



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

2013 Annual Report

Natural Resource Data Series NPS/SFAN/NRDS—2015/758



ON THE COVER

High priority target species of the San Francisco Bay Area Network Invasive Plant Species Early Detection program. Clockwise from top left: common wallaby grass (*Rytidosperma caespitosum*), largeleaf St. Johnswort (*Hypericum grandifolium*), licorice plant (*Helichrysum petiolare*), and Japanese knotweed (*Fallopia japonica*).

Photograph by: by Eric Wrubel, NPS

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

2013 Annual Report

Natural Resource Data Series NPS/SFAN/NRDS—2015/758

Eric Wrubel

National Park Service
San Francisco Bay Area Network
Inventory & Monitoring Program
Fort Cronkhite Building 1063
San Francisco, California 94965

February 2015

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

The National Park Service, Natural Resource Stewardship and Science office in Fort Collins, Colorado, publishes a range of reports that address natural resource topics. These reports are 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.

The Natural Resource Data Series is used to disseminate results of scientific studies in the physical, biological, and social sciences for both the advancement of science and the achievement of the National Park Service mission. The series provides contributors with a forum for displaying comprehensive data that are often deleted from journals because of page limitations.

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.

This report received informal peer review by subject-matter experts who were not directly involved in the collection, analysis, or reporting of the data. 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.

Views, statements, findings, conclusions, recommendations, and data in this report do not necessarily reflect views and policies of the National Park Service, U.S. Department of the Interior. Mention of trade names or commercial products does not constitute endorsement or recommendation for use by the U.S. Government.

This report is available in digital format from the San Francisco Bay Area Network Inventory and Monitoring website (<http://science.nature.nps.gov/im/units/sfan/index.cfm>) and the Natural Resource Publications Management website (<http://www.nature.nps.gov/publications/nrpm/>). To receive this report in a format optimized for screen readers, please email irma@nps.gov.

Please cite this publication as:

Wrubel, E. C. 2015. Invasive plant species early detection in the San Francisco Bay Area Network: 2013 annual report. Natural Resource Data Series NPS/SFAN/NRDS—2015/758. National Park Service, Fort Collins, Colorado.

Contents

	Page
Figures.....	Error! Bookmark not defined.
Tables.....	v
Appendices.....	v
Executive Summary	vi
Acknowledgments.....	vii
Introduction.....	1
Background.....	1
Objectives	1
Methods.....	2
Prioritization	2
Field Methods.....	3
Species List Revisions	4
Results.....	6
GOGA	6
Search Effort.....	6
Species Found.....	6
PORE.....	10
Search Effort.....	10
Species Found.....	10
PINN.....	14
Search Effort.....	14
Species Found.....	14
JOMU	16
Search Effort.....	16
Species Found.....	16
Discussion	18
Species Occurrences.....	18
New Taxa.....	18

Contents (continued)

	Page
Outreach	18
Collaboration	19
Literature Cited	21
Glossary	23

Tables

	Page
Table 1. Tiered levels of data collection.	3
Table 2. Revisions to the GOGA priority species list for 2013.	4
Table 3. Revisions to the PORE priority species list for 2013.	5
Table 4. Revisions to the PINN priority species list for 2013.	5
Table 5. GOGA 2013 survey results. New occurrences and number of subwatersheds with target species present.	7
Table 6. PORE 2013 survey results. New occurrences and number of subwatersheds with target species present.	10
Table 7. PINN 2013 survey results. New occurrences and number of subwatersheds with target species present.	14
Table 8. JOMU 2013 survey results. New occurrences of target species at Mount Wanda.	16

Appendices

	Page
Appendix A: 2013 list of priority invasive species at GOGA.	24
Appendix B: 2013 List of priority invasive species at PORE.	27
Appendix C: 2013 List of priority invasive species at PINN.	30
Appendix D: 2013 List of priority invasive species at JOMU.	32
Appendix E. Maps showing 2013 survey results.	34
Appendix F: New species recorded in SFAN parks during early detection surveys.	35

Executive Summary

This report summarizes the results of the 2013 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 2013 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 2013 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, 2013 was the fifth field season of data collection in PINN and JOMU, the sixth in PORE, and the seventh in GOGA. 2013 was the fifth year of full protocol-level surveys in PORE, marking the completion of the first five-year survey cycle where all roads and trails have been surveyed at least once. The first survey cycle of all target features at PINN was also completed in 2013 (roads, trails, campgrounds, fencelines and major drainages).

Volunteers played an important role in the implementation of the 2013 field surveys. At GOGA, 30 volunteers assisted staff to conduct surveys and enter data, contributing 1470 hours. At PORE, 5 volunteers contributed 114 hours. At PINN, 3 volunteers contributed 127 hours performing surveys. At JOMU, 5 volunteers contributed 30 hours performing surveys.

Ninety miles of trails and roadsides were surveyed within GOGA and 779 individual occurrences of target weed species were recorded. One-hundred and twenty one miles of trails and roadsides were surveyed at PORE and 310 occurrences of target weeds were recorded. Fifty miles of trails, roadsides, fence lines, and drainages were surveyed at PINN and 243 occurrences of target weeds were recorded. Six miles of trails were surveyed at JOMU, and 11 priority weed occurrences were recorded.

In GOGA, 6 species that are new to the park were recorded and collected during the 2013 early detection surveys. Six species new to PINN were also recorded in 2013, as well as 1 species new to PORE.

Maps were created of all areas surveyed in GOGA, JOMU, PINN, and PORE as well as for priority plant populations. Web pages were used to educate the public about the project and provide support to existing volunteers. Features on the web pages included survey maps, species lists, data sheets, and survey calendars. Collaborative efforts with staff at GOGA, JOMU, PINN, PORE, and Golden Gate National Parks Conservancy 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 Point Reyes early detection seasonal biologist, C. Davis, and the invaluable contributions of early detection interns, S. Gorelik, C. Meyer, S. Zweifler, Jackson Vanfleet-Brown, Wilson Loi, and all the Weed Watcher volunteers.

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 monitoring 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 2013 priority exotic species lists for each park unit.

Objectives

Objectives for the 2013 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](http://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.

Golden Gate National Recreation Area opened newly acquired lands at Rancho Corral de Tierra (RCDT) in 2012. In 2013, the 17 subwatersheds within RCDT were prioritized for monitoring using the methodology previously used for all GOGA subwatersheds. Five of the subwatersheds were deemed at high risk of invasion and harm to significant biological resources, 11 of the subwatersheds were deemed to be at moderate risk, and one subwatershed was deemed to be at low risk.

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). PINN is relatively isolated and does not have an active volunteer Weed Watcher program.

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. No active Weed Watcher volunteer program is in effect at JOMU primarily because of limited I&M resources.

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	Example	Explanation	Data Collected
List 1 (Highest Priority Plants)	 capeweed	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)	 cape ivy	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)	 sweet fennel	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)	 rattlesnake grass	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 2013 priority lists for each park were revised in response to concerns of resource management staff based on results of the 2012 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). The species list revisions for 2013 are presented below. These were originally presented in the 2012 annual report (Wrubel and Steers 2013). Minor modifications to the lists were made early in the 2013 survey season, and are presented here. The species list revisions for the 2014 field season will be presented in the 2014 annual report.

Based on results from the 2012 field season, four species were added to the GOGA 2013 priority list (Table 6). These species had not been recorded in the GOGA full list of vascular plant species until they were discovered during the 2012 early detection surveys. All four are reported to be invasive elsewhere. One species was moved from List 2 to List 4 because it was more abundant than previously known.

Table 2. Revisions to the GOGA priority species list for 2013.

Scientific name	Common name	2012 List	2013 List	Justification
<i>Geranium robertianum</i>	Robert geranium	n/a	2	Newly recorded in GOGA during 2012 surveys. On Cal-IPC Watchlist (Cal-IPC 2012).
<i>Glyceria declinata</i>	waxy mannagrass	n/a	2	Newly reported and confirmed in GOGA in 2012. Cal-IPC rating: moderate (Cal-IPC 2006).
<i>Hirschfeldia incana</i>	shortpod mustard	2	4	Too abundant; beyond early detection.
<i>Parietaria judaica</i>	spreading pellitory	n/a	3	Newly recorded in GOGA during 2012 surveys. On Cal-IPC Watchlist (Cal-IPC 2012). Cal-IPC Red Alert 2010. Invasive in some East SF Bay Area urban creeks.
<i>Salsola soda</i>	oppositeleaf Russian thistle	n/a	2	Newly recorded in GOGA during 2012 surveys. On Cal-IPC Watchlist (Cal-IPC 2012). Cal-IPC Red Alert 2009. Invasive in Suisun Marsh, Contra Costa Co., CA.

One species was added to the PORE priority list for the 2013 field season, based on the results of an off-season focused survey (Table 7). This species was placed on List 2 because it is not widespread at PORE and has moderate potential to become invasive.

Table 3. Revisions to the PORE priority species list for 2013.

Scientific name	Common name	2012 List	2013 List	Justification
<i>Rhamnus alaternus</i>	Italian buckthorn	n/a	2	Newly recorded at PORE in 2013. On Cal-IPC Watchlist (Cal-IPC 2012).

