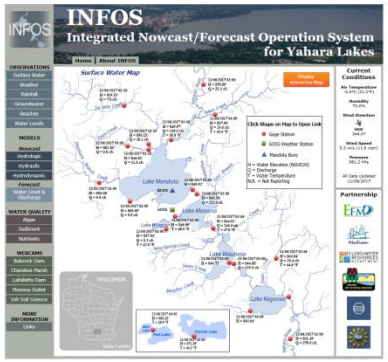
Science Driven Lake Level Management for the Yahara River Chain of Lakes

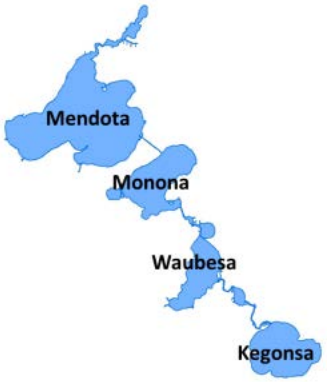


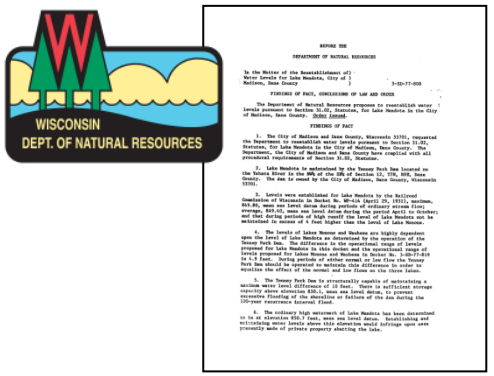
Lakes & Watershed Commission
Environment, Agriculture & Natural Resources Committee
June 14, 2018

