# HEC fish/macrophyte associations

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- Michigan Department of Natural Resources, Lake St. Clair Fisheries Research Station
- With lots of help from USGS Great Lakes Science Center and others

Michigan DNR
Michigan Dept. of Natural Resources

USGS
Great Lakes Science Center

# Environmental and Conservation Issues:

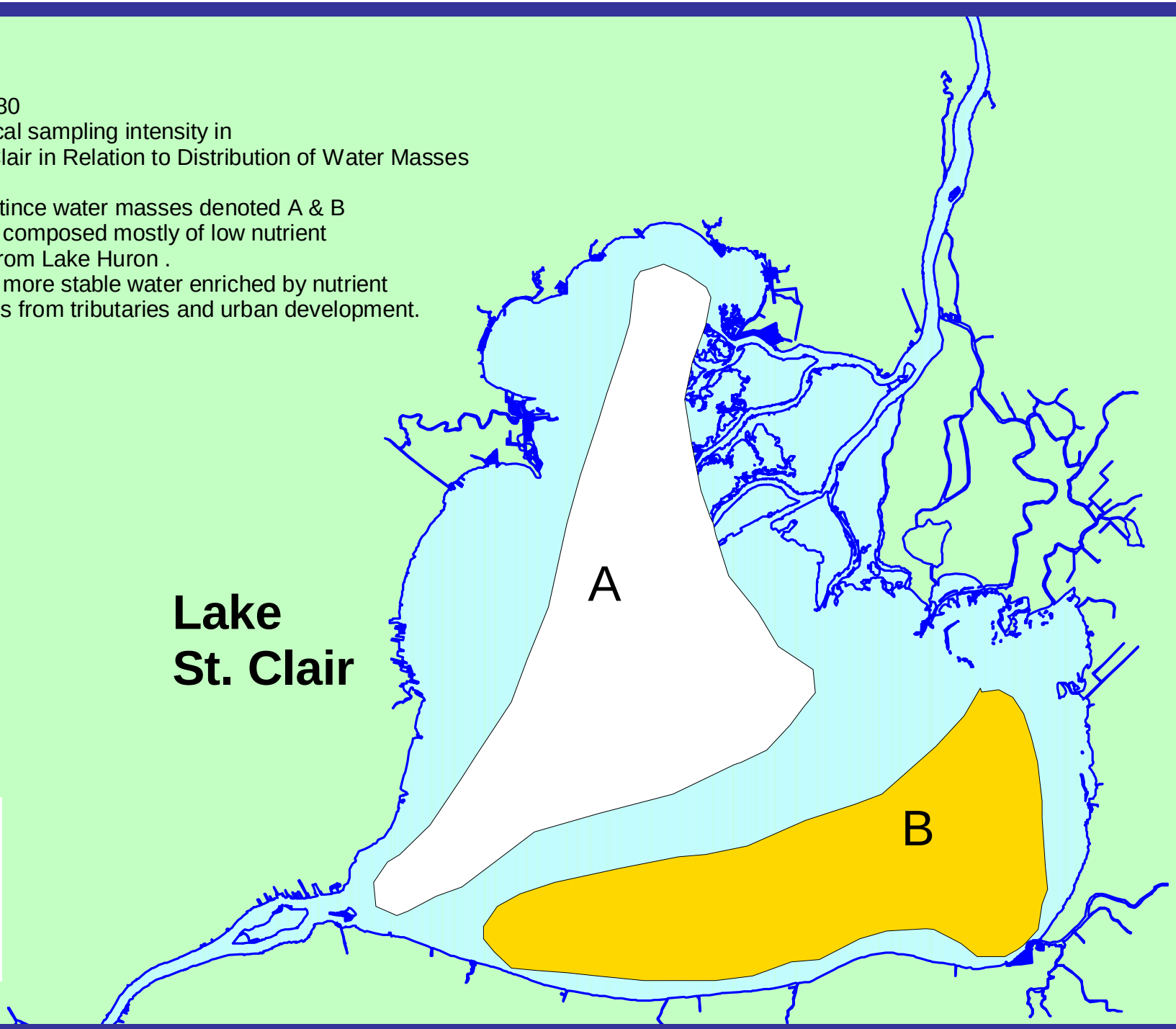
## Lake St. Clair

Wild Celery

- **Native aquatic plants have increased which improved wildlife habitat but also created some public controversy**
- **Smallmouth bass, muskellunge, and yellow perch populations have increased**
- **Hardening of the shoreline, dredging, and increasing recreational boating continue to limit wildlife and fish habitat**
- **Exotic organisms have colonized the lake**
- **Fish diseases and contaminants continue to be present**
- **Very recently, walleye and yellow perch fishing has declined**

Leach, 1980
Limnological sampling intensity in
Lake St. Clair in Relation to Distribution of Water Masses

1. Two distince water masses denoted A & B
2. Mass A composed mostly of low nutrient
   water from Lake Huron .
3. Mass B more stable water enriched by nutrient
   loadings from tributaries and urban development.




Ontario
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A
B

# Historical Context

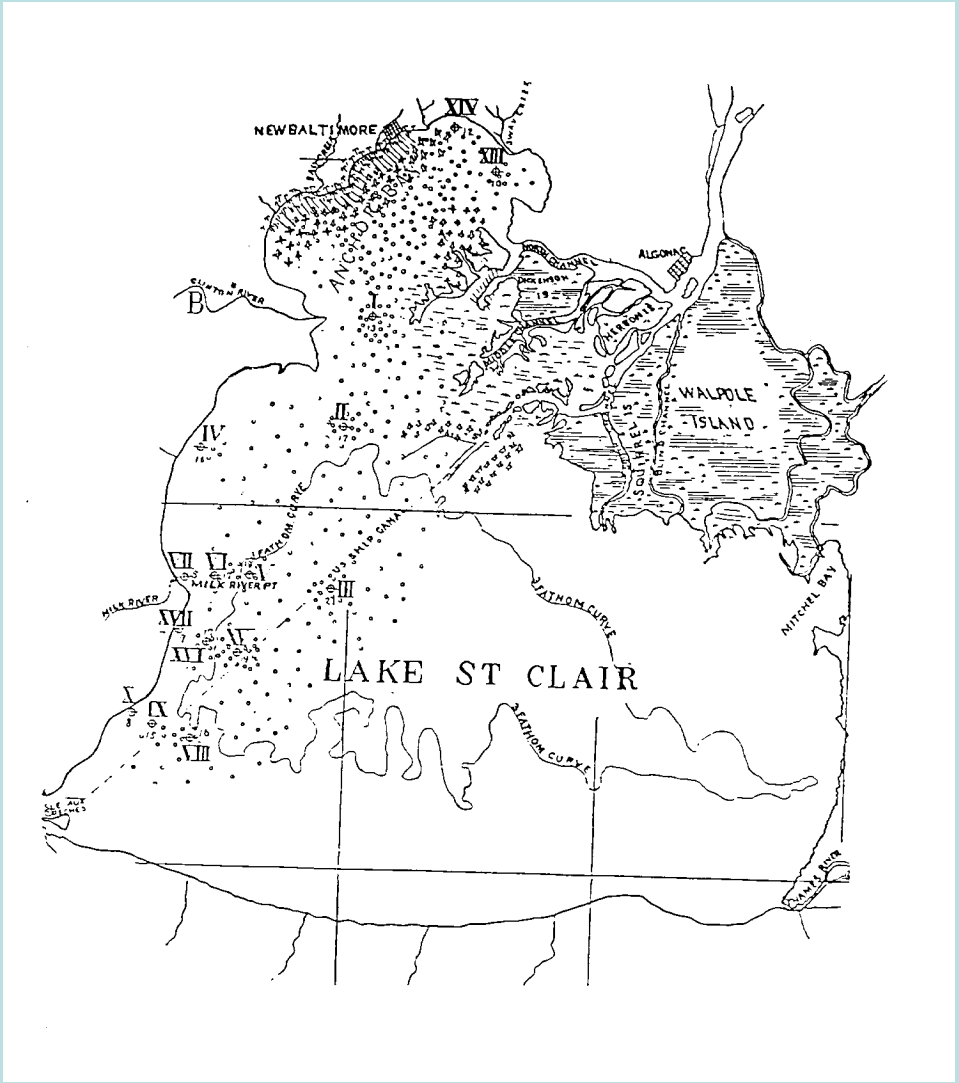
Taken from a July 15, 1842 report to the U. S. Senate from J. C. Spencer, Secretary of War.

