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

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On the cover:

The North Bay Conservation Corps, working with Caltrans, celebrates after removing invasive sea lavender from the Highway 101 right-of-way in Marin County. Invasive sea lavender is a regional priority species for salt marsh habitat around the Bay. Photo: Dana Morawitz

FROM THE DIRECTOR'S DESK

Return of WMA funding?

By Executive Director Doug Johnson

Last fall, an amazing thing happened in Sacramento. Then-Governor Brown signed an executive order mandating that:

"the Secretaries of Food and Agriculture and Natural Resources will implement this [biodiversity] initiative to achieve the following goals, consistent with the Convention on Biological Diversity: promote deeper understanding of current and future threats to California's biodiversity; protect native vegetation; manage and restore natural and working lands and waterways; and explore appropriate financing options to achieve these goals."

Concurrently, the State of California released the *California Biodiversity Initiative: A Roadmap for Protecting the State's Natural Heritage*. Although it does not explore as thoroughly as it might the many invasive species-related actions that can be taken to protect biodiversity, the road map does generally direct state

agencies to "accelerate and streamline prevention, detection, and management of invasive species." The California Department of Food and Agriculture (CDFA) and the Department of Fish and Wildlife are specifically directed to "join forces... to tackle head on the challenges posed by weeds and invasive species."

An interagency working group to

oversee implementation of the initiative is still in the works, but Gov. Newsom's draft budget for 2019-2020 (the state's fiscal year begins July 1) includes funds designed to support implementation. This includes a golden nugget for the state's land managers: \$3 million for CDFA's Weed Management Area (WMA) program, funding that will catalyze extensive local work on invasive plant management across the state. Cal-IPC's persistent advocacy message — that invasive plant

management is essential to protecting biodiversity (and agriculture and water resources and fire safety) — found a foothold with the Biodiversity Initiative.

Supported by your donations, we are working in Sacramento to ensure this funding remains in the final state budget. Thank you to the many organizations that have signed onto our coalition letter supporting the funding. We also support allied efforts, like the push by the California Native Plant Society

to get funding for botanic gardens involved in seed-banking rare native plants through the California Plant Rescue partnership.

We celebrate this symbolic step forward and will be working hard with others to ensure that it results in sustained action to protect California's incomparable biodiversity.

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CAL-IPC UPDATES

2019 Cal-IPC Symposium – Join us at the Riverside Convention Center and the historic Mission Inn, Oct. 15-18! Registration is now open. Abstracts for presenters due June 1. See page 9 for more information.

Planning BMPs – Cal-IPC partnered with the US Fish & Wildlife Service to compile best practices for planning an invasive plant management program. The guide is available in the cal-ipc.org library. A training based on the guide will be held at this year's Symposium.

WMA funding – We are hard at work in Sacramento advocating for funding for invasive plant management grants statewide. The California Dept. of Food & Agriculture has \$3M for the Weed Management Area program in its draft budget for 2019/2020, the first new funding for WMAs in 8 years. Track and support our work at cal-ipc.org/WMAfunding.

Auto-renew is here – Now available through Cal-IPC's online membership renewal page at cal-ipc.org/join.

Diversity updates – Want to keep tabs on the progress of our working group on equity, diversity, and inclusion? Join the email list at cal-ipc.org/EDIconservation.

Orange County plan – Cal-IPC worked with Orange County Parks, the Irvine Ranch Conservancy, California State Parks, and the Natural Communities Coalition to complete a 5-year management plan for HCP/NCCP reserve lands.

Voluntaria control – With another superbloom in the desert, Cal-IPC and partners are busy in Borrego Springs mapping and removing invasive desert knapweed to keep it from escaping containment. It is currently found over 25 square miles, so eradication will take significant funding.

YOUR MEMBERSHIP

Thank you for keeping your membership current. Note that your expiration date is shown on the mailing label of this newsletter.

Wildland Weed News

Map sharing – With funding from the US Forest Service, State and Private Forestry, Cal-IPC supported Calflora and EDDMapS in sharing their spatial data for invasive plant locations. This enables land managers to see weed populations across state borders.

OTHER NEWS

Biodiversity Initiative – California has a new action plan for protecting biodiversity (see article at left). The executive order announcing its release recognizes that “the new reality of climate change requires a more thoughtful and systemic approach that considers the... vast web of relationships that tie together the myriad elements of California's ecosystems.” See the roadmap document at cal-ipc.org/WMAfunding.

Shipping threat – A study projects that rising global shipping traffic is likely to far outweigh climate change as driver of bio-invasions over the next 30 years. *ScienceDaily*, March 18, 2019

Conservation Fund – The federal Land and Water Conservation Fund has been permanently reauthorized via the passage of S.47, which also protects desert lands near Death Valley and Joshua Tree national parks and elsewhere.

Weed wrench – The original tool, long out of production, has been reincarnated as the Uprooter. theuprooter.com.

Top threat in AU

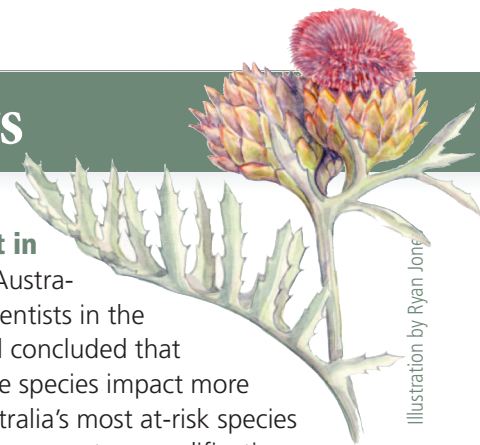
– Australian scientists in the journal concluded that invasive species impact more of Australia's most at-risk species than do ecosystem modifications, agriculture and other threats. *Pacific Conservation Biology*, 9/17/18.

Denialism denied – An article maintains that conservation is strengthened when scientists distinguish those disagreements based on value-based aspects of invasive species issues from disagreements about the accuracy of science-based aspects. *Conservation Biology*, 1/19/19.