John Reimer
Dane County Land & Water Resources

DANE COUNTY LAND&WATER RESOURCES DEPARTMENT

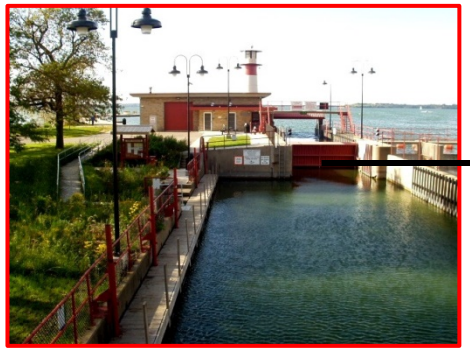
Lake Level Orders





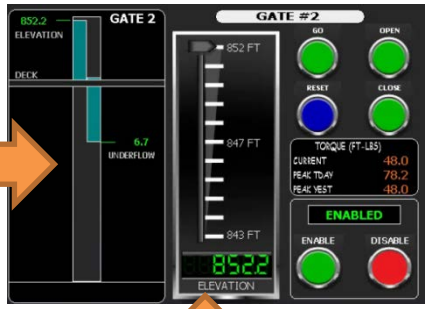
WDNR Orders, 1979

Lake Level Management



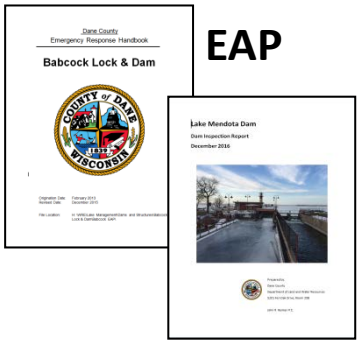
2017 Upgrades

Automation



2013 Rehabilitation

Dam Regulations



EAP

IOM

Integrated Nowcast/Forecast Operation System

for Yahara Waters

Observations → **Integration** ← **Models**

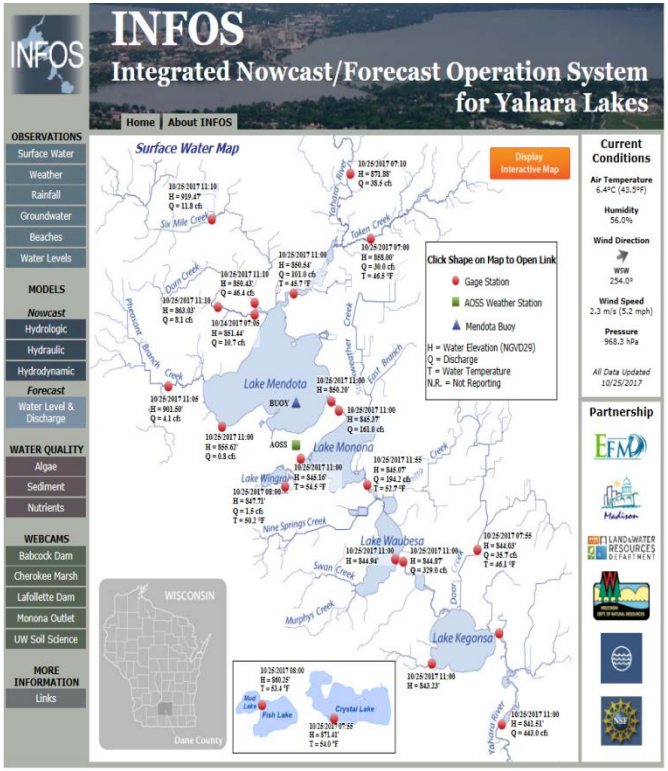
USGS Gauges

Wireless Buoys

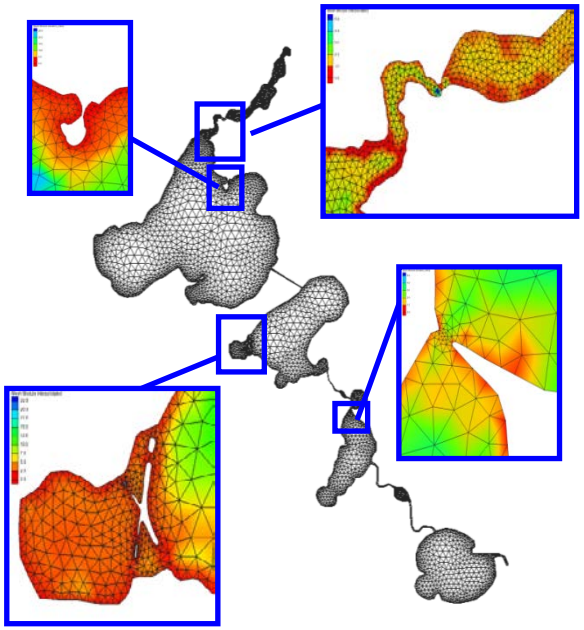
AOSS

INFOS Gauges

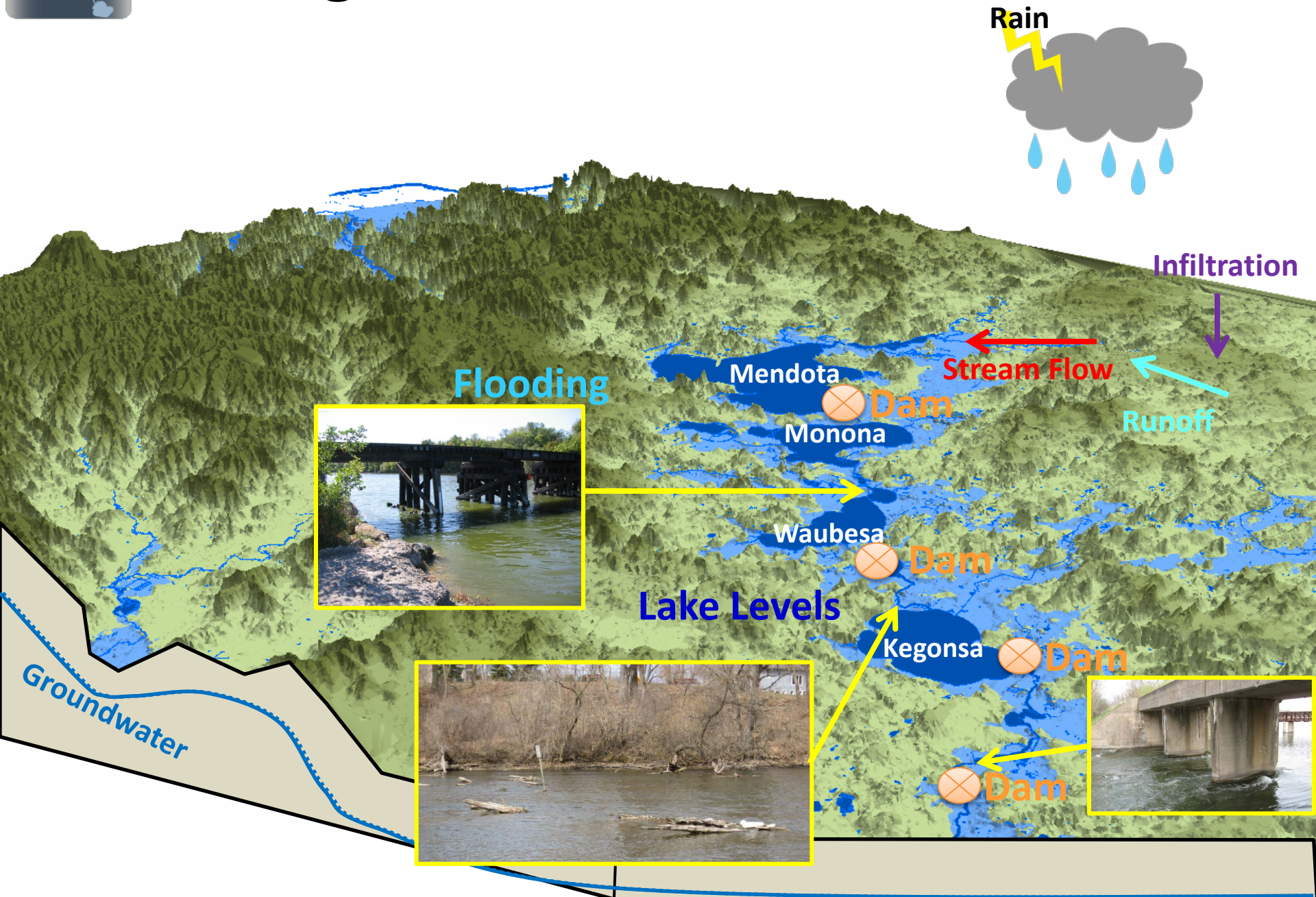
Web Cam



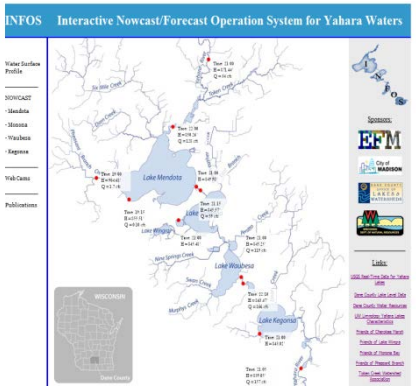
www.infosyahara.org



Integrated Observations & Models



