

HARBOR HABITAT Milwaukee Wisconsin

The Milwaukee Harbor supports a vibrant downtown scene with high-end real estate, restaurants, kayaking, boating, fishing, swimming, and other leisure activities. It is a center of shipping and commerce; the Port of Milwaukee annually produces \$100 million of revenue for the city. The Harbor spans nine miles of shoreline and by volume it is the third largest body of water entirely within the state of Wisconsin. It is at the center of Milwaukee life and culture, and is key to health, wealth, and quality of life for residents throughout southeast Wisconsin.

Most maps show Milwaukee's Harbor as a nondescript area of black or blue. Research funded by the Fund for Lake Michigan and the Wisconsin Department of Natural Resources was conducted at the University of Wisconsin-Milwaukee School of Freshwater Sciences. The Milwaukee Harbor Habitat Map reveals what lies beneath the water's surface. Maps are never final, and conditions in and around the Harbor will continue to change. The creators of these maps invite the public to use the maps explore the wildlife and habitat of the Milwaukee Harbor, for their own enjoyment and to better inform the continued development and revitalization of the City of Milwaukee.

Milwaukee Harbor (577 feet above sea level)

FEATURE SYMBOLS

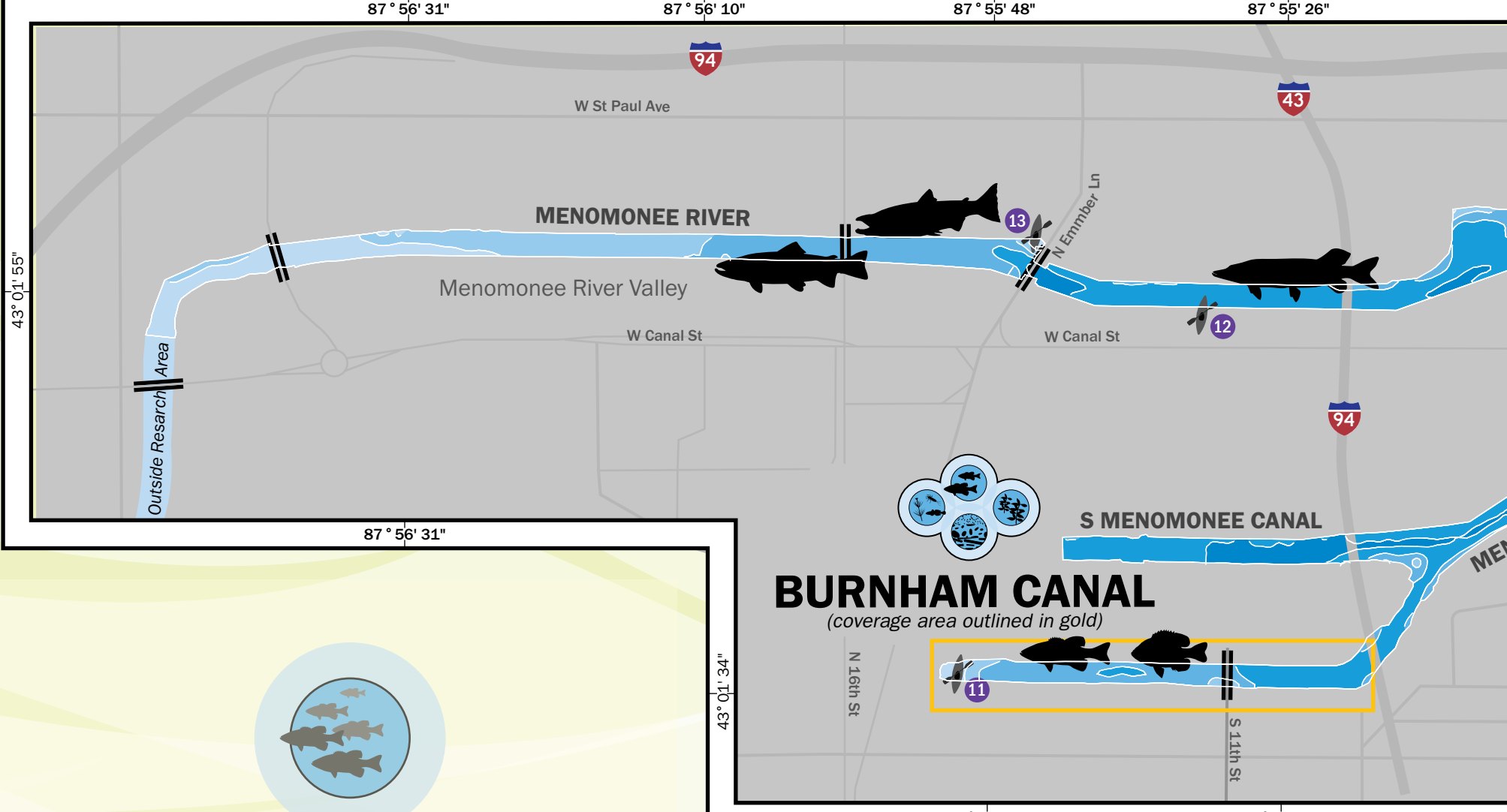
Boat Landing (Trailer Access)	Fish	Clay, Mud, Sand
Boat Landing (Hand-carry)	Vegetation	Rocks
Festival	Substrate	Mixed Rocky
Museum	Forage	Boulders
Marker		Small, Large Wood
Park		Wood, Steel Piling
Marina		Open Water
State University	Nuisance Species	
Bridge	Non-native Species	

