



RANCHO SANTA ANA BOTANIC GARDEN

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March 6, 2017

Bradd Baskerville-Bridges, Ph.D.
Recovery Branch Chief
U.S. Fish and Wildlife Service
Carlsbad Field Office
2177 Salk Avenue, Suite 250
Carlsbad, CA 92008

Dear Bradd,

Please find my review of the proposed rule to remove *Trichostema austromontanum* subsp. *compactum* (Hidden Lake Blue Curls; Lamiaceae) from Federal List of Endangered and Threatened Plants, and the Post Delisting Monitoring Plan for *T. austromontanum* subsp. *compactum* (Hidden Lake Blue Curls). Overall I found both documents to be thorough, they address key information regarding the current status of this taxon, and they clearly outline the conservation efforts that are underway to alleviate external threats to *T. austromontanum* subsp. *compactum*. The California State Parks have been diligent in their efforts to ensure protection of *T. austromontanum* subsp. *compactum*, including limiting access to the Hidden Lake, providing additional land protection by establishing the Hidden Divide Natural Preserve, participating in annual monitoring of plants and human activity at Hidden Lake. All of these efforts have greatly reduced threats to this taxon. Below you will find specific comments, first to the proposed rule and then for the Post Delisting Monitoring Plan. If you have any questions regarding my comments please feel free to contact me.

Sincerely,

Naomi Fraga PhD
Director of Conservation Programs
Rancho Santa Ana Botanic Garden



Comments on the proposed rule:

Under Species biology.

The pollination biology of *Trichostema austromontanum* subsp. *compactum* has not been studied specifically. Pollinator exclusion studies have only been performed on *T. a.* subsp. *austromontanum*. I do not think it is appropriate to suggest that both subspecies are not commonly pollinated by insects, therefore may not rely heavily on pollinators. More research is needed for *T. a.* subsp. *compactum* to determine the importance of pollinators for reproduction and seed set. Based on preliminary results from a common garden study, there appear to be several morphological differences between *T. a.* subsp. *compactum* and *T. a.* subsp. *austromontanum*. It is possible that these taxa do not represent each other's closest relative and could perhaps be quite different in important life history traits such as reproductive biology.

Under Summary of Factors Affecting Trichostema austromontanum ssp. compactum

A. *The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range*

Hidden Lake is a relatively pristine location and there are very few if any disturbances that have been noted at this location during my time monitoring (2006 to 2016). Prior to establishing the systematic monitoring protocol I noted the absence of non-native and invasive plant species at Hidden Lake (see checklist of vascular plants in post delisting monitoring plan for reference). As a part of our monitoring effort we have been recording the presence of any non-native or invasive species present with prescriptions for immediate removal. In 2016 we noted the presence of *Lactuca serriola* (pricky lettuce Asteraceae) in low abundance, only a single individual was documented (Fraga 5912). As a part of the post delisting monitoring plan I recommend that documentation of habitat quality and specifically the presence or absence of non-native species be included and emphasized in the monitoring effort.

I would also like to emphasize the need to monitor the hydrology with regard to construction of the Hidden Divide Trail and the trail to the desert view overlook. This is outlined in the plan but I would like to reiterate the need for monitoring to ensure that the trail does not alter the natural flow of water to the lake and that there is little to no impact to the population of Hidden Lake bluecurls. I would also like to reiterate the need to monitor any increases in visitation related to trail use especially with respect to potential dispersal of non-native plant species to the site.

Under Summary of Factor E.

"We do not consider stochastic events to be a substantial threat to *T. a.* ssp. *compactum* or its habitat at this time because the subspecies' soil seed bank will likely persist, allowing future growth."

Despite the persistence of a long lived soil seed bank, stochastic events such as catastrophic wildfire could still pose a substantial threat to *Trichostema austromontanum* subsp. *compactum*. A wildfire could increase sedimentation into the lake basin and alter hydrology, subsequently having a substantial impact on the local environment. A fire did burn near Hidden Lake in 2013 (Mountain Fire), and due to several years of drought and potential increases in drought stressed trees and/or standing dead trees, large catastrophic fire could pose a threat to the habitat of Hidden Lake bluecurls.

Comments on the Post Delisting Monitoring Plan

Regarding population status, both documents outlined very well the difficulty that scientists have in determining long term population trends for this taxon. The standing population fluctuates widely from year to year and the number of standing individuals is largely dependent on the environmental conditions experienced in the winter and spring prior to germination. The majority of individuals for *T. austromontanum* subsp. *compactum* reside in the soil seed bank and there have not been attempts to quantify the seed bank, although Michael Wall at Rancho Santa Ana



Botanic Garden did take soil samples and attempted to germinate seeds taken from the soil seed bank. In 2008 seeds Wall extracted 274 seeds from a 50cm x 1 cm deep soil core from samples taken throughout the lake population site (Fraga and Wall 2009). On page 6 of the Post Delisting Monitoring plan two research questions are proposed under RSABG institutional commitment. In addition to these two potential studies, I would like the service to consider a soil seed bank density study to further investigate and potentially estimate the size of the soil seed bank. Study of the standing population might not provide an accurate picture of the actual population size and the long term viability of the population since it excludes the seed bank. It is also important that new contributions to the seed bank are documented and noted, and that seed set is included in monitoring. As a part of our monitoring plan we have noted phenology and if the plants are in flower and fruit. Monitoring often takes place during the flowering/fruiting period, but it would be good to get regular estimates of seed set, perhaps by sampling some number of individuals in fruit during monitoring.