Botany bill – Ask your Congressional representative to sign onto H.R.1572, promoting botanical research and science capacity. botanybill.weebly.com

Biocontrol for Brazilian pepper – After decades of work, Florida will soon release two biological control agents for *Schinus terebinthifolius*, which has overtaken melaleuca as the worst woody invasive in the state.

Cats indoors – The Hawaii Invasive Species Council adopted a resolution supporting the keeping of pet cats indoors and the use of peer-reviewed science in pursuing humane mitigation of the impacts of feral cats on wildlife and people.



California Invasive Species Action Week (CISAW) 2019 – Saturday, June 1 – Sunday, June 9. The goals of CISAW are to increase public awareness of invasive species issues and promote public participation in the fight against California's invasive species and their impacts on our natural resources. The week features events around the state organized by local partners, plus a youth art contest. Is your organization sponsoring an event? Submit it to be listed on the California Department of Fish and Wildlife's online map. Otherwise, look for a field day, workshop or other event and join in. www.wildlife.ca.gov/cisaw

A poster for the 2019 California Invasive Species Action Week (CISAW) from June 1 to 9. The poster features a purple background with several images: a black bear, a green plant, a group of people, and a person working in a field. Text on the poster includes: '2019 CALIFORNIA INVASIVE SPECIES ACTION WEEK JUNE 1 - 9', 'Promoting invasive species awareness • Encouraging public action • Protecting California's resources', 'Visit the CISAW webpage at wildlife.ca.gov/CISAW to find out how you can take action!', 'STOP INVASIVE SPECIES', 'Get Involved! Volunteer for invasive species removal or restoration projects - check the Schedule of Events to find one near you! wildlife.ca.gov/CISAW', and 'CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE'.

Wildfire helps *Arundo* control at Hansen Dam basin

Bill Neill, Riparian Repairs

Wildfire is a given in California and may offer opportunities for making progress on weed management projects. This article describes one case.

The largest and most natural riparian woodland within Los Angeles city limits is found in northeastern San Fernando Valley at the Hansen Dam flood control basin. Hansen Dam was constructed in 1940 by the Army Corps of Engineers to prevent Tujunga Wash flood waters (draining the western San Gabriel Mountains) from joining the Los Angeles River and inundating downtown Los Angeles.

Invasive *Arundo donax* is a major threat to the native flora of Hansen Dam basin, including native trees such as arroyo willow, cottonwood, sycamore, and white alder, plus shrubs such as chaparral bush mallow and golden current.

Starting in September 2016, a major project to control *Arundo* was funded by grants to the National Forest Foundation and administered by the Los Angeles Conservation Corps (LACC). Under my supervision, LACC staff operated a rotary mower to reduce the biomass of two large *Arundo* stands that were accessible to the mower, and crews cut access trails to other dense *Arundo* stands. As a professional herbicide applicator, I worked 620 hours over two years on the project. The Council for Watershed Health provided a project map and paid for the initial post-fire control of *Arundo* and perennial pepperweed; and the City of Los Angeles Dept. Recreation & Parks paid for herbicide treatment of castor bean and eupatory. We also opportunistically controlled less common invasive plants, including fig tree, Spanish broom, tree tobacco, Chinese tree-of-



Project map showing burn area perimeters, *Arundo* that was partly treated with herbicide before the Creek Fire (green polygons), and *Arundo* that was mostly inaccessible before burning but was sprayed afterwards (red polygons). Net *Arundo* area is approximately 45 acres. Map by Jason Casanova, Council of Watershed Health.

heaven, tamarisk, pampas grass, tropical ash, Mexican fan palm, bull thistle, and African umbrella sedge.

Wildfires — a small fire in September 2016, and the larger Creek Fire in

ARUNDO CONTROL METHOD

We used multiple approaches to control *Arundo*. Two large stands were accessible to a tractor mower/mulcher. We used this equipment to reduce biomass to the

ground, and then sprayed resprouts with herbicide. However, most large stands were not accessible by the tractor mower. In these cases, we used chainsaws and loppers to cut access trails, although we could not reach all interior stalks. We treated tall uncut *Arundo* clumps by low-volume foliar application using backpack sprayers and left the treated stalks in place because manual removal would have been expensive.

Foliar applications employed imazapyr-based herbicide

(either Polaris, Habitat, or Stalker) diluted to about 3% in water (4 oz per gallon) with an equal amount of methylated seed oil with surfactant to promote spreading.

In the low-volume treatment method, the applicator does not aim for complete foliar coverage (as in a “spray-to-wet” approach); partial coverage is sufficient. For instance, on tall stalks we got effective control when about one-quarter of the *Arundo* leaf foliage was contacted, with



This large *Arundo* stand had been impenetrable before the Creek Fire. It burned completely, and by April, four months after the fire, resprouts had grown 5 feet tall. They were easily accessed and sprayed by the Los Angeles Conservation Corps.

December 2017 — facilitated the *Arundo* control project by removing significant biomass. This gave easy access for treating resprouts. We were able to take advantage of this opportunity because we already had permitting and funding in place for the pre-existing *Arundo* removal project. This article documents our methods and results of *Arundo* control and describes the benefits of being project-ready when wildfire occurs.

some herbicide applied to all accessible stalks if possible; and on resprouts 4 to 8 feet tall, we obtained control when about one-third to one-half of the *Arundo* leaf surfaces were contacted. Using this approach, a backpack sprayer containing 3 gallons of herbicide mix can rapidly treat *Arundo* clumps containing hundreds of tall stalks or about 1/6 acre of shorter resprouts.

Historically, *Arundo* has been controlled using glyphosate-based herbicide, which has a reputation of greater efficacy during late summer and fall months, when stalk growth has stopped and nutrients (and herbicide) in the foliage are translocated to the roots. In contrast, imazapyr-based herbicide is excellent at controlling fast-growing new stalks during spring months and post-fire resprouts at any time of year. Following the Creek Fire, this attribute was critically important.

