
Year End Report for the 2022 Botanical Survey Season



Photo Caption: Lilium bolanderi basking in the sun.

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Year End Report for the 2022 Botanical Survey Season

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EXECUTIVE SUMMARY

Green Diamond Resource Company (GDRCo) botanical technicians surveyed a total of 40 timber harvest plans covering approximately 6,940 acres. A total of 38 plans were surveyed to completion; 6 plans were initiated in 2021 and completed in 2022; and 2 plans were initiated in 2022 and will be completed in 2023. The 2022 floristic survey season commenced on February 28th and concluded on September 2nd with an estimated 125 field days. A total of 118 new California Rare Plant Rank (CRPR) 1 and 2 BotID#s were generated representing 5 taxa. A total of 120 new CRPR 3 and 4 BotID#s representing 12 taxa were generated as a part of a continued commitment to collecting spatial data and habitat data for uncommon species. There were no State or Federally listed Rare, Threatened or Endangered species observed during the 2022 survey effort.

Within the Coastal Lagoons and Little River Botanical Management Area (CL/LR BMA), 7 harvest plans were reviewed and 4 received surveys in unique habitats. Running pine (*Lycopodium clavatum*) was the most prevalent uncommon plant encountered in the harvest plans.

A summary data set for all occurrences has been prepared and submitted to the CNDDDB. This summary will include 168 field survey forms for all CRPR taxa discovered in 2022, 159 follow-up forms for 21 taxa, and the corresponding location data in ESRI File Based Geodatabase (FBGDB) format.

Occupancy monitoring for *Montia howellii* in the Salmon Creek Tract concluded in 2022. Results of this eleven-year study were presented to CDFW in May 2022 (See page 34). The data indicate a slight downhill trend that mirrors the reduction of disturbance in the watershed. Overall, GDRCo and CDFW agreed that continued occupancy monitoring was unnecessary for the long term management of the species. Going forward, GDRCo botanists will still monitor *Montia howellii* in the Salmon Creek tract, however, the effort will be more strategic than previous occupancy monitoring.

In 2022 monitoring efforts were made in the Salmon Creek Tract during the first few weeks of March. Newly constructed roads for Timber Harvest Plans (THP) were surveyed by the botany crew to determine if *Montia howellii* has spread into newly created habitats. While beneficial conditions were identified, there were no new detections of the species.

The Botany Department has set some new goals and continues to work on previous goals from 2022. The department has worked diligently on our goals and there has been success in completing and making great progress on these goals.

- Develop a Botanical Management Area in the County Line region.
 - The County Line BMA has been written and will be presented to CDFW in spring of 2023.
 - We are hopeful to get concurrence from CDFW and incorporate this new BMA into our Sensitive Plant Conservation Plan in 2023.

- Perform consistent and comprehensive updates to the GDRCo herbarium in CCH2 and internally.
 - The herbarium has had some extensive work done to update and bolster the collection. A large effort was made by the crew to collect target specimens that weren't represented in the herbarium. Progress has been made towards digitizing the herbarium, collaborating with

the Cal Poly Humboldt herbarium (HSC) and curator Robin Bencie to photograph and upload the photos of the specimens to their CCH2 record. Photos were taken in December and uploaded to the CCH2 in January 2023. Just over 500 specimens were photographed and uploaded to the CCH2.

- See our collection here <https://www.cch2.org/portal/collections/listtabledisplay.php?db=73>



Photo caption: A photographed specimen of *Veronica americana* (left). Freshly mounted specimens from collections made during the 2022 season (top right). Alex Shedlock placing a specimen into the photobooth at the Cal Poly Humboldt Herbarium (bottom right).

- Foster more engagement with the local botanical community by organizing field trips and participating in events with the local California Native Plant Society (CNPS) chapter, local community college, and local state university.
 - The botany department was active in the community this year. The crew started off the year with flower collections for the local CNPS wildflower show in April. The crew gathered local flowers and brought them to the show, helped set up the stations and identify unknown species. The chapter was thankful for our contribution to the wildflower show.
 - Botany supervisor, Gabe Cashman, planned and led a tour for the local CNPS chapter in June around the botanically unique Christmas Prairie Lake. The tour displayed the distinctive botanical diversity of the lake to fellow botanists. Gabe’s hospitality and botanical knowledge of the landscape granted the group a rewarding and enriching visit.

- Northwest Lichenologists and California Lichen Society toured Bald Mountain to observe the species richness of the mountain. Gabe joined the trip, gleaming off their knowledge of lichens. The group shared the species list that they gathered from the tour, helping to boost our understanding of some of the lichen diversity on our landscape.
- In September, Gabe and Macy assisted an Environmental Studies class at the College of the Redwoods with vegetation sampling and plant identification. We aimed to aide in plant identification and teach the students about the plants while they conducted their transects along the edge of a pond.
- The botany crew assisted in Sudden Oak Death (SOD) sampling in Smith River for the University of California Cooperative Extension (UCCE) for three days in December. A team that included a forest pathologist from USFS, a forest pathologist from CalFire, a forester from the USFS, two members of the UCCE and members of the biology staff from the Tolowa Dee-Ni' Nation assisted with sampling SOD in the known infection zone. It was a great opportunity for our crew to learn the signs of SOD and to build relations with local organizations.

RESULTS OF SPECIAL STATUS PLANT POPULATION SURVEYS

Exhibited in the following tables are the records of new plant populations in 2022 for California Rare Plant Ranks 1-4. There are two main sections, separated by detections made within and outside of active THPs. For clarity, plant findings that are associated with THPs that are still in need of complete surveys are not recorded in the tallies for the year. There were several rare and uncommon plant detections found in 6 unfinished plans from 2021 that were not reflected in last year's annual report but will be reflected in this year's annual report as the projects are now complete.

Rare and Uncommon Species Associated with THPs

Rare Species – CRPR 1 and 2 Detections

CRPR	Scientific Name	Common Name	Code	Detections (BotID#s)	Number of Projects
2B.3	<i>Astragalus umbraticus</i>	Bald Mountain milkvetch	ASUM	11	2
2B.2	<i>Cardamine angulata</i>	Seaside bittercress	CAAN	2	1
2B.2	<i>Erythronium revolutum</i>	Coast fawn lily	ERRE	4	3
2B.2	<i>Monotropa uniflora</i>	Ghost pipe	MOUN	99	11
1B.2	<i>Piperia candida</i>	White flowered rein orchid	PICA	2	2
Total				118	13

Uncommon Species – CRPR 3 and 4 Detections

CRPR	Scientific Name	Common Name	Code	Detections (BotID#s)	Number of Projects
4.3	<i>Chrysosplenium glechomifolium</i>	Golden saxifrage	CHGL	15	10
4.2	<i>Coptis laciniata</i>	Oregon goldthread	COLA	4	2
4.2	<i>Listera cordata</i>	Heart-leaved twayblade	LICO	43	15
4.1	<i>Lycopodium clavatum</i>	Running pine	LYCL	18	7
4.2	<i>Mitellastra caulescens</i>	Leafy-stemmed miterwort	MICAU	12	7
4.3	<i>Oxalis suksdorfii</i>	Suksdorf's woodsorrel	OXSU	2	2
4.2	<i>Pityopus californicus</i>	California pinefoot	PICAL	15	7
4.2	<i>Pleuropogon refractus</i>	Nodding semaphore grass	PLRE	6	3
4.3	<i>Ribes laxiflorum</i>	Trailing black currant	RILA	2	2
4.2	<i>Sidalcea malachroides</i>	Maple-leaved checkerbloom	SIMA	1	1
3.2	<i>Tiarella trifoliata</i> var. <i>trifoliata</i>	Three-leaf foamflower	TITRTR	1	1
4.2	<i>Usnea longissima</i>	Methuselah's beard lichen	USLO	1	1
Total				120	24

Detections of Potentially Rare Species

The Botany Department seeks to visit THPs during the peak blooming window for species of special concern so there is a positive species ID with presented floral characteristics. There are a few reasons as to why plant populations are recorded as an unidentified species, such as herbivory or immaturity. It is common for *Erythronium* and *Piperia* populations to be detected in early spring and require a follow-up visit to determine if it is rare or not based on specific species level identifiers. Though the identification process may prove to be challenging as it may take years to complete because some plants require a few years to develop floral parts that are vital for identification.

Surveys completed in 2022 found 10 new potentially rare plant populations in 4 different THPs: Tully Creek 2022, Williams Ridge 23, Tectah 180 and West Moody. Three of the plant populations were provided mitigations while the remaining were not; though a majority of those remaining resided on the road surface and were unable to receive substantial protections.

Scientific Name	Common Name	Code	Detections (BotID#s)	Number of Projects
<i>Piperia sp.</i>	Rein orchid	PISP	7	4
<i>Erythronium sp.</i>	Fawn lily	ERSP	3	2

Non-Rare Species Detections

West Moody THP (CDF# 1-22-00052-HUM) (GDRCo# 01-2101) proved to be a hotspot for multiple *Piperia* species as there was a bountiful discovery of the plants in early spring. During a revisit to the site to establish specific species level identifications, 16 of the 21 populations were confirmed to be the non-rare *Piperia transversa*. The only other *Piperia transversa* detected was a single individual in the William Ridge 23 THP (GDRCo# 51-2103).



Photo caption: The very distinct perpendicular petal spurs of *Piperia transversa* found in the West Moody THP.

Scientific Name	Common Name	Code	Detections (BotID#s)	Number of Projects
<i>Piperia transversa</i>	Green striped Piperia	PITR	17	2

Rare and Uncommon Species Not Associated with THPs (Incidental Detections)

There are several rare and uncommon plant populations that are detected every year on various parts of the property that are not associated with THPs. The Botany Department still records and submits data for these populations to the CNDDB.

Rare Species – CRPR 1 and 2 Detections

The Wildlife Department has presented special discoveries to the Botany Department as they have detected numerous new plant populations. There was one observation of a population of *Piperia*. It is presumed that the specific species is indeed *Piperia candida* - as seen in photographs - but a field visit will be required to confirm. The Wildlife crew also made 7 new detections of *Monotropa uniflora*.

An exciting detection of a CRPR 1 species was discovered in the seepy outlet of Snow Camp Lake. An unidentified *Sidalcea* was first noticed in the wet meadow in 2021 but was not recorded since it was not revisited for further identification. A follow-up on the site in 2022 found the population in full bloom. The site was visited again later in the summer for seed collection to make a proper ID by closely examining the beak of the seed and the texture of the epidermis. With confidence, the botany crew determined the species to be *Sidalcea oregana* var. *eximia*, a CRPR 1B.2 endemic to California. It has a limited range along the North Coast of California, with 45 known occurrences. There is only 1 known occurrence on GDRCo property, so this was a special find for the crew.



Photo caption: Magenta petals of the coast checkerbloom standing out against the rich greenery of the meadow (left). Botanists in their natural habitat identifying plants in the outlet of Snow Camp Lake (right).