With regard to the location of plants, it has been indicated that the majority of plants occur on the northern margin of Hidden Lake. This is true for the most part, however our monitoring also indicates that the majority of plants are located along the northeast and east side of the lake (See table 1 and figure 1) based on the average number of plants from 2012-2016 across transects. Transects 1-10 run west to east. Our data suggests that the majority of plants occur at the eastern end of the lake, with transects 8-10 having the highest average number of plants across all years sampled. In addition Transects 8-10 also have the highest variance, so the number of plants in these areas around the lake fluctuate the most from year to year. Transect 1 has on average the lowest number of plants and the least variance between years. We record the position of each plant within each transect; therefore with this data we can create a heat map of where plants most often occur within the macroplot.

Table 1. Average number of plants in each transect from 2012 and 2016, and the variance in those transects between years.

Transect	Variance (2012-2016)	Average # Plants
Transect 1	53	5
Transect 2	200.7	7.8
Transect 3	475.5	10
Transect 4	915.5	20
Transect 5	12548.7	54.8
Transect 6	541.3	11.4
Transect 7	332.7	23.2
Transect 8	1967793	681.6
Transect 9	1075736	726.6
Transect 10	69033	131

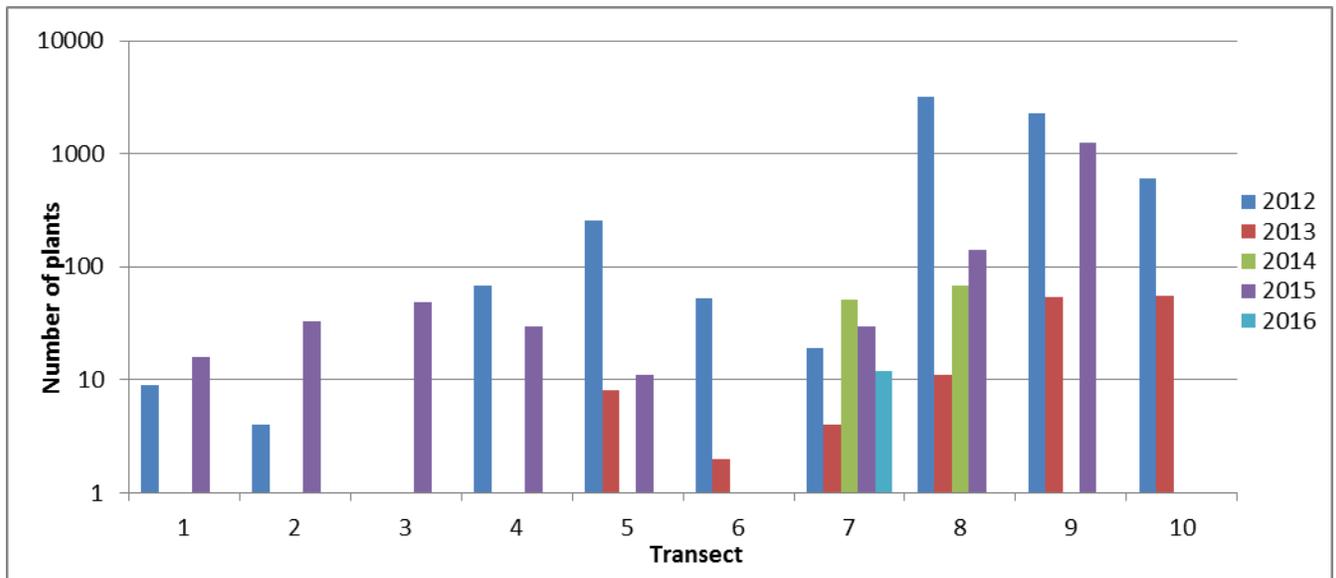


Figure 1. A bar graph with the number of plants counted in each transect from 2012 to 2016. Transect 7 was the only transect to have plants across all years. Transects 8, 9 and 10 had the most plants in 2012, but did not have plants present in all years. Transects 1, 2, 3, and 4 typically had the fewest number of plants.

With respect to climate change it is mentioned that a HOBO data logger was installed at Hidden Lake. It is my understanding that it has been difficult to get this system up and running, although it would be extremely valuable to have this data for Hidden Lake. Based on very preliminary regression analysis of estimated population size and climate data gathered from the Mount San Jacinto RAWS Station (<http://www.wrcc.dri.edu/cgi-bin/rawMAIN.pl?caCMSJ>), it appears that the population size of *Trichostema austromontanum* subsp. *compactum* is not correlated with total annual precipitation, annual maximum temperature, or annual minimum temperature. However the climate data used for this analysis may not be a good proxy for weather experienced at Hidden Lake, because the RAWS station is located on a ridge top (Ken Keitzer pers com.). The data from Long Valley could be used for comparison but is not easily accessed for analysis.

Literature Cited

Fraga N. and M. Wall. 2008. Activities report for conservation and seed banking of *Trichostema austromontanum* subsp. *compactum*. Prepared for Jonathan Snapp-Cook, U.S. Fish and Wildlife Service, Carlsbad, CA.. Dated Revised February 9, 2009.