On the negative side, imazapyr treatments are slow to cause visible symptoms. Although stalks stop growing and apical tips turn color in two weeks, most treated *Arundo* foliage remains green for about a month and turns noticeably yellow about 5-6 weeks after application. If insufficient herbicide is applied, root masses can turn dormant rather than die, then revive 2-3 years later. Thus, monitoring for several years post-treatment is necessary to ensure full control.

For more discussion about using imazapyr-based herbicide for *Arundo* control, see the *Arundo* plant profile page on Cal-IPC's website, including my Spring 2006 article in Cal-IPC News.

CREEK FIRE

In early December of 2017, the Creek Fire burned nearly all the riparian woodland east and southeast of the central lake. This had several results that helped the *Arundo* control project.

Larger *Arundo* stands (other than the

two that had been mowed and mulched) had been sprayed only around the periphery due to lack of access. The fire removed extensive biomass and triggered resprouting during the spring months of 2018. In areas where we had already treated, we saw minor resprouting from root masses that were still alive. Interior



Rotary mower employed used to reduce biomass of two half-acre *Arundo* stands.



Arundo stand six months after herbicide application. Note the adjacent, unharmed elderberry tree.



Post-fire resprouting amidst black stubs, from a small root area that was missed in pre-fire herbicide treatment.

areas of large dense stands (that had been inaccessible) were now cleared and the vigorous resprouts were now accessible. We were able to spray these resprouts quickly and cheaply using access provided by the fire that otherwise would have taken years while we waited for stalks treated on the stand's periphery

to decompose. Herbicide treatment of post-fire *Arundo* resprouts was started in February 2018 and continued almost non-stop through September.

The fortuitous coincidence of herbicide treatment and wildfire provided an indication of our pre-fire treatment efficacy. In most places, *Arundo* biomass burned entirely, whether alive or dead before the fire, leaving only fibrous ash and short black stubs of burnt stalks remaining to mark where *Arundo* was present. Judging from the amount of post-fire resprouting in areas of dead stubs, I estimated that about 90 percent of *Arundo* root mass was controlled by the pre-fire herbicide treatment of tall uncut stalks.

By burning *Arundo* biomass quickly and completely, recent wildfires have proved highly beneficial for removing *Arundo*, but only because permits and financing were in place to allow post-fire herbicide application before *Arundo* resprouts grew tall and dense. Although wildfire can't be anticipated in large *Arundo* infestations, readiness for wildfire would seem a worthwhile goal on a watershed scale, on the assumption that some of the *Arundo* in a watershed will burn in a given year.

In past years, when Weed Management Areas (WMAs) in California received funding from the California Dept. Food & Agriculture, the Los Angeles County WMA budgeted for post-fire invasive weed control work, anticipating natural areas would burn somewhere in the county that would benefit.

Following the large Station fire of 2009 in the San Gabriel Moun-

tains, this WMA money was applied to control post-fire *Arundo* on private inholdings within Angeles National Forest. The CDFA funding would have been insufficient at Hansen Dam basin, but the Creek Fire aftermath demonstrates the concept's value.

All photos courtesy Bill Neill.

Another stinkin' weed: Stinknet expands in southern California

Christopher J. McDonald, Natural Resource Advisor, University of California, Cooperative Extension

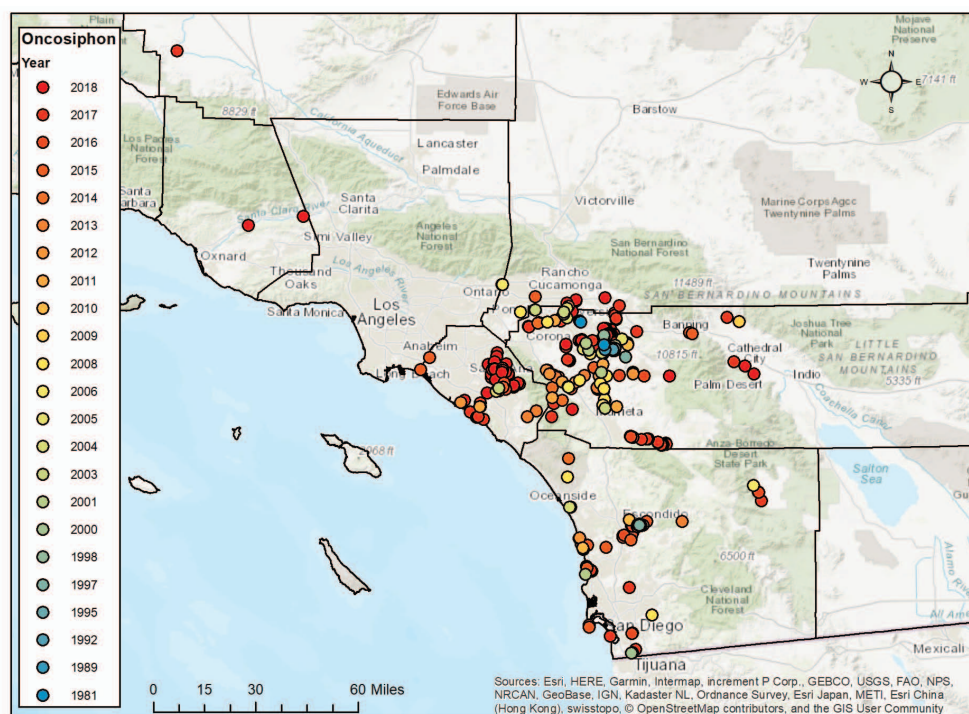
[Note: Stinknet is currently listed as a Watch species by Cal-IPC. It is in the queue for formal evaluation to support inclusion on the Cal-IPC Inventory as invasive. All photos courtesy Christopher J. McDonald.]

It seems like when we start to get a handle on the weeds we already have, another clever weed makes management more difficult. Stinknet (*Oncosiphon piluliferum*) is spreading across Southern California and making its way across the Southwestern U.S. Stinknet is a relatively new weed to North America, discovered in the early 1980s near Riverside. Like the common name suggests, the plant stinks. It has a pungent, turpentine, pine-like smell.

