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## STRATEGY: PLANNING FOR EFFECTIVENESS



Someone once described the spread of invasive plants as a “raging biological wildfire—out of control and spreading rapidly.” It’s an apt analogy. Invasive plants and wildfires can both inflict heavy economic and ecological damage. Much like wildfires, weed infestations can start small and then expand rapidly if not quickly controlled. And like wildfire management, effective weed management depends on four key strategies: prevention, early detection, control, and restoration.

We’ll cover these four strategies a bit later, but first a question: Do those who fight wildfires try to get as much information about a fire before deciding how best to fight it? Of course they do, and they use maps to help organize that information. The same is true for weed workers. Knowing what’s at stake—which invasive plants are threats and what they are threatening—is an essential step in developing an effective weed management strategy. Are there particular natural resources that are especially important to protect? Are there particular weeds that you know from reputation or personal experience could cause serious damage if they become established in your park? Which of the weeds in your park have the potential for rapid expansion and which have been there for decades without much change in the size of their populations? These are all geographical questions in the end, so it’s only natural to use a map to organize the information.

## **MAPPING**

Weed maps are great tools for prioritizing your work, monitoring your success, and creating a documentary record for those who will take your place in the future. A well-made map can also be an engaging outreach tool; like photographs, a single map can be worth a thousand words.

Mapping by hand is the simplest way to track weed infestations, rare plant populations, or other conservation targets. Select a base map—a USGS quad, a park trail map, or even an aerial photo—and then mark where particular weeds are found. Some weed workers make maps of particular invasive plant species on separate copies of the base map, one species per copy; others mark up a single copy. A map with just the right level of detail is what you're after, and that depends on your goals and aptitude. Map the type and size of the infestation using a standard set of symbols and indicate areas you have found to be weed-free. Also, of course, mark your conservation targets—the things you want to conserve.

It is also possible to map your weeds using a Geographic Information System (GIS) in combination with data collected in the field using a Global Positioning System (GPS) unit. This computer-intensive method is becoming the norm among professional weed managers, but many continue to rely on hand-drawn maps. For more information on both methods, refer to the California Department of Food and Agriculture's weed mapping handbook at [cain.nbii.gov/weedhandbook](http://cain.nbii.gov/weedhandbook).

## **PRIORITIZATION**

Once you have identified your conservation targets and the weed infestations that threaten them, you can begin establishing some priorities. You may find that your first priority is to protect endangered species populations and other valuable areas, just like someone fighting a wildfire might seek to protect people and buildings. But that's not your only priority. You also want to contain the fire (stop the big infestations from expanding) while extinguishing spot fires that have jumped outside the perimeter (eliminating pioneer weed populations). You're looking for a balanced mix of the four main strategies mentioned earlier: prevention, early detection, control, and restoration.

## **PREVENTION**

Preventing a new weed from becoming established in a park or open space is one of the best things you can do for the land. Weeds are so numerous in the Bay Area that it may be hard to imagine having to deal with new ones, but the distribution of weeds is always changing, due, in large part, to the activities of humans. You and your fellow outdoor enthusiasts may even be contributing to the spread of

weed seeds from one local park to another. They can be dispersed by mountain bike tires, for example, or hiking boot treads.

If you want to prevent new invasions, think about how they might get there. If there are equestrian users in your park or open space, work with them to use certified weed-free hay for their animals. If there are neighboring properties that have an invasive weed that has not yet arrived on yours, then work with them to eliminate it on theirs, or at least prevent it from reproducing. If there is construction work, landscaping, or other management that might entail seeding or planting, make sure that they don't include invasive plants in their seed mix or planting palette. You'd be surprised how often this happens! Construction equipment itself is also a vector for moving weed seeds, so it's a good idea to keep an eye on the area over time.

## **EARLY DETECTION AND ERADICATION**

Detecting new weeds and responding to them quickly is as important as prevention. It's almost certain that new weeds will arrive in your park. But the inevitability of arrival doesn't mean that they will persist. That's where you come in.

Containing a new weed, like containing an epidemic, depends on identifying it as soon as possible and initiating a rapid, coordinated response. Sounds challenging, but at a local scale it can be relatively straightforward. The main thing is to be attentive. If you see a plant that you've never seen before, try to find out what it is by asking an expert or keying it out (using the *Jepson Manual*, for instance). If it turns out to be an invasive plant and still occurs in relatively low numbers, try to eradicate the entire population.

Eradication means eliminating every single individual from the population, not just most of them. If you're diligent enough, and visit the site year after year to ensure that plants germinating from the seedbank are never able to set seed, you can be successful in eradicating the population. (Imagine if someone had done that with yellow starthistle back in the nineteenth century when it was first becoming established in California!)

The keys to eradication are detecting a new infestation early, responding quickly, and monitoring it carefully. An underlying assumption is that the invasive plant, once eradicated, is unlikely to reinvade. If it's likely to do so—for instance, if it occurs in great numbers on an adjacent property—then by all means try to keep it out of your park or open space, but it doesn't make sense to mount an all-out effort to eradicate every last individual. The probability of reinvasion is too high.

