

LAKE WINNEBAGO REGULATION MEETING

USACE Chicago District
6 October 2020



US Army Corps
of Engineers®





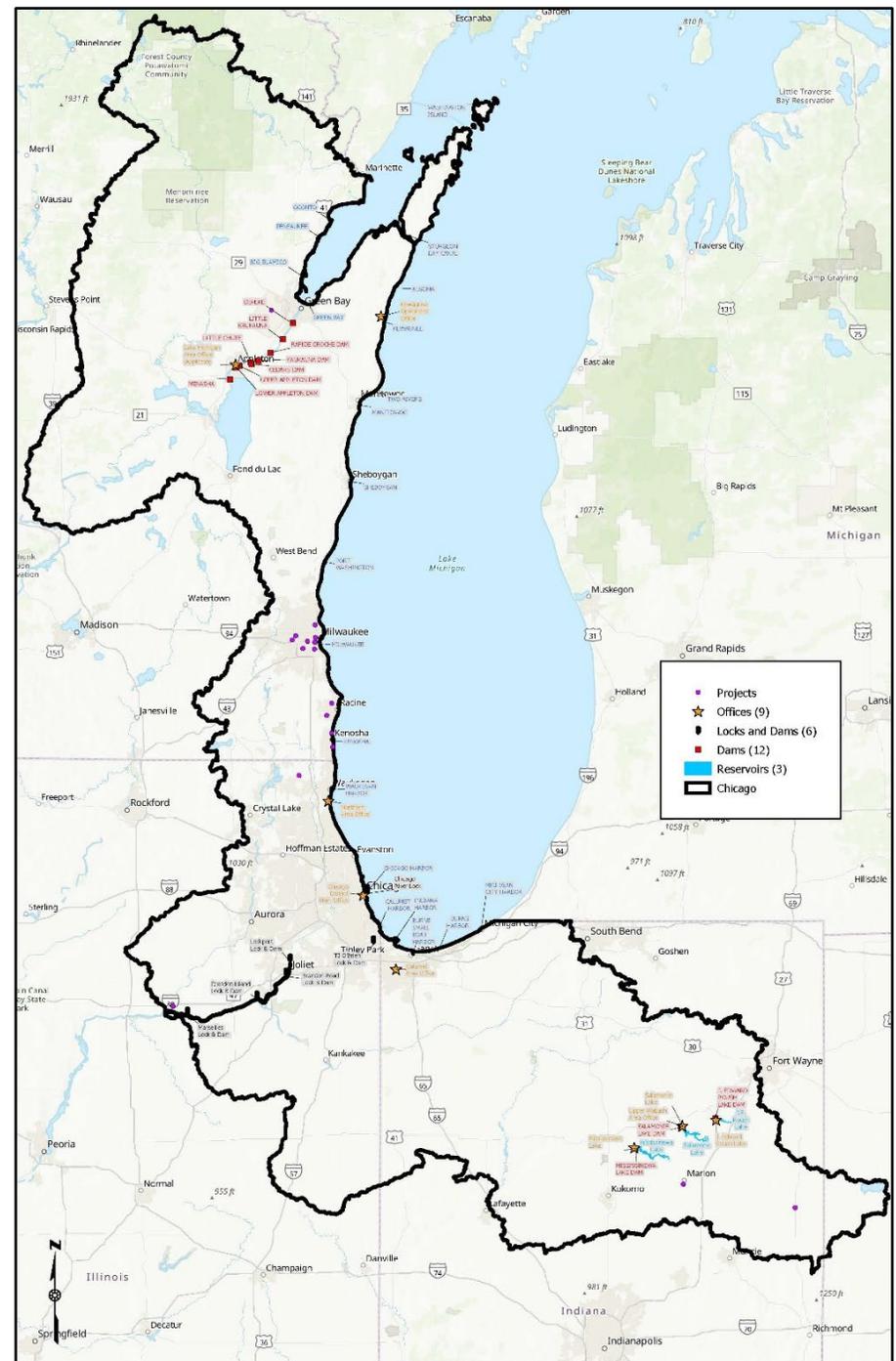
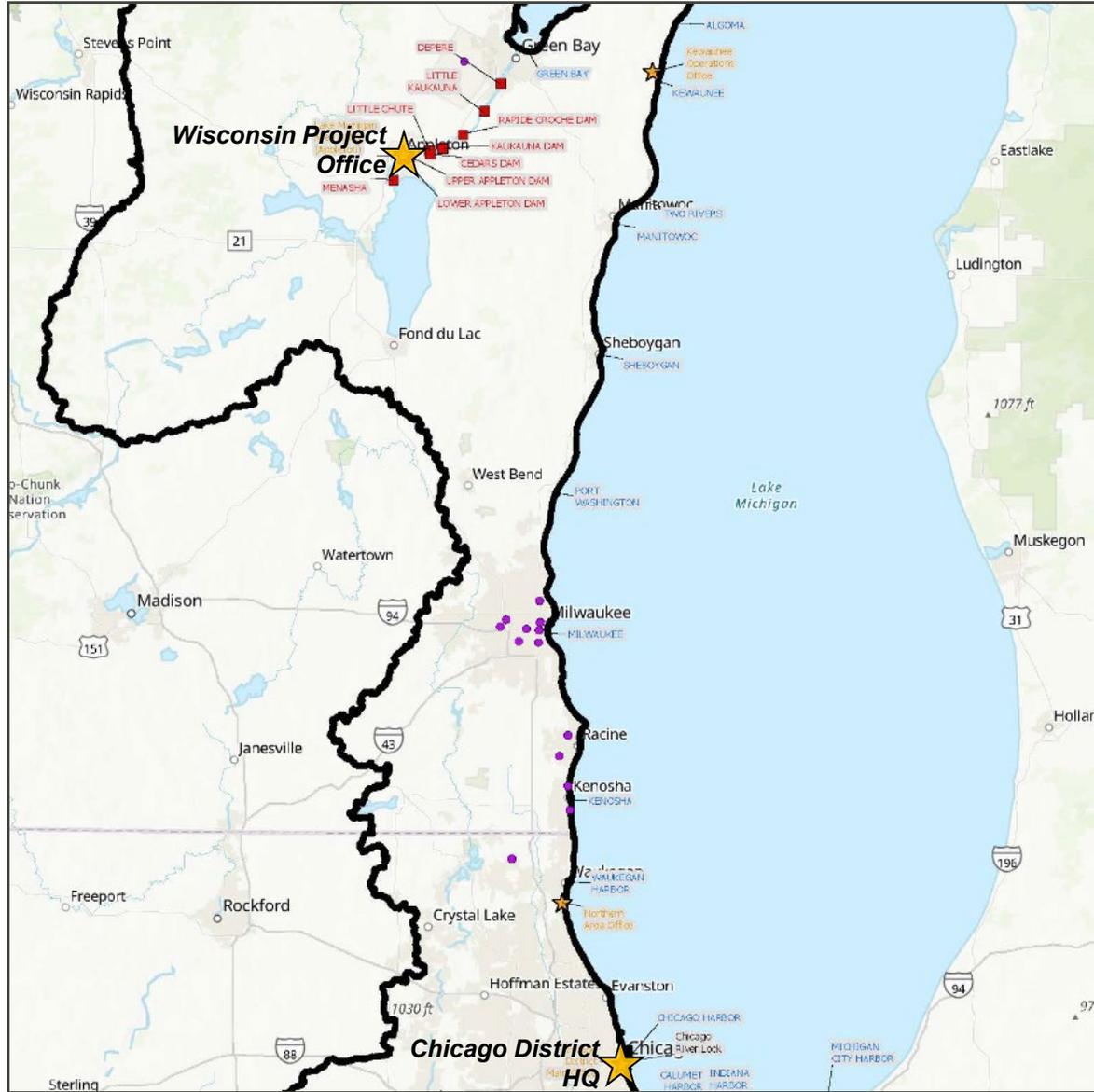
AGENDA



- **Regulation Team Introduction**
- **WRRDA 2014, Section 7001**
- **Major Stakeholders**
- **Basin Overview**
- **Operations Overview**
- **FRNSA Update**
- **Current Basin Conditions**
- **2019-2020 Water Level Explanation**
- **NWS (Milwaukee and Green Bay) Update**
- **2020-2021 Water Level Strategy Development**
- **Open Discussion/Questions**



CHICAGO DISTRICT AREA OF RESPONSIBILITY





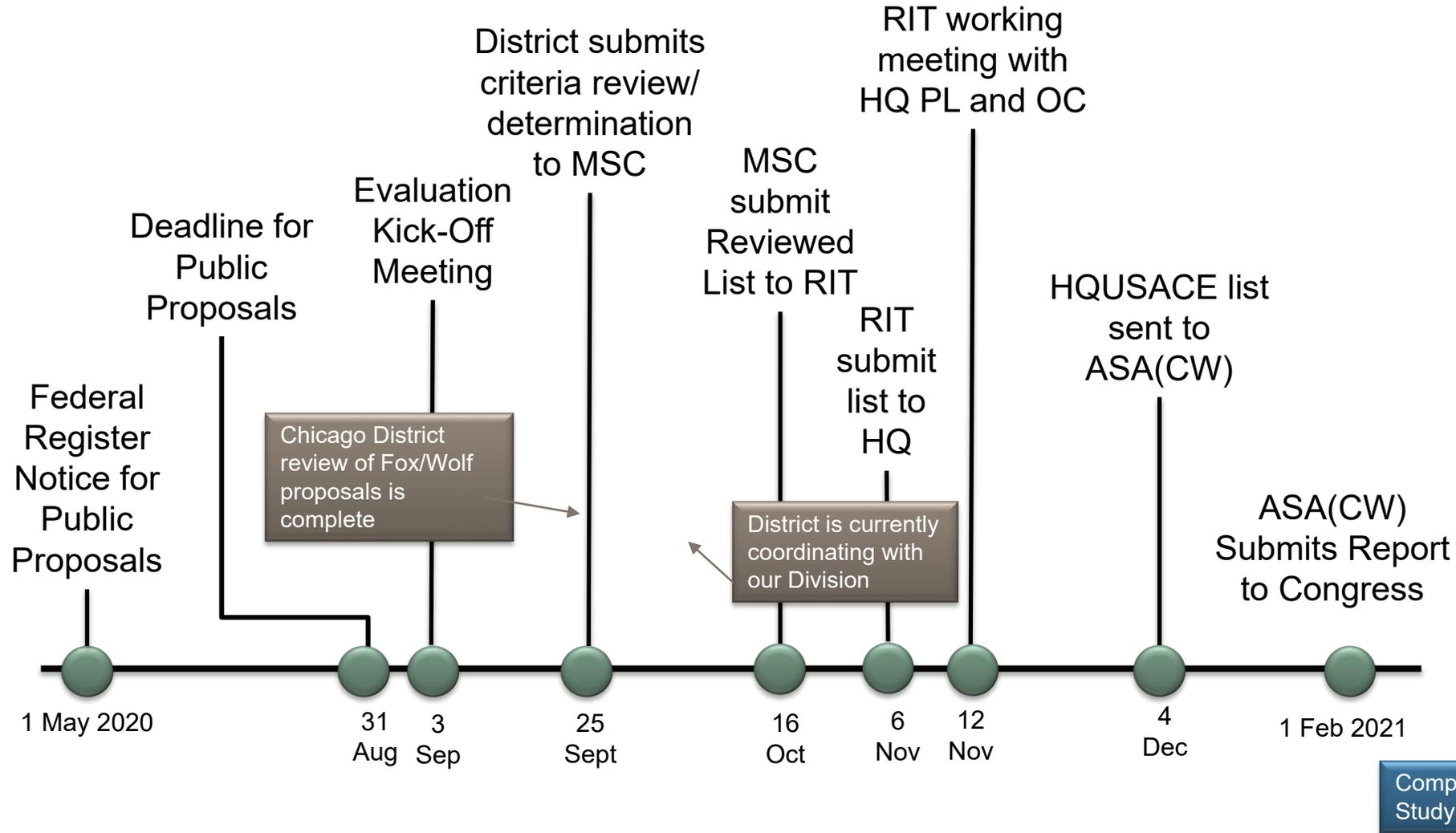
WRRDA 2014 SECTION 7001 OVERVIEW: ANNUAL REPORT ON FUTURE WATER RESOURCES DEVELOPMENT



- Identifies proposals from non-Federal interests for (1) new study authorizations, (2) new project authorizations, and (3) modifications to existing feasibility study, environmental infrastructure program, and project authorities
- Corps Required to Submit Annual Report to Congress since 2015
- Is used by Congress when considering studies and projects that need authorization
- Is used by Administration when considering funding new start studies in annual Work Plan
- Proposals must meet the five criteria below:
 1. Are related to the Corps' primary missions of navigation, flood risk management, and aquatic ecosystem restoration;
 2. Require specific congressional authorization;
 3. Have not been congressionally authorized;
 4. Have not been included in the main table of a previous annual report;
 5. If authorized could be carried out by the Corps of Engineers.
- Fox – Wolf Watershed Alliance submitted a request
- <https://www.usace.army.mil/Missions/Civil-Works/Project-Planning/WRRDA-7001-Proposals/>