Stinknet is native to South Africa and, in its home range, stinknet is found from the coast to the arid desert. It is also invading Western Australia. It can flower later than some of our spring wildflowers and other weeds, creating an even longer management season.

Stinknet continues to spread throughout Southern California. Within 20 years of its discovery, large populations now occur in most Southern California counties, extending from the coast to the desert. New sightings in Kern (Stutz 2017, Calflora.org) and Ventura (Merkord 2018, Calflora.org) (see map) Counties suggest its further potential for expansion. In 2018, a small population was reported in Las Vegas, Nevada (Eckberg 2018, iNaturalist.org) as well as Phoenix, Arizona. It has also probably spread into Mexico.

Native plants and wildlife are likely harmed by stinknet. It is not palatable to livestock and possibly not to many native herbivores and granivores. Plants often show few signs of damage and harbor few insects. Stinknet also forms large dense patches in open spaces between shrubs, which can reduce foraging areas



Current and historic records of stinknet (source: Calflora.org; map created March 2019, Cal-IPC).

for birds, reptiles, and small mammals. Stinknet patches can carpet the ground and grow to densities of at least 6 seedlings per square in. (1 per square cm.). Over time, small infestations within a varied matrix of plant species transform into stinknet-dominated patches where wildflower diversity is low. It is unknown if these dense patches can reduce the vigor of native shrubs or outcompete invasive annual grasses. In disturbed open areas, stinknet patches can cover several to hundreds of acres.

Stinknet is a 2-3 ft. tall winter annual that germinates with winter rains and flowers in the late winter through the late spring. Plants can be as small as 1 ft. with 2-4 inflorescences, to as high as 4 ft. producing hundreds of flowers. In wetter locations, it can even flower into the summer. On all three continents where stinknet is found, it thrives in disturbed, open, semi-arid to arid environments. Here, plants can be found

in a variety of communities from coastal sage scrub, desert scrub, and invasive annual grasslands, to disturbed habitats such as roadsides, abandoned farms, and fields, as well as ephemeral streams and riparian areas. It is unknown whether stinknet populations can thrive under the canopy of taller plants, such as under chaparral or oak trees.

Stinknet seeds are tiny and easily transported by people and equipment, which are likely the main method of long-distance dispersal. The seeds are smaller than the size of the ball in a ball point pen (1 mm). Stinknet seeds are difficult to see and remove from equipment, boots, and clothes. As many have mentioned before, preventing invasive weeds is worth a pound of cure, and preventing stinknet seeds from spreading takes hard work. Cleaning efforts will have to be very thorough to remove the miniscule seeds.

Stinknet seeds disperse through a



A relatively small stinknet plant in flower. The upright growth and globe-shaped inflorescences distinguish this species from similar looking species, such as brass buttons and pineapple weed.

variety of mechanisms. They travel on people, equipment, and dirty vehicles. They are also likely carried by water, wind, and possibly wildlife. Off-trail occurrences noted during surveys and management activities in 2018 suggest that wind and wildlife are vectors. The dry inflorescences remain intact for months after the plants senesce. When the dry flowers are disturbed, they easily fall apart, with the seeds almost melting off the inflorescence and onto pants or shoes.

Stinknet can produce several cohorts during the growing season, which makes management difficult. Multiple treatments are often needed to control an infestation. Stinknet is not palatable to livestock and, because the seeds are so small, livestock are also likely excellent dispersers, by attaching to their hair or feet. While prescribed fire can reduce stinknet, it does not provide control beyond a single growing season. Stinknet can increase the amount of fine fuels in invaded areas, possibly increasing wildfire risk, extending into the summer months, as the dry plants are tall and persistent.

It is unknown how long the seeds of stinknet survive in the soil, although research is underway to determine the longevity. In Australia and California, the



Large, dense patches of stinknet in flower

seeds appear to remain viable for at least several years and it takes several years to fully control infestations (CJM Pers. Obs.).

Several herbicides can provide excellent control of stinknet. In my research, clopyralid, aminopyralid, glyphosate, and aminopyralid + triclopyr provide greater than 90% control of stinknet in California. Chlorsulfuron does not provide adequate control. In addition, clopyralid and aminopyralid provide good long-term control of stinknet, with some stinknet populations remaining below 10% cover over a year after treatment. In addition, several pre-emergent herbicides are currently being tested on stinknet populations with results expected in the next few years.

At some sites, stinknet flowers later in the growing season than some wildflowers, thus it is possible to treat stinknet after the wildflowers have started to seed but before stinknet is flowering. Applications of herbicides to stinknet during or just after the peak of flowering may not kill the plant fast enough to stop seed production.

Stinknet plants can be mechanically removed either by hand pulling (with gloves, the plants stink!), using mowers, or string trimmers. Applications will need to be repeated as multiple cohorts of plants will continue to flower throughout the growing season and small plants will flower when taller plants have been cut down. Equipment will need to be thoroughly cleaned to remove attached soil and seeds.



A closeup of stinknet seedlings growing in a dense cluster. Seedlings are very small and, with 6 seedlings crowding into a square inch of soil, competition is high.

Stinknet is relatively easy to monitor when flowering. The flowers are somewhat distinct, forming a bright yellow round globe, and plants usually stay green longer than some invasive grasses or wildflowers. The plants can resemble pineapple weed (*Matricaria discoidea*) or brass buttons (*Cotula australis*, *C. coronopifolia*), but neither of those species smell like stinknet.

Large, dense patches of stinknet can be spotted from a distance when flowering, especially with binoculars. The plants dry to a dark, almost rusty brown color, aiding in mapping after senescence. It is often more efficient to monitor new stinknet populations in the spring when it is flowering or even after flowering and mark the perimeter of populations for treatment the following winter. Stinknet creates dense patches where few other species can compete, and it can flower all spring, which means more work for managers who must deal with this stinky species.

