

# Dispatch

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*Protecting California's environment and  
economy from invasive plants*

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#### Cal-IPC Dispatch

Summer 2022 – Vol 30, No. 2

Editor: Doug Johnson

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## FROM THE DIRECTOR'S DESK

### Biodiversity in cities

By Executive Director Doug Johnson

*Note: A special session at this year's  
Symposium features speakers on the  
forefront of studying — and protecting  
— nature in cities.*

California land managers work to  
control invasive plants in a variety  
of settings, from remote wilder-  
ness to urban parklands.

Metropolitan areas typically evolve in  
prime locations near waterways, and  
unique biodiversity remains present in  
these areas. At the global level, the non-  
profit C40 has initiated an Urban Nature  
Campaign with a network of mayors  
from nearly 100 major cities worldwide.  
Through the initiative, cities establish and  
work toward stewardship goals.

Across California, cities are looking  
for ways to understand, protect, and  
enhance local nature. Campaigns like the  
state's 30x30 Initiative (to protect 30%  
of California's lands and waters by 2030)  
make clear the connections between  
protecting biodiversity, building climate  
resiliency, and broadening public access.  
Stewarding biodiversity is being recog-  
nized as a necessary part of a sustainable  
future.

To protect the biodiversity found  
in and around cities, land managers  
need to address invasive plants. Even a  
highly urbanized city like San Francisco  
maintains a fair amount of open  
space, including undeveloped natural

areas where weed management is  
implemented to protect native habitat.

Though the sites may be relatively  
small in area, these efforts have an  
outsized impact in a number of ways.  
The sites being stewarded provide  
wildlife with a foothold in an otherwise  
developed region. The sites themselves  
may also have unique habitat value.  
In addition, these sites can serve as an  
educational resource for community  
members to learn about the importance  
of biodiversity and their own role in  
protecting it. Residents, from schoolkids  
to retirees, can engage in hands-on  
work as a volunteer that helps extend  
the limited capacity of professional  
stewards.

Focusing on invasive species in cities is  
also important because many invasives  
are first introduced via ports and large  
population centers. Effective preven-  
tion and early detection efforts require  
monitoring metropolitan areas.

Our efforts to stop the spread of  
invasive plants need to be integrated  
across the full spectrum of lands, from  
urban to working to remote. This is  
reflected in the theme for this year's  
Symposium, "Invasive Plant Management  
from Cities to Wildlands." It has been  
great seeing many of you in person at  
the in-person Mini-Symposia this sum-  
mer, and we hope you can join us online  
in November!

#### ON THE COVER

A goat munches on stems of jubata grass (*Cortaderia jubata*) at the Mill Bend Preserve, a 113-acre property along the Gualala Estuary in coastal Sonoma. The Redwood Coast Land Conservancy, along with several project partners, is engaged in a multi-year project to restore this sensitive habitat, an important freshwater environment for juvenile Coho salmon, steelhead, and other fish. Restoration plans include connecting to the California Coastal Trail and providing public access to waterways. This photo was submitted to the 2021 Photo Contest by James Nybakken with the Redwood Coast Land Conservancy. See our article on page 6 to learn how goats are helping to manage annual grasses and mustards in Southern California.

# Wildland Weed News

## CAL-IPC UPDATES

**WMA funding** – After years of advocacy by Cal-IPC, the state has finally budgeted new funding for invasive plant management through county Weed Management Areas (WMAs). The \$10 million will provide grants for county WMAs as well as grants for activities like research and prioritization, plus support for the California Dept. of Food & Agriculture to run the program. This funding will catalyze collaborative efforts to address cross-jurisdictional projects across the state.

**Symposium 2022** – Thank you to all the participants of our two in-person mini-symposia this summer, at Cal Poly Pomona in June and CSU East Bay Concord in July. The main event takes place online this fall, Nov. 1-3. See details on page 9.

**WeedCUT 2.0** – The California Dept. of Pesticide Regulation is funding a second phase of development for the WeedCUT online decision-support tool, designed to provide land managers with situation-based weed management options. The first version of the tool focused on non-chemical approaches; this phase adds chemical approaches. We will again work closely with the University of California's Integrated Pest Management (IPM) program.

**National Parks** – Cal-IPC is beginning work with parks in California to plan ways for preventing the spread of invasive plants through wildfire events. We will also work with the John Muir Home National Historic Site on a weed management plan.

**Orange County IPM Planning** – Cal-IPC submitted a letter to the Orange County Board of Supervisors to support inclusion of chemical control methods as a useful and appropriate part of the IPM

## YOUR MEMBERSHIP

Thank you for keeping your membership current. Note that your expiration date is shown on the mailing label of this newsletter. Cal-IPC's success in meeting its mission depends on your vital support.

toolbox for invasive plant management in county open spaces.

**ESVM stalled** – Cal-IPC co-sponsored a bill (AB2610 - Friedman) to create funding for "ecologically sensitive vegetation management" projects that reduce wildfire risk while protecting habitat. The bill was not funded through the state legislature's regular session, but we will continue to advocate for the measure.

## OTHER NEWS

**YST water consumption** – A five-year field study led by Dr. Joe DiTomaso, retired UC Cooperative Extension Weed Specialist, found that watersheds in which yellow starthistle was controlled had 0.25 acre-feet more water per acre than those left infested. (mavensnotebook.com July 6, 2022)

**YST weevil** – A new biocontrol for yellow starthistle, the rosette weevil, has completed its permitting process under the guidance of retired USDA Agricultural Research Service scientist Lincoln Smith, and is now being reared for distribution by the California Dept. of Food & Agriculture. It's the first new biocontrol for YST in nearly 30 years, and the first that feeds on the taproot and rosette leaves rather than flowers or seedheads. Field impact on controlling YST is still to be determined.

