
Rare Plants Annual Report

Humboldt Redwood Company LLC.

December 1, 2016



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Cover Photo: seacoast ragwort (*Packera bolanderi* var. *bolanderi*) in the Van Duzen watershed

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EXECUTIVE SUMMARY

Humboldt Redwood Company, LLC (HRC) botanists, foresters, and contract foresters assessed and/or surveyed 21 projects in 2016 looking for the 26 species of rare or uncommon “sensitive” plants on our Special Status Plant List. These projects consisted primarily of Timber Harvesting Plan (THP) units covering approximately 4,258 acres, and 159 miles of roads (includes 13 miles of road surveyed for *Howell's montia*), altogether totaling over 4,987 acres. This year on HRC property we found 42 new occurrences of five of our Special Status plant species, which represent 2 new populations, bringing the total number of rare plant populations detected on HRC land to 161. We reduced impacts to these occurrences to less than significant levels by implementing a variety of mitigation methods, in consultation with the California Department of Fish and Wildlife (CDFW), and established buffers around sensitive plant occurrences as needed in conjunction with the use of herbicides in regeneration forestry. We documented 38 occurrences of ten species that are on our Watch List (not rare but of limited distribution in California), which were found incidental to surveys for Special Status plants. Research projects, post-mitigation monitoring, and wetlands determinations for THP preparation made up the remainder of our activities.

Each Special Status plant species in this report is discussed in a separate section, along with reports of ongoing research if applicable. Maps of the individual species are provided in Appendix 5. Our Watch List species are presented in a brief format following the Special Status plant species discussions. Accompanying this report is a Rare Plant Detections Map showing all active plant occurrences on HRC land, and a Rare Plant Road Surveys Map which shows total road survey coverage (cut bank and fill slope surveys) from 2010 to 2016 and *Montia howellii* road surveys (MOHO Research) from 2005 to 2016. California Natural Diversity Data Base (CNDDDB) forms for the Special Status and Watch List species occurrences will be provided on CD to CNDDDB and are available to the HCP Wildlife Agencies on request.

We surveyed 13 miles of roads for *Montia howellii* in 2016. We documented plant locations and numbers for known sites, and discovered several newly occupied road segments adjacent to these existing seed sources. We also documented one new site on a road that had not been previously occupied. Five roads containing *Montia howellii* populations are exempt from the property-wide

winter use restrictions which currently mitigate other known populations. One of these “open” sites was visited in 2016. The results of monitoring efforts are presented in the Howell’s montia species section for review.

Proposed Changes for 2016

HRC does not propose any significant changes to the Rare Plant Program for the 2017 survey season.

INTRODUCTION

HRC employees, foresters, and forestry contractors conducted plant habitat assessments and seasonally appropriate floristic plant surveys in 2016 on timberlands owned by Humboldt Redwood Company, LLC. We conducted the surveys and habitat assessments to comply with the California Environmental Quality Act (CEQA) and HRC's Habitat Conservation Plan (HCP) "Conservation Plan for Sensitive Plants" (§6.12.1). This section requires that the presence of rare plant species be determined through field surveys conducted during planning of covered activities including, but not limited to, development of THPs, planning for new road construction, and development of quarries or borrow pits. Company employees and forestry contractors delineated potential rare plant habitat, and a qualified botanist verified the habitat determinations and performed a seasonally appropriate survey if potential habitat was present.

The procedures that we follow provide a high probability that rare plants are discovered during planning. When plants are found, mitigation measures are applied to reduce impacts to a level that is less than significant; these measures are reviewed by CDFW and include avoidance of herbicide application to these plants.

This report summarizes the results of surveys, mitigations, research, and monitoring conducted in the year 2016 and fulfills HRC's HCP reporting requirements for rare plants (section 6.12.1, Item 5).

SPECIAL STATUS PLANTS

We conducted floristic surveys to look for the plants on HRC's current Special Status Plant List (Table 1). This list includes vascular plants which are of limited abundance in California, and are known or believed to occur in Humboldt County. We report the results of our surveys to CNDDDB annually (both new occurrences and updates to previously reported occurrences). The list was derived from the following sources in consultation with CDFW and the United States Fish and Wildlife Service (USFWS):

- Federally listed or proposed threatened or endangered plants
- California state listed or proposed rare, threatened or endangered plants
- CDFG Natural Diversity Database, Special Vascular Plants, Bryophytes, and Lichens

- California Native Plant Society (CNPS) species with California Rare Plant Rank (CRPR) 1A, 1B, 2A, and 2B.¹

Table 1. HRC's Special Status Plant List for the 2016 field season.

Scientific Name/Common Name	Status	Presence on Ownership
<i>Astragalus agnicidus</i> Humboldt milk-vetch	G2, S2, CE, CRPR 1B.1	Yes
<i>Astragalus umbraticus</i> Bald mountain milk-vetch	G3, S2, CRPR 2B.3	Unknown
<i>Bensoniella oregona</i> bensoniella	G3, S2, CR, CRPR 1B.1	Unknown
<i>Carex arcta</i> northern clustered sedge	G5, S1, CRPR 2B.2	Yes
<i>Carex leptalea</i> flaccid sedge	G5, S1, CRPR 2B.2	Unknown
<i>Carex praticola</i> meadow sedge	G5, S2, CRPR 2B.2	Unknown
<i>Cornus Canadensis</i> bunchberry	G5, S2, CRPR 2B.2	Unknown
<i>Epilobium oreganum</i> Oregon fireweed	G2, S2, CRPR 1B.2	Unknown
<i>Erythronium oregonum</i> giant fawn lily	G4G5, S2, CRPR 2B.2	Presumed
<i>Erythronium revolutum</i> coast fawn lily	G4G5, S3, CRPR 2B.2	Yes
<i>Gilia capitata</i> ssp. pacifica Pacific gilia	G5T3, S2, CRPR 1B.2	Yes
<i>Glyceria grandis</i> American manna grass	G5, S3, CRPR 2B.3	Unknown
<i>Iliamna latibracteata</i> California globe mallow	G2G3, S2, CRPR 1B.2	Unknown
<i>Juncus supiniformis</i> hair-leaved rush	G5, S1, CRPR 2B.2	Unknown
<i>Kopsiopsis hookeri</i> small ground cone	G4?, S1S2, CRPR 2B.3	Unknown
<i>Lilium occidentale</i> western lily	G1, S1, FE, CE, CRPR 1B.1	Unknown
<i>Moneses uniflora</i> woodnymph	G5, S3, CRPR 2B.2	Unknown
<i>Montia howellii</i> Howell's montia	G3G4, S2, CRPR 2B.2	Yes
<i>Noccaea fendleri</i> ssp. <i>californicum</i> Kneeland Prairie pennycress	G5?T1, S1, FE, CRPR 1B.1	Adjacent
<i>Packera bolanderi</i> var. <i>bolanderi</i> seacoast ragwort	G4T4, S2S3, CRPR 2B.2	Yes
<i>Piperia candida</i> white-flowered rein orchid	G3, S3, CRPR 1B.2	Yes
<i>Polemonium carneum</i> royal sky pilot	G4, S1, CRPR 2B.2	Unknown
<i>Sanguisorba officinalis</i> great burnet	G5?, S2, CRPR 2B.2	Unknown
<i>Sidalcea malvaeflora</i> ssp. <i>patula</i> Siskiyou checkerbloom	G5T2, S2, CRPR 1B.2	Yes
<i>Sidalcea oregana</i> ssp. <i>eximia</i> coast checkerbloom	G5T1, S1, CRPR 1B.2	Unknown
<i>Sisyrinchium hitchcockii</i> Hitchcock's blue-eyed grass	G2, S1, CRPR 1B.1	Unknown

Abbreviations: FE, federally listed Endangered; SE, California state listed Endangered; SR, California state listed Rare; CRPR, California Rare Plant Rank; G, global rank; S, state or provincial rank.

WATCH LIST PLANTS

In 2006 we developed our Watch List (CRPR 4²) and began recording occurrences of these plants which we encountered while conducting our operational surveys.

¹ California Native Plant Society (CNPS 2014) CRPR 1A: Plants presumed extirpated in California and rare or extinct elsewhere; CRPR 1B: rare, threatened, or endangered in California and elsewhere; CRPR 2A: Plants presumed extirpated in California, but more common elsewhere; CRPR 2B: rare, threatened, or endangered in California, but more common elsewhere.

Table 2. HRC's Watch List Plants for the 2016 field season.

Scientific Name/Common Name	Status	On HRC
<i>Astragalus rattanii</i> var. <i>rattanii</i> Rattan's milk-vetch	G4T3, S3.3, CRPR 4.3	
<i>Calamagrostis bolanderi</i> Bolander's reed grass	G3, S3.2, CRPR 4.2	
<i>Calamagrostis foliosa</i> leafy reed grass	G3, S3.2, CRPR 4.2	
<i>Carex buxbaumii</i> Buxbaum's sedge	G5, S3.2, CRPR 4.2	
<i>Castilleja ambigua</i> ssp. <i>ambigua</i> Johnny nip	G4T3T4, S3, CRPR 4.2	
<i>Chrysosplenium glechomifolium</i> Pacific golden saxifrage	G5, S3, CRPR 4.3	Yes
<i>Collomia tracyi</i> Tracy's collomia	G3, S3.3, CRPR 4.3	
<i>Coptis laciniata</i> Oregon goldthread	G4, S3, CRPR 4.3	Yes
<i>Epilobium septentrionale</i> Humboldt County fuchsia	G3, S3.3, CRPR 4.3	
<i>Erigeron biolettii</i> streamside daisy	G3?, S3?, CRPR 3	
<i>Erigeron robustior</i> robust daisy	G3, S3.3, CRPR 4.3	
<i>Fritillaria purdyi</i> Purdy's fritillary	G3, S3.2, CRPR 4.3	
<i>Gilia (Navarretia) sinistra</i> ssp. <i>pinnatisecta</i> pinnate-leaved navarretia	G4G5T3, S3.3, CRPR 4.3	
<i>Hemizonia congesta</i> ssp. <i>tracyi</i> Tracy's tarplant	G5T3, S3.3, CRPR 4.3	
<i>Hosackia gracilis (Lotus formosissimus)</i> harlequin lotus	G4, S3.2, CRPR 4.2	Yes
<i>Iris longipetala</i> coast iris	G3, S3.2, CRPR 4.2	
<i>Lathyrus glandulosus</i> sticky pea	G3, S3.3, CRPR 4.3	Yes
<i>Leptosiphon (Linanthus) acicularis</i> bristly leptosiphon	G3, S3.2, CRPR 4.2	
<i>Lilium kelloggii</i> Kellogg's lily	G3, S3.3, CRPR 4.3	Yes
<i>Lilium rubescens</i> redwood lily	G3, S3.2, CRPR 4.2	Yes
<i>Lilium washingtonianum</i> ssp. <i>purpurascens</i> purple-flowered Washington lily	G4T4, S3.3, CRPR 4.3	
<i>Listera cordata</i> heart-leaved twayblade	G5, S3.2, CRPR 4.2	Yes
<i>Lycopodium clavatum</i> running-pine	G5, S3, CRPR 4.1	Yes
<i>Lycopus uniflorus</i> northern bugleweed	G5, S3.3, CRPR 4.3	
<i>Mitellastra caulescens (Mitella caulescens)</i> leafy-stemmed mitrewort	G5, S4.2, CRPR 4.2	Yes
<i>Piperia michaelii</i> Michael's rein orchid	G3, S3.2, CRPR 4.2	
<i>Pityopus californicus</i> California pinefoot	G4G5, S3.2, CRPR 4.2	Yes
<i>Platanthera stricta</i> slender bog-orchid	G5, S3.2?, CRPR 4.2	
<i>Pleuropogon refractus</i> nodding semaphore grass	G4, S3.2?, CRPR 4.2	Yes
<i>Ribes laxiflorum</i> trailing black currant	G5, S3.3, CRPR 4.3	Yes
<i>Ribes roezlii</i> var. <i>amictum</i> hoary gooseberry	G3G4T3, S3.3, CRPR 4.3	Yes
<i>Sidalcea malachroides</i> maple-leaved checkerbloom	G3, S3, CRPR 4.2	Yes
<i>Usnea longissima</i> Long- beard lichen	G4, S4, CRPR 4.2	Yes
<i>Wyethia longicaulis</i> Humboldt County wyethia	G3, S3.3, CRPR 4.3	

² CRPR 4: Plants of limited distribution, a watch list.

