialis</i>	yellow starthistle	0	0	0.0%
3	<i>Cirsium vulgare</i>	bull thistle	0	0	0.0%
3	<i>Hirschfeldia incana</i>	shortpod mustard	3	3	42.9%
3	<i>Lactuca serriola</i>	prickly lettuce	5	4	57.1%
	<i>Mentha spicata</i> var. <i>spicata</i>	spearmint	0	0	0.0%
3	<i>Mentha X piperita</i>	peppermint	0	0	0.0%
3	<i>Plantago lanceolata</i>	lanceleaf plantain,	0	0	0.0%
3	<i>Polygonum arenastrum</i>	oval-leaf knotweed	0	0	0.0%
3	<i>Raphanus sativus</i>	wild radish	0	0	0.0%

Table 3. PINN Occurrences based on 2010 field results. Percentages based on seven subwatersheds searched. (continued)

2010 List	Scientific Name	Common Name	Number of occurrences	Number of subwatersheds	Percent subwatersheds with species
3	<i>Rumex acetosella</i>	sheep sorrel	0	0	0.0%
3	<i>Rumex crispus</i>	curly dock	0	0	0.0%
3	<i>Silybum marianum</i>	blessed milkthistle	0	0	0.0%
3.1	<i>Ailanthus altissima</i>	tree-of-heaven	0	0	0.0%
	<i>Chenopodium ambrosioides</i>	Mexican-tea	0	0	0.0%
3.1	<i>Dittrichia graveolens</i>	stinkweed	0	0	0.0%
3.1	<i>Lolium multiflorum</i>	Italian ryegrass	0	0	0.0%
3.1	<i>Lolium perenne</i>	perennial ryegrass	0	0	0.0%
3.1	<i>Lolium temulentum</i>	darnel	0	0	0.0%
3.1	<i>Malva parviflora</i>	cheeseweed	0	0	0.0%
3.1	<i>Picris echioides</i>	bristly oxtongue	0	0	0.0%
3.1	<i>Piptatherum miliaceum</i>	smilo grass	0	0	0.0%
3.1	<i>Poa bulbosa</i>	bulbous bluegrass	1	1	14.3%
3.1	<i>Tragopogon dubius</i>	yellow salsify	0	0	0.0%
3.1	<i>Tribulus terrestris</i>	puncturevine	0	0	0.0%
3.1	<i>Trifolium hirtum</i>	rose clover	0	0	0.0%
3.1	<i>Verbascum blattaria</i>	moth mullein	0	0	0.0%
3.1	<i>Xanthium spinosum</i>	spiny cocklebur	0	0	0.0%
5.1	<i>Arundo donax</i>	giant reed	0	0	0.0%
5.1	<i>Iris pseudacorus</i>	yellow flag	0	0	0.0%
5.1	<i>Tamarix ramosissima</i>	saltcedar	0	0	0.0%
5.2	<i>Cotula coronopifolia</i>	brassbuttons	0	0	0.0%
5.2	<i>Crypsis schoenoides</i>	swamp prickly grass	0	0	0.0%
5.2	<i>Cyperus difformis</i>	variable flatsedge	0	0	0.0%

Discussion

Species Occurrences

The occurrence data captured by park staff and volunteers reveals that collectively, invasive species are ubiquitous throughout the park units of the SFAN (Appendix B). Because the monitoring program is in initial stages of implementation, it is difficult to draw conclusion about environmental correlations or trends in species detection at this time. However, the overall quality of the data is assumed to be high since greater than 80% of all occurrence points have either been collected by park staff or highly trained early detection interns. The small amount of data utilized from volunteers or citizen scientists was always collected in the field under direct supervision of park staff or early detection interns. No data from unsupervised volunteers is utilized for data analyses at this point. Instead, unsupervised volunteer data, which is collected on paper maps, is currently informing park staff of priority invasive plants for removal efforts or is used as references when those places are resurveyed during protocol implementation.

For all parks, the greatest number of invasive plants mapped were List 2 then List 1 species. This outcome is expected since the listings directly reflect abundances of these species in the parks based on pilot data. It follows then, that List 3 species would have the highest amount of occurrences. However, the smaller percentage of List 3 species observances in 2009 is not due to lesser numbers or distribution of these species, but rather because occurrences were only recorded for plants with a patch size of less than 100 m². Furthermore, many of the surveys conducted with supervised volunteer assistance, including training surveys, used abbreviated plant lists that focused on List 1 or 2 species. Therefore, not all surveys completed were for the entire set of List 1, 2, 3 and 4 species. The low amount of plants mapped in PINN was due to only one week spent surveying. In addition, only a small portion of this park unit was visited. Because new occurrences of invasive plants were discovered on each survey route, we are assuming that if more time was spent conducting surveys in a larger portion of PINN, additional species occurrences would have been collected.

It should be noted that the numbers of occurrences found for each species may not be a true indication of abundance, as the delineation of individual patches is somewhat subjective for many species. A species can occur across the landscape at low densities (<30% cover) and still be considered a patch, thus creating many large patches greater than 100 m² which are not recorded. Other species, such as jubata grass (*Cortaderia jubata*) can be delineated at a much finer scale, sometimes with individual plants comprising a single patch, resulting in more occurrences. Additionally, detectability can vary during the field season for many species. For example, oxeye daisy (*Leucanthemum vulgare*) is not obvious from any distance except during its flowering period, whereas Monterey pine (*Pinus radiata*) is obvious year round.

Assessments were recorded in addition to occurrences for all List 1 and 3.1 species as well as all List 2 and 3.2 species with a patch size of less than 100 m². These assessments are polygons that include the extent and coverage of all invasive plant populations detected and are critically important for assessing the rapid response potential and to detect change over time; however, this information on patch size is not presented here. Occurrence information alone can be sufficient to discern new populations that require rapid response, but a true measure of success for the

parks—the reduction in extent of an invasive species—will require amended assessments of weed occurrences or other monitoring of control efforts done by park staff.

Species List Revisions

After each field season, species lists are updated for the following field season. The majority of list revisions were made after the 2007 or 2008 seasons (Williams and Speith 2008, Williams and Jordan 2010). However, the 2010 species lists were also changed based on results from the 2009 annual report (Williams et al. 2011) and there are additional changes that need to be made for the 2011 field season, which are described here in detail.

After the 2010 GOGA field season, additional revisions were made to the priority list for the upcoming 2011 field season (Table 4). Six species were added to the 2011 priority list in response to concerns of resource management staff, seven species were moved from List 4 to List 3 because they were listed by BAEDN (BAEDN 2010) as target species, and one species was removed from the list because it is not present in the park nor are there any records of naturalized individuals of this species in the state of California to our knowledge.

Table 4. Revisions to the GOGA priority species list for 2011.