**Calfire reporting** – Language in SB120, one of the legislature's recent budget trailer bills in Sacramento, will now require Calfire to monitor the ecological impacts (presumably including invasive plants) of their extensive vegetation management projects and to include results of this monitoring in their annual reports to the legislature.

## EAB found in OR

– Emerald ash borer, one of the most destructive forest pests in the eastern U.S., was identified near Portland, Oregon in July (by invasive species biologist Dominic Maze, who is speaking at this year's Cal-IPC Symposium).

**RAWA moves forward** – The Recovering America's Wildlife Act, HR2773, passed in the House of Representatives in June. Next, it needs to pass the Senate.

The bill would provide \$1 billion+ per year to states and tribes for proactive, collaborative efforts to restore wildlife and plants of greatest conservation need.

**Tribal Corps** – U.S. Dept. of Interior Secretary Deb Haaland has launched the Indian Youth Service Corps, a conservation corps program for Native Americans to work on federal or tribal lands. In California, the Fernandeño Tataviam Band of Mission Indians announced the creation of the Tiüvac'a'ai (healthy land) Tribal Conservation Corps, with funding from the state's

Regional Forest and Fire Capacity program.

**Right relations** – Efforts to decolonize conservation, including addressing climate change, can be based on Indigenous concepts of "right relations," of responsibilities to those we are in relationship with, including other species, the land, and the climate. (*Sustainability Science*, May 7, 2021)

**Public gardens** – The Morton Arboretum's growing national program promoting "Public Gardens as Sentinels Against Invasive Plants" now has a newsletter – sign up at [pgsip.mortonarb.org/Bol/pgsip](https://pgsip.mortonarb.org/Bol/pgsip).



Yellow starthistle rosette weevil (*Ceratapion basicorne*) adult. Photo: USDA-ARS.



Emerald ash borer (*Agrilus planipennis*) adult. Photo: USDA, licensed under CC BY-ND 2.0.



# A pungent new invader: Garlic mustard in the San Bernardino Mountains

Chris McDonald, University of California, Cooperative Extension; Duncan Bell, California Botanic Garden; Naomi Fraga, California Botanic Garden; and Joseph Esparza, USDA Forest Service

**A**s crews from California Botanic Gardens (CalBG) were conducting a botanical survey of the newly designated Wild and Scenic River, Deep Creek in the San Bernardino Mountains, an unusual plant was discovered growing in a riparian area. A small carpet of the plant, identified as garlic mustard (*Alliaria petiolata*), was found growing in the understory of a riparian forest.

Garlic mustard is an aggressive invasive plant in North America and has a wide native range across Europe to western Asia. It has also been documented in South America and Australia (Cortat 2019). It has a wide distribution in North America, from Georgia to Southern Canada west to Oregon, British Columbia and southern Alaska (Cortat 2019). This is the first known infestation in California, with a single previous iNaturalist report in Napa County. It can be found in a wide variety of habitats including in disturbed areas, forests, forest edges, trails, and roadsides (Rodgers 2008).

## Identification

The plant usually grows from 1 to 3 feet tall, but large individuals can grow over 4 feet tall when flowering. The new leaves strongly smell like garlic when crushed, which can be a useful identification characteristic. The root forms a characteristic “S” or “L” shape at the soil surface. The young leaves are round with a cleft at the base and, as the plant matures, new leaves are elongated, from cordate to triangular to lanceolate, with teeth at the margins. When flowering, the leaves gradually reduce in size towards the top of the stem. The small clusters of flowers are white and, like many mustards, the four petals form a



Garlic mustard root forms a characteristic “S” or “L” shape at the soil surface. Photo: Chris McDonald.



The young leaves are round with a cleft at the base and, as the plant matures, new leaves are elongated. Photos: (left) Chris McDonald, (right) Duncan Bell.

characteristic cross or “X” shape about ¼ inch wide. It is easy to establish new populations because the flowers can self-pollinate. The plants only reproduce by seed, typically flowering starting in March or April. Fruits mature in July. The cylindrical seeds are 3 mm long and capable of floating. The species can also act as a host for several damaging crop diseases and provides poor forage for pollinator larvae.

## Biology

Garlic mustard is a biennial; it germinates and grows as a small rosette in its first year, sending down a long tap root. In the second year, the rosette grows larger and the plant flowers, fruits, and dies. Each second-year rosette produces flowers or dies first. A single large plant can produce over 3,000 seeds, but most plants produce less. Plants also grow very densely. We’ve counted over two dozen





seedlings in a single handful of leaf litter in Hook Creek. Researchers have found these dense infestations lead to very high rates of seed production, around 30,000 (and, in one case, over 100,000) seeds per square meter (Anderson 2012). Most seedlings die over the winter. However, with such high densities, the seedlings that survive are still numerous. Because garlic mustard is a biennial, it can grow taller earlier than many native annuals and perennial seedlings. It then bolts and flowers before the native annuals and before the tree canopy closes in and shades the understory.

### Effects

Researchers and practitioners have found garlic mustard has many negative qualities. It is allelopathic and it can alter soil chemistry. Although it is relatively small, it can inhibit tree seedlings from establishing and eventually alter forest composition. The seeds can survive more than ten years in the soil, but most germinate within six years (Blossey et al. 2017). Plants that are not removed at the soil level can resprout. It can grow in full sun to full shade and tolerates a variety of soil types from clay to sand. It grows well in disturbed sites and also undisturbed forests. The number of plants germinating and blooming can fluctuate widely each year, making year-to-year budgeting and labor forecasting difficult on a long-term eradication project. Some seeds disperse long distances. However, most seeds fall near the parent plant. Populations can double in size every four years and form new meta-populations which then coalesce into larger populations. The seeds need to be cold stratified at around 40 F or less to germinate, thus the plant may not spread in the lower elevations of the California mountains and desert.