INFOS History

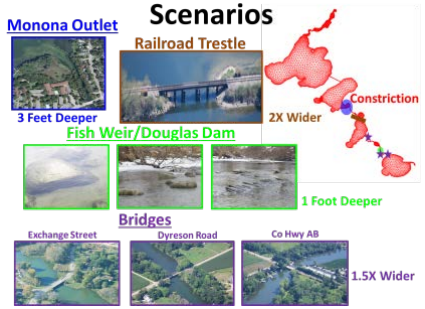


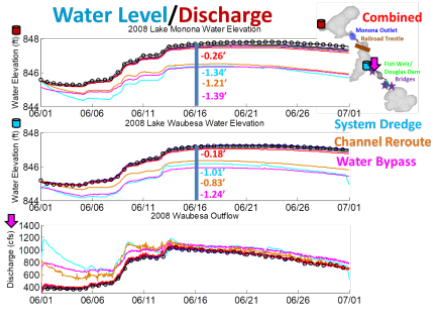
2009

2010

2012

YLAG2 – Water Levels





WISCONSIN LAKES
Welcome To Stoughton
UW Extension
Town Of WESTPORT Welcomes You
City of MADISON
EFM
YLA
USGS science for a changing world
Madison Fishing Expo
Quam's Motor Sports
MONONA
VON RUTENBERG VENTURES
COUNTY OF DANE WISCONSIN
Village of McFarland
DANE COUNTY LAND&WATER RESOURCES DEPARTMENT
DANE COUNTY OFFICE OF LAKES & WATERSHEDS
CAPITAL AREA REGIONAL PLANNING COMMISSION
Friends of Lake Kegonsa Society
WISCONSIN DEPT. OF NATURAL RESOURCES
Madison Metropolitan Sewerage District
MAZANET MARINA
Town of DUNN
Lake Waubesa Conservation Association
CLEAN LAKES ALLIANCE
Pleasant Springs