SCALE OF US SURVEY MILES
0 0.5

NOT FOR NAVIGATION
SAFETY NOTICE: This map is not intended for use as a navigational chart. Although various structures under the water are shown other hazardous areas are not. The publisher is not responsible for omissions or location changes of these navigational aids.

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FISHES OF MILWAUKEE HARBOR

RESIDENT
Fish commonly in harbor year round

Flathead catfish	Quillback carpsucker	Bowfin	Bluegill
Channel catfish	Common carp	Golden redbreast	Green sunfish
Walleye	Black bullhead	Silver redbreast	Largemouth bass
Golden shiner	Yellow perch	Greater redbreast	Smallmouth bass
Common shiner	Northern pike	Shorthead redbreast	Rock bass
Fathead minnow	Muskellunge	Pumpkinseed	Grass carp
Backstripe topminnow	Gizzard shad	Round goby	Black crappie

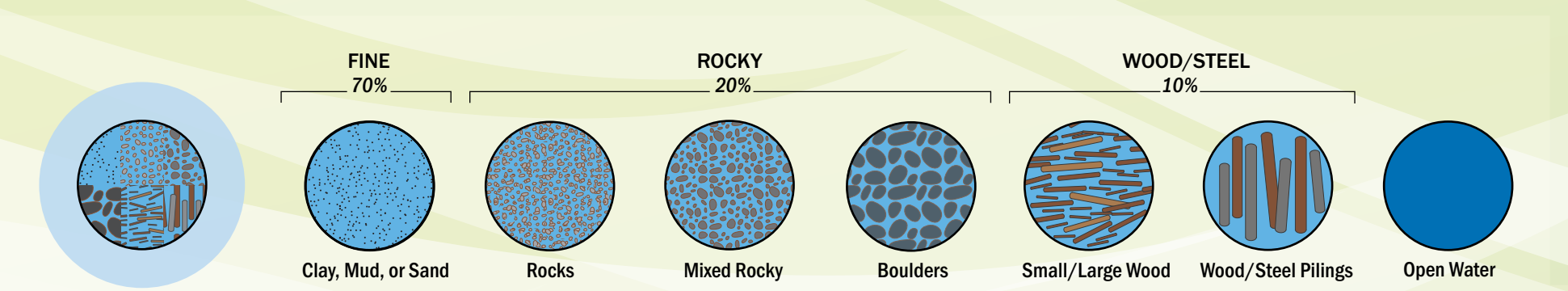
OFF SHORE TRANSIENT
In deep water or surface off-shore, frequently come into harbor to spawn

Alewife	Chinook salmon
Burbot	Coho salmon
Lake trout	Rainbow smelt
Rainbow trout	

COASTAL TRANSIENT
Common along coast moving into harbor periodically

Brown trout	Lake sturgeon	Three spine stickleback
Lake chub	Longnose sucker	Nine spine stickleback
Lake whitefish	Emerald shiner	Trout perch
Round whitefish	Spottail shiner	Freshwater drum
Yellow perch	Longnose dace	

NUISANCE SPECIES (Red circle)
NON-NATIVE SPECIES (Black square)



