

2020-2024

Oregon Glaciers Institute Impact Report

*Four years of glacier research and
education in Oregon's mountains*



Oregon Glaciers Institute

A brief history...

- A 501-c-3 founded in May 2020 with the following overarching goals:
 - Monitor glacier change and health in Oregon's mountains
 - Relate such data to on-going climate change to project glacier viability
 - Educate the public and policy makers about these changes in Oregon's water resources and impacts to ecosystems and economies



OGI's Volunteers

growing group of willing folk

- OGI is an all volunteer organization that consists of a core group of volunteers that provide their time on a monthly to daily basis to OGI's core mission
- Dr. Anders Carlson is the president and founder of OGI
- Megan Thayne directs education and digital programs, bringing her expertise in geospatial analysis and data archiving
- Nicolas Bakken-French leads the fieldwork for OGI, bringing his expertise as a backcountry mountain and ski guide and ski patroller
- Ethan Shaw tracks the changes in snowfields and remnants of glaciers in the Wallowa Mountains in northeast Oregon
- Daisy Boyes-Hunter brings her skills in remote sensing to OGI, leading summer snow line mapping
- Sam Pappas spearheads remote sensing of glacier dimensional change, focusing on the Three Sisters region



Research

We've accomplished a lot...

- We finished the first complete, field based census of Oregon's glaciers, determining that the state had at least 60 individual flowing ice bodies in as recent as the 1970s of which now only 27 remain flowing and many are completely gone
- We have set up an annual glacier health monitoring program where we measure end-of-summer snow coverage on a suite of representative Cascade glaciers using remote sensing and field data
- We are placing recent glacier changes in context of their historic record, finding unprecedented glacier recession in the last few decades
- We've teamed up with physicists at the University of Oregon to develop new parameters for detecting the reflectivity of ice and snow from satellites, with this work being published in the international journal *Journal of Glaciology*
- We've also developed an on-going collaboration with geochronologists at Imperial University London to reconstruct the prehistory of Oregon's glaciers back to the ice ages



Coe Glacier, Mt. Hood retreat from 2003 (above left) to 2023 (above right), disappeared unnamed glacier, North Sister (below left), and measuring laser penetration on Crook Glacier, Broken Top (below right)



Journal of Glaciology



Direct measurement of optical properties of glacier ice using a photon-counting diffuse LiDAR

HIGHLIGHT

Mt. Hood's Glaciers

Unprecedented retreat

- We used photographs taken in 2003 by Portland mountaineer Steve Boyer to document 20 years of 21st century Mt. Hood glacier retreat
- Mt. Hood's 12 glaciers lost 17% of their area since 2016 and 39% of their area since 1981
- Two glaciers have ceased to flow with another three nearing this status
- 21st century glacier retreat rates are 3.5 times faster than the 20th century average
- Glaciers are currently losing >2% of their area each year
- This unprecedented retreat is in response to regional climate warming where summer temperatures are now 1.7-1.8°C (3.1-3.2°F) warmer than the early 1900s
- This research was published in the international journal *The Cryosphere*

