ERADICATING 25 SPECIES- CHALLENGES AND SUCCESSES OF SWITCHING FROM POPULATION TO SEED BANK MANAGEMENT ON CATALINA ISLAND, CALIFORNIA

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Abstract

In 2003 an extensive island-wide invasive plant mapping survey was conducted on Catalina Island, and 76 species were prioritized for management action. Total area infested, number of populations, and median population size were used to develop a ranking index to identify species for eradication. A two-year funding campaign secured the initial support for eradication of 25 species including: *Arundo donax*, *Centaurea solstitalis*, *Delairea odorata*, and *Tamarix ramosissima*. Physical removal and a variety of chemical application techniques were used to remove all living plants of species targeted for eradication over a three-year period. The program is now transitioning from treating live populations to managing seed-banks; this switch in management objectives has affected all aspects of the program from invasive plant awareness, program support, staffing, species detection, equipment needs, and funding acquisition. The program is now dependent on employing extremely detail-oriented field crews to conduct more precise surveys of small populations and seedlings, limiting our ability to use volunteers. Monitoring and control of these persistent seed-banks poses funding challenges. Educating funding agencies and decision makers about the process of invasion, seed bank dynamics and the importance of consistent population treatment is vital to continue effective weed management programs.

Introduction

Invasive species are considered one of the greatest threats to biodiversity (Wilson 2002) and are the leading cause of species extinctions in island ecosystems (Clout and Veitch 2002). Catalina Island (Catalina), California is no exception. Faced with 76 invasive plant species threatening over 200 rare taxa of flora and fauna, and rare vegetation communities, the Catalina Island Conservancy (Conservancy), who owns and manages 88% of the 19,425-hectare island, has developed and implemented an science-based management program to protect the Island's biodiversity from priority invasive plant species (Knapp and Knapp 2005).

Twenty-five of the 76 species are targeted for eradication due to their limited abundance and distribution on Catalina (Table 1). Although there are many wide-spread invasive plant species on Catalina, including such as: *Foeniculum vulgare, Genista linifolia,* and *Phalaris aquatica*, our goal is to eliminate the 25 highly invasive species before they reach the spread phase of invasion and become the next widespread species. Eradication programs must meet a set of criteria for them to be successful (Bomfield and O'Brien 1995), which the Conservancy has exceeded in some areas, but has had difficulty meeting others.

The devil is usually in the details, and although invasive plant species eradication sounds straight forward, it is not. This poster highlights the management challenges encountered during the first three years of a successful on-going eradication program. The program has progressed from managing populations to managing seed banks after an intensive control period. As a result, it has struggled to evolve to meet the challenge of conducting more precise treatment work, and securing support for a problem that is now inconspicuous.

The objective of this poster is to share our challenges and successes in conducting the initial phases of an eradication program, and to encourage land managers to consider eradication as a viable goal as part of their invasive plant management program.

Challenges and Obstacles

There is an accepted set of eradication criteria that have to be met in order to be successful, and they include: proper planning, putting entire populations at risk, removing them faster than they can reproduce, and most importantly- a commitment to complete. The Conservancy has invested a significant amount of resources and time to properly plan for its eradication program by conducting island-wide surveys, development of management plans, and acquiring sufficient operational infrastructure. It has also been very successful at removing plants faster than they can reproduce by utilizing an army of volunteers, interns, contractors, and staff; however, it has been difficult to put entire populations at risk while securing support to complete eradication objectives (Fig.1).

Figure 1. Securing funding to tackle a conspicuous infestation of salt cedar (left) is easier than funding years of monitoring and follow-up treatment of seedlings emerged from the soil seed bank (right) over time. Soil seed bank viability can often be longer than the commitment to manage it.

PUTTING ENTIRE POPULATIONS AT RISK

The Conservancy, has limited resources to devote to large long-term conservation challenges such as invasive plant management. To economically meet its goals, the program has utilized various types of relatively "cheap" labor, such as individual volunteers, volunteer groups, conservation corps crews, and short and long-term interns, as well as more expensive qualified staff. Each labor group has its strengths and limitations, and knowing those boundaries is important in order to utilize them effectively and use limited resources efficiently in each phase of an eradication program. However, shifting from one labor force to another poses significant operational challenges, especially on an island. Having sufficient infrastructure to properly train, house, equip, and supervise each labor group is essential. When the labor group is mismatched with the project phase, you can miss the opportunity to put the entire population at risk by not eliminating every individual plant.

