

# Great Lakes Water Levels And Community Impacts



**MICHIGAN  
ASSOCIATION  
OF MAYORS**

**Summer Workshop  
August 13, 2021**

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Policy Director

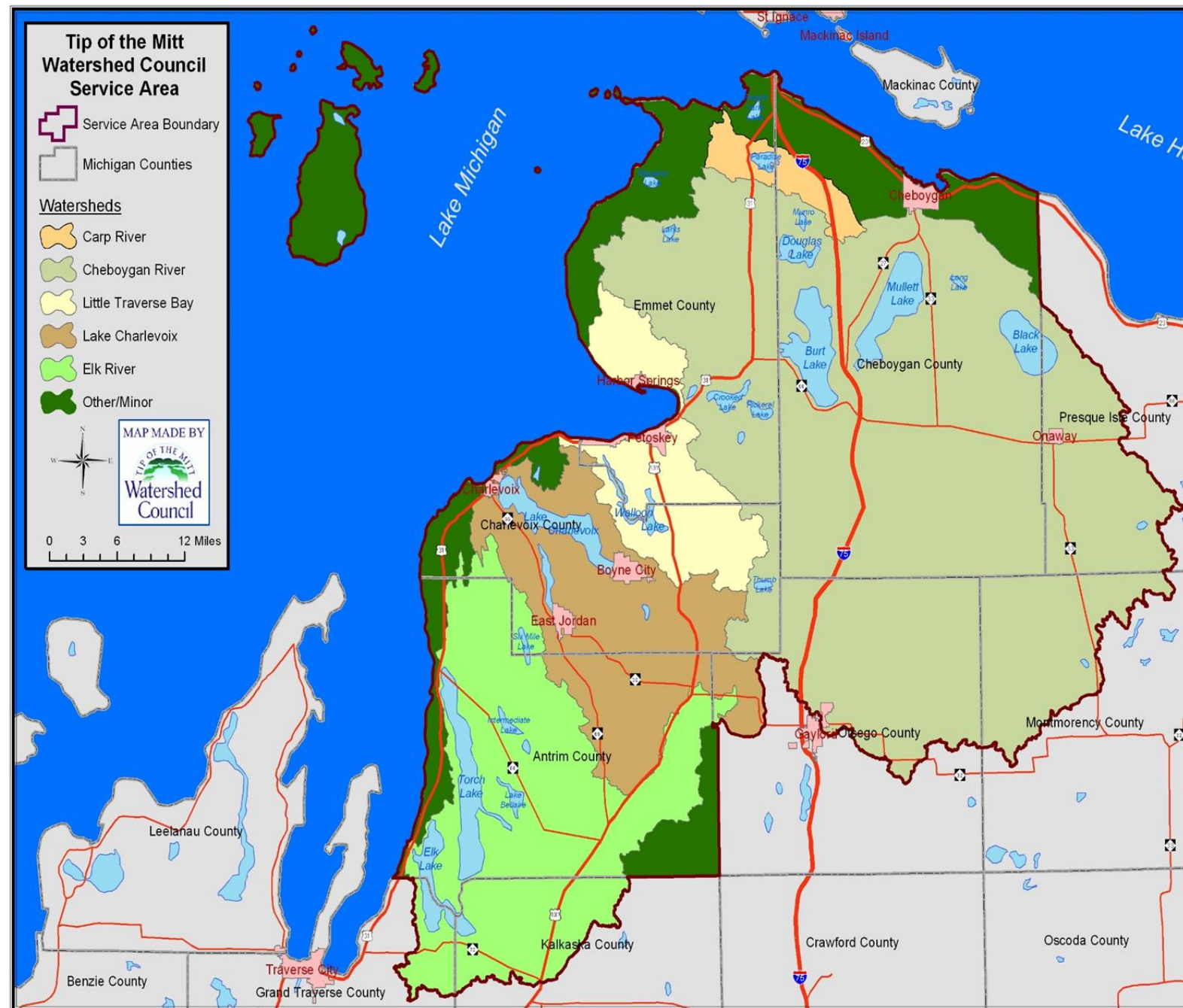
Tip of the Mitt Watershed Council



# Overview

- Understanding Water Level Changes
- Shoreline Protection and Best Management Practices
- Inland Lake Concerns
- Current Water Levels
- Policies and Policy Implications

# Tip of the Mitt Watershed Council



- Nonprofit formed in 1979
- Over 2,700 members

*The Watershed Council is dedicated to protecting our lakes, rivers, wetlands, and groundwater through respected advocacy, innovative education, technically sound water quality monitoring, and thorough research.*