The Cryosphere, 18, 4517–4530, 2024

<https://doi.org/10.5194/tc-18-4517-2024>

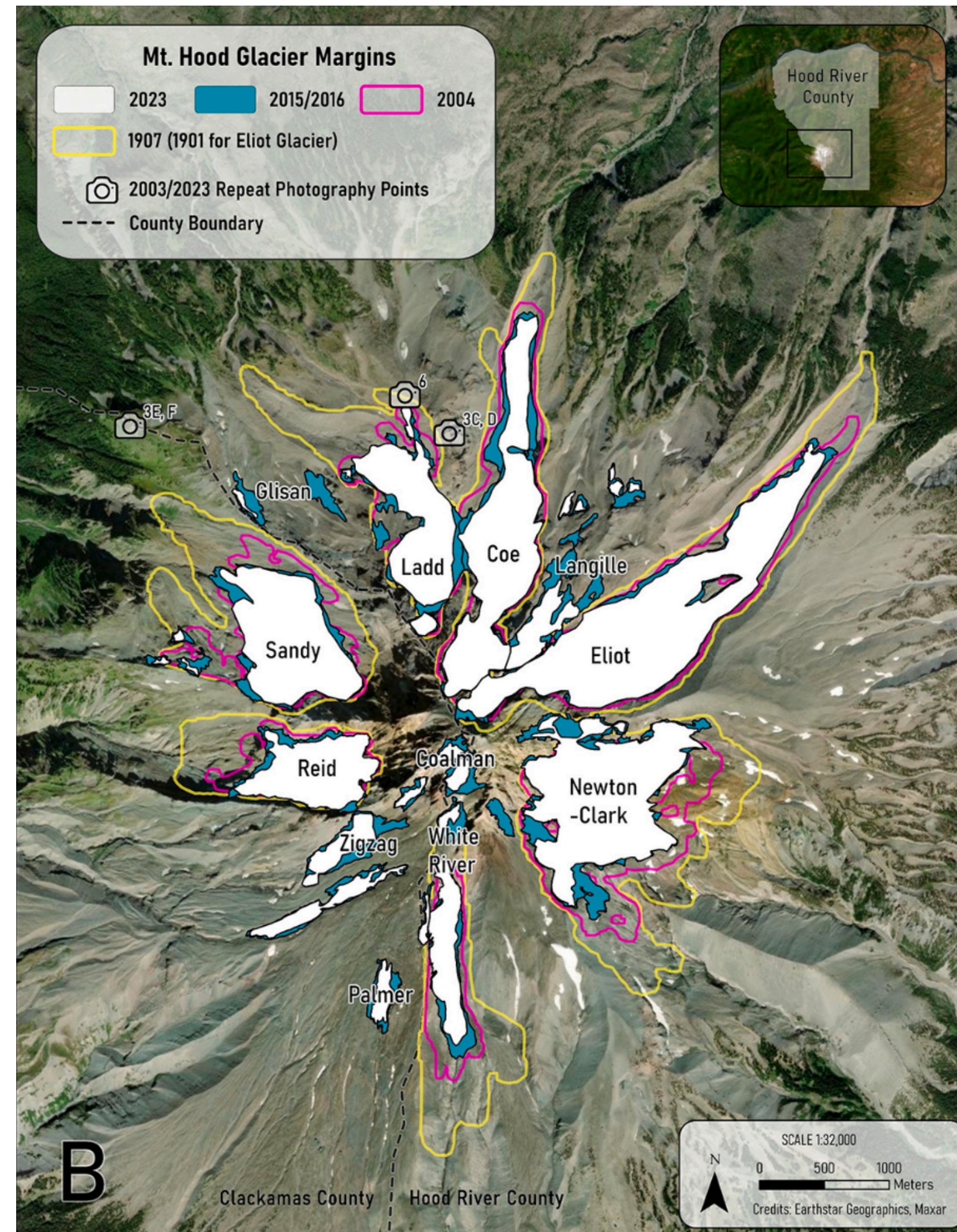
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Unprecedented 21st century glacier loss on Mt. Hood, Oregon, USA