Scenario:

(i) Aquatic Plant Harvesting

Herling

2.5 times

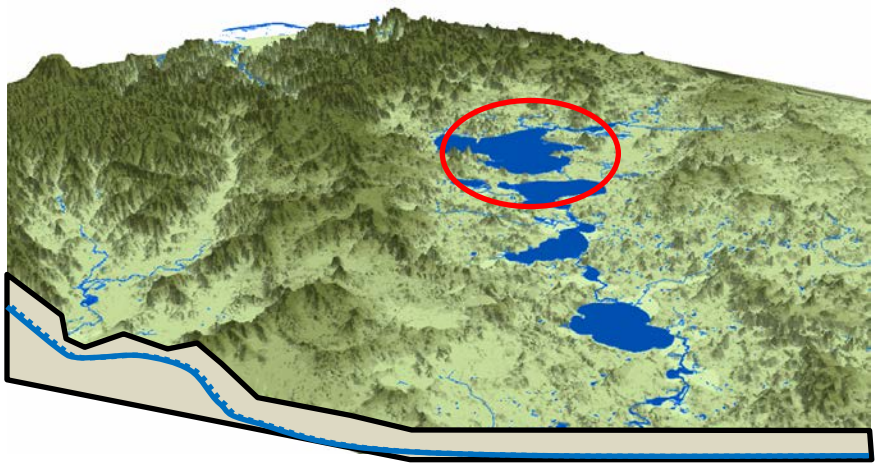
	Discharge - No Vegetation	Discharge - Vegetation
Summer Minimum	350.2 cfs	144.8 cfs

New Developments

Integrated Nowcast/Forecast Operation System

for the Yahara River Chain of Lakes

The 100 Year Flood



Myth:

A flood occurrence that happens once every 100 years!

Fact:

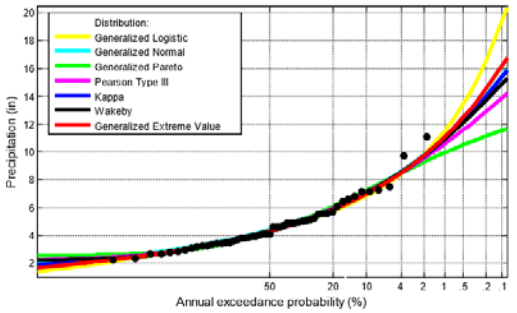
A flood occurrence that has a 1% chance of occurring

WISCONSIN INITIATIVE ON CLIMATE CHANGE IMPACTS

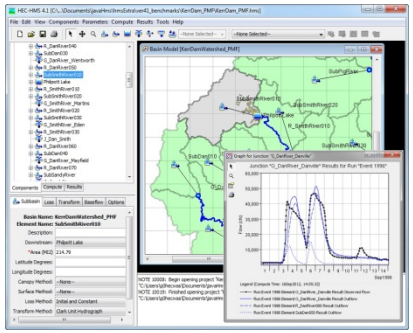
How was it determined for the Yahara Lakes?

FEMA

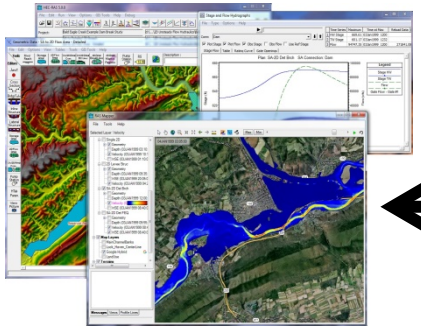
Rainfall



Statistical Rainfall



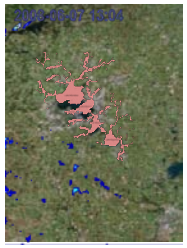
Watershed Modeling

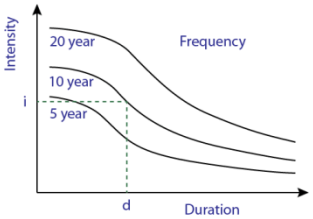


Hydraulic Modeling

Concept of Flood Risk

Hazard
(Rainfall)