CRPR	Scientific Name	Common Name	Code	Detections (BotID#s)
1B.1	<i>Gilia capitata</i> ssp. <i>Pacifica</i>	Pacific blue field gilia	GICAPA	2
2B.2	<i>Monotropa uniflora</i>	Ghost pipe	MOUN	7
1B.2	<i>Piperia candida</i> (unconfirmed)	White flowered rein orchid	PICAU	1
1B.2	<i>Sidalcea malviflora</i> var. <i>patula</i>	Siskiyou checkerbloom	SIMAPA	2
1B.2	<i>Sidalcea oregana</i> var. <i>eximia</i>	Coast checkerbloom	SIOR	1
1B.2	<i>Thermopsis robusta</i>	Robust false lupine	THRO	1

Uncommon Species – CRPR 3 and 4 Detections

Another special observation was seen on the landscape this year of a new *Lilium bolanderi* population on a newly developed road along a serpentine ridge. This species is exceptionally uncommon on the GDRCo landscape with only 3 existing populations known to be present, not including this new detection.

CRPR	Scientific Name	Common Name	Code	Detections (BotID#s)
4.2	<i>Lilium bolanderi</i>	Bolander’s lily	LIBOL	1
4.2	<i>Listera cordata</i>	Heart-leaved twayblade	LICO	1
4.1	<i>Lycopodium clavatum</i>	Running pine	LYCL	1

Detections of Potentially Rare Species

Scientific Name	Common Name	Code	Detections (BotID#s)
<i>Piperia sp.</i>	Rein orchid	PISP	2

Non-Rare Species Detections

Scientific Name	Common Name	Code	Detections (BotID#s)
<i>Piperia transversa</i>	Green striped Piperia	PITR	1



Photo caption: The beautiful vista of Bald Hills as seen from the WM-10 gate.

COASTAL LAGOONS AND LITTLE RIVER BOTANICAL MANAGEMENT PLAN STATUS

GDRCo and CDFW agreed that the long-term survey protocol for THPs within the Coastal Lagoons and Little River BMA, effective 2009, is as follows:

1. *RPFs shall conduct focused surveys for all THPs within the Coastal Lagoons and Little River BMA. RPFs shall be responsible for reporting the presence of any unique, high quality, sensitive plant habitat within their project area, e.g. bogs, well developed lakes or ponds, coastal prairie or large mossy boulders or rock outcrops. When Lycopodium clavatum is encountered within THP areas, voluntary, non-enforceable PPMs will be applied. These PPMs include establishing ELZs for select populations and retaining non-merchantable trees. If other sensitive species are observed, the RPF will consult with GDRCo botany staff.*
2. *Botanical technicians shall survey unique, high quality sensitive plant habitats within THPs as identified by RPFs. If sensitive species are discovered appropriate PPMs shall be applied.*
3. *Botanical technicians shall monitor a subset of L. clavatum populations on a yearly basis. Initially, monitoring activities will focus on pre- and post-harvest monitoring of populations protected with voluntary, internal PPMs that were implemented for plans submitted after July 8, 2008. Revisions to internal PPMs may be made based on monitoring results.*
4. *Botanical technicians will survey unique or high-quality habitats outside of THPs when they are identified. The intent is to find and survey areas within the BMA that have the greatest likelihood of supporting sensitive species, regardless of whether the habitat would ever be impacted by timber harvest operations.*

Summary of THP activity and survey coverage in the CL/LR BMA since adoption of the Botanical Management Plan (BMP) in 2008.

Year	THP acres in BMA	BMA acres surveyed	BMA acres exempt from survey
2008	3,029	1,219	1,810
2009	670	76	594
2010	3,813	109	3,704
2011	1,975	52	1,923
2012	893	1	892
2013	1,811	52	1,759
2014	2,185	137*	1,620
2015	2,625	148*	2,374
2016	1,594	109	1,485

2017	1,857	204	1,654
2018	2,344	807	1,537
2019	1,138	273	865
2020	1,262	60	1,202
2021	762	60	702
2022	905	14	891
Totals	26,863	3,036	23,012

Four new THPs were surveyed partially within the Coastal Lagoons and Little River BMA by the Botany Department in the 2022 field season to assess for potential habitat for rare plants. Surveys were focused on wetland features and major water courses with Sitka spruce present, looking for habitat that could host *Cardamine angulata* or *Moneses uniflora*. Four new populations of *Lycopodium clavatum* and one population of *Pleuropogon refractus* were found during these surveys. Three of the four *Lycopodium clavatum* populations will receive mitigation.

YEAR END MITIGATION SUMMARY

Survey efforts in 2022 yielded 120 new BotID#s for confirmed CRPR List 1 and 2 species. Many of these populations were mitigated to keep the entire population protected from impacts due to timber harvest operations. With a whopping 99 new populations of *Monotropa uniflora* found this year, not all could be afforded programmatic protections. This was either due to operational logistics or the sheer size of the population, with a few that spanned 2-10 acres in size. That said, many of the populations occurred within the riparian corridors, so they will be protected by default within the Riparian Management Zone (RMZ) buffers.

Programmatic protections were implemented for most of the new CRPR 1 and 2 detections, with some variation. This disturbance will provide seed scarification and clear out overgrown, competing vegetation for the next few years. The Botany Department will continue to monitor these sites and observe the overall health and success of these populations with the protection measures provided, with the intention of promoting and protecting quality habitat to conserve the sensitive species that exist across the Green Diamond landscape.

Table: Summary of Plant Protection Measures for 2022 Season

Code	Species	Common Name	Mitigation Used	Total Populations	Mitigated Populations
ASUM	<i>Astragalus umbraticus</i>	Bald Mountain milkvetch	Other	13	1
CAAN	<i>Cardamine angulata</i>	Seaside bittercress	Programmatic	2	2
ERRE	<i>Erythronium revolutum</i>	Coast fawn lily	Avoidance, Programmatic	4	4
ERSP	<i>Erythronium sp.</i>	fawn lily	Programmatic	2	2
GICAPA	<i>Gilia capitata var. pacifica</i>	pacific gilia	Other	6	6
ILLA	<i>Iliamna latibracteata</i>	California globe mallow	None	1	0
LYCL	<i>Lycopodium clavatum</i>	Running pine	Programmatic	18	6
MOUN	<i>Monotropa uniflora</i>	Ghost pipe	Other, Programmatic	99	29
MOHO	<i>Montia howellii</i>	Howell's montia	Programmatic	16	16
PICA	<i>Piperia candida</i>	White-flowered rein orchid	Programmatic	4	4
PISP	<i>Piperia sp.</i>	rein orchid	50 ft. buffer	1	1

MONITORING AGREEMENTS

THP Monitoring Agreements

The following summaries are specifically for binding monitoring agreements that have been made with CDFW during consultation for proposed mitigations in select THPs. Voluntary monitoring efforts are described in detail in this report, as well (see Follow-up Visits section of report).

Bald Mountain milkvetch (*Astragalus umbraticus*)

Although there is no formal Programmatic Agreement for *Astragalus umbraticus*, the botany crew has deployed varying levels of protection to populations over the years, ranging from Equipment Limitation Zones (ELZ) to limitations on road maintenance activities. With 11 new populations of *Astragalus umbraticus* detected this year, the botany crew decided to use a different method of mitigation in effort to provide an environment that best suits the species. Given its history on the landscape, the plants have shown that they thrive in areas with periodic disturbance. The seed banked in the soil from many years of reproduction, erupts with life after road maintenance disturbance has scarified the seeds. This has been seen in many of the populations that exist on the property. Protecting this species and not allowing disturbance to occur creates a less suitable habitat rather than creating more suitable habitat. We chose to allow disturbance to occur at 12 of the 13 populations associated with the THPs, which includes preexisting populations.

Hereunder are the project names and BotID#s associated with the monitoring agreements for that project for this species.

Big Prairie (2018) THP (CDF#1-17-137H): BotID#1361, BotID#1362, and BotID#35361

Tully Thin THP (CDF#1-20-00085-HUM): BotID#36348, BotID#36338, BotID#31584, BotID#1361, BotID#1362

Tully Creek East THP (CDF#1-17-143H): BotID#398, BotID#31592, BotID#35667, BotID#35668

Big Prairie (2018) THP

The three *Astragalus umbraticus* populations (BotID#1361, BotID#1362, and BotID#35361) associated with the Big Prairie (2018) THP (GDRC# 51-1702) that had received limited protections during road maintenance in 2019 and 2020 have been sustaining their numbers since the initial flush of new plants post-disturbance. BotID#1361 has continued to increase in size while BotID#1362 and BotID#35361 have slightly declined in size. The populations consisted of mostly large, mature, reproductive plants with few seedlings.

BotID#1361 and BotID#1362 were both originally detected in 2006 with modestly robust populations. The populations began to decline in numbers over the course of 10 years as the brush and vegetation outcompeted the plants. Plant protection measures for these two populations consisted of limitations to grading depth and reducing the movement of spoils. These protections were tailored to promote a disturbance event and keep seeds on site. After road maintenance and harvesting occurred in 2018, the populations had an initial drop in individuals, but the following year had a huge flush of seedlings. BotID#1361 went from 3 individuals pre-disturbance to 410 the following year. The population has now grown to 450 individuals in 2022. BotID#1362 was last recorded with 125 individuals in 2013, then it expanded to 500 individuals in 2017 2 years after road maintenance had occurred. The population now stands at 400 individuals in 2022 after having its largest population size of 1,000 plants in 2020. BotID#1362 received further disturbance in 2020 with the Tully Thin THP mentioned below, which may explain a decrease in population size. Both populations have mostly large and mature plants now with fewer seedlings.

BotID#35361 was detected in 2018 with 18 individuals on a brushed over road segment. The population was not provided any protection measures. Road maintenance in 2019 led to a total of 25 individuals in 2020 which then exploded into a flush of 900 individuals in 2021. The population may be in a slight decline, with an estimated 700 individuals reported in 2022 but the surveyor stated they were unable to get a better estimate of the population size because of the numerous individuals and the other weedy species growing amongst the population. All three of the populations associated with this THP have now developed into mature, reproductive plants that are now reestablishing the seed bank. The mitigation measures have proven to be successful for the populations and accommodating to the species life cycle.

Tully Thin THP

Five populations (BotID#36348, BotID#36338, BotID#31584, BotID#1361, BotID#1362) are associated with The Tully Thin THP (GDRCo# 51-2001). BotID#1361 and BotID#1362 are well established populations that were provided mitigation in the Big Prairie (2018) THP. As described in the section above, both populations had a positive response to the disturbance with both populations having a huge flush in new seedlings. Additional PPM's added to these two populations permitted designated skid trails and log decking areas along the road to facilitate harvesting of the unit and to minimize impact on the population. The protection measures have been successful as the populations are sustaining their numbers. With the more recent disturbance, further assessment of the populations will help determine the success of the protection measures.

BotID#31584 was found in association with the 2015 Annual Work Plan points. There were 40 individuals at the time of detection, but a follow-up in 2020 revealed no plants. The area was shaded and overgrown with blackberries. The population was not provided any mitigation measures. In 2022, the road had signs of maintenance with daylighting observed. The road cut banks were engulfed in weedy forbs and grasses, with no signs of any *Astragalus* plants. Operations on the adjacent unit have yet to occur, but the disturbance created may awaken the seed bank and revitalize the population.

BotID#36338 has significantly increased in size since the last year, going from 410 individuals to 1,400. The population has expanded into the interior of the thinned unit, with large patches of mature, flowering individuals. The seed source has been spread by machinery further down the main road from its original extent and along skid trails in the unit. BotID#36348 growing on the same road has remained the same size since last year's visit with 119 individuals. A few plants were flowering and mature, but most were not robust individuals yet. The absence of protection measures has been successful for the populations.



