



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

2014 Annual Report

Natural Resource Data Series NPS/SFAN/NRDS—2017/1080



ON THE COVER

Early Detection Technician Nicholas Stevenson maps an infestation of purple wallaby grass (*Rytidosperma penicillatum*) at Point Reyes National Seashore.

Photograph by: by Eric Wrubel, NPS

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January 2017

U.S. Department of the Interior
National Park Service
Natural Resource Stewardship and Science
Fort Collins, Colorado

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All manuscripts in the series receive the appropriate level of peer review to ensure that the information is scientifically credible, technically accurate, appropriately written for the intended audience, and designed and published in a professional manner.

Data in this report were collected and analyzed using methods based on established, peer-reviewed protocols and were analyzed and interpreted within the guidelines of the protocols.

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Please cite this publication as:

Wrubel, E. C. 2017. Invasive plant species early detection in the San Francisco Bay Area Network: 2014 annual report. Natural Resource Data Series NPS/SFAN/NRDS—2017/1080. National Park Service, Fort Collins, Colorado.

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Executive Summary

This report summarizes the results of the 2014 invasive plant early detection protocol surveys for the San Francisco Bay Area Network (SFAN) Inventory and Monitoring Program (I&M). Invasive plants (see Glossary) represent a high priority vital sign for SFAN because of the negative effects they have on park resources, including altering ecosystem processes (fire regime, hydrology, soil biogeochemical cycling, etc.), reducing habitat quality and scenic value, and increasing trail maintenance needs. The 2014 early detection surveys were conducted in Golden Gate National Recreation Area (GOGA), John Muir National Historic Site (JOMU), Pinnacles National Monument (PINN), and Point Reyes National Seashore (PORE). Objectives and methods for the 2014 field season were based on a peer-reviewed early detection protocol published in the NPS Natural Resource Report series (Williams et al. 2009). Including field seasons when pilot data was collected, 2014 was the sixth field season of data collection in PINN and JOMU, the seventh in PORE, and the eighth in GOGA. Volunteers played an important role in the implementation of the 2014 field surveys. At GOGA, 6 volunteers assisted staff to conduct surveys and enter data, contributing 471 hours. At PORE, 6 volunteers contributed 138 hours. At PINN, 2 volunteers contributed 64 hours performing surveys.

In GOGA, 78 miles of trails and roadsides were surveyed and 777 individual occurrences of target weed species were recorded. In PORE, 121 miles of trails and roadsides were surveyed and 1,124 occurrences of target weeds were recorded. In PINN, 10 miles of trails, roadsides, fence lines, and drainages were surveyed, and 37 occurrences of target weeds were recorded. In JOMU, 5 miles of trails were surveyed, and 15 priority weed occurrences were recorded.

In GOGA, 6 species that are new to the park were recorded and collected during the 2014 early detection surveys; 1 species new to the park was recorded at PORE; 1 species new to the park was recorded at PINN; and 3 species new to the park were recorded at JOMU.

Maps were created of all priority plant populations recorded in GOGA, JOMU, PINN, and PORE. Web pages were used to educate the public about the project and provide support to existing volunteers. Collaborative efforts with staff at GOGA, JOMU, PINN, PORE, and partners at Golden Gate National Parks Conservancy and the Calflora Database continued to facilitate communication of findings and to broaden the early detection network.

Acknowledgments

In addition to the primary authors, many contributors provided critical assistance. We thank A. Williams for producing the first early detection annual report, which was used as a template to create this report. We also thank D. George, D. Adams, S. Mohren, M. Koenen, J. Rogers, N. Howe, J. Cartan, K. Hacker, and N. Tallent for providing valuable comments on this manuscript or previous years' reports; M. Alvarez and the Habitat Restoration Team for contributing new records to the GeoWeed database; E. Hamingson and the Habitat Restoration Program for providing important insights into invasive plant issues at PORE; B. Johnson for providing important insights into invasive plant issues at PINN; F. Villalba for providing important insights into invasive plant issues at JOMU; the Golden Gate National Parks Conservancy and the Point Reyes National Seashore Association for support and partnership; the NPS California Exotic Plant Management for support; the Point Reyes early detection seasonal biologist, N. Stevenson, and the invaluable contributions of early detection interns, Joseph Aquila, Rachel Chen, Betty Cheong, Emily Huizenga, and Matt Unitis.

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, 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 urban development pressures, the San Francisco Bay Area Network (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. For example, in Golden Gate National Recreation Area (GOGA), 25 species of exotic or non-native plants have been noted as directly threatening rare plant populations (NPS 2004). Trails, roads, and waterways are the main routes of infestation of new exotic 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).

During vital sign prioritization by SFAN I&M, invasive plant species early detection ranked as the second most important vital sign for the network (Adams et al. 2006). The early detection protocol was developed by SFAN I&M to locate new, isolated infestations of invasive plants before they become entrenched in the network parks (Williams et al. 2009). For this vital sign, SFAN I&M staff ranked both species and areas (i.e. subwatersheds) in each park to prioritize search efforts. Every year, exotic species lists for each park are re-prioritized, if necessary, based on previous survey data and updated management concerns. Appendices A through D contain the 2014 priority exotic species lists for each park unit.

Objectives

Objectives for the 2014 field season were based on the early detection protocol (Williams et al. 2009) and current management priorities:

- 1) Within GOGA and PORE, survey all roads and trails in high-priority subwatersheds, and also in one-fifth of all other subwatersheds, noting presence and absence of priority exotic species. Use visual assessment and GPS technology to accurately map populations of the top-priority exotic plant species based on ranked species lists.
- 2) Train interns and volunteers to conduct early detection surveys for top-priority SFAN exotic plants.
- 3) Train GOGA and PORE staff plus park-partners to identify top-priority SFAN exotic plants for opportunistic early detection of new populations during regular work activities.
- 4) Revise priority species lists based on information acquired during the previous season.
- 5) Survey select roads, trails, fencelines, and stream corridors for priority species at PINN.
- 6) Survey all trails in the Mt Wanda section of JOMU.

Methods

All methodology follows the SFAN early detection monitoring of invasive plant species protocol (Williams et al. 2009). The following section briefly describes sampling methods, scheduling, data management, and data collection detailed in the protocol.

Prioritization

Full prioritization methods can be found in the protocol and subsequent annual reports, but are summarized briefly here. The lists of target species for GOGA, PINN, and PORE were prioritized based on current knowledge and rankings. This included summing recognized invasiveness and stratifying by feasibility of control based on categories of actual or estimated infested acreage in a park. The target species list for JOMU was finalized in 2011 and implemented in 2012. It was based on data collected from 2009 through 2011, records in the CalFlora database (www.Calflora.org), and procedures described in the protocol (Williams et al. 2009), where applicable.

The list of priority areas where monitoring would take place was generated once for GOGA and PORE in the year prior to full-protocol implementation (2008 and 2009, respectively). This was done by ranking subwatersheds using their number and degree of current infestations, risk of further infestations, and priority of natural resources present. For example, subwatersheds that scored highest were ones that exhibited low infestation levels, had a high risk of further infestation based on presence of infrastructure or invadable vegetation types, and included populations of rare plants or animals.

GOGA manages all or part of 30 watersheds and 118 subwatersheds. Thirty-eight of these subwatersheds were deemed at high risk of invasion and harm to significant biological resources. Roads and trails within the high-priority subwatersheds were the first places to be searched. For the purposes of this report, data collected in Fort Point 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 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 and not GOGA.

PINN is divided into 18 management units that roughly correspond to subwatersheds. None of these units have been prioritized based on their risk of invasion and/or harm to significant biological resources. Instead, surveys are performed on roads, trails, pig fence, and riparian corridors that are of concern to the Pinnacles resource management division. Surveys follow field methods in Williams et al. (2009).

JOMU contains a small amount of natural vegetation centered on Mount Wanda. This area is not subdivided into smaller subwatersheds/management units. However, the entire Mount Wanda open

space can be surveyed each year. Surveys do not occur in the orchard and landscaped areas maintained at the historic Muir residence across the freeway (State Hwy. 4) to the north.

Field Methods

Searches were conducted by teams of one to four individuals along trails and roads within the parks. The official search area used for recording both positive (plant occurrence) and negative data (areas where target plants were not found) was restricted to 5 m on either side of the route.

Along the survey route observers recorded location and associated biological information (phenology, habitat, distribution) of priority target plant populations that were encountered. The level of detail for data collection was dictated by the ranking of the plant on the priority list, and the extent of the infestation (Table 1).

Table 1. Tiered levels of data collection.

Our Priorities	Explanation	Data Collected
List 1 (Highest Priority Plants)	List 1 plants are highly invasive and are typically not widespread. Control or even eradication is often feasible	Point occurrences and polygon assessments are recorded for all patches, regardless of their size
List 2 (High Priority Plants)	List 2 plants are highly invasive and usually more common than List 1 species. Small, outlier patches may be targeted for eradication or control	Point occurrences are recorded for all patches regardless of their size, and polygon assessments are recorded for all patches smaller than 100 m ² .
List 3 (Medium Priority Plants)	List 3 plants are usually widespread and difficult to control at the scale of the park. Uncommon species of concern are also listed here to improve our understanding of their distribution in the park.	Point occurrences are recorded for all patches smaller than 100 m ² .
List 4 (Lower Priority Plants)	List 4 plants include all other exotic species that are not captured by Lists 1-3. Typically, these are very widespread invasive plants and are beyond control, or they are waifs.	These plants are not mapped. Observers record presence/absence.

For the initial survey of a route, point *occurrences* and polygon *assessments* were mapped for list 1 species; point *occurrences* and polygon *assessments* (if patch size is less than 100 m²) for list 2 species; presence/absence, or point *occurrences* (if patch size is less than 100 m²) for list 3 species; and presence/absence recorded for list 4 species, along with the *survey area*.

All of the reported field data to date have been collected during surveys for the full list of species by advanced observers. No data from unsupervised volunteers are in the GeoWeed database or are utilized for data analyses or incorporated into summaries reported herein. A detailed description of field methodology can be found in the early detection of invasive plants protocol: SOP 2- Mapping; SOP 3- Field Data Collection (Williams et al. 2009).

Species List Revisions

The 2014 priority lists for each park were revised in response to concerns of resource management staff based on results of the 2013 surveys.

After each field season, the species lists for each park unit are updated for the following field season. The majority of list revisions were made immediately following the 2007 and 2008 seasons (Williams and Speith 2008, Williams and Jordan 2010). Minor list revisions were made in subsequent years (Williams et al. 2011, Steers et al. 2011, Wrubel and Steers 2012, Wrubel and Steers 2013, Wrubel 2015). The species list revisions for 2014 are presented below.