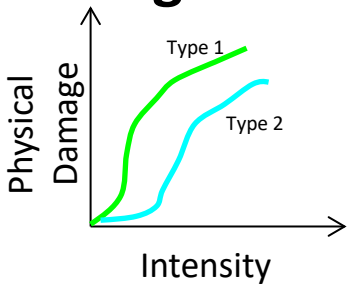
Probability

×

Vulnerability
(building)

×

Damage Curve



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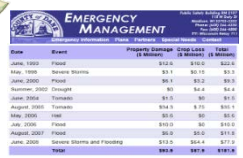


Loss

=

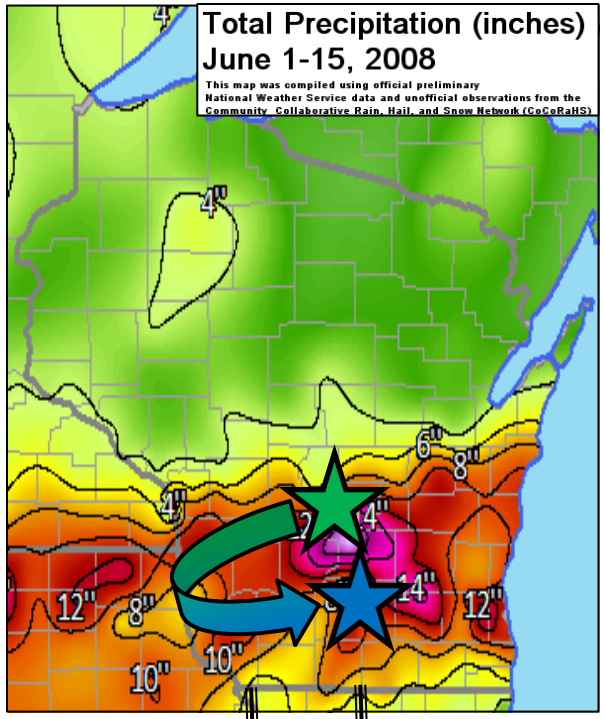
Risk

RP	A # B	V*A Eco	V*A #B (10^7)
5	368	32	1.93
10	490	69	3.44
25	699	194	10.00
50	856	375	19.91
100	1588	1096	51.07

=

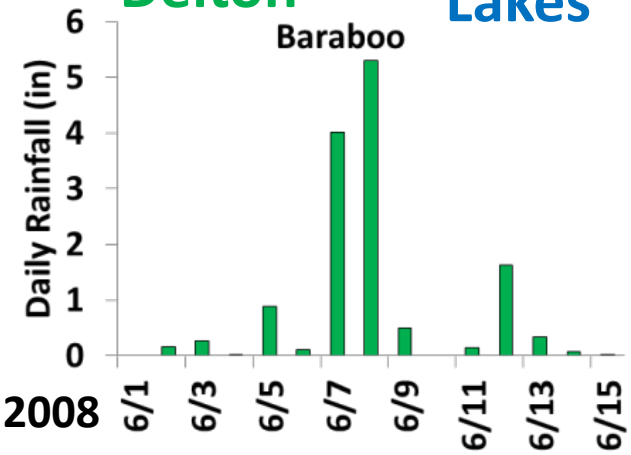
Probability of Loss

Storm Transposition



Deterministic

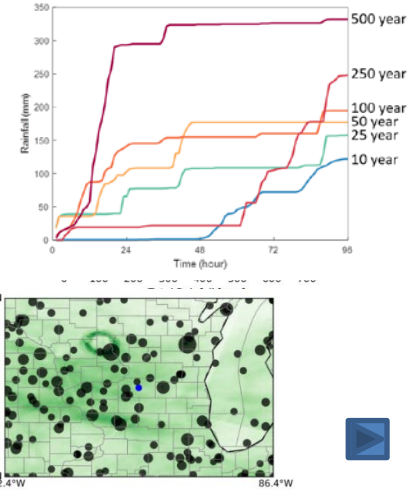
Lake Delton → Yahara Lakes



Hayden et al., 2016

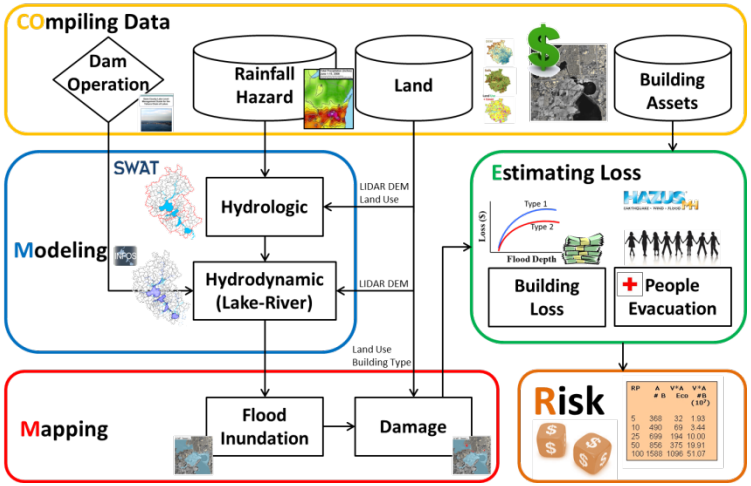
Stochastic