"Lake St. Clair is not more than seven miles wide in this part, and yet, the whole mass of waters of the lakes are discharged through it at this point, over, one may almost say, a bed of subaqueous vegetation; the sides of the steamboat in passing through the channel are swept on either side by the rushes"

# 1890 Aquatic Plant Study of Michigan waters

"The bottom of the lake wherever examined [*US side*], was found to be covered by plants [*much Chara*]. It is probable that they also covered the bottom of the whole lake [*ontario side*]."

Quote taken from: Pieters 1893; "The plants of Lake St. Clair"

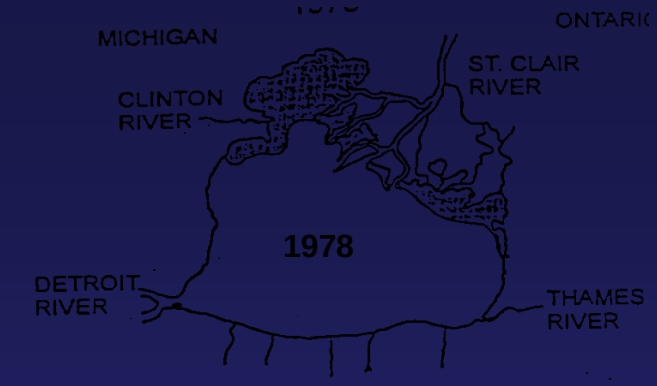


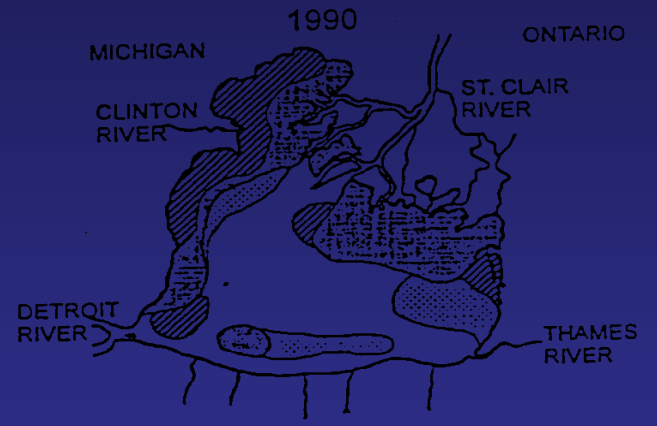

Summer of '94
This stinks!

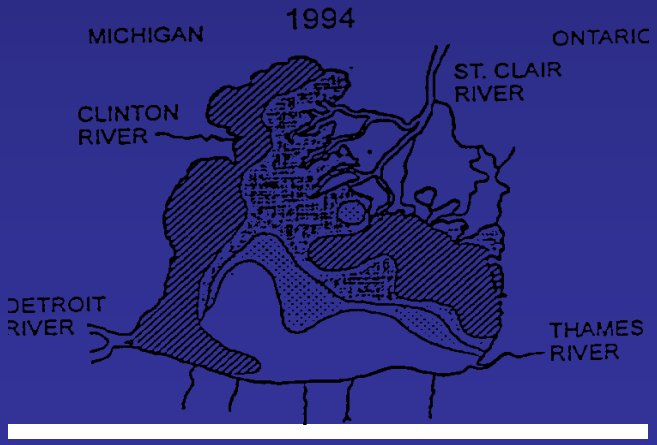
# Rooted Aquatic Plants

## What happened in 1994?

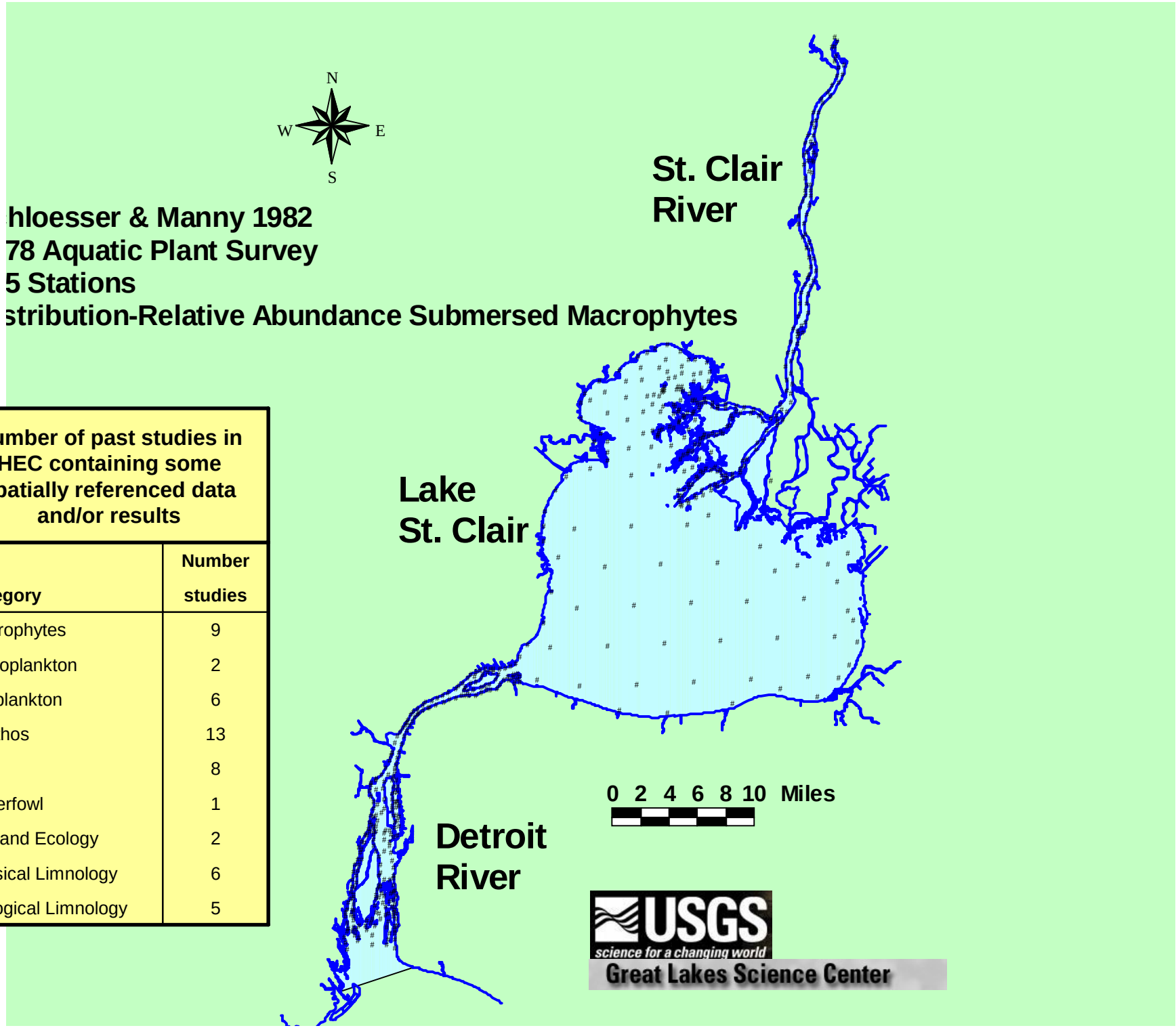
1. **Many assumed 1978 was good.**
2. **Compared 1990 and 1994.**
3. **Reasoned that changes were bad because of floating vegetation and bacteria problems in 1994.**
4. **Actually, 1994 was much closer to original, natural condition.**


