



Presents



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We Are In This Together...



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Pure Michigan?



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Under Siege...



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Challenge for All Seasons...



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Statewide Problem...



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Breaking the Force of Water...

- Breakwaters are designed to absorb the energy of the waves that strike it, either by using a large mass or a revetment slope. Traditional barrier and erosion control methods used in breakwaters, such as, boulder and conventional concrete blocks tend to become dislodged over time. The main reason for this, hydro-dynamic wave forces can become greater than the mass of the simple shape.
- The goal with a breakwater is to absorb incidental swell, reduce wave overtopping and minimize reflection. A well-designed breakwater should have a rough surface so that it can dissipate energy and slow the water which rises along its face.
- Add to this an interlocking shape arrangement and you will increase the internal friction of the natural forces and strengthen the breakwater over time. Simply stated, breakwaters and coastal barriers made up of elements having projections ensure a rough external surface and an interlocking shape.



Minds Over Matter...

- Breakwaters using Great Lakes Breakwater's Tetrapod™ dissipate the force of incoming waves by allowing water to flow around, rather than against it. Great Lakes Breakwater's Tetrapods™ also reduce displacement by allowing a random distribution of Tetrapods to mutually interlock and settle into a linked configuration.
- Tetrapods can be used in an armor layer or in a full depth placement arrangement. Full depth arrangements allow water to pass through above the sediment layer.
- The most important feature of Tetrapods barriers is their flexibility and capability to maintain their hydraulic performance even after collapse, which makes our structures a particularly suitable civil protection. The collapse is a design feature that allows the Tetrapods to “key” together forming a significantly stronger barrier for erosion and security.



Can Stop a Freight Train...



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Trusted Experience...



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Trusted Solutions...



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Patented Systems...



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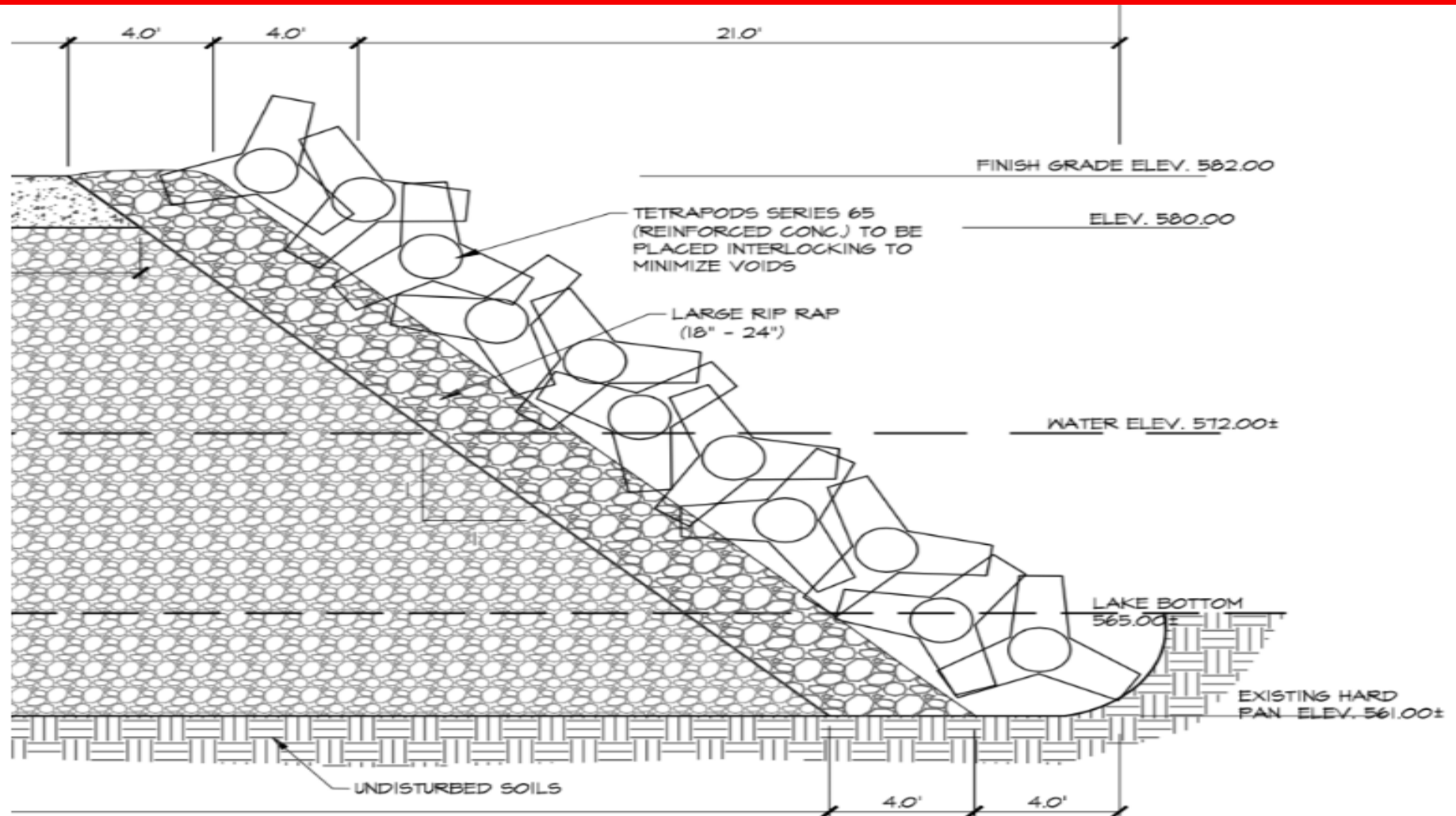
Local Production... Local Partnership...



