

# Spirit Lake Great Lakes Legacy Act Project

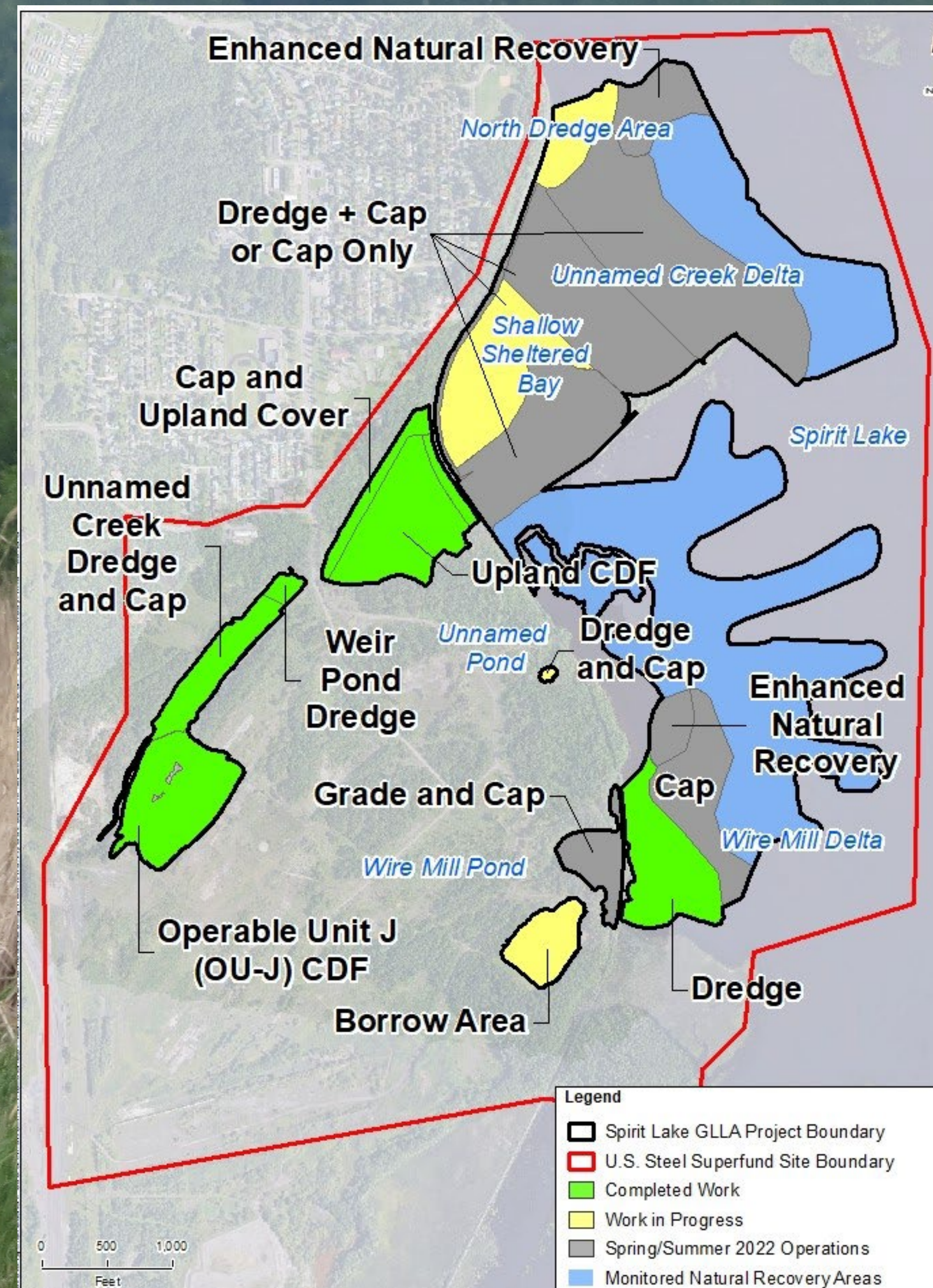
a partnership to restore community and environmental health

## About the Spirit Lake Site

An environmental cleanup began in Spirit Lake, near Morgan Park in late 2020. Decades ago, impacts from various sources settled into the lake bottom sediment. The U. S. Environmental Protection Agency and U. S. Steel have formed a cleanup partnership, consulting with Minnesota Pollution Control Agency, City of Duluth, Fond du Lac Band, Morgan Park Community Club, and other state and local agencies. The cleanup includes dredging, capping, and monitoring impacted sediment to restore the Saint Louis River.



*Spirit Lake and Spirit Island*



## The Spirit Lake Community

- The cleanup will remove and contain impacts that benefit the local community, aquatic life, and ecological system.
- The project will restore both in-water and shore habitat, including the creation of a protective Shallow Sheltered Bay for fish, birds, frogs, plants, and more.
- The former steel site and the water around it will temporarily be a construction zone.
- EPA has resolved the project's adverse effects on the local railroad and Spirit Island in compliance with Section 106 of the National Historic Preservation Act.



*Former steel works facility*



*Unnamed Creek Restoration*



*Wire Mill Delta Dredging*



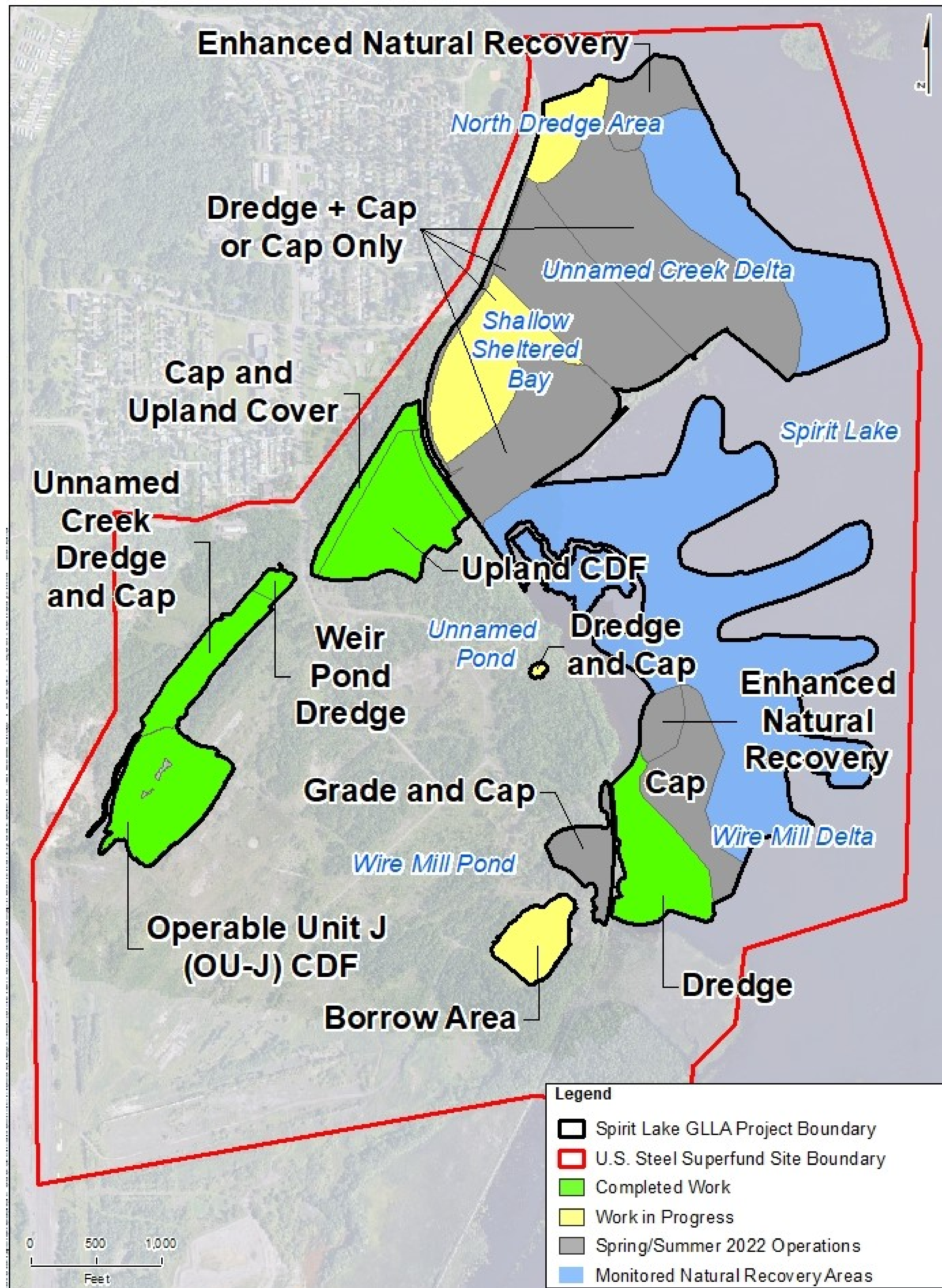
*Shallow Sheltered Bay Creation*



Spirit Lake Great Lakes Legacy Act Project Questions? Contact Francisco Arcaute at: [Arcaute.Francisco@epa.gov](mailto:Arcaute.Francisco@epa.gov)

More information can also be found at: [www.epa.gov/great-lakes-aocs/spirit-lake-great-lakes-legacy-act-cleanup](http://www.epa.gov/great-lakes-aocs/spirit-lake-great-lakes-legacy-act-cleanup) [www.greatlakesmud.org](http://www.greatlakesmud.org)