### EDRR

This species serves as an excellent reminder of the steps needed when developing an early detection and rapid response (EDRR) program: detection, identification, reporting, risk and feasibility assessments, response, and re-assessment (Reaser et al. 2020). After discovery



Garlic mustard invading habitat. Photo: Chris McDonald.

by botanists at the California Botanic Garden (CalBG), the plant was quickly identified. CDFA was quick to list this species as A-rated. US Forest Service biologists reached out to partners, including the local County Agricultural Commissioner, University of California Cooperative Extension, and the local Urban Conservation Corps to begin mapping the infestation. So far, the known individuals are in one watershed, located along 2.5 miles of creek side habitat. They occupy at least dozens of patches along the creek, potentially more.

Next, control options were assessed. Due to the sensitive nature of the riparian habitat, hand pulling was begun in 2021. Because this species is a biennial, crews only need to remove the flowering plants and can leave behind seedlings for next year. Optimally, plants are pulled at the bolting stage before fruiting, and plants in fruit are bagged. As mentioned earlier, this species has a high risk of altering riparian forest habitat.

Currently, we are working on finding long-term funding to continue treatments for this aggressive species. If funding is acquired, we have identified a larger team of partners that can help to remove this infestation, including CalBG invasive weed crews, the local Urban



Garlic mustard seeds prolifically. Photo: Chris McDonald.

Conservation Corps, and local Resource Conservation District crews.

Since containment is a high priority, we have yet to engage the broader volunteer community, which will reduce the risk of spreading seeds by being accidentally tracked to new sites on muddy shoes or tools. We may engage well-trained volunteers in the future. We will continue to expand our mapping efforts, continue hand pulling treatments, and assess our containment efforts to potentially eradicate this species. The work will be difficult and will take many years, but the effort will be worth it.

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# Using goats to control annual grasses and mustards for habitat restoration

Robert Freese, PhD, Irvine Ranch Conservancy

**A**nual grasses (*Avena*, *Bromus*, *Festuca* spp.) and various forbs in the mustard family (*Brassica*, *Hirschfeldia*, *Raphanus* spp.) are some of the most common invasive weeds in Southern California. Mixtures of these two groups often dominate degraded habitats and present management challenges throughout the course of a restoration project.

Restoration is a multi-year process that involves clearing vegetation debris or thatch and killing flushes of weeds to gradually deplete the weed seedbank. This site preparation phase is followed by seeding of native species and several years of maintenance to ensure their establishment.

Irvine Ranch Conservancy (IRC) has experimented with using goats to control these weed species at three stages: thatch clearance, grow-and-kill seedbank depletion, and maintenance of restored native grasslands. Our experiences may assist other land managers, especially given increased interest in non-chemical weed control techniques. Although goats prefer woody vegetation, they also graze grasses under certain conditions. Their versatility may make them good candidates for managing mixed stands of grasses and coarse forbs.

## Thatch clearance

IRC first used goats in 2012 to clear dense thatch material on steep and rocky slopes where mowing was not feasible. In early spring, the forage was a mix of new and senesced weed material. Through a combination of grazing and trampling, the goats successfully cleared the site, making it ready for herbicide-based site preparation. We tried this approach at another site in late fall where the forage was entirely dead grass. Goats would not graze this low nutritive material and manual techniques



Goat grazing did not prevent seed set of annual grasses but did selectively control radish (*Raphanus sativus*) in this site preparation experiment. Photo: Robert Freese.

had to be later employed to strip away the thatch. Season and forage quality must be considered since goats are not indiscriminate consumers.

## Grow-and-kill seedbank depletion

At the Bommer Canyon Preserve (City of Irvine), IRC experimented with goat grazing for site preparation in 2019 and 2020. Successful site preparation requires near complete prevention of seed set during multiple years. Goats were imperfect grazers of annual grass, trampling as much as they consumed. Two years of grazing followed by one year of mowing provided no reduction in cover of annual grasses. Goats were more effective in controlling mustards and reduced absolute cover from 28 to < 1 percent. However, manual treatments were still necessary to control re-sprouts. These non-chemical techniques also shifted

species composition toward low-growing and early flowering filaree (*Erodium cicutarium*). IRC has since abandoned grazing as a site preparation technique in areas where herbicides cannot be used in favor of frequent mowing, which is cheaper and easier to mobilize.

## Management of native grasslands

IRC has restored approximately 80 acres of purple needlegrass (*Stipa pulchra*) grasslands over the past ten years through the support of mitigation funding from Orange County Transportation Authority. However, we have been challenged by a recurring pattern of annual grass re-invasion three to five years after successful establishment of needlegrass.

In April 2018, we introduced goats into a thatch-suppressed stand of needlegrass for ten days. The goats preferentially grazed annual grasses and left needle-



grass largely untouched. This mid-spring grazing occurred when annual grass was palatable and needlegrass still relatively dormant. Goats also trampled thatch into the soil and promoted its decomposition, which may have stimulated tillering of needlegrass. Relative to 2017, vegetation monitoring in 2019 documented an increase in absolute cover of needlegrass from 83 to 91 percent and a decrease in cover of non-native annual grass from 40 to 9 percent. However, duration of grazing must be closely monitored to prevent over-grazing, which occurred in localized patches.