Scientific Name	Common Name	2010 List	2011 List	Justification
<i>Arrhenatherum elatius</i>	tall oatgrass	4	3	On 2010 BAEDN list
<i>Carex pendula</i>	Hanging sedge	n/a	3.1	Reported locally, included on BAEDN list and not on 2010 priority list
<i>Cestrum aurantiacum</i>	orange jessamine	3.2	n/a	Not present in park nor of concern
<i>Cestrum parqui</i>	Chilean jessamine	n/a	3.2	Species of concern, not on 2010 priority list
<i>Coprosma repens</i>	creeping mirrorplant	4	3	On 2010 BAEDN list
<i>Cotoneaster lacteus</i>	milkflower cotoneaster	n/a	3	Found in GOGA in 2010, not on 2010 priority list
<i>Erigeron karvinskianus</i>	Latin American fleabane	4	3	Species of concern
<i>Gunnera tinctoria</i>	Chilean gunnera	4	3	On 2010 BAEDN list
<i>Ligustrum ovalifolium</i>	California privet	4	3	On 2010 BAEDN list
<i>Linaria vulgaris</i>	butter and eggs	4	3	On 2010 BAEDN list
<i>Lonicera japonica</i>	Japanese honeysuckle	4	3	On 2010 BAEDN list
<i>Romulea rosea</i> var. <i>australis</i>	rosy sandcrocus	n/a	3.1	Species of concern, not on 2010 priority list
<i>Rytidosperma penicillatum</i>	hairy oatgrass	n/a	3.1	On 2010 BAEDN list
<i>Trifolium angustifolium</i>	narrowleaf crimson clover	n/a	3.1	Species of concern, not on 2010 priority list

Three revisions were made to the PORE priority list for the upcoming 2011 field season (Table 5). *Carex pendula* was added to list 3.1 because it has been reported invading two wetlands in Marin County (Calflora 2011). *Cestrum parqui* was added to List 3 because it has been reported in lands adjacent to PORE at Tomales Bay State Park (Calflora 2011), and it was listed by BAEDN (BAEDN 2010) as a target species. *Romulea rosea* var. *australis* was moved from List 4 to List 2.1 in response to concerns of vegetation staff (Table 5).

Table 5. Revisions to the PORE priority species list for 2011.

Scientific Name	Common Name	2010 List	2011 List	Justification
<i>Carex pendula</i>	Hanging sedge	n/a	3.1	Reported locally, and on BAEDN list
<i>Cestrum parqui</i>	Chilean Jessamine	n/a	3	Reported locally, and on BAEDN list
<i>Romulea rosea</i> var. <i>australis</i>	rosy sandcrocus	4	3.1	Species of concern

Because the surveys to date at PINN have been focused on relatively small areas, there is not enough data on park-wide distribution of priority species to provide an accurate assessment of species abundance. Therefore, no species were removed from the list, and no plants were shifted from one priority list to another. The lists will be adjusted as more data are collected and as invasive plant management priorities are clarified.

Outreach

Education and outreach plays a critical role in the engagement of a network of early detectors. A number of “Weed ID” classes were held for GOGA staff, volunteers, interns, Golden Gate National Parks Conservancy (GGNPC) staff, and PORE volunteers, as discussed in the Methods section. Whenever possible, volunteers were trained on an individual basis to conduct early detection surveys and map incipient populations of target invasive plants.

Web pages were maintained to provide support to Weed Watcher participants (http://science.nature.nps.gov/im/units/sfan/vital_signs/Invasives/weed_watchers.cfm). Online versions of the “Plant-out-of-Place” cards, a narrative explaining the necessity for invasive plant early detection, and information about how to take part in the Weed Watcher program are featured on the web pages, as well as maps, data sheets and the WhatSNOO monthly reports.

Collaboration

Early detection is ineffective without rapid assessment and response to invasions. Many invasive plant management teams exist in the San Francisco Bay Area parks. The importance of both collaboration and communication with these management teams is imperative to the success of an early detection program.

At GOGA there are several groups that manage invasive species. The Habitat Restoration Team (HRT), under the direction of Maria Alvarez, has adopted the GeoWeed data management system. In addition, the HRT’s Invasive Plant Patrol (IPP) roving hikes now include early detection surveys as part of their protocol. There is potential to augment the existing IPP hikes with Weed Watcher hikes to cover a larger area of GOGA. The HRT works at sites throughout the park, and are host to a sizeable volunteer program of knowledgeable people who have the capacity to respond to new invasions. Continued coordination with the HRT is critical to any successful early detection program at this park.

The GGNPC also houses several weed management programs that have participated in the Weed Watcher program including the Native Plant Nurseries at Muir Woods, the Marin Headlands, and the Presidio. The Site Stewardship restoration programs housed at the GGNPC manage areas in Sweeney Ridge, Mori Point, and Tennessee Valley. These groups have the potential to make a large contribution to eradicating the species detected during our surveys if we can effectively communicate our findings to them and they can implement rapid-response.

Point Reyes National Seashore has a well-established weed management program with an affiliated volunteer program, the Habitat Restoration Program (HRP). Ellen Hamingson leads the HRP program and worked closely with the Weed Watcher program in 2010 to implement rapid response treatment for many of the infestations that were mapped by the Weed Watchers.

The SFAN I&M Program continued its partnership in 2010 with the California Exotic Plant Management Team (EPMT) to hire two early detection and rapid response interns that worked at PORE and GOGA. The EPMT, under the direction of Bobbi Simpson, is responsible for managing weed populations at national parks across California. EPMT is integral to rapid response at parks that are not served by in-house management programs, or as an augmentation to existing programs. Funding from EPMT was vital for financial support of the interns. The interns conducted early detection surveys three days a week, and worked for HRT on the other two days for rapid response removal work. The interns improved communication between the programs and made sure rapid response was removing priority species mapped during early detection surveys. Interns also treated many invasive species during their surveys.

With the help of the resource staff at Pinnacles National Monument, high-priority areas were surveyed using the newly developed species list. A PINN GeoWeed database that was developed in 2008 was populated with more data from the results of the 2010 surveys.

Further work at other SFAN network parks is necessary to ensure that findings will be communicated to the responsible entities for rapid response. Reliance upon shared data via the GeoWeed system is only one step in a communication process that should include an alert system of emails, reports, and phone calls. This component of the Weed Watcher program needs to be further streamlined and formalized so that responsible entities for each region of network parks can be notified in a timely manner about Weed Watcher findings.

As network parks share borders with many other land management agencies, an integrated approach is key to stopping the spread of new invaders. In addition to working with the network of parks, I&M staff are active participants in the Bay Area Early Detection Network (BAEDN). In 2010, BAEDN hosted its first region-wide conference, where working groups were established to guide prioritization, rapid response, and survey methodologies based largely on SFAN I&M protocols. Following the 2010 conference a priority species list was developed for invasive species known to occur in limited distribution in the Bay Area, and BAEDN began the process of coordinating eradication efforts with local agencies and landowners.

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Glossary

Assessments: Surveys and monitoring of isolated weeds and weed population *occurrences* are defined and recorded in the database as individual *assessments*. An *assessment* can be a set of measurements taken over time, recorded for a specified weed *occurrence*. Each *assessment* relates to one specific *occurrence*, while each *occurrence* can accrue a series of *assessments* over time. An *assessment* for each *occurrence* can be recorded as a point, a line, or a polygon. *Assessments* will be used to depict the size, scale, and coverage of an occurrence and therefore will be used as a basis for monitoring the project's effectiveness. The initial *occurrence* and *assessment* data will serve as the baseline for the entire project area, and the project area will be examined regularly for the duration of the project. Periodic *assessments* will be used to determine if weed populations are increasing or decreasing in size and distribution and if *treatments* are having the desired effects.

Exotic: Occurring in a given place as a result of direct or indirect, deliberate or accidental actions by humans. Synonyms: alien, introduced, non-native, and non-indigenous.

GeoWeed: The Microsoft Access-based database developed by the Sonoma Ecology Center from the Weed Information Management System. GeoWeed is a relational database that offers digital data collection of management and spatial weed data through ESRI ArcPad applets. The San Francisco Bay Area Network uses GeoWeed for its Early Detection data. Additional information available in SFAN's protocol and at <http://geoweed.org>.

