Biology and Management of Non -Native Plant Species in the Santa Monica Mountains National Recreation Area

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A group project submitted in partial satisfaction of the requirements for the degree of
Master in Environmental Science and Management for the
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As authors of this Group Project report, we are proud to archive it on the Bren School's web site such that the results of our research are available for all to read. Our signatures on the document signify our joint responsibility to fulfill the archiving standards set by the Donald Bren School of Environmental Science & Management.

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The mission of the Donald Bren School of Environmental Science & Management is to produce professionals with unrivaled training in environmental science and management who will devote their unique skills to the diagnosis, assessment, mitigation, prevention, and remedy of the environmental problems of today and the future. A guiding principal of the School is that the analysis of environmental problems requires quantitative training in more than one discipline and an awareness of the physical, biological, social, political, and economic consequences that arise from scientific or technological decisions.

The Group Project is required of all students in the Master's of Environmental Science and Management (MESM) Program. It is a four-quarter activity in which small groups of students conduct focused, interdisciplinary research on the scientific, management, and policy dimensions of a specific environmental issue. This Final Group Project Report is authored by MESM students and has been reviewed and approved by:

Bruce Kendall, Ph.D.

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ABSTRACT

Non-native plant species have the potential to be invasive, and thus are capable of significantly altering the quality of natural ecosystems. The management of these species is a priority for the Santa Monica Mountains National Recreation Area (SMMNRA). However, management is difficult because the national recreation area is currently home to over 300 non-native plant species, with populations at thousands of locations. Because funds are limited, an efficient management plan is critical.

We developed an exotic threat assessment (ETA) to rank the invasiveness of non-native plant species found in the SMMNRA that was based on species' biological traits, history of invasiveness, and potential to be managed. Next, we further analyzed populations of the nine species determined to be most invasive by the ETA. Using the criteria of surrounding habitat quality, ease of control, potential to be a source population, and public relations, we prioritized the populations for management.

To present this prioritization in a form easily used by park managers, we took two further steps. First, we organized the results temporally by creating a list and a map of high priority populations that could be managed given seasonal restrictions. Second, we provided the prioritization in a format that can be modified as the needs of the recreation area change through time.

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TABLE OF CONTENTS

EXECUTIVE SUMMARY

Introduction

The Santa Monica Mountains extend from the Hollywood Hills in the east to Point Mugu in the west. The mountains are bordered by the San Fernando Valley to the north and the city of Los Angeles to the southeast. Within this area lies the 150,000 acre Santa Monica Mountains National Recreation Area (SMMNRA). The SMMNRA contains land managed by over 70 agencies, including the National Park Service (NPS), California State Parks, and Santa Monica Mountains Conservancy, as well as large tracts of private land.

Numerous vegetative habitats thrive within the SMMNRA, including chaparral, oak woodlands, coastal sage scrub, and marshes. Nearly one thousand species of native plants exist within these vegetative habitats. Fifty species of mammals, close to 400 bird species, and over 30 species of reptiles and amphibians also make the mountains their home. Twenty-five species in the SMMNRA are known to be endangered, rare, or threatened, including steelhead trout (*Oncorhynchus mykiss*), Lyon's pentachaeta (*Pentachaeta lyonii)* and Canyon Wren (*Catherpes mexicanus*) (NPS 2002).

Similar to other areas with a Mediterranean climate, the Santa Monica Mountains are highly susceptible to invasion by non-native plant species (NPS 2002). Most non-native plant species are not invasive, but those that are can significantly degrade the quality of natural ecosystems. Invasive non-native plants out-compete and even completely replace native vegetation, which reduces the biodiversity of an area and can cause the extinction of rare species (Williams 2000). Additionally, invasive non-native species can alter ecosystem processes, such as the fire regime, water availability and nutrient cycling (Randall 1996). Consequently, managing non-native invasive species is an integral part of maintaining the health of the SMMNRA's ecosystems.

Our project goals were to:

- Create an exotic threat assessment (ETA) for non-native plant species found in the SMMNRA.

- Create a multi-criteria prioritization to determine which invasive non-native populations should be considered a priority for management.

- Synthesize the information obtained through the exotic threat assessment and the prioritization and provide it in a format that can be modified and updated as new information becomes available or the goals of the park change.

Methods and Results

Exotic Threat Assessment

The SMMNRA compiled a list of 19 non-native species suspected to be the most invasive based on expert opinion. However, given the nearly 300 additional non-native species present in the NRA and the informality of the criteria used to generate the list, a more formal method for evaluating the threat of non-native species was necessary to determine which species should be a priority for management.

An exotic threat assessment (ETA) uses biological traits, history of invasiveness, environmental impact, and management potential to rank the threat of non-native species. We arranged our ETA in the following fashion:

Section 1: The General Risk of a Given Species Becoming Invasive
- A. Biological Attributes (three questions)
- B. History of Invasiveness (three questions)
- C. Environmental Impact (three questions)

Section 2: SMMNRA Specific Threat Assessment
- A. Distribution within SMMNRA (three questions)
- B. SMMNRA Impact (two questions)
- C. Management Potential (four questions)

The answers to each question within the ETA were scored. The number of high, medium and low scores a species received determined its overall ranking. If a species is ranked high for two or more subsections, it received a high ranking for that section. In section 2 we only assessed species that were ranked high in section 1.

Using our ETA, we assessed the 19 species suspected to be the most invasive, plus eleven additional species. Of these 30 species, seven were ranked high within the SMMNRA:

- Yellow starthistle (*Centaurea solstitalis*)
- Pampas grass (*Cortaderia jabata*)
- German ivy (*Delairea odorata*)
- False caper (*Euphorbia terracina*)
- Fennel *(Foeniculum vulgare*)
- Tobacco tree (*Nicotiana glauca*)
- Harding grass (*Phalaris aquatica*)

Russian thistle (*Acroptilon repens*) and perennial pepperweed (*Lepidium latifolium*) were added to this list because, while they both currently have a very limited distribution, they are suspected to be spreading quickly in the SMMNRA. The populations of these nine invasive non-native species were then prioritized for management.

Prioritization

We used a five step process to prioritize invasive non-native populations for management. First, through a literature search, we defined 30 criteria as indicators of a population's removal priority. These included the quality of the area in which the population resides, the population's ability to become a source, the population's ease of control, and any public relation considerations for the area. We then organized these criteria into a hierarchy.

Second, we mapped the 3,729 populations of the nine species and collected the necessary information using spatial analysis and the data provided by the park. Third, we developed a scoring system for each criterion using a 20 point scale, with a score of one representing the lowest priority and a score of 20 the highest. Fourth, we used the Analytic Hierarchy Process (AHP), a method of paired comparisons, to assign weights to each criterion. Fifth, we multiplied the score and weight for each criterion, and then added together the weighted scores to calculate a total priority for each population.

After assessing the populations using the prioritization, the final scores ranged from a high of 12.60 to a low of 3.56. No one criterion had a disproportionate effect on the results, though our sensitivity analysis revealed that "distance from roads/trails/streams" and "elevation" have slightly higher sensitivity than other criteria.

Temporal Analysis

The temporal analysis further analyzes populations using species' traits and management techniques. A species' biology can limit the times of year it can be effectively managed, and certain management techniques work better during certain months or stages of a species' lifecycle.

We examined the biology and management of all nine species to determine when and how they can be most effectively managed. The prioritization results were then divided into months, so populations appropriate for management in a particular month were grouped together. We presented these results in a series of monthly maps that could be used by managers to design effective management strategies.

Discussion/Recommendations

Our ETA, prioritization, and temporal analysis give managers at the SMMNRA a structure to make informed management decisions about invasive non-native species. Where prior decisions were made using a combination of expert opinion, informed intuition and time constraints, this project provides a formal, data-driven method for devising long-term strategies. The ETA and prioritization can also be shared with other interested agencies and modified for continual use.

The process should not end here, however. Opportunities exist to refine the ETA and prioritization, including adding a spatial analysis, further defining the public relations criterion, and determining rate of spread for non-natives in the SMMNRA. In addition, all non-natives plant species present in the SMMNRA should be ranked by the ETA, and those ranked high or medium should be reassessed over time.

Ultimately, the main achievement of our project was the design of a system for prioritizing invasive non-native plant species' populations for management. Using this tool, managers can now begin to systematically target invasive non-native populations efficiently and effectively.

INTRODUCTION

The Santa Monica Mountains are an east-west oriented mountain range, extending from the Hollywood Hills in the east to Point Mugu in Ventura County. The highly urbanized San Fernando Valley and Los Angeles basin border the mountains to the north and southeast. Within this area lies the Santa Monica Mountains National Recreation Area (SMMNRA). The world's largest urban national park, it encompasses over 150,000 acres. There are five area codes and twenty-six zip codes within its boundaries.

The SMMNRA was created by the U.S. Congress in 1978. This was a unique venture, as the park boundaries include large tracts of private land and land controlled by over seventy agencies, including the National Park Service (NPS), California State Parks, the University of California, the Santa Monica Mountains Conservancy, and the city of Malibu.

In 1997, to guide future planning of the park, the National Park Service, California State Parks, and the Santa Monica Mountains Conservancy issued a mission statement, to which all future plans would be assessed:

> *The mission of the Santa Monica Mountains National Recreation Area is to protect and enhance, on a sustainable basis, one of the world's last remaining examples of a Mediterranean ecosystem and to maintain the area's unique natural, cultural, and scenic resources, unimpaired for future generations. The SMMNRA is to provide an inter-linking system of parklands and open spaces that offer compatible recreation and education opportunities that are accessible to a diverse public. This is accomplished by an innovative federal, state, local, and private partnership that enhances the regions' quality of life and provides a model for other parks challenged by urbanization* (NPS 2002).

The Santa Monica Mountains have a typical Mediterranean climate – hot summers and cool, wet winters. Numerous vegetative habitats thrive, including chaparral, oak woodlands, and coastal marshes. Fifty species of mammals, close to 400 bird species, and over thirty species of reptiles and amphibians make the mountains their home. (NPS 2002)

Similar to other California areas with Mediterranean climates, the Santa Monica Mountains display a high propensity for invasion by non-native plant species. Due to human disturbance and unintended introduction, invasive plant species have set root and thrived. Consequently, eliminating non-native invasive plants is an integral part of maintaining the park's health and usability. Identification and prioritization of the most problematic invasive populations is the focus of this project.

Invasive species are capable of significantly altering the quality of natural ecosystems. They out-compete and eventually replace natural vegetation, reduce the overall biodiversity of an area, and potentially cause the extinction of rare or endangered native plant species. In addition to changes in biodiversity, invasive plants can alter ecosystem processes such as water availability, nutrient cycling, and the overall fire regime (Randall 1996). This shift in species composition and natural processes can threaten an area's stability and functional complexity (Williams 2000).

Increased awareness of the threat of invasive plant species has made their management a priority in most national parks and nature preserves. Most non-native species do not have major effects on the natural ecosystem, but those that do can cause serious degradation. Removing invasive non-natives and restoring native habitat is expensive, time consuming, and difficult to do properly. Since funds are typically limited, effective weed management plans are critical.

In recent decades weed risk assessments have helped screen potential pests by their threat to the country as a whole. However, the focus of prior weed risk assessments has not been to determine risk to particular ecosystems or smaller areas within countries. To act more efficiently, managers need weed management plans suited to the ecology of their parks. In collaboration with Christy Brigham, a plant biologist with the National Park Service, we developed a weed management plan for the SMMNRA. In our plan, we designed an exotic threat assessment specifically tailored to SMMNRA, which identifies high-risk *species*, as well as a prioritization of weed *populations* for removal. In addition to the specific information presented to the National Park Service, our project was designed so it could be customized by different agencies in different parts of the country.

Our project goals are to:

- Create an exotic threat assessment for non-native species within the SMMNRA. This assessment of invasiveness is a synthesis of existing regional assessments, but tailored and applied to the SMMNRA.

- Create a multi-criteria prioritization to determine which invasive non-native populations should be prioritized for management.
    - Criteria are based on the particular biology of non-natives, the quality of the area in question, public relation considerations for the area, the ability to affect ecosystem processes, and the ease of control.
    - Create a weed map of SMMNRA, detailing the spatial hierarchy.

- Synthesize the information obtained through the exotic threat assessment and the prioritization and provide it in a format that can be modified and updated as new information becomes available or the goals of the park change.

BACKGROUND

The Santa Monica Mountains National Recreation Area (SMMNRA) was formed in 1978. Its relatively recent formation and management by over 70 governmental agencies, along with its multiple uses and land-interests, create a challenging situation for ecologists and caretakers of the area.

To achieve the goals of this project, we attempted to determine what methods have been utilized in the past, both in the Santa Monica Mountains and elsewhere, to prioritize and manage non-native invasive plants. There is no comprehensive weed management plan for the NRA, and the efforts of groups within the park have proceeded in a reactive manner, responding to the problems of invasiveness without a unified plan. Creating an ecologically based plan is our goal, and building off past research to define the crucial elements of a plan was our first step.

History of Invasive Non-Native Plant Management in the SMMNRA

The lack of centralized historical information about the area and the lack of cohesive ecological oversight made it difficult for us to find historical data and prior work on invasive non-native plant management. We consulted scholarly journals, National Park Service management documents, official state documents, and organization websites for data, but historical land use information for the past 100 years proved elusive. With little to no historical management information for the SMMNRA, we relied more heavily on biological, ecological, and spatial indicators to guide our background study on weed risk assessments and prioritization of invasive non-native populations for removal.

Weed Risk Assessment Systems

A variety of studies have tried to pinpoint characteristics of plant invasiveness, investigating factors including range, biology, and history of invasiveness (Mack 1996). The biogeography of an invader's native habitat is a good predictor of its potential invasiveness—particularly into similar habitat types (Goodwin 1998; Rejmanek & Richardson 1996; Williamson & Fitter 1996; Rejmanek 1996). Useful biological predictors of species invasiveness include short juvenile periods, short intervals between large seed crops, small seed mass (Rejmanek & Richardson 1996; Kolar & Lodge 2001), and vegetative reproduction (Reichard 1996; Kolar & Lodge 2001). Species with a history of invasiveness are also more likely to invade pristine areas (Reichard 1996; Kolar & Lodge 2001).

Starting in the 1990s, weed risk assessment systems have been developed for purposes that include ranking potential invasiveness of non-native species at specific locations (Hiebert & Stubbendieck 1993), ranking non-natives already present in California (Randall 1999), listing and de-listing species as invasive (Lehtonen 1995),

and deciding to allow or deny import of non-natives into countries (Pheloung 1999, Williams 2002, and Daehler 2004).

The first weed risk assessment—the *Alien Plants Ranking System*—ranked non-native species based on a series of questions in different categories, including significance of impact, ability to become a pest, and feasibility of control or management. The answers to each question were weighted, and the overall score determined a species' invasiveness. Depending on the score, the species received a rating of serious threat- hard to control, serious threat- easy to control, lesser threat- hard to control, or lesser threat- easy to control. This system was designed to be used at specific parks or preserves and adapted for use at additional locations (Hiebert & Stubbendieck 1993).

A weed risk assessment was designed in 1994 to rate non-natives already present in California. This assessment was revised in 1996 and 1999, with the latter producing rankings based on impact on native habitat, biological characteristics, distribution and abundance, and management potential. For each question, species were ranked high, medium, low, or insignificant. Based on the number of high, medium, low, and insignificant answers, the species were given overall rankings. Over 100 non-native species were ranked using this system, although some borderline medium-high species and entrenched, annual, non-native grasses were difficult to rank (Randall 1999).

By 1999, weed risk assessments were being designed to determine which non-native species should be allowed or denied import into countries. Australia implemented one of the best known of these systems, using a combination of questions about history of invasiveness, native climate and habitat preferences, and biological attributes. The system consisted of 49 questions integrated into a scoring scheme that ranked the potential invasiveness of non-native species. Information answering a minimum of ten questions – about history of invasiveness and climate/habitat preferences and six about biological attributes – had to be available for a plant to be ranked. Species were given a critical score between zero (benign) and six (maximum invasiveness). Species with a critical score of zero were accepted into the country. Species with a critical score from one to five required further evaluation and species with a critical score of six were denied import (Pheloung 1999).

With slight alterations, this Australian system was used to assess potential invasive non-natives in New Zealand (Williams 2002) and Hawaii. The Hawaiian system added a second set of five questions to further assess species that fell into the middle (indeterminate) range (Daehler, 2004). These questions were based on a species' seed dispersal, growth patterns, life cycle, and history of invasiveness.

When the accuracy of the Australian system was tested, it was found to correctly identify 84% of invasive non-natives already present in Australia. When this system was modified for use in New Zealand, it was found to be 93% accurate (Pheluong

1999, Williams 2005). In Hawaii, additional questions were added, which increased its accuracy to 95% (Daehler 2004). Success rates were ascertained by comparing the assessment's predictions with expert opinion and observed invasiveness of assessed species in the corresponding country or state.

The constantly changing nature of the invasive plant problem may render an assessment obsolete in a relatively short time if it is unable to adapt to the changing conditions. In addition, no one system is useful in all situations and so each must be tailored to a specific area (Stohlgren 2006). In spite of these limitations, weed risk assessments are the most useful tools for evaluating the invasiveness of non-native species.

Management and Prioritization Guidelines

Managing invasive non-natives is often a costly and labor intensive undertaking (Higgins et al. 2000). Thus, it is imperative that prioritizing for invasive non-native population management be defined so that time and money can be most efficiently spent. However, constructing such a system, especially when considering multiple species and areas, is difficult due to the complexities of population dynamics, community interactions, and the lack of information about each invasive non-native's growth, reproduction, and habitat requirements (Hobbs and Humphries 1995). Our goals for the SMMNRA are even more challenging for prioritization systems, as this project is attempting to prioritize multiple populations of multiple species over a large area. While at present there is no comprehensive model that takes into account all pertinent variables, various prioritization schemes have been suggested, including the following.

Multi-level, mixed effects statistical model

Buckley et al. (2003) developed a model to explore the dynamics of a single species, St. John's Wort *(Hypericum perforatum)*. They first used data to determine that growth, survival, fecundity, intrinsic plant variables, environmental variables, herbivory, and spatial and temporal stochasticity most influenced plant growth and persistence. With this data, they created a model that could predict which control strategies would be most successful. Buckley et al. suggested that using this model, managers can test potential management strategies to determine their effectiveness before field application, resulting in lower management cost and time. However, this approach requires a detailed understanding of the species and location-specific population biology and is also limited to prioritizing a single species.

Weed lists

Little information exists on simultaneous control of multiple species of invasive non-natives. Hobbs and Humphries (1995) maintained that at the time of their publication, there was no comprehensive framework for prioritizing which species to focus on first.

Skinner et al. (2000) advocated the utilization of weed lists to identify invasive non-natives of high priority. They compiled noxious weed lists for the 48 contiguous states and six Canadian provinces. Using these lists, the authors determined the frequency of listing using a relational database. The database allowed managers to identify the most invasive non-natives in their area and target those plants ranked high first (those more frequently listed by the states and provinces).

While this method represents a solid general framework from which to work, it does not take into account the specifics of an area, and the cumulative knowledge built-up by the SMMNRA staff. Additionally, this method works on a statewide scale and our project area, though large, is much smaller.

Lag phase, site value, and human activity

Hobbs and Humphries (1995) contended that in order for invasive non-native management to be successful, three things had to be taken into consideration: the lag phase between introduction and explosive growth, the level of disturbance of a particular area, and the impacts of human activity. Many invasive species have a lag time between their introduction in an area and when they become a problem. By identifying this lag time, managers could more easily control invaders. Also, by monitoring an area for secondary foci, managers could identify the beginning of the rapid growth phase and therefore address it early.

They also maintained that management should focus on the ecosystem invaded and not solely on the invasive plants (Hobbs and Humphries 1995). Each system has its own unique attributes that make it more or less susceptible to invasion. Perhaps most important is the system's level of disturbance. Disturbance is well known to promote invasion, and can include fire, grazing, nutrient inputs, trampling, and fragmentation (Hobbs and Huenneke 1992).

Hobbs and Humphries (1995) proposed a model to identify areas of high priority for management. Areas of high value and high disturbance necessitate high levels of protection. Areas of low value and high disturbance should be "let go."

Human activities are the main source of non-native invasions, and more importantly, socioeconomic factors are the driving force behind most invasions. Activities such as development and agriculture both inadvertently and intentionally introduce non-native species. Additionally, the control of invasive non-native plants is often contingent upon the availability of funding. Accordingly, Hobbs and Humphries (1995) asserted that steps must be taken to address the human component of invasions. They advocated implementation of quarantine legislation, early treatment of invasive plants, and preventative methods. We have incorporated Hobbs and Humphries ideas, but they are merely one aspect of our overall prioritization.

Invasibility

In addition to human disturbance, natural disturbance can contribute to the vulnerability of a system to invasion, or invasibility. Furthermore, the inherent composition, structure, and function of an ecosystem can also predict invasibility. Studies have found relationships between invasibility and vegetation communities, including coastal salt marsh (Zedler and Kercher 2004), chaparral (Kricher 1993 and Knops et al. 1993), and riparian woodland (Stohlgren et al. 1998). Appendix 6 contains detailed information on the invasibility of each of the SMMNRA's vegetation communities: coastal salt marsh, coastal strand, coastal sage scrub, chaparral, riparian woodland, valley grassland, valley oak savannah, coast live oak woodland, and freshwater ponds and lakes.

Numerous other studies have examined the role of natural features across communities such as plant species diversity or empty niches and the role they play in the invasibility of an area, but Prieur-Richard and Lavorel (2000) found that the studies have mixed results. Davis et al. (2000) assert that resource availability is the key factor underlying invasibility. Their theory of "fluctuating resource availability" says that an increase in unused resources leads to heightened invasibility. Thus, Davis et al. propose that invasibility might not be an attribute of community structure, but a condition that can change with time, depending on resource availability.

Foci size

One of the most cited criteria for prioritization is the size of the foci. Like Hobbs and Humphries (1995), various researchers have recognized the need to identify secondary foci quickly and act before the population is large. Using computer models, Moody and Mack (1988), Gevstad (2005), and Taylor and Hastings (2004) studied the dynamics of invasive populations under different control strategies.

Moody and Mack modeled a weed population using a simple geometric model. Using this model, they explored the effects of two main removal strategies: initial emphasis on secondary foci or on primary foci. They found that control measures were most successful when secondary populations were removed first – regardless of the growth rates of the primary foci, rate of secondary foci population establishment, or the intensity of removal of either primary or secondary focal populations. They also found that management that focuses on the primary population center and moves outward is usually futile.

Grevstad (2005) used a model to explore management strategies for *Spartina alterniflora* (smooth cordgrass). Grevstad likewise found that a management strategy that focuses on the secondary populations first is most successful. He also stated that when yearly effort or expenditure is low, the advantage gained by this strategy is particularly great.

In contrast to Grevstad (2005), Taylor and Hastings (2004) found that when managing *Spartina alterniflora*, the most effective management plan is dependent on whether the plant exhibits an Allee effect, which is when the vital rate of secondary populations is lower than primary population. If the plant does not exhibit an Allee effect, it is better to remove the secondary populations first, under all budgets.

However, if the population does demonstrate an Allee effect, the budget for management should be the most important consideration when determining the approach. If the budget is low (funding to remove <22% of initial invasion) to medium (funding to remove ~30% of the initial invasion), the best strategy is to remove the secondary populations first. Conversely, if the budget is large (funding to remove >40% of the initial invasion), the best strategy is to remove the primary population first. We have taken into account foci size and meta-population theory when developing our prioritization.

Our Prioritization Method

Trying to make use of an existing method to prioritize plant removal proved difficult due to the nature and goals of our project – we aimed to prioritize multiple populations of multiple species in a large area. While none of the above methods was a direct fit with our goals, we did incorporate many of their elements. We designed our own prioritization method to takes into account four main population characteristics: habitat quality, potential to be a source population, public relations, and ease of control. These criteria were broken out into sub-criteria and organized into a hierarchy, where all tiers in the hierarchy received a weight. We were able to compare criteria using Analytical Hierarchy Process (AHP – see "Methods" section).

METHODS

Exotic Threat Assessment

The exotic threat assessment (ETA) in this analysis has been designed to determine the threat of invasion and spread of non-native species currently found in the Santa Monica Mountains National Recreation Area. Eighteen questions are grouped into six subsections (table 1):

Table 1: ETA Questions

Section 1: General Threat Assessment	
Subsection	**Questions**
Biology	**B-1. Does the species in question utilize any of the following reproduction methods?** - High seed production (1000+) - Long seed viability (2+ years) - Produces seeds more than once a year - Self-fertilization - High germination rate - Rapid growth to maturity - Vegetative reproduction - Other- rhizomes, node sprouts, etc.
	B-2. Does the species exhibit any of the following competitively advantageous traits? - Alleopathic - Stress tolerant (drought, shade, etc) - Growth habits (dense, smothering, etc) - Other (nitrogen-fixing, parasitic, etc.)
	B-3. Does the species in question use any of the following methods of dispersal? - Wind - Water - Animal - Human - Rapid local dispersement - Fragments resprout
History	**H-1. Is the species in question naturalized beyond its native range elsewhere?** Yes, at a wide variety of places- high Yes, at a few places- medium No, not at present- low
	H-2. Has the species in question invaded habitats found in the SSMNRA? Yes, in a wide variety of places- high Yes, in a few places- medium No, not at present- low
	H-3. Are there other weedy species in the genera? Yes, a large proportion of the genera are weedy- high Yes, a small proportion of the genera are weedy- medium No or only a very small number- low
Impact	**I-1. Does the species in question alter ecosystem processes?** Yes, substantially- high Yes, slightly- medium No- low Unknown
	I-2. Does the species in question alter community structure? Yes, substantially- high Yes, slightly- medium No- low Unknown
	I-3. Does the species in question alter community composition? Yes, substantially- high Yes, slightly- medium No- low Unknown

Section 2: SMMNRA Threat Assessment	
Subsections	**Questions**
Current Distribution	**D-1. What is the species questions current range in SMMNRA?** 1000+ ha- Entrenched [stop here, species is ranked E for Entrenched] 999 to100 ha- difficult to manage 99 to 11 ha- medium difficulty to manage 10 to 0 ha- easiest to manage [GET NOW!} Unknown
	D-2. How many locations in the SMMNRA have stands? 12 or more sites- High 11 to 6 sites- Medium 5 or fewer sites- Low Unknown
	D-3. Which of the known habitats on SMMNRA are susceptible to the species? - Coastal Salt Marsh - Coastal Strand - Coastal Sage Scrub - Chaparral - Riparian Woodland - Valley Grassland - Valley Oak Savanna - Coast Live Oak Woodland - Freshwater Ponds and Lakes
SMMNRA Impact	**SI-1. The areas threatened by the species in question are of:** High significance- high Medium significance- medium Low significance- low Unknown
	SI-2. The native species threatened by the species in questions are: Endangered/threatened/rare in SMMNRA- high Common species- medium No species are directly threatened- low
Management	**M-1. What techniques are available for managing the species in question?** - Mechanical - Biological - Chemical - Volunteer/Hand-pull - Other
	M-2. Are the areas invaded by the species in question accessible? 5 or more difficult to access areas- high 2 to 4 difficult to access areas- medium 1 or no difficult to access areas- low
	M-3. Are there impacts of the control of the species in question on native species? Heavy control impacts- high Somewhere in the middle- medium Slight control impacts- low
	M-4. What is the time commitment to the management of the species in question? Repeat treatments over a number of years- high Repeat treatments only once or twice after initial- medium Treat once- low

The questions in the *general risk section* are based on contents of published weed risk assessments while the questions in the *park specific threat section* are based on the park's goals, concerns, and ability to manage invasive non-natives.

For each question, a non-native is determined to be high, medium, or low and is assigned a point value of 5, 3, or 1, respectively. In cases in which data is unclear or unavailable, the non-native is assigned no value.

If a species is rated high for two or more questions in a subsection, the species receives a high ranking for that entire subsection. If two or three subsections within a main section are ranked high, the main section is ranked high. Combinations of sub-section rankings and their corresponding section ranks are detailed in table 2. The ranking in section one is not related to and is not combined with the ranking from section two.

Table 2: Non-native Threat Determination

Section Rank	Combination of Subsection Rankings to Determine Section Rank				
High	High, High, High	High, High, Med.	High, High, Low		
Medium	High, Med., Med.	High, Med., Low.	Med., Med., Med.	High, Low, Low	Med., Med., Low
Low	Low, Low, Low	Med., Low, Low,			

Species for which 30% or more of the questions are evaluated to be unknown are assigned an overall rank of *unknown*. Finally, a special rating of *entrenched* is assigned to species whose distribution in the park exceeds 1000 ha. A prior study determined that the benefit of managing invasive non-native species inhabiting 1000 or more hectares does not equal the cost, and consequently, entrenched species will not be managed by the park (McNeely 2003).

The SMMNRA provided us with a list of 19 non-native species suspected to be the most invasive based on expert opinion and observation by park staff. We began our ETA analysis with these 19 species, along with two species known to be entrenched, and nine additional, randomly chosen species (table 3). Due to the large number of species evaluated, only those rated high for Section 1 (general risk section) were assessed for Section 2 (park specific threat).

To conduct our analysis, we collected general information on each non-native species from internet and published resources (appendix 8). In addition, park specific information was gathered from the SMMNRA natural resource databases and park personnel.

Table 3: Species Ranked Through the Exotic Threat Assessment

Listed	Entrenched
Russian thistle (*Acroptilon repens*) tree-of-heaven (*Ailanthus altissima*) giant reed (*Arundo donax*) onionweed (*Asphodelus fistulosus*) yellow starthistle (*Centaurea solstitialis*) poison hemlock (*Conium maculatum*) pampas grass (*Cortaderia jubata*) cape ivy (*Delairea odorata*) false caper (*Euphorbia terracina*) fennel (*Foeniculum vulgare*) perennial pepperweed (*Lepidium latifolium*) false sandalwood (*Myoporum laetum*) tobacco tree (*Nicotiana glauca*) fountain grass (*Pennisetum setaceum*) Harding grass (*Phalaris aquatica*) castorbean (*Ricinus communis*) tumbleweed (*Salsola tragus*) Spanish broom (*Spartina junceum*) periwinkle (*Vinca major*)	slender oats (*Avena barbata*) soft chess (*Bromus hordeaceus*)
	Other Non-Natives
	western boxelder (*Acer negundo* var *californicum*) hairy beggarticks (*Bidens pilosa*) field bindweed (*Convolvulus arvensis*) umbrella plant (*Cyperus involucratus*) panic veldtgrass (*Erharta erecta*) common whorehound (*Marrubium vulgare*) hood canarygrass (*Phalaris paradoxa*) matilija poppy (*Romneya coulteri*) American black nightshade (*Solanum americanum*)

Prioritization

To prioritize populations for removal, we used a six step process. First, we identified populations of high priority species consisting of non-native invasive species rated high by the exotic threat assessment and two additional species of high concern due to their rate of spread. The two additional species were not identified in the ETA due to lack of data from the NPS. Second, we identified criteria for prioritizing populations for removal. Third, we assigned scores to each criterion. Fourth, we used the Analytic Hierarchy Process (AHP) to identify weights for our criteria. Fifth, we multiplied the score times the weight for each criterion and added the weighted scores to calculate a final priority score for each population. Finally, we calculated the sensitivity for the scores for all criteria and adjusted our hierarchy to avoid biasing our results toward one criterion.

To begin, we used information from an extensive literature search to brainstorm a list of criteria that would likely describe a population's priority for management. In particular, we utilized information from the prioritization methods we researched. From the multi-level, mixed effects statistical model, developed by Buckley et al., we identified numerous criteria. In addition, the lag phase, site value, and human activity model proposed by Hobbs and Humphries was incorporated into our habitat quality

and ease of control criteria. Specifically, Hobbs and Humphries suggest targeting effort toward areas of high quality and small populations. We then grouped these criteria into four main groups: the overall quality of a population's location, the likelihood of a particular population to act as a source, the ease of control of a population, and public relations for a particular area. Next, we presented this list to our advisors and client for comments and suggestions. After comment, we revised this list to arrive at our ideal descriptive criteria (figure 1).

At this point, we assessed the data available and adjusted our list accordingly. In particular, after reviewing the data, we discovered that we could not use weed to native ratio or native species richness as criteria. Consequently, we defined alternative criteria to measure the same characteristics. We chose to use habitat invasibility to replace weed to native ratio and expert opinion of area quality to replace native species richness. Neither of these measures is as precise as the original criteria, however. After we defined our list of criteria, we organized them into a hierarchy.

For each criterion, we developed a scoring system using a 20 point scale, where 20 indicated the highest priority. For all criteria, we assigned a score of 10 to unknowns. Since 10 is approximately the median of our scale, an unknown score neither biased the population as high or low priority. For example, for the criterion "altering of ecosystem processes," a population that does not alter processes received a score of 1, a population that does alter ecosystem processes received a score of 20, and a population where it is not known whether there is alteration received a score of 10.

Next, to identify weights for each criterion, we used the mathematical decision making method: the Analytic Hierarchy Process. Developed by Thomas Saaty in 1980, AHP uses hierarchies and paired comparisons to prioritize both qualitative and quantitative criteria. The method is employed in various sectors from business to engineering. It is especially useful in evaluating criteria that are hard to quantify. For a detailed description of the AHP method, please see appendix 5. Lastly, for each population, we multiplied the score by the weight for each criterion. We then added these weighted scores to calculate a total score for each population.

At this step, we calculated the sensitivity of the score for each criterion. Using the function developed to calculate prioritization scores, we calculated partial derivatives, with respect to each scored criterion. This calculation allowed us to identify criteria that were contributing strongly to our final prioritization. In particular, we determined that the criterion of potential to be a source population was essentially driving the prioritization. To address this, we further defined this criterion by adding distance from roads/trails/streams, elevation in the watershed, and population size sub-criteria.

Finally after determining that we would use methods of control and timing limitations in the temporal analysis, we removed them from the hierarchy. The final hierarchy we utilized for our analysis is displayed in figure 2 and each main criterion is described below.

Overall quality of the area describes the degree to which a particular area is invaded by non-natives, its risk to be invaded in the future, and its ecological significance. This criterion was defined using seven sub-criteria: habitat invasibility, area quality (determined by expert opinion), proximity to sensitive habitat, impact on endangered species, alternation of ecosystem processes, proximity to other invasive populations, and distance from uncontrollable source of new populations.

The likelihood of a particular population to spread is a measure of that population's risk of dispersal. This criterion was defined using three sub-criteria: distance from roads/trails/streams, population size, and elevation.

Often educational areas, overlooks, or highly visited areas are a priority for a park in terms of restoration. The criterion of public relations is intended to measure this value. In this analysis, SMMNRA requested that we not consider this criterion, and so, we did not further define it using sub-criteria.

Ease of control describes how much effort is required to control a particular population. In this analysis, we further define ease of control with four sub-criteria: population size, the need for active restoration, the need for repeated management, and the ease of access.

Please see appendix 4 for a more detailed explanation of all criteria and sub-criteria.

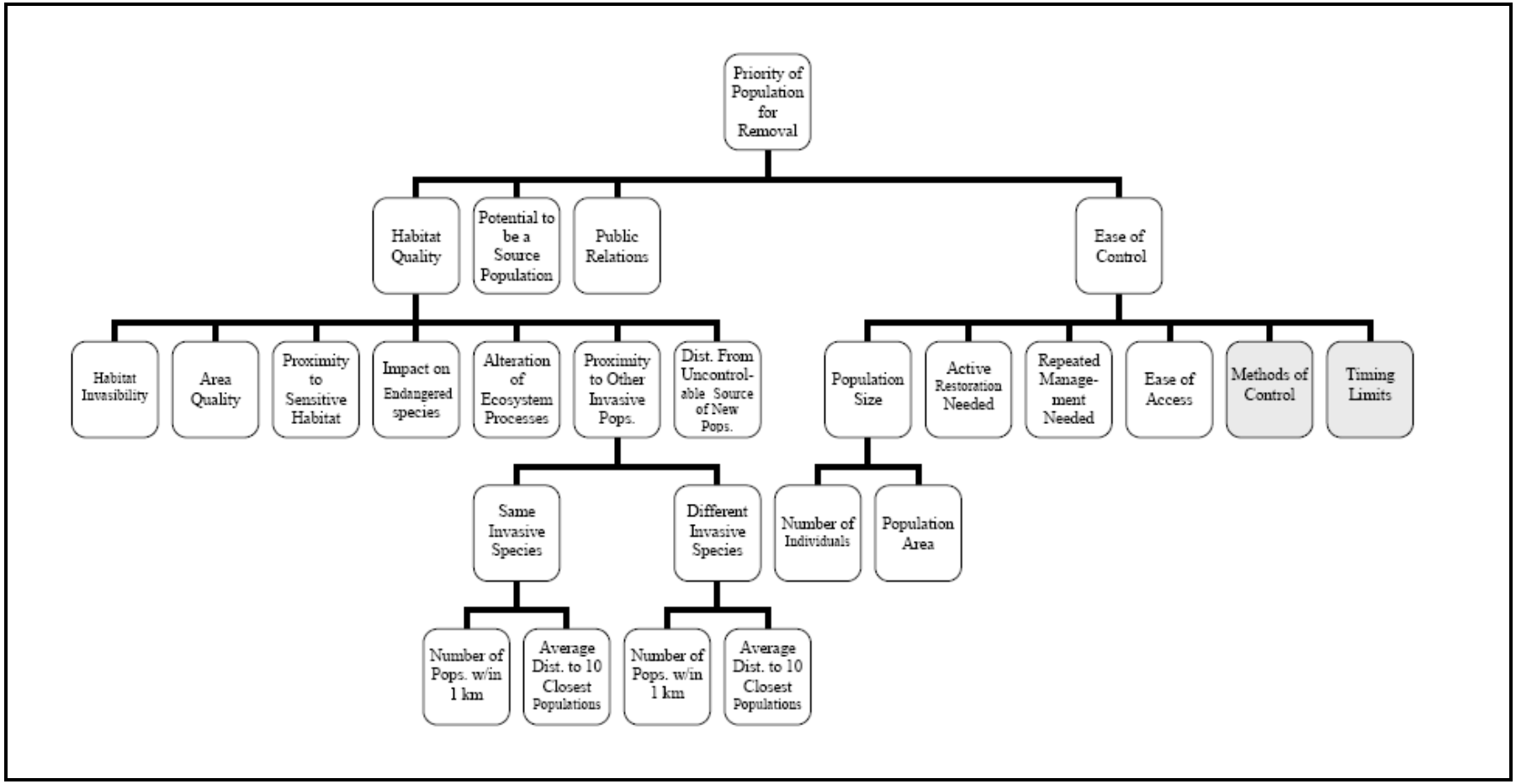

Figure 1 Hierarchy initially identified. The final version did not contain the criteria of methods of control and timing limitations because these criteria were include in the temporal analysis. In addition, potential to be a source population was further defined to include three sub-criteria.

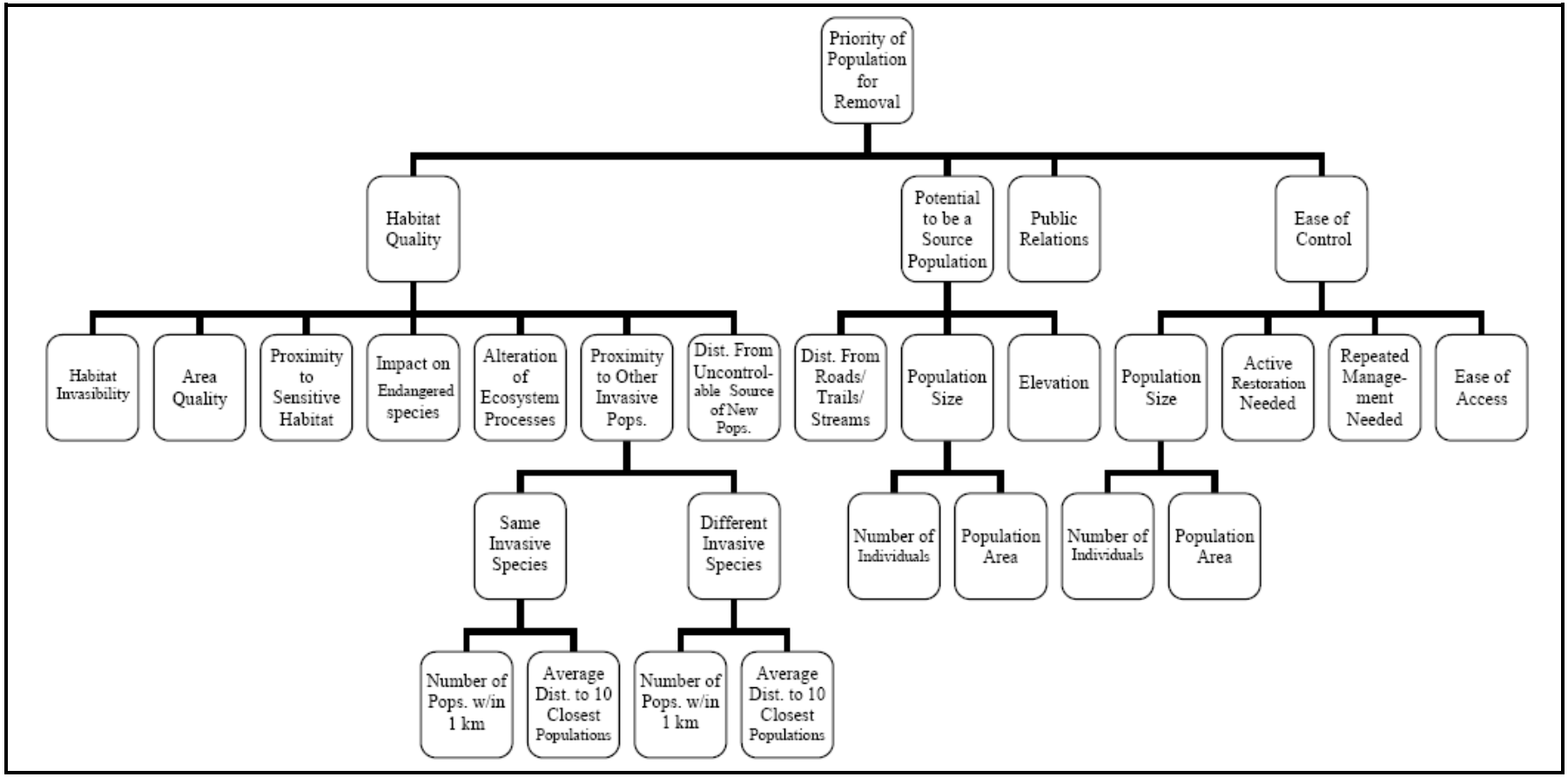

Figure 2: Final hierarchy used for the prioritization analysis.

Temporal Analysis

The temporal analysis further prioritizes invasive non-native populations using species' traits and management techniques. A species' biology can limit when it can be effectively managed during the year. Also, certain management techniques work better during particular months or stages of a species' life cycle.

To conduct our analysis, we first examined the biology and management strategies for the nine species analyzed in the prioritization to determine when and how they can be controlled. We then combined the results into a 12 month table to ascertain when each species could be managed (table 11). Finally, for every month, we sorted our prioritization results to only include populations of species appropriate for management in that month.

Management Maps

Using GIS, we designed monthly management maps, in which only the species that can be managed in a given month are displayed (appendix 1). Of those species, we differentiated the management importance of high priority populations (score 8-12) with filled circles of different sizes. The larger the circle is, the higher the management priority. To show the location of low priority populations (score 7 and under), but not emphasize their management, we depicted them as smaller hollow circles as shown in figure 3.

