



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

2018 Annual Report

Natural Resource Data Series NPS/NCCN/NRDS—2019/1211



ON THE COVER

Biological science technician Sarah Inman maps invasive tree of heaven (*Ailanthus altissima*) along Lagunitas Creek. Golden Gate National Recreation Area, North District. Photograph by Eric Wrubel, NPS.

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

2018 Annual Report

Natural Resource Data Series NPS/NCCN/NRDS—2019/1211

Eric Wrubel

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

March

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 intended for the timely release of basic data sets and data summaries. Care has been taken to assure accuracy of raw data values, but a thorough analysis and interpretation of the data has not been completed. Consequently, the initial analyses of data in this report are provisional and subject to change.

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

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

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](#) and the [Natural Resource Publications Management website](#). If you have difficulty accessing information in this publication, particularly if using assistive technology, please email irma@nps.gov.

Please cite this publication as:

Wrubel, E. 2019. Invasive plant species early detection in the San Francisco Bay Area Network: 2018 annual report. Natural Resource Data Series NPS/NCCN/NRDS—2019/1211. National Park Service, Fort Collins, Colorado.

Contents

	Page
Figures.....	v
Tables.....	v
Executive Summary	vi
Acknowledgments.....	vii
Introduction.....	1
Background.....	1
Objectives	1
Methods.....	2
Species List Revisions	2
Prioritization	4
Revisit Schedules.....	5
Field Methods.....	5
Results.....	7
PORE.....	7
Search Effort.....	7
Species Detected.....	7
Maps	9
PINN.....	11
Search Effort.....	11
Species Detected.....	11
Maps	11
JOMU	13
Search Effort.....	13
Species Detected.....	13
Maps	13
Season highlights	15

Contents (continued)

	Page
Communication	15
Collaboration	15
Literature Cited	17
Glossary	19
Appendix A: 2018 lists of priority invasive species in SFAN parks.	20
Appendix B: New species recorded in SFAN parks during early detection surveys.	29

Figures

	Page
Figure 1. Map of target invasive plant species recorded at PORE during 2018 early detection surveys, showing point locations of priority 1 and priority 2 species.	10
Figure 2. Map of PINN belt transect monitoring results from 2015-2018.....	12
Figure 3. Map of target invasive plant species recorded at JOMU during 2018 early detection surveys, showing point locations of priority 1 and priority 2 species.	14

Tables

	Page
Table 1. Revisions to the GOGA priority species list for 2018.	2
Table 2. Revisions to the PORE priority species list for 2018.	3
Table 3. Revisions to the PINN priority species list for 2018.	4
Table 4. Revisions to the JOMU priority species list for 2018.	4
Table 5. Tiered levels of data collection.	6
Table 7. PORE 2018 survey results. Total new occurrences of priority species.....	7
Table 8. PINN 2018 survey results. Total occurrences of priority species in belt transects.	11
Table 9. JOMU 2018 survey results. Total new occurrences of priority species.	13

Executive Summary

This report summarizes the results of the 2018 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 2018 early detection surveys were conducted in John Muir National Historic Site (JOMU), Pinnacles National Monument (PINN), and Point Reyes National Seashore (PORE). Objectives and methods for the 2018 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, 2018 was the ninth field season of data collection in PINN, and the tenth in PORE and JOMU. Surveys were not conducted at GOGA in 2018, per the revised survey schedule for PORE and GOGA.

At PORE, 225 miles of trails and roadsides were surveyed and 979 occurrences of target weed species were recorded. At PINN, 16 miles of trails and roadsides were surveyed and 129 occurrences of target weed species were recorded. Five miles of trails were surveyed at JOMU, and 42 occurrences of target weed species were recorded. No invasive plant species were detected in SFAN parks in 2018 that had not been detected in prior years.

Data were collected on mobile devices and stored in the Calflora database using the Weed Manager system. Mapped invasive plant occurrences, assessments and treatments may be viewed online using interactive web maps on Calflora.

Collaborative efforts with staff at JOMU, PINN, PORE, Golden Gate National Parks Conservancy, and external agencies continued to facilitate communication of findings and to broaden the early detection network.

Acknowledgments

Many contributors provided critical assistance. Thanks to D. George, and S. Wakamiya for providing valuable comments on this manuscript or previous year's reports; M. Alvarez and the Habitat Restoration Team at GOGA; E. Hamingson and the Habitat Restoration Program at PORE; A. Ryan and the vegetation management team at PINN; F. Villalba and the vegetation management team at JOMU; B. Simpson of the California Exotic Plant Management Team; the Golden Gate National Parks Conservancy and the Tamalpais Lands Collaborative. Finally, this work would not have been possible without the hard work and dedication of the early detection field crew – biological science technician Sarah Inman, and intern Steven Cognac.

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 combined with 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 Invasive Plant Species Early Detection protocol (ISED) 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 species 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. Appendix A contains the 2018 priority exotic species lists for each park unit.

Objectives

Objectives for the 2018 field season were based on the early detection protocol (Williams et al. 2009), 2015 revisions (Wrubel and Floreani Buzbee 2017) and current management priorities:

- 1) Survey all roads and trails in PORE, 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 SFAN 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) Contribute new species to park unit NPSpecies vascular plant lists.
- 6) Survey select roads and trails, for priority species at PINN, utilizing standard survey methods and pilot belt transect methods.
- 7) Survey all trails in the Mt Wanda section of JOMU.

Methods

Methodology follows the SFAN early detection of invasive plant species protocol (Williams et al. 2009), revised in 2015 (Wrubel and Floreani Buzbee 2017). The following section briefly describes sampling methods, scheduling, data management, and data collection detailed in the protocol.

Species List Revisions

The 2018 priority lists for each park were revised in response to concerns of resource management staff based on results of the 2017 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. The species list revisions for 2018 are presented below. The full 2018 Priority 1 and 2 species lists for each park are included in Appendix A. Discoveries of species new to SFAN parks are documented in Appendix B.

To increase survey efficiency or mapping precision, the ranks of eight species on the GOGA priority list were changed (Table 1), and the ranks of nine species on the PORE priority list were changed (Table 2), based on improved distribution information gleaned from previous survey cycles. One new species was added to the PINN priority list (Table 3). Two new species were added to the JOMU priority list (Table 4).

Table 1. Revisions to the GOGA priority species list for 2018.

Scientific Name	Common Name	2017 List	2018 List	Justification
<i>Ammophila breviligulata</i>	American beachgrass	1	4	Not known to be invasive in California. Only several locations reported.
<i>Brachypodium distachyon</i>	purple false brome	4	3	Concern that this species is spreading
<i>Carpobrotus chilensis</i>	sea fig	1	3	Not as invasive, and similar in ecology to congener <i>C. edulis</i> , a List 3 species.
<i>Fallopia japonica</i>	Japanese knotweed	2	1	Highly invasive. Only one known location in park, mapped as priority 1. Need good assessments of extent for any new patches discovered.
<i>Festuca arundinacea</i>	tall fescue	2	3	Widespread in park and thoroughly mapped along roads and trails.

Table 1 (continued). Revisions to the GOGA priority species list for 2018.

Scientific Name	Common Name	2017 List	2018 List	Justification
<i>Glyceria declinata</i>	Waxy manna grass	2	3	Species not widespread in park. Cryptic and difficult for non-experts to detect. Invasive in vernal pools of Central California, but not competitive in seasonal wetlands near the coast.
<i>Hedera canariensis</i>	Algerian ivy	1	2	Equally as invasive and similar in ecology to congener <i>H. helix</i> , a List 2 species.
<i>Rytidosperma penicillatum</i>	Purple awned wallaby grass	1	2	Widespread in park and thoroughly mapped along roads and trails.

Table 2. Revisions to the PORE priority species list for 2018.

Scientific Name	Common Name	2017 List	2018 List	Justification
<i>Fallopia japonica</i>	Japanese knotweed	2	1	Mapped as priority 1 since its discovery at PORE in 2013. Active eradication program underway.
<i>Glyceria declinata</i>	Waxy manna grass	2	3	Species not widespread in park. Cryptic and difficult for non-experts to detect. Invasive in vernal pools of Central California, but not competitive in seasonal wetlands near the coast.
<i>Maytenus boaria</i>	Chilean mayten	2	1	Uncommon adjacent to park. Need good assessments of extent for any new patches discovered.
<i>Pittosporum undulatum</i>	Victorian box	2	1	Not widespread in park, except for extensive invasion at Palomarin. Risk of invasiveness elsewhere. Need better assessment of extent.
<i>Rhamnus alaternus</i>	Italian buckthorn	2	1	Only one location mapped in park. Need good assessments of extent for any new patches discovered.
<i>Rytidosperma penicillatum</i>	purple awned wallaby grass	1	2	Widespread in park and thoroughly mapped along roads and trails.
<i>Scabiosa atropurpurea</i>	mourningbride	3	1	Only known from one location in park. Potential for eradication. Need good assessments of extent for any new patches discovered.

Table 2 (continued). Revisions to the PORE priority species list for 2018.

Scientific Name	Common Name	2017 List	2018 List	Justification
<i>Sorghum halepense</i>	Johnsongrass	3	2	Only known from several locations in park. Potential for eradication. Need good assessments of extent for any new patches discovered.
<i>Tradescantia fluminensis</i>	Small leaf spiderwort	2	1	Only known from one location in park. Potential for eradication. Need good assessments of extent for any new patches discovered.

Table 3. Revisions to the PINN priority species list for 2018.