The following is a summary of each labor group's strengths and limitations, and optimal time to utilize them.

Individual volunteers: *Strengths*- Once trained, they are able to be self sufficient and adopt target sites or populations during all phases of an eradication project, and they can also help to communicate with the local community regarding the need for managing invasive plants. They can also help supervise volunteer groups, and can be your eyes in the field. *Limitations*- There are very few of these dedicated individuals in the community. A considerable amount of time is needed to train, supervise, and provide recognition to these volunteers.

Volunteer groups: *Strengths*- Perfect for removing large single species infestations during the initial phase of eradication. They can be enthusiastic and help to make work days fun for staff. *Limitations*- They typically have little patience for searching for outliers and seedlings, thus resulting in missed plants. Following up after a volunteer project by staff is always necessary to find all population individuals (and tools left behind).

Figure 2. After the site was declared "clean" by a short-term intern, a full-time staff member found the second to last yellow star thistle plant (Centaurea solstitialis) (held by the intern). After consistent monitoring, all yellow star thistle populations have yielded no plants over the last two years.

Conservation Corps': *Strengths*- Similar to volunteer groups, but they have a greater attention to detail and can conduct very difficult work not suitable for volunteers. They are often unfairly given a "bum rap," and they are extremely effective in invasive plant management; however, they do have *limitations*. There is often inconsistency between corps and between crews. Working closely with your corps can help alleviate this issue.

Short-term interns: *Strengths*- They are usually enthusiastic and hard working. *Limitations*- The training and coordination required is often not cost effective for the short work periods (three months) if utilized alone; however, they are effective when used in combination with staff. They are ideal for splitting up staff into two-person teams (the "buddy system").

Long-term interns: *Strengths*- They are usually hard working and enthusiastic in the first five months of their program. *Limitations*- After several months, they can become disenfranchised with the lack in pay, which results in a decrease in productivity and attention to detail which is necessary in the middle and final stages of an eradication program.

Qualified staff: *Strengths*- Once trained, they are able to problem solve, work independently, or lead interns and volunteers. They have a keen understanding of why it is important to be thorough and consistent. If they work for more than one season, they are instrumental in conducting follow-up work on targeted populations. *Limitations*- Pay is often not sufficient to retain them for over a year. Not able to tackle large infestations due limited amount of staff.

Conclusion: To successfully conduct an eradication program, it is important to utilize the correct labor group for each phase of an eradication. Having the right group at the right phase is essential; however, several other factors that might seem minuscule can affect the overall effectiveness of a group even when used at the right time, these include: sufficient quality gear and equipment, shared housing situations, benefits and recognition.

COMMITMENT TO COMPLETE

Many wildland sites in California have long histories of disturbance that contribute to plant invasions such as: overgrazing, alteration of fire regimes, and habitat conversion. Nearly 200 years of disturbance, a backlog of ecosystem maintenance, cannot be solved in a short-term project which is often the time period of project funding- "it takes much longer to put Humpty-Dumpty back together again."

Species	Common Name
Ailanthus altissima	Tree-of-heaven
Aptenia cordifolia	Baby sun-rose
Arundo donax	Giant cane
Asparagus asparagoides	Bridal creeper
Caesalpina spinosa	Tara
Centaurea solstitialis	Yellow star thistle
Centranthus ruber	Jupiter's beard
Cortaderia selloana	Pampas grass
Cotoneaster spp.	Cotoneaster
Cynara cardunculus	Artichoke thistle
Delairea odorata	Cape ivy
Ehrharta calycina	Veldt grass
Eriogonum fasiculatum	California buckwheat
Ficus carica	Fig tree
Lyonothamnus floribundus var. asplenifolius	Fern-leaf ironwood
Hedera helix	English ivy
Lathyrus odoratus	Sweet pea
Pittosporum undulatum	Mock orange
Ricinus communis	Castor bean
Rubus discolor	Himalayan blackberry
Senna didymobotrya	African senna
Silybum marianum	Milk thistle
Spartium junceum	Spanish broom
Tamarix ramosissima	Salt cedar
Vinca major	Periwinkle

Table 1. Twenty-five invasive plant species targeted for eradication have been controlled over the past 3 years. Species highlighted have had little to no regrowth or seed bank germination following repeat monitoring thus far.