Photo Credit: Jeff J. Cashman



Photo Credit: Mark Brederland, Michigan Sea Grant



Photo Credit: Brian Wells, Times Herald



Photo Credit: Steve Zucker, Petoskey News Review

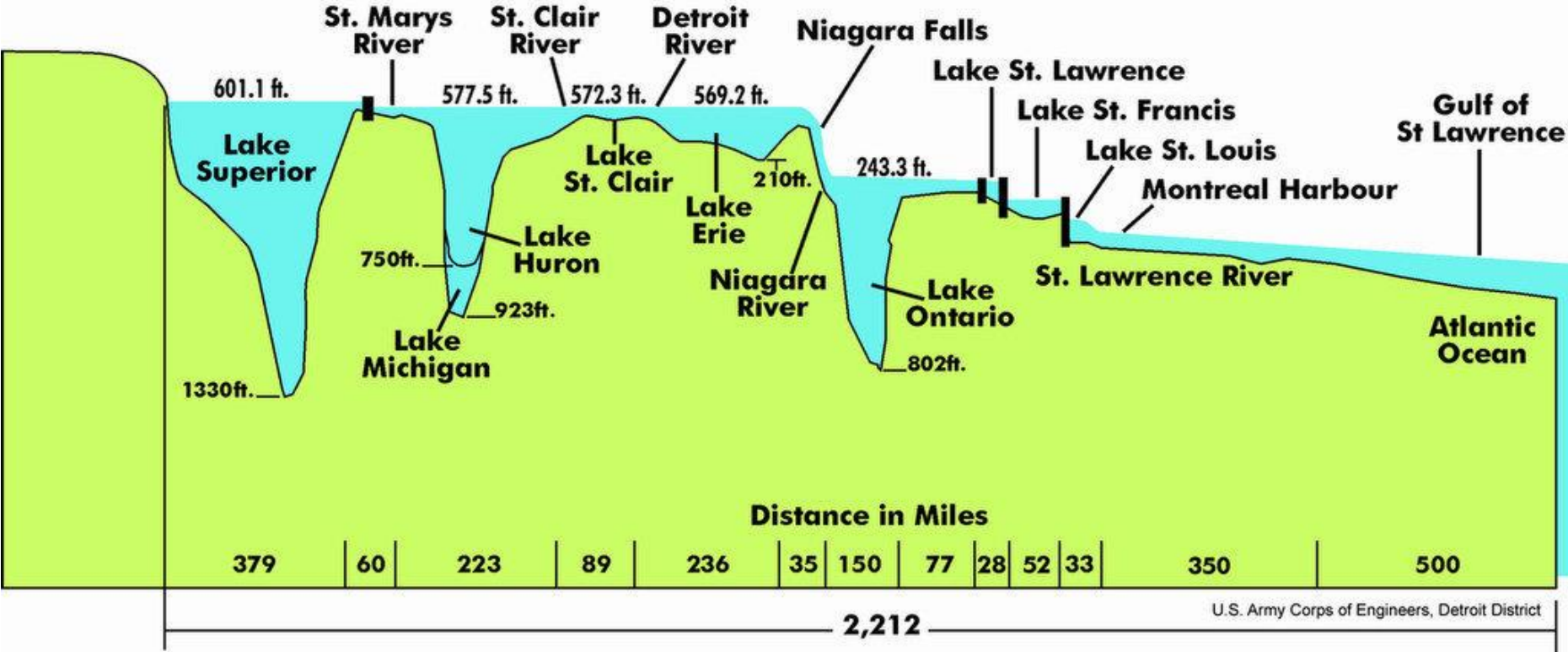
# Water Level Data

- Water levels are reported as an elevation above sea level (not a depth).
- Levels are referenced to the International Great Lakes Datum of 1985.
- Lake Michigan and Lake Huron are viewed as one lake
- Water levels are based on still water conditions, and do not take meteorological forcing into account.
- Daily reported levels are based on a network of water level gauges
- Coordination with Environment and Climate Change Canada (ECCC).
- Detroit District of the USACE is the keeper of the official monthly water level statistics from 1918-2020.



