



ARTICLE

Botany News – Winter 2022-2023

[Golden Gate National Recreation Area \(https://www.nps.gov/goga/\)](https://www.nps.gov/goga/), [John Muir National Historic Site \(https://www.nps.gov/jomu/\)](https://www.nps.gov/jomu/), [Muir Woods National Monument \(https://www.nps.gov/muwo/\)](https://www.nps.gov/muwo/), [Pinnacles National Park \(https://www.nps.gov/pinn/\)](https://www.nps.gov/pinn/), [Point Reyes National Seashore \(https://www.nps.gov/pore/\)](https://www.nps.gov/pore/), [Presidio of San Francisco \(https://www.nps.gov/prsf/\)](https://www.nps.gov/prsf/)

What we do

The San Francisco Bay Area Inventory and Monitoring Network (SFAN) Botany Program consists of Plant Community Monitoring (PCM) and Invasive Species Early Detection (ISED) teams, both of which work to better understand trends in plant communities within the San Francisco Bay Area national parks.

While PCM aims to track long-term changes in vegetation structure and composition, ISED is focused on mapping, assessing, and promptly reporting occurrences of priority invasive plants along trails and roads, as well as treating infestations when feasible.



Shea Nolan surveys for prairie dog burrows at Aztec Ruins National Monument //

NPS / Dana Hawkins

Fall Feature

Meet Scientists-in-Parks GIS Intern Shea Nolan

Bay Area born and raised, Shea comes from La Honda, California, a tiny town nestled in the Santa Cruz Mountains. Shea grew up kissing banana slugs, hugging the bark of 1,000 year old redwood trees, and re-enacting dinosaur documentaries in their backyard. Shea's fondness for life on planet Earth drew them to study biodiversity and environmental science in college. Shea has worked in a variety of roles over the years, starting first as a park interpreter with California state parks, then as an outdoor educator, and even as a reptile handler with an exotic pet store! Shea broke into science working as a Scientists-in-Parks intern at [Aztec Ruins National Monument \(https://www.nps.gov/azru/index.htm\)](https://www.nps.gov/azru/index.htm), where they used GIS to map invasive plants and prairie dog colonies.

Shea joined the I&M team in November of 2022 and during their 20-week internship, they will work on

map redesign for multiple vital signs as well as a variety of projects with spatial data collected for both botany programs.

Botany Indoors

PCM

Much to the chagrin of the botany team, PCM field work was completed in September. So what did our crew do behind closed doors this past fall? As familiar as we may be with the flora that is found within our plots, there are some vascular plant species that stump us. Specimens of that nature are collected outside the plot perimeter, so as not to disrupt the plot for future sampling, and are preserved in a fridge in the office to be identified and pressed as soon as possible. While it is ideal to try and solve the mysteries of unidentified and questionable species while still in the field, there is not enough time to solve every case in the heat and hurry of the field season. Thus in September, with the long field days accomplished, the botany team devoted more time to fighting over the microscope and dissecting miniscule plant parts.

< > **Can you identify these invasive species?**



Left image

Credit: NPS / Katherine Stratton



Right image

Credit: NPS / Lisa Schomaker

For answers, [jump to the end](#) of the newsletter!

Additionally, fall was the time for the team to take a look at all the data collected during the season and ensure it was all entered, checked, and double-checked. While it was less glamorous (and far less entertaining) than trudging around in swamp mud or scraping through coastal scrub, it is a vital component of this vital sign monitoring. Once the data were certified, the real fun of analysis could begin!

ISED

Having finished the final surveys of the Presidio in late September, the ISED team, much like the PCM team, completed the arduous task of reviewing every observation made this field season. For over 1,700 assessments of invasive plant patches, the team cross-referenced notes taken in the field with the online database, correcting any quirks they came across. Because ISED is primarily focused on documenting a set of priority plants already known to be problematic, there are relatively few instances of unknown species relevant to the protocol compared to what PCM encounters.

The team also took this time to beef up the program's reference documentation for look-alike species (e.g.