Invasive: Tending to spread, intrude, or encroach, usually aggressively and in a hurtful manner. Gardeners characterize cultivated plants as "invasive" when they spread aggressively beyond where they were intended to remain, particularly if they outcompete and displace other plants in the garden. Native species can behave invasively, but this term generally connotes non-natives which can spread into undisturbed ecosystems.

Invasive species: Official term for an exotic species whose introduction can cause economic or environmental harm or harm to human health. This definition originated in Presidential Executive Order 13112 issued February 3, 1999.

IPP: Invasive Plant Patrol. Early detection program implemented at Golden Gate National Recreation Area.

Management units: Areas to be monitored for new species/infestations. A management unit may be the entire park, critical habitat within a park, or areas of concern given their proximity to known entry points. Some parks define areas by watershed, others use site names—both are considered a management unit.

Occurrences: The weed *occurrence* is the basic unit of mapping and assessing a singular weed or weed population/infestation within WIMS and GeoWeed. Each *occurrence* defines the presence of a single species and is recorded at a specific location. The *occurrence* location is recorded as a point in space, although each *occurrence* may actually be a population of plants covering an extensive area.

Regions: A region is a uniquely named parcel of land that may have either legally defined boundaries or locally derived place names. In the protocol we may use up to three *regions* to locate each *occurrence*; one is mandatory: the sub-watershed (e.g. Fort Mason is in GGNRA26-3). *Regions* are synonymous with *area* in WIMS.

SOP: Standard Operating Procedures. These are the detailed steps explaining how to carry out the monitoring protocol.

Subwatershed: A management unit subunit of a watershed, based largely on drainages, and used to track weed work in GOGA.

Survey area: A point with typed-in length and width data, the *survey area* is mapped and documented each survey as a way of showing what area was surveyed, thus showing where target species were NOT found. The *survey area* tab in GeoWeed allows collection of negative data (species name with 0% cover and no phenology information), as well as a full inventory of plants seen (species name, % cover, phenology, identification confidence and reason for doubt). The *survey area* point is augmented by a tracklog for more detailed visualization of the survey route.

Treatments: A *treatment* is any weed management activity that occurs at a specific time over a defined geographical area. One *treatment* may affect one or more *occurrences* (of one or several species) over one or more *regions*. The WIMS and GeoWeed databases track all types of weed control methods, including manual and mechanical methods, prescribed fire, grazing, biological control, and any chemical treatments. The database also keeps track of how much staff and/or volunteer time has been spent controlling weeds.

Weed: A weed is a plant out of place. The term “noxious weed” is an official designation for weeds which cause economic harm. More precise, accepted, and general terms for environmentally harmful non-natives are exotic pest plant (although “pest” has a legal definition of causing harm, similar to “noxious”) and invasive plant species. In Australia, exotic pest plants are termed environmental weeds.

Appendix A: List of priority invasive species by park (2010).

Golden Gate, Muir Woods, Presidio and Fort Point:

Priority	Scientific Name	Common Name	Family	Code
1	<i>Arctotheca calendula</i>	capeweed	Asteraceae	ARCA45
1	<i>Arctotheca prostrata</i>	creeping capeweed	Asteraceae	ARPR??
1	<i>Centaurea calcitrapa</i>	purple starthistle	Asteraceae	CECA2
1	<i>Cortaderia selloana</i>	Uruguayan pampas grass	Poaceae	COSE4
1	<i>Cytisus scoparius</i>	Scotch broom	Fabaceae	CYSC4
1	<i>Cytisus striatus</i>	Portuguese broom	Fabaceae	CYST7
1	<i>Digitalis purpurea</i>	purple foxglove	Scrophulariaceae	DIPU
1	<i>Euphorbia oblongata</i>	oblong spurge	Euphorbiaceae	EUOB4
1	<i>Helichrysum petiolare</i>	licorice plant	Asteraceae	HEPE8
1	<i>Ilex aquifolium</i>	English holly	Aquifoliaceae	ILAQ80
1	<i>Ulex europaeus</i>	gorse, furze	Fabaceae	ULEU
1	<i>Vinca major</i>	periwinkle	Apocynaceae	VIMA
2	<i>Acacia melanoxylon</i>	blackwood acacia	Fabaceae	ACME
2	<i>Ageratina adenophora</i>	thoroughwort	Asteraceae	AGAD2
2	<i>Calendula arvensis</i>	field marigold	Asteraceae	CAAR
2	<i>Centaurea melitensis</i>	toçalote	Asteraceae	CEME2
2	<i>Delairea odorata</i>	cape ivy	Asteraceae	DEOD
2	<i>Dipsacus fullonum</i>	Fuller's teasel	Dipsacaceae	DIFU2
2	<i>Eucalyptus globulus</i>	bluegum eucalyptus	Myrtaceae	EUGL
2	<i>Hedera helix</i>	English ivy	Araliaceae	HEHE
2	<i>Leucanthemum vulgare</i>	ox-eye daisy	Asteraceae	LEVU
2	<i>Mentha pulegium</i>	pennyroyal	Lamiaceae	MEPU
2	<i>Oxalis pes-caprae</i>	Bermuda buttercup	Oxalidaceae	OXPE
2	<i>Rubus armeniacus</i>	Himalayan blackberry	Rosaceae	RUDI2
3	<i>Brassica rapa</i>	field mustard	Brassicaceae	BRRA
3	<i>Carpobrotus edulis</i>	freeway iceplant	Aizoaceae	CAED3
3	<i>Cortaderia jubata</i>	jubata grass	Poaceae	COJU2
3	<i>Cotoneaster franchetii</i>	orange cotoneaster	Rosaceae	COFR3
3	<i>Cotoneaster pannosus</i>	silverleaf cotoneaster	Rosaceae	COPA14
3	<i>Ehrharta erecta</i>	panic veldt grass	Poaceae	EHHER
3	<i>Foeniculum vulgare</i>	sweet fennel	Apiaceae	FOVU
3	<i>Genista monspessulana</i>	French broom	Fabaceae	GEMO2
3	<i>Lathyrus latifolius</i>	perennial pea	Fabaceae	LALA4
3	<i>Phalaris aquatica</i>	Harding grass	Poaceae	PHAQ
3	<i>Pinus radiata</i>	Monterey pine	Pinaceae	PIRA2
3	<i>Schinus molle</i>	pepper tree	Anacardiaceae	SCMO
3	<i>Tamarix chinensis</i>	saltcedar	Tamaricaceae	TACH2
3	<i>Xanthium spinosum</i>	spiny cocklebur	Asteraceae	XASP2

Golden Gate, Muir Woods, Presidio and Fort Point (continued):

