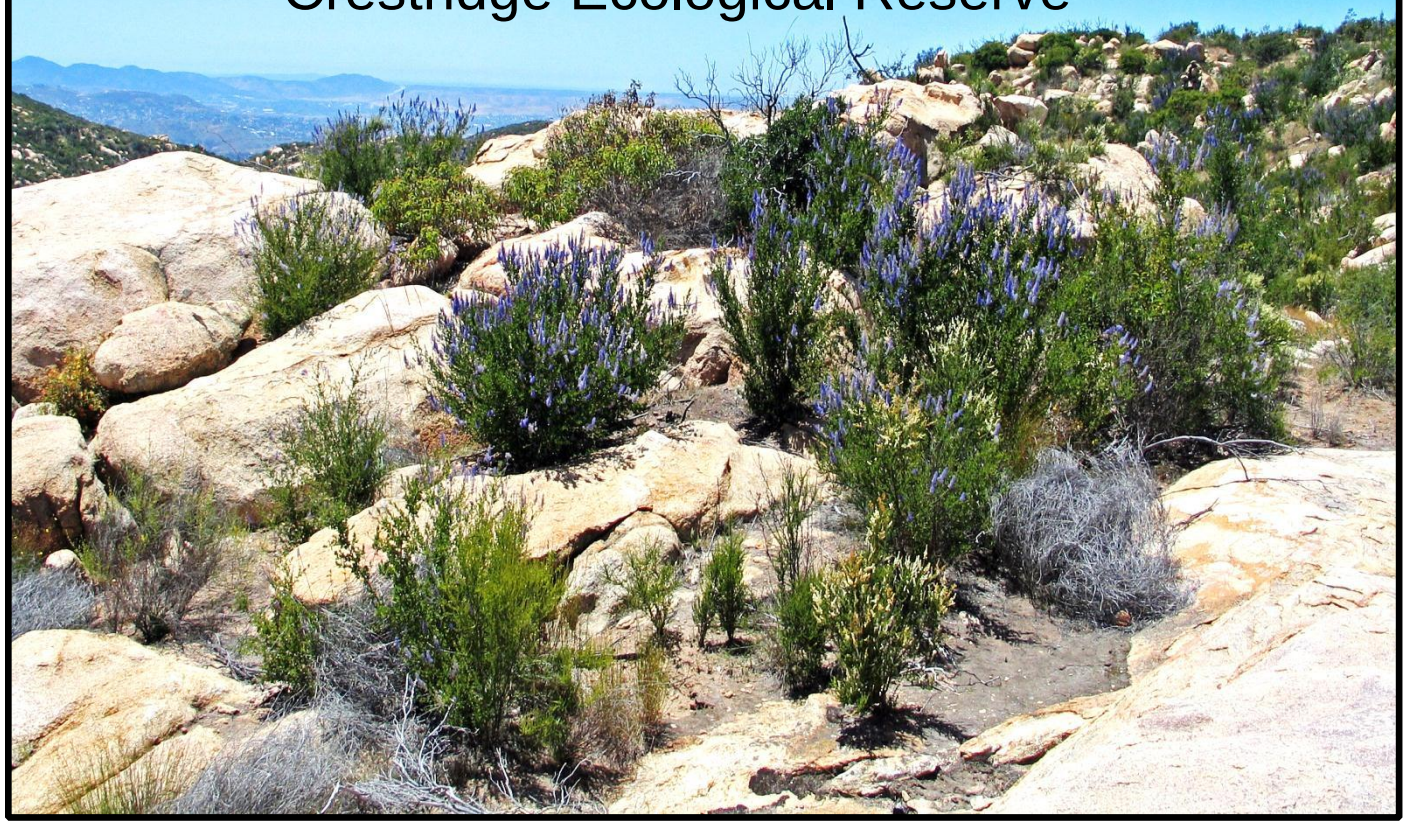
2011

Biological Monitoring Status Report

Crestridge Ecological Reserve



Prepared for

Endangered Habitats Conservancy

Prepared by

Conservation Biology Institute

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Executive Summary

In 2011, the Conservation Biology Institute (CBI) conducted biological monitoring on the Crestridge Ecological Reserve (CER) in San Diego County, California. Monitoring focused on detecting and/or assessing the status of two MSCP covered plant species: San Diego thornmint (*Acanthomintha ilicifolia*) and Lakeside ceanothus (*Ceanothus cyaneus*). Monitoring strategies included direct observations and photomonitoring, as well as seed collection for Lakeside ceanothus. Additional sensitive or unique species were mapped or recorded where observed; these included Palmer's sagewort (Artemisia *palmeri*), Palmer's grapplinghook (*Harpagonella palmeri*), and rush-like bristleweed (*Xanthisma junceum*).

Focused surveys were conducted for San Diego thornmint, a federally threatened and state endangered species. A small population (17 plants) of thornmint was found on the slopes above Rios Canyon ('Thornmint Hill') in 2010; thus, 2011 efforts included revisiting this population and searching adjacent, suitable habitat for additional stands. We detected this species within the 2010 stand boundary; however, only one individual was observed and the density of the nonnative plant, tocalote (*Centaurea melitensis*), appeared to be higher than in 2010. We did not detect thornmint elsewhere onsite. Much of the formerly suitable habitat is now dominated by the nonnative grass, purple falsebrome (*Brachypodium distachyon*).

Photomonitoring was conducted for both San Diego thornmint and Lakeside ceanothus, utilizing the one thornmint and eight Lakeside ceanothus photopoint locations established in 2010. The 2011 photodocumentation was compared to 2010 baseline photodocumentation to assess and provide a record of general habitat conditions and threats to population stability from natural or anthropogenic sources. Photomonitoring is intended to serve as both an 'early-warning' system and provide a long-term (photographic) record of change over time.

Seed collection was conducted for Lakeside ceanothus in the east-central portion of the reserve, east of the 2010 seed collection effort. Seed collection is a goal for this species in the HMMP, and is intended as a 'hedge' against extinction or extirpation by preserving genetic diversity and providing a seed source in the event of catastrophic disturbance. Seed collection was considered a priority after the 2003 Cedar fire, which burned the majority of the Lakeside ceanothus population onsite. Collected seed was deposited at the San Diego Zoo Global Institute for Conservation Research (ICR) for processing and long-term storage. The collection effort yielded nearly 38,500 seeds. The seed is currently in long-term storage at ICR and will be available for conservation/recovery purposes on the reserve.

Although not a specific element of the 2011 work scope, CBI biologists also detected a California gnatcatcher (*Polioptila californica*) on Thornmint Hill. This constitutes the first observation of this federally threatened species on CER since the 2003 Cedar Fire.