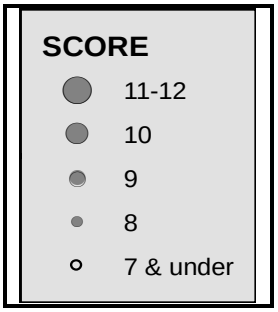

Figure 3: Population priority scores in temporal analysis

For each month, we identified species of high importance for management. We based this importance on efficiency, if a species can be managed using an ideal strategy only during certain months, and opportunity, if a species can only be managed a few months out of the year.

Given that our GIS output is in the form of maps, making 3,700 populations visible is problematic. So, we devised a way to make the maps consistent and legible. The general rules we developed for displaying populations on a map are as follows:

1) For a given species, populations with higher priority will be displayed on top of lower priority populations.

2) In a given month all high priority populations of a species with *higher management* importance will be displayed on top of high priority populations of a species with *lesser management* importance. However, all populations with a priority of 7 or less are placed at the very bottom.

3) In a given level of management importance, all high priority of populations of a species with earlier alphabetical order will be placed on top of high priority populations of a species with later alphabetical order.

RESULTS

Exotic Threat Assessment

Of the thirty species that we initially assessed using the ETA, 26 were ranked high in section 1. These 26 were then evaluated in section 2 and were assigned a rating of high, medium, low, entrenched, or unknown (table 4).

Table 4: Exotic Threat Assessment Results

High	Medium
yellow starthistle (*Centaurea solstitialis*) pampas grass (*Cortaderia jubata*) cape ivy (*Delairea odorata*) false caper (*Euphorbia terracina*) fennel (*Foeniculum vulgare*) tobacco tree (*Nicotiana glauca*) Harding grass (*Phalaris aquatica*)	giant reed (*Arundo donax*) poison hemlock (*Conium maculatum*) fountain grass (*Pennisetum setaceum*) castorbean (*Ricinus communis*) tumbleweed (*Salsola tragus*) Spanish broom (*Spartina junceum*) periwinkle (*Vinca major*)
Low	**Entrenched**
Russian thistle (*Acroptilon repens*) tree-of-heaven (*Ailanthus altissima*) onionweed (*Asphodelus fistulosus*) field bindweed (*Convolvulus arvensis*) perennial pepperweed (*Lepidium latifolium*) common whorehound (*Marrubium vulgare*) false sandalwood (*Myoporum laetum*) American black nightshade (*Solanum americanum*)	slender oats (*Avena barbata*) soft chess (*Bromus hordeaceus*) panic veldtgrass (*Erharta erecta*)
	Unknown
	umbrella plant (*Cyperus involucratus*)

The seven species ranked high in both sections, as well as Russian knapweed (*Acroptilon repens)* and perennial pepperweed (*Lepidium latifolium)* were the species we considered in our invasive non-native population prioritization. Although Russian knapweed and perennial pepperweed were ranked low by the second section due to insufficient data, they are suspected of spreading quickly in the SMMNRA and so were included in our analysis.

All seven of the species ranked high by the ETA were present on the list of 19 species suspected to be invasive. However, the other 12 species present on the list were ranked as medium or low by the ETA. Also, American black nightshade (*Solanum americanum)* and common whorehound (*Marribum vulgare)* were not present on the list, and received a low ranking in the ETA. Umbrella plant (*Cyperus involcratus),* also not included on the list, received a high ranking in the first section of the ETA, but due to data limitations, we were unable to assign a SMMNRA specific rank.

Prioritization

AHP Weights

The weights calculated for each comparison matrix are listed in tables 5, 6, 7, and 8. Higher weights indicated higher priority for management. The comparison matrices all have acceptable consistency ratios (CR) of less than 0.1 (tables 5, 6, 7, and 8).

Table 5: Weights (eigenvector) and consistency measures for overall criteria.

Weights	
Habitat Quality	0.391
Potential to be a Source	0.400
Public Relations	0.080
Ease of Control	0.129
Summary Statistics	
λ_{max}	4.04
CI	0.01
RI	0.90
CR	0.01

Table 6: Weights (eigenvectors), and consistency measures for habitat quality sub-criteria.

Weights	
Ecosystem Invasibility	0.071
Area Quality	0.084
Proximity to Other Invasive Populations	0.118
Proximity to Sensitive Habitats	0.189
Impact on Endangered Species	0.308
Ability to Affect Ecosystem Processes	0.117
Distance From Uncontrollable Source	0.112
Summary Statistics	
λ_{max}	7.25
CI	0.04
RI	1.32
CR	0.03

Table 7: Weights (eigenvector) and consistency measures for potential to be a source population sub-criteria

Weights	
Elevation	0.4
Size of Population	0.2
Distance From Roads, Trails, Streams	0.4
Summary Statistics	
λ_{max}	3.00
CI	0.00
RI	0.90
CR	0.00

Table 8: Weights (eigenvector) and consistency measures for ease of control sub-criteria.

Weights	
Size of Population	0.351
Active Restoration Necessary	0.351
Repeated Management Necessary	0.189
Ease of Access	0.109
Summary Statistics	
λ_{max}	4.00
CI	0.00
RI	1.24
CR	0.00

Since each criterion in table 9 is compared to only one other criterion, we did not use AHP and simply used one pair-wise comparison to determine the relative importance of the two criteria. For example, for the sub-criteria of proximity to other invasive populations, we determined that same species were twice as important as different species, so different species received a weight of 0.333 and same species received a weight of 0.667.

Table 9: Paired comparisons and weights (eigenvectors) for all criteria with only one comparison.

Population Size (Potential to be a Source Population Sub-Criterion)	Weights
Number of Individuals in Population	0.5
Area of Population	0.5
Population Size (Control Sub-Criterion)	Weights
Number of Individuals in Population	0.333
Area of Population	0.667
Proximity to Other Invasive Populations Sub-criteria	Weights
Different Species	0.333
Same Species	0.667
Proximity to Other Invasive Populations (Species Type Sub-Criterion)	Weights
Number of Populations Within 1 km	0.5
Average Distance to 10 Closest Populations	0.5

The prioritization scores for both the SMMNRA and the NPS land exhibited a fairly normal distribution, with a slight positive skew (figures 4 and 5). The distribution has a mean of 7.06 and a standard deviation of 1.55. The highest overall score was 12.18 and the lowest was 3.71. Because we often assigned scores in a non-linear fashion, the scores on their own are not indicative of a particular priority. For example, we are not able to designate a particular score as the "high priority" threshold. Instead, the scores must be interpreted in relation to each other.

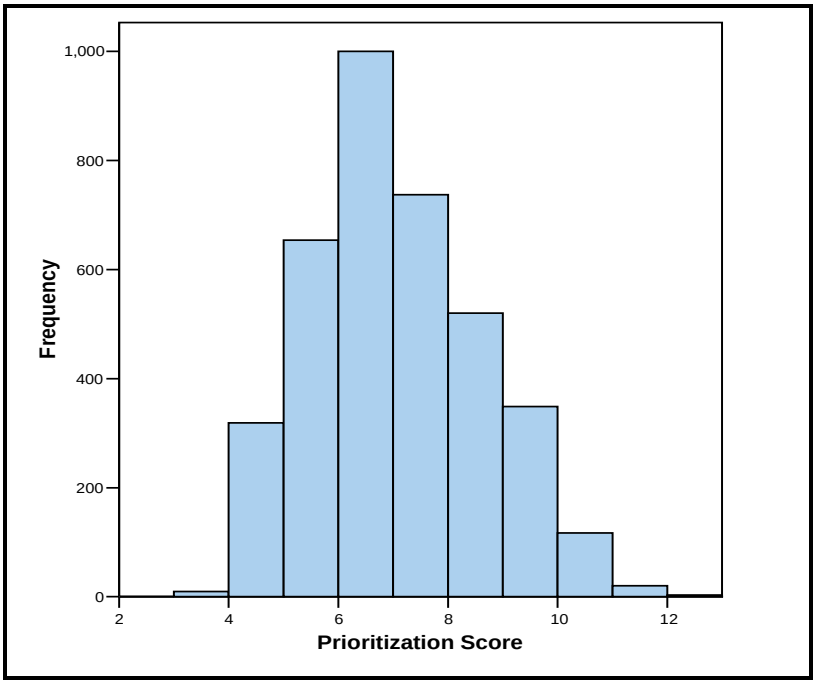

Figure 4: Distribution of prioritization scores for all populations in SMMNRA.

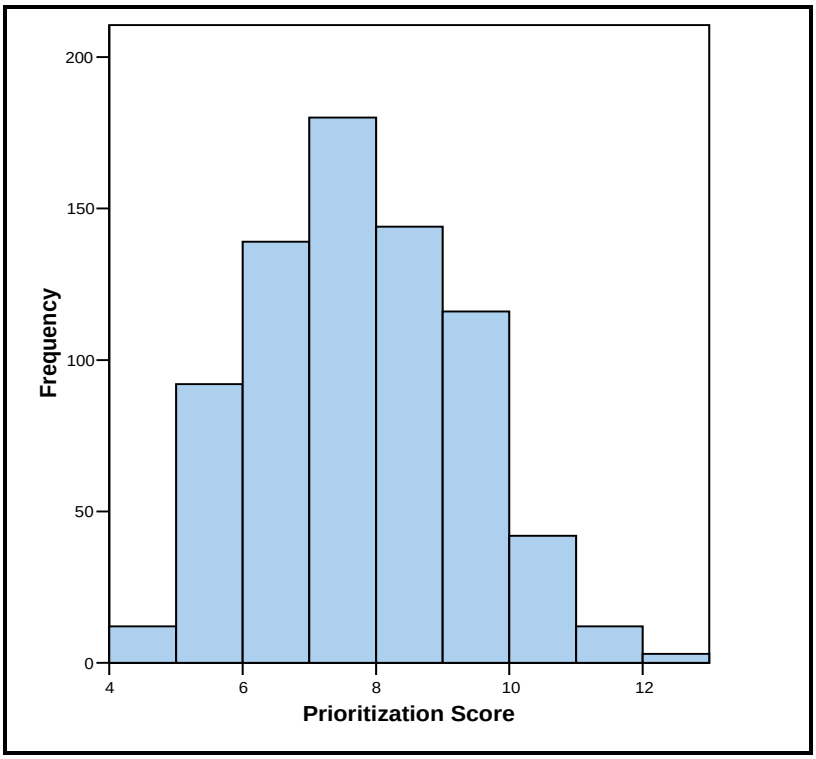

Figure 5: Distribution of prioritization scores for all populations within NPS land.

The sensitivity of the scores for each criterion was calculated (table 10). In the prioritization, elevation and distance from roads/ trails/ streams were the most sensitive to a change in scores. Both had sensitivities of 0.1599, indicating that a 1 point change in the score of either of these criteria had a 0.1599 change in the prioritization score. The sub-criteria for the criterion of different species both had the lowest sensitivity (0.0077). Scores for criteria with high sensitivity are contributing more toward the final priority than scores for criteria with low sensitivity.

Table 10: Score sensitivity for all criteria in prioritization.

Criterion	Score Sensitivity
Habitat Quality	no score
Vegetation Type	0.027939495
Area Quality	0.032979259
Proximity to Sensitive Habitats	0.074092957
Impact on Endangered Species	0.12055239
Alteration of Ecosystem Processes	0.045706504
Proximity to other Invasive Populations	no score
Same Species	no score
Number of Populations w/in 1 km (Same Species Sub-Criterion)	0.01538199
Average Distance to 10 Closest Populations (Same Species Sub-Criterion)	0.01538199
Different Species	no score
Number of Populations w/in 1 km (Different Species Sub-Criterion)	0.007690995
Average Distance to 10 Closest Populations (Different Species Sub-Criterion)	0.007690995
Distance from Uncontrollable Source of new Populations	0.043799615
Potential to be a Source Population	no score
Distance from Roads/ Trails/ Streams	0.159917849
Population Size (Potential to be a Source Population Sub-Criterion)	no score
Number of Individuals (Potential to be a Source of new Populations Sub-Criterion)	0.039979462
Population Area (Potential to be a Source of new Populations Sub-Criterion)	0.039979462
Elevation	0.159917849
Public Relations	0.080302062
Ease of Control	no score
Population Size (Ease of Control Sub-Criterion)	no score
Population Area (Ease of Control Sub-Criterion)	0.030105999
Number of Individuals (Ease of Control Sub-Criterion)	0.015053
Active Restoration Needed	0.045158999
Repeat Management Needed	0.02436682
Ease of Access	0.01400231

Temporal Analysis

Table 11 illustrates the results of the temporal analysis for managing the top nine invasive non-native plant species at the SMMNRA. The letters correspond to a particular management strategy appropriate for that species in the month indicated. Many species had overlapping management techniques during a month, for example both yellow starthistle (*Centaurea solstitialis*) and German ivy (*Delairea odorata*) can be managed using the chemical Clopyralid during the month of Feruary. Other species, like Russian knapweed (*Acroptilon repens*), can only be managed during very specific times of year and with limited techniques.

Table 11: Management Timing for Species

	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Russian knapweed						a,b	a,b					
yellow starthistle		b	b, f, g	b, f, g	d, e, f, g	d, e, f, g	d, e, f, g			c	c	
pampas grass				d,f, h	d, f, h	d, f, h	d, f	d ,f	d, e, f, h	d, e, f, h	d, e, f, h	
German ivy	b, f, i	b, f, i	b, f, i	b, f, i	b, f, i	b, f, i	b, f, i	b, f, i	b, f, i	b, f, i	b, f, i	b, f, i
False caper	e	e	e	e	e	e	e	d, e	d, e	d, e	d, e	E
fennel	f	f	e, f, j	e, f, j	e, f	f	f	f	f	f	f	F
perennial pepperweed	f	f	f	f	f, m	f, m	f, m	f, m	f	f	f	F
tobacco tree	d,e,f	d,e,f	d,e,f	d,e,f	d,e,f	d,e,f	d,e,f	d,e,f	d,e,f	d,e, f	d,e,f	d,e,f
Harding grass		k, l	d, k, l	d, e, k, l	d,e, k, l	d, e		e	e			

Management Key:

a = Dicamba (chemical control)
b = Clopyralid (chemical control)
c = biocontrol
d = mechanical
e = Glyphosate (chemical control)
f = hand pull
g = other
h = Imazepyr (chemical control)
i = Glyphosate/Garlon/Silwit (chemical control)
j = Garlon (chemical control)
k = Hexazinone (chemical control)
l = Bromacil (chemical control)
m = Chlorsulfuron (chemical control)

Below is a plant-by-plant account of the most effective methods with which to control populations:

Russian knapweed (*Acroptilon repens*) is effectively managed in June and July using either Dicamba (at 2-4 lb ae/A) or Clopyralid (at .38-.50 lb ae/A) (TNC 2005).

Yellow starthistle *(Centaurea solstitialis)* is most effectively managed during February, March, and early April, when it can be sprayed with Clopyralid (at 1.5 oz a.e./acre). However, it can also be effectively sprayed with Glyphosate (at 1 lb a.e./acre) during May, June, and July. There is an effective biocontrol, yellow starthistle hairy weevil (*Eustenopus villosus),* which should be applied during October and November. Hand-pulling and mechanical techniques can be used from March to July (later if plants seed and senesce in late summer/early autumn), but they are generally more labor and time intensive than chemical and biocontrol methods (TNC 2006).

Pampas grass (*Cortaderia jubata*) is most effectively killed by an application of Glyphosate (at eight quarts per 100 gallons) from September-November. Application of Imazapyr at 1 percent volume provides excellent control in April, May, and June or September, October, and November (Drewitz et al. unpubl. data).

German ivy (*Delairea odorata*) can be very effectively managed year-round using a combination of 0.5 percent Glyphosate + 0.5 percent Garlon + 0.1 percent silicone surfactant Silwit. This mixture can even eliminate mature stands. Also useable, though less effective, are Clopyralid (at 150g/L) or hand-pulling, though all parts must be bagged and removed in hand-pulling (CAL-IPC 1997).

False caper (*Euphorbia terracina*) can be very effectively managed year-round with Glyphosate using a 2 percent solution. From approximately August to November, mechanical brush-cutting effectively kills older plants (Brigham 2006).

Fennel (*Foeniculum vulgare*) is most effectively managed from late March to early May with Garlon at rates of 6 lbs/100 gallons water. Glyphosate (at the manufacturer's recommended concentration) is slightly less effective when applied from late March- early June. Hand-pulling can be used most of the year, but is very labor intensive and requires bagging of any seeds (Cal-IPC 1996).

Perennial pepperweed (*Lepidium latifolium*) is most effectively managed from May-August using Chlorsulfuron at 0.75-1 oz/acre, mixing in 30 gallons water with 0.5 percent non-ionic surfactant. Hand-pulling can be done year-round, but is more labor-intensive and less effective for large populations (Cal-IPC 1996).

Tobacco tree (*Nicotiana glauca*) can be removed mechanically year-round, and painting the stump with Glyphosate effectively kills the plant. Small trees can also be hand-pulled at any time, though all management is most effective before the trees seed (Cal-IPC 1996).

For adult Harding grass (*Phalaris aquatica*) plants, a spray of 1.5 to 2.0 lb ai/acre of Glyphosate will effectively kill large stands from mid-April to June and late August

to early September. Mechanical mowing is very effective from March to June. Hexazinone (at 3.0 to 6.0 lb ai/acre) can provide control for seedlings (usually February- May). Bromacil (at 5.5 to 8.5 lb ai/acre) can be applied at the same time for similar targeting of seedlings and young plants (TNC 2005).

The information discussed above is graphically represented in table 12. This table is meant to illustrate which management practices work best in specific months, and is not meant to be a comparison between species. A "1" indicates that the best management practice for a particular species can be conducted in that month, a "2" indicates the second best, and a "3", the third.

Table12: Best Management Timing for Prioritized Species

	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
ACRE						1	1					
CESO		1	1	1	2	2	2			2	2	
COJU				2	2	2	3	3	1	1	1	
DEOD	-	-	-	-	-	-	-	-	-	-	-	-
EUTE	-	-	-	-	-	-	-	-	-	-	-	-
FOVU	3	3	1	1	2	3	3	3	3	3	3	3
LELA	2	2	2	2	1	1	1	1	2	2	2	2
NIGL	-	-	-	-	-	-	-	-	-	-	-	-
PHAQ		2	2	1	1	1		1	1			

DISCUSSION

Significance

Our project consists of three parts: 1) exotic threat assessment, 2) prioritization, and 3) temporal analysis. While the development of each of these parts is based off past research, we have made significant modifications such that each part is unique, and the *combination* of them is even more novel. Therefore, this project could serve as a template for future research and further refinements.

There are hundreds of non-native plant species currently found in the SMMNRA – yet it would be a mistake to treat them all equally. To distill this number to something more manageable, we conducted an exotic threat assessment (ETA). While exotic threat assessments have been done at scales smaller than that of a country, only one has been constructed to work at the level of a nature reserve or national park (Hiebert and Stubbendieck, 1993). Additionally, ETAs are more frequently used as a way to determine which species are to be *kept out* of a country, not as a means to identify high-threat species that have already invaded. In this way, we have taken an innovative approach to identifying the most invasive species in the SMMNRA.

Our ETA enabled us to focus our attention on species whose biological characteristics caused them to be a significant threat to the SMMNRA. This project was able to identify a more manageable number of high priority species: seven identified by the ETA and two suggested by NPS biologists.

The prioritization that we have created will be useful to the NPS and other SMMNRA groups when thinking about how to approach the thousands of weed populations within the NRA. The result of this process is a numbered list of populations, arranged from the highest priority for management to the lowest. While the scores that have been calculated for each of the populations have no *absolute* meaning, the *relative* value of the scores (and thus, populations) is crucial.

Potentially even more valuable than the actual numbered list will be the generalized framework that we have developed. The prioritization developed here is customizable for use by the NPS and other groups. This will insure that groups can use an adaptive management process to maximize efficiency and allow them to eliminate the most troubling threats over time.

While the ETA and prioritization determine the hierarchy of species and populations, they do not provide a way of ascertaining an efficient management strategy. The prioritization does provide a numbered list, but consecutive ranked populations could be spaced at great distances over the park – going from one to the next could be a very inefficient use of resources. Refining the prioritization list to a smaller number

would enable better decisions and more efficient management. To further limit the number of populations we conducted a temporal analysis.

While management of invasive species should be a year-round endeavor, the same species should not necessarily be targeted at all times of the year. Factors such as life stages, abscission (the die-off of a plant's upper parts, specifically drought-deciduous plants), temperature, and rainfall can determine the best time to attack a particular species. Moreover, some management techniques can only be used at certain times. With this in mind, we conducted a temporal analysis aimed at reducing the number of invasive populations to a more manageable level for a given month of the year. Based on the data of the nine species we have targeted, we have created a monthly schedule that delineates which species to deal with at a given time. When we combine this information with our prioritization, the numbered list becomes more manageable and an efficient strategy can be determined.

While the NPS will have the specific results of our ETA, prioritization, and temporal analysis, ultimately the product of this project is a system to follow. Whereas before there was no system, now there is, and it can shared with other institutions, and modified over time.

Management Implications

Because it is only possible to target a limited number of populations in any given period of time, we make the following recommendations. In any given month, we recommend directing management toward the high priority populations of species with high management importance. For example, in February, we recommend management efforts first focus on high priority populations of yellow starthistle (*Centaurea solstitalis*), false caper (*Euphorbia terracina*), and German ivy (*Delairea odorata*).

Although we have not conducted a formal spatial analysis, we recommend that managers use the monthly maps to identify areas with the highest density of high priority populations for species with high management importance. By targeting areas with the highest density of high priority populations and species, managers will minimize travel time and cost.

For example, in October, managers would notice that there are a large number of high priority populations of fennel (*Foeniculum vulgare)* and purple pampas grass *(Cortaderia jabata*) in Zuma and Trancas Canyons (appendix 1). Since fennel (*Foeniculum vulgare*) and purple pampas grass (*Cortaderia jabata*) are both high priority species for October, this area would be the recommended starting point for the month.

The number of species and in turn the number of populations that can be targeted varies significantly from one month to the next. In June and July, for example, all species can be managed, while in December and January, only five species can be targeted. In the summer months, the park may want to hire additional laborers to more effectively manage the large number of target populations.

Ideally, the numerous agencies, land trusts, and private individuals would work jointly to control the invasive non-natives in SMMNRA. We recommend that whenever possible, these entities utilize the prioritization to target populations of highest priority. Without cooperation, managed areas, controlled by one agency, may sit adjacent to unmanaged areas controlled by another agency. This could undermine management efforts by increasing the likelihood of the re-establishment of invasive non-natives in managed areas as they spread from the nearby unmanaged areas.

However, for our analysis, we assumed that all populations outside the national park were uncontrollable sources of new populations. If cooperation between the national park and other agencies was achieved, it would be necessary to update the data on uncontrollable source populations and recalculate the prioritization scores.

Each subsequent part of our project served to further refine our management recommendations. The ETA first identified key species that threaten SMMNRA. Next, the prioritization determined the populations of high risk species that should be targeted first for management. Finally, the temporal analysis identified the particular species and their corresponding populations that managers should focus on in any given month. By utilizing this information, managers will be able to control the invasive non-native plants within the SMMNRA more effectively and efficiently throughout the year.

Uncertainties

The results of our ETA and prioritization were based on the best available knowledge and data, but there are various sources of uncertainty, including a lack of data for some non-native species, data errors, and issues specific to AHP and GIS limited our analysis.

<u>Lack of Data</u>

A lack of data limited our analysis in the ETA and prioritization. For the ETA, data available on certain species is limited and so, the true invasibility of these species was not calculable. Consequently, these species were classified as “unknown” by the ETA and were left out of our subsequent prioritization. Furthermore, some aspects of invasiveness, such as the impact of invasive non-natives on ecosystem processes, are not well understood, and so limited data is available on this topic.

The SMMNRA only collected data describing populations for the 19 species thought to be the most invasive by expert opinion. Consequently, the location and extent of the more than 200 additional species on the non-native list are currently unknown. Since we did not have access to information about these locations, we were unable to include these species in the prioritization analysis.

For the ETA, we evaluated 11 species not identified as highly invasive by the park. For these species, we used expert opinion to determine their population locations and management. The data collected in this manner was often imprecise.

The SMMNRA had no accessible data regarding the ranges and habitat requirements of endangered/threatened animals within the park, and so the impact of invasive non-natives on animal species was not used in our prioritization. If this data becomes available in the future, it should be incorporated into the prioritization and ETA.

In the prioritization, all populations not located on NPS land were assigned unknown scores for distance from uncontrollable source populations and quality of area, as this information was not provided for us.

Criteria selection and weighting

The prioritization only included criteria for which we had sufficient information from the SMMNRA. Some important and informative criteria were left out because we did not have sufficient data to use them as part of the prioritization. In particular, we were not able to use native species richness or weed to native ratio to define habitat quality.

The weighing of criteria in the prioritization was based on the opinions of a disparate group of individuals with varying backgrounds, objectives, and knowledge about invasive non-natives and the SMMNRA. In addition, a small group of people (10) participated in the weighing process. The larger the group of informed, knowledgeable individuals, the more robust the resulting weights will be.

Spatial analysis

A population's location was given by the northwest corner of the area it covered. While consistent, this method of using a point location did not account for the varying area and shape of each population. This could have implications for criteria with scores calculated by distance measurements — especially for criteria that had narrow distance intervals along with higher sensitivities. Table 13 shows that the criterion "distance from roads/trails/streams" had both narrow distance intervals and a relatively high sensitivity.

Table 13: Distance Measurement Uncertainty

Distance Criterion	Distance Intervals	Sensitivity
Proximity to sensitive habitat	<10, 10-50, 50-200, 200-500, > 500m	0.074
Distance to uncontrollable sources of new populations	<10, 10-50, 50-200, 200-500, > 500m	0.044
Distance from roads/trails/streams	1-2, 2-5, 5-10, >10m	0.160
Ease of access	<5, 5-50, >50m	0.014
Average Distance to 10 Closest Populations (Same Species Sub-Criterion)	<10, 10-50, 50-200, 200-500, > 500m	0.015
Average Distance to 10 Closest Populations (Different Species Sub-Criterion)	<10, 10-50, 50-200, 200-500, > 500m	0.008

Distance measurements had two additional areas of uncertainty. First, the spatial representation of shapefile features to which distances were calculated from population locations could be imprecise. These features included sensitive habitat boundaries, roads, trails, and streams. Second, our flat surface depiction of the SMMNRA did not consider elevation and topography.

We also used spatial analysis to determine where populations were located. However, these determinations were only as accurate as the shapefiles to which we were associating the population locations. For example, the boundaries in the vegetation type shapefile were estimates based on aerial photographs. Yet we used the shapefile to determine the vegetation type to which the location of each population corresponded and to create the sensitive habitat polygons. This may have had implications for a population's prioritization score in terms of the criteria "invasibility of vegetation type" (if indicating a different vegetation type than was actually present) and "distance to sensitive habitat" (if erroneously indicating a sensitive vegetation type).

These forms of uncertainty could be reduced by acquiring more information and improving the quality of existing information. For instance, shapefile accuracy could be assessed by field checking the data. Polygons, rather than points, would more accurately indicate the extent of populations. At the same time, it is important to remember that while spatial analysis involves uncertainties, it provides data that could not feasibly be collected otherwise.

Future Refinements

Our project represents the first formal attempt to prioritize the removal of populations of invasive non-native plants using a combination of an ETA and population prioritization. Over time, the structure of this analysis will likely evolve as more data

becomes available and the needs of the SMMNRA change. In particular, we suggest the following refinements be considered.

Exotic Threat Assessment (ETA)

The ETA's content and structure is based on what is currently known about invasive non-natives both in a general context and specific to their impact on the SMMNRA. As additional data on non-native species' biology, history and management becomes available, it should be added to the ETA. For example, the addition of a question or section addressing the rate of spread of non-natives would help differentiate between non-native species with currently small populations that are spreading rapidly and those whose populations tend to remain small and isolated. Under the current ETA, there is no way to differentiate between the two because there is no rate of spread data available.

Additional data on non-natives would reduce the number of unknown scores and further strengthen rankings assigned by the ETA. Of the 30 species we assessed using the ETA, only umbrella sedge (*Cyperus involucratus*) received an unknown ranking. However, there are an additional 270 species in the SMMNRA that should be assessed; and given the sheer number of remaining species, it is likely that there will be information gaps on their biology, history and management.

Prioritization

The contributions of more people during the AHP criteria identification and weighting process, specifically from biologists, ecologists and other managers with a vested interest in this topic, would lend additional credibility to the identified criteria and reduce bias in the weighting. For example, none of the people who contributed to the weighing process had much experience with public relations, and contributions from park staff — all from the park's Natural Resource Division — did not place any importance on public relations. Adding contributions from staff in other divisions, such as interpretation, could better reflect the overall goals of the park. If public relations were determined to be important, the criteria would need to be further fleshed out with the addition of sub-criteria to assess the importance of an area to the public. .

The robustness of the prioritization could be increased by further defining each of the criteria when additional data becomes available. For example, accounting for the intensity of traffic on roads and recreational use on trails would allow more accurate identification of potential source populations. When available, data regarding the specific effects of invasive non-natives on endangered animals should also be incorporated.

Economic factors were not directly considered in this prioritization, but they may be of importance to other weed managers. The addition of economics as a criterion on

the hierarchy with supporting sub-criteria should be considered in future iterations of this process.

General Refinements

Ideally, all agencies in the SMMNRA should have been involved in the design and implementation process of this project. Since only one agency (NPS) was involved, the management plan will not be as effective as if it were coordinated in conjunction with the other agencies managing land in the SMMNRA.

Before any agency uses the ETA and prioritization, it should update its non-native population and management data. Up-to-date data will ensure that the prioritization does not recommend targeting populations that are already being managed or miss new populations that may be of high importance.

Additionally, further analyzing the population prioritization in terms of areas within the SMMNRA would allow for more efficient management. An area analysis would generate more specific recommendations of where populations should be targeted first. An area analysis could also address some cost considerations related to travel time.

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APPENDIX 1 -- MAPS

While management of invasive species should be a year-round endeavor, the same species should not necessarily be targeted at all times of the year. With this in mind, we conducted a temporal analysis aimed at reducing the number of invasive populations to a more manageable level for a given month of the year. For each month, we identified species of high importance for management. We based this importance on efficiency, if a species can be managed using an ideal strategy only during certain months, and opportunity, if a species can only be managed a few months out of the year.

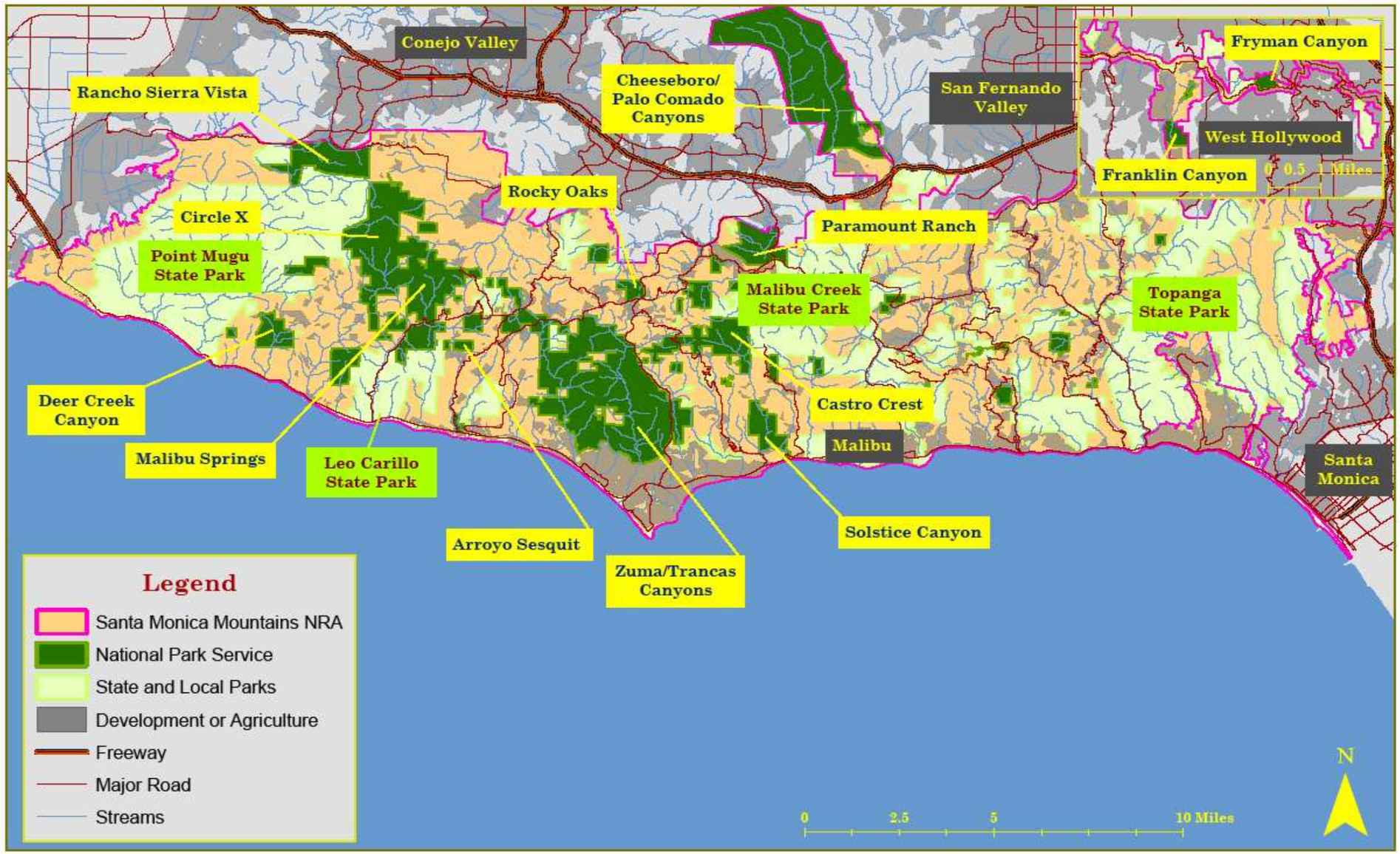
Given that our GIS output is in the form of maps, making 3,700 populations visible is problematic. So, we devised a way to make the maps consistent and legible. The general rules we developed for displaying populations on a map are as follows:

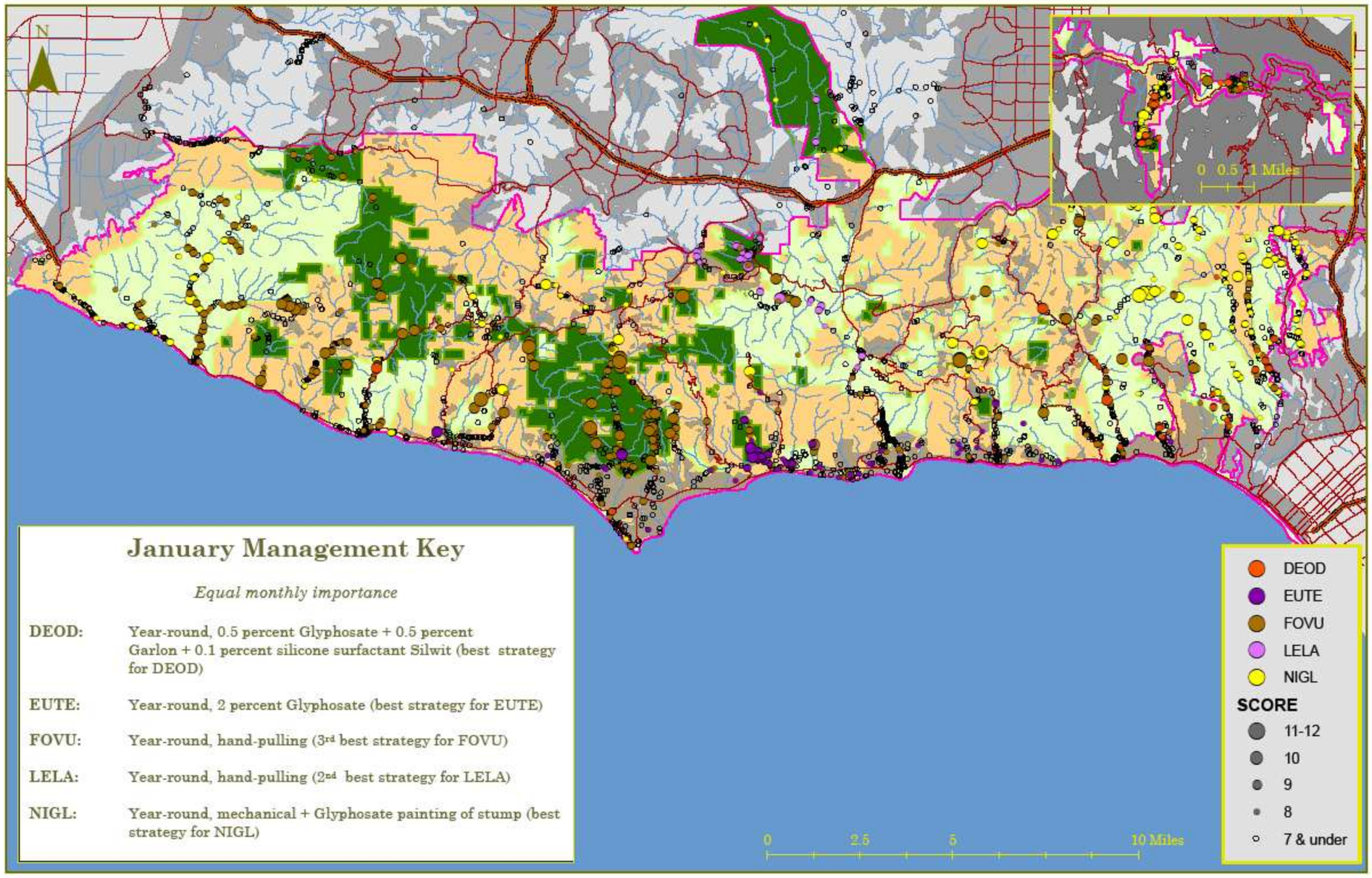
1) For a given species, populations with higher priority will be displayed on top of lower priority populations.
2) In a given month all high priority populations of a species with *higher management* importance will be displayed on top of high priority populations of a species with *lesser management* importance. However, all populations with a priority of 7 or less are placed at the very bottom.
3) In a given level of management importance, all high priority of populations of a species with earlier alphabetical order will be placed on top of high priority populations of a species with later alphabetical order.

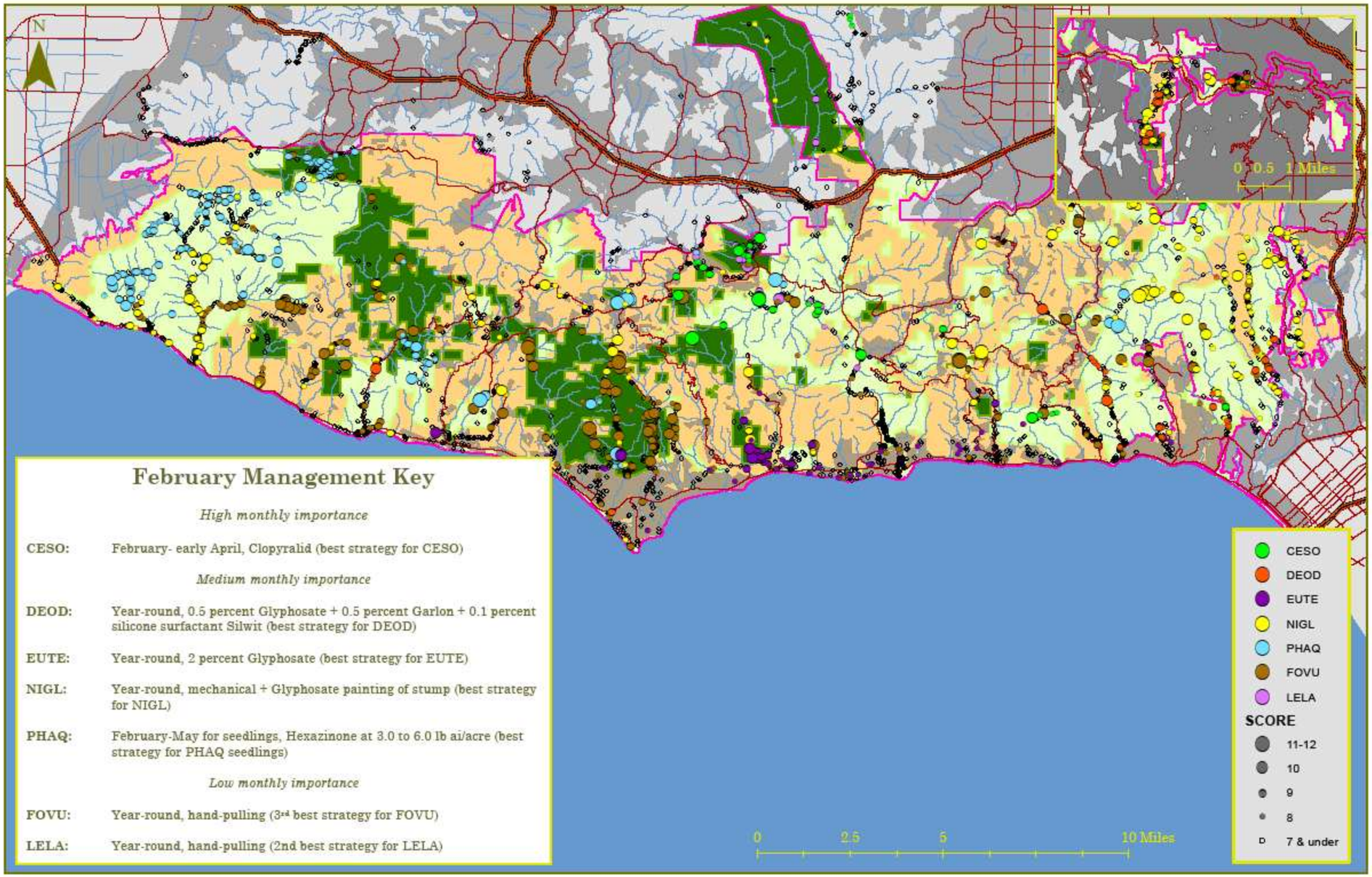
The following pages of this appendix include a map the Santa Monica Mountains National Recreation Area and vicinity along with twelve monthly management maps. Table 14 lists the codes and symbols to represent species in the management maps.