Contact the author at: cjmcdonald@ucanr.edu

Conservation Corps and Cal-IPC partner in new training courses

Claire F. Meyler and Alene Spindel, Cal-IPC

Cal-IPC is thrilled to partner with local Conservation Corps (LCCs) to train the next generation of land managers. LCCs provide young men and women 18–25 years old with a year of paid service. Corpsmembers work on a range of environmental projects, gaining skills and experience that lead to meaningful careers.

Early this year, Cal-IPC launched a pilot program of training sessions for three Bay Area Conservation Corps groups: San Francisco Conservation Corps (SFCC), Civ Corps (in Oakland), and San Jose Conservation Corps (SJCC) at each chapter's main campus. Partners from local agencies, nonprofits, and private firms shared stories, expertise, and professional guidance for corpsmembers interested in pursuing careers in conservation, environmental education, and natural resource management. Attendees gained a fundamental understanding of why the ongoing weed abatement and management work of their Corps is vital to the health of California's wildlands and urban green spaces.

Representatives from partnering agencies led discussions on local ecology, ecosystem functions, plant biology and reproduction, tools of the trade, and the basics of planning and implementing invasive weed management strategies. Corpsmembers were exposed to the range of jobs, paid internships, and educational opportunities available to them in the conservation field. At the San Jose training, project leaders from Ecological Concerns, Inc. (ECI) led a walking tour of a future invasive plant management project site along Coyote Creek that San Jose Conservation Corps would be implementing to remove and

treat giant reed (*Arundo donax*) and Himalayan blackberry (*Rubus armeniacus*) alongside ECI.

Our pilot training program has received enthusiastically positive feedback from participants, LCC staff, and partners.



A crew from San Jose Conservation Corps spent four days working and camping at Rancho Canada del Oro Open Space removing French broom. It rained every day, it was cold, and the corpsmembers' boots were wet, but the crew still kept a positive attitude and did a great job improving the habitat. Photo courtesy SJCC.

corpsmember shared her feedback with Cal-IPC staff. She said, "Being in nature and working outside is healing. I am less anxious and am happier in nature. I am so grateful this training happened, because I want to find a career where I can work outdoors. I am planning to apply to both seasonal jobs you shared and hope I can start working in this field as soon as possible."

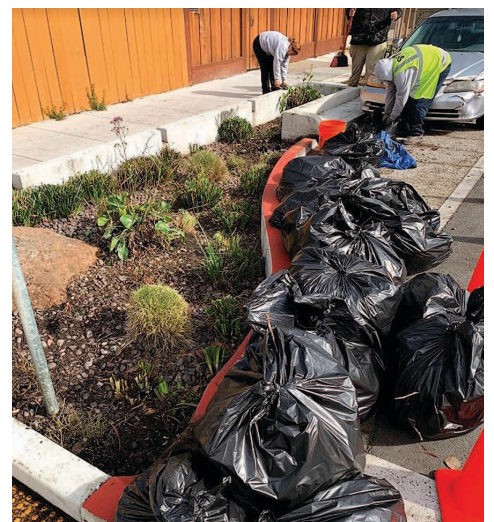
Building on the success of this program, we are pursuing additional grants and partnerships to repeat these training sessions for next year's corpsmembers. We are also looking to expand the program to serve other regions in California.

OUR CORPS PARTNERS

The San Francisco Conservation Corps was founded in 1983,



Before and after of weeding and landscaping work in urban greenways by the San Francisco Conservation Corps. Photo courtesy SFCC.



Ninety percent of survey respondents found that the training was "helpful" and "interesting," with staff unanimously requesting a repeat of the program. One

creating the first urban municipal youth corps in the nation. SFCC has grown from a basic education and training program

(Continued on page 14)

Evolving management perspectives in a changing world

Cal-IPC Symposium

Oct. 15-18, 2019 ~ Riverside

SAVE THE DATE!

Join colleagues in Riverside to share the latest in invasive plant biology and management.

SYMPOSIUM FEATURES

Our program includes talks, posters, trainings, discussion groups and field trips on a range of topics addressing invasive plants and their management. Connect with colleagues from across the state, and get the latest updates on effective tools, relevant research, and strategic management approaches.

Check out trade exhibits from our sponsors, discuss the student paper/poster contests, vote in the annual photo contest, cheer for the awards, and enjoy the social hour with raffle and silent auction. Sign up for an optional field trip Friday to explore conservation efforts and invasive plant management in and around Riverside.

New! 2019 Statewide WMA Meeting

– Representatives from Weed Management Areas across the state will share information on project design, new weeds, control techniques, early detection, mapping, permitting and more!

TRAININGS:

- Calflora Weed Mapping Tools
- BMPs for Planning Your Organization's Invasive Plant Management
- Bringing Diversity to Your Organization's Work

FIELD TRIPS:

1. **Santa Rosa Plateau** (Full day)
Experience a unique ecological mosaic and discussion of Native American history and grassland management tools.
2. **Santa Ana River and Tributaries** (Full day) Explore the unique challenges of restoring urban rivers and watersheds.
3. **Mill Creek Canyon** (Half day) Learn how partners support successful post-fire recovery and collaborate with their community.

SPECIAL TOPICS INCLUDE:

Research; Restoration and recovery in diverse habitats, including fire recovery; Management tools and methods; Ecological interactions; Community outreach; and Equity, diversity, and inclusion in land management.

SPECIAL SESSIONS:

- Reports on strategy from USFWS Refuges across the country
- Evolving perspectives on the role of invasive plant management in restoration
- CEUs for licensed applicators

OUR VENUE

We are meeting at the Riverside Convention Center and staying at the historic



Meet your colleagues from across the state to network, learn, and celebrate! Photo: Claire F. Meyler

Mission Inn. Built in 1876 and renovated to a AAA Diamond Hotel, the Inn has hosted Presidents and celebrities, including Amelia Earhart and John Muir. All sites are in downtown Riverside, steps away from restaurants and entertainment. Visit our site for registration details.