Priority	Scientific Name	Common Name	Family	Code
3	<i>Xanthium strumarium</i>	rough cocklebur	Asteraceae	XAST
3.1	<i>Ailanthus altissima</i>	tree-of-heaven	Simaroubaceae	AIAL
3.1	<i>Albizia lophantha</i>	silk tree; cape wattle	Fabaceae	ALLO
3.1	<i>Anthoxanthum odorata</i>	sweet vernal grass	Poaceae	ANOD
3.1	<i>Berberis darwinii</i>	Darwin's berberis	Berberidaceae	BEDA
3.1	<i>Carduus acanthoides</i>	plumeless thistle	Asteraceae	CAAC
3.1	<i>Carthamus lanatus</i>	woolly distaff thistle	Asteraceae	CALA20
3.1	<i>Centaurea solstitialis</i>	yellow starthistle	Asteraceae	CESO3
3.1	<i>Cirsium arvense</i>	Canada thistle	Asteraceae	CIAR4
3.1	<i>Crataegus monogyna</i>	singleseed hawthorn	Rosaceae	CRMO
3.1	<i>Cynara cardunculus</i>	artichoke thistle	Asteraceae	CYCA
3.1	<i>Dittrichia graveolens</i>	stinkweed	Asteraceae	DIGR4
3.1	<i>Echium plantagineum</i>	salvation jane	Boraginaceae	ECPL
3.1	<i>Ehrharta calycina</i>	perennial veldt grass	Poaceae	EHCA
3.1	<i>Hedera canariensis</i>	Algerian ivy	Araliaceae	HECA
3.1	<i>Hypericum perforatum</i>	Klamathweed	Clusiaceae	HYPE
3.1	<i>Nicotiana glauca</i>	tree tobacco	Solanaceae	NIGL
3.1	<i>Phalaris arundinacea</i>	reed canary grass	Poaceae	PHAR3
3.1	<i>Pittosporum crassifolium</i>	stiffleaf cheesewood	Pittosporaceae	PICR
3.1	<i>Pyracantha angustifolia</i>	narrowleaf firethorn	Rosaceae	PYAN
3.1	<i>Robinia pseudoacacia</i>	black locust	Fabaceae	ROPS
3.1	<i>Scabiosa atropurpurea</i>	mourningbride	Dipsacaceae	SCAT
3.1	<i>Spartium junceum</i>	Spanish broom	Fabaceae	SPJU2
3.2	<i>Bromus madritensis</i> ssp. <i>rubens</i>	red brome	Poaceae	BRMAR
3.2	<i>Bromus tectorum</i>	cheat grass	Poaceae	BRTE
3.2	<i>Cestrum aurantiacum</i>	orange jessamine	Solanaceae	CEAU2
3.2	<i>Cynodon dactylon</i>	Bermudagrass	Poaceae	CYDA
3.2	<i>Dactylis glomerata</i>	orchard grass	Poaceae	DAGL
3.2	<i>Hirschfeldia incana</i>	shortpod mustard	Brassicaceae	HIIN3
3.2	<i>Festuca arundinacea</i>	tall fescue	Poaceae	FEAR3
3.2	<i>Leptospermum laevigatum</i>	Australian teatree	Myrtaceae	LELA29
3.2	<i>Pennisetum clandestinum</i>	Kikuyu grass	Poaceae	PECL2
3.2	<i>Rosa eglanteria</i>	sweetbriar rose	Rosaceae	ROEG
3.2	<i>Solanum aviculare</i>	New Zealand nightshade	Solanaceae	SOAV
4	<i>Acacia baileyana</i>	Cootamundra wattle	Fabaceae	ACBA
4	<i>Acacia dealbata</i>	silver wattle	Fabaceae	ACDE3
4	<i>Acacia decurrens</i>	green wattle	Fabaceae	ACDE
4	<i>Acacia longifolia</i>	Sydney golden wattle	Fabaceae	ACLO
4	<i>Acacia mearnsii</i>	black wattle	Fabaceae	ACME80
4	<i>Acacia verticillata</i>	prickly Moses	Fabaceae	ACVE2

Golden Gate, Muir Woods, Presidio and Fort Point (continued):

Priority	Scientific Name	Common Name	Family	Code
4	<i>Allium triquetrum</i>	threecorner leek	Liliaceae	ALTR4
4	<i>Alopecurus pratensis</i>	meadow foxtail	Poaceae	ALPR3
4	<i>Amaryllis belladonna</i>	belladonna lily	Liliaceae	AMBE3
4	<i>Anredera cordifolia</i>	Madeira vine	Basellaceae	ANCO6
4	<i>Arrhenatherum elatius</i>	tall oatgrass	Poaceae	AREL3
4	<i>Barbarea verna</i>	early yellowrocket	Brassicaceae	BAVE
4	<i>Barbarea vulgaris</i>	winter cress	Brassicaceae	BAVU
4	<i>Bellardia trixago</i>	bellardia	Scrophulariaceae	BETR
4	<i>Brachypodium distachyon</i>	purple false brome	Poaceae	BRDI2
4	<i>Brassica nigra</i>	black mustard	Brassicaceae	BRNI
4	<i>Briza maxima</i>	big quakinggrass	Poaceae	BRMA
4	<i>Briza minor</i>	little quakinggrass	Poaceae	BRMI2
4	<i>Bromus diandrus</i>	ripgut brome	Poaceae	BRDI3
4	<i>Bromus catharticus</i>	rescue grass	Poaceae	BRCA6
4	<i>Bromus hordeaceus</i>	soft brome	Poaceae	BRHO2
4	<i>Bromus stamineus</i>	roadside brome	Poaceae	BRST3
4	<i>Carduus tenuiflorus</i>	slender-flowered thistle	Asteraceae	CATU2
4	<i>Centaurea diluta</i>	North African knapweed	Asteraceae	CEDI4
4	<i>Centranthus ruber</i>	red valerian	Valerianaceae	CERU2
4	<i>Chrysanthemum segetum</i>	corndaisy	Asteraceae	CHSE
4	<i>Conium maculatum</i>	Poison hemlock	Apiaceae	COMA2
4	<i>Coprosma repens</i>	creeping mirrorplant	Rubiaceae	CORE4
4	<i>Cotula australis</i>	Australian waterbuttons	Asteraceae	COAU3
4	<i>Cotula coronopifolia</i>	brassbuttons	Asteraceae	COCO7
4	<i>Crocasmia X crocosmiiflora</i>	crocasmia, montbretia	Iridaceae	CRCR6
4	<i>Cupressus macrocarpa</i>	Monterey cypress	Cupressaceae	CUMA2
4	<i>Cytisus multiflorus</i>	white spanishbroom	Fabaceae	CYMU3
4	<i>Daucus carota</i>	Queen Anne's lace	Apiaceae	DACA6
4	<i>Digitaria sanguinalis</i>	crabgrass	Poaceae	DISA
4	<i>Dipsacus sativus</i>	Indian teasel	Dipsacaceae	DISA9
4	<i>Duchesnea indica</i>	mock-strawberry	Rosaceae	DUIN
4	<i>Echium candicans</i>	pride of Madeira	Boraginaceae	ECCA5
4	<i>Epipactis helleborine</i>	broadleaf helleborine	Orchidaceae	EPHE
4	<i>Erechtites glomerata</i>	Australian fireweed	Asteraceae	ERGL8
4	<i>Erechtites minima</i>	Australian fireweed	Asteraceae	ERMI6
4	<i>Escallonia rubra</i>	redclaws	Grossulariaceae	ESRU4
4	<i>Euphorbia peplus</i>	petty spurge	Euphorbiaceae	EUPE6
4	<i>Geranium retrorsum</i>	New Zealand geranium	Geraniaceae	GERE
4	<i>Gunnera tinctoria</i>	Chilean gunnera	Gunneraceae	GUTI
4	<i>Hainardia cylindrica</i>	barbgrass	Poaceae	HACY

Golden Gate, Muir Woods, Presidio and Fort Point (continued):