We report these occurrences to CNDDDB at the end of each year along with the new and updated occurrences of our Special Status plants. Our purpose in reporting CRPR 4 plants is to further the knowledge of California flora and provide accurate records for future decisions relating to rare plant listings and habitat protections.

SETTING

The HRC ownership is located in Humboldt County, California. The ownership totals approximately 209,300 acres and is managed primarily for timber production. The soils are largely derived from sedimentary rocks (such as claystone, mudstone, siltstone and sandstone) with scattered intrusions of metamorphosed sedimentary and ultramafic rocks. The ownership is situated in the following geographic subdivisions of the California Floristic Province: the North Coast and North Coast Ranges sub-regions of the Northwestern California region (Hickman 1993, Baldwin 2012)). The primary vegetation types on the ownership, called “series” in the Manual of California Vegetation (Sawyer and Keeler-Wolf 1995), and later called “Vegetation Alliances” in the Manual of California Vegetation 2nd edition (Sawyer J.O., Keeler-Wolfe T. and Evans J.M. 2009) include Redwood, Douglas-fir, Douglas-fir/Tan oak, Tan oak, Mixed oak, and Mixed conifer forests as well as smaller areas of several different grassland, scrub, riparian, and wetland vegetation alliances.

METHODS

SURVEY METHODS

HRC botanists and consultants use survey methods based on the CDFW recommended protocol for rare plant surveys, “Protocol for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities” (CDFG 2009). All surveys are floristic in nature and seasonally appropriate for the species considered, focusing not only on the predicted Special Status plants but also identifying and recording all vascular plant taxa encountered to the lowest taxonomic level (i.e. genus or species) necessary for identification of our focus species. When we conduct field-based habitat assessments at times of the year which were not seasonally appropriate, we return to areas identified as suitable habitat for the surveyed species during the next appropriate floristic season.

MITIGATION METHODS

When we locate Special Status plants which have the potential to be adversely affected by land management activities, we adopt one or more of the following measures to avoid, minimize, and/or mitigate adverse impacts to the species to less than significant levels. These same measures are listed in CEQA, Section 15370.

- Avoid the impact altogether by not taking a certain action
- Minimize impacts by limiting the degree or magnitude of the action
- Rectify the impact by repairing, rehabilitating, or restoring the impacted environment
- Reduce or eliminate the impact over time by preservation and maintenance operations during the life of the project
- Compensate for the impact by replacing or providing substitute resources or environments

The measures we propose take into consideration the population size, viability, and habitat needs of the Special Status plant in relation to the proposed project activities, constraints, and scope. We achieve avoidance and minimization of impacts by several means, alone or in combination, and depending on the species may include:

- Establishing no-cut retention areas (for canopy dependent species) or equipment and site preparation limitation areas (for non-canopy dependent species) that incorporate the population.
- Designating an appropriate buffer zone according to the habitat requirements of the species and the specifics of the population at the site.
- Designating species-specific overstory canopy retention in the buffer and core areas.
- Establishing an equipment exclusion zone within the buffer and core areas.
- Directional falling of timber away from the areas.

CDFW reviews and approves all proposed mitigation measures. The measures used in 2016 at any particular site are described in the individual species sections.

EFFECTIVENESS MONITORING METHODS

Mitigation measures are based on reasonable assumptions about the impacts of operations and the environmental needs of the species, and are put in place prior to THP operations.

Effectiveness monitoring consists of one or more post-impact visits to determine if the mitigation measures were effective in reducing impacts to less than significant levels. Appendix 3 provides a historical summary of the events which triggered these THP-specific monitoring visits. The monitoring methods used depend on the circumstances of the species at each location, and are described in the individual species sections. THP-specific survey and monitoring of *Montia howellii* was suspended in 2003 in favor of a property-wide mitigation and monitoring agreement (see Appendix 4).

RESEARCH METHODS

Research methods and procedures are detailed in the research plans on file in HRC's Botany Office and described briefly in the appropriate species chapters in this report.

DATA MANAGEMENT AND ANALYSIS METHODS

HRC botany staff collect data during a variety of activities (e.g. plant surveys, plant monitoring, habitat assessments, research projects, and species site evaluations). This data is then stored in two interconnected systems, a Microsoft Office Access relational database and ESRI ArcGIS coverage. During the planning and operations of activities on the HRC ownership we can query this information to determine if surveys have been conducted, when surveys were conducted, and whether or not populations of Special Status (CRPR 1 and 2) or Watch List (CRPR 4) plants were found within a given area.

All species presented in this report have been analyzed based on data from both storage systems. We present data generated from ArcGIS and the Access database in tables provided within the text or in an appendix, as well as on the accompanying maps.

Beginning in 2005 we expanded our baseline data gathering effort to include ecological data at plant occurrence locations, and in 2006 we began documenting CRPR 4 plants in the same way as Special Status plants. In 2010 we began recording more detailed descriptions of survey coverage in ArcGIS, which now include lines and polygons attributed with the surveyor, survey area, and dates of the survey. The use of handheld GPS recorders to track survey routes has been

instrumental in streamlining this process. These changes give us the ability to more accurately report our day-to-day and month-to-month survey efforts.

Most data is stored and managed in the Access database and linked to its associated activity (e.g. rock pit, THP, or road building project). The spatial data stored in ArcGIS coverage allows for analysis based upon additional parameters. This data is stored in the form of points that represent an individual plant or a plant population location, polygons that represent survey coverage, and linear data that represents survey routes and road survey coverage.

During analyses for surveys and research we process data utilizing both point and polygon data. We can conduct analyses utilizing point data against other parameters to describe location proximity. For example, we can analyze a specific plant site or group of sites against parameters such as watercourses (e.g. type, length and frequency), timber harvest restriction areas (e.g. no-cuts, selective entry bands [SEBs], and silviculture prescription type), or locations of other Special Status plant sites, in order to better understand and manage these populations.

Prior to 2013, total plant numbers for each species were kept in a Microsoft Office Excel spreadsheet and were essentially a summation of occurrences discovered each year added to the totals from the previous years' surveys. If a particular plant site was revisited for monitoring or research purposes that data was kept in separate files for that particular project. Results of research and monitoring were presented in our Annual Reports but the results were seldom used to adequately correct total plant numbers in the Access database.

For the past several seasons HRC staff have been keeping records of all site revisits, not just those associated with a research or monitoring project. We now treat all revisits just as we do new occurrences and store the data in our Access database. Therefore, the total plant counts reported from 2013 forward are calculated with a database query that sums the plant numbers from each occurrence of a species. When an occurrence has a record of a revisit the query uses the *latest plant count for that occurrence* in the calculation, essentially replacing the original count with the revisit count.

In most cases this system works very well. Problems arise when plant occurrence numbers are linked to many points in the GIS system; this happens when large, widely spread plant groups or

populations are recorded as one occurrence number. In an attempt to show the spatial extent of these large occurrences, maps were populated with many points of the same occurrence number. In the database, the occurrence is one record; in GIS and in the field this occurrence may consist of many distinct groups of plants. When the occurrence is revisited it is unlikely that the entire occurrence is re-counted, but nonetheless the counts actually obtained are recorded in the database. This creates a problem when the new query is run, because the new “partial” count revisit recorded in the database will replace the original count for the whole occurrence, potentially creating a false downward trend for that occurrence.

Moving forward we will, to the extent feasible, revisit entire occurrences during follow-up surveys, and when creating new points in GIS we will divide large groups of plants into multiple occurrences so that revisits for monitoring will be more easily recorded and more accurately reported.

HRC has joined our data systems with Mendocino Redwood Company (MRC) and going forward will be keeping all botanical data gathered during surveys from both companies in the same database and GIS system. Additionally, both companies are working to support an online webGIS system for fast and easy viewing of occurrence data without the need for desktop GIS software.

DEFINITION OF OCCURRENCE

Because of database limitations, HRC uses the term “occurrence” to refer to a group of plants of the same species which were discovered during a specific survey event. These may be groups of plants close together and representing a single population or part of a larger population previously discovered, or they can be widely scattered groups representing several populations. Based on this definition, an occurrence as we use it has no relationship to a “biological population,” or to the CNDDDB meaning of “occurrence.”

RESULTS

SURVEY RESULTS

We assessed and/or surveyed 21 projects for Special Status plants in 2016, covering a total of approximately 4,987 acres; including 159 miles of roads (this includes 13 miles of survey for *Montia howellii*). Most of the assessment and survey acres were associated with THP preparation or operational needs such as THP completions and were inspected between March and August (Table 3). We also located several Special Status plants during non-THP related projects such as trail maintenance, hydrology, forestry, or wildlife monitoring activities.

Table 3. 2016 Assessed/surveyed acres by month.

Year	Month	Unit Survey Acres	Road Survey Acres	Total Acres
2015	December	16	11	27
2016	January	0	0	0
2016	February	66	57	123
2016	March	905	166	1071
2016	April	523	119	642
2016	May	882	111	993
2016	June	415	73	488
2016	July	560	41	601
2016	August	709	106	815
2016	September	182	13	195
2016	October	0	10	10
Total 2016 Survey Acres		4,258	707	4,965
2016	Howell's montia Surveys		22	
Total 2016 Survey/Assessment Acres				4,987

*This value is generated in ArcGIS by creating polygons from survey route data. Total 2016 project acres from database records are approximately 5,314. Some portions of projects were surveyed in previous years or have future surveys planned. December totals for previous years are included in current year survey statistics.

We located 42 new occurrences totaling approximately 1,098 plants of five of the species on our Special Status Plant List and 38 occurrences of ten of the species on our Watch List during the 2016 survey season (Appendix 2: 2016 Plant Detections, Appendix 5: Rare Plant Detections and Rare Plant Road Surveys maps, and Table 4 below).

Table 4. Summary of 2016 Special Status Plant detections and property-wide totals.