# Great Lakes Ecosystem

**Great Lakes System Profile**

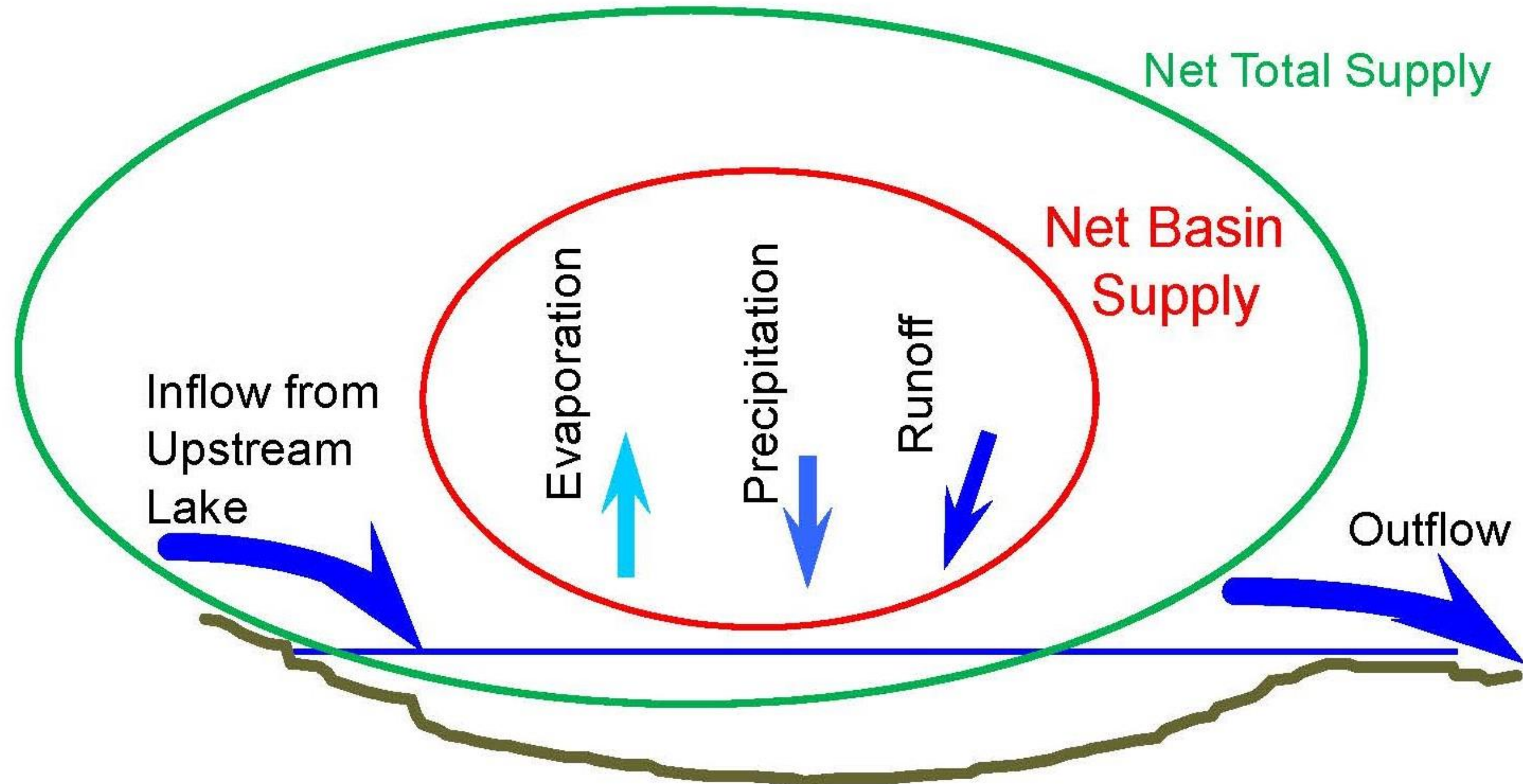


Credit: USACE



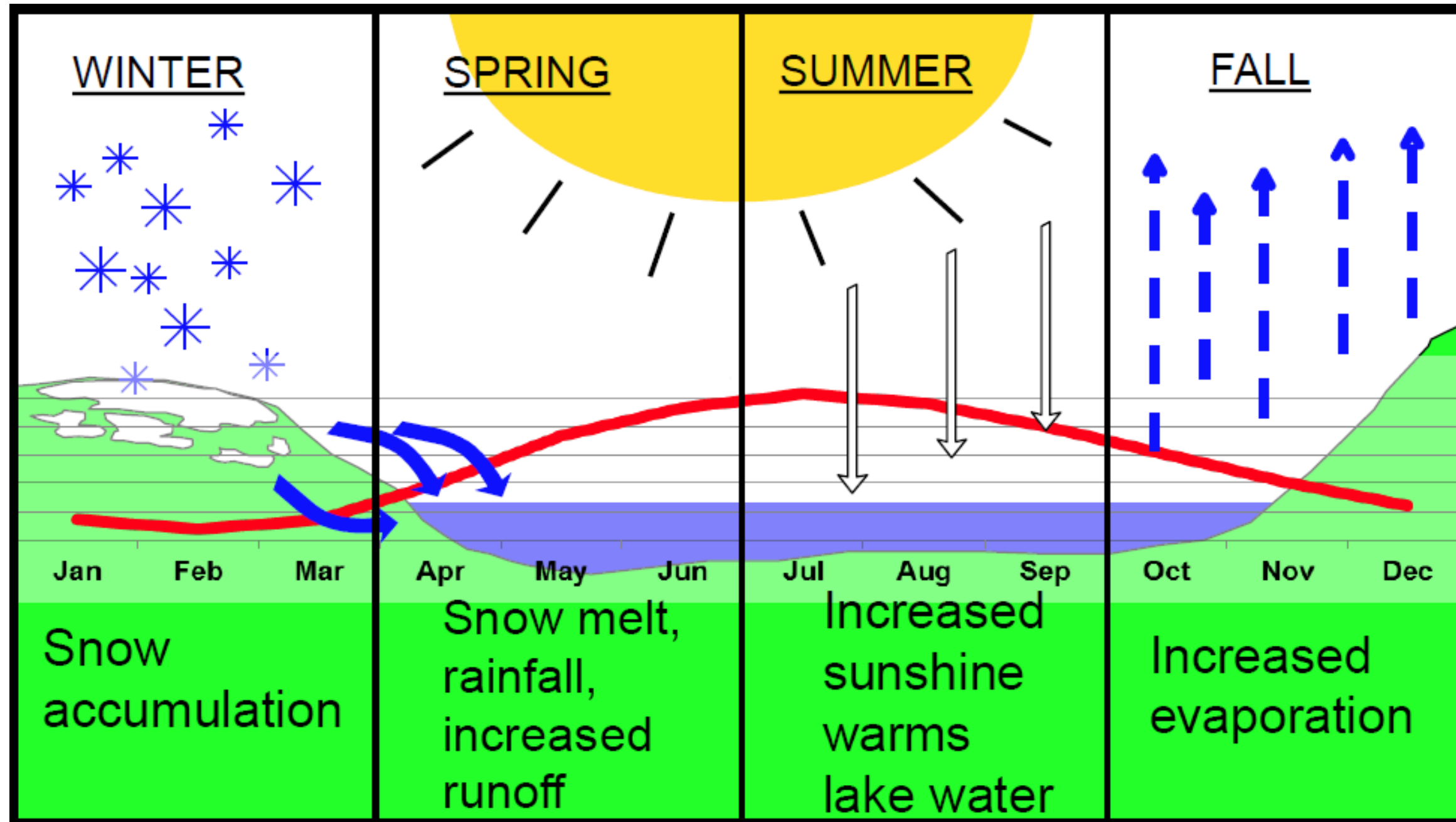
Credit: USEPA

# Factors Affecting Water Levels



Credit: USACE

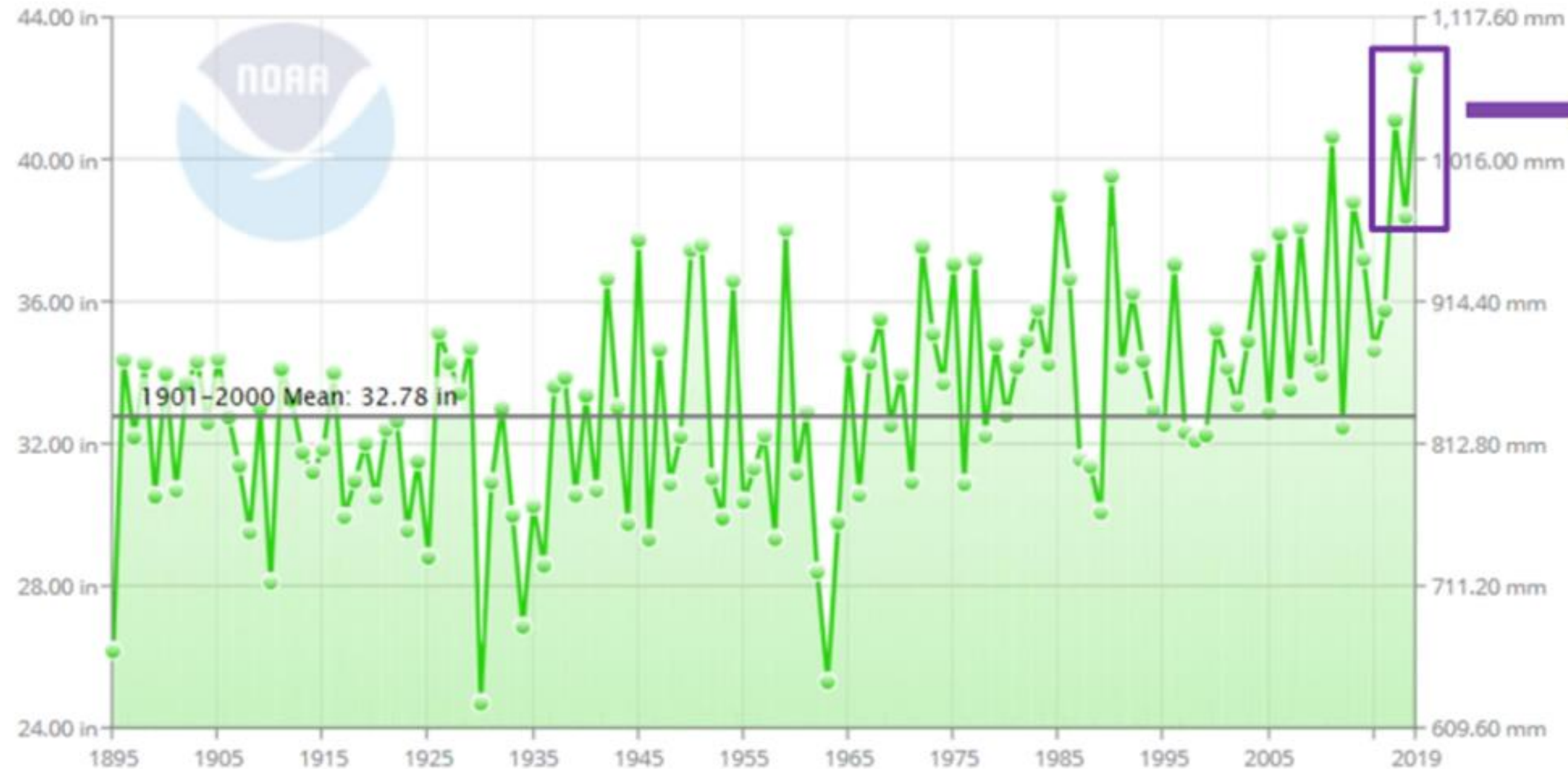
# Annual Water Levels and Hydrologic Cycle



Credit: USACE

# Why did water levels go so high?

Great Lakes Basin Precipitation  
January–December



Last 3 years (2017-2019), exceptionally wet for the Great Lakes Basin.

NOAA National Centers for Environmental information, Climate at a Glance


# Great Lake Water Levels

## From Record-Lows to Record-Highs in 6 Years

### January 2013

- Lakes Superior and Michigan-Huron in midst of 14-year streak of below average water levels
- January hit lowest monthly mean level for Lake Michigan-Huron since 1918

### May 2019

- Great Lakes experiencing record high levels
- Lakes Michigan –Huron set monthly mean record high levels in 2020 (Jan. – Aug.)
- 6.17 feet difference between January 2013 and July 2020
- 576.02 ft.  582.19ft.