Many invasive plant species have extremely long-lived soil seed banks, and require consistent monitoring for many years in some cases decades. Many funding entities and organizational decision makers do not have a background in ecology or resource management, and planning for a 50-year eradication program is hard to fathom.

Although it is difficult to support eradication projects through short-term funding cycles, investing resources into proper planning such as landscape-level invasive plant surveys, species and site prioritization, and management plans can be effective in demonstrating the need for eradication projects (Knapp 2004). Comparing a map of a widespread species and one that is in its initial stage of invasion is a powerful tool to justify the funding need for eradication from potential supporters and decision makers.

Developing planning tools can also help to ensure eradication program consistency and commitment in a career field with high staff turnover rates that can set eradication programs back to the start.

Figure 3. A Los Angeles Conservation Corps crew (photo #1) removes all the above ground plants of a flex-leaved broom (Genista linifolia) population targeted for eradication. A group of International Student volunteers (photo #2) from New Zealand and Australia help to remove a portion of the same population. When short-term interns are teamed up with staff (photo #3), they can divide into more mobile teams to conquer. Enthusiastic hardworking staff (photo #4) will always be the backbone of a successful eradication program.

Figure 4. A long-term intern from the Los Angeles Conservation Corps treats a Pampas grass (Cortaderia selloana) population (photo #1) by wick applying glyphosate. Eradication does not always occur in the easiest of places, but having full-time employees makes a difference when it is time to tackle the difficult ones such as the Pampas grass in photo #2 (red arrow). Eradication takes its toll on even the toughest (photo #3), note the technician's expression. Pampas grass can hide (photo #4), as on this steep cliff, but it can't run from the long-term intern that is scrambling to treat it (green arrows).

Discussion

Eradication- is it possible? Many people think that it is not, however, humans are quite successful at causing species extinctions worldwide. Both the tools and knowledge are there to do so. Proper planning is the key that determines all other factors of a successful eradication program. Planning enables managers to secure funding, although usually for short periods, by demonstrating a need and the competency to conduct the project. Preserve-wide species maps, management plans, and procedures in place are attractive to funders and decision makers who will consider funding or supporting an eradication program.

Planning allows managers to consistently meet the eradication criteria of putting entire populations at risk, removing them faster than they can reproduce, and securing a commitment to do so. Without a plan, there is no guarantee that future land managers will continue to monitor past populations targeted for eradication- a decade of hard work potentially wasted.

Although there is an accepted set of eradication criteria, other details such as pairing the right labor force with the right phase of an eradication project, or providing a labor force with the quality gear and equipment can influence the amount of resources used, thus affect the long-term availability of funding for a program.

Little funding is available for invasive plant management projects, and it is vital to be responsible in using funding efficiently over the period of a project to ensure continued funding for your project and that of others.

Acknowledgements

A special thank you is due to our generous program funders (in alphabetical order): California Department of Food and Agriculture (Steve Schoenig), Coastal Conservancy (Mary Small), Los Angeles Conservation Corps (Dan Knapp & Bruce Saito), National Fish and Wildlife Foundation (Kiran Goldman), Natural Resource Conservation Service (Casey Burns & Brooks Englhardt), Patagonia, Seaver Institute (Victoria Seaver-Dean), U.S. Fish and Wildlife Service (Jill Terp, Ken Corey, & Samantha Marcum), Wildlife Conservation Board (Dave Means & Scott Clemons).

The program would not be a success without the hard work and dedication of the following people (in alphabetical order): *Staff*- Kyle Gunderman, Jon Hall, Mia Hannan, Josh Lanham, Micah Phillips, Sarah Ratay, Robyn Shea, and Cara Stafford. *Interns*: Adam Coleman, Megan Cromp, Colin Dentel-Post, Tom Faughnan, Katie Kovach, Damian Morando, Eddie Natareno, Teagan Pennell, Charles Wang, and Mitch Winiecki. *Volunteers*- Lauren Danner, John Ekhoff, Annerose and Hans Grellmann, Denise and Wyatt Knapp, Mary and Steve Story, and many community groups.

We would also like to thank the scientists and staff of the New Zealand Department of Conservation for their creativity, forethought, and knowledge that has inspired the Conservancy's eradication program.

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