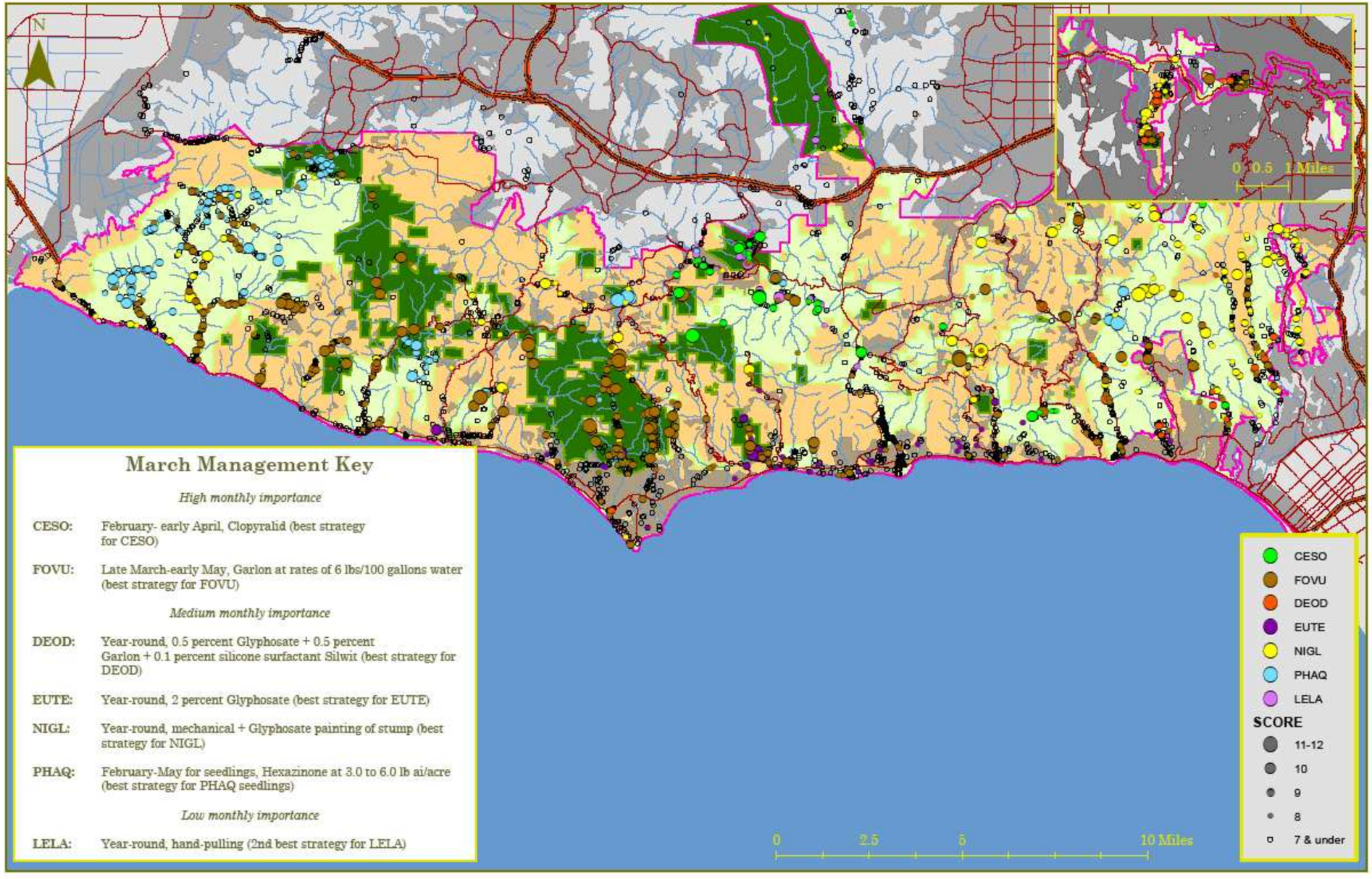
Table 14: Codes and symbols used to represent species in the management maps

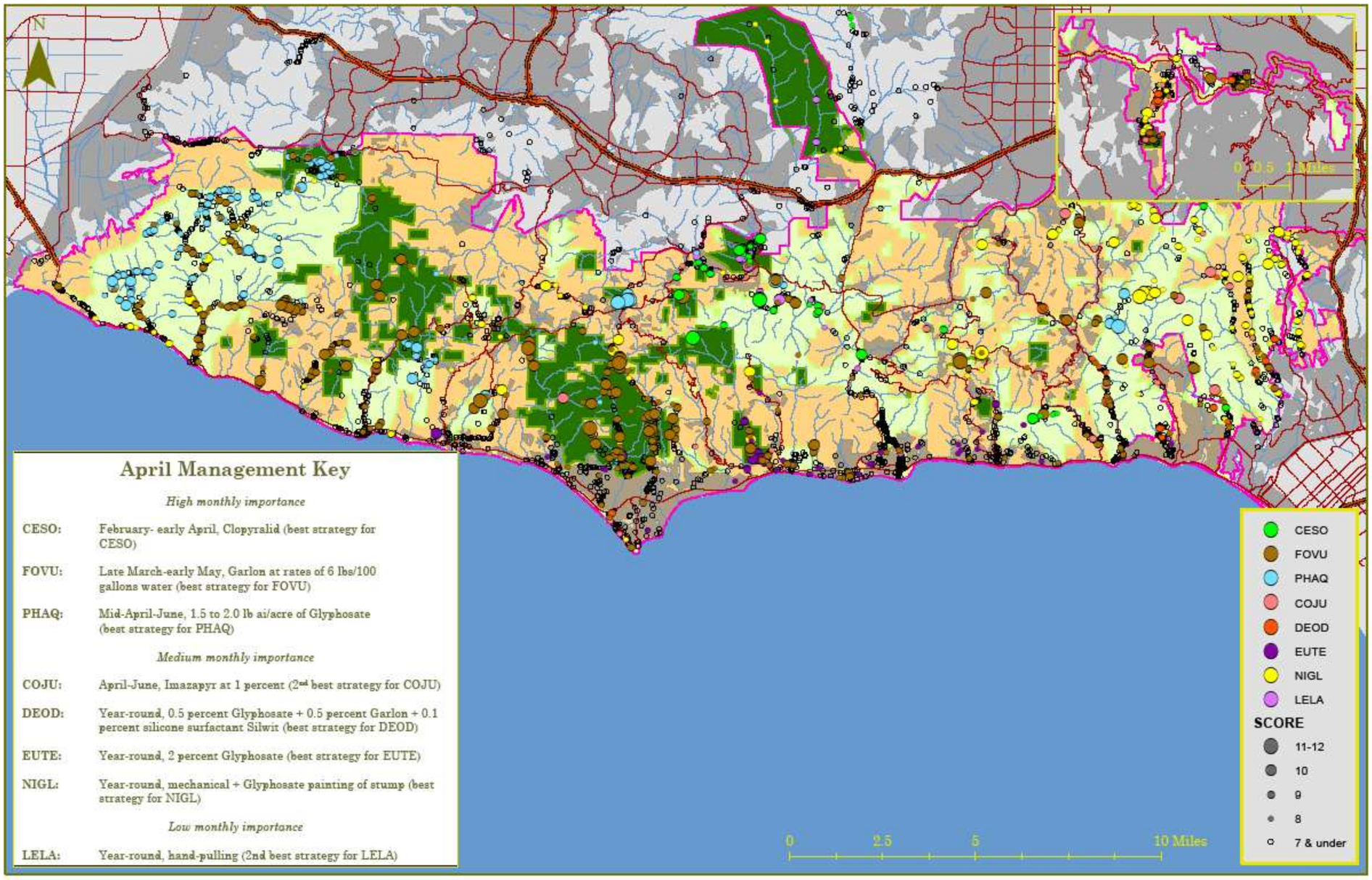
Scientific Name	Common Name	Code	Symbol
Acroptilon repens	Russian thistle	ACRE	
Centaurea solstitialis	yellow starthistle	CESO	
Cortaderia jubata	pampas grass	COJU	
Delairea odorata	cape ivy	DEOD	
Euphorbia terracina	false caper	EUTE	
Foeniculum vulgare	fennel	FOVU	
Lepidium latifolium	perennial pepperweed	LELA	
Nicotiana glauca	tobacco tree	NIGL	
Phalaris aquatica	Harding grass	PHAQ	

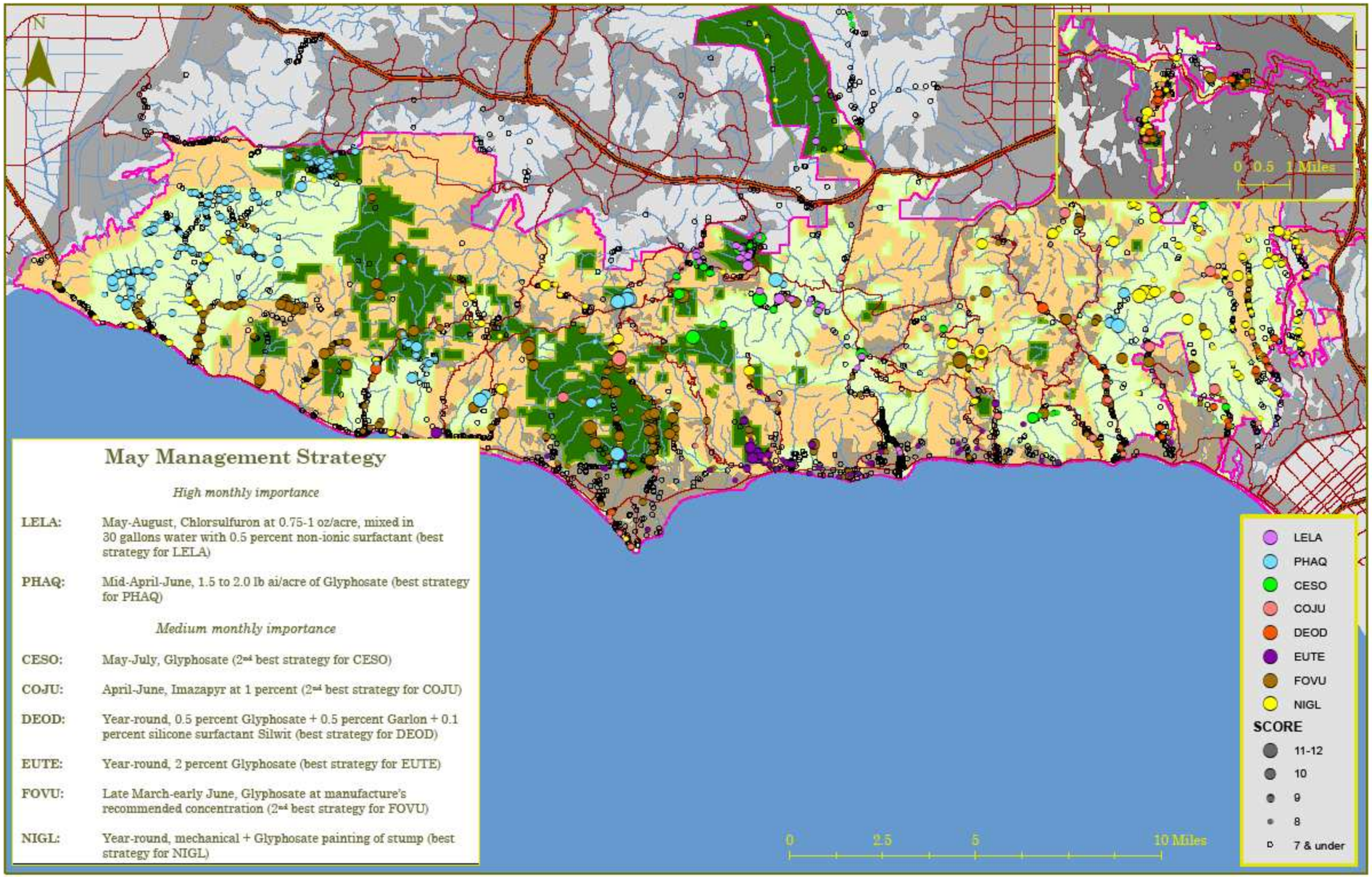

Conejo Valley
Rancho Sierra Vista
Cheeseboro/
Palo Comado
Canyons
San Fernando
Valley
Fryman Canyon
West Hollywood
Franklin Canyon
0 0.5 1 Miles
Rocky Oaks
Circle X
Paramount Ranch
Point Mugu
State Park
Malibu Creek
State Park
Topanga
State Park
Deer Creek
Canyon
Malibu Springs
Leo Carillo
State Park
Arroyo Sesquit
Zuma/Trancas
Canyons
Castro Crest
Malibu
Solstice Canyon
Santa
Monica
Legend
Santa Monica Mountains NRA
National Park Service
State and Local Parks
Development or Agriculture
Freeway
Major Road
Streams
0 2.5 5 10 Miles
N

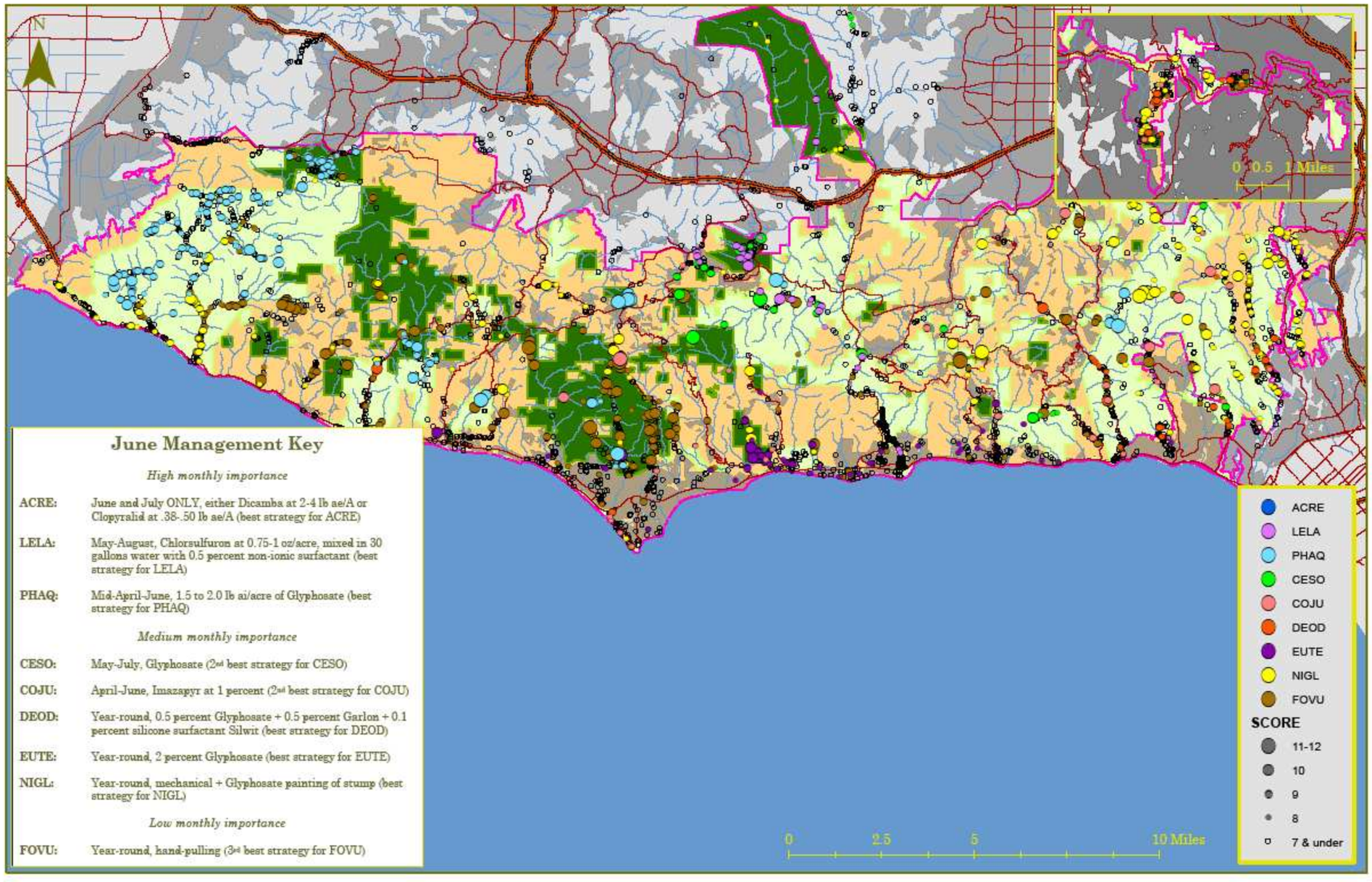

N
0 0.5 1 Miles
January Management Key
Equal monthly importance
DEOD: Year-round, 0.5 percent Glyphosate + 0.5 percent Garlon + 0.1 percent silicone surfactant Silwit (best strategy for DEOD)
EUTE: Year-round, 2 percent Glyphosate (best strategy for EUTE)
FOVU: Year-round, hand-pulling (3rd best strategy for FOVU)
LELA: Year-round, hand-pulling (2nd best strategy for LELA)
NIGL: Year-round, mechanical + Glyphosate painting of stump (best strategy for NIGL)
0 2.5 5 10 Miles
DEOD
EUTE
FOVU
LELA
NIGL
SCORE
11-12
10
9
8
7 & under

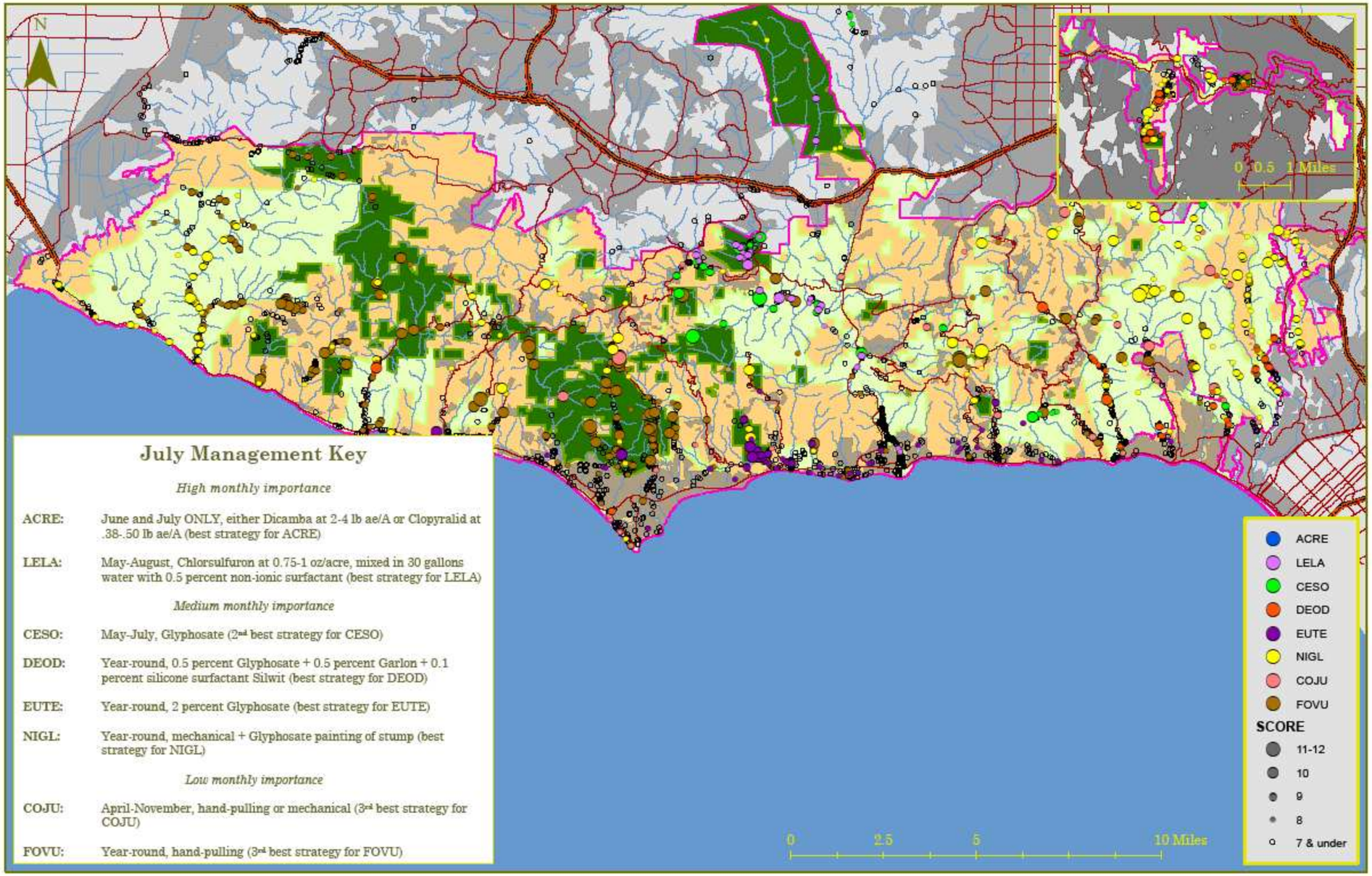

N
0 0.5 1 Miles
February Management Key
High monthly importance
CESO: February- early April, Clopyralid (best strategy for CESO)
Medium monthly importance
DEOD: Year-round, 0.5 percent Glyphosate + 0.5 percent Garlon + 0.1 percent silicone surfactant Silwit (best strategy for DEOD)
EUTE: Year-round, 2 percent Glyphosate (best strategy for EUTE)
NIGL: Year-round, mechanical + Glyphosate painting of stump (best strategy for NIGL)
PHAQ: February-May for seedlings, Hexazinone at 3.0 to 6.0 lb ai/acre (best strategy for PHAQ seedlings)
Low monthly importance
FOVU: Year-round, hand-pulling (3rd best strategy for FOVU)
LELA: Year-round, hand-pulling (2nd best strategy for LELA)
0 2.5 5 10 Miles
CESO
DEOD
EUTE
NIGL
PHAQ
FOVU
LELA
SCORE
11-12
10
9
8
7 & under

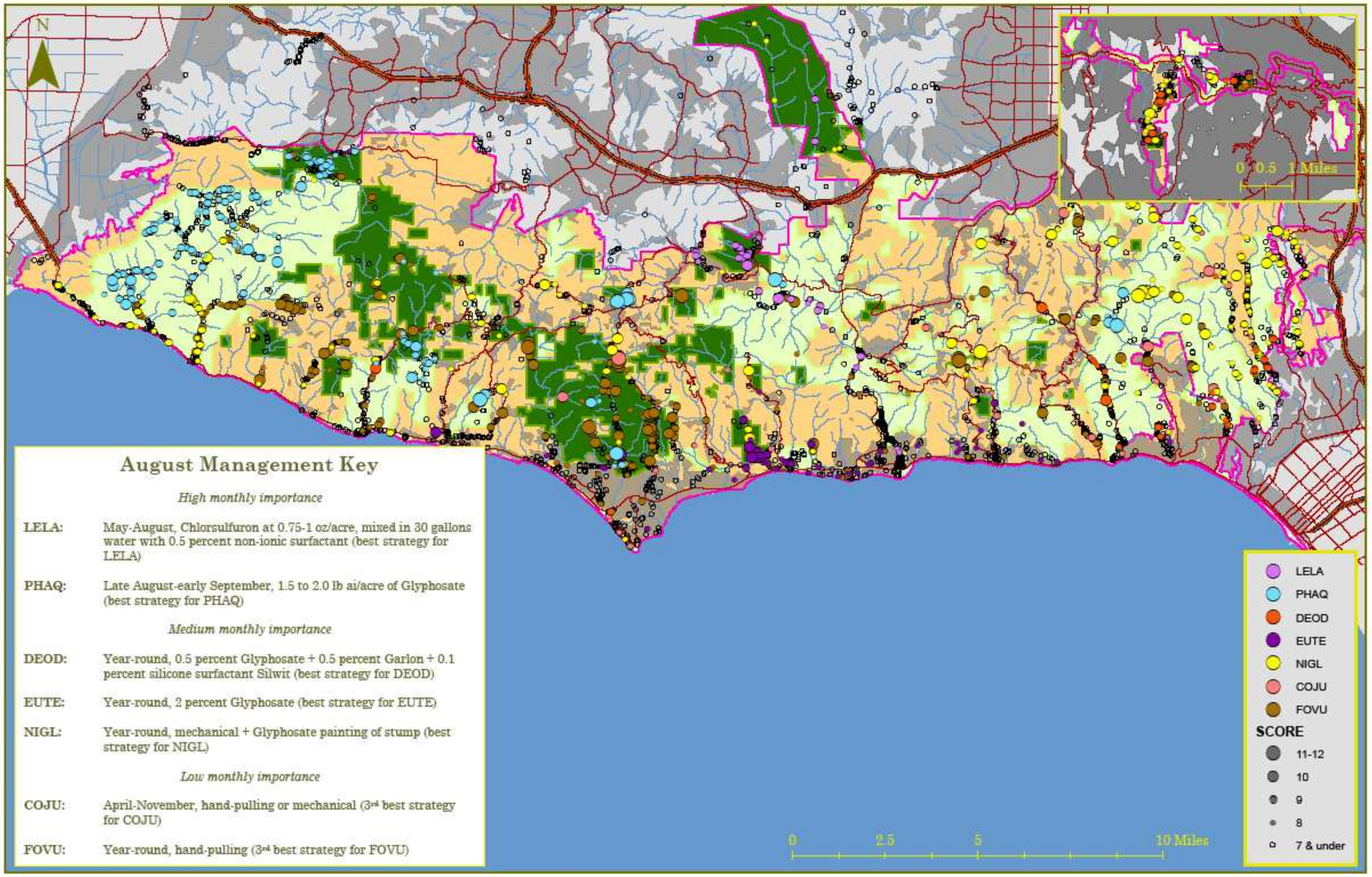

N
0 0.5 1 Miles
March Management Key
High monthly importance
CESO: February- early April, Clopyralid (best strategy for CESO)
FOVU: Late March-early May, Garlon at rates of 6 lbs/100 gallons water (best strategy for FOVU)
Medium monthly importance
DEOD: Year-round, 0.5 percent Glyphosate + 0.5 percent Garlon + 0.1 percent silicone surfactant Silwit (best strategy for DEOD)
EUTE: Year-round, 2 percent Glyphosate (best strategy for EUTE)
NIGL: Year-round, mechanical + Glyphosate painting of stump (best strategy for NIGL)
PHAQ: February-May for seedlings, Hexazinone at 3.0 to 6.0 lb ai/acre (best strategy for PHAQ seedlings)
Low monthly importance
LELA: Year-round, hand-pulling (2nd best strategy for LELA)
0 2.5 5 10 Miles
CESO
FOVU
DEOD
EUTE
NIGL
PHAQ
LELA
SCORE
11-12
10
9
8
7 & under

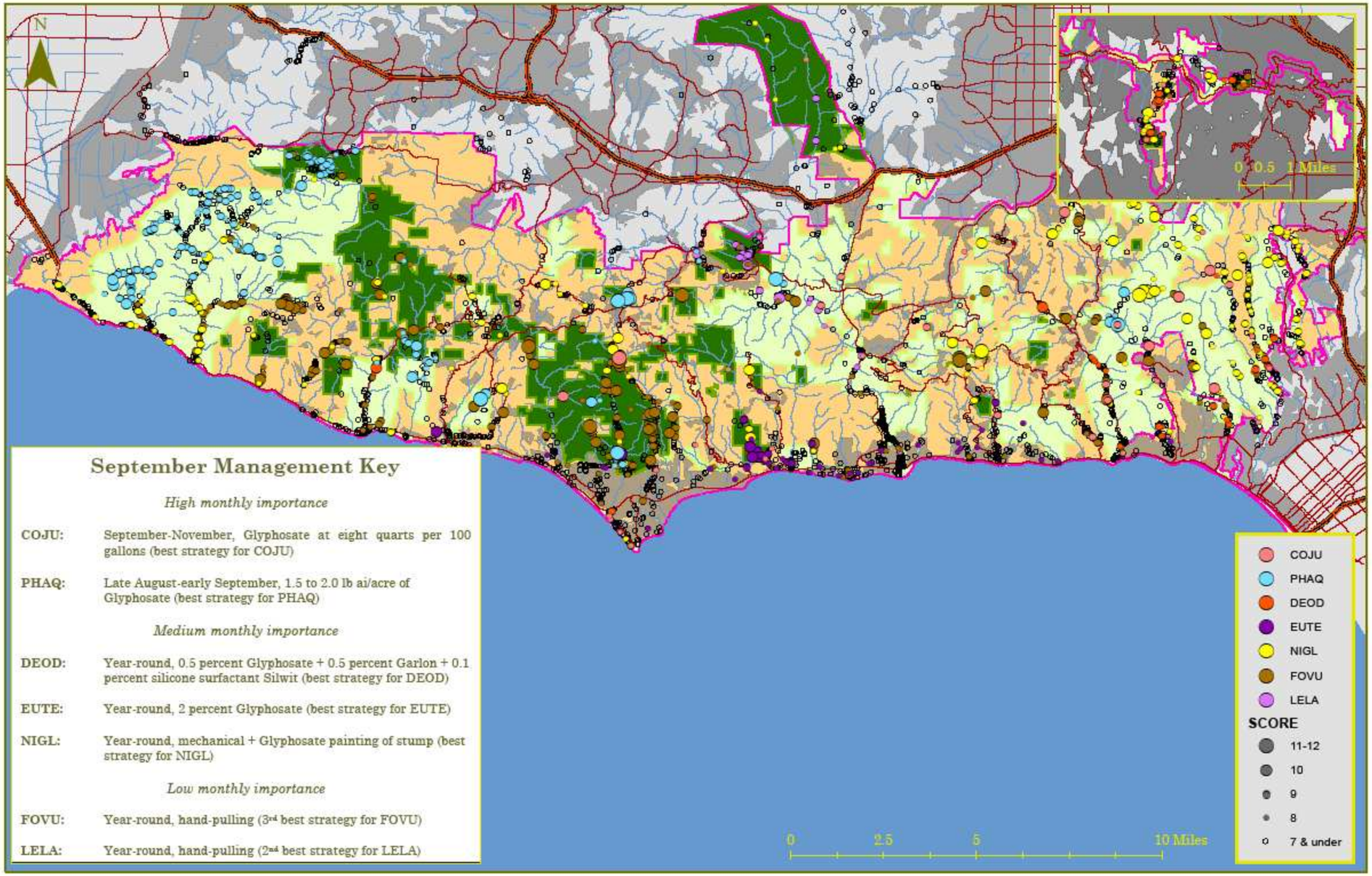

N
0 0.5 1 Miles
April Management Key
High monthly importance
CESO: February- early April, Clopyralid (best strategy for CESO)
FOVU: Late March-early May, Garlon at rates of 6 lbs/100 gallons water (best strategy for FOVU)
PHAQ: Mid-April-June, 1.5 to 2.0 lb ai/acre of Glyphosate (best strategy for PHAQ)
Medium monthly importance
COJU: April-June, Imazapyr at 1 percent (2nd best strategy for COJU)
DEOD: Year-round, 0.5 percent Glyphosate + 0.5 percent Garlon + 0.1 percent silicone surfactant Silwit (best strategy for DEOD)
EUTE: Year-round, 2 percent Glyphosate (best strategy for EUTE)
NIGL: Year-round, mechanical + Glyphosate painting of stump (best strategy for NIGL)
Low monthly importance
LELA: Year-round, hand-pulling (2nd best strategy for LELA)
0 2.5 5 10 Miles
CESO
FOVU
PHAQ
COJU
DEOD
EUTE
NIGL
LELA
SCORE
11-12
10
9
8
7 & under

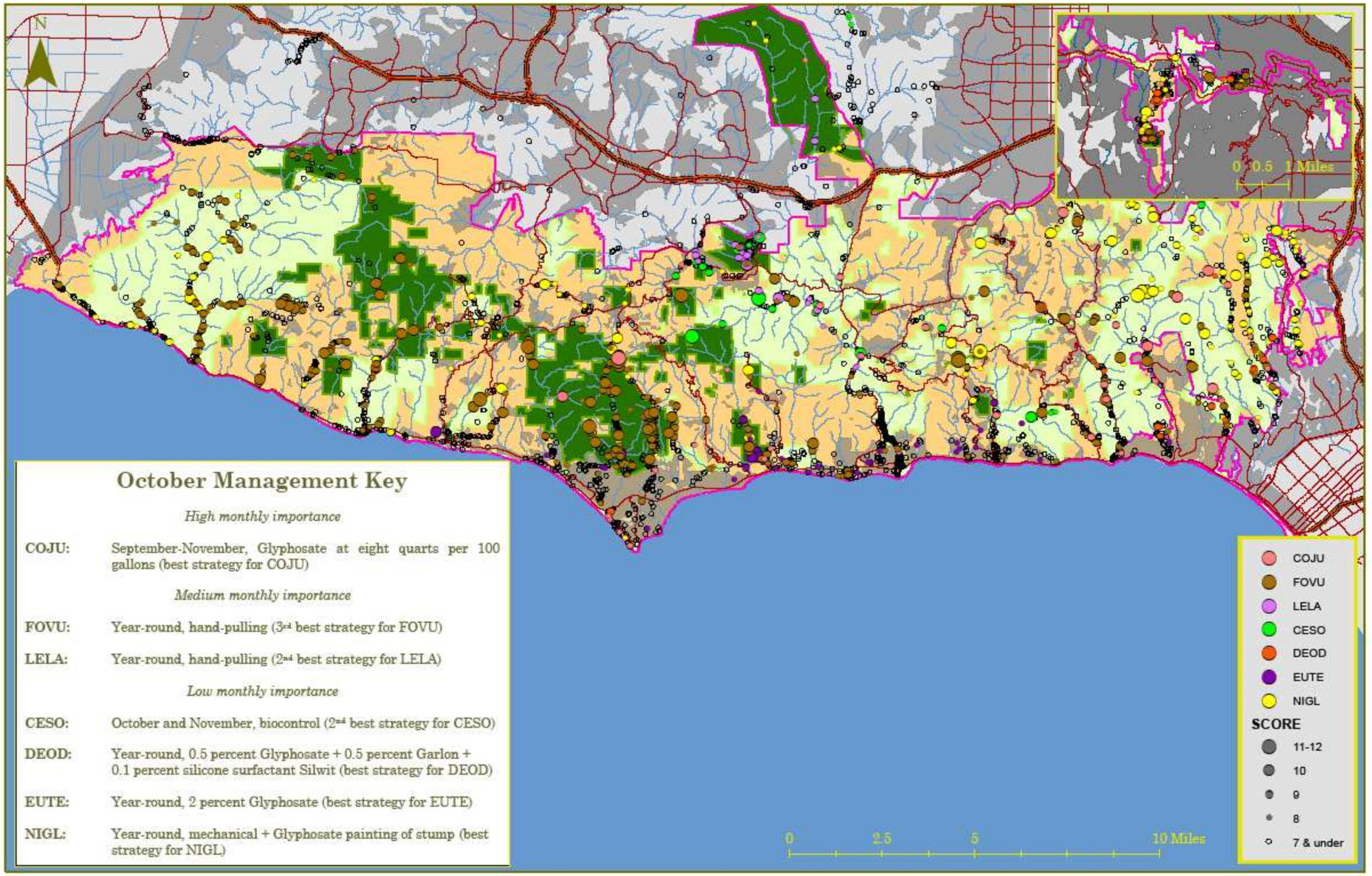

N
0 0.5 1 Miles
May Management Strategy
High monthly importance
LELA: May-August, Chlorsulfuron at 0.75-1 oz/acre, mixed in 30 gallons water with 0.5 percent non-ionic surfactant (best strategy for LELA)
PHAQ: Mid-April-June, 1.5 to 2.0 lb ai/acre of Glyphosate (best strategy for PHAQ)
Medium monthly importance
CESO: May-July, Glyphosate (2nd best strategy for CESO)
COJU: April-June, Imazapyr at 1 percent (2nd best strategy for COJU)
DEOD: Year-round, 0.5 percent Glyphosate + 0.5 percent Garlon + 0.1 percent silicone surfactant Silwit (best strategy for DEOD)
EUTE: Year-round, 2 percent Glyphosate (best strategy for EUTE)
FOVU: Late March-early June, Glyphosate at manufacture's recommended concentration (2nd best strategy for FOVU)
NIGL: Year-round, mechanical + Glyphosate painting of stump (best strategy for NIGL)
0 2.5 5 10 Miles
LELA
PHAQ
CESO
COJU
DEOD
EUTE
FOVU
NIGL
SCORE
11-12
10
9
8
7 & under

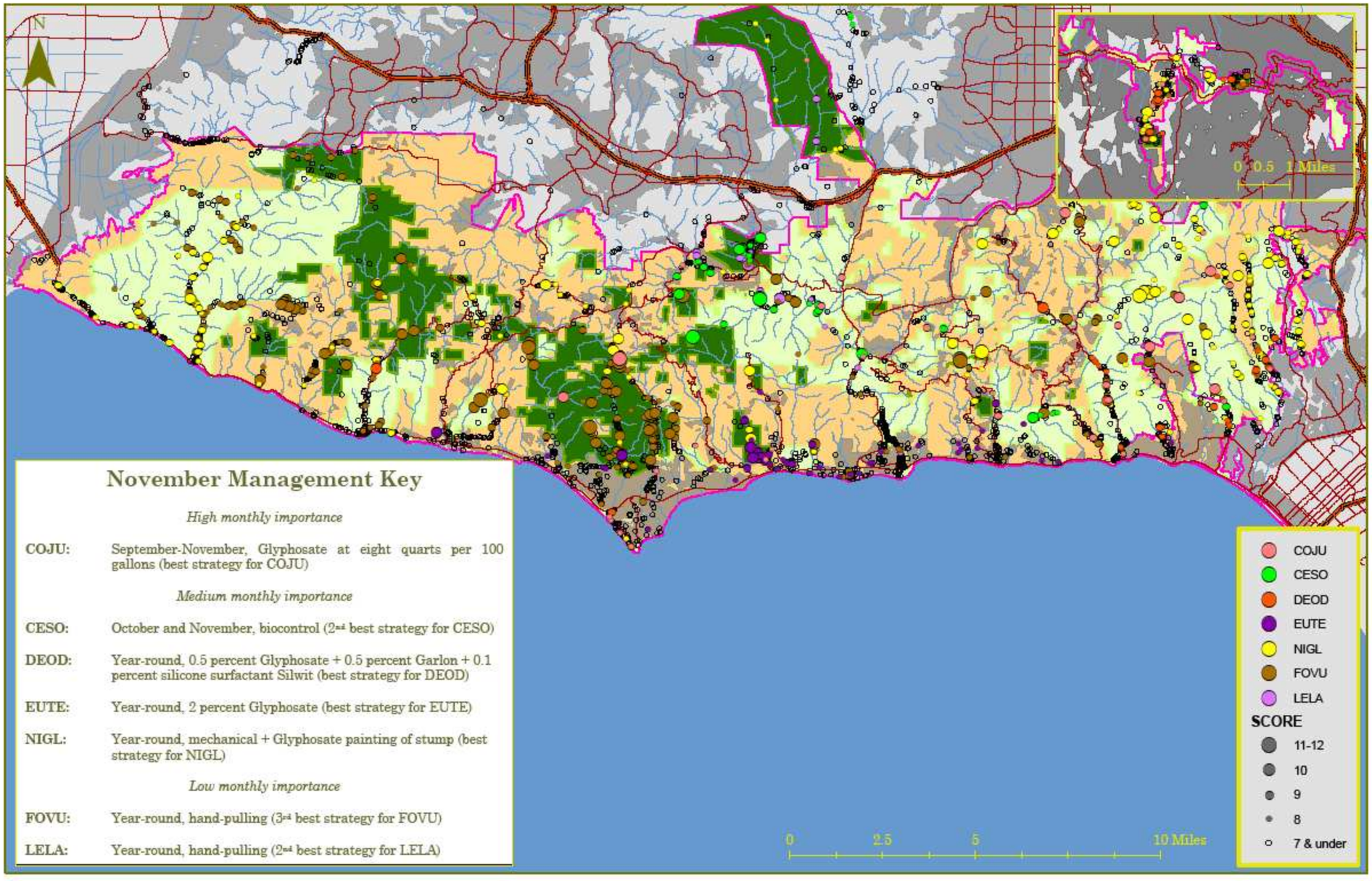

N
0 0.5 1 Miles
June Management Key
High monthly importance
ACRE: June and July ONLY, either Dicamba at 2-4 lb ae/A or Clopyralid at .38-.50 lb ae/A (best strategy for ACRE)
LELA: May-August, Chlorsulfuron at 0.75-1 oz/acre, mixed in 30 gallons water with 0.5 percent non-ionic surfactant (best strategy for LELA)
PHAQ: Mid-April-June, 1.5 to 2.0 lb ai/acre of Glyphosate (best strategy for PHAQ)
Medium monthly importance
CESO: May-July, Glyphosate (2nd best strategy for CESO)
COJU: April-June, Imazapyr at 1 percent (2nd best strategy for COJU)
DEOD: Year-round, 0.5 percent Glyphosate + 0.5 percent Garlon + 0.1 percent silicone surfactant Silwit (best strategy for DEOD)
EUTE: Year-round, 2 percent Glyphosate (best strategy for EUTE)
NIGL: Year-round, mechanical + Glyphosate painting of stump (best strategy for NIGL)
Low monthly importance
FOVU: Year-round, hand-pulling (3rd best strategy for FOVU)
ACRE
LELA
PHAQ
CESO
COJU
DEOD
EUTE
NIGL
FOVU
SCORE
11-12
10
9
8
7 & under
0 2.5 5 10 Miles

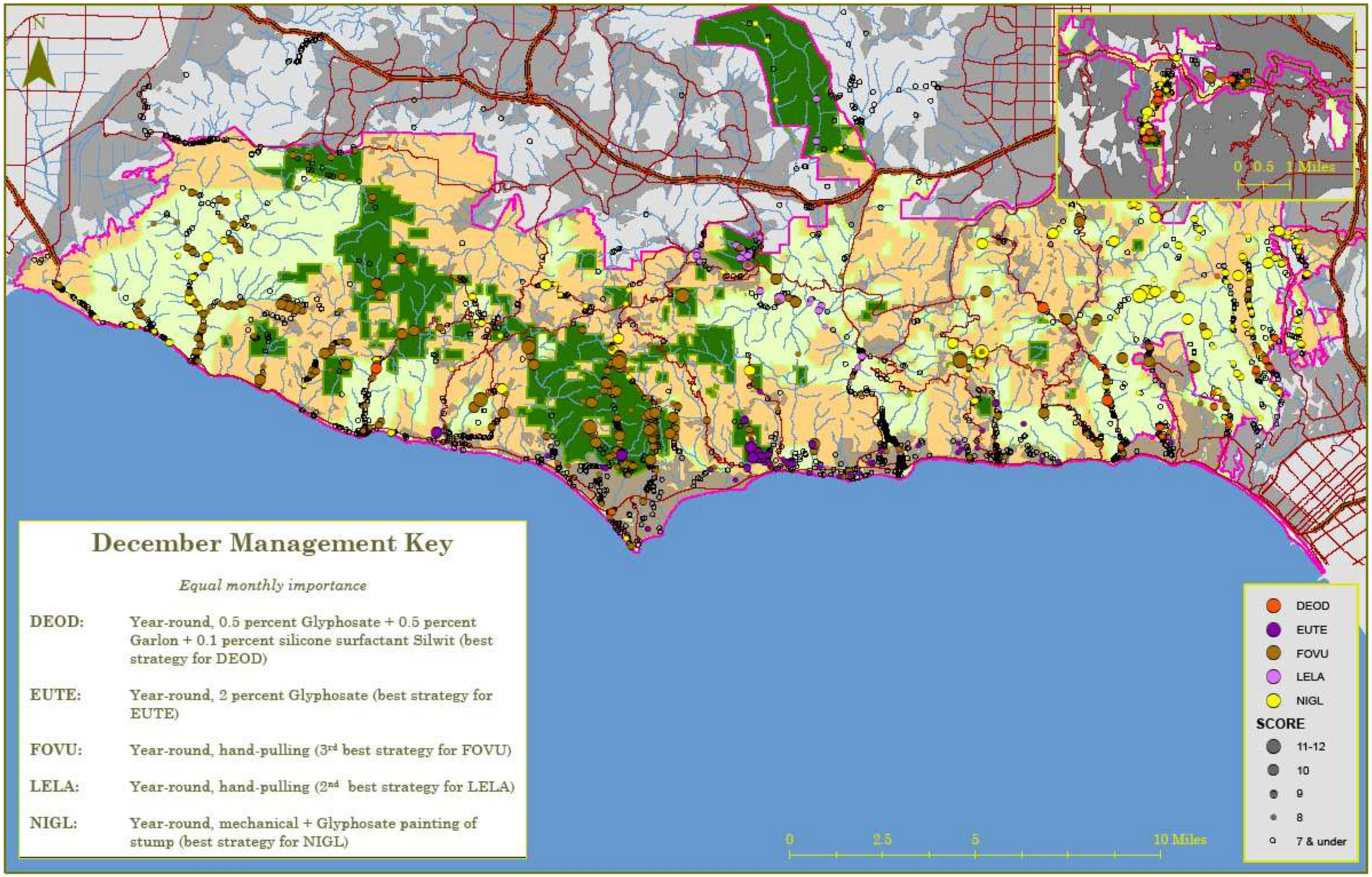

N
0 0.5 1 Miles
July Management Key
High monthly importance
ACRE: June and July ONLY, either Dicamba at 2-4 lb ae/A or Clopyralid at .38-.50 lb ae/A (best strategy for ACRE)
LELA: May-August, Chlorsulfuron at 0.75-1 oz/acre, mixed in 30 gallons water with 0.5 percent non-ionic surfactant (best strategy for LELA)
Medium monthly importance
CESO: May-July, Glyphosate (2nd best strategy for CESO)
DEOD: Year-round, 0.5 percent Glyphosate + 0.5 percent Garlon + 0.1 percent silicone surfactant Silwit (best strategy for DEOD)
EUTE: Year-round, 2 percent Glyphosate (best strategy for EUTE)
NIGL: Year-round, mechanical + Glyphosate painting of stump (best strategy for NIGL)
Low monthly importance
COJU: April-November, hand-pulling or mechanical (3rd best strategy for COJU)
FOVU: Year-round, hand-pulling (3rd best strategy for FOVU)
0 2.5 5 10 Miles
ACRE
LELA
CESO
DEOD
EUTE
NIGL
COJU
FOVU
SCORE
11-12
10
9
8
7 & under