Species	2016 occurrences	New populations	Total populations ³	# new plants*	Total plants**
<i>Astragalus agnicidus</i>	2	0	2	16	7,597
<i>Carex arcta</i>	0	0	3	0	55
<i>Erythronium revolutum/oregonum</i>	0	0	28	0	6,685
<i>Gilia capitata ssp. pacifica</i>	0	0	21	0	14,490
<i>Montia howellii</i>	1	1	41	9	36,823
<i>Packera bolanderi</i> var. <i>bolanderi</i>	22	0	35	655	8,405
<i>Piperia candida</i>	16	1	22	318	2,041
<i>Sidalcea malvaeflora ssp. patula</i>	1	0	9	100	2,763
Totals	42	2	161	1,098	86,511

*Totals of new occurrences only, does not include changes in known sites

**Total plant count is tally of original occurrence data and subsequent revisit counts, from Microsoft Access Database.

The CNDDDB Rare Plant Report forms corresponding to the new occurrences of Special Status plants on HRC property are provided as a CD and will be sent to the Sacramento CNDDDB office no later than the last week of December 2016.

In 2016 we also revisited known Special Status plant locations either for monitoring, or for new THP layout. These revisits are documented in each species chapter and also in Appendix 7 at the end of this report. All revisited sites have been documented on a CNDDDB report form and will be sent along with the new occurrence reports by the end of December 2016.

EFFECTIVENESS MONITORING RESULTS

HRC conducts post-impact effectiveness monitoring of some Special Status plant sites. The purpose of effectiveness monitoring is to determine if the mitigations applied to plants at a specific site are effective at minimizing impacts on the population from covered timberland management activities (e.g. timber harvest, road building, reforestation). We also conduct post-impact monitoring where impacts may have been significant but unavoidable and the population is being monitored for the level of response. Effectiveness monitoring usually consists of one follow-up visit or, rarely, revisits over several years, conducted by a qualified botanist or plant ecologist. Appendix 3 provides a summary of the events which trigger THP-specific monitoring

³ Populations are defined as groups of the species separated by at least a quarter-mile from other such known groups, equivalent to CNDDDB definition of “occurrence”.

visits. Results from effectiveness monitoring visits are included in the appropriate individual species sections.

PROPERTY-WIDE CONSULTATIONS

HRC has assumed implementation of four property-wide species-specific management agreements that were originally developed through consultation with CDFG by The Pacific Lumber Company (PALCO), the previous landowner. These species are *Astragalus agnicidus*, *Erythronium revolutum*, *Montia howellii*, and *Packera bolanderi* var. *bolanderi*. Copies of the consultation letters are in Appendix 4. The mitigation measures provided in these agreements will likely reduce impacts for these species to a less than significant level. We will request site-specific consultations from CDFW only if we propose mitigations that deviate from these agreements at specific locations.

CHANGES TO HRC'S SPECIAL STATUS PLANT AND WATCH LISTS

HRC does not propose any substantial changes to either the special status plant list or watch list for the 2016 survey season. One watch list species has been re-named in the past year; *Navarretia sinistra* ssp. *pinnatisecta* changed to *Naverretia linearifolia* ssp. *pinnatisecta*. Our list has been updated to reflect this change.

***ASTRAGALUS AGNICIDUS* (HUMBOLDT MILK-VETCH)**

INTRODUCTION AND SUMMARY

Astragalus agnicidus Barneby is a coarse leafy perennial herb of the Fabaceae (pea family) which blooms in the summer to early fall. The geographical distribution of this species in California includes the outer North Coast ranges in Mendocino and Humboldt counties (Hickman 1993). It ranges in elevation from 120 to over 800 meters (393 to 2,624 feet, CNPS 2016 and HRC data). It is known from several locations in Mendocino County but from only two watersheds in Humboldt County.

The 2 populations on HRC property are the most northerly occurrences known of this California endangered species. These populations are very close to each other in the Larabee Creek drainage, and may actually be part of a single population. When future disturbance occurs to adjacent areas containing a seed bank, new groups of plants may fill in the gaps and we may find that the spatial distinction between these existing populations disappears.

Humboldt milk-vetch is a California State Endangered Species, ranked G2⁴, S2⁵, and is a CRPR 1B.1⁶.

It is described as occupying disturbed areas in the broadleaved upland forest and North Coast coniferous forest (CNPS 2016, Baldwin 2012)) and open soil in woodland (Baldwin 2012). On HRC land it is typically found in mixed North Coast coniferous forest with a tanoak component on recently disturbed sites.

Surveys for Humboldt milk-vetch began in 1999, and the species was first located during the 2000 floristic season. All locations on HRC property are included on the map in Appendix 5.

⁴ G2: Imperiled: At high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors.

⁵ S2: Imperiled: Imperiled in the state because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the nation or state/province .

⁶ CRPR 1B: Plants rare, threatened, or endangered in California and elsewhere.

METHODS

Survey Methods

We conduct surveys for Humboldt milk-vetch in THP units and along roads in suitable habitats on the portions of the property where a mixed evergreen forest with redwood, Douglas-fir and tanoak predominates.

Mitigation Methods

HRC and CDFW have agreed to a property-wide mitigation (25 foot equipment exclusion zone) for known roadside occurrences of *Astragalus agnicidus*, documented in a letter from CDFG to PALCO dated February 7, 2005 (Appendix 4). Occurrences that are not located on a roadside are currently mitigated on a site-specific basis through consultation with CDFW.

RESULTS

Survey and Mitigation Results

We found two new occurrences of Humboldt milk-vetch this year (Table 5). To date there are two populations of *Astragalus agnicidus* on property managed by HRC with roughly 7,597 total individual plants (Table 4).

Table 5. *Astragalus agnicidus* locations, numbers, and mitigations

Occurrence ID	Project Name	Township	Range	Section	Quantity	Mitigation
4354	14-149 PBL	1S	3E	16	14	25' ELZ*
4355	14-149 PBL	1S	3E	16	2	25' ELZ

*ELZ – Equipment Limitation Zone

Effectiveness Monitoring Results

This year we revisited several known *Astragalus agnicidus* sites for pre-project surveys (Table 6). HRC botany staff will be revisiting several occurrences, starting in 2017, while monitoring the PBL THP 1-14-149HUM during the next several years. The mitigation plan in the THP calls for effectiveness monitoring visits for at least three years after completion of harvest or roadwork. HRC plans to conduct timber harvest operations within this THP in 2017 and completed a small amount of the planned roadwork in 2015 and 2016.

Table 6. 2016 *Astragalus agnicidus* site revisits.

Occurrence ID	Project Name	Township	Range	Section	Previous Visit	Previous Quantity	2016 Quantity	Mitigation
115	14-149 PBL	1S	3E	9	2014	9	4	25' ELZ*
268	14-149 PBL	1S	3E	15	2014	69	13	25' ELZ
269	14-149 PBL	1S	3E	16	2000	25	0	None

*ELZ – Equipment Limitation Zone

DISCUSSION

Astragalus agnicidus is a short-lived perennial (Pickart et al. 1992) endemic to mixed evergreen forests in Humboldt and Mendocino counties, California. We speculate that the population exists largely as seeds which can remain dormant for decades (Bencie 1997; Decker et al. 2002; Pickart et al. 1992). We have observed that these seeds can rapidly populate an area with new plants following disturbance which removes overlying vegetation and exposes mineral soil.

Management of this species may need to include periodic disturbance of the soil to allow new plants to replenish the seed bank (Hiss and Pickart 1992). To avoid impacting the flush of young plants that emerge after harvest, reforestation activities should be conducted the same year as harvest (Renner et al, 2009).

All known populations occur on lands managed for timber harvesting. The results of the 5-year study completed in 2008 (Renner et al, 2009) at the Larabee South site, the “George” THP, and other THP-specific effectiveness monitoring projects strongly suggest that populations of *Astragalus agnicidus* cannot be sustained long term without mineral soil disturbance. Even with adequate protection during operations plant numbers tend to decline as competing shrub and herbaceous plant species fill in the understory and overstory tree canopy shading increases. Regardless of whether the plants are managed with no-impact protection, minor impacts from canopy removal, or are fully impacted by operations, and regardless of the type of reforestation activities, whether pile burning alone, pile burning and herbicides, or no site prep at all, plant numbers declined sharply unless maintained by continued disturbance (Renner et al, 2009). We have noted in all our monitoring efforts that *Astragalus* seedlings are robust and prolific in areas that contained a burn pile from the previous harvest. We therefore theorize that a closely monitored prescribed burn may be the best alternative to herbicides or mechanical site manipulation for the maintenance of this species.

Harvest methodologies, including selection, group selection, and variable retention will not likely change this pattern. Group selection and variable retention allow for larger openings and more soil disturbance than single tree selection and could allow more *Astragalus* plants to germinate and/or spread, with the potential outcome of a higher volume of viable seed in the replenished seed bank. Additionally, selection harvest methodologies generally call for larger THPs with more roads and skid trails (in ground-based yarding units), again allowing for more soil disturbance, canopy reduction, and potentially more suitable habitat for the germination of *Astragalus* plants. Current management practices are to slash-pack skid trails after operations to protect soils from erosion and loss of fertility. Deep slash packing may diminish *Astragalus* germination, but at this time the effects of slash-packing are unknown.

Plant number estimates for populations on HRC property (Table 4) are now calculated from occurrence and revisit data contained in our Access database. Most *Astragalus* on HRC property are recorded in GIS as widely scattered points with the same occurrence ID, and during revisits the entire occurrence was generally not re-counted. The database query for total plant numbers does not allow for a partial re-count but replaces the plant numbers for the entire occurrence with the partial count. Going forward, HRC will make changes to our record keeping improving the quality and reliability of this calculation. By making efforts to revisit and count plants at all mapped points associated with a particular occurrence ID, the new query will accurately update plant numbers for the entire occurrence. When new occurrences are detected HRC will break them into logical spatial groups and give each group a unique occurrence ID, allowing each to be revisited, re-counted, updated and reported individually. We plan on conducting an inventory survey of all *Astragalus* occurrences over the next several seasons in an effort to update all occurrences and establish an accurate total plant count for the property. This inventory survey will also aid in re-mapping and verifying activity of these occurrences.

The current property-wide mitigation agreement covers only known roadside occurrences. We believe that the best management for this species is to avoid existing plants when possible, but to allow silviculture techniques which expose mineral soil in order to facilitate germination of seeds stored in the seed bank. Herbicide use should be avoided where plants are present.

CAREX ARCTA (NORTHERN CLUSTERED SEDGE)

INTRODUCTION AND SUMMARY

Carex arcta Boott is a mid- to late-summer (June-August) blooming member of the Cyperaceae (Sedge family). The geographical distribution of this species in California is centered in Mendocino, Humboldt, and Del Norte counties (Mason 1957). This species also extends north to British Columbia and east to the Atlantic coast (Munz and Keck 1970).

Its preferred habitats are wetlands, swamps, sphagnum bogs and marshes from sea-level to elevations of around 1,400 meters (4,600 feet), usually associated with Douglas-fir and North Coast coniferous forests and woodlands (Munz and Keck 1970, Mason 1957, Hickman 1993, Baldwin 2012, CNPS 2016). On HRC land it is typically found in Redwood forest, Douglas-fir forest or woodland (sometimes with a hardwood component) in areas of periodic inundation and typical wetland characteristics, such as marshes or ponds.

