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 27 projects in 2022 looking for the 28 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 11,018 acres. Botanical survey coverage during the 2022 survey season was approximately 7,836.8 acres with 234.3 miles of surveyed roads (includes 8.7 miles of road surveyed for Howell's montia), altogether totaling 8,951.8 acres. This year on HRC property we found 26 new occurrences of four of our Special Status plant species, which represent six new populations, bringing the total number of rare plant populations detected on HRC land to 187. 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 57 occurrences of eight 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.

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 2017 to 2022 and *Montia howellii* road surveys (MOHO Research) from 2005 to 2022. California Natural Diversity Data Base (CNDDB) forms for the Special Status and Watch List species occurrences will be provided on CD to CNDDB and are available to the HCP Wildlife Agencies on request.

We surveyed 8.7 miles of roads for *Montia howellii* in 2022. We documented plant locations and numbers for known sites and discovered several newly occupied road segments adjacent to these existing occurrences. Five roads containing *Montia howellii* populations are exempt from the property-wide winter use restrictions which currently mitigate other known populations. Two of

these “open” sites were visited in 2022. The results of monitoring efforts are presented in the summary tables below and are included in tables found in Appendix 7.

Proposed Changes for 2023

HRC does not propose any significant changes to the Rare Plant Program for the 2023 survey season.

INTRODUCTION

HRC employees, foresters, and consultants conducted plant habitat assessments and seasonally appropriate floristic plant surveys in 2022 on timberlands owned by HRC. 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 generally include avoidance of herbicide application.

This report summarizes the results of surveys, mitigations, research, and monitoring conducted in the year 2022 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 CNDDB 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 2022/2023 field season.

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

[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.

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 3 and 4[2]) and began recording occurrences of these plants which we encountered while conducting our operational surveys.

Table 2. HRC's Watch List Plants for the 2022/2023 field season.

Scientific Name/Common Name	Status	On HRC
***Astragalus rattanii* var. *rattanii* Rattan's milk-vetch**	**G4T3, S4, CRPR 4.3**	**Yes**
Calamagrostis bolanderi Bolander's reed grass	G4, S4, CRPR 4.2	
Calamagrostis foliosa leafy reed grass	G3, S3, CRPR 4.2	
Carex buxbaumii Buxbaum's sedge	G5, S3, CRPR 4.2	
Castilleja ambigua var. *ambigua* Johnny nip	G4T4, S3S4, CRPR 4.2	
***Chrysosplenium glechomifolium* Pacific golden saxifrage**	**G5?, S3, CRPR 4.3**	**Yes**
Collomia tracyi Tracy's collomia	G4, S4, CRPR 4.3	
***Coptis laciniata* Oregon goldthread**	**G4?, S3?, CRPR 4.2**	**Yes**
***Epilobium septentrionale* Humboldt County fuchsia**	**G4, S4, CRPR 4.3**	**Yes**
Erigeron biolettii streamside daisy	G3?, S3?, CRPR 3	
Erigeron robustior robust daisy	G3, S3, CRPR 4.3	
Fritillaria purdyi Purdy's fritillary	G4, S4, CRPR 4.3	
***Hemizonia congesta* ssp. *tracyi* Tracy's tarplant**	**G5T4, S4, CRPR 4.3**	**Yes**
***Hosackia gracilis (Lotus formosissimus)* harlequin lotus**	**G3G4, S3, CRPR 4.2**	**Yes**
Iris longipetala coast iris	G3, S3, CRPR 4.2	
***Lathyrus glandulosus* sticky pea**	**G3, S3, CRPR 4.3**	**Yes**
Leptosiphon (Linanthus) acicularis bristly leptosiphon	G4?, S4?, CRPR 4.2	
***Lilium kelloggii* Kellogg's lily**	**G3, S3, CRPR 4.3**	**Yes**
***Lilium rubescens* redwood lily**	**G3, S3, CRPR 4.2**	**Yes**
Lilium washingtonianum ssp. *purpurascens* purple-flowered Washington lily	G4T4, S3S4, CRPR 4.3	
***Listera cordata* heart-leaved twayblade**	**G5, S4, CRPR 4.2**	**Yes**
***Lycopodium clavatum* running-pine**	**G5, S3, CRPR 4.1**	**Yes**
Lycopus uniflorus northern bugleweed	G5, S4, CRPR 4.3	
***Mitellastra caulescens (Mitella caulescens)* leafy-stemmed mitrewort**	**G5, S4, CRPR 4.2**	**Yes**
Navarretia linearifolia ssp. pinnatisecta pinnate-leaved navarretia	G4G5T4, S4, CRPR 4.3	
Piperia michaelii Michael's rein orchid	G3, S3, CRPR 4.2	
***Pityopus californicus* California pinefoot**	**G4G5, S4, CRPR 4.2**	**Yes**
Platanthera stricta slender bog-orchid	G5, S3, CRPR 4.2	
***Pleuropogon refractus* nodding semaphore grass**	**G4, S4, CRPR 4.2**	**Yes**
***Ribes laxiflorum* trailing black currant**	**G5?, S3, CRPR 4.3**	**Yes**
***Ribes roezlii* var.*amictum* hoary gooseberry**	**G5T4, S4, CRPR 4.3**	**Yes**

[2] CRPR 3: Review list, plants with uncertain taxonomy, more information needed. CRPR 4: Plants of limited distribution, a watch list.

Scientific Name/Common Name	Status	On HRC
***Sidalcea malachroides* maple-leaved checkerbloom**	**G3, S3, CRPR 4.2**	**Yes**
***Usnea longissima* Long- beard lichen**	**G4, S4, CRPR 4.2**	**Yes**
Wyethia longicaulis Humboldt County wyethia	G4, S4, CRPR 4.3	

We report these occurrences to CNDDB at the end of each year along with the new and updated occurrences of our Special Status plants. Our purpose in reporting CRPR 3 or 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 woodland, 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” (CDFW 2018). 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 special status 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 requirements 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, which 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 2022 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 CNDDB definition of "occurrence."