1990 & 1994 taken from Griffiths: “Unpublished maps of aquatic plants in Lake St. Clair” Ontario Ministry of Environment and Energy.




hloesser & Manny 1982
78 Aquatic Plant Survey
5 Stations
stribution-Relative Abundance Submersed Macrophytes

**Number of past studies in HEC containing some spatially referenced data and/or results**

| Category | Number studies |
|---|---|
| Macrophytes | 9 |
| Phytoplankton | 2 |
| Zooplankton | 6 |
| Benthos | 13 |
| Fish | 8 |
| Waterfowl | 1 |
| Wetland Ecology | 2 |
| Physical Limnology | 6 |
| Biological Limnology | 5 |

## Square kilometers colonized by macrophytes

| | 1978 | 1995 | Percent change |
|---|---|---|---|
| Lower St. Clair River | 26 | 26 | 0.0 |
| Anchor Bay | 147 | 155 | 2.6 |
| Lake St. Clair | 153 | 818 | 68.5 |
| Total | 326 | 999 | 50.8 |

## Taxonomic Composition by Decreasing Frequency of Abundance

| | 1978 | 1995 |
|---|---|---|
| Chara | 1 | 1 |
| Wild celery | 2 | 4 |
| Slender naiad | 3 | 2 |
| Eurasian watermilfoil | 4 | 5 |
| Elodea | 5 | 6 |
| Clasping-leaf pondweed | 6 | 3 |
| Narrow-leaf pondweeds | 7 | 7 |
| Water stargrass | 8 | 8 |
| Broad-leaf pondweeds | 9 | 9 |
| Native milfoil | 10 | 11 |
| Curly-leaf pondweed | none | 12 |
| Water bulrush | none | 13 |

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## Poe, Hatcher, Brown, and Schloesser, 1986

## Comparison of Species Composition and Richness of Fish Assemblages in Altered and Unaltered Littoral Habitats

1. Muscamoot Bay was unaltered containing historically dominant plant, invertebrate, and fish community.

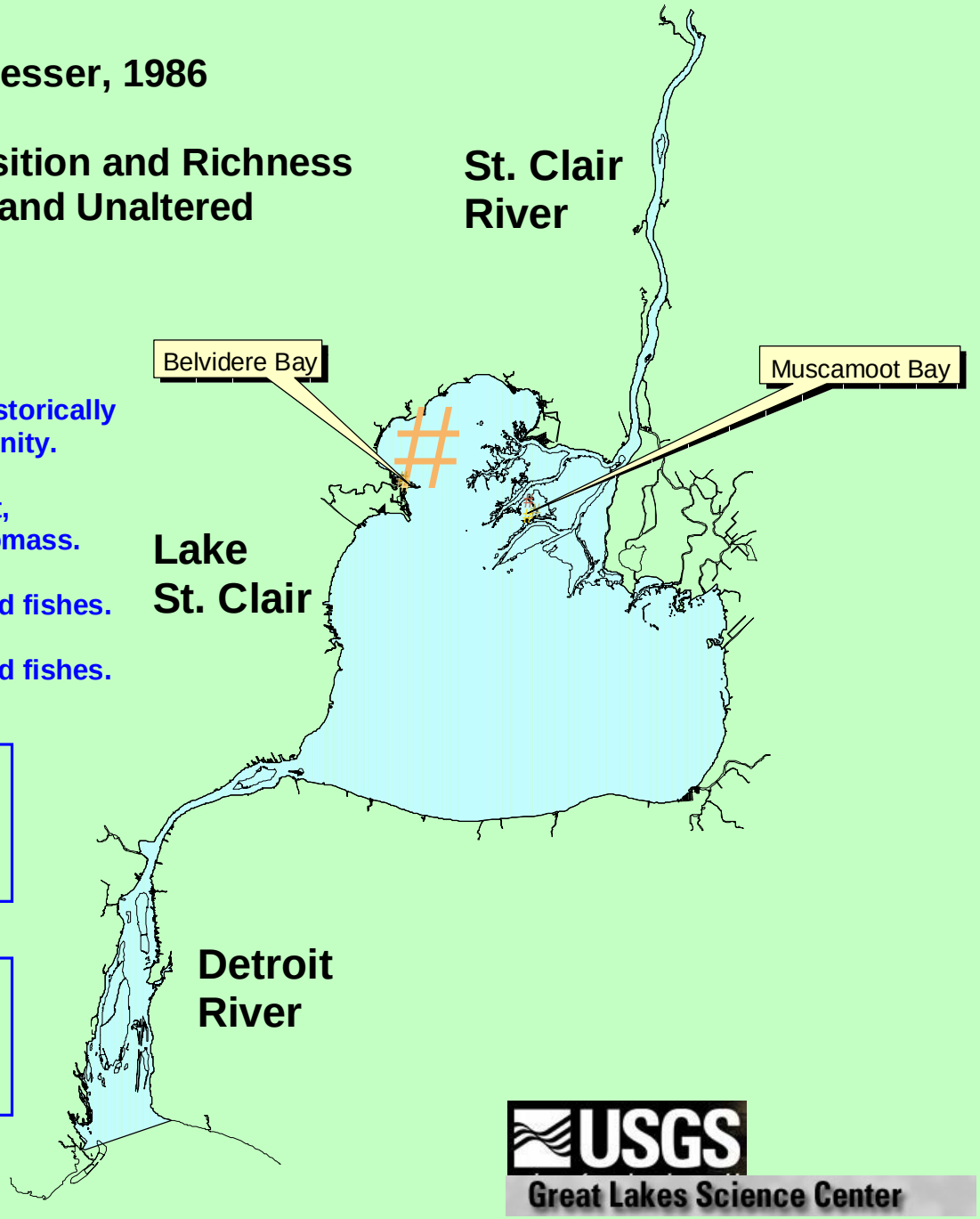
2. Belvidere Bay was degraded with lower plant, invertebrate, and fish diversity but higher biomass.

