
Rare Plants Annual Report

Humboldt Redwood Company LLC.

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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 consultants assessed and/or surveyed 24 projects in 2017 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 6,580.1 acres. Botanical survey coverage during the 2017 survey season was approximately 5,358 acres with 170.8 miles of surveyed roads (includes 8.4 miles of road surveyed for Howell’s montia), altogether totaling over 6,166.4 acres. This year on HRC property we found 23 new occurrences of four of our Special Status plant species, which represent five new populations, bringing the total number of rare plant populations detected on HRC land to 165. 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.

Maps of the individual species are provided in Appendix 5. 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 2017 and *Montia howellii* road surveys (MOHO Research) from 2005 to 2017.

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 8.4 miles of roads for *Montia howellii* in 2017. 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 three new sites on roads 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. All of these “open” sites were visited in 2017. The results of monitoring efforts are presented in the summary tables below and are included in tables found in Appendix 7.

Proposed Changes for 2018

HRC does not propose any significant changes to the Rare Plant Program for the 2018 survey season.

INTRODUCTION

HRC employees, foresters, and consultants conducted plant habitat assessments and seasonally appropriate floristic plant surveys in 2017 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 2017 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 2017 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. <i>pacifica</i> 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 2017 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	Yes
<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>Mitellastrum 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 2017 at any particular site are noted on the sensitive species detections table in Appendix 2 and in the site revisit table in Appendix 7.

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 24 projects for Special Status plants in 2017, covering a total of approximately 6,166.4 acres; including 170.8 miles of roads (this includes 8.4 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. 2017 Assessed/surveyed acres by month.

Year	Month	Unit Survey Acres	Road Survey Acres	Total Acres
2016	December	63.4		63.4
2017	January		3.7	3.7
2017	February			
2017	March	874.8	118.3	993.1
2017	April	1,051.9	187.7	1,239.6
2017	May	1,013.2	151.4	1,164.6
2017	June	695.4	106.5	801.9
2017	July	866.1	100.7	966.8
2017	August	640.3	105.4	745.7
2017	September	117.3	11.6	246.2
2017	October			
2017	November	35.5	2.9	38.4
Total 2017 Survey Acres		5,358	788.1	6,146.1
2017	Howell's montia Surveys		20.3	
Total 2017 Survey/Assessment Acres				6,166.4

*This value is generated in ArcGIS by creating polygons from survey route data. Total 2017 project acres from database records are approximately 6,580.1. 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.

Table 4 includes a summary of the totals for new occurrences and populations found in 2017.

These data are also included in tables in Appendix 2: 2017 Plant Detections, Appendix 5: Rare Plant Detections and Rare Plant Road Surveys maps.

Table 4. Summary of 2017 Special Status Plant detections and property-wide totals.

Species	2017 occurrences	New populations	Total populations ³	# new plants*	Total plants**
<i>Astragalus agnicidus</i>	11	0	1	603	8,083
<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>	1	1	22	54	14,544
<i>Montia howellii</i>	5	2	43	711	37,534
<i>Packera bolanderi</i> var. <i>bolanderi</i>	6	2	37	405	8,810
<i>Piperia candida</i>	0	0	22	0	2,041
<i>Sidalcea malvaeflora ssp. patula</i>	0	0	9	0	2,763
Totals	23	5	165	1,773	80,719

*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.

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".

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 2017.

In 2017 we also revisited known Special Status plant locations either for monitoring, or for new THP layout. These revisits are documented 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 2017.

EFFECTIVENESS MONITORING

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 visits.

Five projects were visited this season for mitigation effectiveness monitoring (including yearly monitoring for Howell's montia). Results of the monitoring efforts are detailed below and also included in plant detection tables and re-visit tables in Appendices 2 and 7.

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 changes to either the special status plant list or watch list for the 2018 survey season.

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 16 of these species during surveys.

Appendices 2 and 7 contain details on newly detected occurrences as well as data for site re-visits. 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 CNDDB.

METHODS

Survey Methods

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

This season HRC botany staff located a list 4 species new to our ownership. A small occurrence of *Astragalus rattanii* var. *rattanii* (Rattan’s milk-vetch) was detected on a gravel bar within the Eel River high waterline adjacent to the town of Scotia.

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 CDFW 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.