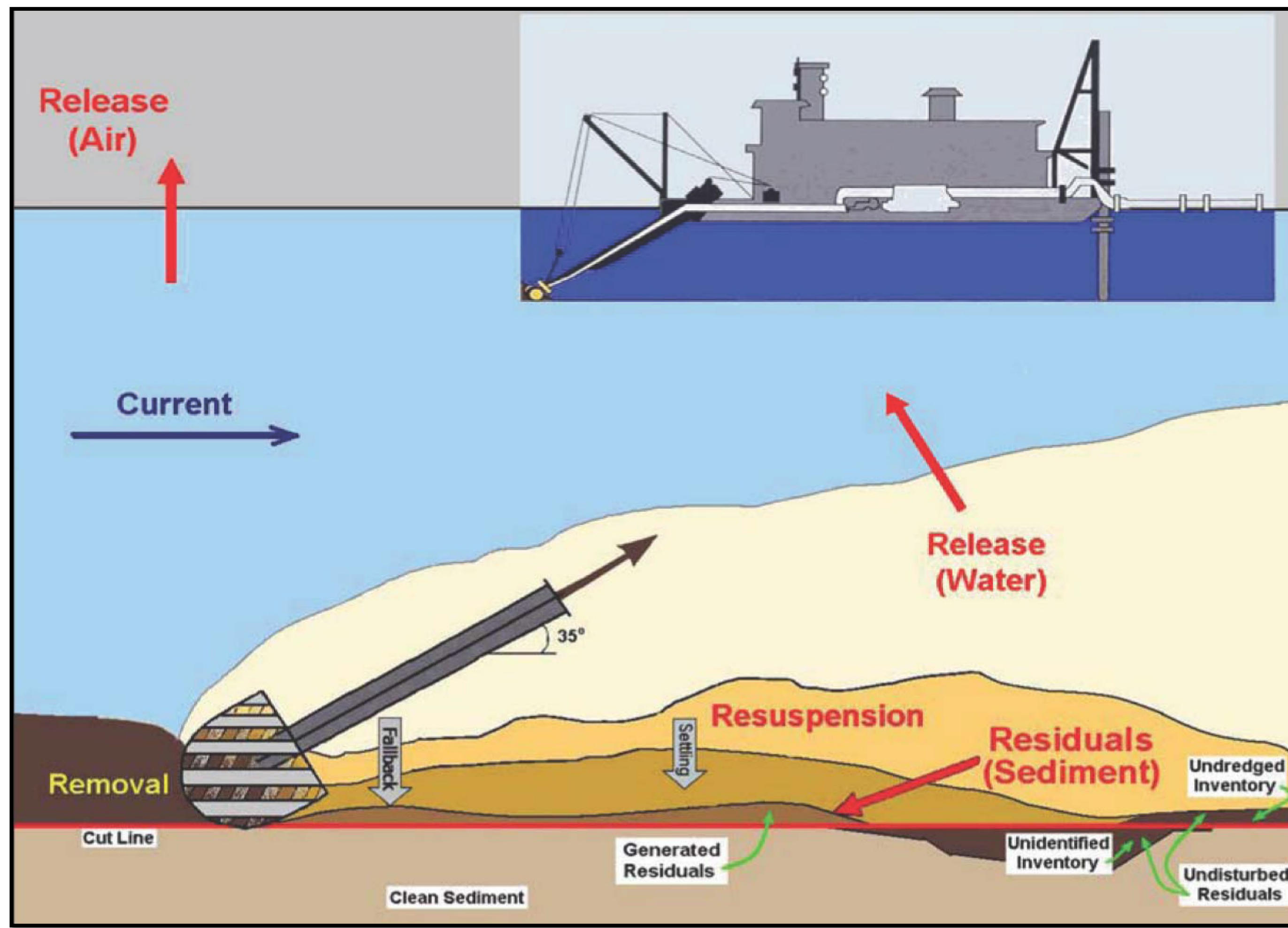


## Project Features

- Environmental Dredging—removal of 425,000 cubic yards of material.
- Underwater Environmental Capping—86 acres (estuary).
- Upstream Capping and Restoration—9 acres (Unnamed Creek and floodplain).
- Natural Recovery Areas—127 acres.
- Confined Disposal Facilities—2 CDFs, located above the ordinary high-water level.
- Rehabilitation and/or enhancement of 138 acres of aquatic habitat.
- 14 acres of new open water created as part of a 42-acre Shallow Sheltered Bay habitat.
- New protected spawning area and deep water habitat for fish refuge.



## Hydraulic Dredging



*Environmental hydraulic dredging process with key considerations.*

### How hydraulic dredging works:

- Hydraulic dredging utilizes suction to remove sediments and pressurized pipes to transfer material
- Removal is performed with a vessel-mounted suction pipe.
  - When sediments are dense or cohesive, a rotating cutterhead is attached to the end of the suction pipe to loosen the sediment.
  - As material is cut from the sediment surface it mixes with water and pulled into the dredge pipe.
  - Booster pumps on barges or at pump stations help maintain pressure in the pipe so the slurry is carried to the placement site.
  - Requires mobilization and maintenance of temporary infrastructure including installation of floating or submerged dredge pipe.
- Hydraulic dredging produces a greater volume of material placed due to the addition of water but can accelerate workflow by reducing the need for material transfers and rehandling.

### What does hydraulic dredging look like?



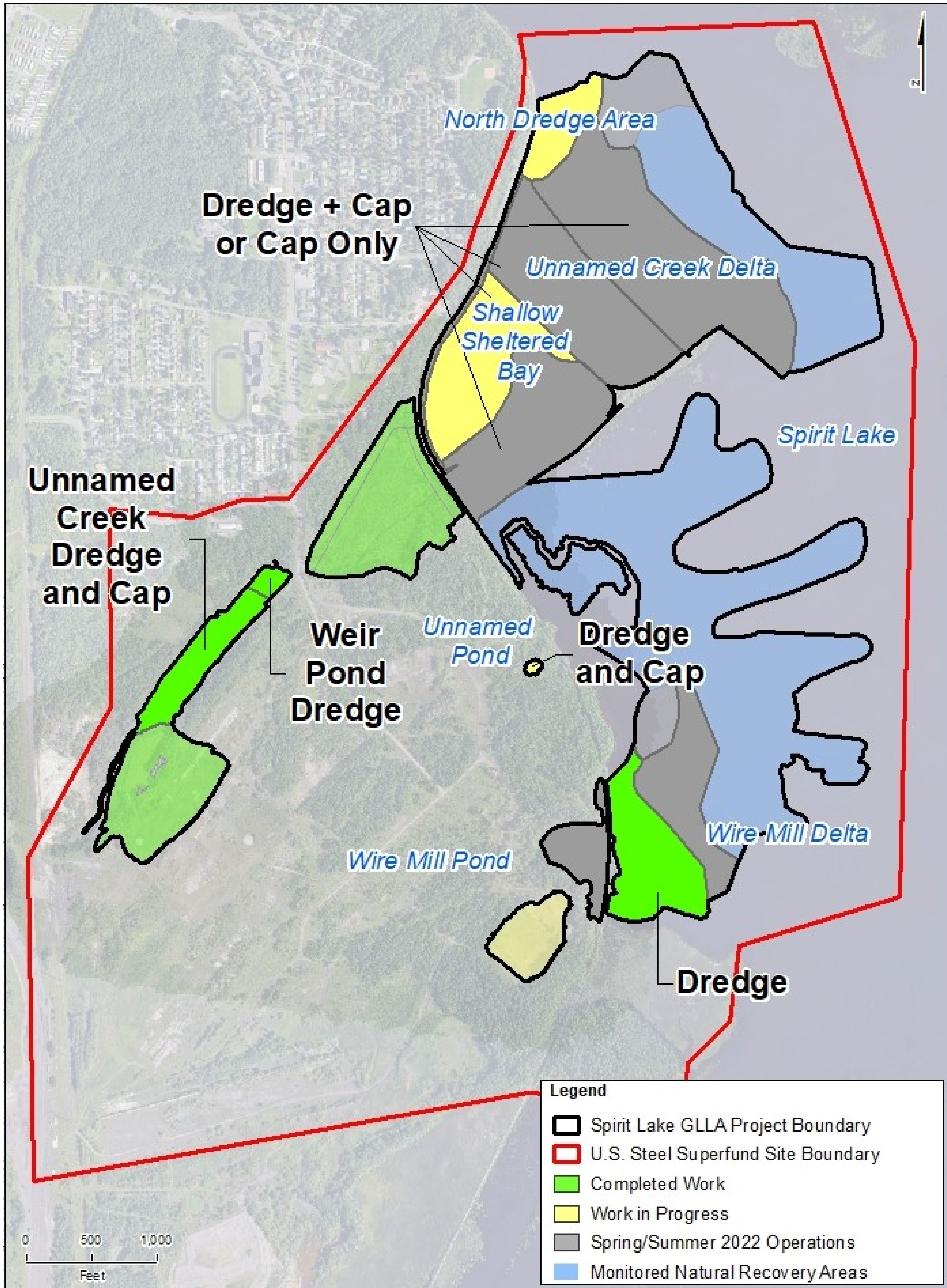
*Hydraulic dredge at Spirit Lake.*



*Source: Ellicott Dredges - <https://www.dredge.com>*

*Cutterhead attached to dredge pipe.*





## Dredging Areas

- The project uses a combination of mechanical and hydraulic dredging to remove impacted sediment.
- Mechanical methods have been used in upland/upstream areas.
- Hydraulic methods are used in Spirit Lake.



Dredging is conducted with a mechanical dredge in the Shallow Sheltered Bay.



Dredging is conducted with a hydraulic cutterhead dredge in the Wire Mill Delta.