REGISTRATION

Visit cal-ipc.org/symposium to register, find information about the conference center and hotels, submit an abstract proposal, participate in the photo contest, and find more Symposium information.



Lessons learned from a 12-year eradication program targeting 34 species

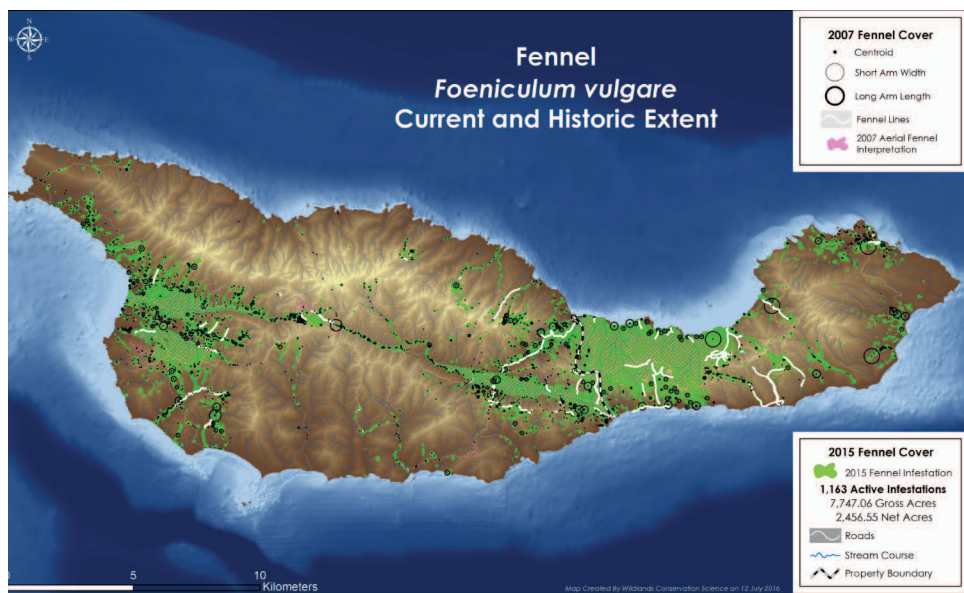
John Knapp, Senior Scientist, The Nature Conservancy

Eradication is considered a more effective management strategy than sustained control because the outcome is final. Why then do land managers rarely target invasive plant species (weeds) for eradication? It may be that their infestations are too large with well-established seedbanks, they lack the ability to commit, or they don't believe it is possible to achieve. Nevertheless, eradication is a viable strategy that is more accepted in the Southern Hemisphere than in North America.

The Nature Conservancy (TNC), which owns and manages 76% of the 62,000-acre island of Santa Cruz, utilizes its preserve as a platform to test and develop novel conservation tools and strategies. In 2007, TNC began its *Invasive Plant Eradication Program* to protect the resources of Santa Cruz Island while developing new survey, mapping, and treatment techniques.

The program began by evaluating which of the non-native species present (n=107) were invasive (n=55) using Cal-IPC's Invasive Plant Inventory and then conducting an island-wide, low-level helicopter survey for those weeds. The 55 species were then prioritized for management strategy (eradication, control, or no action), of which 35 were determined to be eradicable based on their distribution and abundance. A species-led weed management strategy was developed to guide the program. In 2007, 14 weed species were targeted. Over the next two years, weed workers were deployed to each site, relying on the support of a small two-passenger helicopter. We achieved success faster than traditional ground-based methods, and reinvested the money saved in tackling all but one of the target 35 weed species by 2014.

All species are treated annually. When



Comparing points to polygons is like comparing apples to oranges and has proven challenging, necessitating a switch to a nested grid system when collecting and comparing data. Map courtesy The Nature Conservancy.

all above ground plants have been removed, each infestation is monitored annually except for perennial species whose reproductive lifecycle is greater than two years, such as: Italian stone pine (*Pinus pinea*), Peruvian pepper tree (*Schinus molle*), or Mexican fan palm (*Washingtonia robusta*). After three years of monitoring following their initial removal, these species are now being monitored on a 3-5-year cycle to save unnecessary monitoring costs. Thirty-two of the 34 weed species are considered incipient and are low in the invasion curve, having small seedbanks. However, two species: Carnation spurge (*Euphorbia terricina*) and limelight (*Helichrysum petiolare*) are relatively abundant as compared to the other 32 species.

Of the 34 species targeted for eradication, 12 have been controlled to zero density, 20 are almost entirely in surveillance phase (98% of 18 species and 92% of two species), and two species remain under 100% active control. The follow-

ing are several key take-aways we have learned over the past 12 years:

LESSON 1 – ADAPT

Although the goals are the same, the program TNC started with isn't the program we have now. The strategies and tools employed to monitor, treat, collect data, and communicate results have evolved. As infestations reached zero density (no above-ground plants), the program has become more complex. It becomes much more time consuming to prove the absence of plants than to confirm they exist. How we used the helicopter to address these changes in infestation abundance has changed overtime. Where we once only monitored from the helicopter, we now also deploy weed workers to hunt and peck to find "the needle in the haystack." Just because we improved something, didn't mean that we stopped there. We are constantly evolving with the challenges we face as we approach eradication status.

LESSON 2 – DO NO HARM

Invasive plants pose a significant threat to the environment. However, how we go about removing these target species can also have unintended consequences such as: soil erosion, trampling native vegetation, dispersing weeds to other sites, or applying herbicides over multiple years. One reason we switched from a ground-based program to an aerial program was that it reduced and even eliminated many of the indirect impacts associated with traditional weed work. Additionally, we would avoid spraying flowers to reduce pollinators potentially becoming contaminated with herbicide. To protect chorus frogs and salamanders in upland sites, we would use aquatic formulations even if the cost was more expensive.