EFFECTIVENESS MONITORING RESULTS

Appendix 3 contains a spreadsheet with the current monitoring schedule for sensitive plant sites.

This year several projects were scheduled for effectiveness monitoring visits including:

- Mountain View THP 1-13-035HUM
- Strong Armed THP 1-12-126HUM
- Redwood House Selection THP 1-16-004HUM
- Up and Cummings THP 1-15-114HUM
- PBL THP 1-14-149HUM
- Yearly Howell's montia monitoring

Results for monitoring visits are described below.

MOUNTAIN VIEW THP 1-13-035HUM

This project was originally surveyed in 2013. During surveys an occurrence of *Piperia candida* (white-flowered rein orchid, PICA 1660) was discovered situated on the running surface and cut-bank of the graveled access road. The occurrence was buffered with a 50 foot zone in which selective tree removal was allowed but road use and maintenance were limited to attempt to retain site character and plant viability while allowing timber harvest to continue. During the summer of 2014 roadwork adjacent to the site was completed and equipment and dump trucks passed through the occurrence during work. In 2015 the site was visited and site condition was good, no observable disturbance has occurred within the protected area and plant numbers were higher than in 2013. Timber harvest on the plan took place late in 2017. A visit to the site before the start of operations was conducted and while the site seems un-changed the plant numbers were lower than the previous year. Additional monitoring visits are planned for post-harvest results. Table 5 contains plant numbers and a simple trends analysis.

Table 5. Monitoring Results – Plant Counts for PICA 1660

Species Code	Occurrence ID	2013	2015	2017
PICA	1660	82	137	46
	Change in number		55	-91
	% Change		+67.1	-66.4

It is unclear what has caused the plant numbers to drop. Numbers came up significantly after the road use in 2014 but have dwindled to almost half of the original numbers since then. The road prism was left ungraded and all buffers were in place. No trees had been cut from the roadsides at this location prior to the monitoring visit. Harvest took place later in 2017. HRC shall return for additional monitoring and analysis of the site conditions in 2018.

STRONG ARMED THP 1-12-126HUM

The Strong Armed THP was originally surveyed in 2012 and was found to contain numerous occurrences of *Packera bolanderi* var. *bolanderi* (seacoast ragwort, PABOBO). Two sites, occurrences 742 and 1589 required site-specific mitigation in order to complete timber harvest and attempt to maintain the plants and associated habitat.

Occurrence 742 is a large occurrence with several locations that was first detected in 2005 during surveys for the Parsnip THP 1-05-053HUM. Only one site within the occurrence is included in the monitoring plan. This site is located at the end of a spur road just below a landing. The landing was needed for placement of a cable yarding tower and the planned yarding corridors necessarily came within the protective buffer for the site. HRC installed a two banded zone that placed a no operations buffer around the plant population core with a second band extending from the edge of the plants and out to 50 feet. Yarding corridor construction and use was allowed within the outer band. Timber harvest and yarding took place in 2015.

Table 6. Monitoring Results – Plant Counts for PABOBO 742

Species Code	Occurrence ID	2013	2016	2017
PABOBO	742	39	61	53
	Change in number		22	-8
	% Change		+56.4	-13.1

This site experienced a jump in plant numbers post-harvest, perhaps due to increased light and potentially higher amounts of precipitation (due to reduction of dense conifer canopy) reaching the ground at the site. The buffers were intact and no cable yarding or tree harvest took place within the inner band. Many of the plants counted in the 2016 visit were young seedlings. Some plants have spread into the recently opened yarding corridor west of the core area. The slight drop in plant numbers recorded in 2017 may represent some of those young plants failing to develop.

Occurrence 1589 was detected in 2014 during surveys for the Strong Armed THP 1-12-126HUM and is located on a steep, slightly unstable slope above a native soil haul road. The cut-bank had slumped into the road at this point and excavation of the road surface and the removal of a large root wad were necessary to open the road for access to the harvest plan. HRC installed a 50 foot no-cut buffer around the plants but allowed road work to proceed with several measures included to minimize the excavation and tree removal during roadwork. Table 7 contains plant numbers for the site.

Table 6. Monitoring Results – Plant Counts for PABOBO 1589

Species Code	Occurrence ID	2014	2016	2017
PABOBO	1589	260	435	273
	Change in number		175	-162
	% Change		+67.3	-37.2

Again, as at site 742, the plant numbers jump post-operations but then decline again before the next visit. This may be due to many young seedlings germinating and sprouting in the newly opened areas and then being overgrown or otherwise failing to develop in the following seasons.