Northern clustered sedge is ranked G5⁷, S1⁸, and is a CRPR 2B.2⁹.

Surveys for this species began in 2002, and it was first located during the same floristic season. No new occurrences were located this year. All locations on HRC property are included on the maps in Appendix 5.

METHODS

Survey Methods

From June until August, we conduct surveys for northern clustered sedge where suitable wetland habitats exist on the property. Outside of the appropriate floristic season, we assess project areas for suitable habitat characteristics and if present, we delineate the habitat and complete seasonal surveys prior to any operations in that area.

⁷ G5: Secure- Common; widespread and abundant

⁸ S1: Critically Imperiled-Critically imperiled in the state because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as steep declines making it especially vulnerable to extirpation from the nation or state/province.

⁹ CRPR 2B.2: Plants rare, threatened, or endangered in California, but more common elsewhere; fairly threatened in CA.

Mitigation Methods

A mitigation that we used in the past to protect this species from potential adverse impacts consisted of a 50-foot no-cut equipment exclusion zone (ELZ) placed around the population (1 site). *Carex arcta* sites are generally contained in Class II wetlands which already receive protection under the California Forest Practice Rules and HRC's HCP watercourse prescriptions. These measures provide adequate protection for *Carex arcta* without the need for additional mitigation.

RESULTS

Survey and Mitigation Results

We did not find any new occurrences of northern clustered sedge this year. There are currently three populations of *Carex arcta* on HRC managed lands with a total of 55 individual plants (Table 4).

Effectiveness Monitoring Results

We did not re-visit any sites for effectiveness monitoring in 2015. HRC had planned on visiting all three of our known locations during the 2016 floristic season but was unable to do so due to the need to survey other higher priority areas in preparation for future operations.

DISCUSSION

The habitat for this species in bogs and wetlands is already excluded from management and harvest activities. Surveyors examine areas 50 feet into the large buffers protecting wetland habitat and seldom enter the wetland itself. This is one possible reason for the low number of detections on HRC lands. If more is to be learned about the presence of this species, specific surveys of suitable habitats would have to be done outside of the normal THP surveys.

***ERYTHRONIUM REVOLUTUM* (COAST FAWN LILY)**

INTRODUCTION AND SUMMARY

Erythronium revolutum Smith is a small pink-flowered bulbiferous member of the Liliaceae (lily family) which blooms in the spring. The geographical distribution of this species in California encompasses Sonoma, Mendocino, Humboldt, Del Norte, Trinity, Tehama, and Siskiyou counties (CNPS 2016), from near sea level to over 1,600 meters (5,249 feet). It also occurs in western Oregon, Washington and southern British Columbia (Hitchcock 1973).

Its preferred habitats are moist Douglas-fir and mixed evergreen forests and woodlands, and it can be found along stream banks and other obviously wet or moist locations as well as places that are well shaded but not otherwise distinctly moist. On HRC land it is typically found in Douglas-fir forest or woodland with a hardwood component on northerly-facing slopes in shade.

Coast fawn lily is ranked G5¹⁰, S2S3¹¹, and is a CRPR 2B.2¹².

Surveys for this species began in 2001, and it was first located during the 2002 floristic season. By the end of the 2005 season, we reported 29 populations; however, during a GIS quality control exercise, we found that several of these occurrences and populations were not on HRC land but had been previously included in our Access and GIS databases. In addition, properties sold in 2006 contained three populations. During the 2007 flowering season we re-visited several *Erythronium* populations that were originally reported as *Erythronium revolutum* based on plants found while in vegetative condition, in order to verify the identification. We determined that four occurrences were actually *E. californicum* and we corrected our database accordingly. We also found that some populations had white-flowered plants. In 2008 we conducted a research project to determine if white flowered forms of *E. revolutum* were in fact *E. Oregonum*, a white-flowered species more common in Oregon and Washington. We were unable to reach a

¹⁰ G5: Secure- Common; widespread and abundant

¹¹ S2S3: Imperiled-Vulnerable: Imperiled in the state because of rarity due to the very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the nation or state/province. Vulnerable in the state due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.

¹² CRPR 2B.2: Plants rare, threatened, or endangered in California, but more common elsewhere; fairly threatened in CA.

definitive conclusion and until such time as we are sure of the taxonomy, we will continue to record and report both white and pink forms as *E. revolutum*.

We are continuing the research project examining the effect on *E. revolutum* of hack-and-squirt (“frilling”) herbicide treatment applied to hardwood overstory trees at a population near Kneeland, CA. Experimental treatments were initiated in 2007 and we will be monitoring the permanent plots every other year for at least 10 years post treatment. Results from this study were recently presented at the 2016 Coast Redwood Forest Symposium in Eureka, CA and the poster from that presentation is included in Appendix 8.

There are currently 28 known populations of *Erythronium* on HRC property with approximately 6,685 individual plants (Table 4)

All locations of *E. revolutum* (including potential *E. oregonum*) on HRC property are shown on the maps in Appendix 5.

METHODS

Survey Methods

In late March through mid-May, we conduct surveys for coast fawn lily in suitable habitats of the portions of the property where Douglas-fir and tanoak predominate.

Mitigation Methods

HRC and CDFW have agreed that the property-wide consultation and mitigation (50 foot no-cut and equipment limitation zone) for *Erythronium revolutum*, documented in a letter from CDFG to PALCO dated February 27, 2006 will remain in effect (Appendix 4). We are currently treating all *E. revolutum*-like plants, regardless of flower color, as *E. revolutum* for mitigation purposes.

Research Methods: Erythronium revolutum Response to Herbicide Application

Beginning in 2003, portions of the *E. revolutum* population in the Kneeland area found during surveys for the Moore’s THP 1-01-359HUM have been the focus of research aimed at better understanding this species’ response to timber harvest practices. We are collecting data to assess the effects to *E. revolutum* of hardwood over-story removal by “frilling” (direct application of herbicide to the cambium layer). We established permanent research plots and collected several

years of baseline data before the first herbicide application. We began the first round of application to a portion of the management plots in the fall of 2007, and completed the treatments in November 2008. We notified CDFW prior to these applications. Research protocols and maps are available upon request.

RESULTS

Survey and Mitigation Results

We did not locate any new occurrences of *Erythronium revolutum* during the 2016 season. All known populations are in Douglas-fir-and-hardwood dominated habitats. The largest occurrences found to date on HRC property are in the Kneeland area, discovered in 2002.

Effectiveness Monitoring Results

We did not revisit any *Erythronium* sites this year during seasonal THP surveys.

Research Results: Erythronium revolutum Response to Herbicide Application

The results to date for this ongoing project have been compiled and presented in poster form at the recent Coast Redwood Forest Symposium in Eureka, CA. The following is taken from that presentation, associated charts and figures are included as Appendix 8:

Treatment of tan oak and other non-conifer tree species in order to restore conifer stocking and reduce competition has long been a part of timber management in Northern California. Land managers use a number of methods to achieve this, including treatment of the trees by direct application of herbicide to the cambium of the target species. This method is often called “frilling” and is both cost effective and efficient especially when compared to manual falling and removal of trees. With the advent and expansion of the forest disease sudden oak death (SOD) in Northern California, land owners are faced with the prospect of managing for the disease by thinning forest stands, removing diseased trees, and reducing the potential hosts which include tan oak and bay laurel. Forest herbicides have been, and will continue to be, instrumental in these projects. At Humboldt Redwood Company (HRC), protecting biodiversity, avoiding impacts to rare or sensitive species, maintaining forest stand structure, and retaining iconic or unique forest components are hallmarks of the commitment to beneficial land management and environmental stewardship. Finding common ground between project goals, i.e. improved stocking or disease control, and environmental protection is a difficult but necessary balance. This study is intended to help guide land management decisions regarding the use of this treatment on HRC lands where coast fawn lily may be found.

Forest types inhabited by *Erythronium revolutum* are typical of those that could receive herbicide treatment of hardwoods for both restoring conifer stocking and control of forest pathogens such as *Phytophthora ramorum*, the causal agent of Sudden Oak Death (SOD). Beginning in 2004 portions of a population of coast fawn lily near Kneeland, CA. were monitored for response to selective removal of tan oak and bay laurel by direct application of herbicide (imazapyr) to the cambium of the target species. Thirteen monitoring plots (10 treatment, 3 control) were established and have been visited regularly between 2004 and 2015. Adjacent timber harvest occurred in 2004, herbicide treatment occurred in 2007 and 2008. Conifer species, larger hardwoods (>30”), and true oaks (*Quercus* spp.) were not treated. Trees that were located within existing buffers for watercourses were likewise left untreated. Results indicate that maintenance of this sensitive species may be compatible with herbicide treatment of hardwoods. Post

treatment density (plants/m²) of coast fawn lily was not significantly different ($P > .05$) from pre-treatment numbers and was not significantly different from control plots either before or after treatment. Average canopy cover in treatment plots was significantly reduced ($P = .003037$) over the same time period. Although an increase in herbaceous competition and woody litter may have reduced coast fawn lily density in some individual plots, the treatment did not result in a significant reduction in plant density when averaged across all treatment plots.

Coast fawn lily (Baldwin 2012, CDFG 2009, CDFW 2014, CNPS 2016) generally occupies mosaic openings on the forest floor where it is not shaded by ferns or low shrubs. Coast fawn lily also occurs on road banks and in rocky openings. At the Kneeland site coast fawn lily occurs in fairly dense clumps separated by large areas with no plants. Seedling recruitment occurs near the parents. Pilot sampling allowed HRC to determine that the sub-populations are much too clumped and widely separated to effectively sample using standard macroplot and quadrat techniques. Random allocation of a quadrat-based sampling effort within the forest would be an inefficient design (Green, 1979). It would result in an inflation of the error variation among quadrats because of the clumped differences in abundance. It would also have a reduced ratio of variation among treatments (between control and impact areas) to variation within treatments. However, the clumps of plants occupy areas small enough that all data can be recorded from the occupied areas without the need to take samples. Mueller-Dombois and Ellenberg (2002) call this "plot selection will be subjective without a preconceived bias." While not a random sample, this is sufficiently inclusive to enable HRC to make inferences about the rest of the sites at the Kneeland study site (Elzinga, Salzer, and Willoughby, 1998; Iles, 2004).

Rectangular plots were placed snugly around sub-population groups. Plot sizes varied according to group size. The effect on this research plan is that only the strata of the forest floor containing coast fawn lily will be sampled and differences between treatments will not be diluted by differences between segments of the forest floor mosaic not occupied by coast fawn lily. This is acceptable because there is no intention to determine frequency throughout the habitat. This sampling design imposes limits on the inferences that can be made from the results of the study. Statistically, HRC will not be able to apply conclusions from this study to areas outside of the sampled population. Biologically, however, it will be reasonable to use the study results to make future management decisions (Iles, 2004). Plot locations were monumented by paint and flagging, plot corners were marked by painted rebar stakes. Plot locations include a variety of positions on the landscape and some plots were adjacent to or partially within protective buffers for watercourses. Trees within existing buffers for watercourses were not treated. Likewise trees retained for HRC's green tree retention program, marked wildlife habitat trees, or marked nest trees would not have been treated, if present.