RAINY DAY

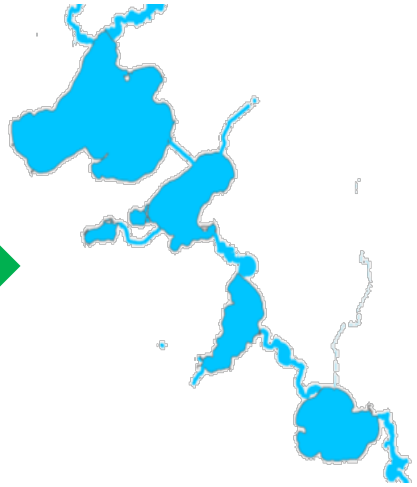


Wright et al., 2017

COMMER



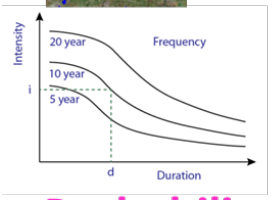
Reimer and Wu, 2016



$??? Million

Recall: Flood Risk

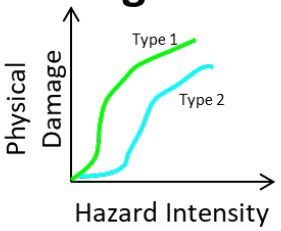
Hazard
(Rainfall)



Probability

Vulnerability
(building)

Damage Curve



= **Risk**

RP	A # B	V*A Eco	V*A #B (10^7)
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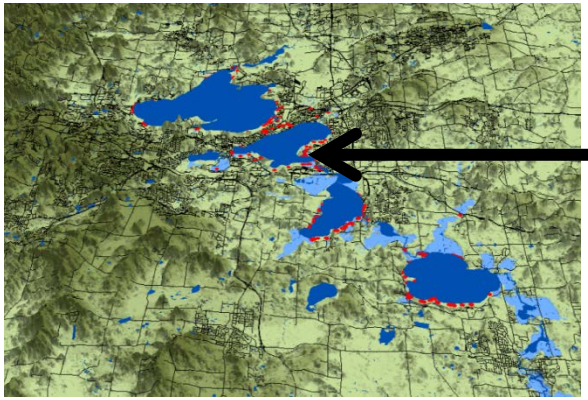
Loss

= **Probability of Loss**

Vulnerability Mitigation

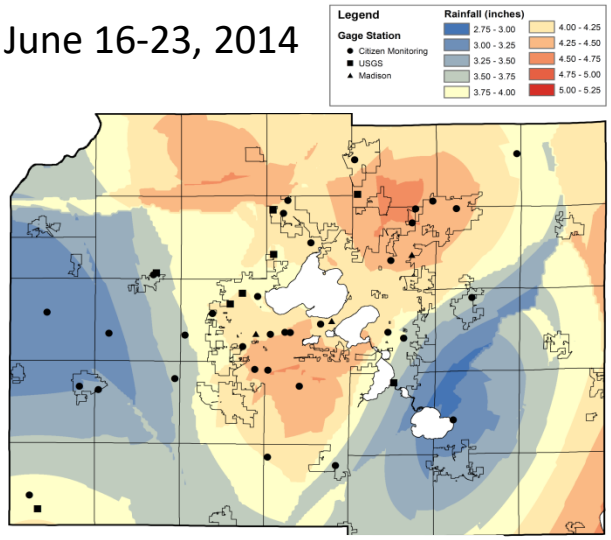


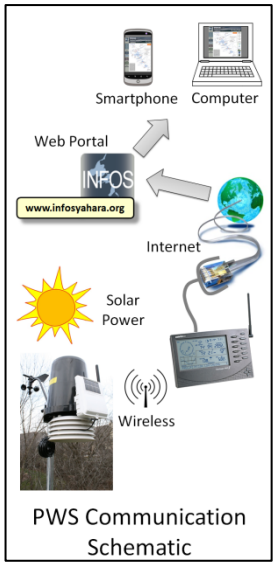
Are we prepared today for tomorrow's flood?