REDWOOD HOUSE SELECTION THP 1-16-004HUM

The Redwood House Selection THP was surveyed in 2016 and numerous known and newly detected occurrences of *Packera bolanderi* var. *bolanderi* (seacoast ragwort, PABOBO) were included therein. Post-harvest monitoring visits are planned on a number of sites that required site-specific mitigation buffers to allow timber harvest activities to proceed. The THP was harvested late in 2017 and the required monitoring visit has not yet taken place. Visits are planned for 2018 and 2019.

UP AND CUMMINGS THP 1-15-114HUM

The Up and Cummings THP was surveyed in 2014 and 2015. During surveys a single small occurrence of the genus *Piperia* was detected. Two small plants were located along a rocky ridge in the lower portions of a harvest unit. Identification of the plants to the species level was not possible as neither of the plants bloomed in 2014, 2015, or 2017. Harvest took place in 2016. This site is included in monitoring visits for two reasons. First, the identification of the plants to the species level is necessary for accurate record keeping and inclusion of the site in future project scoping and species distribution maps. Second, the site was protected by a site-specific buffer to allow yarding corridor use and construction within 50 feet of the site. A two banded buffer was installed prior to operations. The protective zone included a 25 foot inner band in which no timber harvest activities would occur, and a second band from 25-50 feet in which selective tree removal and minimized yarding corridors could be established. The site was visited after harvest and the mitigation zones were intact and there did not appear to be any significant disturbance of the plant site. The identity of the plants at this site is still unknown. While the monitoring period for the effectiveness of the mitigation is concluded with this year's visit; HRC shall return to the site for species ID during the next blooming season.

PBL THP 1-14-149HUM

The PBL THP 1-14-149HUM located in the Larabee watershed contains a host of historic and contemporary occurrences of *Astragalus agnicidus* (Humboldt milk-vetch, ASAG). This species appears to be closely linked with disturbance and has been known to flourish in disturbed areas after timber harvest on HRC property. Surveys for this THP were done in 2014. Additional surveys and some monitoring visits were conducted in 2015 and 2016. HRC botany staff will be continuing to revisit several occurrences while monitoring the PBL THP during the next several

years. The mitigation plan calls for effectiveness monitoring visits for at least three years after completion of harvest or roadwork. HRC had plans to conduct timber harvest operations within this THP in 2017 and did complete some of the planned roadwork in 2015 and 2016. However, all of the planned roadwork has not yet been completed and timber harvest has been postponed. Harvest is now planned for 2018. The 2017 monitoring efforts focused on sections of road with recent roadwork or newly constructed road sections. Table 7 contains the results of the 2017 monitoring and includes re-visits to known sites as well as documentation of newly detected sites in areas of recent roadwork where plants were not previously located. Plant numbers seem to be following the observed pattern of boom and bust typical of this species. Plant numbers boom after disturbance and usually fade in the next few years as competitive shrub and tree species re-colonize the site. Seeds are long lived and may wait for years until the site is disturbed again to emerge.

Table 7. Monitoring Results – ASAG at PBL

Species Code	Occurrence ID	2012	2014	2016	2017	Notes
ASAG	87	0	225		14	Roadwork in 2013, not disturbed since then.
ASAG	115		9	4	4	Minor roadwork, plants on edge of mainline
ASAG	267	0	1		5	Minor roadwork, plants on edge of mainline
ASAG	271		38		106	Minor roadwork, new plants on road edges
ASAG	272	1			0	Minor roadwork, more is planned at this location
ASAG	273	1	5		9	Plants in recently opened road and landing
ASAG	274	11	22		40	Recent grading and minor roadwork
ASAG	4532				4	New sites in areas of recent roadwork (construction or re-construction), these roads were surveyed prior to roadwork and no plants were detected at these sites.
ASAG	4533				166	New
ASAG	4534				46	New
ASAG	4535				1	New
ASAG	4536				23	New
ASAG	4537				3	New
ASAG	4538				21	New
ASAG	4539				33	New

Species Code	Occurrence ID	2012	2014	2016	2017	Notes
ASAG	4540				22	New
ASAG	4541				267	New
ASAG	4542				17	New

MONTIA HOWELLII (HOWELL'S MONTIA, MOHO) YEARLY MONITORING

All Howell's montia sites are monitored on a five year rotation (all known sites are visited and counted once every five years). Sites that have had roadwork or timber harvest in the previous year are generally included in the following year's monitoring to document the species response to the operational activity. General mitigation for the species includes seasonal road use and maintenance restrictions, although a sub-set of occurrences are located on the "Open Roads" which are described further below.

