

EDRR HANDBOOK

APPENDICES

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APPENDIX A - Initial Considerations in Implementing a District EDRR Program

As you gather within your district staff to determine how to implement EDRR, you can inventory both needs and resources to create this program. Consider having at least two preliminary conversations. In the first you may mostly explore the following questions, determining who will follow up in each district to answer any determined essential to the process. In the second meeting you may be ready to prioritize within or across Park Units. Or you may be ready to develop criteria for prioritization at a later date. Completion of these steps may vary by district. In this discussion, you don't have to answer every question; you are still brainstorming to determine the overall needs of Park Units to be aggregated into the needs of a district as a whole.

While aggregating needs is important for communicating resource limitations and opportunities to headquarters, you may need to customize some elements of the EDRR program to Park Units or groups of Units (Sectors), depending on your organization and level of staffing. Document the way you approach this for internal clarity.

Guiding Questions:

District Needs for EDRR Surveys

1. What Park Units would we like to survey?
Recommendation – survey all Park Units to some extent whenever feasible.
2. What areas within Park Units are the highest priority?
Recommendation: If you cannot survey an entire road and trail network within a Park Unit, consider starting with a combination of heavily trafficked trails and infrastructure areas (parking lots, campgrounds, maintenance yards) and more remote, high quality habitats with lower visitation. In this way, you are covering areas most likely to get new weeds and areas most important to protect. Usually you will find that trails cut through both of these zones and hit some middle ground as well. You can also start with these high priority areas and then rotate through the rest of the Park Unit in subsequent years, creating a 3 – 5-year cycles in which all roads, trails, and infrastructure areas are covered.
3. How many miles of roads and trails fall within the high priority areas identified in question #2?
4. How many days would it take to survey the high priority areas for the first time? How many surveyors will you need?
Early Detection surveys take varying lengths of time based on the density of target species, complexity of vegetation, roughness of terrain, and distance of the survey area from offices or work sites. Think about it roughly: You know you want to survey a five-mile loop trail at a Park Unit an hour from the office. That might take a day if you include a rigorous search of the adjacent parking lot and non-system spurs to viewpoints, etc.

But it might go quickly if there are few weeds. Make this estimate as a rough guide to the overall need but be loose about it. Think in workdays or fractions of days, if feasible.

5. When should surveys occur, based on the habitat of the high priority areas and phenology of target species?
Are there any limitations on timing based on factors like heat, water levels, etc?
You will need to integrate target species phenology after the creation of a species list. At this stage, you may have some knowledge of how target species influence timing. Integrate that information if you know it or come back to it later.
6. Do you want to do treatments on surveys? Or will you separate treatment and surveying?
Many EDRR programs integrate surveying and treatment when feasible. Feasibility can be defined by a population size, time needed to treat population (no more than 10 minutes), access limitations, etc. Some detections happen after a plant has gone to seed or are made of species that are not treatable with equipment one can carry on a survey. These will require separate follow up treatment. The strength of surveyor's plant ID skills should also factor into whether to treat on surveys.
7. Which specifics of your protocols do you want to determine? Decide if points or polygons make sense for your program. What is the minimal data necessary to accurately record and complete follow-up treatments (if necessary)? What % flowering will you use for phenology definitions, etc.

Surveyors

1. Who is available to perform surveys?
Whenever feasible, integrate year-round district staff into your planning. These staff are most likely to know what is out of place. Supplement with seasonal staff and knowledgeable contractors who are willing to execute the district's protocol diligently. If you have experienced volunteers who will diligently execute the protocol, consider using them as a supplement to the core effort.
2. Based on your expected labor source, how often will you need to provide training and support?
Expect to provide more support for seasonal staff and volunteers. Training should include plant identification as well as data collection methodology and protocols, and database training (e.g. Calflora).
3. Who will manage and analyze the data?
If you are using volunteers and seasonal staff, you need a point person to QC and manage the data. Regardless of who surveys, the data are only useful if you integrate it into work plans, which means someone has to review it both in season to allocate resources to rapid response and annually to integrate new projects into work plans.

Treatment Strategy

1. Will treatments occur on surveys?

Recommendation – treat during surveys whenever feasible. Consider any extra tools or equipment needed to bring on surveys for treatments or when not feasible, develop protocols for reporting and follow-up (rapid response).



Weed workers from Redwoods Rising are ready to assist North Coast Redwoods District staff with an assortment of tools.

APPENDIX B - Developing a Target Species List Using CalWeedMapper

CalWeedMapper is a website (<http://calweedmapper.cal-ipc.org/>) that enables natural resource managers to create maps and reports of invasive plant distribution, to identify management opportunities in a region, and to maintain up-to-date species distribution data statewide. CalWeedMapper is integrated with [Calflora](http://calflora.org/) (<http://calflora.org/>) and [Consortium of California Herbaria](http://ucjeps.berkeley.edu/consortium/) (CCH) (<http://ucjeps.berkeley.edu/consortium/>) databases, such that any new occurrence data submitted to either database updates the statewide distribution in CalWeedMapper nightly. Calflora and CCH contain a compilation of specific plant occurrence data throughout California, including both user observations and herbarium specimen data. The CalWeedMapper website contains this occurrence data as well as data from Cal-IPC's statewide mapping effort, combining expert knowledge data and occurrence (GIS) data into one statewide system whose resolution is at the 7.5 Minute USGS Quadrangle level. Another function of CalWeedMapper is the ability to generate a management opportunity report for designated regions of the State. The management report for an area breaks down the species listed into the following categories:

- Surveillance: Survey to detect new infestations of species not yet present but nearby (occurs 50 miles from the boundary of your selected region)
- Eradication: Complete removal of infestations (occurs within isolated quads)
- Containment: Limit spread from existing populations

As part of this project, Cal-IPC added State Parks Early Detection Regions to the CalWeedMapper website. These regions are roughly based on Parks sectors, so districts with large geographic areas will be able to split their land base into smaller regions which may have different EDRR target plants.