Flood Forecasts

Past Rainfall

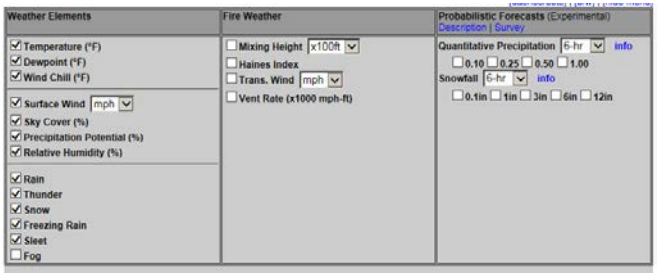
June 16-23, 2014





PWS Communication Schematic

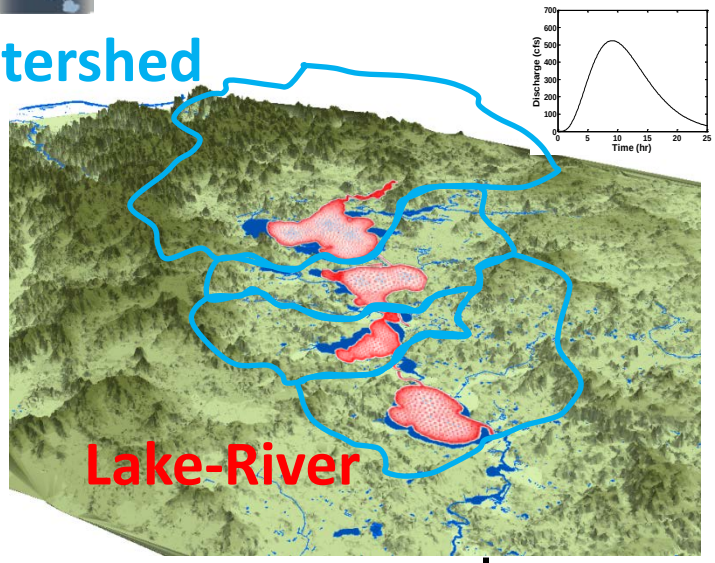
Forecast Rainfall



NATIONAL WEATHER SERVICE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

INFOS Integrated Models

Watershed



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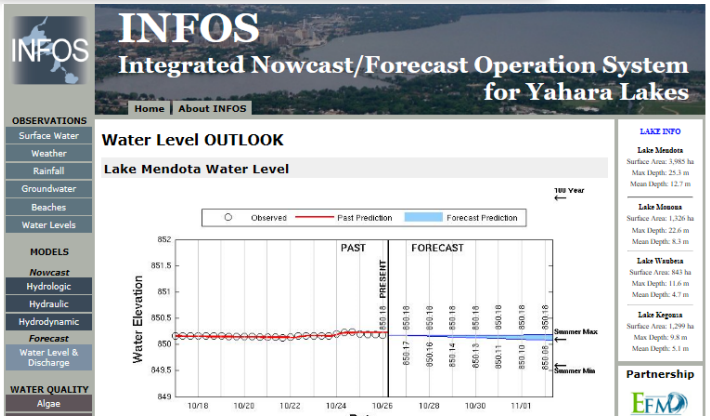
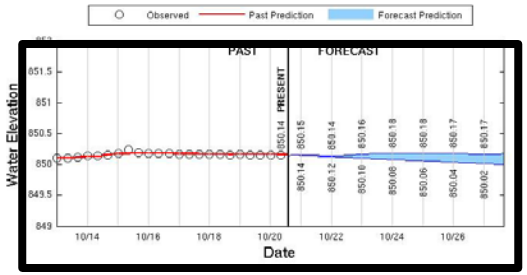
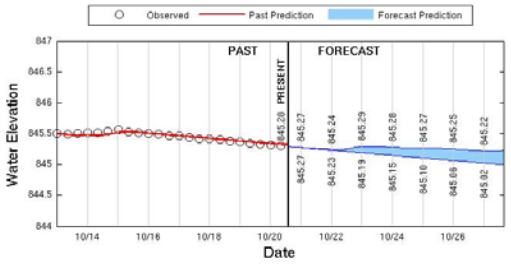