Photo caption: *BotID#36338 teaming with life along the cut bank of the recently thinned unit.*

Tully Creek East THP

Four populations (BotID#398, BotID#31592, BotID#35667 and BotID#35668) are associated with the Tully Creek East THP (GDRCo# 51-1706). Three of those populations occur on the appurtenant BH-1900 road system: BotID#398, BotID#35667, and BotID#35668. Road maintenance was permitted along the populations, but spoils generated from road grading were kept within the population boundary. Monitoring efforts of the populations to assess their response to standard road maintenance activities have shown the same results; BotID#398 and BotID#35667 are in a slow decline while BotID#35668 has remained stable for the last three years staying at about 18 individuals. Vegetation encroachment following the roadwork activities has been the greatest contributor to the decline of the populations since their initial expansion post-disturbance in the last ten years. The units appurtenant to the BH-1900 were harvested in 2021, with roadwork occurring in 2020. The repeated disturbance may be the cause for the smaller population sizes, so monitoring in following years may give a better idea of the size and health of the populations.

One population along the BH-2700 was detected in 2015 with the Annual Work Plan. The road work at that site was completed in 2020 in association with the Tully Creek East THP, bringing the population from 25 plants in 2018 to 12 in 2020. A flush of seedlings was seen in 2021, growing to 90 individuals. In 2022 the population doubled in size to 196 individuals composed mostly of large, flowering plants. No protections were provided to the population, which has produced positive results.

Seaside bittercress (*Cardamine angulata*)

Hereunder is the project name and BotID# of the species which is included in the special monitoring agreements made with CDFW.

North Fork Ah Pah THP (CDF# 1-19-00156-HUM): BotID#36053

BotID#36053 is a vast population which spans along the entire North Fork Ah Pah Creek on both banks in a unit associated with the North Fork Ah Pah THP. It was first discovered in 2019 with a population size of 1000. The creek habitat was in excellent condition to host the population as it was a rocky aggregate with clay rich mud and silt. The population was largely protected from timber harvest operations out of default due to its presence within the class I creek RMZ.

Five cable yarding corridors were cut through the RMZ to log the associated unit. No ground disturbance in the bottom of the creek was anticipated and the impacts to the population were thought to be minor, if at all. The associated unit completed harvest operations in March of 2021 and was revisited in August of 2022. The creek habitat appeared to be entirely undisturbed from harvest operations, other than a few fallen logs overlaying in the creek. The follow up estimated the population to be around 500 individuals. Other threats to this population include the increase in weedy species that may be outcompeting in this area, as well as, fluctuating water levels that may impact this population. Overall, the plants look incredibly healthy and thriving despite lower population estimates.

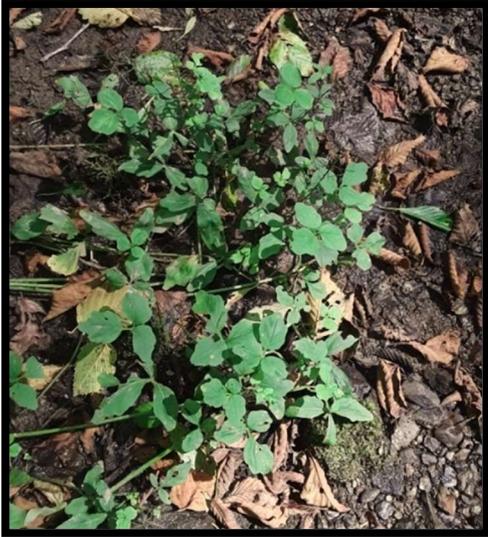
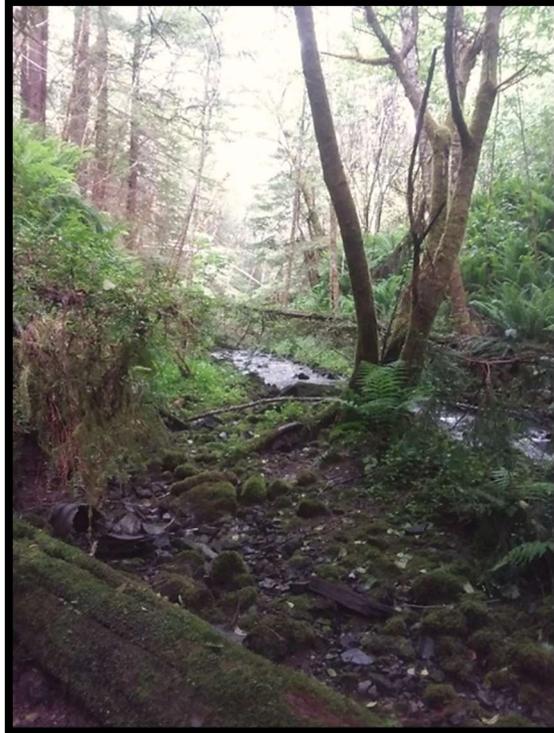


Photo caption: A patch of Cardamine angulata along the streambank of the North Fork Ah Pah Creek(left).



Siskiyou checkerbloom (*Sidalcea malviflora ssp. patula*)

Hereunder is the project name and BotID#s of the species which is included in the special monitoring agreements made with CDFW.

Goodman Prairie (2020) THP (CDF# 1-18-00176-HUM): BotID#35799, BotID#35801, BotID#35802, BotID#35815 and BotID#35816

Five populations of *Sidalcea malviflora ssp. patula* were found in one unit of the Goodman Prairie project. Four of those were located close to the border of the unit and were provided plant protections with an ELZ. BotID#35816 was found in the middle of the unit along a strategic road segment and was not granted plant protections. This population was initially recorded in 2019 with 10 individuals. During the first post-harvest visit in 2020, there were 3 plants present despite the substantial disturbance to the area as a seasonal road was constructed. In 2021, the population was found to be twice the size and more than half of the plants were reproductively successful. This most recent visit found only 2 plants that appear to be declining in health and suitable environment. The seasonal road is now being swarmed with invasive grasses and herbs that are crowding out the *Sidalcea malviflora ssp. patula*.

The protected populations received a 50-foot ELZ, in which all true oaks (*Quercus* sp.) were retained and all conifers were permitted to be harvested in the outer 25-foot ELZ. Additionally, the inner 25-foot ELZ was required to have an overstory canopy of greater than 50%. This methodology proved to be successful in the perseverance of each population. As of 2022, each BotID has grown since its initial detection, except for one – BotID#35799. This population was discovered along the unit’s top boundary with 150 plants, some of which were very robust. Since then, the population has experienced both a decline and a surge but as of 2022 has

returned to 150 plants. Along the same road is BotID#35815. This population was smaller, at 15 plants during initial detection. Over time this group was able to grow to what is now recorded at 50 individuals. Towards the opposite end of the unit is where the other occurrences were observed. BotID#35801 was another small cluster with 12 plants. While this population consistently appears to be healthy, it has been the only one that has never had flowers on display during monitoring. Nevertheless, it has grown to 15 plants as recorded in 2022. BotID#35802 is spread out in prolific bunches and has maintained 500 individuals since 2019. This most recent visit determined the count at 650 thriving plants with nearly 100 in flower.

Robust false lupine (*Thermopsis robusta*)

Hereunder is the project name and BotID# of the species which is included in the special monitoring agreements made with CDFW.

High Prairie Combo 19 THP (CDF# 1-20-00012-HUM): BotID#1898

BotID#1898 was initially detected in 2008 during surveys for High Prairie 2008 THP. The population was a small bunch of just 3 plants that resided on the side of the HP300 road. Avoidance protection measures were put in place and the population was provided plant buffer flagging, but impacts were expected to this population as timber had to be hauled out of the area. The population size varied between 2 to 4 plants and were observed on both sides of the road margin in following visits.

Avoidance protections for this population were reestablished in 2019 in association with the High Prairie Combo 19 THP. Notes regarding the population in 2019 visits mentioned how the plants were being outcompeted by other vegetation and had suffered from having brush piled on top of them after recent road clearing. To reduce these impacts, the remaining plants were protected with an Equipment Exclusion Zone (EEZ) where the plants occurred and demarcated with 3 painted t-posts. Harvest activities were still permitted to occur immediately adjacent to and surrounding the plants, with the prospect that the disturbance will increase habitat for expansion.

During the most recent monitoring visit the population was recorded at 15 individuals, with nearly 75% of those being seedlings. Harvest operations completely avoided the protected cluster of plants on the east side of the HP300 road. On the west side, the proposed road HP-390 road was made and a new flush of plants was found in the disturbed habitat. All together the plants were in excellent condition. The older, previously existing plants were robust and were successfully reproductive. The plants will presumably continue to thrive in this newly disturbed habitat.

Spotted Knapweed Monitoring at Sweet Flat, Mad River

In 2013 the GDRCo botany department began collaborating with the Humboldt County Department of Agriculture to monitor and remove spotted knapweed (*Centaurea stoebe*) from the gravel bars along the Mad River near the City of Blue Lake. Spotted knapweed was initially detected in 2013 along the Mad River at three locations south of the Mad River Hatchery. One of these locations is at “Sweet Flat” which is best accessed from private GDRCo roads.

In 2014, the site was surveyed, and no plants were detected. The gravel bars along the river were surveyed to the south of the site and no other populations were detected in these regions either. The site was surveyed in 2015 and one population was detected and removed; the gravel bars along the river were surveyed to the south of the site again and no additional plants were detected. In 2016 the botany crew removed approximately one hundred spotted knapweed plants and disposed of them offsite. Plants have been removed every year since with some variability in the number of plants found. Thirty plants were removed in 2017, fifty in 2018, four in 2019, six in 2020, thirty-four in 2021, and twenty-nine were observed and removed in 2022. Additionally, there is an infestation of yellow star thistle (*Centaurea solstitialis*) at this site that was first detected in 2016 and has been variably present over the years, as with the spotted knapweed. There are several known infestations of yellow star thistle throughout the watershed. It is assumed that the low water conditions and higher than average temperatures associated with the drought cycle may be contributing to increased suitability for invasive species infestations. Due to the riparian nature of the habitat, there is no plan to use herbicides in treating this site.

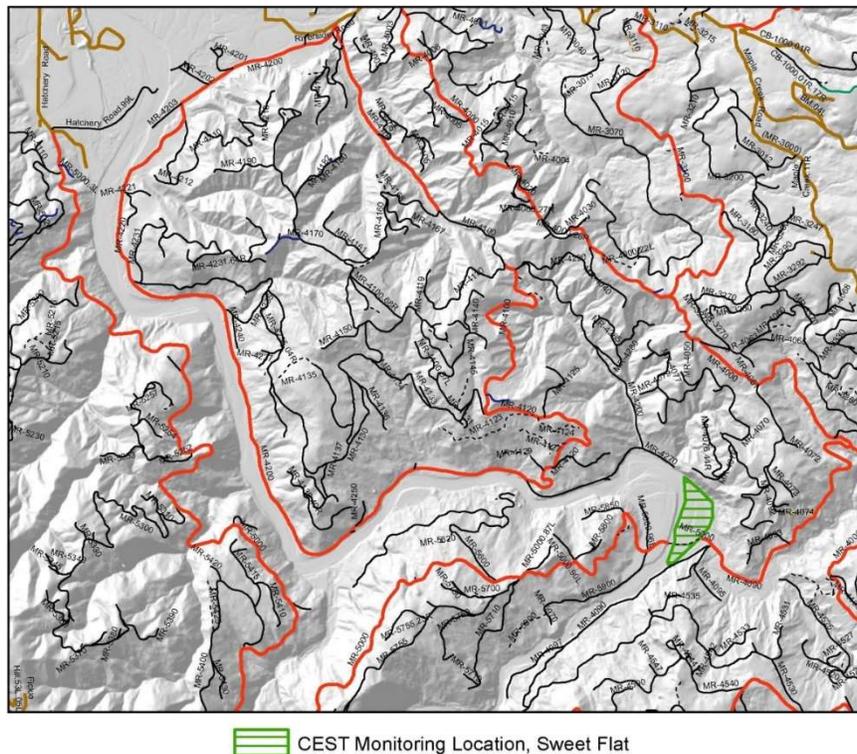


Figure 1. Location of *Centaurea stoebe* removal efforts at Sweet Flat, Mad River

A new population was detected on the property this year along the BL-1000, on the ridge above Big Lagoon. The population is growing in an old log staging area where the railroad used to pass through to transport logs. The railroad has been removed and now exists as a rocked road that is actively used. The population was first detected on a small pile of river rock next to the road and was later found to be quite expansive throughout the old staging area and along the road. The area is a square feature in the landscape, hardpacked with course rock preventing any trees from growing in the area. Moss, sparse grass, and a few shrubs have established themselves in the staging area, along with *Centaurea stoebe*. The plants remain small and stunted until the gravel road, where they have grown large in the soil castings.