Priority	Scientific Name	Common Name	Family	Code
4	<i>Hedypnois cretica</i>	Cretanweed	Asteraceae	HECR2
4	<i>Holcus lanatus</i>	velvet grass	Poaceae	HOLA
4	<i>Hypericum calycinum</i>	Aaron's beard	Clusiaceae	HYCA10
4	<i>Ipomoea mutabilis</i>	oceanblue morning-glory	Convolvulaceae	IPMU6
4	<i>Kniphofia uvaria</i>	redhot poker	Liliaceae	KNUV80
4	<i>Lepidium strictum</i>	upright pepperweed	Brassicaceae	LEST2
4	<i>Leucanthemum maximum</i>	Shasta daisy and hybrids	Asteraceae	LEMA8
4	<i>Ligustrum ovalifolium</i>	California privet	Oleaceae	LIOV
4	<i>Linaria vulgaris</i>	butter and eggs	Scrophulariaceae	LIVU2
4	<i>Lobularia maritima</i>	sweet alyssum	Brassicaceae	LOMA
4	<i>Lonicera japonica</i>	Japanese honeysuckle	Caprifoliaceae	LOJA
4	<i>Marrubium vulgare</i>	horehound	Lamiaceae	MAVU
4	<i>Mentha spicata</i> var. <i>spicata</i>	spearmint	Lamiaceae	MESP3
4	<i>Mentha Xpiperita</i>	peppermint	Lamiaceae	MEPI
4	<i>Muehlenbeckia complexa</i>	maidenhair vine	Polygonaceae	MUCO3
4	<i>Myosotis discolor</i>	forget-me-not	Boraginaceae	MYDI
4	<i>Myosotis latifolia</i>	broadleaf forget-me-not	Boraginaceae	MYLA4
4	<i>Narcissus pseudonarcissus</i>	common daffodil	Liliaceae	NAPS
4	<i>Nerium oleander</i>	oleander	Apocynaceae	NEOL
4	<i>Parapholis incurva</i>	curved sicklegrass	Poaceae	PAIN
4	<i>Parentucellia viscosa</i>	yellow glandweed	Scrophulariaceae	PAVI3
4	<i>Paspalum dilatatum</i>	dallis grass	Poaceae	PADI3
4	<i>Phalaris canariensis</i>	annual canarygrass	Poaceae	PHCA5
4	<i>Phalaris minor</i>	littleseed canarygrass	Poaceae	PHMI3
4	<i>Phalaris paradoxa</i>	hood canarygrass	Poaceae	PHPA5
4	<i>Pittosporum undulatum</i>	Victorian box	Pittosporaceae	PIUN2
4	<i>Polycarpon tetraphyllum</i>	fourleaf manyseed	Caryophyllaceae	POTE
4	<i>Prunus avium</i>	bird cherry	Rosaceae	PRAV
4	<i>Prunus cerasifera</i>	cherry plum	Rosaceae	PRCE2
4	<i>Ranunculus muricatus</i>	spinyfruit buttercup	Ranunculaceae	RAMU2
4	<i>Ranunculus repens</i>	creeping buttercup	Ranunculaceae	RARE3
4	<i>Raphanus sativus</i>	wild radish	Brassicaceae	RASA2
4	<i>Rumex acetosella</i>	sheep sorrel	Polygonaceae	RUAC3
4	<i>Schinus molle</i>	pepper tree	Anacardiaceae	SCMO
4	<i>Senecio elegans</i>	redpurple ragwort	Asteraceae	SEEL
4	<i>Sinapis arvensis</i>	charlock	Brassicaceae	SIAR4
4	<i>Solanum marginatum</i>	white-margined nightshade	Solanaceae	SOMA
4	<i>Sparaxis tricolor</i> hybrid	harlequin flower	Iridaceae	SPTR
4	<i>Tanacetum parthenium</i>	feverfew	Asteraceae	TAPA6
4	<i>Tetragonia tetragonioides</i>	New Zealand spinach	Aizoaceae	TETE3

Golden Gate, Muir Woods, Presidio and Fort Point (continued):

Priority	Scientific Name	Common Name	Family	Code
4	<i>Thinopyrum junceiforme</i>	Russian wheatgrass	Poaceae	THJU3
4	<i>Tragopogon porrifolius</i>	purple salsify	Asteraceae	TRPO
4	<i>Tropaeolum majus</i>	nasturtium	Tropaeolaceae	TRMA7
4	<i>Verbascum blattaria</i>	moth mullein	Scrophulariaceae	VEBL
4	<i>Watsonia borbonica</i>	bugle-lily	Iridaceae	WABO
4	<i>Watsonia marginata</i>	fragrant bugle-lily	Iridaceae	WAMA2
4	<i>Watsonia meriana</i>	bulbil bugle-lily	Iridaceae	WAME
4	<i>Zantedeschia aethiopica</i>	calla lily	Araceae	ZAAE
5	<i>Ammophila arenaria</i>	European beachgrass	Poaceae	AMAR4
5	<i>Ammophila breviligulata</i>	American beachgrass	Poaceae	AMBR
5	<i>Aptenia cordifolia</i>	heartleaf iceplant	Aizoaceae	APCO
5	<i>Arundo donax</i>	giant reed	Poaceae	ARDO4
5	<i>Carpobrotus chilensis</i>	sea fig	Aizoaceae	CACH38
5	<i>Conicosia pugioniformis</i>	narrow-leaved iceplant	Aizoaceae	COPU18
5	<i>Drosanthemum floribundum</i>	showy dewflower	Aizoaceae	DRFL2
5	<i>Eichhornia crassipes</i>	water hyacinth	Pontederiaceae	EICR
5	<i>Mesembryanthemum crystallinum</i>	ice plant	Aizoaceae	MECR3
5	<i>Myriophyllum aquaticum</i>	parrot's-feather	Haloragaceae	MYAQ2
5	<i>Myriophyllum spicatum</i>	Eurasian watermilfoil	Haloragaceae	MYSP2
5	<i>Spartina alterniflora</i>	Smooth cordgrass	Poaceae	SPAL

Appendix A: 2010 List of priority invasive species by park (continued).

Point Reyes:

Priority	Scientific Name	Common Name	Family	Code
1	<i>Carduus acanthoides</i>	plumeless thistle	Asteraceae	CAAC
1	<i>Carthamus lanatus</i>	woolly distaff thistle	Asteraceae	CALA20
1	<i>Centaurea calcitrapa</i>	purple starthistle	Asteraceae	CECA2
1	<i>Centaurea melitensis</i>	Napa thistle, tocalote	Asteraceae	CEME2
1	<i>Centaurea solstitialis</i>	yellow starthistle	Asteraceae	CESO3
1	<i>Cotoneaster franchetii</i>	orange cotoneaster	Rosaceae	COFR3
1	<i>Cotoneaster pannosus</i>	silverleaf cotoneaster	Rosaceae	COPA14
1	<i>Euphorbia oblongata</i>	oblong spurge	Euphorbiaceae	EUOB4
1	<i>Helichrysum petiolare</i>	licorice plant	Asteraceae	HEPE8
1	<i>Ulex europaea</i>	gorse, furze	Fabaceae	ULEU
2	<i>Acacia melanoxylon</i>	blackwood acacia	Fabaceae	ACME
2	<i>Arctotheca calendula</i>	capeweed	Asteraceae	ARCA45
2	<i>Arctotheca prostrata</i>	creeping capeweed	Asteraceae	ARPR??
2	<i>Berberis darwinii</i>	Darwin's berberis	Berberidaceae	BEDA
2	<i>Cytisus scoparius</i>	Scotch broom	Fabaceae	CYSC4
2	<i>Datura stramonium</i>	jimsonweed, thorn apple	Solanaceae	DAST
2	<i>Delairea odorata</i>	cape ivy	Asteraceae	DEOD
2	<i>Echium candicans</i>	pride of Madeira	Boraginaceae	ECCA5
2	<i>Genista monspessulana</i>	French broom	Fabaceae	GEMO2
2	<i>Hedera helix</i>	English ivy	Araliaceae	HEHE
2	<i>Ilex aquifolium</i>	English holly	Aquifoliaceae	ILAQ80
2	<i>Lathyrus latifolius</i>	perennial pea	Fabaceae	LALA4
2	<i>Leucanthemum vulgare</i>	ox-eye daisy	Asteraceae	LEVU
2	<i>Linaria vulgaris</i>	butter and eggs	Scrophulariaceae	LIVU2
2	<i>Paspalum dilatatum</i>	dallis grass	Poaceae	PADI3
2	<i>Pennisetum clandestinum</i>	Kikuyu grass	Poaceae	PECL2
2	<i>Pittosporum undulatum</i>	Victorian box	Pittosporaceae	PIUN2
2	<i>Rubus armeniacus</i>	Himalayan blackberry	Rosaceae	RUDI2
2	<i>Tetragonia tetragonioides</i>	New Zealand spinach	Aizoaceae	TETE3
2	<i>Vinca major</i>	periwinkle	Apocynaceae	VIMA
2	<i>Xanthium spinosum</i>	spiny cocklebur	Asteraceae	XASP2
3	<i>Acacia longifolia</i>	Sydney golden wattle	Fabaceae	ACLO
3	<i>Acacia verticillata</i>	prickly Moses	Fabaceae	ACVE2
3	<i>Carpobrotus chilensis</i>	sea fig	Aizoaceae	CACH38
3	<i>Carpobrotus edulis</i>	freeway iceplant	Aizoaceae	CAED3

Point Reyes (continued):

Priority	Scientific Name	Common Name	Family	Code
3	<i>Conium maculatum</i>	poison hemlock	Apiaceae	COMA2
3	<i>Cortaderia jubata</i>	jubata grass	Poaceae	COJU2
3	<i>Cortaderia selloana</i>	Uruguayan pampas grass	Poaceae	COSE4
3	<i>Cotoneaster lacteus</i>	milkflower cotoneaster	Rosaceae	COLA18
3	<i>Crataegus monogyna</i>	singleseed hawthorn	Rosaceae	CRMO
3	<i>Cupressus macrocarpa</i>	Monterey cypress	Cupressaceae	CUMA2
3	<i>Cynodon dactylon</i>	Bermudagrass	Poaceae	CYDA
3	<i>Digitalis purpurea</i>	purple foxglove	Scrophulariaceae	DIPU
3	<i>Dipsacus fullonum</i>	common or Fuller's teasel	Dipsacaceae	DIFU2
3	<i>Dipsacus sativus</i>	indian teasel	Dipsacaceae	DISA9
3	<i>Drosanthemum floribundum</i>	showy dewflower	Aizoaceae	DRFL2
3	<i>Echium plantagineum</i>	salvation jane	Boraginaceae	ECPL
3	<i>Ehrharta erecta</i>	panic veldt grass	Poaceae	EHHER
3	<i>Eucalyptus globulus</i>	bluegum eucalyptus	Myrtaceae	EUGL
3	<i>Euphorbia lathyris</i>	gopher plant, caper spurge	Euphorbiaceae	EULA4
3	<i>Festuca arundinacea</i>	tall fescue	Poaceae	FEAR3
3	<i>Foeniculum vulgare</i>	sweet fennel	Apiaceae	FOVU
3	<i>Hypericum calycinum</i>	Aaron's beard	Clusiaceae	HYCA10
3	<i>Lythrum hyssopifolia</i>	hyssop loosestrife	Lythraceae	LYHY2
3	<i>Mentha pulegium</i>	pennyroyal	Lamiaceae	MEPU
3	<i>Myoporum laetum</i>	myoporum	Myoporaceae	MYLA5
3	<i>Phalaris aquatica</i>	Harding grass	Poaceae	PHAQ
3	<i>Pinus radiata</i>	Monterey pine	Pinaceae	PIRA2
3	<i>Populus alba</i>	white poplar	Salicaceae	POAL7
3	<i>Pyracantha angustifolia</i>	narrowleaf firethorn	Rosaceae	PYAN
3	<i>Rosa eglanteria</i>	sweetbriar rose	Rosaceae	ROEG
3	<i>Scabiosa atropurpurea</i>	mourningbride	Dipsacaceae	SCAT
3	<i>Sorghum halepense</i>	Johnson grass	Poaceae	SOHA
3	<i>Tanacetum parthenium</i>	feverfew	Asteraceae	TAPA6
3	<i>Verbascum blattaria</i>	moth mullein	Scrophulariaceae	VEBL
3	<i>Watsonia meriana</i>	bulbil bugle-lily	Iridaceae	WAME
3	<i>Zantedeschia aethiopica</i>	calla lily	Araceae	ZAAE
3.1	<i>Acroptilon [Centaurea] repens</i>	Russian knapweed	Asteraceae	ACRE3
3.1	<i>Aegilops triuncialis</i>	barbed goatgrass	Poaceae	AETR
3.1	<i>Ageratina adenophora</i>	thoroughwort	Rosaceae	AGAD2
3.1	<i>Albizia lophantha</i>	silk tree, cape wattle	Fabaceae	ALLO
3.1	<i>Anthoxanthum odoratum</i>	sweet vernalgrass	Poaceae	ANOD
3.1	<i>Brachypodium distachyon</i>	purple false brome	Poaceae	BRDI2
3.1	<i>Centaurea iberica</i>	Iberian starthistle	Asteraceae	CEIB

Point Reyes (continued):