RESULTS

SURVEY RESULTS

We assessed and/or surveyed 27 projects for Special Status plants in 2022, covering a total of approximately 8,951.8 acres; including 234.3 miles of roads (this includes 8.7 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. Habitat assessment visits may occur during the typical floristic period or may occur outside of those documented blooming

periods. If potential sensitive plant habitat is located outside of the floristic period those areas are re-visited during the next appropriate time frame for floristic survey.

Table 3. 2022 Assessed/surveyed acres by month.

Year	Month	Unit Survey/Assessment Acres*
2021	December	0
2022	January	0
2022	February	140.6
2022	March	750.5
2022	April	1,529.0
2022	May	1,294.2
2022	June	1,161.2
2022	July	1,430.2
2022	August	1,312.3
2022	September	218.8
2022	October	0
2022	November	0
Total 2022 Unit Survey/Assessment Acres		**7,836.8**
2022	Road Survey/Assessment Acres	1,094.0
2022	Howell's montia Surveys	21.0
Total 2021 Survey/Assessment Acres		**8,951.8**

*This value is generated in ArcGIS by creating polygons from survey route data. Total 2022 project acres from database records are approximately 11,018.0. 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 2022. These data are also included in tables in Appendix 2: 2022 Plant Detections, Appendix 5: Rare Plant Detections and Rare Plant Road Surveys maps.

Table 4. Summary of 2022 Special Status Plant detections and property-wide totals.

Species	2022 occurrences	New populations	Total populations[3]	# New plants*	Total plants**
Astragalus agnicidus	0	0	2	0	7,086
Carex arcta	0	0	3	0	55
Erythronium revolutum/oregonum	16	2	32	2,266	10,577
Gilia capitata ssp. *pacifica*	2	2	29	127	16,058
Montia howellii	0	0	44	0	16,039

[3] Populations are defined as groups of the species separated by at least a quarter mile from other such known groups, equivalent to CNDDB definition of "occurrence"

Species	2022 occurrences	New populations	Total populations[3]	# New plants*	Total plants**
Packera bolanderi var. *bolanderi*	3	1	38	28	11,347
Piperia candida	5	1	26	15	2,332
Sidalcea malvaeflora ssp. *patula*	0	0	13	0	3,008
Totals	**26**	**6**	**187**	**2,436**	**66,502**

*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.
New populations do not always increase total populations, known occurrences may shift or increase joining adjacent populations and reducing total numbers.

The CNDDB 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 CNDDB office no later than the last week of January 2023.

In 2022 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 CNDDB report form and will be sent along with the new occurrence reports by the end of January 2023.

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.

Four 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 included in plant detection tables and re-visit tables in Appendices 2 and 7. This section includes details of invasive species control which took place in sensitive wetland habitats in "The Pond" THP 1-18-00167HUM. Additionally, a new project for study of both site maintenance and mitigation effectiveness was implemented within the "Hely Sprite" THP 1-21-00191HUM. This effort will include two PABOBO sites, one in which a cable corridor will pass through the programmatic buffer and HRC will monitor the response for several years post-harvest. At a second site HRC will monitor plant response to the hand removal of competitive woody vegetation.

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 to 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.

In March of 2021 HRC and CDFW completed consultation on an alteration to the property-wide mitigation measures for *Astragalus agnicidus.* The updated agreement allows the use of targeted herbicide application ("frilling") to remove tan oak individuals from within mitigation buffers for the species. *Astragalus agnicidus* is not a canopy dependent species and can benefit from removal of overstory canopy. A copy of the CDFW consultation including the updated mitigation language and justification for the change is included in Appendix 4. Part of the newly formed agreement includes an annual summary of the treatment of occupied areas: in 2022 HRC did not apply targeted herbicide within any occupied Humboldt milk-vetch sites.

No changes to property-wide consultations were made during the 2022 season.

CHANGES TO HRC'S SPECIAL STATUS PLANT AND WATCH LISTS

HRC has made one small change to the special status plant list for the 2023 survey season. The sensitive species formerly known as *Cornus canadensis* (COCA, bunchberry) has been renamed *Cornus unalaschkensis* (COUN, bunchberry). This change has been made to HRC records and databases.

HRC does not propose any additional changes to either the Special Status or Watch List Plant Lists for the 2023 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). 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 18 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.

Mitigation Methods

CRPR 3 and 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 CNDDB 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 CNDDB 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 (*Piperia candida*)
- PBL THP 1-14-149HUM (*Astragalus agnicidus*)
- Yearly Howell's montia monitoring (*Montia howellii*)
- The Pond THP 1-18-00167 (*Cortaderia jubata* removal project)
- Hely Sprite THP 1-21-00191HUM (*Packera bolanderi var. bolanderi*)

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 a 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. A wooden barrier was erected along the cut bank side of the road to encourage truck drivers to stay near the road center and avoid plants along the base of the cut bank. 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 had occurred within the protected area and plant numbers were higher than in 2013. Timber harvest on the plan began late in 2017. A visit to the site before the start of operations in 2017 was conducted and while the site seemed un-changed the plant numbers were lower than the previous year. Timber harvest lasted until July of 2018. The 2018 monitoring visit was

conducted just at the cessation of timber harvest and the road segment containing *Piperia candida* was graded prior to the monitoring visit. The grading was light, and all spoils were kept on the road prism. The flagging and wooden barrier were in place and undisturbed by timber harvest or road maintenance activity. The plant count for 2018 was rather low, the visit was conducted late in the season and most plants were either fully blooming or had senesced for the year. The wooden barrier was removed, and a small amount of woody debris was cleared from the occupied road segment. The monitoring schedule for this project calls for visits in year one and three after harvest and roadwork. Harvest was completed in 2018 and the site was scheduled to be visited for a final time in 2021. Although a visit was not planned for the 2020 season, the site was included in a prescribed burn and oak woodland habitat restoration effort, so the site was visited to assess impacts from those activities as well. During restoration, conifer species were removed from oak stands and prairie edges adjacent to the buffered zone associated with this occurrence. A light understory fire was set in late 2019 and passed through the occupied zone. The 2021 visit was conducted late in the season (18 June) and 2021 was a year with well below average rainfall. Plant numbers were relatively low compared to previous years in which the monitoring visit took place earlier in the season. By the time of the 2021 visit it is likely that a portion of the occurrence would have senesced for the year. The two plants found in 2021 were both located at the top of the road cutbank and were blooming at the time of survey. Table 5 contains plant numbers and a simple trends analysis.

