



Bioweathering in the Forefield of a Receding Glacier: Insights from Storglaciären, Tarfala Sweden



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Scientific Questions

- How does rock weathering in a post glacial environment support soil and plant development?
- How does the soil composition change chronologically to the receded glacier?
- How are willows uptaking nutrients from the soil? Which nutrients are they uptaking?
- Do willows (*Salix* spp.) remove harmful metals in Arctic ecosystems?

Station Background

- Tarfala Research Station (TRS) is an alpine and glacial research station in Arctic Sweden established in 1948.
- Originally established to study long-term mass balance of Storglaciären in 1946.
- TRS measures both snow accumulation and snow and ice melt on the glaciers every year.
- Glaciers in the area have significantly receded since the station has founded.
- TRS also monitors the hydrology, meteorology, and permafrost in the area along with the receding south peak of Mount Kebnekaise.



Figure 1. Tarfala Research Station (TRS).

Figure 2. Storglaciären.

Acknowledgments

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Approach

- Researchers surveyed TRS glacial alpine vegetation by glacier years starting from Pre 1910-1980s
- Biological genus of *Salix* (willows) were collected varying from groundcover to shrubs
- Samples had a ratio of 1:2; for every 1 foliage, 2 sediment samples were taken
- Samples Taken: foliage, rhizosphere for microbio, and rhizosphere for chemical content
- A total of 14 sites were identified, samples collected from most (some sites had very little vegetation).



Figure 3. Site location of foliage and soil samples mapped along Storaglaciären moraine.

Biogeochemical Background

Geologic Background of Tarfala Valley:

- Features: Glacial moraines, streams, rivers, and three glaciers (Tarfalaglaciären, Storglaciären, Rabots glaciär).

Importance of Studying Soil Development in Recently Glaciated Landscapes:

- Changes in soil composition and chemical weathering processes as the glacier recedes impact nutrient availability.
- Bioweathering, a natural process that occurs by plants and microorganisms, breaks down rocks mechanically and chemically to facilitate nutrient cycling

Salix Types



Figure 4. *Salix glauca*.



Figure 5. *Salix glauca* at Site 4.



Figure 6. *Salix polaris*.



Figure 7. Tarfala Research Station (TRS).

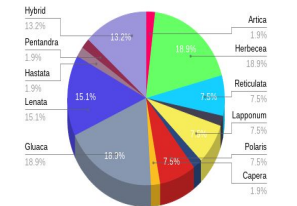


Figure 8. Distribution of *Salix* along the TRS Glacial Alpine recorded in transects across the chronosequence.

Future Work

- Soil and foliage samples will be assessed for nutrient, metal and trace metals in UNH and Jackson State University labs.
- Microbial community compositions will be assessed on soil samples
- A second transect, or gridded sample network, will be carried out along the documented years of glacial retreat
- Study the development of more accurate paleoclimate models and the improvement of environmental monitoring strategies in high-latitude regions

References

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