3. Muscamoot Bay dominated by percid-cyprinid fishes.

4. Belvidere Bay dominated by small centrarchid fishes.

A related study by Brown, Poe, French, and Schloesser (1988) showed that more diverse plant communities in Lk. St. Clair contained more invertebrate organisms

Another study by French (1988) showed that numbers of prey and gut volumes of rock bass and pumpkinseeds increased with increasing plant canopy

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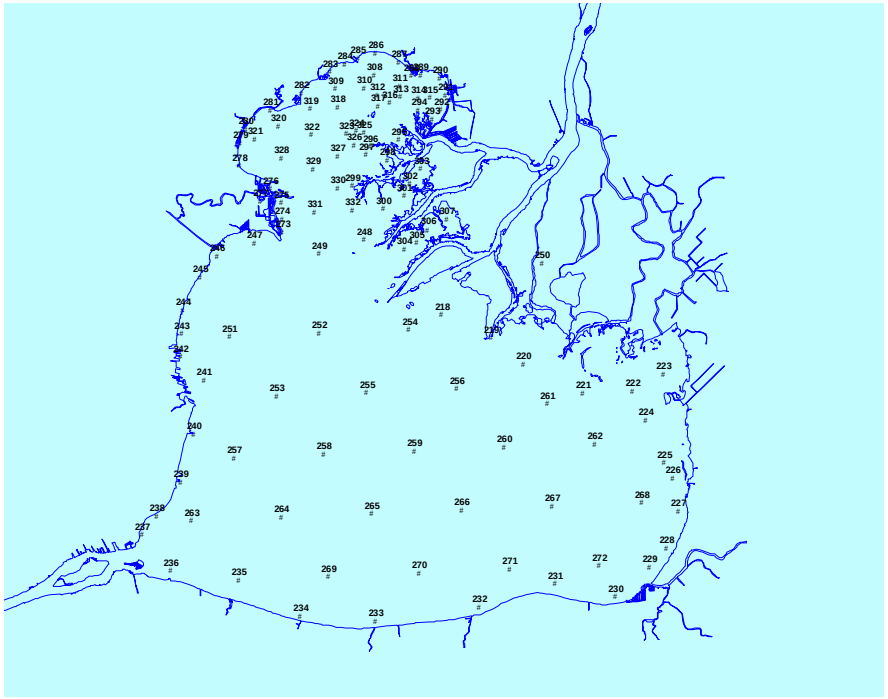
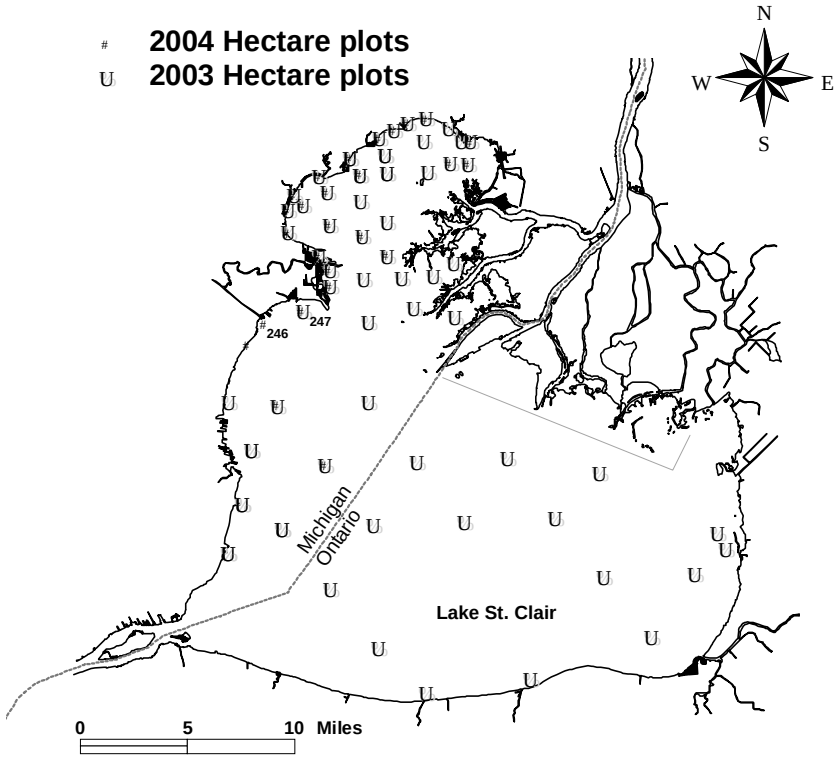
# MDNR Long-term research project underway to monitor submerged plant community including percent coverage and biomass






115 plant stations sampled with a hook in 1978 by USGS

Michigan Dept. of Natural Resources

Our sampling of subset of 1978 stations with combination of hook and hydroacoustic equipment

**In addition to hydroacoustic data, plant hook samples are collected:**

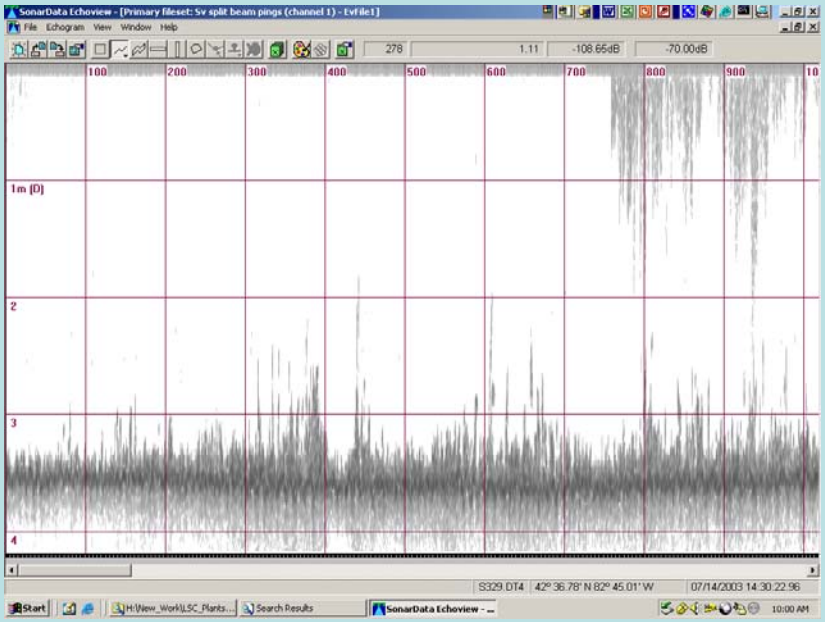
1. **To identify plant species**
2. **Compare with historical data**

Collecting wet weight by species may allow conversion of previous data to approximate biomass

Michigan Dept. of Natural Resources

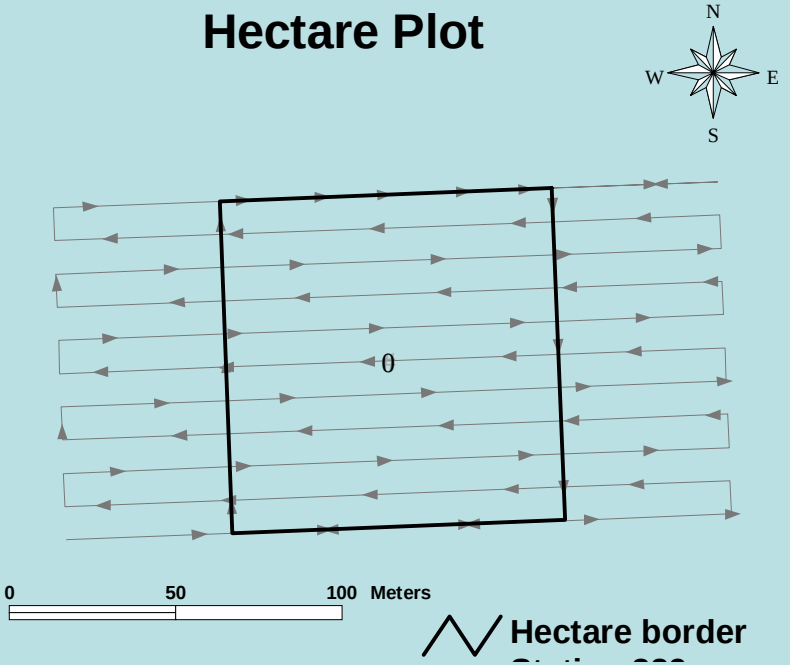
# Oakland University and MDNR Research Project: Aquatic Vascular Plants of Lake St. Clair: A survey of community status and interactions with the exotic zebra mussel