Based on 2011 monitoring results, in conjunction with information from the 2009-2010 monitoring seasons, the following recommendations are provided for future monitoring or management of MSCP covered plant species *and* additional sensitive plant species on CER:

Species[1]	Status	Recommendations[2]
San Diego Thornmint (*Acanthomintha ilicifolia*)	Detected in 2010 and 2011; habitat threatened by invasive plants	• Protocol monitoring • Maintain/establish additional photoplots as warranted • Invasives control
Lakeside Ceanothus (*Ceanothus cyaneus*)	Stable	• Protocol monitoring • Photoplot monitoring
San Diego Sagewort (*Artemisia palmeri*)	Stable/Increasing	• Presence/absence monitoring every 3 years • Establish additional photomonitoring plots; monitor annually or biannually
Palmer's Grapplinghook (*Harpagonella palmeri*)	Stable/habitat threatened by invasive plants	• Implement invasives control (see thornmint, above)
Rush-like bristleweed (*Xanthisma junceum*)	Stable	• Periodically assess along trails; reroute trails or implement invasives control as needed
Ramona Horkelia (*Horkelia truncata*)	Stable/some stands threatened by erosion; no new detections in 2011	• Population monitoring every 3 years • Photoplot monitoring annually or biannually
San Diego Goldenstar (*Bloomeria [=Muilla] clevelandii*)	Detected in 2010; no new detections in 2011	• Protocol monitoring during optimal rainfall years • Establish photoplots

[1] San Diego thornmint, Lakeside ceanothus, San Diego sagewort, Palmer's grapplinghook, and rush-like bristleweed are discussed in this report; recommendations for the remaining species are based on 2009-2010 monitoring efforts.

[2] Protocol monitoring for MSCP covered species is per the San Diego rare plant monitoring plan (Tracey et al. 2011) or forthcoming recommendations from the Rare Plant Monitoring Protocol Oversight Committee. Protocol monitoring replaces earlier MSCP monitoring recommendations.

Introduction

This report summarizes 2011 biological monitoring activities conducted by the Conservation Biology Institute (CBI) on the Crestridge Ecological Reserve (CER) in San Diego County, California (Figure 1). The 2011 monitoring effort focused on two MSCP covered species: San Diego thornmint (*Acanthomintha ilicifolia*) and Lakeside ceanothus (*Ceanothus cyaneus*).

Previous monitoring for these species onsite included:

- Presence/absence surveys for San Diego thornmint in 2009 and 2010 (with detection in 2010)
- Population monitoring for Lakeside ceanothus in 2009
- Photopoint monitoring for San Diego thornmint and Lakeside ceanothus in 2010
- Seed collection for Lakeside ceanothus in 2010

Monitoring follows general guidelines in the Habitat Management and Monitoring Plan (HMMP) (CBI and EHC 2009) and is additionally informed by results and recommendations from previous monitoring efforts (Table 1). Based on the 2011 budget allocation, specific tasks included presence/absence monitoring for San Diego thornmint, photopoint monitoring for San Diego thornmint and Lakeside ceanothus, and seed collection for Lakeside ceanothus. Although not a part of the work scope, additional sensitive species detected during the course of field surveys were documented and are also reported in this document. Invasive species mapping and control efforts on CER were conducted under a separate contract and are not included in this report. The 2011 monitoring activities for sensitive plants on CER are discussed in the following sections with respect to methodology, results, and recommendations.

Sensitive Species Surveys

Focused surveys were conducted for the federally and state-endangered plant, San Diego thornmint. San Diego thornmint was detected on CER in 2010, which constituted the first onsite observation since 2003. The 2011 monitoring effort assessed the status of the 2010 occurrence, and surveyed additional, potentially suitable habitat. San Diego thornmint and other detected sensitive species are addressed in this section.

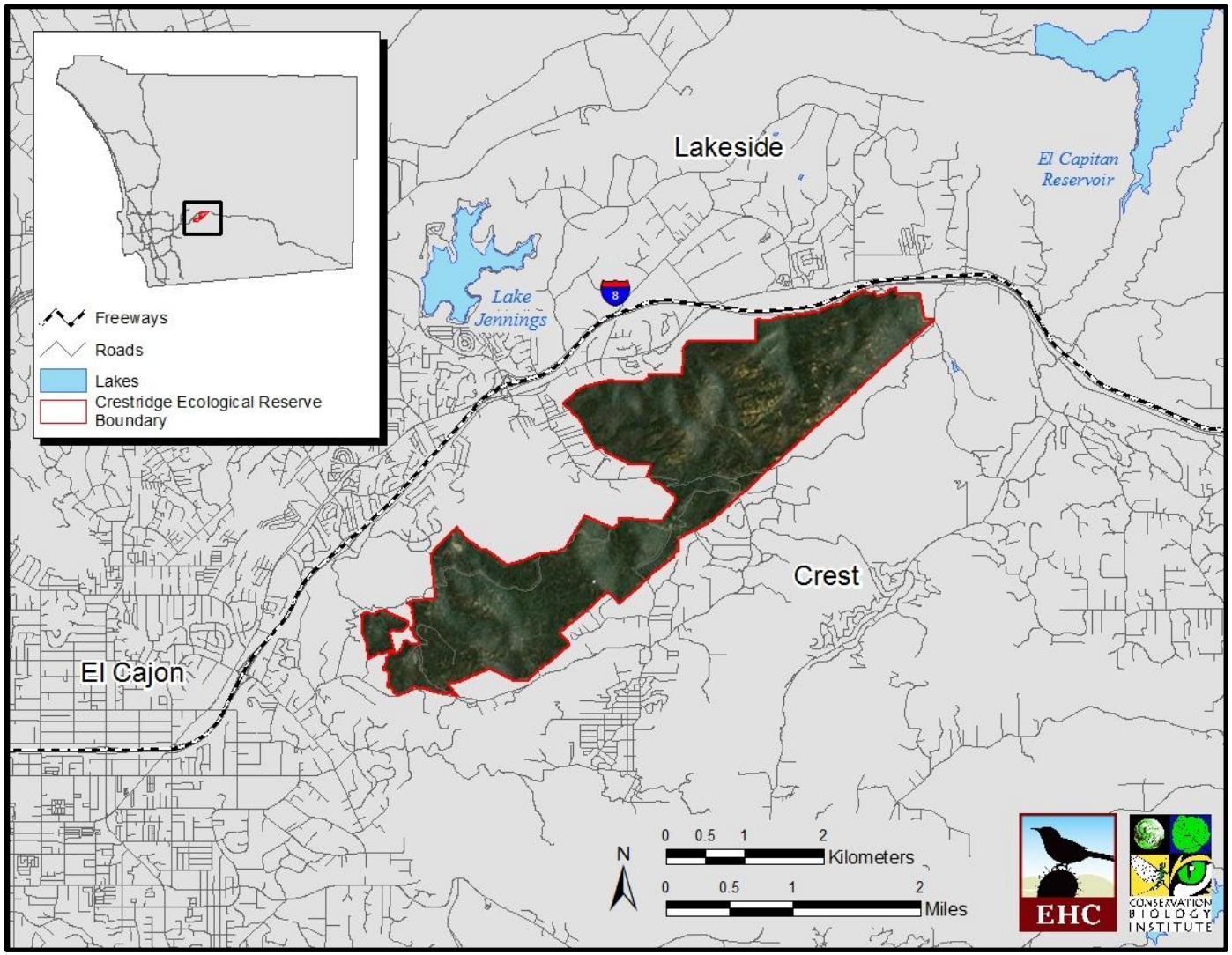

Figure 1. Location of Crestridge Ecological Reserve, San Diego County, California.

