Yahara Lakes Advisory Group

Final Report

September 2002

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Introduction

Background Information on Yahara Lake Levels

Dane County Lakes have been regulated in one form or another for over one hundred and fifty years. Lake Mendota was originally raised 4.5 feet in 1847 by the Tenney Dam, which operated as a gristmill for most of the 19th century. The higher water flooded out some tamarack/black ash swamps and deep water marshes around Lake Mendota as well as upstream along the Yahara River. The Babcock Lock and Dam controls the water levels for Lakes Monona and Waubesa. LaFollette dam controls Lake Kegonsa's water level. During low flow conditions, this dam has a significant effect on lake levels, habitat and the flow of the Yahara River. During high water conditions, all the dams in the Yahara Lakes system below Lake Mendota are in free flow.

Construction and regulation of these dams was originally in the jurisdiction of the Railroad Commission and the Public Service Commission. They set operating orders for these dams as early as 1917. Operating orders have been reissued through the years for these dams, but they have remained largely unaltered.

The authority to regulate the levels and flows of dams was first granted to the Wisconsin Railroad Commission in the Water Power Laws of 1915. This very broad authority was used by the Commission to regulate levels and flows at about 1000 dams throughout the state. This authority was eventually transferred to the Public Service Commission and finally given to the Wisconsin Department of Natural Resources in the early 1970's.

The State of Wisconsin's statutory mandate is to regulate operation of these dams in the public interest. Predecessors to the Wisconsin Department of Natural Resource's (DNR) established a series of orders to address the state's "public interest" in 1979. Compromises among competing lake interests determined the present operating rules for the Yahara Lakes.

Since 1959 the Yahara Lakes area has experienced major droughts (1988) and historic flood events (1959, 1993, 1996, 2000). Additionally, since 1959 there has been considerable development in nearly all areas that surround this chain of lakes. This development has led to an increased amount of impervious surfaces which in turn has led to a higher inflow of stormwater and heightened lake level responses. Thus, it has become timely to explore the following questions:

- Are these orders serving the lakes well?
- Can fish spawning be enhanced by a different approach?
- Are we protecting flood-prone areas?
- Are we encouraging the recharge of our groundwater?
- Are we doing a good job managing our recreational opportunities?
- Can we improve the water quality of the lakes?
- Are there physical changes to the system that need to be pursued?
- Are we still serving the "public's interest"?

Formation of an Advisory Group

In September of 2001 Ken Johnson, Wisconsin Department of Natural Resources (DNR) Lower Rock River Water Leader, contacted key stakeholders responsible for the management of the Yahara Lakes system to see if there was interest in convening a work group. The workgroup would be formed to assess the effectiveness of the more than twenty-year-old lake level orders to see if they were still an effective tool for the management of the water levels and flow. When a core group of people expressed interest in convening such a group, Johnson contacted Mindy Habecker, Dane County UW-Extension Natural Resource and Community Development Educator and Ken Wiesner, WDNR Special Assistant to the Water Division, to help convene and facilitate the education and discussion process. Both agreed to assist. Several meetings were held in the fall of 2001 to help develop a list of key stakeholders to invite and to plan a process that would help the group to meet the proposed group mission.

The draft mission or charge of the group originally was:

The Department of Natural Resources is entrusted with the responsibility to establish levels and flows within the Yahara Lakes Chain. The Yahara Lakes Advisory Group will evaluate the current operating orders for their adequacy and advise the DNR South Central Regional Director as to what modifications need to be made to address the public interest.

This was subsequently modified by the group to be broader in scope as time went on (see appendix 1).

Members of the Advisory Group

Margaret Andreasen, Village of Shorewood Hills, Trustee
Eileen Bruskewitz, Dane County Supervisor
John P Dunn, Dane County Public Works
Bill Fitzpatrick, Yahara Lakes Association
Rick Gullickson, City of Stoughton Street Department
Don Hammes, Madison Fishing Expo, Yahara Fishing Club, Dane County Conservation League
Brett Hulsey, Dane County Supervisor
Ken Johnson, DNR Lower Rock River Water Leader
Sue Jones, Dane County Lakes and Watershed Commission
Mike Kakuska, Dane County Regional Planning Commission
Dick Lathrop, UW Limnology/DNR
Larry Nelson, City of Madison Engineer
Don Peterson, Village of McFarland
Mike Pinnow, Skipper Bud's Marina
Ray Potempa, Friends of Lake Kegonsa
Ken Potter, UW Department of Civil and Environmental Engineering
Dave Ritter, Dane County Sheriff's Department
Aicardo Roa, Dane County Land Conservation Department
Jon Schellpfeffer, Madison Metropolitan Sewerage District
Carl Sinderbrand, Dane County Lakes & Watershed Commission
Dave Taylor, Madison Metropolitan Sewerage District
John VanDinter, Town of Westport Supervisor, Lakes & Watershed Commission
Gary Weinert, City of Monona Public Works
Kurt Welke, DNR Fisheries Biologist, Dane County

Jan Zimmerman, Lake Waubesa Conservation Association
Dave Zugenbuehlen, 4-Lakes Bassmasters

Overview of the Group's Work

The group of stakeholders met 14 times over a period of ten months, from October 2001 until late July 2002. This was the time frame that the group had given itself to complete its work.

At the initial meeting on October 16, 2001 the group's mission was clarified and an explanation was given as to why there was a need to discuss the operation of the Yahara Lakes System. The group was queried as to the need of additional stakeholders. Several representation gaps were noted. Candidates to represent these areas were suggested and found. Additionally, members introduced themselves and expressed their interests pertaining to the group's mission.

During the next two meetings, the group reviewed what is entailed in a facilitated process including its elements, the group's authority (i.e. develop non-binding recommendations for state and local government officials), the facilitator's role and facilitation principles. The Dane County UW-Extension Office developed the proposed process that was later adopted by the stakeholders. The group discussion process is based upon a number of community development, citizen participation, and conflict resolution principles. The group established communication guidelines that it would abide by throughout the process (see appendix 2).

The group also identified what issues, questions or concerns they had regarding the Yahara Lakes System. These were clarified and clustered by general topic area (see appendix 3). A list of potential presenters for the topics was also created.

Education on each of the specific issues became the focus for the group's next six meetings. A summary of these presentations follows. The meeting minutes (see appendix 4) and presenter's handouts (see appendix 5) provide detailed information from these presentations. The major findings from this intensive educational program are given in the report.

The final five meetings of the group revolved around generating, then discussing, the clarified proposed recommendations and determining next steps for action. The group also had two field trips, one in early November 2001 by motorboat to give members an introduction to the Yahara lake and river system. The second trip occurred in late June 2002 by canoe and kayak, to explore the Yahara River channel between Lake Waubesa and Lake Kegonsa and was followed by a group meeting. This stretch of the river became a focal point during the presentations for potentially causing constrictions of the water flow due to aquatic plants and structural limitations. The findings from this canoe trip are listed at the end of the presentation summaries.

The discussion of proposed recommendations took several meetings. During this time, not only were the proposals clarified, but negotiations occurred on refining the wording and intent of the proposals. In many cases these negotiations made proposals more acceptable to the larger group. Voting did not occur at this time, as this was a staging process for voicing the attributes and problems that may be associated with proposals. Compromises were made to garner more support for the proposals between the author and the group.

After discussion on each of the proposed recommendations, members submitted votes by electronic mail, with a two-thirds positive vote needed for a proposal to become a final recommendation of the group. A tiered scale of support ranging from strongly agree to strongly disagree was utilized as part of the voting process.

A subgroup from the advisory group met on a regular basis to plan a public education event. This was held on June 12, 2002 (see appendix 6 for public forum brochure). The YLAG group decided that the final report would be sent to all stakeholders and local government officials involved in this issue. A subgroup was formed to put together a budget proposal to continue the monitoring gages at several locations on the Yahara River System which would help bolster the momentum of the group and elevate their work in the public eye. Finally, four subcommittees were formed to develop action plans for implementation of the recommendations using a common format that includes a statement of the issue, justification of the proposed actions, objectives, time frame, responsible parties, costs and other details (see appendix 7 for action planning template).