Since the staging area is owned by the California State Parks, we had to reach out and get their concurrence for the treatment of the infestation. With their collaboration, the population is planned to be sprayed in the spring of 2023 with herbicide to eradicate the plants.

FOLLOW UP VISITS

The follow-up section of this report has been expanded upon to describe in more detail some of the specific responses we have observed in a variety of species over the years. The following populations revisited are not included in formal monitoring agreements per consultation with CDFW.

Bald Mountain milkvetch (*Astragalus umbraticus*)

There were 2 *Astragalus umbraticus* populations followed up on this 2022 season in which were not part of the monitoring agreements.

BotID#30484 was a population that was initially detected in 2007 in the N #527 THP (CDF# 1-07-022-HUM) (GDRCo# 51-0604) with a total population size of 20 individuals. ELZ plant protection measures were put in place for this population in April of 2014 in association with the Bald Hills THP in 2014 (CDF# 1-14-073-HUM) (GDRCo# 51-1401). These mitigations protected most of the population, although a small portion was impacted due to the necessity of a constructed road landing and vehicular traffic on the road between two units. During a revisit conducted this year, it was observed to have grown to 125 individuals. The population has responded well to the protections, without being negatively impacted long term. It was noted that this population has expanded from its past boundaries and new flags were hung to honor that growth.

BotID#30872 was discovered on the edge of an overgrown old road grade during surveys in the Bald Hills THP in 2014, during which it only consisted of 2 individuals. The population erupted in size to 200 individuals, as observed during a revisit in 2018. The follow up visit conducted this 2022 estimated it to be 500 individuals. The plants were clustered along the road surface, especially in soil mounds that were remnant of road work and sometimes spread into the forest interior. The road work disturbance assisted in the rebound of the population from a bottleneck effect. Clearing out the overgrown road surface established a more suitable habitat for the species.

Total Known ASUM Populations on GDRCo	Populations Revisited (2022)	Populations Found to be Extant (2022)
47	12	11



Photo Caption: BotID#30484 successfully flowering during observations on the SK200 road system (left). A sea of A. umbraticus flourishing on a recently used log staging area (right).

Benson’s saxifrage (*Bensoniella oregana*)

BotID#30329 was initially located with 5 individuals during surveys in 2012 for Little Boulder Creek THP (CDF# 1-11-113-HUM) (GDRCo# 18-1101). The population was spread along a road and was ultimately transplanted to one designated spot just off the road in which a no-harvest buffer was placed to protect it from road construction. In the late summer of 2021, the population endured unforeseen disruption as the adjacent landowner instituted rocking the road to combat the mucky road conditions, which therein buried a portion of the plant’s holding. At the time of this discovery, there were only 4 observable plants. Plant protections measures were redefined for this population in association with Snow Camp Lake THP (CDF# 1-21-00049-HUM) (GDRCo# 17-2002) so that there was a 75-foot no-harvest EEZ. The recent 2022 revisit observed 5 plants that were in full bloom. Ongoing monitoring of this population will be conducted to track recovery.



Total Known BEOR Populations on GDRCo	Populations Revisited (2022)	Populations Found to be Extant (2022)
17	1	1

Photo Caption: Brilliant pink anthers of Bensoniella glowing in the summer rays.

Coastal fawn lily (*Erythronium revolutum*)

Although no monitoring efforts were necessary in 2022 for *Erythronium*, 18 populations of *Erythronium revolutum* and *Erythronium sp.* were revisited.

The majority of unidentified *Erythronium* species were found in association with a hack and squirt project in the Bald Hills in 2018. Four populations (BotID#35413, 35414, 35416 and 35418) were successfully identified to *E. revolutum*. They were all protected nearby a creek RMZ, except for one, which was on a road surface. Another RMZ protected and unidentified fawn lily (BotID#31162), initially from the Bald Hills #2 THP (CDF# 1-14-136-HUM) (GDRCo#51-1402), was also found to be *E. revolutum* upon investigation. All these populations were found to be extant and healthy.

An exciting new discovery was made regarding the extent and flowering window of this species in the county line tract of GDRCo property. *Erythronium* is not known to occur in this region of the property, so the initial detections of these populations was a surprise. These occurrences (BotID#31231, 35320, 36035 and 36036) had remained unidentified for several years as they have defied the typical schedule the species follows for blooming. All of these populations were revisited in late March and were able to be keyed to *E. revolutum*! It is safe to say that the occurrences are thriving as most of them have grown a considerable amount since their original detection.

BotID#77 was a small population of 10 individuals that was detected in 2004 during surveys for the Chicken Ranch THP (CDF# 1-01-020-HUM) (GDRCo# 26-00401). The population was undetectable in 2006 and 2014 visits and was thought to be extirpated. Survey efforts this 2022 season were successful in curtailing that assumption as 5 individuals were found; one of which was in bloom. This population was found on the road and was not able to be protected from operations, but time would indicate that it was able to survive post-harvest.

Total Known ERSP Populations on GDRCo	Populations Revisited (2022)	Populations Found to be Extant (2022)	Identified to <i>Erythronium revolutum</i>
69	11	10	9



Total Known ERRE Populations on GDRCo	Populations Revisited (2022)	Populations Found to be Extant (2022)
359	16	16

Photo caption: Mahogany fawn lily emerging from the scattering of Douglas fir branches.

Pacific blue field gilia (*Gilia capitata ssp. pacifica*)

BotID#30654 was initially detected in 2013 in association with a non-THP, cattle grazing project area in Williams Ridge. The population size at this time was noted to be 500 individuals at 4 locations along an existing, permanent WM-10 road. The following year it was provided plant protection measures with no-harvest ELZs for the Bald Hills 2014 THP (CDF# 1-14-073-HUM) (GDRCo# 51-1401). Currently, the population size is still measured to be at 500 individuals. The protections provided for this population appear to be positive in providing suitable and undisturbed habitat for the species to persist.



Total Known GICAPA Populations on GDRCo	Populations Revisited (2022)	Populations Found to be Extant (2022)
15	1	1

Photo caption: Up close and personal with a flower of the Pacific blue field gilia, taking a peek at the characteristic blue edges along the calyx membrane.

California globe mallow (*Iliamna latibracteata*)

The detection of BotID#36837 in 2021 was momentous as *Iliamna latibracteata* only has a mere 11 observations in Humboldt County since 2000. The population was recorded to have 4 individuals growing alongside an appurtenant road accessing two units that are part of the Snow Camp Lake 2022 THP (CDF# 1-21-00049-HUM) (GDRCo# 17-2002). Plant protection measures consisting of an EEZ were put in place for this population, although road grading did impact some space it occupied. The recent population count was 3, which may be due to the grading of the population edge and/or the recent growth of surrounding vegetation.

Total Known ILLA Populations on GDRCo	Populations Revisited (2022)	Populations Found to be Extant (2022)
3	1	1

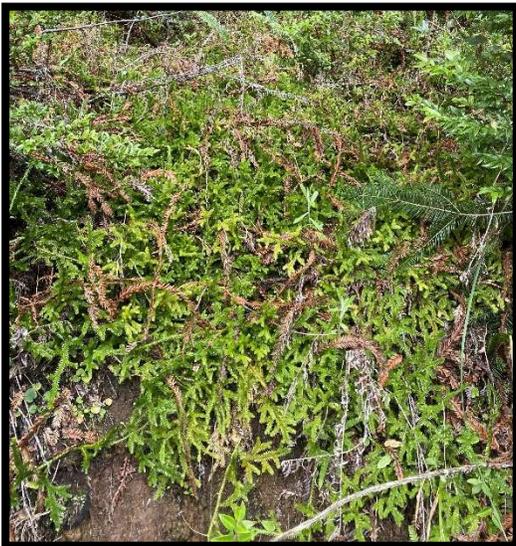
Running pine (*Lycopodium clavatum*)

Lycopodium clavatum receives voluntary PPMs typically in the form of a 25-foot ELZ drawn from the edge of the population extent or are provided protection through riparian buffers or Habitat Retention Areas.

The majority of *Lycopodium clavatum* populations (BotID#783, 1837, 31433 and 37117) that were revisited in 2022 exhibited good health. Three of populations occur along the roadsides but are generally undisturbed from road use and have expanded along the margin. BotID#1851 had a weak pigment and appeared stressed in a

habitat that was <10% canopy and had *Cortaderia jubata* hindering growth. This population was programmatically mitigated in 2008, but no flags were seen in the 2022 visit.

One population (BotID#790) was not found during this recent follow-up visit. Programmatic protection measures were provided to this population following its discovery in 2005, in which retained the surrounding mature trees with an ELZ. The sensitive plant tags were observed in 2022, yet the surrounding *Pseudotsuga menziesii* were so crowded that no light could penetrate through to the forest floor. The area was desolate from any other plants.



Total Known LYCL Populations on GDRCo	Populations Revisited (2022)	Populations Found to be Extant (2022)
1003	6	5

Photo caption: Running pine pouring from the forests edge onto the cutbank along the road.

Howell’s montia (*Montia howellii*)

There were two populations (BotID#1079 and BotID#36771) revisited in 2022 in which resulted in negative findings for *Montia howellii*. The former was found in 2000 on an old seasonal road that was left intact during road decommissioning. The site was visited in 2009 and 2022, both failing to locate plants. Suitable habitat for the species has been overgrown by other vegetation. The latter is a more puzzling loss. This population was found in 2021 and was provided programmatic protection measures. The plant area was adjacent to a public road, though it was noted that it was not heavily disturbed.

BotID#31030 has thrived in excellent habitat to which it has grown 6 times in size since its initial detection in 2014 for the MR 6000 THP (CDF# 1-14-028-HUM) (GDRCo# 221302). The population was granted programmatic mitigations, proving to be beneficial to the perseverance of the species. Current population count is recorded at 6,000 individuals. In this location, the plant is the dominant herb on the road.