All plots were buffered (50 foot radius no harvest and equipment exclusion zone) prior to selective timber harvest in 2004. No harvest occurred in buffered areas. Control plots remained protected within the 50 foot buffer while the areas around (and including) the experimental plots were treated by application of herbicide (imazapyr) to all tan oak and California bay laurel not otherwise retained. Treatment took place in 2007 and 2008. Imazapyr is a non-selective amino acid synthesis inhibitor used for the control of a broad range of plants. In soil imazapyr is degraded primarily by microbial metabolism. It is not, however, degraded significantly by photolysis or other chemical reactions and may linger in soils for months if not metabolized. Imazapyr is exuded from some root systems (legumes) and can move between plants with grafted or intertwined root systems, so potential for negative effects on non-target species are possible (Tu 2001). Treatment consisted of direct application of imazapyr to the cambium layer of target trees. Field crews removed bark and created openings in the cambium with hatchets, 1mL of herbicide was injected into each cut. Application rate was approximately 1mL for every three inches of circumference at breast height.

Within each plot the number of coast fawn lily individuals was recorded and grouped according to life stage (seedling, vegetative, reproductive). Canopy cover was estimated by use of a spherical densiometer (both live and dead trees were counted the same). Field visits were conducted from mid-April to mid-May when coast fawn lily was fully up and blooming at the project site.

Plant counts taken during field visits were used to calculate plant density for each plot by dividing number of plants by plot area in meters squared. Treatment and control plots were grouped and the average plant densities are displayed below. Grouping of plants by life stage allowed for analysis of group demographics in the same way. Standard F-Test (two sample for variance) and appropriate t-Test (two sample considering variance) were used to determine if observed changes in canopy cover and average plant density (both total density and density by life stage) were statistically significant and represented true changes between pre and post treatment and between control vs. treatment plots.

Results indicate that post treatment density (plants/m²) of coast fawn lily in treated plots, untreated plots, and between demographic segments was not significantly different ($P > .05$) from pre-treatment numbers. Additionally, treatment plot density was not significantly different from control plots either before or after treatment. Average canopy cover in treatment plots was significantly reduced ($P = .003037$) over the same time period, while control plot canopy cover was not.

These results indicate that there was no significant reduction in coast fawn lily density in treated plots. It is unlikely that herbicide leached from treated trees or remained active in soil occupied by coast fawn lily as there was no significant decrease in plant density immediately following site treatment. There was also no significant decrease in plant density due to canopy loss resulting from treatment. It can also be inferred that mitigation buffers were effective at reducing or eliminating significant canopy loss or impacts to plants during selective timber harvest at all plots. Woody debris from dead and dying treated trees can, at least temporarily, reduce the available growing space for coast fawn lily which tends to inhabit soils with thin duff or detritus layers. The amount of woody debris added to plots was not calculated but as there was no significant decrease in plant density overall it can be assumed that any added debris did not adversely affect plant density when averaged across all treatment plots. HRC's management of forests by treatment of hardwoods by direct application of herbicide may be compatible with maintenance of this sensitive species without specific protective buffers. HRC's management strategies retain many hardwoods both in protective buffers for watercourses and as single retention trees for snag recruitment or wildlife habitat retention. When combined with non-target trees like conifers and true oaks HRC policy allows for treated sites to continue to have adequate canopy cover, in this case average cover did not drop below 60%. However, this study does not include areas where average canopy cover was reduced below 60% which could occur in areas of heavy initial tan oak or bay laurel cover, areas with few retention trees and no watercourse buffers, or any other potential treatment area that will have a greater reduction in canopy cover than was experienced here. In this study canopy cover at two individual plots dropped below 50%, these two plots experienced the greatest reduction in plant density out of any plot included here, likely due to an increase in other competitive herbaceous species which is common after both timber harvest and treatment of hardwoods (Welch 2004).

DISCUSSION

We continue to find *Erythronium* in the predicted habitat type of mixed conifer and hardwood with rocky, well drained, soils either in shady sites or adjacent to watercourses. Based on the limited results of post-impact monitoring, it appears that this species can tolerate some level of disturbance, but maintaining shaded conditions, and avoiding direct mechanical impact to individual plants is important.

We have not resolved the taxonomic confusion between *E. revolutum* and *E. oregonum* resulting from the white and pink color forms co-mingling in the same population, first-discussed in the 2008 Rare Plant Report. Until we are able to consult with a taxonomist familiar with the species, we will consider the data analysis to be "on hold."

GILIA CAPITATA SSP. PACIFICA (PACIFIC GILIA)

INTRODUCTION AND SUMMARY

Gilia capitata Sims ssp. *pacifica* V. E. Grant is an annual herb in the Polemoniaceae (Phlox family). The tiny blue-violet flowers, present from April to August, are clustered into heads atop a 25-50 cm stem, with cauline and basal leaves that are twice-pinnate. Pacific gilia habitat is coastal bluffs and prairies up to 1665 meters (5,463 feet) according to CNPS (2016). The second edition of the Jepson Manual (Baldwin 2012) notes that the subspecies usually occurs at less than 400 meters (1,312 feet). Our highest occurrence is at approximately 896 meters (2,940 feet).

Pacific gilia occurs in Mendocino, Humboldt, and Del Norte counties in California, and extends into Oregon (CNPS 2016, Hickman 1993).

Pacific gilia is ranked G5T3T4¹³, S2¹⁴, and is a CRPR 1B.2¹⁵.

Surveys for Pacific gilia began in 2001 and it was detected on the property the following year. All locations on HRC property are included on the map in Appendix 5.

METHODS

Survey methods

Prior to field surveys we utilize aerial photographs to delineate possible Pacific gilia habitat (prairies) within and adjacent to proposed THP units. We conduct field surveys during the floristic season, May through August.

Mitigation methods

Currently, our mitigation for Pacific gilia consists of avoidance. We place an equipment limitation zone (ELZ) around the population so that direct impacts to plants are minimized while allowing use of existing roads which pass through the ELZ. ELZ buffers vary in size depending

¹³ G5T3T4: G rank refers to the species as a whole; T rank refers to the subspecies rank. At this time Pacific gilia is ranked between T3T4. T3: Vulnerable- At moderate risk of extinction due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors. T4: Apparently secure-Uncommon but not rare; some cause for long-term concern due to declines or other factors.

¹⁴ S2: Imperiled-Imperiled in the state because of rarity due to the very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the nation or state/province. There is still some uncertainty to this ranking.

¹⁵ CRPR 1B.2: Plants rare, threatened, or endangered in California and elsewhere; fairly threatened in CA.

on the nature of the harvest methods and proximity to the Pacific gilia site. In most cases, Pacific gilia sites are easily avoided as the habitat type occurs in areas that are usually not incorporated into a harvesting plan. Potential impacts from road construction are avoided when feasible by altering road placement or use. Pacific gilia sites on HRC land seem to persist in their pre-harvest numbers after operations have ceased, although this information is anecdotal from a few locations and re-counts have not been conducted on most of the known sites.

RESULTS

Survey and Mitigation Results

We did not locate any new occurrences of *Gilia capitata* ssp. *pacifica* during the 2016 survey season. There are currently 21 known populations of Pacific gilia on HRC property with approximately 14,490 individual plants.

Effectiveness Monitoring Results

We did not re-visit any Pacific gilia sites for effectiveness monitoring during the 2016 season.

DISCUSSION

We have found Pacific gilia on HRC property in expected habitat types, such as prairies in the coastal mountains. Aerial photos continue to be a valuable tool for predicting potential habitat in the field.

***MONTIA HOWELLII* (HOWELL'S MONTIA)**

INTRODUCTION AND SUMMARY

Montia howellii S. Watson is a tiny winter-growing annual recently placed in the family Montiaceae (miner's lettuce family). Germinating when the cold rains arrive in late fall, it grows through the early spring, flowers from March to May, then sets seed and quickly disappears. The current geographical distribution of this species in California is Humboldt County and the very western edge of Trinity County (CNPS 2016). It also occurs in western Oregon, Washington and southern British Columbia (CNPS 2016, Hitchcock 1973). It has been reported from near sea level to about 835 meters (2,740 feet, CNPS 2016).

Its preferred habitats are vernal wet, compacted soils (Hickman 1993, Baldwin 2012), meadows and seeps, vernal pools, and vernal mesic areas in the North Coast coniferous forest (CNPS 2016). On HRC land, it is found on roads, roadsides, skid trails, turnouts, landings, grazed meadows, and other areas where compacted soils maintain a vernal wet area and competing vegetation is minimal during its growing season. It is always associated with disturbance.

Howell's montia is ranked G3G4¹⁶, S3¹⁷, and is a CRPR 2B.2¹⁸.

Surveys for this species began in 1999 and it was found that same year. Population counts shown in Table 4 are from "active" sites; places where plants have not been located for several successive years are not included.

The spread of plants from known populations has generally resulted in our total population count decreasing, as previously separate "populations" have merged. In the case of newly occupied road sections that we found this year, most were likely the result of spread from nearby established populations, or seed banks; therefore we recorded them as part of previously documented occurrences. However, this year we found one new occurrence on a road that we

¹⁶G3G4: Judged to be between G3 and G4; G3: Vulnerable- At moderate risk of extinction due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors. ; G4: Apparently secure-Uncommon but not rare; some cause for long-term concern due to declines or other factors.

¹⁷S3: Vulnerable- Vulnerable in the state due to a restricted range, relatively few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the nation or state/province.

¹⁸CRPR 2B.2: Plants rare, threatened, or endangered in California, but more common elsewhere; fairly threatened in CA.

had previously thought was unoccupied, although there are known occurrences from the general area.

All active locations on HRC property are presented on the maps in Appendix 5. Inactive sites are not mapped here or used in population totals but are still maintained in our GIS mapping and given the same mitigation as active sites during roadwork and harvest operations in the hope that any latent seed sources left onsite will be properly protected should they sprout and again become active occurrences.

On 23 May 2003 a property-wide mitigation and monitoring agreement went into effect. At that time all THP-specific monitoring efforts ended. All monitoring conducted through 2004 was described in the HRC “Rare Plant Annual Report 2004.” A research project begun in 2005 replaced surveys and monitoring for this species. In summary, the project results indicate that maintaining populations of this species can be compatible with active forest management. Where ongoing disturbance to populations from summer road maintenance and use occurs, conditions favorable to Howell’s montia have been preserved. As part of our Howell’s montia management strategy, we avoid heavy road rocking, excavation, and deep grading where plants are known to occur, since these activities can alter the microsite conditions or bury the seed bank. The research paper was included in the 2011 Rare Plants Annual Report and is available upon request.

Beginning in 2008 we have documented all of our revisits to known occupied sites and going forward plan on visiting all known sites on a five year rotation. All revisited occurrences are listed in Table 9 and in Appendix 7.

METHODS

Mitigation methods

HRC and CDFW have agreed that the property-wide consultation and mitigation for *Montia howellii*, documented in a letter from CDFG to PALCO dated February 27, 2006, will continue in effect. This consultation, which restricts road use by heavy equipment in the winter and grading in the summer, was amended by agreement on March 17, 2010 to change the seasonal effective dates of the mitigation measures from January 1 through May 31 to December 1 through May 1. The revised property-wide mitigation was incorporated into all THPs going

forward and the date has been changed on all rare plant caution signs along occupied roads. Copies of this and all property-wide consultations are available in Appendix 4.