Table 1

2011 Sensitive Plant Species Monitoring Recommendations

Species	Status	Recommendations
San Diego Thornmint (*Acanthomintha ilicifolia*)	Unknown (not detected in 2009)	• Annual presence/absence monitoring • Annual population monitoring if species is detected • Invasives control • Document invasives control efforts
Lakeside Ceanothus (*Ceanothus cyaneus*)	Stable	• Population monitoring every 3-5 years • Annual photoplot monitoring • Seed collection

Methodology

San Diego thornmint surveys were conducted by botanist Patricia Gordon-Reedy and field assistant Curtis Battle, according to the schedule in Table 2. Surveys focused on suitable habitat, i.e., clay soils in the vicinity of 'Thornmint Hill' (slopes directly east of Rios Canyon). Survey methodology consisted of walking transects through suitable habitat; surveyors were generally spaced no more than 5-10 meters (m) apart. Habitat was visited multiple times to determine presence/absence and collect pertinent data.

Although focused surveys were conducted only for San Diego thornmint, new occurrences of additional sensitive plant species were mapped where encountered. Locations of all sensitive plants were recorded using a Garmin 60CSX GPS unit and are listed in Appendix A.

For all sensitive plant species detected in 2011, population size and habitat information was recorded in field notes and California Native Species Field Survey Forms were completed (Appendix B). These forms will be submitted to the CNDDB as part of the 2011 reporting process.

Table 2

2011 Sensitive Plant Survey Schedule

Survey Personnel[1]	Survey Date	Survey Type	Survey Location
PGR/CB	4/20/11	Presence/absence; population estimates	Slopes above Rios Canyon
PGR/CB	5/6/11	Presence/absence; population estimates	Slopes above Rios Canyon
PGR/CB	6/2/11	Presence/absence; population estimates	Slopes above Rios Canyon

[1]PGR = Patricia Gordon-Reedy; CB = Curtis Battle.

Results

San Diego Thornmint

San Diego thornmint is a federally threatened and state endangered species, as well as a MSCP covered species. In the revised California Native Plant Society's (CNPS) ranking system (CNPS 2011), this species has a California Rare Plant Rank of 1B.1, indicating that it is rare, threatened, or endangered in California and elsewhere, and seriously endangered in California.

San Diego thornmint was first detected on CER in 2000, when two stands were mapped on slopes above Rios Canyon ('Thornmint Hill'). A small stand was detected by the California Department of Fish and Game (CDFG) in the same area in 2003 (D. Lawhead, pers. comm.). The species had not been seen in this location since 2003, despite numerous survey efforts (D. Lawhead, pers. comm.; SDNHM 2005; CBI 2009). In addition, habitat on Thornmint Hill had burned in the 2003 Cedar fire. The 2009 monitoring report (CBI 2009) provides the survey history and known locations of San Diego thornmint on CER. In 2010, a small stand of thornmint (17 plants) was detected near the smallest of the year 2000 occurrences. A photomonitoring point was established at this location in 2010 to develop a photographic record of the species, habitat, and general location.

In 2011, a single thornmint plant was detected within the 2010 stand boundary (Figure 2). Despite the similarity in dates between 2010 and 2011 surveys, phenology in 2011 was advanced compared to 2010, with the observed individual in fruit versus in flower at the time of detection (see Appendix C.1). While this made the plant more cryptic, the surrounding area was carefully assessed to ensure that no additional plants were present, regardless of phenological condition.

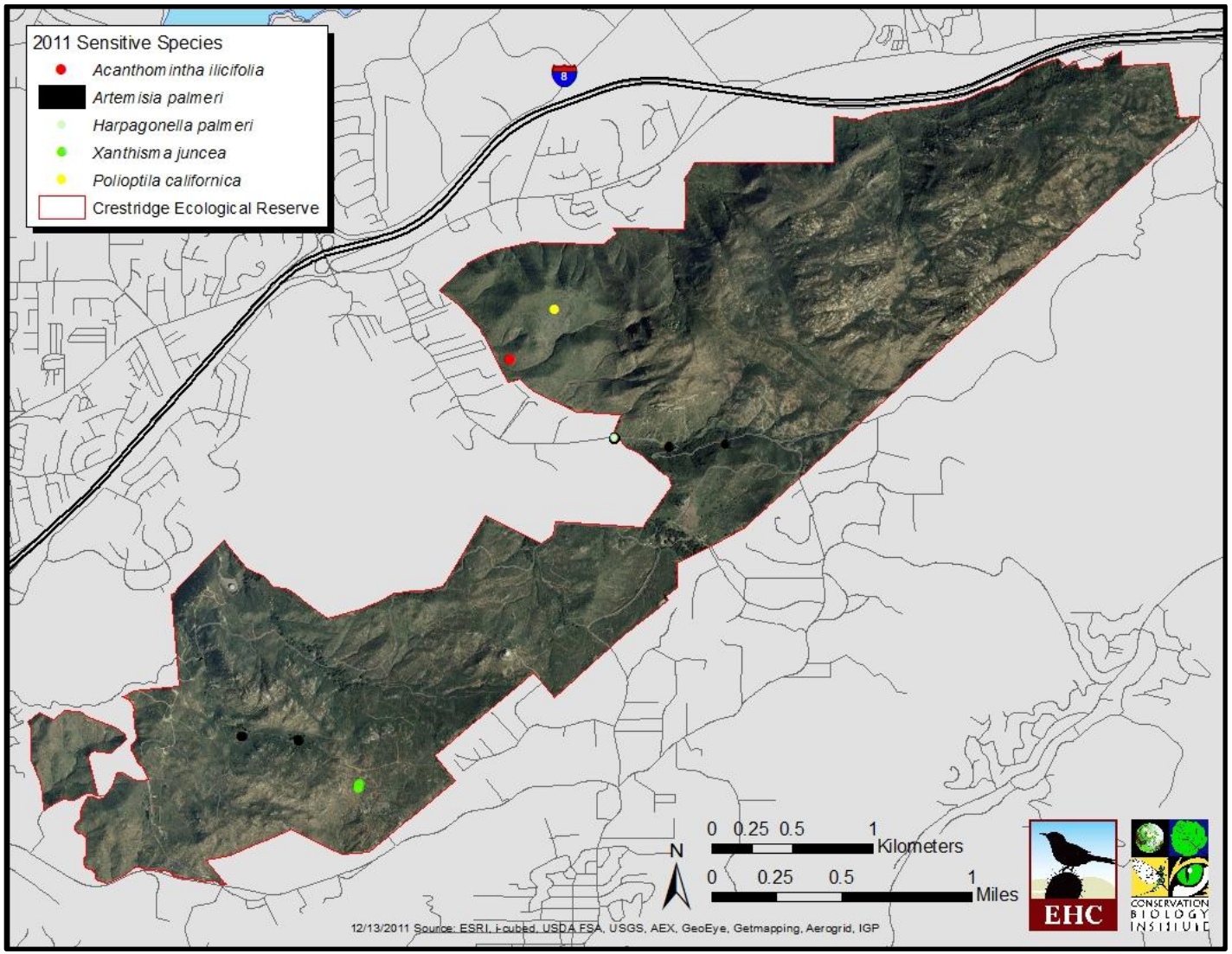

Figure 2. 2011 Sensitive Species Locations.