Total Known MOHO Populations on GDRCo	Populations Revisited (2022)	Populations Found to be Extant (2022)
36	4	2

Ghost pipe (*Monotropa uniflora*)

There were 58 *Monotropa uniflora* follow-ups conducted in 2022, of which 34 were found to be extant. Twenty percent of those that were found to be extant did not have any plant protections provided to them. Many of the sites that were prioritized for follow-up visits in 2022 were small populations, and populations that haven't been visited in many years which might explain the somewhat deflated success of our efforts.

It is paramount to consider the life cycle and plant associations this species has before making concrete conclusions about undetectable populations. *Monotropa uniflora* has mycorrhizal associations with other species and the health of the population is easily linked to the health of host species. There were 3 populations (BotID# 31758, 31493 and 29569) that were visited in 2022 that had 0 plants observed in a past visit but have now rebounded with recordable existences.



Total Known MOUN Populations on GDRCo	Populations Revisited (2022)	Populations Found to be Extant (2022)
1030	58	34

Photo caption: Emergent ghost pipe sprinkled in water droplets from the coastal fog drip.

White flowered rein orchid (*Piperia candida*)

As a part of our floristic surveys, the crew visits reference sites of target species before entering a new plan to assure that we are conducting our survey during the right flowering window. 2 of the 4 populations of *Piperia candida* followed-up on this year were a part of a reference site visit. The other populations revisited were either an unplanned follow-up or an old population that is part of a new THP.

BotID#36368 which was originally detected in 2019 in association with the SP-1000 THP (CDF# 1-20-00175-HUM) (GDRCo #01-1903) is now associated with the West Moody THP (CDF# 1-22-00052-HUM) (GDRCo#01-2101). This single individual has persevered over the years, seen flowering in both 2020 and in the most recent follow-up in 2022.

An incidental detection in the Sproul Creek tract, BotID#36221, has maintained its population size of approximately 100 plants since its discovery in 2019. It occurs across the road from our property boundary and remains an excellent reference site with its abundance of flowering individuals.

Total Known PICA Populations on GDRCo	Populations Revisited (2022)	Populations Found to be Extant (2022)
92	4	4



Photo caption: Young, budding inflorescence of *Piperia candida* (left) with a mature inflorescence in full flower (right).

Rein orchid (*Piperia* sp.)

In 2022, several of the THPs surveyed hosted excellent habitat for *Piperia* and produced 26 new populations. Due to the timing of the surveys, the initial detections of these populations yielded no identification to species as it was too early in the spring for the plants to have produced an inflorescence. 24 of the 26 populations were revisited, with 19 that were able to be identified to species level. 17 keyed out to *Piperia transversa* while 2 populations were keyed to *Piperia candida*! A strong effort was also made to follow-up on 24 old *Piperia* sp. populations. The bulk of the effort was conducted in late August, which may explain the negative findings for some of these populations as it is near the tail end of their blooming window, especially for *P. candida*. Proper early season visits with caging to protect developing inflorescences would likely have produced better results. A positive ID was made on 9 of the 12 extant populations.

Total Known PISP Populations on GDRCo	Populations Revisited (2022)	Populations Found to be Extant (2022)	Identified to <i>Piperia transversa</i>	Identified to <i>Piperia elongata</i>
220	24	12	8	1

Siskiyou checkerbloom (*Sidalcea malviflora ssp. patula*)

There were 2 *Sidalcea malviflora ssp. patula* populations followed-up on this 2022 season in which were not part of the monitoring agreements.

BotID#35122 was detected in 2017 during surveys for Knutz Creek (2017) (CDF# 1-16-084-HUM) (GDRCo# 42-4078). A 50-foot plant buffer was awarded to the population of 100 plants. Through the years the population wavered down to 40, up to 80 and is currently recorded at 50 individuals. Although, the revisit in 2022 was completed early in the season and may be a factor in the decreased population size.

Surveys completed for the Elk Habitat Improvement Fulton Ranch in 2013 found a population (BotID#30633) of 10 individuals. There was a 50-foot buffer provided to these plants so that they would avoid impacts from thinning operations in the habitat improvement zone. Although the area is now liberated from harvesting threats, it is still vulnerable to natural abiotic and biotic threats. Recent counts denote the population has grown to 40 individuals. Previous follow-ups have noted the low number of flowering individuals despite the dense patch of basal leaves observed.

Total Known SIMAPA Populations on GDRCo	Populations Revisited (2022)	Populations Found to be Extant (2022)
17	7	7

Robust false lupine (*Thermopsis robusta*)

There were 4 *Thermopsis robusta* populations followed-up on this 2022 season in which were not part of the monitoring agreements.

Two populations (BotID#1208 and BotID#31044) were found to be in poor habitat as is reflected in their low population count. The former was provided a plant buffer on the BM1400 road prism when it was detected in the Bald Mountain Cutoff 2006 THP (CDF# 1-06-013H) (GDRCo# 26-0601). The area these two plants exists was being outcompeted by other shrubs such as *Rubus armeniacus* and large conifers that blocked beneficial sunlight. The latter was found in similar conditions as the last, in which it was being shaded out by large trees and *Arctostaphylos*. The population was made up of only one plant. It had successfully flowered but the entire flower stalk had been torn off potentially due to herbivory. This population was given an avoidance mitigation in association with the Upper Lupton THP (CDF# 1-14-043H) (GDRCo# 27-1401). For both populations, it would likely be beneficial to clear out competing plants and overstory to promote expansion.

BotID#692 and BotID#36686 both had variability in their population sizes through the years. BotID#692 was first detected in 2002 with 100 individuals along the road prism for the C900 THP (CDF# 1-03-13H) (GDRCo#27-0301). Plant protections put in place in 2002 were confined to directional falling and have not been revamped since, but restoration to this area is ongoing as brush clearing in 2020 has provided more light exposure. In 2022, the population was recorded to be at 95 individuals. There was a lot of active logging on the road in 2022 that may have impacted recordable size. Though this disturbance may prove to promote further growth and expansion. An incidental detection, BotID#36686, was found to have grown from its previous follow-up to this current visit, 150 to 230. It has not been mitigated but continues to grow while the habitat is prime.

Total Known THRO Populations on GDRCo	Populations Revisited (2022)	Populations Found to be Extant (2022)
30	5	5

Moore Tract: Species Return Post Fire



Photo caption: Brilliant colors light up the charred landscape.

Two years have passed since the destruction brought on by the Slater Fire in 2020, wiping out 157,270 acres of National Forest and private land in Northwestern California. The fire burned through 4,052 acres of GDRCo ownership named the Moore Tract. This area of forest hosted a suite of rare plant occurrences including *Coptis laciniata*, *Iris bracteata*, *Piperia candida*, *Arctostaphylos nortensis*, *Asarum marmoratum*, *Listera cordata*, *Erythronium howellii*, *Lilium kelloggii*, and *Prosartes parvifolia*.

The botany crew continues to revisit the site to assess the rare plant populations and regeneration of flora across the barren landscape. A flush of wildflowers was seen amongst the scorched trees mid-summer. Bright purple hues and pops of white amongst the patchy seas of green livened up the blackened, bare landscape. Tan oak and maple stumps were full of sprouts.

Other areas of the Slater Fires footprint are seeing similar results. The Siskiyou Crest reported on the super bloom happening near Tanner Lake, Oregon in July of 2022. The hillsides transformed from bleak, burnt snags to glowing, golden hillsides. Oregon sunshine (*Eriophyllum lanatum*) was the most abundant wildflower to be seen across the slopes, along with Mountain blue penstemon (*Penstemon laetus*), Shasta lupine (*Lupinus albicaulis*

var. shastensis), and Pussy paws (*Calyptridium umbellatum*). The wildflower show attracted a host of wildlife from busy pollinators to singing birds to grazing ungulates. The author really emphasized the beauty and biodiversity the fire has produced (The Siskiyou Crest, 2022).



Photo caption: View of the burned timber in the Moore Tract.

Marbled wild ginger (*Asarum marmoratum*)

This single population of *Asarum marmoratum* (BotID#30739) known on GDRCo property has survived the scorching of the Slater Fire in 2020. The photo on the left shows the first year of regenerating leaves after the fire, and the photo on the right shows two years of growth post-fire. The plants rhizomes deep in the soil protected it from completely desiccating in the fire. With the new abundance of sunlight, the population is taking off. A visit to the site in 2022 recorded the population size to be at 11 individuals, which is a boost in size since the prior recording of 3.

The Botany Department has encountered recent disagreements with the specific species level identification of this population via iNaturalist. According to the skeptics, the population exhibits traits that are consistent with *Asarum hartwegii*. The Botany Department will arrange a visit to the population in 2023 with the intention of thoroughly examining the floral and vegetative characteristics of the plant to deliver a confident resolution to said debate.



2021



2022

Total Known ASMA Populations on GDRCo	Populations Revisited (2022)	Populations Found to be Extant (2022)
1	1	1

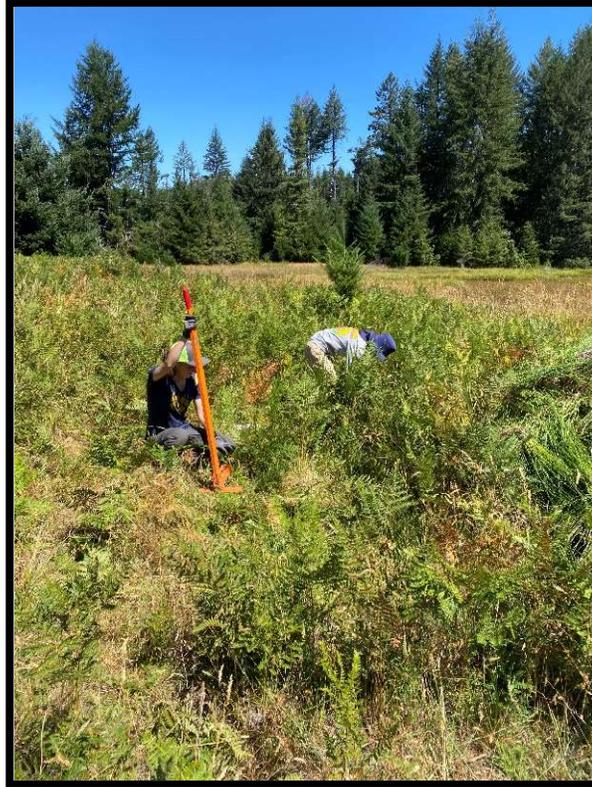
HABITAT IMPROVEMENT PROJECTS

Scotch Broom (*Cytisus scoparius*) Removal

The preservation of the botanically unique Christmas Prairie Lake continues for the fourth year in a row working on the removal of Scotch broom (*Cytisus scoparius*) from the margins of the lake. The botany crew spent two days removing the invasive weed through hand pulling and the use of weed wrenches. Much of the plants seen were small, young sprouts with a few large plants that couldn't be removed last year. The population hasn't expanded beyond the original extent, showing that the crews' efforts have been successful. With several more years of physical removal, the population may begin to deplete as the seed bank is being exhausted.

During the monitoring of *Astragalus umbraticus* on Williams Ridge, sites cleared of Scotch broom in last year's habitat improvements were checked up on. There were no large Scotch broom plants seen along the populations, only young sprouts in some of the areas where Scotch broom had been the thickest. The ASUM populations seemed to be benefitting from the lack of competition and increased light from removal of the invasive species.

The botany crew will continue to remove Scotch broom from the property in areas of high importance such as Christmas Prairie Lake and around known sensitive plant occurrences.