Steps for generating a Management Opportunities Report using CalWeedMapper:

- Go to (<http://calweedmapper.cal-ipc.org/>)
- Click on Go to Maps
- Click on Advanced Tab in upper left
- Click Select Region Type, choose State Parks Early Detection Regions
- Select your region of interest
- Click on the "Get Management Opportunities Report" button for a .pdf or select the "Create a Report" dropdown to get a report in either PDF or Excel format. The PDF format gives a formatted report with pictures showing the three types of species, while the Excel report is the same info in a table including a list of the species with the categories in separate columns.
- Choose one of them and click "Get Report for Map Extent"

This CalWeedMapper report can be used as the starting point to choose your EDRR target species.

APPENDIX C – EXERCISES AND CHECKLISTS

We suggest creating your own custom checklists. Here is an example to get you started.

EDRR Equipment List - Example from One Tam

- Hiking pack
- GPS device for data collection
- Notebook and writing utensil
- Plastic bags for weed debris
- Gloves
- Water
- Lunch
- Mt. Tam trail map
- Specimen bags
- First aid kit
- Radio

Hand tools for treatment and detection. At least one of each tool per pair of surveyors

- Handsaw
- Hori hori
- Hand pruner
- Binoculars
- Boot brush for BMPs

Each mobile device should be loaded with the following:

- One Tam EDRR Illustrated Plant List
- Annotated Plant List in pdfs
- Observer Pro app
- GPS Logger for Android app
- Red Cross First Aid app
- iNaturalist app
- Avenza Maps app
- Collector app (or other apps as appropriate)



Japanese hori hori garden tool

QUICK CALCULATIONS FOR THE FIELD

Length:

- Feet x .305 = Meters
- 10ft = 3.05m
- 25ft = 7.62m
- 50ft = 15.24m
- 100ft = 30.48m
- Yards x .91 = Meters

Area:

- Circle: $3.14r^2$
- Circle (1m): 3.14 m^2
- Circle (5m): 78.5 m^2
- Circle (10m): 314 m^2
- Circle (20m): $1,256 \text{ m}^2$
- Circle (100m): $31,400 \text{ m}^2$
- When recording a radius, do not record anything less than .6m (= 1 square meter)



- 1 Hectare = $10,000 \text{ m}^2$ (length and width are 100m)
- Acres x .4046 = Hectares (1 acre is about 2.5 hectares)
- Acres x .0016 = Miles²
- Acres x .4047 = Meters²
- Feet² x .093 = Meters²

SIGHT ESTIMATIONS:

- 1 Acre = half of a standard size soccer field
- 1 Mile² = 320 standard size soccer fields
- From 49 Sky Oaks Road to Bon Tempe Lake Trailhead = .5 mile (example; pick your own familiar local landmarks)
- 100 Meters² = ~1 residential car intersection or ~half of a tennis court
- 1 Meter² = half of the area of a doorway
- This German shepherd is inside a square meter box.

**Calculating Labor Hours (for Weed Manager):**

- 15 min = .25
- 20 min = .33
- 40 min = .66
- 55 min = .92

DISTANCE ESTIMATION EXERCISES

1. Pacing

A pace is two steps. Knowing how many meters in a pace, or 10 paces, will help you in many mapping, monitoring, and orienteering situations. Understanding how your paces change with differences in terrain will make your distance estimates more accurate.

Lay out a meter-tape to 20 meters over a piece of flat, level ground. Walk as you usually would, counting your paces over the 20 meters. Record the number of paces in 20m, turn around, and walk back, counting your paces. Repeat this 5 times. Repeat the exercise on a slope.

of paces in 20 meters:

	Flat ground	Uphill	Downhill
1	_____	_____	_____
2	_____	_____	_____
3	_____	_____	_____
4	_____	_____	_____
5	_____	_____	_____
Total	_____	_____	_____
Meters/ pace	_____	_____	_____

To determine the number of meters in your pace, divide the number of meters by the number of paces (e.g., if it took me 25 paces to go 20m my pace would be 0.8m, and in 10 paces I would travel about 8m). How different is it in each situation?

2. Estimating

Often you will want to estimate distances, and practicing this skill helps hone that ability. We will take a meter tape and a rangefinder out into the field and estimate shorter and longer distances; check with the rangefinder and tape.

When are you most accurate in estimating distance?

Do you consistently over- or under-estimate?

3. Finding your location on a topo map or airphoto

Using landmarks and topographic features

Things most/all maps should have

Checking distance estimations with maps

4. Cover Estimation

Cheat sheet with different cover levels represented

Notice how lifeform skews cover estimates

Using cover classes

Gross area and infested area: gross=the area of the polygon around the entire infestation; infested=the area actually covered by the plant ("squished" to 100% cover), sometimes obtained by multiplying gross area by % cover (or midpoint of cover class)

Practice estimating cover of trees (all types and split by species), broom, coyote brush, and grass.