COMMON HABITAT FOR FISHES

PANFISH

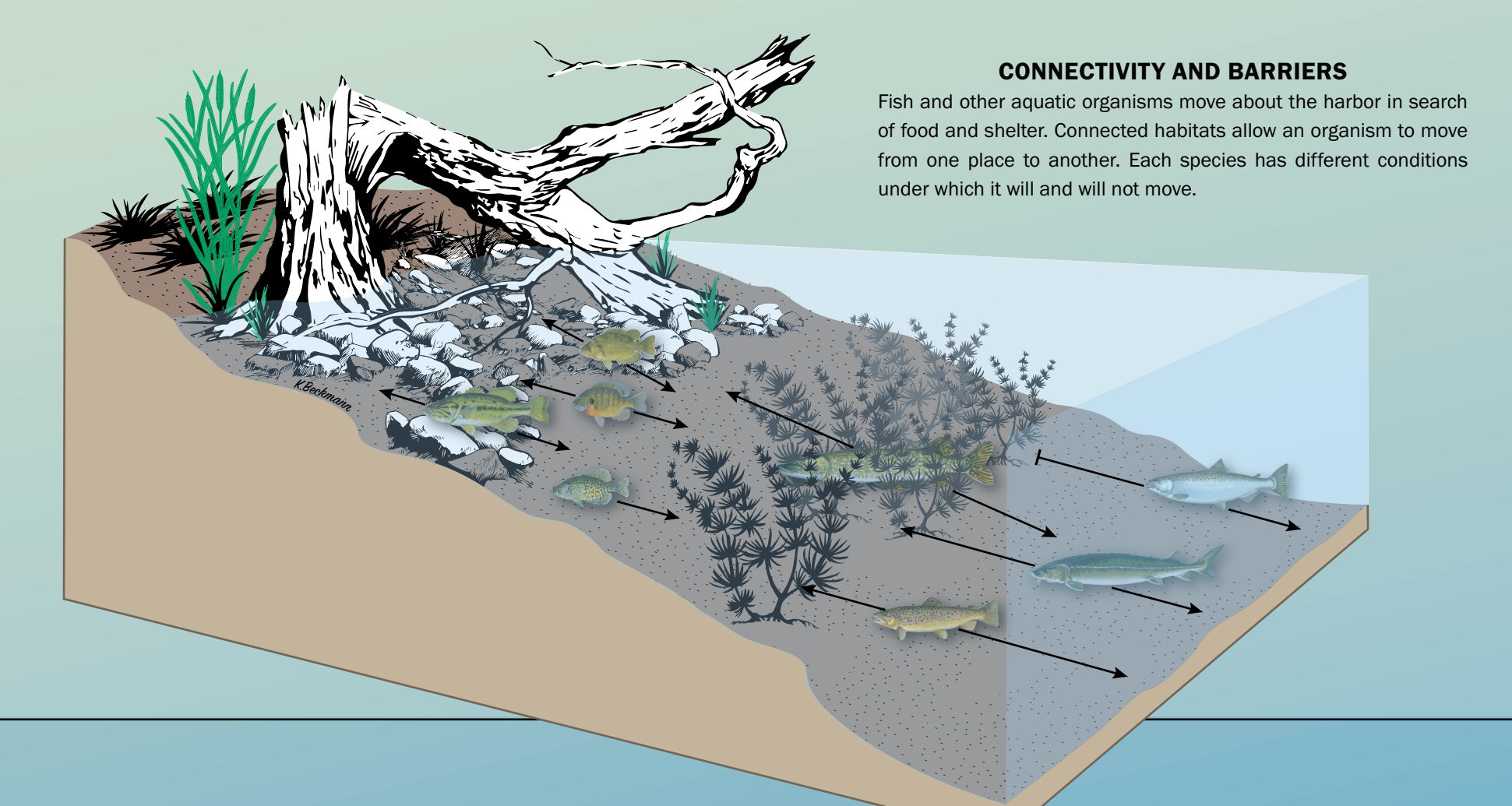
Yellow perch Common Catch Size: 7-12", 4 oz	Pumpkinseed Common Catch Size: 5-7", up to 8 oz	Bluegill Common Catch Size: 6-8", 6-8 oz	Black crappie Common Catch Size: 7-10", 7-12 oz	Round goby Common Catch Size: 4-10", up to 3 oz
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SALMON

