Frequently Asked Questions
About the Detroit and St. Clair River Fish Spawning Reef Projects

What is a fish spawning reef?
Many fish use rocky areas for spawning (laying and fertilizing their eggs). The construction of commercial shipping channels removed much of the rocky habitat that historically existed in the St. Clair and Detroit rivers. The spawning reefs installed through this project recreate natural spawning areas and consist of loose rock strategically placed on the river bottom. The rock provides a safe place for fish eggs to incubate until they hatch and larvae drift down the river.

Who is involved in the reef projects?
The restoration team is made up of local, state, national and private partners working to bolster local fish populations. The team includes scientists from the U.S. Geological Survey (USGS), the U.S. Fish and Wildlife Service, the University of Michigan, JJR SmithGroup, and the Michigan Department of Natural Resources (DNR). Several marine construction companies have been selected to build past and current reef projects, including Faust Corporation, Dean Construction and Kokosing Industrial. Funding comes from the federal Great Lakes Restoration Initiative with additional support from the cooperating agencies.

Where are reefs being built and how big are they?
After carefully evaluating the fish populations and physical conditions throughout the St. Clair and Detroit rivers, the project team selected six locations to create fish spawning reefs over the past 12 years. These locations are all in deep, clean, fast-flowing waters that will keep the spawning reefs clear of excessive sediment and will help deliver oxygen to fish eggs that are deposited on the reefs. The table at the end of this document provides more details about each location and completed reef project. One new project is being planned for 2016:

- **Planned – Belle Isle Reef Project.** The project includes 3 reef units located around the head and just upstream of Belle Isle. Each reef unit consists of a bed of loose rock about 2 feet thick and, combined, they cover 4 acres of river bottom. Construction is expected to begin in late Fall 2016.

The size and dimensions for each reef project were selected based on the constraints of each location and the project's budget. The team's first reef project involved three small pilot reef beds, which together covered just 0.28 acres of river bottom near Belle Isle. The team's largest reef project to date was built in 2015 upstream of Grassy Island and consists of a single 4-acre reef bed (1219 x 143 feet and 2 feet thick). The reef rock beds are typically 2 feet thick.

What type of rock is used and where does it come from?
Recent fish spawning reefs are made of broken limestone about 4 to 8 inches in diameter. For reef projects on the U.S. side of the border, the rock is typically produced by quarries in southeast Michigan and transported by truck to staging areas along the shoreline of the rivers. The rock is inspected before it is used and will not affect water quality.


Limestone used to build spawning reefs

How are the spawning reefs constructed?
Potential construction contractors propose rock placement methods as part of the bidding process. Two construction methods have been used to build spawning reef projects in these rivers. In some cases, rock was placed on the river bottom using a crane mounted on a barge. A GPS-guided clamshell shovel placed the rock at the locations specified by the project plans. Another barge brought rock from the shoreline to the reef site using a tugboat.

For other projects, rock was placed using a side- or bottom-dump barge and then a beam was dragged over the surface to smooth the bed of rock. A variety of survey methods are used to check that the reefs are built according to the team's design.


Crane and clamshell rock placement


A side-dump barge used to drop rock

What species of fish use the reefs?
These fish habitat projects were designed to enhance the reproduction of lake sturgeon (a state threatened species), walleye (a popular sport fish), and lake whitefish (a commercially harvested fish). These three species, as well as a number of suckers, catfish, and perch, seek out rocky areas in fast-flowing water to deposit their eggs and have been observed using completed reef projects.

Why is this project needed?
Over the past 100 years, both the St. Clair and Detroit rivers have been extensively modified by human activities. For example, the river bottoms were dredged to create deep channels for large, commercial ships and to mine gravel, which damaged the rocky and gravel areas where millions of fish spawned. These and other factors led the St. Clair and Detroit rivers to be listed as Areas of Concern under the Great Lakes Water Quality Agreement, and federal dollars are now available to remediate fish and wildlife habitat. Unlike most other large rivers, the St. Clair and Detroit rivers do not have dams that block access to historical spawning areas, making it especially important to remediate fish habitat here.