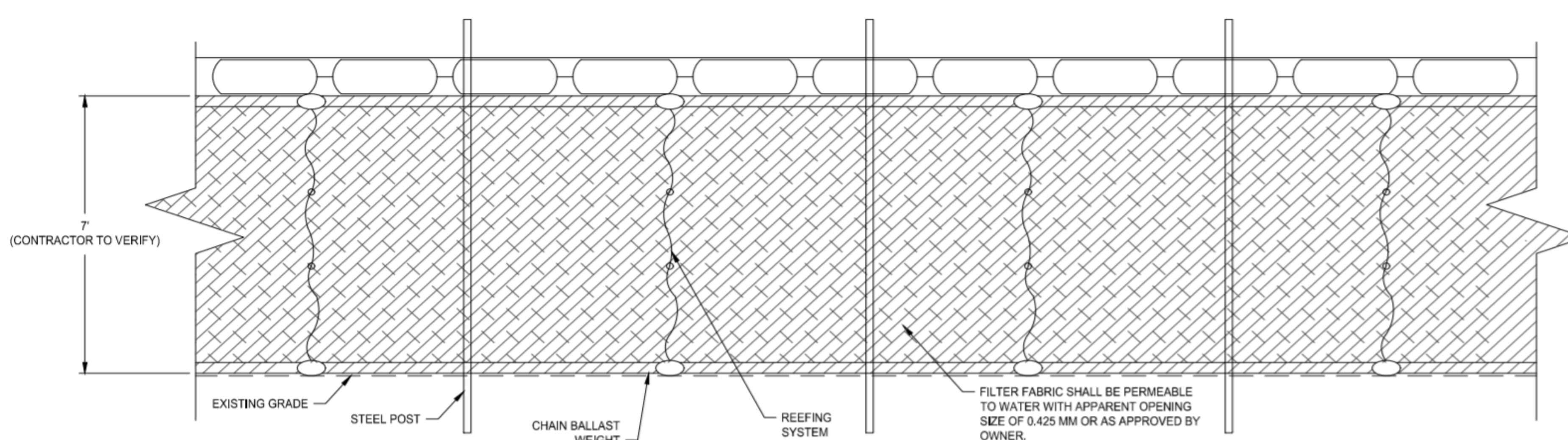
## Environmental Controls and Monitoring



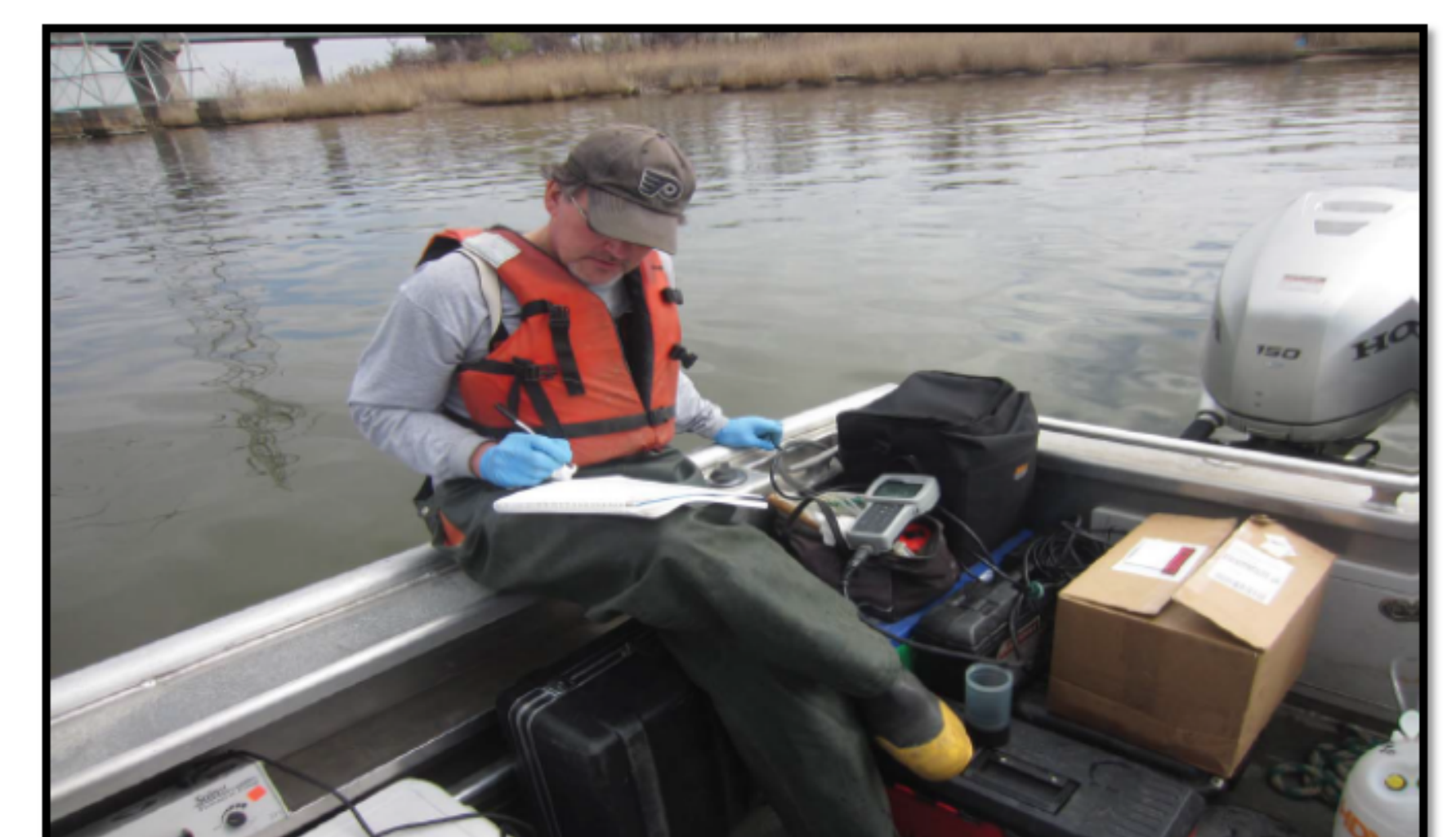
Conceptual example of a typical silt curtain.



Turbidity curtains deployed during hydraulic dredging in Wire Mill Delta.



Conceptual example of a silt curtain drawing.

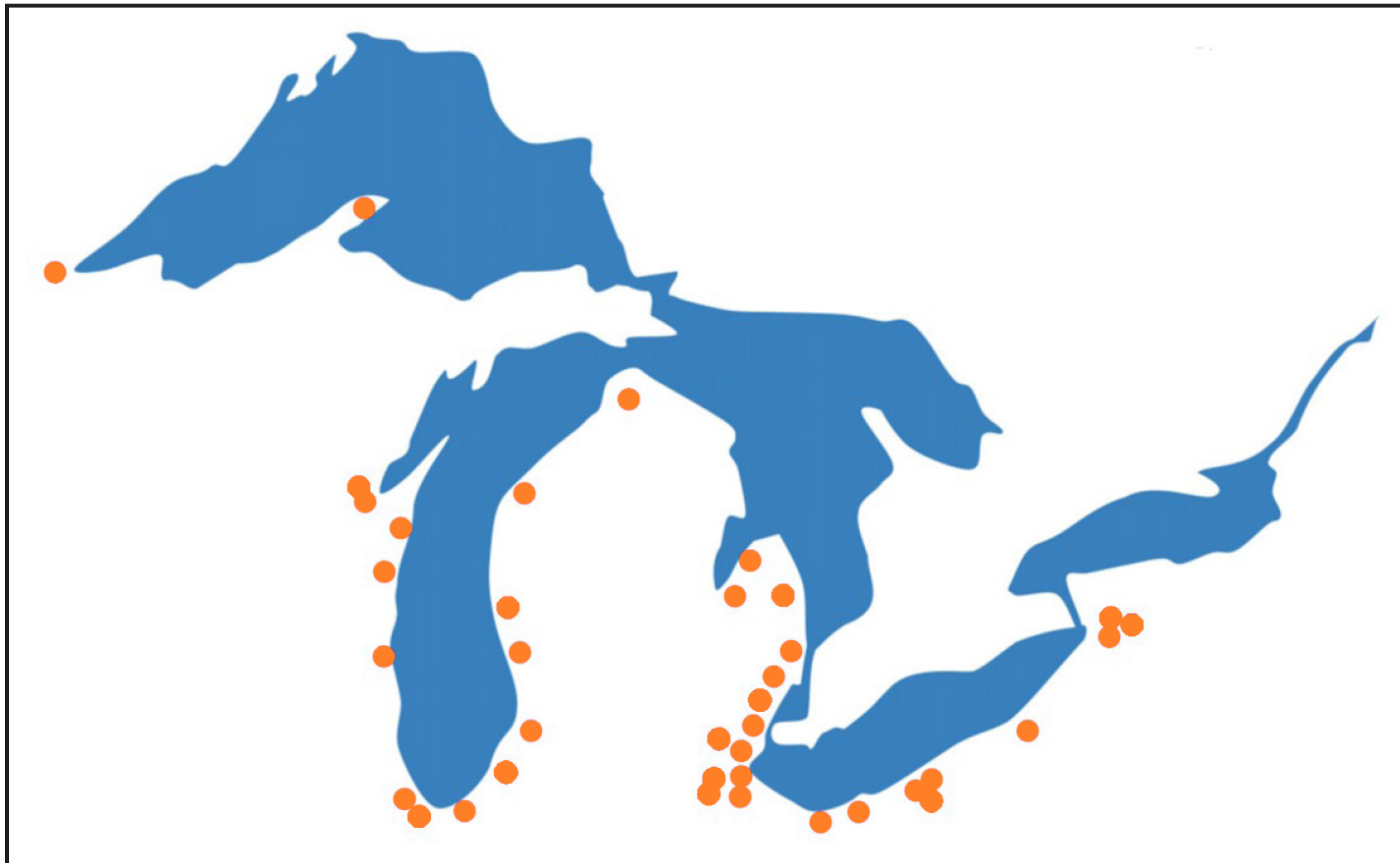


Water quality monitoring is conducted at specific locations outside of the curtains.