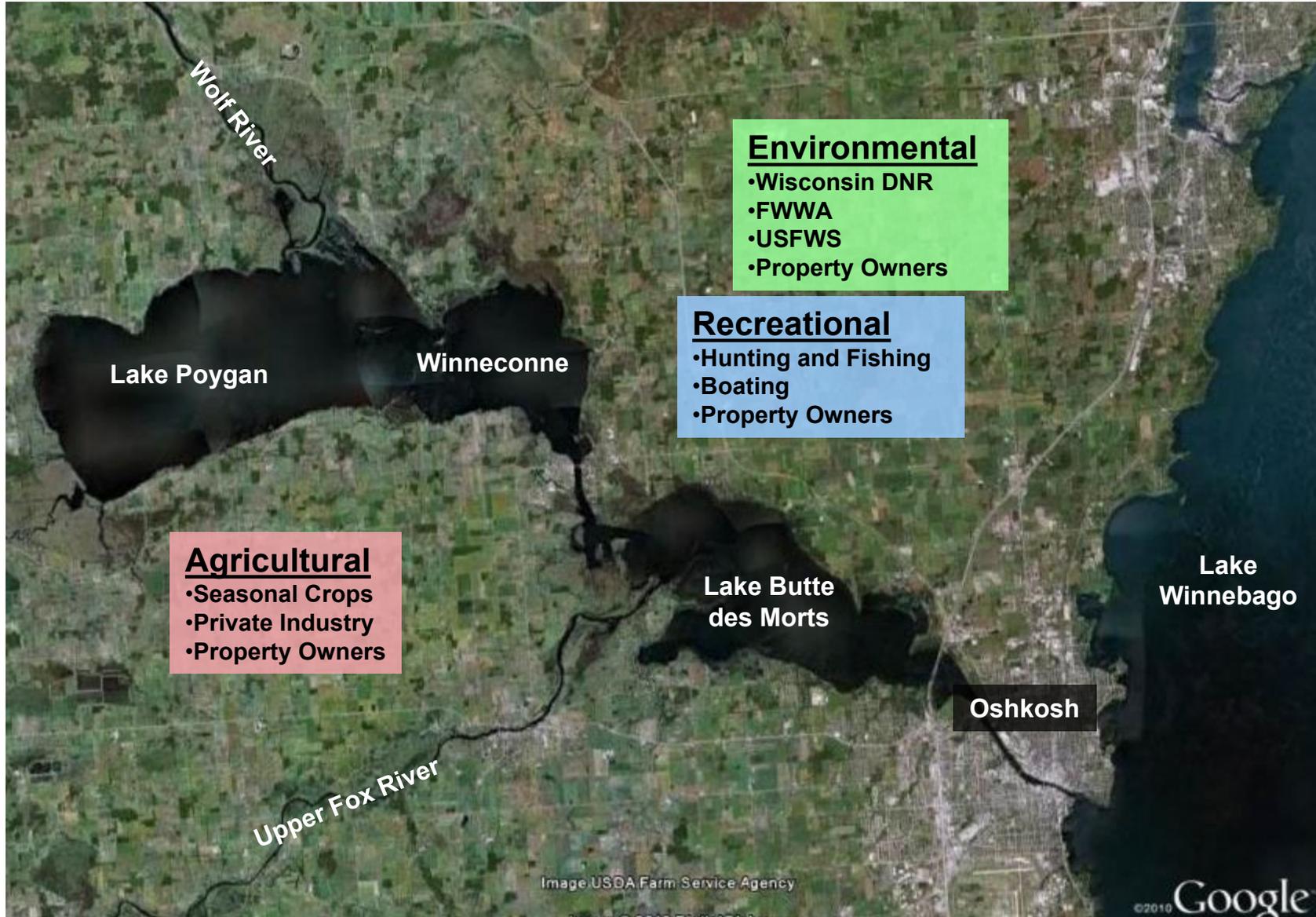


2021 REPORT EVALUATION TIMELINE



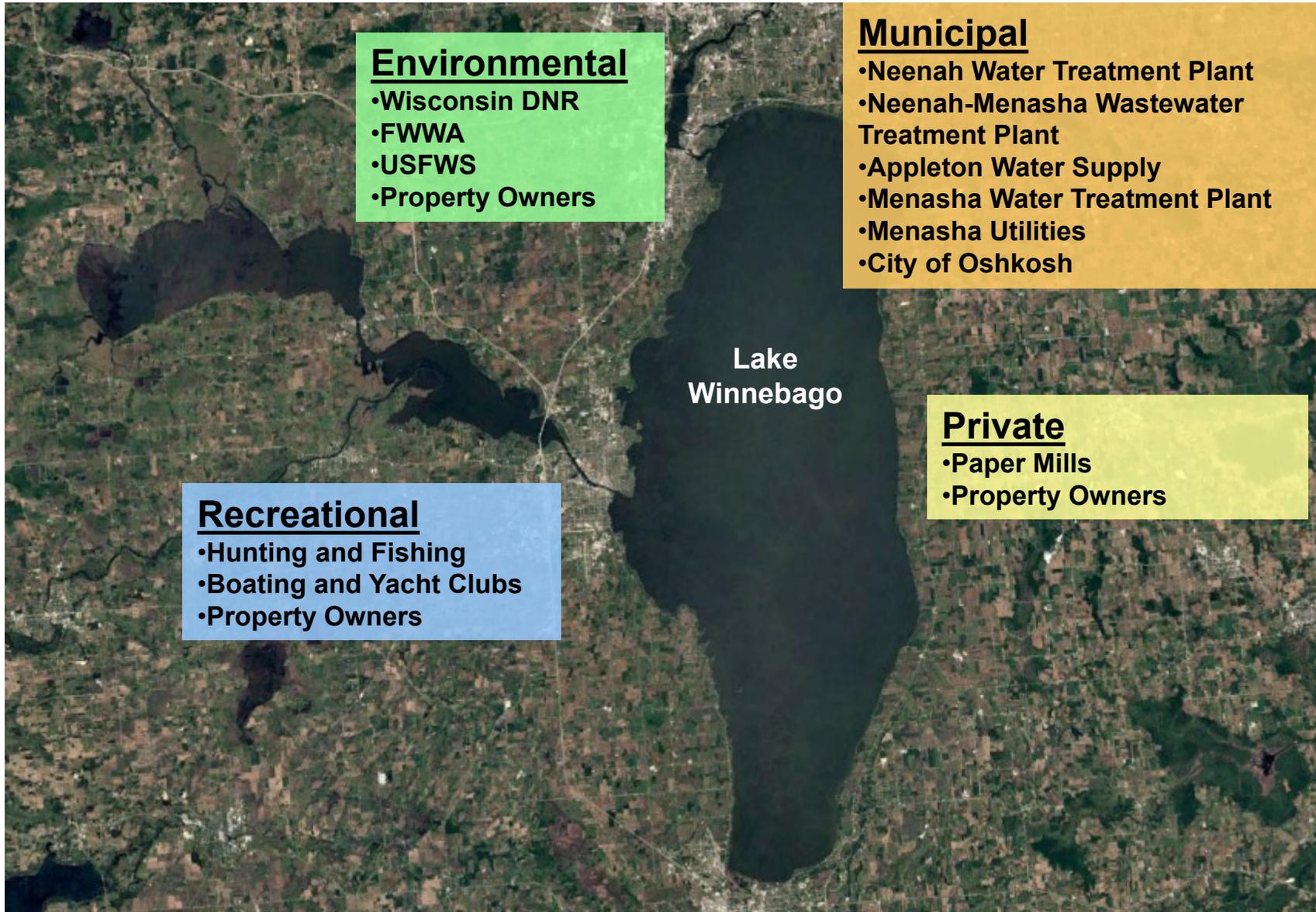


STAKEHOLDER GROUPS: UPSTREAM LAKES





STAKEHOLDER GROUPS: LAKE WINNEBAGO



Environmental
•Wisconsin DNR
•FWWA
•USFWS
•Property Owners

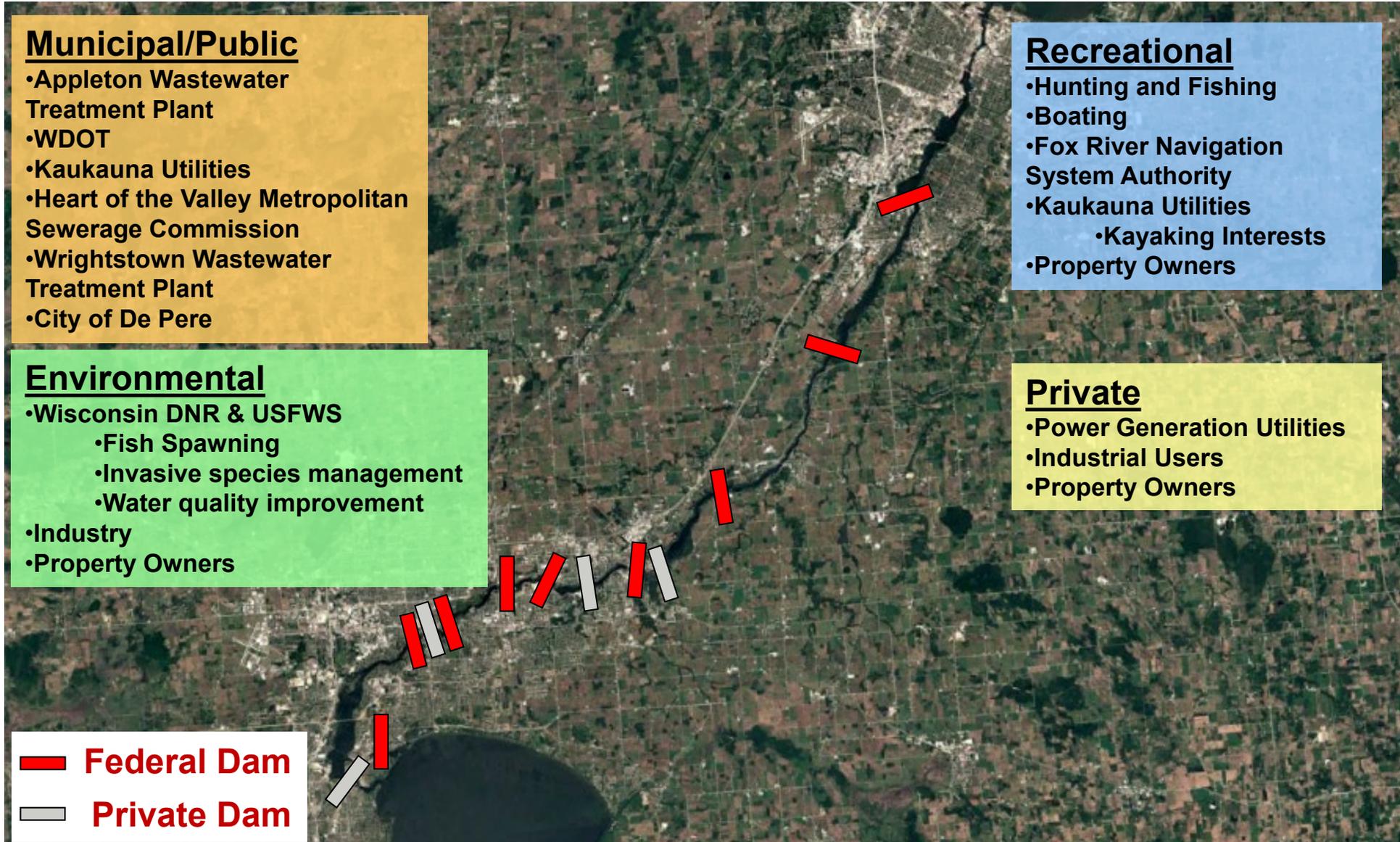
Municipal
•Neenah Water Treatment Plant
•Neenah-Menasha Wastewater Treatment Plant
•Appleton Water Supply
•Menasha Water Treatment Plant
•Menasha Utilities
•City of Oshkosh

Private
•Paper Mills
•Property Owners

Recreational
•Hunting and Fishing
•Boating and Yacht Clubs
•Property Owners



STAKEHOLDER GROUPS: LOWER FOX RIVER





COMPETING INTERESTS



A wide variety of stakeholders produces compounding and competing needs

- Upper Pools
- Lake Winnebago
- Lower Fox River

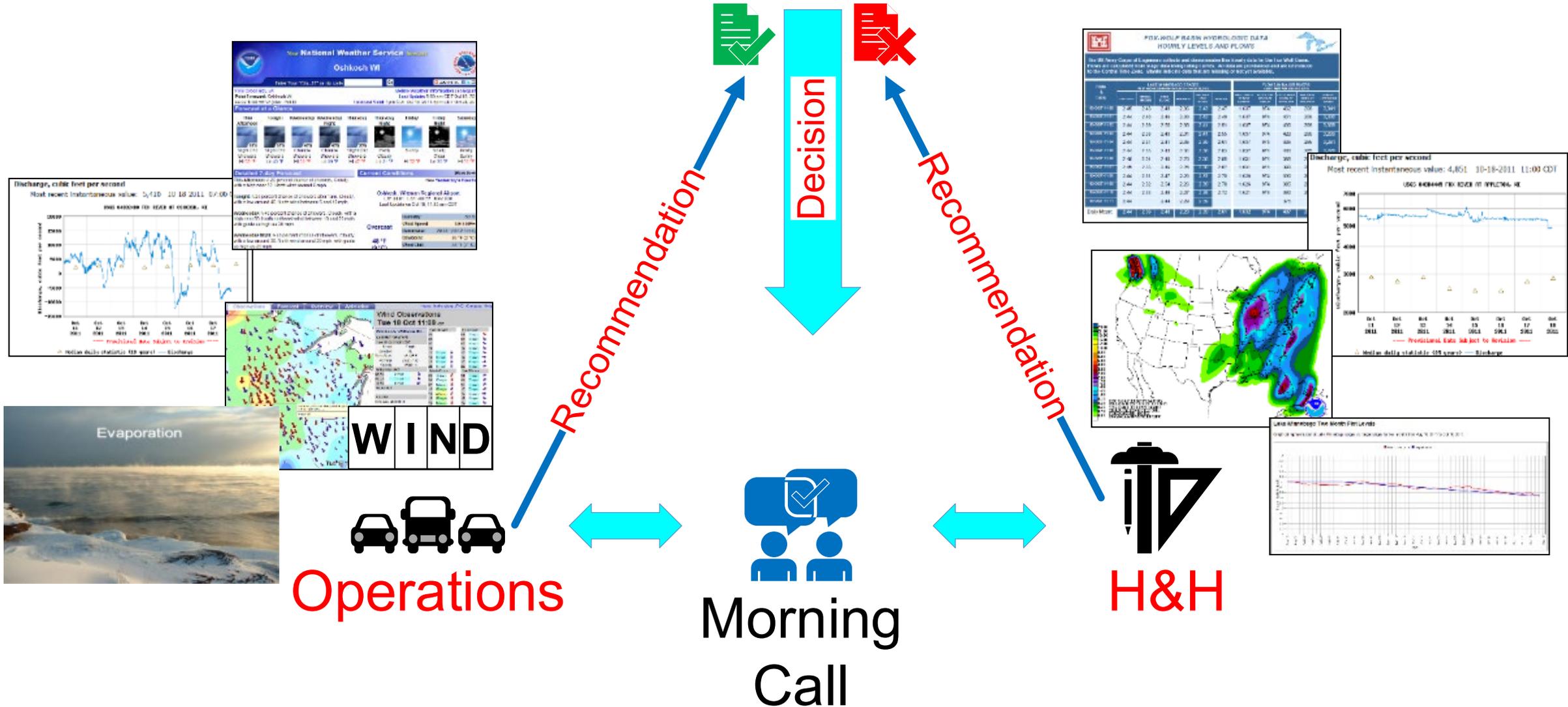




DAILY COORDINATION

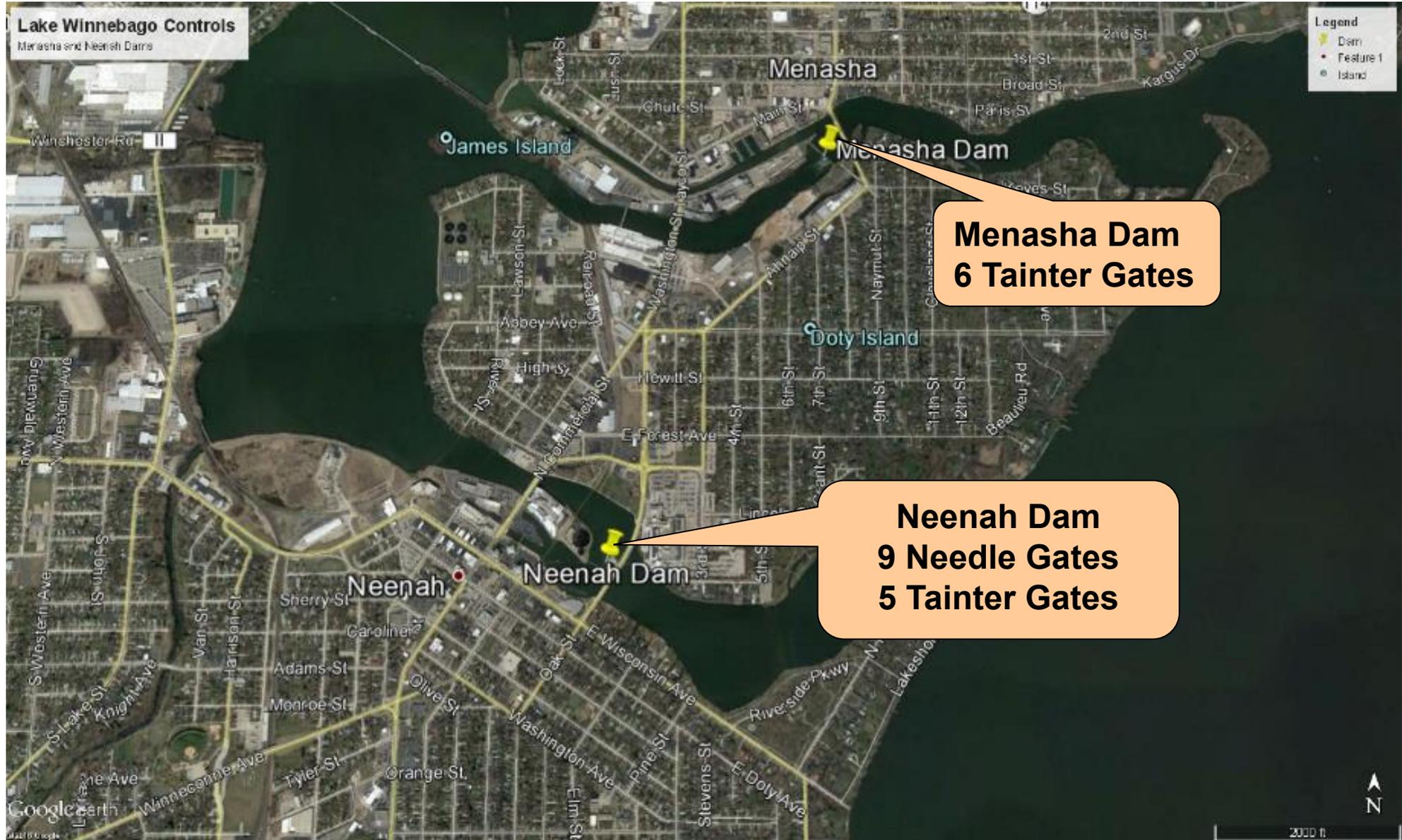


Wisconsin Project Office Operations Manager





LAKE WINNEBAGO CONTROLS





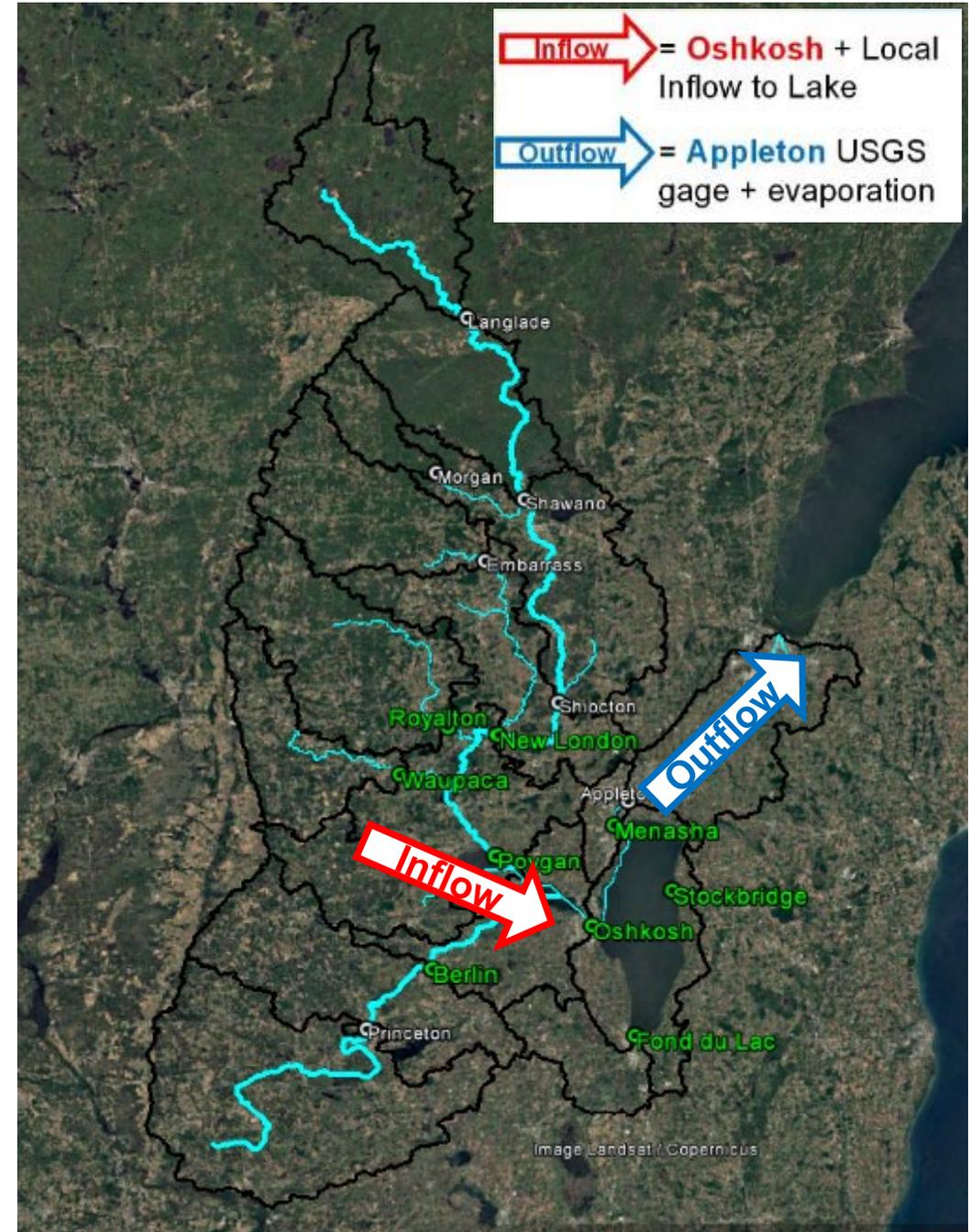
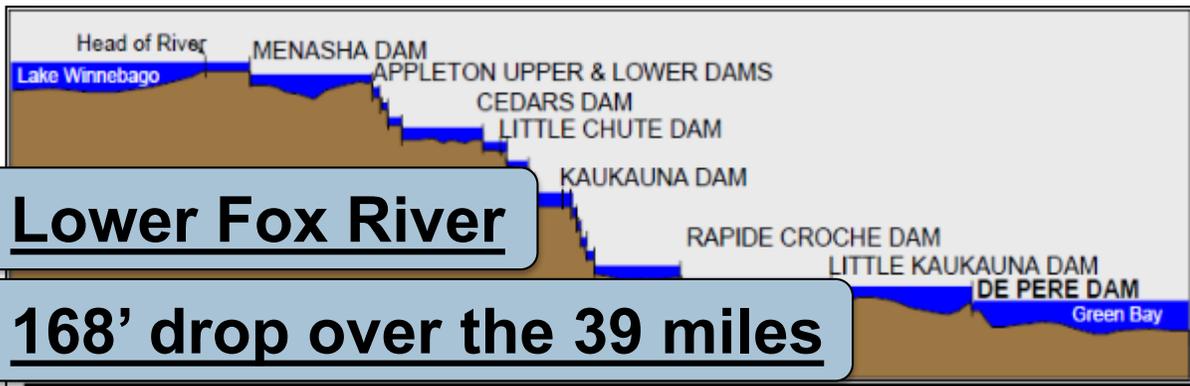
FOX-WOLF RIVER BASIN