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 2004-2017 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 all of these roads in 2017. We will continue to examine these occupied road areas to follow trends in population numbers related to impacts of un-mitigated winter road use.

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

The numbers at Wrigley Road had declined after the dramatic increase following some light grading and road maintenance that was conducted there in 2011. Numbers appear to have increased in 2017, potentially due to the long wet winter and spring.

The Jordan Creek site is maintaining high numbers and has experienced a large resurgence in 2017 but much of the habitat is gradually becoming overgrown with grasses and weedy forbs. This site is maintained by occasional use of the road for access by public utilities to the power lines running overhead as well as occasional use for access to Jordan Creek for hydrological sampling and survey.

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 were used as a helicopter service landing, log decking, and loading area during THP operations in 2017.

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. The 89 plants detected in 2017 are only located in one small section of road, but that number of plants has not been seen on this road since before 2005 when this monitoring project began.

In all, the combined change in plant numbers between "open road" sites is an increase of 20,666 plants (273%) when comparing 2017 with the most recent count at each site.

By comparison, total plants at the mitigated sites (Table 9) revisited this year have increased by more than 31,000 plants (155% increase) 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 and the fact that this year we visited some of our largest and most productive sites.

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

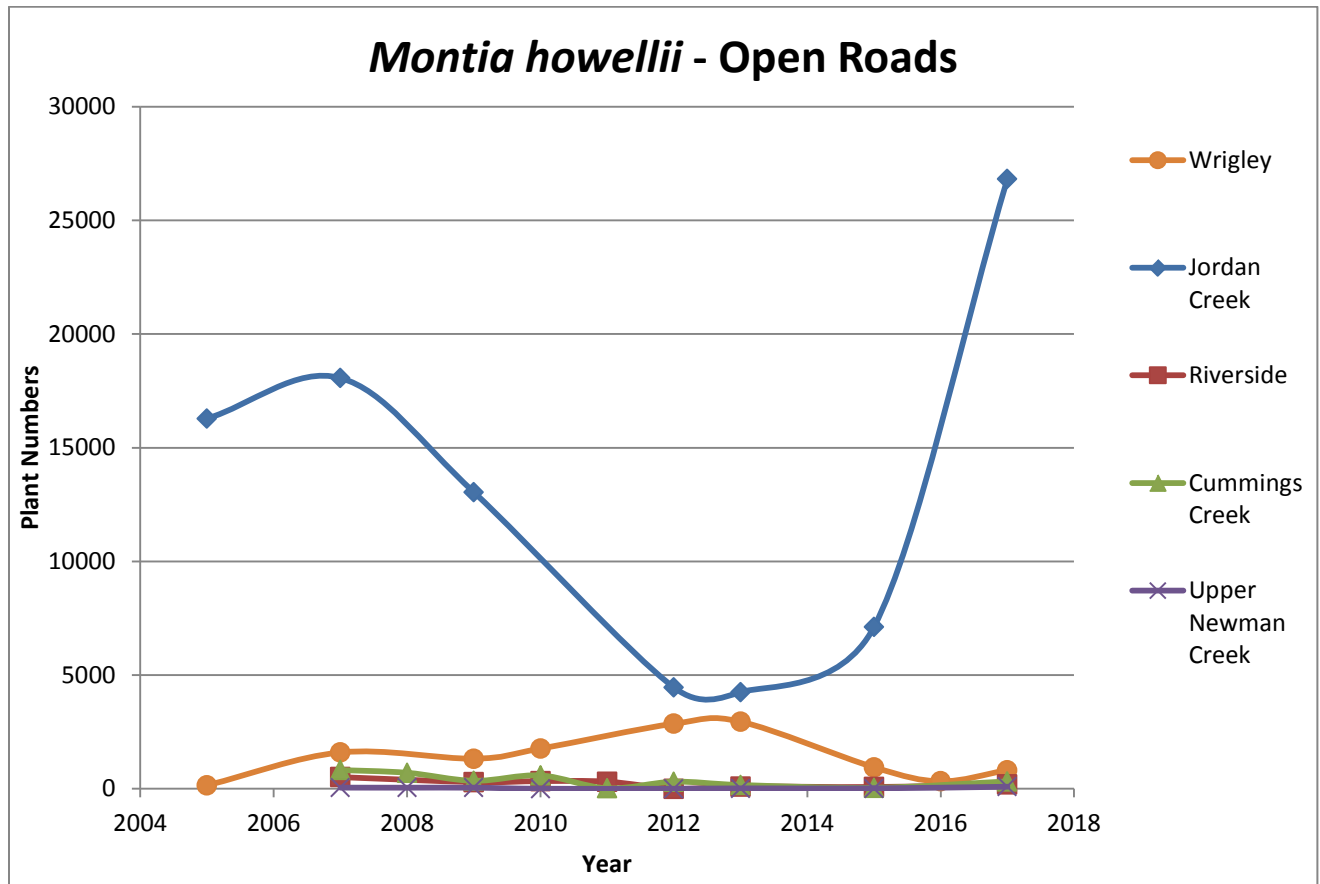
Location	Road Number	Occurrence IDs	2005	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Wrigley	U11	374, 563, 564	152	1,598		1,323	1,765		2,861	2,950		943	328	819
Jordan Creek	A51.19	351	16,284	18,066		13,047	†		4,456	4,250		7,119		26,825
Riverside	L46	163		511		294	336	312	3	99		77		194
Cummings Creek	L33	40		821	702	350	585	19	308	165		42		322
Upper Newman Creek	C07.2327	82		49	47	47	1		0	17		17		89