Seven species were added to the GOGA 2014 priority list. Table 2 shows changes to the priority list, and the justification for the changes.

Table 2. Revisions to the GOGA priority species list for 2014.

Scientific name	Common name	2013 List	2014 List	Justification
<i>Fuchsia magellanica</i>	hardy fuchsia	n/a	2	Naturalized and spreading at two locations in park. Regarded as an environmental weed in Australia, and Tasmania.
<i>Lamium galeobdolon</i>	yellow archangel	n/a	2	Reported invasive in redwood forests in Santa Cruz, CA. Class B Noxious weed in Oregon and Washington. Known from one location in park, at Druid Heights.
<i>Phalaris elongata</i>	koleagrass	n/a	1	New discovery from PORE in 2013, not previously known from California. Would like to know if it occurs in GOGA.
<i>Phoenix canariensis</i>	Canary island date palm	n/a	2	Found in scattered locations in the park. Known to invade riparian habitat in Southern California. Climate change may favor invasiveness in San Francisco Bay Area. Listed by the California Invasive Plant Council (Cal-IPC) as Limited threat to native ecosystems.
<i>Stipa chaetophora</i>	stipoid ricegrass	n/a	1	Only known population in U.S is in GOGA near Dogtown. Covers many acres there. Potentially invasive.
<i>Stipa purpurata</i>	bristly needlegrass	n/a	1	First discovered in GOGA near Dogtown. Covers many acres there. Large populations have been found recently at Bolinas-Fairfax Road and Marin Headlands.
<i>Tradescantia fluminensis</i>	small-leaf spiderwort	n/a	2	Discovered at Muir Woods in 2012. May be invasive in riparian habitat. Large population exists in forested drainage along Panoramic Hwy, in Mt. Tamalpais SP. Has naturalized and spread elsewhere in San Francisco Bay Area.

Three species were added to the PORE 2014 priority list. Table 3 shows changes to the priority list, and the justification for the changes.

Table 3. Revisions to the PORE priority species list for 2014.

Scientific name	Common name	2013 List	2014 List	Justification
<i>Fallopia japonica</i>	Japanese knotweed	n/a	1	Reported in Lagunitas Creek in Fall 2013. Known to be invasive in many parts of the world. Focused surveys in winter 2013 and spring 2014.
<i>Phalaris elongata</i>	koleagrass	n/a	2	New discovery from PORE in 2013, at Limantour Beach. Not previously known from California.
<i>Stipa purpurata</i>	bristly needlegrass	n/a	1	First discovered in GOGA near Dogtown. Covers many acres there. Large populations have been found recently at Bolinas-Fairfax Road and Marin Headlands.

At PINN and JOMU, no species were added or removed from the priority lists for 2014.

Each park unit's species lists for the 2014 field season are included in Appendices A through D.

Results

The 2014 survey results are presented below. All data on species occurrences are based on the species lists for each park for the 2014 field season (Appendices A–D). Species nomenclature follows The Jepson Manual, Second Edition (Baldwin et al. 2012). Links to interactive web maps of 2014 survey results are found in Appendix E.

GOGA

Search Effort

In GOGA, 78 miles of trails and roadsides were surveyed during the 2014 field season. A total of 74 priority subwatersheds were surveyed. In total, 8 people spent 559 hours to complete these surveys; 471 of these hours were contributed by 6 volunteers. Two of the volunteers were I&M interns, who worked for the Invasive Species Early Detection Team (ISED) at both GOGA and PORE for 6 months. The Golden Gate National Parks Conservancy (GGNPC) sponsored 3 additional volunteer interns, one through the GGNPC Academic Internship Program, and two through the GGNPC Advanced Youth Internship Program.

Species Found

In 2014, 777 individual occurrences of target weed species (List 1, 2 or 3) were recorded in GOGA during early detection surveys and entered into the GOGA GeoWeed database (Table 4). There were 159 occurrences of List 1 species, 299 occurrences of List 2 species, and 319 occurrences of List 3 species. A total of 70 species were recorded during the GOGA surveys.

Six new species were found during the 2014 early detection surveys that were not previously documented on the GOGA full list of vascular plants (NPSpecies 2014). Appendix F, Table F-1 contains documentation for species observed during early detection surveys from 2008–2014, that were new additions to the GOGA full list of vascular plants.

Table 4. GOGA 2014 survey results. New occurrences and number of subwatersheds with target species present.

Priority	Scientific name	Common name	Number of new occurrences	Number of sub-watersheds
1	<i>Ailanthus altissima</i>	tree-of-heaven	0	0
1	<i>Albizia lophantha</i>	Stink bean	8	6
1	<i>Aptenia cordifolia</i>	Dew plant	1	1
1	<i>Arctotheca prostrata</i>	Prostrate cape weed	11	5
1	<i>Carex pendula</i>	Hanging sedge	2	1
1	<i>Carpobrotus chilensis</i>	Sea fig	8	4
1	<i>Centaurea calcitrapa</i>	Purple star thistle	8	1
1	<i>Cortaderia selloana</i>	Pampas grass	1	1
1	<i>Crataegus monogyna</i>	Hawthorn	1	1

Table 4 (continued). GOGA 2014 survey results. New occurrences and number of subwatersheds with target species present.

Priority	Scientific name	Common name	Number of new occurrences	Number of sub-watersheds
1	<i>Cytisus scoparius</i>	Scotch broom	8	6
1	<i>Cytisus striatus</i>	Portuguese broom	1	1
1	<i>Digitalis purpurea</i>	Foxglove	2	2
1	<i>Dittrichia graveolens</i>	Stinkwort	5	2
1	<i>Euphorbia oblongata</i>	Eggleaf spurge	3	2
1	<i>Helichrysum petiolare</i>	Licorice plant	6	4
1	<i>Ilex aquifolium</i>	Holly	2	2
1	<i>Lepidium latifolium</i>	Perennial pepperweed	1	1
1	<i>Maytenus boaria</i>	Mayten	3	2
1	<i>Nassella tenuissima</i>	Finestem needlegrass	3	1
1	<i>Pyracantha angustifolia</i>	Firethorn	9	5
1	<i>Rhamnus alaternus</i>	Italian buckthorn	1	1
1	<i>Rytidosperma caespitosum</i>	Tufted wallaby grass	3	1
1	<i>Rytidosperma penicillatum</i>	Purple awned wallaby gras	23	9
1	<i>Scabiosa atropurpurea</i>	Pincushions	8	6
1	<i>Stipa manicata</i>	Andean tussockgrass	2	2
1	<i>Stipa purpurata</i>	Bristly needle grass	7	1
1	<i>Trifolium angustifolium</i>	Narrow leaved clover	14	4
1	<i>Ulex europaeus</i>	Gorse	1	1
1	<i>Vinca major</i>	Vinca	17	6
2	<i>Acacia melanoxylon</i>	Blackwood acacia	34	8
2	<i>Ageratina adenophora</i>	Thoroughwort	28	5
2	<i>Bromus madritensis ssp. Rubens</i>	Foxtail brome	20	9
2	<i>Buddleja davidii</i>	Butterfly bush	1	1
2	<i>Calendula arvensis</i>	Field marigold	7	3
2	<i>Centaurea melitensis</i>	Tocalote	12	9
2	<i>Cestrum parqui</i>	Chilean jessamine	1	1
2	<i>Cynodon dactylon</i>	Bermuda grass	6	3
2	<i>Dactylis glomerata</i>	Orchardgrass	19	12
2	<i>Delairea odorata</i>	Cape ivy	19	8
2	<i>Dipsacus fullonum</i>	Wild teasel	3	3
2	<i>Eucalyptus globulus</i>	Blue gum	12	6
2	<i>Fallopia japonica</i>	Japanese knotweed	1	1
2	<i>Festuca arundinacea</i>	Reed fescue	23	12

Table 4 (continued). GOGA 2014 survey results. New occurrences and number of subwatersheds with target species present.

Priority	Scientific name	Common name	Number of new occurrences	Number of sub-watersheds
2	<i>Fuchsia magellanica</i>	Hardy fuchsia	2	2
2	<i>Hedera helix</i>	English ivy	26	10
2	<i>Iris pseudacorus</i>	Horticultural iris	3	2
2	<i>Leptospermum laevigatum</i>	Australian tea tree	2	2
2	<i>Leucanthemum vulgare</i>	Oxe eye daisy	21	7
2	<i>Mentha pulegium</i>	Pennyroyal	3	2
2	<i>Oxalis pes-caprae</i>	Bermuda buttercup	8	2
2	<i>Pennisetum clandestinum</i>	Kikuyu grass	4	1
2	<i>Phoenix canariensis</i>	Canary island date palm	2	1
2	<i>Rosa rubiginosa</i>	Sweet brier	4	3
2	<i>Rubus armeniacus</i>	Himalayan blackberry	36	10
2	<i>Salsola soda</i>	Alkali russian thistle	1	1
2	<i>Stipa miliacea</i>	Smilo grass	1	1
3	<i>Brassica rapa</i>	Common mustard	2	2
3	<i>Carpobrotus edulis</i>	Iceplant	15	6
3	<i>Cortaderia jubata</i>	Andean pampas grass	46	16
3	<i>Cotoneaster franchetii</i>	Cotoneaster	8	5
3	<i>Cotoneaster lacteus</i>	Milkflower cotoneaster	29	11
3	<i>Cotoneaster pannosus</i>	Woolly cotoneaster	15	7
3	<i>Ehrharta erecta</i>	Upright veldt grass	31	10
3	<i>Erigeron karvinskianus</i>	Latin american fleabane	2	2
3	<i>Foeniculum vulgare</i>	Fennel	44	12
3	<i>Genista monspessulana</i>	French broom	42	14
3	<i>Lathyrus latifolius</i>	Sweet pea	47	12
3	<i>Ligustrum ovalifolium</i>	California privet	1	1
3	<i>Lonicera japonica</i>	Japanese honeysuckle	1	1
3	<i>Phalaris aquatica</i>	Harding grass	26	11

PORE

Search Effort

One-hundred and twenty one miles of trails and roadsides were surveyed during the 2014 field season at PORE, including the PORE managed GOGA North District. A total of 44 subwatersheds were surveyed. In total, 8 people spent 564 hours to complete these surveys, 138 of those hours were contributed by 6 volunteers. Two of the volunteers were I&M interns, who worked for ISED at both

GOGA and PORE for 6 months. The Golden Gate National Parks Conservancy (GGNPC) sponsored three additional volunteer interns, one through the GGNPC Academic Internship Program, and two through the GGNPC Advanced Youth Internship Program.

Species Found

In 2014, 1,124 individual occurrences of target weed species (List 1, 2 or 3) were recorded in PORE during early detection surveys and entered into the PORE GeoWeed database (Table 5). There were 239 occurrences of List 1 species, 388 occurrences of List 2 species, and 497 occurrences of List 3 species. A total of 64 species were recorded during the PORE surveys.