Based on the results of the 2012 field season, four species were added to the PINN priority list for the 2013 field season (Table 8). One species was placed on List 1, because of its known invasiveness in habitats similar to those found at PINN. Three species were placed on List 2 because they do not appear to be widespread at PINN, and have moderate potential to become invasive at PINN.

Table 4. Revisions to the PINN priority species list for 2013.

Scientific name	Common name	2012 List	2013 List	Justification
<i>Bromus tectorum</i>	cheatgrass	n/a	1	Newly recorded at PINN during 2012 surveys. Cal-IPC rating: high (Cal-IPC 2006).
<i>Centaurea solstitialis</i>	yellow starthistle	3	2	Not as widespread as previously thought. Populations tend to be large, but relatively uncommon, and are not captured on priority list 3. High management priority warrants moving to list 2 in order to capture all populations.
<i>Dactylis glomerata</i>	orchard grass	n/a	2	Newly recorded at PINN during 2012 surveys. Cal-IPC rating: limited (Cal-IPC 2006).
<i>Phalaris aquatica</i>	Harding grass	n/a	2	Confirmed present at PINN during 2012 surveys. Cal-IPC rating: moderate (Cal-IPC 2006).
<i>Schismus arabicus</i>	Arabian schismus	n/a	2	Newly recorded at PINN during 2012 surveys. Cal-IPC rating: limited (Cal-IPC 2006).

At JOMU, no species were removed from the list, and no plants were shifted from one priority list to another for the 2013 field season.

Each park unit's species lists for the 2013 field season are also included in Appendices A through D.

Results

The 2013 survey results are presented below. All data on species occurrences are based on the species lists for each park for the 2013 field season (Appendices A–D). Species nomenclature follows The Jepson Manual, Second Edition (Baldwin et al. 2012). Links or directions to the survey maps are found in Appendix E.

GOGA

Search Effort

Ninety miles of trails and roadsides were surveyed within GOGA during the 2013 field season. Seventy three priority subwatersheds were surveyed. In total, 32 people spent 1668 hours to complete these surveys; 1470 of these hours were contributed by 30 volunteers. Four of the volunteers were I&M interns, two who worked for the Early Detection Team (EDT) at both GOGA and PORE for a six month duration, and one who was shared by they EDT and the PINN Restoration Crew. 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 2013, 791 individual occurrences of target weed species were recorded in GOGA during early detection surveys and entered into the GOGA GeoWeed database, representing List 1, 2, and 3 species (Table 5). One hundred and sixty five of these occurrences were List 1 species, 341 were List 2 species, and 285 were List 3 species. The 791 individual occurrences of target weed species that were recorded during the GOGA surveys were represented by 67 plant species.

Six new species were found during the 2013 early detection surveys that were not previously documented on the GOGA full list of vascular plants (NPSpecies 2013a). Appendix F, Table 5 contains documentation for species observed during early detection surveys from 2008–2013, that were new additions to the GOGA full list of vascular plants.

Table 5. GOGA 2013 survey results. New occurrences and number of subwatersheds with target species present.

GOGA 2013 list	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>	silk tree	1	1
1	<i>Ammophila arenaria</i>	European beachgrass	0	0
1	<i>Ammophila breviligulata</i>	American beachgrass	0	0
1	<i>Anthoxanthum odoratum</i>	sweet vernalgrass	0	0
1	<i>Aptenia cordifolia</i>	heartleaf iceplant	0	0
1	<i>Arctotheca calendula</i>	fertile capeweed	0	0
1	<i>Arctotheca prostrata</i>	creeping capeweed	8	5
1	<i>Arundo donax</i>	giant reed	0	0
1	<i>Berberis darwinii</i>	Darwin's berberis	0	0
1	<i>Carduus acanthoides</i>	plumeless thistle	0	0
1	<i>Carex pendula</i>	hanging sedge	0	0
1	<i>Carpobrotus chilensis</i>	sea fig	3	2
1	<i>Carthamus lanatus</i>	woolly distaff thistle	0	0
1	<i>Centaurea calcitrapa</i>	purple starthistle	3	3
1	<i>Centaurea solstitialis</i>	yellow starthistle	0	0
1	<i>Cirsium arvense</i>	Canada thistle	0	0
1	<i>Conicosia pugioniformis</i>	narrow-leaved iceplant	2	1
1	<i>Cortaderia selloana</i>	pampas grass	1	1
1	<i>Crataegus monogyna</i>	singleseed hawthorn	2	2
1	<i>Cynara cardunculus</i>	cardoon	0	0
1	<i>Cytisus scoparius</i>	Scotch broom	8	5
1	<i>Cytisus striatus</i>	Portuguese broom	3	2
1	<i>Digitalis purpurea</i>	purple foxglove	1	1
1	<i>Dittrichia graveolens</i>	stinkweed	0	0
1	<i>Drosanthemum floribundum</i>	showy dewflower	2	2
1	<i>Echium plantagineum</i>	salvation jane	0	0
1	<i>Ehrharta calycina</i>	perennial veldt grass	0	0
1	<i>Eichhornia crassipes</i>	water hyacinth	0	0
1	<i>Euphorbia oblongata</i>	oblong spurge	4	4
1	<i>Hedera canariensis</i>	Algerian ivy	0	0
1	<i>Helichrysum petiolare</i>	licorice plant	10	2
1	<i>Hypericum grandifolium</i>	largeleaf St. Johnshwort	0	0
1	<i>Hypericum perforatum</i>	Klamathweed	1	1
1	<i>Ilex aquifolium</i>	English holly	6	4
1	<i>Lepidium latifolium</i>	perennial pepperweed	0	0
1	<i>Limonium ramosissimum</i>	Algerian sea lavender	0	0
1	<i>Ludwigia hexapetala</i>	six-petal water primrose	0	0
1	<i>Ludwigia peploides</i> ssp. <i>montevicensis</i>	floating water primrose	0	0
1	<i>Maytenus boaria</i>	Chilean mayten	0	0
1	<i>Mesembryanthemum crystallinum</i>	ice plant	0	0
1	<i>Myriophyllum aquaticum</i>	parrot's-feather	0	0

Table 5. GOGA 2013 survey results. New occurrences and number of subwatersheds with target species present (continued).

GOGA 2013 list	Scientific name	Common name	Number of new occurrences	Number of sub- watersheds
1	<i>Myriophyllum spicatum</i>	Eurasian watermilfoil	0	0
1	<i>Nicotiana glauca</i>	tree tobacco	0	0
1	<i>Phalaris arundinacea</i>	reed canary grass	0	0
1	<i>Pittosporum crassifolium</i>	stifleaf cheesewood	8	3
1	<i>Pyracantha angustifolia</i>	narrowleaf firethorn	2	2
1	<i>Rhamnus alaternus</i>	Italian buckthorn	0	0
1	<i>Robinia Pseudoacacia</i>	black locust	0	0
1	<i>Romulea rosa var. australis</i>	rosy sandcrocus	2	1
1	<i>Rytidosperma caespitosum</i>	common wallaby grass	16	5
1	<i>Rytidosperma penicillatum</i>	hairy wallaby grass	37	14
1	<i>Scabiosa atropurpurea</i>	mourningbride	17	11
1	<i>Spartina alterniflora</i>	smooth cordgrass	0	0
1	<i>Spartium junceum</i>	Spanish broom	0	0
1	<i>Stipa manicata</i>	Andean tussockgrass	13	6
1	<i>Trifolium angustifolium</i>	narrowleaf crimson clover	6	5
1	<i>Ulex europaeus</i>	gorse	0	0
1	<i>Vinca major</i>	periwinkle	9	5
2	<i>Acacia melanoxylon</i>	blackwood acacia	17	9
2	<i>Ageratina adenophora</i>	thoroughwort	21	10
2	<i>Agrostis avenacea</i>	Pacific bentgrass	1	1
2	<i>Bromus madritensis ssp. Rubens</i>	red brome	37	18
2	<i>Bromus tectorum</i>	cheat grass	1	1
2	<i>Buddleja davidii</i>	butterfly bush	0	0
2	<i>Calendula arvensis</i>	field marigold	2	2
2	<i>Centaurea melitensis</i>	toocalote	7	5
2	<i>Cestrum parqui</i>	orange jessamine	0	0
2	<i>Cynodon dactylon</i>	Bermudagrass	2	2
2	<i>Dactylis glomerata</i>	orchard grass	53	24
2	<i>Delairea odorata</i>	cape ivy	21	8
2	<i>Dipsacus fullonum</i>	Fuller's teasel	9	7
2	<i>Eucalyptus globulus</i>	bluegum eucalyptus	2	2
2	<i>Festuca arundinacea</i>	tall fescue	47	24
2	<i>Geranium purpureum</i>	herb robert	0	0
2	<i>Geranium robertianum</i>	Robert geranium	3	2
2	<i>Glyceria declinata</i>	waxy mannagrass	1	1
2	<i>Hedera helix</i>	English ivy	19	10
2	<i>Iris Pseudacorus</i>	yellow flag iris	2	2
2	<i>Leptospermum laevigatum</i>	Australian teatree	2	2
2	<i>Leucanthemum vulgare</i>	oxeye daisy	14	10
2	<i>Ligustrum lucidum</i>	glossy privet	2	2
2	<i>Mentha pulegium</i>	pennyroyal	8	7
2	<i>Mercurialis annua</i>	annual mercury	0	0

Table 5. GOGA 2013 survey results. New occurrences and number of subwatersheds with target species present (continued).