N
0 0.5 1 Miles
August Management Key
High monthly importance
LELA: May-August, Chlorsulfuron at 0.75-1 oz/acre, mixed in 30 gallons water with 0.5 percent non-ionic surfactant (best strategy for LELA)
PHAQ: Late August-early September, 1.5 to 2.0 lb ai/acre of Glyphosate (best strategy for PHAQ)
Medium monthly importance
DEOD: Year-round, 0.5 percent Glyphosate + 0.5 percent Garlon + 0.1 percent silicone surfactant Silwit (best strategy for DEOD)
EUTE: Year-round, 2 percent Glyphosate (best strategy for EUTE)
NIGL: Year-round, mechanical + Glyphosate painting of stump (best strategy for NIGL)
Low monthly importance
COJU: April-November, hand-pulling or mechanical (3rd best strategy for COJU)
FOVU: Year-round, hand-pulling (3rd best strategy for FOVU)
0 2.5 5 10 Miles
LELA
PHAQ
DEOD
EUTE
NIGL
COJU
FOVU
SCORE
11-12
10
9
8
7 & under


N
0 0.5 1 Miles
September Management Key
High monthly importance
COJU: September-November, Glyphosate at eight quarts per 100 gallons (best strategy for COJU)
PHAQ: Late August-early September, 1.5 to 2.0 lb ai/acre of Glyphosate (best strategy for PHAQ)
Medium monthly importance
DEOD: Year-round, 0.5 percent Glyphosate + 0.5 percent Garlon + 0.1 percent silicone surfactant Silwit (best strategy for DEOD)
EUTE: Year-round, 2 percent Glyphosate (best strategy for EUTE)
NIGL: Year-round, mechanical + Glyphosate painting of stump (best strategy for NIGL)
Low monthly importance
FOVU: Year-round, hand-pulling (3rd best strategy for FOVU)
LELA: Year-round, hand-pulling (2nd best strategy for LELA)
0 2.5 5 10 Miles
COJU
PHAQ
DEOD
EUTE
NIGL
FOVU
LELA
SCORE
11-12
10
9
8
7 & under


N
0 0.5 1 Miles
October Management Key
High monthly importance
COJU: September-November, Glyphosate at eight quarts per 100 gallons (best strategy for COJU)
Medium monthly importance
FOVU: Year-round, hand-pulling (3rd best strategy for FOVU)
LELA: Year-round, hand-pulling (2nd best strategy for LELA)
Low monthly importance
CESO: October and November, biocontrol (2nd best strategy for CESO)
DEOD: Year-round, 0.5 percent Glyphosate + 0.5 percent Garlon + 0.1 percent silicone surfactant Silwit (best strategy for DEOD)
EUTE: Year-round, 2 percent Glyphosate (best strategy for EUTE)
NIGL: Year-round, mechanical + Glyphosate painting of stump (best strategy for NIGL)
0 2.5 5 10 Miles
COJU
FOVU
LELA
CESO
DEOD
EUTE
NIGL
SCORE
11-12
10
9
8
7 & under


N
0 0.5 1 Miles
November Management Key
High monthly importance
COJU: September-November, Glyphosate at eight quarts per 100 gallons (best strategy for COJU)
Medium monthly importance
CESO: October and November, biocontrol (2nd best strategy for CESO)
DEOD: Year-round, 0.5 percent Glyphosate + 0.5 percent Garlon + 0.1 percent silicone surfactant Silwit (best strategy for DEOD)
EUTE: Year-round, 2 percent Glyphosate (best strategy for EUTE)
NIGL: Year-round, mechanical + Glyphosate painting of stump (best strategy for NIGL)
Low monthly importance
FOVU: Year-round, hand-pulling (3rd best strategy for FOVU)
LELA: Year-round, hand-pulling (2nd best strategy for LELA)
0 2.5 5 10 Miles
COJU
CESO
DEOD
EUTE
NIGL
FOVU
LELA
SCORE
11-12
10
9
8
7 & under


N
0 0.5 1 Miles
December Management Key
Equal monthly importance
DEOD: Year-round, 0.5 percent Glyphosate + 0.5 percent Garlon + 0.1 percent silicone surfactant Silwit (best strategy for DEOD)
EUTE: Year-round, 2 percent Glyphosate (best strategy for EUTE)
FOVU: Year-round, hand-pulling (3rd best strategy for FOVU)
LELA: Year-round, hand-pulling (2nd best strategy for LELA)
NIGL: Year-round, mechanical + Glyphosate painting of stump (best strategy for NIGL)
0 2.5 5 10 Miles
DEOD
EUTE
FOVU
LELA
NIGL
SCORE
11-12
10
9
8
7 & under

Santa Monica Mountains National Recreation Area Weed Prioritization Data

Identification Information

Citation
- Originator: Santa Monica Mountains National Recreation Area Bren Group Project (SMMNRA- Group Project)
- Publication Date: 200704
- Title: Prioritization of Invasive Non-Native Plant Populations

Publication Information
- Publication Place: Santa Barbara, California
- Publisher: Donald Bren School of Environmental Science & Management, University of California, Santa Barbara
- Abstract: The Santa Monica National Recreation Area Weed Prioritization Data file contains information about invasive non-native populations surveyed in the SMMNRA. The SMMNRA Group Project assembled data recorded by SMMNRA staff and calculated further data from GIS spatial analysis, in order to prioritize the populations for management. This is a single dataset containing planimetric coordinates of population point features and attributes. The digital data and hardcopy maps used as the source for the digital data were collected by National Park Service Botany Division staff in the SMMNRA.
- Purpose: The data provides SMMNRA staff with information on invasive non-native population removal priority through spatial information and risk analysis. The data was collected to meet the SMMNRA's efforts to manage their invasive non-native populations.

Time Period of Content
- Multiple Dates/Times
  - Single_Date/Time
    - Calendar Date: 200610
  - Single Date/Time
    - Calendar Date: 200701
- Currentness Reference: current as of 20070129

Status
- Progress: Incomplete
- Maintenance and Update Frequency: As needed

Keywords
- Theme
  - Theme Keyword Thesaurus: None
  - Theme Keyword: invasive
  - Theme Keyword: non-native
  - Theme Keyword: management
  - Theme Keyword: plant

Theme Keyword: biology
Theme Keyword: prioritization
Theme Keyword: GIS
Place
Place Keyword Thesaurus: None
Place Keyword: Santa Monica Mountains
Place Keyword: California
Access Constraints: none
Use Constraints: none
Point of Contact
Contact Organization Primary
Contact Organization: SMMNRA- Group Project, Bren School, UC Santa Barbara
Contact Address
Address Type: mailing and physical address
Address: 2400 Bren Hall, University of California, Santa Barbara
City: Santa Barbara
State or Province: California
Postal Code: 93106
Native Data Set Environment: SMMNRA- Group Project uses ESRI's ArcGIS software version 9.1 to digitize invasive non-native population information.

Data Quality Information

Attribute Accuracy
Attribute Accuracy Report: At this time, the protocol used to collect population data is unknown. Conflicting designations between Access and GIS data were automatically given the designation in the Access record because they were recorded by observers in the field, whereas GIS designations were determined from spatial analysis.
Logical Consistency Report: Data points with illogical coordinates (usually missing or added digits) were removed from the dataset. Data points with the same coordinates and species were combined into one data point. Data points outside the SMMNRA vicinity were removed. Data points with attributes locating the population in the SMMNRA, but with coordinates outside the park were removed. Over two hundred points were thus removed from the dataset.
Completeness Report: All SMMNRA invasive non-native populations with complete coordinate and attribute information were included in the data set. A more complete on-the-ground survey of the SMMNRA may result in additional invasive non-native populations and revisions in the location of some documented populations. In addition, invasive non-native populations not covered by previous monitoring or incorrectly documented were not included in this dataset.

Lineage
Source Information
Source Citation
Originator: SMMNRA National Park Service Natural Resource staff
Publication Date: 20050912
Title: Exotic Flora_MS
Geospatial Data Presentation Form: x and y coordinates
Source Scale Denominator: 122300
Type of Source Media: Access Database
Source Time Period of Content
Multiple Dates/Times
Single_Date/Time
Calendar Date: 20010724
Single Date/Time
Calendar Date: 20050912
Source Currentness Reference: 20050912
Process Step
Process Description: The dataset was compiled through prioritization of the invasive non-native populations through an Analytical Hierarchy Process which calculated a priority score for each population. These populations were then ordered by priority into the final dataset.
Process Date: 20070124
Source Produced Citation Abbreviation: SMMNRA- Group Project

Spatial Data Organization Information

Direct Spatial Reference Method: Vector

Spatial Reference Information

Horizontal Coordinate System Definition
Planar
Grid Coordinate System
Grid Coordinate System Name: Universal Transverse Mercator
Universal Transverse Mercator
UTM Zone Number: 11
Transverse Mercator
Scale Factor at Central Meridian: 0.9996
Longitude of Central Meridian: -117.0
Latitude of Projection Origin: 0.0
False Easting: 500000.0
False Northing: 0.0
Planar Coordinate Information
Planar Coordinate Encoding Method: coordinate pair
Planar Distance Units: meters
Geodetic Model
Horizontal Datum Name: North American Datum of 1927

Ellipsoid Name: Clarke 1866
Semi-major Axis: 6378206.4
Denominator of Flattening Ratio: 294.9787

Entity and Attribute Information

Entity Type
- Entity Type Label: invasive non-native population
- Entity Type Definition: a recorded population of a non-native species determined high-threat (invasive) by the Exotic Threat Assessment. A population consists of plants of one species and must be contiguous.
- Entity Type Definition Source: SMMNRA- Group Project
- Attribute
  - Attribute Label: Bren ID#
  - Attribute Definition: unique identifier assigned to a population using string consisting of its x-coordinate, y-coordinate, and 4 letter species code
  - Attribute Definition Source: SMMNRA- Group Project
- Attribute
  - Attribute Label: Old ID#
  - Attribute Definition: ID number assigned to a population in the NPS Exotic Flora_MS Database
  - Attribute Definition Source: SMMNRA, NPS- Natural Resource Division staff
- Attribute
  - Attribute Label: prioritization score
  - Attribute Definition: the prioritization score of a population, calculated from a series of scored and weighted criteria. These criteria balance ecological and social considerations, based on the mandate of the SMMNRA.
  - Attribute Definition Source: SMMNRA- Group Project
- Attribute
  - Attribute Label: species
  - Attribute Definition: the species of a population, given by 4-letter code consisting of the first two letters of its genus and the first two letters of its species
  - Attribute Definition Source: SMMNRA- Group Project
- Attribute
  - Attribute Label: population count
  - Attribute Definition: the number of individuals in a population
  - Attribute Definition Source: SMMNRA- Group Project
- Attribute
  - Attribute label: population area
  - Attribute Definition: the square meters covered by a population
  - Attribute Definition Source: SMMNRA- Group Project

Entity Type
- Entity Type Label: location
- Entity Type Description: the spatial location of an invasive non-native population
- Entity Type Definition Source: SMMNRA- Group Project
- Attribute
  - Attribute Label: Bren ID#
  - Attribute Definition: unique identifier assigned to a population using string consisting of its x-coordinate, y-coordinate, and 4 letter species code
  - Attribute Definition Source: SMMNRA- Group Project
- Attribute
  - Attribute Label: x coordinate
  - Attribute Definition: the latitude coordinate that has been converted to a two dimensional surface
  - Attribute Definition Source: SMMNRA- Group Project
- Attribute
  - Attribute Label: y coordinate
  - Attribute Definition: the longitude coordinate that has been converted to a two dimensional surface
  - Attribute Definition Source: SMMNRA- Group Project
- Attribute
  - Attribute Label: position in watershed
  - Attribute Definition: the elevation of a population's location
  - Attribute Definition Source: SMMNRA- Group Project

Entity Type
- Entity Type Label: species
- Entity Type Description: the species of an invasive non-native species population, given by 4-letter code consisting of the first two letters of its genus and the first two letters of its species
- Entity Type Definition Source: SMMNRA- Group Project
- Attribute
  - Attribute Label: active restoration needed
  - Attribute Definition: the probability of the population's site requiring restoration after removal of the species
  - Attribute Definition Source: SMMNRA- Group Project
- Attribute
  - Attribute Label: repeated management necessary
  - Attribute Definition: the necessity for the species to require more than one-time management for removal
  - Attribute Definition Source: SMMNRA- Group Project
- Attribute
  - Attribute Label: impact on endangered species (documented)
  - Attribute Definition: documented effect on endangered species by the

species
Attribute Definition Source: SMMNRA- Group Project

Entity Type
Entity Type Label: invasive non-native species population calculation
Entity Type Definition: GIS spatial analysis calculations based on the location of an invasive non-native species population in relation to locations of other invasive non-native species populations
Entity Type Definition Source: SMMNRA- Group Project
Attribute
Attribute Label: Bren ID#
Attribute Definition: unique identifier assigned to a population using string consisting of its x-coordinate, y-coordinate, and 4 letter species code
Attribute Definition Source: SMMNRA- Group Project
Attribute
Attribute Label: distance to other weed populations- different species
Attribute Definition: from the location of a given population, the average distance in meters to populations (of a different species) within 1000m
Attribute Definition Source: SMMNRA- Group Project
Attribute
Attribute Label: distance to other weed populations- same species
Attribute Definition: from the location of a given population, the average distance in meters to populations (of the same species) within 1000m
Attribute Definition Source: SMMNRA- Group Project
Attribute
Attribute Label: number of weeds within one kilometer- different species
Attribute Definition: from the location of a given population, the number of populations (of a different species) within 1000m
Attribute Definition Source: SMMNRA- Group Project
Attribute
Attribute Label: number of weeds within one kilometer- same species
Attribute Definition: from the location of a given population, the number of populations (of the same species) within 1000m
Attribute Definition Source: SMMNRA- Group Project

Entity Type
Entity Type Label: observation
Entity Type Definition: information about the area, at a given time, of the location of an invasive non-native species population
Entity Type Definition Source: SMMNRA- Group Project
Attribute
Attribute Label: Bren ID#

Attribute Definition: unique identifier assigned to a population using string consisting of its x-coordinate, y-coordinate, and 4 letter species code
Attribute Definition Source: SMMNRA- Group Project

Attribute
Attribute Label: time
Attribute Definition: day/month/year in which the observation of the population was recorded
Attribute Definition Source: SMMNRA- Group Project

Attribute
Attribute Label: vegetation community type
Attribute Definition: the dominant vegetation type of the population's location
Attribute Definition Source: SMMNRA- Group Project

Attribute
Attribute Label: area quality
Attribute Definition: the quality of the habitat/ecosystem of the population's location
Attribute Definition Source: Christy Brigham- SMMNRA, NPS staff ecologist

Attribute
Attribute Label: public relations
Attribute Definition: the importance of the population's location to park visitors
Attribute Definition Source: SMMNRA- Group Project

Attribute
Attribute Label: impact on endangered species (overlapping range)
Attribute Definition: whether the population's location falls in the range of an endangered species
Attribute Definition Source: SMMNRA- Group Project

Entity Type
Entity Type Label: observation calculation
Entity Type Definition: GIS spatial analysis calculations based on the location of an invasive non-native species population in relation to locations of features
Entity Type Definition Source: SMMNRA- Group Project

Attribute
Attribute Label: Bren ID#
Attribute Definition: unique identifier assigned to a population using string consisting of its x-coordinate, y-coordinate, and 4 letter species code
Attribute Definition Source: SMMNRA- Group Project

Attribute
Attribute Label: distance from uncontrollable source population

Attribute Definition: the distance of the closest unmanaged invasive non-native population from the population's location
Attribute Definition Source: SMMNRA- Group Project

Attribute
Attribute label: distance from roads/trails/streams
Attribute Definition: distance from the nearest road, trail, or stream to the population's location
Attribute Definition Source: SMMNRA- Group Project

Attribute
Attribute Label: ease of access
Attribute Definition: the ability of the park staff to access the population's location, based on distance to the nearest road
Attribute Definition Source: SMMNRA- Group Project

Attribute
Attribute Label: proximity to sensitive habitats
Attribute Definition**:** distance to nearest edge of sensitive habitat (as defined by SMMNRA- Group Project) from population's location
Attribute Definition Source: SMMNRA- Group Project

Distribution Information

Distributor
Contact Organization Primary
Contact Organization: Donald Bren School of Environmental Science and Management
Contact Address
Address Type: mailing and physical address
Address: 2400 Bren Hall, University of California, Santa Barbara
City: Santa Barbara
State or Province: California
Postal Code: 93106

Metadata Reference Information

Metadata Date: 20070124T1522-0800
Metadata Contact
Contact Person Primary
Contact Person: Robin Kent
Contact Voice Telephone: 1 530 220 4283
Contact Electronic Mail Address: rkent@bren.ucsb.edu
Contact Person Primary
Contact Person: Emmeline Kiyan
Contact Electronic Mail Address: ekiyan@bren.ucsb.edu
Metadata Standard Name: FGDC Content Standards for Digital Geospatial Metadata

APPENDIX 3 – Sources and Processes to Calculate Data for Prioritization

Source	Contents
Access database	The database was provided by the NPS and contains the data park staff collected on populations including their location and size.
GIS spatial analysis	We used spatial analysis to make calculations from the location data to describe the features in which populations are located, proximity to given features, and orientation to each other. GIS terms are in italics.
ETA	The ETA contains data compiled on the attributes of the species including species' biology and impact on ecosystems.

Criteria	Source	Process
1. Habitat Quality		
A. Vegetation type invasibility	Access database (and GIS spatial analysis)	We designated a level of invasibility to each vegetation type. The database specified the vegetation types observed at the sites of the populations. If not specified in the database, we relied on the GIS vegetation type shapefile. We determined the vegetation type in which each population was found using *join by spatial location*.
B. Quality of area	GIS spatial Analysis	Our client designated area quality to property tracts of NPS land. (Property tracts not on NPS land had unknown area quality). We derived an area quality shapefile from the property tracts shapefile. We determined the type of area quality in which each population was found using *join by spatial location*.
C. Proximity to other weed Populations		
i. Different species		
a. Average distance to 10 closest populations	GIS spatial analysis	We used *point distance* to determine straight-line distances to populations of different species *(near feature)* within a 1km search radius of each population of a given species *(input feature)*. We then averaged the distances to the 10 closest.
b. Number of populations w/in 1km	GIS spatial analysis	From the *point distance* results, we counted how many populations were present within the 1km radius of each population of a given species.
ii. Same species		
a. Average distance to 10 closest populations	GIS spatial analysis	We used *point distance* to determine straight-line distances to populations of the same species *(near feature)* within a 1km search radius of each population of a given species *(input feature)*. We then averaged the distances to the 10 closest.
b. Number of populations w/in 1km	GIS spatial analysis	From the *point distance* results, we counted how many populations were present within the 1km radius of the each population of a given species.

D. Proximity to sensitive habitats	GIS spatial analysis	We designated certain vegetation types as sensitive (marsh, riparian, cliff, and oak). We derived a sensitive habitat shapefile from the vegetation type shapefile. We then used *join by spatial location* to calculate the distances from each population to the edge of the closest sensitive habitat. The distance was 0 if the population fell within a sensitive habitat.
E. Impact on endangered/ threatened species	GIS spatial analysis (and ETA)	We only considered impacts on endangered/threatened plants with observed occurrences described in the California Natural Diversity Database. We created 50m radii *(buffers)* around the point occurrences of endangered/threatened plants. We then determined whether the location of each non-native population corresponded to the area within any of the radii using *join by spatial location*. If so, we considered the population to have an impact. If information on the ranges of endangered/threatened animals were to be available, we would determine whether each population was located in any range/s using *join by spatial location.* If information on documented impacts of non-native species on endangered/threatened animals were to be available, it would be included in the ETA
F. Distance from uncontrollable source of new populations	GIS spatial analysis	We designated invasive non-native populations located outside NPS boundaries as uncontrollable sources. We created a shapefile of populations on NPS land *(input feature)* and a shapefile of populations outside NPS boundaries *(near feature)*. We then used *near* to determine the distance to the closest population outside NPS land from each population on NPS land.
G. Altering of ecosystem Processes	ETA	The ETA specified whether or not each species alters ecosystem processes.
2. Potential to be a Source Population		
A. Dispersal distance	ETA	The ETA specified the average dispersal distances for each species.
B. Position in watershed	GIS spatial analysis	We used *extract values to points* to determine the elevation of each population on the Digital Elevation Model raster.

C. Distance from roads, trails, and streams	GIS spatial analysis	We broke the distance from roads, trails, and streams into intervals of 2m, 5m, and 10m. We *merged* the roads, trails, and streams and created a *multiple ring buffer*. We then determined in which buffer each population was located using *join by spatial location*.
D. Population size		
i. Number of individuals	Access database	The database specified the observed number of individuals in each population.
ii. Population area	Access database	The database specified the observed area covered by each population.
3. Public relations		
	GIS spatial analysis	If public relations information were to be available, we would create public relations shapefiles and then determine whether the location of each population corresponds with important public relations areas using *join by spatial location*. Public relations areas could include overlooks, hiking trails, educational sites, areas of high visitation, etc.
4. Ease of control		
A. Population size		
i. Number of individuals	Access database	The database specified the observed number of individuals in each population.
ii. Population area	Access database	The database specified the observed area covered by each population.
B. Method of control	ETA	The ETA specified the number of methods of control for each species
C. Active restoration needed after weed removal	ETA	The ETA specified whether active restoration was needed for each species.
D. Repeated management needed	ETA	The ETA specified whether repeated management was needed for each species.
E. Ease of access	GIS spatial analysis	We broke the distance from roads into intervals of 5m and 50m. The closest buffer indicated easy access, the next indicated medium access, and beyond indicated difficult access. We created a *multiple ring buffer* around the roads. We then determined in which buffer each population was located.
F. Timing Limitations	ETA	The ETA specified whether there were timing limitations for each species.

Habitat Quality

These criteria gauge the overall quality of the habitat in which a particular invasive non-native population is found. If the habitat quality surrounding a population is determined to be high then this population will have a higher priority for management.

Invasibility of Vegetation Type

Originally this criterion was intended to gauge a non-native to native ratio for the areas surrounding a given population. This would have given us an indication of how invaded an area already is. Unfortunately, the data we were given did not allow us to determine this ratio. In lieu of using a ratio, we used the vegetation type along with the invasibility of each vegetation type. This may not have been ideal because it was not based on measured data for the park. In the future, the park may want to supplement this criterion with a measured non-native to native ratio.

Scoring: Through a literature review, vegetation types were determined to have a high, medium or low invasibility. Vegetation types with a high invasibility (grassland, riparian, oak woodland, coastal salt marsh, agriculture, residential, cliff and drainage) (Knops et al. 1995, Stohlgren et al. 1998, NPS 2002, LA County DRP, Zedler and Kercher 2004) have a higher vulnerability to invasion by invasive non-natives and are thus more difficult to protect and so were given the lowest score of one.

Vegetation types with a low invasibility (chaparral, unknown) (Knops et al. 1993) have a lower vulnerability to invasion, and if present, invasive non-natives will have more difficulty spreading. Because these vegetation types are less likely to be invaded and therefore may be of higher quality, they are given a score of five. However, because the populations of invasive non-natives that have managed to invade these low invasibility vegetation types will have difficulty spreading, low invasibility types are given a much lower score than vegetation types with a medium invasibility. Areas of medium invasibility (coastal sage scrub and coastal strand) (Knops et al. 1995) were given the highest score of twenty.

Quality of Area as Designated by the SMMNRA

This criterion was included when it was determined that we did not have enough data to estimate the native species richness for areas within the park. Since native species richness is a measure of the overall quality of an area, we decided to use expert opinion as a proxy for this measure. Christy Brigham, restoration ecologist for the park, designated areas of the park as high, medium, and low quality. As with the

previous criteria, the park may want to supplement this with some quantitative measure of native species richness.

Scoring: The scores for low, medium, and high quality were evenly distributed over the range of possible scores, as there was no apparent reason to skew the scores in any particular direction: low, 1; medium, 10; high, 20 (Brigham 2007).

Proximity to Other Non-native Populations

This criterion determines the proximity to other non-native populations. A non-native population that is isolated is assumed to be located in an area that is of higher quality than a non-native that is proximate to other non-native populations. In relation to the population in question, we assessed proximity to populations of the same species as well as different species. Proximity was determined by two sub-criteria, average distance to the nearest ten populations and the number of non-native populations within one kilometer.

Average Distance to the Nearest Ten Populations

This criterion describes how close a population is to other weed populations. To quantify this, the distance between populations was determined using GIS. The average distance to the closest ten populations within 1000m was determined. Both the distance to populations of the same species and the distance to populations of different species were determined.

Scoring: As the proximity to other populations increases, the habitat quality of the area decreases. We felt that the scores should not be evenly distributed but should place an emphasis on populations that are more isolated (CAL-IPC 2006, TNC 2006). So, longer distances between populations translate into lower scores. Because of this, the scores are skewed towards the longer distances (table 15).

Table 15: Scoring – Average Distance to the Nearest Ten Populations

Distance	Score
< 10m	1
10-50m	2
50-200m	5
200-500m	10
> 500m	20

Number of Weed Populations within One Kilometer

This criterion describes the number of invasive non-native populations within 1000m of each population.

Scoring: As the number of populations within the area increases, the habitat quality of the area decreases. We felt that the scores should not be evenly distributed but should place an emphasis on populations that are more isolated (CAL-IPC 2006, TNC 2006). So, fewer populations translate into higher scores (table 16).

Table 16: Scoring – Number of Weed Populations Within One Kilometer

# of Populations	Score
<10 populations	20
10-25 populations	10
25-50 populations	5
50-100 populations	2
>100 populations	1

Proximity to Sensitive Habitats

This criterion determined the populations that were located within or have the potential to spread to sensitive habitats. The proximity was determined using GIS to analyze the distance from each population to the closest edge of sensitive habitats.

Scoring: Consulting literature on seed dispersal, we determined that invasive non-native populations pose a disproportionately higher risk to sensitivity habitats close in proximity, as compared to those further away (CAL-IPC 2006, TNC 2006). Consequently, as we assigned scores, we placed an emphasis on populations closer to sensitive habitats (table 17)

Table 17: Scoring – Proximity to Sensitive Habitats

Distance	Score
< 10m	20
10-50m	10
50-200m	5
200-500m	2
> 500m	1

Impact on Endangered or Threatened Species

This criterion determines the populations that were located within the range of or have the potential to spread to the range of endangered or threatened species. This was determined using GIS to analyze whether a population fell within a 50m radius of a documented point occurrence of an endangered or threatened plant. Due to data limitations only endangered or threatened plant species were considered.

Scoring: Consulting literature on seed dispersal, we determined that invasive non-native populations pose a high risk to endangered or threatened plant populations (CAL-IPC 2006, TNC 2006). However, we were unable to find documentation of the

negative impacts of an invasive non-native on endangered or threatened plants. In addition, due to data limitations, we were not able to include animals in this analysis. If a population was within 50m of an endangered or threatened plant, it was given a score of 15. We did not assign it a score of 20 because we were not able to find documentation of the negative impacts; we were only able to infer these impacts. If the population was not within 50m, it was assigned a score of 10. If we had found instances in which the invasive non-native had positive effects on the endangered or threatened plant, we would have assigned a score of 1.

Distance from Uncontrollable Source of New Populations

The Santa Monica National Recreation Area is interwoven with parklands, private land that is developed and undeveloped, along with freeways and urban areas. Since the NPS cannot remove populations outside of their boundaries, populations not located on NPS property are considered uncontrollable sources. This creates a unique and challenging situation in terms of uncontrollable sources of new populations. After a weed is removed it will take the surrounding native flora awhile to repopulate the area, making the area vulnerable to new invasions (Hobbs and Huenneke 1992). If an uncontrollable source is nearby, efforts to remove invasive non-natives could be compromised. To determine values for this criterion, GIS was used to determine the straight-line distance to the nearest invasive non-native population outside the park boundary.

Scoring: Consulting literature on seed dispersal, we determined that uncontrollable invasive non-native populations close in proximity represent a disproportionately higher risk of invasion, as compared to those further away (CAL-IPC 2006, TNC 2006). Consequently, as we assigned scores, we placed an emphasis on populations further from uncontrollable sources of new populations (table 18)

Table 18: Scoring – Distance from Uncontrollable Source of New Populations

Distance	Score
< 10m	1
10-50m	2
50-200m	5
200-500m	10
> 500m	20

Ability to Alter Ecosystem Processes

One of the goals of the park is to maintain ecosystem processes. Invasive non-native species have been shown to alter ecosystem processes such as hydrologic processes and the fire regime. The nine species on which this prioritization focuses all have a similar ability to alter ecosystem processes (CAL-IPC 2006, TNC 2006). Because of this, they all had the same score for this criterion. However, if this prioritization is

expanded in the future to include more species, it will be important to note the differences in the ability to alter ecosystem properties.

Scoring: Species with the ability to alter ecosystem processes received a score of 20, those where it was not known if they altered ecosystem processes would receive a score of 10, and those that do not alter ecosystem process would receive a score of 1.

Potential to be a Source Population due to Location

Certain populations within the park have a greater potential to be a source population due to their location. Populations with long dispersal distances, large population size or those found along roads, trails and streams have a higher likelihood of spreading to other areas. These populations are a higher priority for management.

Distance to Roads/Trails/Streams

Roads, trails and streams function as a corridor for dispersal (Jepson 2006, CAL-IPC 2006, TNC 2006). This allows invasive non-natives to spread farther and faster than they otherwise would be able to; making populations located near these features a priority for management.

Scoring: Since populations close to the corridor are disproportionately more likely to spread, we assigned scores in this way (table 19)

Table 19: Scoring – Distance to Roads/Trails/Streams

Distance	Score
1-2m	20
2-5m	10
5-10m	5
>10	1

Elevation

Populations situated higher in a watershed have a much higher likelihood of spread, either by wind or water. In this analysis, we used elevation as a measure of height in the watershed.

Scoring: We used a continuous scoring system for elevation calculated by: 20*(population's elevation/elevation of highest population).

Size of Population

Larger populations produce more seeds and are therefore more likely to spread, making them a priority for removal. The population size was determined by two sub-criteria, number of individuals and population area (tables 20 and 21).

Table 20: ***Scoring – Number of Individuals***

Number of Individuals	Score
1-20 individuals	1
20-50 individuals	5
>50	20

Table 21: ***Scoring – Population Area***

Area	Score
<5 m^2	1
>5-20 m^2	5
>20 m^2	20

Public Relations

Often educational areas, overlooks, or highly visited areas are a priority for a park in terms of restoration.

Scoring: Areas that may be a priority for the park would be given a high score of twenty. Those with no special priority would be given a score of zero. At this time, no areas of the park were given special priority for public relations.

Ease of Control

Given the financial constraints of the park, it is important to consider the ease with which populations can be managed. The following criteria gauged the ease of control for each population within the park.

Population Size

The size of each population was determined by two sub-criteria: the number of individuals and the population area. Smaller areas and populations with fewer individuals are a higher priority for management because they are easier to remove (tables 22 and 23).

Table 22: ***Scoring – Number of Individuals***

Number of Individuals	Score
1-20 individuals	20
20-50 individuals	5
>50	1

Table 23: ***Scoring – Population Area***

Area	Score
<5 m^2	20
>5-20 m^2	5
>20 m^2	1

Active Restoration Needed following Weed Removal

The need for active restoration following weed removal increases the cost of management. Weeds that could be removed without active restoration would be a higher priority for management than those that require active restoration. However, all the species considered in this prioritization require active restoration (CAL-IPC 2006, TNC 2006) (table 24).

Table 24: Scoring – Active Restoration Needed Following Weed Removal:

Action Needed	Score
Active Restoration Needed	1
Active Restoration Not Needed	20
Unknown	10

Repeated Management Needed

The need for repeated management increases the cost of management. Invasive non-natives that do not need repeated management were a higher priority for management than those that require repeated management (CAL-IPC 2006, TNC 2006).

Scoring: Populations that do not need repeated management were given a high score of twenty. Those that do need repeated management were given a low score of one.

Ease of Access

Populations located close to a road are easier to manage, requiring less effort and time to get to them and were considered higher priority for management under this criterion.

Scoring: Scores are not be evenly distributed but place an emphasis on populations much easier to reach. Because of this, the scores are skewed towards the populations found within five meters of a road (table 25).

Table 25: ***Scoring – Ease of Access***

Ease of Access	Score
Hard: More than 50m from road	1
Medium: 5-50m from road	5
Easy: less than 5m from road	20

APPENDIX 5 – DESCRIPTION OF PRIORITIZATION AND AHP METHODS

Note: the example outlined here is a simplified case to illustrate our method. Please consult figure 2 to view our actual hierarchy and tables 5, 6, 7, 8, and 9 to see our matrices and eigenvectors.

Developed by Thomas Saaty, the analytic hierarchy process utilizes paired comparisons to facilitate the ranking, and subsequent weighting of both quantitative and qualitative criteria. To begin, criteria are arranged into a hierarchy, with the top level being the overall goal (figure 6).

In the hierarchy, only criteria at terminal branches have scores assigned to them. Higher branches help organize the criteria, and their weights are used to calculate the final result (explained below). For example, in figure 6, sub-criteria A1, A2, C1, C2, C3, and criterion B have scores, while criteria A and C do not.

At each level in the hierarchy, criteria are compared pair-wise for their relative importance to reaching the overall goal. For example, in figure 6, criterion A is compared pair-wise to criterion B and then to C. Likewise, criterion B is compared to criterion C. At the bottom level, sub-criterion A1 is compared to sub-criterion A2. Separately, sub-criterion C1 is compared to sub-criterion C2 and then sub-criterion C3. Finally, sub-criterion C2 is compared to sub-criterion C3.

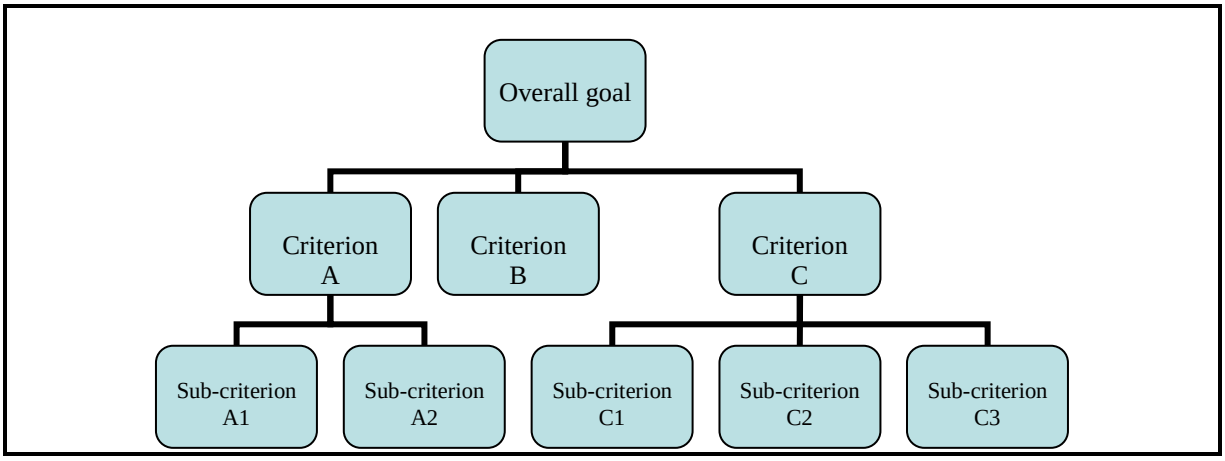


Figure 6: This figure outlines the various criteria and sub criteria that are used to evaluate a hypothetical plan.

For this comparison process, Saaty recommends using a value scale from 1/9 to 9, where larger values indicate *higher* importance. However, we chose to use a scale from 1/5 to 5, where larger values indicate *lower* importance. We decided to use a smaller scale because our comparisons were conducted by a small group of people, and we wanted to reduce variability. Also, in our comparisons, we assigned large values low priority. Because we had already assigned scores to our criteria, and because higher scores indicated higher priority, we needed our weights to also reflect

this trend. Under Saaty's system, after weights are calculated, a *large value* translates into a *small weight* and *high priority*. In contrast, under our system, a *large value* translates into a *small weight* and *low priority*.

To simplify the comparison process, matrices are used in the following manner. Each criterion listed in the top shaded row is compared to each criterion listed in the left shaded column. For example, in table 26, criterion A (in column 1) is compared to criterion A (in row 1). Since they are equally important, we insert a 1 into the box where they meet. Next, criterion A (in column 1) is compared to criterion B (in row 2). Since criterion A is weakly less important than criterion B, we insert a 2 into the box where they meet. This process is repeated for all comparisons.

For the opposite comparisons, we insert reciprocals. For example, we compare criterion B (in column 2) to criteria A (in row 1). Since we previously established that criterion A is weakly less important than criteria B, we know that criteria B is weakly more important than criterion A, and so we insert a 1/2 into the box where they meet. Tables 27 and 28 illustrate the comparison matrices for this example. In our project, each member in our group analyzed the paired comparisons independently, as well as five scientists at the SMMNRA.

For situations in which a criterion is only compared to one other criterion, a matrix is not necessary, as there is only one comparison. In this example, sub-criterion A1 and A2 are compared in this way (table 27).

Table 26: This table demonstrates the AHP process of paired comparisons. Each criterion listed in the top shaded row is compared to each criterion listed in the shaded left column. For opposite comparisons, the inverse is inserted.

	Criterion A	Criterion B	Criterion C
Criterion A	1	1/2	5
Criterion B	2	1	1
Criterion C	1/5	1	1

Table 27: Comparison weights for sub-criteria of A

Sub-criterion A1	Sub-criterion A2
0.6667	0.3333

Table 28: Paired comparisons for sub-criteria of C

	Sub-criterion C1	Sub-criterion C2	Sub-criterion C3
Sub-criterion C1	1	5	3
Sub-criterion C2	1/5	1	4
Sub-criterion C3	1/3	1/4	1

We then consolidated the responses. First, using the comparisons generated by our group, we threw out the highest and lowest values for each criterion. Next we averaged the remaining three values, and rounded to the nearest whole number or its inverse (1/5,1/4, 1/3, 1/2, 1, 2, 3, 4, or 5). In cases where the averaged number could be rounded up or down, we looked to SMMNRA restoration ecologist Dr. Christy Brigham's number to break the tie. For example, if the averaged number was 3.5 and Dr. Brigham's score was 3 or lower, we assigned a 3. Since Dr. Brigham is the individual most familiar with the area, the invasive non-natives, and the management of these invasive non-natives, we felt that she had the best understanding of the situation and thus, her response was most informed. We then repeated the previous steps to consolidate the comparison matrices from the SMMNRA scientists.

Next, we combined the SMMNRA matrices with those of our own by averaging the numbers for each criterion and looking to Dr. Brigham to again break ties (tables 30, 31, 32, and 33). Using these numbers, we calculated eigenvectors (weights) for each matrix. These eigenvectors represent the weights associated with each criterion. Eigenvectors (weights) for the hypothetical example are illustrated in table 29.

Table 29: Weights calculated from the matrices in tables 26 - 28.

	Criterion A	Criterion B	Criterion C	Sub-criterion A1	Sub-criterion A2	Sub-criterion C1	Sub-criterion C2	Sub-criterion C3
Weights	0.4089	0.3893	0.2018	0.6667	0.3333	0.6091	0.2635	0.1275

For each matrix, we also calculated λ_{max}, CI, RI, and CR. $Lambda_{max}$ is the principle eigenvalue for the matrix. The consistency index is a measure of the deviation from consistency, calculated by $(\lambda_{max}-n)/n-1)$, where n is the number of criteria compared in the matrix. The consistency ratio (CR) is a ratio of the consistency index (CI) for the matrix analyzed to the average consistency ratio (RI) for a matrix of the same order (tables 30, 31, 32, 33).

Table 30: Paired comparisons, weights (eigenvectors), and consistency measures for overall criteria.

	Habitat Quality	Potential to be a Source	Public Relations	Ease of Control	Weights
Habitat Quality	1	1	5	3	0.391
Potential to be a Source	1	1	4	4	0.400
Public Relations	1/5	1/4	1	1/2	0.080
Ease of Control	1/3	1/4	2	1	0.129
λ_{max}	CI	RI	CR		
4.04	0.01	0.90	0.01		

Table 31: Paired comparisons, weights (eigenvectors), and consistency measures for habitat quality sub-criteria.

	Ecosystem Invasibility	Area Quality	Proximity to Other Invasive Populations	Proximity to Sensitive Habitats	Impact on Endangered Species	Ability to Affect Ecosystem Processes	Distance From Uncontrollable Source	Weights
Ecosystem Invasibility	1	1	1/2	1/3	1/4	1	1/3	0.071
Area Quality	1	1	1/2	1/3	1/3	1	1	0.084
Proximity to Other Invasive Populations	2	2	1	1/2	1/3	1	1	0.118
Proximity to Sensitive Habitats	3	3	2	1	1/2	1	2	0.189
Impact on Endangered Species	4	3	3	2	1	2	4	0.308
Ability to Affect Ecosystem Processes	1	1	1	1	1/2	1	1	0.117
Distance From Uncontrollable Source	3	1	1	1/2	1/4	1	1	0.112
λ_{max}	CI	RI	CR					
7.25	0.04	1.32	0.03					

Table 32: Paired comparisons, weights (eigenvectors), and consistency measures for potential to be a source population sub-criteria

	Elevation	Size of Population	Distance From Roads, Trails, Streams	Weights
Elevation	1	2	1	0.4
Size of Population	1/2	1	1/2	0.2
Distance From Roads, Trails, Streams	1	2	1	0.4
λ_{max}	CI	RI	CR	
3.00	0.00	0.90	0.00	

Table 33 Paired comparisons, weights (eigenvectors), and consistency measures for ease of control sub-criteria.