Scientific Name	Common Name	2017 List	2018 List	Justification
<i>Lepidium draba</i>	whitetop	N/A	1	Discovered in bottomlands by park staff in 2017. Cal-IPC rating: Moderate*, CDFA Noxious Weed List B**.

* California Invasive Plant Council (2012)

** California Department of Food and Agriculture (2016)

Table 4. Revisions to the JOMU priority species list for 2018.

Scientific Name	Common Name	2017 List	2018 List	Justification
<i>Nassella tenuissima</i>	finestem Needlegrass	N/A	1	Discovered in 2017 spreading into park from adjacent landscaping. Species of concern.
<i>Rubus armeniacus</i>	Himalayan blackberry	N/A	1	Mapped as priority 2 since first record on Mt. Wanda in 2015, but not added to list until now. Potentially eradicable. Need good assessments of extent for any new patches discovered.

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 initially 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. In subsequent years, species priority levels were revised as described above under the species list revisions heading.

The use of subwatershed priority levels to inform survey frequency at GOGA and PORE was discontinued prior to the 2015 field season (Wrubel and Floreani Buzbee 2017). Initially, subwatersheds were prioritized based on their risk of invasion and/or harm to significant biological resources, and higher priority subwatersheds were surveyed with greater frequency than lower priority subwatersheds. This approach was discontinued to increase survey efficiency, and enhance interpretability of the data by making the survey effort equal among all subwatersheds. All subwatersheds are now surveyed once within a three year cycle, rather than 1-5 times during a five year cycle depending on priority.

Revisit Schedules

Each subwatershed at GOGA and PORE is surveyed once within a three-year survey cycle (Wrubel and Floreani Buzbee 2017). GOGA and PORE combined have 234 subwatersheds, and approximately 78 subwatersheds will be sampled each year. The third survey cycle at GOGA and PORE began in 2018. For efficiency, all PORE subwatersheds were surveyed in the first year of the survey cycle (2018), and all GOGA subwatersheds will be surveyed in the second and third years of the survey cycle (2019-2020). Therefore, GOGA was not surveyed in 2018, and PORE will not be surveyed in 2019 or 2020.

Baseline surveys at PINN were conducted from 2009 – 2014. All roads, trails, campgrounds, fencelines and major drainages were surveyed at least once by 2013. In 2018 ISED completed a four-year pilot project to survey all roads and trails using a belt transect survey method. Once formalized, we anticipate this survey method may be completed in a 3-4 year survey cycle.

At JOMU, all roads and trails at Mount Wanda have been surveyed annually since 2009.

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.

At GOGA, PORE and JOMU observers recorded location and associated biological information (phenology, habitat, distribution) of priority target plant populations that were encountered along the survey route. 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 5). Data were collected on mobile devices using the Calflora Observer Pro application (<http://www.calflora.org/phone/pro>), and stored in the Calflora Weed Manager system (<http://calflora.org/entry/weed-mgr>).

Target species encountered during surveys were recorded either as *assessments*, or *occurrences*, or by *presence/absence*. An assessment maps the spatial extent, estimated percent cover, number of plants, and phenology of a patch. An occurrence maps a point to indicate the presence of a patch at a specific location. Presence/absence is recorded for target species found within a subwatershed.

Table 5. Tiered levels of data collection.

Priority Levels	Explanation	Data Collected
List 1 (High Priority Plants)	List 1 plants are highly invasive and are typically not widespread. Control or even eradication is often feasible.	Polygon <i>assessments</i> are recorded for all patches, regardless of their size.
List 2 (Medium Priority Plants)	List 2 plants are highly invasive and usually more common than List 1 species. Small, outlier patches may be targeted for eradication or control. Uncommon species of concern are also listed here to improve our understanding of their distribution in the park.	Point <i>occurrences</i> are recorded for all patches, and buffered point <i>assessments</i> are recorded for patches smaller than 100 m ² .
List 3 (Lower Priority Plants)	This category includes all other non-native plants. These may be widespread invasives that are difficult to control at the scale of the park, or less common species that do not cause significant ecological harm.	<i>Presence/absence</i> is recorded by subwatershed. No points or polygons are mapped.

Polygon assessments were mapped for all list 1 species. Point occurrences were mapped for all list 2 species, and buffered point assessments were recorded for list 2 species if the patch size was less than 100 m². To create a buffered point, observers estimated the radius from the center of the patch to the farthest edge. Presence/absence by subwatershed was recorded for all list 3 species. In 2015, ISED discontinued the mapping of point occurrences for List 3 species at GOGA, PORE, and JOMU, but continued recording presence/absence for all List 1, 2, and 3 species (Wrubel and Floreani Buzbee 2017). All previously mapped observations were re-assessed according to the species priority level. New occurrence records were only generated when a new patch was discovered. If a previously mapped patch was observed, it was re-assessed for gross area, cover, and abundance - but was not counted as a new occurrence.

At PINN, ISED completed pilot belt transect monitoring of all roads and trails, which began in 2015. In this method, roads and trails are segmented into 100m transects, and presence or abundance of target species is recorded in each segment, within a distance of 5m from the edge of the road or trail feature. We recorded abundance for List 1 and 2 species observed in each transect, and presence for List 3 species, using Arc Collector (ESRI, Redlands, California) on GPS-enabled tablets to locate the transects and record data. We also mapped polygon assessments in Weed Manager for each population of List 1 species observed.

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 entered into the database or are utilized for data analyses or incorporated into summaries reported herein. A detailed description of standard 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).

Results

Data summaries are presented below for the 2018 survey results from PORE, PINN, and JOMU. No surveys were conducted at GOGA in 2018. Occurrence summaries are based on the priority species lists for each park for the 2018 field season (Appendix A). Species nomenclature follows The Jepson Manual, Second Edition (Baldwin et al. 2012). Appendix B contains documentation for all species observed during early detection surveys from 2008-2018, that were new additions to the full list of vascular plants in each SFAN park. No new non-native species were found during 2018 early detection surveys.

Occurrence, assessment, and treatment data for each park may be viewed in interactive web maps in the Calflora Weed Manager system by following the links provided under each park summary (Calflora 2019). For instructions go to: <http://www.calflora.org/entry/help/observ-help.html>

The surveys were conducted by staff, interns, and volunteers. Participants included the SFAN botanist, the ISED biological science technician, two I&M vegetation ecology interns, two PINN natural resource interns, one JOMU natural resource intern, and two volunteers.

PORE

Search Effort

225 miles of trails and roadsides were surveyed during the 2018 field season at PORE, including the GOGA North District managed by PORE. A total of six people collectively spent 272 person hours to complete these surveys.

Species Detected

ISED recorded 979 occurrences of target weed species at PORE during the 2018 surveys. There were 227 occurrences of List 1 species and 752 occurrences of List 2 species (Table 7).

Table 7. PORE 2018 survey results. Total new occurrences of priority species.

Priority	Scientific name	Common name	Occurrences
1	<i>Aegilops triuncialis</i>	barbed goatgrass	4
1	<i>Ailanthus altissima</i>	tree of heaven	1
1	<i>Anthoxanthum odoratum</i>	sweet vernal grass	29
1	<i>Arundo donax</i>	giant reed	3
1	<i>Brachypodium distachyon</i>	purple false brome	32
1	<i>Carthamus lanatus</i>	woolly distaff thistle	20
1	<i>Centaurea calcitrapa</i>	purple star thistle	2
1	<i>Centaurea melitensis</i>	toocalote	6
1	<i>Centaurea solstitialis</i>	yellow starthistle	2
1	<i>Cotoneaster franchetii</i>	cotoneaster	16
1	<i>Cotoneaster pannosus</i>	woolly cotoneaster	23

Table 7 (continued). PORE 2018 survey results. Total new occurrences of priority species.

Priority	Scientific name	Common name	Occurrences
1	<i>Euphorbia oblongata</i>	eggleaf spurge	8
1	<i>Hypericum grandifolium</i>	malfurada	1
1	<i>Hypericum perforatum</i>	Klamathweed	3
1	<i>Iris pseudacorus</i>	yellow flag iris	3
1	<i>Lepidium latifolium</i>	perennial pepperweed	1
1	<i>Marrubium vulgare</i>	white horehound	2
1	<i>Maytenus boaria</i>	Chilean mayten	6
1	<i>Myriophyllum aquaticum</i>	parrot's feather	6
1	<i>Parentucellia viscosa</i>	yellow parentucellia	1
1	<i>Phalaris arundinacea</i>	reed canarygrass	5
1	<i>Romulea rosea</i> var. <i>australis</i>	rosy sand crocus	30
1	<i>Stipa purpurata</i>	bristly needle grass	4
1	<i>Tradescantia fluminensis</i>	small leaf spiderwort	1
1	<i>Trifolium angustifolium</i>	narrowleaf clover	18
2	<i>Acacia melanoxylon</i>	blackwood acacia	7
2	<i>Ammophila arenaria</i>	European beachgrass	4
2	<i>Arctotheca prostrata</i>	creeping cape weed	15
2	<i>Bromus tectorum</i>	cheatgrass	1
2	<i>Cytisus scoparius</i>	Scotch broom	36
2	<i>Datura stramonium</i>	jimson weed	3
2	<i>Delairea odorata</i>	cape ivy	5
2	<i>Echium candicans</i>	pride of Madeira	2
2	<i>Genista monspessulana</i>	French broom	45
2	<i>Hedera helix</i>	English ivy	117
2	<i>Ilex aquifolium</i>	holly	65
2	<i>Lathyrus latifolius</i>	sweet pea	63
2	<i>Leucanthemum vulgare</i>	oxeye daisy	82
2	<i>Ligustrum lucidum</i>	glossy privet	3
2	<i>Ligustrum vulgare</i>	European privet	4
2	<i>Linaria vulgaris</i>	butter and eggs	2
2	<i>Oxalis pes-caprae</i>	Bermuda buttercup	4
2	<i>Pennisetum clandestinum</i>	Kikuyu grass	12
2	<i>Phalaris elongata</i>	kolea grass	10
2	<i>Pittosporum undulatum</i>	Victorian box	8
2	<i>Rubus armeniacus</i>	Himalayan blackberry	97
2	<i>Rytidosperma penicillatum</i>	purple awned wallaby grass	130

Table 7 (continued). PORE 2018 survey results. Total new occurrences of priority species.