[Cotoneaster pannosus](https://calphotos.berkeley.edu/cgi/img_query?where-lifeform=any&rel-) (https://calphotos.berkeley.edu/cgi/img_query?where-lifeform=any&rel-

[taxon=contains&where-taxon=cotoneaster+pannosus&rel-namesoup=matchphrase&where-namesoup=&rel-location=matchphrase&where-location=&rel-county=eq&where-county=any&rel-state=eq&where-state=any&rel-country=eq&where-country=any&where-collectn=any&rel-photographer=contains&where-photographer=&rel-kwid=equals&where-kwid=&max_rows=24](#)), *Cotoneaster lacteus*

([https://calphotos.berkeley.edu/cgi/img_query?query_src=ucjeps&where-genre=Plant&where-taxon=Cotoneaster%20lacteus&title_tag=Cotoneaster](https://calphotos.berkeley.edu/cgi/img_query?query_src=ucjeps&where-genre=Plant&where-taxon=Cotoneaster%20lacteus&title_tag=Cotoneaster%20lacteus)), and *Cotoneaster franchetii*

(https://calphotos.berkeley.edu/cgi/img_query?where-lifeform=any&rel-taxon=contains&where-taxon=cotoneaster+franchetii&rel-namesoup=matchphrase&where-namesoup=&rel-location=matchphrase&where-location=&rel-county=eq&where-county=any&rel-state=eq&where-state=any&rel-country=eq&where-country=any&where-collectn=any&rel-photographer=contains&where-photographer=&rel-kwid=equals&where-kwid=&max_rows=24).

Though autumn was well underway, the Bay Area's temperate climate supports plants' flowering and fruiting later than in continental regions. Thanks to the mild weather, ISED was also able to collect late-season specimens and contribute 14 new species to SFAN's digital flora catalog.

Winter brings other exciting activities such as office organization, data analysis, and annual reporting. Sadly, it's also a transitional period for seasonal employees. As of December, each member of the 2022 botany team was off to new adventures throughout the country, bringing fond memories of the season and the last remnants of poison oak rashes along with them.



Sometimes nature provides prime seating for ISED data collection and quality control.

NPS / Katherine Stratton



The Botany Team celebrates a tremendous season together at the first annual Field Olympics and BBQ.

NPS / Alex Iwaki

Noteworthy Early Detections: Grassland Invaders



Bromus tectorum

© Zoya Akulova / [Photo 1120 0037](#)

https://calphotos.berkeley.edu/cgi/img_query?enlarge=0000+0000+1120+0037 / CalPhotos / 2020 / [CC BY-NC 3.0](#) (<http://creativecommons.org/licenses/by-nc/3.0/>).

Cheatgrass (*Bromus tectorum*)

Bromus tectorum is an annual grass that has rapidly colonized rangeland across the Intermountain and Pacific West regions. *B. tectorum* is native to much of Europe, northern Africa and southwestern Asia and was likely introduced to colonial America as a crop seed contaminant. In the 200 years since its introduction, *B. tectorum* spread westward following paths of European settlement, culminating in its extensive range today. Specimens of *B. tectorum* have now been collected in all but the driest desert regions of California.

Short in stature, *B. tectorum* rarely exceeds 40 cm in height. Its culms (hollow stems) are crowned with a set of faintly silver spikelets on drooping branches. The entire plant is typically covered in fine downy hairs, inspiring its other common name “downy chess.” Each plant may produce up to 5,000 seeds, though its seedbank does not typically remain viable for longer than one year as the plant will try to germinate as soon as conditions are favorable. After its first six to eight weeks of growth, *B. tectorum*’s mature seeds sport long, stiff awns (bristles) that can

damage the mouths of any would-be grazers.

B. tectorum has been implicated in changing fire regimes in the western US. An early germinant, *B. tectorum* grows more rapidly than many native forbs and grasses before dying off early in the summer leaving behind a mat of highly flammable tinder. Increased fire activity in scrub ecosystems, including eastern California’s shrub-steppe, leads to decreases in shrub cover relative to that of grasses. Because shrubs are an important source of late-season protein for grazers, and because *B. tectorum* is nutrient-poor relative to other forage species, this process can lead to reduced overall forage availability and threats to native grazer populations. One [recent study](https://www.usda.gov/media/blog/2020/10/01/firefighting-cattle-targeted-grazing-makes-firebreaks-cheatgrass) (<https://www.usda.gov/media/blog/2020/10/01/firefighting-cattle-targeted-grazing-makes-firebreaks-cheatgrass>) by the USDA suggests that targeted early-season grazing of *B. tectorum* by cattle or sheep can create effective firebreaks, one step in reducing the plant’s negative impacts on native plant communities.

B. tectorum was only observed in two locations by ISED this season, both along the Balconies Trail in Pinnacles National Park. There have previously been a few scattered observations throughout Marin County national park sites, though the lack of range expansion to date suggests the species has not yet made a foothold.