Priority	Scientific Name	Common Name	Family	Code
3.1	<i>Dittrichia graveolens</i>	stinkweed	Asteraceae	DIGR4
3.1	<i>Ehrharta calycina</i>	perennial veldt grass	Poaceae	EHCA
3.1	<i>Hypericum perforatum</i>	Klamathweed	Clusiaceae	HYPE
3.1	<i>Marrubium vulgare</i>	horehound	Lamiaceae	MAVU
3.1	<i>Robinia pseudoacacia</i>	black locust	Fabaceae	ROPS
3.1	<i>Salsola soda</i>	Russian thistle	Chenopodiaceae	SASO3
3.1	<i>Senecio jacobaea</i>	tansy ragwort	Asteraceae	SEJA
4	<i>Agrostis avenacea</i>	Pacific bentgrass	Poaceae	AGAV
4	<i>Agrostis capillaris</i>	colonial bentgrass	Poaceae	AGCA5
4	<i>Agrostis stolonifera</i>	creeping bentgrass	Poaceae	AGST2
4	<i>Agrostis viridis</i>	green bent	Poaceae	AGVI11
4	<i>Anthemis cotula</i>	chamomile, dog fennel	Asteraceae	ANCO2
4	<i>Aptenia cordifolia</i>	heartleaf iceplant	Aizoaceae	APCO
4	<i>Avena barbata</i>	slender oat	Poaceae	AVBA
4	<i>Avena fatua</i>	wild oat	Poaceae	AVFA
4	<i>Bellardia trixago</i>	bellardia	Scrophulariaceae	BETR
4	<i>Brassica nigra</i>	black mustard	Brassicaceae	BRNI
4	<i>Brassica rapa</i>	field mustard	Brassicaceae	BRRA
4	<i>Briza maxima</i>	big quakinggrass	Poaceae	BRMA
4	<i>Briza minor</i>	little quakinggrass	Poaceae	BRMI2
4	<i>Bromus diandrus</i>	ripgut brome	Poaceae	BRCA6
4	<i>Bromus hordeaceus</i>	soft brome	Poaceae	BRHO2
4	<i>Bromus madritensis</i> ssp. <i>rubens</i>	red brome	Poaceae	BRMAR
4	<i>Carduus pycnocephalus</i>	Italian thistle	Asteraceae	CAPY2
4	<i>Carduus tenuiflorus</i>	slender-flowered thistle	Asteraceae	CATE2
4	<i>Cichorium intybus</i>	chicory	Asteraceae	CIIN
4	<i>Cirsium vulgare</i>	bull thistle	Asteraceae	CIVU
4	<i>Convolvulus arvensis</i>	field bindweed	Convolvulaceae	COAR4
4	<i>Crocasmia Xcrocosmiiflora</i>	crocasmia, montbretia	Iridaceae	CRCR6
4	<i>Cynosurus echinatus</i>	hedgehog dogtail	Poaceae	CYEC
4	<i>Dactylis glomerata</i>	orchard grass, cocksfoot	Poaceae	DAGL
4	<i>Erechtites glomerata</i>	Australian fireweed	Asteraceae	ERGL8
4	<i>Erechtites minima</i>	Australian fireweed	Asteraceae	ERMI6
4	<i>Geranium dissectum</i>	cutleaf geranium	Geraniaceae	GEDI
4	<i>Hirschfeldia incana</i>	shortpod mustard	Brassicaceae	HIIN3
4	<i>Holcus lanatus</i>	velvet grass	Poaceae	HOLA
4	<i>Hordeum marinum</i> ssp. <i>gussoneanum</i>	Mediterranean barley	Poaceae	HOMAG
4	<i>Hordeum murinum</i>	mouse barley	Poaceae	HOMU

Point Reyes (continued):

Priority	Scientific Name	Common Name	Family	Code
4	<i>Hypochaeris glabra</i>	smooth catsear	Asteraceae	HYGL2
4	<i>Hypochaeris radicata</i>	hairy cat's ear	Asteraceae	HYRA3
4	<i>Leontodon taraxacoides</i> ssp. <i>longirostris</i>	lesser hawkbit	Asteraceae	LETAL
4	<i>Lepidium strictum</i>	upright pepperweed	Brassicaceae	LEST2
4	<i>Leucanthemum maximum</i>	Shasta daisy and hybrids	Asteraceae	LEMA8
4	<i>Lolium multiflorum</i>	Italian or annual ryegrass	Poaceae	LOMU
4	<i>Lolium perenne</i>	perennial ryegrass	Poaceae	LOPE
4	<i>Lotus corniculatus</i>	birdsfoot trefoil	Fabaceae	LOC06
4	<i>Medicago polymorpha</i>	California burclover	Fabaceae	MEPO3
4	<i>Melilotus alba</i>	white sweetclover	Fabaceae	MEAL2
4	<i>Melilotus indica</i>	sourclover	Fabaceae	MEIN2
4	<i>Picris echinoides</i>	bristly oxtongue	Asteraceae	PIEC
4	<i>Plantago lanceolata</i>	English plantain	Plantaginaceae	PLLA
4	<i>Poa pratensis</i> ssp. <i>pratensis</i>	Kentucky bluegrass	Poaceae	POPRP2
4	<i>Polypogon monspeliensis</i>	rabbitfoot beardgrass	Poaceae	POMO5
4	<i>Raphanus raphanistrum</i>	wild radish	Brassicaceae	RARA2
4	<i>Raphanus sativus</i>	wild radish	Brassicaceae	RASA2
4	<i>Rosa canina</i>	dog rose	Rosaceae	ROCA3
4	<i>Rumex acetosella</i>	sheep sorrel	Polygonaceae	RUAC3
4	<i>Rumex crispus</i>	curly dock	Polygonaceae	RUCR
4	<i>Silene gallica</i>	windmill catchfly	Caryophyllaceae	SIGA
4	<i>Silybum marianum</i>	blessed milkthistle	Asteraceae	SIMA3
4	<i>Solanum nigrum</i>	black nightshade	Solanaceae	SONI
4	<i>Sonchus arvensis</i>	perennial sowthistle	Asteraceae	SOAR2
4	<i>Trifolium hirtum</i>	rose clover	Fabaceae	TRHI4
5.1	<i>Alisma lanceolatum</i>	lanceleaf water plantain	Alismataceae	ALLA2
5.1	<i>Arundo donax</i>	giant reed	Poaceae	ARDO4
5.1	<i>Conicosia pugioniformis</i>	narrow-leaved iceplant	Aizoaceae	COPU18
5.1	<i>Egeria densa</i>	Brazilian elodea	Hydrocharitaceae	EGDE
5.1	<i>Iris pseudacorus</i>	yellow flag	Iridaceae	IRPS
5.1	<i>Lepidium latifolium</i>	perennial pepperweed	Brassicaceae	LELA2
5.1	<i>Ludwigia hexapetala</i>	sixpetal water-primrose	Onagraceae	LUHE5X
5.1	<i>Ludwigia peploides</i>	floating primrose-willow	Onagraceae	LUPE5X
5.1	<i>Myriophyllum aquaticum</i>	parrot's-feather	Haloragaceae	MYAQ2
5.1	<i>Phalaris arundinacea</i>	reed canary grass	Poaceae	PHAR3
5.1	<i>Spartina alterniflora</i>	smooth cordgrass	Poaceae	SPAL
5.3	<i>Ammophila arenaria</i>	European beachgrass	Poaceae	AMAR4
5.4	<i>Cakile edentula</i>	European searocket	Brassicaceae	CAED

Point Reyes (continued):

Priority	Scientific Name	Common Name	Family	Code
5.4	<i>Cakile maritima</i>	European searocket	Brassicaceae	CAMA
W2	<i>Oxalis pes-caprae</i>	Bermuda buttercup	Oxalidaceae	OXPE
W3	<i>Allium triquetrum</i>	threecorner leek	Liliaceae	ALTR4
W3	<i>Sparaxis tricolor</i>	harlequinflower	Iridaceae	SPTR
W4	<i>Romulea rosea</i> var. <i>australis</i>	rosy sandcrocus	Iridaceae	ROROA

Appendix A: 2010 List of priority invasive species by park (continued).