Priority	Scientific name	Common name	Occurrences
2	<i>Solanum aviculare</i>	New Zealand nightshade	3
2	<i>Tetragonia tetragonioides</i>	New Zealand spinach	12
2	<i>Vinca major</i>	vinca	20
2	<i>Xanthium spinosum</i>	spiny cocklebur	2
Total	–	–	979

Maps

The link below provides access to an interactive web map in the Calflora Database Observation Hotline tool, showing the location of occurrences, assessments and treatments mapped by ISED in 2018. (Calflora 2019).

[Calflora Database: 2018 PORE Survey Data](#)

Figure 1 shows point locations of priority 1 and priority 2 species recorded at PORE during the 2018 early detection surveys.

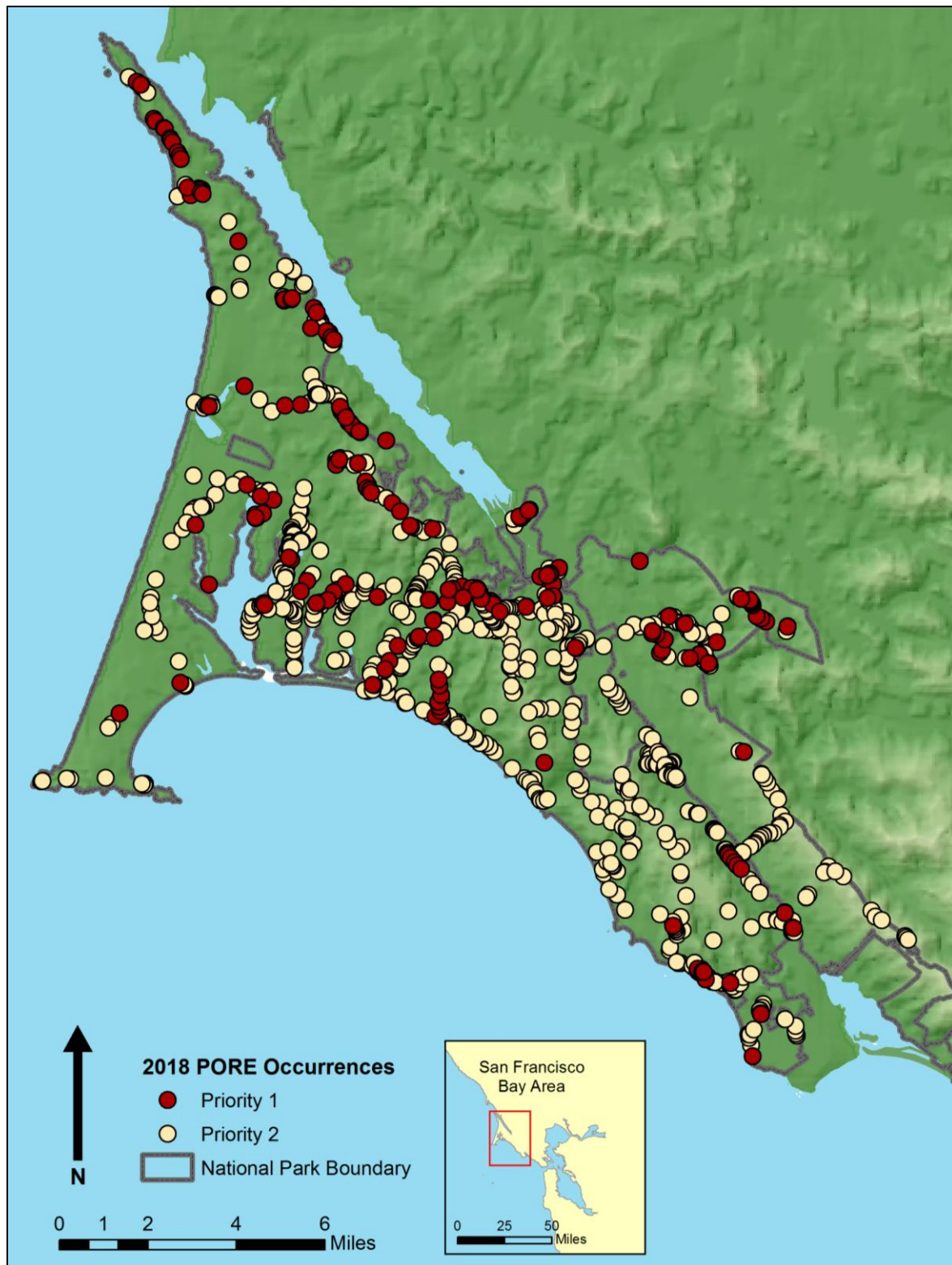


Figure 1. Map of target invasive plant species recorded at PORE during 2018 early detection surveys, showing point locations of priority 1 and priority 2 species.

PINN

Search Effort

ISED surveyed 15.7 miles of trails and roadsides at PINN in 2018, consisting of 253 transects, each 100 meters in length. A total of five people collectively spent 67 person hours to complete these surveys.

Species Detected

In total, 130 occurrences of 13 priority weed species were recorded in the belt transects. Three of these occurrences were List 1 species, 32 were List 2 species, and 95 were List 3 species (Table 8). In addition, three List 1 species populations were mapped and assessed, and entered into Weed Manager.

Table 8. PINN 2018 survey results. Total occurrences of priority species in belt transects.

Priority	Scientific name	Common name	Occurrences
1	<i>Elymus caput-medusae</i>	medusahead	2
1	<i>Malva parviflora</i>	bull mallow	1
2	<i>Carduus pycnocephalus</i>	Italian thistle	3
2	<i>Centaurea solstitialis</i>	yellow starthistle	19
2	<i>Conium maculatum</i>	poison hemlock	1
2	<i>Cynodon dactylon</i>	Bermudagrass	4
2	<i>Marrubium vulgare</i>	horehound	1
2	<i>Schismus arabicus</i>	Arabian schismus	4
3	<i>Centaurea melitensis</i>	toocalote	53
3	<i>Hirschfeldia incana</i>	short podded mustard	21
3	<i>Lactuca serriola</i>	prickly lettuce	13
3	<i>Plantago lanceolata</i>	English plantain	2
3	<i>Rumex crispus</i>	curly dock	6
Total	–	–	130

Maps

The link below provides access to an interactive web map in the Calflora Database Observation Hotline tool, showing the location of occurrences, assessments and treatments mapped by ISED in 2018 (Calflora 2019).

[Calflora Database: 2018 PINN Survey Data](#)

Figure 2 shows the locations of priority 1, 2, and 3 species detected during the first full cycle of belt transect monitoring, conducted from 2015-2018. The priority 3 species, tocalote (*Centaurea melitensis*), was excluded from the map due to its ubiquity and low priority.