	Size of Population	Active Restoration Necessary	Repeated Management Necessary	Ease of Access	Weights
Size of Population	1	1	2	3	0.351
Active Restoration Necessary	1	1	2	3	0.351
Repeated Management Necessary	1/2	1/2	1	2	0.189
Ease of Access	1/3	1/3	1/2	1	0.109
λ_{max}	CI	RI	CR		
4.00	0.00	1.24	0.00		

To calculate the final score, first, we calculated the cumulative weight for each criterion at the terminal branch of the hierarchy. To calculate the cumulative weight, we started at the end of a branch and followed it up to the overall goal, multiplying weights together as we went. For example, in figure 7, starting from sub-criterion A1, and working our way up to the overall goal, we would encounter two weights (0.6667 for sub-criterion A1 and 0.4089 for criterion A) and would multiply them together to calculate the cumulative weight for sub-criterion A1 (0.2726).

Since only terminal branches in the hierarchy have scores associated with them, to calculate the final priority, we multiply the cumulative weight by the score for each terminal branch criterion. Lastly, we add the weighted scores together for each terminal branch criterion to come to the final result for one population

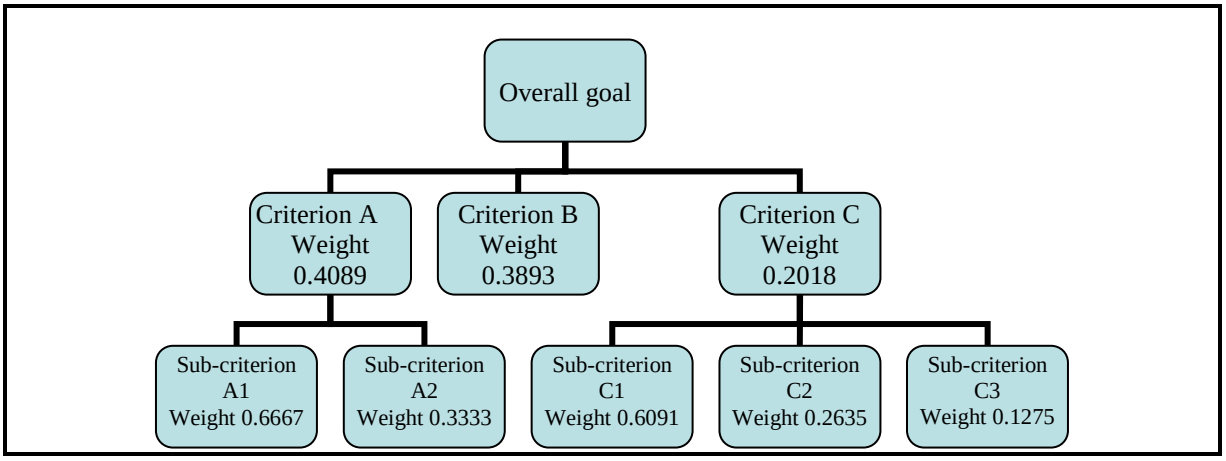


Figure 7: This figure outlines the various criteria and sub criteria that are used to evaluate a particular plan.

APPENDIX 6 –INVASIBILITY OF VEGETATION COMMUNITIES

The National Park Service identified nine predominant vegetation communities in the SMMNRA (NPS 2002). We researched the ecology and geography of these communities, and then examined them in terms of invasibility and potential impacts by invasive non-native plant populations.

Coastal Salt Marsh

These low-lying marshes, seen in Malibu and Mugu Lagoons, receive flooding from year-round freshwater and flushing from saline tides. Reflecting the reach of the tide, the vegetation exhibits decreasing saltwater tolerance from *Spartina foliosa* (cord grass) to *Salcornia* (pickleweed) to *Distichlis spicata* sp. (salt grass), and finally *Sueda californica* (sea blite) (NPS 2002, Schoenherr 1992).

Wetlands, which act as sinks for debris, water, sediments, and nutrients, have a high predisposition to invasion by exotics. Disturbances to upland watersheds deliver material into wetlands that not only alter the habitat and abiotic conditions, but also supply exotics with resources. Drawing on the influx of nutrients and on their ability to disperse by water, wetland invaders often form monotypes (Zedler and Kercher 2004).

Coastal Strand

This windy, exposed community of sandy beaches and dunes can be found along the coastline east of Point Mugu. The salty, shifting soil retains little water and is suited for flat, succulent plants with long taproots. Native vegetation includes *Abronia maritime* (sand verbena), *Atriplex* sp. (saltbush), and *Calystegia soldanella* (beach morning glory) (NPS 2002, Schoenherr 1992).

These same conditions make this community vulnerable to colonization by the invasive non-native low-lying succulents of the *Aizoaceae* (ice plant) family; accordingly, *Carpobrotus edulis* (hottentot fig) and *Carpobrotus crystallinum* (common ice plant) are common species.

Coastal Sage Scrub

This low-elevation community can be found along the coast and at inland locations. On the coastal slopes, which receive direct sunlight and face direct evaporation, leaves tend to be small and drought-deciduous, as demonstrated by the indicator species, *Artemisia californica* (California sagebrush) (Schoenherr 1992). In the inland Simi Hills (NPS 2002), the community exhibits the north-facing tendencies of evergreen growth with larger leaves as a result of the comparatively greater water availability (Schoenherr 1992).

Undisturbed coastal sage scrub, as dominated by shrubs rather than grasses/herbs, has been observed to have few or no introduced plants (Knops et al. 1995). However,

exotics are seen following fire (O'Leary and Westman 1998), and have been shown to interfere with the re-growth of native shrubs (D'Antonio and Mahall 1991).

Chaparral

There are several types of chaparral sub-communities: mixed, red shank, and ceanothus. While their respective locales may differ (moist northern slopes, high elevations, and stable slopes/ridges), they tend to be at higher elevations than coastal sage scrub, and adapted to drought and periodic fire. The deep-rooted evergreen shrubs with sclerophyllous (stiff, waxy) leaves, such as *Ceanothus* spp. (California lilacs), *Arctostaphylos* spp. (manzanita), and *Adenostoma sparsifolium* (red shank), can form thick walls from 4 to 12 feet high (NPS 2002, Schoenherr 1992).

The dense chaparral thickets crowd out much potential undergrowth, including invasive non-natives. After fires, annuals can occupy the area, but in a few years the shrubs are once again dominant (Kricher 1993). As with coastal sage scrub, undisturbed chaparral has been found to be mostly non-invasible (Knops et al. 1993). However, invasive non-natives such as *Bromus* spp., *Avena* spp, and *Erodium botrys* made up a majority of the ground cover in chaparral that had experienced construction, tillage, and other severe disturbance (Stylinski and Allen 1999).

Riparian Woodland

With perennial and intermittent streams at the bottoms of the numerous canyons and valleys, the SMMNRA has a significant amount of riparian habitat. The availability of water allows for a highly diverse, productive, and multi-layered (shrub and tree) vegetative community, which includes *Umbellularia californica* (California bay laurel), *Salix lasiolepsis* (arroyo willow), and *Platanus racemosa* (sycamore) (NPS 2002, Schoenherr 1992).

The high soil fertility and water availability of streamside areas makes them prone to invasion. Also, the connectedness of riparian systems can serve as corridors to transport or facilitate the spread of invasive non-natives, which can then invade other nearby vegetation types (Stohlgren et al. 1998).

Valley Grassland

The valley grassland community historically consisted of native perennial grasses, such as *Nasella pulchra* (purple needlegrass). However, it is currently co-dominated by non-native annuals which include *Bromus* spp. (brome grass) and *Avena* spp. (wild oats) – although a few patches of native grassland remain (NPS 2002, Schoenherr 1992, LA County DRP).

Non-natives are abundant in the previously disturbed and more accessible areas, such as valley bottoms (LA County DRP). Also, grasslands, in general, have been observed to have a higher percentage of non-native species as compared to oak woodland and riparian forest communities (Knops et al. 1995). At the same time, the

drought-adapted native perennials require fewer resources (Seabloom et al. 2003) and have the ability to reduce resources available for non-native productivity if they survive initial suppression by the non-natives (Corbin and D'Antonio 2004).

Valley Oak Savanna

Characterized by widely spaced *Quercus lobata* (valley oak), this community occurs on the inland-facing slopes of the SMMNRA (LA County DRP). The open woodland's grassy understory has been subjected to invasion by non-native annuals (NPS 2002, LA County DRP), in a manner similar to that of valley grasslands. While there has not yet been a specific study regarding *Q. lobata*, of particular concern is the ability of annual grasses to outcompete oak seedlings for soil nutrients (Cheng and Bledsoe 2004).

Coast Live Oak Woodland

This community occurs at moist sites such as inland-facing slopes, canyon bottoms, and on coastal plains/bluffs. It is composed of numerous species including *Quercus agrifolia* (coast live oak), *Rhamnus californica* (coffeeberry), and *Toxicodendron diversilobum* (poison oak) (NPS 2002, Schoenherr 1992).

Freshwater Ponds and Lakes

Most of the water bodies found within the park are either stock ponds or reservoirs, of which the major ones are: Encino Reservoir, Malibu Lake, Century Lake, and Las Virgenes Reservoir (NPS 2002). Reservoirs can promote non-native invasions, possibly through their connectivity to other water bodies, higher anthropogenic disturbance, higher salinity, and altered food webs (Havel et al. 2005).

APPENDIX 7 – EXOTIC THREAT ASSESSMENT QUESTIONS

Section 1: General Threat Assessment

A non-native species' biology, history of invasiveness, and impact on ecosystems can be used to determine its general potential to become invasive (Elkhorn Slough.org 2000). In the first part of the ETA, we used these traits to rank a non-native species' general ability to invade natural areas.

Biology

These questions rate a non-native species' potential to become invasive based on its biological characteristics. Studies have determined certain sets of biological traits that facilitate a species' ability to become invasive (Rejmanek & Richardson 1996; Kolar & Lodge 2001, Reichard 1996) and the majority of weed threat assessments use these traits to rank species (Lehtonen 1995, Pheloung 1999, Hiebert & Stubbendieck 1993, Randall 1999, Daehler 2004).

B-1: Reproduction methods

A plant species' methods of reproduction are one of the key components in determining its ability to become invasive (Rejmanek & Richardson 1996; Kolar & Lodge 2001, Reichard 1996)**.** We used this question to ascertain which out of eight possible reproductive methods a species utilizes, including high seed production, long seed viability, and vegetative reproduction.

Scoring: We assigned a species that uses three of more of the listed reproductive methods a high score, a species that uses two methods a medium score, and a species that uses one or none a low score.

B-2: Competitively Advantageous Traits

Competitively advantageous traits favor the survival of some plant species over others and are used as a measure of invasive potential in a number of weed threat assessments (Lehtonen 1995, Pheloung 1999, Hiebert & Stubbendieck 1993, Randall 1999). We used this question to ascertain which traits, such as alleopathy, stress tolerance, and growth habits, a species possessed.

Scoring: We assigned a species with two or more traits a high score, one trait a medium score, and no traits a low score.

B-3: Dispersal Ability

Dispersal ability measures a species' potential to spread from one natural area to another and is also a key factor in potential invasiveness (Lehtonen 1995, Pheloung 1999, Hiebert & Stubbendieck 1993, Randall 1999, Morse 2004). The dispersal question examined which of six potential methods of dispersal—wind, water, animal, human, rapid local, and fragment resprouts—a species utilizes.

Scoring: We assigned a species with two or more traits a high score, one trait a medium score, and no traits a low score.

History of Invasiveness

Studies have ascertained that a plant species which becomes invasive in one area often become invasive in other, similar areas (Reichard 1996; Kolar & Lodge 2001, Mack 1996). These questions in this section use this trend to predict the potential invasiveness of a species and are used by a variety of other weed threat assessments (Pheloung 1999, Hiebert & Stubbendieck 1993, Randall 1999, Morse 2004).

H-1: Naturalized Beyond Native Range

This question examines a species' general tendency to naturalize beyond its native range.

Scoring: For species that have naturalized beyond their native range in many places, a high score was assigned. If a species has naturalized in a few places outside its native range, a medium score was given. A species with no documented naturalization beyond its native range received a low score.

H-2: Habitats Found in SMMNRA

This question examines a species' invasion into areas with similar characteristics to the SMMNRA. Although this question could have gone into the park specific assessment (Section 2), it relates more to the history of invasiveness subsection than to any of the park specific subsections.

Scoring: We assigned a species that has invaded a wide variety of areas with habitats similar to the SMMNRA a high score, a species that has invaded a few places similar to the SMMNRA a medium score, and a species with no documented invasion into areas similar to the SMMNRA a low score.

H-3: Other Weedy Species in Genera

If there is no documentation of a specific species becoming naturalized outside its native habitat, the actions of other members of the genus can be used as a proxy for determining invasiveness.

Scoring: A species with members in its genus that have invaded a wide variety of areas received a high score, one with members that have invaded few places received a medium score, and one with no documented invasions received a low score.

Impact on Ecosystems

A species which damages ecosystems and native species is considered more invasive than one that does not (Lehtonen 1995, Hiebert & Stubbendieck 1993, Randall 1999,

Morse 2004). The questions in this section assess a species' risk based on its potential to harm ecosystems and native species.

I-1: Alter Ecosystems Processes
The main ecosystem processes, with which some non-native species may interfere, include the water cycle, energy flow, the mineral cycle and community dynamics.

Scoring: We assigned a species that substantially alters ecosystem processes a high score, one that slightly alters ecosystem processes a medium score, and one that does not alter ecosystem processes a low score.

I-2: Alter Community Structure
An ecosystem's community structure includes the spatial distribution of plant and animal species, the physical structure of the community, and the hierarchical assemblage of species at different trophic levels (US Fish and Wildlife Service 2007). Some non-native species have the ability to change the community structure of an ecosystem.

Scoring: A species with a high capacity for altering community structures received a high score, one that slightly alters community structure received a medium score, and one that does not alter community structure received a low score.

I-3: Alter Community Composition
A community is composed of a variety of different plant and animal species. Some non-native species change community composition by reducing populations of native species or even by driving them to extinction.

Scoring: A species with a high capacity for altering community composition received a high score, one that slightly alters community composition received a medium score, and one that does not alter composition received a low score.

Section 2: SMMNRA Threat Assessment

The species that were determined to have a generally high ability to become invasive in section one were further assessed in section two, which specifically addresses their threat to the Santa Monica Mountains National Recreation Area. The questions in this section are based on the species' distribution, impact on sensitive habitats and species, and management potential in the recreation area.

Distribution
The more widely a non-native plant species is distributed, the harder it is to control and the more likely it is to spread. Prior risk assessments have used distribution as a measure of threat (Randall 1999, Morse 2004). Our questions assessed a non-native species' risk based on its distribution throughout the SMMNRA.

D-1: Current Range
Hectare numbers from the Access database and park staff were used to assess the overall size of non-native species' populations within the SMMNRA.

Scoring: We considered a species covering 1000 ha or more entrenched, one covering 999 to 100ha was given a high score, one covering 99 to 11 ha was given a medium score, and one covering 10ha or less was given a low score.

D-2: Locations
Using GIS maps and park staff information, we determined the number of sites at which each species was located.

Scoring: A species present at 12 or more sites was given a high score, a species at 11-6 sites was given a medium score, and a species present at 5 or fewer sites was given a low score.

D-3: SMMNRA Habitats
Different habitats are susceptible to invasion by different non-native species. The more SMMNRA habitats a non-native species is capable of invading, the more invasive it is considered.

Scoring: We assigned a species that could invade four or more habitats a high score, a species that could invade two or three habitats a medium score, and a species that could invade only one habitat a low score.

SMMNRA Impact
We used the questions in this section to assess a non-native species' risk based on the severity of its impact on endangered species and sensitive habitats present in the SMMNRA. The higher the threat a species posed to sensitive habitats and endangered species, the higher it was scored.

SI-1: Areas threatened
GIS maps and park staff provided information on which non-native species were present in highly valued areas of the SMMNRA. Species present in sensitive, rare or threatened habitats and ecosystems were scored higher than those which grow primarily in disturbed areas.

Scoring: Species present in areas of high significance were given a high score, those present in areas of medium significance were given a medium score and those present in areas of low significance were given a low score.

SI-2: Native Species Threatened
Some non-native species have negative effects on native species by usurping their habitat and out-competing them for resources. Some have a specifically documented impact, like replacing the food source an endangered species relies on, while other impacts are inferred from the areas and resources non-natives use.

Scoring: Species which threaten rare/threatened/endangered species were given a high score, those that threaten common species were given a medium score, and those which threaten no species were given a low score.

Management Feasibility
An important consideration in a non-native species' risk assessment is its management potential. The harder to control, the more likely the species is to become invasive. A variety of threat assessments use management feasibility as a measure of a species invasiveness (Hiebert & Stubbendieck 1993, Randall 1999, Morse 2004).

M-1: Management Techniques
The fewer techniques that can be used to manage a non-native species, the more likely it is to become invasive. Common management techniques include: mechanical, biological, chemical and hand-pulling.

Scoring: A species with zero or one method of management was given a high score, a species with two or three methods was given a medium score, and a species with more than four nethod was given a low score.

M-2: Impacts of Management
Some management techniques are potentially harmful to native species and habitats. The more harmful the techniques necessary to control a non-native species, the higher the non-native species was scored.

Scoring: A species whose management techniques had heavy impacts was given a high score, a species whose management techniques have some impacts was given a medium score, and species whose management techniques have little or no impacts was given a low score.

M-3: Time Commitment
Many non-native species' populations require repeat management over a period of years before they are eradicated. A species is considered higher risk if a longer time commitment is required.

Scoring: High scores were given to non-native species that require more than three treatments over a period of years. Medium scores were given to those that require only two or three treatments. Low scores were given to species that requires only one treatment.

APPENDIX 8 – SOURCES FOR EXOTIC THREAT ASSESSMENT INFORMATION

Traits	Sources
Biology/ Ecology	Jepson Manual (http://ucjeps.berkeley.edu/interchange/I_treat_indexes.html) Jepson Online Interchange for California Floristics (http://ucjeps.berkeley.edu/interchange.html) AGRICOLA (http://www.invasivespeciesinfo.gov/plants/main.shtml) GRIN (http://www.ars-grin.gov/cgi-bin/npgs/html/index.pl) Plants Database (http://plants.nrcs.usda.gov/cgi_bin/topics.cgi?earl=noxious.cgi) Encycloweedia (http://www.cdfa.ca.gov/phpps/ipc/encycloweedia/encycloweedia_hp.htm) CalPhotos (http://calphotos.berkeley.edu/flora/) TNC Invasive (http://tncweeds.ucdavis.edu/)
Impact	AGRICOLA (http://www.invasivespeciesinfo.gov/plants/main.shtml) Encycloweedia (http://www.cdfa.ca.gov/phpps/ipc/encycloweedia/encycloweedia_hp.htm) TNC Invasive (http://tncweeds.ucdavis.edu/) Cal-IPC (http://www.cal-ipc.org/ip/inventory/index.php)
Control/ Management	AGRICOLA (http://www.invasivespeciesinfo.gov/plants/main.shtml) CABI Bioscience (http://www.cabi-bioscience.org/ISMIndex.asp) Encycloweedia (http://www.cdfa.ca.gov/phpps/ipc/encycloweedia/encycloweedia_hp.htm) TNC Invasive (http://tncweeds.ucdavis.edu/) NRPI (http://www.ice.ucdavis.edu/nrpi/) WSSA (http://www.wssa.net/) Cal-IPC (http://www.cal-ipc.org/ip/inventory/index.php)
Invasive History	AGRICOLA (http://www.invasivespeciesinfo.gov/plants/main.shtml) TNC Invasive (http://tncweeds.ucdavis.edu/)
Introduction Vectors	AGRICOLA (http://www.invasivespeciesinfo.gov/plants/main.shtml)
Current Distribution	AGRICOLA (http://www.invasivespeciesinfo.gov/plants/main.shtml) Encycloweedia (http://www.cdfa.ca.gov/phpps/ipc/encycloweedia/encycloweedia_hp.htm)

	NRPI (http://www.ice.ucdavis.edu/nrpi/) Weed Management Areas (http://www.cdfa.ca.gov/phpps/ipc/weedmgtareas/wma_index_hp.htm)
Journals	Web of Science (http://portal.isiknowledge.com/portal.cgi/wos?Init=Yes&SID=S138P9dAcdI2FLkIFJ6) Environetbase (http://www.environetbase.com/) CSA Illumina (http://oh1.csa.com/ids70/advanced_search.php?SID=9f4924684e78214901df2026ab04a70a) AGRICOLA NAL (http://agricola.nal.usda.gov/) Agrobase (http://biblioline.nisc.com/scripts/login.dll?BiblioLine&dbname=QAGB) Google scholar (http://scholar.google.com/schhp?hl=en&tab=ws&q=)

Santa Monica Mountains National Recreation Area Exotic Threat Assessment (Updated August 9, 2006)

Acer negundo var *californicum*, western boxelder

Section 1: General Threat Assessment

Biology

B-1. Does the species in question utilize any of the following reproduction methods?
High seed production (1000+)
Long seed viability (2+ years)
Produces seeds more than once a year
Self-fertilization
High germination rate
Rapid growth to maturity
Vegetative reproduction
Other- rhizomes, node sprouts, etc.
Explain other:

3 or more traits- high (5 points)
2 traits- medium (3 points)
1 or fewer traits- low (1 point)
Unknown

B-2. Does the species exhibit any of the following competitively advantageous traits?
Alleopathic
Stress tolerant (drought, shade, etc)
Growth habits (dense, smothering, etc)
Other (nitrogen-fixing, parasitic, etc.)
Explain other:

2 or more traits- high (5 points)
1 trait- medium (3 points)
0 traits- low (1 point)
Unknown

B-3. Does the species in question use any of the following methods of dispersal?
Wind
Water
Animal
Human
Rapid local dispersement
Fragments resprout

2 or more traits- high (5 points)
1 trait- medium (3 points)
0 traits- low (1 point)
Unknown

Total for Biology Section: U, Rank: Unknown
(High 15-11, Medium 10-7, Low 6-0)

History

H-1. Is the species in question naturalized beyond its native range elsewhere?
Yes, at a wide variety of places- high (5 points)
Yes, at a few places- medium (3 points)
No, not at present- low (1 point)

H-2. Has the species in question invaded habitats found in the SSMNRA?
Yes, in a wide variety of places- high (5 points)
Yes, in a few places- medium (3 points)
No, not at present- low (1 point)

H-3. Are there other weedy species in the genera?
Yes, a large proportion of the genera are weedy- high (5 points)
Yes, a small proportion of the genera are weedy- medium (3 points)
No or only a very small number- low (1 point)

Total for History Section: 7, Rank: Medium
(High 15-11, Medium 10-7, Low 7-0)

Impact

I-1. Does the species in question alter ecosystem processes?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)
Unknown

I-2. Does the species in question alter community structure?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)

I-3. Does the species in question alter community composition?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)

Total for Impact Section: U, Rank: Unknown
(High 15-11, Medium 10-7, Low 7-0)

Section 1 Total: U, Section 1 Rank: Unknown

Section 2: Park-Specific Threat Assessment (*Acer negundo* var *californicum)*

Distribution

D-1. What is the species' current range in the SMMNRA?
1000+ ha- Entrenched [stop here, species is ranked E for Entrenched]
999 to100 ha- difficult to manage (5 points)
99 to 11 ha- medium difficulty to manage (3 points)
10 to 0 ha- easiest to manage (1 point)
Unknown

D-2. How many locations in the SMMNRA have stands?
12 or more sites- High (5 points)
11 to 6 sites- Medium (3 points)
5 or fewer sites- Low (1 point)
Unknown

List all sites with known stands:

D-3. Which of the known habitats on SMMNRA are susceptible to the species?
Coastal Salt Marsh
Coastal Strand
Coastal Sage Scrub
Chaparral
Riparian Woodland
Valley Grassland
Valley Oak Savanna
Coast Live Oak Woodland
Freshwater Ponds and Lakes

4 or more susceptible- high (5 points)
2 to 3 susceptible- medium (3 points)
1 or none susceptible- low (1 point)

Total for Distribution Section: U, Rank: Unknown
(High 15-11, Medium 10-7, Low 6-0)

SMMNRA Impact

SI-1. The areas threatened by the species in question are of:
High significance- high (5 points)
Medium significance- medium (3 points)
Low significance- low (1 point)
Unknown

SI-2. The native species threatened by the species in questions are:
Endangered/threatened/rare in SMMNRA- high (5 points)
Common species- medium (3 points)
No species are directly threatened- low (1 point)

Total for Impact Section: U, Rank: Unknown
(High 10-8, Medium 7-4, Low 4-0)

Management

M-1. What techniques are available for managing the species in question?
Mechanical
Biological
Chemical
Volunteer/Hand-pull
Other
Explain other:

0 or 1 options- high (5 points)
2 or 3 options- medium (3 points)
4 or more options- low (1 point)

M-2. Are the areas invaded by the species in question accessible?
5 or more difficult to access areas- high (5 points)
2 to 4 difficult to access areas- medium (3 points)
1 or no difficult to access areas- low (1 point)
Unknown

M-3. Are there impacts of the control of the species in question on native species?
Heavy control impacts- high (5 points)
Somewhere in the middle- medium (3 points)
Slight control impacts- low (1 point)

M-4. What is the time commitment to the management of the species?
Repeat treatments over a number of years- high (5 points)
Repeat treatments only once or twice after initial- medium (3 points)
Treat once- low (1 point)

Total for Management Section: 11, Rank: Medium
(High 20-16, Medium 15-10, Low 9-0)

Section 2 Total: U, Section 2 Rank: Unknown

Comments: More data on ACNE needed before rank can be determined. More research into this species will help clarify its potential impacts on the SMMNRA.

Santa Monica Mountains National Recreation Area Exotic Threat Assessment (Updated August 9, 2006)

Acroptilon repens, Russian knapweed

Section 1: General Threat Assessment

Biology

B-1. Does the species in question utilize any of the following reproduction methods?
High seed production (1000+)
Long seed viability (2+ years)
Produces seeds more than once a year
Self-fertilization
High germination rate
Rapid growth to maturity
Vegetative reproduction
Other- rhizomes, node sprouts, etc.
Explain other:

3 or more traits- high (5 points)
2 traits- medium (3 points)
1 or fewer traits- low (1 point)
Unknown

B-2. Does the species exhibit any of the following competitively advantageous traits?
Alleopathic
Stress tolerant (drought, shade, etc)
Growth habits (dense, smothering, etc)
Other (nitrogen-fixing, parasitic, etc.)
Explain other:

2 or more traits- high (5 points)
1 trait- medium (3 points)
0 traits- low (1 point)
Unknown

B-3. Does the species in question use any of the following methods of dispersal?
Wind
Water
Animal
Human
Rapid local dispersement
Fragments resprout

2 or more traits- high (5 points)
1 trait- medium (3 points)
0 traits- low (1 point)
Unknown

Total for Biology Section: 15 , Rank: High
(High 15-11, Medium 10-7, Low 6-0)

History

H-1. Is the species in question naturalized beyond its native range elsewhere?
Yes, at a wide variety of places- high (5 points)
Yes, at a few places- medium (3 points)
No, not at present- low (1 point)

H-2. Has the species in question invaded habitats found in the SSMNRA?
Yes, in a wide variety of places- high (5 points)
Yes, in a few places- medium (3 points)
No, not at present- low (1 point)

H-3. Are there other weedy species in the genera?
Yes, a large proportion of the genera are weedy- high (5 points)
Yes, a small proportion of the genera are weedy- medium (3 points)
No or only a very small number- low (1 point)

Total for History Section: 11, Rank: High
(High 15-11, Medium 10-7, Low 7-0)

Impact

I-1. Does the species in question alter ecosystem processes?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)
Unknown

I-2. Does the species in question alter community structure?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)

I-3. Does the species in question alter community composition?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points) once established, forms thick stands
No- low (1 point)

Total for Impact Section: 9 , Rank: Medium
(High 15-11, Medium 10-7, Low 7-0)

Section 1 Total: 35/45, Section 1 Rank: High

Section 2: Park-Specific Threat Assessment *(Acroptilon repens)*

Distribution

D-1. What is the species' current range in the SMMNRA?
1000+ ha- Entrenched [stop here, species is ranked E for Entrenched]
999 to100 ha- difficult to manage (5 points)
99 to 11 ha- medium difficulty to manage (3 points)
10 to 0 ha- easiest to manage (1 point)
Unknown

D-2. How many locations in the SMMNRA have stands?
12 or more sites- High (5 points)
11 to 6 sites- Medium (3 points)
5 or fewer sites- Low (1 point)
Unknown

List all sites with known stands: Rancho Sierra Vista, private lands

D-3. Which of the known habitats on SMMNRA are susceptible to the species?
Coastal Salt Marsh
Coastal Strand
Coastal Sage Scrub
Chaparral
Riparian Woodland
Valley Grassland
Valley Oak Savanna
Coast Live Oak Woodland
Freshwater Ponds and Lakes

4 or more susceptible- high (5 points)
2 to 3 susceptible- medium (3 points)
1 or none susceptible- low (1 point)

Total for Distribution Section: 5, Rank: Low
(High 15-11, Medium 10-7, Low 6-0)

SMMNRA Impact

SI-1. The areas threatened by the species in question are of:
High significance- high (5 points)
Medium significance- medium (3 points)
Low significance- low (1 point)

SI-2. The native species threatened by the species in questions are:
Endangered/threatened/rare in SMMNRA- high (5 points)
Common species- medium (3 points)
No species are directly threatened- low (1 point)

Total for Impact Section: 2, Rank: Low
(High 10-8, Medium 7-4, Low 4-0)

Management

M-1. What techniques are available for managing the species in question?
Mechanical
Biological
Chemical
Volunteer/Hand-pull
Other
Explain other: burning mixed with spraying very effective, hand-pulling limited in effectiveness, biological viruses now available

0 or 1 options- high (5 points)
2 or 3 options- medium (3 points)
4 or more options- low (1 point)

M-2. Are the areas invaded by the species in question accessible?
5 or more difficult to access areas- high (5 points)
2 to 4 difficult to access areas- medium (3 points)
1 or no difficult to access areas- low (1 point)
Unknown

M-3. Are there impacts of the control of the species in question on native species?
Heavy control impacts- high (5 points)
Somewhere in the middle- medium (3 points)
Slight control impacts- low (1 point)

M-4. What is the time commitment to the management of the species?
Repeat treatments over a number of years- high (5 points)
Repeat treatments only once or twice after initial- medium (3 points)
Treat once- low (1 point)

Total for Management Section: 10, Rank: Medium
(High 20-16, Medium 15-10, Low 9-0)

Section 2 Total: 17/45 , Section 2 Rank: Low

Comments: The species appears to have only one substantial population in the SMMNRA – in a weedy area of Rancho Sierra Vista. Might be worth the effort to eradicate it now, before it spreads to better areas.

Santa Monica Mountains National Recreation Area Exotic Threat Assessment (Updated August 9, 2006)

Ailanthus altissima, tree-of-heaven

Section 1: General Threat Assessment

Biology

B-1. Does the species in question utilize any of the following reproduction methods?
High seed production (1000+)
Long seed viability (2+ years)
Produces seeds more than once a year
Self-fertilization
High germination rate
Rapid growth to maturity
Vegetative reproduction
Other- rhizomes, node sprouts, etc.
Explain other:

3 or more traits- high (5 points)
2 traits- medium (3 points)
1 or fewer traits- low (1 point)
Unknown

B-2. Does the species exhibit any of the following competitively advantageous traits?
Alleopathic
Stress tolerant – droughts, shade, pH
Growth habits (dense, smothering, etc)
Other (nitrogen-fixing, parasitic, etc.)
Explain other:

2 or more traits- high (5 points)
1 trait- medium (3 points)
0 traits- low (1 point)
Unknown

B-3. Does the species in question use any of the following methods of dispersal?
Wind
Water
Animal
Human
Rapid local dispersement
Fragments resprout

2 or more traits- high (5 points)
1 trait- medium (3 points)
0 traits- low (1 point)
Unknown

Total for Biology Section: 13, Rank: High
(High 15-11, Medium 10-7, Low 6-0)

History

H-1. Is the species in question naturalized beyond its native range elsewhere?
Yes, at a wide variety of places- high (5 points)
Yes, at a few places- medium (3 points)
No, not at present- low (1 point)

H-2. Has the species in question invaded habitats found in the SSMNRA?
Yes, in a wide variety of places- high (5 points)
Yes, in a few places- medium (3 points)
No, not at present- low (1 point)

H-3. Are there other weedy species in the genera?
Yes, a large proportion of the genera are weedy- high (5 points)
Yes, a small proportion of the genera are weedy- medium (3 points)
No or only a very small number- low (1 point)

Total for History Section: 7, Rank: Medium
(High 15-11, Medium 10-7, Low 7-0)

Impact

I-1. Does the species in question alter ecosystem processes?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points) changes soil chemistry
No- low (1 point)
Unknown

I-2. Does the species in question alter community structure?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points) alters height profile
No- low (1 point)

I-3. Does the species in question alter community composition?
Yes, substantially- high (5 points) forms monocultures in places
Yes, slightly- medium (3 points)
No- low (1 point)

Total for Impact Section: 11, Rank: High
(High 15-11, Medium 10-7, Low 7-0)

Section 1 Total: 31/45, Section 1 Rank: High

Section 2: Park-Specific Threat Assessment (*Ailanthus altissima)*

Distribution

D-1. What is the species' current range in the SMMNRA?
1000+ ha- Entrenched [stop here, species is ranked E for Entrenched]
999 to100 ha- difficult to manage (5 points)
99 to 11 ha- medium difficulty to manage (3 points)
10 to 0 ha- easiest to manage (1 point) 0.6 ha
Unknown

D-2. How many locations in the SMMNRA have stands?
12 or more sites- High (5 points)
11 to 6 sites- Medium (3 points)
5 or fewer sites- Low (1 point)
Unknown

List all sites with known stands: Palo Comado, Topanga, Corral Canyon, Ahmanson Ranch, private lands

D-3. Which of the known habitats on SMMNRA are susceptible to the species?
Coastal Salt Marsh
Coastal Strand
Coastal Sage Scrub
Chaparral
Riparian Woodland
Valley Grassland
Valley Oak Savanna
Coast Live Oak Woodland
Freshwater Ponds and Lakes

4 or more susceptible- high (5 points)
2 to 3 susceptible- medium (3 points)
1 or none susceptible- low (1 point)

Total for Distribution Section: 5, Rank: Low
(High 15-11, Medium 10-7, Low 6-0)

SMMNRA Impact

SI-1. The areas threatened by the species in question are of:
High significance- high (5 points)
Medium significance- medium (3 points)
Low significance- low (1 point)

SI-2. The native species threatened by the species in questions are:
Endangered/threatened/rare in SMMNRA- high (5 points)
Common species- medium (3 points)
No species are directly threatened- low (1 point)

Total for Impact Section: 4, Rank: Low
(High 10-8, Medium 7-4, Low 4-0)

Management

M-1. What techniques are available for managing the species in question?
Mechanical
Biological
Chemical
Volunteer/Hand-pull
Other
Explain other:

0 or 1 options- high (5 points)
2 or 3 options- medium (3 points)
4 or more options- low (1 point)

M-2. Are the areas invaded by the species in question accessible?
5 or more difficult to access areas- high (5 points)
2 to 4 difficult to access areas- medium (3 points)
1 or no difficult to access areas- low (1 point)
Unknown

M-3. Are there impacts of the control of the species in question on native species?
Heavy control impacts- high (5 points)
Somewhere in the middle- medium (3 points)
Slight control impacts- low (1 point)

M-4. What is the time commitment to the management of the species?
Repeat treatments over a number of years- high (5 points)
Repeat treatments only once or twice after initial- medium (3 points)
Treat once- low (1 point)

Total for Management Section: 14, Rank: Medium
(High 20-16, Medium 15-10, Low 9-0)

Section 2 Total: 23/45, Section 2 Rank: Low

Comments: Potentially a difficult site to reach in Topanga State Park. Current populations appear isolated, but in nice habitats. Recommend removal from undisturbed forest and riparian and nearby areas.

Santa Monica Mountains National Recreation Area Exotic Threat Assessment (Updated August 9, 2006)

Arundo donax, giant reed

Section 1: General Threat Assessment

Biology

B-1. Does the species in question utilize any of the following reproduction methods?
High seed production (1000+)
Long seed viability (2+ years)
Produces seeds more than once a year
Self-fertilization
High germination rate
Rapid growth to maturity
Vegetative reproduction
Other- rhizomes, node sprouts, etc.
Explain other:

3 or more traits- high (5 points)
2 traits- medium (3 points)
1 or fewer traits- low (1 point)
Unknown

B-2. Does the species exhibit any of the following competitively advantageous traits?
Alleopathic
Stress tolerant (drought, shade, etc)
Growth habits (dense, smothering, etc)
Other (nitrogen-fixing, parasitic, etc.)
Explain other:

2 or more traits- high (5 points)
1 trait- medium (3 points)
0 traits- low (1 point)
Unknown

B-3. Does the species in question use any of the following methods of dispersal?
Wind
Water
Animal
Human
Rapid local dispersement
Fragments resprout

2 or more traits- high (5 points)
1 trait- medium (3 points)
0 traits- low (1 point)
Unknown

Total for Biology Section: 13, Rank: High
(High 15-11, Medium 10-7, Low 6-0)

History

H-1. Is the species in question naturalized beyond its native range elsewhere?
Yes, at a wide variety of places- high (5 points)
Yes, at a few places- medium (3 points)
No, not at present- low (1 point)

H-2. Has the species in question invaded habitats found in the SSMNRA?
Yes, in a wide variety of places- high (5 points)
Yes, in a few places- medium (3 points)
No, not at present- low (1 point)

H-3. Are there other weedy species in the genera?
Yes, a large proportion of the genera are weedy- high (5 points)
Yes, a small proportion of the genera are weedy- medium (3 points)
No or only a very small number- low (1 point)

Total for History Section: 11, Rank: High
(High 15-11, Medium 10-7, Low 7-0)

Impact

I-1. Does the species in question alter ecosystem processes?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)
Unknown

I-2. Does the species in question alter community structure?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)

I-3. Does the species in question alter community composition?
Yes, substantially- high (5 points) forms monocultures in places
Yes, slightly- medium (3 points)
No- low (1 point)

Total for Impact Section: 15, Rank: High
(High 15-11, Medium 10-7, Low 7-0)

Section 1 Total: 39/45, Section 1 Rank: High

Section 2: Park-Specific Threat Assessment (*Arundo donax)*

Distribution

D-1. What is the species' current range in the SMMNRA?
1000+ ha- Entrenched [stop here, species is ranked E for Entrenched]
999 to100 ha- difficult to manage (5 points)
99 to 11 ha- medium difficulty to manage (3 points)
10 to 0 ha- easiest to manage (1 point) 3.2 ha
Unknown

D-2. How many locations in the SMMNRA have stands?
12 or more sites- High (5 points)
11 to 6 sites- Medium (3 points)
5 or fewer sites- Low (1 point)
Unknown

List all sites with known stands: Zuma/ Trancas, Malibu Creek SP, Topanga SP, Cold Creek, Franklin Canyon, Coldwater Canyon, San Vincente Mountain, Paramount Ranch, private lands

D-3. Which of the known habitats on SMMNRA are susceptible to the species?
Coastal Salt Marsh
Coastal Strand
Coastal Sage Scrub
Chaparral
Riparian Woodland
Valley Grassland
Valley Oak Savanna
Coast Live Oak Woodland
Freshwater Ponds and Lakes

4 or more susceptible- high (5 points)
2 to 3 susceptible- medium (3 points)
1 or none susceptible- low (1 point)

Total for Distribution Section: 7, Rank: Medium
(High 15-11, Medium 10-7, Low 6-0)

SMMNRA Impact

SI-1. The areas threatened by the species in question are of:
High significance- high (5 points) can change entire riparian landscape
Medium significance- medium (3 points)
Low significance- low (1 point)

SI-2. The native species threatened by the species in questions are:
Endangered/threatened/rare in SMMNRA- high (5 points) fish species
Common species- medium (3 points)
No species are directly threatened- low (1 point)

Total for Impact Section: 10, Rank: High
(High 10-8, Medium 7-4, Low 4-0)

Management

M-1. What techniques are available for managing the species in question?
Mechanical
Biological
Chemical
Volunteer/Hand-pull
Other
Explain other: Angora goats have been very effective.

0 or 1 options- high (5 points)
2 or 3 options- medium (3 points)
4 or more options- low (1 point)

M-2. Are the areas invaded by the species in question accessible?
5 or more difficult to access areas- high (5 points)
2 to 4 difficult to access areas- medium (3 points)
1 or no difficult to access areas- low (1 point)
Unknown

M-3. Are there impacts of the control of the species in question on native species?
Heavy control impacts- high (5 points)
Somewhere in the middle- medium (3 points)
Slight control impacts- low (1 point)

M-4. What is the time commitment to the management of the species?
Repeat treatments over a number of years- high (5 points)
Repeat treatments only once or twice after initial- medium (3 points)
Treat once- low (1 point)

Total for Management Section: 12, Rank: Medium
(High 20-16, Medium 15-10, Low 9-0)

Section 2 Total: 29/45, Section 2 Rank: Medium

Comments: Largest populations in Malibu Creek and Topanga State Park. This has the potential to become a major problem if left unchecked.