GOGA 2013 list	Scientific name	Common name	Number of new occurrences	Number of sub- watersheds
2	<i>Oxalis pes-caprae</i>	Bermuda buttercup	12	5
2	<i>Pennisetum clandestinum</i>	Kikuyu grass	13	9
2	<i>Roldana petasitis</i>	velvet groundsel	0	0
2	<i>Rosa rubiginosa</i>	sweetbriar rose	4	3
2	<i>Rubus armeniacus</i>	Himalayan blackberry	32	17
2	<i>Salsola soda</i>	oppositeleaf Russian thistle	3	1
2	<i>Solanum aviculare</i>	New Zealand nightshade	1	1
2	<i>Sparaxis tricolor hybrid</i>	harlequin flower	5	2
3	<i>Arrhenatherum elatius</i>	tall oatgrass	0	0
3	<i>Brassica rapa</i>	field mustard	0	0
3	<i>Carpobrotus edulis</i>	iceplant	7	7
3	<i>Coprosma repens</i>	creeping mirrorplant	5	2
3	<i>Cortaderia jubata</i>	jubata grass	44	23
3	<i>Cotoneaster franchetii</i>	orange cotoneaster	5	3
3	<i>Cotoneaster lacteus</i>	milkflower cotoneaster	6	5
3	<i>Cotoneaster pannosus</i>	silverleaf cotoneaster	25	17
3	<i>Ehrharta erecta</i>	panic veldt grass	27	12
3	<i>Erigeron karvinskianus</i>	Latin American fleabane	1	1
3	<i>Foeniculum vulgare</i>	sweet fennel	39	20
3	<i>Genista monspessulana</i>	French broom	28	19
3	<i>Gunnera tinctoria</i>	Chilean gunnera	0	0
3	<i>Lathyrus latifolius</i>	everlasting pea	32	16
3	<i>Ligustrum ovalifolium</i>	California privet	1	1
3	<i>Linaria vulgaris</i>	butter and eggs	0	0
3	<i>Lonicera japonica</i>	Japanese honeysuckle	0	0
3	<i>Parietaria judaica</i>	spreading pellitory	3	2
3	<i>Phalaris aquatica</i>	Harding grass	48	19
3	<i>Pinus radiata</i>	Monterey pine	14	8
3	<i>Schinus molle</i>	pepper tree	0	0
3	<i>Tamarix chinensis</i>	saltcedar	0	0
3	<i>Xanthium spinosum</i>	spiny cocklebur	0	0
3	<i>Xanthium strumarium</i>	rough cocklebur	0	0

PORE

Search Effort

One-hundred and twenty one miles of trails and roadsides were surveyed during the 2013 field season at PORE, including GOGA property managed by PORE. A total of 48 subwatersheds were surveyed (39 subwatersheds belonging to PORE and 9 that belong to GOGA but are managed by PORE). In total, 7 people spent 298 hours to complete these surveys, 114 of those hours were contributed by 5 volunteers, 2 of whom were interns who worked part time for the Weed Watchers program at both GOGA and PORE for 6 months.

Species Found

In 2013, 310 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 6). One hundred and eighteen of these occurrences were List 1 species, 80 were List 2 species, and 112 were List 3 species. The 310 individual occurrences of target weed species that were recorded during the PORE surveys were represented by 61 plant species.

One new non-native species was found during the 2013 early detection surveys that had not previously been documented on the PORE full list of vascular plants (NPSpecies 2013b). Appendix F contains documentation for all species observed during early detection surveys from 2008-2013, that were new additions to the PORE full list of vascular plants.

Table 6. PORE 2013 survey results. New occurrences and number of subwatersheds with target species present.

PORE 2013 list	Scientific name	Common name	Number of new occurrences	Number of sub- watersheds
1	<i>Acroptilon repens</i>	Russian knapweed	0	0
1	<i>Aegilops triuncialis</i>	barbed goatgrass	0	0
1	<i>Ageratina adenophora</i>	thoroughwort	0	0
1	<i>Albizia lophantha</i>	silk tree	0	0
1	<i>Alisma lanceolatum</i>	lanceleaf water plantain	0	0
1	<i>Anthoxanthum odoratum</i>	sweet vernalgrass	4	3
1	<i>Arundo donax</i>	giant reed	0	0
1	<i>Brachypodium distachyon</i>	purple false brome	5	4
1	<i>Carduus acanthoides</i>	plumeless thistle	0	0
1	<i>Carex pendula</i>	hanging sedge	0	0
1	<i>Carthamus lanatus</i>	woolly distaff thistle	4	1
1	<i>Centaurea calcitrapa</i>	purple starthistle	0	0
1	<i>Centaurea iberica</i>	Iberian star thistle	0	0
1	<i>Centaurea melitensis</i>	toçalote	4	3
1	<i>Centaurea solstitialis</i>	yellow starthistle	0	0
1	<i>Conicosia pugioniformis</i>	narrow-leaved iceplant	1	1

Table 6. PORE 2013 survey results. New occurrences and number of subwatersheds with target species present (continued).

PORE 2013 list	Scientific name	Common name	Number of new occurrences	Number of sub- watersheds
1	<i>Cotoneaster franchetii</i>	orange cotoneaster	0	0
1	<i>Cotoneaster pannosus</i>	silverleaf cotoneaster	5	5
1	<i>Dittrichia graveolens</i>	stinkweed	0	0
1	<i>Egeria densa</i>	Brazilian waterweed	0	0
1	<i>Ehrharta calycina</i>	perennial veldt grass	0	0
1	<i>Euphorbia oblongata</i>	oblong spurge	3	1
1	<i>Helichrysum petiolare</i>	licorice plant	0	0
1	<i>Hypericum grandifolium</i>	Largeleaf St. Johnswort	0	0
1	<i>Hypericum perforatum</i>	Klamathweed	0	0
1	<i>Iris pseudacorus</i>	yellow flag iris	2	1
1	<i>Lepidium latifolium</i>	perennial pepperweed	0	0
1	<i>Limonium ramosissimum</i>	Algerian sea lavender	0	0
1	<i>Ludwigia hexapetala</i>	six-petal water-primrose	1	1
1	<i>Ludwigia peploides</i> ssp. <i>montevedensis</i>	floating water primrose	0	0
1	<i>Marrubium vulgare</i>	horehound	0	0
1	<i>Myriophyllum aquaticum</i>	parrot's-feather	3	3
1	<i>Phalaris arundinacea</i>	reed canary grass	3	1
1	<i>Robinia pseudoacacia</i>	black locust	0	0
1	<i>Romulea rosea</i> var. <i>australis</i>	rosy sandcrocus	44	8
1	<i>Rytidosperma penicillatum</i>	hairy wallaby grass	31	11
1	<i>Salsola soda</i>	oppositeleaf Russian thistle	0	0
1	<i>Senecio jacobaea</i>	tansy ragwort	0	0
1	<i>Spartina alterniflora</i>	Smooth cordgrass	0	0
1	<i>Trifolium angustifolium</i>	narrowleaf clover	8	3
1	<i>Ulex europaeus</i>	gorse	0	0
2	<i>Acacia melanoxylon</i>	blackwood acacia	1	1
2	<i>Arctotheca calendula</i>	fertile capeweed	2	2
2	<i>Arctotheca prostrata</i>	creeping capeweed	1	1
2	<i>Berberis darwinii</i>	Darwin's berberis	0	0
2	<i>Cakile edentula</i>	European searocket	0	0
2	<i>Cytisus scoparius</i>	Scotch broom	4	2
2	<i>Datura stramonium</i>	jimsonweed	0	0
2	<i>Delairea odorata</i>	cape ivy	2	2
2	<i>Echium candicans</i>	pride of Madeira	0	0
2	<i>Genista monspessulana</i>	French broom	6	3
2	<i>Glyceria declinata</i>	waxy mannagrass	0	0

Table 6. PORE 2013 survey results. New occurrences and number of subwatersheds with target species present (continued).