Table 5. Monitoring Results – Plant Counts for PICA 1660

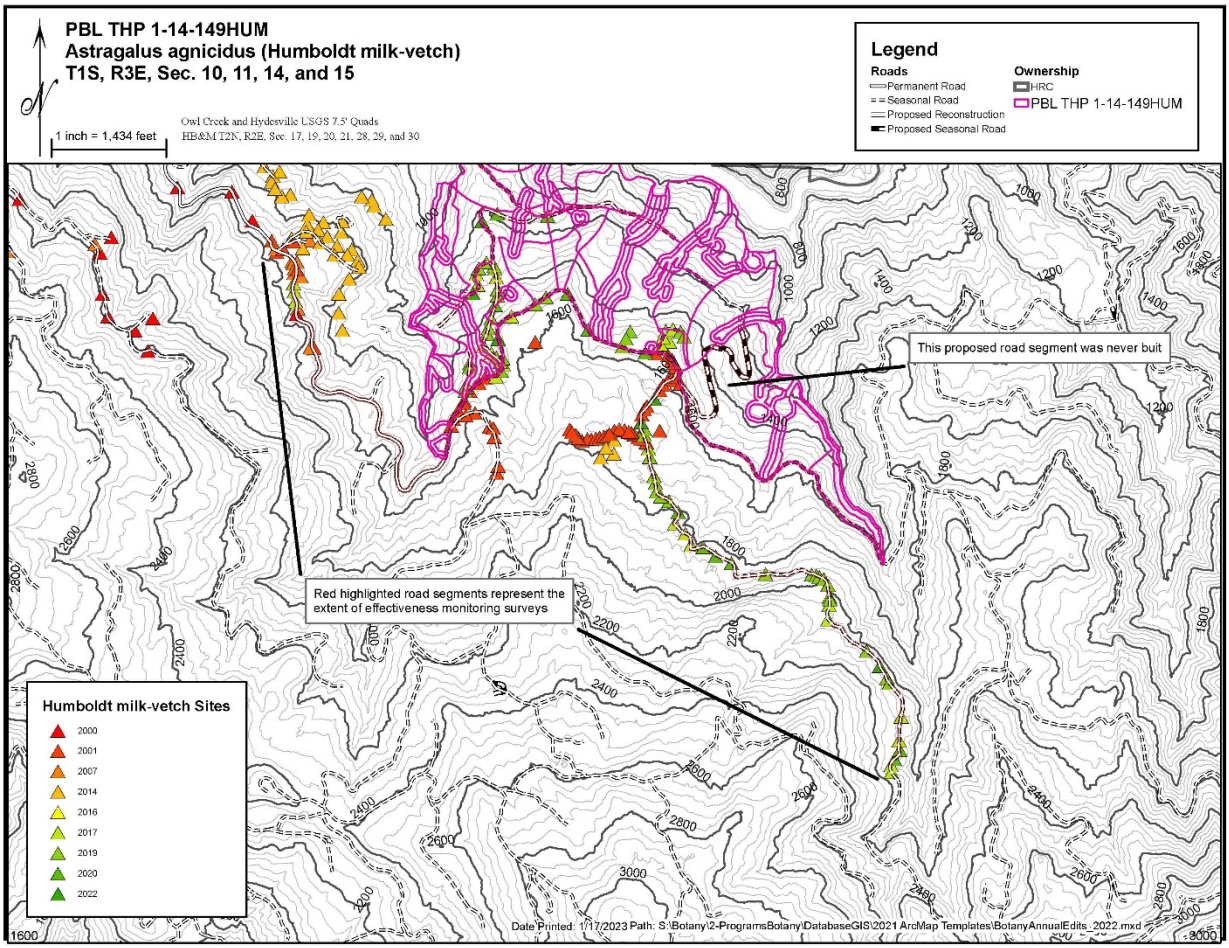
Species Code	Occurrence ID	2013	2015	2017	2018	2019	2020	2021	2022
PICA	1660	82	137	46	15	55	22	2	7
	Change in number		55	-91	-31	40	-33	-20	5
	% Change from previous year		67	-66	-67	267	-60	-91	250
	% Change from baseline		67	-44	-82	-33	-73	-98	-91

Following a decline between 2015 and 2018 plant numbers had rebounded to 33% below baseline in 2019 only to drop again. By 2022 plant numbers have fallen to 91% below baseline. Plant distribution on site has changed, with most of the extant plants located on the cut bank and at the top of the cut bank above the road. Plants in the center of the road prism and closest to the travelled surface have not been re-located and may have been lost during road use and grading activities. Although not required by the monitoring agreement, HRC visited the site again in the spring and summer of 2022. During a visit in March of 2022 three plants were located while in a second visit during June a total of seven plants with three blooming individuals were re-located at the site.

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. Figure 1 is a map which includes the THP area, roads surveyed for the monitoring effort, and Humboldt milk-vetch sites color coded by year of discovery.

Figure 1. ASAG Sites in PBL THP



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 but timber harvest operations did not end until 2018. The 2017 monitoring efforts focused on sections of road with recent roadwork or newly constructed road sections. It should be noted that all planned roadwork was not completed as some of the proposed road sections were found to be un-necessary for timber harvest completion and were not built. The results of the monitoring visits are shown on Table 6, these data represent re-visits to known sites within and adjacent to the

mitigation monitoring sites as well as documentation of newly detected sites in areas of recent roadwork within and adjacent to the specific monitoring sites between 2012 and 2022.