*Photo caption: Botany crew hard at work wrenching up the stubborn taproots of *Cytisus scoparius*.*

Star Thistle (*Centaurea solstitialis*) Removal

As part of GDRCo’s early detection and rapid response policy, in 2021 the botany group formally mapped and began treatment of yellow star thistle in the Bald Hills area. This infestation has been treated by the IFM group in the past, but herbicide application limitations have allowed plants to persist. Another attempt to use herbicide on the population in areas outside of the creek buffers was done this summer with the IFM crew. The populations were surveyed and remapped to show a more accurate extent of the population to plan for which areas were feasible to spray. With only a small percentage of the infestation able to be sprayed with herbicide, the rest of the plants were left to be mechanically treated by means of hand pulling. The botany crew and a few IFM crew members spent the day pulling the dense, young, and grazed over plants that had emerged from the disturbance caused by last year’s hand treatment. A resurvey of the population in the next year will help determine how effective both methods of treatment were.



Figure 2. Map showing the recorded occurrences of star thistle and creek buffers on Williams Ridge Road.

SALMON CREEK HOWELL'S MONTIA MONITORING

Statistical Assessment of Howell's montia (*Montia howellii*)

Occupancy within Salmon Creek (2011-2021)

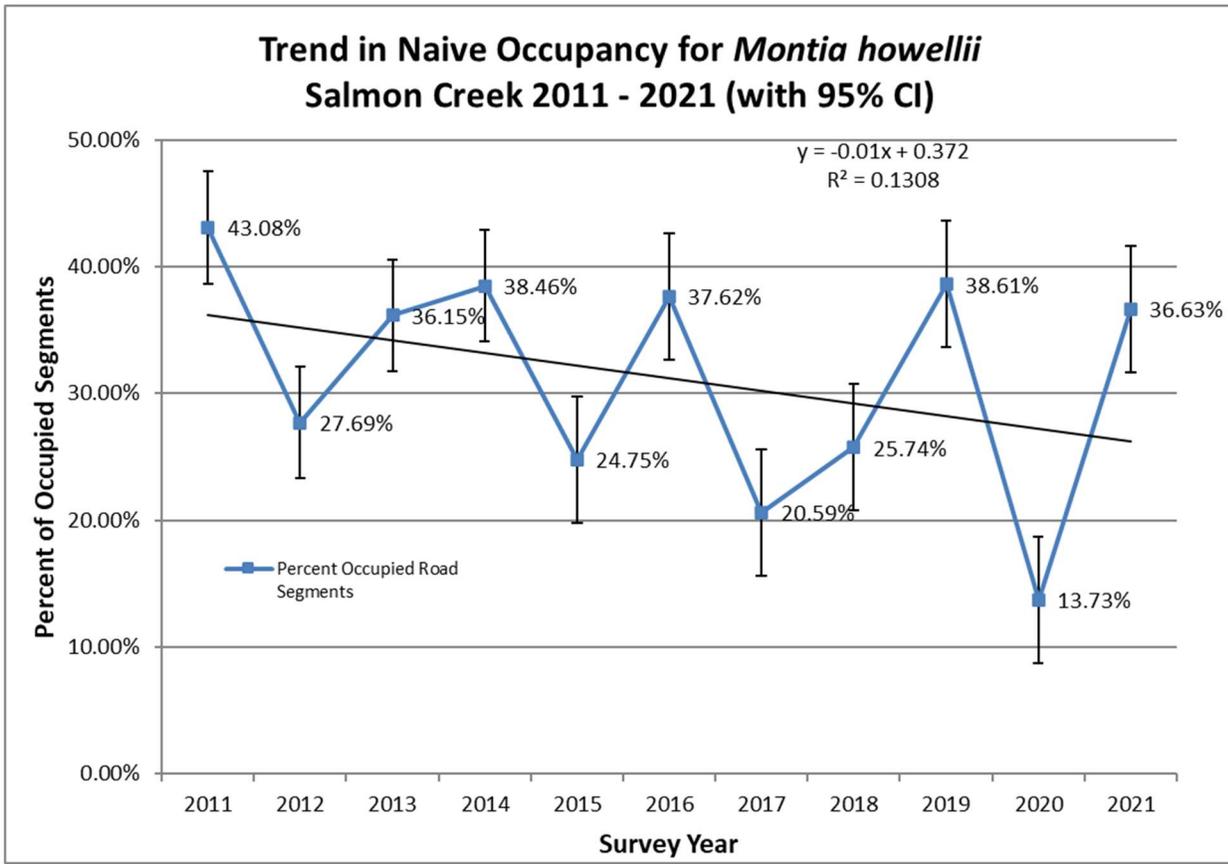
General Background

Multiple analyses have been carried out based on Howell's montia (*Montia howellii* - MOHO) occupancy monitoring data collected yearly within Salmon Creek (2011-2021). This data was collected along 50-meter-long road segments which were part of a large sampling framework. A series of rotating panels was used to select each year's sample units which varied between 100-130 segments. Modification to the panels occurred in 2013 after it was apparent that segments with yearly repeat visits were being negatively impacted. A two years on and one year off protocol was used to minimize this effect while still maintaining the repeated segments.

The primary goals of the monitoring were to assess the trend in MOHO occupancy over time and to investigate the relationship between road surface substrate (the amount of rock and vegetation cover) and MOHO presence. Unfortunately, initial (2011-2014) measurements of rock and vegetation were qualitative at best, and not conducive to statistical analysis. Modifications were made for substrate data collected from 2015-2018, but still lacked the rigor necessary to adequately assess the effects. From 2019-2021, a point-line transect method was employed which generate repeatable accurate assessment of substrate percentages within each of 5 quadrates within each 50-meter sample unit.

Naïve Occupancy

Basic trend monitoring consisted of calculating the naïve occupancy rate based on the number of presence samples divided by the total number of sampled segments within a year. Even though methods of survey changed throughout the study period (2011-2021), we believe that detection rates were generally high and consistent through time. Overall detection rate at the quadrate level for the last three survey years was very high ($\hat{p} = 0.959$, $SD = 0.004$), therefore detections rates at the Sample (five 10-meter-long quadrates) is likely higher. Preliminary investigation of the effects of antecedent precipitation suggests a positive relationship with the occupancy. However, further investigation would be necessary to assess this association.



Occupancy using Mixed Model with Random Coefficients (AR1)

A random coefficients model was used to assess trends in MOHO occupancy over time (Year) based on data grouped by sample ID (SID). Simplistically, we fit a linear regression line with year as a random effect to each group of repeated SID samples and then calculated the mean of those lines. This analysis used 1229 individual SID records results in 267 groups. While the upper confidence interval of the Beta for Year (slope) crosses 0.00, these results still support the decrease in occupancy rate seen in the naïve estimates above (Naïve slope of -0.01 vs. Mixed Model slope of -0.083). Any differences are likely related to the limitation of repeated samples at the same SID imposed in this analysis as compared with all samples entering the naïve estimate above.

Run Summary

Item	Value
Likelihood Type	Restricted Maximum Likelihood
Fixed Model	YEAR
Random Model	SID+SID*YEAR
Repeated Pattern	AR(Time Diff)
Number of Rows	1229
Number of Subjects	267
Solution Type	Newton-Raphson
Fisher Iterations	5 of a possible 5
Newton Iterations	40 of a possible 40
Max Retries	10
Lambda	1
Log Likelihood	-610.6449
-2 Log Likelihood	1221.2898
AIC (Smaller Better)	1231.2898
Convergence	Normal
Run Time (Seconds)	40.546

Solution for Fixed Effects

Effect Name	Effect Estimate (Beta)	Effect Standard Error	Prob Level	95.0% Lower Conf. Limit of Beta	95.0% Upper Conf. Limit of Beta	DF	Effect No.
Intercept	17.1094	8.9860	0.058596	-0.6289	34.8477	170.2	1
Year	-0.0083	0.0045	0.062999	-0.0171	0.0005	170.2	2

Report Definitions

Effect Name: The level of the fixed effect.

Effect Estimate (Beta): The estimated coefficient of this term in the model.

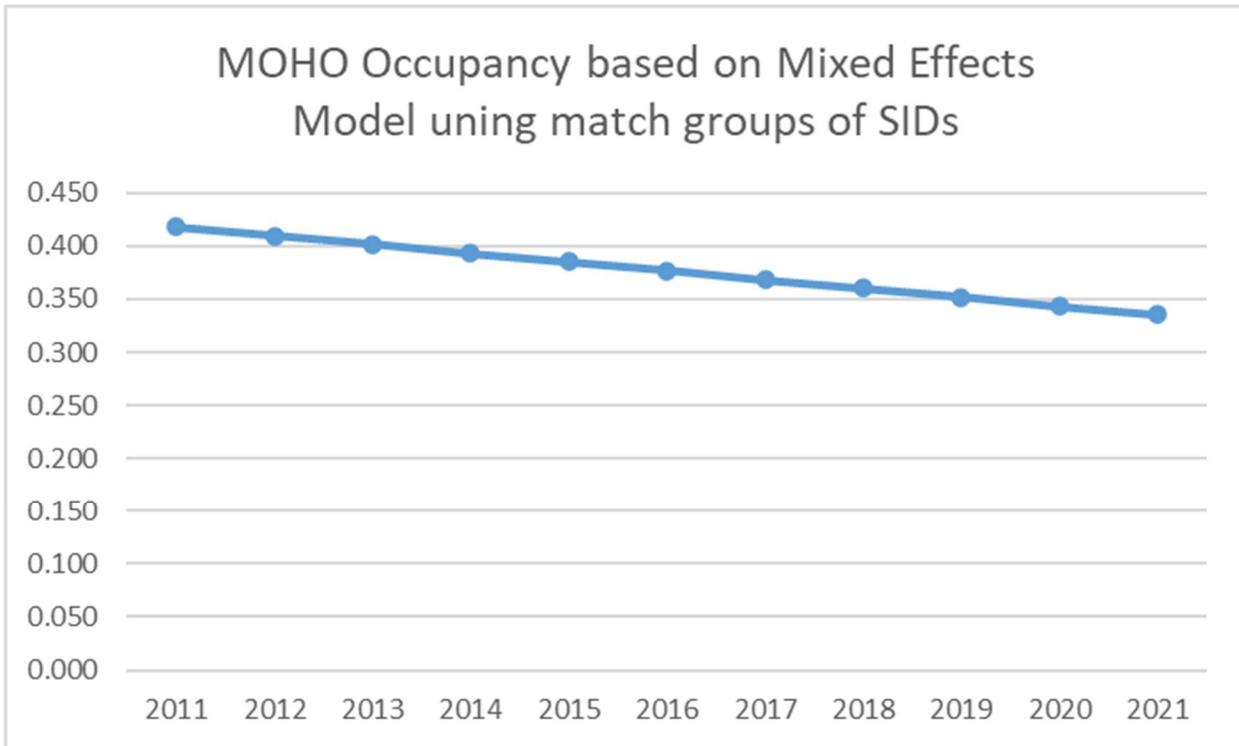
Effect Standard Error: The standard error of the corresponding effect.

Prob Level: Used to test whether the effect is equal to zero.

95.0% Lower (Upper) Conf. Limit of Beta: The confidence limits for the effect.

DF are the degrees of freedom used in confidence interval calculations and hypothesis tests. The degrees of freedom are calculated using the method of Kenward and Roger (1997).

Effect No.: Identifies the effect.