PORE 2013 list	Scientific name	Common name	Number of new occurrences	Number of sub- watersheds
2	<i>Hedera helix</i>	English ivy	13	10
2	<i>Ilex aquifolium</i>	English holly	0	0
2	<i>Lathyrus latifolius</i>	everlasting pea	16	10
2	<i>Leucanthemum vulgare</i>	oxeye daisy	8	4
2	<i>Linaria vulgaris</i>	butter and eggs	0	0
2	<i>Maytenus boaria</i>	Chilean mayten	0	0
2	<i>Oxalis pes-caprae</i>	Bermuda buttercup	5	1
2	<i>Paspalum dilatatum</i>	dallis grass	5	4
2	<i>Pennisetum clandestinum</i>	Kikuyu grass	6	6
2	<i>Pittosporum undulatum</i>	Victorian box	4	1
2	<i>Rubus armeniacus</i>	Himalayan blackberry	0	0
2	<i>Tetragonia tetragonioides</i>	New Zealand spinach	2	2
2	<i>Vinca major</i>	periwinkle	5	3
2	<i>Xanthium spinosum</i>	spiny cocklebur	0	0
3	<i>Acacia longifolia</i>	Sydney golden wattle	0	0
3	<i>Acacia verticillata</i>	prickly Moses	0	0
3	<i>Allium triquetrum</i>	Three corner leek	1	1
3	<i>Ammophila arenaria</i>	European beachgrass	0	0
3	<i>Carpobrotus chilensis</i>	sea fig	0	0
3	<i>Carpobrotus edulis</i>	iceplant	10	6
3	<i>Cestrum parqui</i>	chilean jessamine	0	0
3	<i>Conium maculatum</i>	poison hemlock	11	8
3	<i>Cortaderia jubata</i>	jubata grass	3	3
3	<i>Cortaderia selloana</i>	Uruguayan pampas grass	1	1
3	<i>Cotoneaster lacteus</i>	milkflower cotoneaster	1	1
3	<i>Crataegus monogyna</i>	singleseed hawthorn	0	0
3	<i>Cupressus macrocarpa</i>	Monterey cypress	0	0
3	<i>Cynodon dactylon</i>	Bermuda grass	3	3
3	<i>Digitalis purpurea</i>	purple foxglove	9	6
3	<i>Dipsacus fullonum</i>	Fuller's teasel	1	1
3	<i>Dipsacus sativus</i>	Indian teasel	0	0
3	<i>Drosanthemum floribundum</i>	showy dewflower	0	0
3	<i>Echium plantagineum</i>	salvation jane	0	0
3	<i>Ehrharta erecta</i>	panic veldt grass	13	6
3	<i>Eucalyptus globulus</i>	bluegum eucalyptus	0	0
3	<i>Euphorbia lathyris</i>	gopher plant	6	2

Table 6. PORE 2013 survey results. New occurrences and number of subwatersheds with target species present (continued).

PORE 2013 list	Scientific name	Common name	Number of new occurrences	Number of sub- watersheds
3	<i>Festuca arundinacea</i>	tall fescue	10	5
3	<i>Foeniculum vulgare</i>	sweet fennel	8	7
3	<i>Hypericum calycinum</i>	Aaron's beard	2	2
3	<i>Lythrum hyssopifolia</i>	hyssop loosestrife	0	0
3	<i>Mentha pulegium</i>	pennyroyal	8	5
3	<i>Myoporum laetum</i>	myoporum	0	0
3	<i>Phalaris aquatica</i>	Harding grass	13	8
3	<i>Pinus radiata</i>	Monterey pine	0	0
3	<i>Populus alba</i>	white poplar	0	0
3	<i>Pyracantha angustifolia</i>	narrowleaf firethorn	0	0
3	<i>Rosa eglanteria</i>	sweetbriar rose	0	0
3	<i>Scabiosa atropurpurea</i>	mourningbride	0	0
3	<i>Sorghum halepense</i>	Johnson grass	0	0
3	<i>Sparaxis tricolor</i>	harlequin flower	10	3
3	<i>Tanacetum parthenium</i>	feverfew	0	0
3	<i>Verbascum blattaria</i>	moth mullein	0	0
3	<i>Watsonia meriana</i>	bulbil bugle-lily	0	0
3	<i>Zantedeschia aethiopica</i>	calla lily	2	2

PINN

Search Effort

Fifty miles of trails, fencelines, and drainages were surveyed during the 2013 field season at PINN. In total, six people spent 182 hours conducting surveys; 127 of these hours were contributed by three I&M interns, 2 who worked primarily for the EDT at GOGA and PORE and 1 who worked primarily at PINN for the EDT and Habitat Restoration Crew.

Species Found

In 2013, 243 occurrences of target weed species were recorded in PINN during early detection surveys and entered into the PINN GeoWeed database. Twelve of these occurrences were List 1 species, 105 were List 2 species, and 126 were List 3 species (Table 7). The 243 individual occurrences of target weed species that were recorded during the PINN surveys were represented by 21 plant species.

Six new non-native species were found during the 2013 early detection surveys that were not previously documented on the PINN full list of vascular plants (NPSpecies 2013c). Appendix F contains documentation for species observed during early detection surveys from 2010-2013, that were new additions to the PINN full list of vascular plants.

Table 7. PINN 2013 survey results. New occurrences and number of subwatersheds with target species present.

PINN 2013 list	Scientific name	Common name	Number of new occurrences	Number of sub- watersheds
1	<i>Acroptilon repens</i>	Russian knapweed	0	0
1	<i>Ailanthus altissima</i>	tree-of-heaven	0	0
1	<i>Arundo donax</i>	giant reed	0	0
1	<i>Bromus tectorum</i>	cheatgrass	9	1
1	<i>Chenopodium ambrosioides</i>	Mexican tea	0	0
1	<i>Cnicus benedictus</i>	blessed thistle	0	0
1	<i>Dittrichia graveolens</i>	stinkweed	0	0
1	<i>Iris pseudacorus</i>	yellow flag iris	0	0
1	<i>Lepidium latifolium</i>	perennial pepperweed	0	0
1	<i>Lolium multiflorum</i>	Italian ryegrass	0	0
1	<i>Lolium perenne</i>	perennial ryegrass	0	0
1	<i>Lolium temulentum</i>	darnel	0	0
1	<i>Malva parviflora</i>	cheeseweed	0	0
1	<i>Melilotus alba</i>	white sweetclover	0	0
1	<i>Nicotiana glauca</i>	tree tobacco	0	0
1	<i>Picris echioides</i>	bristly oxtongue	0	0
1	<i>Piptatherum miliaceum</i>	smilo grass	0	0
1	<i>Poa bulbosa</i>	bulbous bluegrass	0	0
1	<i>Rubus armeniacus</i>	Himalayan blackberry	0	0

Table 7. PINN 2013 survey results. New occurrences and number of subwatersheds with target species present (continued).

PINN 2013 list	Scientific name	Common name	Number of new occurrences	Number of sub- watersheds
1	<i>Salsola tragus</i>	oppositeleaf Russian thistle	1	1
1	<i>Taeniatherum caput-medusae</i>	Medusahead	0	0
1	<i>Tamarix ramosissima</i>	saltcedar	0	0
1	<i>Tragopogon dubius</i>	yellow salsify	1	1
1	<i>Tribulus terrestris</i>	puncturevine	0	0
1	<i>Trifolium hirtum</i>	rose clover	1	1
1	<i>Verbascum blattaria</i>	moth mullein	0	0
1	<i>Verbascum thapsus</i>	woolly mullein	0	0
1	<i>Xanthium spinosum</i>	spiny cocklebur	0	0
2	<i>Carduus pycnocephalus</i>	Italian thistle	20	4
2	<i>Carduus tenuiflorus</i>	slender-flowered thistle	1	1
2	<i>Centaurea solstitialis</i>	yellow starthistle	33	4
2	<i>Conium maculatum</i>	poison hemlock	5	3
2	<i>Cotula coronopifolia</i>	brassbuttons	0	0
2	<i>Crypsis schoenoides</i>	swamp prickly grass	0	0
2	<i>Cynodon dactylon</i>	Bermudagrass	0	0
2	<i>Cyperus difformis</i>	variable flatsedge	0	0
2	<i>Dactylis glomerata</i>	orchard grass	1	1
2	<i>Marrubium vulgare</i>	horehound	40	3
2	<i>Phalaris aquatica</i>	Harding grass	4	1
2	<i>Schismus arabica</i>	Arabian schismus	0	0
2	<i>Veronica persica</i>	birdseye speedwell	0	0
2	<i>Vinca major</i>	periwinkle	1	1
3	<i>Amaranthus albus</i>	tumbleweed	0	0
3	<i>Brassica nigra</i>	black mustard	0	0
3	<i>Brassica rapa</i>	field mustard	0	0
3	<i>Centaurea melitensis</i>	toocalote	28	8
3	<i>Cirsium vulgare</i>	bull thistle	8	2
3	<i>Hirschfeldia incana</i>	shortpod mustard	40	12
3	<i>Lactuca serriola</i>	prickly lettuce	5	4
3	<i>Mentha spicata</i> var. <i>spicata</i>	spearmint	1	1
3	<i>Mentha X piperita</i>	peppermint	0	0
3	<i>Plantago lanceolata</i>	English plantain	1	1
3	<i>Polygonum aviculare</i> ssp. <i>arenastrum</i>	oval-leaf knotweed	3	2
3	<i>Raphanus sativus</i>	wild radish	0	0
3	<i>Rumex acetosella</i>	sheep sorrel	0	0
3	<i>Rumex crispus</i>	curly dock	32	8
3	<i>Silybum marianum</i>	blessed milkthistle	8	2

JOMU

Search Effort

Six miles of trails in the Mount Wanda section of JOMU were surveyed during the 2013 field season. In total, 6 people spent 36 hours conducting surveys, 30 of which were volunteer hours. Three of the volunteers were I&M interns who worked for the Weed Watchers program and two of the volunteers were interns for the JOMU Natural Resources Division.