One apparent difference in site conditions within and surrounding the 2010-2011 occurrence was an increase in density of the invasive plant, tocalote (*Centaurea melitensis*). Tocalote is a winter annual, and dense infestations are known to displace native plants and animals (DiTomaso and Gerlach 2000). Tocalote is specifically cited as reducing seed production of San Diego thornmint (Bauder unpublished data *in* DiTomaso and Gerlach 2000).

The remainder of potentially suitable San Diego thornmint habitat onsite is currently invaded by the nonnative, invasive grass, purple falsebrome (*Brachypodium distachyon*). The density of this infestation has displaced virtually all native annual plant species. Efforts are currently underway through a San Diego Association of Governments (SANDAG) Environmental Mitigation Program (EMP) grant to determine appropriate control strategies for purple falsebrome onsite, with a focus on restoring habitat for San Diego thornmint.

While it appears evident that the lack of thornmint plants over the majority of Thornmint Hill is related to the density of purple falsebrome, and the small stand of thornmint observed in 2010 and 2011 may be adversely affected by tocalote density, climatic conditions also influence germination and survivorship of native plants and particularly, annual species. For that reason, we reviewed temperature and rainfall patterns during the growing period. For our purposes, we conservatively consider the 'growing period' as September through June, since rainfall during this period can result in germination and persistence of both native annual species and nonnative grasses and forbs.

Climatic data was obtained from the Western Regional Climate Center (WRCC 2011), Alpine, California station, and consisted of monthly averages for temperature and precipitation. While these data are coarse, they give some indication of the overall weather patterns during the period of interest. WRCC data gaps (i.e., months for which no temperature data were available) were supplemented with information from a Granite Hills/El Cajon weather station (Weather Underground 2011). Figure 3 provides temperature data for the years 2000, 2009, 2010, and 2011. Year 2000 represents the largest recorded population of San Diego thornmint onsite. The remaining years represent years for which we have monitoring data; San Diego thornmint was observed in 2010 and 2011, but not in 2009.

Both 2000 and 2009 – the years with the highest and lowest numbers of thornmint – showed a slight spike in fall temperatures; otherwise, temperature patterns between years appear similar throughout the growing season. No statistical analyses were run on temperature data.

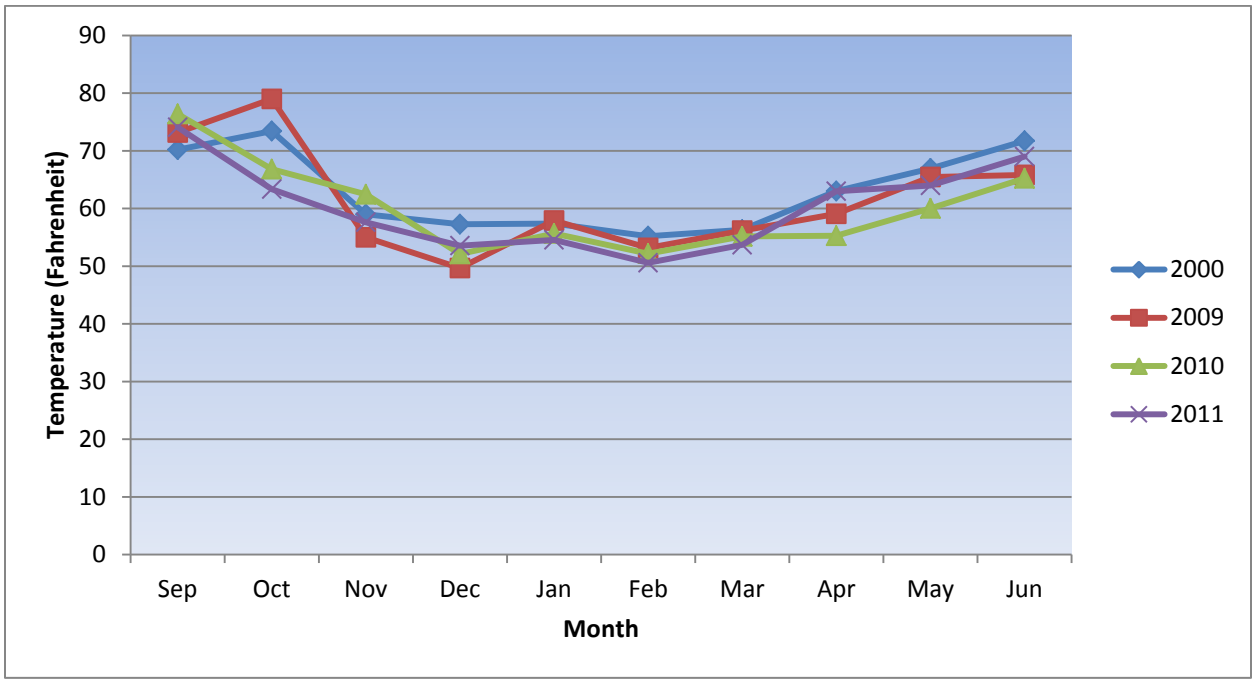

Figure 3. Temperature patterns near the Crestridge Ecological Reserve (2000 and 2009-2011 growing seasons).

Rainfall data are presented in Figure 4 for the same set of years and growing period. No statistical analyses were run on these data. Of interest is the shift in year 2000 rainfall versus the other years, i.e., there was relatively little fall and early winter precipitation, accompanied by persistence of precipitation into the late spring. One hypothesis is that fall-early winter rains promote establishment of nonnative grasses and forbs that outcompete native annual species. The lack of a dense grass cover in 2000 may have been beneficial for thornmint germination and establishment.

Precipitation data for 2010 and 2011, years in which thornmint was present in small numbers, also reveal inter-year differences in rainfall patterns that may have influenced germination and/or establishment of this species (Figure 5). Observations on CER and other wildland areas in San Diego County indicated that both native and nonnative grasses benefitted from the late winter-early spring rains during the 2011 growing season. Likewise, late season rains may be important for the growth, survival, and productivity of thornmint, particularly in the presence of high temperatures. Lower rainfall in April 2011 likely contributed to the advanced phenology seen by early June 2011. Conversely, late season rainfall in April 2010 may have contributed to the phenology (i.e., plants were still flowering) seen in early June of that year.