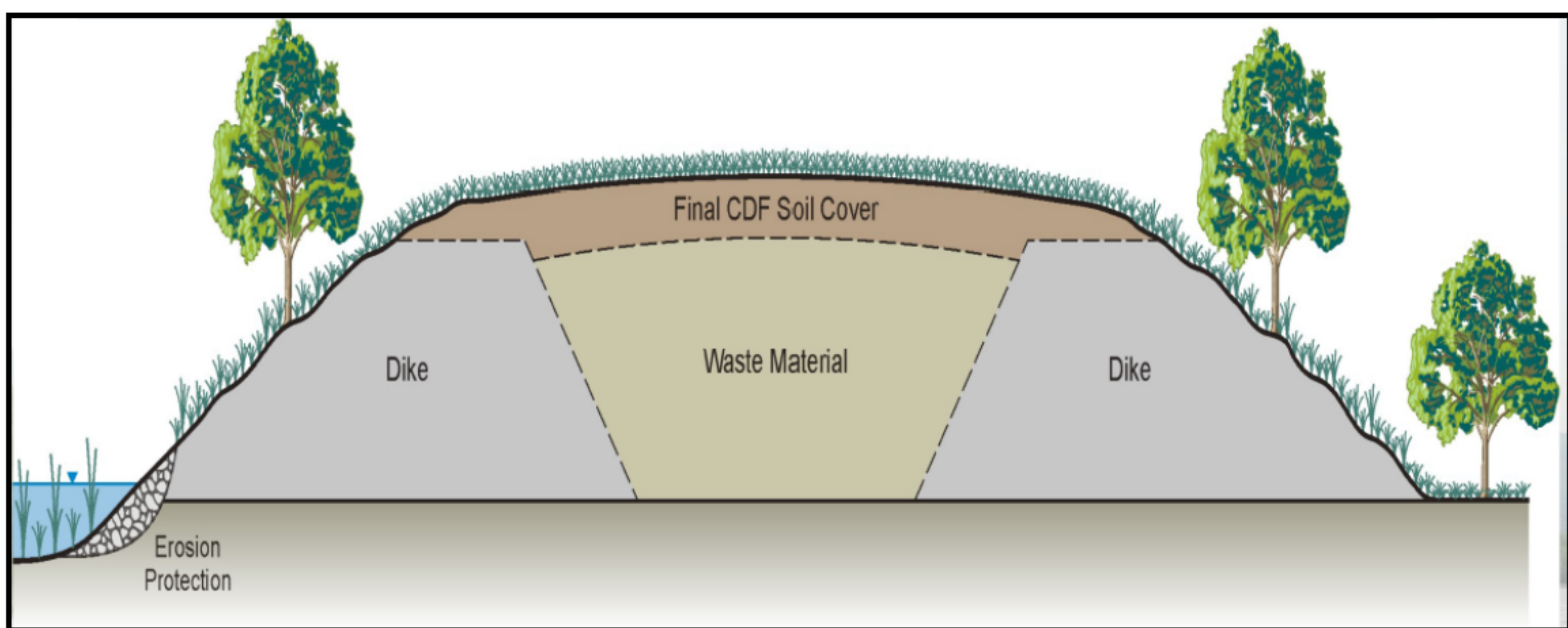
## What is a Confined Disposal Facility (CDF)?

- A CDF is a structure designed to contain impacted sediments.
- CDFs can be constructed on land or adjacent to water.
- The site clean-up includes two CDFs, both adjacent to Unnamed Creek.



Great Lakes CDF locations.

## Design Perspective



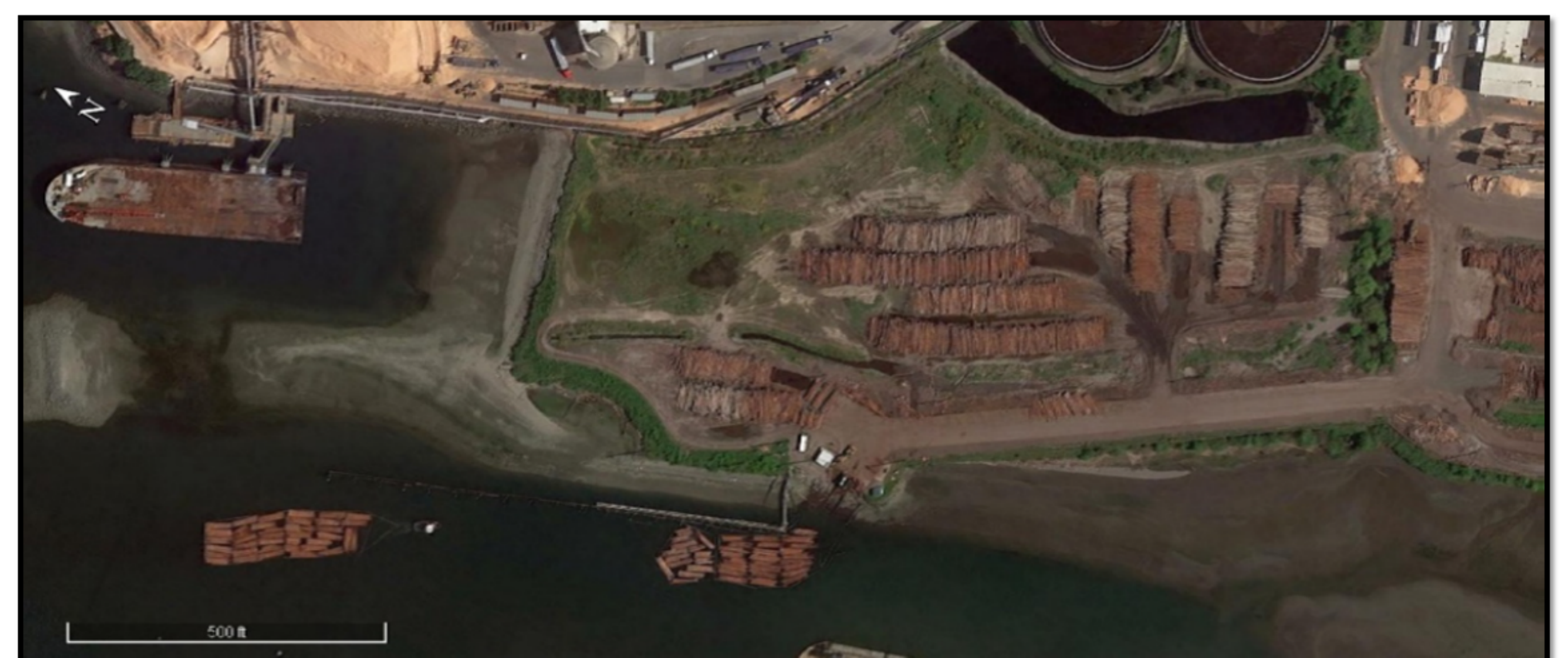
Conceptual example of a CDF design integrating shoreline habitat features.



Conceptual example of plantings to promote habitat restoration.

## Are CDFs Safe? Yes, CDFs are safe.

- CDFs have been used throughout the Great Lakes Region for over 50 years to manage and dispose of impacted sediments from Great Lakes harbors.
- 45 CDFs have been constructed and safely operated in the Great Lakes Region since 1970.
- Monitoring studies conducted at operational CDFs have shown that CDFs are extremely effective at containing impacted sediments with minimal risks.

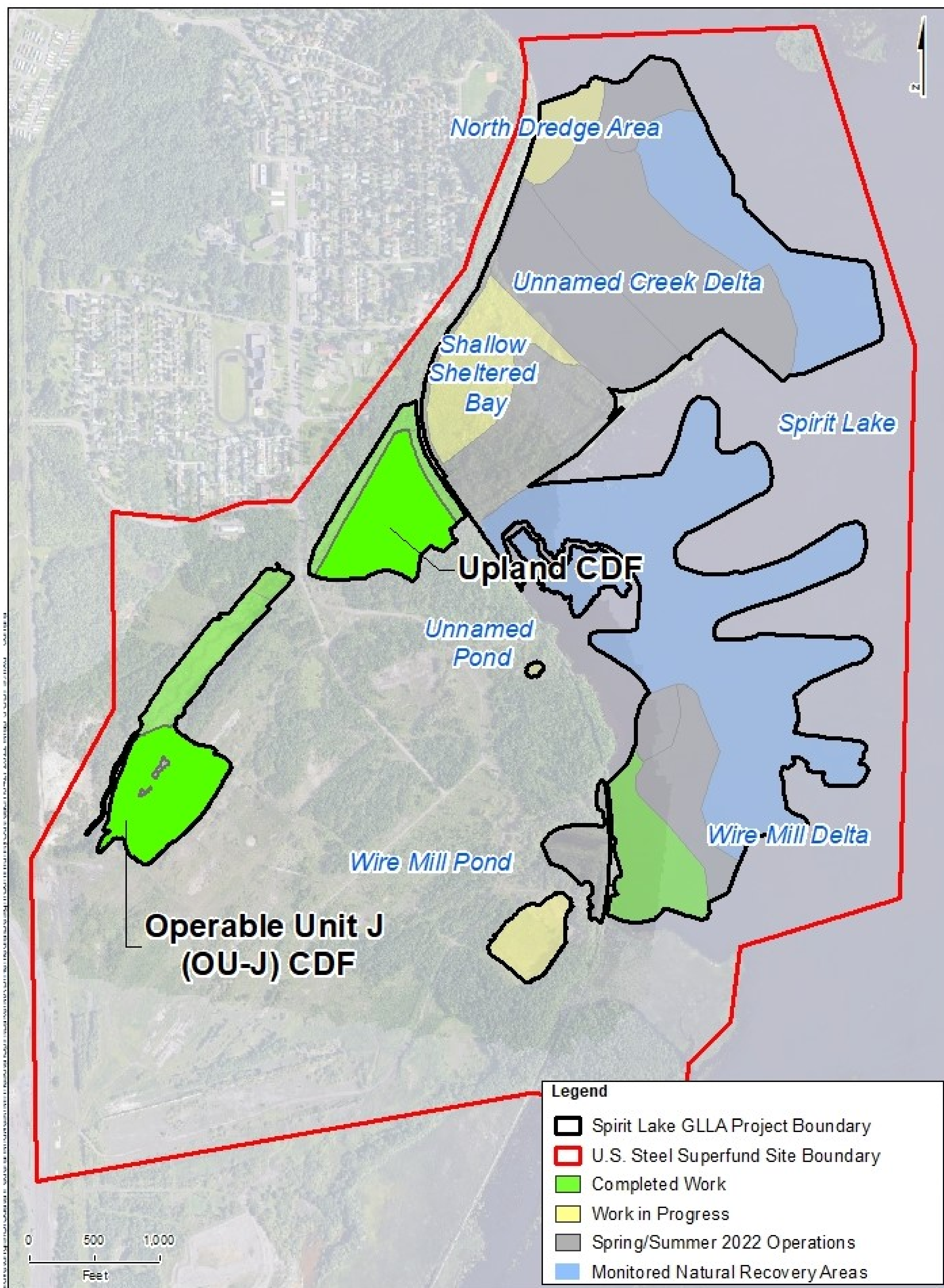


Conceptual example of a CDF with softened shoreline for habitat development.