Lake Michigan-Huron Monthly Mean Levels, 2013 - 2019 vs Monthly LTA Levels

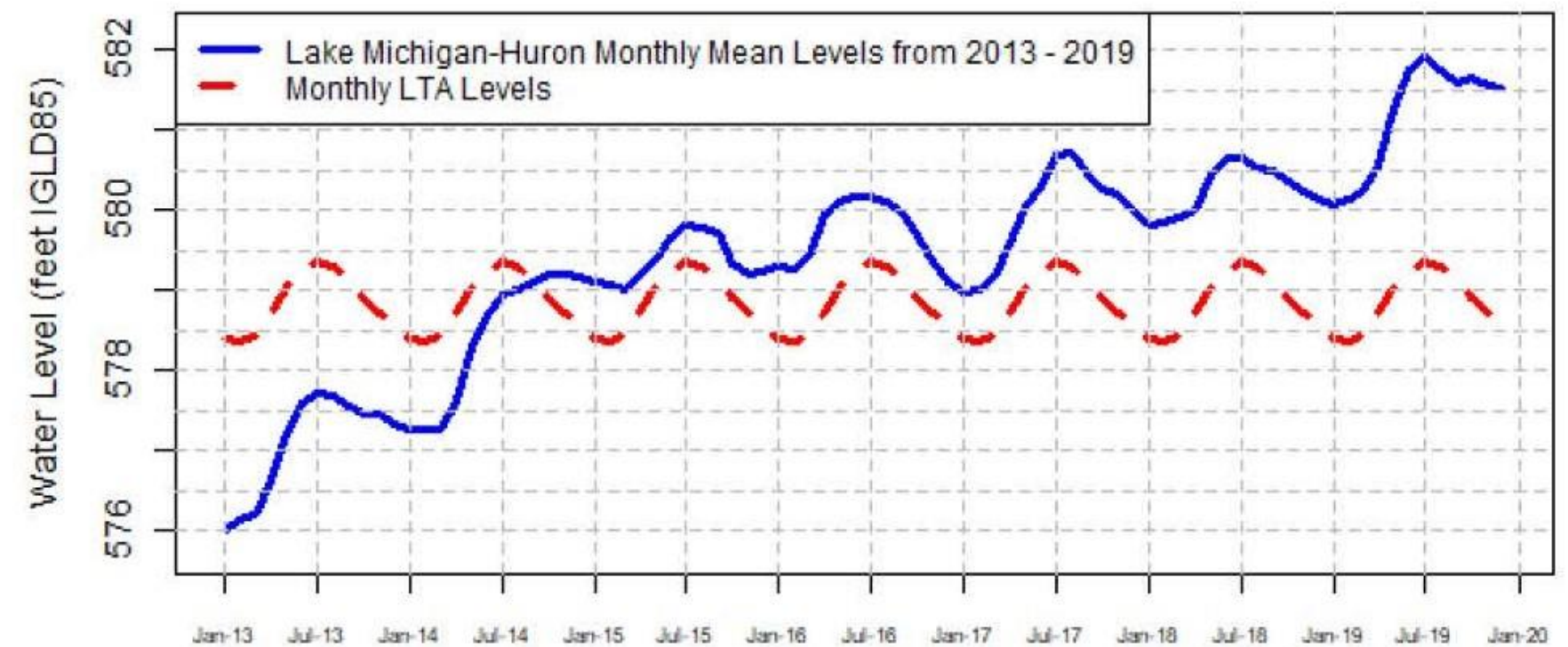


Figure 2: Plot of Lake Michigan-Huron water levels from 2013 to 2019 versus the lake's LTA levels.


# High Water Impacts



# Cost of Coastal Damages

	U.S.	Canada	Totals
# of responses	266	66	332
Past 2 years	\$815 million	\$63 million	\$878 million
Next 5 years	\$1.79 billion	\$2.86 billion	\$4.65 billion

*\*Preliminary data compiled from two Cities Initiative surveys: Stimulus Survey (2020) and Coastal Management Needs Assessment Survey (2021)*