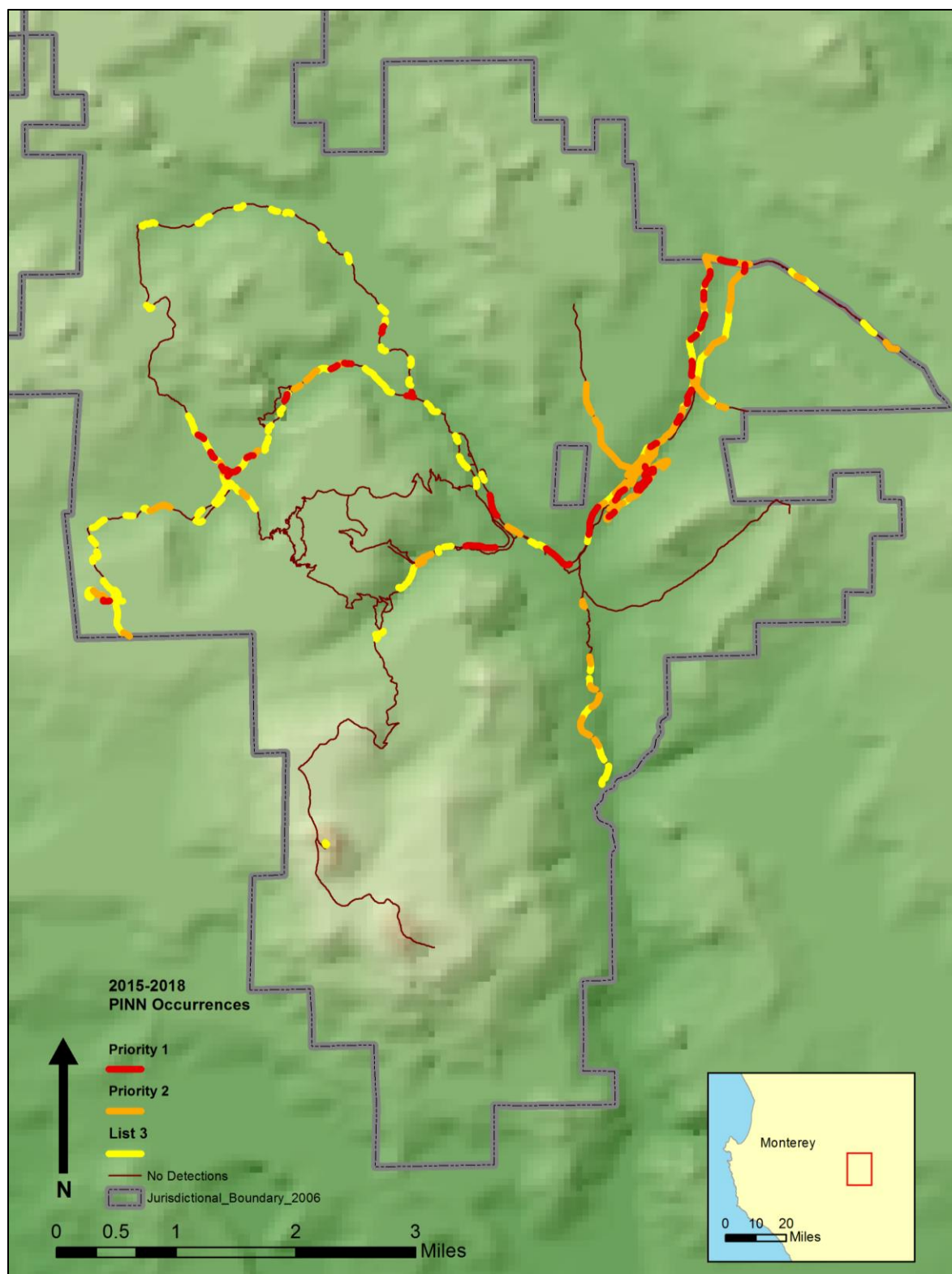


Figure 2. Map of PINN belt transect monitoring results from 2015-2018. Detections of target species by priority level are color coded as follows: priority 1 – red, priority 2 – orange, priority 3 – yellow, and no detection – brown. The priority 3 species, tocalote, was excluded from the map due to its ubiquity.

JOMU

Search Effort

ISED surveyed five miles of trails in the Mount Wanda section of JOMU in 2018. A total of three people collectively spent 32 person hours to complete these surveys.

Species Detected

ISED recorded 42 individual occurrences of target weed species at JOMU during the 2018 surveys (Table 9). Seventeen of these occurrences were List 1 species and 25 occurrences were List 2 species.

Table 9. JOMU 2018 survey results. Total new occurrences of priority species.

Priority	Scientific name	Common name	Occurrences
1	<i>Centaurea melitensis</i>	toocalote	5
1	<i>Dittrichia graveolens</i>	stinkwort	7
1	<i>Euphorbia oblongata</i>	eggleaf spurge	1
1	<i>Lepidium latifolium</i>	perennial pepperweed	4
2	<i>Bellardia trixago</i>	Mediterranean linseed	2
2	<i>Centaurea solstitialis</i>	yellow starthistle	2
2	<i>Cirsium vulgare</i>	bull thistle	1
2	<i>Cotoneaster pannosus</i>	silverleaf cotoneaster	1
2	<i>Hirschfeldia incana</i>	mustard	5
2	<i>Olea europaea</i>	olive	8
2	<i>Phalaris aquatica</i>	Harding grass	4
2	<i>Xanthium spinosum</i>	spiny cocklebur	2
Total	–	–	42

Maps

The link below provides access to an interactive web map in the Calflora Database Observation Hotline tool, showing the location of occurrences, assessments and treatments mapped by ISED in 2018 (Calflora 2019).

[Calflora Database: 2018 JOMU Survey Data](#)

Figure 3 shows point locations of priority 1 and priority 2 species recorded at JOMU during the 2018 early detection surveys.

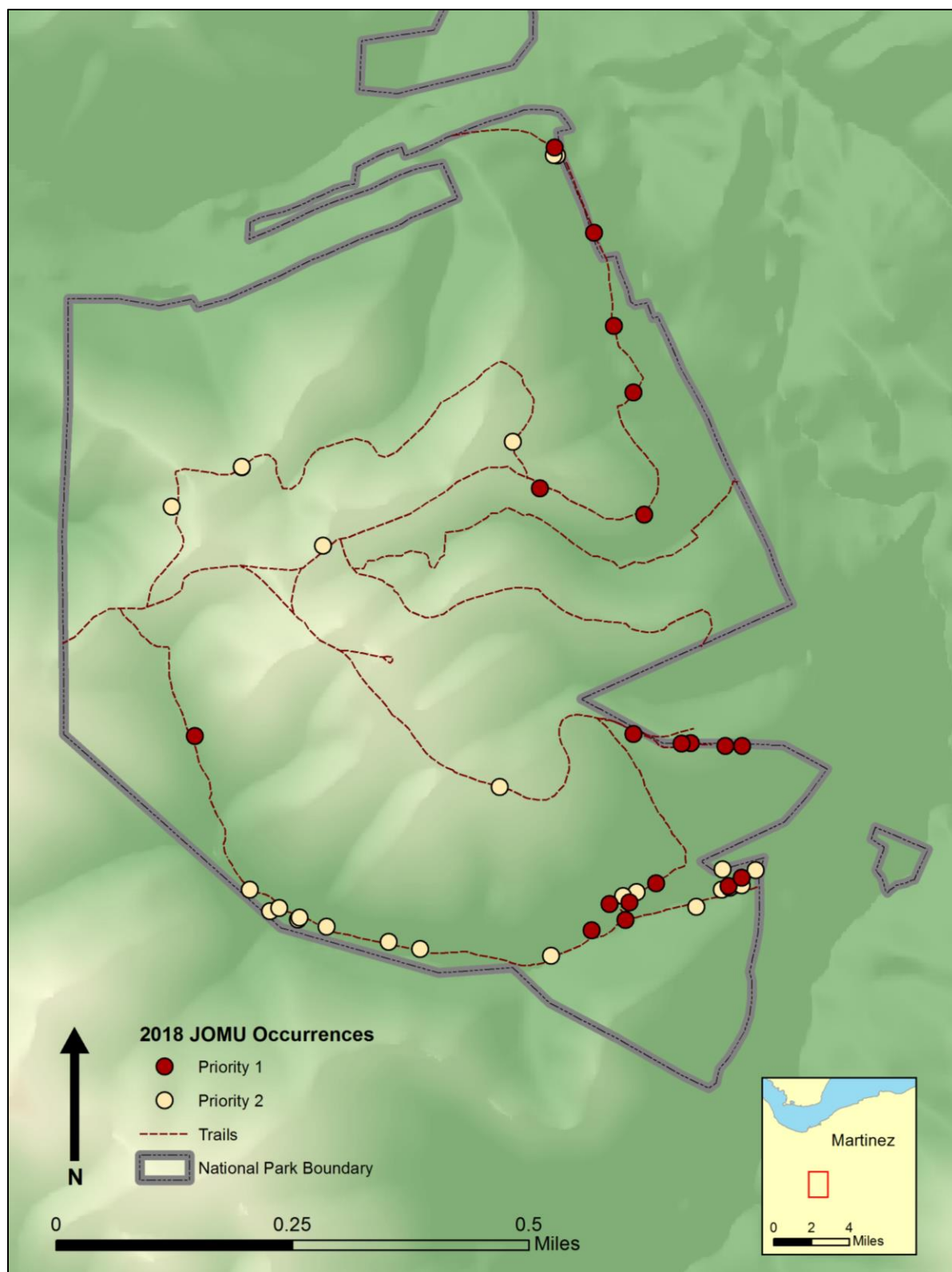


Figure 3. Map of target invasive plant species recorded at JOMU during 2018 early detection surveys, showing point locations of priority 1 and priority 2 species.

Season highlights

Communication

ISED staff maintain multiple lines of communication with SFAN resource managers, park partners, regional, state, and national agencies, non-governmental organizations, and other stakeholders to disseminate and gather information on invasive plant early detection issues. The highest priority early detections are reported immediately via direct communication to responsible park managers. Monthly survey results are reported to all SFAN vegetation staff and partner agencies via “Early Detection News,” an email newsletter.

Collaboration

In 2018 ISED developed a framework to prioritize invasive species for eradication by analyzing all invasive plant spatial data collected at PORE and GOGA to date, then prioritizing the highest risk species present at the lowest abundance in the parks. ISED worked with the Point Reyes Habitat Restoration Program to treat the top ranked species for eradication. Species treated and potentially eradicated at PORE in 2018 included: cheatgrass (*Bromus tectorum*), horehound (*Marrubium vulgare*), hanging sedge (*Carex pendula*), pincushions (*Scabiosa atropurpurea*), barbed goatgrass (*Aegilops triuncialis*), and butter-and-eggs (*Linaria vulgaris*). Species searched for but not found included: Italian buckthorn (*Rhamnus alaternus*), purpletop vervain (*Verbena bonariensis*), thoroughwort (*Ageratina adenophora*). Species under continuing treatment for potential eradication include: Johnsongrass (*Sorghum halepense*), tree of heaven (*Ailanthus altissima*), malfurada (*Hypericum grandifolium*), and giant reed (*Arundo donax*).

In 2018, ISED continued a productive collaboration with One Tam EDRR, the invasive species early detection program of Tamalpais Lands Collaborative. ISED staff participated in a working group with One Tam EDRR, California State Parks, Marin County Open Space District, and Marin Municipal Water District, to coordinate early detection efforts on Marin County public lands, and guide Weed Manager development. One Tam EDRR conducted off-trail surveys in riparian zones in select drainages on Bolinas Ridge to expand early detection surveillance on NPS lands in the One Tam area of interest. The link below provides access to an interactive web map in the Calflora Database Observation Hotline tool, showing the location of occurrences, assessments and treatments mapped by One Tam EDRR in 2018 (Calflora 2019).