Chinook salmon Common Catch Size: 34", 16 lb	Coho salmon Common Catch Size: 25", 6 lb	Lake trout Common Catch Size: 17-23", 3-7 lb	Rainbow trout Common Catch Size: 16-28", 2-10 lb	Brown trout Common Catch Size: 16-28", 2-10 lb
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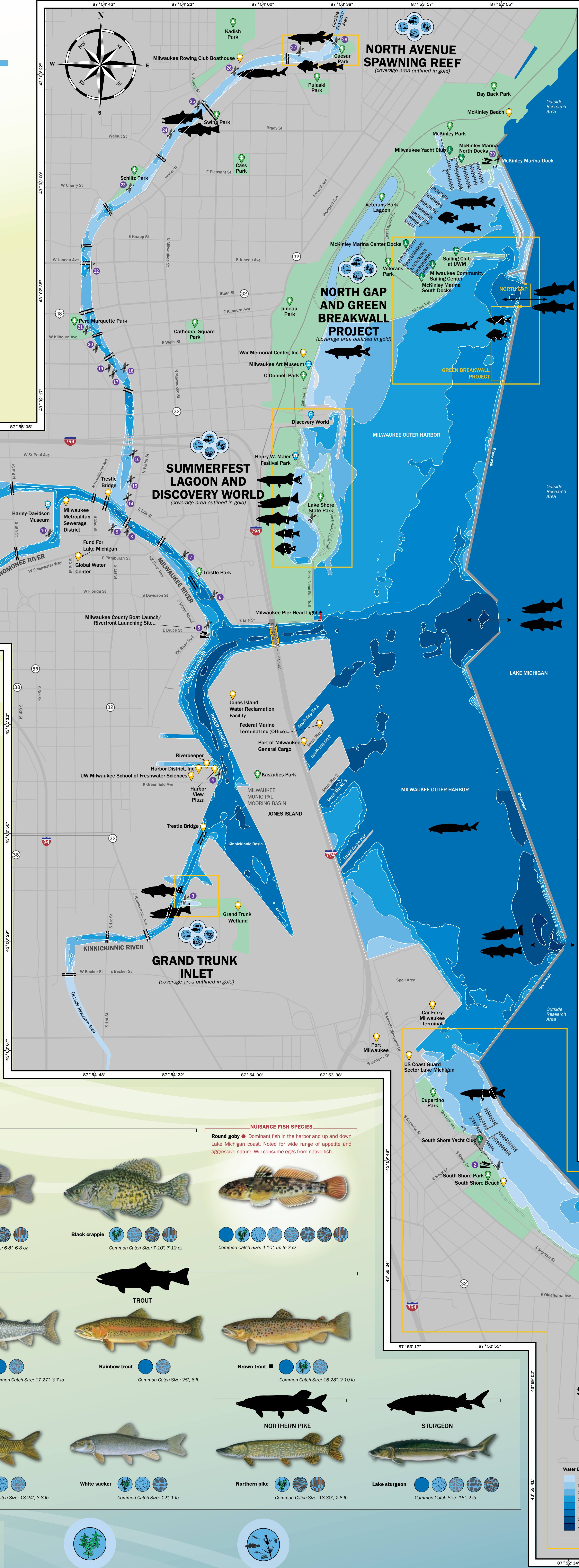
BASS

Largemouth bass Common Catch Size: 12-14", 1 lb	Smallmouth bass Common Catch Size: 12", 1-2 lb	Common carp Common Catch Size: 18-24", 3-8 lb	White sucker Common Catch Size: 12", 1 lb	Northern pike Common Catch Size: 18-30", 2-8 lb	Lake sturgeon Common Catch Size: 16", 2 lb
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CONNECTIVITY AND BARRIERS

Fish and other aquatic organisms move about the harbor in search of food and shelter. Connected habitats allow an organism to move from one place to another. Each species has different conditions under which it will and will not move.



HABITAT HOTSPOTS

Research conducted at UW Milwaukee School of Freshwater Sciences identified six "Habitat Hotspots" in the Milwaukee Harbor. Substrate, Vegetation, and Forage all play important roles in providing suitable habitat for aquatic organisms such as fish, as do other factors such as water temperature. The Burnham Canal, Grand Trunk Inlet, Green Breakwall at the North Gap, North Avenue Spawning Reef, South Shore Park, and the Summerfest and Discovery World Lagoon are all Habitat Hotspots in the Harbor. Each provides different types of habitat supporting a variety of aquatic organisms at different times of the year.

NON-NATIVE AND NUISANCE SPECIES

Non-Native Species
Many organisms found in the Milwaukee Harbor, its tributary rivers and Lake Michigan proper are not native to the Great Lakes. Some, like alewives, smelt, round gobies, or zebra and quagga mussels, arrived because of human carelessness or through the opening of the St. Lawrence Seaway. Others, like the chinook and coho salmon, were deliberately placed in the Great Lakes to create an economic boon for the region in the form of a world-class sport fishery. Now these species are part of the ecosystem, for better or for worse.

Stocking
Lake Michigan is a managed ecosystem. To maintain some species of fishes at desirable levels, regulatory natural resources agencies in surrounding states routinely stock both native and non-native species. Examples of stocked fish include lake sturgeon, lake trout, and coho and chinook salmon. These fish often become residents in the harbor or find their way in to reproduce.

Nuisance Species
Not all non-native species are a rise to the level of nuisance, but some have become dominant in the Harbor and cause significant ecological and economic damage. To avoid spreading these nuisance species, be sure to inspect, clean, and drain your boat before leaving the lake and do not transport live animals or plants.