# Shoreline Protection and Best Management Practices



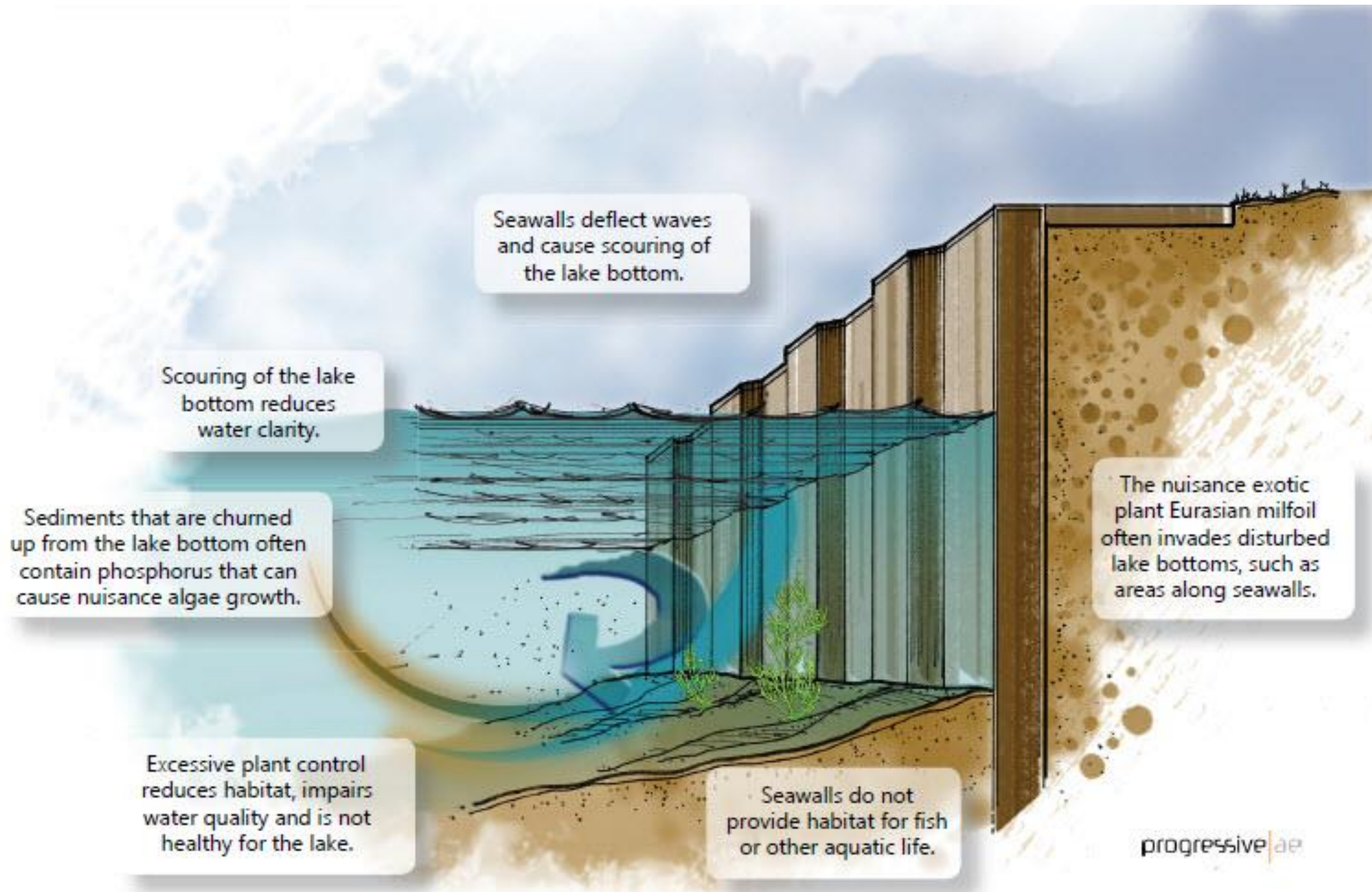
# Michigan's Shoreline



# Michigan's Shoreline



Credit. WWMT, Will Hawnni



Seawalls deflect waves and cause scouring of the lake bottom.

Scouring of the lake bottom reduces water clarity.

Sediments that are churned up from the lake bottom often contain phosphorus that can cause nuisance algae growth.

Excessive plant control reduces habitat, impairs water quality and is not healthy for the lake.

Seawalls do not provide habitat for fish or other aquatic life.

The nuisance exotic plant Eurasian milfoil often invades disturbed lake bottoms, such as areas along seawalls.

progressive|ae

# Bioengineering



# Moving Homes

- Better long-term solution
- Actual move can be completed in a few days
- Cost: \$12,000-\$100,000 (\$12-\$16/square foot)
- List of home movers on EGLE and TOMWC websites
  - [Michigan.gov/EGLEHighWater](https://www.michigan.gov/EGLEHighWater)
  - <https://www.watershedcouncil.org/home-moving.html>



Credit: MLive



# Inland Water Concerns

# Inland High Water Levels

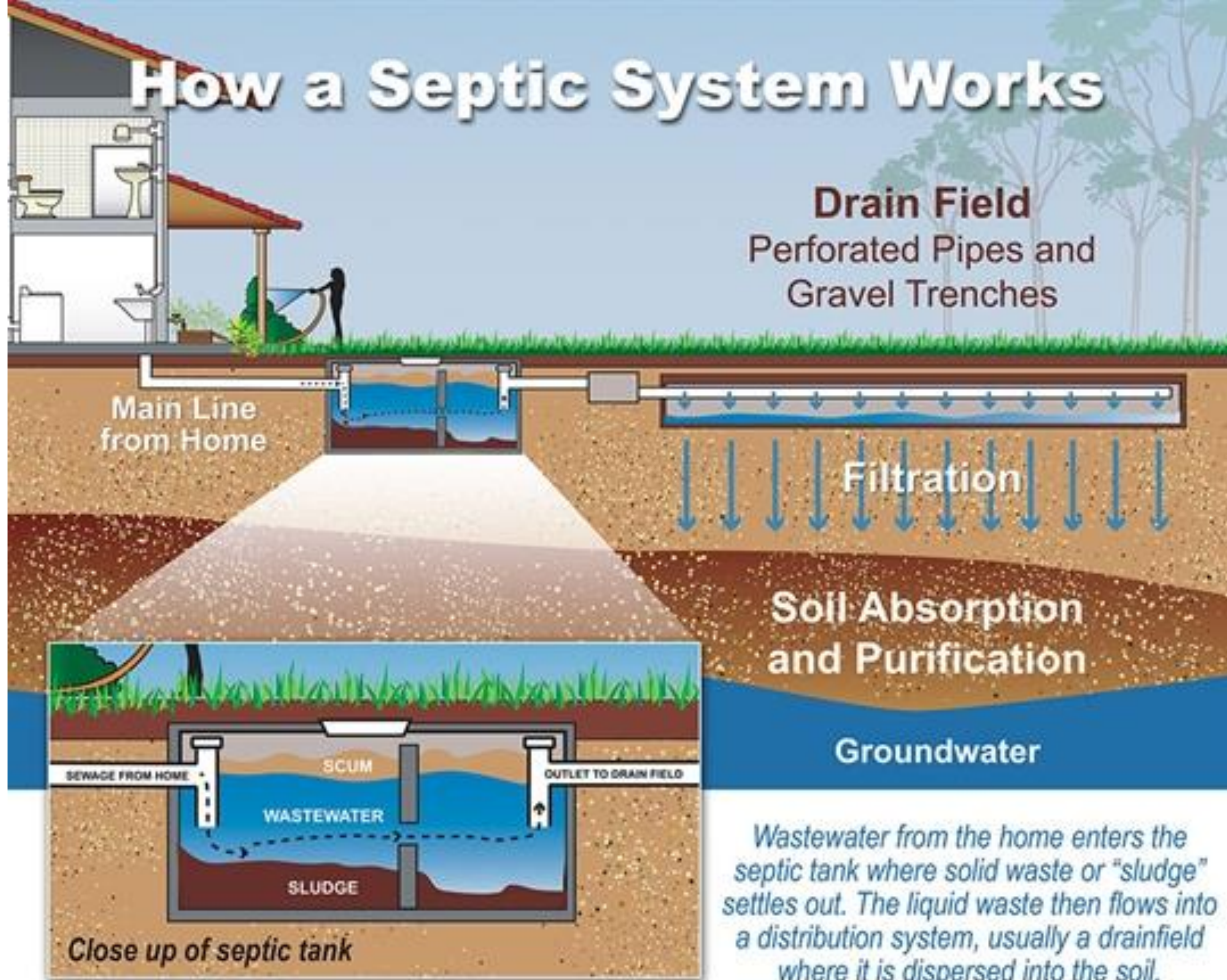


Credit: Brian Marshall  
Michigan Department of Environment  
Great Lakes, and Energy



Credit: Brian Marshall  
Michigan Department of Environment  
Great Lakes, and Energy

# How a Septic System Works



Wastewater from the home enters the septic tank where solid waste or "sludge" settles out. The liquid waste then flows into a distribution system, usually a drainfield where it is dispersed into the soil.



# Signs of Septic System Failure



Wet areas, lush grass, or foul odors around the drain field.