Grazing also resulted in increased cover of aggressive forbs, including native tarweed (*Deinandra fasciculata*) and non-native black mustard (*Brassica nigra*), which had previously been suppressed by annual grass. The gaps opened by grazing also presented opportunities to seed a more diverse mix of native annual and perennial forbs.

## Conclusions

Grazing is one strategy that can be used to control weeds at various stages in habitat restoration. Goats are often considered browsers (typically favoring woody plants) but, due to their versatility, they can sometimes be used to manage annual grasses. Goat grazing for site clearance is analogous to mowing but can be conducted on steep and rocky slopes. It also provides some reduction in weed biomass, but consumption depends on season and forage quality.

Goat grazing was not a satisfactory technique for site preparation since it did not provide the near perfect prevention of seed set needed to deplete the weed seedbank. Grazing in this context shifted species composition by decreasing cover of mustards and increasing cover of filaree. However, it produced no reduction in cover of annual grass and no overall decrease in weed cover. Mowing may be a more effective strategy than grazing for site preparation.

In contrast, goat grazing was highly effective in managing a restored native grassland. Goats selectively targeted annual grasses in mid-spring without



Goats selectively grazed annual grasses and trampled thatch to revitalize this needlegrass stand. Photo: Robert Freese.



Temporary fencing keeps the goats contained while they work, and a guardian dog helps protect them from predators. Photo: Robert Freese.

damaging relatively dormant purple needlegrass. Goat trampling removed thatch and improved bunchgrass vigor. Grazing also recycles nutrients locked up in thatch and makes them available for new growth. In this context, grazing offers several benefits that mowing cannot provide.

Mowing or other manual techniques may be preferable when managing small tracts of land. Due to fixed costs for set up, maintenance, and oversight, grazing may not be economically viable for small areas and is best conducted on a medium or large scale (greater than ten acres).



# 2022 Cal-IPC Southern California Mini-Symposium in photos

This year, we are trying an inventive approach to gather in-person while maintaining COVID-19 safety guidelines. We are hosting two smaller in-person events in summer and creating a three-day online gathering in fall. Thank you to the many partners and presenters who made our summer events a rousing success! Here are some highlights from the June Mini-Symposium at Cal Poly Pomona, where 94 attendees gathered to share information on protecting and enhancing habitats in Southern California.

As this issue goes to print, we are busy preparing for the Northern California Mini-Symposium at Cal State University East Bay, Concord Campus. Look for highlights from both the Northern California and Online events in the next issue.



Meghan Jeffus, grad student at Cal Poly Pomona (center, in baseball cap), shares her initial findings on using plastic tree shelters to reduce water use when seeding native plants (*Diplacus longiflorus*, *Amsinckia intermedia*, and *Eriogonum fasciculatum*) for shrubland restoration. Photo: Claire F. Meyler.



Erin Questad, Associate Professor of Biological Sciences at Cal Poly Pomona, (right, in maroon) leads an exercise in identifying invasive annual grasses (including *Bromus diandrus* and *B. madritensis*). On this walking tour of the Lyle Center for Regenerative Studies, the group visits research sites for restoration of grassland and California walnut woodland ecosystems. Photo: Claire F. Meyler.



Attendees enjoy reconnecting and discussing their weed management projects during meals and breaks. Photo: Claire F. Meyler.



Independent contractor Henry DiRocco (left, in baseball cap) leads a Tool Tailgate Workshop, introducing common tools used in wildland invasive plant management. Photo: Jutta Burger.



Justin Valliere, Assistant Professor at CSU Dominguez Hills, launches the event with an overview of historical factors that have shaped the Southern California landscape. To address the impacts of plant invasion and climate change, he suggests we form strong collaboration among scientists, practitioners, and policy makers, engage the public, and train the next generation of invasion ecologists. Photo: Claire F. Meyler.



# Invasive Plant Management from Cities to Wildlands

**2022 Cal-IPC Symposium | Online, Nov. 1-3**

Photo: Aaron Echols

**Join the 2022 Cal-IPC Symposium Online! Share the latest in invasive plant biology and management.**

## **SYMPOSIUM FEATURES**

Connect with colleagues and share the latest updates on effective tools, relevant research, and strategic management approaches. Our online format will include opportunities to pose questions to speakers, chat with sponsors/exhibitors, engage during discussion groups, talk to lightning talk presenters, and create video meetups with friends and colleagues. This year's theme sessions explore stewardship challenges along the spectrum of landscapes from urban environments to remote wildlands.

## **TUES., NOV. 1: WMA MEETING, LAWS & REGS, AND MORE**

- 2022 Statewide WMA Meeting. Representatives from Weed Management Areas share information on project design, new weeds, control techniques, early detection, mapping, and funding. (no cost)
- Career Panel
- Workshop: Setting up an EDRR program
- DPR Laws & Regulations

## **WED. & THURS., NOV. 2-3: SESSIONS AND MORE**

Session talks, discussion groups, lightning talks, and posters cover a range of topics, including:

- Strengthening stewardship across California
- Post-fire EDRR
- Management tools and techniques
- Bridging the research-application divide
- Managing aquatic wildland-urban interfaces
- Expanding community and equity in conservation
- And more!

