Grunnafjordur Unified Action for Restoration and Development (GUARD)

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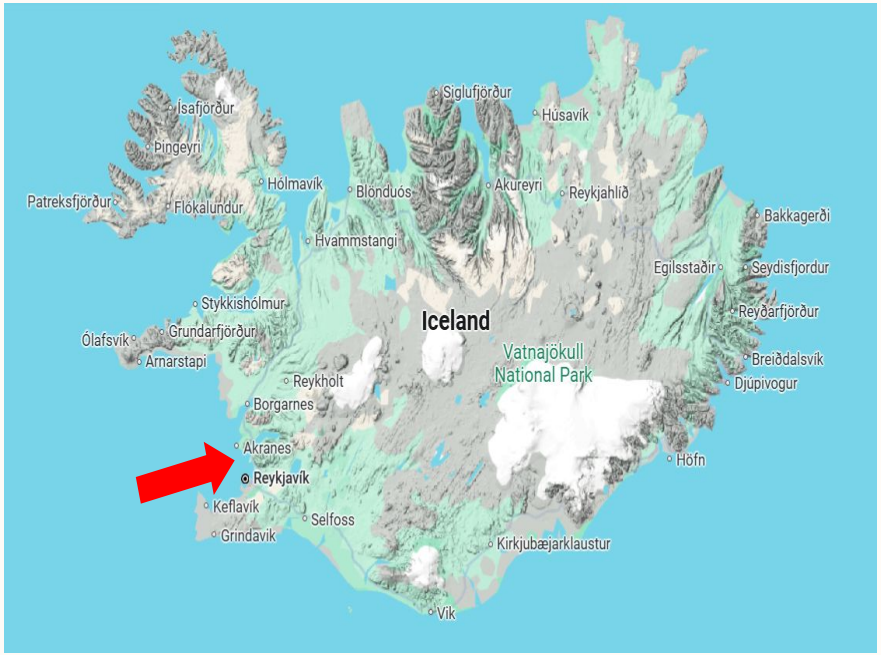


Location of Watershed

- Located in western Iceland
- Close to the Capital of Iceland Reykjavik
- Grundarfjordur city different than the watershed

Delineation

Geography

Farmlands

Mountains

Wetlands

Laxá River

Lakes

Policies Affecting Icelandic Waterways

Main Legal Body: Icelandic Environment and Energy Agency. Responsible on implementing the Water Management Act.

- Many different act numbers with different focuses
- No. 36 (2011): protection and rules on water authority, environmental goals, and drinking water standards.

Icelandic River Basin Management Plan (2022-2027): emphasis on protection and monitoring of water quality and species, not so much restoration

Recreation

- Recognized as an essential location for migratory birds.
- Birds enthusiasts come to see the diversity.
- Scientists come to track bird populations.

- 20 kilometers long
- 2,000 salmon per fishing season in the Laxa River.
- Joyville recreation activities like kayaking, fishing and hiking.

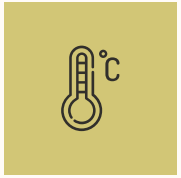
Mission Statement

GUARD’s mission is to assess the effects of anthropogenic activity on the watershed and develop appropriate remedial efforts to alleviate any concerns. The primary focus of this plan will be to reinvigorate deteriorated wetlands and minimize the impacts of glacial outburst floods to maximise ecological function by 2035.

Problems affecting watershed

Declining Water storage

Drainage practices have been implemented to increase land for agriculture.



Glacier Melts

Glacier melts and floods alter stream flows and channels.

Greenhouse Gas Emissions

Increased greenhouse gas emissions due to reduction of wetlands.