Summary of Issue Presentations

Introduction to the Yahara Lakes System

Presenter: Sue Josheff, Dam Safety Engineer, Wisconsin DNR (608)275-3305
susan.josheff@dnr.state.wi.us

- The original Mendota Dam was built in 1847 to operate a flour mill and reconstructed in 1866 after failure. The City of Madison purchased the dam in 1896 when the wooden dam was replaced with a concrete dam and lock. The current dam was rebuilt in 1959 and Dane County took ownership in 1980. It currently has two 12-foot tainter gates and is 20 feet wide by 110 feet long.
- The Kegonsa Dam, built in 1938, has water level orders of 843.1 max. and 842.6 min.
- The Stoughton Dam was originally built in about 1911 by the City of Stoughton. It failed in 1915 and was reconstructed of concrete gated sections in 1915-16. The dam embankment failed in 1959 and was repaired with additional repairs made in 1973-74. It consists of two 14-foot tainter gaters, a 14-foot stoplog section and a 4 by 4-foot sluice gate. In 1917 there were problems with the water levels.
- The Waubesa Dam was built in 1938 and in 1977 the water levels were set with a max. of 845.0. It has four 12- foot stoplog bays and one 10 (12?)- foot wide lock. In both 1917 and 1942 there were complaints about the set water levels.
- The water level orders for Lake Mendota were set in January 18, 1979. The max. is 850.1 and the min. (set for the first spring runoff after March 1 to October 30) is 848.2. From April 1 through May 15 one tainter gate is to be open 0.3 feet. During normal and low flows, a 4.9 foot difference between Lakes Mendota and Monona is ordered, to be adhered to as closely as possible.
- The water level orders for Lakes Monona and Waubesa were set in January 18, 1979 with the max of 845.2 in Lake Monona and 845.0 in Lake Waubesa. The min. to be held from November 1 to the spring runoff is 842.2 (Monona), 842.0 (Waubesa). The orders specify the minimum discharge as 50 cfs at the dam between April 1 and May 15 and at all other times 10 cfs, to be adhered to as closely as possible.

- The water level orders of Lake Kegonsa were set April 11, 1979 with a max. of 843.5 and a min. of 843.0. Dane County is to coordinate this with the Mendota, Waubesa, Kegonsa and Stoughton Dams.

Biological and Chemical Issues

Presenters: Susan Graham, Lakes Coordinator, Wisconsin DNR (608)275-3329, susan.graham@dnr.state.wi.us
Kurt Welke, Fish Manager, Wisconsin DNR, (608)273-5946, kurt.welke@dnr.state.wi.us
Russ Hefty, Conservation Supervisor, Madison Parks Dept, (608)267-4918, rhefty@ci.madison.wi.us

Graham

- Chemical treatments to control aquatic plants in flowing water have been ineffective and ineffective treatments are prohibited in NR 107 (see appendix 5 for presenter's handout).
- Unlike a typical lake application where treatments are isolated along relatively small littoral areas, a river treatment will expose the entire channel to chemical(s) and the potential for negative impacts are greater. Decomposing aquatic vegetation in a long channel stretch could create a significant BOD (biological oxygen demand) and dissolved oxygen depletion. Any potential chemical treatment that results in a direct or indirect fish kill will be denied.
- If effective, a chemical treatment will have only short-term relief and repeated treatments will be needed, increasing the potential for negative impacts discussed above.
- Vallisneria also known as wild celery, eelgrass or tapegrass is the predominant plant growing in the Yahara River. This plant is considered a high quality aquatic plant for waterfowl and fish. It is not a plant that you would want to completely remove. The chemical registered for use in Wisconsin that will kill Vallisneria, is Hydrothol 191, the amine form of endothol. The label states "the minimum contact time with plants for optimum results should be two hours". This contact would be difficult if not impossible to achieve in a flowing water situation such as a river. Hydrothol 191 is toxic to fish at dosages well below the concentration required to effectively kill plants. Use of this chemical, therefore, would be in violation of the laws cited above it would be ineffective, and it would cause adverse side effects on fish, which are a non-target organism.

Welke

- For successful fish spawn you need to emulate the natural hydrograph as fish cue on rising water and rising temperature. To do this winter lows should be held on the high end as ice break-up occurs, but specific elevations need to be established at representative points within critical habitats to determine required water levels. In the Yahara River below McFarland, any stage below 844'+ is too low to allow access into the marshes of Lower Mud Lake (see appendix 5 for presenter's handout).
- Any discharge below 150 cfs is too little water to maintain high quality habitats for fish.
- The specific habitat needs for fish include: 1) adequate water level for access into and out of spawning marshes 2) maintenance of water through period of incubation 3) preservation of correct vegetative communities and substrate types and 4) control of sedimentation and eutrophication.
- From the 1960's to the 1980's the number of northern pike per net sampled by the DNR has declined steadily from over 12 to less than 3 due to loss of spawning habitat. The loss of opportunity to spawn equates with a dependence upon stocked contributions, which are

expensive, numerically less than from hatchery quotas required to establish and maintain populations and are never guaranteed.
- Lowering of winter water levels has the potential to cause some localized winterkill in already shallow habitats, especially in years of low fall water levels, opaque ice and heavy snow.
- Lowering of the summer minimum would have lesser negative effects if instituted after the spring spawn.

Hefty
- Since 1835 the Yahara Lakes have lost significant portions of the wetland associated with them. (The wetland losses are, by lake: Mendota – 5088 acres or 50% of the 1835 total, Monona – 4520 acres or 92%, Waubesa 4520 acres or 73% and Kegonsa – 4075 acres or 70%). We continue to lose sedge meadows during flood events as they "float up" at this time to create what people call floating bogs. These are "lost" when they break away and have to be removed because they become navigational hazards.
- Using air photos, Hefty has documented the loss of over 30 acres of wetland in the Cherokee marsh are of the Yahara River in the past 30 years. There is a need to develop some method of biostabilization to stem the continued loss of these diverse wetlands.
- The total lost flood storage with this loss of wetland area is 18-90,000 acre-feet of water or 5.4-27 billion gallons.
- Possibility exists to use bioengineering to stabilize wetlands; however, more stable water levels are needed to do this.

Water Dynamic and Modeling Issues

Presenters: Ken Potter, UW Civil and Environmental Engineering, (608)262-0040, kwpotter@facstaff.wisc.edu
Bill Krug, US Geological Survey, Hydrologist, (608)821-3829, wrkrug@usgs.gov

Potter
- Lake Mendota levels have increased over time (see appendix 5 for presenter's handout).
- Analysis of precipitation and lake response indicates that this increase in lake levels is due at least in part to development in the watershed.
- USGS modeling of Pheasant Branch indicates that if low-density residential development occurs in the undeveloped portion of the Lake Mendota watershed, runoff amounts from medium to large storms will increase by about 20%. More aggressive development would increase runoff by greater amounts.
- Water balance analysis of Lake Mendota indicates that a 20% increase in the runoff occurring in 1993 would have increased the peak level of Lake Mendota by over 1.5 feet, assuming releases to Lake Mendota remained unchanged. A 50% increase in runoff would have increased the peak level by over 4 feet.
- Conventional storm water management (i.e. detention) will not mitigate the impact of future watershed development on lake levels.
- Exploration of various alternatives for preventing catastrophic increases in Lake Mendota levels requires a much-improved modeling capability, including a continuous rainfall-runoff model of the Yahara Lakes watershed and a sophisticated hydraulic model of the connecting channels. The cost of the modeling would be about $200,000 or more depending on the questions the model is asked to answer and would take approximately two years work according to USGS. The cost of a gage can be $10,000-$20,000 for installation and $10,000-

$15,000 per year for maintenance and data management.