## **SPECIAL SESSIONS:**

Ecologically sensitive vegetation management: Protecting habitat while reducing fire risk

Urban biodiversity and stewardship

**Plus, our annual Photo Contest and Exhibitor Gallery.**

## **REGISTRATION**

**Early Bird through Aug. 26 / Regular through Oct. 21 / Late through Oct. 31.**

**Registration closes Oct. 31, 5:00 pm.**

**Member:** \$75 early bird / \$100 regular / \$125 late

**Non-Member:** \$100 early bird / \$125 regular / \$150 late

**Student Member:** \$25 early bird / \$40 regular / \$55 late

**Student Non-Member:** \$40 early bird / \$55 regular / \$70 late

**Presenter - Submitted Abstract:** \$25

**Presenter (Student or Invited):** \$0

**Financial Need:** \$0

## **ADDITIONAL COSTS/DISCOUNTS:**

Charge for DPR continuing education credits: \$50

Discount for attending SERCAL: Subtract \$25 (Discount code needed)

## **FREE RATE:**

Cal-IPC welcomes new audiences to the annual Symposium. We encourage Conservation Corps members, field techs, and early career professionals to use the "Financial Need" registration rate. Please share with your community.

Register, join the Photo Contest, and more at [cal-ipc.org/symposium](https://cal-ipc.org/symposium)



# Expanding continuity and capacity in invasive plant risk assessments

Jutta Burger, Cal-IPC, and Alex Simmons, PlantRight

*Funding from the Western Integrated Pest Management Center helps fuel risk assessments across the western United States.*

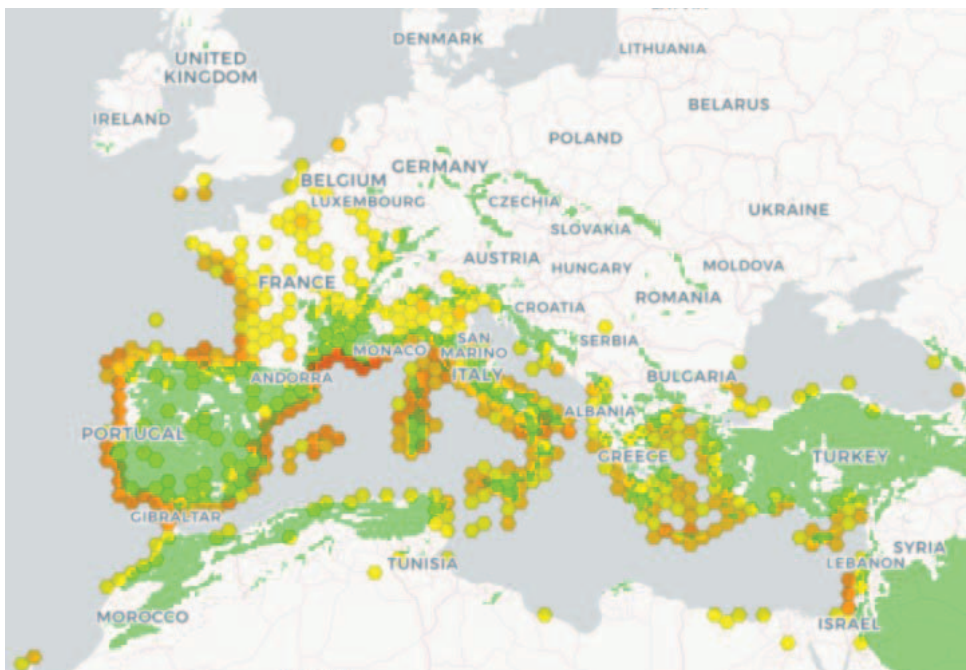
**E**arly detection and prevention are key to effective control of invasive plants before they spread and cause environmental impacts. But evaluating risk is never straightforward. How do you accurately predict that something will cause harm before it does?

Cal-IPC and PlantRight have an ongoing partnership to do just that for horticultural plants on the market in California. The Plant Risk Evaluator (PRE) tool was created in collaboration with UC Davis and University of Washington in 2015 and is managed by PlantRight to assess new horticultural introductions for their potential invasiveness.

By scoring answers to 20 questions associated with invasive history in other regions, climate matching, impacts, reproductive strategies, and dispersal, PRE tool users can get a robust predictor of a species' potential for invasiveness in their area. PRE has been used by several institutions across the country to evaluate horticultural plants and now contains a database of more than 500 assessments for plant species and varieties. Cal-IPC has also broadened its use to evaluate non-horticultural introductions that are not yet widely established in California.

In 2020, Cal-IPC and PlantRight saw the need to promote use of this helpful tool more broadly and to train a larger community of partners on how to use it consistently. Over the last two years, we have been funded by grants from the Western Integrated Pest Management Center (WIPM) to build an inter-regional collaboration centered around the PRE tool.

Last year, we were able to train partners from Washington (Pacific Northwest Invasive Plant Council and Washington



A screenshot from the PRE climate-matching tool, showing results for seaside daisy (*Panacratium maritimum*), one of the plants currently being evaluated. The green shading shows areas that have a climate similar to some part of California; the yellow-to-red hexagonal cells show presence of the plant from the Global Biodiversity Information Facility (GBIF) database. This map shows that the plant grows elsewhere in the world in places where the climate matches California's, which is one factor in evaluating its likelihood to become invasive here.



*Multiflora rose* (*Rosa multiflora*) was evaluated by Washington State partners as "High" risk. It has not been evaluated yet for California but is under consideration as a future candidate for review. Photo: Amadej Trnkoczy

State Department of Agriculture), Oregon (Western Invasives Network), Arizona (University of Arizona Extension), and within California (professional botanists from various institutions) to use PRE, building an information sharing network that now spans across multiple states. Collectively, we completed 29 PREs for



*Herb Robert* (*Geranium robertianum*) was evaluated by Oregon partners as "High" risk. It had been evaluated previously by Cal-IPC and was not considered to have enough impact in California to be considered invasive. Photo: Amadej Trnkoczy

horticultural species across the western U.S.

