

# High Elevation Plant Community Turnover in Yosemite National Park

California Native Plant Society  
2023 Project Report



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December 14, 2023

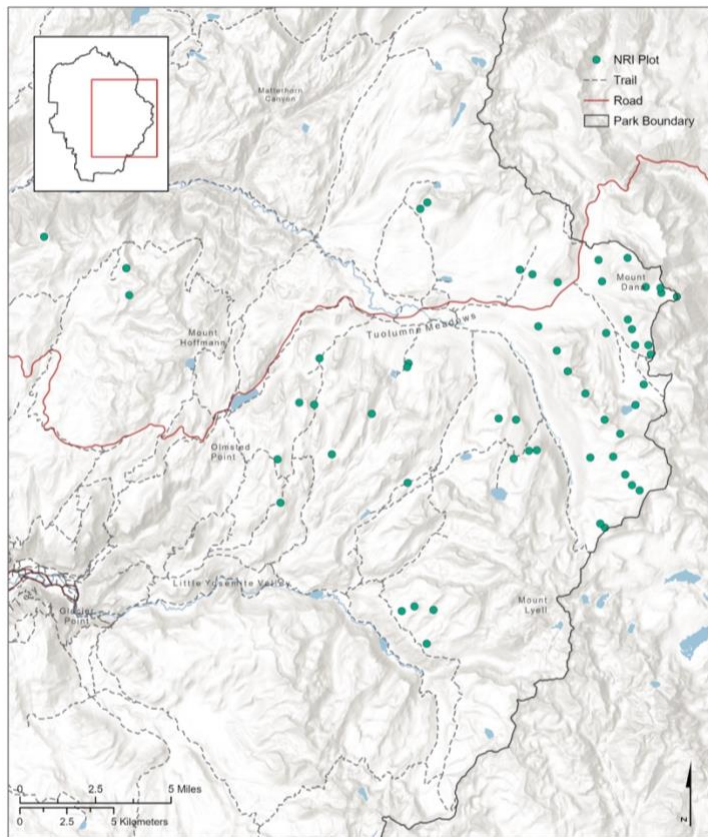
## Project Goals

This project proposes to resample Natural Resource Inventory plots for the first time in 30 years to document how the changing climate has affected alpine plants in Yosemite and share that information with the public. The project will also set up new monitoring transects that will be more sensitive to detecting change and map informal trail proliferation in alpine areas of concern.

## Season Summary

In 2023, we resurveyed historic vegetation plots in Yosemite's subalpine and alpine, and installed new monitoring plots on Mt Dana. The graduate student lead planned logistics for the field season and the research team successfully relocated and resurveyed 23 historic Natural Resources Inventory (NRI) plots on multi-day backcountry trips (Figure 1). Additionally, we established 12 new transects following the GLORIA (Global Observation Research Initiative in Alpine Environments) downslope protocol on the southwest slope of Mt. Dana (Figures 2 and 3). We collaborated with NPS staff and GLORIA botanists throughout the season. Due to the record snowpack from Winter 2022, we had to shorten our field season and were unable map informal trails.

Since returning from the field, we have entered data, processed specimens, and are starting preliminary analyses. We have shared about the project with the public through five presentations at symposia and community meetings, four newspaper and newsletter articles, and one post on the park social media. At every step of the project, we have involved undergraduate students at Cal Poly. To-date, eleven undergraduate students have been involved in this project and have gained invaluable backcountry field experience and botanical research skills. Our research will contribute to land managers' understanding the impacts of climate change on high-elevation plant community dynamics in Yosemite National Park.



**Figure 1.** Map of high-elevation Natural Resource Inventory (NRI) plots in Yosemite National Park. To-date we have resurveyed 55 plots.