Table 6. Monitoring Results – Plant Counts for ASAG at PBL

Species Code	Occurrence ID	2012	2014	2016	2017	2019	2020	2022	Notes
ASAG	87	0	225		14				Roadwork in 2013, not disturbed since then. Not part of THP specific monitoring, did not re-visit in 2019-2020
ASAG	115		9	4	4				Minor roadwork, plants on edge of mainline. Not part of THP specific monitoring, did not re-visit in 2019-2020
ASAG	267	0	1		5		14	9	Plants on edge of mainline. Not part of THP specific monitoring, incidental revisit in 2020
ASAG	271		38		106		10	34	Not part of THP specific monitoring, did not re-visit in 2019, 2020 visit only covers a portion along mainline road
ASAG	272	1			0	0	69	26	Minor roadwork, more work was planned at this location but did not occur, plants came up on adjacent new road spurs (occ. 4541)
ASAG	273	1	5		9	17	114	122	Plants in recently opened road and landing
ASAG	274	11	22		40	54	10	33	Grading and minor roadwork, new spurs contain newly occupied sections (occ. 4538, 4539, 4540, 5023, 5024)
ASAG	4532				4	3	17	28	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	12	66	28	New 2017
ASAG	4534				46	121	208	156	New 2017
ASAG	4535				1				New 2017, Not part of THP specific monitoring, did not re-visit in 2020 or 2022
ASAG	4536				23				New 2017, Not part of THP specific monitoring, did not re-visit in 2020 or 2022
ASAG	4537				3	0	0	0	New 2017
ASAG	4538				21	56	55	23	New 2017
ASAG	4539				33	65	75	20	New 2017
ASAG	4540				22	35	48	18	New 2017
ASAG	4541				267	388	370	85	New 2017
ASAG	4542				17				New 2017, off road, not re-visited
ASAG	5019					14	139	9	New 2019
ASAG	5020					6	9	2	New 2019

Species Code	Occurrence ID	2012	2014	2016	2017	2019	2020	2022	Notes
ASAG	5023					6	10	0	New 2019
ASAG	5024					24	24	0	New 2019
ASAG	5025					5	14	0	New 2019
ASAG	5026					18	108	98	New 2019
ASAG	5027					1	1	1	New 2019
ASAG	5028					278	273	145	New 2019
ASAG	5029					1	1	0	New 2019
ASAG	5030					6	17	10	New 2019
ASAG	5342						14	0	New 2020, in gaps between known sites
ASAG	5343						1	1	New 2020, in gaps between known sites
ASAG	5344						1	0	New 2020, in gaps between known sites
ASAG	5345						1	1	New 2020, in gaps between known sites
ASAG	5346						1	0	New 2020, in gaps between known sites
ASAG	5347						10	17	New 2020, in gaps between known sites

Totals (All Sites)	**13**	**300**	**4**	**781**	**1110**	**1680**	**866**
Total (Monitoring Sites)	**13**	**27**	**0**	**611**	**1110**	**1656**	**823**

Percent Change (from 2014 baseline) **2948.15**

HRC had planned a final monitoring visit in 2021, this survey did not occur due to seasonal constraints and the need to allocate survey time to other projects. A cursory survey was conducted late in 2021 and plants and roadside conditions appeared to be similar to previous years, although the dry conditions of 2021 were evident in the appearance of roadside vegetation and early senescence of some species, including Humboldt milk-vetch. A final monitoring visit was conducted in 2022.

From the monitoring data it appears that mitigation measures were effective in reducing the impacts to this species to a less than significant level. The results indicate that by 2022 plant populations within the monitored area increased by almost than 3,000 percent following harvest and roadwork activities. This number was higher than 6,000 percent after the 2020 visits perhaps

indicating that the population has peaked and is dwindling due to competition and infill from other species. Throughout the monitoring period new plants were found in areas of new road construction or disturbance and in areas with significant road work and adjacent timber harvest. These occurrences continued to expand and fill in gaps even several years after roadwork. New occurrences were often found in places that were not occupied prior to disturbance and are likely sourced from dormant seedbank either located at the site of the new occurrence or pushed in from adjacent areas during road work. It is likely that, as seen in the trends in Table 1, in an absence of new disturbance these populations will continue to dwindle as adjacent competing vegetation increases and overstory canopy cover closes in. This "boom and bust" pattern has been documented in several other effectiveness monitoring efforts associated with this species in THPs on HRC properties in this watershed.

Noted during the 2021 and 2022 visits was the increased presence of jubata grass (*Cortaderia jubata*), an invasive species which has a similar habitat and lifestyle as Humboldt milk-vetch, tending to spread into and occupy recently disturbed areas, especially roadsides and landings. Jubata grass appears to spread more quickly and produce more seed which can travel further than Humboldt milk-vetch seed. The increase in abundance of this invasive plant could pose a threat to milk-vetch sites. Jubata grass would potentially more rapidly fill in areas favored by milk-vetch, preventing colonization by the rare plant, and possibly out-compete the milk-vetch in places where it is already established, thereby potentially shortening the time the milk-vetch plants have to grow and produce seed. To allow Humboldt milk-vetch sites more time to mature and produce seed it may be necessary to treat jubata grass in and adjacent to areas occupied by this rare native species.

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 2004-2022 winter seasons. These roads have 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 two of these roads in 2022. 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 3).

The numbers at Wrigley Road had been in decline after an increase following some light grading and road maintenance that was conducted there in 2011. Plant numbers since that disturbance have varied. Habitat at this site is gradually shrinking as the roadsides and landings fill in with grasses and shrubs, remaining plants are found on the edges of tire tracks from light seasonal use. This site was recently included in a THP. Timber harvest and roadwork was largely completed during 2020. Plant counts in 2021 show an increase in plant numbers as a result, however by the spring of 2022 those numbers have dropped again potentially due to wet season use of the road by powerline maintenance crews and an increase in competitive herbaceous vegetation.

Jordan Creek typically maintains high plant numbers due to traffic from contractors maintaining powerlines as well as occasional travel by HRC employees. A small amount of roadwork took place on portions of this road system in 2020. The 2021 visit shows a decrease in overall plant numbers. Plant distribution has also changed at this site, new plants were found in an area in which plants had not been seen before and a road spur with dwindling numbers was re-invigorated by recent activity.

Riverside has fluctuated in plant numbers and spatial extent over the monitoring period. This site is used by neighbors and passersby as a route to the river bar and as a location for recreational vehicle use, often in the wet period when Howell's montia is active. Suitable habitat is extensive at the site and historically plants have been found scattered throughout the area but currently only a small, occupied area exists.