<u>Calflora Database: 2018 One Tam EDRR Survey Data</u>
--

ISED provided consultation and field support to the NPS California Exotic Plant Management Team (EPMT) in continued attempts to eradicate invasive Japanese knotweed from Lagunitas Creek; and participated in the Marin Knotweed Action Team, (MKAT), a multi-agency working group dedicated to eliminating Japanese knotweed from Marin County.

ISED provided field support to the PORE Range Program to conduct rangeland surveys for medusahead on Bolinas Ridge and provided field support to the PORE Vegetation Program to conduct shoreline surveys for perennial pepperweed in Tomales Bay.

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.
- Calflora. 2019. Calflora, Observation Hotline Application. Online Mapping Application. Calflora, Berkeley, California. Available at: <https://www.calflora.org/> (accessed 08 March 2019).
- California Invasive Plant Council [Cal-IPC]. 2017. California invasive plant inventory. Available at: www.cal-ipc.org/plants/inventory (accessed 1 February 2018).
- California Department of Food and Agriculture [CDFA]. 2016. Encycloweed: Noxious weed list – Section 4500 Food and Agriculture Code. Available at: www.cdffa.ca.gov/plant/ipc/encycloweed/encycloweed_hp.html (accessed 1 February 2018).
- 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. 2018. Park Species Lists – Category: Vascular Plants. Available at <https://irma.nps.gov/NPSpecies/Search/SpeciesList> (accessed 18 September 2018).
- Scott, J. M., and D. S. Wilcove. 1998. Improving the future for endangered species. *Bioscience* 48:579-80.
- 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.

Wrubel, E., and R. E. Floreani Buzbee. 2017. Invasive plant species early detection in the San Francisco Bay Area Network: 2015 annual report. Natural Resource Data Series NPS/SFAN/NRDS—2017/1123. National Park Service, Fort Collins, Colorado.

Glossary

Assessments: Evaluation of a weed population at an occurrence point over time. Assessments are mapped as polygons with estimates of percent cover and abundance, which may be re-assessed upon each revisit to the population. Each assessment relates to one specific occurrence, while each occurrence can accrue a series of assessments over time. Assessments may 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.

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.

Occurrences: The weed occurrence is the basic unit of mapping and assessing a singular weed or weed population/infestation within Weed Manager. Each occurrence defines the first detection of a weed population 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. Each occurrence is static, but the extent and abundance of the population may be tracked through time by assessments.

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.

Treatment: A treatment is any weed management activity that occurs at a specific time over a defined geographical area. Weed Manager tracks all types of weed control methods and how much staff and/or volunteer time has been spent controlling weeds. Each treatment record is associated with an occurrence record. There may be many treatments records per occurrence record.

Weed: A plant that causes economic losses or ecological damage, creates health problems for humans or animals, or is undesirable where it is growing (Weed Science Society of America). The term “noxious weed” is an official designation for weeds which cause economic harm.

Appendix A: 2018 lists of priority invasive species in SFAN parks.

Table A-1. 2018 list of priority invasive species at GOGA.

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

Table A-1 (continued). 2018 list of priority invasive species at GOGA.

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

Table A-1 (continued). 2018 list of priority invasive species at GOGA.

Priority	Scientific Name	Common Name	Family
2	<i>Acacia melanoxylon</i>	blackwood acacia	Fabaceae
2	<i>Acacia paradoxa</i>	kangaroo Thorn	Fabaceae
2	<i>Ageratina adenophora</i>	thoroughwort	Asteraceae
2	<i>Agrostis avenacea</i>	Pacific bentgrass	Poaceae
2	<i>Bromus madritensis</i> ssp. <i>rubens</i>	red brome	Poaceae
2	<i>Bromus tectorum</i>	cheatgrass	Poaceae
2	<i>Buddleja davidii</i>	butterfly bush	Scrophulariaceae
2	<i>Calendula arvensis</i>	field marigold	Asteraceae
2	<i>Centaurea melitensis</i>	totalote	Asteraceae
2	<i>Cestrum parqui</i>	orange jessamine	Solanaceae
2	<i>Cynodon dactylon</i>	Bermudagrass	Poaceae
2	<i>Dactylis glomerata</i>	orchard grass	Poaceae
2	<i>Datura stramonium</i>	jimsonweed	Solanaceae
2	<i>Delairea odorata</i>	Cape ivy	Asteraceae
2	<i>Dipsacus fullonum</i>	Fuller's teasel	Dipsacaceae
2	<i>Eucalyptus globulus</i>	bluegum eucalyptus	Myrtaceae
2	<i>Fuchsia magellanica</i>	hardy fuchsia	Onagraceae
2	<i>Geranium purpureum</i>	herb Robert	Geraniaceae
2	<i>Geranium robertianum</i>	Robert geranium	Geraniaceae
2	<i>Hedera canariensis</i>	Algerian ivy	Araliaceae
2	<i>Hedera helix</i>	English ivy	Araliaceae
2	<i>Iris pseudacorus</i>	yellow flag iris	Iridaceae
2	<i>Lamium galeobdolon</i>	yellow archangel	Lamiaceae
2	<i>Leptospermum laevigatum</i>	Australian teatree	Myrtaceae
2	<i>Leucanthemum vulgare</i>	oxeye daisy	Asteraceae
2	<i>Ligustrum lucidum</i>	glossy privet	Oleaceae
2	<i>Mentha pulegium</i>	pennyroyal	Lamiaceae
2	<i>Mercurialis annua</i>	annual mercury	Rubiaceae
2	<i>Oxalis pes-caprae</i>	Bermuda buttercup	Oxalidaceae
2	<i>Pennisetum clandestinum</i>	Kikuyu grass	Poaceae
2	<i>Phoenix canariensis</i>	Canary Isl. date palm	Arecaceae
2	<i>Phytolacca americana</i> var. <i>americana</i>	pokeweed	Phytolaccaceae
2	<i>Roldana petasitis</i>	velvet groundsel	Asteraceae
2	<i>Rosa rubiginosa</i>	sweetbriar rose	Rosaceae
2	<i>Rubus armeniacus</i>	Himalayan blackberry	Rosaceae
2	<i>Rytidosperma penicillatum</i>	hairy wallaby grass	Poaceae

Table A-1 (continued). 2018 list of priority invasive species at GOGA.

Priority	Scientific Name	Common Name	Family
2	<i>Salsola soda</i>	oppositeleaf Russian thistle	Chenopoiaceae
2	<i>Solanum aviculare</i>	New Zealand nightshade	Solanaceae
2	<i>Sorghum halepense</i>	Johnson grass	Poaceae
2	<i>Sparaxis tricolor</i>	harlequin flower	Iridaceae
2	<i>Stipa miliacea</i> var. <i>miliacea</i>	smilo grass	Poaceae
2	<i>Tradescantia fluminensis</i>	small leaf spiderwort	Commelinaceae

Table A-2. 2018 list of priority invasive species at PORE.

Priority	Scientific Name	Common Name	Family
1	<i>Acroptilon repens</i>	Russian knapweed	Asteraceae
1	<i>Aegilops triuncialis</i>	barbed goatgrass	Poaceae
1	<i>Ageratina adenophora</i>	thoroughwort	Asteraceae
1	<i>Ailanthus altissima</i>	tree-of-heaven	Simaroubaceae
1	<i>Albizia lophantha</i>	silk tree	Fabaceae
1	<i>Alisma lanceolatum</i>	lanceleaf water plantain	Alismataceae
1	<i>Anthoxanthum odoratum</i>	sweet vernal grass	Poaceae
1	<i>Arundo donax</i>	giant reed	Poaceae
1	<i>Brachypodium distachyon</i>	purple false brome	Poaceae
1	<i>Carduus acanthoides</i>	plumeless thistle	Asteraceae
1	<i>Carex pendula</i>	hanging sedge	Cyperaceae
1	<i>Carthamus lanatus</i>	woolly distaff thistle	Asteraceae
1	<i>Centaurea calcitrapa</i>	purple starthistle	Asteraceae
1	<i>Centaurea iberica</i>	Iberian starthistle	Asteraceae
1	<i>Centaurea melitensis</i>	totalote	Asteraceae
1	<i>Centaurea solstitialis</i>	yellow starthistle	Asteraceae
1	<i>Conicosia pugioniformis</i>	narrow-leaved iceplant	Aizoaceae
1	<i>Cotoneaster franchetii</i>	orange cotoneaster	Rosaceae
1	<i>Cotoneaster pannosus</i>	silverleaf cotoneaster	Rosaceae
1	<i>Dittrichia graveolens</i>	stinkweed	Asteraceae
1	<i>Egeria densa</i>	Brazilian elodea	Hydrocharitaceae
1	<i>Ehrharta calycina</i>	perennial veldt grass	Poaceae
1	<i>Elymus caput-medusae</i>	medusahead	Poaceae
1	<i>Euphorbia oblongata</i>	oblong spurge	Euphorbiaceae
1	<i>Fallopia japonica</i>	Japanese knotweed	Polygonaceae
1	<i>Helichrysum petiolare</i>	licorice plant	Asteraceae

Table A-2 (continued). 2018 list of priority invasive species at PORE.

