Salvage and Transplantation of Coast Lily, Swamp Harebell, and Point Reyes Ceanothus from Roadside Habitat in Sonoma County

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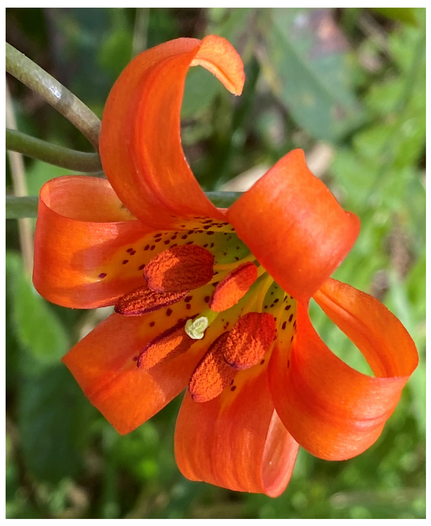


Coast lily (*Lilium maritimum*)

Coast lily with red coloration and straighter perianth tips. Possible morphological intermediate with leopard lily (*L. pardalinum*)

Coast lily with more typical orange coloration, campanulate perianth with rolled tips, and nodding habit

Swamp harebell (*Eastwoodiella* [*Campanula*] *californica*) in flower

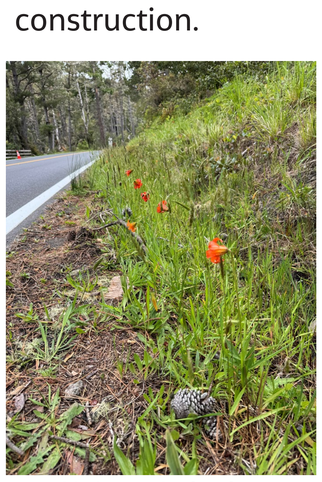
Point Reyes ceanothus (*Ceanothus gloriosus* var. *gloriosus*)

Introduction

Road repairs were needed for public safety along SR 1 in northern Sonoma County. Three rare plant species were located in the impact area:

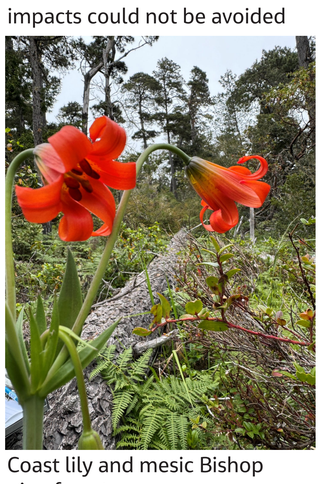
- Coast lily (*Lilium maritimum*) (CRPR 1B.1)
- Swamp harebell (*Eastwoodiella* [*Campanula*] *californica*) (CRPR 1B.2)
- Point Reyes ceanothus (*Ceanothus gloriosus* var. *gloriosus*) (CRPR 4.3)

We salvaged and transplanted coast lily, swamp harebell, and Point Reyes ceanothus individuals from three rare plant subpopulations that would otherwise have been impacted by construction.



Coast lily located a few feet from the road. Construction and impacts could not be avoided

Swamp harebell has weak stems and clambers up species such as rush (*Juncus* spp.) for support



Coast lily and mesic Bishop pine forest

Swamp harebell – one in flower and leaves of smaller plants

Stiff retrorse hairs lining swamp harebell stem. This character was useful for out of season identification

Coast lily bulb and growing stalk

Methods

- 40 coast lily bulbs and bulb scales and 84 swamp harebell plants (71 vegetative, 4 flowering, and 9 capsules) in the impact area were salvaged. Coast lily seed was also collected.
- To minimize shock, salvaged plants were replanted immediately into suitable habitat outside of the construction limits instead of holding all bulbs/plants to be replanted at the end of the day.
- Coast lily and swamp harebell occur in mesic habitats, and the transplantation area had moist soil – but replanted bulbs were watered in as they were planted, and again a few weeks later.
- Coast lily seed was collected from plants that would otherwise have been impacted prior to construction and then hand-sown in the rare plant transplantation area. Seeded areas were covered with a few millimeters of native soil and lightly compacted.
- In hopes of increasing long-term survivorship, all salvaged plants were transplanted into suitable habitat in close proximity to the impacted populations that had similar microhabitat variables (topography, aspect, soil, hydrology, and plant associates).
- All hand tools were sanitized using 70 percent isopropyl alcohol to avoid introducing *Phytophthora* or other pathogens.
- Point Reyes ceanothus cuttings were taken from healthy plants near the impact area, using “new wood”, cut from roughly the mid-point of the plant. All cuttings had ≥4 nodes, were pencil-width in diameter, dipped into rooting hormone, and inserted into native soil for half of the cutting length.
- All cuttings were watered in at planting and again a few weeks later.

Small swamp harebell plant

Point Reyes ceanothus cutting and rooting hormone

Coast lily bulb and stem

Swamp harebell salvaged with rushes for support

Point Reyes ceanothus cutting

First-year leaf of coast lily

Continued Monitoring

Continued monitoring will be conducted as required to evaluate plant survivorship and transplantation success. Results of this study may provide information regarding the effectiveness of salvage and transplantation for these rare species, be helpful to other practitioners, and useful in developing impact avoidance and minimization measures on future roadway projects

Lessons Learned

Practical observations noted during salvage and replanting:

- Work closely with the construction contractor. During a final walk-through between biology and construction, we were able to decrease the construction footprint, reducing impacts to the rare plants.
- The construction contractor staked the reduced footprint using the avoidance stake/fence design that the heavy-equipment contractors were using — avoiding misinterpretation.
- Very precise (and time-consuming) surveys were needed to identify all first-year (single-leaf) coast lily individuals and small swamp harebell.
- We had to excavate to unanticipated depths (about 6-12 inches) to dig soil from underneath the coast lily bulbs, even for single-leaf plants.
- Coast lily capsules are heavily browsed or eaten by deer. To obtain seed, we found it helpful to place lightweight mesh bags over early-stage capsules and collect seed later in the season to prevent browse.
- Coast lily seed collected from green capsules ripened (turned brown) off the plant, unlike seed from some species that won’t ripen if collected too early. However, germination testing was not performed.
- Optimum timing for plant salvage is not always practicable given construction schedules and work-windows.
- If possible, schedule swamp harebell salvage during summer when flowers are present and plants are more visible.
- Swamp harebell is much harder to locate and identify using leaves — but leaf shape and presence of retrorse hairs along the stem were useful in correct identification.
- Many swamp harebell individuals were very small (less than ½ inch) and were “hidden” in the grass and under shrubs. Allow sufficient time for careful surveys so that all plants can ben identified and moved.
- Swamp harebell is fragile and weak-stemmed, and it clambers up the stems of species such as rushes or sedges. To provide support, rushes were salvaged along with swamp harebell and interplanted to help support the plants.