Cummings Creek populations have declined, presumably due to lack of use and roadwork on the occupied spur roads, which contain the bulk of the historic population in the drainage. The mainline road is well traveled but may be impacted too often throughout the year and has never held a large portion of the plant population there. Roadsides in this area are often dense with jubata grass or other competitive species leaving little habitat on roadsides outside of the vehicle tracks. This site was visited in 2021. Currently HRC is planning a THP in the area which may invigorate the population post-harvest.

Upper Newman Creek shows a strong increase in plant numbers from the baseline and subsequent counts, but historically the site was much more spread out whereas now the plants are relegated to two small sites. This road is used to access a small inholding and in 2021 was used for timber harvest on this inholding. The 2022 visit results indicate that plant numbers have declined since last visit the population numbers are still well above baseline.

In all, the average change in plant numbers across "open road" sites show a decrease of 6% when comparing the latest plant counts with the baseline counts done in 2005 and 2007. Individually, the sites vary greatly.

- Wrigley Road – 8.9% decrease from baseline
- Jordan Creek – 18.5% increase from baseline
- Riverside – 70.3% decrease from baseline
- Cummings Creek – 97.2% decrease from baseline

- Upper Newman Creek – 200.0% increase from baseline

Table 7. *Montia howellii* plant numbers (Open Roads)

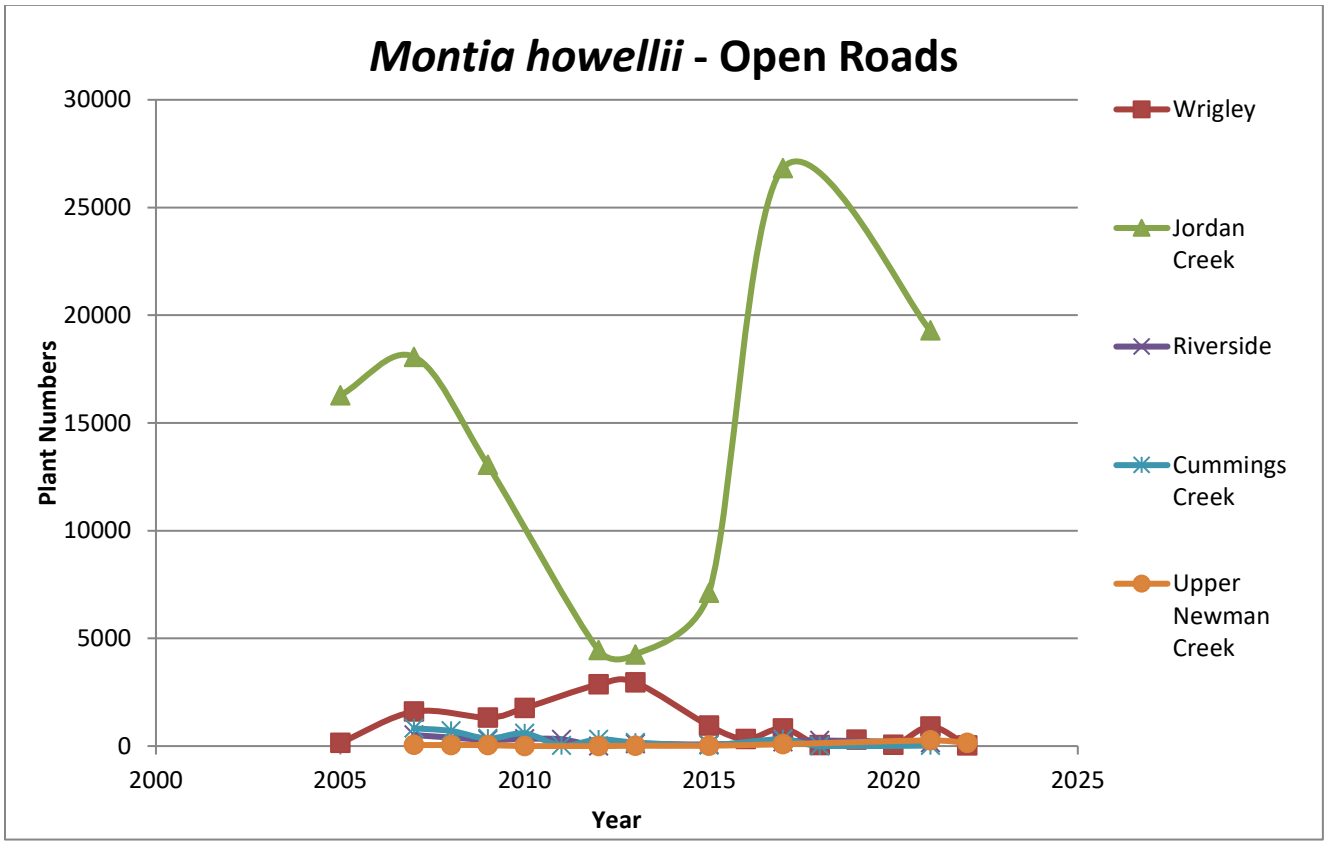
Location	Wrigley	Jordan Creek	Riverside	Cummings Creek	Upper Newman Creek
Road	U11	A51.19	L46	L33	C07.2327
Occ IDs	374, 563, 564	351	163	40	82
2005	152	16,284			
2007	1,598	18,066	511	821	49
2008				702	47
2009	1,323	13,047	294	350	47
2010	1,765	†	336	585	1
2011			312	19	
2012	2,861	4,456	3	308	
2013	2,950	4,250	99	165	17
2015	943	7,119	77	42	17
2016	328				
2017	819	26,825	194	322	89
2018	45		264	12	
2019	297				
2020	51				
2021	903	19,296	152	23	263
2022	32				147
Percent change from baseline	-78.9	18.5	-70.3	-97.2	200.0
Change in plant numbers from last visit	-871	-7,529	-112	11	-116

Average percent change from baseline	-6.0
Total change in plant numbers from last visit	-8,617

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

The variety in both year-to-year plant counts within sites and therefore the change from baseline conditions between sites creates a large standard deviation in the mean of population changes making comparison of site and determination of significance of the change difficult to determine without additional data collection and deeper statistical analysis. Open road sites decreased in plant numbers by 8,617 plants since the last count and overall plant numbers across open sites have slightly decreased since the baseline counts were taken.