Species Found

In 2013, 11 individual occurrences of target weed species were recorded in JOMU during early detection surveys and entered into the JOMU GeoWeed database. Two of these occurrences were List 1 species, 6 occurrences were List 2 species, and 3 occurrences were List 3 species. The 11 individual occurrences of target weeds that were recorded during the JOMU surveys were represented by 7 plant species (Table 8).

Table 8. JOMU 2013 survey results. New occurrences of target species at Mount Wanda.

JOMU 2013 list	Scientific name	Common name	Number of new occurrences
1	<i>Acroptilon repens</i>	Russian knapweed	0
1	<i>Aegilops triuncialis</i>	barbed goatgrass	0
1	<i>Arundo donax</i>	giant reed	0
1	<i>Calendula arvensis</i>	field marigold	0
1	<i>Cardaria draba</i>	Whitetop	0
1	<i>Carthamus baeticus</i>	Smooth distaff thistle	0
1	<i>Centaurea calcitrapa</i>	Purple star thistle	0
1	<i>Centaurea melitensis</i>	Napa star thistle	0
1	<i>Cynara cardunculus</i>	cardoon	0
1	<i>Cytisus striatus</i>	striated broom	0
1	<i>Dittrichia graveolens</i>	stinkwort	0
1	<i>Ehrharta erecta</i>	panic veldt grass	0
1	<i>Eucalyptus globulus</i>	Bluegum eucalyptus	0
1	<i>Euphorbia oblongata</i>	oblong spurge	0
1	<i>Ficus carica</i>	common fig	0
1	<i>Genista monspessulana</i>	French broom	0
1	<i>Geranium robertianum</i>	Robert geranium	0
1	<i>Lepidium latifolium</i>	perennial pepperweed	2
1	<i>Lythrum salicaria</i>	purple loosestrife	0
1	<i>Nicotiana glauca</i>	tree tobacco	0
1	<i>Oxalis pes-caprae</i>	sourgrass	0
1	<i>Schinus molle</i>	Peruvian peppertree	0
1	<i>Sesbania punicea</i>	rattlebox	0
1	<i>Tamarix parviflora</i>	Fourstamen tamarisk	0
2	<i>Bellardia trixago</i>	Mediterranean lineseed	0

Table 8. JOMU 2013 survey results. New occurrences of target species at Mount Wanda (continued).

JOMU 2013 list	Scientific name	Common name	Number of new occurrences
2	<i>Brachypodium distachyon</i>	False brome	0
2	<i>Centaurea solstitialis</i>	yellow star thistle	
2	<i>Cestrum parqui</i>	Chilean jessamine	0
2	<i>Cirsium vulgare</i>	bull thistle	2
2	<i>Conium maculatum</i>	poison hemlock	2
2	<i>Cotoneaster lacteus</i>	milkflower cotoneaster	0
2	<i>Cotoneaster pannosus</i>	silverleaf cotoneaster	0
2	<i>Cynodon dactylon</i>	Bermudagrass	0
2	<i>Dactylis glomerata</i>	orchard grass	0
2	<i>Foeniculum vulgare</i>	sweet fennel	0
2	<i>Hirschfeldia incana</i>	shortpod mustard	1
2	<i>Olea europaea</i>	olive	1
2	<i>Phalaris aquatica</i>	Harding grass	0
2	<i>Piptatherum miliaceum</i>	smilo grass	0
2	<i>Rubus discolor</i>	Himalayan blackberry	0
2	<i>Tribulus terrestris</i>	puncturevine	0
3	<i>Ailanthus altissima</i>	tree-of-heaven	0
3	<i>Brassica nigra</i>	black mustard	0
3	<i>Carduus pycnocephalus</i>	Italian thistle	0
3	<i>Convolvulus arvensis</i>	field bindweed	0
3	<i>Lathyrus latifolius</i>	everlasting pea	0
3	<i>Ligustrum lucidum</i>	glossy privet	0
3	<i>Ligustrum ovalifolium</i>	California privet	0
3	<i>Marrubium vulgare</i>	horehound	0
3	<i>Picris echioides</i>	Bristly oxtongue	0
3	<i>Prunus cerasifera</i>	cherry plum	2
3	<i>Robinia pseudoacacia</i>	black locust	0
3	<i>Silybum marianum</i>	blessed milkthistle	1
3	<i>Vinca major</i>	periwinkle	0

Discussion

Species Occurrences

The occurrence data from 2013 and years past reveal that collectively, invasive species are widespread throughout the park units of the SFAN. As of 2013, all roads and trails in the SFAN parks have been surveyed at least once. Sufficient data has been gathered to reach targets identified in the monitoring protocol for trends analysis in areas that had multi-year surveys (high priority subwatersheds in GOGA and PORE) and to analyze data for environmental correlations with species occurrences. In 2014, the SFAN I&M Program plans to initiate the first five-year program review of early detection data.

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 2013, 14 plant taxa were discovered during early detection surveys that were new records for the SFAN parks (NPSpecies 2013a, b, c). Since 2010 SFAN I&M early detection surveys have recorded 76 taxonomic additions to the vascular plant lists of SFAN parks (NPSpecies 2013a–d). Appendices F–I contain documentation for all new taxa observed during early detection surveys from 2010–2013.

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, I&M created the SFNPS Early Detection user group on the Calflora website (www.calflora.org/entry/onegroup.html?gid=51). Using the 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 uploaded to the Calflora database, and edited online with the Weed Observation Entry application. Species identifications are confirmed by the early detection

coordinator, and then published for public access. Any group member can see all the unpublished and published records in the group. The SFNPS Early Detection user group is an effective communication tool, allowing the EDT to efficiently confirm the location and identity of plant species from a wide variety of reporters, and to distribute this information to the appropriate land managers within and outside of the parks. The EDT 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.

The Weed Watchers webpage was completely redesigned, and moved to the San Francisco Bay Area National Parks Science and Learning website (www.sfnps.org/weed_watchers). Web pages were maintained to provide support to Weed Watcher participants. 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 our volunteer program are featured on the web pages, as well as the Early Detection News monthly reports and links to the SFNPS Early Detection user group and illustrated lists of target species on the Calflora.org website.

To communicate findings to a wider audience, I&M staff presented a talk entitled “Application of data from the Invasive Species Early Detection Program: San Francisco Bay Area Inventory and Monitoring Program” at the San Francisco Bay Area Network Science Symposium at Fort Mason, San Francisco in April of 2013.

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 the Weed Watcher program in 2013 to implement rapid response treatment for many of the infestations that were mapped by the Weed Watchers. 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 2013 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 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 for rapid response removal work. The interns improved communication between the programs at GOGA and made sure priority species mapped during early detection surveys were being removed.

In 2013 I&M hosted two student interns through the GGNPC Advanced Youth Internship program. This program funds summertime internships for exceptional student-volunteers. The interns assisted with early detection surveys and data entry.

SFAN I&M supported an intern, who was stationed at PINN from March to September, 2013. In addition to providing support for pilot amphibian monitoring efforts and assistance to the falcons Vital Sign program, he shared his time between early detection surveys and the Habitat Restoration Crew, serving as a liaison between the two programs. The 2013 PINN intern facilitated completion of the first survey cycle of roads, trails, fencelines and major drainages. With the help of the resource and maintenance staff at PINN, high-priority areas were surveyed for weeds and the results were reported to Park Botanist, Brent Johnson.

At JOMU, surveys were conducted with the assistance of park interns 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 Cal-IPC. In 2013, I&M staff provided technical support to BAEDN and Cal-IPC to develop invasive species eradication targets for the San Mateo coast. I&M also continued consultations with California State Parks staff to support the development of a State Parks early detection protocol.