Krug

- A statistical analysis representing the trend of Yahara River runoff over the years 1931 to 2001 (for the same amount of rainfall) indicated that there was a statistically significant increase in the amount of runoff over that period of time if the diverted Madison Metropolitan Sewerage District water is factored into the analysis. This trend also existed when compared to adjacent basins (see appendix 5 for presenter's handouts).
- The most constrictive points are probably the channel downstream of Lake Waubesa to Lake Kegonsa, which is affected by the levels held by the Kegonsa dam and the outflow from Lake Kegonsa because the Stoughton Dam keeps water up to limit outflow from Kegonsa. This is based on regulatory pool levels, not dam capacity. The channel between Kegonsa Dam and the Stoughton Dam is also a factor limiting outflow from Lake Kegonsa
- Each of the five dam's ability to pass flow on the Yahara Lakes system does not appear to be the problem in flow constriction. It appears that the problem is that Stoughton Dam operated in its regulatory range backs up water and appears to limit the outflow from Kegonsa Dam. If Stoughton Dam was able to operate outside its current legal range, with the dam gates open, the reservoir could be drawn down and the Lake Kegonsa Dam could have a greater outflow capacity to pass flood flows, which could lower Lake Kegonsa. Similarly, Lake Kegonsa Dam backs up water and appears to limit the outflow from Lake Waubesa Dam. If Kegonsa Dam was able to operate outside its legal range, the dam gates could be opened and reservoir could be drawn down. Then the Lake Waubesa Dam could have a greater outflow capacity to pass flood flows and lower Lakes Waubesa and Monona.
- USGS has developed a low flow model for the Yahara system that looked at options to increase the base flow downstream. This could be accomplished by holding water in Mendota and limiting the outflow to allow the stored water to supplement the natural low flow. The model is currently being expanded and calibrated to simulate the full range of flooding and drought conditions.

Infiltration and Stormwater Issues

Presenters: Ken Potter, UW Civil and Environmental Engineering, (608)262-0040, kwpotter@facstaff.wisc.edu
Roger Bannerman, Wisconsin DNR Environmental Specialist, (608)266-9278, banner@dnr.state.wi.us
Kevin Connors, Dane County Land Conservation Dept, (608)224-3731, connors.kevin@co.dane.wi.us
Brett Hulsey, Dane County Supervisor, (608)238-6070, brett4us@aol.com

Potter

- Standard methods of storm water management do not sufficiently address increases in high lake levels due to urban and suburban development. Detention, by far the most common storm water management practice, reduces the rate of storm water runoff, but not the volume (see appendix 5 for presenter's handout).
- An effective stormwater management strategy must be predicated on infiltration of runoff from impervious surfaces.
- Potential methods to reduce the volume of storm water include large-scale infiltration basins (which have been used effectively in Long Island, New York for over 65 years) and small-scale practices such as rain gardens, avoidance of compaction of soils, enhancement of the

infiltration capacity of pervious surfaces, installation of grassed swales and infiltration trenches. Some of these practices require further research and testing of their effectiveness.
- Infiltration practices have primarily been used to maintain groundwater levels and base flow, rather than to control flooding.
- Large-scale infiltration practices can be difficult to site and design. Thus for this region, small-scale infiltration practices may offer more promise than large-scale practices.
- Based on theoretical calculations, it is feasible to use small-scale infiltration practices to control the 100-year storm event, except where the water table is high or the subsoils are impermeable.

Bannerman
- Using infiltration to manage stormwater runoff is still fairly new to Wisconsin; however, Maryland, Massachusetts, Washington, Vermont and California have been using and experimenting with infiltration for at least 10 years (see appendix 5 for presenter's handout).
- There are currently a number of case studies in Wisconsin including the 35-acre development of Cedar Hills (75 residential lots) that has reduced street widths, curb and gutter grassed swales and detention basin. Saint Francis Addition, a 72 acre, 80-lot subdivision required rain gardens via deed restriction, infiltration trenches between streets, buffer zones on the bank of Brewery Creek in western Dane County, and two regional infiltration basins. Collectively the runoff was reduced 74% of predevelopment.

Connors
- The Dane County erosion control ordinance has two distinguishable components – erosion control and stormwater management. The ordinance requires stormwater management plans for new impervious areas greater than 20,000 square feet and erosion control for land disturbance more than 4,000 square feet (see appendix 5 for presenter's handouts).
- The need for a more restrictive stormwater/infiltration ordinance needs to be weighed against the ability to comply. Dane County soils are high in clay/silt content. The ability to incorporate infiltration into a stormwater management plan is limited by the soil type and an understanding of long-term maintenance requirements.
- The county has identified a concern with the current version of the proposed NR 151, Wis. Adm. Code. This code establishes prohibitions and restrictions on infiltration according to the depth of groundwater and bedrock among other concerns. This proposed code may jeopardize the county's ability to adequately use infiltration as a stormwater management technique. Approximately 60% of Dane County's land area would be prohibited to incorporate infiltration with the current version of NR 151.

Hulsey
- Dane County is especially susceptible to flooding and appears on FEMA's list of high-risk flood areas going back to 1965 (see appendix 5 for presenter's handout).
- In Dane County the most notable floods cost the following:
    - 1993 - $12 million
    - 1996 - $18 million
    - 2000 - $11 million, not including agricultural losses
- Reversing wetland loss is an effective way to reduce flood frequencies. According to the U.S. Fish and Wildlife Service, 50% of the wetlands in Wisconsin have been drained through 1985. However in the Yahara Lakes basin a study conducted by Dick Lathrop (WDNR) indicates

that 75% of the wetlands have been drained or destroyed through 1975. Thus in the Yahara Lakes Basin there are approximately 36,000 acres of potential flood storage (assuming 2 acre-feet of storage on wetlands). Restoration would cost about $36 million, assuming $1000 per acre permanent easement cost. (36,400 acres of wetlands have been drained in the Yahara Watershed)

- The number of extreme rain and snow events has increased by 20% since 1990 in the world according to a NOAA study.
- According to the Illinois State Water survey, flood flows increase by 7% for every 1% of wetland drained.

Sewerage Issues

Presenter: Jon Schellpfeffer, Madison Metropolitan Sewerage District, (608)222-1201 ext 266, jons@madsewer.org

- Madison Metropolitan Sewerage District (MMSD) serves over 300,000 people. Effluent (clean water) discharges are to Badfish Creek east of Oregon and to Badger Mill Creek in the Town of Verona (see appendix 5 for presenter's handout).
- MMSD has an open channel to Nine Springs Creek and Lake Waubesa for emergency use.
- The MMSD effluent has a biochemical oxygen demand (BOD) of 3-5 parts per million (ppm), suspended solids of 5-7ppm, and phosphorus levels of 0.3-0.5 ppm. The phosphorus concentration is still a magnitude higher than the current phosphorus concentration in the lakes. The water is swimmable and boatable, but not potable.
- The effluent discharge rate is currently 40-42 million gallons per day (mgd). Future discharge rates in 50 years are predicted to be in the range of 65-70 mgd.
- In 1993 Verona was annexed to MMSD. Verona is in the Sugar River Watershed, rather than the Yahara River Watershed where the MMSD effluent is discharged. The District agreed to provide service if an equivalent volume of effluent could be returned to the Sugar River Watershed to balance the volume of water pumped from the Sugar River Watershed to the Yahara River Watershed. Today MMSD returns about 3 MGD to the Sugar River basin via Badger Mill Creek. This treated effluent return cost approximately $4.75 million to build, as requested by and with a high degree of community support. The purpose is to recycle the water as a beneficial resource and not a waste.
- MMSD's current effluent is not suitable for discharge into the Yahara Lakes due primarily to the level of phosphorus. The level of treatment at the Nine Springs plant would need to be improved to include tertiary treatment. Technology to reach the proper water quality is available, but are people willing to spend the money? Conventional treatment plants cost approximately $5-10 million/MGD, and tertiary treatment could double that cost.
- MMSD is looking in the next 10-20 years at having to replace the Waunakee and DeForest area interceptor sewers to expand their capacity. That could be the time to put new technology in place to meet higher water quality standards. MMSD has purchased land north of Lake Mendota as a site for a new treatment plant.
- During storm events as rainfall intensity increases and lake levels increase, the flow rates in the sanitary sewers increase. At some point in the 2-10 year rain events, flooding in the Lake Monona low-lying areas takes place, and at certain lake levels the 5 and 10-year events lead to overflows at the MMSD plant. The August 2000 storm led to the bypass of approximately 30 million gallons of effluent to Lake Waubesa due to overloading the capacity of the effluent pumping system to Badfish and Badger Mill Creeks.