One new non-native species was found during the 2014 early detection surveys that had not previously been documented on the PORE full list of vascular plants (NPSpecies 2014). Appendix F, Table F-2 contains documentation for all species observed during early detection surveys from 2008-2014, that were new additions to the PORE full list of vascular plants.

Table 5. PORE 2014 survey results. New occurrences and number of subwatersheds with target species present.

Priority	Scientific name	Common name	Number of new occurrences	Number of sub-watersheds
1	<i>Anthoxanthum odoratum</i>	Sweet vernal grass	11	4
1	<i>Arundo donax</i>	Giant reed	1	1
1	<i>Brachypodium distachyon</i>	Purple false brome	29	16
1	<i>Carthamus lanatus</i>	Woolly distaff thistle	10	6
1	<i>Centaurea calcitrapa</i>	Purple star thistle	1	1
1	<i>Centaurea melitensis</i>	Tocalote	14	3
1	<i>Centaurea solstitialis</i>	Yellow starthistle	8	2
1	<i>Conicosia pugioniformis</i>	False ice plant	1	1
1	<i>Cotoneaster franchetii</i>	Cotoneaster	3	2
1	<i>Cotoneaster pannosus</i>	Woolly cotoneaster	10	6
1	<i>Euphorbia oblongata</i>	Eggleaf spurge	1	1
1	<i>Fallopia japonica</i>	Japanese knotweed	17	11
1	<i>Iris pseudacorus</i>	Horticultural iris	3	2
1	<i>Myriophyllum aquaticum</i>	Parrot's feather	5	2
1	<i>Phalaris arundinacea</i>	Reed canarygrass	1	1
1	<i>Robinia pseudoacacia</i>	Black locust	1	1
1	<i>Rytidosperma penicillatum</i>	Purple awned wallaby gras	127	22
1	<i>Stipa purpurata</i>	Bristly needle grass	2	2

Table 5 (continued). PORE 2014 survey results. New occurrences and number of subwatersheds with target species present.

Priority	Scientific name	Common name	Number of new occurrences	Number of sub-watersheds
1	<i>Trifolium angustifolium</i>	Narrow leaved clover	11	5
2	<i>Acacia melanoxylon</i>	Blackwood acacia	2	2
2	<i>Arctotheca calendula</i>	Cape weed	4	1
2	<i>Arctotheca prostrata</i>	Prostrate cape weed	5	5
2	<i>Cytisus scoparius</i>	Scotch broom	3	3
2	<i>Datura stramonium</i>	Jimson weed	1	1
2	<i>Delairea odorata</i>	Cape ivy	3	3
2	<i>Genista monspessulana</i>	French broom	17	8
2	<i>Glyceria declinata</i>	Waxy mannagrass	2	2
2	<i>Hedera helix</i>	English ivy	60	13
2	<i>Ilex aquifolium</i>	Holly	32	11
2	<i>Lathyrus latifolius</i>	Sweet pea	53	12
2	<i>Leucanthemum vulgare</i>	Oxe eye daisy	67	16
2	<i>Linaria vulgaris</i>	Butter and eggs	2	1
2	<i>Oxalis pes-caprae</i>	Bermuda buttercup	1	1
2	<i>Paspalum dilatatum</i>	Dallis grass	43	14
2	<i>Pennisetum clandestinum</i>	Kikuyu grass	6	6
2	<i>Phalaris elongata</i>	Kolea grass	1	1
2	<i>Rubus armeniacus</i>	Himalayan blackberry	41	16
2	<i>Tetragonia tetragonioides</i>	New zealand spinach	8	6
2	<i>Vinca major</i>	Vinca	19	11
2	<i>Xanthium spinosum</i>	Spiny cocklebur	1	1
3	<i>Arrhenatherum elatius</i>	Tall oatgrass	1	1
3	<i>Carpobrotus chilensis</i>	Sea fig	1	1
3	<i>Carpobrotus edulis</i>	Iceplant	26	14
3	<i>Conium maculatum</i>	Poison hemlock	105	33
3	<i>Cortaderia jubata</i>	Andean pampas grass	14	9
3	<i>Cynodon dactylon</i>	Bermuda grass	19	12
3	<i>Digitalis purpurea</i>	Foxglove	14	8
3	<i>Dipsacus sativus</i>	Indian teasel	4	3

Table 5 (continued). PORE 2014 survey results. New occurrences and number of subwatersheds with target species present.

Priority	Scientific name	Common name	Number of new occurrences	Number of sub-watersheds
3	<i>Ehrharta erecta</i>	Upright veldt grass	27	13
3	<i>Eucalyptus globulus</i>	Blue gum	1	1
3	<i>Euphorbia lathyris</i>	Gopher plant	8	5
3	<i>Festuca arundinacea</i>	Reed fescue	110	28
3	<i>Foeniculum vulgare</i>	Fennel	21	13
3	<i>Hesperocyparis macrocarpa</i>	Monterey cypress	7	4
3	<i>Hypericum calycinum</i>	Aaron's beard	1	1
3	<i>Ligustrum ovalifolium</i>	California privet	1	1
3	<i>Lythrum hyssopifolia</i>	Hyssop loosestrife	8	7
3	<i>Mentha pulegium</i>	Pennyroyal	47	20
3	<i>Phalaris aquatica</i>	Harding grass	72	25
3	<i>Pinus radiata</i>	Monterey pine	3	2
3	<i>Pyracantha angustifolia</i>	Firethorn	2	2
3	<i>Rosa rubiginosa</i>	Sweet brier	1	1
3	<i>Scabiosa atropurpurea</i>	Pincushions	2	1
3	<i>Sorghum halepense</i>	Johnsongrass	2	2

PINN

Search Effort

Ten miles of trails, fencelines, and drainages were surveyed during the 2014 field season at PINN. In total, 5 people spent 128 hours conducting surveys; 64 of these hours were contributed by 2 I&M interns, who worked primarily for ISED at GOGA and PORE.

Species Found

In 2014, 37 occurrences of target weed species were recorded in PINN during early detection surveys and entered into the PINN GeoWeed database (Table 6). Four of these occurrences were List 1 species, 17 were List 2 species, and 15 were List 3 species. A total of 12 target plant species were recorded during the PINN surveys.

One new non-native species was found during the 2014 early detection surveys that was not previously documented on the PINN full list of vascular plants (NPSpecies 2014). Appendix F, Table F-3 contains documentation for species observed during early detection surveys from 2010-2014, that were new additions to the PINN full list of vascular plants.

Table 6. PINN 2014 survey results. New occurrences and number of subwatersheds with target species present.

Priority	Scientific name	Common name	Number of new occurrences	Number of sub-watersheds
1	<i>Malva parviflora</i>	cheeseweed	2	2
1	<i>Poa bulbosa</i>	bulbous bluegrass	1	1
1	<i>Tragopogon dubius</i>	yellow salsify	1	1
2	<i>Carduus pycnocephalus</i>	Italian thistle	11	3
2	<i>Centaurea solstitialis</i>	yellow starthistle	2	2
2	<i>Marrubium vulgare</i>	horehound	2	2
2	<i>Schismus arabicus</i>	Arabian schismus	2	1
3	<i>Centaurea melitensis</i>	totalote	3	2
3	<i>Hirschfeldia incana</i>	shortpod mustard	2	1
3	<i>Lactuca serriola</i>	prickly lettuce	3	3
3	<i>Rumex crispus</i>	curly dock	6	3
3	<i>Silybum marianum</i>	blessed milkthistle	1	1

JOMU

Search Effort

Five miles of trails in the Mount Wanda section of JOMU were surveyed during the 2014 field season. In total, 3 people spent 24 hours conducting the surveys. Two of the surveyors were JOMU Natural Resources staff.

Species Found

In 2014, 15 individual occurrences of target weed species were recorded in JOMU during early detection surveys and entered into the JOMU GeoWeed database (Table 7). Four of these occurrences were List 1 species, 9 occurrences were List 2 species, and 2 occurrences were List 3 species. A total of 12 target plant species were recorded during the JOMU surveys.

Three new non-native species were found during the 2014 early detection surveys that had not previously been documented on the JOMU full list of vascular plants (NPSpecies 2014). Appendix F, Table F-4 contains documentation for all species observed during early detection surveys from 2010-2014, that were new additions to the JOMU full list of vascular plants.

Table 7. JOMU 2014 survey results. New occurrences of target species at Mount Wanda.

Priority	Scientific name	Common name	Number of new occurrences
1	<i>Cynara cardunculus</i>	Cardoon	1
1	<i>Dittrichia graveolens</i>	Stinkwort	1
1	<i>Eucalyptus globulus</i>	Blue gum	1
1	<i>Lepidium latifolium</i>	Perennial pepperweed	1
2	<i>Conium maculatum</i>	Poison hemlock	1
2	<i>Cotoneaster pannosus</i>	Woolly cotoneaster	2
2	<i>Cynodon dactylon</i>	Bermuda grass	2
2	<i>Dactylis glomerata</i>	Orchardgrass	2
2	<i>Phalaris aquatica</i>	Harding grass	1
2	<i>Tribulus terrestris</i>	Puncture vine	1
3	<i>Ailanthus altissima</i>	Tree of heaven	1
3	<i>Silybum marianum</i>	Milk thistle	1

Discussion

Species Occurrences

The occurrence data from 2014 and years past reveal that collectively, invasive species are widespread throughout the park units of the SFAN. As of 2014, all roads and trails in the SFAN parks have been surveyed at least once. It should be noted that the numbers of occurrences found for each species during protocol surveys are not always an indication of their abundance. For example, the distribution of a species that is locally abundant along a survey route can be underestimated through relying on occurrence data alone since only one occurrence point will be used to represent the population. 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. Finally, only new occurrences are recorded each year, and previously mapped occurrences are not recorded. Thus, if a species is actively recruiting in a park, the number of occurrences mapped each year should remain relatively constant or increase over time, while species that are not expanding their range in a park should show decreasing occurrences over time, as more of the extant populations are recorded.

Assessments were also recorded in addition to occurrences for all List 1 species and also for all List 2 species that have a patch size < 100 m² (Figure 1). These assessments include the spatial coverage of the listed exotic plant. Assessments can be used to detect change in a species' aerial extent over time; however, assessment data are not presented in this report.

New Taxa

In 2014, 11 plant taxa were discovered during early detection surveys that were new records for the SFAN parks. Since 2010 SFAN I&M early detection surveys have recorded 84 taxonomic additions to the vascular plant lists of SFAN parks (NPSpecies 2014). Appendix F contains documentation for all new taxa observed during early detection surveys from 2008–2014.