Berm construction for the OU-J CDF at Spirit Lake.





## Examples of Completed Confined Disposal Facilities (CDFs)



Conceptual example- Port of Cleveland CDF (Cleveland Lakefront Nature Preserve).



Conceptual example- Times Beach CDF in Buffalo Harbor.

## Spirit Lake CDF Construction Process and Methods



During construction, high strength fabric is placed over the Upland CDF.

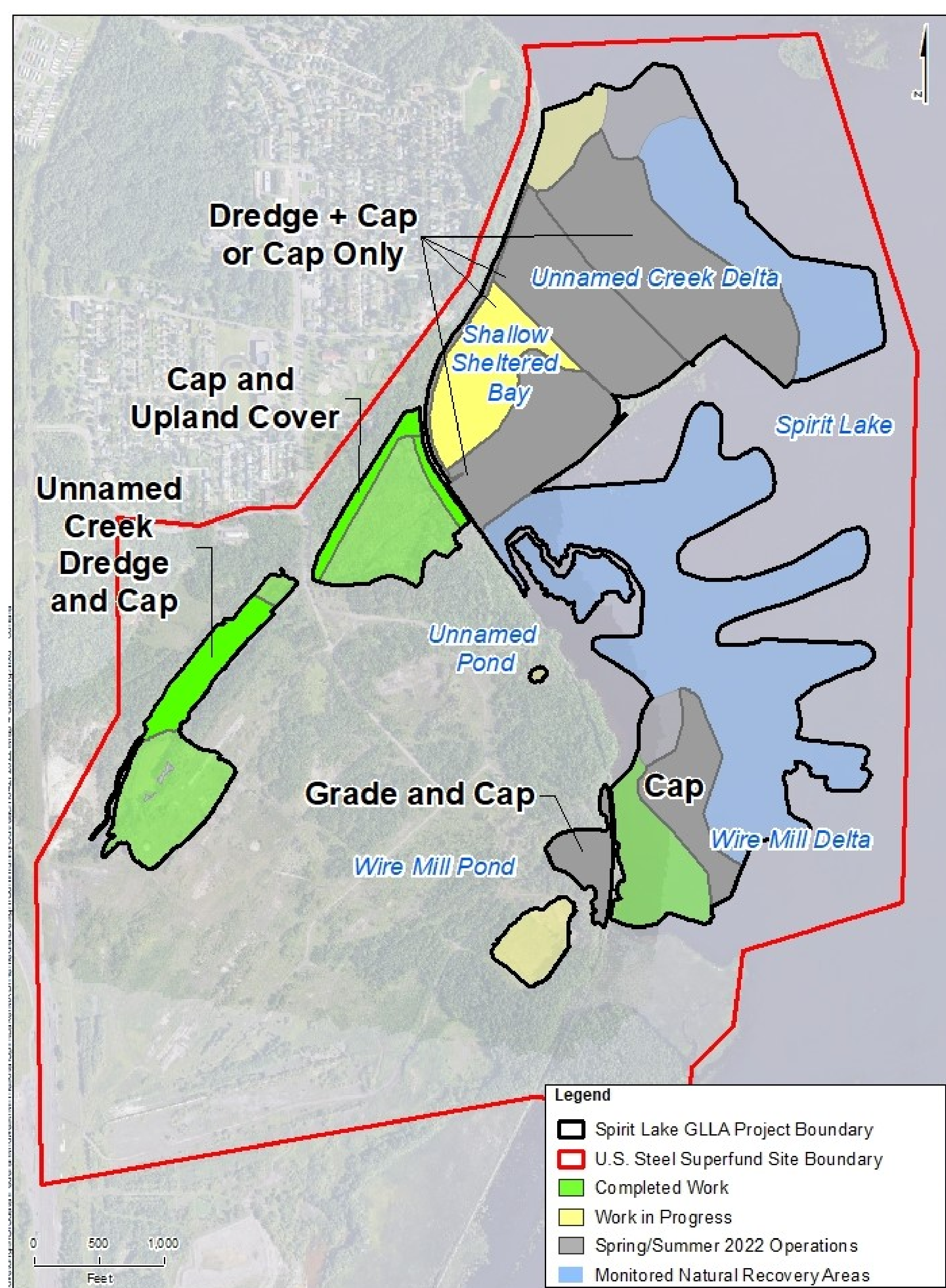


Dredge material is pumped into Geotubes® located in the Upland CDF. Geotubes® are specially engineered tubular, bag-like filters used to remove water from the dredge material before processing.



Processed material is placed directly in the OU-J CDF.





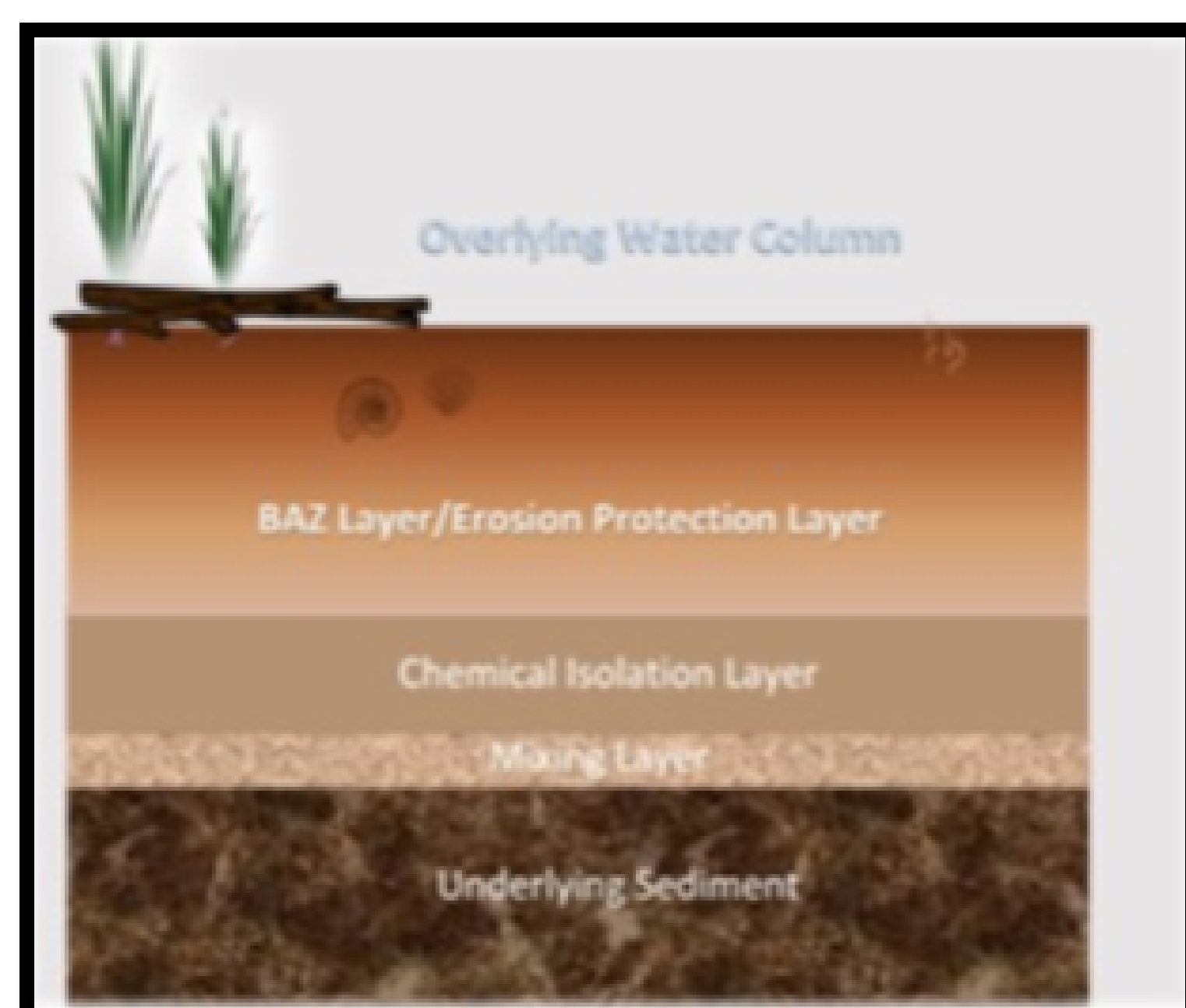
## How do Caps Work?

- Underwater caps provide a physical and a chemical barrier to prevent exposure of humans and wildlife to impacted sediment.
- Caps prevent direct contact with the sediments and reduce movement of chemicals.
- Upland caps also provide a physical barrier to prevent exposure to impacted sediment or soil below.