Priority	Scientific Name	Common Name	Family
1	<i>Hypericum grandifolium</i>	malfurada	Clusiaceae
1	<i>Hypericum perforatum</i>	Klamathweed	Clusiaceae
1	<i>Iris pseudacorus</i>	yellow flag iris	Iridaceae
1	<i>Lepidium latifolium</i>	perennial pepperweed	Brassicaceae
1	<i>Limonium ramosissimum</i>	Algerian sea lavender	Plumbaginaceae
1	<i>Ludwigia hexapetala</i>	six-petal water primrose	Onagraceae
1	<i>Ludwigia peploides</i> ssp. <i>montevidensis</i>	floating water primrose	Onagraceae
1	<i>Marrubium vulgare</i>	horehound	Lamiaceae
1	<i>Maytenus boaria</i>	Chilean mayten	Celastraceae
1	<i>Myriophyllum aquaticum</i>	parrot's-feather	Haloragaceae
1	<i>Myriophyllum spicatum</i>	Eurasian watermilfoil	Haloragaceae
1	<i>Nassella tenuissima</i>	finestem needlegrass	Poaceae
1	<i>Phalaris arundinacea</i>	reed canary grass	Poaceae
1	<i>Pittosporum undulatum</i>	Victorian box	Pittosporaceae
1	<i>Rhamnus alaternus</i>	Italian buckthorn	Rhamnaceae
1	<i>Robinia pseudoacacia</i>	black locust	Fabaceae
1	<i>Romulea rosea</i> var. <i>australis</i>	rosy sandcrocus	Iridaceae
1	<i>Salsola soda</i>	oppositeleaf Russian thistle	Chenopoiaceae
1	<i>Senecio jacobaea</i>	tansy ragwort	Asteraceae
1	<i>Scabiosa atropurpurea</i>	mourningbride	Dipsacaceae
1	<i>Spartina alterniflora</i>	smooth cordgrass	Poaceae
1	<i>Spartium junceum</i>	Spanish broom	Fabaceae
1	<i>Stipa chaetophora</i>	stipoid ricegrass	Poaceae
1	<i>Stipa manicata</i>	Andean tussockgrass	Poaceae
1	<i>Stipa purpurata</i>	bristly needle grass	Poaceae
1	<i>Tradescantia fluminensis</i>	small leaf spiderwort	Commelinaceae
1	<i>Trifolium angustifolium</i>	narrowleaf clover	Fabaceae
1	<i>Ulex europaeus</i>	gorse	Fabaceae
2	<i>Acacia melanoxylon</i>	blackwood acacia	Fabaceae
2	<i>Ammophila arenaria</i>	European beachgrass	Poaceae
2	<i>Arctotheca calendula</i>	fertile capeweed	Asteraceae
2	<i>Arctotheca prostrata</i>	creeping capeweed	Asteraceae
2	<i>Berberis darwinii</i>	Darwin's berberis	Berberidaceae
2	<i>Bromus tectorum</i>	cheatgrass	Poaceae
2	<i>Buddleja davidii</i>	butterfly bush	Scrophulariaceae

Table A-2 (continued). 2018 list of priority invasive species at PORE.

Priority	Scientific Name	Common Name	Family
2	<i>Cakile edentula</i>	European searocket	Brassicaceae
2	<i>Calendula arvensis</i>	field marigold	Asteraceae
2	<i>Cytisus scoparius</i>	Scotch broom	Fabaceae
2	<i>Datura stramonium</i>	jimsonweed	Solanaceae
2	<i>Delairea odorata</i>	cape ivy	Asteraceae
2	<i>Echium candicans</i>	pride of Madeira	Boraginaceae
2	<i>Genista monspessulana</i>	French broom	Fabaceae
2	<i>Geranium purpureum</i>	herb Robert	Geraniaceae
2	<i>Geranium robertianum</i>	Robert geranium	Geraniaceae
2	<i>Hedera helix</i>	English ivy	Araliaceae
2	<i>Ilex aquifolium</i>	English holly	Aquifoliaceae
2	<i>Lamiastrum galeobdolon</i>	yellow archangel	Lamiaceae
2	<i>Lathyrus latifolius</i>	everlasting pea	Fabaceae
2	<i>Leucanthemum vulgare</i>	oxeye daisy	Asteraceae
2	<i>Ligustrum lucidum</i>	glossy privet	Oleaceae
2	<i>Ligustrum vulgare</i>	European privet	Oleaceae
2	<i>Linaria vulgaris</i>	butter and eggs	Scrophulariaceae
2	<i>Oxalis pes-caprae</i>	Bermuda buttercup	Oxalidaceae
2	<i>Paspalum dilatatum</i>	dallis grass	Poaceae
2	<i>Pennisetum clandestinum</i>	Kikuyu grass	Poaceae
2	<i>Phalaris elongata</i>	Kolea grass	Poaceae
2	<i>Phytolacca americana</i> var. <i>americana</i>	pokeweed	Phytolaccaceae
2	<i>Rubus armeniacus</i>	Himalayan blackberry	Rosaceae
2	<i>Rytidosperma penicillatum</i>	hairy wallaby grass	Poaceae
2	<i>Solanum aviculare</i>	New Zealand nightshade	Solanaceae
2	<i>Sorghum halepense</i>	Johnson grass	Poaceae
2	<i>Stipa miliacea</i> var. <i>miliacea</i>	smilo grass	Poaceae
2	<i>Tetragonia tetragonioides</i>	New Zealand-spinach	Aizoaceae
2	<i>Tradescantia fluminensis</i>	small leaf spiderwort	Commelinaceae
2	<i>Verbena bonariensis</i>	purple top vervain	Verbenaceae
2	<i>Vinca major</i>	periwinkle	Apocynaceae
2	<i>Xanthium spinosum</i>	spiny cocklebur	Asteraceae

Table A-3. 2018 list of priority invasive species at PINN.

Priority	Scientific Name	Common Name	Family
1	<i>Acroptilon repens</i>	Russian knapweed	Asteraceae
1	<i>Ailanthus altissima</i>	tree-of-heaven	Simaroubaceae
1	<i>Arundo donax</i>	giant reed	Poaceae
1	<i>Bromus tectorum</i>	cheatgrass	Poaceae
1	<i>Centaurea benedicta</i>	blessed thistle	Asteraceae
1	<i>Dittrichia graveolens</i>	stinkweed	Asteraceae
1	<i>Dysphania ambrosioides</i>	Mexican tea	Chenopodiaceae
1	<i>Elymus caput-medusae</i>	medusahead	Poaceae
1	<i>Festuca arundinacea</i>	tall fescue	Poaceae
1	<i>Festuca perennis</i>	Italian ryegrass	Poaceae
1	<i>Helminthotheca echioides</i>	bristly oxtongue	Asteraceae
1	<i>Iris pseudacorus</i>	yellow flag iris	Iridaceae
1	<i>Lepidium draba</i>	whitetop	
1	<i>Lepidium latifolium</i>	perennial pepperweed	Brassicaceae
1	<i>Malva parviflora</i>	cheeseweed	Malvaceae
1	<i>Melilotus alba</i>	white sweetclover	Fabaceae
1	<i>Nicotiana glauca</i>	tree tobacco	Solanaceae
1	<i>Poa bulbosa</i>	bulbous bluegrass	Poaceae
1	<i>Rubus armeniacus</i>	Himalayan blackberry	Rosaceae
1	<i>Salsola tragus</i>	prickly Russian thistle	Chenopodiaceae
1	<i>Stipa miliacea</i> var. <i>miliacea</i>	smilo grass	Poaceae
1	<i>Tamarix ramosissima</i>	saltcedar	Tamaricaceae
1	<i>Tragopogon dubius</i>	yellow salsify	Asteraceae
1	<i>Tribulus terrestris</i>	puncturevine	Zygophyllaceae
1	<i>Trifolium angustifolium</i>	narrowleaf clover	Fabaceae
1	<i>Trifolium hirtum</i>	rose clover	Fabaceae
1	<i>Verbascum blattaria</i>	moth mullein	Scrophulariaceae
1	<i>Verbascum thapsus</i>	woolly mullein	Scrophulariaceae
1	<i>Xanthium spinosum</i>	spiny cocklebur	Asteraceae
2	<i>Carduus pycnocephalus</i>	Italian thistle	Asteraceae
2	<i>Carduus tenuiflorus</i>	slender-flowered thistle	Asteraceae
2	<i>Centaurea solstitialis</i>	yellow starthistle	Asteraceae
2	<i>Conium maculatum</i>	poison hemlock	Apiaceae
2	<i>Cotula coronopifolia</i>	brassbuttons	Asteraceae
2	<i>Crypsis schoenoides</i>	swamp prickly grass	Poaceae
2	<i>Cynodon dactylon</i>	Bermudagrass	Poaceae

Table A-3 (continued). 2018 list of priority invasive species at PINN.

Priority	Scientific Name	Common Name	Family
2	<i>Cyperus difformis</i>	variable flatsedge	Cyperaceae
2	<i>Dactylis glomerata</i>	orchard grass	Poaceae
2	<i>Festuca temulenta</i>	darnel	Poaceae
2	<i>Marrubium vulgare</i>	horehound	Lamiaceae
2	<i>Phalaris aquatica</i>	Harding grass	Poaceae
2	<i>Schismus arabicus</i>	Arabian schismus	Poaceae
2	<i>Veronica persica</i>	birdseye speedwell	Scrophulariaceae
2	<i>Vinca major</i>	periwinkle	Apocynaceae

Table A-4. 2018 list of priority invasive species at JOMU.