Figure 2. *Montia howellii* plant numbers (Open Roads)



Total plants at the mitigated sites (Table 9) revisited this year have decreased by 1,035 plants (-13.6%) since the last count. These are known sites that were re-visited in 2022 and do not include new occurrences found at locations that were not previously occupied. As in the open roads the variety of values in both the plant numbers and percent change across these sites creates a large standard deviation and makes determination of significance and comparison between treatments difficult without additional analysis.

Table 8. *Montia howellii* plant numbers (Mitigated Sites).

Occurrence ID	Plant ID	Township	Range	Section	Previous Quantity	Previous Year	2022 Quantity	Change in Plant Numbers	Percent Change
4848	MOHO	2N	2E	33	69	2018	31	-38	-55
4841	MOHO	4N	2E	23	75	2018	0	-75	-100
3893	MOHO	2N	2E	33	513	2018	684	171	33
3892	MOHO	2N	2E	33	304	2018	9	-295	-97
1467	MOHO	2N	2E	33	0	2020	0	0	NA
1466	MOHO	2N	2E	33	0	2020	0	0	NA
1441	MOHO	4N	2E	23	750	2018	300	-450	-60
797	MOHO	1N	2E	9	0	2019	0	0	NA
571	MOHO	1S	3E	8	259	2017	664	405	156
564	MOHO	4N	1W	25	9	2021	0	-9	-100
563	MOHO	4N	1W	25	50	2021	4	-46	-92
562	MOHO	3N	2E	2	0	2019	19	19	NA
559	MOHO	2N	2E	30	7	2021	7	0	0
558	MOHO	1N	2E	8	0	2019	0	0	NA
557	MOHO	2N	2E	31	0	2018	0	0	NA
535	MOHO	2S	3E	3	7	2018	0	-7	-100
385	MOHO	2N	2E	32	0	2018	0	0	NA
379	MOHO	3N	2E	10	104	2018	69	-35	-34
378	MOHO	3N	2E	2+3	1610	2018	157	-1453	-90
374	MOHO	4N	1W	25	844	2021	28	-816	-97
369	MOHO	1S	3E	21	1	2017	3	2	200
353	MOHO	1N	1E	19+20	1618	2018	2567	949	59
237	MOHO	1N	2E	9	0	2019	0	0	NA
160	MOHO	1N	2E	12	791	2018	377	-414	-52

Occurrence ID	Plant ID	Township	Range	Section	Previous Quantity	Previous Year	2022 Quantity	Change in Plant Numbers	Percent Change
114	MOHO	1N	2E	8	1	2019	0	-1	-100
83	MOHO	1N	1E	19	329	2019	1503	1174	357
82	MOHO	1S	3E	19+20	263	2021	147	-116	-44
34	MOHO	1N	2E	8	0	2019	0	0	NA
				Totals	**7,604.00**		**6,569.00**	**-1,035.00**	**-13.61**

There are many possible reasons for the reduction in plant numbers in both the open roads and mitigated sites. Many of these sites are located on little used roads or are in locations that do not receive adequate traffic or periodic disturbance necessary to maintain the site in a condition favorable to Howell's montia. These sites are in danger from competitive vegetation and eventual loss of habitat. Recent dry and droughty conditions in the region may also have played a part in the decline in plant numbers at selected sites. Howell's montia enjoys wet, cool conditions and periods of low rainfall and higher average temperatures especially in the late winter and early spring may adversely affect this species ability to thrive and produce seed in exposed sites.

THE POND THP 1-18-00167HUM

The Pond THP is located in the Elk River watershed on a south facing slope between the South Fork Elk River and the North Fork Elk River just northwest of the Headwaters Reserve. Surveys for this harvest plan took place in 2017 and although no sensitive plant species were detected an example of a sensitive natural vegetation community in the form of a large freshwater pond/swamp complex was located within the project area. This feature was classified as a Class II water and provided with appropriate buffers during harvest activities.

In addition to providing Riparian Management Zone (RMZ) protections to the feature HRC also agreed to monitor the site for the presence of the invasive plant species *Cortaderia jubata* (jubata

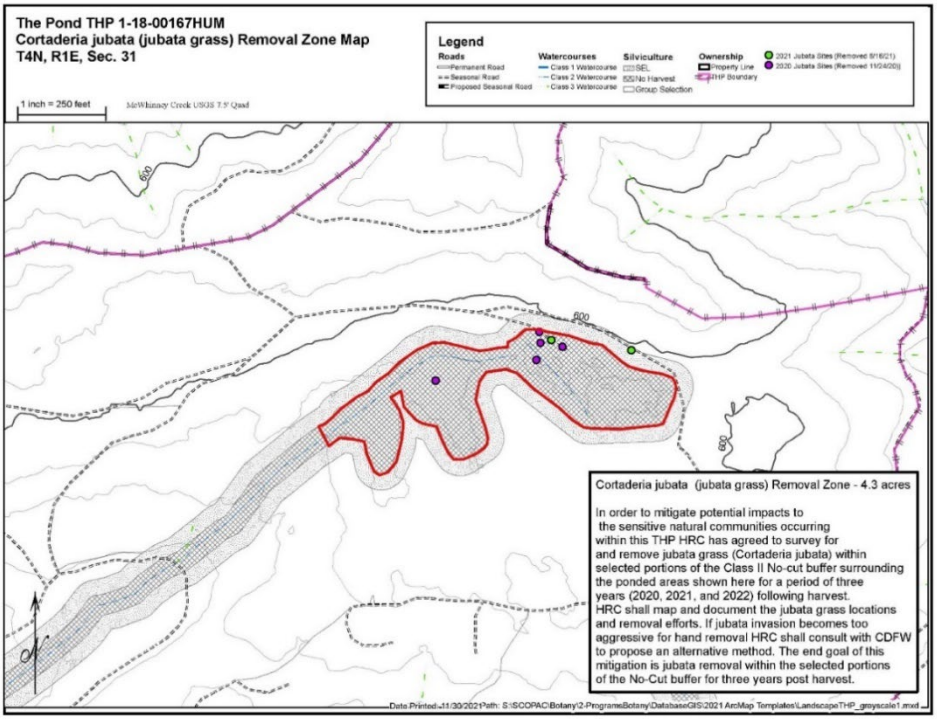
grass) which is common to roadsides and disturbed areas in the watershed and can quickly colonize sites and outcompete native plants for space and resources. During consultation with CDFW, HRC agreed to survey for, and hand remove all jubata grass present within the No-Cut buffer associated with the feature, an approximate 4.3-acre area (see Figure 4 below) for a three-year period following harvest.