Researchers have determined that additional rocky spawning habitat is needed to increase the reproduction of native fish and help restore fish populations in the rivers. Currently, many fish spawn near the Bluewater Bridge at the head of the St. Clair River because it is one of the few optimal spawning sites in the region. Spawning reef construction projects diversify the type and locations of spawning habitat available, making the system more resilient to potential future changes.

How do these reef projects differ from other restoration efforts?
The projects described in this FAQ are designed to create habitat that is needed by a particular group of fish that deposit their eggs on rocks in fast-flowing waters, including lake sturgeon, walleye, and lake whitefish. Research shows that in the St. Clair and Detroit rivers, these fish select deep-water sites for spawning, and natural and constructed reefs in deep water remain free of algae that could make the habitat unattractive to these fish.

Federal restoration programs are also supporting projects designed to improve shoreline and shallow-water habitat of the rivers, such as those in Port Huron, Marysville, and Clay Township. Some of these projects include rock material that is helping make shorelines more natural and providing habitat for small fish and other aquatic life. Creating and restoring a variety of habitat types in the river we can sustain many different species of native fish.

The St. Clair and Detroit rivers are different; how does this affect restoration?
Both the St. Clair and Detroit rivers have been designated as Areas of Concern under the Great Lakes Water Quality Agreement, and efforts are underway to correct the loss of historical fish and wildlife habitat in both rivers. However, the riverbed geology and fish communities are unique in each river, which influences restoration planning.

For example, fish spawning habitat has been damaged in different ways — gravel mining was widespread in the St. Clair River and blasting of limestone shelves was extensive in the lower Detroit River. Currently there are more lake sturgeon in the St. Clair River and more walleye and lake whitefish in the Detroit River. Knowledge of historical changes and the current fish community helps the team set realistic objectives for restoration efforts. In general, the goal is to enhance the reproduction of a number of target native fish species, while diversifying the type of habitat and the fish community in a given area.

The St. Clair River already has a large population of lake sturgeon. Why create spawning reefs?
The St. Clair-Detroit River System is home to approximately 50,000 adult lake sturgeon, which is one of the largest populations in the Great Lakes, and sturgeon from other areas migrate to these rivers to spawn. However, current sturgeon populations are roughly 1 percent of what they once were in the Great Lakes. Scientists anticipate that bolstering populations of lake sturgeon in the St. Clair and Detroit rivers will help repopulate other parts of the Great Lakes. In addition to lake sturgeon, constructed spawning reefs have been shown to benefit a number of other native fish, such as walleye and lake whitefish. Currently, relatively few walleye and lake whitefish spawn in the St. Clair River, but spawning reef construction could increase their numbers.

How do you know the reefs are working?
The project team performs ongoing monitoring and evaluation of completed habitat projects in the St. Clair and Detroit rivers. Project scientists study the numbers and types of adult fish, eggs, and fish larvae in the area before and after the spawning reefs are created. Data collected at the reef site during spring and fall spawning seasons can be compared to reference areas without spawning reefs. In addition, underwater cameras, sonar, and scuba divers are used to evaluate how well the reef material stays clean over time.

Sturgeon eggs found on a constructed reef in the Detroit River in 2016. *Photo credit: USGS*

Sturgeon larvae found drifting downstream from a constructed spawning reef in the St. Clair River in 2016. *Photo credit: USGS*

Will young fish produced by the constructed reefs find enough nursery habitat?

Fish need access to different types of habitats during their life span in order to successfully survive and reproduce. Wetlands provide nursery habitat for many types of young fish. However, there are relatively few remaining wetlands along the St. Clair and Detroit rivers. The team uses hydrological models and a variety of sampling equipment to predict and study the movement of larval fish that emerge from eggs deposited on the reef. For example, larval fish from the St. Clair River reefs are expected to settle in the river, delta wetlands, and open waters of Lake St. Clair, and a number of sturgeon larvae have been caught in these locations. In addition, evidence suggests that fish larvae produced on spawning areas under the Bluewater Bridge of the St. Clair River are able to successfully migrate downstream and find suitable nursery habitat.