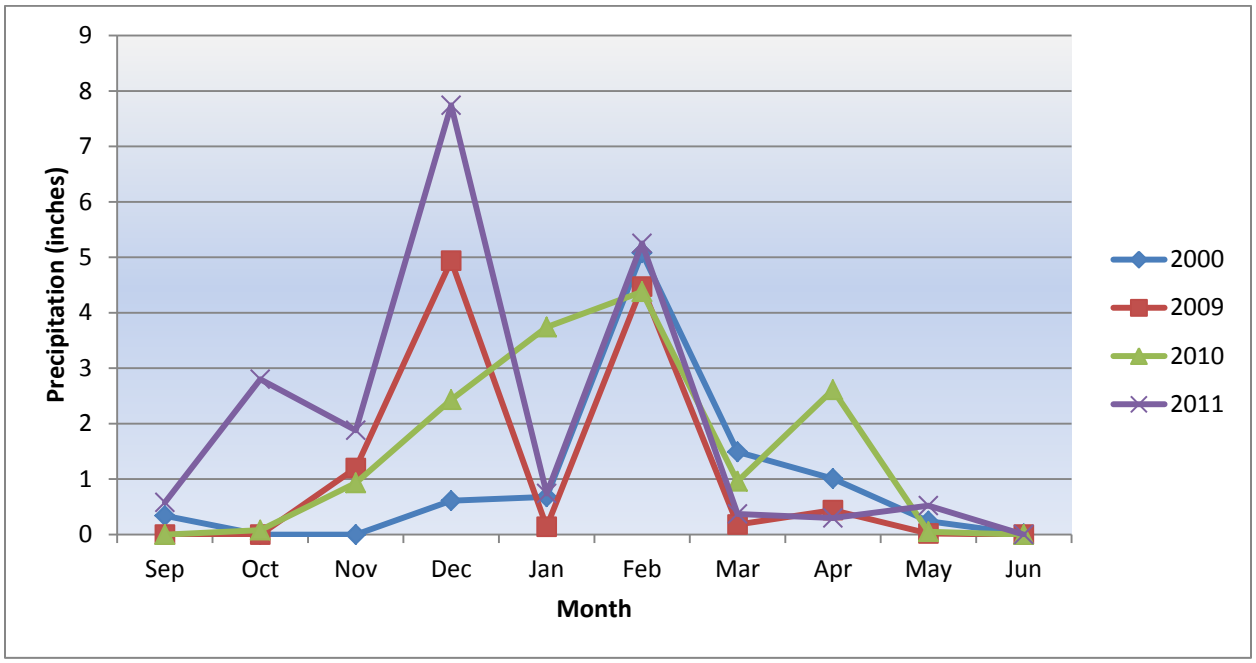

Figure 4. Distribution of rainfall near the Crestridge Ecological Reserve (2000 and 2009-2011 growing seasons).

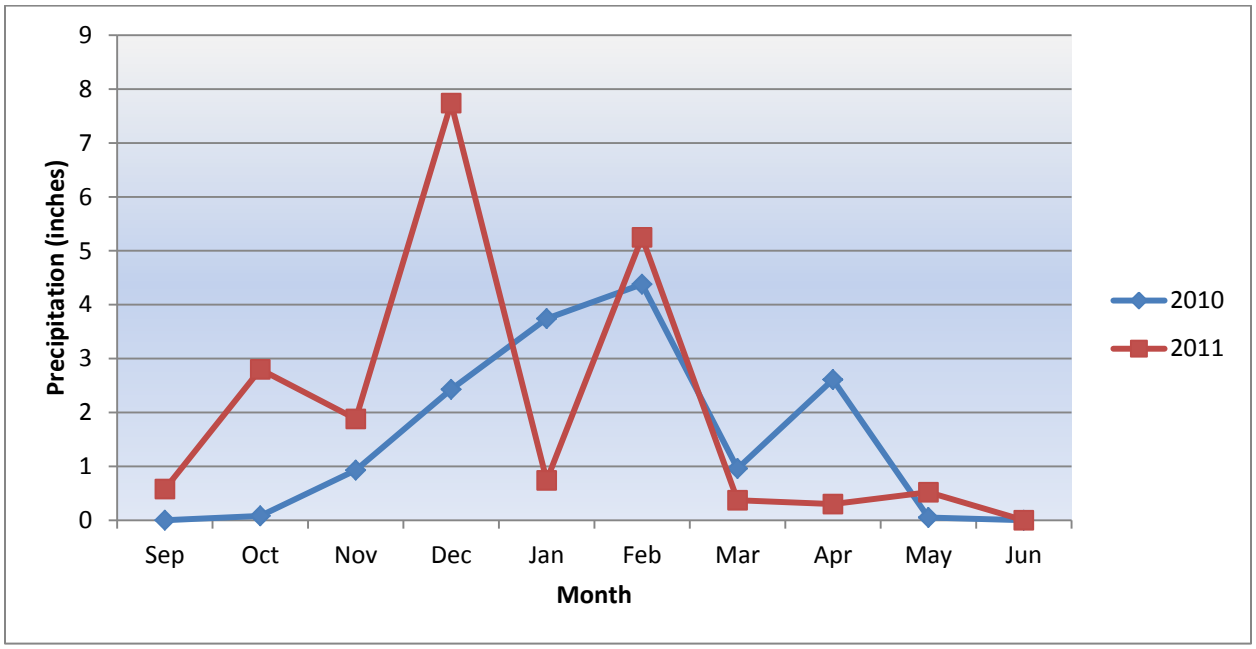

Figure 5. Distribution of rainfall near the Crestridge Ecological Reserve (2010 and 2011 growing seasons).

Palmer's Sagewort

A number of small to medium-sized stands of the native Palmer's sagewort were mapped onsite in 2011, in association with an invasive plant mapping project conducted through a SANDAG EMP grant. Some of these occurrences had been previously recorded as point locations, and the 2011 effort constituted a refinement of earlier mapping. Other locations are additions to the sensitive plant database for CER. These stands were found primarily in association with scrub or oak woodland habitat in three locations: (1) Rios Canyon; (2) the oak grove in the west-central portion of CER; and (3) along the powerline road in the west-central portion of CER. Mapped locations are presented in Figure 2; stand information (including location, vegetative association, and population size) is included in Appendices A and B. In the California Native Plant Society's (CNPS) ranking system, Palmer's sagewort has a Rare Plant Rank of 4.2. Rank 4 is a watch list (formerly CNPS List 4); a ranking status of 4.2 indicates that the species is both uncommon and fairly endangered in California. Palmer's sagewort has no federal or state listing status.