**conducted by Dr. Douglas Hunter, Sarah Cholder-Blust, and Robert Haas, assisted by volunteer divers from InterSeas Exploration, Ltd., Sea Cadet Corps.**



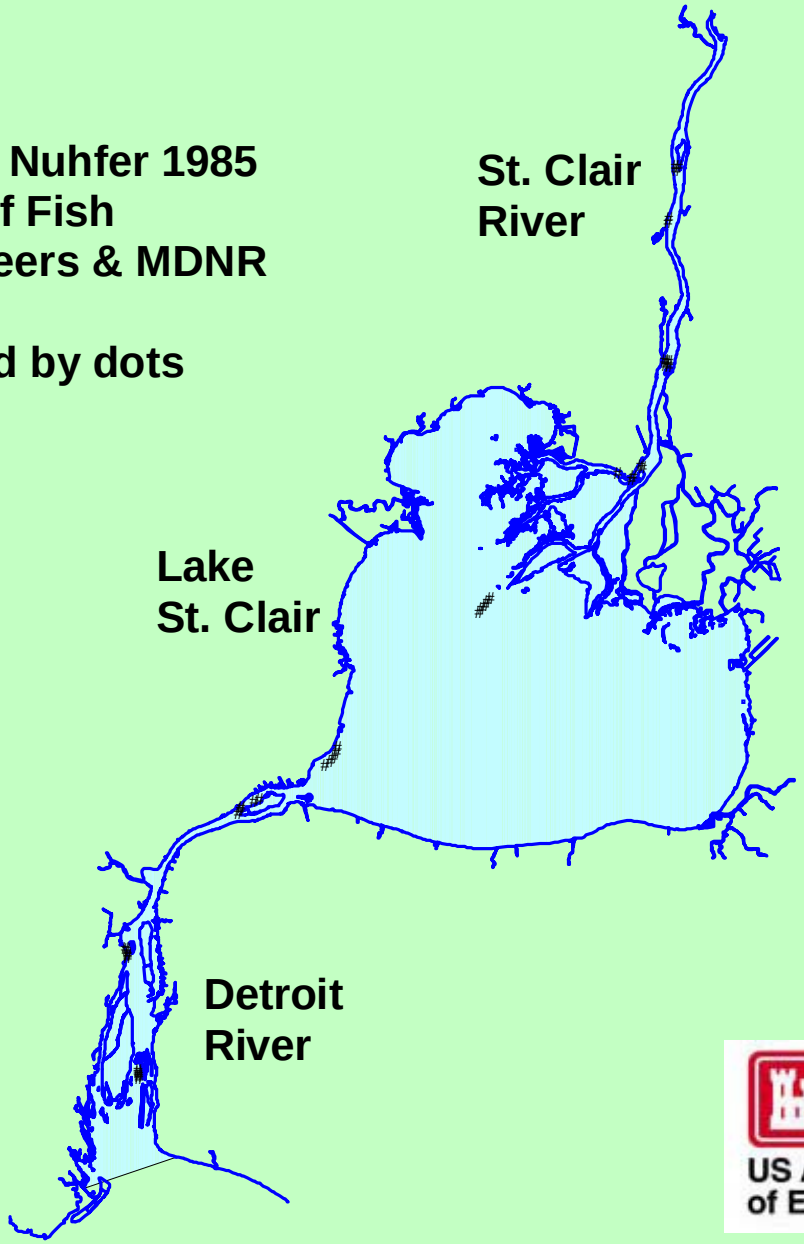

Screen-shot from EchoView© software with submerged plants clearly visible on lake bottom.

## Hectare Plot




Typical square hectare plant sampling plot centered on 1978 USGS sampling station. Dark border outlines hectare sample area and lighter gray line shows route of 11 transects at 10-m intervals followed by survey boat during hydroacoustic sampling. Hook tosses were typically made at center of hectare area.

**Haas, Bryant, Smith, and Nuhfer 1985**
**Movement and Harvest of Fish**
**US Army Corps of Engineers & MDNR**
**Winter Navigation Study**
**40 trap net sites indicated by dots**