Additionally, all partners benefited by seeing the species that we each choose to evaluate, reviewing one another's evaluations, and otherwise sharing information about new problematic weeds in our area. Oregon partners have been able to apply

*(Continued on page 14)*



# Inclusive internships at UC Riverside reserves

Doug Johnson, Cal-IPC

**"T**here was a three-day battle in slow motion, a tipping contest, between these two male desert tortoises: the resident and the intruder. It was all captured by [the] wildlife camera. And, all the time, a female was watching from the burrow. On the one hand, it was like watching paint dry, but it was also incredible drama!" This is one of the stories Kim Hammond tells me about the experiences that students have had over their summer internships.

Kim, a professor in the University of California Riverside's (UC Riverside) Department of Evolution, Ecology, and Organismal Biology, serves as the director for the university's six reserves, working in partnership with Natural Reserve System (NRS) Campus Administrative Officer Heather Constable. Under Kim's guidance, UC Riverside has created an Advancing Inclusivity Internship program, bringing students from a variety of backgrounds to their reserve lands for a summer of work.

Kim envisions building a pathway for a broad range of young people to experience nature and to explore career options. In 2022, the program's second year, five students — one from a UC campus, one from a CSU campus, and three from community colleges — join in assisting research projects on forest dynamics, bumblebee genetics, desert tortoise ecology, and more.

Applicants to the program do not need to have prior experience. "We're looking for passion and character, for a certain mindset," says Kim. An amazing field experience at a formative age changed her life, and she is committed to offering that opportunity to others.

Some interns come from low-income households. The \$6,000 stipend they receive for the summer not only provides

important support; it also demonstrates that there is financial potential for careers connected to the outdoors. Additional assistance is available to help interns with needed equipment, which may include basics like boots and daypacks.

While the program focuses primarily on natural sciences, the internship is open to students from any discipline. Of the

cal research. (The 2019 Cal-IPC Symposium in Riverside included a field trip to the Motte Rimrock Reserve.) Overall, the UC Natural Reserve System includes some forty properties across the state, where researchers can conduct studies.

This program was made possible by generous financial support from emeritus professors Mary Price and Nickolas Waser.

Dr. Price is a mammologist who researched the endangered Stephens's kangaroo rat at the Motte Rimrock Reserve, while Dr. Waser is a pollination biologist. (Their research occasionally touched on invasive plants, as when they compared pollination and reproduction of silverleaf nightshade in Arizona and in Greece, where it's invasive.) They have started an endowment and hope additional contributions can grow it to \$800,000.

This year, there were 48 applications from students at

18 colleges and universities, and Kim thinks the interest will only grow. She hopes this program can expand to meet the demand, and that other programs will follow their example. "As I near the end of my career, this is more important to me than the research legacy I leave," says Kim. "It is so valuable, on many levels, to enable more young people to experience these unique places."

As the program evolves, Kim Hammond and her team encourage community building among the interns, providing support as the former participants move forward in their education and careers. Given their backgrounds, these interns may have life experiences that differ from their other work colleagues. "When I see that a former intern is now serving as a mentor for a new intern," says Kim, "I know things are headed in a good direction."

Learn more about the program at <https://ucnrns.ucr.edu/Internship>.



2021 UCR NRS Inclusivity Interns and staff (L to R) Advyth Ramashandran, Caryn Iwnaga, Megan Peukert, Dr. Christopher Tracy, and Dr. Heather Constable. Photo: Kimberly Hammond.



Desert tortoise tipping battle observed by Inclusivity Intern at Boyd Deep Canyon Reserve. Photo: Christopher Tracy.

program's philosophy, Kim says, "The experience of immersion in nature can be just as valuable for writers and artists as it is to scientists."

UC Riverside oversees six reserves: Box Springs Reserve, Boyd Deep Canyon Desert Research Center, Emerson Oaks Reserve, James San Jacinto Mountains Reserve, Motte Rimrock Reserve, and Sweeney Granite Mountains Desert Research Center. These cover a broad range of habitat types, serving as natural laboratories for ecologi-



# Ecologically sensitive vegetation management for wildfire risk reduction

Doug Johnson, Cal-IPC

*Note: A special session at this year's Symposium will explore efforts underway to develop site-specific vegetation management practices that reduce wildfire risk while supporting invasive plant control goals.*

In response to massively destructive wildfires in recent years, California has dedicated substantial resources to vegetation management to make communities safer.

Establishing defensible space around structures has become common, and vegetation management along roads can help reduce fire ignitions as well as ensure safe transportation corridors in the event that residents need to evacuate.

This vegetation management, especially along roadsides, frequently overlaps with invasive plants that favor these disturbed areas. Vegetation management that focuses on removing biomass for near-term fuels reduction may unintentionally exacerbate an invasive plant problem. For instance, mowing rangeland weeds after plants have matured can spread seeds further along a road corridor. Similarly, cutting down broom stands can result in vigorous regrowth and seedling recruitment that soon exceeds the original infestation.

In cases such as these, the management approach has the potential to make the situation worse, both from an ecological stewardship standpoint and a fuels reduction standpoint.

Roadsides are major vectors for the spread of weeds, and finding ways to adjust roadside vegetation management practices to reduce weeds has been an



*Preventive burning reduces fuel at the Auburn Shaded Fuel Break. Photo: Placer Resource Conservation District.*

ongoing challenge. Caltrans and other agencies are charged with protecting traveler safety, and roadside vegetation management is driven by this mission. They face significant challenges when it comes to tasks such as mowing thousands of miles of roadsides with a finite workforce and equipment fleet. It may not be possible to mow an area at the best time for limiting spread of weed seeds, or to mow multiple times in a season.

