

## Technical Work Group Review of Summer Minimum and Midrange Operation

### Background

In 2018, the Yahara lakes experienced widespread flooding resulting in millions of dollars of damage. Flooding in the Yahara lakes prompted Resolution 2018 RES-227 by Dane County Board of Supervisors that requested convening a technical work group to evaluate and model various scenarios to improve resiliency for future flooding events. The technical workgroup produced a report in February 2019 with their findings. Subsequently, a policy task force was formed to gather public opinion and make recommendations. Those recommendations were finalized on March 18, 2019. The technical committee, as requested by the Land Conservation Committee, Environmental Agriculture and Natural Resources Committee, and Lakes and Watershed Commission, evaluated one of the recommendations from the task force regarding operation of water levels at summer minimum and midrange to reduce flooding. Specifically, the task force recommendation is as follows:

“Dane County will continue to implement any tools that may be available to lower lake levels to DNR designated seasonal minimum levels as soon as possible and work to maintain lakes at that level. This directive will be implemented where possible and to the extent that managing any given lake will not create flooding on other lakes or other unintended consequences.”

The table below shows water elevations at summer minimum, midrange, maximum, and 100 year flood elevation for each lake. The water level difference from summer maximum to minimum and summer midrange to minimum is the same for each lake at 6 and 3 inches, respectively. For lakes Mendota, Monona, Waubesa and Kegonsa, the water level difference from 100 year flood to summer minimum is 38.4, 36, 30, and 26.4 inches, respectively. Each lake varies in water difference from summer minimum to 100 year which is useful for determining volume of water storage capacity. Overall, the largest storage volume (Volume = Height x Area) occurs on Lake Mendota due to the lake having largest height (difference from summer minimum to 100 year) and largest area.

Lake	Summer Minimum	Summer Midrange	Summer Maximum	100 Year Flood
Mendota	849.60	849.85	850.10	852.80
Monona	844.70	844.95	845.20	847.70
Waubesa	844.50	844.75	845.00	847.00
Kegonsa	843.00	843.25	843.50	845.20

In 2020, a dry spring period occurred which allowed water levels to reach summer minimum per the task force recommendation. Prior to the task force recommendation, water levels were operated at midrange between summer minimum and maximum. The goal to manage at midrange was established in the [Dane County Lake Level Management Guide for the Yahara Chain of Lakes](#), which was prepared by Dane County staff, adopted by the Lakes & Watershed Commission, and peer reviewed by professionals from the University of Wisconsin, Wisconsin Department of Natural Resources, USGS Wisconsin Water Science Center and private and public water resource professionals. In 2020, the Environment, Agriculture & Natural Resources Committee raised the question of whether the change to an operating goal at the summer minimum played a role in minimizing

future flood events. On one hand, the goal to operate at the summer minimum is often unattainable and beyond anyone's control. On the other hand, water levels at summer minimum provided a sense of security to those that experienced recent flooding. These two viewpoints of water levels at summer minimum versus midrange prompted the technical workgroup to evaluate modeling scenarios. The goal of modeling various scenarios was to provide technical data to confirm or deny the concept that operating at summer minimum would minimize future flood events.

### **Modeling Scenarios**

1. The 2020 season was evaluated for two scenarios of summer minimum and midrange. In 2020, the spring time conditions were relatively dry and summer minimum targets were possible to achieve. Peak water levels for Lake Mendota, Monona, Waubesa, and Kegonsa were below 100 year flood levels by 17, 13, 8, 10 inches, respectively.

#### **Results**

- Lake Mendota midrange scenario was 2.9 inch greater than minimum scenario in May. At peak water levels, the midrange scenario was 1.1 inch greater than the minimum scenario.
  - Lake Monona midrange scenario was 4.9 and 0.5 inch greater than minimum scenario in March and May, respectively. At peak water levels, the midrange scenario was 0.6 inch greater than the minimum scenario.
  - Lake Waubesa midrange scenario was 2.9 and 2.6 inch greater than minimum scenario in March and May, respectively. At peak water levels, the midrange scenario was 0.6 inch greater than the minimum scenario.
  - Lake Kegonsa midrange scenario was 2.8 inch greater than minimum scenario in March. At peak water levels, the midrange scenario was 0.6 inch less than the minimum scenario.
2. The combination of 2020 and 2018 was evaluated for two scenarios of summer minimum and midrange. The 2020 springtime (January to April) conditions were used due to it being relatively dry and summer minimum targets were possible to achieve. The 2018 summer and fall (April to November) conditions were used because of wet conditions that resulted in flooding. The peak water levels for Lake Monona, Waubesa, and Kegonsa were above 100 year flood levels by 10, 10, and 7 inches, respectively.

