Connecting Hydrological Research With Water Resource Practice 1/17/06 -
Synthesis of Major Themes

1. Organizational Challenges

- There is a lack of recognition for a stake in cooperation.
- Incentive systems for sharing results or monitoring effectiveness are missing in both the private and academic sectors.
- Conflicting decision making timelines in public arena/agencies, academic and consulting worlds can make coordination difficult.
- Dealing with uncertainty and accountability in the public arena and process.
- Innovative approaches often embody risk of failure. We need to understand how to manage those risks.

2. Professional Enhancements

- Better qualified practitioners are needed.
- We need a middle ground between academic journals & practice, e.g. a research project that investigates and solves a real-world problem, and concludes with a paper that is aimed at helping practitioners.
- The adequacy of existing models/tools was questioned:
    - Consistency of data collection
    - Surface ground water interaction models
    - Adequacy of models to for pollutant loads and BMP effectiveness
- There is a lack of user friendly tools, and more tools are needed. For example:
    - Better (i.e. more effective & useable) models are needed for analysis, design and monitoring.
    - An integrated "toolbox" that comprises both surface and groundwater.
    - Location specific forecasting of urbanization impacts
    - Real-cost allocation for implementation options
    - Treatment evaluation for new BMPs
- We should re-examine existing methods and assumptions, and dissect past failures to learn from those mistakes.

3. Design and Performance Data

- We need consistency (and context) of data collection for various water resource decision-making purposes, particularly model applications. Data is being used for purposes it wasn't collected for, e.g. conflicting cost-benefit data for consumptive use.
- There is a growing need for basic data:
    - Performance and longevity data that can be used for recommendations for innovative processes
    - Better (quality/quantity) data to feed the models
    - More performance monitoring to provide data to support decision making
    - Need better data on water consumptive use

4. Communication Issues

- We need to promote engagement and understanding.
- We need to communicate effectively with decision makers, a "water lobbyist" to advocate for the public good would be useful.

- There are cultural differences between academic, agency and consulting worlds, disconnects between the scientific understanding and public policy, and problems with public confidence. Lack of understanding of applied research exacerbates these problems.
- A guide to language used by a range of water resource professionals would be helpful.

(e.g. Nevada Water Words Dictionary http://water.nv.gov/Water%20Planning/dict-1/ww-index.htm)

5. Academic Issues

- Facilitate collaboration with the private sector on research projects.
- There is a lack of engagement by academics in applied situations, more value needs to be placed on applied research and outreach. Develop incentive systems for applied research in academic sector.
- Involve social scientists in research and education.

6. Regulatory Issues

- We should include outstanding and exceptional waters (not just impaired).
- More results-oriented planning activity (vs TMDL).
- Urban planning, and implementation, should reflect regional resource needs.

7. Societal Issues

- There is a lack of societal engagement in water management:
    - Credibility of stakeholders
    - Value of healthy water
    - Conflict between economic and ecological value
- Public need to understand the hydrologic cycle, including individual and societal impacts upon water resources.
- What are the economic and cultural drivers affecting use patterns?
- Build stewardship among public for Water resources protection.

8. Technical/Research Issues

- Research should be planned so that it addresses specific, useful goals, e.g. what is the impact of rain barrels and cisterns on groundwater hydrology?
- Research projects should use a holistic view, e.g. chemistry, hydraulics, probability, social sciences, etc.
- How do we close the water cycle for small scale-consumptive use, in the context of high density development? This goes beyond a straightforward technology fix, and relates to land use population density and cultural issues.
- Evaluation of new technologies, and transmittal of information about them.
- Analysis of alternative future scenarios for specific sites and management strategies.
- Challenges of a Changing Climate:
    - Connect climate change research with terrestrial research
    - Focus on technical (not political/social) issues
    - Focus on local-scale impacts
    - Update current models for future forecasting
    - Lake level impacts on flooding and erosion
    - Impact of climate change on design standards

Connecting Hydrological Research With Water Resource Practice 1/17/06 -
Synthesis of Approaches

A. Developing Organizational Support

Integrate disciplines, knowledge and implementation through an unbiased, multidisciplinary Wisconsin-based group comprising academic, outreach, private sector design professionals and municipal engineers to:

- Facilitate communication between disciplines
- Be a source of credible information for communities, public, practitioners
- Be an authoritative voice to policy makers and private sector
- Prepare "white papers" on specific issues that provide quantitative information (e.g. importance, pros & cons, costs/benefits, alternative scenarios).
- Act as a clearinghouse for new information
- Identify and fund research needs
- Promote collaboration with state and national water resource organizations

B. Water Resource Scenario Building

Develop a holistic vision of water resource management

1. Examine existing methods and assumptions
2. Obtain basic data that is needed
3. Develop descriptive holistic models
4. Create alternative futures analyses
5. Use analyses to promote effective use of water resources

Outcome: More effective public involvement and outreach education.

C. Self-Supporting Activities

Use an informal approach for learning from each other about our respective activities:

- An annual water resources workshop
- Utilize multidisciplinary groups (e.g. WDNR SOC process)
- Hold workshops of experts (e.g. EPA conferences)
- Initiate multidisciplinary projects (e.g. Power plant cooling)
- Use senior faculty to lead change in the academic incentive systems
- Mandatory environmental awareness training on college campuses, and continuing education for engineers
- Line item in the state/federal budget to support our activities
- Expansion and elevation of the State infrastructure (ASCE) report card
    - Bring in natural functions as well
    - Enhances the asset notion
    - Reaches the public directly

D. Collaborating with Existing Organizations.

Recognize possible roles of existing professional organizations that deal with water issues.