Database Development

In 2013, SFAN initiated a cooperative agreement with Calflora to build a mapping system to replace the GeoWeed system. The new Weed Manager system will enhance the capabilities of existing weed mapping tools hosted by Calflora, including the Observer Pro mapping application for smartphones and tablets, and the online Weed Observation Entry tool. This new cloud-based invasive plants database will facilitate unprecedented capability for data sharing within SFAN parks, and the wider community of invasive plant managers and researchers throughout California, while allowing users control over the publication of sensitive information. Data migration from GeoWeed will occur in winter 2014, and ISED anticipates using Weed Manager as the primary data collection and storage system for the 2015 field season.

Outreach

Education and outreach play an important role in the engagement of a network of early detectors. Whenever possible, volunteers were trained in the field on an individual basis to conduct early detection surveys and map incipient populations of target invasive plants.

To facilitate reporting and communication among NPS staff, volunteers, and partners, ISED utilizes the SFNPS Early Detection user group on the Calflora website (www.calflora.org/entry/onegroup.html?gid=51). Using the freely available Calflora Observer app, group members can record the location and extent of plant populations, and photograph their observations using a smartphone. These observations can be reported to ISED through the Calflora database, and edited online with the Weed Observation Entry application. ISED also posts monthly survey results to this user group.

The monthly newsletter “Early Detection News” continued to be well received by network parks staff and other organizations involved in vegetation management throughout the Bay Area region. The newsletter is sent via email in HTML format, so recipients can view it directly in their email client. The newsletter contains tables of monthly survey results, and news of noteworthy early detections, with links to information about featured invasive species. The monthly report also includes links to the SFNPS Early Detection user group on Calflora, where the monthly survey results are posted.

Collaboration

Early detection surveys have the greatest utility to park management when coupled with rapid response to invasions. Invasive plant management teams exist in each of the SFAN parks. Collaboration and communication with these management teams is aided by both the implementation of the SFAN early detection program and the quality of its reporting products. Monthly survey results are reported to all SFAN vegetation staff via the Early Detection News.

PORE has a well-established weed management program with an affiliated volunteer program, the Habitat Restoration Program (HRP). Ellen Hamingson, the NPS lead for the HRP program, worked closely with ISED in 2014 to implement rapid response treatment for many of the infestations that were mapped by the ISED. She also provided on-site supervision to the seasonal early detection technician at PORE, which readily facilitated daily communication between the two programs.

The SFAN I&M Program continued its partnership in 2014 with the California Exotic Plant Management Team (EPMT), and the GOGA Habitat Restoration Team (HRT) to hire two early detection and rapid response interns that worked at PORE and GOGA. The EPMT provides grants for weed management projects at national parks across California. The interns conducted early detection surveys three days a week, and worked for HRT on the other two days, focusing on rapid response removal work of licorice plant, and oxeye daisy. The interns improved communication between ISED and HRT and made sure priority species mapped during early detection surveys were being removed.

In 2014 ISED hosted three student interns. One intern was hosted through the GGNPC Academic Internship Program, which recruits local college students and provides academic credit. Two interns were hosted through the Advanced Youth Internship program. This program funds summertime internships for exceptional student-volunteers of high school or college age. The interns assisted with early detection surveys and data entry.

At JOMU, surveys were conducted with the assistance of park staff, and the results were reported to the Natural Resources Specialist, Fernando Villalba.

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), the Marin-Sonoma Weed Management Area (MSWMA), the San Mateo Weed Management Area, and the California Invasive Plant Council (Cal-IPC). In 2014, ISED conducted focused surveys along Lagunitas Creek to detect and map the newly discovered, and highly invasive Japanese knotweed (*Fallopia japonica*). ISED advised BAEDN on a funding request to treat Japanese knotweed and other riparian invasive species in Marin County. ISED also provided commentary and input to BAEDN on early detection/rapid response targets for western San Mateo County.

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Glossary

Assessments: 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 evaluating change with or without management actions.

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 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.

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.

Region: 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.

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

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

Treatments: A treatment is any weed management activity that occurs at a specific time over a defined geographical area. The GeoWeed databases track all types of weed control methods and 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.

Appendix A: 2014 list of priority invasive species at GOGA.

Priority	Scientific Name	Common Name	Family
1	<i>Acroptilon repens</i>	Russian knapweed	Asteraceae
1	<i>Ailanthus altissima</i>	tree-of-heaven	Simaroubaceae
1	<i>Albizia lophantha</i>	silk tree	Fabaceae
1	<i>Ammophila arenaria</i>	European beachgrass	Poaceae
1	<i>Ammophila breviligulata</i>	American beachgrass	Poaceae
1	<i>Anthoxanthum odorata</i>	sweet vernal grass	Poaceae
1	<i>Aptenia cordifolia</i>	heartleaf iceplant	Aizoaceae
1	<i>Arctotheca calendula</i>	fertile capeweed	Asteraceae
1	<i>Arctotheca prostrata</i>	creeping capeweed	Asteraceae
1	<i>Arundo donax</i>	giant reed	Poaceae
1	<i>Berberis darwinii</i>	Darwin's berberis	Berberidaceae
1	<i>Brachypodium sylvaticum</i>	Slender false brome	Poaceae
1	<i>Carduus acanthoides</i>	plumeless thistle	Asteraceae
1	<i>Carex pendula</i>	hanging sedge	Cyperaceae
1	<i>Carpobrotus chilensis</i>	sea fig	Aizoaceae
1	<i>Carthamus lanatus</i>	woolly distaff thistle	Asteraceae
1	<i>Centaurea calcitrapa</i>	purple starthistle	Asteraceae
1	<i>Centaurea solstitialis</i>	yellow starthistle	Asteraceae
1	<i>Cirsium arvense</i>	Canada thistle	Asteraceae
1	<i>Conicosia pugioniformis</i>	narrow-leaved iceplant	Aizoaceae
1	<i>Cortaderia selloana</i>	pampas grass	Poaceae
1	<i>Crataegus monogyna</i>	singleseed hawthorn	Rosaceae
1	<i>Cynara cardunculus</i>	cardoon	Asteraceae
1	<i>Cytisus scoparius</i>	Scotch broom	Fabaceae
1	<i>Cytisus striatus</i>	Portuguese broom	Fabaceae
1	<i>Digitalis purpurea</i>	purple foxglove	Scrophulariaceae
1	<i>Dittrichia graveolens</i>	stinkweed	Asteraceae
1	<i>Drosanthemum floribundum</i>	showy dewflower	Aizoaceae
1	<i>Echium plantagineum</i>	salvation jane	Boraginaceae
1	<i>Ehrharta calycina</i>	perennial veldt grass	Poaceae
1	<i>Eichhornia crassipes</i>	water hyacinth	Pontederiaceae
1	<i>Euphorbia oblongata</i>	oblong spurge	Euphorbiaceae

Priority	Scientific Name	Common Name	Family
1	<i>Hedera canariensis</i>	Algerian ivy	Araliaceae
1	<i>Helichrysum petiolare</i>	licorice plant	Asteraceae
1	<i>Hypericum grandifolium</i>	largeleaf St. Johnswort	Clusiaceae
1	<i>Hypericum perforatum</i>	Klamathweed	Clusiaceae
1	<i>Ilex aquifolium</i>	English holly	Aquifoliaceae
1	<i>Lepidium latifolium</i>	perennial pepperweed	Brassicaceae
1	<i>Limonium ramosissimum</i>	Algerian sea lavender	Plumbaginaceae
1	<i>Ludwigia hexapetala</i>	six-petal water primrose	Onagraceae
1	<i>Ludwigia peploides</i> ssp. <i>montevidensis</i>	floating water primrose	Onagraceae
1	<i>Maytenus boaria</i>	Chilean mayten	Celastraceae
1	<i>Mesembryanthemum crystallinum</i>	ice plant	Aizoaceae
1	<i>Myriophyllum aquaticum</i>	parrot's-feather	Haloragaceae
1	<i>Myriophyllum spicatum</i>	Eurasian watermilfoil	Haloragaceae
1	<i>Nicotiana glauca</i>	tree tobacco	Solanaceae
1	<i>Phalaris arundinacea</i>	reed canary grass	Poaceae
1	<i>Phalaris elongata</i>	koleagrass	Poaceae
1	<i>Pittosporum crassifolium</i>	stiffleaf cheesewood	Pittosporaceae
1	<i>Pyracantha angustifolia</i>	narrowleaf firethorn	Rosaceae
1	<i>Rhamnus alaternus</i>	Italian buckthorn	Rhamnaceae
1	<i>Robinia pseudoacacia</i>	black locust	Fabaceae
1	<i>Romulea rosea</i> var. <i>australis</i>	rosy sandcrocus	Iridaceae
1	<i>Rytidosperma caespitosum</i>	common wallaby grass	Poaceae
1	<i>Rytidosperma penicillatum</i>	hairy wallaby grass	Poaceae
1	<i>Scabiosa atropurpurea</i>	mourningbride	Dipsacaceae
1	<i>Spartina alterniflora</i>	smooth cordgrass	Poaceae
1	<i>Spartium junceum</i>	Spanish broom	Fabaceae
1	<i>Stipa chaetophora</i>	stipoid ricegrass	Poaceae
1	<i>Stipa manicata</i>	Andean tussockgrass	Poaceae
1	<i>Stipa purpurata</i>	bristly needlegrass	Poaceae
1	<i>Trifolium angustifolium</i>	narrowleaf clover	Fabaceae
1	<i>Ulex europaeus</i>	gorse	Fabaceae
1	<i>Vinca major</i>	periwinkle	Apocynaceae
2	<i>Acacia melanoxydon</i>	blackwood acacia	Fabaceae