Declining Water Storage

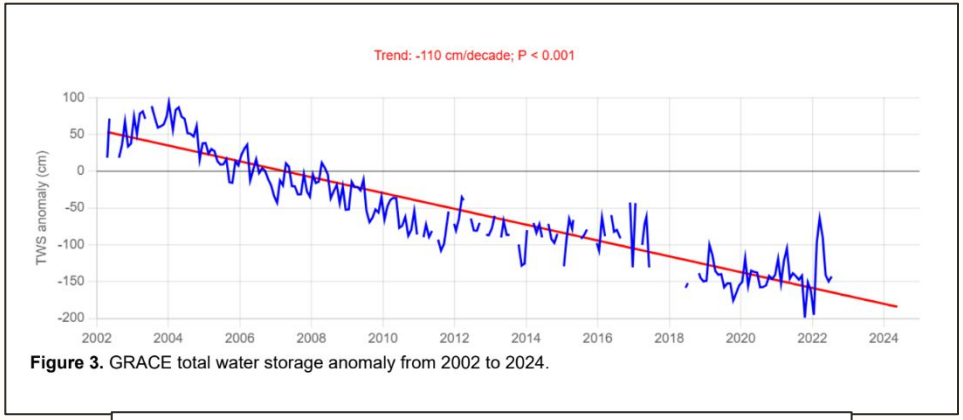
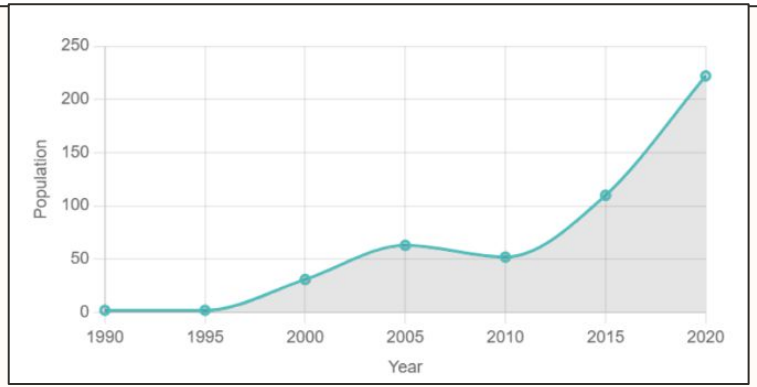


Figure 3. GRACE total water storage anomaly from 2002 to 2024.

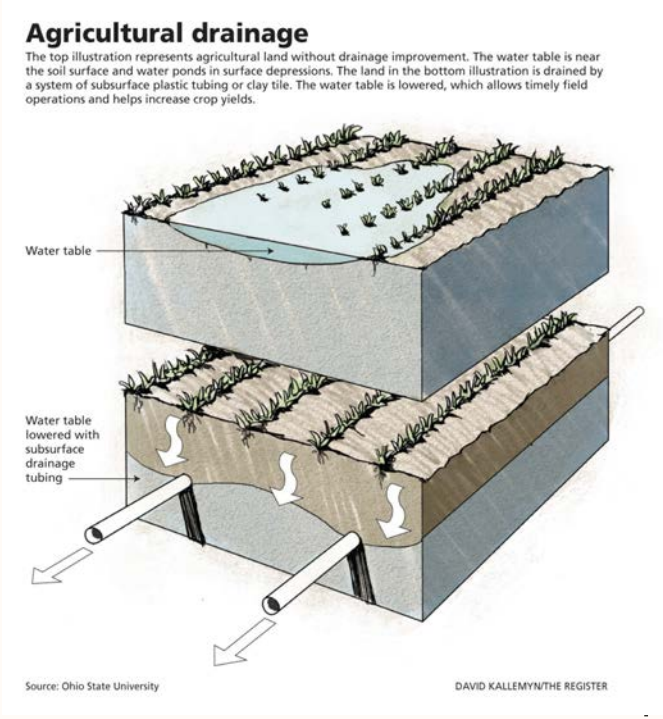


- Recent flux of farmers in the watershed have been practicing ways to reduce water in the wetlands to plant more crops.
    - Draining the soil so roots can grow deeper.
- With the declining precipaparion in the watershed, this has damaged the water storage in the area.