#### **Results**

- Lake Mendota resulted in negligible differences at peak water levels of summer minimum and midrange scenarios.
- Lake Monona midrange scenario was 4.9 inch greater than minimum scenario in March. At peak water levels, the midrange scenario was <0.1 inch greater than the minimum scenario.
- Lake Waubesa midrange scenario was 2.9 inch greater than minimum scenario in March. At peak water levels, the midrange scenario was <0.1 inch greater than the minimum scenario.
- Lake Kegonsa midrange scenario was 2.8 inch greater than minimum scenario in March. At peak water levels, the midrange scenario was <0.1 inch greater than the minimum scenario.

## **Conclusions**

- The 2020 scenario showed that operating at summer minimum levels would lower spring water levels ranging from 2.8 to 4.9 inches.
- The 2020 scenario indicated that operating at summer minimum would reduce peak water levels ranging from 0.5 to 1.1 inch on lakes Mendota, Monona, and Waubesa.
- The 2020 scenario indicated that operating at summer midrange would reduce peak water levels on Lake Kegonsa 0.6 inch due to storage of water on upstream lakes.
- The combination 2020 and 2018 scenario showed that operating at summer minimum levels would lower spring water levels ranging from 0 to 4.9 inches.
- The combination 2020 and 2018 scenario revealed that operating at either summer minimum or midrange had little to no impact on peak flood levels.

## **Recommendation**

Operation of water levels should follow the Dane County Lake Level Guide for the Yahara Chain of Lakes, which establishes midrange as the summer goal but provides flexibility for proactive management guided by weather forecasts. For example, when water levels are at midrange and weather forecasts predict rainfall in the future, the dams should be opened to increase flow and reduce water levels to summer minimum. Alternatively, when water levels are at summer minimum and weather forecasts predict dry conditions, the dams should be closed to reduce flow and increase water levels near summer midrange.