Watershed Drainage Area = 6,430 mi²

Lake Winnebago Surface Area
206 mi² or 131,939 acres

Lake Winnebago
Length = 28 mi
Width = 10 mi
Maximum Depth = 21 ft

Water takes 7 days in travel time from upper reaches of basin to Lake Winnebago





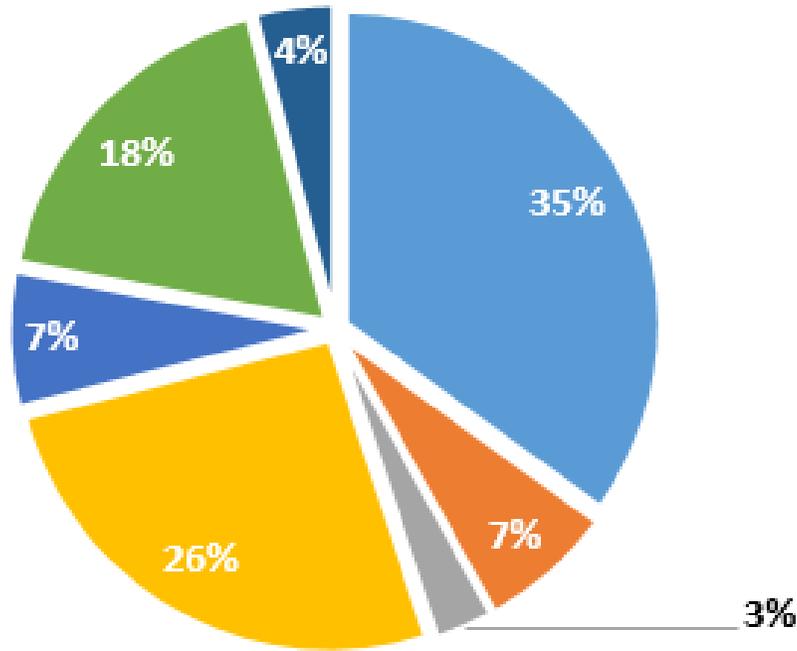
FOX-WOLF RIVER BASIN (CONT'D)



97% of Inflows come from The Wolf and Upper Fox Rivers

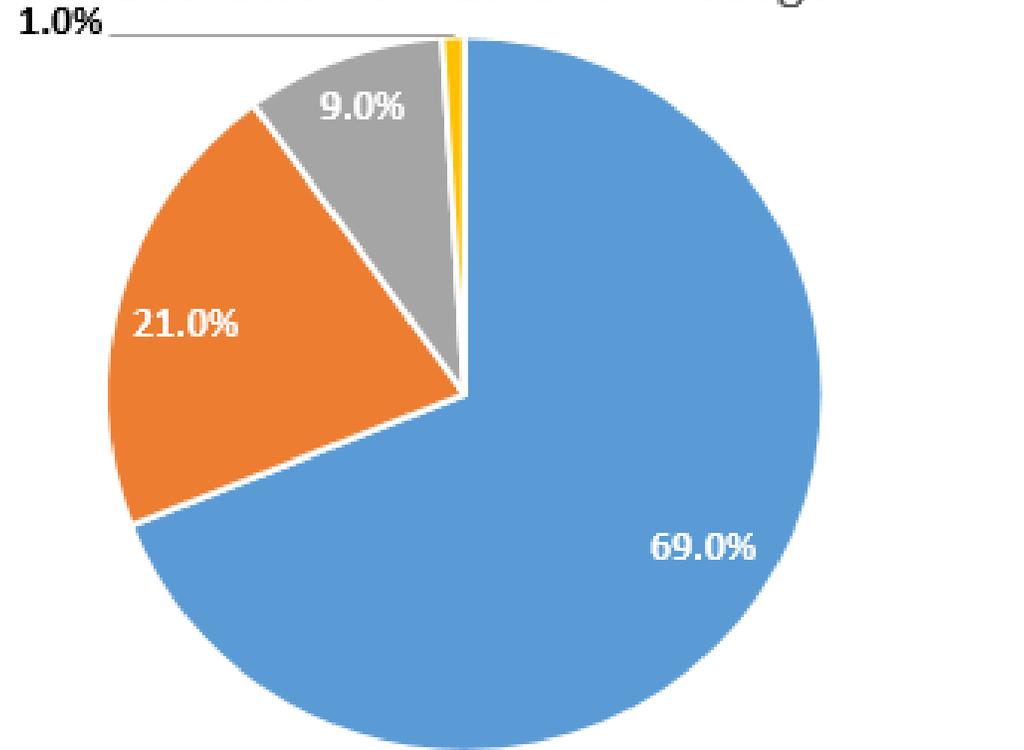
90% of all water that leaves Lake Winnebago goes out via the dams

Inflows to Lake Winnebago



- Wolf River at New London
- Fond du Lac River
- Winnebago Local
- Waupaca River
- Little Wolf at Royalton
- Upper Fox at Berlin
- Upper Pools Local

Outflows from Lake Winnebago



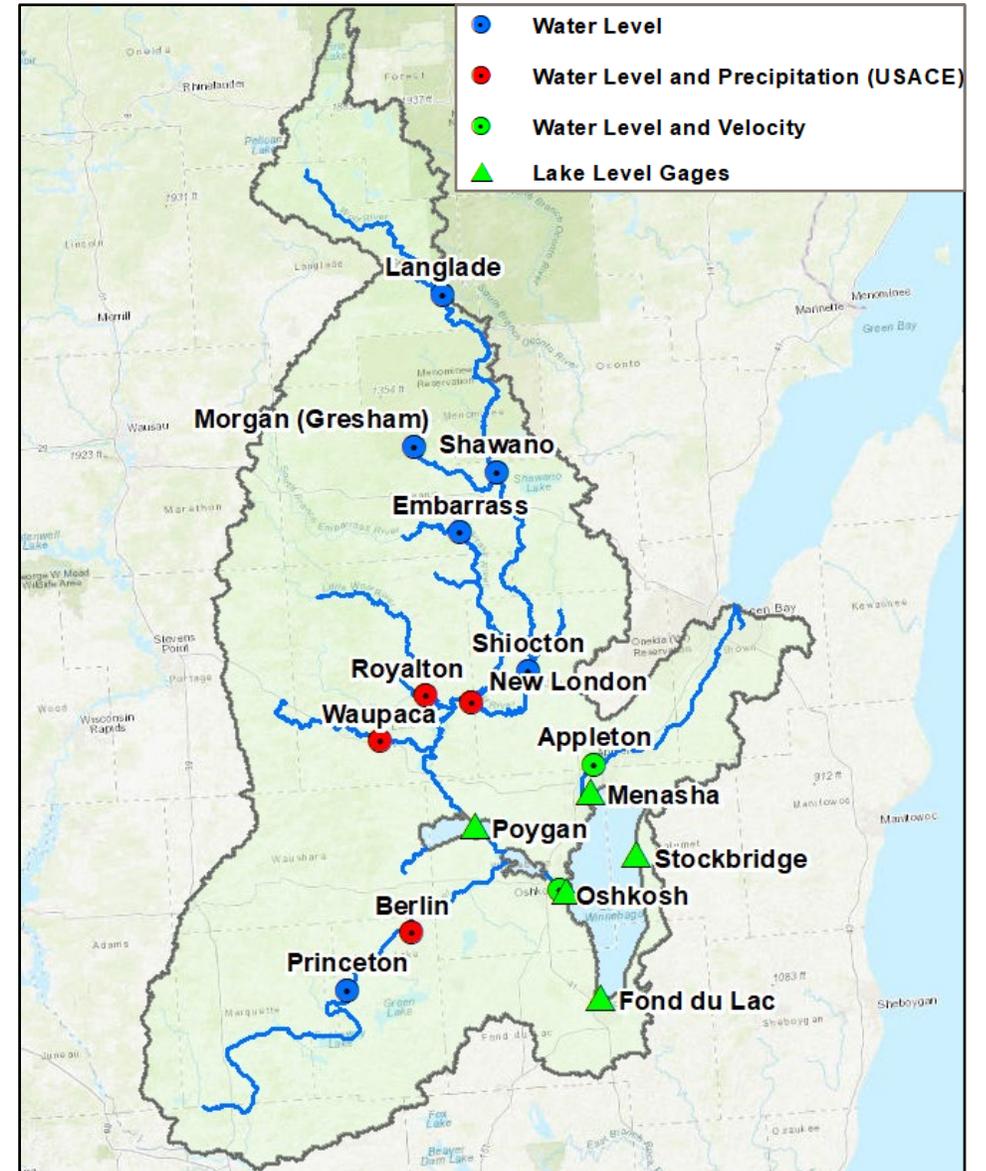
- 69.0% Through the Gates
- 21.0% Over the Spillway
- 9.0% Evaporation
- 1.0% Other Uses



RIVER AND LAKE GAGE LOCATIONS

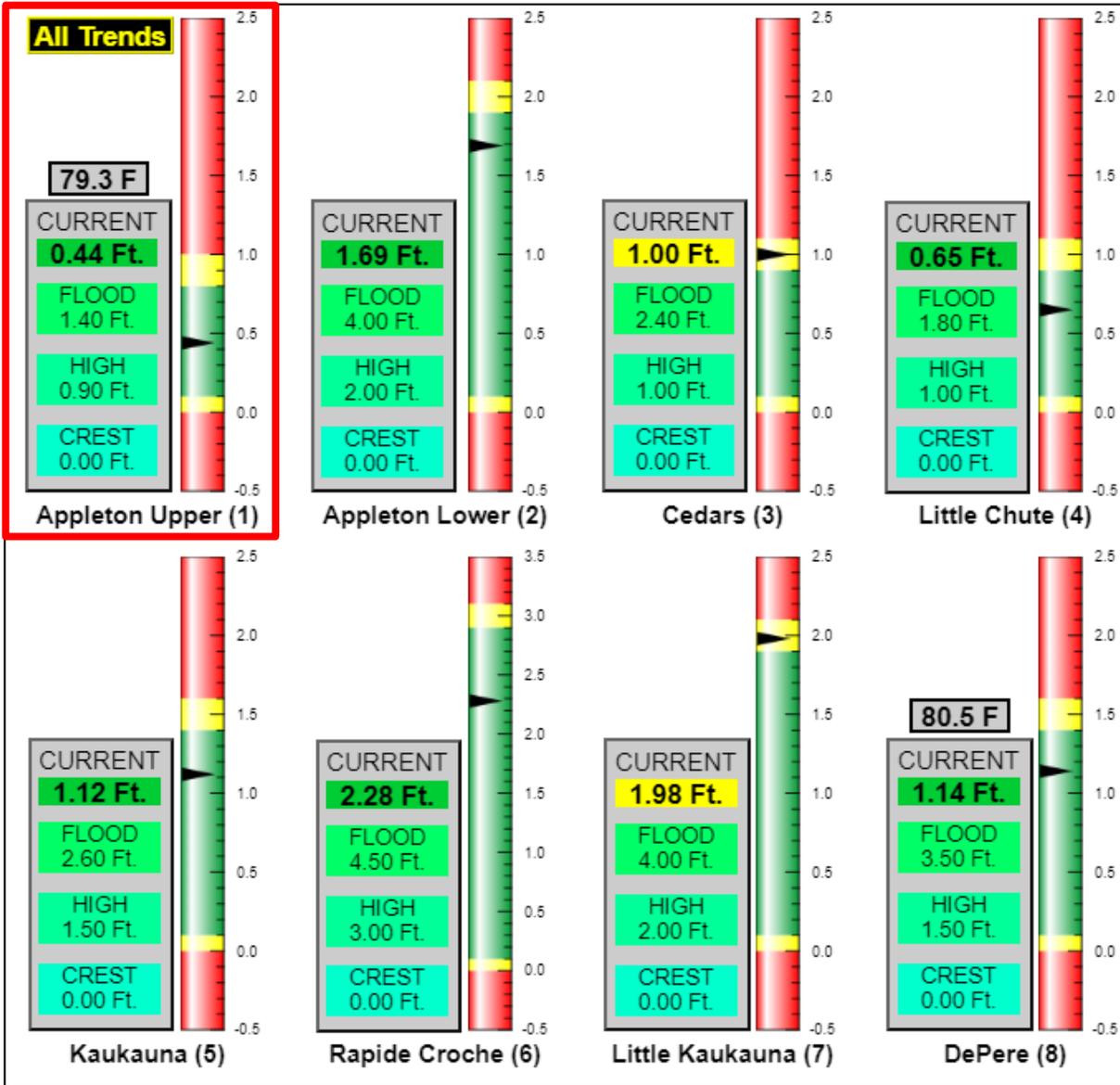


- USACE uses several stream gages throughout the basin in regulation decisions.
- Gages are operated by USACE and partner agencies USGS and NWS
- 4 Lake gages provide an average lake level

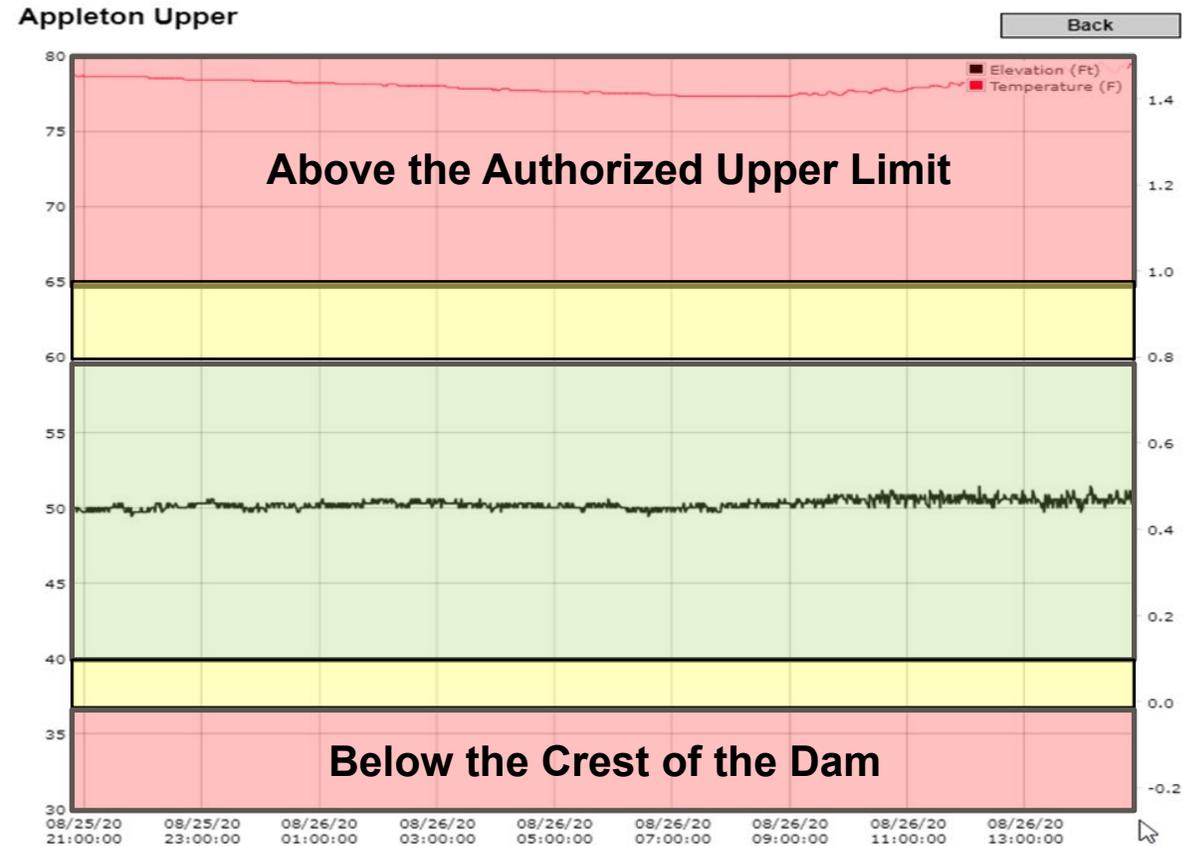




LOWER FOX RIVER DAMS

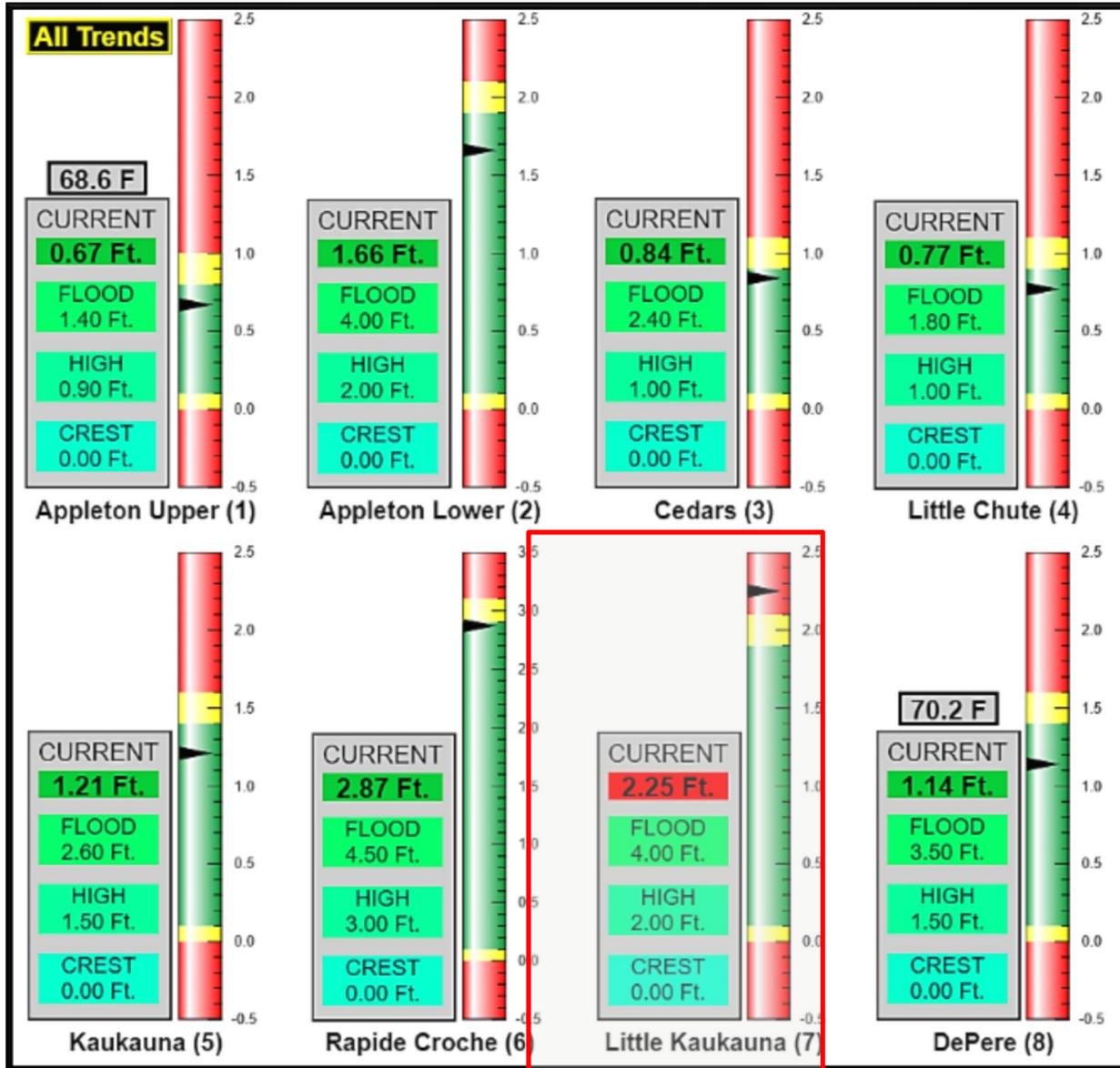


- There are 8 federal dams on the lower Fox River, managed for *flood risk, hydro power, municipal and industrial uses, and recreation.*





LOWER FOX RIVER DAMS (CONT'D)



All 8 gates open with an outflow from Lake Winnebago of 10,200 cfs.