Literature Cited

- Adams, D., S. Allen, J. Bjork, M. Coopridge, A. Fesnock, M. Koenen, T. Leatherman, S. O'Neil, D. Press, D. Schirokauer, B. Welch, and B. Witcher. 2006. San Francisco Bay Area Network Vital Signs Monitoring Plan. NPS/SFAN/NRR 2006/017. National Park Service, Fort Collins, Colorado.
- Baldwin, B. G., D. H. Goldman, D. J. Keil, R. Patterson, T. J. Rosatti, and D. H. Wilken (eds). 2012. The Jepson manual: Vascular plants of California, second edition. University of California Press, Berkeley, California.
- California Invasive Plant Council [Cal-IPC]. 2006. California invasive plant inventory. Cal-IPC Publication 2006-02. California Invasive Plant Council, Berkeley, California.
- California Invasive Plant Council [Cal-IPC]. 2012. California invasive plant council watchlist. Available at <http://www.cal-ipc.org/ip/management/alerts> (accessed 17 December 2012).
- McNeely, J. A., H. A. Mooney, L. E. Neville, P. J. Schei, and J. K. Waage (eds). 2001. Global strategy on invasive alien species. IUCN. Available at <http://www.iucn.org/> (accessed 31 August 2006).
- National Park Service [NPS]. 2004. Rare plant monitoring report. Unpublished Report. Golden Gate National Recreation Area, Ft. Cronkhite, California.
- NPSpecies. 2013a. Golden Gate National Recreation Area (GOGA) Park Species List – Category: Vascular Plants. Available at <http://irma.nps.gov/NPSpecies/Search/SpeciesList/GOGA> (accessed 20 December 2013).
- NPSpecies. 2013b. Point Reyes National Seashore (PORE) Park Species List – Category: Vascular Plants. Available at <http://irma.nps.gov/NPSpecies/Search/SpeciesList/PORE> (accessed 20 December 2013).
- NPSpecies. 2013c. Pinnacles National Park (PINN) Park Species List – Category: Vascular Plants. Available at <http://irma.nps.gov/NPSpecies/Search/SpeciesList/PINN> (accessed 20 December 2013).
- Scott, J. M., and D. S. Wilcove. 1998. Improving the future for endangered species. *Bioscience* 48:579-80.
- Steers, R., E. Wrubel, A. Williams, N. Howe, J. Jordan-Rogers. 2011. Invasive plant species early detection in the San Francisco Bay Area Network: 2010 annual report. Natural Resource Report NPS/PWR/SFAN/NRTR—2011/494. National Park Service, Fort Collins, Colorado.
- Williams, A. E., and E. Speith. 2008. Invasive plant species early detection in the San Francisco Bay Area Network: 2007 annual report. Natural Resource Report NPS/PWR/SFAN/NRTR—2008/135. National Park Service, Fort Collins, Colorado.

- Williams, A. E., S. O'Neil, E. Speith, and J. Rodgers. 2009. Early detection of invasive plant species in the San Francisco Bay Area Network: A volunteer-based approach. Natural Resource Report NPS/SFAN/NRR—2009/136. National Park Service, Fort Collins, Colorado.
- Williams, A. E., and J. Jordan. 2010. Invasive plant species early detection in the San Francisco Bay Area Network: 2008 annual report. Natural Resource Technical Report NPS/SFAN/NRTR—2010/308. National Park Service, Fort Collins, Colorado.
- Williams, A. E., J. J. Rogers, N. Howe, R. J. Steers, and E. C. Wrubel. 2011. Invasive plant species early detection in the San Francisco Bay Area Network: 2009 annual report. Natural Resource Technical Report NPS/SFAN/NRTR—2011/493. National Park Service, Fort Collins, Colorado.
- Wrubel, E. C., and R. J. Steers. 2012. Invasive plant species early detection in the San Francisco Area Network: 2011 annual report. Natural Resource Technical Report NPS/SFAN/NRTR—2012/620. National Park Service, Fort Collins, Colorado.
- Wrubel, E. C., and R. J. Steers. 2013. Invasive plant species early detection in the San Francisco Bay Area Network: 2012 annual report. Natural Resource Technical Report NPS/SFAN/NRTR—2013/797. National Park Service, Fort Collins, Colorado.

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: 2013 list of priority invasive species at GOGA.

Priority	Scientific Name	Common Name	Family	Code
1	<i>Ailanthus altissima</i>	tree-of-heaven	Simaroubaceae	AIAL
1	<i>Albizia lophantha</i>	silk tree	Fabaceae	ALLO
1	<i>Ammophila arenaria</i>	European beachgrass	Poaceae	AMAR4
1	<i>Ammophila breviligulata</i>	American beachgrass	Poaceae	AMBR
1	<i>Anthoxanthum odorata</i>	sweet vernal grass	Poaceae	ANOD
1	<i>Aptenia cordifolia</i>	heartleaf iceplant	Aizoaceae	APCO
1	<i>Arctotheca calendula</i>	fertile capeweed	Asteraceae	ARCA45
1	<i>Arctotheca prostrata</i>	creeping capeweed	Asteraceae	ARPR
1	<i>Arundo donax</i>	giant reed	Poaceae	ARDO4
1	<i>Berberis darwinii</i>	Darwin's berberis	Berberidaceae	BEDA
1	<i>Carduus acanthoides</i>	plumeless thistle	Asteraceae	CAAC
1	<i>Carex pendula</i>	hanging sedge	Cyperaceae	CAPE45
1	<i>Carpobrotus chilensis</i>	sea fig	Aizoaceae	CACH38
1	<i>Carthamus lanatus</i>	woolly distaff thistle	Asteraceae	CALA20
1	<i>Centaurea calcitrapa</i>	purple starthistle	Asteraceae	CECA2
1	<i>Centaurea solstitialis</i>	yellow starthistle	Asteraceae	CESO3
1	<i>Cirsium arvense</i>	Canada thistle	Asteraceae	CIAR4
1	<i>Conicosia pugioniformis</i>	narrow-leaved iceplant	Aizoaceae	COPU18
1	<i>Cortaderia selloana</i>	pampas grass	Poaceae	COSE4
1	<i>Crataegus monogyna</i>	singleseed hawthorn	Rosaceae	CRMO
1	<i>Cynara cardunculus</i>	cardoon	Asteraceae	CYCA
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>Dittrichia graveolens</i>	stinkweed	Asteraceae	DIGR3
1	<i>Drosanthemum floribundum</i>	showy dewflower	Aizoaceae	DRFL2
1	<i>Echium plantagineum</i>	salvation jane	Boraginaceae	ECPL
1	<i>Ehrharta calycina</i>	perennial veldt grass	Poaceae	EHCA
1	<i>Eichhornia crassipes</i>	water hyacinth	Pontederiaceae	EICR
1	<i>Euphorbia oblongata</i>	oblong spurge	Euphorbiaceae	EUOB4
1	<i>Hedera canariensis</i>	Algerian ivy	Araliaceae	HECA
1	<i>Helichrysum petiolare</i>	licorice plant	Asteraceae	HEPE8
1	<i>Hypericum grandifolium</i>	largeleaf St. Johnswort	Clusiaceae	HYGR6
1	<i>Hypericum perforatum</i>	Klamathweed	Clusiaceae	HYPE
1	<i>Ilex aquifolium</i>	English holly	Aquifoliaceae	ILAQ80
1	<i>Lepidium latifolium</i>	perennial pepperweed	Brassicaceae	LELA2
1	<i>Limonium ramosissimum</i>	Algerian sea lavender	Plumbaginaceae	LIRA2
1	<i>Ludwigia hexapetala</i>	six-petal water primrose	Onagraceae	LUGRH
1	<i>Ludwigia peploides</i> ssp. <i>montevidensis</i>	floating water primrose	Onagraceae	LUPEM

Priority	Scientific Name	Common Name	Family	Code
1	<i>Maytenus boaria</i>	Chilean mayten	Celastraceae	MABO8
1	<i>Mesembryanthemum crystallinum</i>	ice plant	Aizoaceae	MECR3
1	<i>Myriophyllum aquaticum</i>	parrot's-feather	Haloragaceae	MYAQ2
1	<i>Myriophyllum spicatum</i>	Eurasian watermilfoil	Haloragaceae	MYSP2
1	<i>Nicotiana glauca</i>	tree tobacco	Solanaceae	NIGL
1	<i>Phalaris arundinacea</i>	reed canary grass	Poaceae	PHAR3
1	<i>Pittosporum crassifolium</i>	stiffleaf cheesewood	Pittosporaceae	PICR
1	<i>Pyracantha angustifolia</i>	narrowleaf firethorn	Rosaceae	PYAN
1	<i>Rhamnus alaternus</i>	Italian buckthorn	Rhamnaceae	RHAL12
1	<i>Robinia pseudoacacia</i>	black locust	Fabaceae	ROPS
1	<i>Romulea rosea</i> var. <i>australis</i>	rosy sandcrocus	Iridaceae	ROROA
1	<i>Rytidosperma caespitosum</i>	common wallaby grass	Poaceae	RYCA
1	<i>Rytidosperma penicillatum</i>	hairy wallaby grass	Poaceae	RYPE
1	<i>Scabiosa atropurpurea</i>	mourningbride	Dipsacaceae	SCAT
1	<i>Spartina alterniflora</i>	smooth cordgrass	Poaceae	SPAL
1	<i>Spartium junceum</i>	Spanish broom	Fabaceae	SPJU2
1	<i>Stipa manicata</i>	Andean tussockgrass	Poaceae	NAMA7
1	<i>Trifolium angustifolium</i>	narrowleaf clover	Fabaceae	TRAN6
1	<i>Ulex europaeus</i>	gorse	Fabaceae	ULEU
1	<i>Vinca major</i>	periwinkle	Apocynaceae	VIMA
2	<i>Acacia melanoxydon</i>	blackwood acacia	Fabaceae	ACME
2	<i>Ageratina adenophora</i>	thoroughwort	Asteraceae	AGAD2
2	<i>Agrostis avenacea</i>	Pacific bentgrass	Poaceae	AGAV
2	<i>Bromus madritensis</i> ssp. <i>rubens</i>	red brome	Poaceae	BRMAR
2	<i>Bromus tectorum</i>	cheat grass	Poaceae	BRTE
2	<i>Buddleja davidii</i>	butterfly bush	Scrophulariaceae	BUDA2
2	<i>Calendula arvensis</i>	field marigold	Asteraceae	CAAR
2	<i>Centaurea melitensis</i>	totalote	Asteraceae	CEME2
2	<i>Cestrum parqui</i>	orange jessamine	Solanaceae	CEPA9
2	<i>Cynodon dactylon</i>	Bermudagrass	Poaceae	CYDA
2	<i>Dactylis glomerata</i>	orchard grass	Poaceae	DAGL
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>Festuca arundinacea</i>	tall fescue	Poaceae	FEAR3
2	<i>Geranium purpureum</i>	herb robert	Geraniaceae	GEROP
2	<i>Geranium robertianum</i>	Robert geranium	Geraniaceae	GERO
2	<i>Glyceria declinata</i>	waxy mannagrass	Poaceae	GLDE
2	<i>Hedera helix</i>	English ivy	Araliaceae	HEHE
2	<i>Iris pseudacorus</i>	yellow flag iris	Iridaceae	IRPS