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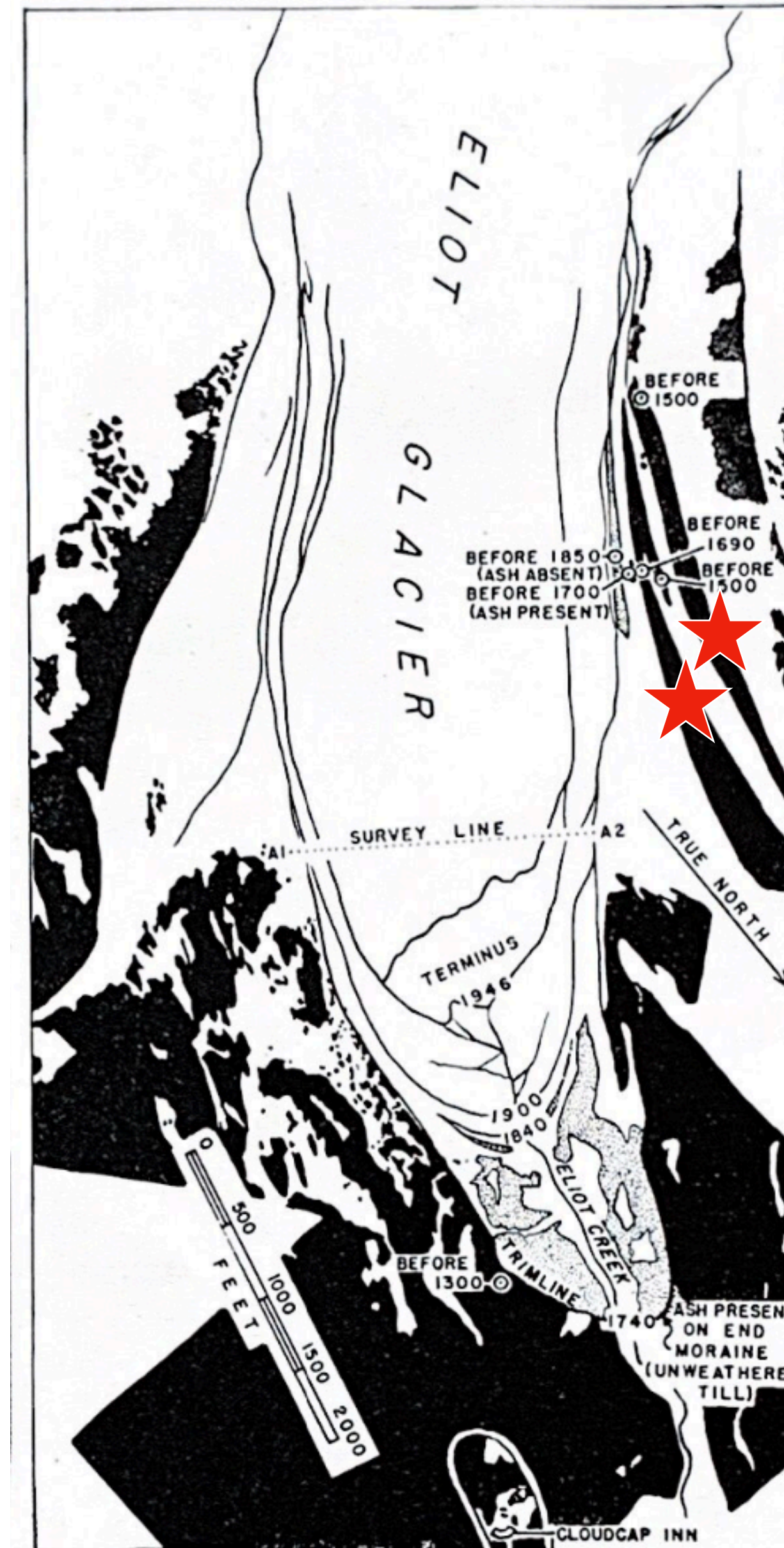


HIGHLIGHT

Eliot Glacier

Has been around a long time

- The oldest photo of Eliot Glacier on Mt. Hood dates to 1901 C.E. (Common Era) and places it at its maximum extent
- Volcanic ashes have the ice at a similar extent in 1700
- But there are two moraines outside this (red stars) that tree rings showed to be older than 1690 C.E. and 1500 C.E. (work conducted by the Mazamas in 1940s)
- We determined their direct age with colleagues at Imperial College London using cosmogenic isotopic surface exposure dating methods (in this case Helium 3) that were measured at CalTech by noble gas mass spectrometry
- The inner moraine dates to 3,000 years ago while the outer moraine dates to 5,400 years ago
- Using a series of climate forcings, we are able to show that the current glacier retreat on Mt. Hood is likely unprecedented in over 6,000 years!
- We are expanding this work to other glaciers on other volcanos throughout the Cascades (e.g., Jefferson, Middle Sister, Three Fingered Jack)



Education

experiential to traditional

- Our educational goal is to take climate change, an etherial fact, and relate it to visual place using Oregon's glacier
- We have hosted 7 interns in the last 4 years, coming from Portland State University, Oregon State University, Western Washington University, the University of Michigan, and Mt. Hood Community College
- We've taken numerous college students and groups of middle school to high school students out onto glaciers for their first experience of flowing ice and glacier fieldwork
- We've presented our method of experiential learning by tying climate change to place to National Geographic
- We have developed a grade school half hour educational product, both in-person and on-line, that explains what glaciers are, how one works on glaciers, and why one would do this