Will sand or silt build up in the reefs?

The likelihood of sediment building up in and around a constructed reef is an important consideration when planning a restoration project. Each completed reef project has generated important lessons that are applied in subsequent projects, following an adaptive management approach. Over the past 10 years, the team has completed three spawning reef projects, and two of the projects have accumulated more sediment than expected, including projects in the Middle Channel of the St. Clair River and near Fighting Island in the Detroit River.

These two spawning reef projects included 9-12 experimental reef beds spread across the channel, allowing the team to evaluate fish preferences for different rock types and locations within the channel. The cross channel layout was used to maximize opportunities for fish to pass over and notice the constructed habitat. However, sand is accumulating in the reef beds located in parts of the channel with slower-moving water and higher sediment movement, while other beds remain clean and continue to provide fish habitat. Despite some sand build-up, the exposed portions of the Middle Channel reef are still larger than the only other known sturgeon spawning site in the St. Clair delta region (the Mazlinkas Reef in the North Channel), and it allows fish larvae to now colonize a new part of the delta wetlands.

As a result of the experimental design of these early projects, the team now uses an optimal rock type to construct a single long, narrow reef bed that is oriented parallel to the current in a spot with ideal conditions. Based on these early experiences, the team has also significantly enhanced the site selection and assessment processes to identify potential sources of sediment, places where sediment is regularly deposited, and whether modifications to the river bottom are likely to cause sediment to settle. Sidescan sonar, underwater video, acoustic Doppler current profilers, hydrodynamic models, and a range of fish sampling gear are used to evaluate potential reef locations.

Sediment build-up is likely to be a problem in areas where the river is carrying large amounts of sediment and is near its capacity, such that small changes in water velocity could cause the river to drop some of that load. A number of observations help identify erosional areas where a constructed reef is likely to be scoured clean, including fast water; a hard, stable river bottom with relatively little loose sediment; and an absence of upstream sources of sediment. However, some amount of sediment deposition is expected with every constructed spawning reef and has been incorporated into the design and planning.

Will the projects affect shipping or boating or change the flow of water?
No. The reefs are located in waters 18-40 feet deep, and they only rise 2 feet above the river bottom. The reefs will not interfere with personal boats or freighters. All reef projects are carefully reviewed by a number of agencies, and all analyses indicate that there will be no detectable effect on water flow or water levels in the river.

Will these projects improve fishing?
Eventually. The spawning reefs are designed to enhance the reproduction of specific types of fish, such as lake sturgeon. Most of these fish will only spend time on the reefs during spawning season and, therefore, fishing directly above the reef is not expected to be exceptional. However, over time, the projects should improve fishing in the St. Clair River and Lake St. Clair. After many years, the spawning reefs could expand fishing opportunities for lake sturgeon, the largest fish in the Great Lakes that currently provides a unique — but tightly regulated — fishing experience.

How else will these projects benefit people?
These spawning reef projects are part of a large effort to remediate the St. Clair River and Detroit River and remove the areas from the federal list of Areas of Concern. Despite a variety of changes to the shoreline and water quality, the river is home to the largest remaining population of lake sturgeon in the Great Lakes. Projects like this help improve the region's environment, and unique fish and wildlife populations can boost the region's identity and reputation and ultimately help attract talented people and businesses. For example, Clay Township, which is located along the lower St. Clair River, was recently officially named the Sturgeon Angling Capital of Michigan.

Where can I find more information?
Please contact us if you have any questions that are not answered here.