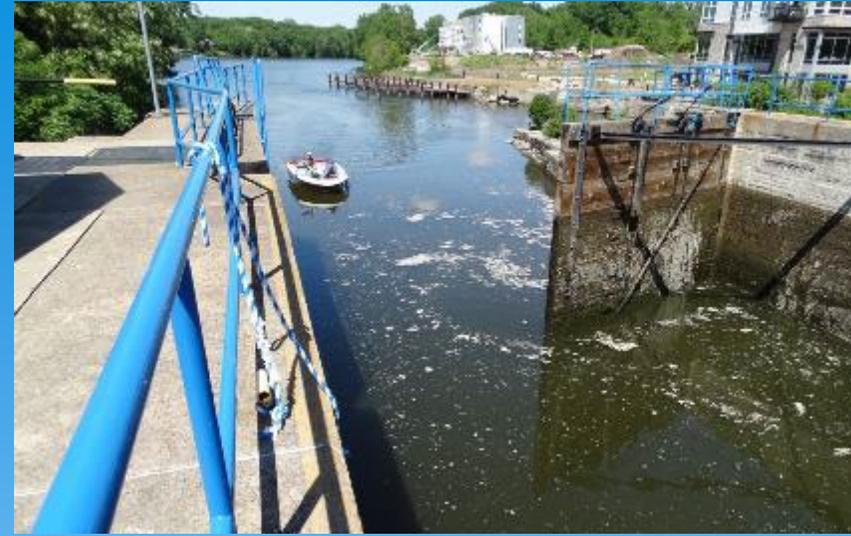
CRITICAL INFRASTRUCTURE REPAIR AND SAFETY BUOY INSTALL



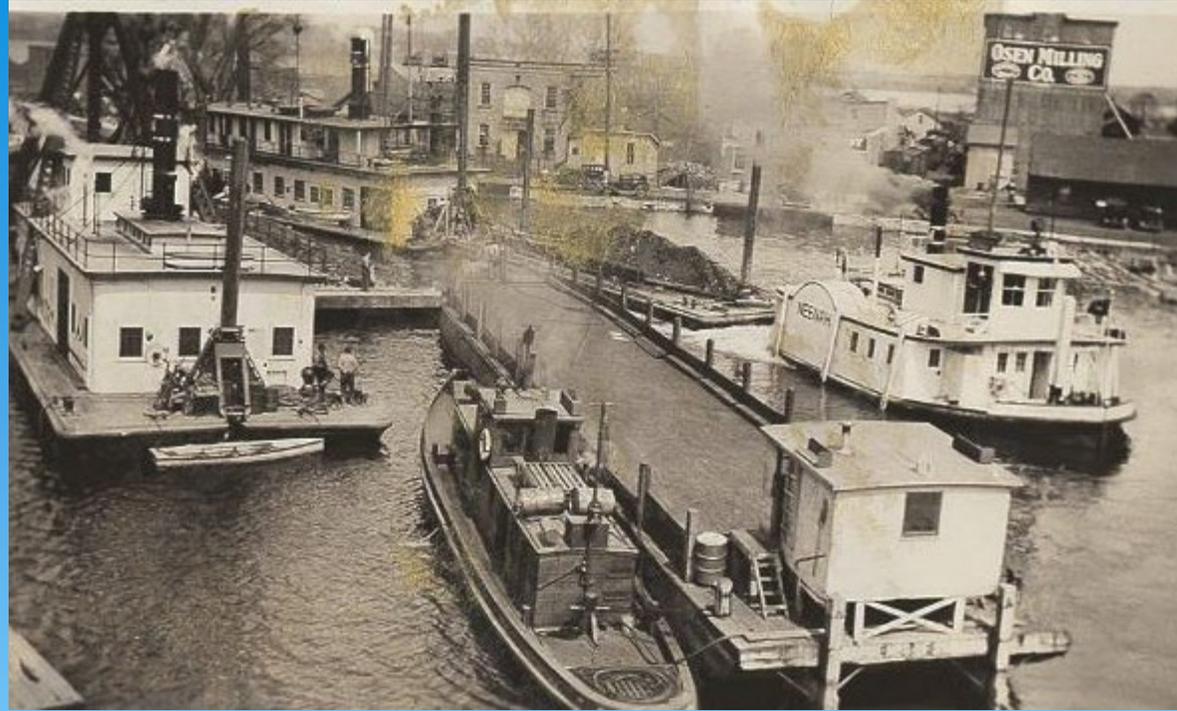


FOX RIVER NAVIGATION SYSTEM AUTHORITY UPDATE

Jeremy Cords, CEO



FOX LOCKS



- First public works project in the state of Wisconsin
- Built before the Civil War
- Military transportation route to link with the Mississippi





Appleton 1st Lock



Appleton 1885

History of the Lock System

- 1846-1853 – owned by the State of Wisconsin
- 1853-1866 – owned by the Fox and Wisconsin Improvement Company
- 1861 – 1865 - The Civil War
- 1866-1872 – owned by the Green Bay and Mississippi Canal Company
- 1872 - Yellowstone National Park, the first National Park was established
- 1916 - The National Park Service was created
- 1872-2001 – owned by the Federal Government and administered by the USACOE
- 1984 – local leaders organize effort to save the lock system
- 2001-present – owned by the State of Wisconsin and administered by the Fox River Navigational System Authority

2020 Season Lockage Report

2020 Lock Report	# Lockages	# Boats	# Passengers	# Day Pass	# Annual Pass
Appleton Locks	266	68	645	67	9
Cedars	72	74	401	23	2
Combined Locks	60	49	242	14	0
De Pere	1392	2401	10454	768	30
Little Chute Lock	23	23	114	0	0
Little Rapids	1013	1367	5899	437	15
	2,852	3,982	17,755	1,309	56
2019 Lock Report	# Lockages	# Boats	# Passengers	# Day Pass	# Annual Pass
Appleton 1-4	287	98	484	56	10
Cedars	58	76	605	15	1
Combined Locks	24	30	84	7	0
De Pere	990	1,478	6,936	613	19
Little Chute	20	31	90	0	0
Little Kaukauna	681	850	3,853	327	13
Total	2,060	2,563	12,052	1,018	43

Fox Locks 2020



Appleton Lock 4 Turn-Style

Appleton Lock 4 Project

- Rehabilitation of canal wall
\$450K

Menasha Lock - Round Goby Study

- Great Lakes Environmental Center - \$150K

Visitor Center plans scrubbed

- Interpretive Trails instead



Fox River Navigational System Authority
www.foxlocks.org



CURRENT WEATHER AND BASIN CONDITIONS



Current Lake Level	2.76
Inflows at Oshkosh	3,900 cfs (wind impacted)
Outflows at Appleton	5,400 cfs
5 Day Rainfall Forecast	No anticipated rain in extended forecast
Winds	Strong S/SW winds
Soil Moisture	High, 4 to 6 inches above normal
Forecasted Water Level Trend	Steady decline after winds settle

2019-2020 WATER LEVEL EXPLANATION

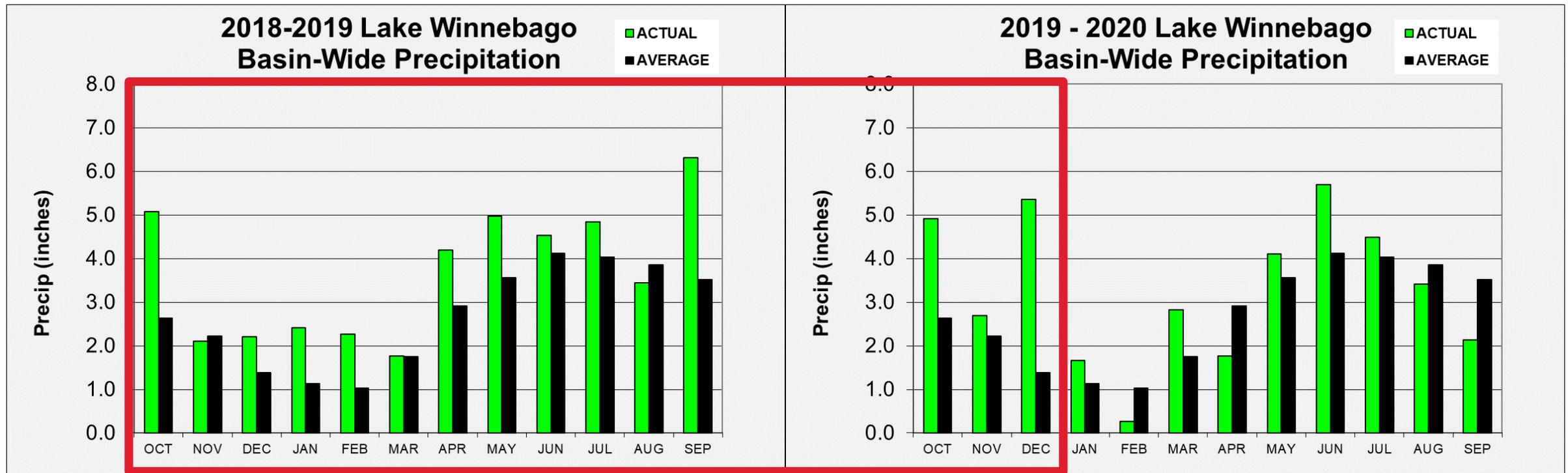




LAKE WINNEBAGO BASIN: RAINFALL



- A continuation of 2018 and 2019 wet pattern at the beginning of season
- 4 months of below average precipitation: February, April, August and September





WISCONSIN STATE-WIDE PRECIPITATION



Download: [XML](#)

View Period (Months): [All](#) 1 2 3 4 5 6 7 8 9 10 11 12 18 24 36 48 60

Record Driest	Bottom 1/10	Bottom 1/3	Normal	Top 1/3	Top 1/10	Record Wettest
PERIOD	VALUE	1901-2000 MEAN	ANOMALY	RANK (1895-2020)	WETTEST/DRIEST SINCE	RECORD
April 2020 1-Month	2.26" (57.40mm)	2.63" (66.80mm)	-0.37" (-9.40mm)	48th Driest	Driest since: 2016	1946
				79th Wettest	Wettest since: 2019	2008

Download: [XML](#)

View Period (Months): [All](#) 1 2 3 4 5 6 7 8 9 10 11 12 18 24 36 48 60

Record Driest	Bottom 1/10	Bottom 1/3	Normal	Top 1/3	Top 1/10	Record Wettest
PERIOD	VALUE	1901-2000 MEAN	ANOMALY	RANK (1895-2020)	WETTEST/DRIEST SINCE	RECORD
August 2020 1-Month	3.23" (82.04mm)	3.78" (96.01mm)	-0.55" (-13.97mm)	48th Driest	Driest since: 2013	1930
				79th Wettest	Wettest since: 2019	1980

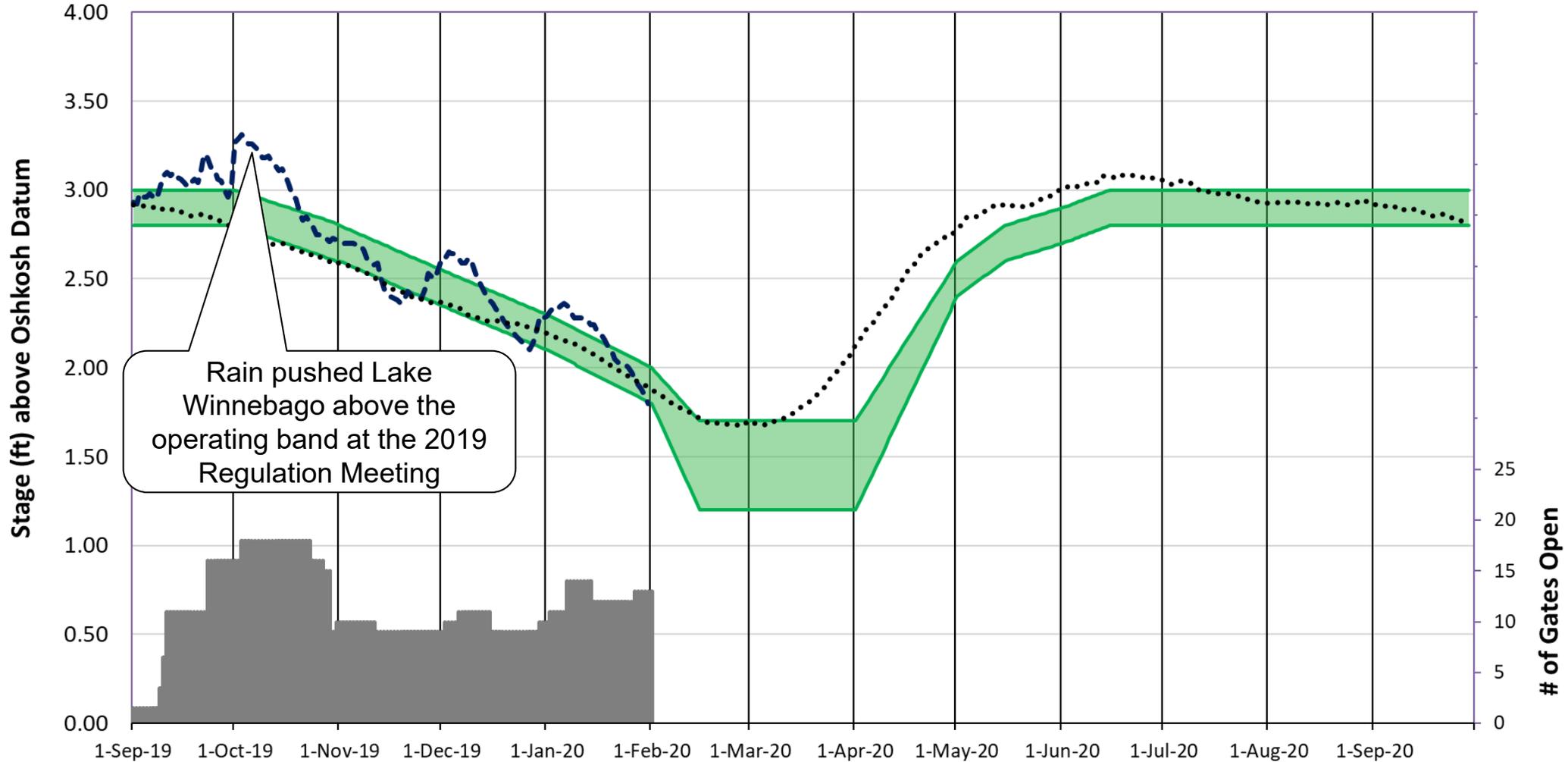


REGULATION DECISIONS - FALL DRAWDOWN

2019 - 2020 Lake Winnebago Stage with # of Open Gates

--- 2019-2020 Actual Stage
4 Gage Average

..... Average (1993 - 2019)

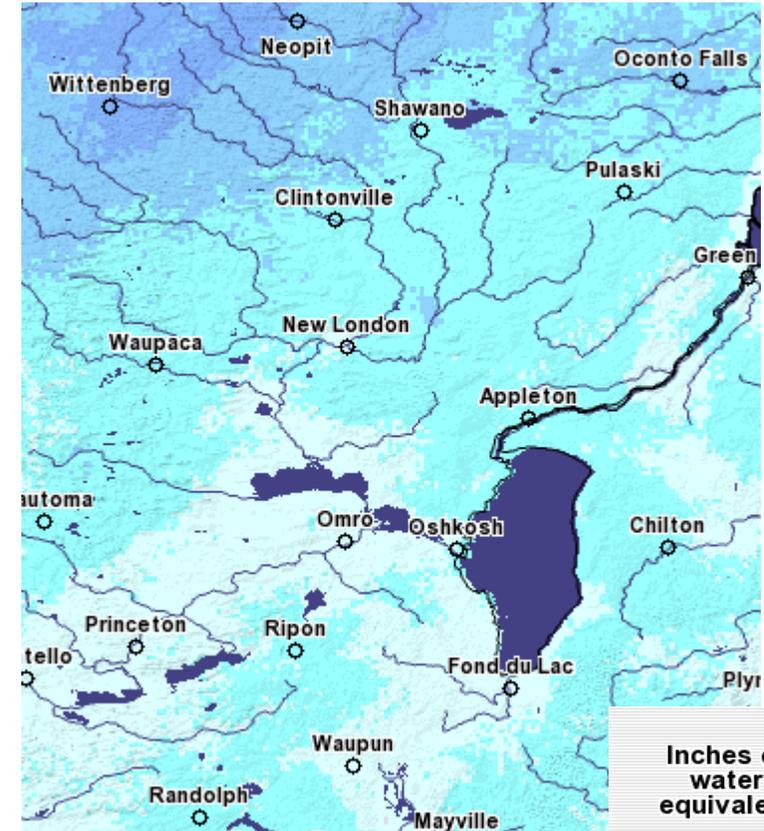
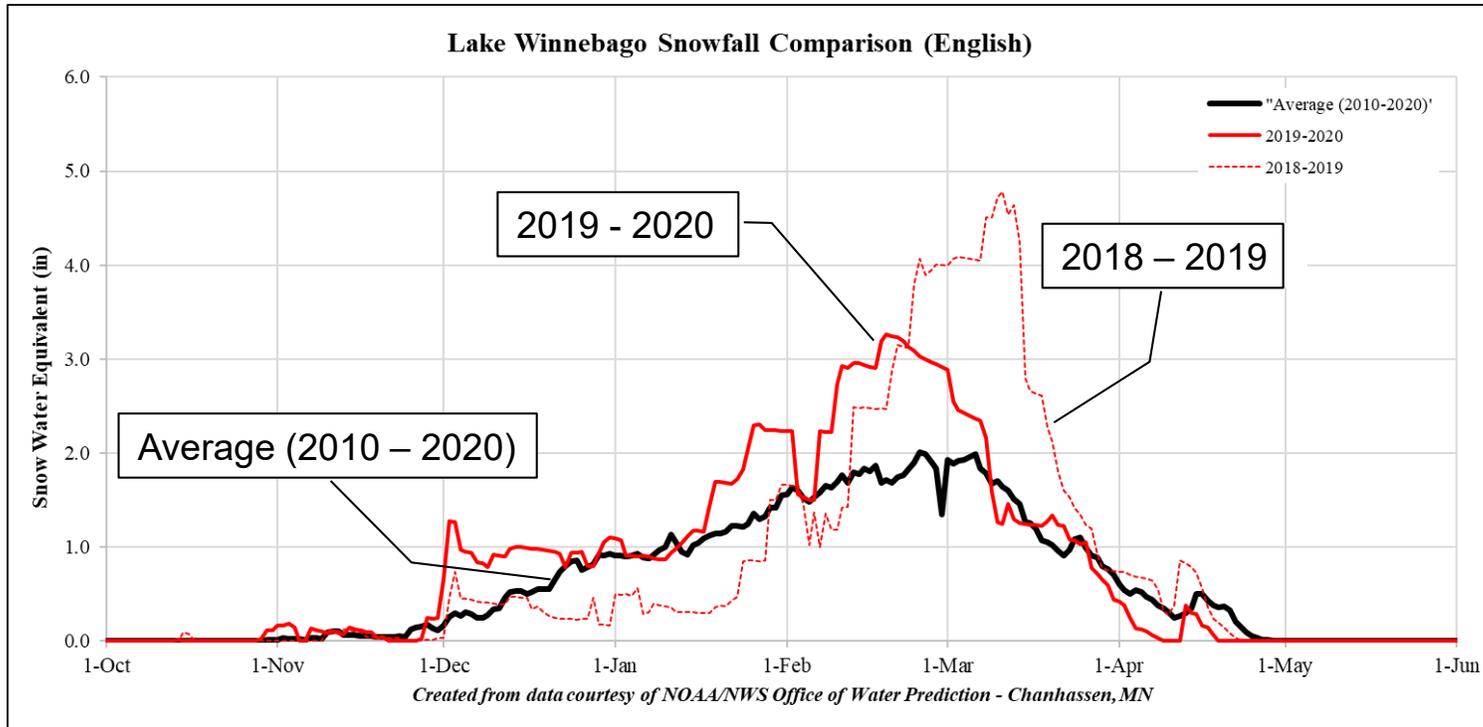