Public Engagement direct and via the media

- In the last 4 years, more than 40 news stories have covered OGI's work across a diverse media field from the Roseburg News-Review to the New York Times and the Guardian, from the Willamette Week to Backcountry Magazine, from Portland's KGW News to the U.S. government's Middle East Broadcasting Network in Arabic
- We raised awareness about glacier loss with a globally reported funeral for Clark Glacier on the steps of the Oregon Capital building in Salem that is now being featured in an upcoming documentary
- We have worked with the Senators Merkley (OR) and Whitehouse (RI) and Representative Wyden (OR) to increase federal funding for monitoring cryosphere change the western U.S.
- And we've made more than 25 presentations to community groups from nordic clubs, to libraries, retirement communities to Oregon's state environmental departments, national ski area association to mountaineering clubs, historic mountain lodges to rotary clubs

The
New York
Times

WILLAMETTE WEEK
WW





OREGON GLACIERS INSTITUTE

We are developing smartphone apps that will allow citizen scientists to take repeat glacier photographs that upload in real time to a community database

We are maintaining our glacier monitoring program and will be adding new reference glaciers on Mt. Jefferson to those on Mt. Hood and in the Three Sisters

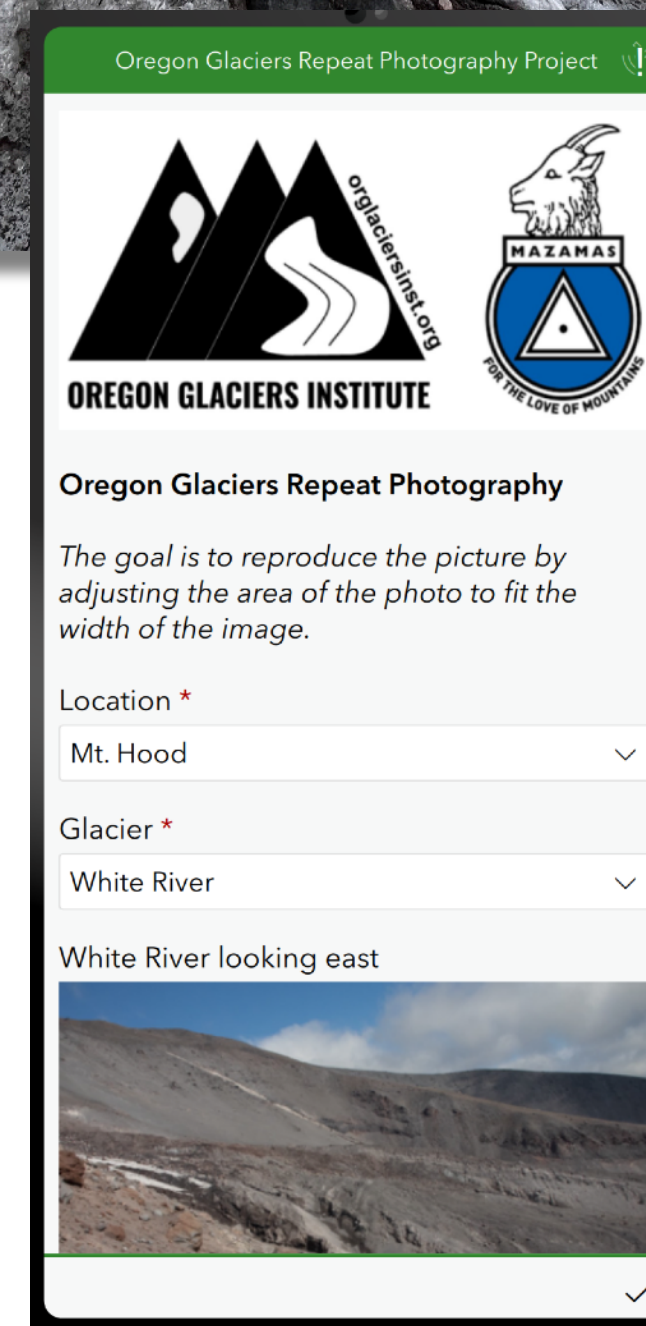
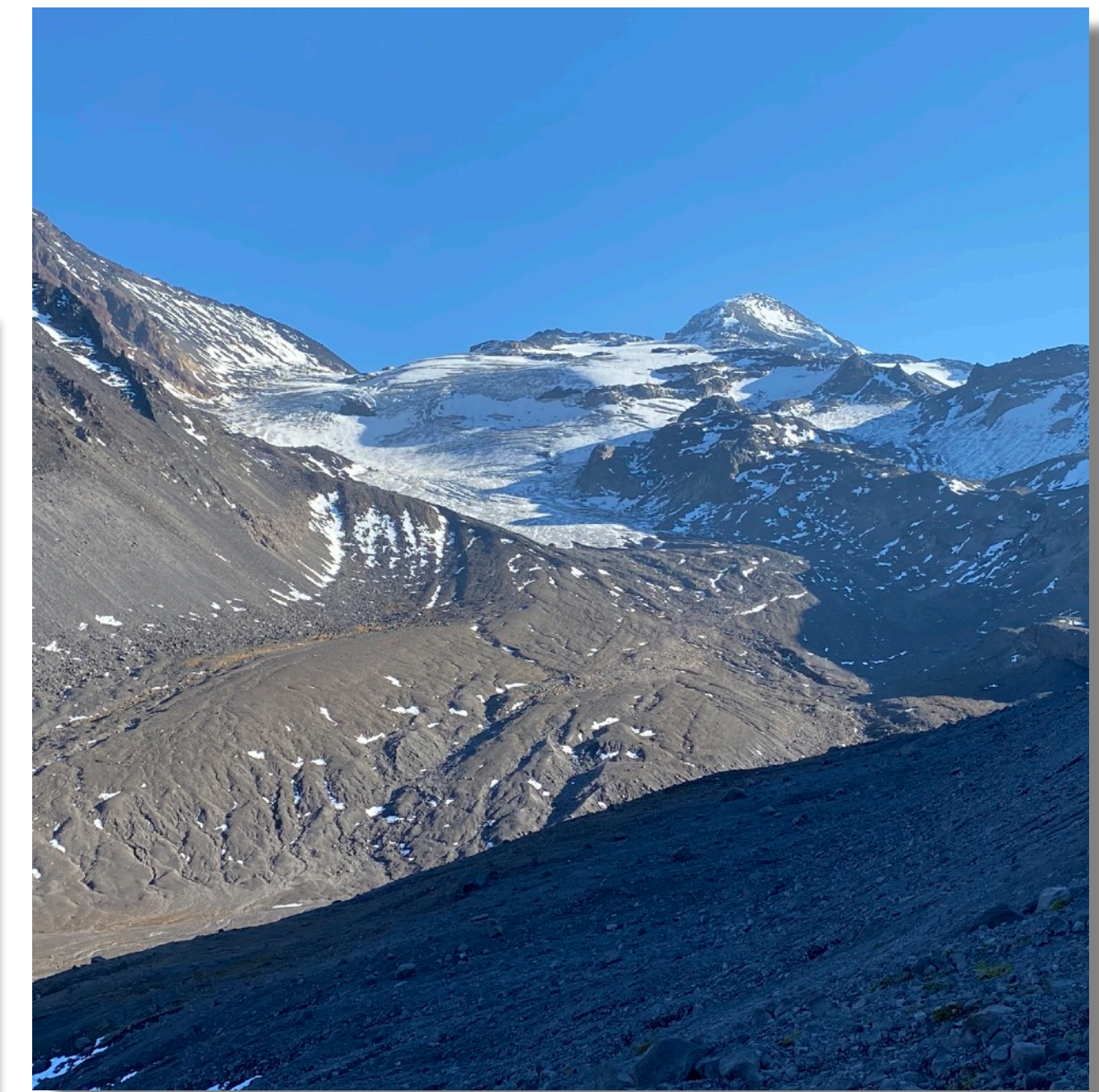
The next 4 years

The urgency of now only grows

And we need your support!

We will continue to build the paleo-history of Oregon's glaciers to construct a complete glacier-climate relationship to accurately project their future

We are creating an online digital educational platform for middle school to high school levels that will educate on climate change impacts on mountains and build skills in geospatial analysis





And we are just getting starting...

**Your financial support is vital to our mission: orglacersinst.org
and click on the donate now button**