Priority	Scientific Name	Common Name	Family
2	<i>Ageratina adenophora</i>	thoroughwort	Asteraceae
2	<i>Agrostis avenacea</i>	Pacific bentgrass	Poaceae
2	<i>Bromus madritensis</i> ssp. <i>rubens</i>	red brome	Poaceae
2	<i>Bromus tectorum</i>	cheat grass	Poaceae
2	<i>Buddleja davidii</i>	butterfly bush	Scrophulariaceae
2	<i>Calendula arvensis</i>	field marigold	Asteraceae
2	<i>Centaurea melitensis</i>	totalote	Asteraceae
2	<i>Cestrum parqui</i>	orange jessamine	Solanaceae
2	<i>Cynodon dactylon</i>	Bermudagrass	Poaceae
2	<i>Dactylis glomerata</i>	orchard grass	Poaceae
2	<i>Delairea odorata</i>	cape ivy	Asteraceae
2	<i>Dipsacus fullonum</i>	Fuller's teasel	Dipsacaceae
2	<i>Eucalyptus globulus</i>	bluegum eucalyptus	Myrtaceae
2	<i>Festuca arundinacea</i>	tall fescue	Poaceae
2	<i>Fuchsia magellanica</i>	hardy fuchsia	Onagraceae
2	<i>Geranium purpureum</i>	herb robert	Geraniaceae
2	<i>Geranium robertianum</i>	Robert geranium	Geraniaceae
2	<i>Glyceria declinata</i>	waxy mannagrass	Poaceae
2	<i>Hedera helix</i>	English ivy	Araliaceae
2	<i>Iris pseudacorus</i>	yellow flag iris	Iridaceae
2	<i>Lamiaeum galeobdolon</i>	Yellow archangel	Lamiaceae
2	<i>Leptospermum laevigatum</i>	Australian teatree	Myrtaceae
2	<i>Leucanthemum vulgare</i>	oxeye daisy	Asteraceae
2	<i>Ligustrum lucidum</i>	glossy privet	Oleaceae
2	<i>Mentha pulegium</i>	pennyroyal	Lamiaceae
2	<i>Mercurialis annua</i>	annual mercury	Rubiaceae
2	<i>Oxalis pes-caprae</i>	Bermuda buttercup	Oxalidaceae
2	<i>Pennisetum clandestinum</i>	Kikuyu grass	Poaceae
2	<i>Phoenix canariensis</i>	Canary island date palm	Arecaceae
2	<i>Roldana Petasitis</i>	velvet groundsel	Asteraceae
2	<i>Rosa rubiginosa</i>	sweetbriar rose	Rosaceae
2	<i>Rubus armeniacus</i>	Himalayan blackberry	Rosaceae
2	<i>Salsola soda</i>	oppositeleaf Russian thistle	Chenopoiaceae
2	<i>Solanum laciniatum</i>	New Zealand nightshade	Solanaceae

Priority	Scientific Name	Common Name	Family
2	<i>Tradescantia fluminensis</i>	small-leaf spiderwort	Commelinaceae
2	<i>Sparaxis tricolor hybrid</i>	Harlequin flower	Iridaceae
3	<i>Arrhenatherum elatius</i>	tall oatgrass	Poaceae
3	<i>Brassica rapa</i>	field mustard	Brassicaceae
3	<i>Carpobrotus edulis</i>	iceplant	Aizoaceae
3	<i>Coprosma repens</i>	creeping mirrorplant	Rubiaceae
3	<i>Cortaderia jubata</i>	jubata grass	Poaceae
3	<i>Cotoneaster franchetii</i>	orange cotoneaster	Rosaceae
3	<i>Cotoneaster lacteus</i>	milkflower cotoneaster	Rosaceae
3	<i>Cotoneaster pannosus</i>	silverleaf cotoneaster	Rosaceae
3	<i>Ehrharta erecta</i>	panic veldt grass	Poaceae
3	<i>Erigeron karvinskianus</i>	Latin American fleabane	Asteraceae
3	<i>Foeniculum vulgare</i>	sweet fennel	Apiaceae
3	<i>Genista monspessulana</i>	French broom	Fabaceae
3	<i>Gunnera tinctoria</i>	Chilean gunnera	Gunneraceae
3	<i>Lathyrus latifolius</i>	everlasting pea	Fabaceae
3	<i>Ligustrum ovalifolium</i>	California privet	Oleaceae
3	<i>Linaria vulgaris</i>	butter and eggs	Scrophulariaceae
3	<i>Lonicera japonica</i>	Japanese honeysuckle	Caprifoliaceae
3	<i>Parietaria judaica</i>	spreading pellitory	Urticaceae
3	<i>Phalaris aquatica</i>	Harding grass	Poaceae
3	<i>Pinus radiata</i>	Monterey pine	Pinaceae
3	<i>Schinus molle</i>	pepper tree	Anacardiaceae
3	<i>Tamarix chinensis</i>	saltcedar	Tamaricaceae
3	<i>Xanthium spinosum</i>	spiny cocklebur	Asteraceae
3	<i>Xanthium strumarium</i>	rough cocklebur	Asteraceae

Appendix B: 2014 List of priority invasive species at PORE.

Priority	Scientific Name	Common Name	Family
1	<i>Acroptilon repens</i>	Russian knapweed	Asteraceae
1	<i>Aegilops triuncialis</i>	barbed goatgrass	Poaceae
1	<i>Ageratina adenophora</i>	thoroughwort	Asteraceae
1	<i>Albizia lophantha</i>	silk tree	Fabaceae
1	<i>Alisma lanceolatum</i>	lanceleaf water plantain	Alismataceae
1	<i>Anthoxanthum odoratum</i>	sweet vernalgrass	Poaceae
1	<i>Arundo donax</i>	giant reed	Poaceae
1	<i>Brachypodium distachyon</i>	purple false brome	Poaceae
1	<i>Carduus acanthoides</i>	plumeless thistle	Asteraceae
1	<i>Carex pendula</i>	hanging sedge	Cyperaceae
1	<i>Carthamus lanatus</i>	woolly distaff thistle	Asteraceae
1	<i>Centaurea calcitrapa</i>	purple starthistle	Asteraceae
1	<i>Centaurea iberica</i>	Iberian starthistle	Asteraceae
1	<i>Centaurea melitensis</i>	totalote	Asteraceae
1	<i>Centaurea solstitialis</i>	yellow starthistle	Asteraceae
1	<i>Conicosia pugioniformis</i>	narrow-leaved iceplant	Aizoaceae
1	<i>Cotoneaster franchetii</i>	orange cotoneaster	Roseaceae
1	<i>Cotoneaster pannosus</i>	silverleaf cotoneaster	Roseaceae
1	<i>Dittrichia graveolens</i>	stinkweed	Asteraceae
1	<i>Egeria densa</i>	Brazilian waterweed	Hydrocharitaceae
1	<i>Ehrharta calycina</i>	perennial veldt grass	Poaceae
1	<i>Euphorbia oblongata</i>	oblong spurge	Euphorbiaceae
1	<i>Fallopia japonica</i>	Japanese knotweed	Polygonaceae
1	<i>Helichrysum petiolare</i>	licorice plant	Asteraceae
1	<i>Hypericum grandifolium</i>	largeleaf St. Johnswort	Clusiaceae
1	<i>Hypericum perforatum</i>	Klamathweed	Hypericaceae
1	<i>Iris pseudacorus</i>	yellow flag iris	Iridaceae
1	<i>Lepidium latifolium</i>	perennial pepperweed	Brassicaceae
1	<i>Limonium ramosissimum</i>	Algerian sea lavender	Plumbaginaceae
1	<i>Ludwigia hexapetala</i>	six-petal water primrose	Onagraceae
1	<i>Ludwigia peploides</i> ssp. <i>montevedensis</i>	floating water primrose	Onagraceae
1	<i>Marrubium vulgare</i>	horehound	Lamiaceae

Priority	Scientific Name	Common Name	Family
1	<i>Myriophyllum aquaticum</i>	parrot's-feather	Haloragaceae
1	<i>Phalaris arundinacea</i>	reed canary grass	Poaceae
1	<i>Robinia pseudoacacia</i>	black locust	Fabaceae
1	<i>Romulea rosea</i> var. <i>australis</i>	rosy sandcrocus	Iridaceae
1	<i>Rytidosperma penicillatum</i>	hairy wallaby grass	Poaceae
1	<i>Salsola soda</i>	oppositeleaf Russian thistle	Chenopodiaceae
1	<i>Senecio jacobaea</i>	tansy ragwort	Asteraceae
1	<i>Spartina alterniflora</i>	Smooth cordgrass	Poaceae
1	<i>Stipa purpurata</i>	bristly needlegrass	Poaceae
1	<i>Trifolium angustifolium</i>	narrowleaf clover	Fabaceae
1	<i>Ulex europaeus</i>	gorse	Fabaceae
2	<i>Acacia melanoxylon</i>	blackwood acacia	Fabaceae
2	<i>Arctotheca calendula</i>	fertile capeweed	Asteraceae
2	<i>Arctotheca prostrata</i>	creeping capeweed	Asteraceae
2	<i>Berberis darwinii</i>	Darwin's berberis	Berberidaceae
2	<i>Cakile edentula</i>	European searocket	Brassicaceae
2	<i>Cystisus scoparius</i>	Scotch broom	Fabaceae
2	<i>Datura stramonium</i>	jimsonweed	Solanaceae
2	<i>Delairea odorata</i>	cape ivy	Asteraceae
2	<i>Echium candicans</i>	pride of Madeira	Boraginaceae
2	<i>Genista monspessulana</i>	French broom	Fabaceae
2	<i>Glyceria declinata</i>	waxy mannagrass	Poaceae
2	<i>Hedera helix</i>	English ivy	Araliaceae
2	<i>Ilex aquifolium</i>	English holly	Aquifoliaceae
2	<i>Lathyrus latifolius</i>	everlasting pea	Fabaceae
2	<i>Leucanthemum vulgare</i>	oxeye daisy	Asteraceae
2	<i>Linaria vulgaris</i>	butter and eggs	Scrophulariaceae
2	<i>Maytenus boaria</i>	Chilean mayten	Celastraceae
2	<i>Oxalis pes-caprae</i>	Bermuda buttercup	Oxalidaceae
2	<i>Paspalum dilatatum</i>	dallis grass	Poaceae
2	<i>Pennisetum clandestinum</i>	Kikuyu grass	Poaceae
2	<i>Phalaris elongata</i>	koleagrass	Poaceae
2	<i>Pittosporum undulatum</i>	Victorian box	Pittosporaceae
2	<i>Rubus armeniacus</i>	Himalayan blackberry	Rosaceae