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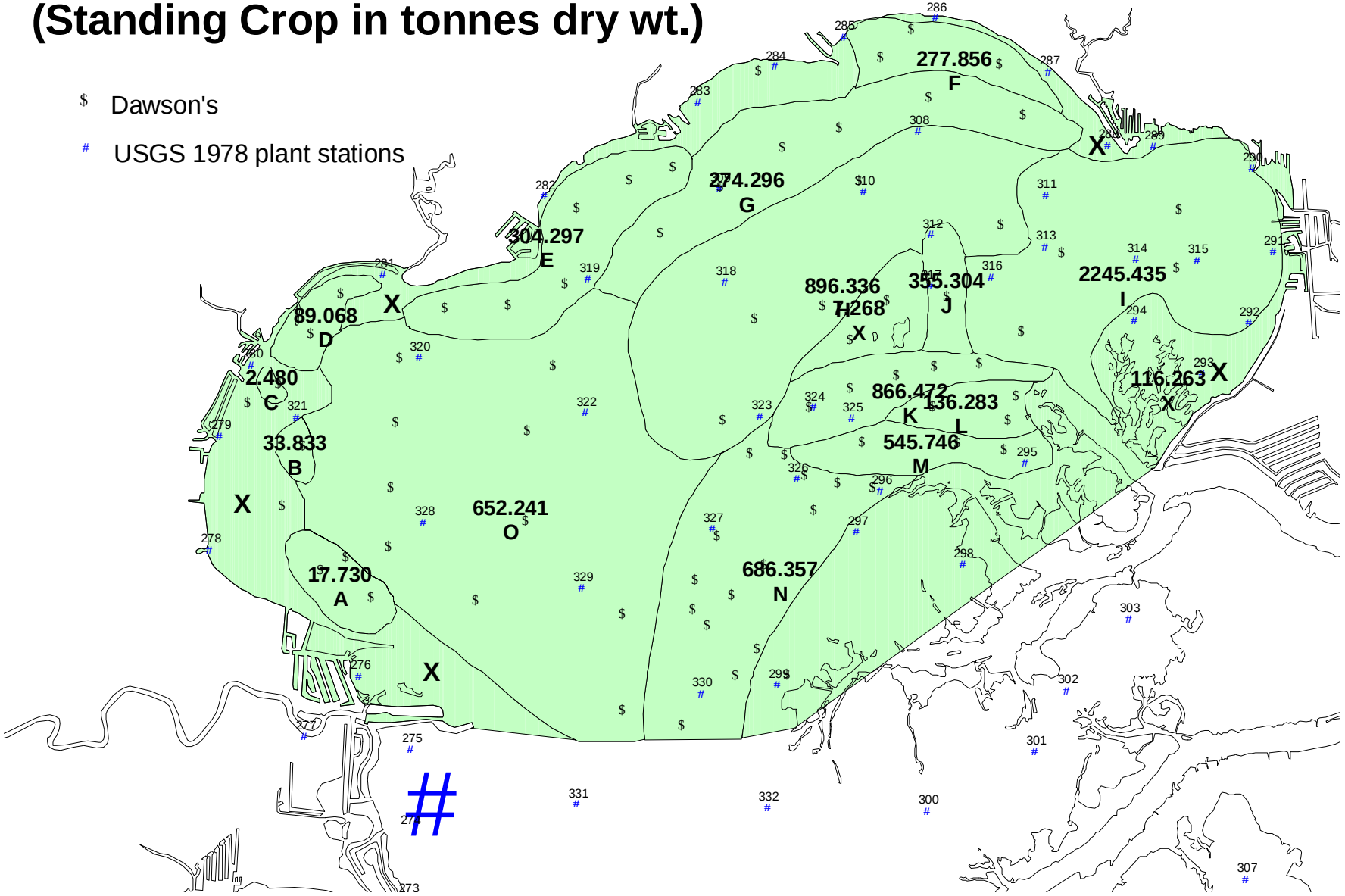
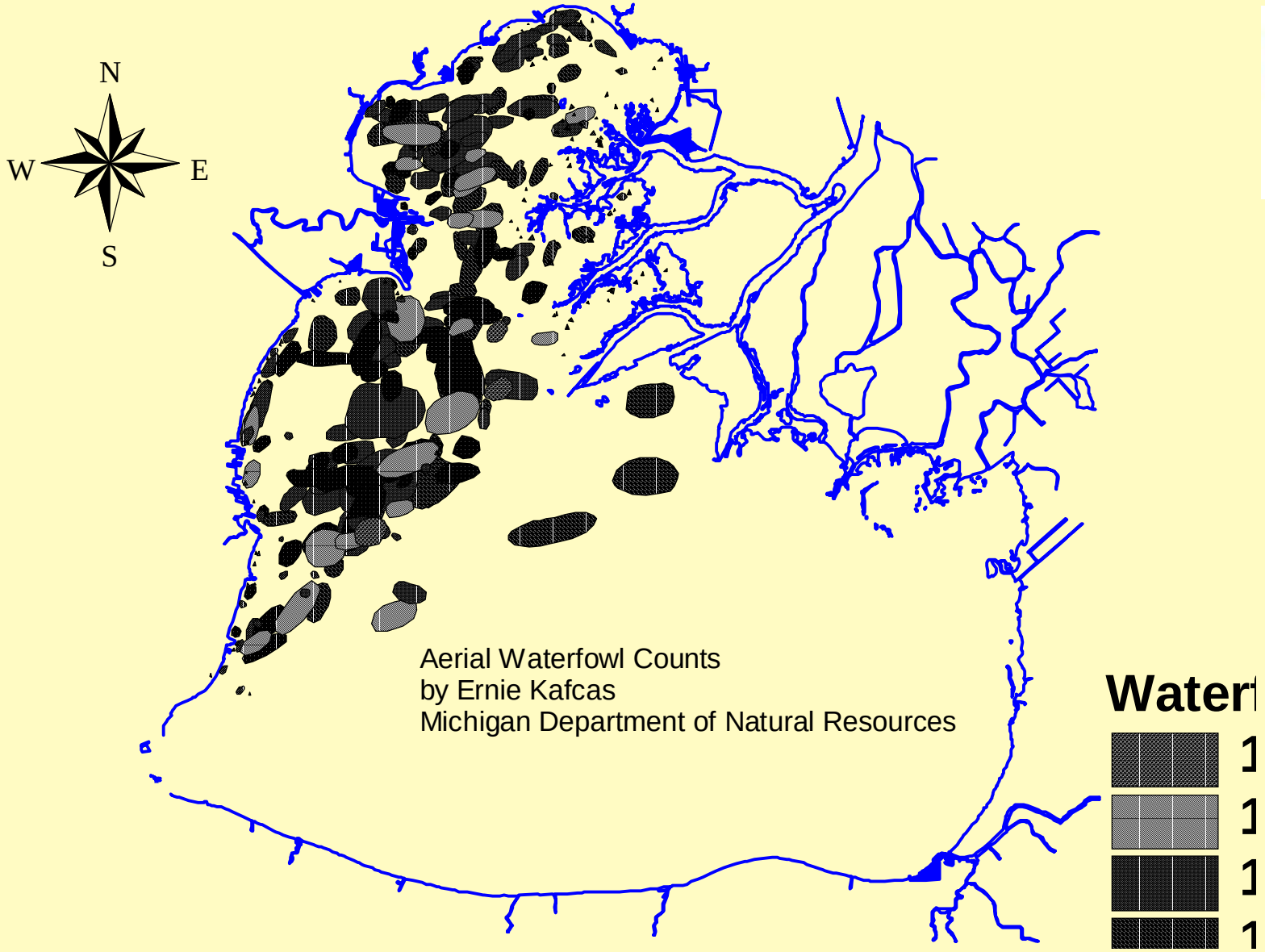
# Vegetation map from Dawson's 1975 thesis on waterfowl food & feeding (Standing Crop in tonnes dry wt.)




N
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Michigan
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Resources
Aerial Waterfowl Counts
by Ernie Kafcas
Michigan Department of Natural Resources
Water

# Wetzel, 1995. “Death, detritus, and energy flow in aquatic ecosystems”.

Quote: “large, and slow, metabolism of detritus provides an inherent ecosystem stability that energetically dampens the ephemeral, volatile fluctuations of higher trophic levels.”

**Willans, 1996 "Historic and Comparative perspectives on rehabilitation of marshes as habitat for fish in the lower Great Lakes basin"**

**Some problems identified:**

1. **Inorganic turbidity**
2. **Increased fetch**
3. **High (stable) water level**
4. **Channelization**

**Potential solutions through adaptive management:**

1. **Re-introduce vegetation**
2. **Reduce fetch**
3. **Exclude exotics**

# Lk St. Clair Has Habitat for Many Animal Species of Concern

Michigan's species of special concern are those having low or declining populations and are therefore in greatest conservation need

| Fish | Status |
|---|---|
| Mooneye | T |
| Lake sturgeon | T |
| Silver lamprey | SC |
| Silver chub | SC |
| Pugnose minnow | E |
| Black buffalo | SC |
| Spotted sucker | SC |
| Golden redhorse | SC |
| Brown bullhead | SC |
| Stonecat | SC |
| Tadpole madtom | SC |
| Brindled madtom | SC |
| Northern madtom | E |
| Grass pickerel | SC |
| Eastern sand darter | T |
| Channel darter | E |
| River darter | E |
| Sauger | T |