Research Methods

Winter Road Use (Open Roads)

Five roads that would ordinarily be blocked from heavy equipment traffic according to the property-wide mitigation agreement were left open during the 2004-2016 winter seasons. These roads are ones with deeded in-holding owner rights-of-way, or are in areas where we are not able to restrict public access. We recorded plant numbers and mapped the locations of *Montia howellii* on only one of these roads in 2016 (Wrigley Road). We will continue to examine these occupied road areas to follow trends in population numbers related to impacts of un-mitigated winter road use.

RESULTS

Survey and Mitigation Results

Table 7 shows location and plant numbers of the new sites found in 2016. There are currently 41 known populations of Howell's montia located on HRC property, with approximately 36,823 individual plants (Table 4).

Table 7. 2016 *Montia howellii* new occurrence locations, numbers, and mitigations.

Occurrence ID	Project Name	Township	Range	Section	Quantity	Mitigation
4388	2016 MOHO	4N	2E	23	9	MOHO Programmatic

Research Results

Winter Road Use (Open Roads)

Population numbers at the "Open Road" sites have fluctuated, sometimes greatly, from year to year (Table 8, Figure 1).

The numbers at Wrigley Road have declined after the dramatic increase following some light grading and road maintenance that was conducted there in 2011.

The Jordan Creek site is maintaining high numbers but much of the habitat is gradually becoming overgrown with grasses and weedy forbs. This site is on the route to an active hydrology sampling station and the habitat is maintained by winter visits to that station and by occasional use of the road for access by public utilities to the power lines running overhead.

Riverside has rebounded from a low several years ago, but continued impacts to that population are likely due to unrestricted and abundant use of the area by motor vehicle recreationists. Portions of the nearby (unoccupied) road system are scheduled to be used as a helicopter service landing, log decking, and loading area during upcoming THP operations as early as 2016.

The population at Upper Newman Creek has been in decline for a number of years and in 2012 we were unable to locate any plants in the previously occupied road segments. The road does still contain habitat for Howell's montia and in 2013 and 2015 we found 17 plants in a turnout. This occurrence was detected in 2000 during surveys for the Upper Newman 18 THP 1-99-454HUM and estimated to contain more than 7,000 plants. The road has been used in several harvest plans since that time and is also used by an adjacent landowner who has deeded access to their property. HRC does not fully control the use or maintenance of this road and the habitat has been used by the in-holder without regard to season or impact to the plants. This road will be surveyed again in the hope that the population may be able to re-establish itself from a stored seed bank, if available.

By comparison, total plants at the mitigated sites (Table 9) revisited this year have increased by more than 4000 plants since the last count. This may be due in part to the return to a more "normal" pattern of precipitation following several years of moderate to severe drought.

Figure 1. *Montia howellii* plant numbers (Open Roads)

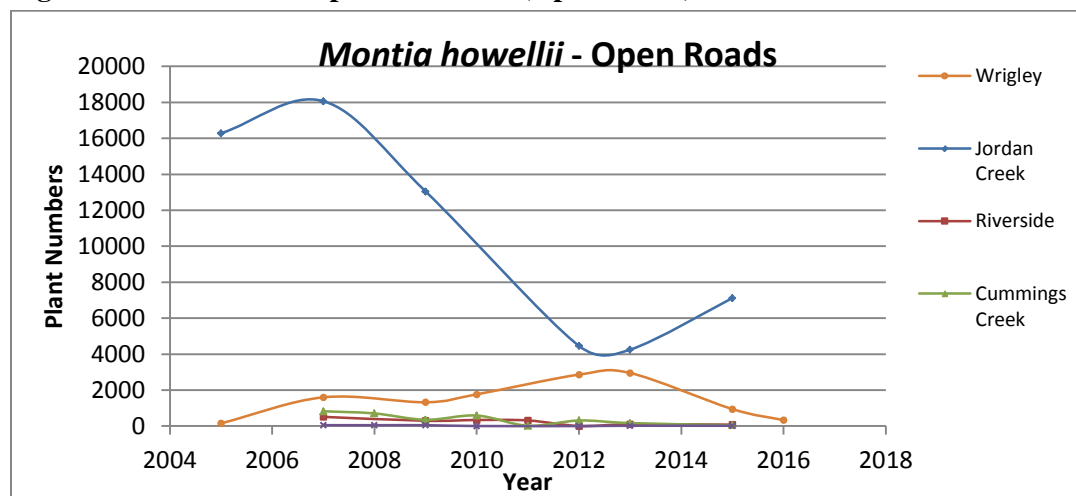


Table 8. *Montia howellii* plant numbers (Open Roads).

Location	Road Number	Occurrence IDs	2005	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Wrigley*	U11	374, 563, 564	152	1,598		1,323	1,765		2,861	2,950		943	328
Jordan Creek*	A51.19	351	16,284	18,066		13,047	†		4,456	4,250		7,119	
Riverside	L46	163		511		294	336	312	3	99		77	
Cummings Creek	L33	40		821	702	350	585	19	308	165		42	
Upper Newman Creek	C07.2327	82		49	47	47	1		0	17		17	

* Both of these “open roads” were also included in the 10 road areas monitored for the research project.

† Portions of this location were revisited coincidentally with other surveys and approximately 8,000 plants were observed.

Effectiveness Monitoring Results

After concluding the six-year research project in 2010, we began revisiting occurrences that were not included in the study and had not been revisited in up to ten years. Many of these sites have not had recent disturbance and have declining numbers. Where numbers increased, there had been recent road use or road work. In 2016 plants were found in areas where the previous count was zero (e.g. occurrences 238, 370, 553, 554, 844, 880, and 1016; Table 9). As in previous years we found that several of the original populations have expanded spatially (total numbers may not have increased), some have contracted (as portions became inactive), and some have migrated into previously unoccupied road areas since the last time they were counted and mapped (if plants in original location are no longer active). Newly occupied road segments are shown on the map of active sites in Appendix 5 and are coded as 2016 finds. The roads surveyed

in 2016 are included on the Rare Plant Road Survey Map also located in Appendix 5. Table 9 shows the details of the sites revisited in 2016.

Table 9. 2016 *Montia howellii* site revisits.

Occurrence ID	Township	Range	Section	Previous Visit	Previous Quantity	2016 Quantity	Mitigation
14	1S	2E	5	2013	187	399	MOHO Programmatic
55	1N	1E	36	2015	18	140	MOHO Programmatic
68	2N	2E	27	2015	3	1	MOHO Programmatic
84	1N	1E	31	2013	1	1	MOHO Programmatic
90	1S	3E	6	2013	3,024	4,140	MOHO Programmatic
144	1N	1E	34	2014	2,963	5,931	MOHO Programmatic
238	2N	2E	32	2014	0	7	MOHO Programmatic
239	2N	2E	33	2014	0	0	MOHO Programmatic
296	2N	2E	32	2014	0	0	MOHO Programmatic
312	4N	2E	13	2012	450	592	MOHO Programmatic
354	1N	1W	25	2013	0	0	MOHO Programmatic
370	1N	2E	5	2013	0	54	MOHO Programmatic
374	4N	1W	25	2015	915	328	MOHO Programmatic
536	2S	1W	17	2011	150	198	MOHO Programmatic
553	1S	2E	5	2013	0	61	MOHO Programmatic
554	1S	2E	5	2013	0	1	MOHO Programmatic
559	2N	2E	29	2015	4	0	MOHO Programmatic
563	4N	1W	25	2015	2	0	MOHO Programmatic
564	4N	1W	25	2015	26	0	MOHO Programmatic
844	1S	2E	5	2013	0	19	MOHO Programmatic
845	1S	2E	5	2013	0	0	MOHO Programmatic
846	1S	2E	5	2013	4	0	MOHO Programmatic
847	1S	2E	5	2013	0	0	MOHO Programmatic
880	1N	1E	34	2014	0	10	MOHO Programmatic
881	1N	1E	34	2013	1000	800	MOHO Programmatic
1016	2N	2E	19	2014	0	4	MOHO Programmatic
1135	1N	1E	5	2013	89	24	MOHO Programmatic
1466	2N	2E	33	2014	0	0	MOHO Programmatic
1467	2N	2E	33	2014	0	0	MOHO Programmatic
1805	1N	1E	26	2014	658	303	MOHO Programmatic
3892	2N	2E	33	2014	174	898	MOHO Programmatic
4160	4N	1E	12	2015	2	3	MOHO Programmatic
				Totals	9670	13914	

DISCUSSION

The vast majority of Howell's montia populations on HRC land are associated with roads. Plants are also occasionally found on skid trails or along cow, elk, or deer trails in suitable habitat adjacent to occupied roads. In 2016 we again encountered road segments with previously mapped locations which did not support plants, and we found previously unoccupied roads now containing active populations. Again, total plants at the mitigated sites revisited this year have increased by more than 4000 plants since the last count. Most of the newly occupied road segments appear to be sourced from known nearby populations. We have noted similar temporal and spatial changes every year since 2004 when we began returning to known locations.

In addition to spatial and temporal movement, strong annual number fluctuations occur in *Montia howellii* populations. We do not know what causes these fluctuations, although we suspect road use is the most significant factor, based on the research data we have collected. Timing and amount of early winter and early spring rains may also influence observed numbers.

Each year HRC conducts an audit of all site revisits and sites that have had zero plants in the last three visits are changed to "inactive" status and are no longer counted toward total populations or total plant numbers for this species. Inactive sites are not removed from our records. Mitigation and monitoring efforts continue to be enforced as future operations in those areas could potentially re-activate those sites.

In areas of little or no road use, vegetative competition by grasses and herbs appears to be the primary agent in causing Howell's montia occurrences to become inactive. We have observed that roads left unused and undisturbed will eventually be covered with other species, reducing the potential Howell's montia habitat available. Conversely, we have observed that heavily rocked roads which are regularly used and maintained by grading are also less likely to contain plants, even though other conditions may be favorable. HRC continues to upgrade, maintain, and storm-proof roads as required by the HCP Aquatic Conservation Plan. As more roads achieve a well-drained condition, the overall amount of potential Howell's montia habitat may be reduced, although we suspect that some percentage of roads on HRC property will always be seasonal, native soil roads and contain adequate habitat for Howell's montia

Roads occupied by Howell's montia which get light grading and summer use after the plants have set seed typically have sustained populations regardless of whether or not winter use is restricted to light vehicles. HCP wet weather road restrictions aid in protecting occurrences on seasonal roads.

The pattern of widely fluctuating plant numbers at individual locations that we have documented is likely to continue within the context of HRC's property-wide landscape planning. In this system, units of marketable timber within larger "block" areas are considered available for harvest planning on a 20-year rotation, with operations occurring within the block in five out of the 20 years. Individual roads may be in use for one to several years in the 5-year period. After use, many of the seasonal native-surface roads are closed and crossings are pulled, rather than leaving culverts in place; these roads won't be re-opened until the next cycle of activity. Where Howell's montia occurs on these roads, the populations will almost certainly decline until the next harvest cycle. We have documented that the plants return and spread when the habitat is again made suitable as a result of disturbance, and assume that the plants come from dormant seeds in the soil. Our landscape-wide monitoring plan for Howell's montia will continue to document these fluctuations in numbers.