Santa Monica Mountains National Recreation Area Exotic Threat Assessment (Updated August 9, 2006)

Asphodelus fistulosus, onionweed

Section 1: General Threat Assessment

Biology

B-1. Does the species in question utilize any of the following reproduction methods?
High seed production (1000+)
Long seed viability (2+ years)
Produces seeds more than once a year
Self-fertilization
High germination rate
Rapid growth to maturity
Vegetative reproduction
Other- rhizomes, node sprouts, etc.
Explain other:

3 or more traits- high (5 points)
2 traits- medium (3 points)
1 or fewer traits- low (1 point)
Unknown

B-2. Does the species exhibit any of the following competitively advantageous traits?
Alleopathic
Stress tolerant (drought, shade, etc)
Growth habits (dense, smothering, etc)
Other (nitrogen-fixing, parasitic, etc.)
Explain other:

2 or more traits- high (5 points)
1 trait- medium (3 points)
0 traits- low (1 point)
Unknown

B-3. Does the species in question use any of the following methods of dispersal?
Wind
Water
Animal
Human
Rapid local dispersement
Fragments resprout

2 or more traits- high (5 points)
1 trait- medium (3 points)
0 traits- low (1 point)
Unknown

Total for Biology Section: 13, Rank: High
(High 15-11, Medium 10-7, Low 6-0)

History

H-1. Is the species in question naturalized beyond its native range elsewhere?
Yes, at a wide variety of places- high (5 points)
Yes, at a few places- medium (3 points)
No, not at present- low (1 point)

H-2. Has the species in question invaded habitats found in the SSMNRA?
Yes, in a wide variety of places- high (5 points)
Yes, in a few places- medium (3 points)
No, not at present- low (1 point)

H-3. Are there other weedy species in the genera?
Yes, a large proportion of the genera are weedy- high (5 points)
Yes, a small proportion of the genera are weedy- medium (3 points)
No or only a very small number- low (1 point)

Total for History Section: 11, Rank: High
(High 15-11, Medium 10-7, Low 7-0)

Impact

I-1. Does the species in question alter ecosystem processes?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points) changes N when in large patches
No- low (1 point)
Unknown

I-2. Does the species in question alter community structure?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)

I-3. Does the species in question alter community composition?
Yes, substantially- high (5 points) forms monocultures in places
Yes, slightly- medium (3 points)
No- low (1 point)

Total for Impact Section: 13, Rank: High
(High 15-11, Medium 10-7, Low 7-0)

Section 1 Total: 37/45, Section 1 Rank: High

Section 2: Park-Specific Threat Assessment *(Asphodelus fistulosus)*

Distribution

D-1. What is the species' current range in the SMMNRA?
1000+ ha- Entrenched [stop here, species is ranked E for Entrenched]
999 to100 ha- difficult to manage (5 points)
99 to 11 ha- medium difficulty to manage (3 points)
10 to 0 ha- easiest to manage (1 point) 0.04 ha
Unknown

D-2. How many locations in the SMMNRA have stands?
12 or more sites- High (5 points)
11 to 6 sites- Medium (3 points)
5 or fewer sites- Low (1 point)
Unknown

List all sites with known stands: Yellow Hills, Malibu Bluffs

D-3. Which of the known habitats on SMMNRA are susceptible to the species?
Coastal Salt Marsh
Coastal Strand
Coastal Sage Scrub
Chaparral
Riparian Woodland
Valley Grassland
Valley Oak Savanna
Coast Live Oak Woodland
Freshwater Ponds and Lakes

4 or more susceptible- high (5 points)
2 to 3 susceptible- medium (3 points)
1 or none susceptible- low (1 point)

Total for Distribution Section: 5, Rank: Low
(High 15-11, Medium 10-7, Low 6-0)

SMMNRA Impact

SI-1. The areas threatened by the species in question are of:
High significance- high (5 points)
Medium significance- medium (3 points)
Low significance- low (1 point)

SI-2. The native species threatened by the species in questions are:
Endangered/threatened/rare in SMMNRA- high (5 points)
Common species- medium (3 points)
No species are directly threatened- low (1 point)

Total for Impact Section: 2, Rank: Low
(High 10-8, Medium 7-4, Low 4-0)

Management

M-1. What techniques are available for managing the species in question?
Mechanical
Biological
Chemical
Volunteer/Hand-pull
Other
Explain other:

0 or 1 options- high (5 points)
2 or 3 options- medium (3 points)
4 or more options- low (1 point)

M-2. Are the areas invaded by the species in question accessible?
5 or more difficult to access areas- high (5 points)
2 to 4 difficult to access areas- medium (3 points)
1 or no difficult to access areas- low (1 point)
Unknown

M-3. Are there impacts of the control of the species in question on native species?
Heavy control impacts- high (5 points)
Somewhere in the middle- medium (3 points)
Slight control impacts- low (1 point)

M-4. What is the time commitment to the management of the species?
Repeat treatments over a number of years- high (5 points)
Repeat treatments only once or twice after initial- medium (3 points)
Treat once- low (1 point)

Total for Management Section: 12, Rank: Medium
(High 20-16, Medium 15-10, Low 9-0)

Section 2 Total: 19, Section 2 Rank: Low

Comments:

Santa Monica Mountains National Recreation Area Exotic Threat Assessment (Updated August 9, 2006)

Avena barbata, slender oats

Section 1: General Threat Assessment

Biology

B-1. Does the species in question utilize any of the following reproduction methods?
High seed production (1000+)
Long seed viability (2+ years)
Produces seeds more than once a year
Self-fertilization
High germination rate
Rapid growth to maturity
Vegetative reproduction
Other- rhizomes, node sprouts, etc.
Explain other:

3 or more traits- high (5 points)
2 traits- medium (3 points)
1 or fewer traits- low (1 point)
Unknown

B-2. Does the species exhibit any of the following competitively advantageous traits?
Alleopathic
Stress tolerant (drought, shade, etc)
Growth habits (dense, smothering, etc)
Other (nitrogen-fixing, parasitic, etc.)
Explain other:

2 or more traits- high (5 points)
1 trait- medium (3 points)
0 traits- low (1 point)
Unknown

B-3. Does the species in question use any of the following methods of dispersal?
Wind
Water
Animal
Human
Rapid local dispersement
Fragments resprout

2 or more traits- high (5 points)
1 trait- medium (3 points)
0 traits- low (1 point)
Unknown

Total for Biology Section: 15, Rank: High
(High 15-11, Medium 10-7, Low 6-0)

History

H-1. Is the species in question naturalized beyond its native range elsewhere?
Yes, at a wide variety of places- high (5 points)
Yes, at a few places- medium (3 points)
No, not at present- low (1 point)

H-2. Has the species in question invaded habitats found in the SSMNRA?
Yes, in a wide variety of places- high (5 points)
Yes, in a few places- medium (3 points)
No, not at present- low (1 point)

H-3. Are there other weedy species in the genera?
Yes, a large proportion of the genera are weedy- high (5 points)
Yes, a small proportion of the genera are weedy- medium (3 points)
No or only a very small number- low (1 point)

Total for History Section: 15, Rank: High
(High 15-11, Medium 10-7, Low 7-0)

Impact

I-1. Does the species in question alter ecosystem processes?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)
Unknown

I-2. Does the species in question alter community structure?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)

I-3. Does the species in question alter community composition?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)

Total for Impact Section: 9, Rank: Medium
(High 15-11, Medium 10-7, Low 7-0)

Section 1 Total: 39/45, Section 1 Rank: High

Section 2: Park-Specific Threat Assessment *(Avena barbata)*

Distribution

D-1. What is the species' current range in the SMMNRA?
1000+ ha- Entrenched [stop here, species is ranked E for Entrenched]
999 to100 ha- difficult to manage (5 points)
99 to 11 ha- medium difficulty to manage (3 points)
10 to 0 ha- easiest to manage (1 point)
Unknown

D-2. How many locations in the SMMNRA have stands?
12 or more sites- High (5 points)
11 to 6 sites- Medium (3 points)
5 or fewer sites- Low (1 point)
Unknown

List all sites with known stands:

D-3. Which of the known habitats on SMMNRA are susceptible to the species?
Coastal Salt Marsh
Coastal Strand
Coastal Sage Scrub
Chaparral
Riparian Woodland
Valley Grassland
Valley Oak Savanna
Coast Live Oak Woodland
Freshwater Ponds and Lakes

4 or more susceptible- high (5 points)
2 to 3 susceptible- medium (3 points)
1 or none susceptible- low (1 point)

Total for Distribution Section: n/a, Rank: n/a
(High 15-11, Medium 10-7, Low 6-0)

SMMNRA Impact

SI-1. The areas threatened by the species in question are of:
High significance- high (5 points)
Medium significance- medium (3 points)
Low significance- low (1 point)

SI-2. The native species threatened by the species in questions are:
Endangered/threatened/rare in SMMNRA- high (5 points)
Common species- medium (3 points)
No species are directly threatened- low (1 point)

Total for Impact Section: n/a, Rank: n/a
(High 10-8, Medium 7-4, Low 4-0)

Management

M-1. What techniques are available for managing the species in question?
Mechanical
Biological
Chemical
Volunteer/Hand-pull
Other
Explain other:

0 or 1 options- high (5 points)
2 or 3 options- medium (3 points)
4 or more options- low (1 point)

M-2. Are the areas invaded by the species in question accessible?
5 or more difficult to access areas- high (5 points)
2 to 4 difficult to access areas- medium (3 points)
1 or no difficult to access areas- low (1 point)
Unknown

M-3. Are there impacts of the control of the species in question on native species?
Heavy control impacts- high (5 points)
Somewhere in the middle- medium (3 points)
Slight control impacts- low (1 point)

M-4. What is the time commitment to the management of the species?
Repeat treatments over a number of years- high (5 points)
Repeat treatments only once or twice after initial- medium (3 points)
Treat once- low (1 point)

Total for Management Section: n/a, Rank: n/a
(High 20-16, Medium 15-10, Low 9-0)

Section 2 Total: E, Section 2 Rank: Entrenched

Comments:

Santa Monica Mountains National Recreation Area Exotic Threat Assessment (Updated August 9, 2006)

Bidens pilosa, hairy beggarticks

Section 1: General Threat Assessment

Biology

B-1. Does the species in question utilize any of the following reproduction methods?
High seed production (1000+)
Long seed viability (2+ years)
Produces seeds more than once a year
Self-fertilization
High germination rate
Rapid growth to maturity
Vegetative reproduction
Other- rhizomes, node sprouts, etc.
Explain other:

3 or more traits- high (5 points)
2 traits- medium (3 points)
1 or fewer traits- low (1 point)
Unknown

B-2. Does the species exhibit any of the following competitively advantageous traits?
Alleopathic
Stress tolerant (drought, shade, etc)
Growth habits (dense, smothering, etc)
Other (nitrogen-fixing, parasitic, etc.)
Explain other:

2 or more traits- high (5 points)
1 trait- medium (3 points)
0 traits- low (1 point)
Unknown

B-3. Does the species in question use any of the following methods of dispersal?
Wind
Water
Animal
Human
Rapid local dispersement
Fragments resprout

2 or more traits- high (5 points)
1 trait- medium (3 points)
0 traits- low (1 point)
Unknown

Total for Biology Section: U, Rank: Unknown
(High 15-11, Medium 10-7, Low 6-0)

History

H-1. Is the species in question naturalized beyond its native range elsewhere?
Yes, at a wide variety of places- high (5 points)
Yes, at a few places- medium (3 points)
No, not at present- low (1 point)

H-2. Has the species in question invaded habitats found in the SSMNRA?
Yes, in a wide variety of places- high (5 points)
Yes, in a few places- medium (3 points)
No, not at present- low (1 point)

H-3. Are there other weedy species in the genera?
Yes, a large proportion of the genera are weedy- high (5 points)
Yes, a small proportion of the genera are weedy- medium (3 points)
No or only a very small number- low (1 point)

Total for History Section: 11, Rank: High
(High 15-11, Medium 10-7, Low 7-0)

Impact

I-1. Does the species in question alter ecosystem processes?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)
Unknown

I-2. Does the species in question alter community structure?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)
Unknown

I-3. Does the species in question alter community composition?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)
Unknown

Total for Impact Section: U, Rank: Unknown
(High 15-11, Medium 10-7, Low 7-0)

Section 1 Total: U, Section 1 Rank: Unknown

Section 2: Park-Specific Threat Assessment *(Bidens pilosa)*

Distribution

D-1. What is the species' current range in the SMMNRA?
1000+ ha- Entrenched [stop here, species is ranked E for Entrenched]
999 to100 ha- difficult to manage (5 points)
99 to 11 ha- medium difficulty to manage (3 points)
10 to 0 ha- easiest to manage (1 point)
Unknown

D-2. How many locations in the SMMNRA have stands?
12 or more sites- High (5 points)
11 to 6 sites- Medium (3 points)
5 or fewer sites- Low (1 point)
Unknown

List all sites with known stands: Solstice Canyon, Zuma, San Nichols

D-3. Which of the known habitats on SMMNRA are susceptible to the species?
Coastal Salt Marsh
Coastal Strand
Coastal Sage Scrub
Chaparral
Riparian Woodland
Valley Grassland
Valley Oak Savanna
Coast Live Oak Woodland
Freshwater Ponds and Lakes

4 or more susceptible- high (5 points)
2 to 3 susceptible- medium (3 points)
1 or none susceptible- low (1 point)

Total for Distribution Section: U, Rank: Unknown
(High 15-11, Medium 10-7, Low 6-0)

SMMNRA Impact

SI-1. The areas threatened by the species in question are of:
High significance- high (5 points)
Medium significance- medium (3 points)
Low significance- low (1 point)
Unknown

SI-2. The native species threatened by the species in questions are:
Endangered/threatened/rare in SMMNRA- high (5 points)
Common species- medium (3 points)
No species are directly threatened- low (1 point)

Total for Impact Section: U, Rank: Unknown
(High 10-8, Medium 7-4, Low 4-0)

Management

M-1. What techniques are available for managing the species in question?
Mechanical
Biological
Chemical
Volunteer/Hand-pull
Other
Explain other: prevented by thick mulching

0 or 1 options- high (5 points)
2 or 3 options- medium (3 points)
4 or more options- low (1 point)

M-2. Are the areas invaded by the species in question accessible?
5 or more difficult to access areas- high (5 points)
2 to 4 difficult to access areas- medium (3 points)
1 or no difficult to access areas- low (1 point)
Unknown

M-3. Are there impacts of the control of the species in question on native species?
Heavy control impacts- high (5 points)
Somewhere in the middle- medium (3 points)
Slight control impacts- low (1 point)

M-4. What is the time commitment to the management of the species?
Repeat treatments over a number of years- high (5 points)
Repeat treatments only once or twice after initial- medium (3 points)
Treat once- low (1 point)

Total for Management Section: 6, Rank: Low
(High 20-16, Medium 15-10, Low 9-0)

Section 2 Total: U, Section 2 Rank: Unknown

Comments: Mostly along trails, but watch for BIPI in restoration sites. More data needed on impacts and locations of BIPI.

Santa Monica Mountains National Recreation Area Exotic Threat Assessment (Updated August 9, 2006)

Bromus hordeaceus, soft chess

Section 1: General Threat Assessment

Biology

B-1. Does the species in question utilize any of the following reproduction methods?
High seed production (1000+)
Long seed viability (2+ years)
Produces seeds more than once a year
Self-fertilization
High germination rate
Rapid growth to maturity
Vegetative reproduction
Other- rhizomes, node sprouts, etc.
Explain other:

3 or more traits- high (5 points)
2 traits- medium (3 points)
1 or fewer traits- low (1 point)
Unknown

B-2. Does the species exhibit any of the following competitively advantageous traits?
Alleopathic
Stress tolerant (drought, shade, etc)
Growth habits (dense, smothering, etc)
Other (nitrogen-fixing, parasitic, etc.)
Explain other:

2 or more traits- high (5 points)
1 trait- medium (3 points)
0 traits- low (1 point)
Unknown

B-3. Does the species in question use any of the following methods of dispersal?
Wind
Water
Animal
Human
Rapid local dispersement
Fragments resprout

2 or more traits- high (5 points)
1 trait- medium (3 points)
0 traits- low (1 point)
Unknown

Total for Biology Section: 13, Rank: High
(High 15-11, Medium 10-7, Low 6-0)

History

H-1. Is the species in question naturalized beyond its native range elsewhere?
Yes, at a wide variety of places- high (5 points)
Yes, at a few places- medium (3 points)
No, not at present- low (1 point)

H-2. Has the species in question invaded habitats found in the SSMNRA?
Yes, in a wide variety of places- high (5 points)
Yes, in a few places- medium (3 points)
No, not at present- low (1 point)

H-3. Are there other weedy species in the genera?
Yes, a large proportion of the genera are weedy- high (5 points)
Yes, a small proportion of the genera are weedy- medium (3 points)
No or only a very small number- low (1 point)

Total for History Section: 11, Rank: High
(High 15-11, Medium 10-7, Low 7-0)

Impact

I-1. Does the species in question alter ecosystem processes?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)
Unknown

I-2. Does the species in question alter community structure?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)

I-3. Does the species in question alter community composition?
Yes, substantially- high (5 points) forms monocultures
Yes, slightly- medium (3 points)
No- low (1 point)

Total for Impact Section: 9, Rank: Medium
(High 15-11, Medium 10-7, Low 7-0)

Section 1 Total: 33/45, Section 1 Rank: High

Section 2: Park-Specific Threat Assessment *(Bromus hordeaceus)*

Distribution

D-1. What is the species' current range in the SMMNRA?
1000+ ha- Entrenched [stop here, species is ranked E for Entrenched]
999 to100 ha- difficult to manage (5 points)
99 to 11 ha- medium difficulty to manage (3 points)
10 to 0 ha- easiest to manage (1 point)
Unknown

D-2. How many locations in the SMMNRA have stands?
12 or more sites- High (5 points)
11 to 6 sites- Medium (3 points)
5 or fewer sites- Low (1 point)
Unknown

List all sites with known stands:

D-3. Which of the known habitats on SMMNRA are susceptible to the species?
Coastal Salt Marsh
Coastal Strand
Coastal Sage Scrub
Chaparral
Riparian Woodland
Valley Grassland
Valley Oak Savanna
Coast Live Oak Woodland
Freshwater Ponds and Lakes

4 or more susceptible- high (5 points)
2 to 3 susceptible- medium (3 points)
1 or none susceptible- low (1 point)

Total for Distribution Section: n/a, Rank: n/a
(High 15-11, Medium 10-7, Low 6-0)

SMMNRA Impact

SI-1. The areas threatened by the species in question are of:
High significance- high (5 points)
Medium significance- medium (3 points)
Low significance- low (1 point)

SI-2. The native species threatened by the species in questions are:
Endangered/threatened/rare in SMMNRA- high (5 points)
Common species- medium (3 points)
No species are directly threatened- low (1 point)

Total for Impact Section: n/a, Rank: n/a
(High 10-8, Medium 7-4, Low 4-0)

Management

M-1. What techniques are available for managing the species in question?
Mechanical
Biological
Chemical
Volunteer/Hand-pull
Other
Explain other:

0 or 1 options- high (5 points)
2 or 3 options- medium (3 points)
4 or more options- low (1 point)

M-2. Are the areas invaded by the species in question accessible?
5 or more difficult to access areas- high (5 points)
2 to 4 difficult to access areas- medium (3 points)
1 or no difficult to access areas- low (1 point)
Unknown

M-3. Are there impacts of the control of the species in question on native species?
Heavy control impacts- high (5 points)
Somewhere in the middle- medium (3 points)
Slight control impacts- low (1 point)

M-4. What is the time commitment to the management of the species?
Repeat treatments over a number of years- high (5 points)
Repeat treatments only once or twice after initial- medium (3 points)
Treat once- low (1 point)

Total for Management Section: n/a , Rank: n/a
(High 20-16, Medium 15-10, Low 9-0)

Section 2 Total: E, Section 2 Rank: Entrenched

Comments:

Santa Monica Mountains National Recreation Area Exotic Threat Assessment (Updated August 9, 2006)

Centaurea solstitialis, yellow starthistle

Section 1: General Threat Assessment

Biology

B-1. Does the species in question utilize any of the following reproduction methods?
High seed production (1000+)
Long seed viability (2+ years)
Produces seeds more than once a year
Self-fertilization
High germination rate
Rapid growth to maturity
Vegetative reproduction
Other- rhizomes, node sprouts, etc.
Explain other:

3 or more traits- high (5 points)
2 traits- medium (3 points)
1 or fewer traits- low (1 point)
Unknown

B-2. Does the species exhibit any of the following competitively advantageous traits?
Alleopathic
Stress tolerant (drought, shade, etc)
Growth habits (dense, smothering, etc)
Other (nitrogen-fixing, parasitic, etc.)
Explain other:

2 or more traits- high (5 points)
1 trait- medium (3 points)
0 traits- low (1 point)
Unknown

B-3. Does the species in question use any of the following methods of dispersal?
Wind
Water
Animal
Human
Rapid local dispersement
Fragments resprout

2 or more traits- high (5 points)
1 trait- medium (3 points)
0 traits- low (1 point)
Unknown

Total for Biology Section: 11, Rank: High
(High 15-11, Medium 10-7, Low 6-0)

History

H-1. Is the species in question naturalized beyond its native range elsewhere?
Yes, at a wide variety of places- high (5 points)
Yes, at a few places- medium (3 points)
No, not at present- low (1 point)

H-2. Has the species in question invaded habitats found in the SSMNRA?
Yes, in a wide variety of places- high (5 points)
Yes, in a few places- medium (3 points)
No, not at present- low (1 point)

H-3. Are there other weedy species in the genera?
Yes, a large proportion of the genera are weedy- high (5 points)
Yes, a small proportion of the genera are weedy- medium (3 points)
No or only a very small number- low (1 point)

Total for History Section: 15, Rank: High
(High 15-11, Medium 10-7, Low 7-0)

Impact

I-1. Does the species in question alter ecosystem processes?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)
Unknown

I-2. Does the species in question alter community structure?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)

I-3. Does the species in question alter community composition?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)

Total for Impact Section: 15, Rank: High
(High 15-11, Medium 10-7, Low 7-0)

Section 1 Total: 41/45, Section 1 Rank: High

Section 2: Park-Specific Threat Assessment (*Centaurea solstitialis)*

Distribution

D-1. What is the species' current range in the SMMNRA?
1000+ ha- Entrenched [stop here, species is ranked E for Entrenched]
999 to100 ha- difficult to manage (5 points)
99 to 11 ha- medium difficulty to manage (3 points)
10 to 0 ha- easiest to manage (1 point) 3.11 ha
Unknown

D-2. How many locations in the SMMNRA have stands?
12 or more sites- High (5 points)
11 to 6 sites- Medium (3 points)
5 or fewer sites- Low (1 point)
Unknown

List all sites with known stands: Tuna Canyon, Peter Strauss, Paramount Ranch, Malibu Creek, Palo Camodo, Castro Crest, Topanga SP, Lake Eleanor, Ahmanson Ranch, Ladyface, private lands.

D-3. Which of the known habitats on SMMNRA are susceptible to the species?
Coastal Salt Marsh
Coastal Strand
Coastal Sage Scrub
Chaparral
Riparian Woodland
Valley Grassland
Valley Oak Savanna
Coast Live Oak Woodland
Freshwater Ponds and Lakes

4 or more susceptible- high (5 points)
2 to 3 susceptible- medium (3 points)
1 or none susceptible- low (1 point)

Total for Distribution Section: 11, Rank: High
(High 15-11, Medium 10-7, Low 6-0)

SMMNRA Impact

SI-1. The areas threatened by the species in question are of:
High significance- high (5 points)
Medium significance- medium (3 points)
Low significance- low (1 point**)**

SI-2. The native species threatened by the species in questions are:
Endangered/threatened/rare in SMMNRA- high (5 points)
Common species- medium (3 points)
No species are directly threatened- low (1 point)

Total for Impact Section: 8, Rank: High
(High 10-8, Medium 7-4, Low 4-0)

Management

M-1. What techniques are available for managing the species in question?
Mechanical
Biological
Chemical
Volunteer/Hand-pull
Other
Explain other: burning before seeds produced effective

0 or 1 options- high (5 points)
2 or 3 options- medium (3 points)
4 or more options- low (1 point)

M-2. Are the areas invaded by the species in question accessible?
5 or more difficult to access areas- high (5 points)
2 to 4 difficult to access areas- medium (3 points)
1 or no difficult to access areas- low (1 point)
Unknown

M-3. Are there impacts of the control of the species in question on native species?
Heavy control impacts- high (5 points)
Somewhere in the middle- medium (3 points)
Slight control impacts- low (1 point)

M-4. What is the time commitment to the management of the species?
Repeat treatments over a number of years- high (5 points)
Repeat treatments only once or twice after initial- medium (3 points)
Treat once- low (1 point)

Total for Management Section: 12, Rank: Medium
(High 20-16, Medium 15-10, Low 9-0)

Section 2 Total: 31/43, Section 2 Rank: High

Comments: Difficult to ascertain most affected areas. Hectares recorded in database seem low, given the number of sites.

Santa Monica Mountains National Recreation Area Exotic Threat Assessment (Updated August 9, 2006)

Conium maculatum, poison hemlock

Section 1: General Threat Assessment

Biology

B-1. Does the species in question utilize any of the following reproduction methods?
High seed production (1000+)
Long seed viability (2+ years)
Produces seeds more than once a year
Self-fertilization
High germination rate
Rapid growth to maturity
Vegetative reproduction
Other- rhizomes, node sprouts, etc.
Explain other:

3 or more traits- high (5 points)
2 traits- medium (3 points)
1 or fewer traits- low (1 point)
Unknown

B-2. Does the species exhibit any of the following competitively advantageous traits?
Alleopathic
Stress tolerant (drought, shade, etc)
Growth habits (dense, smothering, etc)
Other (nitrogen-fixing, parasitic, etc.)
Explain other:

2 or more traits- high (5 points)
1 trait- medium (3 points)
0 traits- low (1 point)
Unknown

B-3. Does the species in question use any of the following methods of dispersal?
Wind
Water
Animal
Human
Rapid local dispersement
Fragments resprout

2 or more traits- high (5 points)
1 trait- medium (3 points)
0 traits- low (1 point)
Unknown

Total for Biology Section: 11, Rank: High
(High 15-11, Medium 10-7, Low 6-0)

History

H-1. Is the species in question naturalized beyond its native range elsewhere?
Yes, at a wide variety of places- high (5 points)
Yes, at a few places- medium (3 points)
No, not at present- low (1 point)

H-2. Has the species in question invaded habitats found in the SSMNRA?
Yes, in a wide variety of places- high (5 points)
Yes, in a few places- medium (3 points)
No, not at present- low (1 point)

H-3. Are there other weedy species in the genera?
Yes, a large proportion of the genera are weedy- high (5 points)
Yes, a small proportion of the genera are weedy- medium (3 points)
No or only a very small number- low (1 point)

Total for History Section: 11, Rank: High
(High 15-11, Medium 10-7, Low 7-0)

Impact

I-1. Does the species in question alter ecosystem processes?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)
Unknown

I-2. Does the species in question alter community structure?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)

I-3. Does the species in question alter community composition?
Yes, substantially- high (5 points) forms monocultures
Yes, slightly- medium (3 points)
No- low (1 point)

Total for Impact Section: 11, Rank: High
(High 15-11, Medium 10-7, Low 7-0)

Section 1 Total: 33, Section 1 Rank: High

Section 2: Park-Specific Threat Assessment *(Conium maculatum)*

Distribution

D-1. What is the species' current range in the SMMNRA?
1000+ ha- Entrenched [stop here, species is ranked E for Entrenched]
999 to100 ha- difficult to manage (5 points)
99 to 11 ha- medium difficulty to manage (3 points) 23.93 ha
10 to 0 ha- easiest to manage (1 point)
Unknown

D-2. How many locations in the SMMNRA have stands?
12 or more sites- High (5 points)
11 to 6 sites- Medium (3 points)
5 or fewer sites- Low (1 point)
Unknown

List all sites with known stands: Point Mugu, Long Grade Canyon, Leo Carillo, Malibu Creek, Paramount Canyon, Coldwater Canyon, Rancho Sierra Vista, private lands

D-3. Which of the known habitats on SMMNRA are susceptible to the species?
Coastal Salt Marsh
Coastal Strand
Coastal Sage Scrub
Chaparral
Riparian Woodland
Valley Grassland
Valley Oak Savanna
Coast Live Oak Woodland
Freshwater Ponds and Lakes

4 or more susceptible- high (5 points)
2 to 3 susceptible- medium (3 points)
1 or none susceptible- low (1 point)

Total for Distribution Section: 9, Rank: Medium
(High 15-11, Medium 10-7, Low 6-0)

SMMNRA Impact

SI-1. The areas threatened by the species in question are of:
High significance- high (5 points)
Medium significance- medium (3 points) usually degraded, but can get into riparian
Low significance- low (1 point)

SI-2. The native species threatened by the species in questions are:
Endangered/threatened/rare in SMMNRA- high (5 points)
Common species- medium (3 points)
No species are directly threatened- low (1 point)

Total for Impact Section: 6, Rank: Medium
(High 10-8, Medium 7-4, Low 4-0)

Management

M-1. What techniques are available for managing the species in question?
Mechanical
Biological
Chemical
Volunteer/Hand-pull
Other
Explain other:

0 or 1 options- high (5 points)
2 or 3 options- medium (3 points)
4 or more options- low (1 point)

M-2. Are the areas invaded by the species in question accessible?
5 or more difficult to access areas- high (5 points)
2 to 4 difficult to access areas- medium (3 points)
1 or no difficult to access areas- low (1 point)
Unknown

M-3. Are there impacts of the control of the species in question on native species?
Heavy control impacts- high (5 points)
Somewhere in the middle- medium (3 points)
Slight control impacts- low (1 point)

M-4. What is the time commitment to the management of the species?
Repeat treatments over a number of years- high (5 points)
Repeat treatments only once or twice after initial- medium (3 points)
Treat once- low (1 point)

Total for Management Section: 14, Rank: Medium
(High 20-16, Medium 15-10, Low 9-0)

Section 2 Total: 29/45, Section 2 Rank: Medium

Comments: Malibu Creek and Paramount Ranch have largest populations. On the cusp of being rated a high threat.

Santa Monica Mountains National Recreation Area Exotic Threat Assessment (Updated August 9, 2006)

Convolvulus arvensis, field bindweed

Section 1: General Threat Assessment

Biology

B-1. Does the species in question utilize any of the following reproduction methods?
High seed production (1000+)
Long seed viability (2+ years)
Produces seeds more than once a year
Self-fertilization
High germination rate
Rapid growth to maturity
Vegetative reproduction
Other- rhizomes, node sprouts, etc.
Explain other:

3 or more traits- high (5 points)
2 traits- medium (3 points)
1 or fewer traits- low (1 point)
Unknown

B-2. Does the species exhibit any of the following competitively advantageous traits?
Alleopathic
Stress tolerant (drought, shade, etc)
Growth habits (dense, smothering, etc)
Other (nitrogen-fixing, parasitic, etc.)
Explain other:

2 or more traits- high (5 points)
1 trait- medium (3 points)
0 traits- low (1 point)
Unknown

B-3. Does the species in question use any of the following methods of dispersal?
Wind
Water
Animal
Human
Rapid local dispersement
Fragments resprout

2 or more traits- high (5 points)
1 trait- medium (3 points)
0 traits- low (1 point)
Unknown

Total for Biology Section: 15, Rank: High
(High 15-11, Medium 10-7, Low 6-0)

History

H-1. Is the species in question naturalized beyond its native range elsewhere?
Yes, at a wide variety of places- high (5 points)
Yes, at a few places- medium (3 points)
No, not at present- low (1 point)

H-2. Has the species in question invaded habitats found in the SSMNRA?
Yes, in a wide variety of places- high (5 points)
Yes, in a few places- medium (3 points)
No, not at present- low (1 point)

H-3. Are there other weedy species in the genera?
Yes, a large proportion of the genera are weedy- high (5 points)
Yes, a small proportion of the genera are weedy- medium (3 points)
No or only a very small number- low (1 point)

Total for History Section: 15, Rank: High
(High 15-11, Medium 10-7, Low 7-0)

Impact

I-1. Does the species in question alter ecosystem processes?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)
Unknown

I-2. Does the species in question alter community structure?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)

I-3. Does the species in question alter community composition?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)

Total for Impact Section: 6, Rank: Medium
(High 15-11, Medium 10-7, Low 7-0)

Section 1 Total: 36/45, Section 1 Rank: High

Section 2: Park-Specific Threat Assessment *(Convolvulus arvensis)*

Distribution

D-1. What is the species' current range in the SMMNRA?
1000+ ha- Entrenched [stop here, species is ranked E for Entrenched]
999 to100 ha- difficult to manage (5 points)
99 to 11 ha- medium difficulty to manage (3 points)
10 to 0 ha- easiest to manage (1 point)
Unknown

D-2. How many locations in the SMMNRA have stands?
12 or more sites- High (5 points)
11 to 6 sites- Medium (3 points)
5 or fewer sites- Low (1 point)
Unknown

List all sites with known stands:

D-3. Which of the known habitats on SMMNRA are susceptible to the species?
Coastal Salt Marsh
Coastal Strand
Coastal Sage Scrub
Chaparral
Riparian Woodland
Valley Grassland
Valley Oak Savanna
Coast Live Oak Woodland
Freshwater Ponds and Lakes

4 or more susceptible- high (5 points)
2 to 3 susceptible- medium (3 points)
1 or none susceptible- low (1 point)

Total for Distribution Section: U, Rank: Unknown
(High 15-11, Medium 10-7, Low 6-0)

SMMNRA Impact

SI-1. The areas threatened by the species in question are of:
High significance- high (5 points)
Medium significance- medium (3 points)
Low significance- low (1 point)

SI-2. The native species threatened by the species in questions are:
Endangered/threatened/rare in SMMNRA- high (5 points)
Common species- medium (3 points)
No species are directly threatened- low (1 point)

Total for Impact Section: 2, Rank: Low
(High 10-8, Medium 7-4, Low 4-0)

Management

M-1. What techniques are available for managing the species in question?
Mechanical
Biological
Chemical
Volunteer/Hand-pull
Other
Explain other:

0 or 1 options- high (5 points)
2 or 3 options- medium (3 points)
4 or more options- low (1 point)

M-2. Are the areas invaded by the species in question accessible?
5 or more difficult to access areas- high (5 points)
2 to 4 difficult to access areas- medium (3 points)
1 or no difficult to access areas- low (1 point)
Unknown

M-3. Are there impacts of the control of the species in question on native species?
Heavy control impacts- high (5 points)
Somewhere in the middle- medium (3 points)
Slight control impacts- low (1 point)

M-4. What is the time commitment to the management of the species?
Repeat treatments over a number of years- high (5 points)
Repeat treatments only once or twice after initial- medium (3 points)
Treat once- low (1 point)

Total for Management Section: 12, Rank: Medium
(High 20-16, Medium 15-10, Low 9-0)

Section 2 Total: U, Section 2 Rank: Low

Comments: COAR does not appear to have any impact on wildlands, though it grows in a wide variety of habitats.

Santa Monica Mountains National Recreation Area Exotic Threat Assessment (Updated August 9, 2006)

Cortaderia jubata, pampas grass

Section 1: General Threat Assessment

Biology

B-1. Does the species in question utilize any of the following reproduction methods?

High seed production (1000+)
Long seed viability (2+ years)
Produces seeds more than once a year
Self-fertilization
High germination rate
Rapid growth to maturity
Vegetative reproduction
Other- rhizomes, node sprouts, etc.
Explain other:

3 or more traits- high (5 points)
2 traits- medium (3 points)
1 or fewer traits- low (1 point)
Unknown

B-2. Does the species exhibit any of the following competitively advantageous traits?

Alleopathic
Stress tolerant (drought, shade, etc)
Growth habits (dense, smothering, etc)
Other (nitrogen-fixing, parasitic, etc.)
Explain other:

2 or more traits- high (5 points)
1 trait- medium (3 points)
0 traits- low (1 point)
Unknown

B-3. Does the species in question use any of the following methods of dispersal?

Wind
Water
Animal
Human
Rapid local dispersement
Fragments resprout

2 or more traits- high (5 points)
1 trait- medium (3 points)
0 traits- low (1 point)
Unknown

Total for Biology Section: 11, Rank: High
(High 15-11, Medium 10-7, Low 6-0)

History

H-1. Is the species in question naturalized beyond its native range elsewhere?
Yes, at a wide variety of places- high (5 points)
Yes, at a few places- medium (3 points)
No, not at present- low (1 point)

H-2. Has the species in question invaded habitats found in the SSMNRA?
Yes, in a wide variety of places- high (5 points)
Yes, in a few places- medium (3 points)
No, not at present- low (1 point)

H-3. Are there other weedy species in the genera?
Yes, a large proportion of the genera are weedy- high (5 points)
Yes, a small proportion of the genera are weedy- medium (3 points)
No or only a very small number- low (1 point)

Total for History Section: 15, Rank: High
(High 15-11, Medium 10-7, Low 7-0)

Impact

I-1. Does the species in question alter ecosystem processes?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)
Unknown

I-2. Does the species in question alter community structure?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)

I-3. Does the species in question alter community composition?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)

Total for Impact Section: 13, Rank: High
(High 15-11, Medium 10-7, Low 7-0)

Section 1 Total: 39/45, Section 1 Rank: High

Section 2: Park-Specific Threat Assessment (*Cortaderia jubata)*

Distribution

D-1. What is the species' current range in the SMMNRA?
1000+ ha- Entrenched [stop here, species is ranked E for Entrenched]
999 to100 ha- difficult to manage (5 points)
99 to 11 ha- medium difficulty to manage (3 points)
10 to 0 ha- easiest to manage (1 point) 1.446 ha
Unknown

D-2. How many locations in the SMMNRA have stands?
12 or more sites- High (5 points)
11 to 6 sites- Medium (3 points)
5 or fewer sites- Low (1 point)
Unknown

List all sites with known stands: Pt. Mugu, Malibu Bluffs, Las Flores, Solstice Can., Pac. Pal., Gateway, Santa Ynez, Corral Can., Will Rogers, Temescal, Zuma, Tuna, Circle X, Sullivan, Lechusa, Mandeville, Franklin, Fryman, Cold Creek, Wilacre, Ed, Edelman, Tapia, Corbin

D-3. Which of the known habitats on SMMNRA are susceptible to the species?
Coastal Salt Marsh
Coastal Strand
Coastal Sage Scrub
Chaparral
Riparian Woodland
Valley Grassland
Valley Oak Savanna
Coast Live Oak Woodland
Freshwater Ponds and Lakes

4 or more susceptible- high (5 points)
2 to 3 susceptible- medium (3 points)
1 or none susceptible- low (1 point)

Total for Distribution Section: 9, Rank: Medium
(High 15-11, Medium 10-7, Low 6-0)

SMMNRA Impact

SI-1. The areas threatened by the species in question are of:
High significance- high (5 points) coastal bluffs
Medium significance- medium (3 points)
Low significance- low (1 point**)**

SI-2. The native species threatened by the species in questions are:
Endangered/threatened/rare in SMMNRA- high (5 points)
Common species- medium (3 points)
No species are directly threatened- low (1 point)

Total for Impact Section: 10, Rank: High
(High 10-8, Medium 7-4, Low 4-0)

Management

M-1. What techniques are available for managing the species in question?
Mechanical
Biological
Chemical
Volunteer/Hand-pull
Other
Explain other:

0 or 1 options- high (5 points)
2 or 3 options- medium (3 points)
4 or more options- low (1 point**)**

M-2. Are the areas invaded by the species in question accessible?
5 or more difficult to access areas- high (5 points)
2 to 4 difficult to access areas- medium (3 points)
1 or no difficult to access areas- low (1 point)
Unknown

M-3. Are there impacts of the control of the species in question on native species?
Heavy control impacts- high (5 points)
Somewhere in the middle- medium (3 points)
Slight control impacts- low (1 point)

M-4. What is the time commitment to the management of the species?
Repeat treatments over a number of years- high (5 points)
Repeat treatments only once or twice after initial- medium (3 points)
Treat once- low (1 point)

Total for Management Section: 16, Rank: High
(High 20-16, Medium 15-10, Low 9-0)

Section 2 Total: 35/45, Section 2 Rank: High

Comments: Not large ha yet, but spread all over. Threaten coastal bluff species by displacing them completely. Recommend removal from best habitats now.

Santa Monica Mountains National Recreation Area Exotic Threat Assessment (Updated August 9, 2006)

Cyperus involucratus, umbrella plant

Section 1: General Threat Assessment

Biology

B-1. Does the species in question utilize any of the following reproduction methods?
High seed production (1000+)
Long seed viability (2+ years)
Produces seeds more than once a year
Self-fertilization
High germination rate
Rapid growth to maturity
Vegetative reproduction
Other- rhizomes, node sprouts, etc.
Explain other:

3 or more traits- high (5 points)
2 traits- medium (3 points)
1 or fewer traits- low (1 point)
Unknown

B-2. Does the species exhibit any of the following competitively advantageous traits?
Alleopathic
Stress tolerant (drought, shade, etc)
Growth habits (dense, smothering, etc)
Other (nitrogen-fixing, parasitic, etc.)
Explain other:

2 or more traits- high (5 points)
1 trait- medium (3 points)
0 traits- low (1 point)
Unknown

B-3. Does the species in question use any of the following methods of dispersal?
Wind
Water
Animal
Human
Rapid local dispersement
Fragments resprout

2 or more traits- high (5 points)
1 trait- medium (3 points)
0 traits- low (1 point)
Unknown

Total for Biology Section: 11, Rank: High
(High 15-11, Medium 10-7, Low 6-0)

History

H-1. Is the species in question naturalized beyond its native range elsewhere?
Yes, at a wide variety of places- high (5 points)
Yes, at a few places- medium (3 points)
No, not at present- low (1 point)

H-2. Has the species in question invaded habitats found in the SSMNRA?
Yes, in a wide variety of places- high (5 points)
Yes, in a few places- medium (3 points)
No, not at present- low (1 point)

H-3. Are there other weedy species in the genera?
Yes, a large proportion of the genera are weedy- high (5 points)
Yes, a small proportion of the genera are weedy- medium (3 points)
No or only a very small number- low (1 point)

Total for History Section: 15, Rank: High
(High 15-11, Medium 10-7, Low 7-0)

Impact

I-1. Does the species in question alter ecosystem processes?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)
Unknown

I-2. Does the species in question alter community structure?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)
Unknown

I-3. Does the species in question alter community composition?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)
Unknown

Total for Impact Section: U, Rank: Unknown
(High 15-11, Medium 10-7, Low 7-0)

Section 1 Total: U, Section 1 Rank: High

Section 2: Park-Specific Threat Assessment *(Cyperus involucratus)*

Distribution

D-1. What is the species' current range in the SMMNRA?
1000+ ha- Entrenched [stop here, species is ranked E for Entrenched]
999 to100 ha- difficult to manage (5 points)
99 to 11 ha- medium difficulty to manage (3 points)
10 to 0 ha- easiest to manage (1 point)
Unknown

D-2. How many locations in the SMMNRA have stands?
12 or more sites- High (5 points)
11 to 6 sites- Medium (3 points)
5 or fewer sites- Low (1 point)
Unknown

List all sites with known stands: Solstice Creek, Malibu Creek, Tuna Canyon

D-3. Which of the known habitats on SMMNRA are susceptible to the species?
Coastal Salt Marsh
Coastal Strand
Coastal Sage Scrub
Chaparral
Riparian Woodland
Valley Grassland
Valley Oak Savanna
Coast Live Oak Woodland
Freshwater Ponds and Lakes

4 or more susceptible- high (5 points)
2 to 3 susceptible- medium (3 points)
1 or none susceptible- low (1 point)

Total for Distribution Section: U, Rank: Unknown
(High 15-11, Medium 10-7, Low 6-0)

SMMNRA Impact

SI-1. The areas threatened by the species in question are of:
High significance- high (5 points)
Medium significance- medium (3 points)
Low significance- low (1 point)
Unknown

SI-2. The native species threatened by the species in questions are:
Endangered/threatened/rare in SMMNRA- high (5 points)
Common species- medium (3 points)
No species are directly threatened- low (1 point)
Unknown

Total for Impact Section: U, Rank: Unknown
(High 10-8, Medium 7-4, Low 4-0)

Management

M-1. What techniques are available for managing the species in question?
Mechanical
Biological
Chemical
Volunteer/Hand-pull
Other
Explain other:

0 or 1 options- high (5 points)
2 or 3 options- medium (3 points)
4 or more options- low (1 point)

M-2. Are the areas invaded by the species in question accessible?
5 or more difficult to access areas- high (5 points)
2 to 4 difficult to access areas- medium (3 points)
1 or no difficult to access areas- low (1 point)
Unknown

M-3. Are there impacts of the control of the species in question on native species?
Heavy control impacts- high (5 points)
Somewhere in the middle- medium (3 points)
Slight control impacts- low (1 point)

M-4. What is the time commitment to the management of the species?
Repeat treatments over a number of years- high (5 points)
Repeat treatments only once or twice after initial- medium (3 points)
Treat once- low (1 point)

Total for Management Section: 11, Rank: Medium
(High 20-16, Medium 15-10, Low 9-0)

Section 2 Total: U, Section 2 Rank: Unknown

Comments: More data needed on the impact of CYIN on ecosystems and native species. The status and impact of this exotic is currently unknown in SMMNRA.