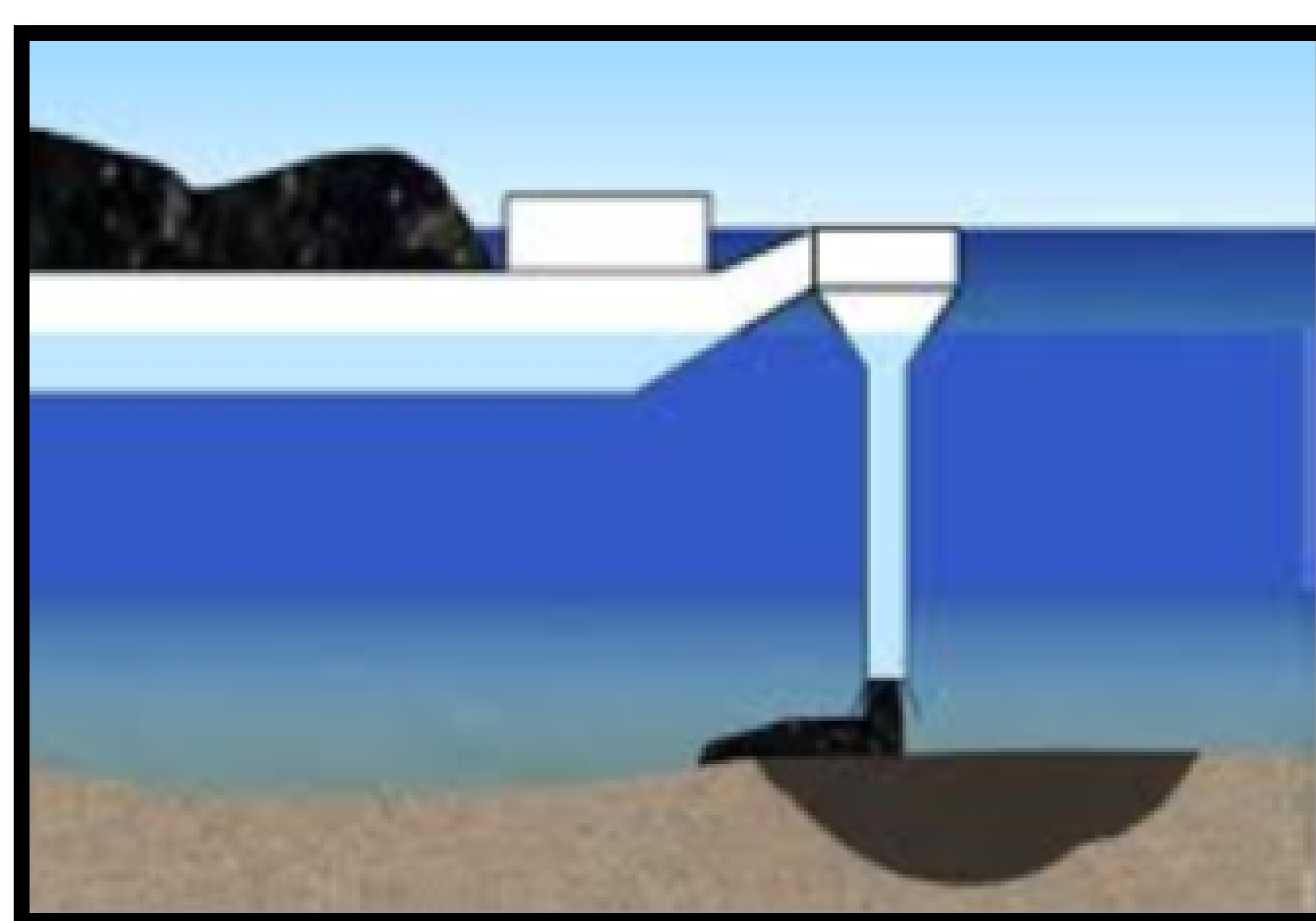
## Have Caps Been Used at Other Sites?

- Caps have been used throughout the Great Lakes and the U.S. to successfully remediate impacted sediments.
- They can be one of the most effective ways to immediately reduce exposures to impacted sediments.
- The Interlake/ Duluth Tar site and Duluth Slip 2 project are local examples of successful capping remedies.

## Typical Cap Components and Placement Methods



91 Ua d'YcZhdjWU 'WUd' UnYfg"



Example of WUd'a UnYfJU' d'UNWa YbhVmidjdY'jbY"



Clean cap material placed in Weir Pond using a spreader barge.



7cbWdhi U'example of cap armor placed along a shoreline.



Root barrier being installed in a cap in the Shallow Sheltered Bay Spirit Lake.



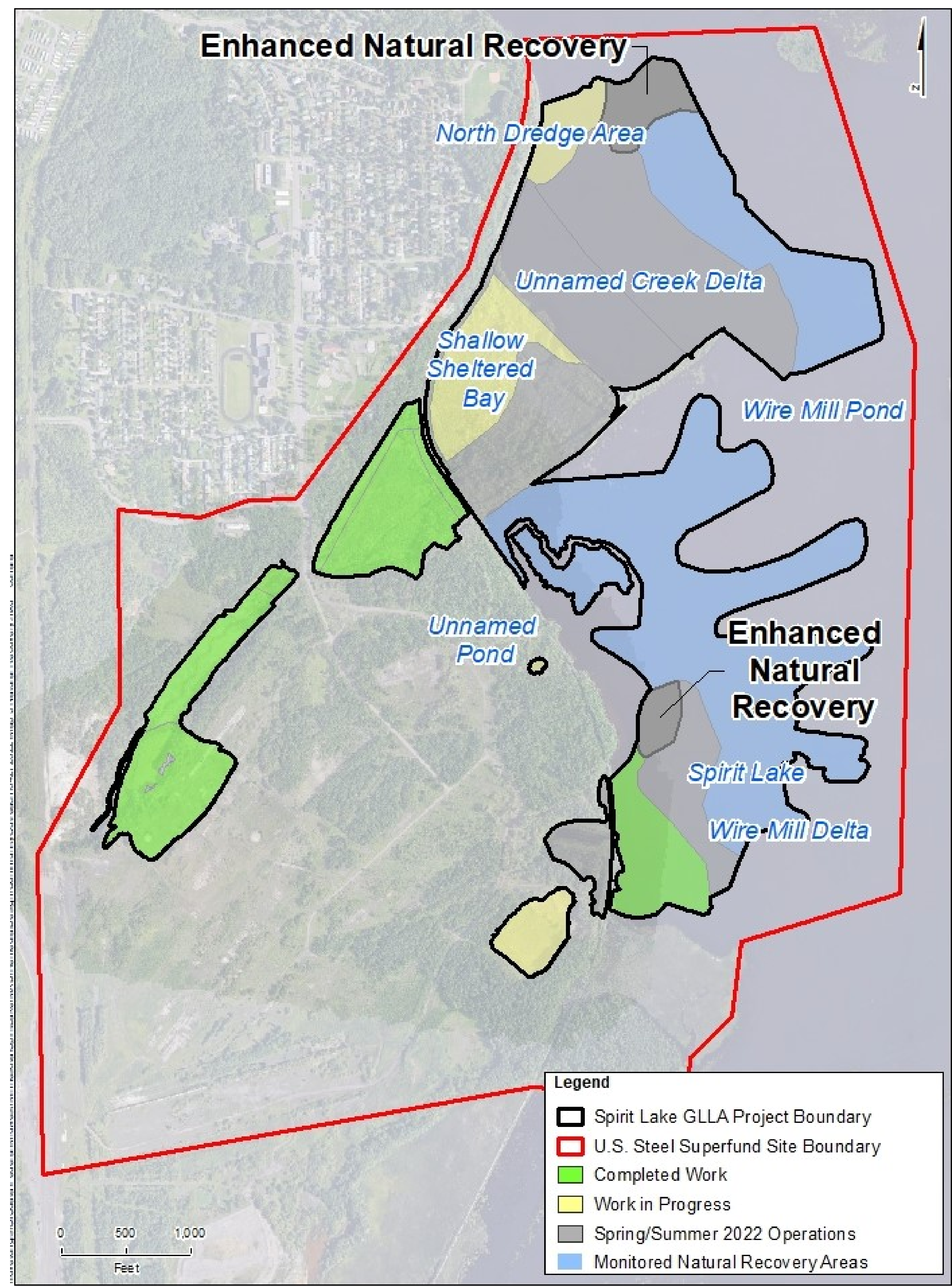
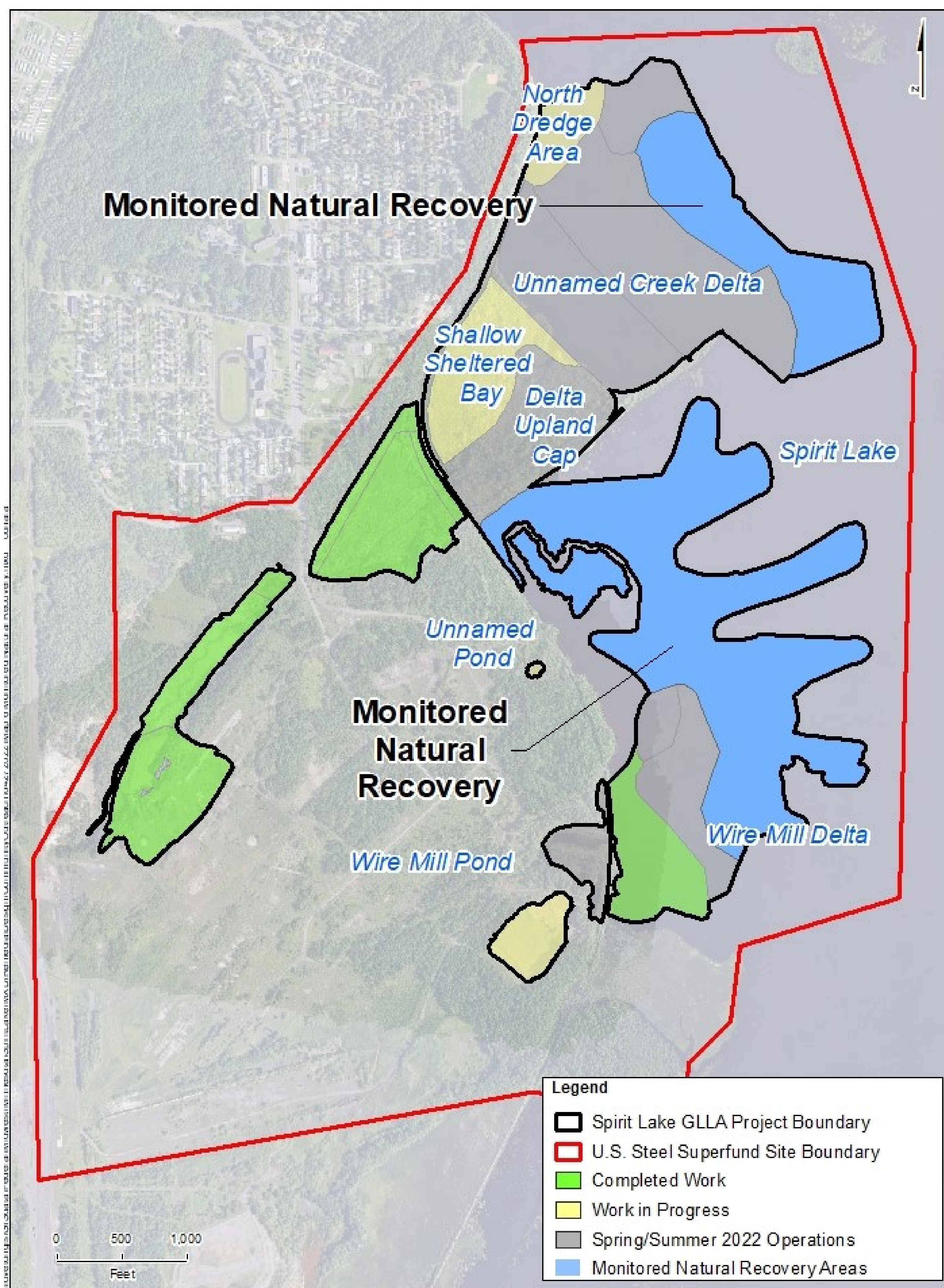
Armor stone is loaded for capping in the Unnamed Creek area.