***PACKERA BOLANDERI* VAR. *BOLANDERI* (SEACOAST RAGWORT)**

INTRODUCTION AND SUMMARY

Packera bolanderi A. Gray, W. A. Weber, and A Love var. *bolanderi* is a perennial herb of the Asteraceae (sunflower family). Seacoast ragwort is 1-5 dm tall with dark green pinnately lobed foliage and showy, yellow radiate flower heads. Habitat is described as wet cliffs, coastal forest, less than 300 meters (984 feet) elevation (Baldwin 2012). Other references include coastal strand, north coast scrub; coastal headlands, bluffs and prairies; and moist (wet) slopes in mixed evergreen/Douglas-fir/Redwood forest types usually associated with streams, rivers, or seeps. According to CNPS (2016) the elevation range is from 30 to around 650 meters (98 to 2,132 feet); however on HRC we have found it up to 911 meters (2,989 feet). It occurs in Mendocino, Humboldt, and Del Norte counties in California, and extends north to Oregon and Washington.

Seacoast ragwort is ranked G4T4¹⁹, S2S3²⁰, and is a CRPR 2B.2²¹.

We began surveys for seacoast ragwort in 2003. By the end of 2004 we had located 14 occurrences grouped into 13 populations. All locations on HRC property are included on the map in Appendix 5. There are nearby off-property occurrences in Grizzly Creek State Park, Dyerville Loop Road area, and near Kneeland Airport. The population summary given in Table 4 includes only plants on HRC property.

METHODS

Survey Methods

We conduct surveys for seacoast ragwort from January through August and focus our attention on steep bluffs, cliff faces, and cut banks often associated with a watercourse or road.

¹⁹ G4T4: Apparently secure-Uncommon but not rare; some cause for long-term concern due to declines or other factors.

²⁰ S2S3: Imperiled-Vulnerable: Imperiled in the state because of rarity due to the very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the nation or state/province. Vulnerable in the state due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.

²¹ CRPR 2B.2: Rare or endangered in California, more common elsewhere; fairly threatened in CA.

Mitigation Methods

HRC and CDFW have agreed upon a property-wide consultation and mitigation (50 foot no-cut and equipment limitation zone) for *Packera bolanderi* var. *bolanderi* documented in a letter from CDFG to PALCO dated February 27, 2006 (Appendix 4).

RESULTS

Survey and Mitigation Results

We located 22 new occurrences (655 new plants) of seacoast ragwort during the 2016 season (Table 10). These were located near known occurrences for this species and did not result in any new populations on HRC property but instead resulted in the loss of one population as the new sites joined together previously separated populations. There are currently 35 populations of seacoast ragwort known to exist on HRC property with approximately 8,405 total individual plants.

Table 10. *Packera bolanderi* var. *bolanderi* locations, numbers, and mitigations

Occurrence ID	Project Name	Township	Range	Section	Quantity	Mitigation
4286	16-004 Redwood House Selection	1N	2E	4	83	50' No Cut-ELZ*
4287	16-004 Redwood House Selection	1N	2E	4	14	50' No Cut-ELZ
4288	16-004 Redwood House Selection	1N	2E	4	12	50' No Cut-ELZ
4292	16-004 Redwood House Selection	1N	2E	4	20	50' No Cut-ELZ
4294	16-004 Redwood House Selection	2N	2E	33	7	None - No Ops Area
4295	16-004 Redwood House Selection	2N	2E	33	5	None - No Ops Area
4296	16-004 Redwood House Selection	2N	2E	33	5	None - No Ops Area
4297	16-004 Redwood House Selection	2N	2E	33	7	None - No Ops Area
4298	16-004 Redwood House Selection	2N	2E	33	6	None - No Ops Area
4301	16-004 Redwood House Selection	2N	2E	33	201	50' No Cut-ELZ
4302	16-004 Redwood House Selection	2N	2E	34	2	50' No Cut-ELZ
4303	16-004 Redwood House Selection	2N	2E	34	74	None - No Ops Area
4304	16-004 Redwood House Selection	2N	2E	34	5	50' No Cut-ELZ
4306	16-004 Redwood House Selection	2N	2E	34	23	50' No Cut-ELZ
4307	16-004 Redwood House Selection	2N	2E	34	72	50' No Cut-ELZ
4308	16-004 Redwood House Selection	2N	2E	34	39	50' No Cut-ELZ
4309	16-004 Redwood House Selection	2N	2E	34	17	50' No Cut-ELZ
4310	16-004 Redwood House Selection	2N	2E	34	22	50' No Cut-ELZ
4311	16-004 Redwood House Selection	2N	2E	34	14	50' No Cut-ELZ

Occurrence ID	Project Name	Township	Range	Section	Quantity	Mitigation
4312	16-004 Redwood House Selection	2N	2E	34	6	None - No Ops Area
4320	Blue Bull	1N	2E	3	6	50' No Cut-ELZ
4324	Blue Bull	1N	2E	4	15	50' No Cut-ELZ

*ELZ – Equipment Limitation Zone

Effectiveness Monitoring Results

This year we revisited two known occurrences during monitoring for effectiveness of mitigation measures (Table 11). These sites, located in the Strong Armed THP were given a site specific avoidance buffer that protected the plants while allowing for roadwork (#1589) or cable yarding (#742) to occur. It appears that the mitigation strategies applied at these sites have succeeded in protecting the plants and the available habitat as plant numbers at both have increased considerably post operations likely due to an increase in incident sunlight, minor ground disturbance, and reduction in competing vegetation in adjacent harvested areas.

Planned monitoring for seacoast ragwort found in the Shively 12 (1-12-126HUM) THP has not yet taken place because operations have not been completed in that area. The Shively 12 THP unit containing the occurrence (#1497) is unharvested at this time and due to operational difficulties the project may be infeasible. Monitoring of this site will remain on hold until harvest operations are conducted.

Table 11. 2016 *Packera bolanderi* var. *bolanderi* site revisits.

Occurrence ID	Project Name	Township	Range	Section	Previous Visit	Previous Quantity	2016 Quantity	Mitigation
606	Blue Bull	1N	2E	4	2004	516	116	50' NoCut – ELZ*
606	16-004 Redwood House Selection	1N	2E	4	2004	516	65	50' NoCut - ELZ
631	16-004 Redwood House Selection	2N	2E	33	2011	20	36	None - No Ops Area
632	16-004 Redwood House Selection	2N	2E	34	2004	68	37	50' NoCut - ELZ
716	16-004 Redwood House Selection	1N	2E	4	2004	481	701	Varied Site Specific
717	16-004 Redwood House Selection	2N	2E	34	2004	59	140	50' NoCut - ELZ
718	16-004 Redwood House Selection	2N	2E	33	2004	45	232	50' NoCut - ELZ
742	12-126 Strong Armed	1N	2E	17	2013	39	61	50' NoCut - ELZ
771	16-004 Redwood House Selection	1N	2E	4	2010	41	20	50' NoCut - ELZ
772	16-004 Redwood House Selection	1N	2E	3	2008	14	21	50' NoCut - ELZ
803	16-004 Redwood House Selection	1N	2E	4	2006	20	133	None - No Ops Area

Occurrence ID	Project Name	Township	Range	Section	Previous Visit	Previous Quantity	2016 Quantity	Mitigation
804	16-004 Redwood House Selection	1N	2E	4	2006	3	22	None - No Ops Area
1213	Blue Bull	1N	2E	4	2012	130	120	50' NoCut - ELZ
1589	12-126 Strong Armed	1N	2E	17	2014	260	435	50' NoCut - ELZ
1662	16-004 Redwood House Selection	2N	2E	33	2013	2	27	None - No Ops Area

*ELZ – Equipment Limitation Zone

DISCUSSION

Most of the known occurrences of seacoast ragwort on our ownership are in the Van Duzen watershed. We have also found occurrences in the Sequoia watershed (Eel River) around the Dyerville Loop area and in the upper reaches of Stitz and Nanning Creeks, also tributaries to the Eel River. From the map included with this report (Appendix 5) it is evident that two areas (HRC lands along the Van Duzen River and the Dyerville Loop area on the Eel River) are *Packera* “hot-spots.” These two areas contain the bulk of all *Packera* findings on HRC lands. In 2013 we found one new occurrence in the Blue Slide Creek drainage within the Mad River watershed north of the Kneeland Airport and one new occurrence in the Yager Creek watershed. Taylor Peak on the eastern boundaries of our property contains a single occurrence un-associated with a watercourse. The occurrences on Kneeland and Taylor Peak are relatively small and seemingly isolated from the larger populations mentioned above.

Based on our post-impacts monitoring of a few known occurrences, it appears seacoast ragwort populations can withstand at least some level of disturbance – not surprising when one considers its common habitat is unstable slopes and road cuts. However, we do not know the extent to which the population numbers may fluctuate naturally. To put our monitoring results into perspective, we would need to monitor nearby, non-impacted occurrences as a comparison.

***PIPERIA CANDIDA* (WHITE FLOWERED REIN ORCHID)**

INTRODUCTION AND SUMMARY

Piperia candida R. Morgan & J. Ackerman is a perennial herb of the Orchidaceae (orchid family). The white flowered rein orchid is 10-60 cm tall with 2-3 basal leaves approximately 3 cm by 10 cm, which do not generally persist after anthesis. The inflorescence is typically one-sided and may have as many as 100 flowers. Flowers are predominantly white with a green midvein on the upper sepal. Other parts of the flower may have some hints of green also. Coleman (1995) describes the habitat as coniferous and mixed evergreen forest, in dense shade to full sun and from gravel bars to flat terrain or steep hillsides in elevations from near sea level to 1,200 meters (3,937 feet). CNPS (2016) has records as high as 1,310 meters (4,298 feet). It occurs in coastal California from the San Francisco Bay Area, northward to Alaska (CNPS 2016, UDSA 2010).

White flowered rein orchid is ranked G3?²², S2²³, and is CRPR 1B.2²⁴.

We began surveys for *Piperia* in 2008 but have records of it from surveys in 2004 and 2005. In 2008 we located five occurrences grouped into four populations; we now know of 22 populations on HRC property, containing approximately 2,041 individual plants. All locations are included on the map in Appendix 5.

METHODS

Survey Methods

We conduct surveys for *Piperia candida* between May and September. Besides *Piperia candida*, we have also found *Piperia transversa*, *Piperia elegans*, *Piperia unalacensis*, and *Piperia elongata*. We conduct early surveys in March through May to identify *Piperia* populations from the leaves. At that time we make an estimate of population size and extent but we must revisit the sites as late as August and September to identify the species.

²² G3?: Vulnerable- At moderate risk of extinction due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors. There is still some uncertainty to this ranking.

²³ S2: Imperiled-Imperiled in the state because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the nation or state/province.

²⁴ CRPR 1B.2: Plants rare, threatened, or endangered in California and elsewhere; fairly threatened in CA.

Mitigation Methods

We have developed mitigation for this species through consultation with CDFW on a site-specific basis. Protective measures can include a variety of options to reduce impacts to a less than significant level, but generally consist of selective tree retention and an equipment exclusion or limitation buffer. We give all *Piperia* plants in vegetative condition the same protection measures as for *P. candida* until we can make a positive identification to species.