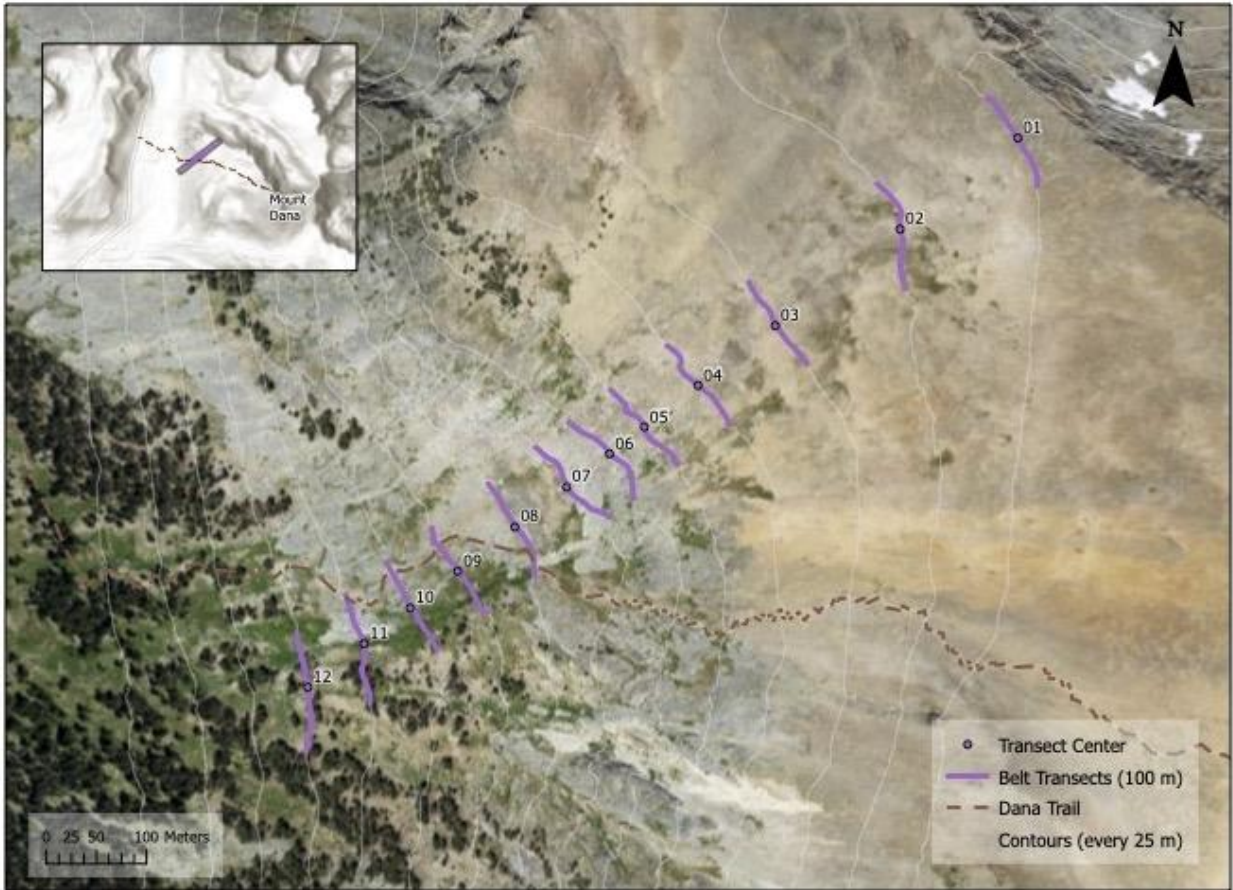


Figure 2. Map of 12 new downslope belt transects installed in 2023 on the southwest slope of Mt. Dana.