When collected: All quadrat species
Field width: 1 digit
MQO: No errors, at least 80% of the time

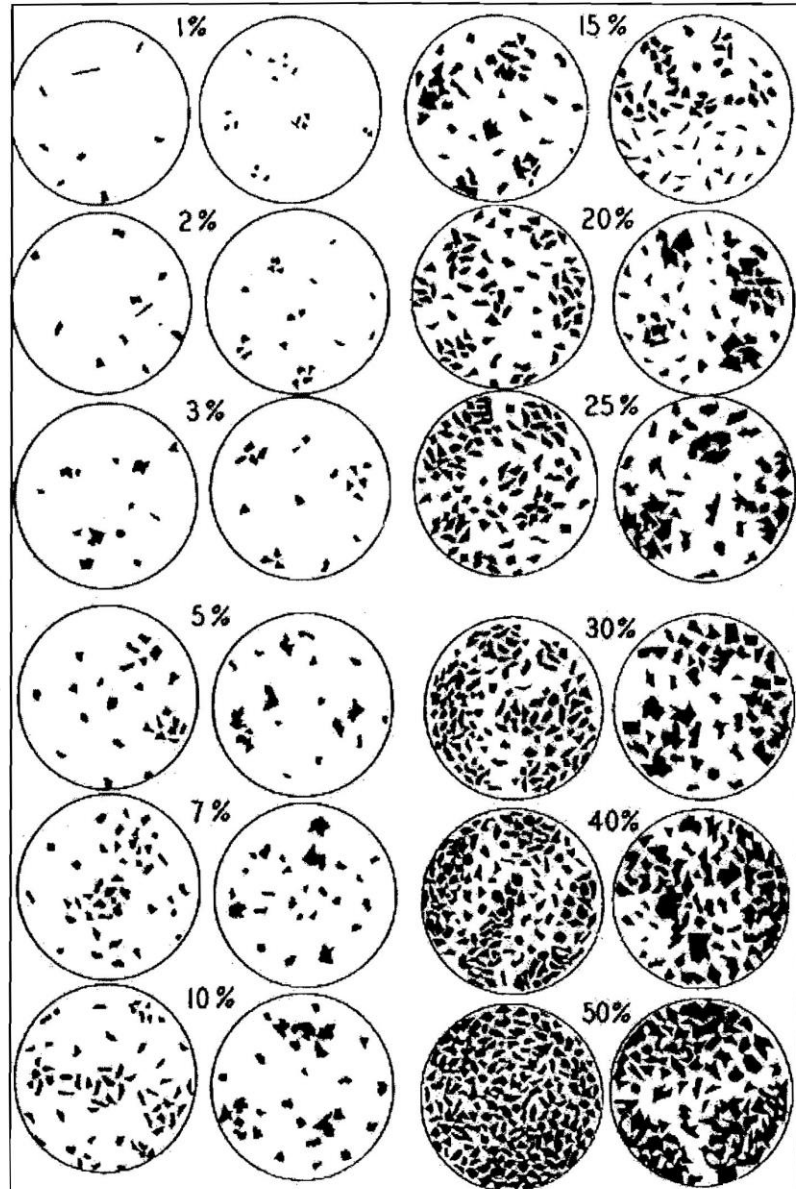
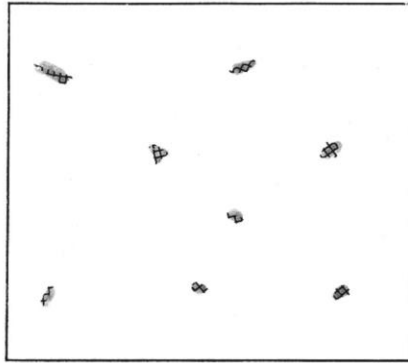


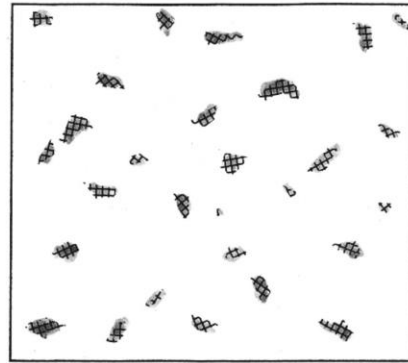
Figure 13-4. Reference plots for cover estimation.

CNPS COVER DIAGRAMS

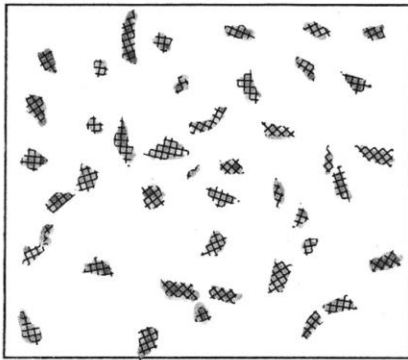
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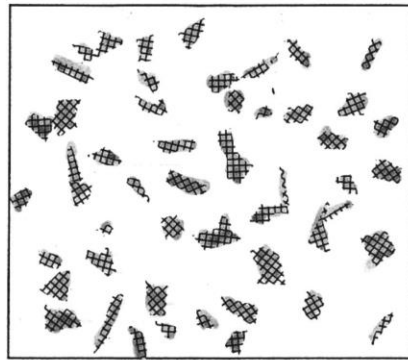
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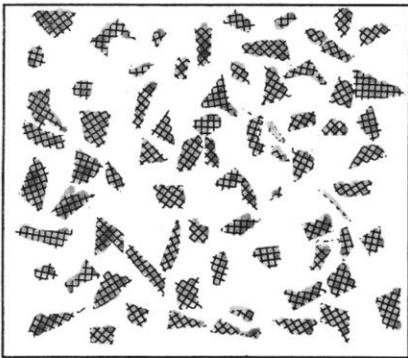
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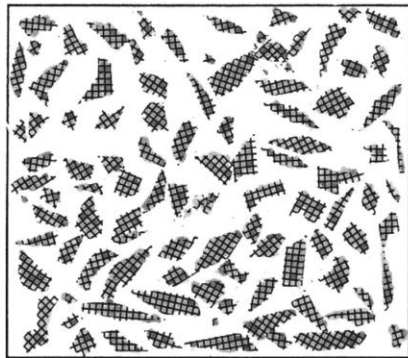
15%