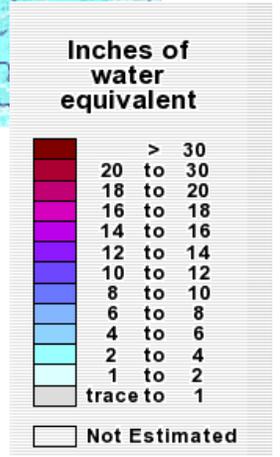
SNOWFALL IN THE BASIN



- Track and use Snow Water Equivalent (SWE) in making regulation decisions.
- 2020 had an above average SWE; however about 1.5” less than 2019



February 20, 2020



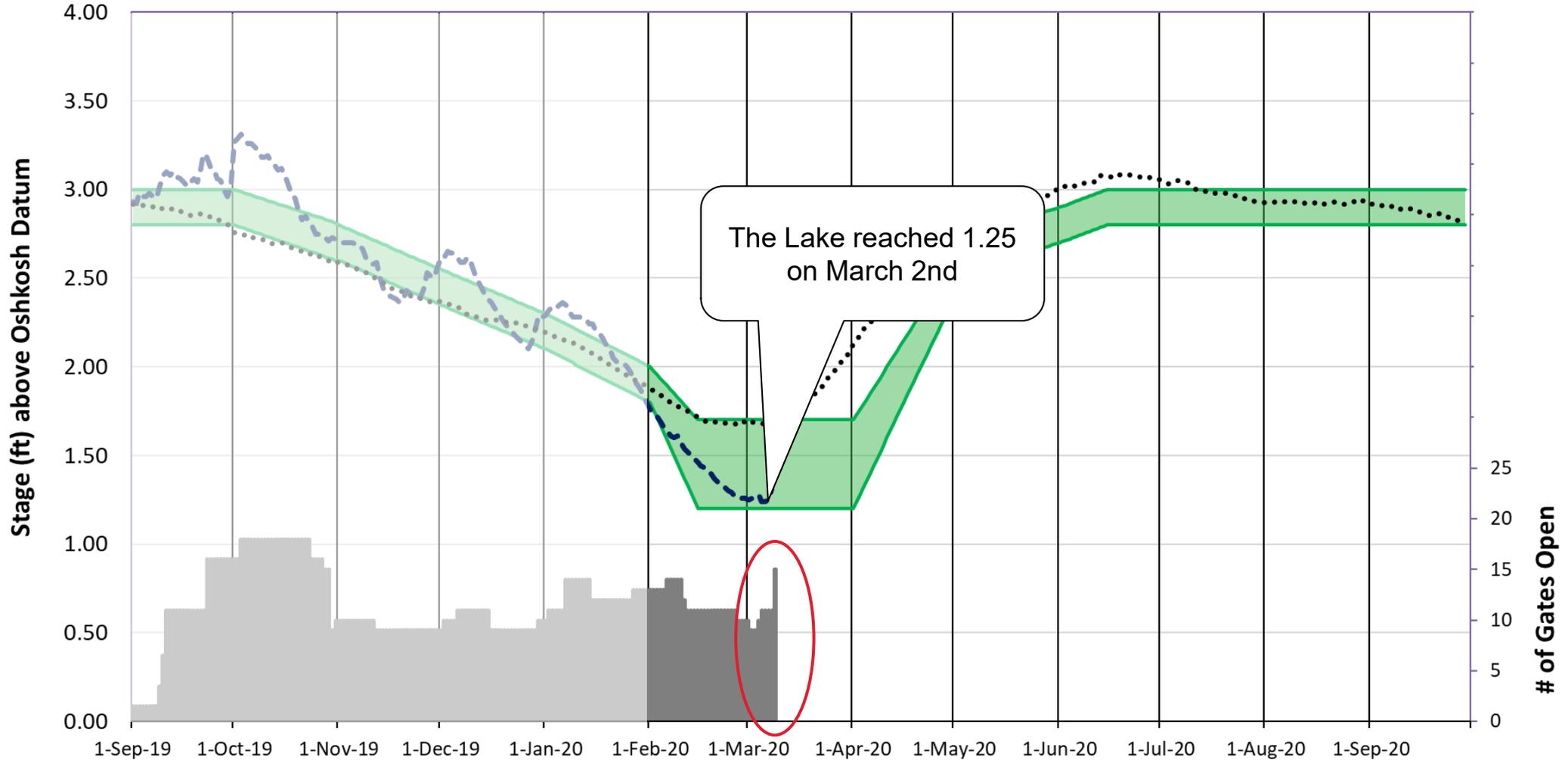


THE TURNING POINT – MARCH 9

2019 - 2020 Lake Winnebago Stage with # of Open Gates

--- 2019-2020 Actual Stage
4 Gage Average

..... Average (1993 - 2019)

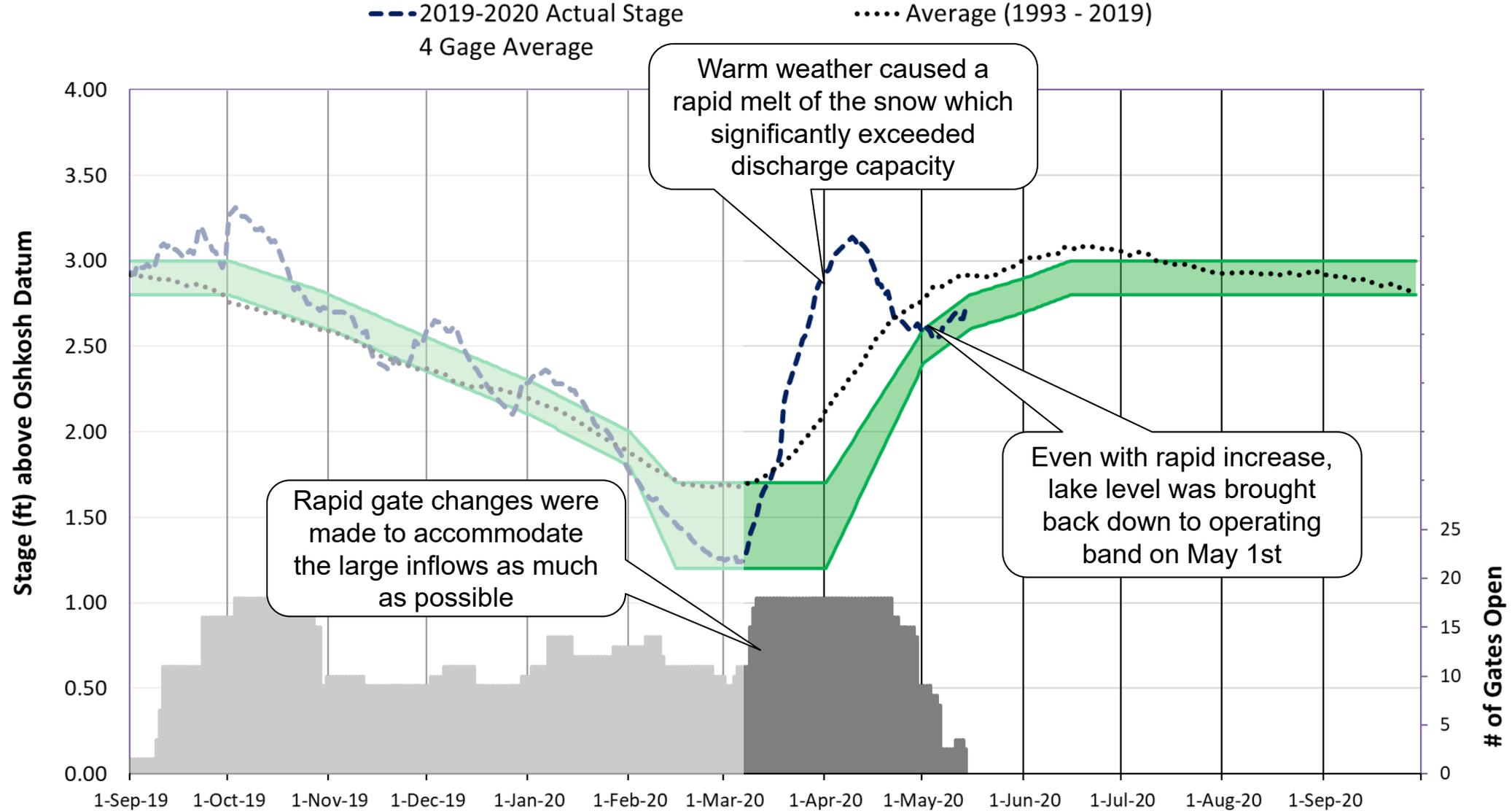




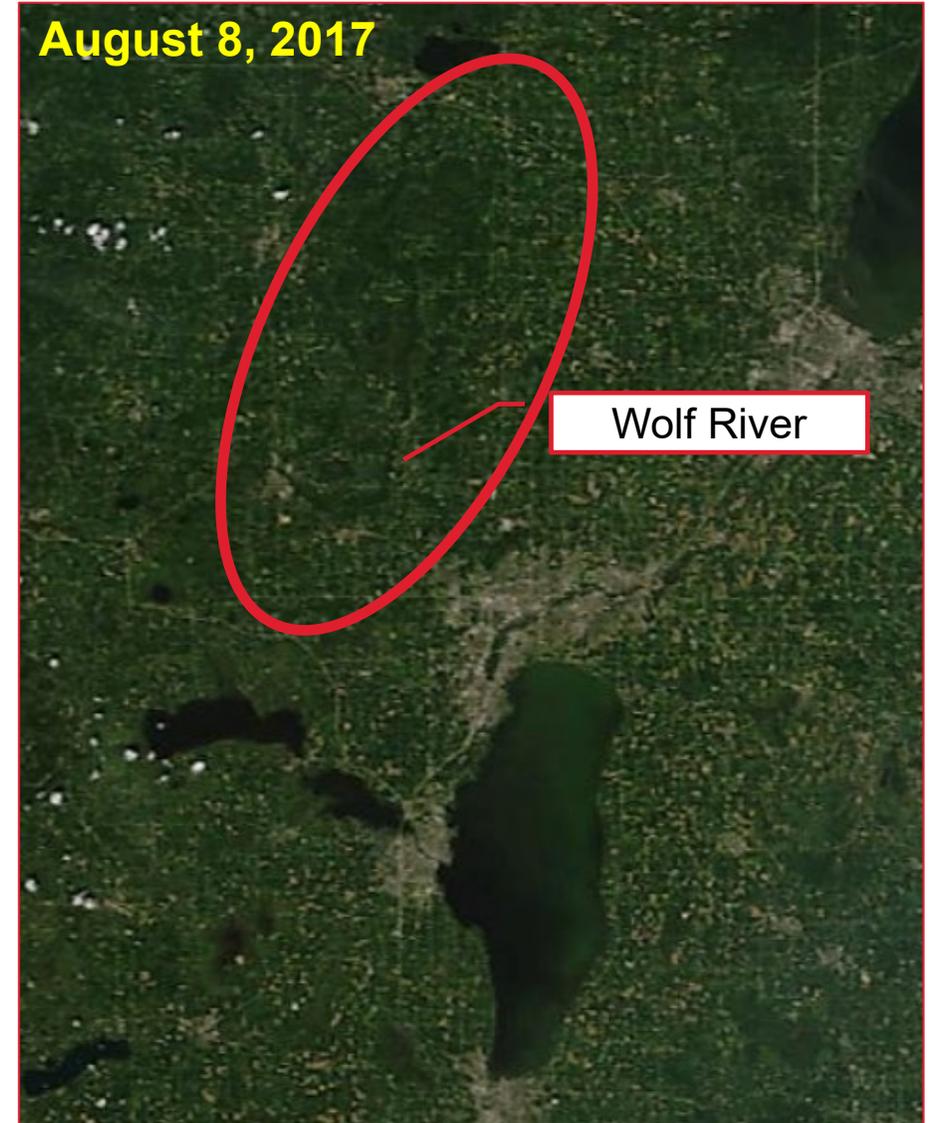
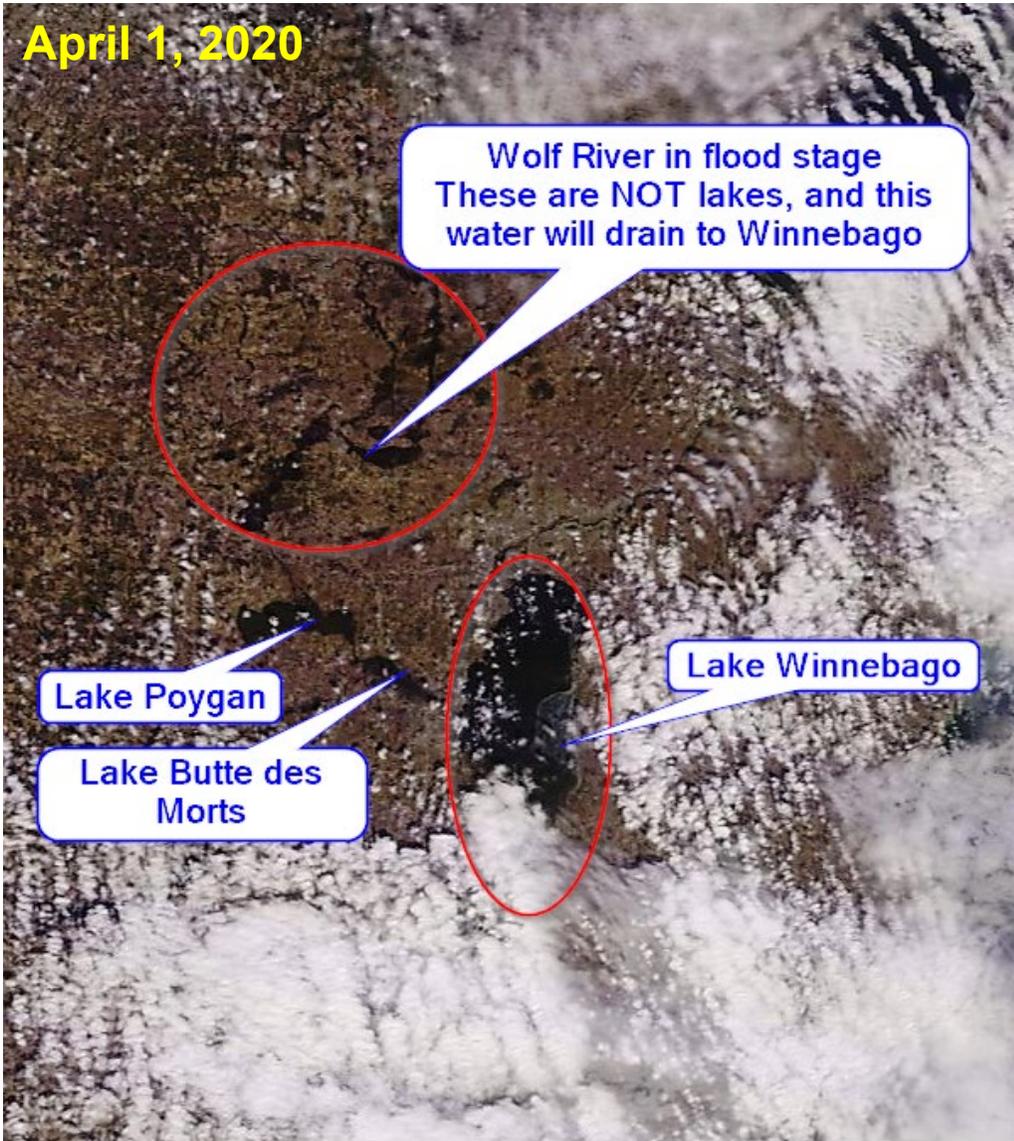
SPRING RISE