Sinks or toilets backing up or draining slowly, in spite of using plungers and drain cleaner



Noticeable algae and plant growth or a distinctly colored patch of bottom sediment



Credit: Brian Marshall

Michigan Department of Environment, Great Lakes, and Energy

- **Immediately call the local Health Department.**
- Pump out septic tank
- Reduce water use
- Fence off the wet area around the drain field to minimize contact with wastewater

# Drinking Water Wells

- Ensure the septic system is functioning properly
- Casing should extend 12 inches above the ground
- Extend well casing if needed
- Install watertight cap on wellhead
- If water reaches or covers top of well casing, assume well is contaminated
- Have well disinfected and tested by health department



Credit: Chuck Edwards,  
Health Department of Northwest Michigan



Matthew Hatcher/SOPA Images/LightRocket via Getty Images

- Detroit's second 500-year flood in 7 years
- 6 inches of rain fell in 5 hours
- Flooded homes, businesses, and roads, backed-up sewage
- Disaster declared by President Biden

# Other Concerns



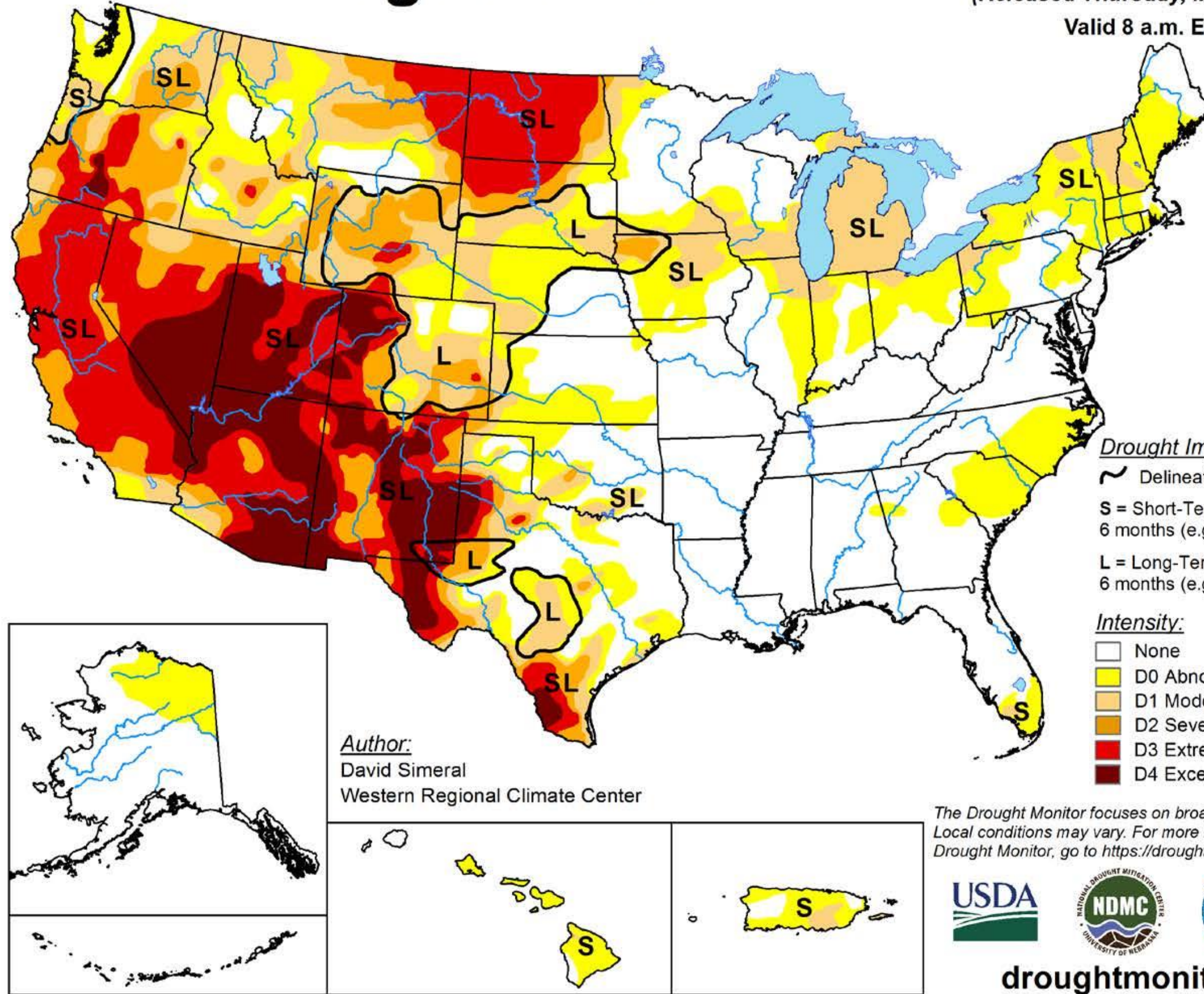
- Electric currents in waters
- Contamination from basement/garage flooding
- Boating hazards



# Current Water Levels

# U.S. Drought Monitor

May 4, 2021  
 (Released Thursday, May. 6, 2021)  
 Valid 8 a.m. EDT



**Drought Impact Types:**

- ~ Delineates dominant impacts
- S = Short-Term, typically less than 6 months (e.g. agriculture, grasslands)
- L = Long-Term, typically greater than 6 months (e.g. hydrology, ecology)

**Intensity:**

- None
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

**Author:**  
 David Simeral  
 Western Regional Climate Center

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to <https://droughtmonitor.unl.edu/About.aspx>



[droughtmonitor.unl.edu](https://droughtmonitor.unl.edu)