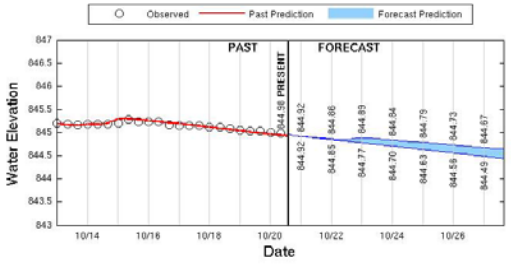
Flood *Warning*



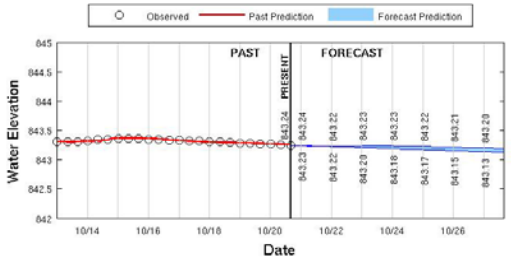
Lake Mendota



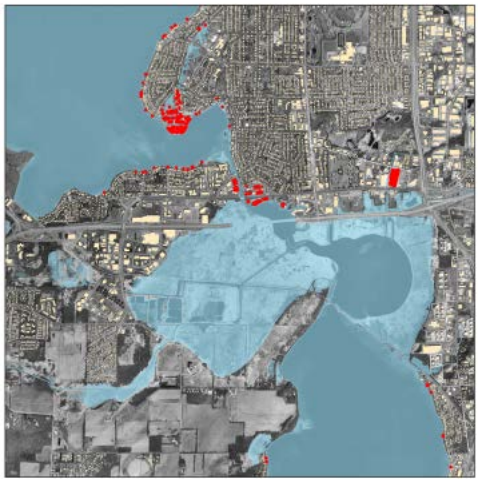
Lake Monona

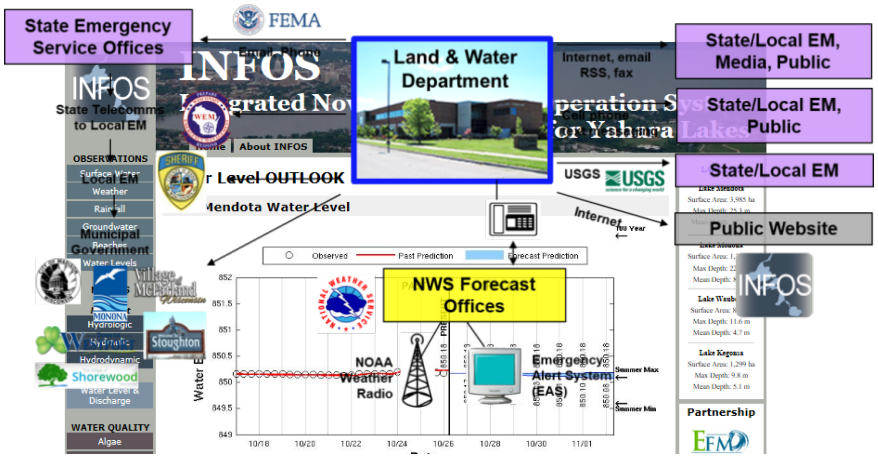


Lake Waubesa



Lake Kegonsa





Summary

Science Driven Lake Level Management

Adaptation Strategies

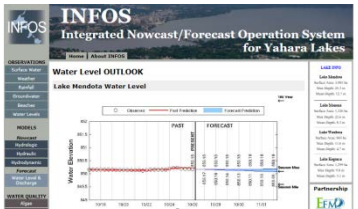
(i) Aquatic Plant Harvesting

- **Characterize Flood Risk**

	LOSS	RISK
	Building	Building
Mendota	500 Year	250
Monona	500	10
Waubesa	500	250
Kegonsa	500	Mixed

Vulnerability Mitigation

- **Develop Flood Forecast and Warning**



Resilience & Preparedness