Discharge Capacities of the Yahara Lakes Hydraulic Structures
Presenters: John Dunn, Dane County Public Works, (608)266-4179, dunn@co.dane.wi.us
Larry Nelson, City of Madison Engineer, (608)267-4227, lnelson@ci.madison.wi.us

- One constriction area is the Yahara River between Lake Waubesa and Lake Kegonsa.
- At Babcock and LaFollette dams there is not a lot of hydraulic drop seen.
- There is an almost 90 degree bend in the river near the historic Dryeson fish weir, but this area is not necessarily a pinch point.
- A proposal was made to place multiple staff gages along the Yahara River and collect data of the cross section and velocity to see where we could increase flow. There are four bridges involved so we can get good vertical control at those sites. This effort is a joint one with Dane County, City of Madison and DNR. The effort needs to have two parts, data collection and hydraulic modeling to extrapolate to other years. This effort won't have any information to guide decisions for 1-2 years.

Social Issues
Presenters: Sergeant Dave Ritter, Dane County Sheriff's Dept, (608)284-6808, ritter.dave@co.dane.wi.us
Sue Jones, Dane County Lakes and Watershed Commission, (608)267-0118, jones.susan@co.dane.wi.us
Steve Born, Chair, UW Dept of Urban and Regional Planning, (608)262-9985, smborn@facstaff.wisc.edu
Yahara Lakes Advisory Group Members

Ritter & Jones

- The 2001 Dane County boater registration figures showed that 25,852 boats were registered in the county. By boat type these were: open (22,414), cabin (1,187), personal watercraft (798), pontoon (541),canoe/kayak (480), sailboat (351), inflatable (54), house boat (19) and unknown (8). The total 25,852 broken down by footage was: 11522 under 16 feet, 14,019 between 16-26 feet and 312 over 26 feet with the largest being 39 feet long (see appendix 5 for presenters' handout).
- The limitations of this registration data are:
    - Does not include all Dane County watercraft such as sailboats less than 12 feet without motors, manually propelled without motor or sail, and sailboards.
    - Does not include all watercraft using Dane county waters such as out-of-county or out-of-state boats.
- The County Executive, County Board Chair and Sheriff can enact emergency slow-no-wake restrictions.
- The potential navigation trouble spots if the water levels are lowered include: upper Yahara River channel to Mendota, Lake Mendota "six-pack", shallow landings (Olin Park, Gov. Nelson State Park, and inlet on Mendota near the governor's mansion), and on the entire Yahara River except between Mendota and Monona and Monona and Waubesa.
- The potential navigation trouble spots if water levels were higher include: Yahara River (Tenney locks), Winnebago Street bridge, County Highway AB and State Highway 51 bridges and beltline causeway bridge to Monona Bay.
- If the water levels were sustained at a higher level we would expect an increase in boat traffic in the Yahara River between Waubesa and Kegonsa.

- Any changes to the county boating regulations prompted by a change in DNR lake level orders would involve Lakes & Watershed Commission and would need to be approved by the County Board.

Born

- The public will need to evaluate how it responds to this hydraulic change in the river system by examining the associated social and economic impacts. What actually gets accomplished will depend on the ability of the community to effectively manage the conflicts that arise when social and economic changes are deemed necessary.
- There are three kinds of conflict management which when factored together identify what actions will be accomplished or taken.
    - Cognitive conflict: data collection and analysis needed to fully understand the problem.
    - Interests or distributional conflict: identifies whose interests are served by both doing nothing and by taking action. Decisions do not necessarily coincide with cognitive facts, as the actions must be acceptable to the array of affected parties.
    - Value conflict: the ideology of the parties at core of management conflict.
- Balancing these three types of conflict among the stakeholders will help identify workable solutions to the problems.
- Raising the awareness of the public can be achieved by using media to the fullest extent by appealing to peoples' interests and values.
- Changing the political will requires more than public awareness of the problem. Changes in public behavior typically rely on the ability to get the issue on the political radar screen. Stimulating interest groups in moving the issue ahead is key to moving politicians into taking action.

Yahara Lakes Advisory Group Members

- All members of the advisory group were queried on what are the natural resource constraints for minimum and maximum water levels? Where is there flexibility? Where are they mutually exclusive? This information was requested for each of the lakes. The group identified the following:

<u>Lake Mendota</u>

- Need to maintain current uses – recreation, fishery, aesthetics, shoreline
- Properties have the highest value and taxes located adjacent to the four lakes
- Need to increase storage upstream because of development potential
- Increase conveyance out of the dam - however the Yahara River downstream of the dam will flood
- High levels cause destruction of wetlands
- Development causing increasing stormwater to lakes
- 1993 and 2000 lake levels excessive - damage threshold elevation is not known
- Water level order doesn't directly address floods
- Elevation of dam's embankment is low
- High levels cause shoreline erosion and damage to vegetation
- Water levels need to be predictable
- There is a perception that there is water control and that the maximum and minimum water levels will be maintained
- Navigation - too high and boats can't get under bridges, too low and boats can't access

particular areas
- Capacity of the system can be increased at Mendota & Stoughton
- Water level orders require levels be raised after ice breakup to get water into marshes for fish spawning - this reduces spring flooding storage
- Many of the conditions found on Lake Mendota can apply to Lakes Monona, Waubesa and Kegonsa

Lake Monona
- Better sewerage, etc. data - public health concerns start at elevation 846 - don't know where sewer infiltration comes from, greater cost to MMSD during flooding, approximately two events of overflow at plant per year
- Basement sewerage back up is a problem with flooding
- There was a handout on when the problems begin for sewer back-up
- Navigation - similar to Mendota
- Beach closure due to sewerage discharge
- Many buildings built to 100-year + 2'

Lake Waubesa
- Navigation - similar to Mendota
- Marsh segments break off and float away during high water
- Boat landings affected by varying water levels

Lake Kegonsa
- Navigation - similar to Mendota
- State park beach and boat launch - need to have accessible
- Basement - sumps and pumps
- High water levels can affect the Door Creek Drainage District's drainage

Lake	**Lake Area in sq. miles**	**Volume of Top One Foot in million cu. feet**	**Volume of Top One Inch in million cu. feet**
Mendota	15.38 (or 9,843 acres)	430 (or 3.2 billion gallons)	36 (or 269 million gallons)
Monona	5.12 (or 3,277acres)	143 (or 1.1 billion gallons)	12 (or 90 million gallons)
Wingra	0.74 (or 474 acres)	21 (or 0.16 billion gallons)	2 (or 12 million gallons)
Waubesa	3.25 (or 2,080 acres)	91 (or 0.68 billion gallons	8 (or 60 million gallons)
Kegonsa	5.01 (or 3,206 acres)	140 (or 1.0 billion gallons)	12 (or 90 million gallons)
TOTAL	29.50 (or 18,880 acres)	825 (or 6.2 billion gallons)	70 (or 524 million gallons)

Yahara River @ McFarland	**Q*** $_{7,2}$	**Q*** $_{7,10}$
Pre- MMSD Diversion (1912 - '59)	36.0 cfs	16.6 cfs
Post - MMSD Diversion (1960- '74)	14.6 cfs	5.6 cfs

* $Q_{7,2}$ is a statistical term standing for the 7 day 2 year low flow and $Q_{7,10}$ standing for the 7 day 10 year low flow. For example a $Q_{7,2}$ means that one might expect to see this average 7 day low flow condition once every 2 years.

Economic Issues

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Larry Nelson, City of Madison Engineer, (608)267-4227, lnelson@ci.madison.wi.us

Connors

- An economic model can be developed to estimate costs associated with making meaningful physical improvements in the Yahara watershed. The economic model would need three primary elements:
    - Structural elements describing what improvements will include and how they will be installed.
    - Operational and maintenance elements to forecast how the improvements need to be managed to ensure effectiveness.
    - Evaluation of improvements with respect to their impact or perceived impact on public rights (e.g. drainage issue for farmers or length of pier rights for riparians).
- There are few financial programs available that could be used for the type of improvements needed to make a positive impact on the Yahara River watershed. Some communities have used the Army Corps of Engineers (ACOE) 206 Program to help fund specific habitat improvement projects. Currently the 206 program is being used for improvements to Token Creek, Lake Belle View and Lake Koshkonong. The 206 program requires a 35% local funding match.