Priority	Scientific Name	Common Name	Family
2	<i>Tetragonia tetragonoides</i>	New Zealand spinach	Aizoaceae
2	<i>Vinca major</i>	periwinkle	Apocynaceae
2	<i>Xanthium spinosum</i>	spiny cocklebur	Asteraceae
3	<i>Acacia longifolia</i>	Sydney golden wattle	Fabaceae
3	<i>Acacia verticillata</i>	prickly Moses	Fabaceae
3	<i>Allium triquetrum</i>	threecorner leek	Liliaceae
3	<i>Ammophila arenaria</i>	European beachgrass	Poaceae
3	<i>Carpobrotus chilensis</i>	sea fig	Aizoaceae
3	<i>Carpobrotus edulis</i>	iceplant	Aizoaceae
3	<i>Cestrum parqui</i>	chilean jessamine	Solanaceae
3	<i>Conium maculatum</i>	poison hemlock	Apiaceae
3	<i>Cortaderia jubata</i>	jubata grass	Poaceae
3	<i>Cortaderia selloana</i>	Uruguayan pampas grass	Poaceae
3	<i>Cotoneaster lacteus</i>	milkflower cotoneaster	Rosaceae
3	<i>Crataegus monogyna</i>	singleseed hawthorn	Rosaceae
3	<i>Cynodon dactylon</i>	Bermudagrass	Poaceae
3	<i>Digitalis purpurea</i>	purple foxglove	Scrophulariaceae
3	<i>Dipsacus fullonum</i>	Fuller's teasel	Dipsacaceae
3	<i>Dipsacus sativus</i>	indian teasel	Dipsacaceae
3	<i>Drosanthemum floribundum</i>	showy dewflower	Aizoaceae
3	<i>Echium plantagineum</i>	salvation jane	Boraginaceae
3	<i>Ehrharta erecta</i>	panic veldt grass	Poaceae
3	<i>Eucalyptus globulus</i>	bluegum eucalyptus	Myrtaceae
3	<i>Euphorbia lathyris</i>	gopher plant	Euphorbiaceae
3	<i>Festuca arundinacea</i>	tall fescue	Poaceae
3	<i>Foeniculum vulgare</i>	sweet fennel	Apiaceae
3	<i>Hesperocyparis macrocarpa</i>	Monterey cypress	Cupressaceae
3	<i>Hypericum calycinum</i>	Aaron's beard	Clusiaceae
3	<i>Lythrum hyssopifolia</i>	hyssop loosestrife	Lythraceae
3	<i>Mentha pulegium</i>	pennyroyal	Lamiaceae
3	<i>Myoporum laetum</i>	myoporum	Myoporaceae
3	<i>Phalaris aquatica</i>	Harding grass	Poaceae
3	<i>Pinus radiata</i>	Monterey pine	Pinaceae
3	<i>Populus alba</i>	white poplar	Salicaceae

Priority	Scientific Name	Common Name	Family
3	<i>Pyracantha angustifolia</i>	narrowleaf firethorn	Rosaceae
3	<i>Rosa eglanteria</i>	sweetbriar rose	Rosaceae
3	<i>Scabiosa atropurpurea</i>	mourningbride	Dipsacaceae
3	<i>Sorghum halepense</i>	Johnson grass	Poaceae
3	<i>Sparaxis tricolor</i>	harlequin flower	Iridaceae
3	<i>Tanacetum parthenium</i>	feverfew	Asteraceae
3	<i>Verbascum blattaria</i>	moth mullein	Scrophulariaceae
3	<i>Watsonia meriana</i>	bulbil bugle-lily	Iridaceae
3	<i>Zantedeschia aethiopica</i>	calla lily	Araceae

Appendix C: 2014 List of priority invasive species at PINN.

Priority	Scientific Name	Common Name	Family	Code
1	<i>Acroptilon repens</i>	Russian knapweed	Asteraceae	ACRE3
1	<i>Ailanthus altissima</i>	tree-of-heaven	Simaroubaceae	AIAL
1	<i>Arundo donax</i>	giant reed	Poaceae	ARDO4
1	<i>Bromus tectorum</i>	cheatgrass	Poaceae	BRTE
1	<i>Chenopodium ambrosioides</i>	Mexican tea	Chenopodiaceae	CHAM
1	<i>Cnicus benedictus</i>	blessed thistle	Asteraceae	CNBE
1	<i>Dittrichia graveolens</i>	stinkweed	Asteraceae	DIGR
1	<i>Iris pseudacorus</i>	yellow flag Iris	Iridaceae	IRPS
1	<i>Lepidium latifolium</i>	perennial pepperweed	Brassicaceae	LELA2
1	<i>Lolium multiflorum</i>	Italian ryegrass	Poaceae	LOMU
1	<i>Lolium perenne</i>	perennial ryegrass	Poaceae	LOPE
1	<i>Lolium temulentum</i>	darnel	Poaceae	LOTE2
1	<i>Malva parviflora</i>	cheeseweed	Malvaceae	MAPA5
1	<i>Melilotus alba</i>	white sweetclover	Fabaceae	MEAL2
1	<i>Nicotiana glauca</i>	tree tobacco	Solanaceae	NIGL
1	<i>Picris echioides</i>	bristly oxtongue	Asteraceae	PIEC
1	<i>Piptatherum miliaceum</i>	smilo grass	Poaceae	PIMI3
1	<i>Poa bulbosa</i>	bulbous bluegrass	Poaceae	POBU
1	<i>Rubus armeniacus</i>	Himalayan blackberry	Rosaceae	RUDI2
1	<i>Salsola tragus</i>	oppositeleaf Russian thistle	Chenopodiaceae	SATR12
1	<i>Taeniatherum caput-medusae</i>	Medusahead	Poaceae	TACA8
1	<i>Tamarix ramosissima</i>	saltcedar	Tamaricaceae	TARA
1	<i>Tragopogon dubius</i>	yellow salsify	Asteraceae	TRDU
1	<i>Tribulus terrestris</i>	puncturevine	Zygophyllaceae	TRTE
1	<i>Trifolium hirtum</i>	rose clover	Fabaceae	TRHI4
1	<i>Verbascum blattaria</i>	moth mullein	Scrophulariaceae	VEBL
1	<i>Verbascum thapsus</i>	woolly mullein	Scrophulariaceae	VETH
1	<i>Xanthium spinosum</i>	spiny cocklebur	Asteraceae	XASP2
2	<i>Carduus pycnocephalus</i>	Italian thistle	Asteraceae	CAPY2
2	<i>Carduus tenuiflorus</i>	slender-flowered thistle	Asteraceae	CATE2
2	<i>Centaurea solstitialis</i>	yellow starthistle	Asteraceae	CESO3
2	<i>Conium maculatum</i>	poison hemlock	Apiaceae	COMA2

Priority	Scientific Name	Common Name	Family	Code
2	<i>Cotula coronopifolia</i>	brassbuttons	Asteraceae	COCO7
2	<i>Crypsis schoenoides</i>	swamp prickle grass	Poaceae	CRSC
2	<i>Cynodon dactylon</i>	Bermudagrass	Poaceae	CYDA
2	<i>Cyperus difformis</i>	variable flatsedge	Cyperaceae	CYDI4
2	<i>Dactylis glomerata</i>	orchard grass	Poaceae	DAGL
2	<i>Marrubium vulgare</i>	horehound	Lamiaceae	MAVU
2	<i>Phalaris aquatica</i>	Harding grass	Poaceae	PHAQ
2	<i>Veronica persica</i>	birdseye speedwell	Scrophulariaceae	VEPE3
2	<i>Schismus arabicus</i>	Arabian schismus	Poaceae	SCAR
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>	totalote	Asteraceae	CEME2
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 aviculare</i> ssp. <i>depressum</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

Appendix D: 2014 List of priority invasive species at JOMU.

Priority	Scientific Name	Common Name	Family	Code
1	<i>Acroptilon repens</i>	Russian knapweed	Asteraceae	ACRE3
1	<i>Aegilops triuncialis</i>	barbed goatgrass	Poaceae	AETR
1	<i>Arundo donax</i>	giant reed	Poaceae	ARDO4
1	<i>Calendula arvensis</i>	field marigold	Asteraceae	CAAR
1	<i>Cardaria draba</i>	Whitetop	Brassicaceae	CADR
1	<i>Carthamus baeticus</i>	Smooth distaff thistle	Asteraceae	CALAC3
1	<i>Centaurea calcitrapa</i>	Purple star thistle	Asteraceae	CECA2
1	<i>Centaurea melitensis</i>	Napa star thistle	Asteraceae	CEME2
1	<i>Cynara cardunculus</i>	cardoon	Asteraceae	CYCA
1	<i>Cytisus striatus</i>	striated broom	Fabaceae	CYST7
1	<i>Dittrichia graveolens</i>	stinkwort	Asteraceae	DIGR3
1	<i>Ehrharta erecta</i>	panic veldt grass	Poaceae	EHHER
1	<i>Eucalyptus globulus</i>	bluegum eucalyptus	Myrtaceae	EUGL
1	<i>Euphorbia oblongata</i>	oblong spurge	Euphorbiaceae	EUOB4
1	<i>Ficus carica</i>	common fig	Moraceae	FICA
1	<i>Genista monspessulana</i>	French broom	Fabaceae	GEMO2
1	<i>Geranium robertianum</i>	Robert geranium	Geraniaceae	GERO
1	<i>Lepidium latifolium</i>	broadleaved pepperweed	Brassicaceae	LELA2
1	<i>Lythrum salicaria</i>	purple loosestrife	Lythraceae	LYSA2
1	<i>Nicotiana glauca</i>	tree tobacco	Solanaceae	NIGL
1	<i>Oxalis pes-caprae</i>	sourgrass	Oxalidaceae	OXPE
1	<i>Schinus molle</i>	Peruvian peppertree	Anacardiaceae	SCMO
1	<i>Sesbania punicea</i>	rattlebox	Fabaceae	SEPU7
1	<i>Tamarix parviflora</i>	Fourstamen tamarisk	Tamaricaceae	TAPA4
2	<i>Bellardia trixago</i>	Mediterranean linseed	Scrophulariaceae	BETR
2	<i>Brachypodium distachyon</i>	False brome	Poaceae	BRDI2
2	<i>Centaurea solstitialis</i>	yellow star thistle	Asteraceae	CESO3
2	<i>Cestrum parqui</i>	Chilean jessamine	Solanaceae	CEPA9
2	<i>Cirsium vulgare</i>	bull thistle	Asteraceae	CIVU
2	<i>Conium maculatum</i>	poison hemlock	Apiaceae	COMA2
2	<i>Cotoneaster lacteus</i>	milkflower cotoneaster	Rosaceae	COLA18
2	<i>Cotoneaster pannosus</i>	silverleaf cotoneaster	Rosaceae	COPA14

Priority	Scientific Name	Common Name	Family	Code
2	<i>Cynodon dactylon</i>	Bermudagrass	Poaceae	CYDA
2	<i>Dactylis glomerata</i>	orchard grass	Poaceae	DAGL
2	<i>Foeniculum vulgare</i>	sweet fennel	Apiaceae	FOVU
2	<i>Hirschfeldia incana</i>	shortpod mustard	Brassicaceae	HIIN3
2	<i>Olea europaea</i>	olive	Oleaceae	OLEU
2	<i>Phalaris aquatica</i>	Harding grass	Poaceae	PHAQ
2	<i>Piptatherum miliaceum</i>	smilo grass	Poaceae	PIMI3
2	<i>Rubus discolor</i>	Himalayan blackberry	Rosaceae	RUDI2
2	<i>Tribulus terrestris</i>	puncturevine	Zygophyllaceae	TRTE
3	<i>Ailanthus altissima</i>	tree-of-heaven	Simaroubaceae	AIAL
3	<i>Brassica nigra</i>	black mustard	Brassicaceae	BRNI
3	<i>Carduus pycnocephalus</i>	Italian thistle	Asteraceae	CAPY2
3	<i>Convolvulus arvensis</i>	field bindweed	Convolvulaceae	COAR4
3	<i>Lathyrus latifolius</i>	everlasting pea	Fabaceae	LALA4
3	<i>Ligustrum lucidum</i>	glossy privet	Oleaceae	LILU2
3	<i>Ligustrum ovalifolium</i>	California privet	Oleaceae	LIOV
3	<i>Marrubium vulgare</i>	horehound	Lamiaceae	MAVU
3	<i>Picris echioides</i>	Bristly oxtongue	Asteraceae	PIEC
3	<i>Prunus cerasifera</i>	cherry plum	Rosaceae	PRCE
3	<i>Robinia pseudoacacia</i>	black locust	Fabaceae	ROPS
3	<i>Silybum marianum</i>	blessed milkthistle	Asteraceae	SIMA3
3	<i>Vinca major</i>	periwinkle	Apocynaceae	VIMA

Appendix E. Interactive web maps of 2014 survey results.