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

Table 9. *Montia howellii* plant numbers (Mitigated Sites).

Occurrence ID	Plant ID	Township	Range	Section	Previous Quantity # (Year)	Previous Year	2017 Quantity	Change in Plant Numbers	Percent Change
7	MOHO	4N	1E	3	0	2015	0	0	
40	MOHO	2N	2E	29	55	2015	322	+267	+485%
55	MOHO	1N	1E	36	140	2016	15	-125	-89%
82	MOHO	1S	3E	20	17	2015	89	+72	+424%
107	MOHO	1N	1W	15	0	2013	0	0	
163	MOHO	1N	2E	6	11	2015	194	+183	1,664%
293	MOHO	2N	2E	30	71	2015	679	+608	+856%
351	MOHO	1N	1E	26	7,119	2015	26,825	+19,706	+277%
352	MOHO	1S	2E	16	31	2013	0	-31	-100%
367	MOHO	1S	3E	17	0	2013	0	0	
368	MOHO	1S	3E	16	7,076	2013	11,464	+4,388	+62%
369	MOHO	1S	3E	21	32	2012	1	-31	-97%
374	MOHO	4N	1W	25	328	2016	819	+491	+150%
532	MOHO	1S	3E	17	0	2013	0	0	
551	MOHO	1N	1E	19	267	2014	737	470	+176%
552	MOHO	1N	1E	30	0	2014	0	0	
560	MOHO	2N	2E	30	0	2013	0	0	
561	MOHO	1N	1E	19	0	2013	0	0	
565	MOHO	1S	3E	17	773	2010	1,065	+292	+38%
566	MOHO	1S	3E	17	100	2013	414	+314	+314%
567	MOHO	1S	3E	17	60	2013	1,909	+1,849	+3,082%
568	MOHO	1S	3E	17	0	2013	0	0	
569	MOHO	1S	3E	16	0	2013	0	0	
570	MOHO	1S	3E	16	132	2013	4,689	+4,557	+3,452%
571	MOHO	1S	3E	17	130	2015	259	+129	+99%
848	MOHO	1S	3E	16	10	2013	221	+211	+2,110%
849	MOHO	1S	3E	16	120	2013	230	+110	+92%
850	MOHO	1S	3E	17	80	2013	840	+760	+950%
888	MOHO	1S	3E	16	0	2013	0	0	
1250	MOHO	1S	2E	10	3,500	2012	323	-3,177	-91%
1655	MOHO	1N	1E	36	4	2015	6	+2	+50%
4160	MOHO	4N	1E	12	3	2015	1	-2	-67%
Totals					20,059		51,102	31,043	+155%

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



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