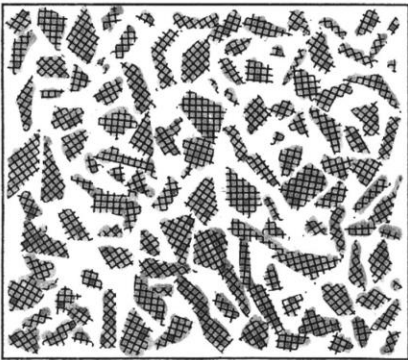
25%



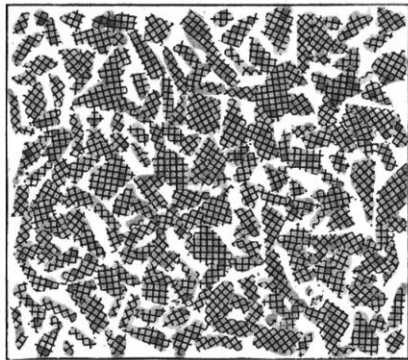
35%



50%



75%



APPENDIX D – BEST MANAGEMENT PRACTICES

Preventing the Spread of Invasive Plants: Best Management Practices for Land Managers
<https://www.cal-ipc.org/resources/library/publications/landmanagers/>

Preventing the Spread of Invasive Plants: Best Management Practices for Transportation and Utility Corridors
<https://www.cal-ipc.org/resources/library/publications/tuc/>

Best Management Practices for Wildland Stewardship: Protecting Wildlife When Using Herbicides for Invasive Plant Management
<https://www.cal-ipc.org/resources/library/publications/herbicidesandwildlife/>

List of Purchasable Equipment and Tools for Weed BMPs

Gaiters

For keeping vegetative debris out of shoes and socks while hiking off trail. Wear over boots when traveling through dense vegetation. Options come in a variety of colors and sizes.

Vendor:

<https://www.outdoorresearch.com/us/rocky-mountain-low-gaiters-243097?cat=129,25,6>

Boot brushes for field packs

For brushing off boots in the field and on the go. Give weeds the brush off when traveling in between work sites or across diverse habitats. Use after hiking through areas with weed seeds and before entering areas with sensitive habitat to avoid contamination. Pick can be used to get mud out of boot tread and other crevices.

Vendor:

<https://www.statelinetack.com/item/plastic-hoof-pick-brush-combo/SLT901729%20BLK/>
<https://www.amazon.com/Tough-Great-Grip-Hoof-Brush/dp/B00EJFD91E/>

Scrub Brush

Brushes that can be used for additional boot cleaning, scouring the sides and bottoms of boots. Attach to packs with carabiner for field use.

Vendor:

<https://www.lowes.com/pd/Scotch-Brite-Utility-Brush/1000622077>

Boot Brush Station

For brushing off boots when returning to the office from the field. Stationary unit can be placed in a location outside office building ideally near a hose and where any seeds will not travel to sensitive areas while cleaning occurs.

Vendor:

<https://www.amazon.com/Personal-Security-Products-BB2-Scraper/dp/B000T9SQQW>

Chemical Resistant Spray Bottle

For use with isopropyl alcohol or Quat disinfectant to clean after exposure to different pathogens. It is important to choose a bottle that is chemical resistant so that plastic does not break down between uses. Spray boots with isopropyl alcohol when finished visiting a site and returning from field or moving from *Phytophthora sp.* infected areas to non-infected areas. Spray equipment with Quat disinfectant after exposure to creeks with New Zealand mudsnails before changing creek systems.

Vendor:

https://www.uline.com/Product/Detail/S-16187/Spray-Bottles-and-Nozzles/SprayMaster-Chemical-Resistant-Spray-32-oz-Bottle?pricode=WB0997&gadtype=pla&id=S-16187&gclsrc=aw.ds&&gclid=Cj0KCQjw6eTtBRDdARIsANZWjYa1HGnk_bieWLZgxZo46iS4iGnnzZEKVPfChAckowWO8aFy18APElcaAmQeEALw_wcB

Isopropyl Alcohol

For cleaning off boots after exposure to areas with *Phytophthora sp.* Spray boots after visiting a site and before returning from the field or moving from *Phytophthora* infected areas to non-infected areas.

Vendor:

https://www.uline.com/BL_6718/Alcohol?keywords=Isopropyl+Alcohol

Bucket in a crate

Option for storing boot brushes and other BMP tools/equipment to make a BMP travel kit. Choose a size that best fits your equipment and storage space needs. A link to the Container Store provided below for a larger variety of bin sizes.