The links below provide access to interactive web maps in the Calflora Database Observation Hotline tool, that show the location of occurrences, assessments and treatments mapped by ISED in 2014 in SFAN parks (Figure 1). Zoom in to your area of interest and refresh the search. For instructions on use of the Observation Hotline go to: <http://www.calflora.org/entry/help/observ-help.html>

GOGA, PORE and JOMU 2014 Observations

<http://www.calflora.org/entry/observ.html#srch=t&src=SFNPS+Early+Detection&before=2014-12-31&after=2014-01-01&inma=t&y=37.8524&x=-122.615&z=9>

PINN 2014 Observations

<http://www.calflora.org/entry/observ.html#srch=t&src=SFNPS+Early+Detection&before=2014-12-31&after=2014-01-01&inma=t&y=36.4846&x=-121.1837&z=12>

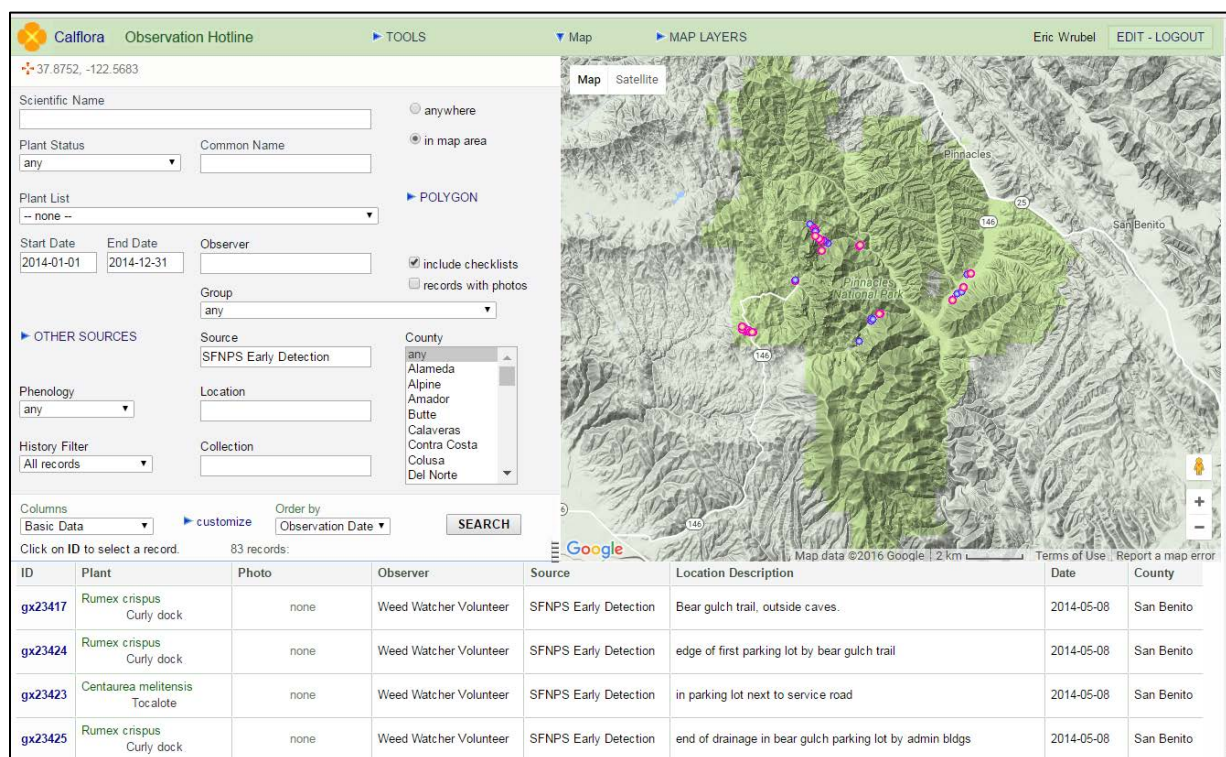


Figure E-1. Screenshot of interactive web map showing locations of occurrences mapped by ISED at PINN in 2014.

Appendix F: New species recorded in SFAN parks during early detection surveys.

Table F-1. New species recorded at GOGA¹.

Year	Scientific name	Family	Reporter	Location(s)	Nativity (California)	Evidence
2011	<i>Cotoneaster lacteus</i> W.W. Sm.	Rosaceae	Robert Steers, I&M	widespread	non-native	Voucher
2011	<i>Agrostis avenacea</i> J.F. Gmel.	Poaceae	Eric Wrubel, I&M	Muir Beach; Conzelman Road	non-native	Voucher
2011	<i>Buddleja davidii</i> Franch.	Scrophulariaceae	Eric Wrubel, I&M	Sausalito	non-native	Observation
2011	<i>Crassula multicava</i> Lem.	Crassulaceae	Eric Wrubel, I&M	Marin Headlands, Youth Hostel; Land's End	non-native	Photo
2011	<i>Dittrichia Graveolens</i> (L.) Greuter	Asteraceae	Eric Wrubel, I&M	Marin Headlands, Marine Mammal Center	non-native	Photo
2011	<i>Echinochloa muricata</i> (P. Beauv.) Fernald var. <i>microstachya</i> Wiegand	Poaceae	Eric Wrubel, I&M	Conzelman Road	non-native	Voucher
2011	<i>Elymus ponticus</i> (Podp.) N. Snow	Poaceae	Eric Wrubel, I&M	McCullough Road	non-native	Observation
2011	<i>Erigeron sumatrensis</i> Retz.	Asteraceae	Eric Wrubel, I&M	Marin Headlands, Marine Mammal Center	non-native	Voucher
2011	<i>Heliotropium amplexicaule</i> Vahl	Boraginaceae	Eric Wrubel, I&M	Slide Ranch	non-native	Photo
2011	<i>Iris pseudacorus</i> L.	Iridaceae	Eric Wrubel, I&M	Marin Headlands, Rodeo Lagoon	non-native	Voucher
2011	<i>Kickxia elatine</i> (L.) Dumort.	Plantaginaceae	Eric Wrubel, I&M	Marin Headlands, Alexander Avenue	non-native	Observation
2011	<i>Ludwigia peploides</i> (Kunth) P. H. Raven ssp. <i>montevidensis</i> (Spreng.) P. H. Raven	Onagraceae	Doreen Smith, CNPS	Marin Headlands, Rodeo Lake	non-native	Voucher
2011	<i>Mercurialis annua</i> L.	Euphorbiaceae	Eric Wrubel, I&M	Sweeney Ridge	non-native	Observation
2011	<i>Nymphaea odorata</i> Aiton	Nymphaeaceae	Eric Wrubel, I&M	Tennessee Valley, Backdoor Pond.	non-native	Photo
2011	<i>Rhamnus alaternus</i> L.	Rhamnaceae	Eric Wrubel, I&M	Mori Point	non-native	Photo
2011	<i>Roldana Petasitis</i> (Sims) H. Rob. & Brettell	Asteraceae	Eric Wrubel, I&M	Marin Headlands, Rodeo Avenue; Muir Woods, Camino del Canyon Road	non-native	Voucher

Year	Scientific name	Family	Reporter	Location(s)	Nativity (California)	Evidence
2011	<i>Rytidosperma caespitosum</i> (Gaudich.) Connor & Edgar	Poaceae	Eric Wrubel, I&M	Sweeney Ridge	non-native	Voucher
2011	<i>Soleirolia soleirolii</i> (Req.) Dandy	Uritaceae	Eric Wrubel, I&M	Mori Point	non-native	Photo
2011	<i>Stipa manicata</i> E. Desv.	Poaceae	Alisa Shor, GGNPC	Marin Headlands, Fort Baker, Fort Cronkhite, Capeheart Housing	non-native	Voucher
2011	<i>Teucrium fruticans</i> L.	Lamiaceae	Eric Wrubel, I&M	Marin Headlands, Battery Townsley	non-native	Photo
2011	<i>Trifolium angustifolium</i> L.	Fabaceae	Eric Wrubel, I&M	Marin Headlands, Alexander Avenue; Mori Point; Rancho Corral de Tierra	non-native	Voucher
2011	<i>Trifolium striatum</i> L.	Fabaceae	Eric Wrubel, I&M	Nicasio Ridge, Cheda Ranch Road	non-native	Photo
2011	<i>Trifolium tomentosum</i> L.	Fabaceae	Eric Wrubel, I&M	Marin Headlands, Fort Cronkhite	non-native	Photo
2012	<i>Allium vineale</i> L.	Alliaceae	Eric Wrubel, I&M	Marin Headlands, Fort Cronkhite	non-native	Voucher
2012	<i>Antirrhinum orontium</i> L.	Scrophulariaceae	Neal Kramer, consultant	Rancho Corral de Tierra, top of Alta Vista Trail	non-native	Photo
2012	<i>Carex nudata</i> W. Boott	Cyperaceae	Eric Wrubel, I&M	Muir Woods, Redwood Creek; Lagunitas Creek	native	Observation
2012	<i>Coreopsis tinctoria</i> Nutt.	Asteraceae	Eric Wrubel, I&M	Marin Headlands; Hwy 1 at Green Gulch	non-native	Voucher
2012	<i>Cotoneaster integrifolius</i> (Roxb.) G. Klotz	Rosaceae	Eric Wrubel, I&M	Marin Headlands, Hwy 1 at Miwok Trailhead	non-native	Photo
2012	<i>Freesia laxa</i> (Thunb.) Goldblatt & J.C. Manning	Iridaceae	Eric Wrubel, I&M	Muir Woods, Druid Heights	non-native	Observation
2012	<i>Geranium robertianum</i> L.	Geraniaceae	Eric Wrubel, I&M	Muir Woods, entrance	non-native	Voucher
2012	<i>Geranium rotundifolium</i> L.	Geraniaceae	Eric Wrubel, I&M	Marin Headlands, Conzelman at Alexander Ave.	non-native	Voucher
2012	<i>Glyceria declinata</i> Brébiss.	Poaceae	Dan Glusenkamp, BAEDN	Muir Beach, equipment staging area		Voucher