## Cap Placement at Spirit Lake

## How Long Do Caps Last?

- Caps are usually designed to last 30 to 100 years, but modeling indicates they can be effective even longer.
- MPCA and EPA will require long-term monitoring of the site to verify the capping component of the remedy remains effective.





## Monitored Natural Recovery (MNR)

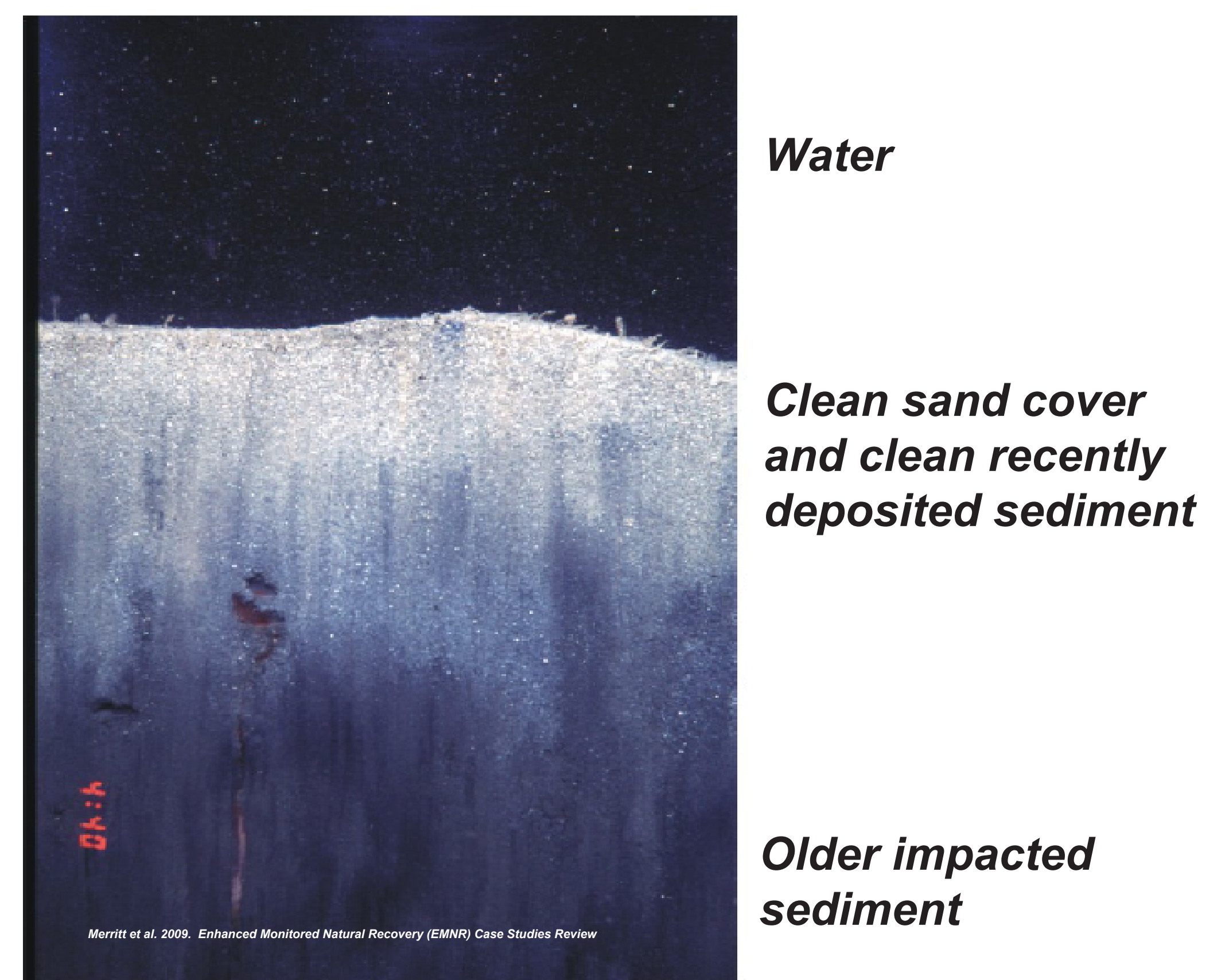
- Sampling at Spirit Lake shows that clean sediment is naturally covering impacted sediment.
- Photographs of the sediment layers confirm that clean sediment has buried impacted sediment in many areas. Recovery will be monitored over time.



Spirit Lake sediment photograph.

## Enhanced Natural Recovery (ENR)

- Natural recovery can be enhanced by placing a thin layer of 6 inches of clean sand to speed up burial while preserving the plants and wildlife that are present already.
- ENR areas will be monitored over time.

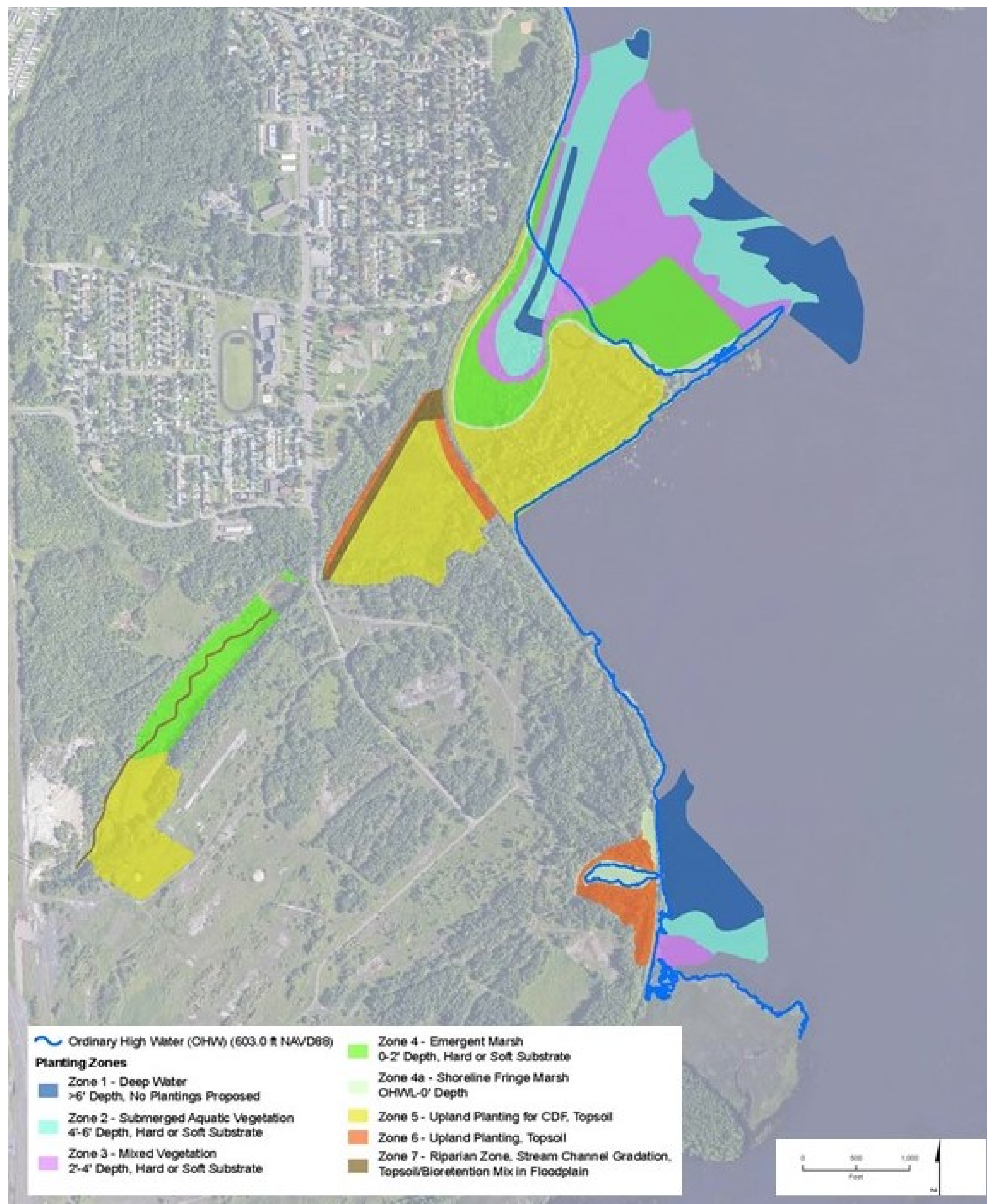


Conceptual example of ENR sediment cover.