Santa Monica Mountains National Recreation Area Exotic Threat Assessment (Updated August 9, 2006)

Delairea odorata, German ivy

Section 1: General Threat Assessment

Biology

B-1. Does the species in question utilize any of the following reproduction methods?
High seed production (1000+)
Long seed viability (2+ years)
Produces seeds more than once a year
Self-fertilization
High germination rate
Rapid growth to maturity
Vegetative reproduction
Other- rhizomes, node sprouts, etc.
Explain other: 95% of stolons w/ only one node sprout

3 or more traits- high (5 points)
2 traits- medium (3 points)
1 or fewer traits- low (1 point)
Unknown

B-2. Does the species exhibit any of the following competitively advantageous traits?
Alleopathic
Stress tolerant (drought, shade, etc)
Growth habits (dense, smothering, etc)
Other (nitrogen-fixing, parasitic, etc.)
Explain other:

2 or more traits- high (5 points)
1 trait- medium (3 points)
0 traits- low (1 point)
Unknown

B-3. Does the species in question use any of the following methods of dispersal?
Wind
Water
Animal
Human
Rapid local dispersement
Fragments resprout

2 or more traits- high (5 points)
1 trait- medium (3 points)
0 traits- low (1 point)
Unknown

Total for Biology Section: 13, Rank: High
(High 15-11, Medium 10-7, Low 6-0)

History

H-1. Is the species in question naturalized beyond its native range elsewhere?
Yes, at a wide variety of places- high (5 points)
Yes, at a few places- medium (3 points)
No, not at present- low (1 point)

H-2. Has the species in question invaded habitats found in the SSMNRA?
Yes, in a wide variety of places- high (5 points)
Yes, in a few places- medium (3 points)
No, not at present- low (1 point)

H-3. Are there other weedy species in the genera?
Yes, a large proportion of the genera are weedy- high (5 points)
Yes, a small proportion of the genera are weedy- medium (3 points)
No or only a very small number- low (1 point)

Total for History Section: 11, Rank: High
(High 15-11, Medium 10-7, Low 7-0)

Impact

I-1. Does the species in question alter ecosystem processes?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points) erosion on stream banks
No- low (1 point)
Unknown

I-2. Does the species in question alter community structure?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)

I-3. Does the species in question alter community composition?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)

Total for Impact Section: 13, Rank: High
(High 15-11, Medium 10-7, Low 7-0)

Section 1 Total: 37/45, Section 1 Rank: High

Section 2: Park-Specific Threat Assessment (*Delairea odorata)*

Distribution

D-1. What is the species' current range in the SMMNRA?
1000+ ha- Entrenched [stop here, species is ranked E for Entrenched]
999 to100 ha- difficult to manage (5 points)
99 to 11 ha- medium difficulty to manage (3 points) 36.84 ha
10 to 0 ha- easiest to manage (1 point)
Unknown

D-2. How many locations in the SMMNRA have stands?
12 or more sites- High (5 points)
11 to 6 sites- Medium (3 points)
5 or fewer sites- Low (1 point)
Unknown

List all sites with known stands: Leo Carrillo, Topanga, San Vincente Mountain, Franklin Can., Coldwater Can., Fryman Can., private lands

D-3. Which of the known habitats on SMMNRA are susceptible to the species?
Coastal Salt Marsh
Coastal Strand
Coastal Sage Scrub
Chaparral
Riparian Woodland
Valley Grassland
Valley Oak Savanna
Coast Live Oak Woodland
Freshwater Ponds and Lakes

4 or more susceptible- high (5 points)
2 to 3 susceptible- medium (3 points)
1 or none susceptible- low (1 point)

Total for Distribution Section: 11, Rank: High
(High 15-11, Medium 10-7, Low 6-0)

SMMNRA Impact

SI-1. The areas threatened by the species in question are of:
High significance- high (5 points)
Medium significance- medium (3 points)
Low significance- low (1 point**)**

SI-2. The native species threatened by the species in questions are:
Endangered/threatened/rare in SMMNRA- high (5 points)
Common species- medium (3 points)
No species are directly threatened- low (1 point)

Total for Impact Section: 8, Rank: High
(High 10-8, Medium 7-4, Low 4-0)

Management

M-1. What techniques are available for managing the species in question?
Mechanical
Biological
Chemical
Volunteer/Hand-pull
Other
Explain other:

0 or 1 options- high (5 points)
2 or 3 options- medium (3 points)
4 or more options- low (1 point)

M-2. Are the areas invaded by the species in question accessible?
5 or more difficult to access areas- high (5 points)
2 to 4 difficult to access areas- medium (3 points)
1 or no difficult to access areas- low (1 point)
Unknown

M-3. Are there impacts of the control of the species in question on native species?
Heavy control impacts- high (5 points)
Somewhere in the middle- medium (3 points)
Slight control impacts- low (1 point)

M-4. What is the time commitment to the management of the species?
Repeat treatments over a number of years- high (5 points)
Repeat treatments only once or twice after initial- medium (3 points)
Treat once- low (1 point)

Total for Management Section: 12, Rank: Medium
(High 20-16, Medium 15-10, Low 9-0)

Section 2 Total: 31/45, Section 2 Rank: High

Comments: Most serious in Leo Carrillo and Topanga Canyons

Santa Monica Mountains National Recreation Area Exotic Threat Assessment (Updated August 9, 2006)

Erharta erecta, panic veldtgrass

Section 1: General Threat Assessment

Biology

B-1. Does the species in question utilize any of the following reproduction methods?
High seed production (1000+)
Long seed viability (2+ years)
Produces seeds more than once a year
Self-fertilization
High germination rate
Rapid growth to maturity
Vegetative reproduction
Other- rhizomes, node sprouts, etc.
Explain other:

3 or more traits- high (5 points)
2 traits- medium (3 points)
1 or fewer traits- low (1 point)
Unknown

B-2. Does the species exhibit any of the following competitively advantageous traits?
Alleopathic
Stress tolerant (drought, shade, etc)
Growth habits (dense, smothering, etc)
Other (nitrogen-fixing, parasitic, etc.)
Explain other:

2 or more traits- high (5 points)
1 trait- medium (3 points)
0 traits- low (1 point)
Unknown

B-3. Does the species in question use any of the following methods of dispersal?
Wind
Water
Animal
Human
Rapid local dispersement
Fragments resprout

2 or more traits- high (5 points)
1 trait- medium (3 points)
0 traits- low (1 point)
Unknown

Total for Biology Section: 13, Rank: High
(High 15-11, Medium 10-7, Low 6-0)

History

H-1. Is the species in question naturalized beyond its native range elsewhere?
Yes, at a wide variety of places- high (5 points)
Yes, at a few places- medium (3 points)
No, not at present- low (1 point)

H-2. Has the species in question invaded habitats found in the SSMNRA?
Yes, in a wide variety of places- high (5 points)
Yes, in a few places- medium (3 points)
No, not at present- low (1 point)

H-3. Are there other weedy species in the genera?
Yes, a large proportion of the genera are weedy- high (5 points)
Yes, a small proportion of the genera are weedy- medium (3 points)
No or only a very small number- low (1 point)

Total for History Section: 15, Rank: High
(High 15-11, Medium 10-7, Low 7-0)

Impact

I-1. Does the species in question alter ecosystem processes?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)
Unknown

I-2. Does the species in question alter community structure?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)

I-3. Does the species in question alter community composition?
Yes, substantially- high (5 points) forms monocultures
Yes, slightly- medium (3 points)
No- low (1 point)

Total for Impact Section: U, Rank: Unknown
(High 15-11, Medium 10-7, Low 7-0)

Section 1 Total: U, Section 1 Rank: High

Section 2: Park-Specific Threat Assessment *(Erharta erecta)*

Distribution

D-1. What is the species' current range in the SMMNRA?
1000+ ha- Entrenched [stop here, species is ranked E for Entrenched]
999 to100 ha- difficult to manage (5 points)
99 to 11 ha- medium difficulty to manage (3 points)
10 to 0 ha- easiest to manage (1 point)
Unknown

D-2. How many locations in the SMMNRA have stands?
12 or more sites- High (5 points)
11 to 6 sites- Medium (3 points)
5 or fewer sites- Low (1 point)
Unknown

List all sites with known stands:

D-3. Which of the known habitats on SMMNRA are susceptible to the species?
Coastal Salt Marsh
Coastal Strand
Coastal Sage Scrub
Chaparral
Riparian Woodland
Valley Grassland
Valley Oak Savanna
Coast Live Oak Woodland
Freshwater Ponds and Lakes

4 or more susceptible- high (5 points)
2 to 3 susceptible- medium (3 points)
1 or none susceptible- low (1 point)

Total for Distribution Section: n/a, Rank: n/a
(High 15-11, Medium 10-7, Low 6-0)

SMMNRA Impact

SI-1. The areas threatened by the species in question are of:
High significance- high (5 points)
Medium significance- medium (3 points)
Low significance- low (1 point)

SI-2. The native species threatened by the species in questions are:
Endangered/threatened/rare in SMMNRA- high (5 points)
Common species- medium (3 points)
No species are directly threatened- low (1 point)

Total for Impact Section: n/a, Rank: n/a
(High 10-8, Medium 7-4, Low 4-0)

Management

M-1. What techniques are available for managing the species in question?
Mechanical
Biological
Chemical
Volunteer/Hand-pull
Other
Explain other:

0 or 1 options- high (5 points)
2 or 3 options- medium (3 points)
4 or more options- low (1 point)

M-2. Are the areas invaded by the species in question accessible?
5 or more difficult to access areas- high (5 points)
2 to 4 difficult to access areas- medium (3 points)
1 or no difficult to access areas- low (1 point)
Unknown

M-3. Are there impacts of the control of the species in question on native species?
Heavy control impacts- high (5 points)
Somewhere in the middle- medium (3 points)
Slight control impacts- low (1 point)

M-4. What is the time commitment to the management of the species?
Repeat treatments over a number of years- high (5 points)
Repeat treatments only once or twice after initial- medium (3 points)
Treat once- low (1 point)

Total for Management Section: n/a, Rank: n/a
(High 20-16, Medium 15-10, Low 9-0)

Section 2 Total: E, Section 2 Rank: Entrenched

Comments: Look for in restoration sites.

Santa Monica Mountains National Recreation Area Exotic Threat Assessment (Updated August 9, 2006)

Euphorbia terracina, false caper

Section 1: General Threat Assessment

Biology

B-1. Does the species in question utilize any of the following reproduction methods?
High seed production (1000+)
Long seed viability (2+ years)
Produces seeds more than once a year
Self-fertilization
High germination rate
Rapid growth to maturity
Vegetative reproduction
Other- rhizomes, node sprouts, etc.
Explain other:

3 or more traits- high (5 points)
2 traits- medium (3 points)
1 or fewer traits- low (1 point)
Unknown

B-2. Does the species exhibit any of the following competitively advantageous traits?
Alleopathic
Stress tolerant (drought, shade, etc)
Growth habits (dense, smothering, etc)
Other (nitrogen-fixing, parasitic, etc.)
Explain other:

2 or more traits- high (5 points)
1 trait- medium (3 points)
0 traits- low (1 point)
Unknown

B-3. Does the species in question use any of the following methods of dispersal?
Wind
Water
Animal
Human
Rapid local dispersement
Fragments resprout

2 or more traits- high (5 points)
1 trait- medium (3 points)
0 traits- low (1 point)
Unknown

Total for Biology Section: 15, Rank: High
(High 15-11, Medium 10-7, Low 6-0)

History

H-1. Is the species in question naturalized beyond its native range elsewhere?
Yes, at a wide variety of places- high (5 points)
Yes, at a few places- medium (3 points)
No, not at present- low (1 point)

H-2. Has the species in question invaded habitats found in the SSMNRA?
Yes, in a wide variety of places- high (5 points)
Yes, in a few places- medium (3 points)
No, not at present- low (1 point)

H-3. Are there other weedy species in the genera?
Yes, a large proportion of the genera are weedy- high (5 points)
Yes, a small proportion of the genera are weedy- medium (3 points)
No or only a very small number- low (1 point)

Total for History Section: 11, Rank: High
(High 15-11, Medium 10-7, Low 7-0)

Impact

I-1. Does the species in question alter ecosystem processes?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)
Unknown

I-2. Does the species in question alter community structure?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)

I-3. Does the species in question alter community composition?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)

Total for Impact Section: 10, Rank: Unknown
(High 15-11, Medium 10-7, Low 7-0)

Section 1 Total: U, Section 1 Rank: High

Section 2: Park-Specific Threat Assessment (*Euphorbia terracina)*

Distribution

D-1. What is the species' current range in the SMMNRA?
1000+ ha- Entrenched [stop here, species is ranked E for Entrenched]
999 to100 ha- difficult to manage (5 points)
99 to 11 ha- medium difficulty to manage (3 points) 12.92 ha
10 to 0 ha- easiest to manage (1 point)
Unknown

D-2. How many locations in the SMMNRA have stands?
12 or more sites- High (5 points)
11 to 6 sites- Medium (3 points)
5 or fewer sites- Low (1 point)
Unknown

List all sites with known stands: Solstice, Carbon, Zuma/Trancas, Malibu Cr., Topanga, Malibu Lag., Pierdo Gordo, Pt. Dune, El Nudo, Pac. Pal., Malibu Bluffs, Las Flores, Tuna, Corral, Puerco, Latigo, W. Rogers, priv land

D-3. Which of the known habitats on SMMNRA are susceptible to the species?
Coastal Salt Marsh
Coastal Strand
Coastal Sage Scrub
Chaparral
Riparian Woodland
Valley Grassland
Valley Oak Savanna
Coast Live Oak Woodland
Freshwater Ponds and Lakes

4 or more susceptible- high (5 points)
2 to 3 susceptible- medium (3 points)
1 or none susceptible- low (1 point)

Total for Distribution Section: 13, Rank: High
(High 15-11, Medium 10-7, Low 6-0)

SMMNRA Impact

SI-1. The areas threatened by the species in question are of:
High significance- high (5 points)
Medium significance- medium (3 points)
Low significance- low (1 point**)**

SI-2. The native species threatened by the species in questions are:
Endangered/threatened/rare in SMMNRA- high (5 points)
Common species- medium (3 points)
No species are directly threatened- low (1 point)

Total for Impact Section: 8, Rank: High
(High 10-8, Medium 7-4, Low 4-0)

Management

M-1. What techniques are available for managing the species in question?
Mechanical
Biological
Chemical
Volunteer/Hand-pull
Other
Explain other:

0 or 1 options- high (5 points)
2 or 3 options- medium (3 points)
4 or more options- low (1 point)

M-2. Are the areas invaded by the species in question accessible?
5 or more difficult to access areas- high (5 points)
2 to 4 difficult to access areas- medium (3 points)
1 or no difficult to access areas- low (1 point)
Unknown

M-3. Are there impacts of the control of the species in question on native species?
Heavy control impacts- high (5 points)
Somewhere in the middle- medium (3 points)
Slight control impacts- low (1 point)

M-4. What is the time commitment to the management of the species?
Repeat treatments over a number of years- high (5 points)
Repeat treatments only once or twice after initial- medium (3 points)
Treat once- low (1 point)

Total for Management Section: 16, Rank: High
(High 20-16, Medium 15-10, Low 9-0)

Section 2 Total: 37/45, Section 2 Rank: High

Comments: Data on treatment should be shared, since this is a relatively new threat.

Santa Monica Mountains National Recreation Area Exotic Threat Assessment (Updated August 9, 2006)

Foeniculum vulgare, fennel

Section 1: General Threat Assessment

Biology

B-1. Does the species in question utilize any of the following reproduction methods?
High seed production (1000+)
Long seed viability (2+ years)
Produces seeds more than once a year
Self-fertilization
High germination rate
Rapid growth to maturity
Vegetative reproduction
Other- rhizomes, node sprouts, etc.
Explain other:

3 or more traits- high (5 points)
2 traits- medium (3 points)
1 or fewer traits- low (1 point)
Unknown

B-2. Does the species exhibit any of the following competitively advantageous traits?
Alleopathic
Stress tolerant (drought, shade, etc)
Growth habits (dense, smothering, etc)
Other (nitrogen-fixing, parasitic, etc.)
Explain other: out competes other plants for water

2 or more traits- high (5 points)
1 trait- medium (3 points)
0 traits- low (1 point)
Unknown

B-3. Does the species in question use any of the following methods of dispersal?
Wind
Water
Animal
Human
Rapid local dispersement
Fragments resprout

2 or more traits- high (5 points)
1 trait- medium (3 points)
0 traits- low (1 point)
Unknown

Total for Biology Section: 15, Rank: High
(High 15-11, Medium 10-7, Low 6-0)

History

H-1. Is the species in question naturalized beyond its native range elsewhere?
Yes, at a wide variety of places- high (5 points)
Yes, at a few places- medium (3 points)
No, not at present- low (1 point)

H-2. Has the species in question invaded habitats found in the SSMNRA?
Yes, in a wide variety of places- high (5 points)
Yes, in a few places- medium (3 points)
No, not at present- low (1 point)

H-3. Are there other weedy species in the genera?
Yes, a large proportion of the genera are weedy- high (5 points)
Yes, a small proportion of the genera are weedy- medium (3 points)
No or only a very small number- low (1 point)

Total for History Section: 11, Rank: High
(High 15-11, Medium 10-7, Low 7-0)

Impact

I-1. Does the species in question alter ecosystem processes?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points) can alter fire regimes
No- low (1 point)
Unknown

I-2. Does the species in question alter community structure?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)

I-3. Does the species in question alter community composition?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)

Total for Impact Section: 13 , Rank: High
(High 15-11, Medium 10-7, Low 7-0)

Section 1 Total: 39/45, Section 1 Rank: High

Section 2: Park-Specific Threat Assessment (*Foeniculum vulgare)*

Distribution

D-1. What is the species' current range in the SMMNRA?
1000+ ha- Entrenched [stop here, species is ranked E for Entrenched]
999 to100 ha- difficult to manage (5 points)
99 to 11 ha- medium difficulty to manage (3 points) 42.23 ha
10 to 0 ha- easiest to manage (1 point)
Unknown

D-2. How many locations in the SMMNRA have stands?
12 or more sites- High (5 points)
11 to 6 sites- Medium (3 points)
5 or fewer sites- Low (1 point)
Unknown

List all sites with known stands: Long Grade Can., Pt. Mugu, R. Sierra Vista, Circle X, Malibu Spr., Deer Creek, Leo Carrillo, Charmlee, Zuma, Paramount R., Malibu Cr., Solstice Can., Malibu Bl., Topanga, Fryman, Coldwater, Franklin

D-3. Which of the known habitats on SMMNRA are susceptible to the species?
Coastal Salt Marsh
Coastal Strand
Coastal Sage Scrub
Chaparral
Riparian Woodland
Valley Grassland
Valley Oak Savanna
Coast Live Oak Woodland
Freshwater Ponds and Lakes

4 or more susceptible- high (5 points)
2 to 3 susceptible- medium (3 points)
1 or none susceptible- low (1 point)

Total for Distribution Section: 13, Rank: High
(High 15-11, Medium 10-7, Low 6-0)

SMMNRA Impact

SI-1. The areas threatened by the species in question are of:
High significance- high (5 points)
Medium significance- medium (3 points)
Low significance- low (1 point**)**

SI-2. The native species threatened by the species in questions are:
Endangered/threatened/rare in SMMNRA- high (5 points)
Common species- medium (3 points)
No species are directly threatened- low (1 point)

Total for Impact Section: 10, Rank: High
(High 10-8, Medium 7-4, Low 4-0)

Management

M-1. What techniques are available for managing the species in question?
Mechanical
Biological
Chemical
Volunteer/Hand-pull
Other
Explain other:

0 or 1 options- high (5 points)
2 or 3 options- medium (3 points)
4 or more options- low (1 point)

M-2. Are the areas invaded by the species in question accessible?
5 or more difficult to access areas- high (5 points)
2 to 4 difficult to access areas- medium (3 points)
1 or no difficult to access areas- low (1 point)
Unknown

M-3. Are there impacts of the control of the species in question on native species?
Heavy control impacts- high (5 points)
Somewhere in the middle- medium (3 points)
Slight control impacts- low (1 point)

M-4. What is the time commitment to the management of the species?
Repeat treatments over a number of years- high (5 points)
Repeat treatments only once or twice after initial- medium (3 points)
Treat once- low (1 point)

Total for Management Section: 14, Rank: Medium
(High 20-16, Medium 15-10, Low 9-0)

Section 2 Total: 37/45, Section 2 Rank: High

Comments: Appears to be of concern throughout many sections of SMMNRA. Possibly concentrated along roads and in disturbed areas?

Santa Monica Mountains National Recreation Area Exotic Threat Assessment (Updated August 9, 2006)

Lepidium latifolium, perennial pepperweed

Section 1: General Threat Assessment

Biology

B-1. Does the species in question utilize any of the following reproduction methods?
High seed production (1000+)
Long seed viability (2+ years)
Produces seeds more than once a year
Self-fertilization
High germination rate
Rapid growth to maturity
Vegetative reproduction
Other- rhizomes, node sprouts, etc.
Explain other:

3 or more traits- high (5 points)
2 traits- medium (3 points)
1 or fewer traits- low (1 point)
Unknown

B-2. Does the species exhibit any of the following competitively advantageous traits?
Alleopathic
Stress tolerant (drought, shade, etc)
Growth habits (dense, smothering, etc)
Other (nitrogen-fixing, parasitic, etc.)
Explain other:

2 or more traits- high (5 points)
1 trait- medium (3 points)
0 traits- low (1 point)
Unknown

B-3. Does the species in question use any of the following methods of dispersal?
Wind
Water
Animal
Human
Rapid local dispersement
Fragments resprout

2 or more traits- high (5 points)
1 trait- medium (3 points)
0 traits- low (1 point)
Unknown

Total for Biology Section: 13, Rank: High
(High 15-11, Medium 10-7, Low 6-0)

History

H-1. Is the species in question naturalized beyond its native range elsewhere?
Yes, at a wide variety of places- high (5 points)
Yes, at a few places- medium (3 points)
No, not at present- low (1 point)

H-2. Has the species in question invaded habitats found in the SSMNRA?
Yes, in a wide variety of places- high (5 points)
Yes, in a few places- medium (3 points)
No, not at present- low (1 point)

H-3. Are there other weedy species in the genera?
Yes, a large proportion of the genera are weedy- high (5 points)
Yes, a small proportion of the genera are weedy- medium (3 points)
No or only a very small number- low (1 point)

Total for History Section: 13, Rank: High
(High 15-11, Medium 10-7, Low 7-0)

Impact

I-1. Does the species in question alter ecosystem processes?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)
Unknown

I-2. Does the species in question alter community structure?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)

I-3. Does the species in question alter community composition?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)

Total for Impact Section: 15, Rank: High
(High 15-11, Medium 10-7, Low 7-0)

Section 1 Total: 41/45, Section 1 Rank: High

Section 2: Park-Specific Threat Assessment (*Lepidium latifolium)*

Distribution

D-1. What is the species' current range in the SMMNRA?
1000+ ha- Entrenched [stop here, species is ranked E for Entrenched]
999 to100 ha- difficult to manage (5 points)
99 to 11 ha- medium difficulty to manage (3 points)
10 to 0 ha- easiest to manage (1 point) 4.13 ha
Unknown

D-2. How many locations in the SMMNRA have stands?
12 or more sites- High (5 points)
11 to 6 sites- Medium (3 points)
5 or fewer sites- Low (1 point)
Unknown

List all sites with known stands:
Paramount Ranch, Malibu Creek

D-3. Which of the known habitats on SMMNRA are susceptible to the species?
Coastal Salt Marsh
Coastal Strand
Coastal Sage Scrub
Chaparral
Riparian Woodland
Valley Grassland
Valley Oak Savanna
Coast Live Oak Woodland
Freshwater Ponds and Lakes

4 or more susceptible- high (5 points)
2 to 3 susceptible- medium (3 points)
1 or none susceptible- low (1 point)

Total for Distribution Section: 5, Rank: Low
(High 15-11, Medium 10-7, Low 6-0)

SMMNRA Impact

SI-1. The areas threatened by the species in question are of:
High significance- high (5 points)
Medium significance- medium (3 points)
Low significance- low (1 point)

SI-2. The native species threatened by the species in questions are:
Endangered/threatened/rare in SMMNRA- high (5 points)
Common species- medium (3 points)
No species are directly threatened- low (1 point)

Total for Impact Section: 4, Rank: Low
(High 10-8, Medium 7-4, Low 4-0)

Management

M-1. What techniques are available for managing the species in question?
Mechanical
Biological
Chemical
Volunteer/Hand-pull
Other
Explain other:

0 or 1 options- high (5 points)
2 or 3 options- medium (3 points)
4 or more options- low (1 point**)**

M-2. Are the areas invaded by the species in question accessible?
5 or more difficult to access areas- high (5 points)
2 to 4 difficult to access areas- medium (3 points)
1 or no difficult to access areas- low (1 point)
Unknown

M-3. Are there impacts of the control of the species in question on native species?
Heavy control impacts- high (5 points)
Somewhere in the middle- medium (3 points)
Slight control impacts- low (1 point)

M-4. What is the time commitment to the management of the species?
Repeat treatments over a number of years- high (5 points)
Repeat treatments only once or twice after initial- medium (3 points)
Treat once- low (1 point)

Total for Management Section: 14, Rank: Medium
(High 20-16, Medium 15-10, Low 9-0)

Section 2 Total: 23/45, Section 2 Rank: Low

Comments: Locally very bad in Paramount Ranch

Santa Monica Mountains National Recreation Area Exotic Threat Assessment (Updated August 9, 2006)

Marrubium vulgare, common horehound

Section 1: General Threat Assessment

Biology

B-1. Does the species in question utilize any of the following reproduction methods?
High seed production (1000+)
Long seed viability (2+ years)
Produces seeds more than once a year
Self-fertilization
High germination rate
Rapid growth to maturity
Vegetative reproduction
Other- rhizomes, node sprouts, etc.
Explain other:

3 or more traits- high (5 points)
2 traits- medium (3 points)
1 or fewer traits- low (1 point)
Unknown

B-2. Does the species exhibit any of the following competitively advantageous traits?
Alleopathic
Stress tolerant (drought, shade, etc)
Growth habits (dense, smothering, etc)
Other (nitrogen-fixing, parasitic, etc.)
Explain other:

2 or more traits- high (5 points)
1 trait- medium (3 points)
0 traits- low (1 point)
Unknown

B-3. Does the species in question use any of the following methods of dispersal?
Wind
Water
Animal
Human
Rapid local dispersement
Fragments resprout

2 or more traits- high (5 points)
1 trait- medium (3 points)
0 traits- low (1 point)
Unknown

Total for Biology Section: 13, Rank: High
(High 15-11, Medium 10-7, Low 6-0)

History

H-1. Is the species in question naturalized beyond its native range elsewhere?
Yes, at a wide variety of places- high (5 points)
Yes, at a few places- medium (3 points)
No, not at present- low (1 point)

H-2. Has the species in question invaded habitats found in the SSMNRA?
Yes, in a wide variety of places- high (5 points)
Yes, in a few places- medium (3 points)
No, not at present- low (1 point)

H-3. Are there other weedy species in the genera?
Yes, a large proportion of the genera are weedy- high (5 points)
Yes, a small proportion of the genera are weedy- medium (3 points)
No or only a very small number- low (1 point)

Total for History Section: 11, Rank: High
(High 15-11, Medium 10-7, Low 7-0)

Impact

I-1. Does the species in question alter ecosystem processes?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)
Unknown

I-2. Does the species in question alter community structure?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points) mainly on islands
No- low (1 point)

I-3. Does the species in question alter community composition?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points) mostly in disturbed areas
No- low (1 point)

Total for Impact Section: U, Rank: Unknown
(High 15-11, Medium 10-7, Low 7-0)

Section 1 Total: U, Section 1 Rank: High

Section 2: Park-Specific Threat Assessment *(Marrubium vulgare)*

Distribution

D-1. What is the species' current range in the SMMNRA?
1000+ ha- Entrenched [stop here, species is ranked E for Entrenched]
999 to100 ha- difficult to manage (5 points)
99 to 11 ha- medium difficulty to manage (3 points)
10 to 0 ha- easiest to manage (1 point)
Unknown

D-2. How many locations in the SMMNRA have stands?
12 or more sites- High (5 points)
11 to 6 sites- Medium (3 points)
5 or fewer sites- Low (1 point)
Unknown

List all sites with known stands: Solstice Ranch, Big Sycamore

D-3. Which of the known habitats on SMMNRA are susceptible to the species?
Coastal Salt Marsh
Coastal Strand
Coastal Sage Scrub
Chaparral
Riparian Woodland
Valley Grassland
Valley Oak Savanna
Coast Live Oak Woodland
Freshwater Ponds and Lakes

4 or more susceptible- high (5 points)
2 to 3 susceptible- medium (3 points)
1 or none susceptible- low (1 point)

Total for Distribution Section: 5, Rank: Low
(High 15-11, Medium 10-7, Low 6-0)

SMMNRA Impact

SI-1. The areas threatened by the species in question are of:
High significance- high (5 points)
Medium significance- medium (3 points)
Low significance- low (1 point)

SI-2. The native species threatened by the species in questions are:
Endangered/threatened/rare in SMMNRA- high (5 points)
Common species- medium (3 points)
No species are directly threatened- low (1 point)

Total for Impact Section: 2, Rank: Low
(High 10-8, Medium 7-4, Low 4-0)

Management

M-1. What techniques are available for managing the species in question?
Mechanical
Biological
Chemical
Volunteer/Hand-pull
Other
Explain other:

0 or 1 options- high (5 points)
2 or 3 options- medium (3 points)
4 or more options- low (1 point)

M-2. Are the areas invaded by the species in question accessible?
5 or more difficult to access areas- high (5 points)
2 to 4 difficult to access areas- medium (3 points)
1 or no difficult to access areas- low (1 point)
Unknown

M-3. Are there impacts of the control of the species in question on native species?
Heavy control impacts- high (5 points)
Somewhere in the middle- medium (3 points)
Slight control impacts- low (1 point)

M-4. What is the time commitment to the management of the species?
Repeat treatments over a number of years- high (5 points)
Repeat treatments only once or twice after initial- medium (3 points)
Treat once- low (1 point)

Total for Management Section: 12, Rank: Medium
(High 20-16, Medium 15-10, Low 9-0)

Section 2 Total: 19/45, Section 2 Rank: Low

Comments: Does not spread beyond weedy areas in SMMNRA, but can impact revegetation projects.

Santa Monica Mountains National Recreation Area Exotic Threat Assessment (Updated August 9, 2006)

Myoporum laetum, false sandalwood

Section 1: General Threat Assessment

Biology

B-1. Does the species in question utilize any of the following reproduction methods?
High seed production (1000+)
Long seed viability (2+ years)
Produces seeds more than once a year
Self-fertilization
High germination rate
Rapid growth to maturity
Vegetative reproduction
Other- rhizomes, node sprouts, etc.
Explain other: resprouts from trunk

3 or more traits- high (5 points)
2 traits- medium (3 points)
1 or fewer traits- low (1 point)
Unknown

B-2. Does the species exhibit any of the following competitively advantageous traits?
Alleopathic
Stress tolerant (drought, shade, etc)
Growth habits (dense, smothering, etc)
Other (nitrogen-fixing, parasitic, etc.)
Explain other:

2 or more traits- high (5 points)
1 trait- medium (3 points)
0 traits- low (1 point)
Unknown

B-3. Does the species in question use any of the following methods of dispersal?
Wind
Water
Animal
Human
Rapid local dispersement
Fragments resprout

2 or more traits- high (5 points)
1 trait- medium (3 points)
0 traits- low (1 point)
Unknown

Total for Biology Section: 11, Rank: High
(High 15-11, Medium 10-7, Low 6-0)

History

H-1. Is the species in question naturalized beyond its native range elsewhere?
Yes, at a wide variety of places- high (5 points)
Yes, at a few places- medium (3 points)
No, not at present- low (1 point)

H-2. Has the species in question invaded habitats found in the SSMNRA?
Yes, in a wide variety of places- high (5 points)
Yes, in a few places- medium (3 points)
No, not at present- low (1 point)

H-3. Are there other weedy species in the genera?
Yes, a large proportion of the genera are weedy- high (5 points)
Yes, a small proportion of the genera are weedy- medium (3 points)
No or only a very small number- low (1 point)

Total for History Section: 9, Rank: Medium
(High 15-11, Medium 10-7, Low 7-0)

Impact

I-1. Does the species in question alter ecosystem processes?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)
Unknown

I-2. Does the species in question alter community structure?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)

I-3. Does the species in question alter community composition?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)

Total for Impact Section: U, Rank: Unknown
(High 15-11, Medium 10-7, Low 7-0)

Section 1 Total: U, Section 1 Rank: High

Section 2: Park-Specific Threat Assessment *(Myoporum laetum)*

Distribution

D-1. What is the species' current range in the SMMNRA?
1000+ ha- Entrenched [stop here, species is ranked E for Entrenched]
999 to100 ha- difficult to manage (5 points)
99 to 11 ha- medium difficulty to manage (3 points)
10 to 0 ha- easiest to manage (1 point) 8.01 ha
Unknown

D-2. How many locations in the SMMNRA have stands?
12 or more sites- High (5 points)
11 to 6 sites- Medium (3 points)
5 or fewer sites- Low (1 point)
Unknown

List all sites with known stands: Leo Carrillo, Zuma/Trancas, Topanga, private lands

D-3. Which of the known habitats on SMMNRA are susceptible to the species?
Coastal Salt Marsh
Coastal Strand
Coastal Sage Scrub
Chaparral
Riparian Woodland
Valley Grassland
Valley Oak Savanna
Coast Live Oak Woodland
Freshwater Ponds and Lakes

4 or more susceptible- high (5 points)
2 to 3 susceptible- medium (3 points)
1 or none susceptible- low (1 point)

Total for Distribution Section: 5, Rank: Low
(High 15-11, Medium 10-7, Low 6-0)

SMMNRA Impact

SI-1. The areas threatened by the species in question are of:
High significance- high (5 points)
Medium significance- medium (3 points)
Low significance- low (1 point)

SI-2. The native species threatened by the species in questions are:
Endangered/threatened/rare in SMMNRA- high (5 points)
Common species- medium (3 points)
No species are directly threatened- low (1 point)

Total for Impact Section: 6, Rank: Medium
(High 10-8, Medium 7-4, Low 4-0)

Management

M-1. What techniques are available for managing the species in question?
Mechanical
Biological
Chemical
Volunteer/Hand-pull
Other
Explain other:

0 or 1 options- high (5 points)
2 or 3 options- medium (3 points)
4 or more options- low (1 point)

M-2. Are the areas invaded by the species in question accessible?
5 or more difficult to access areas- high (5 points)
2 to 4 difficult to access areas- medium (3 points)
1 or no difficult to access areas- low (1 point)
Unknown

M-3. Are there impacts of the control of the species in question on native species?
Heavy control impacts- high (5 points)
Somewhere in the middle- medium (3 points)
Slight control impacts- low (1 point)

M-4. What is the time commitment to the management of the species?
Repeat treatments over a number of years- high (5 points)
Repeat treatments only once or twice after initial- medium (3 points)
Treat once- low (1 point)

Total for Management Section: 12, Rank: Medium
(High 20-16, Medium 15-10, Low 9-0)

Section 2 Total: 23/45, Section 2 Rank: Medium

Comments: Very small set of populations, probably best to target now, though in weedy areas.

Santa Monica Mountains National Recreation Area Exotic Threat Assessment (Updated August 9, 2006)

Nicotiana glauca, tobacco tree

Section 1: General Threat Assessment

Biology

B-1. Does the species in question utilize any of the following reproduction methods?
High seed production (1000+)
Long seed viability (2+ years)
Produces seeds more than once a year
Self-fertilization
High germination rate
Rapid growth to maturity
Vegetative reproduction
Other- rhizomes, node sprouts, etc.
Explain other:

3 or more traits- high (5 points)
2 traits- medium (3 points)
1 or fewer traits- low (1 point)
Unknown

B-2. Does the species exhibit any of the following competitively advantageous traits?
Alleopathic
Stress tolerant (drought, shade, etc)
Growth habits (dense, smothering, etc)
Other (nitrogen-fixing, parasitic, etc.)
Explain other:

2 or more traits- high (5 points)
1 trait- medium (3 points)
0 traits- low (1 point)
Unknown

B-3. Does the species in question use any of the following methods of dispersal?
Wind
Water
Animal
Human
Rapid local dispersement
Fragments resprout

2 or more traits- high (5 points)
1 trait- medium (3 points)
0 traits- low (1 point)
Unknown

Total for Biology Section: 13, Rank: High
(High 15-11, Medium 10-7, Low 6-0)

History

H-1. Is the species in question naturalized beyond its native range elsewhere?
Yes, at a wide variety of places- high (5 points)
Yes, at a few places- medium (3 points)
No, not at present- low (1 point)

H-2. Has the species in question invaded habitats found in the SSMNRA?
Yes, in a wide variety of places- high (5 points)
Yes, in a few places- medium (3 points)
No, not at present- low (1 point)

H-3. Are there other weedy species in the genera?
Yes, a large proportion of the genera are weedy- high (5 points)
Yes, a small proportion of the genera are weedy- medium (3 points)
No or only a very small number- low (1 point)

Total for History Section: 13, Rank: High
(High 15-11, Medium 10-7, Low 7-0)

Impact

I-1. Does the species in question alter ecosystem processes?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)
Unknown

I-2. Does the species in question alter community structure?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)

I-3. Does the species in question alter community composition?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)

Total for Impact Section: U, Rank: Unknown
(High 15-11, Medium 10-7, Low 7-0)

Section 1 Total: U, Section 1 Rank: High

Section 2: Park-Specific Threat Assessment (*Nicotiana glauca)*

Distribution

D-1. What is the species' current range in the SMMNRA?
1000+ ha- Entrenched [stop here, species is ranked E for Entrenched]
999 to100 ha- difficult to manage (5 points)
99 to 11 ha- medium difficulty to manage (3 points) 15.53 ha
10 to 0 ha- easiest to manage (1 point)
Unknown

D-2. How many locations in the SMMNRA have stands?
12 or more sites- High (5 points)
11 to 6 sites- Medium (3 points)
5 or fewer sites- Low (1 point)
Unknown

List all sites with known stands: Pt. Mugu, Circle X, Leo Carrillo, Zuma/Trancas, Cheeseboro, Solstice, Malibu Cr., Charmlee, Topanga, Can Vincente, Coldwater, Fryman, Franklin

D-3. Which of the known habitats on SMMNRA are susceptible to the species?
Coastal Salt Marsh
Coastal Strand
Coastal Sage Scrub
Chaparral
Riparian Woodland
Valley Grassland
Valley Oak Savanna
Coast Live Oak Woodland
Freshwater Ponds and Lakes

4 or more susceptible- high (5 points)
2 to 3 susceptible- medium (3 points)
1 or none susceptible- low (1 point)

Total for Distribution Section: 11, Rank: High
(High 15-11, Medium 10-7, Low 6-0)

SMMNRA Impact

SI-1. The areas threatened by the species in question are of:
High significance- high (5 points)
Medium significance- medium (3 points)
Low significance- low (1 point)

SI-2. The native species threatened by the species in questions are:
Endangered/threatened/rare in SMMNRA- high (5 points)
Common species- medium (3 points)
No species are directly threatened- low (1 point)

Total for Impact Section: 10, Rank: High
(High 10-8, Medium 7-4, Low 4-0)

Management

M-1. What techniques are available for managing the species in question?
Mechanical
Biological
Chemical
Volunteer/Hand-pull
Other
Explain other:

0 or 1 options- high (5 points)
2 or 3 options- medium (3 points)
4 or more options- low (1 point)

M-2. Are the areas invaded by the species in question accessible?
5 or more difficult to access areas- high (5 points)
2 to 4 difficult to access areas- medium (3 points)
1 or no difficult to access areas- low (1 point)
Unknown

M-3. Are there impacts of the control of the species in question on native species?
Heavy control impacts- high (5 points)
Somewhere in the middle- medium (3 points)
Slight control impacts- low (1 point)

M-4. What is the time commitment to the management of the species?
Repeat treatments over a number of years- high (5 points)
Repeat treatments only once or twice after initial- medium (3 points)
Treat once- low (1 point)

Total for Management Section: 14, Rank: Medium
(High 20-16, Medium 15-10, Low 9-0)

Section 2 Total: 35, Section 2 Rank: High

Comments: Has been shown to affect Cactus Wren (endangered species), Most populations appear small and manageable. Big chunk of high rating due to potential affect on Cactus Wren.

Santa Monica Mountains National Recreation Area Exotic Threat Assessment (Updated August 9, 2006)

Pennisetum setaceum, fountain grass

Section 1: General Threat Assessment

Biology

B-1. Does the species in question utilize any of the following reproduction methods?
High seed production (1000+)
Long seed viability (2+ years)
Produces seeds more than once a year
Self-fertilization
High germination rate
Rapid growth to maturity
Vegetative reproduction
Other- rhizomes, node sprouts, etc.
Explain other:

3 or more traits- high (5 points)
2 traits- medium (3 points)
1 or fewer traits- low (1 point)
Unknown

B-2. Does the species exhibit any of the following competitively advantageous traits?
Alleopathic
Stress tolerant (drought, shade, etc)
Growth habits (dense, smothering, etc)
Other (nitrogen-fixing, parasitic, etc.)
Explain other:

2 or more traits- high (5 points)
1 trait- medium (3 points)
0 traits- low (1 point)
Unknown

B-3. Does the species in question use any of the following methods of dispersal?
Wind
Water
Animal
Human
Rapid local dispersement
Fragments resprout

2 or more traits- high (5 points)
1 trait- medium (3 points)
0 traits- low (1 point)
Unknown

Total for Biology Section: 13 , Rank: High
(High 15-11, Medium 10-7, Low 6-0)

History

H-1. Is the species in question naturalized beyond its native range elsewhere?
Yes, at a wide variety of places- high (5 points)
Yes, at a few places- medium (3 points)
No, not at present- low (1 point)

H-2. Has the species in question invaded habitats found in the SSMNRA?
Yes, in a wide variety of places- high (5 points)
Yes, in a few places- medium (3 points)
No, not at present- low (1 point)

H-3. Are there other weedy species in the genera?
Yes, a large proportion of the genera are weedy- high (5 points)
Yes, a small proportion of the genera are weedy- medium (3 points)
No or only a very small number- low (1 point)

Total for History Section: 13, Rank: High
(High 15-11, Medium 10-7, Low 7-0)

Impact

I-1. Does the species in question alter ecosystem processes?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)
Unknown

I-2. Does the species in question alter community structure?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)

I-3. Does the species in question alter community composition?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)

Total for Impact Section: 13 , Rank: High
(High 15-11, Medium 10-7, Low 7-0)

Section 1 Total: 39/45, Section 1 Rank: High

Section 2: Park-Specific Threat Assessment *(Pennisetum setaceum)*

Distribution

D-1. What is the species' current range in the SMMNRA?
1000+ ha- Entrenched [stop here, species is ranked E for Entrenched]
999 to100 ha- difficult to manage (5 points)
99 to 11 ha- medium difficulty to manage (3 points)
10 to 0 ha- easiest to manage (1 point)
Unknown

D-2. How many locations in the SMMNRA have stands?
12 or more sites- High (5 points)
11 to 6 sites- Medium (3 points)
5 or fewer sites- Low (1 point)
Unknown

List all sites with known stands: Point Mugu, Malibu Springs, Tuna, Circle X, private lands

D-3. Which of the known habitats on SMMNRA are susceptible to the species?
Coastal Salt Marsh
Coastal Strand
Coastal Sage Scrub
Chaparral
Riparian Woodland
Valley Grassland
Valley Oak Savanna
Coast Live Oak Woodland
Freshwater Ponds and Lakes

4 or more susceptible- high (5 points)
2 to 3 susceptible- medium (3 points)
1 or none susceptible- low (1 point)

Total for Distribution Section: 7, Rank: Medium
(High 15-11, Medium 10-7, Low 6-0)

SMMNRA Impact

SI-1. The areas threatened by the species in question are of:
High significance- high (5 points)
Medium significance- medium (3 points)
Low significance- low (1 point)

SI-2. The native species threatened by the species in questions are:
Endangered/threatened/rare in SMMNRA- high (5 points)
Common species- medium (3 points)
No species are directly threatened- low (1 point)

Total for Impact Section: 8, Rank: High
(High 10-8, Medium 7-4, Low 4-0)

Management

M-1. What techniques are available for managing the species in question?
Mechanical
Biological
Chemical
Volunteer/Hand-pull
Other
Explain other:

0 or 1 options- high (5 points)
2 or 3 options- medium (3 points)
4 or more options- low (1 point)

M-2. Are the areas invaded by the species in question accessible?
5 or more difficult to access areas- high (5 points)
2 to 4 difficult to access areas- medium (3 points)
1 or no difficult to access areas- low (1 point)
Unknown

M-3. Are there impacts of the control of the species in question on native species?
Heavy control impacts- high (5 points)
Somewhere in the middle- medium (3 points)
Slight control impacts- low (1 point)

M-4. What is the time commitment to the management of the species?
Repeat treatments over a number of years- high (5 points)
Repeat treatments only once or twice after initial- medium (3 points)
Treat once- low (1 point)

Total for Management Section: 14, Rank: Medium
(High 20-16, Medium 15-10, Low 9-0)

Section 2 Total: 29, Section 2 Rank: Medium

Comments: On verge of being a major problem. Largest populations on Point Mugu.