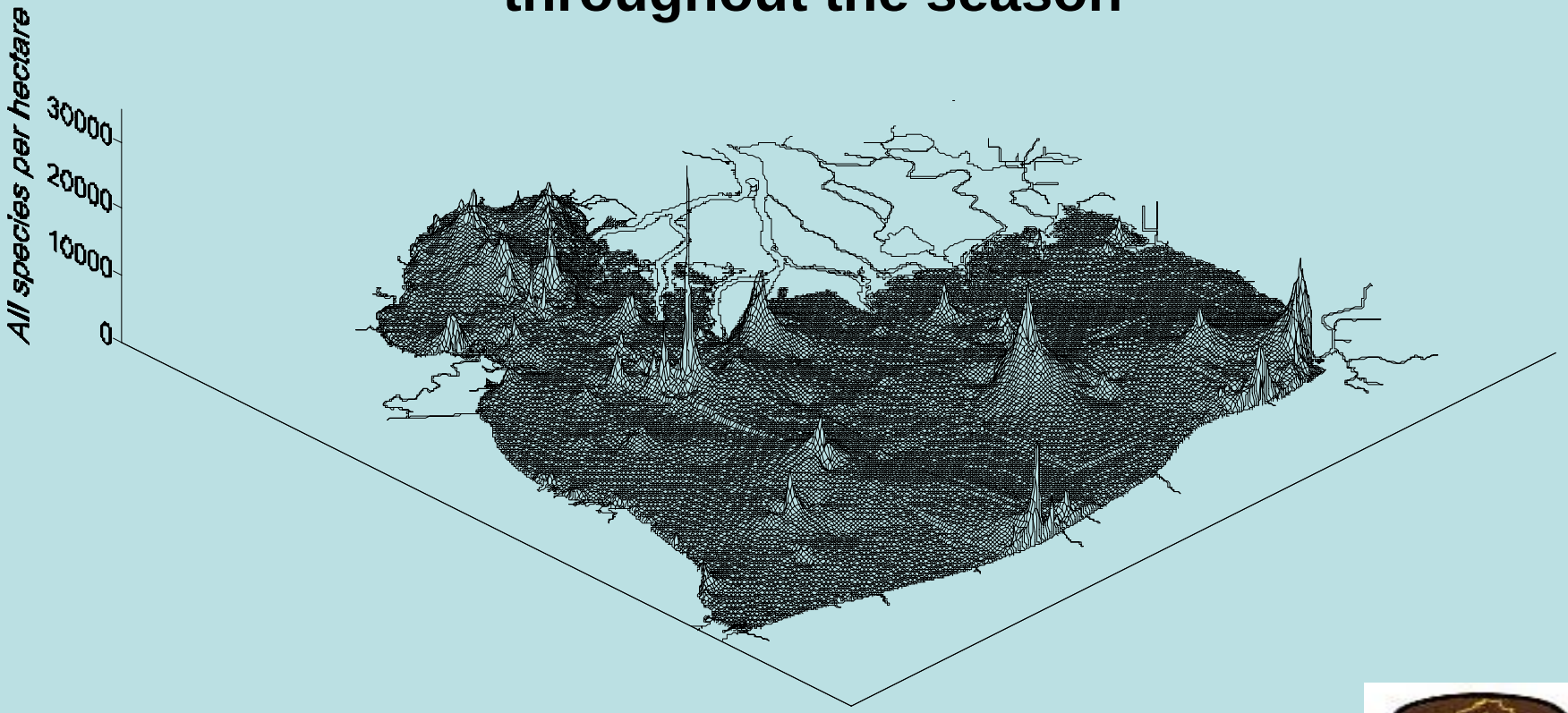
| Freshwater mussel | Status |
|---|---|
| Round pigtoe | SC |
| Rainbow | SC |
| Purple wartyback | SC |
| Pimpleback | SC |
| Eastern pondmussel | SC |
| Black sandshell | SC |
| Threehorn wartyback | SC |
| Round hickorynut | E |
| Kidneyshell | SC |

"E" = Endangered; "T" = Threatened; "SC" = Special Concern

18 fish and 9 mussels

Michigan DNR's new wildlife strategy (2004) is seeking partnerships with non-DNR entities to gather distribution information and improve habitat for these species.