# Habitat Enhancements

- Habitat enhancements include a new open-water area as a shallow sheltered bay habitat, deep-to-shallow-water transitions throughout the site, shoreline restoration through vegetation establishment, and creation of spawning areas and deep water habitat.
- Some enhancement has been started in the Unnamed Creek area. Plantings in Spirit Lake will occur after remediation is complete.



*Habitat design for the Spirit Lake Great Lakes Legacy Act Project includes aquatic and upland plantings to support a mosaic of habitat types for fish and aquatic species and wildlife.*



*Conceptual example- creating a shallow, sheltered bay allows for emergent vegetation and protected areas where such habitat is currently absent.*



*A conceptual example of a shallow, sheltered water area with emergent vegetation transitioning to a restored shoreline.*



*Unnamed Creek has been planted with riparian and emergent wetland species following remediation and rerouting in Summer and Fall 2021.*

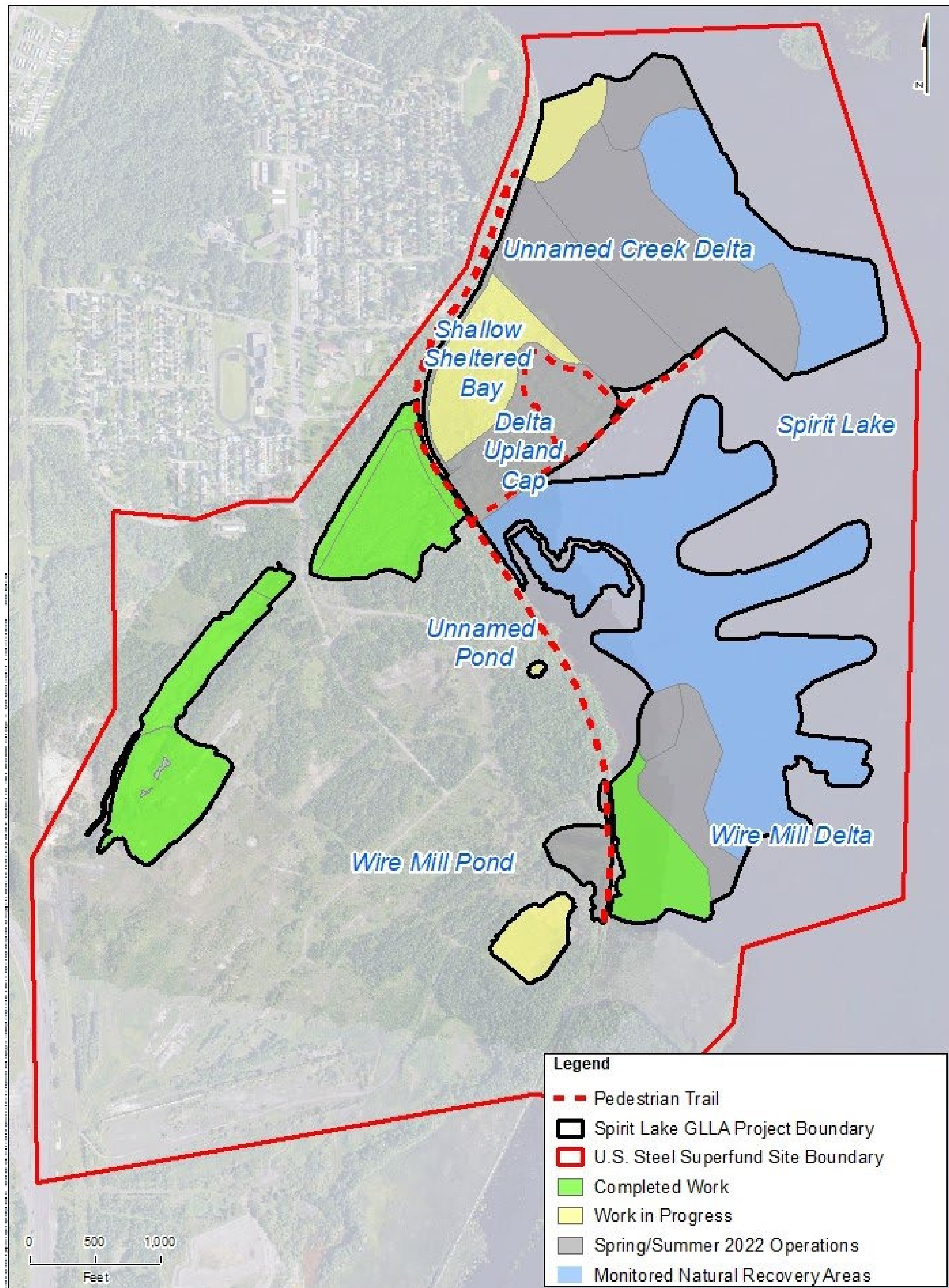


Source: U.S. Fish and Wildlife Service

*The habitat design includes a shallow vegetated spawning shelf to attract muskellunge to the new Shallow Sheltered Bay.*



The project will include the creation of a pedestrian trail and access to greenspaces along the river, including water access and viewing locations. Conceptual photos are shown below.



**Pedestrian walking and biking trail alignment**



**Conceptual example- Shoreline access and canoe/kayak landing.**



**Conceptual example- pedestrian walking and biking trail.**



**Conceptual example- Interpretative signage along trails.**



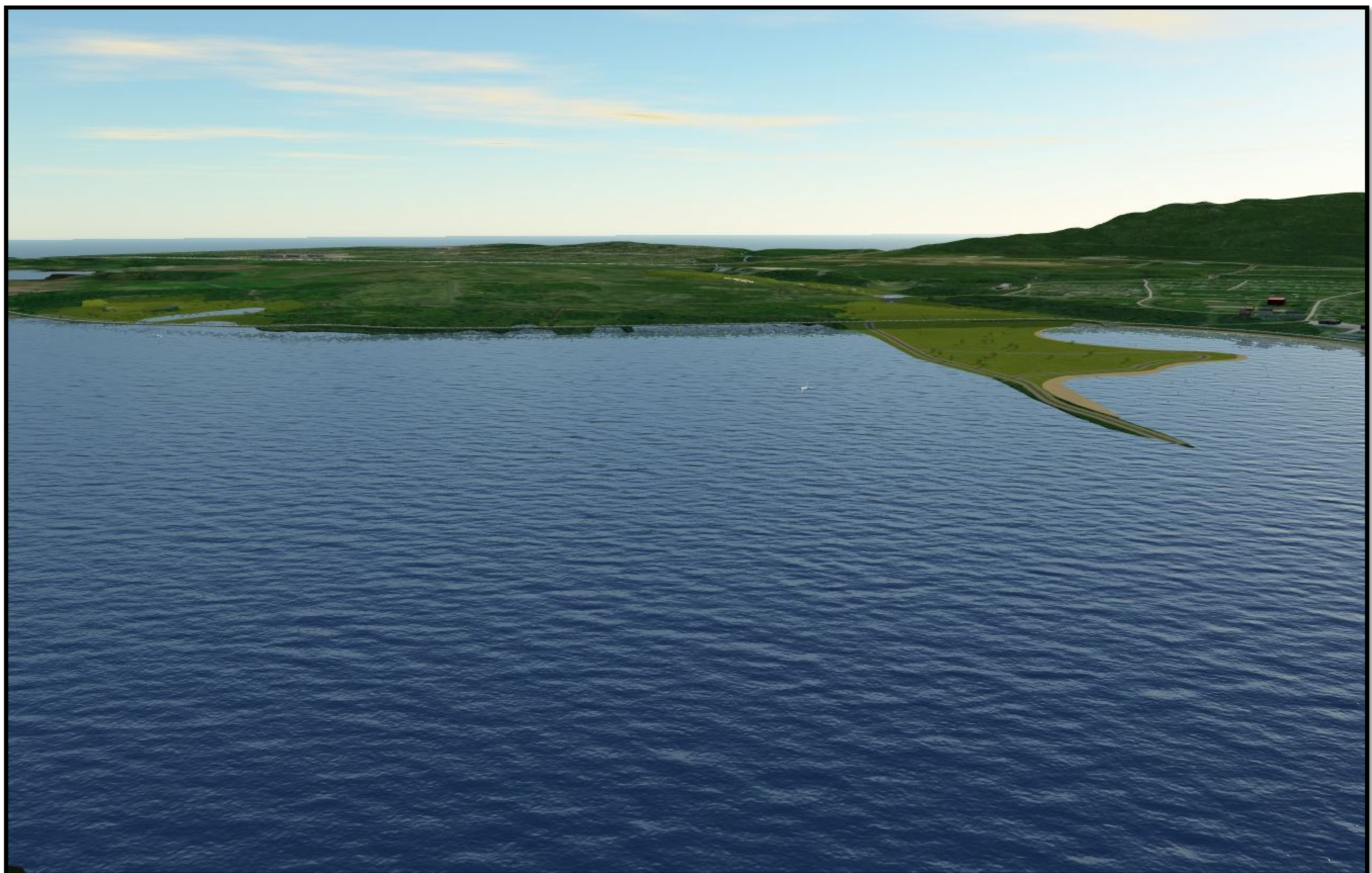
**Conceptual rendering of view of the pedestrian trail and Shallow Sheltered Bay post-construction**



These visualizations demonstrate what the project area will look like from different vantage points after construction and restoration are complete.



*View from Morgan Park (Hilton St.) south toward the new Shallow Sheltered Bay, Delta cap, and pedestrian trail.*



*View from Spirit Island west to the Unnamed Creek Delta and Wire Mill Delta shoreline.*