Priority	Scientific Name	Common Name	Family
1	<i>Acroptilon repens</i>	Russian knapweed	Asteraceae
1	<i>Aegilops triuncialis</i>	barbed goatgrass	Poaceae
1	<i>Arundo donax</i>	giant reed	Poaceae
1	<i>Calendula arvensis</i>	field marigold	Asteraceae
1	<i>Cardaria draba</i>	whitetop	Brassicaceae
1	<i>Carthamus baeticus</i>	smooth distaff thistle	Asteraceae
1	<i>Centaurea calcitrapa</i>	purple starthistle	Asteraceae
1	<i>Centaurea melitensis</i>	totalote	Asteraceae
1	<i>Cynara cardunculus</i>	cardoon	Asteraceae
1	<i>Cytisus striatus</i>	Portuguese broom	Fabaceae
1	<i>Dittrichia graveolens</i>	stinkweed	Asteraceae
1	<i>Ehrharta erecta</i>	panic veldt grass	Poaceae
1	<i>Eucalyptus globulus</i>	bluegum eucalyptus	Myrtaceae
1	<i>Euphorbia oblongata</i>	oblong spurge	Euphorbiaceae
1	<i>Ficus carica</i>	common fig	Moraceae
1	<i>Genista monspessulana</i>	French broom	Fabaceae
1	<i>Geranium robertianum</i>	Robert geranium	Geraniaceae
1	<i>Lepidium latifolium</i>	perennial pepperweed	Brassicaceae
1	<i>Lythrum salicaria</i>	purple loosestrife	Lythraceae
1	<i>Nassella tenuissima</i>	finestem needlegrass	Poaceae
1	<i>Nicotiana glauca</i>	tree tobacco	Solanaceae
1	<i>Oxalis pes-caprae</i>	Bermuda buttercup	Oxalidaceae
1	<i>Rubus armeniacus</i>	Himalayan blackberry	Rosaceae
1	<i>Schinus molle</i>	pepper tree	Anacardiaceae

Table A-4 (continued). 2018 list of priority invasive species at JOMU.

Priority	Scientific Name	Common Name	Family
1	<i>Sesbania punicea</i>	rattlebox	Fabaceae
1	<i>Tamarix parviflora</i>	fourstamen tamarisk	Tamaricaceae
2	<i>Bellardia trixago</i>	Mediterranean linseed	Orobanchaceae
2	<i>Brachypodium distachyon</i>	purple false brome	Poaceae
2	<i>Centaurea solstitialis</i>	yellow starthistle	Asteraceae
2	<i>Cestrum parqui</i>	orange jessamine	Solanaceae
2	<i>Cirsium vulgare</i>	bull thistle	Asteraceae
2	<i>Conium maculatum</i>	poison hemlock	Apiaceae
2	<i>Cotoneaster lacteus</i>	milkflower cotoneaster	Rosaceae
2	<i>Cotoneaster pannosus</i>	silverleaf cotoneaster	Rosaceae
2	<i>Cynodon dactylon</i>	Bermudagrass	Poaceae
2	<i>Dactylis glomerata</i>	orchard grass	Poaceae
2	<i>Foeniculum vulgare</i>	sweet fennel	Apiaceae
2	<i>Hirschfeldia incana</i>	short podded mustard	Brassicaceae
2	<i>Olea europaea</i>	European olive	Oleaceae
2	<i>Phalaris aquatica</i>	Harding grass	Poaceae
2	<i>Rubus discolor</i>	Himalayan blackberry	Rosaceae
2	<i>Stipa miliacea</i> var. <i>miliacea</i>	smilo grass	Poaceae
2	<i>Tribulus terrestris</i>	puncturevine	Zygophyllaceae
2	<i>Xanthium spinosum</i>	spiny cocklebur	Asteraceae

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

These following tables list the species were newly recorded in SFAN parks during ISED surveys. Prior to their discovery, they were not recorded on the NPSpecies full vascular plant list for the indicated parks. Reporter indicates person who initially reported presence of the species to I&M staff. Note that in 2018, no new invasive plant species were detected in SFAN parks.

Table B-1. New species recorded at GOGA.

Year	Scientific name	Family	Reporter	Location(s)	Nativity	Evidence
2011	<i>Cotoneaster lacteus</i> W.W. Sm.	Rosaceae	Robert Steers, I&M	widespread	non-native	Voucher
2011	<i>Agrostis avenacea</i> J.F. Gmel.	Poaceae	Eric Wrubel, I&M	Muir Beach; Conzelman Road	non-native	Voucher
2011	<i>Buddleja davidii</i> Franch.	Scrophulariaceae	Eric Wrubel, I&M	Sausalito	non-native	Location coordinates
2011	<i>Crassula multicava</i> Lem.	Crassulaceae	Eric Wrubel, I&M	Marin Headlands, Youth Hostel; Land's End	non-native	Photo
2011	<i>Dittrichia Graveolens</i> (L.) Greuter	Asteraceae	Eric Wrubel, I&M	Marin Headlands, Marine Mammal Center	non-native	Photo
2011	<i>Echinochloa muricata</i> (P. Beauv.) Fernald var. <i>microstachya</i> Wiegand	Poaceae	Eric Wrubel, I&M	Conzelman Road	non-native	Voucher
2011	<i>Elymus ponticus</i> (Podp.) N. Snow	Poaceae	Eric Wrubel, I&M	McCullough Road	non-native	Location coordinates
2011	<i>Erigeron sumatrensis</i> Retz.	Asteraceae	Eric Wrubel, I&M	Marin Headlands, Marine Mammal Center	non-native	Voucher
2011	<i>Heliotropium amplexicaule</i> Vahl	Boraginaceae	Eric Wrubel, I&M	Slide Ranch	non-native	Photo
2011	<i>Iris pseudacorus</i> L.	Iridaceae	Eric Wrubel, I&M	Marin Headlands, Rodeo Lagoon	non-native	Voucher
2011	<i>Kickxia elatine</i> (L.) Dumort.	Plantaginaceae	Eric Wrubel, I&M	Marin Headlands, Alexander Avenue	non-native	Location coordinates

Table B-1 (continued). New species recorded at GOGA.

Year	Scientific name	Family	Reporter	Location(s)	Nativity	Evidence
2011	<i>Ludwigia peploides</i> (Kunth) P. H. Raven ssp. <i>montevidensis</i> (Spreng.) P. H. Raven	Onagraceae	Doreen Smith, CNPS	Marin Headlands, Rodeo Lake	non-native	Voucher
2011	<i>Mercurialis annua</i> L.	Euphorbiaceae	Eric Wrubel, I&M	Sweeney Ridge	non-native	Location coordinates
2011	<i>Nymphaea odorata</i> Aiton	Nymphaeaceae	Eric Wrubel, I&M	Tennessee Valley, Backdoor Pond.	non-native	Photo
2011	<i>Rhamnus alaternus</i> L.	Rhamnaceae	Eric Wrubel, I&M	Mori Point	non-native	Photo
2011	<i>Roldana Petasitis</i> (Sims) H. Rob. & Brettell	Asteraceae	Eric Wrubel, I&M	Marin Headlands, Rodeo Avenue; Muir Woods, Camino del Canyon Road	non-native	Voucher
2011	<i>Rytidosperma caespitosum</i> (Gaudich.) Connor & Edgar	Poaceae	Eric Wrubel, I&M	Sweeney Ridge	non-native	Voucher
2011	<i>Soleirolia soleirolii</i> (Req.) Dandy	Uritcaceae	Eric Wrubel, I&M	Mori Point	non-native	Photo
2011	<i>Stipa manicata</i> E. Desv.	Poaceae	Alisa Shor, GGNPC	Marin Headlands, Fort Baker, Fort Cronkhite, Capeheart Housing	non-native	Voucher
2011	<i>Teucrium fruiticans</i> L.	Lamiaceae	Eric Wrubel, I&M	Marin Headlands, Battery Townsley	non-native	Photo
2011	<i>Trifolium angustifolium</i> L.	Fabaceae	Eric Wrubel, I&M	Marin Headlands, Alexander Avenue; Mori Point; Rancho Corral de Tierra	non-native	Voucher
2011	<i>Trifolium striatum</i> L.	Fabaceae	Eric Wrubel, I&M	Nicasio Ridge, Cheda Ranch Road	non-native	Photo
2011	<i>Trifolium tomentosum</i> L.	Fabaceae	Eric Wrubel, I&M	Marin Headlands, Fort Cronkhite	non-native	Photo, voucher
2012	<i>Allium vineale</i> L.	Alliaceae	Eric Wrubel, I&M	Marin Headlands, Fort Cronkhite	non-native	Location coordinates

Table B-1 (continued). New species recorded at GOGA.

Year	Scientific name	Family	Reporter	Location(s)	Nativity	Evidence
2012	<i>Antirrhinum orontium</i> L.	Scrophulariaceae	Neal Kramer, Independent Consultant	Rancho Corral de Tierra, top of Alta Vista Trail	non-native	Photo
2012	<i>Carex nudata</i> W. Boott	Cyperaceae	Eric Wrubel, I&M	Muir Woods, Redwood Creek; Lagunitas Creek	native	Location coordinates
2012	<i>Coreopsis tinctoria</i> Nutt.	Asteraceae	Eric Wrubel, I&M	Marin Headlands; Hwy 1 at Green Gulch	non-native	Voucher
2012	<i>Cotoneaster integrifolius</i> (Roxb.) G. Klotz	Rosaceae	Eric Wrubel, I&M	Marin Headlands, Hwy 1 at Miwok Trailhead	non-native	Photo
2012	<i>Freesia laxa</i> (Thunb.) Goldblatt & J.C. Manning	Iridaceae	Eric Wrubel, I&M	Muir Woods, Druid Heights	non-native	Location coordinates
2012	<i>Geranium robertianum</i> L.	Geraniaceae	Eric Wrubel, I&M	Muir Woods, entrance	non-native	Voucher
2012	<i>Geranium rotundifolium</i> L.	Geraniaceae	Eric Wrubel, I&M	Marin Headlands, Conzelman at Alexander Ave.	non-native	Voucher
2012	<i>Glyceria declinata</i> Brébiss.	Poaceae	Dan Glusenkamp, BAEDN	Muir Beach, equipment staging area		Voucher
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

Table B-1 (continued). New species recorded at GOGA.