## **Work Group Members**

Jeremy Balousek, Dane County

Greg Fries, City of Madison

Dick Lathrop, UW – Madison, Retired WDNR

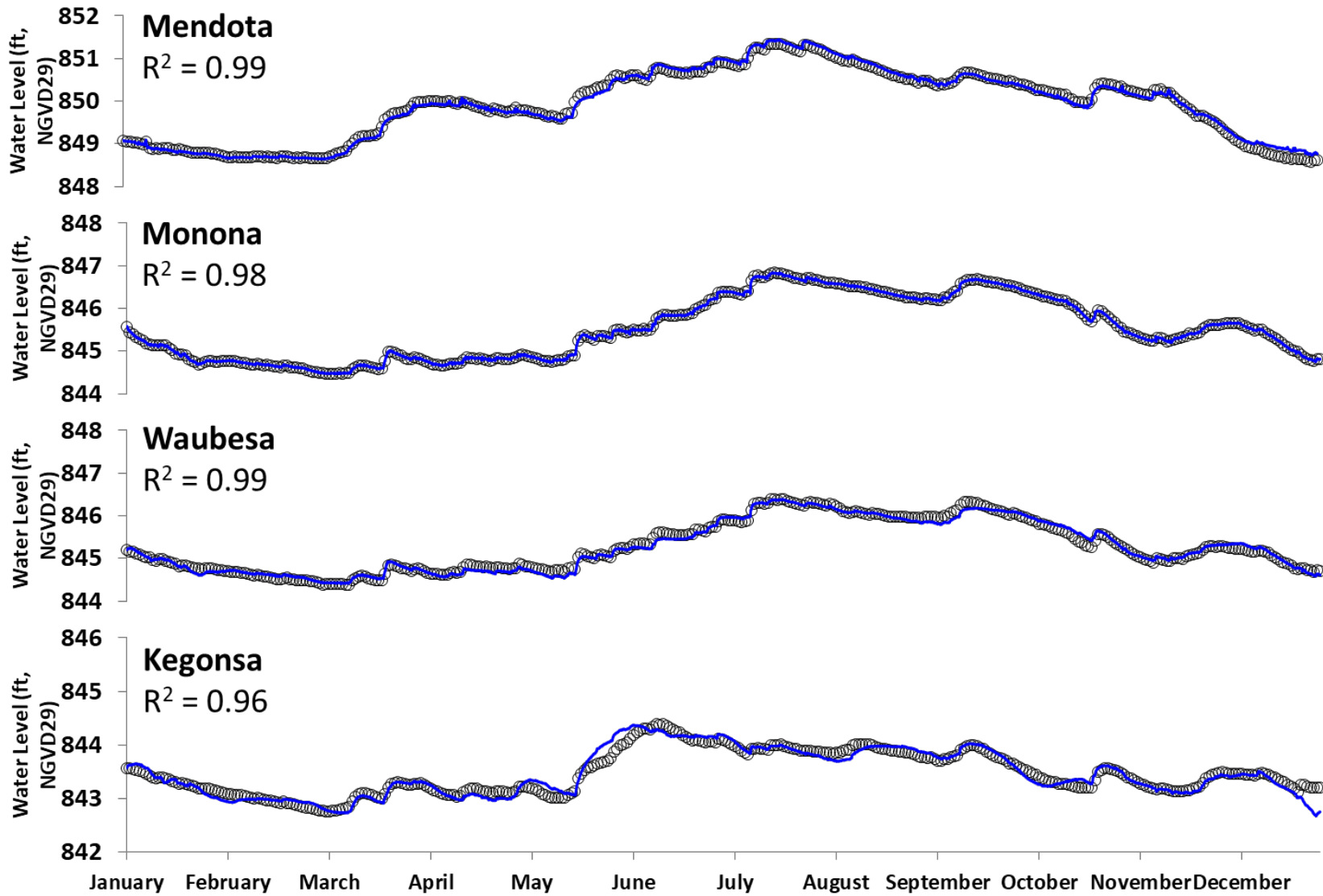
Uriah Monday, WDNR

Ken Potter, UW – Madison

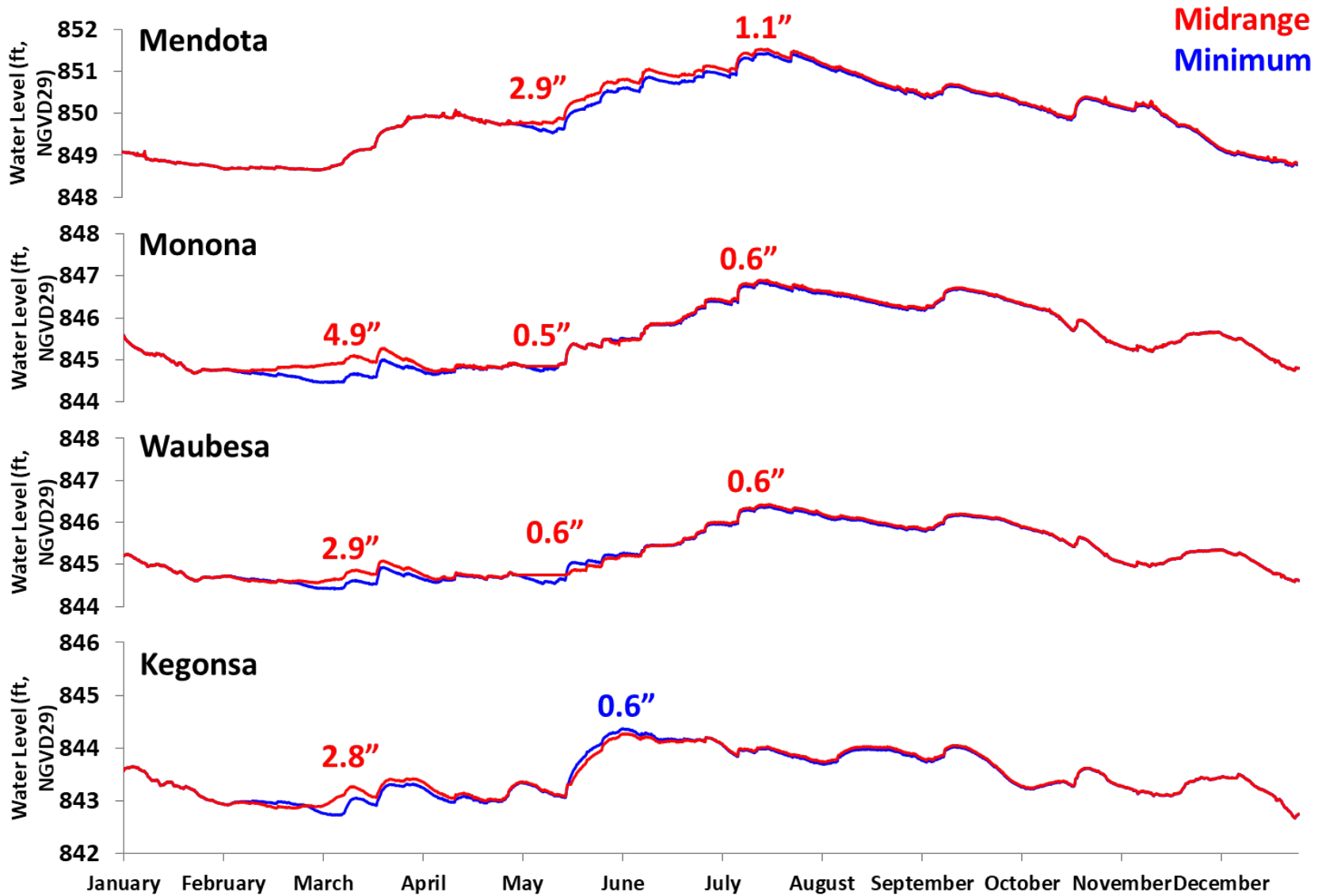