Year	Scientific name	Family	Reporter	Location(s)	Nativity (California)	Evidence
2012	<i>Iris foetidissima</i> L.	Iridaceae	Eric Wrubel, I&M	Stinson Beach, Hwy 1 ; Marin Headlands, Rodeo Valley Trail	non-native	Photo
2012	<i>Lamium galeobdolon</i> (L.) Ehrend. & Polatschek	Lamiaceae	Eric Wrubel, I&M	Muir Woods, Druid Heights	non-native	Photo
2012	<i>Melanthus major</i> L.	Melanthaceae	Chris Friedel, GOGA	Muir Woods, Druid Heights	non-native	Voucher
2012	<i>Oxalis hirta</i> L.	Oxalidaceae	Neal Kramer, Live Oak Associates	Rancho Corral de Tierra, Kanoff Street entrance	non-native	Photo
2012	<i>Parietaria judaica</i> L.	Urticaceae	Eric Wrubel, I&M	Marin Headlands, Battery Spencer; Lands end; Mori Point	non-native	Observation
2012	<i>Prunus caroliniana</i> Ait.	Rosaceae	Eric Wrubel, I&M	above Marin City	non-native	Voucher
2012	<i>Salsola soda</i> L.	Chenopodiaceae	Eric Wrubel, I&M	Bolinas Lagoon	non-native	Photo
2012	<i>Tradescantia fluminensis</i> Vell.	Commelinaceae	Eric Wrubel, I&M	Muir Woods, Druid Heights	non-native	Photo
2013	<i>Elodea canadensis</i> Michx.	Hydrocharitaceae	Eric Wrubel	Marin Headlands, Rodeo Lake	native	Voucher
2013	<i>Fallopia japonica</i> (Houtt.) Ronse Decr.	Polygonaceae	Andrea Williams, MMWD; Eric Wrubel I&M	Lagunitas Creek; Presidio, Lobos Creek	non-native	Photo
2013	<i>Montanoa hibiscifolia</i> (Benth.) Standl.	Asteraceae	Eric Wrubel	Presidio, Lobos Creek, Fort Point	non-native	Observation
2013	<i>Passiflora tarminiana</i> Coppens & V.E. Barney	Passifloraceae	Eric Wrubel	Land's End	non-native	Photo
2013	<i>Sporobolus airoides</i> (Torr.) Torr.	Poaceae	Eric Wrubel	Marin Headlands, Hill 88	non-native	Voucher
2014	<i>Hyacinthoides hispanica</i> (Mill.) Rothm.	Asparagaceae	Eric Wrubel	Marin Headlands	non-native	Photo
2014	<i>Ligustrum vulgare</i> L.	Oleaceae	Eric Wrubel	Sir Francis Drake Blvd, at Tocaloma	non-native	Voucher
2014	<i>Juncus acuminatus</i>	Juncaceae	Eric Wrubel	Marin Headlands, Hawk Camp	native	Voucher
2014	<i>Prunella vulgaris</i> var. <i>vulgaris</i> L.	Lamiaceae	Eric Wrubel	Lagunitas Creek	non-native	Voucher

Year	Scientific name	Family	Reporter	Location(s)	Nativity (California)	Evidence
2014	<i>Sorghum halepense</i> (L.) Pers.	Poaceae	Eric Wrubel	Sir Francis Drake Blvd., at SPAWN Headquarters	non-native	Photo
2014	<i>Stipa miliacea</i> (L.) Hoover var. <i>miliacea</i>	Poaceae	Eric Wrubel	Fort Baker, at Hwy. 101, Sir Francis Drake Blvd., at Tocaloma	non-native	Observation
2014	<i>Symphytum officinale</i> L.	Boraginaceae	Eric Wrubel	Lagunitas Creek	non-native	Photo

¹These species were observed during early detection surveys. Prior to their discovery, they were not recorded on the NPSpecies full vascular plant list for GOGA. Reporter indicates person who initially reported presence of the species to I&M staff.

Table F-2. New species recorded at PORE¹.

Year	Scientific name	Family	Reporter	Location(s)	Nativity (Marin Co.)	Evidence
2011	<i>Glyceria declinata</i> Bréb.	Poaceae	Eric Wrubel, I&M	Mount Vision Road	non-native	Voucher
2011	<i>Kickxia elatine</i> (L.) Dumort.	Plantaginaceae	Eric Wrubel, I&M	Limantour Road	non-native	Observation
2011	<i>Prunus caroliniana</i> Ait.	Rosaceae	Eric Wrubel, I&M	Limantour Road	non-native	Voucher
2011	<i>Trifolium angustifolium</i> L.	Fabaceae	Eric Wrubel, I&M	Highway 1, Sir Francis Drake Blvd., Mount Vision Road	non-native	Observation
2012	<i>Elymus ponticus</i> (Podp.) N. Snow	Poaceae	Eric Wrubel, I&M	Bear Valley Headquarters	non-native	Voucher
2012	<i>Phalaris elongata</i> Braun-Blanq.	Poaceae	Eric Wrubel, I&M	Limantour Beach	non-native	Voucher
2013	<i>Tragopogon porrifolius</i> L.	Asteraceae	Christine Davis, I&M	Bear Valley Headquarters	non-native	Photo
2014	<i>Lychnis coronaria</i> (L.) Descr.	Caryophyllaceae	Nicholas Stevenson	Mount Vision Road	non-native	Photo

¹These species were observed during early detection surveys. Prior to their discovery, they were not recorded on the NPSpecies full vascular plant list for PORE. Reporter indicates person who initially reported presence of the species to I&M staff.

Table F-3. New species recorded at PINN¹.

Year	Scientific name	Family	Reporter	Location(s)	Nativity (California)	Evidence
2012	<i>Agrostis avenacea</i> J.F. Gmel.	Poaceae	Eric Wrubel, I&M	West entrance. Revegetation site.	non-native	Voucher
2012	<i>Alopecurus pratensis</i> L.	Poaceae	Eric Wrubel, I&M	McCabe Canyon.	non-native	Voucher
2012	<i>Bromus catharticus</i> var. <i>catharticus</i>	Poaceae	Eric Wrubel, I&M	Campground. Swimming pool area.	non-native	Voucher
2012	<i>Bromus tectorum</i> L.	Poaceae	Robert Steers, I&M	Balconies trail. Condor Gulch Trail.	non-native	Voucher
2012	<i>Crepis vesicaria</i> L. ssp. <i>taraxacifolia</i> (Thuill.) Thell.	Asteraceae	Eric Wrubel, I&M	Campground. Group camp sites.	non-native	Voucher
2012	<i>Dactylis glomerata</i>	Poaceae	Eric Wrubel, I&M	McCabe Canyon.	non-native	Observation
2012	<i>Lathyrus jepsonii</i> var. <i>californicus</i>	Fabaceae	Eric Wrubel, I&M	North Fork Chalone Tr; South Wilderness Tr.	native	Voucher
2012	<i>Phalaris aquatica</i>	Poaceae	Eric Wrubel, I&M	Campground. By gate to fire road at site 18.	non-native	Observation
2012	<i>Phalaris paradoxa</i>	Poaceae	Eric Wrubel, I&M	West entrance. Revegetation site.	non-native	Observation
2012	<i>Schismus arabicus</i>	Poaceae	Eric Wrubel, I&M	Campground. Bottomland Roads.	non-native	Observation
2012	<i>Sisymbrium altissimum</i>	Brassicaceae	Eric Wrubel, I&M	Highway 146, Bottomlands	non-native	Observation
2013	<i>Atriplex suberecta</i>	Chenopodiaceae	Sean Zweifler, I&M	Unverified	native	Observation
2013	<i>Carex densa</i>	Cyperaceae	Eric Wrubel, I&M	McCabe Canyon	native	Voucher
2013	<i>Carex globosa</i>	Cyperaceae	Eric Wrubel, I&M	Bear Gulch	native	Voucher
2013	<i>Carex schottii</i>	Cyperaceae	Eric Wrubel, I&M	McCabe Canyon	native	Voucher
2013	<i>Oxalis corniculata</i>	Oxalidaceae	Sean Zweifler, I&M	Highway 146	non-native	Observation
2013	<i>Rumex conglomeratus</i>	Polygonaceae	Sean Zweifler, I&M	Unverified	non-native	Observation
2013	<i>Sorghum halepense</i>	Poaceae	Sean Zweifler, I&M	Highway 146	non-native	Observation
2013	<i>Verbena bracteata</i>	Verbenaceae	Sean Zweifler, I&M	Unverified	native	Observation

Year	Scientific name	Family	Reporter	Location(s)	Nativity (California)	Evidence
2014	<i>Sisymbrium irio</i>	Brassicaceae	Eric Wrubel	West side employee housing	non-native	Photo

¹These species were observed during early detection surveys. Prior to their discovery, they were not recorded on the NPSpecies full vascular plant list for PINN. Reporter indicates person who initially reported presence of the species to I&M staff.

Table F-4. New species recorded at JOMU¹.

Year	Scientific name	Family	Reporter	Location(s)	Nativity (California)	Evidence
2010	<i>Dittrichia graveolens</i> (L.) Greuter	Asteraceae	Eric Wrubel, I&M	Mount Wanda Trailhead	non-native	Voucher
2011	<i>Lepidium latifolium</i> L.	Brassicaceae	Eric Wrubel, I&M	Strentzel Creek	non-native	Photo
2011	<i>Ehrharta erecta</i> Lam.	Poaceae	Eric Wrubel, I&M	Strentzel Creek	non-native	Observation
2014	<i>Carduus tenuiflorus</i> Curtis	Asteraceae	Desmond Murray, JOMU	Mount Wanda, south of Nature Trail	non-native	Voucher (JOMU staff)
2014	<i>Pinus pinea</i> L.	Pinaceae	Eric Wrubel, I&M	West of Alhambra Ave.	non-native	Photo
2014	<i>Pinus radiata</i> D. Don	Pinaceae	Eric Wrubel, I&M	West of Alhambra Ave.	Native to California, introduced in Contra Costa Co.	Photo

¹These species were observed during early detection surveys. Prior to their discovery, they were not recorded on the NPSpecies full vascular plant list for JOMU. Reporter indicates person who initially reported presence of the species to I&M staff.

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NPS 641/136095/, 426/136095, 114/136095, 612/136095, January 2017

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