Vendor:

<https://www.homedepot.com/p/Leaktite-5-gal-70mil-Food-Safe-Bucket-White-005GFSWH020/300197644>
<https://www.homedepot.com/p/GSC-Technologies-6-5-Gal-Milk-Crate-Storage-Tote-in-Graphite-STM13131115/306330052>

Push Broom

Option for sweeping out back of truck bed or other vehicle areas of soil and debris that may find its way there. For use doing routine vehicle cleaning or after contamination from a field day.

Vendor:

<https://www.homedepot.com/p/Alpine-Industries-24-in-Green-Indoor-Outdoor-Multi-Surface-Push-Broom-460-24-1/310106899>

Wheel Well Brush

Option for cleaning mud and debris from wheel wells of vehicles that travel off paved roads. Use while washing vehicle.

Vendor:

https://www.uline.com/BL_14/Industrial-Scrub-Brushes?keywords=brushes



One Tam staff brush their boots after removing cheatgrass, a high priority weed in their region, before moving on to another site. Notice they are also wearing gaiters. Photo by Rachel Kesel.



Best Management Practices: *Phytophthora (Sudden Oak Death)* and Weeds

One Tam operates on lands owned by varying agencies, this document combines existing *Phytophthora* protocols. These protocols will also reduce the spread of weeds. By applying the most restrictive BMPs in practice on the mountain, the hope is to contain the spread of these harmful water molds and weeds.

Practices

1. Start clean, end clean.
 - a. Boots, gloves, tools, truck.
2. Clean between each worksite and at end of day.
 - a. If moving sites, all cleaning should be done prior to leaving.
 - b. Remove all organic material from tools, gloves, boots and truck.
- c. Removal can be accomplished using water or compressed air. If needed use a stiff brush or screwdriver to remove material from deep crevices.
 - Make sure if using water that it is dry before moving locations.
 - If using water, make sure that you do not spread contaminated water to non-infected areas. This can be accomplished by cleaning over pavement.
 - It is also important to not flush contaminated water or debris into storm water drainage, but instead the sanitary sewer drain.
 - If you cannot safely decontaminate items in the area you are in, you may bag them and transport to a safe cleaning area.
- d. After material is cleaned off, use rubbing alcohol of at least 70% concentration to sterilize the surface.
 - If any tools were used to clean off infected tools, make sure they are also sterilized.
3. In the field
 - a. Avoid the transfer of dirt or organic matter between sites.
 - b. Work in areas of low risk, then move to areas of higher risk.

APPENDIX E - REFERENCES AND RESOURCES

California Invasive Plant Council (Cal-IPC)

<https://www.cal-ipc.org/>

CalWeedMapper

<http://calweedmapper.cal-ipc.org/>

Cal-IPC Regions Page

<http://calweedmapper.cal-ipc.org/regions/>

Cal-IPC Invasive Plant Mapping & Prioritization

<https://www.cal-ipc.org/solutions/mapping/>

Invasive Species ID Cards for EDRR

<https://www.cal-ipc.org/solutions/management/edrr/species-id-cards/>

Calflora Weed Manager page

<http://www.calflora.org/entry/weed-mgr.html>

California Department of Food and Agriculture (CDFA) Plant Health and Pest Prevention Services Division

<https://www.cdfa.ca.gov/plant/>

Weed Research and Information Center

<https://wric.ucdavis.edu/>

Invasive Species Education Materials

<https://www.playcleango.org/invasive-species-education-materials>

Other EDRR and Weed Management Plans and Guidance Documents

Invasive Plant Management Plan and Environmental Assessment for Redwood National Park and Santa Monica Mountains National Recreation Area

<https://parkplanning.nps.gov/projectHome.cfm?parkID=341&projectID=44351>

One Tam EDRR report (Kesel Greenberger 2020)

<https://www.onetam.org/sites/default/files/pdfs/Beyond%20Boundaries%20One%20Tam%20EDRR%20Report%202020.pdf>

Land Manager's Guide to Developing an Invasive Plant Management Plan

<https://www.cal-ipc.org/resources/library/publications/developingplan/>

Practical Guidebook to the Control of Invasive Aquatic and Wetland Plants of the San Francisco Bay Region – by the San Francisco Estuary Institute
<https://www.sfei.org/nis/>

Weed Workers Handbook
<https://www.cal-ipc.org/resources/library/publications/wwh/>

Stewarding California's Biodiversity: Early Detection and Rapid Response for Invasive Plants.
<https://www.cal-ipc.org/resources/library/publications/ca-biodiversity-edrr/>

Safeguarding America's Lands and Waters from Invasive Species: A National Framework for Early Detection and Rapid Response. US DOI, 2016.
<https://www.doi.gov/sites/doi.gov/files/National%20EDRR%20Framework.pdf#:~:text=A%20national%20EDRR%20Framework%20needs%20to%20consider%20non-yond%20the%20area%20occupied%20by%20the%20founding%20population.>

Early Detection of Invasive Plant Species in the San Francisco Bay Area Network – A Volunteer-Based Approach. NPS, 2009.
<https://irma.nps.gov/DataStore/DownloadFile/460898>

Five-Year Invasive Plant Management Plan for the Central Reserve of the Nature Reserve of Orange County and Adjacent Lands
<https://www.cal-ipc.org/resources/library/publications/nroc-5-year-plan-central/>

Weeds and Wildfire:

Managing Weeds after Wildfire, Montana State University Extension, 2019.
<https://store.msuextension.org/publications/AgandNaturalResources/EB0230.pdf>
and article:
http://www.sarc.montana.edu/documents/weedposts/December%202019_managing%20weeds%20after%20wildfire.pdf

Fire Management and Invasive Plants: A Handbook, US Fish and Wildlife Service, 2008.
https://www.fws.gov/invasives/pdfs/USFWS_FireMgtAndInvasivesPlants_A_Handbook.pdf

Effects of Fire on Nonnative Invasive Plants and Invasibility of Wildland Ecosystems, US Forest Service, 2008. https://www.fs.fed.us/rm/pubs/rmrs_gtr042_6/rmrs_gtr042_6_007_032.pdf

Wildland Fire in Ecosystems: Fire and Nonnative Invasive Plants, USDA, US Forest Service, 2008.
https://www.fs.fed.us/rm/pubs/rmrs_gtr042_6.pdf

Integrated Noxious Weed Management After Wildfires, Natural Resources Conservation Service, 2001.
<https://digitalcommons.usu.edu/cgi/viewcontent.cgi?article=1586&context=govdocs>

APPENDIX F – Methods for Developing Areas to Search

The following is a description of the methods used in 2012 to develop the initial set of search areas for the pilot program.

EDRR search areas were important to develop so staff and volunteers would know where to focus efforts and hopefully find the most new EDRR plant introductions. We chose maps over lists of search areas as names of locations may change over time and would not be helpful for new staff or volunteers without longer-term experience. Maps of search areas can then be provided to EDRR data collectors, along with the identification cards and data collection protocols.

In order to create a state-wide map set, we chose to start with the state-wide GIS layers that are available on the Department's GIS server. While these layers are not complete for all parks, they contain enough base information which could be used as a starting point, and district details could be added to complete them. We called the search area maps generated with GIS layers our "GIS Dumb Model," meaning it was developed with a fixed set of rules applied to an incomplete data set and would certainly have limitations with respect to how "smart" it was when a land manager who knows the area well looked at its output.

We considered the areas in our GIS Model to be those where the likelihood of invasive plant introduction was greatest from visitors and park personnel, namely parking lots, bathrooms, campgrounds, highly traveled/walked/hiked roads, and the start of trails beyond trailheads. This GIS proxy would help to guide natural resource managers to where we thought it would be most effective to search for early detections of invasive plants. The output of this effort was to provide both a draft set of search area maps to land managers and to create a summary table of total lengths and areas to search by unit (aka Park) so that upper management could estimate resource needs for their district's early detection effort. While we knew that land managers in each district would want to refine the GIS model for their district (and indeed, each pilot sector that we worked with did), we thought this was a great place to begin both visualizing and costing the EDRR effort.

Using the "GIS Dumb Model" for selected sectors, our goal was to calculate the number of miles of roads to search by park in every state parks district. To generate this information, we used the State Parks GIS roads (RegRoutes_2014_01_16.gdb) layer. First, we removed (queried out) the roads features that were in Route Class 6 and had Route Categories 7 and 8. We also removed all of the Route Class 9 roads. (To understand these routes and categories, see State Parks GIS Department document describing fields and domains in Route_Collection_FieldsAndDomains_20110829.xls). The remaining roads were then clipped to park boundaries. Finally, we calculated the length in miles of the remaining roads to search for early detection weeds, putting this information both in maps by Unit Name (aka Park) and in one large spreadsheet of miles to search by Unit Name (aka Park).

Next, we calculated areas to search (polygons). To do this we took the state park facilities GIS point layers (picnic areas, parking, campgrounds, buildings, structures other, but NOT utilities) and buffered them by 100 meters (m). We then clipped the resulting polygon to State Park boundaries. We included these polygon search areas in the maps by Unit Name (aka Park) that we generated for all remaining CA State Park districts, and we included the area calculations (in acres) in one large spreadsheet of acreages of search areas by Unit Name (aka Park).

After developing the GIS model for search areas, we suggest meeting with the district managers to refine the maps. Here is the meeting information we developed.

On day one of the District EDRR Start-up Meeting we are developing GIS maps to determine EDRR search areas. These are the areas with frequent use and visitation where there will be staff available to perform EDRR searches at 1 to 3-year intervals. Our goal is to finalize these maps together during the meeting.

Since we have a limited number of staff hours available for this work, we should choose areas with the highest likelihood of new invasive plant introductions. Previous districts have settled on a methodology where they focus on areas like:

- Parking areas
- Day use areas, including restrooms and picnic areas
- Campgrounds
- Parks administrative buildings and housing areas
- Parks maintenance yards
- Major roads and highways adjacent to or near the Park boundaries
- Areas of recent disturbance such as wildfires or construction projects