2019 - 2020 Lake Winnebago Stage with # of Open Gates



LARGE SCALE AREAL FLOODING

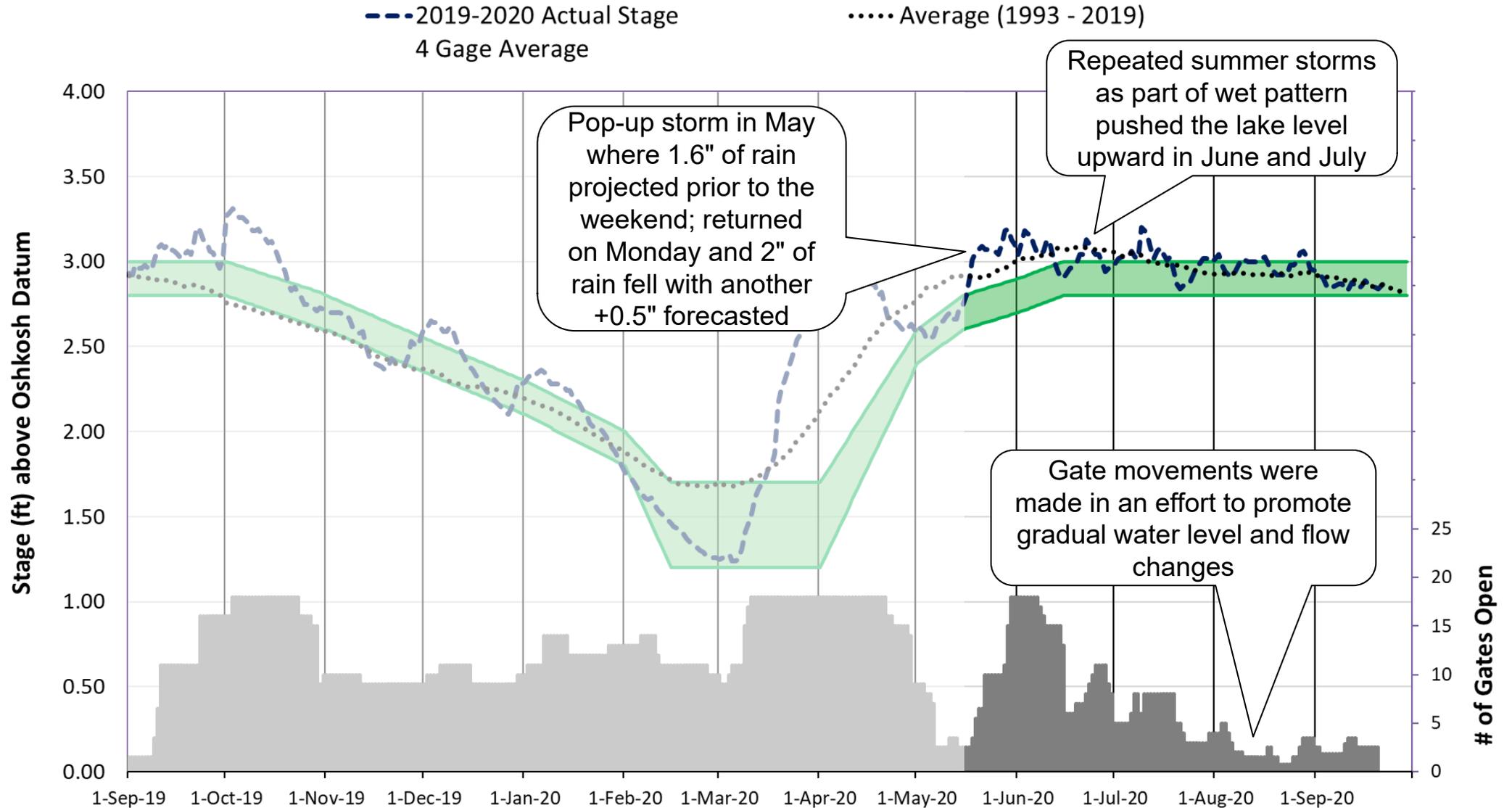




SUMMER OPERATIONS



2019 - 2020 Lake Winnebago Stage with # of Open Gates





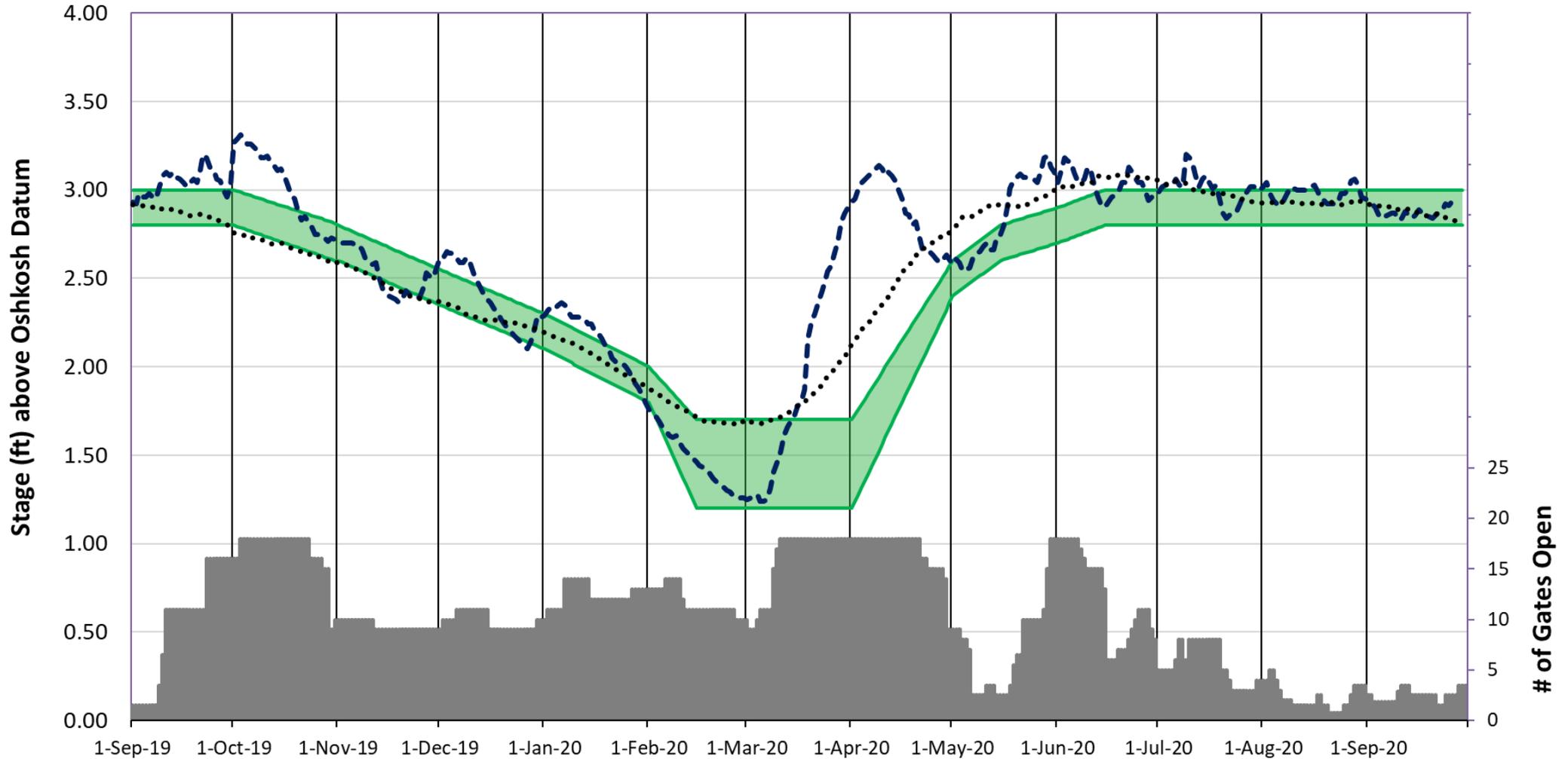
2019-2020 FULL YEAR IN REVIEW



2019 - 2020 Lake Winnebago Stage with # of Open Gates

--- 2019-2020 Actual Stage
4 Gage Average

..... Average (1993 - 2019)





NATIONAL WEATHER SERVICE UPDATE

Sarah Marquardt and Tasos Kallis



FALL 2020 LAKE WINNEBAGO REGULATION

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Current Weather Conditions and Outlook

10/6/2020

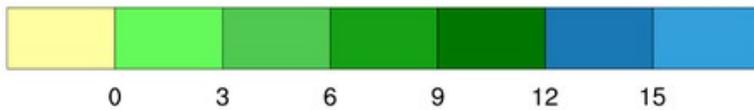
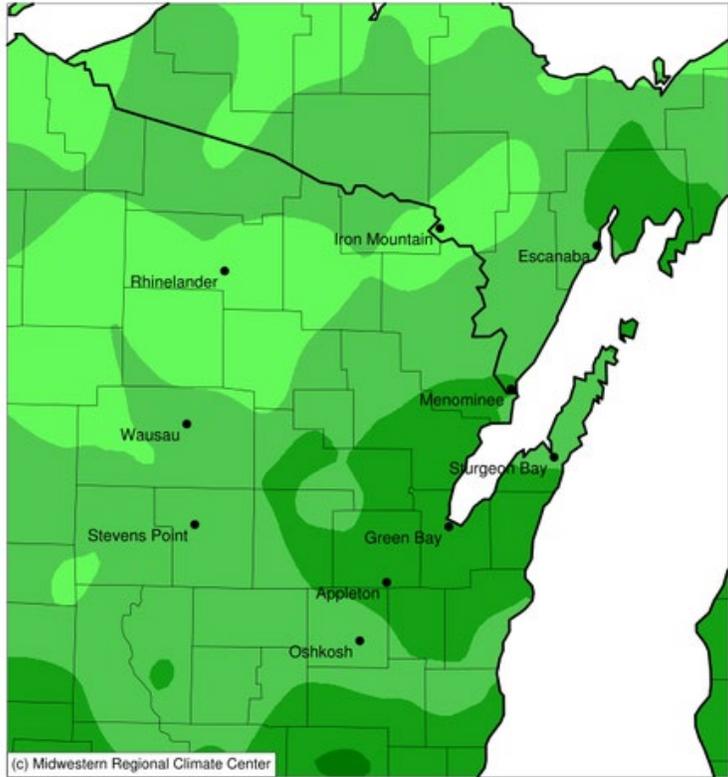
Sarah Marquardt - Senior Service Hydrologist
NWS Milwaukee





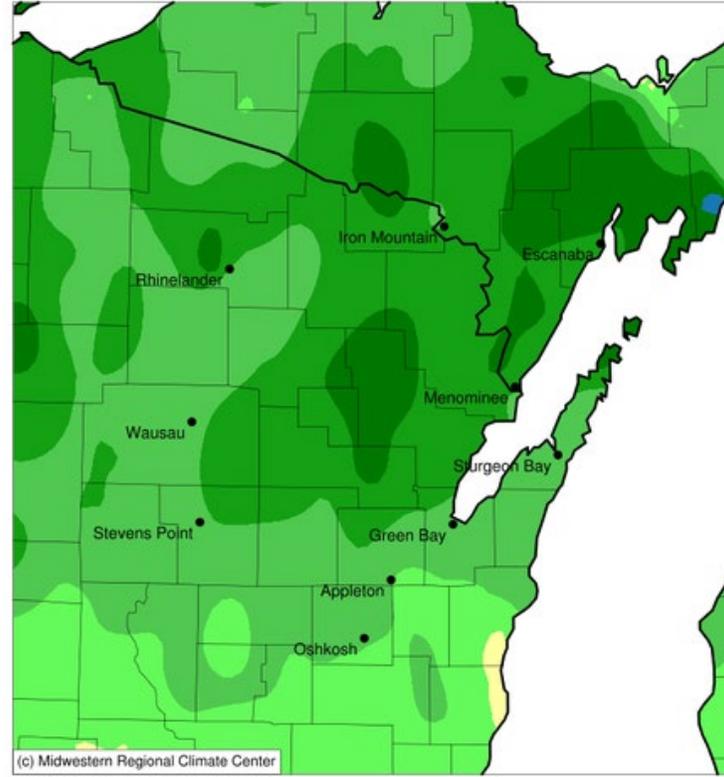
Accumulated Precipitation (in): Departure from 1981-2010 Normals Accumulated Precipitation (in): Departure from 1981-2010 Normals Accumulated Precipitation (in): Departure from 1981-2010 Normals

September 01, 2019 to November 30, 2019



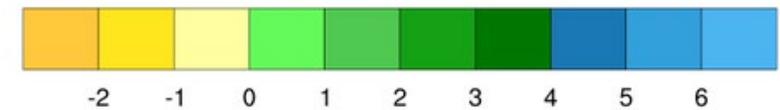
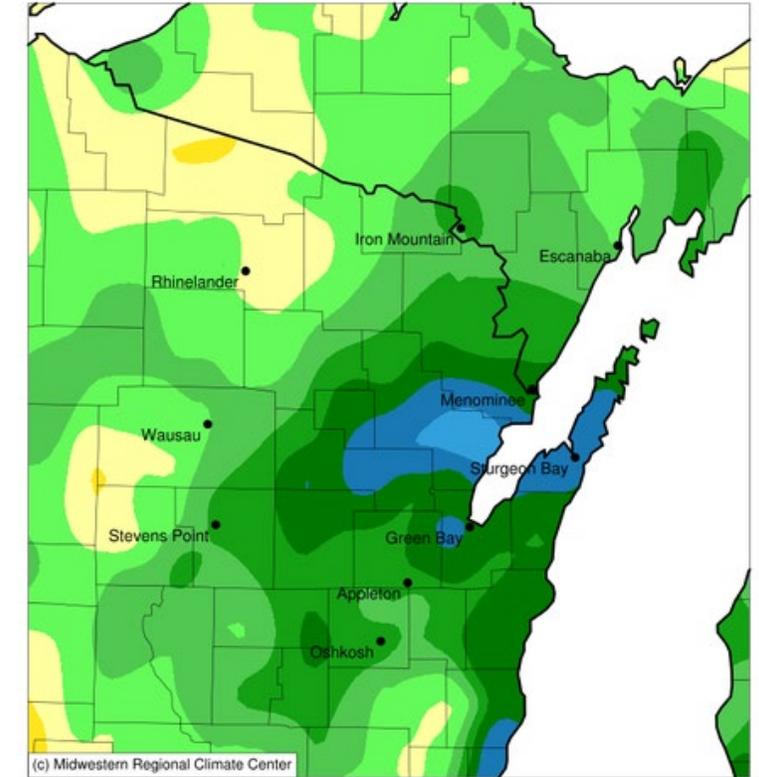
Normal values are ~ 8 inches

December 01, 2019 to February 28, 2020



Normal values are ~ 4 inches

March 01, 2020 to May 31, 2020

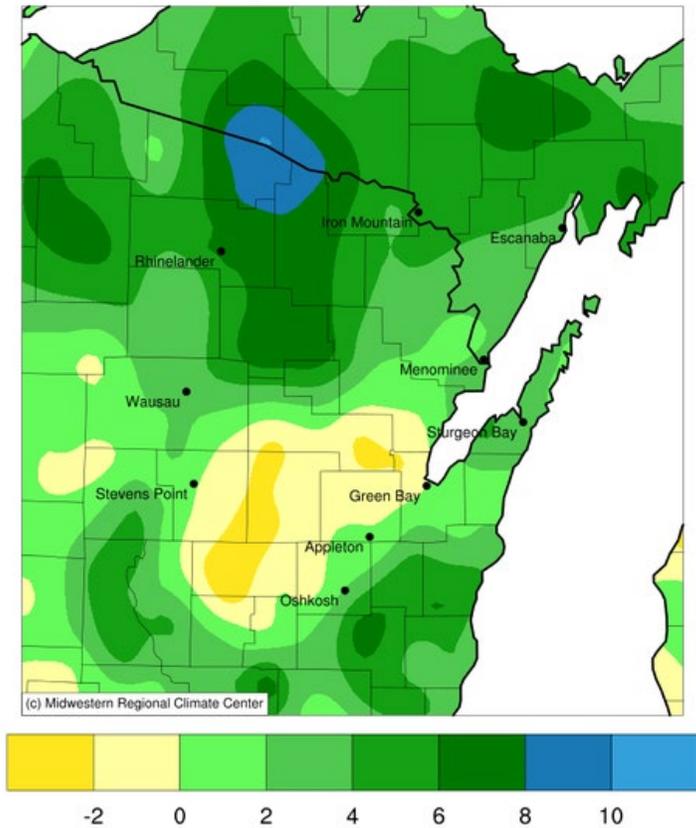


Normal values are ~ 7 inches



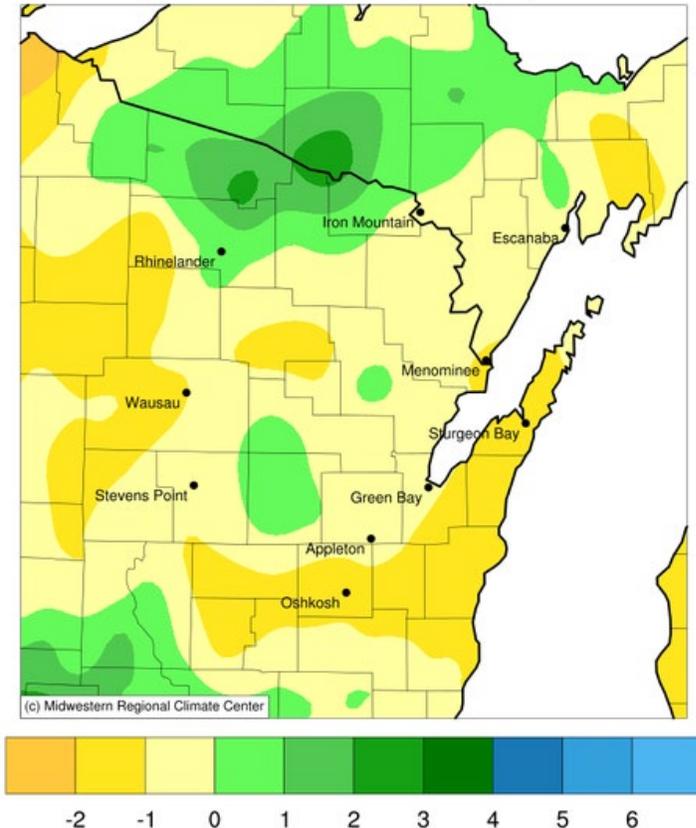


Accumulated Precipitation (in): Departure from 1981-2010 Normals
June 01, 2020 to August 31, 2020



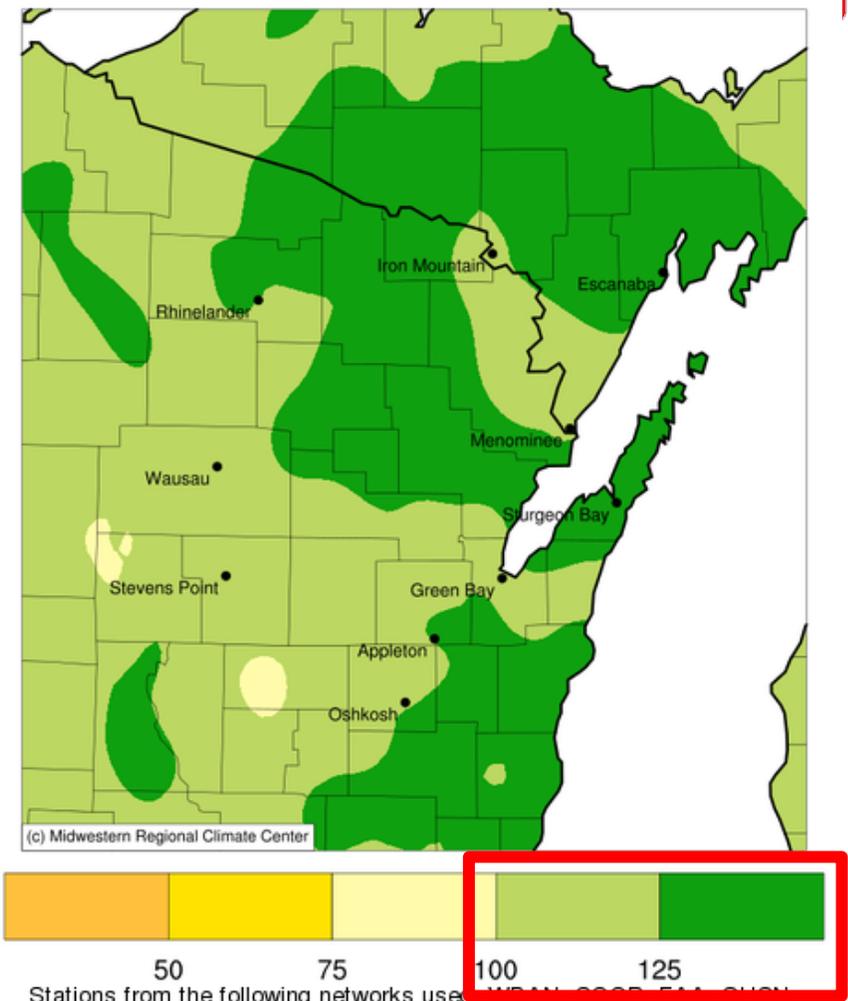
Normal values are ~11 inches

Accumulated Precipitation (in): Departure from 1981-2010 Normals
September 01, 2020 to September 30, 2020