Santa Monica Mountains National Recreation Area Exotic Threat Assessment (Updated August 9, 2006)

Phalaris aquatica, Harding grass

Section 1: General Threat Assessment

Biology

B-1. Does the species in question utilize any of the following reproduction methods?
High seed production (1000+)
Long seed viability (2+ years)
Produces seeds more than once a year
Self-fertilization
High germination rate
Rapid growth to maturity
Vegetative reproduction
Other- rhizomes, node sprouts, etc.
Explain other:

3 or more traits- high (5 points)
2 traits- medium (3 points)
1 or fewer traits- low (1 point)
Unknown

B-2. Does the species exhibit any of the following competitively advantageous traits?
Alleopathic
Stress tolerant (drought, shade, etc)
Growth habits (dense, smothering, etc)
Other (nitrogen-fixing, parasitic, etc.)
Explain other:

2 or more traits- high (5 points)
1 trait- medium (3 points)
0 traits- low (1 point)
Unknown

B-3. Does the species in question use any of the following methods of dispersal?
Wind
Water
Animal
Human
Rapid local dispersement
Fragments resprout

2 or more traits- high (5 points)
1 trait- medium (3 points)
0 traits- low (1 point)
Unknown

Total for Biology Section: 13, Rank: High
(High 15-11, Medium 10-7, Low 6-0)

History

H-1. Is the species in question naturalized beyond its native range elsewhere?
Yes, at a wide variety of places- high (5 points)
Yes, at a few places- medium (3 points)
No, not at present- low (1 point)

H-2. Has the species in question invaded habitats found in the SSMNRA?
Yes, in a wide variety of places- high (5 points)
Yes, in a few places- medium (3 points)
No, not at present- low (1 point)

H-3. Are there other weedy species in the genera?
Yes, a large proportion of the genera are weedy- high (5 points)
Yes, a small proportion of the genera are weedy- medium (3 points)
No or only a very small number- low (1 point)

Total for History Section: 9, Rank: Medium
(High 15-11, Medium 10-7, Low 7-0)

Impact

I-1. Does the species in question alter ecosystem processes?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)
Unknown

I-2. Does the species in question alter community structure?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)

I-3. Does the species in question alter community composition?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)

Total for Impact Section: 11, Rank: High
(High 15-11, Medium 10-7, Low 7-0)

Section 1 Total: 33/45, Section 1 Rank: High

Section 2: Park-Specific Threat Assessment (*Phalaris aquatica)*

Distribution

D-1. What is the species' current range in the SMMNRA?
1000+ ha- Entrenched [stop here, species is ranked E for Entrenched]
999 to100 ha- difficult to manage (5 points)
99 to 11 ha- medium difficulty to manage (3 points) 23.80 ha
10 to 0 ha- easiest to manage (1 point)
Unknown

D-2. How many locations in the SMMNRA have stands?
12 or more sites- High (5 points)
11 to 6 sites- Medium (3 points)
5 or fewer sites- Low (1 point)
Unknown

List all sites with known stands: Pt. Mugu, Malibu Sp., Leo Carrillo, Zuma/Trancas, Castro Cr., Rocky Oaks, P. Strauss, Solstice, Topanga, Coldwater, Charmlee, R. Sierra Vista, private lands

D-3. Which of the known habitats on SMMNRA are susceptible to the species?
Coastal Salt Marsh
Coastal Strand
Coastal Sage Scrub
Chaparral
Riparian Woodland
Valley Grassland
Valley Oak Savanna
Coast Live Oak Woodland
Freshwater Ponds and Lakes

4 or more susceptible- high (5 points)
2 to 3 susceptible- medium (3 points)
1 or none susceptible- low (1 point)

Total for Distribution Section: 11, Rank: High
(High 15-11, Medium 10-7, Low 6-0)

SMMNRA Impact

SI-1. The areas threatened by the species in question are of:
High significance- high (5 points)
Medium significance- medium (3 points)
Low significance- low (1 point)

SI-2. The native species threatened by the species in questions are:
Endangered/threatened/rare in SMMNRA- high (5 points)
Common species- medium (3 points)
No species are directly threatened- low (1 point)

Total for Impact Section: 10, Rank: High
(High 10-8, Medium 7-4, Low 4-0)

Management

M-1. What techniques are available for managing the species in question?
Mechanical
Biological
Chemical
Volunteer/Hand-pull
Other
Explain other: burning after mid-Jan is effective (but park does not burn), also grazing is effective.

0 or 1 options- high (5 points)
2 or 3 options- medium (3 points)
4 or more options- low (1 point)

M-2. Are the areas invaded by the species in question accessible?
5 or more difficult to access areas- high (5 points)
2 to 4 difficult to access areas- medium (3 points)
1 or no difficult to access areas- low (1 point)
Unknown

M-3. Are there impacts of the control of the species in question on native species?
Heavy control impacts- high (5 points)
Somewhere in the middle- medium (3 points)
Slight control impacts- low (1 point)

M-4. What is the time commitment to the management of the species?
Repeat treatments over a number of years- high (5 points)
Repeat treatments only once or twice after initial- medium (3 points)
Treat once- low (1 point)

Total for Management Section: 14, Rank: Medium
(High 20-16, Medium 15-10, Low 9-0)

Section 2 Total: 35/45, Section 2 Rank: High

Comments: Widespread throughout grasslands in SMMNRA. Can spread into remaining CA native grasslands.

Santa Monica Mountains National Recreation Area Exotic Threat Assessment (Updated August 9, 2006)

Phalaris paradoxa, hood canarygrass

Section 1: General Threat Assessment

Biology

B-1. Does the species in question utilize any of the following reproduction methods?
High seed production (1000+)
Long seed viability (2+ years)
Produces seeds more than once a year
Self-fertilization
High germination rate
Rapid growth to maturity
Vegetative reproduction
Other- rhizomes, node sprouts, etc.
Explain other:

3 or more traits- high (5 points)
2 traits- medium (3 points)
1 or fewer traits- low (1 point)
Unknown

B-2. Does the species exhibit any of the following competitively advantageous traits?
Alleopathic
Stress tolerant (drought, shade, etc)
Growth habits (dense, smothering, etc)
Other (nitrogen-fixing, parasitic, etc.)
Explain other:

2 or more traits- high (5 points)
1 trait- medium (3 points)
0 traits- low (1 point)
Unknown

B-3. Does the species in question use any of the following methods of dispersal?
Wind
Water
Animal
Human
Rapid local dispersement
Fragments resprout

2 or more traits- high (5 points)
1 trait- medium (3 points)
0 traits- low (1 point)
Unknown

Total for Biology Section: U, Rank: Unknown
(High 15-11, Medium 10-7, Low 6-0)

History

H-1. Is the species in question naturalized beyond its native range elsewhere?
Yes, at a wide variety of places- high (5 points)
Yes, at a few places- medium (3 points)
No, not at present- low (1 point)

H-2. Has the species in question invaded habitats found in the SSMNRA?
Yes, in a wide variety of places- high (5 points)
Yes, in a few places- medium (3 points)
No, not at present- low (1 point)

H-3. Are there other weedy species in the genera?
Yes, a large proportion of the genera are weedy- high (5 points)
Yes, a small proportion of the genera are weedy- medium (3 points)
No or only a very small number- low (1 point)

Total for History Section: 11, Rank: High
(High 15-11, Medium 10-7, Low 7-0)

Impact

I-1. Does the species in question alter ecosystem processes?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)
Unknown

I-2. Does the species in question alter community structure?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)
Unknown

I-3. Does the species in question alter community composition?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)
Unknown

Total for Impact Section: U , Rank: Unknown
(High 15-11, Medium 10-7, Low 7-0)

Section 1 Total: U, Section 1 Rank: Unknown

Section 2: Park-Specific Threat Assessment *(Phalaris paradoxa)*

Distribution

D-1. What is the species' current range in the SMMNRA?
1000+ ha- Entrenched [stop here, species is ranked E for Entrenched]
999 to100 ha- difficult to manage (5 points)
99 to 11 ha- medium difficulty to manage (3 points)
10 to 0 ha- easiest to manage (1 point)
Unknown

D-2. How many locations in the SMMNRA have stands?
12 or more sites- High (5 points)
11 to 6 sites- Medium (3 points)
5 or fewer sites- Low (1 point)
Unknown

List all sites with known stands: Wildwood

D-3. Which of the known habitats on SMMNRA are susceptible to the species?
Coastal Salt Marsh
Coastal Strand
Coastal Sage Scrub
Chaparral
Riparian Woodland
Valley Grassland
Valley Oak Savanna
Coast Live Oak Woodland
Freshwater Ponds and Lakes

4 or more susceptible- high (5 points)
2 to 3 susceptible- medium (3 points)
1 or none susceptible- low (1 point)

Total for Distribution Section: 3, Rank: Low
(High 15-11, Medium 10-7, Low 6-0)

SMMNRA Impact

SI-1. The areas threatened by the species in question are of:
High significance- high (5 points)
Medium significance- medium (3 points)
Low significance- low (1 point)

SI-2. The native species threatened by the species in questions are:
Endangered/threatened/rare in SMMNRA- high (5 points)
Common species- medium (3 points)
No species are directly threatened- low (1 point)

Total for Impact Section: 2, Rank: Low
(High 10-8, Medium 7-4, Low 4-0)

Management

M-1. What techniques are available for managing the species in question?
Mechanical
Biological
Chemical
Volunteer/Hand-pull
Other
Explain other:

0 or 1 options- high (5 points)
2 or 3 options- medium (3 points)
4 or more options- low (1 point)

M-2. Are the areas invaded by the species in question accessible?
5 or more difficult to access areas- high (5 points)
2 to 4 difficult to access areas- medium (3 points)
1 or no difficult to access areas- low (1 point)
Unknown

M-3. Are there impacts of the control of the species in question on native species?
Heavy control impacts- high (5 points)
Somewhere in the middle- medium (3 points)
Slight control impacts- low (1 point)

M-4. What is the time commitment to the management of the species?
Repeat treatments over a number of years- high (5 points)
Repeat treatments only once or twice after initial- medium (3 points)
Treat once- low (1 point)

Total for Management Section: 10, Rank: Medium
(High 20-16, Medium 15-10, Low 9-0)

Section 2 Total: 15, Section 2 Rank: Low

Comments: Despite being in the Phalaris genus, little is know about PHPA. Only known in one area.

Santa Monica Mountains National Recreation Area Exotic Threat Assessment (Updated August 9, 2006)

Ricinus communis, castorbean

Section 1: General Threat Assessment

Biology

B-1. Does the species in question utilize any of the following reproduction methods?
High seed production (1000+)
Long seed viability (2+ years)
Produces seeds more than once a year
Self-fertilization
High germination rate
Rapid growth to maturity
Vegetative reproduction
Other- rhizomes, node sprouts, etc.
Explain other: can fragment and resprout

3 or more traits- high (5 points)
2 traits- medium (3 points)
1 or fewer traits- low (1 point)
Unknown

B-2. Does the species exhibit any of the following competitively advantageous traits?
Alleopathic
Stress tolerant (drought, shade, etc)
Growth habits (dense, smothering, etc)
Other (nitrogen-fixing, parasitic, etc.)
Explain other:

2 or more traits- high (5 points)
1 trait- medium (3 points)
0 traits- low (1 point)
Unknown

B-3. Does the species in question use any of the following methods of dispersal?
Wind
Water
Animal
Human
Rapid local dispersement
Fragments resprout

2 or more traits- high (5 points)
1 trait- medium (3 points)
0 traits- low (1 point)
Unknown

Total for Biology Section: 13, Rank: High
(High 15-11, Medium 10-7, Low 6-0)

History

H-1. Is the species in question naturalized beyond its native range elsewhere?
Yes, at a wide variety of places- high (5 points)
Yes, at a few places- medium (3 points)
No, not at present- low (1 point)

H-2. Has the species in question invaded habitats found in the SSMNRA?
Yes, in a wide variety of places- high (5 points)
Yes, in a few places- medium (3 points)
No, not at present- low (1 point)

H-3. Are there other weedy species in the genera?
Yes, a large proportion of the genera are weedy- high (5 points)
Yes, a small proportion of the genera are weedy- medium (3 points)
No or only a very small number- low (1 point)

Total for History Section: 13, Rank: High
(High 15-11, Medium 10-7, Low 7-0)

Impact

I-1. Does the species in question alter ecosystem processes?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)
Unknown

I-2. Does the species in question alter community structure?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)

I-3. Does the species in question alter community composition?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)

Total for Impact Section: U, Rank: Unknown
(High 15-11, Medium 10-7, Low 7-0)

Section 1 Total: U, Section 1 Rank: High

Section 2: Park-Specific Threat Assessment *(Ricinus communis)*

Distribution

D-1. What is the species' current range in the SMMNRA?
1000+ ha- Entrenched [stop here, species is ranked E for Entrenched]
999 to100 ha- difficult to manage (5 points)
99 to 11 ha- medium difficulty to manage (3 points)
10 to 0 ha- easiest to manage (1 point) 3.59 ha
Unknown

D-2. How many locations in the SMMNRA have stands?
12 or more sites- High (5 points)
11 to 6 sites- Medium (3 points)
5 or fewer sites- Low (1 point)
Unknown

List all sites with known stands: Rancho Sierra Vista, Leo Carrillo, Zuma, Solstice, Topanga, Coldwater, Long Grade, private lands

D-3. Which of the known habitats on SMMNRA are susceptible to the species?
Coastal Salt Marsh
Coastal Strand
Coastal Sage Scrub
Chaparral
Riparian Woodland
Valley Grassland
Valley Oak Savanna
Coast Live Oak Woodland
Freshwater Ponds and Lakes

4 or more susceptible- high (5 points)
2 to 3 susceptible- medium (3 points)
1 or none susceptible- low (1 point)

Total for Distribution Section: 7, Rank: Medium
(High 15-11, Medium 10-7, Low 6-0)

SMMNRA Impact

SI-1. The areas threatened by the species in question are of:
High significance- high (5 points)
Medium significance- medium (3 points)
Low significance- low (1 point)

SI-2. The native species threatened by the species in questions are:
Endangered/threatened/rare in SMMNRA- high (5 points)
Common species- medium (3 points)
No species are directly threatened- low (1 point)

Total for Impact Section: 6, Rank: Medium
(High 10-8, Medium 7-4, Low 4-0)

Management

M-1. What techniques are available for managing the species in question?
Mechanical
Biological
Chemical
Volunteer/Hand-pull
Other
Explain other:

0 or 1 options- high (5 points)
2 or 3 options- medium (3 points)
4 or more options- low (1 point)

M-2. Are the areas invaded by the species in question accessible?
5 or more difficult to access areas- high (5 points)
2 to 4 difficult to access areas- medium (3 points)
1 or no difficult to access areas- low (1 point)
Unknown

M-3. Are there impacts of the control of the species in question on native species?
Heavy control impacts- high (5 points)
Somewhere in the middle- medium (3 points)
Slight control impacts- low (1 point)

M-4. What is the time commitment to the management of the species?
Repeat treatments over a number of years- high (5 points)
Repeat treatments only once or twice after initial- medium (3 points)
Treat once- low (1 point)

Total for Management Section: 14, Rank: Medium
(High 20-16, Medium 15-10, Low 9-0)

Section 2 Total: 27/45, Section 2 Rank: Medium

Comments: Size of populations on map make database questionable. Natives can co-exist with castor bean.

Santa Monica Mountains National Recreation Area Exotic Threat Assessment (Updated August 9, 2006)

Romneya coulteri, matilija poppy

Section 1: General Threat Assessment

Biology

B-1. Does the species in question utilize any of the following reproduction methods?
High seed production (1000+)
Long seed viability (2+ years)
Produces seeds more than once a year
Self-fertilization
High germination rate
Rapid growth to maturity
Vegetative reproduction
Other- rhizomes, node sprouts, etc.
Explain other:

3 or more traits- high (5 points)
2 traits- medium (3 points)
1 or fewer traits- low (1 point)
Unknown

B-2. Does the species exhibit any of the following competitively advantageous traits?
Alleopathic
Stress tolerant (drought, shade, etc)
Growth habits (dense, smothering, etc)
Other (nitrogen-fixing, parasitic, etc.)
Explain other:

2 or more traits- high (5 points)
1 trait- medium (3 points)
0 traits- low (1 point)
Unknown

B-3. Does the species in question use any of the following methods of dispersal?
Wind
Water
Animal
Human
Rapid local dispersement
Fragments resprout

2 or more traits- high (5 points)
1 trait- medium (3 points)
0 traits- low (1 point)
Unknown

Total for Biology Section: 5, Rank: Low
(High 15-11, Medium 10-7, Low 6-0)

History

H-1. Is the species in question naturalized beyond its native range elsewhere?
Yes, at a wide variety of places- high (5 points)
Yes, at a few places- medium (3 points)
No, not at present- low (1 point)

H-2. Has the species in question invaded habitats found in the SSMNRA?
Yes, in a wide variety of places- high (5 points)
Yes, in a few places- medium (3 points)
No, not at present- low (1 point)

H-3. Are there other weedy species in the genera?
Yes, a large proportion of the genera are weedy- high (5 points)
Yes, a small proportion of the genera are weedy- medium (3 points)
No or only a very small number- low (1 point)

Total for History Section: 3, Rank: Low
(High 15-11, Medium 10-7, Low 7-0)

Impact

I-1. Does the species in question alter ecosystem processes?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)
Unknown

I-2. Does the species in question alter community structure?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)
Unknown

I-3. Does the species in question alter community composition?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)
Unknown

Total for Impact Section: U, Rank: Unknown
(High 15-11, Medium 10-7, Low 7-0)

Section 1 Total: U, Section 1 Rank: Low

Section 2: Park-Specific Threat Assessment *(Romneya coulteri)*

Distribution

D-1. What is the species' current range in the SMMNRA?
1000+ ha- Entrenched [stop here, species is ranked E for Entrenched]
999 to100 ha- difficult to manage (5 points)
99 to 11 ha- medium difficulty to manage (3 points)
10 to 0 ha- easiest to manage (1 point)
Unknown

D-2. How many locations in the SMMNRA have stands?
12 or more sites- High (5 points)
11 to 6 sites- Medium (3 points)
5 or fewer sites- Low (1 point)
Unknown

List all sites with known stands: Upper Malibu Creek

D-3. Which of the known habitats on SMMNRA are susceptible to the species?
Coastal Salt Marsh
Coastal Strand
Coastal Sage Scrub
Chaparral
Riparian Woodland
Valley Grassland
Valley Oak Savanna
Coast Live Oak Woodland
Freshwater Ponds and Lakes

4 or more susceptible- high (5 points)
2 to 3 susceptible- medium (3 points)
1 or none susceptible- low (1 point)

Total for Distribution Section: 3, Rank: Low
(High 15-11, Medium 10-7, Low 6-0)

SMMNRA Impact

SI-1. The areas threatened by the species in question are of:
High significance- high (5 points)
Medium significance- medium (3 points)
Low significance- low (1 point)

SI-2. The native species threatened by the species in questions are:
Endangered/threatened/rare in SMMNRA- high (5 points)
Common species- medium (3 points)
No species are directly threatened- low (1 point)

Total for Impact Section: 2, Rank: Low
(High 10-8, Medium 7-4, Low 4-0)

Management

M-1. What techniques are available for managing the species in question?
Mechanical
Biological
Chemical
Volunteer/Hand-pull
Other
Explain other:

0 or 1 options- high (5 points)
2 or 3 options- medium (3 points)
4 or more options- low (1 point)

M-2. Are the areas invaded by the species in question accessible?
5 or more difficult to access areas- high (5 points)
2 to 4 difficult to access areas- medium (3 points)
1 or no difficult to access areas- low (1 point)
Unknown

M-3. Are there impacts of the control of the species in question on native species?
Heavy control impacts- high (5 points)
Somewhere in the middle- medium (3 points)
Slight control impacts- low (1 point)

M-4. What is the time commitment to the management of the species?
Repeat treatments over a number of years- high (5 points)
Repeat treatments only once or twice after initial- medium (3 points)
Treat once- low (1 point)

Total for Management Section: 6, Rank: Low
(High 20-16, Medium 15-10, Low 9-0)

Section 2 Total: 11/45, Section 2 Rank: Low

Comments: ROCU is not known to be a concern anywhere as an exotic, and in fact is listed as a threatened native by CNPS. ROCU is known to grow at one site which was a former home.

Santa Monica Mountains National Recreation Area Exotic Threat Assessment (Updated August 9, 2006)

Salsola tragus, tumbleweed

Section 1: General Threat Assessment

Biology

B-1. Does the species in question utilize any of the following reproduction methods?
High seed production (1000+)
Long seed viability (2+ years)
Produces seeds more than once a year
Self-fertilization
High germination rate
Rapid growth to maturity
Vegetative reproduction
Other- rhizomes, node sprouts, etc.
Explain other:

3 or more traits- high (5 points)
2 traits- medium (3 points)
1 or fewer traits- low (1 point)
Unknown

B-2. Does the species exhibit any of the following competitively advantageous traits?
Alleopathic
Stress tolerant (drought, shade, etc)
Growth habits (dense, smothering, etc)
Other (nitrogen-fixing, parasitic, etc.)
Explain other:

2 or more traits- high (5 points)
1 trait- medium (3 points)
0 traits- low (1 point)
Unknown

B-3. Does the species in question use any of the following methods of dispersal?
Wind
Water
Animal
Human
Rapid local dispersement
Fragments resprout

2 or more traits- high (5 points)
1 trait- medium (3 points)
0 traits- low (1 point)
Unknown

Total for Biology Section: 11, Rank: High
(High 15-11, Medium 10-7, Low 6-0)

History

H-1. Is the species in question naturalized beyond its native range elsewhere?
Yes, at a wide variety of places- high (5 points)
Yes, at a few places- medium (3 points)
No, not at present- low (1 point)

H-2. Has the species in question invaded habitats found in the SSMNRA?
Yes, in a wide variety of places- high (5 points)
Yes, in a few places- medium (3 points)
No, not at present- low (1 point)

H-3. Are there other weedy species in the genera?
Yes, a large proportion of the genera are weedy- high (5 points)
Yes, a small proportion of the genera are weedy- medium (3 points)
No or only a very small number- low (1 point)

Total for History Section: 15, Rank: High
(High 15-11, Medium 10-7, Low 7-0)

Impact

I-1. Does the species in question alter ecosystem processes?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)
Unknown

I-2. Does the species in question alter community structure?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)

I-3. Does the species in question alter community composition?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)

Total for Impact Section: 9, Rank: Medium
(High 15-11, Medium 10-7, Low 7-0)

Section 1 Total: 35/45, Section 1 Rank: High

Section 2: Park-Specific Threat Assessment *(Salsola tragus)*

Distribution

D-1. What is the species' current range in the SMMNRA?
1000+ ha- Entrenched [stop here, species is ranked E for Entrenched]
999 to100 ha- difficult to manage (5 points)
99 to 11 ha- medium difficulty to manage (3 points)
10 to 0 ha- easiest to manage (1 point) 3.48 ha
Unknown

D-2. How many locations in the SMMNRA have stands?
12 or more sites- High (5 points)
11 to 6 sites- Medium (3 points)
5 or fewer sites- Low (1 point)
Unknown

List all sites with known stands: Rancho Sierra Vista, Point Mugu, Topanga, Malibu Creek, Paramount Ranch, Zuma, private lands

D-3. Which of the known habitats on SMMNRA are susceptible to the species?
Coastal Salt Marsh
Coastal Strand
Coastal Sage Scrub
Chaparral
Riparian Woodland
Valley Grassland
Valley Oak Savanna
Coast Live Oak Woodland
Freshwater Ponds and Lakes

4 or more susceptible- high (5 points)
2 to 3 susceptible- medium (3 points)
1 or none susceptible- low (1 point)

Total for Distribution Section: 7, Rank: Medium
(High 15-11, Medium 10-7, Low 6-0)

SMMNRA Impact

SI-1. The areas threatened by the species in question are of:
High significance- high (5 points)
Medium significance- medium (3 points)
Low significance- low (1 point)

SI-2. The native species threatened by the species in questions are:
Endangered/threatened/rare in SMMNRA- high (5 points)
Common species- medium (3 points)
No species are directly threatened- low (1 point)

Total for Impact Section: 6, Rank: Medium
(High 10-8, Medium 7-4, Low 4-0)

Management

M-1. What techniques are available for managing the species in question?
Mechanical
Biological
Chemical
Volunteer/Hand-pull
Other
Explain other:

0 or 1 options- high (5 points)
2 or 3 options- medium (3 points)
4 or more options- low (1 point)

M-2. Are the areas invaded by the species in question accessible?
5 or more difficult to access areas- high (5 points)
2 to 4 difficult to access areas- medium (3 points)
1 or no difficult to access areas- low (1 point)
Unknown

M-3. Are there impacts of the control of the species in question on native species?
Heavy control impacts- high (5 points)
Somewhere in the middle- medium (3 points)
Slight control impacts- low (1 point)

M-4. What is the time commitment to the management of the species?
Repeat treatments over a number of years- high (5 points)
Repeat treatments only once or twice after initial- medium (3 points)
Treat once- low (1 point)

Total for Management Section: 8, Rank: Low
(High 20-16, Medium 15-10, Low 9-0)

Section 2 Total: 21/45, Section 2 Rank: Medium

Comments: Despite the high ranking in section 1, SATR prefers junky sites and can even be of benefit to some natives.

Santa Monica Mountains National Recreation Area Exotic Threat Assessment (Updated August 9, 2006)

Solanum americanum, American black nightshade

Section 1: General Threat Assessment

Biology

B-1. Does the species in question utilize any of the following reproduction methods?
High seed production (1000+)
Long seed viability (2+ years)
Produces seeds more than once a year
Self-fertilization
High germination rate
Rapid growth to maturity
Vegetative reproduction
Other- rhizomes, node sprouts, etc.
Explain other:

3 or more traits- high (5 points)
2 traits- medium (3 points)
1 or fewer traits- low (1 point)
Unknown

B-2. Does the species exhibit any of the following competitively advantageous traits?
Alleopathic
Stress tolerant (drought, shade, etc)
Growth habits (dense, smothering, etc)
Other (nitrogen-fixing, parasitic, etc.)
Explain other:

2 or more traits- high (5 points)
1 trait- medium (3 points)
0 traits- low (1 point)
Unknown

B-3. Does the species in question use any of the following methods of dispersal?
Wind
Water
Animal
Human
Rapid local dispersement
Fragments resprout

2 or more traits- high (5 points)
1 trait- medium (3 points)
0 traits- low (1 point)
Unknown

Total for Biology Section: 11, Rank: High
(High 15-11, Medium 10-7, Low 6-0)

History

H-1. Is the species in question naturalized beyond its native range elsewhere?
Yes, at a wide variety of places- high (5 points)
Yes, at a few places- medium (3 points)
No, not at present- low (1 point)

H-2. Has the species in question invaded habitats found in the SSMNRA?
Yes, in a wide variety of places- high (5 points)
Yes, in a few places- medium (3 points)
No, not at present- low (1 point)

H-3. Are there other weedy species in the genera?
Yes, a large proportion of the genera are weedy- high (5 points)
Yes, a small proportion of the genera are weedy- medium (3 points)
No or only a very small number- low (1 point)

Total for History Section: 11, Rank: High
(High 15-11, Medium 10-7, Low 7-0)

Impact

I-1. Does the species in question alter ecosystem processes?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)
Unknown

I-2. Does the species in question alter community structure?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)

I-3. Does the species in question alter community composition?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)

Total for Impact Section: U, Rank: Low
(High 15-11, Medium 10-7, Low 7-0)

Section 1 Total: U, Section 1 Rank: High

Section 2: Park-Specific Threat Assessment *(Solanum americanum)*

Distribution

D-1. What is the species' current range in the SMMNRA?
1000+ ha- Entrenched [stop here, species is ranked E for Entrenched]
999 to100 ha- difficult to manage (5 points)
99 to 11 ha- medium difficulty to manage (3 points)
10 to 0 ha- easiest to manage (1 point)
Unknown

D-2. How many locations in the SMMNRA have stands?
12 or more sites- High (5 points)
11 to 6 sites- Medium (3 points)
5 or fewer sites- Low (1 point)
Unknown

List all sites with known stands: a few plants in canyons

D-3. Which of the known habitats on SMMNRA are susceptible to the species?
Coastal Salt Marsh
Coastal Strand
Coastal Sage Scrub
Chaparral
Riparian Woodland
Valley Grassland
Valley Oak Savanna
Coast Live Oak Woodland
Freshwater Ponds and Lakes

4 or more susceptible- high (5 points)
2 to 3 susceptible- medium (3 points)
1 or none susceptible- low (1 point)

Total for Distribution Section: 3, Rank: Low
(High 15-11, Medium 10-7, Low 6-0)

SMMNRA Impact

SI-1. The areas threatened by the species in question are of:
High significance- high (5 points)
Medium significance- medium (3 points)
Low significance- low (1 point)

SI-2. The native species threatened by the species in questions are:
Endangered/threatened/rare in SMMNRA- high (5 points)
Common species- medium (3 points)
No species are directly threatened- low (1 point)

Total for Impact Section: 2, Rank: Low
(High 10-8, Medium 7-4, Low 4-0)

Management

M-1. What techniques are available for managing the species in question?
Mechanical
Biological
Chemical
Volunteer/Hand-pull
Other
Explain other:

0 or 1 options- high (5 points)
2 or 3 options- medium (3 points)
4 or more options- low (1 point)

M-2. Are the areas invaded by the species in question accessible?
5 or more difficult to access areas- high (5 points)
2 to 4 difficult to access areas- medium (3 points)
1 or no difficult to access areas- low (1 point)
Unknown

M-3. Are there impacts of the control of the species in question on native species?
Heavy control impacts- high (5 points)
Somewhere in the middle- medium (3 points)
Slight control impacts- low (1 point)

M-4. What is the time commitment to the management of the species?
Repeat treatments over a number of years- high (5 points)
Repeat treatments only once or twice after initial- medium (3 points)
Treat once- low (1 point)

Total for Management Section: U, Rank: Low
(High 20-16, Medium 15-10, Low 9-0)

Section 2 Total: U, Section 2 Rank: Low

Comments: No data available on impacts, but none noticed in SMMNRA. Scattered throughout SMMNRA but no known effects on natives or habitats.

Santa Monica Mountains National Recreation Area Exotic Threat Assessment (Updated August 9, 2006)

Spartina junceum, Spanish broom

Section 1: General Threat Assessment

Biology

B-1. Does the species in question utilize any of the following reproduction methods?
High seed production (1000+)
Long seed viability (2+ years)
Produces seeds more than once a year
Self-fertilization
High germination rate
Rapid growth to maturity
Vegetative reproduction
Other- rhizomes, node sprouts, etc.
Explain other:

3 or more traits- high (5 points)
2 traits- medium (3 points)
1 or fewer traits- low (1 point)
Unknown

B-2. Does the species exhibit any of the following competitively advantageous traits?
Alleopathic
Stress tolerant (drought, shade, etc)
Growth habits (dense, smothering, etc)
Other (nitrogen-fixing, parasitic, etc.)
Explain other:

2 or more traits- high (5 points)
1 trait- medium (3 points)
0 traits- low (1 point)
Unknown

B-3. Does the species in question use any of the following methods of dispersal?
Wind
Water
Animal
Human
Rapid local dispersement
Fragments resprout

2 or more traits- high (5 points)
1 trait- medium (3 points)
0 traits- low (1 point)
Unknown

Total for Biology Section: 15, Rank: High
(High 15-11, Medium 10-7, Low 6-0)

History

H-1. Is the species in question naturalized beyond its native range elsewhere?
Yes, at a wide variety of places- high (5 points)
Yes, at a few places- medium (3 points)
No, not at present- low (1 point)

H-2. Has the species in question invaded habitats found in the SSMNRA?
Yes, in a wide variety of places- high (5 points)
Yes, in a few places- medium (3 points)
No, not at present- low (1 point)

H-3. Are there other weedy species in the genera?
Yes, a large proportion of the genera are weedy- high (5 points)
Yes, a small proportion of the genera are weedy- medium (3 points)
No or only a very small number- low (1 point)

Total for History Section: 15, Rank: High
(High 15-11, Medium 10-7, Low 7-0)

Impact

I-1. Does the species in question alter ecosystem processes?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)
Unknown

I-2. Does the species in question alter community structure?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)

I-3. Does the species in question alter community composition?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)

Total for Impact Section: 13, Rank: High
(High 15-11, Medium 10-7, Low 7-0)

Section 1 Total: 43/45, Section 1 Rank: High

Section 2: Park-Specific Threat Assessment *(Spartina junceum)*

Distribution

D-1. What is the species' current range in the SMMNRA?
1000+ ha- Entrenched [stop here, species is ranked E for Entrenched]
999 to100 ha- difficult to manage (5 points)
99 to 11 ha- medium difficulty to manage (3 points) 27.66 ha
10 to 0 ha- easiest to manage (1 point)
Unknown

D-2. How many locations in the SMMNRA have stands?
12 or more sites- High (5 points)
11 to 6 sites- Medium (3 points)
5 or fewer sites- Low (1 point)
Unknown

List all sites with known stands: Zuma, Castro Crest, Rocky Oaks, Malibu Creek, private lands

D-3. Which of the known habitats on SMMNRA are susceptible to the species?
Coastal Salt Marsh
Coastal Strand
Coastal Sage Scrub
Chaparral
Riparian Woodland
Valley Grassland
Valley Oak Savanna
Coast Live Oak Woodland
Freshwater Ponds and Lakes

4 or more susceptible- high (5 points)
2 to 3 susceptible- medium (3 points)
1 or none susceptible- low (1 point)

Total for Distribution Section: 7 , Rank: Medium
(High 15-11, Medium 10-7, Low 6-0)

SMMNRA Impact

SI-1. The areas threatened by the species in question are of:
High significance- high (5 points)
Medium significance- medium (3 points)
Low significance- low (1 point)

SI-2. The native species threatened by the species in questions are:
Endangered/threatened/rare in SMMNRA- high (5 points)
Common species- medium (3 points)
No species are directly threatened- low (1 point)

Total for Impact Section: 6, Rank: Medium
(High 10-8, Medium 7-4, Low 4-0)

Management

M-1. What techniques are available for managing the species in question?
Mechanical
Biological
Chemical
Volunteer/Hand-pull
Other
Explain other:

0 or 1 options- high (5 points)
2 or 3 options- medium (3 points)
4 or more options- low (1 point)

M-2. Are the areas invaded by the species in question accessible?
5 or more difficult to access areas- high (5 points)
2 to 4 difficult to access areas- medium (3 points)
1 or no difficult to access areas- low (1 point)
Unknown

M-3. Are there impacts of the control of the species in question on native species?
Heavy control impacts- high (5 points)
Somewhere in the middle- medium (3 points)
Slight control impacts- low (1 point)

M-4. What is the time commitment to the management of the species?
Repeat treatments over a number of years- high (5 points)
Repeat treatments only once or twice after initial- medium (3 points)
Treat once- low (1 point)

Total for Management Section: 12, Rank: Medium
(High 20-16, Medium 15-10, Low 9-0)

Section 2 Total: 25/45, Section 2 Rank: Medium

Comments: May be of concern in specific areas, but not wide-spread.

Santa Monica Mountains National Recreation Area Exotic Threat Assessment (Updated August 9, 2006)

Vinca major, periwinkle

Section 1: General Threat Assessment

Biology

B-1. Does the species in question utilize any of the following reproduction methods?
High seed production (1000+)
Long seed viability (2+ years)
Produces seeds more than once a year
Self-fertilization
High germination rate
Rapid growth to maturity
Vegetative reproduction
Other- rhizomes, node sprouts, etc.
Explain other:

3 or more traits- high (5 points)
2 traits- medium (3 points)
1 or fewer traits- low (1 point)
Unknown

B-2. Does the species exhibit any of the following competitively advantageous traits?
Alleopathic
Stress tolerant (drought, shade, etc)
Growth habits (dense, smothering, etc)
Other (nitrogen-fixing, parasitic, etc.)
Explain other:

2 or more traits- high (5 points)
1 trait- medium (3 points)
0 traits- low (1 point)
Unknown

B-3. Does the species in question use any of the following methods of dispersal?
Wind
Water
Animal
Human
Rapid local dispersement
Fragments resprout

2 or more traits- high (5 points)
1 trait- medium (3 points)
0 traits- low (1 point)
Unknown

Total for Biology Section: 11, Rank: High
(High 15-11, Medium 10-7, Low 6-0)

History

H-1. Is the species in question naturalized beyond its native range elsewhere?
Yes, at a wide variety of places- high (5 points)
Yes, at a few places- medium (3 points)
No, not at present- low (1 point)

H-2. Has the species in question invaded habitats found in the SSMNRA?
Yes, in a wide variety of places- high (5 points)
Yes, in a few places- medium (3 points)
No, not at present- low (1 point)

H-3. Are there other weedy species in the genera?
Yes, a large proportion of the genera are weedy- high (5 points)
Yes, a small proportion of the genera are weedy- medium (3 points)
No or only a very small number- low (1 point)

Total for History Section: 11, Rank: High
(High 15-11, Medium 10-7, Low 7-0)

Impact

I-1. Does the species in question alter ecosystem processes?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)
Unknown

I-2. Does the species in question alter community structure?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)

I-3. Does the species in question alter community composition?
Yes, substantially- high (5 points)
Yes, slightly- medium (3 points)
No- low (1 point)

Total for Impact Section: 15, Rank: High
(High 15-11, Medium 10-7, Low 7-0)

Section 1 Total: 37/45, Section 1 Rank: High

Section 2: Park-Specific Threat Assessment *(Vinca major)*

Distribution

D-1. What is the species' current range in the SMMNRA?
1000+ ha- Entrenched [stop here, species is ranked E for Entrenched]
999 to100 ha- difficult to manage (5 points)
99 to 11 ha- medium difficulty to manage (3 points)
10 to 0 ha- easiest to manage (1 point) 10.14 ha
Unknown

D-2. How many locations in the SMMNRA have stands?
12 or more sites- High (5 points)
11 to 6 sites- Medium (3 points)
5 or fewer sites- Low (1 point)
Unknown

List all sites with known stands: Malibu Creek, Topanga, Coldwater Canyon, private lands

D-3. Which of the known habitats on SMMNRA are susceptible to the species?
Coastal Salt Marsh
Coastal Strand
Coastal Sage Scrub
Chaparral
Riparian Woodland
Valley Grassland
Valley Oak Savanna
Coast Live Oak Woodland
Freshwater Ponds and Lakes

4 or more susceptible- high (5 points)
2 to 3 susceptible- medium (3 points)
1 or none susceptible- low (1 point)

Total for Distribution Section: 5, Rank: Low
(High 15-11, Medium 10-7, Low 6-0)

SMMNRA Impact

SI-1. The areas threatened by the species in question are of:
High significance- high (5 points)
Medium significance- medium (3 points)
Low significance- low (1 point)

SI-2. The native species threatened by the species in questions are:
Endangered/threatened/rare in SMMNRA- high (5 points)
Common species- medium (3 points)
No species are directly threatened- low (1 point)

Total for Impact Section: 8, Rank: High
(High 10-8, Medium 7-4, Low 4-0)

Management

M-1. What techniques are available for managing the species in question?
Mechanical
Biological
Chemical
Volunteer/Hand-pull
Other
Explain other:

0 or 1 options- high (5 points)
2 or 3 options- medium (3 points)
4 or more options- low (1 point)

M-2. Are the areas invaded by the species in question accessible?
5 or more difficult to access areas- high (5 points)
2 to 4 difficult to access areas- medium (3 points)
1 or no difficult to access areas- low (1 point)
Unknown

M-3. Are there impacts of the control of the species in question on native species?
Heavy control impacts- high (5 points)
Somewhere in the middle- medium (3 points)
Slight control impacts- low (1 point)

M-4. What is the time commitment to the management of the species?
Repeat treatments over a number of years- high (5 points)
Repeat treatments only once or twice after initial- medium (3 points)
Treat once- low (1 point)

Total for Management Section: 10, Rank: Medium
(High 20-16, Medium 15-10, Low 9-0)

Section 2 Total: 23/45, Section 2 Rank: Medium

Comments: Locally a problem in Malibu Creek and Topanga State Park.

APPENDIX 10 – GLOSSARY

AHP – Analytic Hierarchy Process – process utilizing paired comparisons to facilitate the ranking, and subsequent weighting of both quantitative and qualitative criteria

Biocontrol – use of natural predators or diseases to control the populations of invasive non-native specues

CESO – *Centaurea solstitalis* (yellow starthistle)

COJU – *Cortaderia jabata* (pampas grass)

CI – consistency index- a measure of the deviation from consistency calculated by $(\lambda_{max}\text{-n})/\text{n-1})$

CR – consistency ratio calculated by: CI/RI

Criterion – one of the 26 population characteristics used in the prioritization

DEDO – *Delairea odorata* (German ivy)

Entrenched – a non-native species too widespread to be effectively managed, so that it is considered permanently established

ETA (Exotic Threat Assessment) – Assessment used to determine the risk a particular plant species poses to an area.

EUTE – *Euphorbia terracina* (false caper)

FOVU – *Foeniculum vulgare* (fennel)

Invasive non-native species – non-native species with the ability to significantly alter the quality of natural ecosystems

Management – the intentional manipulation of habitat, in the case of invasives, to remove or eradicate non-native populations

NIGL – *Nicotiana glauca* (tobacco tree)

Non-native species – an organism living beyond its natural or historical range

NRA – national recreation area

PHAQ – *Phalaris aquatica* (harding grass)

Priority – Final value calculated for a population by adding the weighted scores for each criterion.

RI – average consistency ratio

Score – value assigned to a particular population for one criterion

SMMNRA – Santa Monica Mountains National Recreation Area

Weight – eigenvector values calculated using AHP

Weighted score – calculated by multiplying the score times the weight for a critierion

APPENDIX 11 – SUPPLEMENTAL MATERIALS

For additional materials, including how-to instructions for the ETA and prioritization, completed exotic threat assessment forms for all 30 species assessed, excel prioritization spreadsheet, GIS database, and Access database, please e-mail rkent@bren.ucsb.edu.