Resources

- [CDFA Plant Profile](https://blogs.cdfa.ca.gov/Section3162/?p=1375) (<https://blogs.cdfa.ca.gov/Section3162/?p=1375>)
- [CAL-IPC Plant Profile](https://www.cal-ipc.org/plants/profile/bromus-tectorum-profile/) (<https://www.cal-ipc.org/plants/profile/bromus-tectorum-profile/>)
- [USDA: “Cheating Cheatgrass”](https://tellus.ars.usda.gov/stories/articles/cheating-cheatgrass/) (<https://tellus.ars.usda.gov/stories/articles/cheating-cheatgrass/>)

Purple-awned wallaby grass (*Rytidosperma penicillatum*)

Rytidosperma penicillatum is a grass species native to Australia, occupying coastal habitats in New South Wales similar to those it is invading in California. It is recognized by its slender culms rising up to 90 cm from a

base of narrow, faded green-to-purplish leaves. Most notably, the point of connection between culm and leaf is ringed with a collar of tiny dense hairs. Each spikelet is tipped with purple awns, opening up to a bushier inflorescence as the plant matures. *R. penicillatum* is thought to spread by grazing, though its hairy seeds also stick easily to clothing and often find their way into shoes, socks and car upholstery. Using a boot brush to remove any seed from shoes and clothing after a hike is a great way for visitors to limit their impacts on spreading this pesky bunchgrass.



Rytidosperma penicillatum, green in the field and dry under a microscope.

Left: © Zoya Akulova / [Photo 0809 1958 \(https://calphotos.berkeley.edu/cgi/img_query?enlarge=0000+0000+0809+1958\)](https://calphotos.berkeley.edu/cgi/img_query?enlarge=0000+0000+0809+1958) / CalPhotos / 2009 / [CC BY-NC 3.0 \(http://creativecommons.org/licenses/by-nc/3.0/\)](http://creativecommons.org/licenses/by-nc/3.0/)

Right: NPS / Katherine Stratton

This season, *R. penicillatum* was observed on many of the high coastal ridges throughout Golden Gate National Recreation Area. Similar to *Bromus tectorum*, *R. penicillatum* is a non-native grass species that poses a threat to shrub-dominant ecosystems. Unlike *B. tectorum*, *R. penicillatum* is a perennial bunchgrass, and is more frequently spotted colonizing coastal scrub ecosystems rather than the drier inland shrub-steppe. Though *R. penicillatum* is not yet as widespread as *B. tectorum*, its spread throughout the California coastal sage scrub is worrisome. Rising urbanization within coastal sage scrub ranges paired with distortions in annual precipitation regimes pose increasing threats to this endemic habitat type.

Though it tends to grow in the wetter coastal areas, *R. penicillatum* can also increase the risk of fires in a similar way to *B. tectorum*. As a perennial grass, *R. penicillatum* retains some of its spent stalks around its bunchy base as it lies dormant from December through March. This thatch buildup is flammable, and in the aftermath of a fire *R. penicillatum* will quickly expand through the burned area. Coastal sage scrub habitat has historically been managed by periodic fires, and the eponymous shrubs have the ability to regrow from the root even when fully incinerated aboveground. However, a study by researchers at UC Irvine suggests that both increased nitrogen deposition and decreased precipitation can limit these shrubs' ability to bounce back, leaving the habitat vulnerable to conversion into non-native grassland.

Resources

- [Cal-IPC Plant Profile \(https://www.cal-ipc.org/plants/profile/danthonia-pilosa-profile/\)](https://www.cal-ipc.org/plants/profile/danthonia-pilosa-profile/)
- [NPS - Coastal Scrub Fire Ecology \(https://www.nps.gov/pore/learn/management/firemanagement_fireecology_vegetypes_coastalscrub.htm\)](https://www.nps.gov/pore/learn/management/firemanagement_fireecology_vegetypes_coastalscrub.htm)
- [UCI - Coastal Sage Scrub Study \(https://ceb.bio.uci.edu/research/effects-global-change-coastal-sage-scrub/#:~:text=Coastal%20Sage%20Scrub%20\(CSS\)%2C,non%2Dnative%2C%20invasive%20species.\)](https://ceb.bio.uci.edu/research/effects-global-change-coastal-sage-scrub/#:~:text=Coastal%20Sage%20Scrub%20(CSS)%2C,non%2Dnative%2C%20invasive%20species.)

Native Species Spotlight

Redwood sorrel (*Oxalis oregana*)

Oxalis oregana is a perennial herb found carpeting the forest floor of the redwood and Douglas-fir plant communities. Commonly known as redwood sorrel, this ubiquitous species produces white to pink flowers with five petals and sepals, blooming from February to June.