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Adaptive Implementation...





Hydrological Analysis



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Pilot Project



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Habitat Opportunities...

Linking the Land & the Lake In the Saginaw Bay Watershed

If you live



What is a watershed?

Every place on Earth is part of a watershed. A watershed is an area of land where all of the rain and melting snow drains to a single body of water such as a creek, river, or lake. Nearly all of Michigan's watersheds eventually flow into one of the Great Lakes. You are in the Saginaw Bay Watershed right now!

Why are watersheds important?

It's important to remember that our actions upstream have consequences downstream. Water is only as clean as the land it flows over. A river or lake is only as healthy as the water draining into it. Healthy watersheds reduce flood risk, support crops, filter pollution, balance effects of climate change, and boost human well-being. It's our responsibility to be good caretakers of the watersheds where we live, work, and play.



Watershed - area of land where all rain or melting snow drains to a single body of water such as a creek, river, or lake.



The Saginaw Bay Watershed

- Is Michigan's largest watershed
- Covers nearly 8,700 square miles
- Is home to 1.4 million people
- Contains the largest expanse of connected coastal wetland systems in the country
- Has wetlands that provide resting areas for more than 250 types of migratory birds
- Includes 7,000 miles of rivers & streams
- Provides habitat for shorebirds, amphibians, reptiles & more than 90 fish species

swims to the other side for more!

What can you do to protect the watershed & Saginaw Bay?

What we do on land here in the Saginaw Bay Watershed can have big impacts on Saginaw Bay's habitats, water quality, and the creatures that live here. Past intensive agriculture and shoreline development changed many aquatic habitats in the watershed with 138 species now considered threatened or endangered. Sometimes human activities can add too much sediment (dirt, sand, and silt) and nutrients (nitrogen and phosphorus) to the Saginaw Bay and the rivers that feed into it. Here are just a few ways you can help:



Use a rain barrel to capture rainwater from a downspout for later use in your garden.

Plant a rain garden to give stormwater a chance to slow down & filter through the soil.

Restoring Fish Spawning Reefs In Saginaw Bay

What are spawning reefs?

Saginaw Bay's warm, nutrient-rich waters are a great place for native fish to live and reproduce. The bay's original rock reefs formed from debris dropped by glaciers tens of thousands of years ago. The rocky piles provided a place for native fish to lay and protect their eggs from predators and water currents.

Which fish use spawning reefs?

Many native fish in Saginaw Bay and Lake Huron spawn or live near rocky reefs. Some reproduce in the spring (Walleye, Smallmouth Bass, and Suckers), while others spawn in the fall (Lake Whitefish, Cisco, Lake Trout, and Burbot).



Reefs provide a place for native fish to lay & protect their eggs (🐟) from predators & water currents.

What happened to the old reefs?

In the 1800s and 1900s, land-based activities like logging and agriculture added more sand and silt to Saginaw Bay and its tributary rivers. The sand and silt covered up the rocky reefs, including the Coreyon site in Saginaw Bay, so fish couldn't use them anymore. Many native fish species were already struggling because of other human impacts. Without their spawning reefs, the fish had a harder time coping with these stresses.

Why rebuild them now?

Since the 1970s, people have worked hard to decrease their impact on Michigan's waters. Saginaw Bay is becoming healthier, and fish populations are once again reproducing in nearby rivers. But without the bay's reefs, the fish populations are still limited and vulnerable. Restoring Saginaw Bay's rock reefs gives fish more safe places to reproduce.



Coreyon reef location in Saginaw Bay

swims to the other side for more!

How do you build a reef?

First, researchers studied potential reef sites. They wanted to make sure the water currents wouldn't cover the new reefs with sand and silt. They picked the Coreyon site because it matches up with part of the old reef.

Then they brought in lots of rocks: chunks of limestone and granite about 4-8 inches across, placed onto the lakebed by barge and crane. They used 22,500 tons of rock — that weighs as much as 1,700 school buses!

The new reef covers around 2 acres of lakebed, the size of about one and a half football fields. It stands about 5 feet tall, but is still low enough to let boats move safely overhead.

Want to fish the reef?

Chunks of limestone & granite used to build the reef.



Rocks being placed on lakebed by barge & crane.



questions?



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