Potempa

- Ray Potempa and Aicardo Roa compiled economic data that can be used as a tool to forecast and evaluate the benefits a given improvement may have on the watershed. The data includes all riparian property from Lake Mendota to the Kegonsa Dam (see appendix 5 for presenter's handout).
- Public versus private ownership of the waterfront is a significant factor in the Yahara Lakes System. Payment of property real estate taxes is best indicator of ownership. The following table shows the distribution of waterfront ownership of the major segments of the Yahara Lakes System.

Yahara Lakes System Segments	Water Frontage (FT)	% Taxable
Lake Mendota	111,516	40.3%
Lake Monona	67,162	40.4%
Lake Waubesa	47,836	50.1%
Lake Kegonsa	48,787	75.4%
Off Lakes Channels*	16,130	50.4%
Yahara River System*	75,000	26.7%
TOTAL	366,431	43.9%

* Length x 2

- Over 56 percent of all waterfront properties are owned by non-tax paying entities. The Yahara Lakes System is truly a fully shared resource between the private and public sections.
- "How are the Private Owners Distributed by Segment and Municipality?" The table below shows the distribution of the taxable parcels by system segments:

Yahara Lakes System Segments	% Taxable Frontage	Number of Parcels
Lake Mendota	40.3%	570
Lake Monona	40.4%	404
Lake Waubesa	50.1%	415
Lake Kegonsa	75.4%	596
Off Lakes Channels	50.4%	129
Yahara River System	26.7%	128
TOTAL	43.9%	2242

- Although Lake Mendota is the largest of the four primary lakes within the System, its high degree of the public ownership limits the availability of waterfront private parcels. The majority of the river and "off lake channel" parcels are associated with Lakes Monona and Waubesa, therefore the all of the four primary lakes have roughly equal numbers of available private waterfront parcels.
- The following table shows how the various municipalities having waterfront property within their respective boundaries distribute the private available waterfront parcels:

Municipality	% of Parcels	Number of Parcels
Town of Dunn	30.2%	676
City of Madison	16.7%	374
Village Maple Bluff	4.6%	104
Village of McFarland	6.7%	151
City of Middleton	4.8%	108
City of Monona	17.8%	399
Town of Pleasant Spr.	11.6%	259
Village of Shorewood	2.1%	48
Town of Westport	5.5%	123
TOTAL	100.0%	2242

- The Towns of Dunn, Pleasant Springs, and the Village of Maple Bluff within the Yahara Lakes System have approximately 46 percent of all of the available waterfront parcels. Waterfront parcels represent a significant percentage of the total housing units in these municipalities. On total, the private waterfront parcels represent only about 2% of the total housing units contained the Yahara Lakes System according to the latest census data.
- In an attempt to answer "do municipalities treat waterfront parcels differently?", this study examined the assessed residential land valuations between general and waterfront parcels as they relate to overall equalize values of the parcels. Improvements on the parcels were not considered since assessment criteria appeared to be applied uniformly independent of location.
- A comparison was made of a residential parcel land value as a percentage of its total equalized valuation by either general residential and waterfront. For example, imagine owning a parcel with a total equalized valuation of $300,000 within one of these communities. Now calculate the reduced value of the improvements by relocating on the water for the same property tax bill.

	Land's % of Total EV	
Municipality	General Parcel	Waterfront Parcel*
Town of Dunn	37.6%	57.5%
City of Madison	26.4%	58.5%
Village Maple Bluff	48.7%	54.0%
Village of McFarland	29.5%	62.0%
City of Middleton	35.6%	69.0%
City of Monona	34.6%	53.0%
Town of Pleasant Spr.	52.5%	62.0%
Village of Shorewood	48.1%	53.0%
Town of Westport	37.2%	63.0%
* Figures are rounded		

- Waterfront parcels are treated differently on the municipalities. Depending on the municipality, waterfront parcels make significant contributions to the total property tax revenues well beyond their relative small number.
- Only 44% of the waterfront is taxed on the Yahara Lakes System.
- 2,250 residential waterfront parcels are available.
- Less than 2% of the waterfront parcels turnover in a typical year.
- Taxable waterfront land assessments total about $420 million with an estimated land value of over a half of billion dollars.

Bishop

- A survey was presented which assessed the residents' of the Lake Mendota watershed willingness to pay to reduce phosphorus by 50% which would reduce the number of algal bloom days in summer from occurring every other day to only 20% of the days. Results indicated that the public was willing to pay $353 per household as a lump sum (see appendix 5 for presenter's handout).

- The monetary benefits of water quality under this scenario far exceeded what the WDNR predicted it would cost to make such improvements ($55 million collected while improvement should cost only $17.8 million).

Janda

- Dane County is currently developing a flood mitigation plan to be completed about June 2003. This plan will include food mitigation strategies and projects such as the purchase of lands that are continually flooded or elevation of at-risk structures. FEMA can pay up to 75% for select projects within the approved plan (see appendix 5 for presenter's handouts).
- Climatic change may have a significant impact on flood frequencies in the Upper Midwest. Current models predict that precipitation in North America will be greater in the winter and lower in the summer. This is consistent with historical trends in Wisconsin.
- FEMA's 2003 budget request has $350 million to update floodplain maps. FEMA will work with local governments to include future condition projections in the flood insurance maps. While insurance cost may rise, there is currently no data to support the hypothesis that updated floodplain maps will result in property value reductions.

Kakuska

- Currently there is no specific information on the economic impact or contribution by anglers and others using the lakes to the local economy. This is a complex question because the same dollar can turn over two or three more times through stimulated economic activity by people who live here as well as visitors. There is no doubt these activities provide a substantial base for tourism, recreation and the quality of life (see appendix 5 for presenter's handouts).
- A 1995 Lakes and Watershed Commission sponsored Water Recreation Study focused on boat owners and landowners with a high interest in water recreation indicated that they are generally satisfied with the recreational use on the Yahara Lakes. The biggest problem noted was poor water quality and weedy areas. Other concerns included increasing congestion, boat size/speed and user conflicts. Respondents were fairly well satisfied with the recreational support facilities and services (e.g., restrooms, piers, channel markers, lake levels, etc.) with substantial support and need to increase the sheriff's patrols. Recommendations indicated: a need to control non-point source pollution, continue monitoring recreational use, develop boat access and waterway protection plans, expand the boat patrol and law enforcement, increase boater safety training, investigate the impacts of jet skis, re-evaluate user fees to finance operation and maintenance, and monitor trends in boating activity and motorboat sizes.

Johnson

- A variety of funding sources are available for such projects as channel improvements, gaging, dam improvements, monitoring, modeling, and infiltration or stormwater control. Such sources would include the Waterway Commission, WDNR Urban Stormwater grants, State Stewardship monies, River and Lake Planning Grants, USGS gaging monies, WDNR Fish SEG funds, US Fish and Wildlife Grants and EPA money (see appendix 5 for presenter's handouts).
- Graphs of the actual water levels in relation to the water level orders and the success of Northern fish spawning were shown. They revealed that Lake Mendota water levels appeared to affect the spawning success but a correlation was not evident for Lake Monona. It appears to be critical that the lake levels be rising between March 1 and May 16 of each year. There may be drawdown potential from May 16 into June. Water levels had to correlate with "ripe" females for successful spawning.

- Dick Lathrop observed that in general, water levels going up in the spring improves spawning.

Nelson

- Dane County has a new digital terrain model. The county will map areas in 6-inch elevation intervals above the lake levels. The parcel data layer will be added to the "flooding" intervals to project the flood damage for each 6-inch increase in lake levels.
- The high water of 1993, 1996, and 2000 caused about one million dollars in public damages to the City of Madison shoreline. Along Monona Bay the city intends to raise the shoreline to one foot above the flood elevation and protect it with riprap.
- The city has empirical information developed by MMSD relating sewer backups to lake elevations.
- Most new development areas in Madison are floodproofed.