# Drier Basin Conditions in 2021

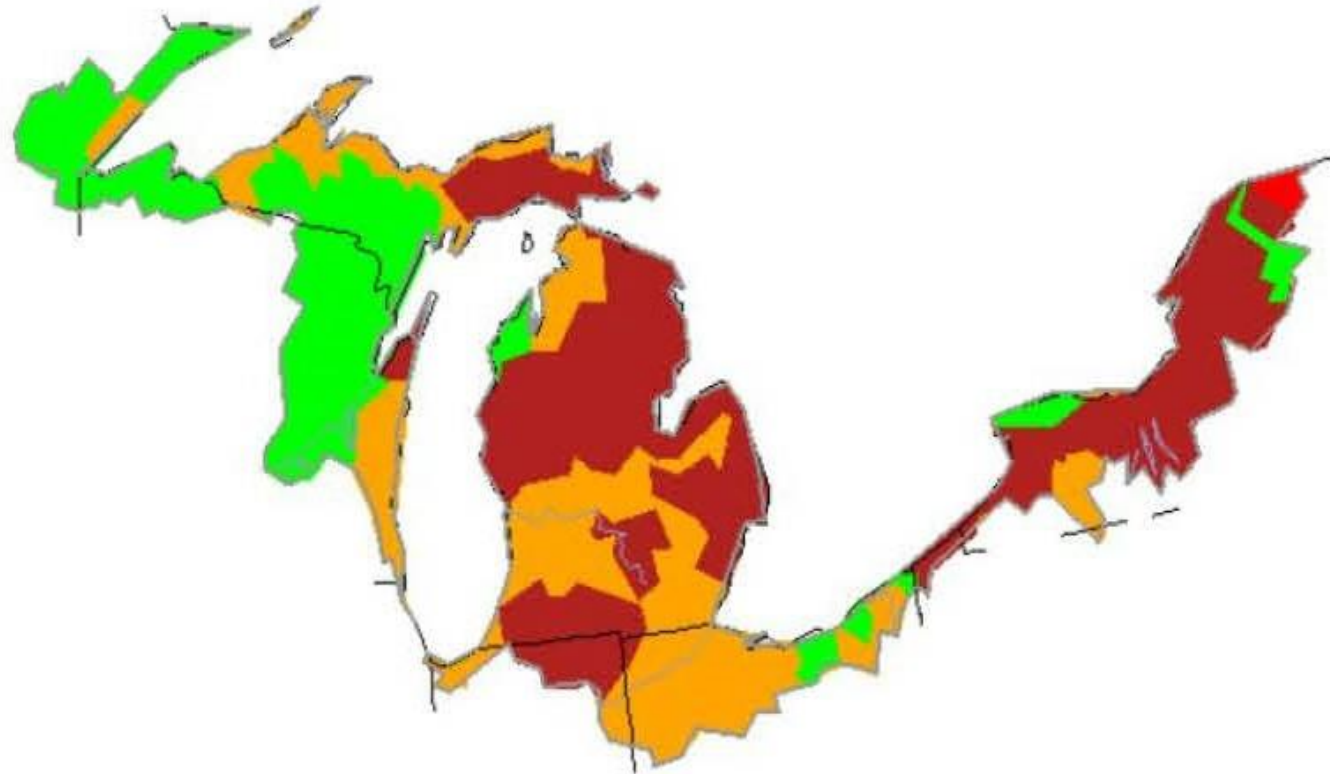


## April 2021 Streamflows

## 2019 Streamflows

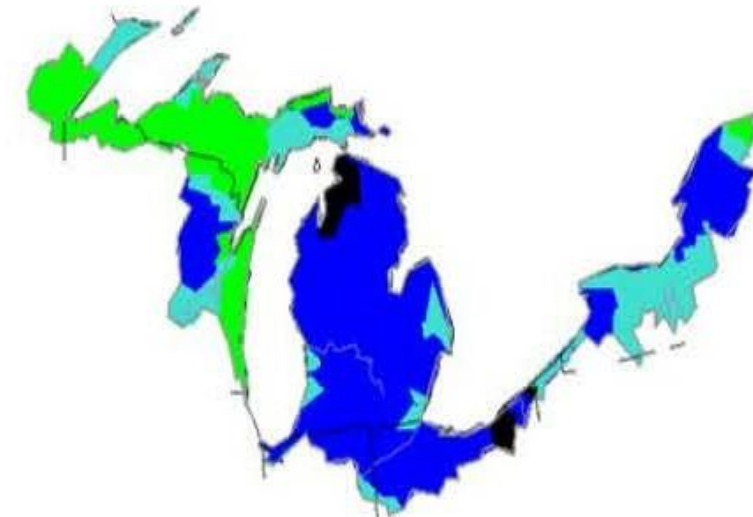
April

May



Explanation - Percentile classes							
Low	<10	10-24	25-75	76-90	>90	High	No Data
	Much below normal	Below normal	Normal	Above normal	Much above normal		

June



Explanation - Percentile classes							
Low	<10	10-24	25-75	76-90	>90	High	No Data
	Much below normal	Below normal	Normal	Above normal	Much above normal		



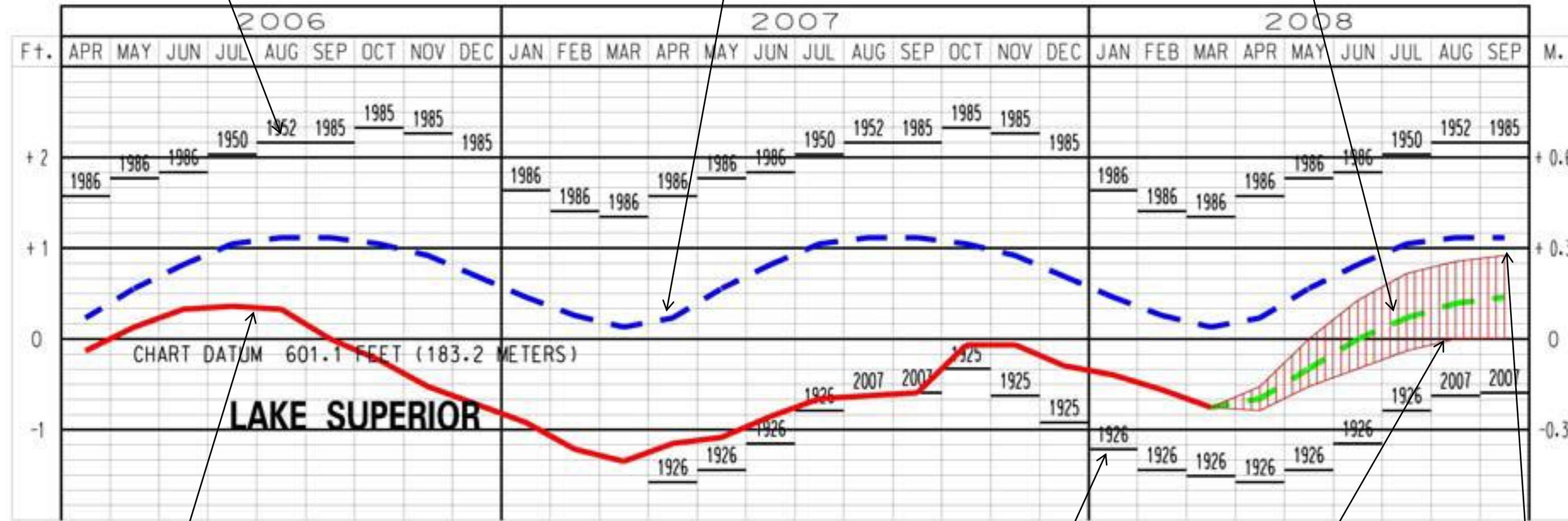


Highest monthly levels (1918-2007)

Long term average levels (1918-2007)

Most likely water level forecast (1 to 6 months)