Palmer's Grapplinghook

Palmer's grapplinghook (*Harpagonella palmeri*) is on the CNPS watch list as a plant of limited distribution (California Rare Plant Rank = 4.2; uncommon and fairly threatened in California). This species is an early-blooming annual herb that occurs on clay soils. Large populations of Palmer's grapplinghook have been observed on Thornmint Hill during every survey season; refer to previous survey reports for mapped locations of this species (CBI 2009, 2010). Although this species persists in large numbers on Thornmint Hill, it has declined in those portions of its habitat that have been invaded by purple falsebrome. In 2011, a new location of grapplinghook was mapped on lower slopes east of Rios Canyon and south of Thornmint Hill (Figure 2). This small stand (<100 individuals) occurred in disturbed scrub habitat just east of Rios Canyon Road. Stand information (including location, vegetative association, and population size) is included in Appendices A and B.

Rush-like Bristleweed

Rush-like bristleweed (*Xanthisma junceum* [=*Machaeranthera juncea*]) is on the CNPS watch list as a plant of limited distribution (California Rare Plant Rank = 4.3; uncommon and not very endangered in California). Several bristleweed plants were detected along the edge of a trail in the west-central portion of CER, in an area where the species had been previously mapped. Rush-like bristleweed is a perennial herb that occurs in or adjacent to chaparral. Because of its relatively late-blooming period (June-January) and wand-like growth habit, it is inconspicuous for much of the year. Mapped locations are presented in Figure 2; stand information (including location, vegetative association, and population size) is included in Appendices A and B.

Coastal California Gnatcatcher

Coastal California gnatcatcher (*Polioptila californica californica*) is a federally threatened species, a state species of special concern, and a MSCP covered species that has been previously reported from scrub habitat near (but not on) CER. The western part of the reserve is part of the Lakeside archipelago, a regional linkage comprised of patches of coastal sage scrub north and south of Interstate-8. Thus, habitat onsite may facilitate multi-generational dispersal of gnatcatchers between conserved lands north and south of the reserve.

Focused gnatcatcher surveys were conducted on CER in 2001 and 2009; however, no birds were detected. On May 6, 2011, a vocalizing bird was detected on Thornmint Hill (Figure 2) during invasive species monitoring under a separate contract.

Recommendations

San Diego Thornmint

Based on results of the 2011 thornmint survey, we recommend the following:

1. Subject to San Diego Rare Plant Monitoring Protocol development and plant presence, implement protocol monitoring in occupied and potential thornmint habitat to establish the boundary/extent of the population and assess population fluctuations and threats. Results should be correlated to climatic variables *and* invasive control treatments.

2. Maintain and/or establish additional photomonitoring points within occupied thornmint habitat and monitor yearly to develop a photographic record of this species and its habitat onsite.

3. Initiate control efforts for tocalote within occupied thornmint habitat detected in 2010 and 2011. The control strategy should include multiple treatments to account for staggered germination times (e.g., 2 week intervals), using a backpack sprayer and glyphosate if no thornmint seedlings are present, and wick applications if thornmint is present. Where tocalote seedlings are small, a 2% glyphosate solution that will cover the entire foliage should be effective; however, if there are a range of rosette sizes, a 50% solution of glyphosate may be required. Where tocalote plants have bolted, they should be cut to the surface and the cut stem wick-treated with the 50% glyphosate solution (J. Ekhoff, pers. comm.) Care should be taken not to disturb the soil surface.

4. Continue efforts to develop and implement a *Brachypodium* monitoring and management strategy to (1) protect San Diego thornmint habitat from further degradation, (2) rehabilitate

degraded thornmint habitat, and (3) improve native species diversity in and adjacent to thornmint habitat. It is envisioned that this strategy will include an experimental component to determine effective treatment methods for *Brachypodium* and the effect of treatments on native species, including thornmint. It should be noted that *Brachypodium* control efforts onsite are expected to be initiated in 2012 under a SANDAG EMP grant.

Palmer's Sagewort

Based on results of the 2011 surveys, we recommend the following:

1. As funding allows, establish additional photomonitoring points for newly detected, larger stands of Palmer's sagewort. We recommend biennial photomonitoring that focuses on stands in or adjacent to sensitive habitats (e.g., coastal sage scrub, oak woodland) and/or along trails where this species could be potentially impacted by recreational activities and invasive plant species. Where impacts are detected that significantly affect the continued existence of Palmer's sagewort in a given location, implement measures to reduce/eradicate the change agent. Potential measures may include rerouting trails or invasives control.

Palmer's Grapplinghook

Based on results of the 2011 survey, as well as previous surveys, we recommend the following:

1. As funding allows, periodically assess (e.g., every 3 years) the status of this species on Thornmint Hill, where it faces threats from invasive plant species. The HMMP calls for presence/absence monitoring, with an assessment of the following attributes: recreational impacts; efficacy of targeted management actions; and population health or condition (e.g., level of disturbance, degree of recruitment, threats from invasive species. It should be noted that Palmer's grapplinghook occurs in similar habitat as San Diego thornmint, and is expected to benefit from invasive control measures currently underway for that species.

Rush-like Bristleweed

Based on results of the 2011 survey, as well as previous surveys, we recommend the following:

1. As funding allows, periodically assess (e.g., every 3 years) the status of this species along trails, where it may be potentially impacted by recreational activities and/or invasive plant species. Where anthropogenic impacts are detected that damage or destroy individual plants, implement measures to reduce/eradicate the change agent. Potential measures may include rerouting trails or invasives control.

Coastal California Gnatcatcher

In recent years, California gnatcatcher surveys have been conducted at the regional versus preserve-level. The San Diego Management and Monitoring Program indicated recently that no gnatcatcher surveys will be conducted in 2012 pending review of regional data and survey protocols. Therefore, no gnatcatcher surveys are recommended on CER in 2012.

Photomonitoring

In 2010, CBI established permanent photopoints to monitor selected populations of sensitive species through photodocumentation. The 2010 monitoring effort developed a baseline photographic record of habitat/site conditions for four sensitive plant species on the reserve: San Diego thornmint, Palmer's sagewort, Lakeside ceanothus, and Ramona horkelia. San Diego thornmint and Lakeside ceanothus are MSCP covered species; the other two species are CNPS listed species that occur primarily along trails and thus, are subject to impacts from authorized/unauthorized land uses and invasive plant species.

For this program, photomonitoring is intended to provide a qualitative record of changing habitat conditions, including invasive species, successional changes, erosion, or other disturbances that might warrant management considerations. This monitoring is not designed to provide estimates of population density or cover, nor is it not intended to replace more intensive (protocol) species monitoring. Rather, it is intended to supplement species monitoring and provide an 'early warning' system in interim years where more intensive monitoring is not conducted. In 2011, CBI continued photomonitoring at points previously established for San Diego thornmint and Lakeside ceanothus.