Canoe Field Trip Findings

- Dyreson area is illustrative of fact that Indian remnants are usually found within ¼ mile of water.
- We've lost 1/3 of the aquatic plant species from the Yahara Lakes in the last 100 years, and that's significant if we think of the lakes as a natural area.
- Plants in the river (Mud plant, wild celery, pond weed) are adapted to floating water environments - they flow with the current.
- We observed an increase in water clarity below Lower Mud Lake, and that indicates that plants in Lower Mud are filtering water.
- Loads of plants harvested by Public Works are mostly water. Some nutrient leaks back to the water from plants as they decay, but the nutrient content is low.
- The only change in the channel seasonally is plant growth, and it does have a backwater effect.
- Any lowering of water levels in Kegonsa to increase head and increase system flow will have an effect on riparians. On the east side of Kegonsa piers are already 100 feet long to reach any depth for launching.

Major Findings from Presentations

Flow Restrictions – Aquatic Plants

- Chemical treatments to control aquatic plants in flowing water have been ineffective and ineffective treatments are prohibited in NR 107.
- Unlike a typical lake application where treatments are isolated along relatively small littoral areas, a river treatment will expose the entire channel to chemical(s) and the potential for negative impacts are greater. Decomposing aquatic vegetation in a long channel stretch could create a significant BOD (biological oxygen demand) and dissolved oxygen depletion. Any potential chemical treatment that results in a direct or indirect fish kill will be denied.
- Vallisneria also known as wild celery, eelgrass or tapegrass is the predominant plant growing in the Yahara River. This plant is considered a high quality aquatic plant for waterfowl and fish. It is not a plant that you would want to completely remove. The chemical registered for use in Wisconsin that will kill Vallisneria, is Hydrothol 191, the amine form of endothol. The label states "the minimum contact time with plants for optimum results should be two hours". This contact would be difficult if not impossible to achieve in a flowing water situation such as a river. Hydrothol 191 is toxic to fish at dosages well below the concentration required to

effectively kill plants. Use of this chemical, therefore, would be in violation of the laws cited above it would be ineffective, and it would cause adverse side effects on fish, which are a non-target organism.

Flow Restrictions – Channels and Dams

- The most constrictive points are probably the channel downstream of Lake Waubesa to Lake Kegonsa, which is affected by the levels held by the Kegonsa dam and the outflow from Lake Kegonsa because the Stoughton Dam keeps water up to limit outflow from Kegonsa. This is based on regulatory pool levels, not dam capacity. The channel between Kegonsa Dam and the Stoughton Dam is also a factor limiting outflow from Lake Kegonsa
- Each of the five dam's ability to pass flow on the Yahara Lakes system does not appear to be the problem in flow constriction. It appears that the problem is that Stoughton Dam operated in its regulatory range backs up water and appears to limit the outflow from Kegonsa Dam. If Stoughton Dam was able to operate outside its current legal range, with the dam gates open, the reservoir could be drawn down and the Lake Kegonsa Dam could have a greater outflow capacity to pass flood flows, which could lower Lake Kegonsa. Similarly, Lake Kegonsa Dam backs up water and appears to limit the outflow from Lake Waubesa Dam. If Kegonsa Dam was able to operate outside its legal range, the dam gates could be opened and reservoir could be drawn down. Then the Lake Waubesa Dam could have a greater outflow capacity to pass flood flows and lower Lakes Waubesa and Monona.

Watershed Development and Lake Level Responses

- Since 1835 the Yahara Lakes have lost significant portions of the wetland associated with them. (The wetland losses are, by lake: Mendota – 5088 acres or 50% of the 1835 total, Monona – 4520 acres or 92%, Waubesa 4520 acres or 73% and Kegonsa – 4075 acres or 70%). We continue to lose sedge meadows during flood events as they "float up" at this time to create what people call floating bogs. These are "lost" when they break away and have to be removed because they become navigational hazards.
- The total lost flood storage with this loss of wetland area is 18-90,000 acre-feet of water or 5.4-27 billion gallons.
- Analysis of precipitation and lake response indicates that this increase in lake levels is due at least in part to development in the watershed.
- USGS modeling of Pheasant Branch indicates that if low-density residential development occurs in the undeveloped portion of the Lake Mendota watershed, runoff amounts from medium to large storms will increase by about 20%. More aggressive development would increase runoff by greater amounts.
- Water balance analysis of Lake Mendota indicates that a 20% increase in the runoff occurring in 1993 would have increased the peak level of Lake Mendota by over 1.5 feet, assuming releases to Lake Mendota remained unchanged. A 50% increase in runoff would have increased the peak level by over 4 feet.
- Exploration of various alternatives for preventing catastrophic increases in Lake Mendota levels requires a much-improved modeling capability, including a continuous rainfall-runoff model of the Yahara Lakes watershed and a sophisticated hydraulic model of the connecting channels. The cost of the modeling would be about $200,000 or more depending on the questions the model is asked to answer and would take approximately two years work according to USGS. The cost of a gage can be $10,000-$20,000 for installation and $10,000-$15,000 per year for maintenance and data management.

- A statistical analysis representing the trend of Yahara River runoff over the years 1931 to 2001 (for the same amount of rainfall) indicated that there was a statistically significant increase in the amount of runoff over that period of time if the diverted Madison Metropolitan Sewerage District water is factored into the analysis. This trend also existed when compared to adjacent basins.

Stormwater Management

- Standard methods of stormwater management do not sufficiently address increases in high lake levels due to urban and suburban development. Detention, by far the most common storm water management practice, reduces the rate of storm water runoff, but not the volume.
- An effective stormwater management strategy must be predicated on infiltration of runoff from impervious surfaces.
- Potential methods to reduce the volume of storm water include large-scale infiltration basins (which have been used effectively in Long Island, New York for over 65 years) and small-scale practices such as rain gardens, avoidance of compaction of soils, enhancement of the infiltration capacity of pervious surfaces, installation of grassed swales and infiltration trenches. Some of these practices require further research and testing of their effectiveness.
- Infiltration practices have primarily been used to maintain groundwater levels and base flow, rather than to control flooding.
- Large-scale infiltration practices can be difficult to site and design. Thus for this region, small-scale infiltration practices may offer more promise than large-scale practices.
- Based on theoretical calculations, it is feasible to use small-scale infiltration practices to control the 100-year storm event, except where the water table is high or the subsoils are impermeable.
- The need for a more restrictive stormwater/infiltration ordinance needs to be weighed against the ability to comply. Dane County soils are high in clay/silt content. The ability to incorporate infiltration into a stormwater management plan is limited by the soil type and an understanding of long-term maintenance requirements.
- The county has identified a concern with the current version of the proposed NR 151, Wis. Adm. Code. This code establishes prohibitions and restrictions on infiltration according to the depth of groundwater and bedrock among other concerns. This proposed code may jeopardize the county's ability to adequately use infiltration as a stormwater management technique. Approximately 60% of Dane County's land area would be prohibited to incorporate infiltration with the current version of NR 151.

Potential Water Level Changes – Fishery Effects

- For successful fish spawn you need to emulate the natural hydrograph as fish cue on rising water and rising temperature. To do this winter lows should be held on the high end as ice break up occurs, but specific elevations need to be established at representative points within critical habitats to determine required water levels. In the Yahara River below McFarland, any stage below 844'+ is too low to allow access into the marshes of Lower Mud Lake.
- Any discharge below 150 cfs is too little water to maintain high quality habitats for fish.
- The specific habitat needs for fish include: 1) adequate water level for access into and out of spawning marshes 2) maintenance of water through period of incubation 3) preservation of correct vegetative communities and substrate types and 4) control of sedimentation and eutrophication.

- Lowering of winter water levels has the potential to cause some localized winterkill in already shallow habitats, especially in years of low fall water levels, opaque ice and heavy snow.
- Lowering of the summer minimum would have lesser negative effects if instituted after the spring spawn.
- Graphs of the actual water levels in relation to the water level orders and the success of Northern fish spawning were shown. They revealed that Lake Mendota water levels appeared to affect the spawning success but a correlation was not evident for Lake Monona. It appears to be critical that the lake levels be rising between March 1 and May 16th of each year. There may be drawdown potential from May 16th into June. Water levels had to correlate with "ripe" females for successful spawning.