### LAKE SUPERIOR WATER LEVELS - APRIL 2008



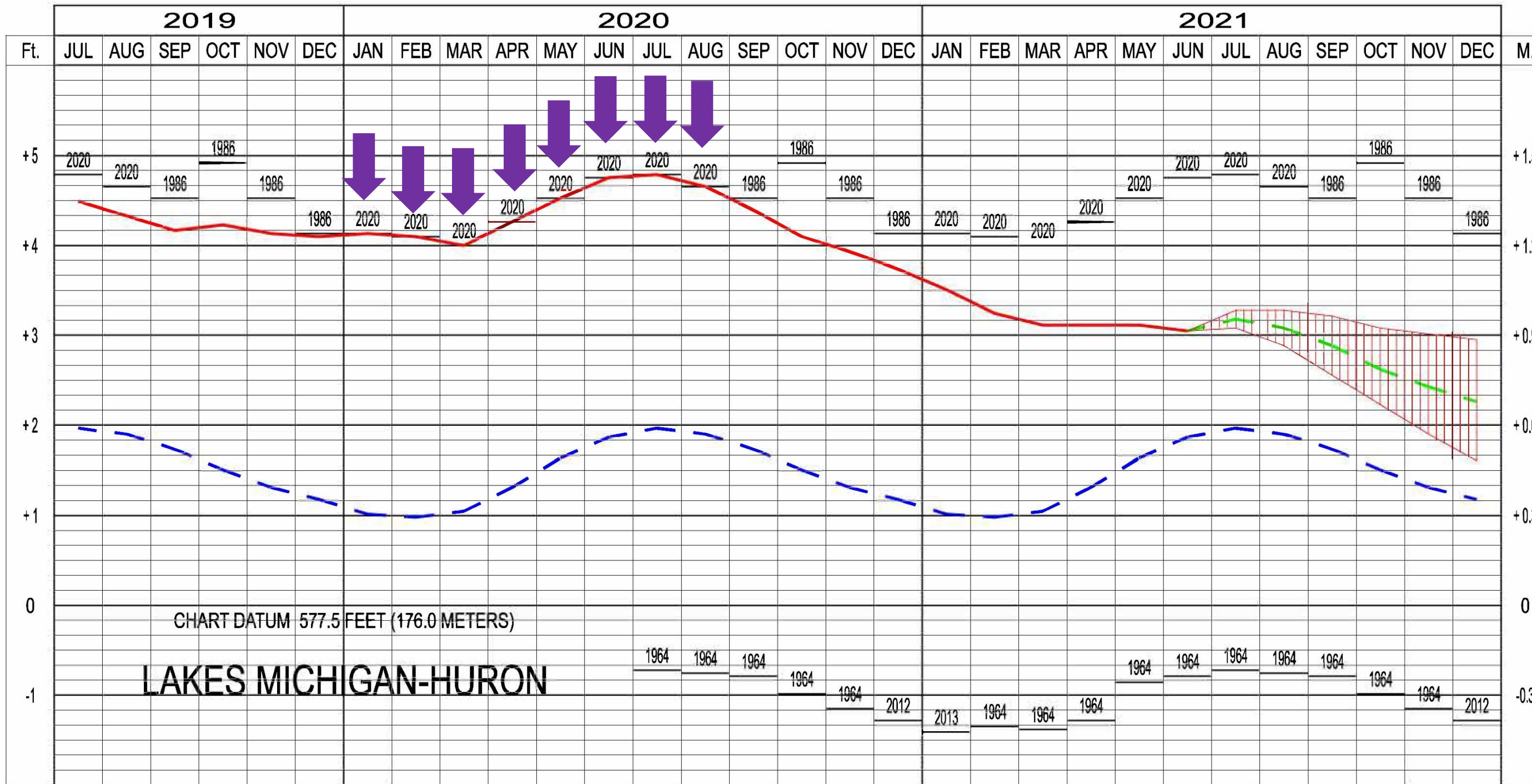
Recorded levels

Lowest monthly levels (1918-2007)

Range of projected levels (1 to 6 months)

# LAKES MICHIGAN-HURON WATER LEVELS - JULY 2021

↓ 2020 Records



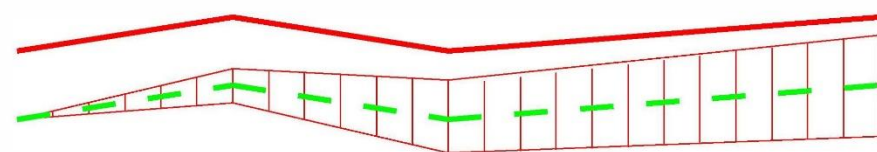
Projected Levels (dashed green line):

- Declined one inch from May to June.
- Has not experienced a seasonal rise this spring and early summer, but the water level is forecast to rise slightly from June to July before continuing its decline later this summer.
- 20 inches below June of last year.

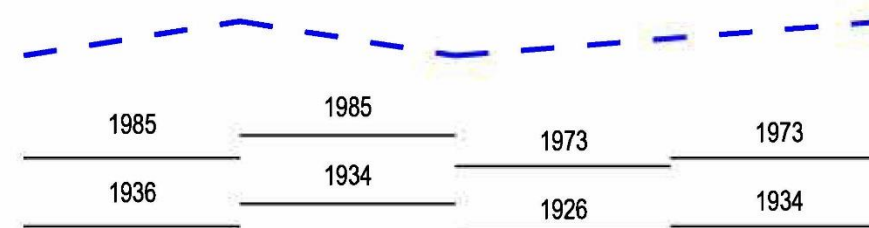
## LEGEND

LAKE LEVELS


RECORDED  
PROJECTED



AVERAGE \*\*  
MAXIMUM \*\*  
MINIMUM \*\*



\*\* Average, Maximum and Minimum for period 1918-2020



# Policy Implications and Recommendations

# Lack of Holistic Approach to Water Levels

2013

- \$21 million emergency spending authorized to dredge due to low water
- Dredging permit fees lowered
- Waiting periods waived
- \$1 million for private marinas for loan-interest loans for dredging

2020

- Shoreline permits expedited
- Exercised emergency permit authority
- Additional staff dedicated to shoreline permitting
- MDOT estimates around \$100 million for repairs
- Requests for emergency declaration
- Bill introduced in Senate to not require a permit for shoreline work

Reactionary policies with no consideration for fluctuations of Great Lakes



# What We Need

- Holistic approach to Great Lakes water levels
- Long-term planning to address both high and low water
- Promotion and implementation of climate adaptation strategies
  
- Maintain/strengthen permitting program for shoreline project
- Move away from hardening shoreline
- Encourage long-term, science-based solutions
  
- Funding for local governments for climate resiliency (assessing vulnerability, master planning, smart growth, hazard mitigation, emergency planning and response)
- Funding for climate resiliency measure (green infrastructure)

# The Problem Will Not Go Away

- Fluctuations in Great Lakes water levels have occurred continually since the Great Lakes formed at the end of the Ice Age.
- When high waters decline, the problem of high water levels will not go away forever...it is merely temporarily until the next cycle of high water.
- In the meantime, we will have to deal with the problem of low water levels.
- Predictions for the future – inconsistent lake level extremes.

# Opportunities

- NOAA and the Great Lakes and St. Lawrence Cities Initiative have kicked off the Lake Michigan Coastal Resilience Initiative to help Great Lakes cities strengthen coastal resilience and respond to challenges such as shoreline erosion, flooding, and severe storm events.  
<https://coast.noaa.gov/regions/greatlakes/glri/>
- The Michigan Department of Environment, Great Lakes, and Energy's Coastal Management Program (MCMP) and the Michigan Association of Planning (MAP) is funding two Coastal Leadership Academies to collectively learn, build relationships, and explore the coastal resilience challenges and solutions in a region.

# Resources

- Michigan Department of Environment, Great Lakes, and Environment  
[Great Lakes High Water Levels](#)
- U.S. Army Corps of Engineers  
<https://www.lre.usace.army.mil/About/Great-Lakes-High-Water/>
- Tip of the Mitt Watershed Council – Home Moving Information  
<https://www.watershedcouncil.org/home-moving.html>
- LIAA Community Sustainability Self-Assessment Tool  
<http://www.resilientmichigan.org/sustainability.asp>



TIP OF THE MITT  
Watershed Council

# Thank You

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