Figure 3. Photo of Mount Dana with new downslope transects overlaid in purple. Photo credit: Ben Sherman

Accomplishments	Metrics	Date
Presented at symposia and meetings <i>(See Appendix A for details)</i>	5 presentations	February 2023 - present
Trained and mentored Cal Poly undergraduate field assistants <i>(See Appendix C for testimonials)</i>	11 students	April 2023 – present
Resurveyed historic vegetation plots	23 plots on 3 backcountry trips	July – September 2023
Installed new monitoring plots on Mt. Dana	12 plots	August 2023
Trained volunteers, NPS staff in project protocols	6 people	July – August 2023
Identified unknown species and mounted specimens	More than 400 specimens	September – December 2023
Shared about the project through articles and a social media post <i>(See Appendix A for details)</i>	4 articles/ posts	September 2023 - present

## Use of Funds

We used the funds received from the CNPS Bristlecone Chapter to offset fuel and travel costs between San Luis Obispo and Yosemite, and between the field station and trailheads for the crew and crew lead. Funding received from the CNPS Bristlecone Chapter was critical to the success of our second field season.

Note: We received other funding that directly covered the housing costs at the Sierra Nevada Aquatic Research Lab, so were able to use the CNPS funds for travel costs instead of housing costs as originally planned.

## Project Timeline

Winter 2024	Data analysis and field season prep
Summer 2024	Resurvey 15 historic plots and 12 new plots, map informal trails, lead hike
Fall 2024	Final data analysis and manuscript preparation

## Appendix A

### *Presentations*

Friesen, R.E. and Grossenbacher, D.L. (2024, January 9). *Subalpine and Alpine Plant Community Turnover in Yosemite National Park Following 30 Years of Climate Warming* [Conference session]. Northern California Botanists Symposium, Chico, CA.

McColl, E., Sherman, B., Wallasch, B., Windsor, M. (2023, September 22). *Alpine Plant Community Shifts in Yosemite*. [Presentation]. Frost Summer Undergraduate Research Program Symposium. San Luis Obispo, CA.

Grossenbacher, D.L., Friesen, R.E., & Wallash, B. (2023, July 20). *Climate Change and Alpine Plant Community Turnover in the Sierra Nevada* [Presentation]. GLORIA Great Basin, White Mountain Research Center, CA.

Friesen, R.E. and Grossenbacher, D.L. (2023, May 19). *Climate Change and Alpine Plant Community Turnover in the Sierra Nevada* [Conference session]. CSM Student Research Conference, San Luis Obispo, CA.

Friesen, R.E., Ross, O., Sibul, R., Wallasch, B. (2023, February 2). *Alpine Plants in Yosemite* [Presentation at Chapter Meeting]. California Native Plant Society, SLO Chapter, San Luis Obispo, CA.

### *Press*

Wallasch, B. and Friesen, R. (2024, January) From Crooked Creek to Yosemite: New Vegetation Monitoring Transects Established on Mt. Dana. *White Mountain Research Center Newsletter*. <https://www.wmrc.edu/blog/>

Wallasch, B. (2023, October) Student Adventures Studying Alpine Plants in Yosemite. *Obispoensis*. <https://cnpsslo.org/wp-content/uploads/2023/09/1023-obispoensis-newsletter-california-native-plant-society-slo-v1.pdf>

McCarthy, G. (2023, September 20) Scientists study climate change's effect on Mount Dana plant species. *The Union Democrat*. [https://www.uniondemocrat.com/news/article\\_59af8a24-5814-11ee-9823-bbb122a2ae20.html](https://www.uniondemocrat.com/news/article_59af8a24-5814-11ee-9823-bbb122a2ae20.html)

McColl, E., Sherman, B., Wallasch, B., Windsor, M. (2023, September 7) Social Media Post. *Yosemite National Park*. <https://m.facebook.com/YosemiteNPS/posts/6619176318130594>

## Appendix B: Photos



Figure 1. An abundance of alpine wildflowers bloomed in 2023 after the snow from the record-breaking winter melted. *Photo credit: Brooke Wallasch*



Figure 2. Maddie Windsor examines a plant using a hand lens while Rachel Friesen records species abundance data in the 1m x 1m quadrat. *Photo credit: Ben Sherman*



Figure 3. Dr. Grossenbacher measures alpine plant species frequency along a transect on Mount Dana while Eda McColl records data. *Photo credit: Brooke Wallasch*