Normal values are ~3 inches

Accumulated Precipitation (in): Percent of 1981-2010 Normals
October 01, 2019 to September 30, 2020



Stations from the following networks used: WDM, CCCC, FAA, SHSN, ThreadEx, CoCoRaHS, WMO, ICAO, NWSLI, Midwest Regional Climate Center cli-MATE: MRCC Application Tools Environment

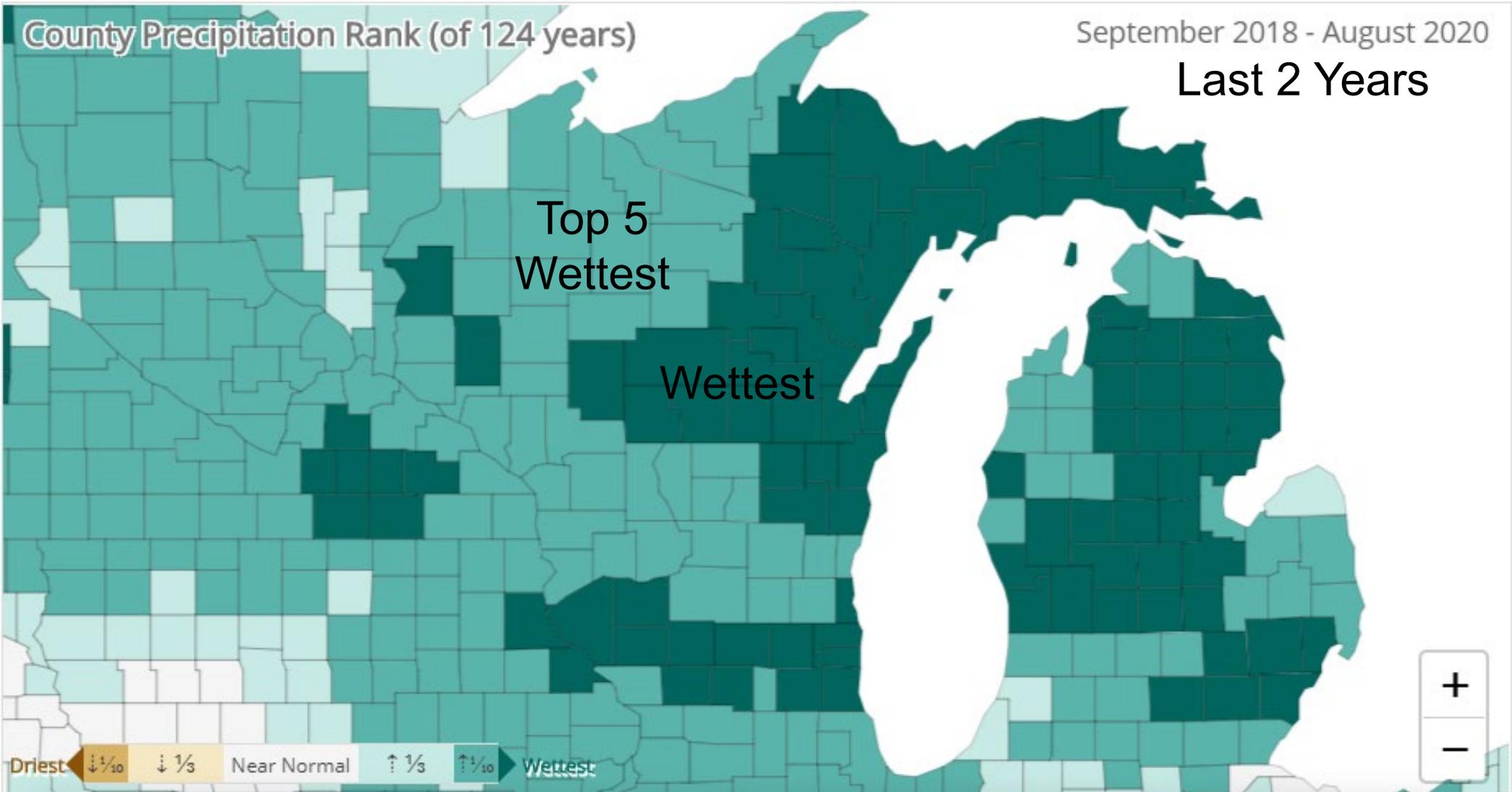




County Precipitation Rank (of 124 years)

September 2018 - August 2020

Last 2 Years



Wisconsin (Hover over a county)

Precip: 83.8"

Rank: Wettest

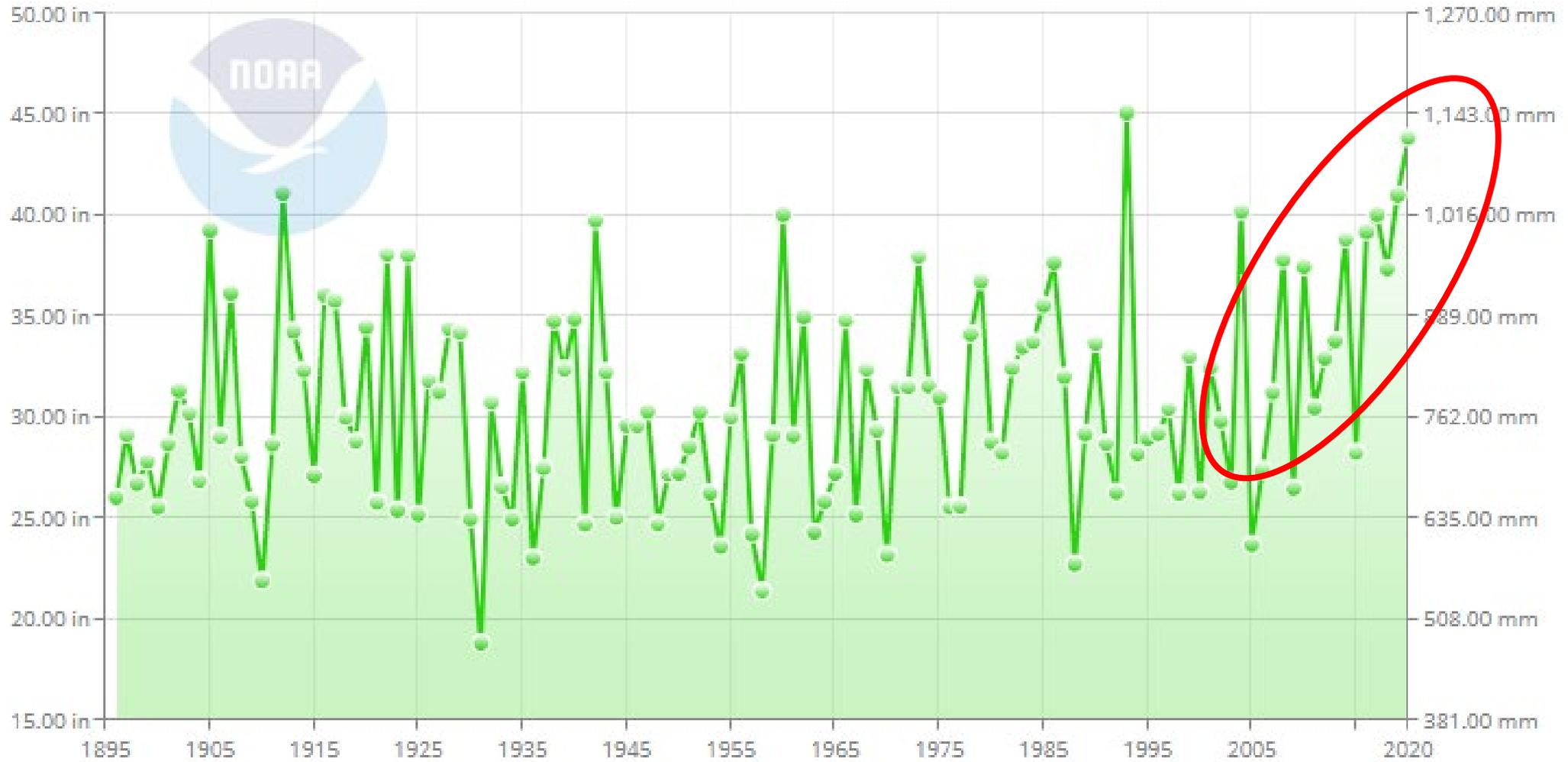
Anomaly: 21.1"

Mean: 62.7"





Winnebago County, Wisconsin Precipitation September–August

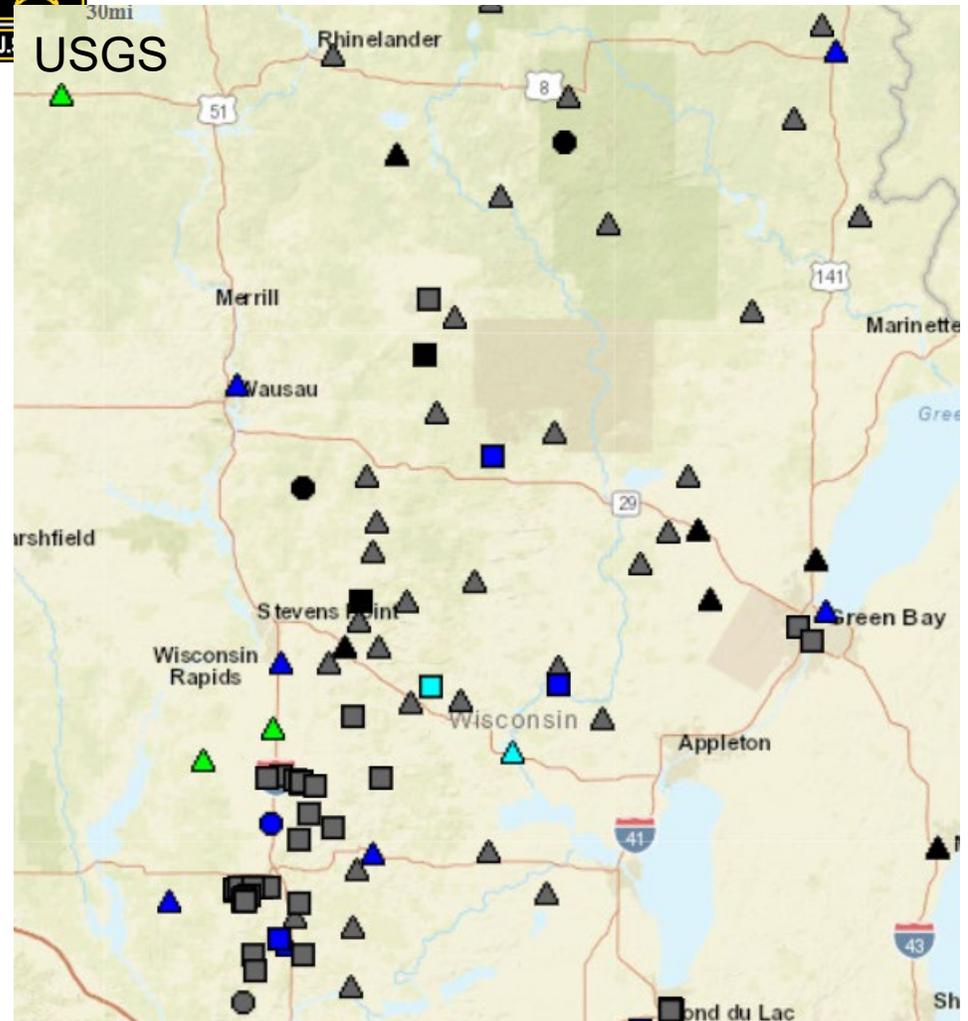




Ground Water Percentile of Normal Observed Summer to Present



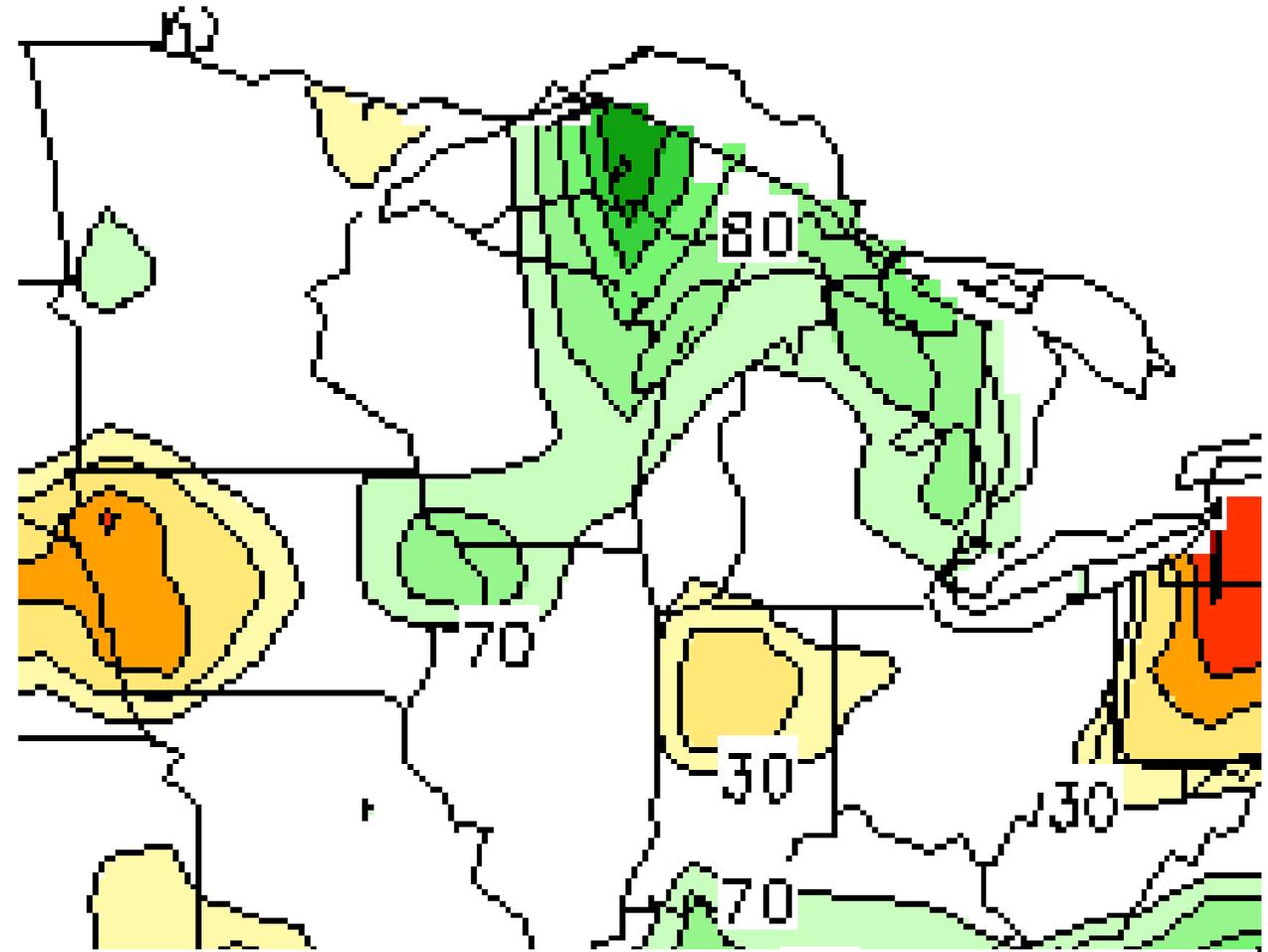
USGS



Explanation - Percentile classes (symbol color based on most recent measurement)

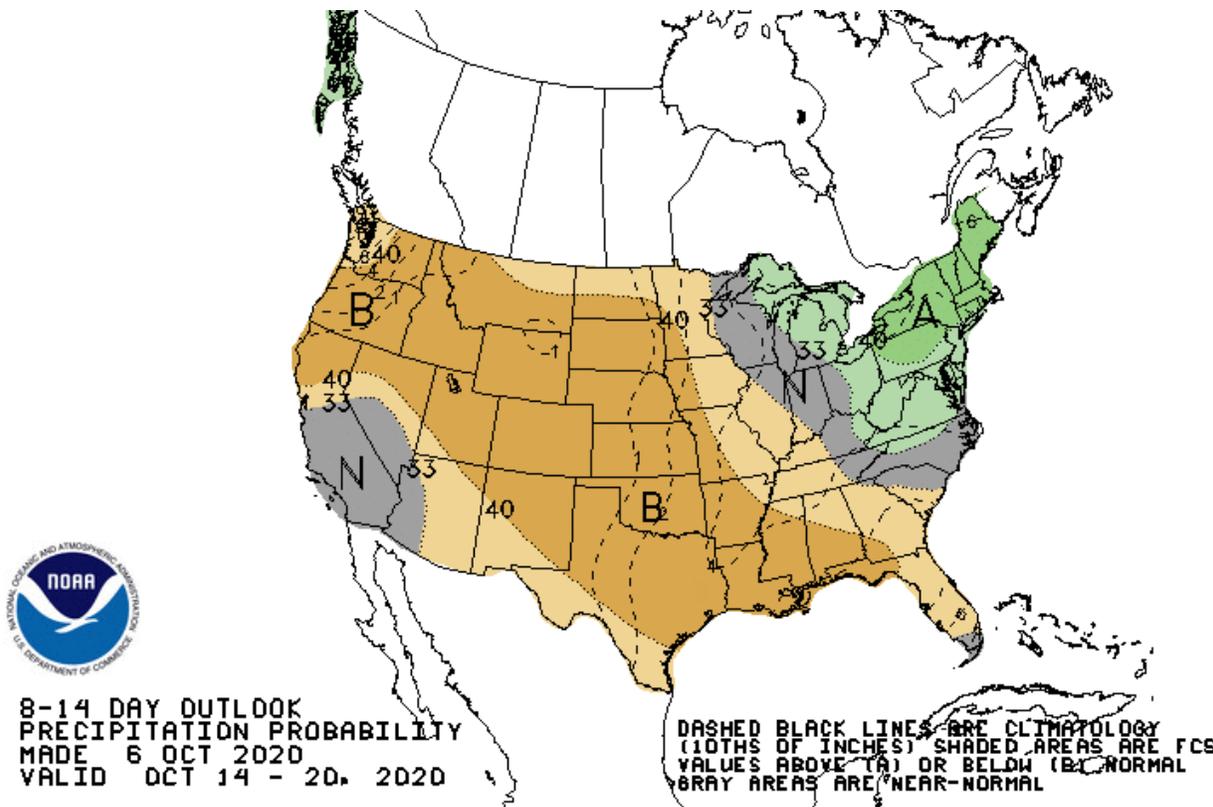
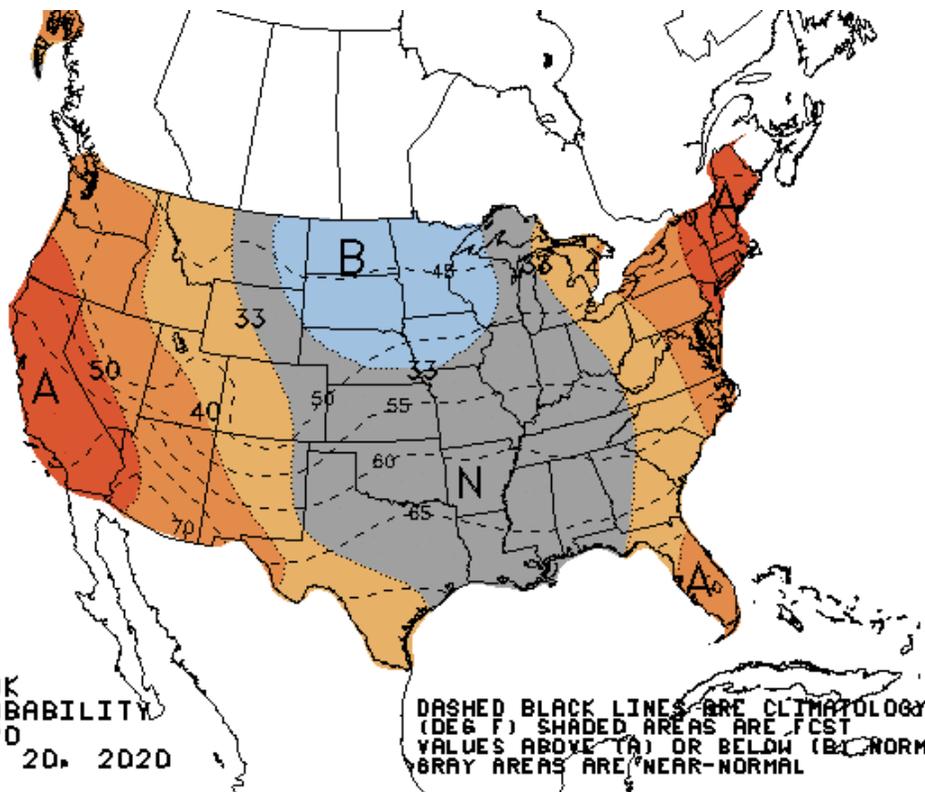
Low	<10	10-24	25-75	76-90	>90	High	Not Ranked
	Much Below Normal	Below Normal	Normal	Above Normal	Much Above Normal		