Potential Water Level Changes – Sanitary Sewer

- MMSD's current effluent is not suitable for discharge into the Yahara Lakes due primarily to the level of phosphorus. The level of treatment at the Nine Springs plant would need to be improved to include tertiary treatment. Technology to reach the proper water quality is available, but are people willing to spend the money? Conventional treatment plants cost approximately $5-10 million/MGD, and tertiary treatment could double that cost.
- MMSD is looking in the next 10-20 years at having to replace the Waunakee and DeForest area interceptor sewers to expand their capacity. That could be the time to put new technology in place to meet higher water quality standards. MMSD has purchased land north of Lake Mendota as a site for a new treatment plant.
- During storm events as rainfall intensity increases and lake levels increase, the flow rates in the sanitary sewers increase. At some point in the 2-10 year rain events, flooding in the Lake Monona low-lying areas takes place, and at certain lake levels the 5 and 10-year events lead to overflows at the MMSD plant. The August 2000 storm led to the bypass of approximately 30 million gallons of effluent to Lake Waubesa due to overloading the capacity of the effluent pumping system to Badfish and Badger Mill Creeks.

Potential Water Level Changes – Navigation Effects

- The potential navigation trouble spots if the water levels are lowered include: upper Yahara River channel to Mendota, Lake Mendota "six-pack", shallow landings (Olin Park, Gov. Nelson State Park, and inlet on Mendota near the governor's mansion), and on the entire Yahara River except between Mendota and Monona and Monona and Waubesa.
- The potential navigation trouble spots if water levels were higher include: Yahara River (Tenney locks), Winnebago Street bridge, County Highway AB and State Highway 51 bridges and beltline causeway bridge to Monona Bay.

Floodplain Management

- Dane County is currently developing a flood mitigation plan to be completed about June 2003. This plan will include food mitigation strategies and projects such as the purchase of lands that are continually flooded or elevation of at-risk structures. FEMA can pay up to 75% for select projects within the approved plan.
- Climatic change may have a significant impact on flood frequencies in the Upper Midwest. Current models predict that precipitation in North America will be greater in the winter and lower in the summer. This is consistent with historical trends in Wisconsin.
- FEMA's 2003 budget request has $350 million to update floodplain maps. FEMA will work with local governments to include future condition projections in the flood insurance maps.

While insurance cost may rise, there is currently no data to support the hypothesis that updated floodplain maps will result in property value reductions.

Economic Impacts, Funding Sources

- Currently there is no specific information on the economic impact or contribution by anglers and others using the lakes to the local economy. This is a complex question because the same dollar can turn over two or three more times through stimulated economic activity by people who live here as well as visitors. There is no doubt these activities provide a substantial base for tourism, recreation and the quality of life.
- Waterfront parcels are treated differently on the municipalities. Depending on the municipality, waterfront parcels make significant contributions to the total property tax revenues well beyond their relative small number.
- Only 44% of the waterfront is taxed on the Yahara Lakes System
- 2,250 residential waterfront parcels are available
- Less than 2% of the waterfront parcels turnover in a typical year
- Taxable waterfront land assessments total about $420 million with an estimated land value of over a half of billion dollars.
- A variety of funding sources are available for such projects as channel improvements, gaging, dam improvements, monitoring, modeling, and infiltration or stormwater control. Such sources would include the Waterway Commission, WDNR Urban Stormwater grants, State Stewardship monies, River and Lake Planning Grants, USGS gaging monies, WDNR Fish SEG funds, US Fish and Wildlife Grants and EPA money.
- The high water of 1993, 1996, and 2000 caused about one million dollars in public damages to the City of Madison shoreline. Along Monona Bay the city intends to raise the shoreline to one foot above the flood elevation and protect it with riprap.

Recommendation and Voting Criteria

The stakeholder group discussed and determined brief criteria for proposed recommendations, which could be used to evaluate them. These would help to frame the discussion (see appendix 8). The criteria included:

A. Can this be part of the best overall solution to the problem?
B. Will this recommendation satisfy the most people, be cost effective and practical (can be implemented), and help produce a long-term solution?
C. Is it in the best interests of the larger community?
D. Does it address the group's primary mission?

It was decided by the group to have a 5-tier system to rank the level of support for a proposed recommendation using the following framework:

Level of Support	Points	Action
Strong support or agreement with the proposal	2	Move forward
Agreement with most aspects of the proposal	1	Move forward
Ambiguous feeling toward proposal. Feel neutral or wish to abstain from voting for our against *	0	Does not move forward, No action
Disagree with most aspects of the proposed	-1	Does not move forward
Strong disagreement with the proposal (can't live with the proposal)	-2	Does not move forward

*Note, a zero or no action vote was counted as a negative vote.

A discussion also arose as to who should vote. The group decided that members would have to have attended a minimum of two of the issue educational meetings to be eligible to vote for the recommendations. This decision made 20 members eligible to vote; however, two members had only attended 3 meetings and those two members chose not to vote on the proposed recommendations. Thus a total of 18 advisory group members participated in the vote. A two-thirds positive vote was needed for a proposed recommendation to move on to become a recommendation of the group. That is, at least 12 of the 18 possible votes were needed to move a proposal forward to become a recommendation. Proposals that received less than 12 votes would be recorded as options, but not included in the group's recommendations. The following chart lists the Yahara Lakes Advisory Group's recommendations, the vote counts, and a tally of the level of support for each item.

Recommendations (received at least 12 of 18 votes)

No	Lakes Management & Operations	Strongly Agree 2	Agree 1	Neutral /Abstain 0	Disagree -1	Strongly Disagree -2
1	All control structures from Lake Mendota to below the Stebbinsville Dam be unified under a coordinated and recordable management strategy based on a Yahara River System management plan to be developed which would be able to articulate responses to various scenarios such as development of the basin.	17	1	0	0	0
2	Evaluate methods such as modification of bridge constrictions, aquatic plant modification, dredging, channel modification, etc. to increase flow conveyance.	12	5	1	0	0
3	Operations rules for the lakes must provide for stable and predictable lake levels that are protective of public and private properties, wetland, shorelines, fisheries, water quality and recreational users.	11	7	-	-	-
4	Design orders to address all four seasons, not just summer maximum and winter minimum.	3	10	5	0	0
5	Develop lake and shoreline regulations affecting all riparians, both public and private, in a uniform way.	4	8	5	1	0
6	Establish a structure and process for planning and funding capital improvement and maintenance of flood control and navigation structures on the Yahara River system (i.e. locks, dams, conveyance channels).	11	7	-	-	-

7	Establish specific processes for responding to flooding that set specific standards for use restriction on recreational users necessary to protect property and the environment.	3	13	1	1	-
8	Consider property values and uses in adjusting lake levels.	5	8	2	2	1
9	A flood management plan shall be developed with shoreline protection elevations.	9	7	1	1	-
10	Dane County Public Works and DNR fisheries should coordinate lake levels in the Yahara River system and particularly Lake Mendota must remain high enough from March 15 to mid-May to allow fish to spawn, young fry to grow to sufficient size to survive once water levels are lowered.	12	4	1	1	-
11	Reevaluate user fees to finance operations and maintenance of boat launch facilities and locks.	6	6	4	1	1
12	When the level of Lake Mendota rises above the OHWM (850.7 MSL)* a state of high flow shall be declared. This state of high flow will remain in effect until all the lakes in the chain are at or below their maximum summer operating level. A declared state of high flow will result in 1. The Babcock and Lafollette Dams discharging under free flow conditions (without stoplogs) and the Stoughton Dam increasing discharge in order to maximize discharge at LaFollette. During this period of declared high flow the Stoughton dam's minimum operating level will not apply. The discharge of the Stoughton dam will be increased until the flow at the LaFollette dam is unaffected by downstream conditions (or until some upstream restriction becomes apparent). 2. Discharge of the Tenney Park Dam will consider flow conditions at the LaFollette Dam and will operated in order to maximize discharge (downstream channel bank full) at the lock but not exacerbate flooding on the downstream lakes as long as dam conditions at Tenney are deemed safe (2000 flood levels minus six inches*). When levels of Lake Mendota approach unsafe conditions the gate setting at the Tenney Dam shall be increased to prohibit any increasing in the lake level of Lake Mendota. *recommended levels to be reviewed and finalized later based on further studies and public and expert input	8	8	-	1	1
13	Evaluate the need to renovate Tenney, Babcock and LaFollette lock and dams. The evaluation should include the possibility of automating the gates at one or all of the dams.	13	4	-	1	-