A survey was conducted in 2019 before harvest started and five separate locations of jubata grass infestation were located within the removal zone. Harvest was completed during the summer of 2020 and the site was again surveyed for jubata grass; plants were found in the same five locations as in 2019. A visit was conducted on 24 of November 2020 and jubata grass at all five sites (7 total plants) were dug up with hand tools and removed from the zone.

The second year of survey was completed on 16 August 2021. The entire removal zone and some surrounding roads and portions of the selection harvest area around the pond were surveyed. All jubata sites removed in 2020 were re-visited, the sites showed no sign of re-sprouting or re-growth and may be considered “treated”. A single new jubata grass plant was found on the side of the access road within the Removal Zone, this plant was removed, and the location marked for re-survey in 2022. An additional two small plants were removed from the selection area below an access road on the east end of the pond feature, these plants were located on the edge of the timber which encircles the pond.

During the 2022 season the removal zone was again surveyed for the presence of jubata grass. All previous locations were re-visited, and the remainder of the area thoroughly inspected. No new jubata grass sites were located within the removal zone and none of the previously removed plants showed any evidence of re-sprouting. It was noted during the 2021 and 2022 visits that jubata grass is beginning to establish itself along the access roads outside of the Removal Zone. HRC botany staff is currently working with our silviculture department on a plan to treat occupied roadsides outside of the stream buffers with herbicide to reduce the availability of jubata seed and limit the possibility of introduction of new plants to the Removal Zone.

Figure 3. The Pond, Removal Zone, and jubata grass locations



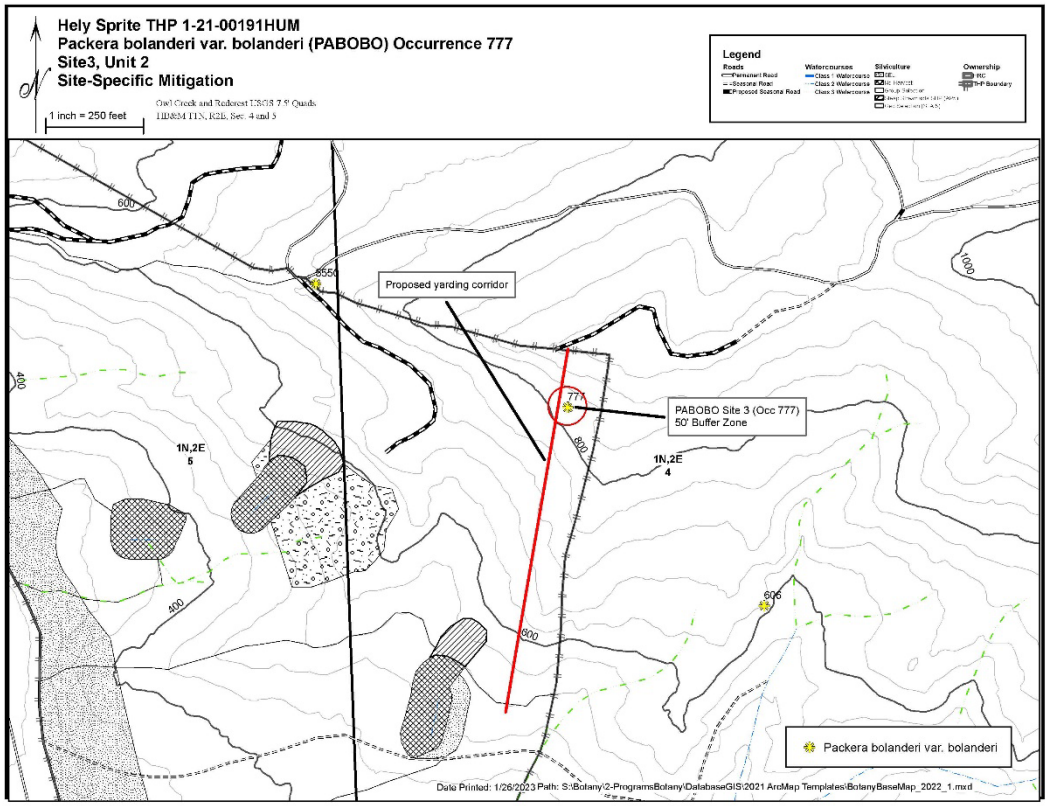
HELY SPRITE THP 1-21-00191HUM

The Hely Sprite THP area is composed of several harvest units situated along the Van Duzen River corridor between Fox Creek and Blue Slide Creek. Units are largely redwood dominant with areas of steep slopes and sandstone bluff features creating excellent suitable habitat for *Packera bolanderi* var. *bolanderi* (seacoast ragwort, PABOBO). Nine occurrences of PABOBO both known and newly discovered are located in Unit 2 of this THP and two of those occurrences have been selected for monitoring efforts.

PABOBO Site 3 is a small (4 plants) occurrence originally detected in 2005. The site is located along the northern boundary of the unit below a newly constructed access road and small landing. The harvest will utilize cable yarding techniques and it became apparent through consultation with the timber operators that the yarding corridor necessary to safely and

efficiently harvest timber below the landing would have to cross through the programmatic mitigation buffer (50’ No Cut/Equipment Limitation Zone (ELZ) for the site.