Cal-IPC has joined with other organizations to promote “ecologically sensitive vegetation management” or ESVM. A bill, AB 2610, was authored this year by Assembly Member Laura Friedman from Burbank, to create a fund at the state’s Wildlife Conservation Board to provide grants for ESVM projects. Unfortunately, after passing unanimously out of the Water, Parks, and Wildlife Committee and the Natural Resources Committee, the bill foundered in the Assembly’s Appropriations Committee. We are continuing our advocacy efforts to create this fund.

Innovative projects supported by the fund would provide proof of concept for approaches that reduce wildfire risk while also protecting habitat. This means

avoiding weed spread and protecting habitat features that are not considered a fire risk. As promising approaches are developed, they can be scaled up and integrated into the mainstream of fuels reduction work.

ESVM will look different across the state’s varied habitats. In a forested area of northern California, thinning may be a favored approach. The five-mile-long Auburn Shaded Fuel Break lies within the wildland-urban-interface

(WUI) between rugged, forested terrain and communities in the foothills east of Sacramento. Understory vegetation, which serves as ladder fuels to tree canopies, is being cut and chipped where possible, and piled for burning when the terrain is steep or invasive plants are widespread. It is designed to keep potential wildfires “low and slow” so that fire crews have a better shot at containment.

Chaparral fires in Southern California have become more frequent and intense because invasive annual grasses provide “flashy” fuels early in the growing season and displace evergreen shrubs, such as manzanita, chamise, and Ceanothus. In addition, ignition sources are much more common. A top focus for wildfire risk reduction efforts is reducing roadside ignitions, which start a high percentage of wildfires in the region. This is done by “hardening” roadsides so that adjacent vegetation is less flammable.

Researchers with the US Forest Service and University of California are testing the flammability of various plant species to determine which may be safest for

*(Continued on page 14)*



# Impacts of weeds on Central Coast rare plants

Nikki Valentine, Cal-IPC

Invasive plants can pose a threat to rare plant populations, but to date there has been little research in California to determine which weeds most threaten each rare plant population. Cal-IPC, in partnership with the Santa Barbara Botanic Garden (SBBG), received a Section 6 grant from the California Department of Fish and Wildlife (CDFW) to support the recovery of federally listed rare plant species along the Central Coast of California by studying the impacts of invasive plants.

This grant supports both a Central Coast-wide assessment of invasive plant threat for 50 federally listed rare plant species as well as on-the-ground monitoring of invasive plant threats to three federally listed rare plants: Camatta Canyon amole (*Hooveria purpurea* var. *reducta*), Pismo clarkia (*Clarkia speciosa* ssp. *immaculata*), and Gaviota tarplant (*Deinandra increscens* ssp. *villosa*). These species are all quite small in stature and can be easily overtopped by other species, especially invasives.

These plants can be found in spectacular and relatively well-protected sites, such as Vandenberg Spaceforce Base and The Nature Conservancy's Dangermond Preserve. But they can also be found in highly disturbed and vulnerable sites, such as along county roads in San Luis Obispo County.

For each of our three target plants, Cal-IPC and SBBG have surveyed three sites in Santa Barbara and San Luis Obispo counties. Each site consists of three small, permanently marked 3x3m plots. Plot locations were selected to represent the habitats in which these plants currently occur, and to be in areas containing high numbers of the rare plants. This enables us to track invasive plant cover in relation to rare plant numbers. These plots are being surveyed annually around their flowering period through the course of the three-year grant.

Over the last three years, we used the CDFW-California Native Plant Society relevé



Camatta Canyon amole (*Hooveria purpurea* var. *reducta*) growing in an area with litter and thatch from annual grasses. Photo: Jutta Burger.



Gaviota tarplant (*Deinandra increscens* ssp. *villosa*) growing where invasive iceplant (*Carpobrotus edulis*) is not completely covering the ground. Photo: Jutta Burger.



Sean Carson, Rare Plant Technician at Santa Barbara Botanic Garden, flags Gaviota tarplant on a plot in Dangermond Preserve. Invasive iceplant (*Carpobrotus edulis*) can be seen in the background encroaching the plot. Photo: Molly Brown.



Pismo clarkia (*Clarkia speciosa* ssp. *immaculata*) growing in a site with bioturbation and grasses including invasive wild oats (*Avena* sp) and perennial veldtgrass (*Ehrharta calycina*). Photo: Jutta Burger.

protocol to survey plots. We estimated percent cover for each plant species present. Percent ground cover (bare ground, rock, litter, and thatch) was also recorded. Thatch (dead plant matter still attached by the roots) is often produced by annual invasive species, creating a buildup of plant matter that can obstruct access to sunlight and nutrients. We also documented other threats to these rare plant populations, such as bioturbation (ground disturbance by animals) and grazing. Lastly, we counted the number of individuals of our target sensitive species as well as the average number of flowers / inflorescences that these plants had on average.

We are now analyzing data to test for

(Continued on page 14)



Heather Schneider, Rare Plant Biologist at the Santa Barbara Botanic Garden, flags Pismo clarkia in a plot in San Luis Obispo County while volunteer Bob Huttar records data. Photo: Jutta Burger.



# Invasive plant risk assessments

(Continued from page 10)

for their own funding to help develop an online pest information hub. Washington has received early detection information about two aquatic invasive weeds. Arizona has become more connected with Southern California regarding new weed species. Here in California, we benefit from learning about problematic species in neighboring partner states.

This year, we're excited to continue our collaboration and add two new partners: Nevada (Nevada Department of Agriculture and National Park Service) and the Yurok Tribe of the Klamath River region.