John Reimer, Dane County

Chin Wu, UW – Madison

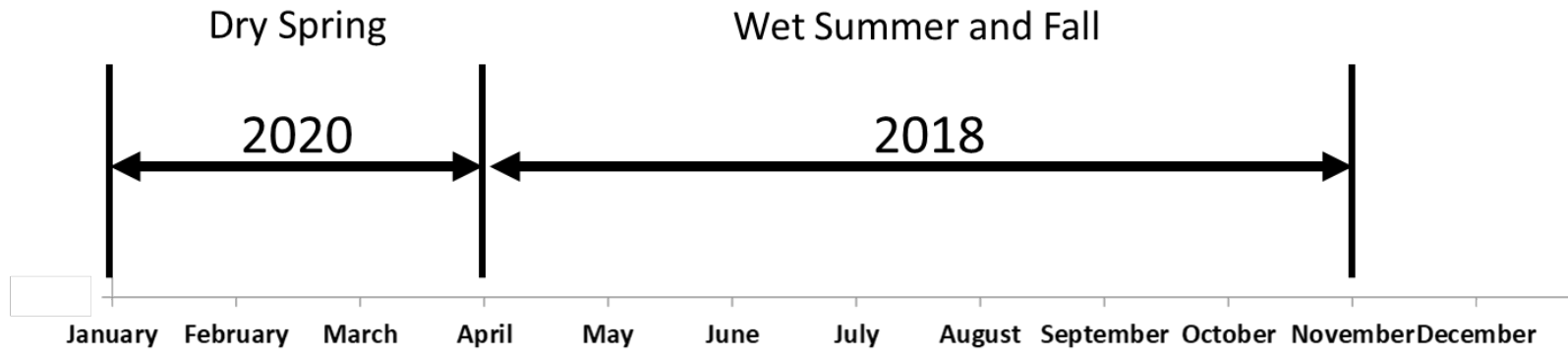
## 2020 Model Validation



## 2020 Modeling Results



**Combination 2018 + 2020 Modeling Setup**



**Combination 2018 + 2020 Modeling Results**