It's hard to overemphasize the importance of detection. New weed populations can't be eradicated if they're not detected! The good news is that it gives you an excuse to spend time hiking around your favorite place. Many weed workers

make a habit of walking every trail in the park at least once or twice a year to increase their likelihood of detecting any new weed populations. Some agencies have even instituted invasive plant patrols made up of volunteers who systematically search trails and other likely places for weed populations.

All this work is really worth it. As two veteran weed workers put it, “preventing or stopping just one new invasive weed would be of greater conservation benefit in the long run than far more costly and difficult efforts to control an already widespread pest.”

## **CONTROL**

When a particular weed has become widespread—like wild oats in a park with extensive annual grasslands—eradication is often no longer a sensible strategy. Instead, the most effective action may be to control its spread or lessen its impacts. Your park or open space may have, in addition to grasslands dominated by annual grasses, serpentine prairies where wild oats are just getting established. Though it may be well beyond your ability to eradicate wild oats from the entire park, you might more easily limit its spread into the serpentine prairies.

This example illustrates why focusing on outlier populations—small patches of a weed in an area that is otherwise relatively free of it—is often much more important than focusing on large, dense patches of that weed. It’s easy to feel compelled to throw all your effort into working on a major infestation. But that’s like sending fire fighters into the middle of a huge wildfire while ignoring its perimeter. It keeps on spreading, as if you hadn’t done a thing.

A strategy of containment may be your best option for invasive plants like Cape ivy or blue gum eucalyptus, which would require huge amounts of labor to fully eradicate and whose spread is mostly limited to areas in the immediate vicinity. For such plants, it’s better to focus on containing the large infestations and eliminating all the outlier populations than to spend countless hours trying to eradicate the main populations. Containment works well with infestations of these two plants because their pattern is to expand outward from the edge of the infestation, Cape ivy with advancing vines, and blue gum eucalyptus with new seedlings. (Eucalyptus seeds don’t tend to disperse very far.) Cleared areas around a patch of Cape ivy—containment paths—allow weed workers to easily patrol for new vines. Plants that disperse their seeds more widely, such as jubata grass, are not as effectively controlled using containment.

Once you’ve tackled an outlier population and removed all the plants you can find, keep track of its location—preferably on a map—and take notes on your effort. You are working against not only the plants you see in front of you, but also the weed seeds in the soil. They can last a long time in the seedbank, for many decades in the case of French broom, or just a few years in the case of small-

seeded plants like pampas grass. Once you've decided to eliminate that outlier population, it's important to return every winter or spring until no more seeds are germinating. Maps and good record-keeping will help you be persistent.

Except in really small parks, it is nearly impossible to keep track of all the sites where you have removed weeds unless you keep written records. Since every site where you have removed weeds needs to be revisited, you will come to rely on your records to make sure that you do. Develop a simple form for tracking the what, where, when, why, and who of work performed.

Conservation targets, maps, outliers, containment, and persistence—these basic ideas will stand you in good stead as you decide how to focus your weed efforts. The aim of control is not to eradicate weeds, but to reduce weed density and abundance below an acceptable threshold. The methods for both eradication and control are similar and include a wide variety of techniques that are treated at much greater length in chapter 5.

## **RESTORATION**

Weed removal is ultimately about returning the native plant community to the area. Once we have removed the weeds, there are often native seeds in the soil that helps restore native vegetation. But in other cases, if the native seedbank has been exhausted, revegetation—that is, replanting with natives—might be necessary after weed removal. This handbook does not cover revegetation, but here are a few tips to keep in mind. In heavily impacted areas, it may be necessary to partner with a native plant nursery that can propagate seedlings from locally gathered seed. When describing your project to others, make sure to communicate the role of weed removal in the greater picture of restoration. This is especially important when you are working on large areas that are in the public eye.

"It's invaluable to have intimate on-the-ground experience with the land. Where you're working with the same piece of land, where you see the changes, season by season, year after year, you're making acute observations about the dynamics going on, and that is what is in such short supply. If you don't know the actual on-the-ground situation, then anything you do as a manager is going to be somewhat off."

*Jake Sigg, California Native Plant Society, San Francisco*

## **WEED WORK IN PRACTICE: ADAPTIVE MANAGEMENT**

Translating these key strategies into action will keep you busy. Learning from your initial actions, so that your next set of actions is more effective, will keep

you smart. It's common sense really—start with a plan, carry it out, check to see if it worked, adjust accordingly, and carry on.

Conservation practitioners have formalized this common sense approach into what they call *adaptive management*. We always have the potential to learn something from our management actions—but only if we monitor and assess the impact of those actions. For weed workers, this can mean something as simple as visiting an outlier population a year after removing all the above-ground individuals. If there are seedlings coming up, then we need to do something we didn't have to do last year: treat seedlings, not big plants. This might call for a different control technique, one more suitable for seedlings.

Monitoring is the key. Without some kind of monitoring, there is essentially no way that you can succeed. The seedbank will always work against you. But monitoring doesn't have to be painful and involve lots of data collection and analysis. The simple steps of keeping good records and visiting all your sites repeatedly go a long way.