No	Monitoring/Modeling	Strongly Agree 2	Agree 1	Neutral /Abstain 0	Disagree -1	Strongly Disagree -2
1	Maintain an active monitoring program on the lower Yahara River to obtain accurate data on channel hydraulics.	16	2	-	-	-
2	Reconvene Yahara Lakes Advisory group or modified group to evaluate and act on the flow measurements, data, provide education, and monitor progress of recommendations after one year.	11	6	1	-	-
3	Use the calibrated USGS Yahara Lakes model currently under development to optimize management of Yahara Lake system and to achieve multipurpose objectives.	8	5	2	2	1
4	Promote and continue development of a state-of-the-art hydrologic monitoring network (i.e. rain gages, lake level recorders, river flow gages) for the Yahara River system	17	1	-	-	-
5	Survey and evaluate the recreational trends, ~~and~~ uses, and economic impacts by various user groups of the Yahara River System.	7	6	5	-	-
6	Promptly develop and apply a continuous hydraulic/hydrologic/water quality model of the watershed including the lakes and connecting channels that can account for present and potential land use conditions and land management practices in the watershed and the potential modification of control structures and channels.	16	1	1	-	-
No	**Land Use**	**Strongly Agree 2**	**Agree 1**	**Neutral /Abstain 0**	**Disagree -1**	**Strongly Disagree -2**
1	A standard watershed-wide legal ordinance be instituted to infiltrate runoff from impervious surfaces at a target level.	6	7	1	-	4
2	Low-lying riparians be invited to voluntarily provide right-or-first-refusal for future ownership of their property in order to revert it to public ownership.	3	9	1	1	4
3	Opportunities to significantly increase the infiltration of stormwater and snow melt into the groundwater should be identified and emphasized to all areas that significantly impact lake levels.	14	3	1	-	-
4	Commercial, industrial and residential development north of Lake Mendota, should if necessary, be restricted by zoning to minimize the impact of stormwater runoff caused by development into the Yahara River system.	11	2	-	3	2
5	Planning and new laws be introduced to reduce stormwater volumes delivered to the Yahara River system.	10	7	1	-	-
6	Where possible we should encourage reestablishment of natural vegetation along public (and private? lake frontage.	5	7	2	2	2

7	Control the inflow of sediment, animal waste, pesticides, fertilizers and other pollutants into the Yahara River system.	14	4	-	-	-
8	Stop the draining of wetlands for either farming or possible future development within the Yahara River System.	13	2	2	1	-
9	Ensure new developments adhere to current standards of control to prevent sediment and erosion into the Yahara River system	15	3	-	-	-
10	Strengthen county stormwater ordinance to control floodwater from the real 100-year rain event using current rainfall information	8	6	3	1	-
11	Preserve and restore wetlands to improve lake quality, natural habitat, and flood storage within the Yahara River System.	11	3	1	-	3
12	Develop better county internal coordination between Land Conservation Department, Lakes and Watershed Commission and Parks Department.	7	5	3	2	1
13	Setup a purchase and/or transfer development rights program to reduce the future development footprint north of the lakes in the entire floodplain.	2	10	3	3	-
14	Update the 100-year flood maps and end new building in 100-year floodplain area.	9	5	-	-	4
15	Identify and target sites for wetland restoration that offer the greatest promise for preventing future increases in flooding in the Yahara lakes.	10	8	-	-	-
No	**Education and Other Efforts**	**Strongly Agree 2**	**Agree 1**	**Neutral /Abstain 0**	**Disagree -1**	**Strongly Disagree -2**
1	Create an account and increase support to fund watershed restoration and improvement work.	8	5	5	-	-
2	Create educational programs focusing on increasing awareness of lake and watershed issues among the general public.	9	9	-	-	-
3	Communicate all key recommendations to officials and the general public via e-mail, brochures, newsletter and other educational efforts.	11	7	-	-	-
4	Encourage the development and real estate industry to go beyond minimum water quality best management.	13	4	1	-	-
5	Investigate and implement more efficient public access to Yahara lakes information on the Internet.	9	8	1	-	-
6	Implement demonstration practices (ie. Rain gardens, shoreline habitat, stormwater detention, aquatic vegetation control and evaluate their effectiveness.	9	9	-	-	-

Options not Receiving a Two-thirds Positive Vote

Proposed recommendations that did not receive the two-thirds positive vote were designated as options. The table below lists the options and the vote count.

No	Lakes Management & Operations	Strongly Agree 2	Agree 1	Neutral /Abstain 0	Disagree -1	Strongly Disagree -2
1	Yahara base flows be maintained at a level where no flow or extreme low flow scenarios are avoided.	8	3	4	3	0
2	Establish a process to repair or compensate riparian property damaged by flooding.	-	1	7	2	8
3	Change the summer minimum of Lake Mendota from 849.6 to 849.1 to allow for greater possible flood storage.	2	5	4	2	5
4	Consider using highly treated wastewater effluent to restore the water balance in the Yahara River system.	3	8	6	1	0
5	The DNR orders should contain flexibility to given water levels since the Yahara Lakes historically have been operated outside of the current borders.	1	9	1	6	1
6	Winter minimum lake levels should be kept at the upper level of their range (highest elevation) especially for the period from March 1st on.	3	7	1	2	5
7	Maintain the lake levels at or below the ordinary high water mark during the summer months.	2	8	3	-	5
8	Establish standing quick response teams in flood prone areas comprised of local and county officials, which will work with county emergency response officials to prepare and respond to flood conditions. The teams should be assembled when the static lake level exceeds the OHWM on any of the lakes.	3	7	6	2	-
9	Examine the feasibility of adding additional flood protection and flood proofing on Lake Monona.	1	10	7	-	-
10	Do not begin to draw down the level of Lake Mendota until October 30 in order to retain safe passage of boats and get all those on and off the lifts on all lakes.	2	4	7	2	3
11	Operate dams to mimic natural river flow. (1 no vote)	3	6	3	4	1
No	**Land Use**	**Strongly Agree 2**	**Agree 1**	**Neutral /Abstain 0**	**Disagree -1**	**Strongly Disagree -2**
1	Municipal and state tax revenues be directed at establishing two full-time stormwater dedicated inspectors to monitor and enforce stormwater ordinances.	3	5	3	5	2
2	Offer voluntary matching money to elevate or buyout existing flooding homes.	2	6	6	4	-
3	Restore drained wetlands in the Lake Mendota Basin to store floodwater and reduce pollution with a goal of restoring at a minimum 20,000 (31.25 square miles) acres by 2012.	5	5	2	2	4
4	Add and expand stormwater detention capacity in existing communities to reduce flood runoff.	1	5	8	4	-

5	In developing lake level orders, consider the aesthetic effects of proposals as well as the interests of individual stakeholders and ecological health.	4	6	3	1	4
No	**Education and Other Efforts**	**Strongly Agree 2**	**Agree 1**	**Neutral /Abstain 0**	**Disagree -1**	**Strongly Disagree -2**
1	Residents and businesses that are located in high flood-prone areas should be notified each year of continuing trends of rising river and lake.	2	7	3	1	5
2	Enforce littering rules/laws by boat ramps, bridges, and fishing spots. Serve fines and use money for cleanup	3	7	7	1	-
3	Increase staff funding for the Lakes and Watershed Commission to promote understanding of the lake level issues and coordinate citizen efforts to maintain healthy lake levels and prevent flooding.	8	3	3	3	1

Acknowledgements

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List of Appendixes

1. Mission of the Yahara Lakes Advisory Group (YLAG)
2. Communication Guidelines & Process Overview
3. Specific Issues to be Addressed by Subject Area and Speakers
4. Meeting Agendas and Minutes
5. Presenter Handouts (in order of presentation) – this section available only from Mindy Habecker, Dane County UW-Extension Natural Resources/Community Development Educator (608)224-3718
6. Public Forum Brochure
7. Action Planning Template & Committee Action Plans
8. Decision Making Process and Method for Recommendation Evaluation
9. Handouts Presented by Stakeholders