Figure 4 Hely Sprite PABOBO Site 3



Through consultation with CDFW the mitigation language was modified to allow a minimum width cable corridor to cross the site. HRC has agreed to monitor the response of the occurrence to these activities for at least two years after operations are complete. Timber harvest is scheduled to be complete at this site in early 2023, and the first monitoring visit will take place later in the same year. Table 9 contains some site details and Figure 4 is a map of the site.

Table 9 PABOBO Site 3 Plant Numbers

PABOBO Occurrence	Site Number	2005	2010	2011	2012	2016	2021
777	3	4					4

PABOBO Site 7 is a larger occurrence with three groups of plants. Group 1 and Group 2 (G1 and G2) are located along a north facing cutbank on the south side of a regularly used gravel road while Group 3 (G3) is located off the north edge of the road along the top of a steep bluff feature above a Class II watercourse. This site was first detected in 2010 and since that time plant numbers have decreased by at least a third following a period of apparent expansion between 2012 and 2016. Plant counts did not distinguish between groups until 2016, see Table 10.

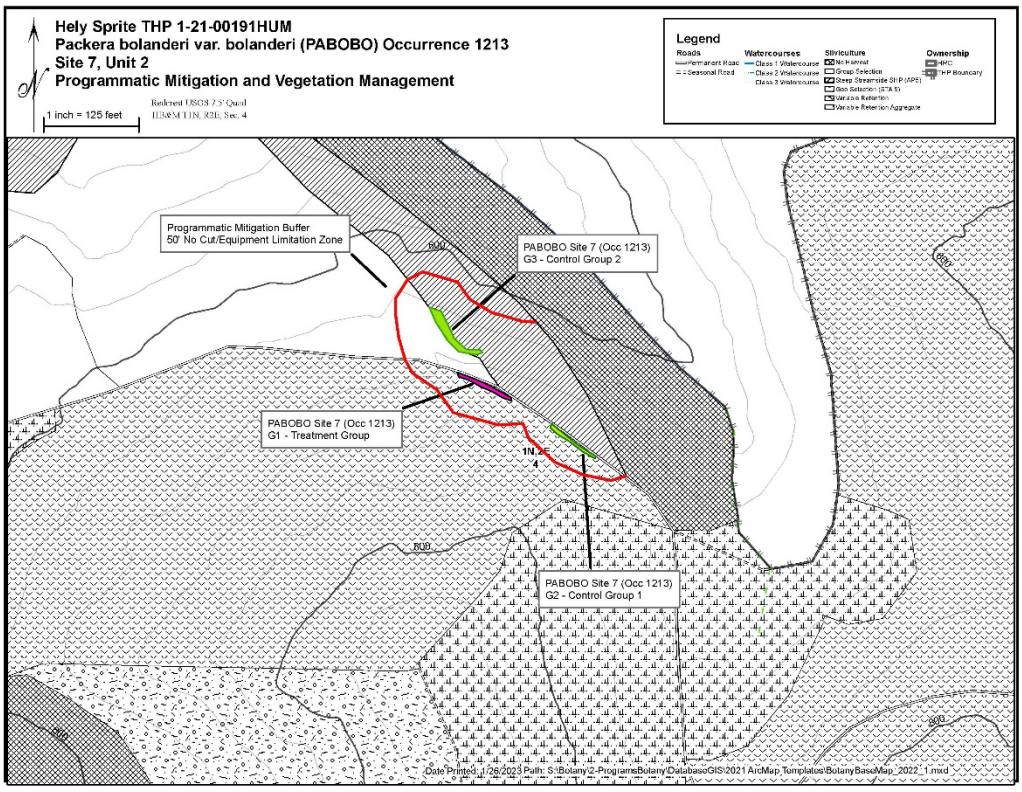
Table 10 PABOBO Site 7 Plant Numbers

PABOBO Occurrence	Site Number	Group	2010	2011	2012	2016	2021
1213	7	G1+G2				90	54
		G3				30	6
		Total	90	90	130	120	60

While Group 3 shows a marked decrease in plants between 2016 and 2021 it should be noted that the bluff feature below the site and the Class II riparian corridor provide excellent habitat that has not been fully surveyed as it is already a protected zone during timber harvest activities. Additional plants may exist in this area. Also, the site has not been disturbed or altered since the original detection so it is unclear what has caused the reduction in plant numbers though it may be attributed to the lengthy period of low rainfall and droughty conditions since the 2016 visit. Group 1 and Group 2 numbers have also dropped since the 2016 visit. These sites are located along a steep cutbank that until recently was fairly open and free of competing vegetation, the roadside is now almost covered in woody brush and sapling conifer which has overgrown the occupied sites and likely contributed to the decrease in plant numbers. Some *Cortaderia jubata* (jubata grass) has begun to occupy the roadsides in the occurrence as well. In an attempt to rejuvenate and enhance the habitat conditions at this site HRC has conducted hand removal of conifer sapling and woody vegetation along the cutbank at Group 1 and removed all jubata grass from the mitigation buffer for all groups. Conifer and woody vegetation was left in place at Groups 2 and 3, they will act as control groups for the treatment of the woody vegetation at Group 1. For the next several years HRC will continue to visit the sites and count PABOBO

plants in each group. At each visit jubata grass will be removed from the mitigation buffer for all groups, and an evaluation of the conifer and woody vegetation at Group 1 will be conducted. Conifer and woody vegetation will be removed by hand as necessary during the monitoring period to maintain the treated conditions.

Figure 5 Hely Sprite PABOBO Site 7



Site photos showing vegetation conditions before, during, and after treatment are included below. Results of vegetation management and the response of PABOBO plants to the treatment will be included in HRC annual reporting efforts and if successful these treatment options could be used at other sensitive plant locations to maintain and enhance site quality and population numbers.

Hely Sprite PABOBO Site 7 – Treatment Photos

Group 1 Treatment Zone, Pre-Treatment

Jubata grass removed.

Group 1 Treatment Zone, Final Conditions

2022 COMPREHENSIVE REFERENCE LIST

Allen, G. and J. Antos. 1988. Morphological And Ecological Variation Across A Hybrid Zone Between *Erythronium oregonum* and *E. revolutum* (Liliaceae). Madroño, Vol. 35, No. 1, pp. 32-38.

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