Logistic Regression – Substrate Effects

A logistic regression model was used to assess the effects of substrate (rock and vegetation cover) on MOHO presence. With Occupancy (0,1) as the response, covariates included linear Percent Vegetation (cover) and its quadratic form, No Rock (categorical, 1 when rock percentage = 0.0, 0 otherwise), and an interaction between No Rock and Percent Vegetation. All coefficients were significant at an alpha = 0.01 except for the linear form of No Rock. Assessing logistic model fit, using available performance metrics, is beset with difficulty, however in the absence of any universally accepted methods we chose to present the Area Under ROC Curve and marginal plots. Our Area Under ROC Curve = 0.75802 (+ 0.95 alpha, 0.720000 and 0.79150 respectively, suggests reasonably good fit and strong model performance. Direct inference from logit-based coefficients is difficult, marginal plots are often used in their place to interpret covariate-based Responses.

Run Summary

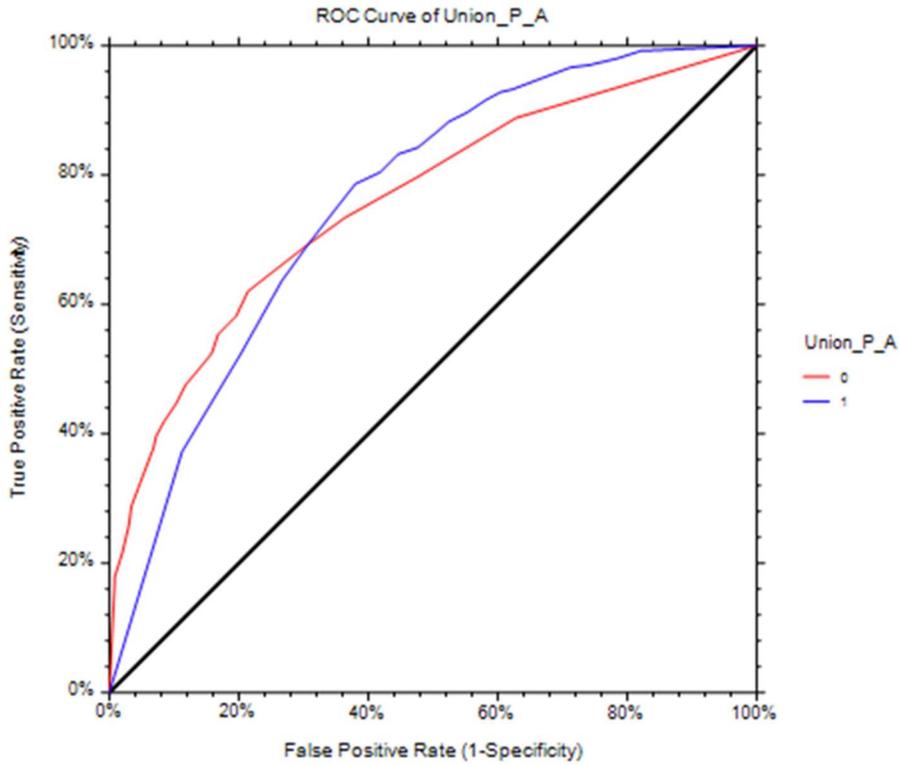
Item	Value	Item	Value
Y Variable	Union_P_A	Rows Processed	1520
Reference Value	0	Rows Used	1520
Number of Y-Values	2	Rows for Validation	0
Frequency Variable	None	Rows X's Missing	0
Numeric X Variables	5	Rows Freq Miss. or 0	0
Categorical X Variables	0	Rows Prediction Only	0
Final Log Likelihood	-603.17449	Unique Rows (Y and X's)	983
Model R ²	0.13468	Sum of Frequencies	1520
Actual Convergence	8.035617E-11	Likelihood Iterations	7
Target Convergence	1E-06	Maximum Iterations	50
Model D.F.	5	Completion Status	Normal Completion
Priors	Equal		

Coefficient Significance Tests

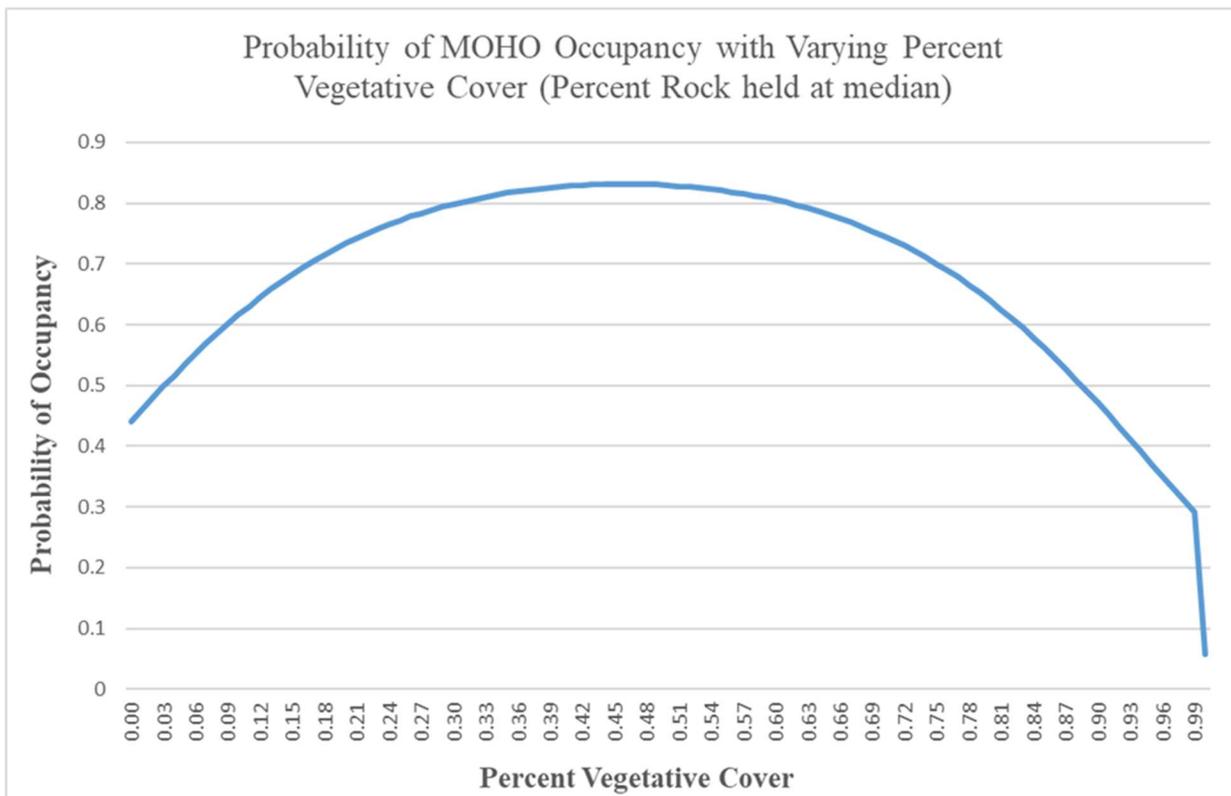
Independent Variable	Regression Coefficient b(i)	Standard Error Sb(i)	Wald Z-Value H0: β=0	Wald P-Value	Odds Ratio Exp(b(i))
Intercept	-1.60764	0.43268	-3.716	0.00020	0.20036
PercentVeg	10.06494	1.63649	6.150	0.00000	10000+
No_Rock	0.87719	0.51120	1.716	0.08617	2.40413
PercentVeg*PercentVeg	-9.72484	1.39836	-6.954	0.00000	0.00006
No_Rock*PercentVeg	-2.30780	0.78707	-2.932	0.00337	0.09948

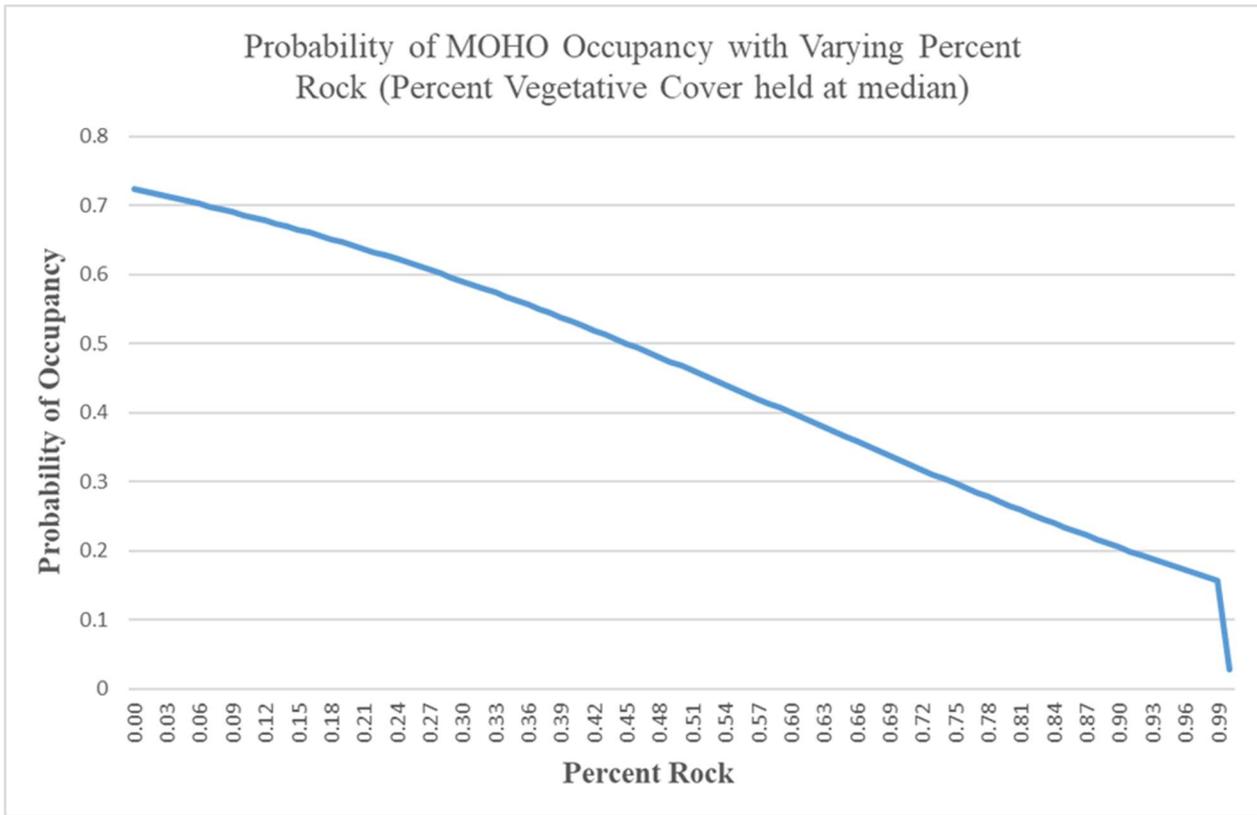
Model for Logit (Union_P_A) = XB when Union_P_A = 1

-1.60763703492864 + 10.0649447396747*PercentVeg + 0.877186402063507*No_Rock - 9.72483947571997*PercentVeg*PercentVeg -2.30779897163896*No_Rock*PercentVeg