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Summary of St. Clair and Detroit River Fish Spawning Reef Projects (updated Nov. 9, 2016)

	Reef Project	Status and Timeframe	Specifications	Funding Sources	Selected Results
Detroit River	**Belle Isle** Detroit	Completed: **June 2004** Designed by SmithGroup JJR, built by Faust Corporation	**0.28 acres,** 3 reef units, 3 rock types (1-3-inch coal cinders, 16-24-inch broken limestone, 6-10-inch cobble stone). GPS Lat: 42.343086°, Long: -82.955384°	Grants from NOAA Coastal Management, GL Fishery Trust, DTE Energy, and in-kind support.	14 native fish have used the reef for spawning, including walleye, whitefish, and suckers. Some sturgeon found, but no documented sturgeon spawning.
	Fighting Island La Salle	Initial project: **Fall 2008** Expansion: **Fall 2013** Designed by Landmark Engineers, built by Dean Construction	**Initial: 0.8 acres**, 12 beds, 4 rock types (4-20-inch limestone, 2-4-inch limestone, rounded stone, and mixture), plus boulder field. **Expansion: 1.2 acres**, one reef bed, one rock type (6-12-inch gabion stone); expanded 5 westernmost reef units. GPS Lat: 42.243052°, Long: -83.112766°	Funding from Environment Canada, OMNR, DTE Energy, MI Wildlife Conservancy, and in-kind support from others.	Sturgeon, suckers, and trout-perch preferentially spawn on reef, fewer walleye and whitefish. Some reef beds have sediment problems, probably from Thames River sediment load.
	Grassy Island Ecorse	Completed: **Fall 2015** Designed by SmithGroup JJR, built by Faust Corp.	**4 acres**, 1219 x 143 ft., 2400 ft. upstream of Grassy Island, one rock type (4-8-inch limestone). GPS Lat: 42.236128°, Long: -83.132305°	Grants from NFWF and EPA, additional support for assessment, all through GLRI.	Pre-reef: lots of sturgeon activity, high walleye and whitefish egg densities, no sturgeon eggs.
	2016 Belle Isle	Construction expected to begin: **Fall 2016**	4 acres planned	Funding from EPA to USGS, through GLRI. In-kind support for assessment by partner agencies, DTE Energy.	Pre-reef: both sites have high walleye and lake whitefish egg densities. Freighter turbulence and sediment dynamics are being studied carefully.
	Fort Wayne Detroit	Test reef built as part of feasibility assessment: **December 2015**	2-4 acres possible if test reef is successful.		
St. Clair River	**Middle Channel** Clay	Completed: **June 2012** Designed by SmithGroup JJR, built by Faust Corp	**1 acre**, 9 reef units each 120 x 40 feet, 3 rock types (4-8-inch angular limestone, 4-6-inch rounded field stone and mixture), downstream boulders. GPS Lat: 42.615324°, Long: -82.591551°	Grants from NOAA and USFWS, plus matching support from partner agencies, all through GLRI.	No spawning prior to restoration, lake sturgeon spawned on reef in 2012 and 2013. 20 species observed at site before and after. Sand now covers some reef beds.
	Harts Light East China	Completed: **November 2014** Smoothed: **May 2015** Designed by SmithGroup JJR, built by Faust Corp	**3.8 acres**, 1007 x 165 ft. split into two units, 300 ft. from shore, one rock type (4-8-inch limestone). GPS Lat: 42.781667°, Long: -82.472138°	Funding from EPA to USGS to build reefs, plus additional support for biological assessment by USFWS, USGS, and MDNR, all through GLRI.	Far more sturgeon eggs collected on reef after restoration. Viable sturgeon larvae collected downstream in 2015.
	Pointe aux Chenes Algonac	Completed: **September 2014** Designed by SmithGroup JJR, built by Faust Corp	**1.5 acres**, 605 x 108 ft., 250 ft from shore, one rock type (4-8-inch limestone). GPS Lat: 42.615072°, Long:-82.531809°		No sturgeon eggs found prior to restoration, many sturgeon eggs and larvae observed after.

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