INVERTEBRATE Quagga mussels	VEGETATION Eurasian watermilfoil
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Lake Michigan's dominant species. Scientists estimate 900 trillion strip the water of plankton serving as base of the food web. A major reason for increase in water clarity and an ecological shift in the lake. Note for harming offshore fisheries, damaging boats, shoreline structures, and water supply pipes.

Often outcompetes native plant species due to flowering and reproductive traits. Causes recreational, economic and ecological damage. Also provides cover for young panfish and bass while supporting invertebrate colonization that fish and ducks eat.

RESEARCH AND METHODOLOGY

The Milwaukee Harbor Habitat Map is based on research of scientists and students in the Janssen lab at the UW-Milwaukee School of Freshwater Sciences. A full technical map was created using GIS, outlining nursery and forage habitat in the Harbor, and provided to experts and stakeholders. Tools used during the research include:

- Side-Scan Sonar**
Side-scan sonar uses pings of sound to generate images of the Harbor bottom. Pings that bounce off physical objects produce darker or lighter images depending on the rate of return or no return. It is similar to shining a flashlight in a dark room to reveal what is inside.
- Diving and Groundtruthing**
A variety of methods were used to conduct targeted inventories of substrate, submerged vegetation, invertebrate forage, and assessment of larval fish production. This included scuba diving in key locations within the Harbor itself. Water depths were gathered using high-end transducers to generate a contour map of the entire research area. Vegetation and fish inventories were collected through rake sampling and observational surveys. They were further enhanced by data gathered from the Nature Conservancy and the United States Geological Survey.

Resources

- UW-Milwaukee School of Freshwater Sciences | Research Projects
- UW-Milwaukee School of Freshwater Sciences | Harbor Habitat Maps | UW-Milwaukee Harbor Habitat Maps Research Project
- Wisconsin Department of Natural Resources
- Fishes of Wisconsin
- Nuisance Species
- Public Access | 50 Places to Fish From Shore Within 60 Minutes of Downtown Milwaukee
- Fund for Lake Michigan | Health of Lake Michigan, Its Shoreline and Tributaries
- Harbor District, Inc. | Revitalization of Milwaukee's Harbor
- Milwaukee Riverkeeper | Protect, Restore, Connect and Advocate for the Three Milwaukee Tributaries
- Urban Water Trail Map

BOAT LAUNCH (Hand-carry)

1 Bay View Park	10 Skippers Marina/Barnacle Buds	19 Plankinton Alley/E Wells Street
2 Harbor View Plaza	11 Waterfront Condos	20 Pave Marquette Park
3 Erie Street Pier	12 Screaming Tuna	21 The Harp Irish Pub
4 Marine Terminal Lofts	13 Harley-Davidson Museum	22 Schiltz Park
5 Waterfront Condos	14 Burnham Canal	23 Trostel Square Condos
6 Screaming Tuna	15 Taisled Fisherman	24 Lakefront Brewery
7 Harley-Davidson Museum	16 N Embury Lane	25 Milwaukee Rowing Club Boathouse
8 Burnham Canal	17 Chicago Street	26 Milwaukee Landing
9 Taisled Fisherman	18 Milwaukee Ale House/E Buffalo Street	27 North Avenue Rapids Downstream Portage

BOAT LAUNCH (Trailer Access)

1 McKinley Marina	2 Milwaukee County Riverfront Launching Site	3 South Shore Park
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Water Depth (feet)

- < 5
- 5 to 10
- 10 to 15
- 15 to 20
- 20 to 25
- 25 to 30
- 30 to 35
- > 35

VEGETATION

Submerged vegetation is an important factor in providing suitable habitat for aquatic organisms. Vegetation provides structure, cover from predation, and offers a nursery environment for young fishes by containing a variety of small prey, such as invertebrates. Vegetation growth and presence is influenced by physical conditions such as quality of sediments, water depth and clarity, and water quality. The optimal plant cover for each fish species varies, as some use it for protection while nesting and others use it for ambushing their prey.

FORAGE

ADULT PREDATOR FISH

- Brown trout
- Lake trout
- Largemouth bass
- Smallmouth bass
- Coho salmon
- Northern pike

FORAGE FISH

- Round goby
- Alewife
- Rainbow smelt
- Emerald and spottail shiner

FORAGE INVERTEBRATES

- Diatoms (microscopic)
- Scud
- Copepod
- Water flea
- Bloody red shrimp
- Rusty crayfish
- Zebra mussel
- Quagga mussel
- Midge

FORAGE VEGETATION

- Flamboyant algae