Pinnacles:

Priority	Scientific Name	Common Name	Family	Code
1	<i>Acroptilon repens</i>	Russian knapweed	Asteraceae	ACRE3
1	<i>Cnicus benedictus</i>	blessed thistle	Asteraceae	CNBE
1	<i>Lepidium latifolium</i>	perennial pepperweed	Brassicaceae	LELA2
1	<i>Melilotus alba</i>	white sweetclover	Fabaceae	MEAL2
1	<i>Nicotiana glauca</i>	tree tobacco	Solanaceae	NIGL
1	<i>Rubus armeniacus</i>	Himalayan blackberry	Rosaceae	RUDI2
1	<i>Salsola tragus</i>	prickly Russian thistle	Chenopodiaceae	SATR12
1	<i>Taeniatherum caput-medusae</i>	Medusahead	Poaceae	TACA8
1	<i>Verbascum thapsus</i>	woolly mullein	Scrophulariaceae	VETH
2	<i>Carduus pycnocephalus</i>	Italian thistle	Asteraceae	CAPY2
2	<i>Carduus tenuiflorus</i>	slender-flowered thistle	Asteraceae	CATE2
2	<i>Conium maculatum</i>	poison hemlock	Apiaceae	COMA2
2	<i>Cynodon dactylon</i>	Bermudagrass	Poaceae	CYDA
2	<i>Marrubium vulgare</i>	horehound	Lamiaceae	MAVU
2	<i>Veronica persica</i>	birdseye speedwell	Scrophulariaceae	VEPE3
2	<i>Vinca major</i>	periwinkle	Apocynaceae	VIMA
3	<i>Amaranthus albus</i>	tumbleweed	Amaranthaceae	AMAL
3	<i>Brassica nigra</i>	black mustard	Brassicaceae	BRNI
3	<i>Brassica rapa</i>	field mustard	Brassicaceae	BRRA
3	<i>Centaurea melitensis</i>	Napa thistle, tocalote	Asteraceae	CEME2
3	<i>Centaurea solstitialis</i>	yellow starthistle	Asteraceae	CESO3
3	<i>Cirsium vulgare</i>	bull thistle	Asteraceae	CIVU
3	<i>Hirschfeldia incana</i>	shortpod mustard	Brassicaceae	HIIN3
3	<i>Lactuca serriola</i>	prickly lettuce	Asteraceae	LASE
3	<i>Mentha spicata</i> var. <i>spicata</i>	spearmint	Lamiaceae	MESP3
3	<i>Mentha Xpiperita</i>	peppermint	Lamiaceae	MEPI
3	<i>Plantago lanceolata</i>	English plantain	Plantaginaceae	PLLA
3	<i>Polygonum arenastrum</i>	oval-leaf knotweed	Polygonaceae	POAR11
3	<i>Raphanus sativus</i>	wild radish	Brassicaceae	RASA2
3	<i>Rumex acetosella</i>	sheep sorrel	Polygonaceae	RUAC3
3	<i>Rumex crispus</i>	curly dock	Polygonaceae	RUCR
3	<i>Silybum marianum</i>	blessed milkthistle	Asteraceae	SIMA3
3.1	<i>Ailanthus altissima</i>	tree-of-heaven	Simaroubaceae	AIAL
3.1	<i>Chenopodium ambrosioides</i>	Mexican-tea	Chenopodiaceae	CHAM
3.1	<i>Dittrichia graveolens</i>	stinkweed	Asteraceae	DIGR
3.1	<i>Lolium multiflorum</i>	Italian ryegrass	Poaceae	LOMU

Pinnacles (continued):

Priority	Scientific Name	Common Name	Family	Code
3.1	<i>Lolium perenne</i>	perennial ryegrass	Poaceae	LOPE
3.1	<i>Lolium temulentum</i>	darnel	Poaceae	LOTE2
3.1	<i>Malva parviflora</i>	cheeseweed	Malvaceae	MAPA5
3.1	<i>Picris echinoides</i>	bristly oxtongue	Asteraceae	PIEC
3.1	<i>Piptatherum miliaceum</i>	smilo grass	Poaceae	PIMI3
3.1	<i>Poa bulbosa</i>	bulbous bluegrass	Poaceae	POBU
3.1	<i>Tragopogon dubius</i>	yellow salsify	Asteraceae	TRDU
3.1	<i>Tribulus terrestris</i>	puncturevine	Zygophyllaceae	TRTE
3.1	<i>Trifolium hirtum</i>	rose clover	Fabaceae	TRHI4
3.1	<i>Verbascum blattaria</i>	moth mullein	Scrophulariaceae	VEBL
3.1	<i>Xanthium spinosum</i>	spiny cocklebur	Asteraceae	XASP2
5.1	<i>Arundo donax</i>	giant reed	Poaceae	ARDO4
5.1	<i>Iris pseudacorus</i>	yellow flag Iris	Iridaceae	IRPS
5.1	<i>Tamarix ramosissima</i>	saltcedar	Tamaricaceae	TARA
5.2	<i>Cotula coronopifolia</i>	brassbuttons	Asteraceae	COCO7
5.2	<i>Crypsis schoenoides</i>	swamp prickly grass	Poaceae	CRSC
5.2	<i>Cyperus difformis</i>	variable flatsedge	Cyperaceae	CYDI4
4	<i>Erodium botrys</i>	longbeak stork's bill	Geraniaceae	ERBO
4	<i>Erodium brachycarpum</i>	shortfruit stork's bill	Geraniaceae	ERBR14
4	<i>Erodium cicutarium</i>	redstem filaree	Geraniaceae	ERIC6
4	<i>Erodium moschatum</i>	musky stork's bill	Geraniaceae	ERMO7
4	<i>Filago [Logfia] gallica</i>	narrowleaf cottonrose	Asteraceae	FIGA
4	<i>Gastridium ventricosum</i>	nit grass	Poaceae	GAVE3
4	<i>Geranium dissectum</i>	cutleaf geranium	Geraniaceae	GED1
4	<i>Gnaphalium luteo-album</i>	Jersey cudweed	Asteraceae	GNLU
4	<i>Herniaria hirsuta</i> ssp. <i>cinerea</i>	hairy rupturewort	Caryophyllaceae	HEHIC
4	<i>Hypochaeris glabra</i>	smooth catsear	Asteraceae	HYGL2
4	<i>Hypochaeris radicata</i>	hairy cat's ear	Asteraceae	HYRA3
4	<i>Lythrum hyssopifolia</i>	hyssop loosestrife	Lythraceae	LYHY2
4	<i>Medicago polymorpha</i>	California burclover	Fabaceae	MEPO3
4	<i>Melilotus indica</i>	sourclover	Fabaceae	MEIN2
4	<i>Nicotiana acuminata</i> var. <i>multiflora</i>	manyflower tobacco	Solanaceae	NIACM
4	<i>Plantago major</i>	broadleaf plantain	Plantaginaceae	PLMA2
4	<i>Polycarpon tetraphyllum</i>	fourleaf manyseed	Caryophyllaceae	POTE
4	<i>Polypogon interruptus</i>	ditch rabbit's-foot grass	Poaceae	POIN7
4	<i>Polypogon monspeliensis</i>	rabbitfoot beardgrass	Poaceae	POMO5
4	<i>Portulaca oleracea</i>	purslane	Portulacaceae	POOL
4	<i>Silene gallica</i>	windmill catchfly	Caryophyllaceae	SIGA

Pinnacles (continued):

Priority	Scientific Name	Common Name	Family	Code
4	<i>Sisymbrium orientale</i>	oriental hedgemustard	Brassicaceae	SIOR4
4	<i>Spergula arvensis</i> ssp. <i>arvensis</i>	corn spurry	Caryophyllaceae	SPAR

Appendix B. Maps showing 2010 survey results.

Available online at:

http://science.nature.nps.gov/im/units/sfan/vital_signs/Invasives/report_maps.cfm

<http://www.calflora.org/cgi-bin/occform.cgi>

The Department of the Interior protects and manages the nation's natural resources and cultural heritage; provides scientific and other information about those resources; and honors its special responsibilities to American Indians, Alaska Natives, and affiliated Island Communities.

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