Priority	Scientific Name	Common Name	Family	Code
2	<i>Leptospermum laevigatum</i>	Australian teatree	Myrtaceae	LELA29
2	<i>Leucanthemum vulgare</i>	oxeye daisy	Asteraceae	LEVU
2	<i>Ligustrum lucidum</i>	glossy privet	Oleaceae	LILU2
2	<i>Mentha pulegium</i>	pennyroyal	Lamiaceae	MEPU
2	<i>Mercurialis annua</i>	annual mercury	Rubiaceae	MEAN
2	<i>Oxalis pes-caprae</i>	Bermuda buttercup	Oxalidaceae	OXPE
2	<i>Pennisetum clandestinum</i>	Kikuyu grass	Poaceae	PECL2
2	<i>Roldana Petasitis</i>	velvet groundsel	Asteraceae	ROPE6
2	<i>Rosa rubiginosa</i>	sweetbriar rose	Rosaceae	ROEG
2	<i>Rubus armeniacus</i>	Himalayan blackberry	Rosaceae	RUDI2
2	<i>Salsola soda</i>	oppositeleaf Russian thistle	Chenopoiaceae	SASO3
2	<i>Solanum laciniatum</i>	New Zealand nightshade	Solanaceae	SOAV
2	<i>Sparaxis tricolor hybrid</i>	Harlequin flower	Iridaceae	SPTR
3	<i>Arrhenatherum elatius</i>	tall oatgrass	Poaceae	AREL3
3	<i>Brassica rapa</i>	field mustard	Brassicaceae	BRRA
3	<i>Carpobrotus edulis</i>	iceplant	Aizoaceae	CAED3
3	<i>Coprosma repens</i>	creeping mirrorplant	Rubiaceae	CORE4
3	<i>Cortaderia jubata</i>	jubata grass	Poaceae	COJU2
3	<i>Cotoneaster franchetii</i>	orange cotoneaster	Rosaceae	COFR3
3	<i>Cotoneaster lacteus</i>	milkflower cotoneaster	Rosaceae	COLA18
3	<i>Cotoneaster pannosus</i>	silverleaf cotoneaster	Rosaceae	COPA14
3	<i>Ehrharta erecta</i>	panic veldt grass	Poaceae	EHHER
3	<i>Erigeron karvinskianus</i>	Latin American fleabane	Asteraceae	ERKA2
3	<i>Foeniculum vulgare</i>	sweet fennel	Apiaceae	FOVU
3	<i>Genista monspessulana</i>	French broom	Fabaceae	GEMO2
3	<i>Gunnera tinctoria</i>	Chilean gunnera	Gunneraceae	GUTI
3	<i>Lathyrus latifolius</i>	everlasting pea	Fabaceae	LALA4
3	<i>Ligustrum ovalifolium</i>	California privet	Oleaceae	LIOV
3	<i>Linaria vulgaris</i>	butter and eggs	Scrophulariaceae	LIVU2
3	<i>Lonicera japonica</i>	Japanese honeysuckle	Caprifoliaceae	LOJA
3	<i>Parietaria judaica</i>	spreading pellitory	Urticaceae	PAJU
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
3	<i>Xanthium strumarium</i>	rough cocklebur	Asteraceae	XAST

Appendix B: 2013 List of priority invasive species at PORE.

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>Ageratina adenophora</i>	thoroughwort	Asteraceae	AGAD2
1	<i>Albizia lophantha</i>	silk tree	Fabaceae	ALLO
1	<i>Alisma lanceolatum</i>	lanceleaf water plantain	Alismataceae	ALLA2
1	<i>Anthoxanthum odoratum</i>	sweet vernalgrass	Poaceae	ANOD
1	<i>Arundo donax</i>	giant reed	Poaceae	ARDO4
1	<i>Brachypodium distachyon</i>	purple false brome	Poaceae	BRDI2
1	<i>Carduus acanthoides</i>	plumeless thistle	Asteraceae	CAAC
1	<i>Carex pendula</i>	hanging sedge	Cyperaceae	CAPE45
1	<i>Carthamus lanatus</i>	woolly distaff thistle	Asteraceae	CALA20
1	<i>Centaurea calcitrapa</i>	purple starthistle	Asteraceae	CECA2
1	<i>Centaurea iberica</i>	Iberian starthistle	Asteraceae	CEIB
1	<i>Centaurea melitensis</i>	toçalote	Asteraceae	CEME2
1	<i>Centaurea solstitialis</i>	yellow starthistle	Asteraceae	CESO3
1	<i>Conicosia pugioniformis</i>	narrow-leaved iceplant	Aizoaceae	COPU18
1	<i>Cotoneaster franchetii</i>	orange cotoneaster	Roseaceae	COFR3
1	<i>Cotoneaster pannosus</i>	silverleaf cotoneaster	Roseaceae	COPA14
1	<i>Dittrichia graveolens</i>	stinkweed	Asteraceae	DIGR3
1	<i>Egeria densa</i>	Brazilian waterweed	Hydrocharitaceae	EGDE
1	<i>Ehrharta calycina</i>	perennial veldt grass	Poaceae	EHCA
1	<i>Euphorbia oblongata</i>	oblong spurge	Euphorbiaceae	EUOB4
1	<i>Helichrysum petiolare</i>	licorice plant	Asteraceae	HEPE8
1	<i>Hypericum grandifolium</i>	largeleaf St. Johnswort	Clusiaceae	HYGR6
1	<i>Hypericum perforatum</i>	Klamathweed	Hypericaceae	HYPE
1	<i>Iris pseudacorus</i>	yellow flag iris	Iridaceae	IRPS
1	<i>Lepidium latifolium</i>	perennial pepperweed	Brassicaceae	LELA2
1	<i>Limonium ramosissimum</i>	Algerian sea lavender	Plumbaginaceae	LIRA2
1	<i>Ludwigia hexapetala</i>	six-petal water primrose	Onagraceae	LUHE5
1	<i>Ludwigia peploides</i> ssp. <i>montevedensis</i>	floating water primrose	Onagraceae	LUPEM
1	<i>Marrubium vulgare</i>	horehound	Lamiaceae	MAVU
1	<i>Myriophyllum aquaticum</i>	parrot's-feather	Haloragaceae	MYAQ2
1	<i>Phalaris arundinacea</i>	reed canary grass	Poaceae	PHAR3
1	<i>Robinia pseudoacacia</i>	black locust	Fabaceae	ROPS
1	<i>Romulea rosea</i> var. <i>australis</i>	rosy sandcrocus	Iridaceae	ROROA
1	<i>Rytidosperma penicillatum</i>	hairy wallaby grass	Poaceae	RYPE
1	<i>Salsola soda</i>	oppositeleaf Russian thistle	Chenopodiaceae	SASO3
1	<i>Senecio jacobaea</i>	tansy ragwort	Asteraceae	SEJA
1	<i>Spartina alterniflora</i>	Smooth cordgrass	Poaceae	SPAL

Priority	Scientific Name	Common Name	Family	Code
1	<i>Trifolium angustifolium</i>	narrowleaf clover	Fabaceae	TRAN6
1	<i>Ulex europaeus</i>	gorse	Fabaceae	ULEU
2	<i>Acacia melanoxylon</i>	blackwood acacia	Fabaceae	ACME
2	<i>Arctotheca calendula</i>	fertile capeweed	Asteraceae	ARCA45
2	<i>Arctotheca prostrata</i>	creeping capeweed	Asteraceae	ARCA
2	<i>Berberis darwinii</i>	Darwin's berberis	Berberidaceae	BEDA
2	<i>Cakile edentula</i>	European searocket	Brassicaceae	CAED
2	<i>Cystisus scoparius</i>	Scotch broom	Fabaceae	CYSC4
2	<i>Datura stramonium</i>	jimsonweed	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>Glyceria declinata</i>	waxy mannagrass	Poaceae	GLDE
2	<i>Hedera helix</i>	English ivy	Araliaceae	HEHE
2	<i>Ilex aquifolium</i>	English holly	Aquifoliaceae	ILAQ80
2	<i>Lathyrus latifolius</i>	everlasting pea	Fabaceae	LALA4
2	<i>Leucanthemum vulgare</i>	oxeye daisy	Asteraceae	LEVU
2	<i>Linaria vulgaris</i>	butter and eggs	Scrophulariaceae	LIVU2
	<i>Maytenus boaria</i>	Chilean mayten	Celastraceae	MABO8
2	<i>Oxalis pes-caprae</i>	Bermuda buttercup	Oxalidaceae	OXPE
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 tetragonoides</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>Allium triquetrum</i>	threecorner leek	Liliaceae	ALTR4
3	<i>Ammophila arenaria</i>	European beachgrass	Poaceae	AMAR4
3	<i>Carpobrotus chilensis</i>	sea fig	Aizoaceae	CACH38
3	<i>Carpobrotus edulis</i>	iceplant	Aizoaceae	CAED3
3	<i>Cestrum parqui</i>	chilean jessamine	Solanaceae	CEPA
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