LESSON 3 – ERADICATION IS MORE THAN KILLING WEEDS

Weeds are like trouble. If you go looking for it, you'll find it. Likewise, if you systematically survey a preserve, you'll find weeds. The more systematic the survey, the more weeds you'll find. A preserve-wide survey is essential to fully understand what you are up against and surveying once isn't enough. Our first survey was in 2007, and by 2011 we began finding new infestations "popping up." In 2015, we surveyed again and found that we had approximately 110 new infestations and are preparing for a third survey in 2020.

Just killing weeds is not enough — determining what data to collect and how to collect it is key to tracking progress and adjusting strategy. Can it be compared from year to year? Does it convey progress? In 2007, we collected point and line data due to technology restrictions. In 2013, we started collecting polygon data as aerial imagery improved and ruggedized tablets became available. Points, lines, and polygons pose significant challenges in comparing progress from year to year and even when comparing the same feature type, e.g. points to points. Now we use a nested grid system, which allows us to track treatment, herbicide use, effort, surveyed area, and area not



Morgan Ball of Wildlands Conservation Science has been deployed by helicopter to begin combing the creek for invasive limelight. Photo: Wildlands Conservation Science



*John Knapp's "taxi" waits on stand-by while he treats Pampas grass (*Cortaderia selloana*) on the North Coast of Santa Cruz Island. Photo: Morgan Ball*

surveyed, and most importantly, compare year to year data.

LESSON 4 – ERADICATION IS PEOPLE MANAGEMENT

Our staffing model necessitated augmenting our staff with a contractor. Instead of treating them as hired help, we considered them a partner. By doing so, we made them more invested in our program and they brought innovative changes that advanced our agenda and reduced program expenses.

Administrators who hold the purse strings and do not see the impacts of

weeds don't always completely understand the importance a program has to the system being managed or its contribution to the field of weed eradication. To ensure an organization is committed to the eradication, it is critical to continuously message internally. Administrators typically do not want to get into the "weeds" of program implementation. Developing graphics that a lay person can easily understand and digest — such as a dashboard — has proven important to communicating our progress and cost-effectiveness to this critical audience.

LESSON 5 – DON'T BE SATISFIED WITH THE STATUS QUO

In designing our program, we knew we could remove all infestations in a year, but we weren't confident we could outpace their reproduction — some infestations would go to seed before they were treated. Therefore, we looked to other industries for solutions. Borrowing from New Zealand vertebrate eradication strategies, we found that using a helicopter to cut access time proved to be 12 times faster and half the cost of traditional methods. Each year, we view the outcomes of the previous year as the benchmark to beat the following season.

Spotted lanternfly, a new threat (and tree-of-heaven, an old one)

Dean Kelch, Plant Pest Diagnostics Branch, California Department of Food & Agriculture

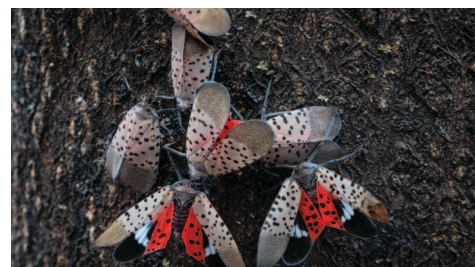
Spotted lanternfly (*Lycorma delicatula*) is a piercing-sucking plant-hopper that invaded the northeastern United States from Asia, possibly by means of an egg mass attached to a wood pallet or other packing material. It can feed as a sap-sucker on leaves and stems of a large array of species. It has distinctive and bright markings, making it easy to identify (see photos). This insect was first found in North America in Pennsylvania in 2014. Since then, it hasn't wasted any time in spreading to at least five states in the eastern U.S. Not surprisingly, there is a lot of concern from state and federal agencies regarding the spread of this insect. We must be on the lookout for it in California.

Spotted lanternfly population levels have exploded in areas of Pennsylvania. They can attack a wide range of plants, including many economically important ones. Apples, cherries, grapes, and hops are just a few of the acceptable hosts of this pest. Although spotted lanternflies can feed on many plants, there is one woody plant that they seem to favor particularly: *Ailanthus altissima*, the tree-of-heaven.

Tree-of-heaven is another invader from Asia, but its history here in North America is different from that of spotted lanternfly. An early horticultural introduction, it was brought to eastern North America



Left: Spotted lanternfly nymphs in their early stages of development appear black with white spots and turn to a red phase before becoming adults. Photo: Stephen Ausmus for USDA-ARS. Right: Adult spotted lanternflies are approximately 1 inch long and one-half inch wide with large wings. Hind wings are scarlet with black spots at the front and white and black bars at the rear. Photo: USDA



intentionally as an ornamental in the late 18th century. It has spread invasively, via both root sprouts and seeds, in urban habitats in the East and has also invaded relatively undisturbed deciduous forests.

It supposedly came to California in the gold rush years, brought by Chinese immigrants for cultural and medicinal reasons. In California, it has not spread widely, but it is remarkably persistent where planted, often forming large thickets that exclude native vegetation and can harm infrastructure. It's generally found near old home sites, sometimes when the original structure is long gone.

In the late 19th century, it fell out of favor as a horticultural plant, no doubt due to the unpleasant smell of the male flowers and its propensity to root-sprout vigorously. The latter characteristic explains its persistence, as well as the difficulty of control. A common, but utterly ineffective, treatment is to cut

down a tree and walk away. Hundreds of sprouts will emerge where one tree grew and develop into a thicket in a few years. Chemical control (sometimes combined with mechanical reduction or damage) has proven effective.

Because tree-of-heaven is so invasive, especially near infrastructures such as houses, offices, access roads, and parking areas, it is desirable to eradicate it where feasible. Nevertheless, because it is usually limited in distribution on any parcel and is difficult to eradicate, it is often ignored. In the calculus of invasive plant control, tree-of-heaven often is a low priority, at least until it impinges on infrastructure (for instance, sprouting in parking lot cracks). Even when managed, temporary mitigation seems to be generally preferred over the more intensive management needed for eradication.