Marginal Plots





PROPERTY-WIDE SUMMARY TABLE FOR 2022 FLORISTIC SURVEYS

THP Name	GDRCO THP #	CalFire THP #	IN CL/LR BMA?	Quad	Elevation (ft)	Survey Acres	Field Work Date(s)	Field Survey Hours	Survey Rate (ac/hr)	CRPR 1-2 Rare/Sensitive Sp. (mitigated)	CRPR 3-4 Uncommon Species
Cemetery Gates	51-1901	1-20-00018-HUM	No	French Camp Ridge	2240-3080	115	2020: 4/29, 4/30, 5/4, 5/5, 6/10; 2022: 4/25	24	4.79	ASUM, ERORLEU, ERRE, ERSP, PISP	THGR, LICO, COLA, PICAL, PITR
Tully Creek 2022	51-2101	1-22-00028-HUM	No	French Camp Ridge, Bald Hills	1600-2600	291.5	5/3, 5/4, 5/5, 5/10, 5/11, 6/6, 6/7, 6/15	73	3.99	ASUM, ERRE, ERSP, PICA, PISP	COLA, LICO
Roach 120	51-2102	1-22-00026-HUM	No	Bald Hills	1168-2365	194.81	3/17, 4/11, 4/19, 4/25	33.45	5.82	Negative	LICO
Williams Ridge 23	51-2103	1-23-00020-HUM	No	French Camp Ridge	1530-2930	293	5/9, 5/10, 5/11, 5/12, 6/13, 6/23	48.25	6.07	ASUM, ERSP, PISP	COLA, LICO, PICAL, PITR
Tectah 180	56-2103	-	No	Holter Ridge	1100-2200	167	4/7, 6/20, 6/21	25.5	6.55	PISP	LICO, PICAL
S-Line Split	61-2201	1-22-00158-HUM	No	Ah Pah Ridge, Fern Canyon	400-1400	364.5	8/1, 8/8, 8/9, 8/10, 8/11	56.75	6.42	CAAN, MOUN	CHGL, MICAU
MG 900 23'	66-2101	1-23-00008-DEL	No	Requa, Ah Pah Ridge	400-1000	188	8/15, 8/16	23.25	8.09	Negative	MICAU
Hunter West	71-2103	1-21-00189-DEL	No	Requa, Child's Hill	240-1600	94.5	2021: 8/16, 8/23, 8/24; 2022: 5/27	1.5	63.00	MOUN	Negative
Wilson One	71-2104	1-22-00107-DEL	No	Child's Hill	100-1200	41	8/22	5.5	7.45	Negative	Negative
Hunter Wilson 23	71-2105	1-22-00167-DEL	No	Child's Hill	320-1720	283	7/15, 7/18, 7/29, 8/5, 8/11, 8/17	34.75	8.14	MOUN	CHGL, PICAL
Cazadores	71-2201	1-23-00010-DEL	No	Requa	240-1760	124.5	8/23, 8/30	16	7.78	MOUN	Negative
Lower Hunter '22	73-2101	1-21-00192-DEL	No	Requa	40-1160	157	2021: 7/13, 7/14, 7/19, 7/22; 2022: 4/7	34	4.62	MOUN	CHGL, MICAU, PICAL

Tip of Tepo	73-2103	1-22-00021-DEL	No	Requa	120-1320	127	2021:8/18, 8/23; 2022:4/7	22.5	5.64	MOUN	Negative
Beaver Slide	85-2201	1-23-00002-DEL	No	Klamath Glen	800-2400	219	6/27, 7/5, 7/11, 7/14, 7/25	30.75	7.12	Negative	PICAL, PLRE
Turwar North	85-2202	1-23-00009-DEL	No	Klamath Glen	1300-1900	34	8/30	3.25	10.46	Negative	Negative
The Jim Adams	93-2102	1-21-00165-DEL	No	High Divide	100-1200	277.5	2021: 8/3, 8/5, 8/11, 8/17; 2022: 3/30	54.75	5.07	MOUN	CHGL
Savoy 23	93-2103	1-22-00066-DEL	No	High Divide	0-1200	393	6/28, 6/29, 7/6, 7/7, 7/12, 7/13	57	6.89	MOUN	PICAL
Winchuck 2022	93-2104	1-22-00145-DEL	No	Smith River	200-760	214	7/7, 7/14, 7/19, 7/20	39	5.49	MOUN	CHGL, MICAU, OXSU
Rough and Rowdy	93-2201	-	No	Smith River	0-1800	57.5	8/3	7.5	7.67	Negative	Negative
Northbank	94-2201	1-22-00141-DEL	No	High Divide, Hiouchi	0-1400	561	7/26, 7/27, 7/28, 8/2, 8/3	67.25	8.34	MOUN	CHGL, OXSU, PICAL
Camp Six Creek	95-2101	1-22-00002-DEL	No	Crescent City	100-700	245	7/21, 8/4, 8/24	21.75	11.26	Negative	CHGL, MICAU
Fort Dick 4	95-2201	1-22-00172-DEL	No	Crescent City, Hiouchi	0-500	111	8/4, 8/24	13	8.54	MOUN	Negative
West Moody	01-2101	1-22-00052-HUM	No	Garberville	600-1800	166	4/4, 4/5, 4/6, 4/8, 6/8, 6/15	73	2.27	PICA, PISP	Negative
Tsarnas	02-2101	1-22-00108-HUM	No	Myers Flat	400-1080	184	2021: 6/9, 6/10; 2022: 4/20	3	61.33	PICA	LICO
The McCloud 5	14-2101	1-22-00173-HUM	No	McWhinney Creek	320-1280	185.1	5/25, 5/26, 5/31	27.75	6.67	MOHO	CHGL, LICO, PLRE
Three's Company	15-2101	1-22-00126-HUM	No	Arcata South	80-900	110.5	3/21, 3/22, 3/24	26	4.25	Negative	CHGL, LICO, LYCL, RILA
Canon Ridge (formerly Ward Road North)	24-2201	1-22-00118-HUM	No	Korbel	1280-1880	92.89	3/25, 3/30	13	7.15	Negative	LICO, LYCL
Knutz Creek 22	26-2101	1-22-00038-HUM	No	Blue Lake, Korbel	1130-2760	136	4/12, 4/13, 4/14, 4/15, 5/31	50	2.72	ERRE	LICO, MICAU, USLO

Noisy Springs (formerly Noisy Creek)	27-2101	1-22-00059-HUM	No	Maple Creek	1200-2800	173	2021: 5/27; 2022: 4/18, 4/21, 4/26, 4/27, 5/2, 5/6	29.75	5.82	ERRE	LICO, MICAU, TITRTR
Fernwood Thin	27-2201	1-22-00150-HUM	No	Maple Creek	2600-2960	120	5/6, 5/17	9	13.33	Negative	LICO
Mather 23	35-2201	1-22-00137-HUM	No	Arcata North	200-500	146	5/18, 5/19, 5/20	11.75	12.43	Negative	LICO, LYCL, RILA
Beaver Basin	42-2101	1-22-00069-HUM	No	Blue Lake, Panther Creek	900-1600	225	4/21, 5/19, 5/20, 5/24, 6/1	24.75	9.09	Negative	LICO
CR 3300 Thin	43-2201	1-23-00004-HUM	Yes	Rodgers Peak	520-1750	406.61	6/23	5	81.32	Negative	LYCL
Upper South Fork (formerly South Fork Little River)	43-2202	1-22-00106-HUM	Yes	Panther Creek, Crannell	320-1920	65	6/1	1.75	37.14	Negative	PLRE
CR 2000/2900	45-2101	1-22-00112-HUM	Yes/No	Panther Creek	1120-2200	312	3/29, 3/31, 5/27	20.25	15.41	Negative	LICO, LYCL
Big Beginning	47-2105	1-22-00016-HUM	Yes	Rodgers Peak	1500-1920	41.5	-	-	-	Negative	Negative
Peppered Pitcher	47-2106	1-22-00037-HUM	Yes	Rodgers Peak, Crannell	400-1280	118.5	6/1	2.25	52.67	Negative	LYCL
Clear Creek 23	47-2201	1-22-00144-HUM	Yes	Rodgers Peak	400-1280	110	-	-	-	Negative	Negative
Roaring Headwaters	48-2101	1-22-00013-HUM	No	Blue Lake, Panther Creek	650-2320	346	3/18, 5/16, 5/17	25.5	13.57	Negative	Negative
CR 2960 (2022)	48-2102	1-22-00018-HUM	No	Panther Creek	400-2000	121.5	3/14, 3/15, 3/16, 3/24	32	3.80	Negative	LICO
K&K 1000 North	48-2103	1-22-00019-HUM	No	Panther Creek	1000-2160	139.65	5/23, 5/24	16.5	8.46	Negative	Negative
AWP 2022	-	-	-	-	-	-	6/3, 6/30, 9/1	6.25	-	Negative	Negative

Light green highlight: surveys initiated in 2021 and completed in 2022. Light grey highlight: surveys initiated in 2022 and status pending results of 2023 surveys.

Key to species abbreviations and CRPR Status

ARNO: <i>Arctostaphylos nortensis</i> (CRPR 4.3)	ERRE: <i>Erythronium revolutum</i> (CRPR 2B.2)	MOUNI: <i>Moneses uniflora</i> (CRPR 2B.2)
ASUM: <i>Astragalus umbraticus</i> (CRPR 2B.3)	GICAPA: <i>Gilia capitata</i> ssp. <i>pacifica</i> (CRPR 1B.2)	PICAL: <i>Pityopus californicus</i> (CRPR 4.2)
BEOR: <i>Bensoniella oregona</i> (CRPR 1B.1)	IRBR: <i>Iris bracteata</i> (CRPR 3.3)	PLRE: <i>Pleuropogon refractus</i> (CRPR 4.2)
CAAN: <i>Cardamine angulata</i> (CRPR 2B.1)	LICO: <i>Listera cordata</i> (CRPR 4.2)	PLST: <i>Plantanthera stricta</i> (CRPR 4.2)
CHGL: <i>Chrysosplenium glechomifolium</i> (CRPR 4.3)	LYCL: <i>Lycopodium clavatum</i> (CRPR 4.1)	RILA: <i>Ribes laxiflorum</i> (CRPR 4.3)
COCAN: <i>Cornus canadensis</i> (CRPR 2B.2)	MICAU: <i>Mitellastra caulescens</i> (CRPR 4.2)	SIMA: <i>Sidalcea malachroides</i> (CRPR 4.2)
COLA: <i>Coptis laciniata</i> (CRPR 4.2)	MOHO: <i>Montia howellii</i> (CRPR 2B.2)	THGR: <i>Thermopsis gracilis</i> (CRPR 4.3)
EROR: <i>Erythronium oregonum</i> (CRPR 2B.2)	MOUN: <i>Monotropa uniflora</i> (CRPR 2B.2)	TITRTR: <i>Tiarella trifoliata</i> var. <i>trifoliata</i> (CRPR 3.2)

PROGRAM GOALS FOR 2023

- Inclusion of the County Line Botanical Management area into the Sensitive Plant Conservation Plan.
- Develop plan for Botanical Management Area development in the short and long term.
- Develop Property-Wide Programmatic Agreements for *Astragalus umbraticus* and *Thermopsis robusta*. If time allows, create programmatic agreements for *Sidalcea malviflora subsp. patula*.

WORKS CITED

The Siskiyou Crest. 2022. *Later Fire Super Bloom & Fire Effects*. [Slater Fire Super Bloom & Fire Effects – The Siskiyou Crest](#)