Soil Moisture Ranking Percentile Sep 30, 2020



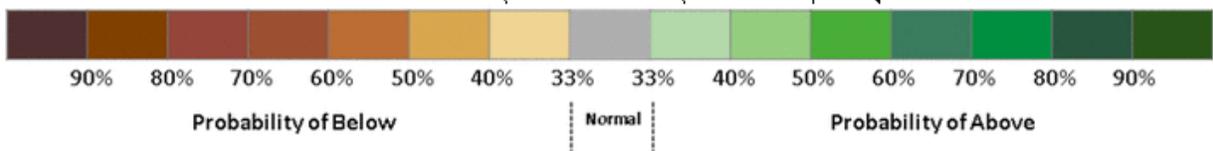
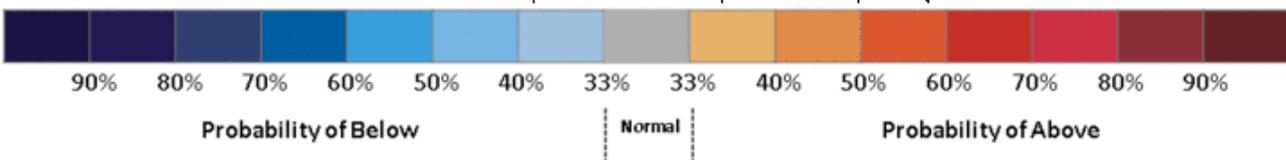


Next 2 Weeks



8-14 DAY OUTLOOK
TEMPERATURE PROBABILITY
MADE 6 OCT 2020
VALID OCT 14 - 20, 2020

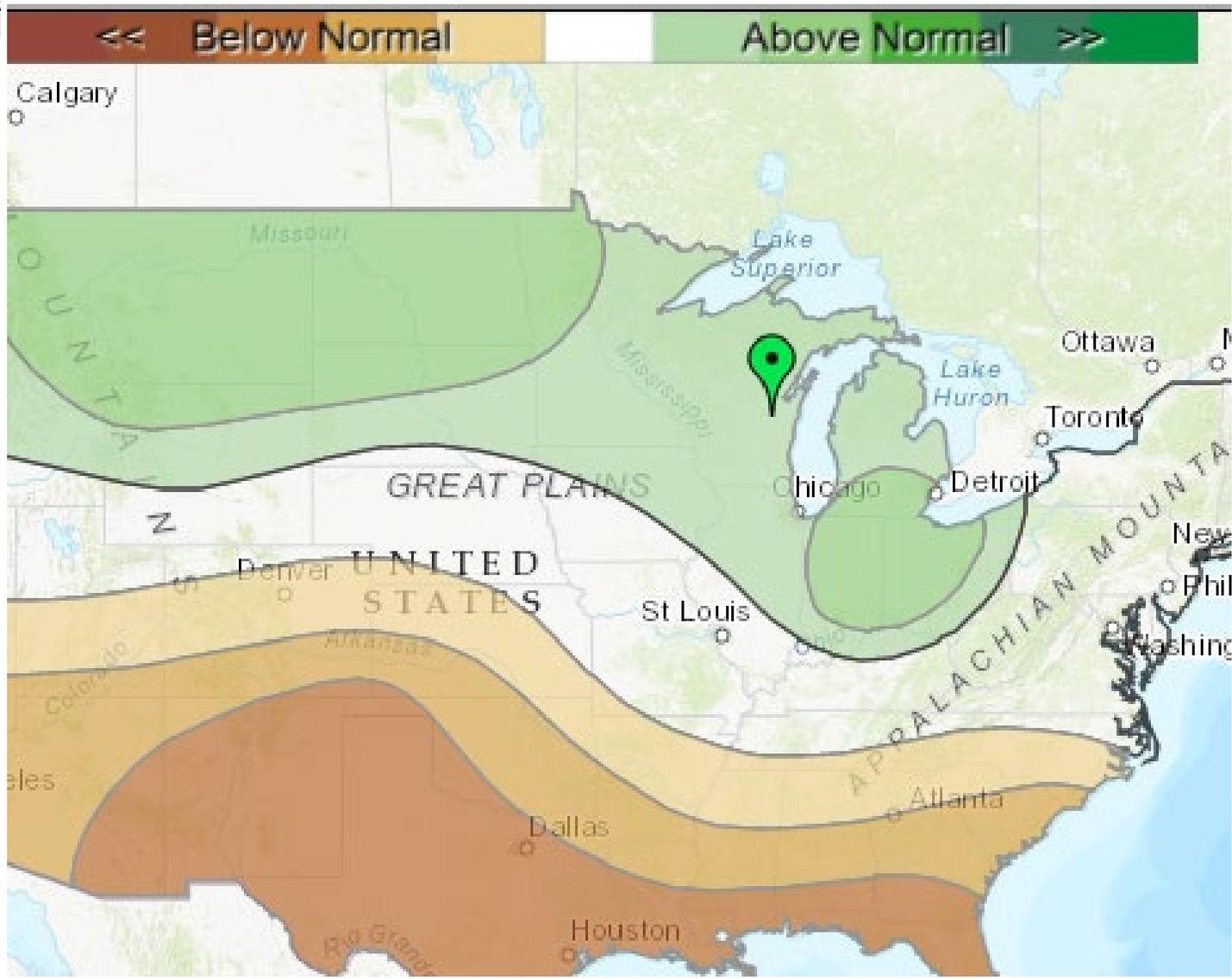
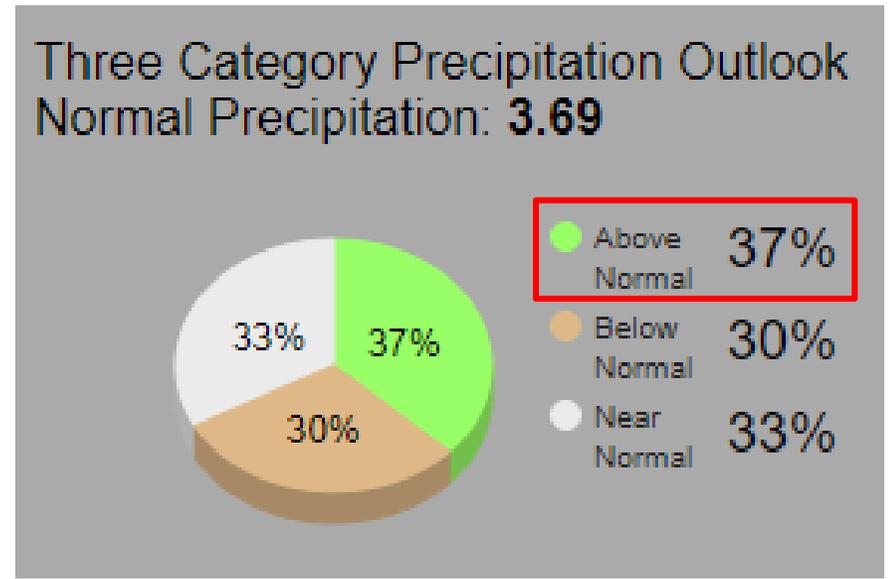
8-14 DAY OUTLOOK
PRECIPITATION PROBABILITY
MADE 6 OCT 2020
VALID OCT 14 - 20, 2020





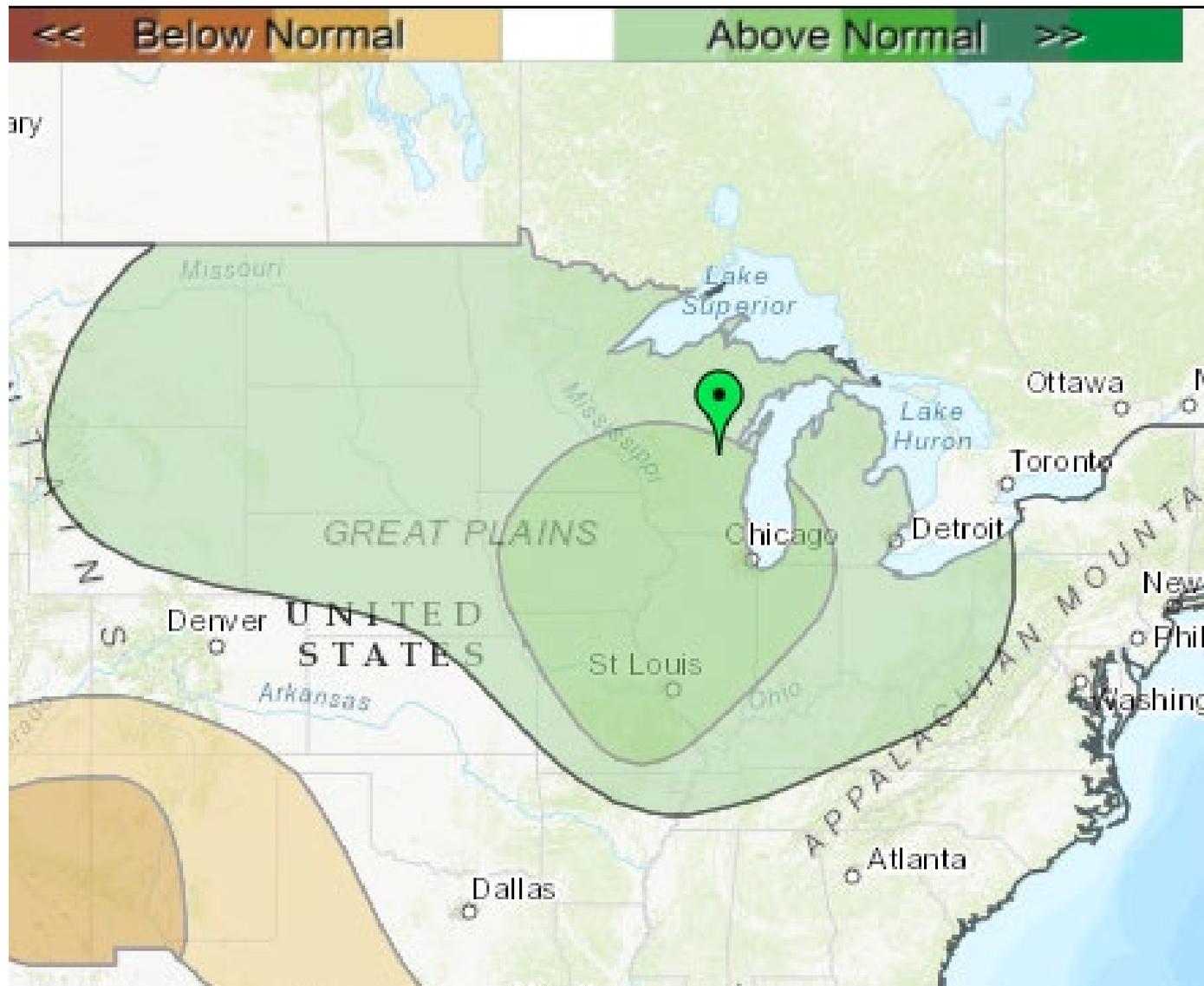
Dec 2020 – Feb 2021 Outlook

La Niña

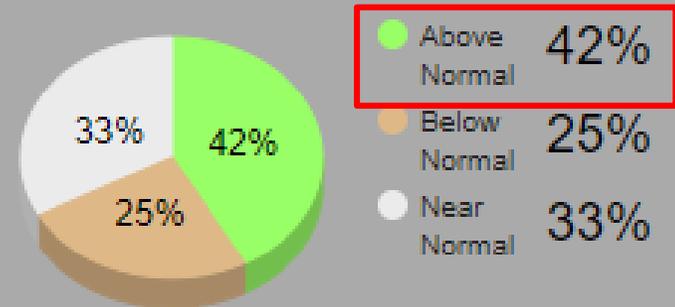




March – May 2021 Outlook



Three Category Precipitation Outlook
 Normal Precipitation: **8.02**





LRC WEBSITE (WWW.LRC.USACE.ARMY.MIL/)



Missions / Water Management

Chicago District Water Management

The Hydraulic and Environmental Engineering section is responsible for the daily operation of four multi-purpose reservoir projects within Wisconsin, Illinois and Indiana and the collection and dissemination of data associated with those projects in regards to... [Read More](#)

Quick Links



Lake Winnebago



Do you know to call b

Missions / Water Management / Lake Winnebago

Lake Winnebago

Important Notices

The IGLD 1985 relationships in the Lake Winnebago system are currently being updated. Please contact the Chief of Construction & Survey at (920) 388-3720 for more information.

- [Lake Winnebago Regulation Meeting Notice: 2020-2021](#)
- [Lake Winnebago Regulation Strategy 2019-2020](#)
- [Click here for the Lake Winnebago Current Conditions Update](#)
- [Click here for the 2019 Lake Winnebago Regulation Presentation](#)
- [Click here for the Revised Lake Winnebago Facts Book](#)
- [Click here for the January 13th, 2020 Lake Winnebago Drawdown Presentation](#)

Lake Winnebago Levels and Flows

- [Click here to view NOAA river observations \(AHPS\).](#)
- [Click here to view NOAA river forecasts \(AHPS\).](#)

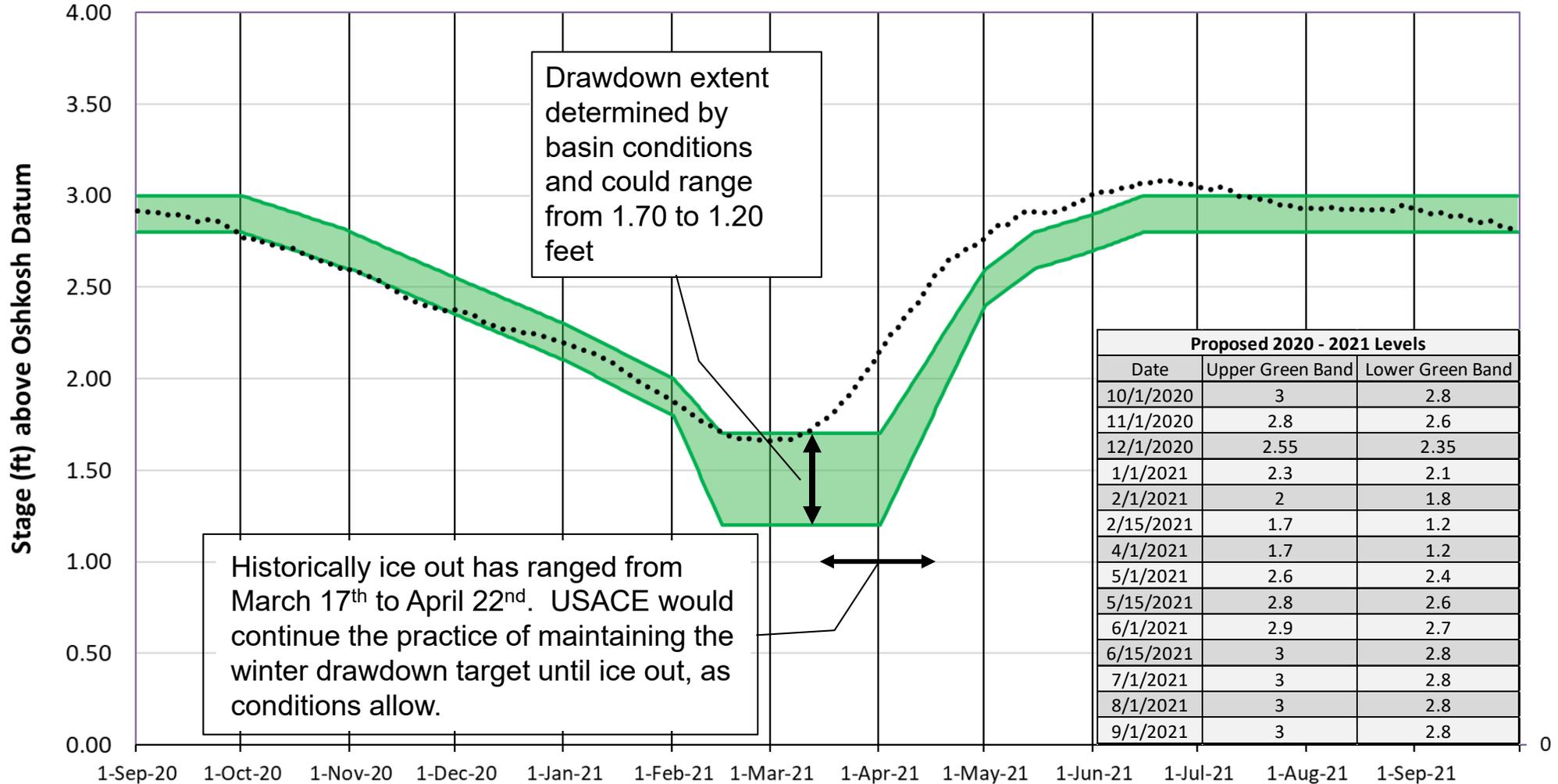
Levels and Flows	
Today's Hourly Data	Yesterday's Hourly Data
This Month's Daily Data	Last Months Daily Data



PROPOSED 2020-2021 WATER LEVEL STRATEGY

2020 - 2021 Lake Winnebago Regulation Strategy

..... Average (1993 - 2019)





QUESTIONS?

Appleton Office: (920) 380 -7101