Priority	Scientific Name	Common Name	Family	Code
3	<i>Dipsacus fullonum</i>	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	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>Sparaxis tricolor</i>	harlequin flower	Iridaceae	SPTR
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

Appendix C: 2013 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
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

Priority	Scientific Name	Common Name	Family	Code
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>	tochalote	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 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: 2013 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	EHET
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>	perennial 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
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

Priority	Scientific Name	Common Name	Family	Code
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. Maps showing 2013 survey results.

Available online at:

<http://www.calflora.org/entry/onegroup.html?gid=51>

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)	Nativeness (Marin Co.)	Voucher
2008	<i>Cotoneaster lacteus</i> W.W. Sm.	Rosaceae	Andrea Williams, I&M	widespread	non-native	Yes
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	No
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>Elymus ponticus</i> (Podp.) N. Snow	Poaceae	Eric Wrubel, I&M	McCullough Road	non-native	No
2011	<i>Erigeron sumatrensis</i> Retz.	Asteraceae	Eric Wrubel, I&M	Marin Headlands, Marine Mammal Center	non-native	Yes?
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	Yes
2011	<i>Kickxia elatine</i> (L.) Dumort.	Plantaginaceae	Eric Wrubel, I&M	Marin Headlands, Alexander Avenue	non-native	No
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	Yes
2011	<i>Mercurialis annua</i> L.	Euphorbiaceae	Eric Wrubel, I&M	Sweeney Ridge	non-native	No
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	Yes
2011	<i>Rytidosperma caespitosum</i> (Gaudich.) Connor & Edgar	Poaceae	Eric Wrubel, I&M	Sweeney Ridge	non-native	Yes
2011	<i>Soleirolia soleirolia</i> (Req.) Dandy	Urticaceae	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	non-native	Yes

Year	Scientific name	Family	Reporter	Location(s)	Nativenes s (Marin Co.)	Voucher
				Housing		
2011	<i>Teucrium fruticans</i> L.	Lamiaceae	Eric Wrubel, I&M	Marin Headlands, Battery Townesley	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	Yes
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	No
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	native	No
2012	<i>Coreopsis tinctoria</i> Nutt.	Asteraceae	Eric Wrubel, I&M	Marin Headlands; Hwy 1 at Green Gulch	non-native	Yes
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	No
2012	<i>Geranium robertianum</i> L.	Geraniaceae	Eric Wrubel, I&M	Muir Woods, entrance	non-native	Yes
2012	<i>Geranium rotundifolium</i> L.	Geraniaceae	Eric Wrubel, I&M	Marin Headlands, Conzelman at Alexander Ave.	non-native	Yes
2012	<i>Glyceria declinata</i> Brébiss.	Poaceae	Dan Glusenkamp, BAEDN	Muir Beach, equipment staging area		Yes
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	Yes

Year	Scientific name	Family	Reporter	Location(s)	Nativeness (Marin Co.)	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	No
2012	<i>Prunus caroliniana</i> Ait.	Rosaceae	Eric Wrubel, I&M	above Marin City	non-native	Yes
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	Yes
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	No
2013	<i>Prunella vulgaris</i> L. var. <i>vulgaris</i>	Lamiaceae	Eric Wrubel	Lagunitas Creek	non-native	Yes
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	Yes

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)	Nativeness (Marin Co.)	Voucher
2008	<i>Cotoneaster lacteus</i> W.W. Sm.	Rosaceae	Melissa Potter, I&M	Numerous	non-native	No
2011	<i>Glyceria declinata</i> Bréb.	Poaceae	Eric Wrubel, I&M	Mount Vision Road	non-native	Yes
2011	<i>Kickxia elatine</i> (L.) Dumort.	Plantaginaceae	Eric Wrubel, I&M	Limantour Road	non-native	No
2011	<i>Prunus caroliniana</i> Ait.	Rosaceae	Eric Wrubel, I&M	Limantour Road	non-native	Yes
2011	<i>Trifolium angustifolium</i> L.	Fabaceae	Eric Wrubel, I&M	Highway 1, Sir Francis Drake Blvd., Mount Vision Road	non-native	No
2012	<i>Elymus ponticus</i> (Podp.) N. Snow	Poaceae	Eric Wrubel, I&M	Bear Valley Headquarters	non-native	Yes
2012	<i>Phalaris elongata</i> Braun-Blanq.	Poaceae	Eric Wrubel, I&M	Limantour Beach	non-native	Yes
2013	<i>Tragopogon porrifolius</i> L.	Asteraceae	Christine Davis, I&M	Bear Valley Headquarters	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)	Nativeness (California)	Voucher
2012	<i>Agrostis avenacea</i> J.F. Gmel.	Poaceae	Eric Wrubel, I&M	West entrance. Revegetation site.	non-native	Yes
2012	<i>Alopecurus pratensis</i> L.	Poaceae	Eric Wrubel, I&M	McCabe Canyon.	non-native	Yes
2012	<i>Bromus catharticus</i> var. <i>catharticus</i>	Poaceae	Eric Wrubel, I&M	Campground. Swimming pool area.	non-native	Yes
2012	<i>Bromus tectorum</i> L.	Poaceae	Robert Steers, I&M	Balconies trail. Condor Gulch Trail.	non-native	Yes
2012	<i>Crepis vesicaria</i> L. ssp. <i>taraxacifolia</i> (Thuill.) Thell.	Asteraceae	Eric Wrubel, I&M	Campground. Group camp sites.	non-native	Yes
2012	<i>Dactylis glomerata</i>	Poaceae	Eric Wrubel, I&M	McCabe Canyon.	non-native	No
2012	<i>Lathyrus jepsonii</i> var. <i>californicus</i>	Fabaceae	Eric Wrubel, I&M	North Fork Chalone Tr; South Wilderness Tr.	native	Yes
2012	<i>Phalaris aquatica</i>	Poaceae	Eric Wrubel, I&M	Campground. By gate to fire road at site 18.	non-native	No
2012	<i>Phalaris paradoxa</i>	Poaceae	Eric Wrubel, I&M	West entrance. Revegetation site.	non-native	No
2012	<i>Schismus arabicus</i>	Poaceae	Eric Wrubel, I&M	Campground. Bottomland Roads.	non-native	No
2012	<i>Sisymbrium altissimum</i>	Brassicaceae	Eric Wrubel, I&M	Highway 146, Bottomlands	non-native	No
2013	<i>Atriplex suberecta</i>	Chenopodiaceae	Sean Zweifler, I&M	Unverified	native	No
2013	<i>Carex densa</i>	Cyperaceae	Eric Wrubel, I&M	McCabe Canyon	native	Yes
2013	<i>Carex globosa</i>	Cyperaceae	Eric Wrubel, I&M	Bear Gulch	native	Yes
2013	<i>Carex schottii</i>	Cyperaceae	Eric Wrubel, I&M	McCabe Canyon	native	Yes
2013	<i>Oxalis corniculata</i>	Oxalidaceae	Sean Zweifler, I&M	Highway 146	non-native	No
2013	<i>Rumex conglomeratus</i>	Polygonaceae	Sean Zweifler, I&M	Unverified	non-native	No
2013	<i>Sorghum halepense</i>	Poaceae	Sean Zweifler, I&M	Highway 146	non-native	No
2013	<i>Verbena bracteata</i>	Verbenaceae	Sean Zweifler, I&M	Unverified	native	No

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)	Nativeness (California)	Voucher
2010	<i>Dittrichia graveolens</i>	Asteraceae	Eric Wrubel, I&M	Mount Wanda Trailhead	non-native	Yes
2011	<i>Lepidium latifolium</i>	Brassicaceae	Eric Wrubel, I&M	Strentzel Creek		Photo
2011	<i>Ehrharta erecta</i>	Poaceae	Eric Wrubel, I&M	Strentzel Creek		No

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.

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.

NPS 114/127954, 426/127954, 612/127954, 641/127954, February 2015

National Park Service
U.S. Department of the Interior



Natural Resource Stewardship and Science

1201 Oakridge Drive, Suite 150
Fort Collins, CO 80525

www.nature.nps.gov

EXPERIENCE YOUR AMERICA™