Declining Water Storage

Method of Draining

- Tile and pipe draining
  - Excavating soil and implementing a series of pipes to funnel water out.



"About 47 % of Icelandic inland wetlands are impacted by drainage. The ditch network extends about 30,000 km, mainly in lowland areas, where about 70 % of the wetland areas are impacted." (Arnalds, 2016)

Glacial Melts and Floods

Langjokull glacier is the primary source of glacier melts and floods affecting Grunnafjordur.

Impacts

- Alter stream flow and channels causing hydrodynamic changes
- Erosion of floodplains affecting their functionality
- Increased sedimentation during flood events increase surface runoff contamination

Causes:

- Driven by volcanic activity
- Global warming

Greenhouse Gas Emissions

- Drained wetlands do not have the same ecological functions as healthy wetlands.
- When a wetland is drained it no longer acts as a sink for carbon dioxide, and instead releases carbon dioxide CO_2.
- In warmer conditions, existing healthy wetlands release more methane, another substantial greenhouse gas
    - Warmer temperatures allow for greater microbial activity (methanogenesis), and thaw frozen soils creating more area for microbes.

Our Goals

Goal #1

Restore 4 km^2 of unused land classified as dense and short vegetation by 2035.

Goal #2

Establish levees around river banks bordering infrastructure and critical ecosystems as well as drainage tunnels to divert high glacial flows.

Goal #3

Restore 8 km^2 of previously dried abandoned wetlands by 2035.

Goal #1: Restore 4 km ^{2} of unused land classified as dense and short vegetation by 2035.

- According to the Watershed Data Report of Grunnafjordur, 116 km^2 of land is dense, short vegetation.
- A primary function of wetlands is water storage
- Dense and short vegetation isn't great for infiltration
- 4 km^2 doesn't seem like a lot of land
    - Land and Forest Iceland predicts around 10 km^2 of land will be already restored by 2025.
- Apply for grants through Land and Forest Iceland

Goal #2: Establish levees around river banks bordering infrastructure and critical ecosystems as well as drainage tunnels to divert high glacial flows.

- GUARD aims to better manage seasonal floods affecting local communities, habitats, and water quality.
- In many areas where jökulhlaups are common, levees are often established alongside river banks to prevent damage to local communities and sensitive ecosystems.
- Grunnafjordur sustains urban communities in the upper region of the watershed, making this preventive measure all the more necessary.
- Alternatively, more expensive drainage tunnels can be installed where glacial outburst floods occur to redirect floodwater and reduce the potential risk of infrastructural or ecological harm.

Goal #3: Restore 8 km^2 previously dried abandoned wetlands.

- 90% of wetlands have been drained for agricultural purposes, overgrazed, and abandoned.
- These abandoned sites contribute to 70% of carbon emissions.
- GUARD's goal is to restore 8 km^2 of these abandoned wetlands by reintroducing native plant species, and water sources.
- Once these areas have been restored they can once again function ecologically as a wetland and be a carbon sink for the environment.

Thank you, any questions?

Resources

https://www.swissinfo.ch/eng/business/floods-from-melting-glaciers-can-they-be-predicted-and-prevented/48431056

https://ust.is/english/visiting-iceland/protected-areas/west/grunnafjordur/

https://www.antarcticglaciers.org/glacier-processes/glacial-lakes/jokulhlaups/

https://www.endangeredlandscapes.org/project/grunnafjordur-watershed/

https://www.usgs.gov/news/featured-story/climate-warming-likely-cause-large-increases-wetland-methane-emissions#:~:text=Draining%20wetlands%20might%20seem%20like,carbon%20dioxide%20from%20the%20atmosphere.

https://link.springer.com/article/10.1007/s13157-016-0784-1

https://networknature.eu/casestudy/28615

https://island.is/en/o/land-and-forest-iceland

https://island.is/en/news/wetland-restoration-discussed

https://www.fao.org/faolex/results/details/en/c/LEX-FAOC200077/