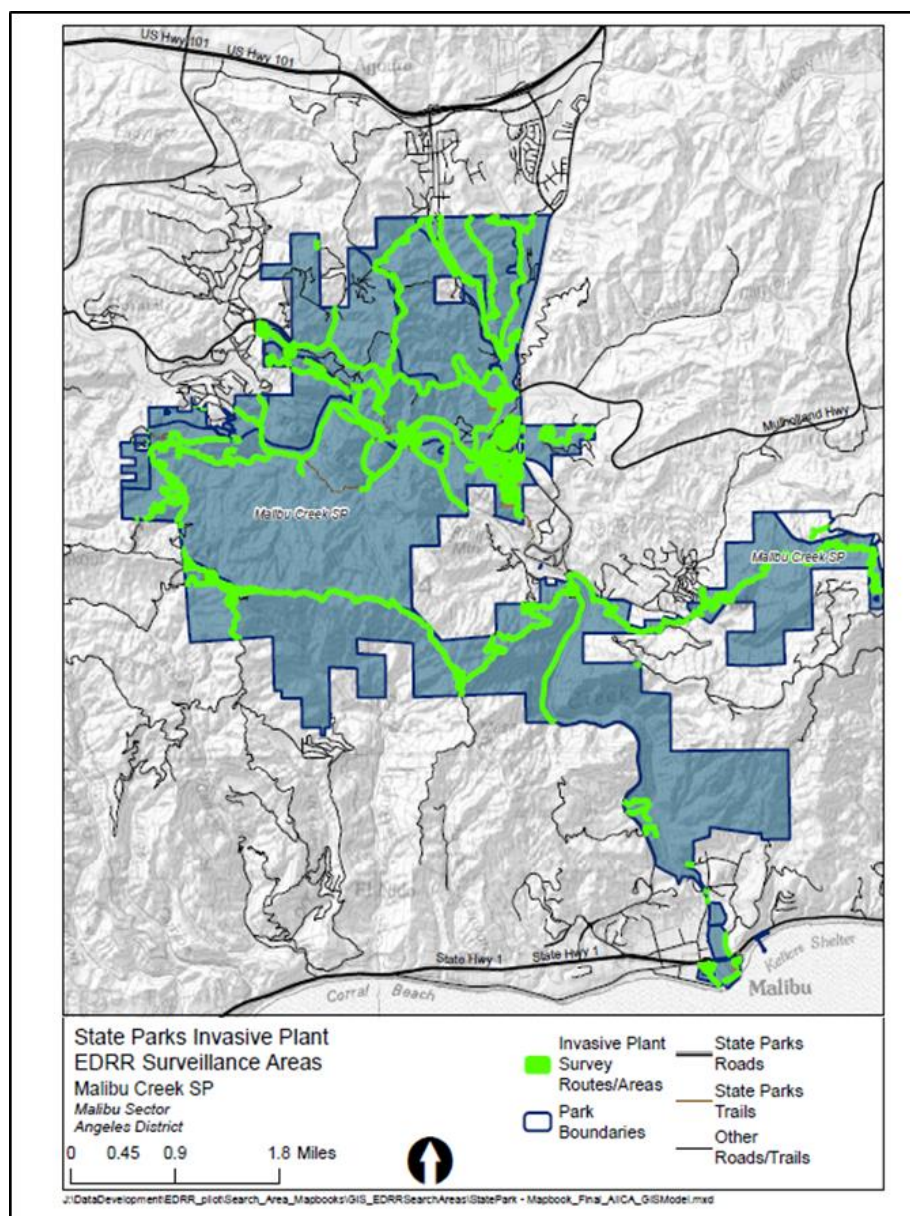
Before the meeting:

1. We would like to gather GIS roads, trails, and facilities layers for the selected EDRR Parks. Note: this is particularly critical if what you have is different from what's in the state GIS layers.
2. We are asking participants to take a look at the included parks in your district and consider the guidelines above. We ask you to make notes on where the EDRR searches should occur, categorizing them into High (every year), Medium (every 2 years), and Low (every 3 years) search efforts. This may be done on existing state parks maps, through Google Earth, or in a GIS, using existing GIS layers and aerial photos.
3. We will have a GIS layer with the roads and trails within the Park, and a buffer around the facilities included in the State GIS layers. We will use this, as well as your district's data, to generate search areas at our meeting.
4. During the meeting, we will go over each park and develop an EDRR search area map. These maps are used to guide staff in where to search and to estimate the amount of effort and budget necessary for this program.

After the meeting we will produce a map book which includes the EDRR search areas, and a set of shape files which can be used by the district and the state-wide program. You will also receive .pdfs of your search areas per each district for use in subsequent years.

We were able to refine the GIS Model into custom GIS search area maps and an accurate table of lengths/areas to survey by Unit Name (aka Park) for the pilot districts and Monterey where we were fortunate to work directly with district staff. In 2015, the map book was expanded statewide to include additional parks using the same methods (example below). It can be found at:

J:\DataDevelopment\EDRR_pilot\Search_Area_Mapbooks\GIS_EDRRSearchAreas\State Park - Mapbook_Final_AllCA_GISModel.mxd



APPENDIX G - Case Studies: Santa Cruz District EDRR Program Development and Orange Coast District: Estimates of Staff Time and Engagement with Local Partners

Some preliminary objectives for Santa Cruz District EDRR pilot project were:

1. Produce and distribute 100 sets of “Early Detection Targets Identification Cards” to docents, staff, and cooperating organizations by 2017.
2. Register all the units within the Santa Cruz District as “Parks” in “What’s Invasive” and create lists of high priority weeds for those parks by 2016.
3. Incorporate EDRR findings into yearly work planning starting in 2015

Developing EDRR Target List

We started with the CalWeedMapper list for the Santa Cruz Mountain Sector which contains 4 parks. The report gave us 33 surveillance targets and we also reviewed the 11 eradication targets, as well as a selection from the 139 containment targets, that met the criteria of being less than 15% infested within the Sector. We considered Cal-IPC rating, prioritizing High and Moderate ratings over Limited. Next, we considered “detectability” meaning would a non-botanist be able to identify this plant while walking along a trail if they were trained to find it? Using that criteria, we eliminated most of the grasses, aquatic plants, and plants with habitat not occurring in the Mountain Sector.