# Estimated density (number per hectare) of fish based on bottom trawl catches throughout the season

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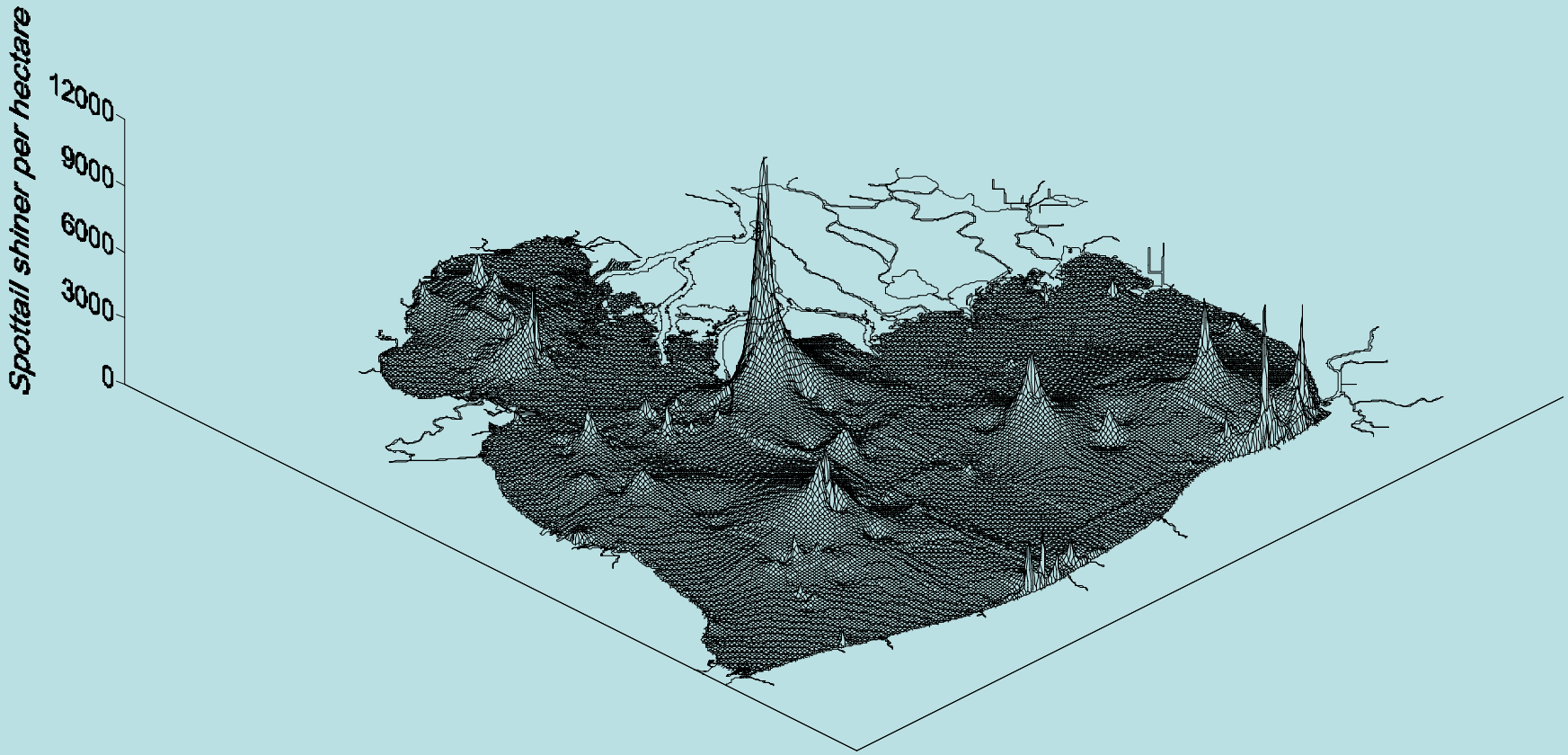
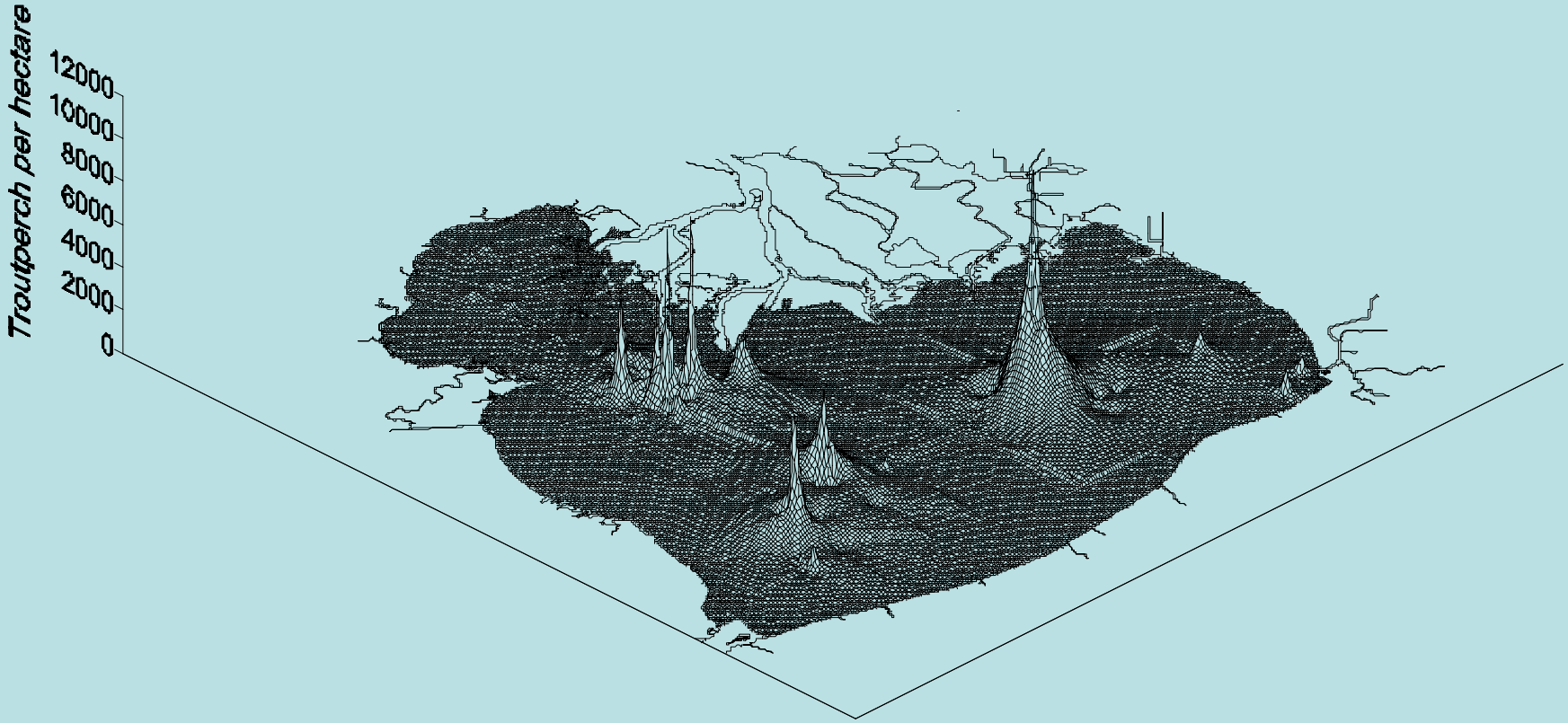
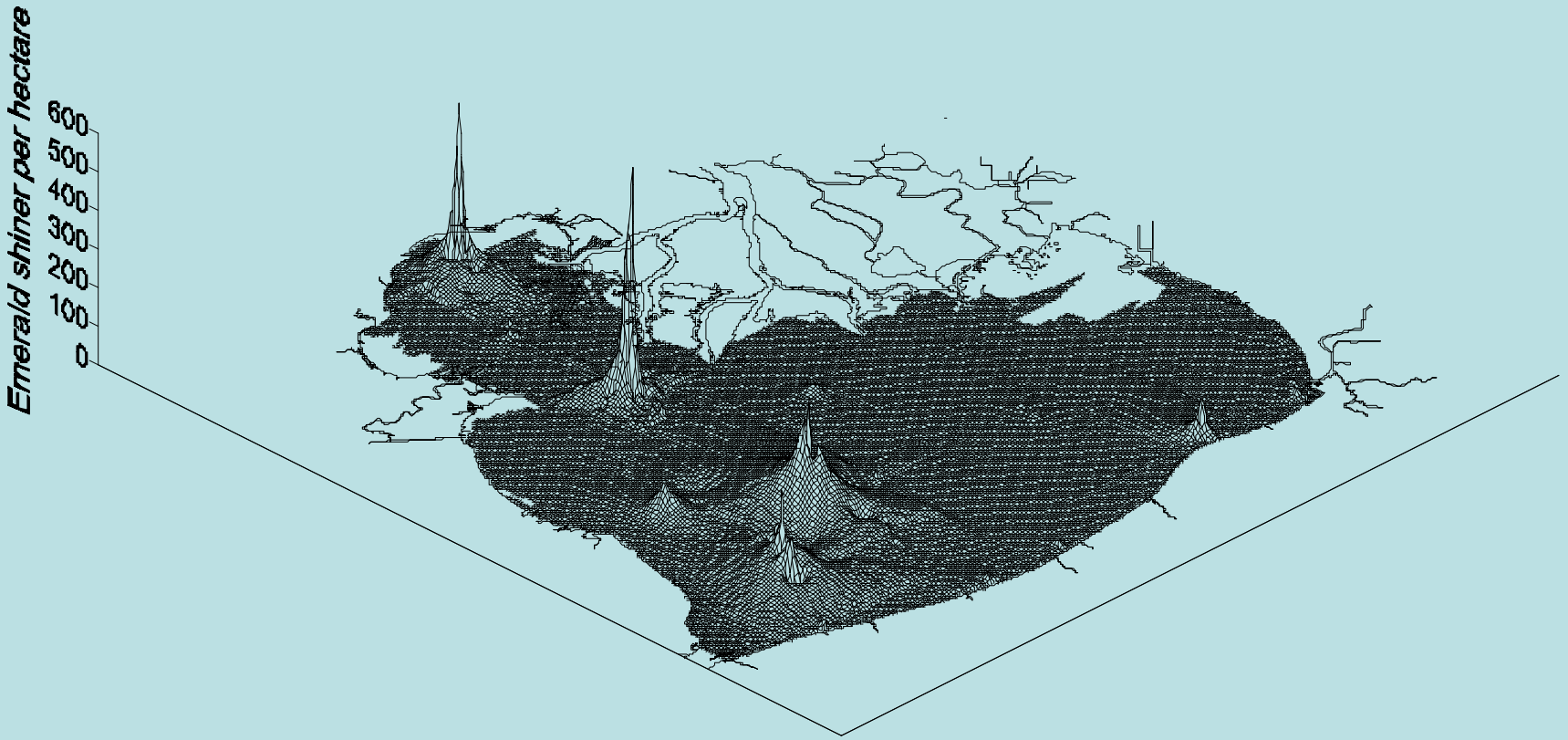
# Spottail Shiner



# Troutperch



# Emerald Shiner



# Mimic Shiner