We've also been able to update the climate matching component of the PRE tool to overlay existing global distribution of a given plant with the regions around the world whose climate matches the climate in California. This helps answer several of the most important PRE criteria, such as whether the plant has become invasive in other parts of the world with climates similar to California's.

We have ambitious goals for the project this year: to complete evaluations for an additional thirty species across partner regions, including ten in California; to continue supporting early-detection based management; and to find ways to streamline how we apply PRE results to management and guidance for the horticultural industry. In future years, we hope to deepen the collaboration so that we can begin to get ahead of the invasion curve.

State	Scientific name	Common name	REGIONAL RISK
ARIZONA	<i>Dimorphotheca sinuata</i>	Cape marigold	LOW
ARIZONA	<i>Enchylaena tomentosa</i>	Ruby saltbush	LOW
ARIZONA	<i>Leucaena leucocephala</i>	white leadtree	MODERATE
ARIZONA	<i>Searsia lancea</i>	African sumac	MODERATE
ARIZONA	<i>Senna artemisioides</i>	Silver Senna	LOW
ARIZONA	<i>Tamarix aphylla</i>	athel	HIGH
CALIFORNIA	<i>Arum italicum</i>	Italian Arum	HIGH
CALIFORNIA	<i>Asclepias curassavica</i>	tropical milkweed	MODERATE
CALIFORNIA	<i>Asparagus aethiopicus</i>	asparagus fern	HIGH
CALIFORNIA	<i>Euphorbia helioscopia</i>	sun spurge	MODERATE
CALIFORNIA	<i>Euphorbia myrsinites</i>	Myrtle spurge	HIGH
CALIFORNIA	<i>Hieracium aurantiacum</i>	Orange hawkweed	HIGH
CALIFORNIA	<i>Lythrum junceum</i>	creeping loosestrife	HIGH
CALIFORNIA	<i>Potentilla recta</i>	sulphur cinquefoil	HIGH
CALIFORNIA	<i>Senecio elegans</i>	purple ragwort	HIGH
CALIFORNIA	<i>Melinis repens</i>	Natal grass	HIGH
CALIFORNIA	<i>Pentaglottis sempervirens</i>	green alkanet	LOW
CALIFORNIA	<i>Searsia lancea</i>	African sumac	MODERATE
OREGON	<i>Aegopodium podagraria</i>	Bishop's goutweed	LOW
OREGON	<i>Geranium robertianum</i>	Herb Robert	HIGH
OREGON	<i>Lysimachia nummularia "Aurea"</i>	Creeping Jenny	MODERATE
OREGON	<i>Pentaglottis sempervirens</i>	green alkanet	LOW
OREGON	<i>Pyrus calleryana</i>	Callery pear	[still pending]
WASHINGTON	<i>Arum italicum</i>	Italian Arum	HIGH
WASHINGTON	<i>Carex pendula</i>	hanging sedge	HIGH
WASHINGTON	<i>Daphne mezereum</i>	February Daphne	MODERATE
WASHINGTON	<i>Epipactis helleborine</i>	garden helleborine	HIGH
WASHINGTON	<i>Petasites japonicus</i>	Japanese coltsfoot	HIGH
WASHINGTON	<i>Rosa multiflora</i>	multiflora rose	HIGH

## Central Coast rare plants

(Continued from page 13)

relationships between invasive plant cover, specific invasive plant species, associated thatch, and rare plant occurrence to determine which sites could benefit from weed and/or thatch control. The end goal for the analysis is to guide management strategy.

The Santa Barbara Botanic Garden has complemented this field work by collecting plant tissue from the rare plants at each site to support genetic research. Their staff and volunteers are also collecting seeds to test viability and create a conservation seed bank. These collections, coupled with the invasive plant monitoring and regional risk modeling, will help us to better protect these rare plant populations. Learn more at [sbbotanicgarden.org/conservation](http://sbbotanicgarden.org/conservation).

## Wildfire Risk Reduction

(Continued from page 12)

roadside seeding. Others with the National Park Service and California State University are working on roadside mowing regimens that reduce seed set from invasive plants while amplifying reproduction of native forbs that are less flammable. Still others are studying the benefits of using cacti as roadside plantings and for residential hazard reduction zones.

Such site-specific solutions need to be developed and implemented widely in order to reduce wildfire risk in a sustainable manner over the long-term, while also supporting the need to control the spread of invasive plants. Join us for a special session at the 2022 Cal-IPC Symposium in November to explore the topic further. (See page 9 for more on the Symposium.)

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*Check all websites for latest event updates*

### **Natural Areas Conference**

September 6-9, Duluth, MN  
[naturalareas.org](http://naturalareas.org)

### **California Native Plant Society**

October 20-22, San Jose, CA  
[conference.cnps.org](http://conference.cnps.org)

### **Cal-IPC Symposium**

November 1-3, Online  
[cal-ipc.org/symposium](http://cal-ipc.org/symposium)

### **California Islands Symposium**

November 7-11, Ventura, CA  
[californiaislands.net/symposium](http://californiaislands.net/symposium)

### **NAISMA Annual Conference**

November 7-10, Fort Myers, FL  
[conference.naisma.org](http://conference.naisma.org)

### **CARCD 77th Annual Conference**

November 2022, Sacramento, CA  
[carcd.org/conferences/carcd-77th-annual-conference](http://carcd.org/conferences/carcd-77th-annual-conference)

### **Innovations in Invasive Species Management Conference and Training**

December 13-16, Nashville, TN  
[invasiveplantcontrol.com/conference](http://invasiveplantcontrol.com/conference)

### **California Weed Science Society**

January 18-20, 2023, Monterey, CA  
[cwss.org](http://cwss.org)

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