We also evaluated a local list, the Bay Area Early Detection Network (BAEDN) List, to include additional species of concern and looked at CalWeedMapper climate projections to see expanding or contracting suitable range for each species in 2050. Finally, we narrowed the number of total training species by lumping similar genera. For example, we had three knapweeds on our list and two types of toadflax, each of which were lumped or treated as a single target.

After our internal screening we solicited expert review by other local botanists. This step was useful because it forced us to re-visit the goals of the project. As a result of the review we added 2 more species to our target list.

Narrowing the Search Area

When starting the pilot project, we narrowed it overall to just 4 parks in the Santa Cruz Mountain Sector instead of covering all 30 Parks in the District. This allowed us to focus on methods and after determining time needed to cover the priority areas, scale the project up to make time and budget estimates for the whole District. At first, we assumed we would be covering all roads and trails on foot, but quickly determined that would take too much time. Some areas, such as redwood forests, are very resistant to invasion and invasive plants tended

to occur only in disturbed areas near facilities and high use areas. Therefore, we developed the GIS methods included in Appendix G to guide formation of priority search areas. This method will also allow more frequent coverage of the high use areas by trained NR staff, while the training materials can be distributed to docents and volunteers to generate searches of roads and trails further afield. This approach has the dual benefit of putting the best trained people where they are most likely to encounter weeds and allowing volunteers to search more scenic areas.

What this method does not account for is how valuable an area is, but only its vulnerability. A more complex analysis would account for both how “valuable” (the relative diversity or rarity of a habitat), and “vulnerable” any given area within a park was. This type of analysis may be incorporated in the future.

One unexpected benefit of the Santa Cruz EDRR pilot project has been the interest from volunteer groups. Santa Cruz staff trained more than 200 volunteers who contributed more than 500 hours of surveillance and reported 3 populations of EDRR target species. For Castle Rock State Park, a college class and a trail patrol group volunteered to test the EDRR methods and the docent group for the area requested a presentation.

Estimating Time and Budget

This component of the EDRR pilot program still needs development. Below is an example used for the Orange Coast District pilot.

Estimates of Staff Time Needed to Cover EDRR Priority Search Areas for Orange Coast District

Park Unit	Yearly Length of Survey (miles) ¹	Yearly Hours for Area Survey ²	Total Yearly Hours Estimate	Cost for team of 2 at \$15/hr ³	GIS “Dumb Model” Areas (acres)	GIS “Dumb Model” Lengths (miles)
Bolsa Chica SB	4.19	2	6.19	185.7	114.10	7.00
Huntington SB	3.17	2.5	5.67	170.1	0	10.86
Crystal Cove SP	11.75	22.9	34.65	1039.5	339.00	46.20
Doheny SB	0.73	3	3.73	111.9	12.71	1.63
San Clemente SB	1.05	10.6	11.65	349.5	20.00	2.52
San Onofre SB	17.65	12	29.65	889.5	61.37	24.37
Totals	38.55	53	91.54 * 2 crew	\$2,746.20	547.18 acres	92.58 miles

1. Lengths determined based on estimate for one year of effort. Calculated using total distance for high priority segments, half distance for medium priority, and one-third distance for low priority.
2. Hours for length per year estimate based on an assumption of 2 miles per hour coverage for a team of 2 people, plus travel time. Area estimates based on time estimate for crew to cover area, prepared by local Natural Resources managers.
3. Hourly cost estimates are for an average of rates in Environmental Services Intern and Park Maintenance Aide classifications. Field time only, data management and project oversight not included in these calculations.

Orange Coast District Examples of Engagement with Local Partners

Volunteers:

A special group to consider drawing volunteers from is your local chapter of the California Native Plant Society (CNPS). Members are passionate about native plants and have good identification skills. A very successful collaboration has been developed in Orange County between the local CNPS chapter and local land managers. The Orange County chapter of CNPS developed an Emergent Invasive Plant Program that includes publishing a priority list and watch list, developing resources, tools, and a training program, and recording new detections using Calflora. They also lead EDRR trainings for staff and volunteers that are supported through NCC (Natural Communities Coalition).

Partnerships:

State Parks Orange Coast District works with regional partners connected through NCCP/HCP permits to collectively agree upon management strategies for invasive plants. In 2016, Cal-IPC wrote an invasive management plan (see link below) for the coastal portion of the reserve system defined in the NCCP/HCP, which formally created an EDRR program for the region. Using a valuation system and comparing multiple existing EDRR and watch lists, a prioritized target list of species was created, frequency of searches defined, and search routes identified. The prioritization structure includes three tiers for searching: high, medium, and low priorities. Four tiers exist for treatment prioritization: eradicate reserve-wide, control within watersheds, control opportunistically, or not treating at this time. Each species is assigned a priority for both search priority and treatment. This dual prioritization allows opportunities for data to be collected on a species that is not currently being treated to inform future management decisions. This list is revisited each year with species priorities adjusted based on the previous year's data. The Natural Communities Coalition (NCC), a group that coordinates the NCCP/HCP participants and signatories, pays for a contractor to walk that year's search routes and collect data within Calflora. Once a population is found, either State Parks NRM staff treat the population or an on-call contractor through NCC can be asked to treat.

<https://www.cal-ipc.org/resources/library/publications/nroc-5-year-plan-central/>