Year	Scientific name	Family	Reporter	Location(s)	Nativity	Evidence
2012	<i>Melianthus major</i> L.	Melianthaceae	Chris Friedel, GOGA	Muir Woods, Druid Heights	non-native	Voucher
2012	<i>Oxalis hirta</i> L.	Oxalidaceae	Neal Kramer, Independent Consultant	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	Location coordinates
2012	<i>Prunus caroliniana</i> Ait.	Rosaceae	Eric Wrubel, I&M	above Marin City	non-native	Voucher
2012	<i>Salsola soda</i> L.	Chenopodiaceae	Eric Wrubel, I&M	Bolinas Lagoon	non-native	Photo
2012	<i>Tradescantia fluminensis</i> Vell.	Commelinaceae	Eric Wrubel, I&M	Muir Woods, Druid Heights	non-native	Photo
2013	<i>Elodea canadensis</i> Michx.	Hydrocharitaceae	Eric Wrubel, I&M	Marin Headlands, Rodeo Lake	native	Voucher
2013	<i>Fallopia japonica</i> (Houtt.) Ronse Decr.	Polygonaceae	Andrea Williams, MMWD; Eric Wrubel I&M	Lagunitas Creek; Presidio, Lobos Creek	non-native	Photo
2013	<i>Montanoa hibiscifolia</i> (Benth.) Standl.	Asteraceae	Eric Wrubel, I&M	Presidio, Lobos Creek, Fort Point	non-native	Location coordinates
2013	<i>Passiflora tarminiana</i> Coppins & V.E. Barney	Passifloraceae	Eric Wrubel, I&M	Land's End	non-native	Photo
2013	<i>Sporobolus airoides</i> (Torr.) Torr.	Poaceae	Eric Wrubel, I&M	Marin Headlands, Hill 88	non-native	Voucher
2014	<i>Hyacinthoides hispanica</i> (Mill.) Rothm.	Asparagaceae	Eric Wrubel, I&M	Marin Headlands	non-native	Photo
2014	<i>Ligustrum vulgare</i> L.	Oleaceae	Eric Wrubel, I&M	Sir Francis Drake Blvd, at Tocaloma	non-native	Voucher

Table B-1 (continued). New species recorded at GOGA.

Year	Scientific name	Family	Reporter	Location(s)	Nativity	Evidence
2014	<i>Juncus acuminatus</i> Michx.	Juncaceae	Eric Wrubel, I&M	Marin Headlands, Hawk Camp	native	Voucher
2014	<i>Prunella vulgaris</i> var. <i>vulgaris</i> L.	Lamiaceae	Eric Wrubel, I&M	Lagunitas Creek	non-native	Voucher
2014	<i>Sorghum halepense</i> (L.) Pers.	Poaceae	Eric Wrubel, I&M	Sir Francis Drake Blvd., at SPAWN Headquarters	non-native	Photo
2014	<i>Stipa miliacea</i> (L.) Hoover var. <i>miliacea</i>	Poaceae	Eric Wrubel, I&M	Fort Baker, at Hwy. 101, Sir Francis Drake Blvd., at Tocaloma	non-native	Location coordinates
2014	<i>Symphytum officinale</i> L.	Boraginaceae	Eric Wrubel, I&M	Lagunitas Creek	non-native	Photo
2016	<i>Elymus caput-medusae</i>	Poaceae	Raphaela Floreani Buzbee, I&M	Hwy 1, Point Reyes Station; C. Rogers Ranch	non-native	Voucher
2016	<i>Phytolacca americana</i> var. <i>americana</i>	Phytolaccaceae	Eric Wrubel, I&M	Redwood Creek, Lagunitas Creek, Lincoln Blvd.	non-native	Voucher
2016	<i>Setaria pumila</i> ssp. <i>pumila</i>	Poaceae	Raphaela Floreani Buzbee, I&M	Sir Francisc Drake Blvd. at Tocaloma	non-native	Voucher

Table B-2. New species recorded at PORE.

Year	Scientific name	Family	Reporter	Location(s)	Nativity	Evidence
2008	<i>Cotoneaster lacteus</i> W.W. Sm.	Rosaceae	Melissa Potter, I&M	Numerous	non-native	Location coordinates
2011	<i>Glyceria declinata</i> Bréb.	Poaceae	Eric Wrubel, I&M	Mount Vision Road	non-native	Voucher
2011	<i>Kickxia elatine</i> (L.) Dumort.	Plantaginaceae	Eric Wrubel, I&M	Limantour Road	non-native	Location coordinates
2011	<i>Prunus caroliniana</i> Ait.	Rosaceae	Eric Wrubel, I&M	Limantour Road	non-native	Voucher
2011	<i>Trifolium angustifolium</i> L.	Fabaceae	Eric Wrubel, I&M	Highway 1, Sir Francis Drake Blvd., Mount Vision Road	non-native	Location coordinates
2012	<i>Elymus ponticus</i> (Podp.) N. Snow	Poaceae	Eric Wrubel, I&M	Bear Valley Headquarters	non-native	Voucher
2012	<i>Phalaris elongata</i> Braun-Blanq.	Poaceae	Eric Wrubel, I&M	Limantour Beach	non-native	Voucher
2013	<i>Tragopogon porrifolius</i> L.	Asteraceae	Christine Davis, I&M	Bear Valley Headquarters	non-native	Photo
2014	<i>Lychnis coronaria</i> (L.) Descr.	Caryophyllaceae	Nicholas Stevenson, I&M	Mount Vision Road	non-native	Photo
2015	<i>Panicum miliaceum</i> (L.) ssp. <i>miliaceum</i>	Poaceae	Raphaela Floreani Buzbee, I&M	Pierce Point Road	non-native	Voucher
2015	<i>Verbena bonariensis</i>	Verbenaceae	Raphaela Floreani Buzbee, I&M	Limantour Beach	non-native	Photo
2016	<i>Bromus tectorum</i>	Poaceae	Raphaela Floreani Buzbee, I&M	Road to Chimney Rock at Sir Francis Drake Blvd.	non-native	Voucher
2017	<i>Tradescantia fluminensis</i>	Commelinaceae	Nicolas Graver, I&M	Olema Valley Trail	native	Photo

Table B-3. New species recorded at PINN.

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

Table B-3. New species recorded at PINN.

Year	Scientific name	Family	Reporter	Location(s)	Nativity	Evidence
2013	<i>Carex schottii</i>	Cyperaceae	Eric Wrubel, I&M	McCabe Canyon	native	Voucher
2013	<i>Oxalis corniculata</i>	Oxalidaceae	Sean Zweifler, I&M	Highway 146	non-native	Location coordinates
2013	<i>Rumex conglomeratus</i>	Polygonaceae	Sean Zweifler, I&M	Unverified	non-native	Location coordinates
2013	<i>Sorghum halepense</i>	Poaceae	Sean Zweifler, I&M	Highway 146	non-native	Location coordinates
2013	<i>Verbena bracteata</i>	Verbenaceae	Sean Zweifler, I&M	Unverified	native	Location coordinates
2014	<i>Sisymbrium irio</i>	Brassicaceae	Eric Wrubel, I&M	West side employee housing	non-native	Photo
2016	<i>Elymus caput-medusae</i>	Poaceae	Eric Wrubel, I&M	Highway 146	non-native	Voucher
2016	<i>Trifolium angustifolium</i>	Fabaceae	Eric Wrubel, I&M	Highway 146	non-native	Voucher

Table B-4. New species recorded at JOMU.

Year	Scientific name	Family	Reporter	Location(s)	Nativity	Evidence
2010	<i>Dittrichia graveolens</i> (L.) Greuter	Asteraceae	Eric Wrubel, I&M	Mount Wanda Trailhead	non-native	Voucher
2011	<i>Lepidium latifolium</i> L.	Brassicaceae	Eric Wrubel, I&M	Strentzel Creek	non-native	Photo
2011	<i>Ehrharta erecta</i> Lam.	Poaceae	Eric Wrubel, I&M	Strentzel Creek	non-native	Location coordinates
2014	<i>Carduus tenuiflorus</i> Curtis	Asteraceae	Desmond Murray, JOMU	Mount Wanda, south of Nature Trail	non-native	Voucher
2014	<i>Pinus pinea</i> L.	Pinaceae	Eric Wrubel, I&M	West of Alhambra Ave.	non-native	Photo
2014	<i>Pinus radiata</i> D. Don	Pinaceae	Eric Wrubel, I&M	West of Alhambra Ave.	Native to California, introduced in Contra Costa Co.	Photo
2015	<i>Stipa miliacea</i> (L.) Hoover var. <i>miliacea</i>	Poaceae	Nicholas Stevenson, I&M	Northwest border of Mt Wanda, near Franklin Canyon Road	non-native	Location coordinates
2017	<i>Nasella tenuissima</i>	Poaceae	Eric Wrubel, I&M	Growing out of landscaping in housing off Alhambra Valley rd	non-native	Photo

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 426/150757, 114/150757, 612/150757, 641/150757, March 2019

National Park Service
U.S. Department of the Interior



[Natural Resource Stewardship and Science](#)

1201 Oakridge Drive, Suite 150
Fort Collins, CO 80525