However, the potential of tree-of-heav-

(Continued on page 14)



Left: Tree of heaven (*Ailanthus altissima*) is the preferred plant for spotted lanternflies. This rapidly-growing tree can reach heights of 50 feet. Photo: Matt Lavin. Middle: Female plant with fruit. Photo: Luis Fernández García. Right: Detail of flowering plant. Photo: H. Zell.

Why Cal-IPC is in my will

Mike Kelly, Cal-IPC Founding Board Member

I was excited to participate in Cal-IPC's founding at Morro Bay in 1992. There were only a few of us managing wildland weeds in San Diego — without training, experience, or knowledgeable people to turn to with our questions. At that meeting, we formed a new organization to meet the challenges of managing wildland weeds in California. I volunteered to be our first Secretary and was elected as President about eight years later.

Including Cal-IPC in my estate plan has been on my mind for many years. It's a very important part of what I consider my legacy as a citizen of this planet. I've been volunteering for over 50 years in many ways: protesting the Vietnam War and organizing for civil rights, women's rights, gay rights, and land conservation and restoration.

For the last 32 years, I've served on the board of directors for the Friends of Peñasquitos Canyon Preserve. Many of the grants I write to protect this land focus on addressing our biggest challenge: invasive weeds. As I work with partnering organizations around the state, I find the influence of Cal-IPC everywhere. I work with key organizers who are long-time members. Early and



Mike Kelly poses with Brownie Troop 3115-3 photo at Black Mountain Open Space, where the group helped to create coastal cactus wren habitat for nesting (cactus) and foraging (coastal sage scrub). In the background, a slope covered in invasive artichoke thistle contrasts with the yellow bloom of garland chrysanthemum.

continuing involvement with Cal-IPC has provided credibility with landowning agencies, especially since many of their rangers and biologists went through Cal-IPC training classes that I taught!

From the beginning, Cal-IPC was unique in promoting community involvement through the membership and participation of volunteers, not just professionals. This is evident in conference talks and in the pages of the newsletter. To ensure Cal-IPC's future, we can all contribute.

Finances of small non-profits like Cal-IPC can be like a roller coaster. Including Cal-IPC as a beneficiary of my estate is my way of contributing to meet this need. If enough members include Cal-IPC in their estate plans, it will allow the establishment of an endowment to help stabilize finances.

For me, the decision to include Cal-IPC in my will was easy. It's my way of securing a very important part of my legacy. I'm very proud of Cal-IPC!

YOUR GIFT TO THE NEXT GENERATION



Rene Sforza

How to join the Cal-IPC Legacy Community

To name Cal-IPC in your will or as a beneficiary of your bank or retirement account, the following information is all you need:

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Address: 5 Hamilton Landing, Suite 200
Novato, CA 94949

Tax ID: 68-0289333

Established: October 9, 2007

Already named us as a beneficiary? Contact Claire F. Meyler at 510.843.3902 x310 or cmeyler@cal-ipc.org.

Conservation Corps partnership

(Continued from page 8)

into a robust academic, job training, work readiness, and life skills experience program for more than 100 very low-income young adults each year. SFCC partners with Recreation & Parks and the Department of Public Works in the restoration of dozens of San Francisco's open spaces, including Buena Vista Park and Brewster Rutledge Community Garden. www.sfcc.org

Civcorps, in Oakland, started in 1983 as a GED preparation and job training program. In 1995, Civcorps received their charter to become a high-school diploma program, making it the only high school for young adults, age 18–26, in the district. During job training, corpsmembers work on contracts for employers such as Caltrans, EBMUD, and East Bay Regional Parks. In 2018, the Civcorps class put in 58,195 hours of work experience, reduced wildfire fuel loads from 543 acres of open space, cleared 51 miles of waterways, and maintained 33 miles of trails. www.cvcorps.org

San Jose Conservation Corps, founded in 1987, combines an on-site charter school with job training and life skills. SJCC work crews have a significant impact on their community, completing a total of approximately 50,000 hours each year of public service conservation projects, such as neighborhood cleanups; construction of fuel breaks, hiking trails, fences and picnic areas; renovation of parks; landscaping, including irrigation systems and tree planting/pruning; concrete sidewalk repair; and assisting at community events. www.sjcccs.org

More about the California Association of Local Conservation Corps: callocalcorps.org

Spotted lanternfly, a new threat (and tree-of-heaven, an old one)

(Continued from page 12)

en to attract a rapidly advancing invasive insect might well change that calculus. When (not if) spotted lanternfly reaches California, colonies of tree-of-heaven may well serve as hubs where the pest can multiply in large numbers and disperse onto other vegetation. In this case, tolerating one species of woody weed may have significant consequences for the health of surrounding cultivated and wild vegetation. This, in turn, may greatly increase the incentive for land managers to control tree-of-heaven as a high priority.

At least one other generalist, plant-feeding, invasive insect, the brown marmorated stink bug (*Halyomorpha halys*), is anecdotally reported as building up large populations on tree-of-heaven. In this case, the introduced insect is already established and spreading in California.

It's clear that ecological considerations in weed management can extend beyond concerns regarding direct competitive exclusion of native vegetation. Such connected ecological issues can be critical in weed control decision-making for prioritizing the use of limited resources.

In the case of tree-of-heaven and other pest attractors, amelioration or control may not be enough to prevent negative impacts to managed land. Although it may entail a greater initial investment of resources, eradication should be preferred to population reduction. Such an approach may pay great dividends in the form of harm reduction.

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emapi2019.org/

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ser.org/page/SER2019

Student Conference on Conservation Science

October 2-4, New York, NY
www.amnh.org/sccsny

Cal-IPC Symposium

October 15-17, Riverside, CA
cal-ipc.org/symposium

*"It's Game of Thrones in the
plant community. We think
there's a lot of really interesting
intrigue and backstabbing
and war going on in the plant
communities behind us, but
there's a lot of facilitation and
cooperation, too."*

— Noah Teller, from "the Impact of
Firebreaks in Southern California Sage
Lands" at westernipm.org.