Methodology

Photopoint locations monitored in 2011 are presented in Figure 6, and include one photopoint for San Diego thornmint and eight photopoints for Lakeside ceanothus. Photopoints were originally sited to provide an advantageous view of the plant population or stand of interest. At each photopoint location, a permanent marker – or *monument marker* – was installed in 2010. We relocated survey markers and used photographic logs (see CBI 2010, Appendix C) to replicate approximate location and photo-direction of 2010 photographs. Photopoint monitoring was conducted according to the schedule in Table 3.

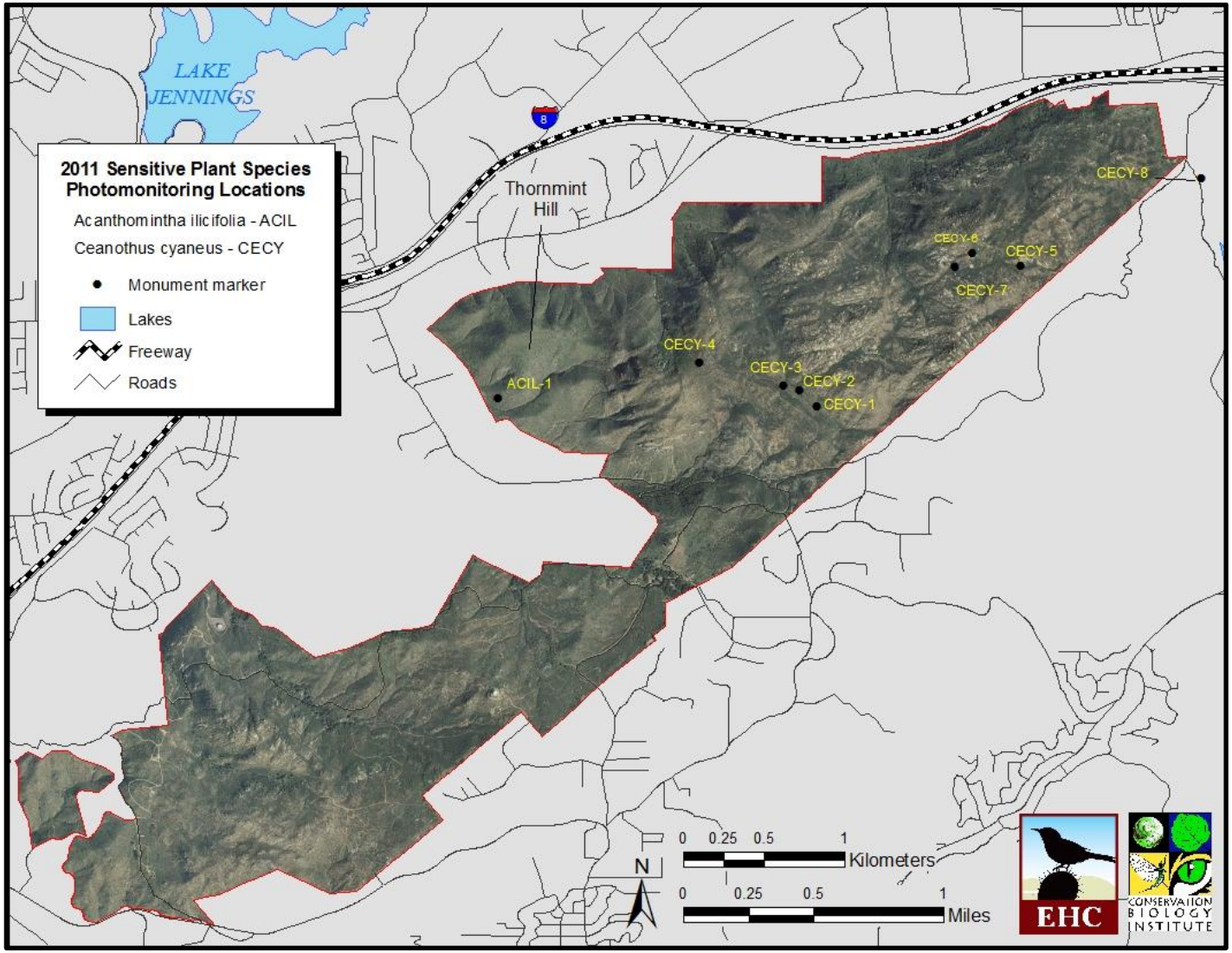

Figure 6. 2011 Photomonitoring Locations.

Table 3

2011 Photomonitoring Survey Schedule

Survey Personnel[1]	Survey Date	Species	Survey Location
PGR/CB	5/3/11	Lakeside Ceanothus	West-central portion of CER (vicinity of the 'racetrack')
PGR/CB	6/2/11	San Diego Thornmint	Slopes above Rios Canyon
PGR/CB	6/10/11	Lakeside Ceanothus	Eastern edge of CER
PGR/CB	6/14/11	Lakeside Ceanothus	East-central portion of reserve

[1]PGR = Patricia Gordon-Reedy; CB = Curtis Battle.

In a few locations, plant biomass (e.g., live growth and litter) had obscured markers, making relocation of markers difficult. We were unable to find the in-ground monument marker in only one location. In this case, previously recorded landmarks were used to approximate photo location.

Results

The photodocumentation record for 2011 is included in Appendix C, as follows:

- San Diego thornmint – Appendix C.1
- Lakeside ceanothus - Appendix C.2

The record includes both 2010 and 2011 photographs, to provide an inter-annual comparison of site conditions. Photodocumentation and visual observations of the San Diego thornmint site indicate an increase in cover of the nonnative, invasive plant, tocalote. Photodocumentation for Lakeside ceanothus sites show little inter-annual variability other than phenological conditions. However, visual observations did note an increase in nonnative species adjacent to one stand of Lakeside ceanothus (CECY-6).

Recommendations

Photopoint monitoring provides a relatively efficient and cost-effective method for monitoring changes in habitat and population conditions. Set-up of photomonitoring points is the most time-intensive phase of this monitoring activity. Now that points have been established, photographic documentation should be conducted at these points annually to allow for a 'rapid response' to impacts or changing habitat conditions. Photopoint monitoring should be supplemented by more detailed species monitoring at less frequent intervals (e.g., every 3-5 years; last conducted in 2009).

Based on results of the 2011 photopoint monitoring, we recommend continued photopoint monitoring of San Diego thornmint and Lakeside ceanothus in 2012. Monitoring for San Diego thornmint will likely continue indefinitely; the recommendation for monitoring of Lakeside ceanothus in 2012 is predicated largely on a perceived increase in invasive plants at some locations.

In addition, we recommend two specific improvements to the photomonitoring program that will improve re-location efficiency and use of photographs for yearly comparisons:

1. Replace the current monument markers, which are flush to the ground surface, with markers that are more visible to surveyors, yet still relatively inconspicuous to recreational users and other members of the public.

2. Utilize a tripod when photographing sites to better replicate photographic position from year-to-year. Photo-direction is currently replicated with compass points.