At this point in the year, many in the San Francisco Bay area are familiar with the sunshine-yellow flowers of *Oxalis pes-caprae*, a close relative of *O. oregana*. Both plants are in the wood sorrel family, Oxalidaceae, and they both possess three heart-shaped leaflets on each stalk. This appearance causes *Oxalis* plants to commonly be confused with the genus *Trifolium*, the three-leaved clovers. Unlike *Trifolium*, *Oxalis* species produce oxalic acid, which is the source of the sour taste in edible varieties of these plants.

While *O. pes-caprae* is an introduced species, *O. oregana* is a native plant that thrives in the temperate rainforests of the California coast ranges. *O. oregana* spreads through the leafy duff of the forest floor with creeping rhizomes, and it is specially adapted to the low-light conditions found in moist conifer forests. When exposed to direct sunlight, *O. oregana* will fold down its leaves to defend itself from excess solar radiation. This photonastic movement happens at a remarkably quick pace, [occurring within 6 minutes](https://web.archive.org/web/20160319153322/http://plantsinaction.science.uq.edu.au/edition1/?q=content%2F12-1-1-light-interception-and-utilisation) (<https://web.archive.org/web/20160319153322/http://plantsinaction.science.uq.edu.au/edition1/?q=content%2F12-1-1-light-interception-and-utilisation>)!



Oxalis oregana in bloom.
NPS / T. Lim



The leaves of *Oxalis oregana* emerge from the duff and thick redwood litter in late winter and early spring.

NPS / Lisa Schomaker

O. oregana is an iconic component of the redwood ecosystem, and its absence can be an indicator of large numbers of people visiting popular destinations within a national park. Redwood forests are especially vulnerable to visitor traffic. The roots of redwood trees grow shallow in the earth, and they are susceptible to trampling. The addition of boardwalks to sensitive areas within parks helps alleviate the impacts of high visitation, and visitors can assist in protecting these unique ecosystems by sticking to designated trails.

Resources

- [CalFlora \(https://www.calflora.org/app/taxon?crn=6015\)](https://www.calflora.org/app/taxon?crn=6015)
- [Jepson eFlora \(https://ucjeps.berkeley.edu/eflora/eflora_display.php?tid=35641\)](https://ucjeps.berkeley.edu/eflora/eflora_display.php?tid=35641)

2022 ISED Survey Results

This overview of all this season's ISED observations may be viewed in an interactive map at the [Calflora Observation Search](#)

(<https://www.calflora.org/entry/observ.html#srch=t&src=SFNPS+Early+Detection&before=2022-09-30&after=2022-04-01&cols=b&incobs=f>) website. Navigate to the [Help Site](#) (<http://www.calflora.org/entry/help/observ-help.html>) for assistance using the Observation Search page.

Invasive species ID answers:

Left image: *Rytidosperma penicillatum* (purple-awned wallaby grass)

Right image: *Mentha pulegium* (pennyroyal)

☒ Want more information or to get involved?

To report early detections or for more information [contact us](#) (<https://www.nps.gov/im/sfan/contactus.htm>)!

Learn more about ISED & PCM:

[Invasive Plants Monitoring Program](https://www.nps.gov/im/sfan/invasive-plants.htm) (<https://www.nps.gov/im/sfan/invasive-plants.htm>)

[Plant Community Monitoring Program](https://www.nps.gov/im/sfan/plant-communities.htm) (<https://www.nps.gov/im/sfan/plant-communities.htm>)

[San Francisco Bay Area I&M Network](https://www.nps.gov/im/sfan/index.htm) (<https://www.nps.gov/im/sfan/index.htm>)

[Newsletter archives](https://www.nps.gov/im/sfan/botany-news.htm) (<https://www.nps.gov/im/sfan/botany-news.htm>)

[Invasive Plants Priority Species Lists](https://www.nps.gov/articles/invasive-plant-species-priority-lists.htm) (<https://www.nps.gov/articles/invasive-plant-species-priority-lists.htm>)

Volunteer Opportunities:

[Invasive Plant Patrol](http://www.parksconservancy.org/get-involved/volunteer/drop-in-programs/invasive-plant-patrol.html) (<http://www.parksconservancy.org/get-involved/volunteer/drop-in-programs/invasive-plant-patrol.html>)

[Habitat Restoration Team](http://www.parksconservancy.org/get-involved/volunteer/drop-in-programs/habitat-restoration-team.html) (<http://www.parksconservancy.org/get-involved/volunteer/drop-in-programs/habitat-restoration-team.html>)



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john muir national historic site

muir woods national monument

pinnacles national park

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