Figure 4. Maddie Windsor troubleshoots using a high-accuracy GPS unit on Mount Dana. *Photo credit: Brooke Wallasch*



Figure 5. (Left) A field biologist in the early 1990s sets up an NRI plot. (Right) Eda McColl resurveys the same plot 30 years later. Note the growth and expansion of whitebark pines in the background. *Photo credit: Ben Sherman*



Figure 6. Brooke Wallasch measure alpine plant leaf thickness for her senior project. *Photo credit: Ben Sherman*





Figure 7. Ben Sherman helps collect a sedge specimen during an NRI plot resurvey.  
*Photo credit: Brooke Wallasch*

## Appendix C: Undergraduate Testimonials

Going into the season as a field research assistant in Yosemite, I expected to learn a lot of plants and have a fantastic summer, but I could not have anticipated how much I would learn about working on a field crew and what it takes to run one of the United States' best national parks. This experience was an eye-opening deep dive into Sierra ecology and geography as well as fascinating exposure to the passionate teams and professionals who work in the park. Having the privilege to work in this awe-inspiring setting and interact with field crews, park rangers, supervisors, and more has profoundly shaped my career aspirations. I now have more drive than ever to better myself as a professional and scientist so that I can hopefully find my way back to working in Yosemite soon. I cherish this experience immensely and hope that opportunities like the one I had will remain accessible to other students and aspiring professionals.

- Ben Sherman

Working in Yosemite's backcountry this last summer was truly a profound experience. Living in and learning about the alpine in such an immersive, stunning and exciting setting was a gift that I will never stop feeling grateful for. I feel as though I learned more about alpine plants, my goals for the future, and myself in our two months in the field than I could have in six months in a classroom setting. Spending the summer with our field crew allowed me to become fully immersed in the natural scenery of the park, as well as the scientific community that is lucky enough to work and study there. We had opportunities to network with Park staff and to learn about incredible research being conducted in Yosemite, and these conversations opened my eyes to all of the exciting ways to work in the outdoors as an environmental steward and scientist. I couldn't have asked for a better field crew or first experience working in the Sierras.

- Maddie Windsor

I am incredibly grateful that I was able to work as a field technician alongside Rachel Friesen this field season. Not only was it a treat to spend 8 weeks in one of the most beautiful places on Earth, but it gave me a more in depth understanding of both the countless examples of flora in the park and how to identify the smallest details to designate them from one another. Additionally, it gave me more of an understanding as to what an individual working in field research does in botany, what park ranger work entails, and the steps needed to enlist in either of these positions. On top of the experience and knowledge that will doubtless be incredibly valuable to my future in this field, becoming familiar with the plants of Yosemite inspired me to pick up several new hobbies like edible herb and mushroom foraging which was introduced to me on this internship and has quickly become one of my favorite pastimes!

- Eda McColl

I had the opportunity to work on Rachel Friesen's field crew during the 2022 field season and I had such a great time that I chose to return for the 2023 field season! Working in the Yosemite alpine for a second season allowed me to become increasingly familiar with the plant species and the logistical interworkings of a backcountry field crew. I really enjoyed the process of establishing the downslope belt transects on Mt. Dana this season and seeing first-hand how the community composition changes as you move up an elevation gradient from treeline to alpine regions. It was truly an honor to be part of the establishment of these new plots with the knowledge that they will likely be used to inform conservation efforts to protect the incredible alpine diversity of Yosemite that I had the privilege of surveying for the past two summers. In addition to resurveying NRI plots and setting up the new transects on Mt. Dana, I also had the opportunity to collect my own dataset looking at functional traits of alpine plants thanks to the Frost Fund and the flexibility of Rachel Friesen and Dr. Grossenbacher. Working on this crew has allowed me to explore the world of ecological field work and has provided me with a wealth of resources, skills, connections and an immersive research experience against the beautiful backdrop of Yosemite National Park. I will truly cherish these lessons and experiences as I continue along my academic and professional career.

- Brooke Wallasch