As funding allows, photomonitoring points should be established for San Diego goldenstar and newly detected populations of Palmer's sagewort, and points previously established for Palmer's sagewort and Ramona horkelia should be monitored.

Seed Collection

In 2010, CBI initiated a conservation seed collection for two 'populations' of Lakeside ceanothus on the reserve. Seed collection is identified as a goal in the HMMP, and was considered particularly important for this species because of impacts from the 2003 Cedar fire. The seed collection was established to act as a 'hedge' against extinction or extirpation by preserving genetic diversity and providing a seed source in the event of catastrophic disturbance. In addition, the collection provided information on seed viability and potentially functions as a

source of material for researchers. The 2010 seed collection effort focused on plants in the east-central portion of CER.

In 2011, we expanded the seed collection effort to include seed from stands of Lakeside ceanothus in the eastern portion of CER. These stands are separated from those in the east-central portion of the reserve by a north-south trending ridgeline, and typically bloom weeks to a month later than plants to the west. Collected seed was delivered to the San Diego Zoo's Global Institute for Conservation Research (ICR) at the Wild Animal Park in Escondido, California for processing, testing, and long-term storage. ICR was selected over Rancho Santa Ana Botanic Garden (the repository for the 2010 seed collection) because there was no funding mechanism to contract with the latter, as had been done in 2010. ICR agreed to take the seed at no expense.

Methodology

Seed collection was conducted by botanist Patricia Gordon-Reedy and field assistant Curtis Battle on July 2, 2011. Seed was collected according to standard seed collection protocols (e.g., CDFG Guidelines; General Seed Collection Guidelines for California Native Plant Species, Rancho Santa Ana Botanic Garden). In general, no more than 5% of seed was collected on a population or per plant basis; sampling was done randomly and evenly through the population (subject to topographic constraints); and plants were sampled in a variety of habitat conditions to maximize genetic diversity. For conservation collections, a minimum of 2,500 seeds per collection is typically used as a baseline target; the seed collection strategy onsite used this number as a minimum goal.

Collections were maintained in the field as maternal line samples (e.g., seed from each plant was maintained in separate bags) from 25 plants. General seed collection locations are presented in Figure 7. Collected seed was packaged and deposited at ICR for processing, viability testing, and long-term storage. The ICR seed collection form is included in Appendix D; collecting locations are listed in Appendix E.

Results

The collections yielded nearly 38,500 seeds. The collection has been placed in long-term storage at ICR and will be available for conservation/recovery purposes on the reserve, if needed. Minimum recommended conservation seed collections are typically on the order of 500-2,000 seeds.

ICR processed, tested, and stored seed as maternal line samples from 25 plants in one population on CER. A total of 38,478 seeds were collected, which far surpassed the collecting strategy objective. Quantity of seed is related to prolific seed production and does not represent

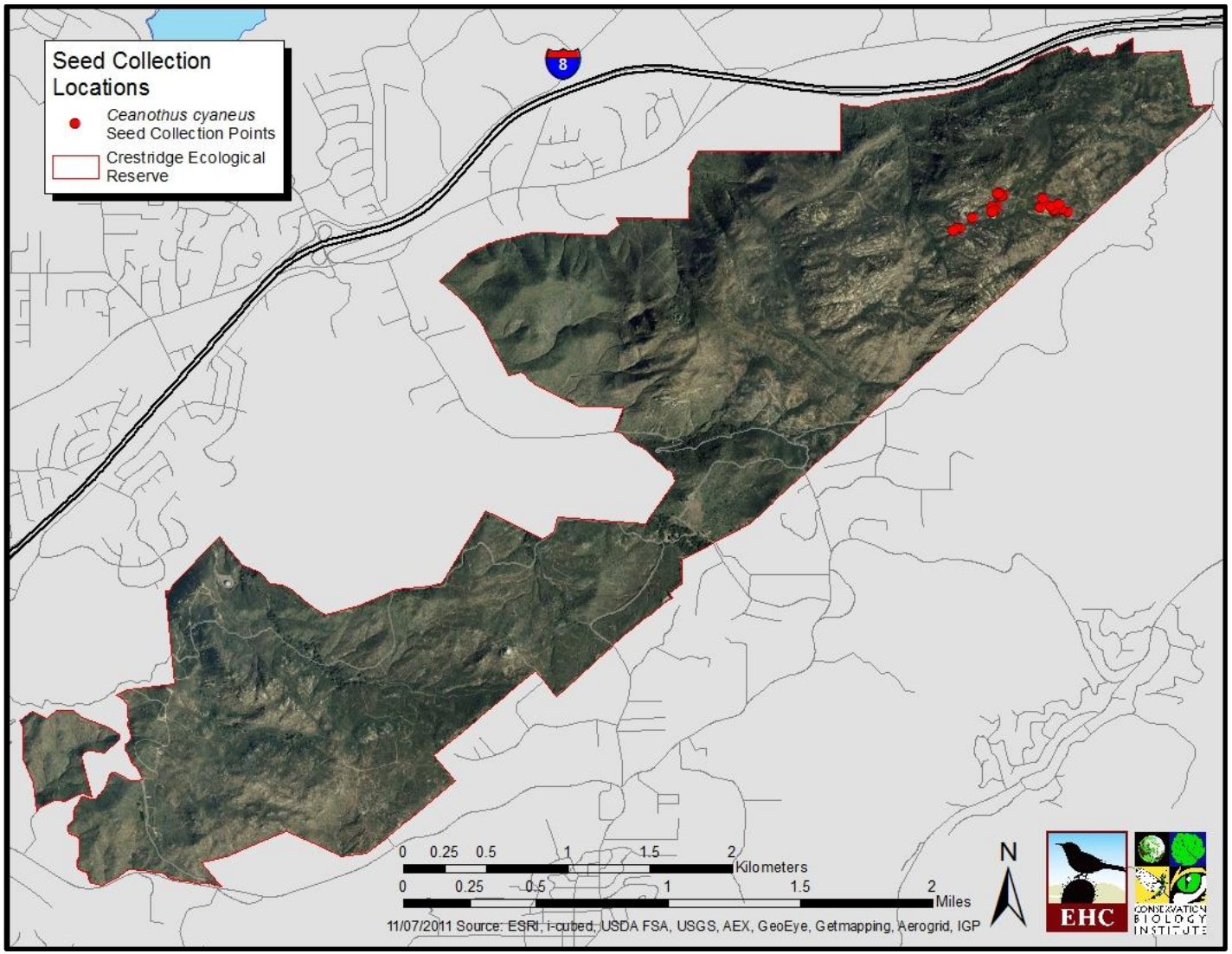

Figure 7. 2011 Seed Collection Locations.

collections beyond the 5% threshold. In combination with seed collected in 2010 and stored at Rancho Santa Ana Botanic Garden, the Lakeside ceanothus seed collection for CER now totals 117,391 seeds.

Recommendations

Based on successful seed collections in 2010 and 2011, no further seed collection is recommended at this time.

References

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