RESULTS

Survey and Mitigation Results

We continue to find *Piperia candida* in areas that are predominately Douglas-fir forest or mixed Douglas-fir/Redwood forest types with a strong hardwood component. The sites are xeric to mesic and mostly on or near old skid trails or roads, although, occurrences are also found within and directly adjacent to Class II and Class III watercourses

We found that the different *Piperia* species on our property may occupy the same habitat and grow in close proximity to each other although they mature at different times. For example, we have found *P. elegans* with *P. elongata*, *P. unalacensis* with *P. transversa*, and *P. transversa* with *P. candida*. *P. candida* is the only *Piperia* species for which HRC is required to provide mitigation during covered activities.

Table 12 shows locations and numbers of plants found during the 2016 survey season along with the mitigation applied to each occurrence. This year HRC botany staff documented 16 new occurrences of *Piperia candida*, representing one new population on HRC property. In addition to the verified *P. candida* sites HRC staff also detected several occurrences of *Piperia* sp. that did not bloom in 2016. These sites will be revisited in the next appropriate season to determine the exact species. Without positive identification, sites will receive mitigation buffers during any activities that have the potential to significantly impact the plants. Buffers will remain in place until the species is identified as other than *P. candida* and the need for mitigation is removed or through consultation a site specific mitigation agreement is reached. There are currently 22 known *Piperia candida* populations on HRC property containing approximately 2,041 individual plants among them.

Table 12. 2016 *Piperia candida* locations, numbers, and mitigations.

Occurrence ID	Project Name	Township	Range	Section	Quantity	Mitigation
4329	16-032 Power Bear	1S	1E	17	24	50' No Cut-ELZ*
4331	16-032 Power Bear	1S	1E	16	5	25' No Cut-ELZ
4332	16-032 Power Bear	1S	1E	16	3	None - No Ops Area
4333	16-032 Power Bear	1S	1E	9	43	50' No Cut-ELZ
4334	16-032 Power Bear	1S	1E	16	3	25' No Cut-ELZ
4335	16-032 Power Bear	1S	1E	16	1	None - No Ops Area
4336	16-032 Power Bear	1S	1E	16	99	50' No Cut-ELZ
4337	16-032 Power Bear	1S	1E	9	10	50' No Cut-ELZ
4338	16-032 Power Bear	1S	1E	9	33	25' No Cut-ELZ
4339	16-032 Power Bear	1S	1E	9	58	50' No Cut-EEZ**
4340	16-032 Power Bear	1S	1E	9	11	50' No Cut-ELZ
4341	16-032 Power Bear	1S	1E	9	7	50' No Cut-ELZ
4342	16-032 Power Bear	1S	1E	9	18	50' No Cut-EEZ
4330	16-032 Power Bear	1S	1E	16	1	50' No Cut-ELZ
4343	16-032 Power Bear	1S	1E	17	1	None (road prism)
4344	16-032 Power Bear	1S	1E	18	1	None (road prism)

* ELZ - Equipment Limitation Zone

** EEZ - Equipment Exclusion Zone

Effectiveness Monitoring Results

A revisit for monitoring was planned within Unit 1 of the Mountain View THP (1-13-035HUM) on an occurrence of *P. candida* located on the prism and side slopes of an existing rocked haul road. Timber harvest has not yet begun on this plan, and as such, effectiveness monitoring has been postponed until such time as the timber operations have been completed. No other *Piperia candida* sites were re-visited during the 2016 survey season.

DISCUSSION

Piperia plants have to reach full anthesis before we can determine the species. We have observed that *Piperia* plants may not show leaves every season and not every plant with leaves will bloom in a given year. Blooming plants have often lost their leaves before a positive identification can be made, which makes it hard to determine population size and boundaries if the survey is only conducted when flowers are present.

***SIDALCEA MALVAEFLORA* SSP. *PATULA* (SISKIYOU CHECKERBLOOM)**

INTRODUCTION AND SUMMARY

Sidalcea malvaeflora (D.C.) Benth. ssp. *patula* C.L. Hitchcock is a perennial herb of the Malvaceae (mallow family). It is 50 to 90 cm tall with long trailing rhizomes and rose-pink flowers. Lower leaf blades are crenate to shallowly lobed and upper leaf blades are generally deeply lobed.

Habitat for the species includes North Coast coniferous forest, coastal prairie, and open coastal bluff scrub generally up to 880 meters (2,887 feet) in elevation (CNPS 2016). Siskiyou checkerbloom is also found in broadleaved upland forest (CNDDDB Rare Find, November 2014), along the coast on stable dunes and sea bluffs, sunny openings of foothill woodland (Smith and Wheeler 1992), and Redwood Forest plant communities (Munz and Keck 1970). It occurs in Mendocino, Humboldt, and Del Norte counties in California, and north into Oregon (CNPS 2016). HRC botanists have found Siskiyou checkerbloom along grassy roadsides, in prairies, and at the prairie interface with Redwood or mixed evergreen forest types.

Siskiyou checkerbloom is ranked G5T2²⁵, S2²⁶, and is a CRPR 1B.2²⁷.

Surveys for Siskiyou checkerbloom began in 1999, and it was found that same year. All locations on HRC property are included on the map in Appendix 5.

METHODS

Survey Methods

We conduct surveys for Siskiyou checkerbloom during its floristic season, May through August. We focus our survey efforts in areas of preferred habitat for this species such as grassy roadsides, meadows, and edges of forest stands.

²⁵ G5T2: Critically Imperiled- At very high risk of extinction due to extreme rarity (often 5 or fewer populations), very steep declines, or other factors. (The T rank reflects the global condition of the subspecies, the G rank to the species including all subspecies).

²⁶ S2: Imperiled-Imperiled in the state because of rarity due to the very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the nation or state/province.

²⁷ CRPR 1B.2: Rare, threatened, or endangered in California and elsewhere; fairly threatened in CA.

Mitigation Methods

The mitigation method used follows CEQA guidelines and consists of avoidance and minimization of impacts by using no-cut and equipment exclusion zones (EEZ) or equipment limitation zone (ELZ) buffers. All mitigations are site-specific, requiring concurrence from CDFW.

RESULTS

Survey and Mitigation Results

There was one new detection of *Sidalcea malvaeflora* ssp. *patula* on HRC lands during the 2016 survey season, see Table 13 for details. There are currently nine known populations of Siskiyou checkerbloom on lands managed by HRC with approximately 2,763 total individual plants among them.

Table 13. 2016 *Sidalcea malvaeflora* ssp. *patula* locations, numbers, and mitigations.

Occurrence ID	Project Name	Township	Range	Section	Quantity	Mitigation
4406	2016 Rarefind	1N	1W	15	100	None - No Ops Area

Effectiveness Monitoring Results

No Siskiyou checkerbloom sites were revisited during the 2016 survey season. HRC had plans to conduct monitoring on four occurrences in 2016 but priority survey and mitigation efforts took precedence and none of the voluntary re-visits were possible. HRC botanists will conduct monitoring visits on these sites as soon as possible in the next few years. The first planned monitoring will include occurrences 162 and 908 which are located along Riverside Road, a county access road in the Van Duzen River area. At this site in 2014 CalFire hand crews cleared roadside vegetation for fuels reduction. HRC botanists met with CalFire prior to the operation and agreed on a short set of mitigations in order to reduce impacts to the plants and habitat on site at the time. CalFire agreed to conduct their operation after the blooming season for the plants, not to apply herbicide, and to restrict weed whacking of grassy roadsides to leave at least 8-10 inches of vegetation (no whacking to bare dirt) in order to avoid impacts to checkerbloom rhizomes and prostrate stems. It is hoped that the work will aid this occurrence by reducing competition, opening up suitable habitat, and spreading/sowing checkerbloom seed. HRC also

plans on conducting a monitoring visit to Siskiyou checkerbloom occurrences 1 and 1152 located along Monument Road west of the towns of Scotia and Rio Dell. At this site HRC has a ranch lease that allows for the grazing of cattle and monitoring visits are planned to ensure the sites remain active and viable during the life of the lease.

DISCUSSION

All of HRC's survey reports describe the areas where we have found Siskiyou checkerbloom as meadow habitat, roadsides, or in openings or at the edges of Douglas-fir or mixed evergreen forests. Other than roadsides, these habitats are not typically impacted during timber harvesting operations. The potential impacts to this plant on HRC land arise primarily from re-establishment of conifer stands, road building, and road maintenance. Grazing has the potential to impact individual plants but could maintain the habitat. Grazing animals help maintain the open prairie and keep competition from grasses down, but plants found in grazed fields are often located along fence lines and in amongst shrubs and woody debris where it may be difficult for cattle to impact individual plants.

We currently survey in designated harvesting plan areas and along appurtenant roads, so there are areas of suitable habitat on the property that have not been or are not likely to be surveyed. Because of this, there may be more populations on our land than the nine populations we have recorded. There is abundant habitat off HRC property, so we believe it is likely there are more populations in California than shown in the CNPS and CNDDDB records.

CALIFORNIA NATIVE PLANT SOCIETY (CNPS) WATCH LIST PLANTS

INTRODUCTION AND SUMMARY

In 2006 HRC botanists began to voluntarily document plants ranked as CRPR 4: “plants of limited distribution, a watch list”, and CRPR 3: “plants of problematic taxonomy and about which we need more information” (CNPS 2016). This was modified in 2010 to include only CRPR 4 plants. There are approximately 34 species on these CRPR lists that are known or are likely to occur on HRC ownership (see Introduction, Table 2). HRC botanists have located populations of 15 of these species during surveys.

During 2014 HRC botanists found 38 occurrences of ten of these species (see Appendix 2: Plant Detections). We record these as we would plants on our Special Status Plant List and maintain them in our database (see Data Management and Analysis Methods). We also report these plants annually to CNDDDB.

METHODS

Survey Methods

These species are found incidentally during the course of our normal operational surveys.

Mitigation Methods

CRPR 4 plants are generally not considered sufficiently rare to qualify for mitigation and protection under CEQA.

Voluntary Management Plan for *Lycopodium clavatum*

In July 2008, *Lycopodium clavatum* was moved from CRPR 2 to CRPR 4. HRC has voluntarily implemented the following management plan for this species:

1. Humboldt Redwood Company, LLC (HRC), will report to CDFG and CNDDDB all occurrences of *Lycopodium clavatum* discovered during forestry operations once a year.

2. HRC will no longer include enforceable language for the protection of this species in new THPs.
3. Where *Lycopodium clavatum* is found within a THP unit, HRC will make efforts during planning to conserve mats through silvicultural practices, such as placing retained tree clusters at the plant locations, but will harvest any marketable tree that is not otherwise retained.

RESULTS

Watch list plant detections are included in Appendix 2: Plant Detections.

DISCUSSION

Our goal in surveying and reporting these occurrences is to further the knowledge of California flora and provide accurate records for future decisions concerning plant and habitat protections. Prior to 2006, watch list plants were mentioned in THP and habitat surveys but the data was not reported to CNDDDB nor retained in HRC's data base. There are likely additional occurrences of these species on the property.

Maps of the watch list species on HRC property are included in Appendix 5.

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