American Geophysical Union
American Institute of Hydrology (AIH)
American Public Works Association (APWA)
American Society of Agricultural and Biological Engineers
American Society of Civil Engineers
American Society of Limnology and Oceanography

American Society Of Civil Engineers (ASCE)
American Water Resources Association, Wisconsin Section (AWRA-WI)
American Water Works Association (AWWA)
Army Corps of Engineers
Association of State Floodplain Managers (ASFPM)
Ecological Society of America (ESA)
Fox Wolf Watershed Alliance
Gathering Waters Conservancy
Geological Society of America
Illinois Association for Floodplain and Stormwater Management (IAFSM)
International Association for Great Lakes Research (IAGLR)
International Association of Hydraulic Engineering and Research (IAHR)
International Society of Limnology
League of Wisconsin Municipalities
Madison Metropolitan Sewerage District
Milwaukee Metropolitan Sewerage District
National Association of Clean Water Agencies (NACWA)
National Association of Flood & Stormwater Management Agencies (NAFSMA)
National Ground Water Association (NGWA)
National Rural Water Association
North American Stormwater & Erosion Control Association of Wisconsin (NASECA)
North American Lake Management Society (NALMS)
Organization of Clean Water Agencies
River Alliance of Wisconsin
Sierra Club
Soil Science Society of America (SSSA)
Standards Oversight Council (SOC):
    USDA - Natural Resources Conservation Service (NRCS)
    Wisconsin Department of Commerce (DComm)
    Wisconsin Department of Agriculture, Trade & Consumer Protection (DATCP)
    Wisconsin Department of Natural Resources (WDNR)
    University of Wisconsin - Extension (UWEX)
    Wisconsin Land & Water Conservation Association (WLWCA)
    Wisconsin Assoc. of Land Conservation Employees (WALCE)
Society of Wetlands Scientists
Southeastern Wisconsin Regional Planning Commission (SEWRPC)
Trout Unlimited
Upper Sugar River Watershed Association (e.g.)
US-Environmental Protection Agency
US-Geological Survey
UW-Water Resources Institute (WRI)
Water Environment Federation (WEF)
Water Environment Research Foundation (WERF)
Wisconsin Academy of Sciences, Arts and Letters
Wisconsin Association of Consulting Engineers (WACE)
Wisconsin Association for Floodplain, Stormwater, and Coastal Management
Wisconsin Association of Lakes (WAL)
Wisconsin Coastal Zone Management (WCZM)
Wisconsin Geological and Natural History Survey (WGNHS)

Wisconsin Groundwater Association (WGWA)
Wisconsin Rural Water Association
Wisconsin Water Association (WI-AWWA)
Wisconsin Wastewater Operators Association
Wisconsin Wetlands Association
Wisconsin Wildlife Federation (WWF)

Connecting Hydrological Research With Water Resource Practice 1/17/06 -
Transcribed Facilitator's notes

Morning Session
Small groups addressed the question: What are the Technical Impediments to Better Resource management in expanding urban areas that could be addressed though research?

Group A (Eagan) - 16 ideas were generated originally and ultimately lumped into 7:
1. Adequacy of computer models to determine pollutant loads and BMP effectiveness
2. Dealing with uncertainty in the public arena and process
3. Dealing with accountability in the public arena and process
4. Conflicting decision making timelines in public arena/agencies, academic and consulting worlds
5. Consistency and context of data collection for various water resources decision-making purposes—particularly model applications. Data is used for purposes it wasn't collected for
6. Better treatment evaluation for new BMPs
7. Closing the water cycle on the small scale—consumptive use issues for the small scale sites. This is raised in the context of hi density development and goes beyond a straightforward technology fix. It relates to land use population density and cultural issues
8. Disconnects between the scientific understanding and public policy. Cultural differences between academic, agency and consulting worlds. Problems with public confidence.
9. Lack of understanding of applied research exacerbates problems in the previous issue
10. Lack of engagement by academics in applied situations
11. Incentive systems for applied research in academic sector are not there.
12. Incentive systems in the private sector are not there for sharing results or monitoring effectiveness
13. Lack of recognition of a stake in cooperation
14. Lack of user friendly tools
15. Lack of societal engagement in water management:
    - Credibility of stakeholders
    - Value of healthy water
    - Conflict between economic and ecological value
16. Need for better ground and surface water models

These were distilled down to:
1. Adequacy of models/tools
    - Consistency of data collection
    - Surface ground water interaction
    - BMP effectiveness
2. Consumptive use issues
    - Conflicting cost-benefit
3. Public process
    - Dealing with uncertainty/accountability
    - Engagement and understanding
4. Relationships—between practitioners, academics, agencies
5. Lack of incentive systems—academic and private
6. Evaluation of new technology and transmittal of information about them
7. Disconnect between scientific understanding and public policy

Group B (Liebl)

1. Tools and Data for Infrastructure Design and Regulatory Review

- Performance and longevity data / recommendations for innovative processes
- How to manage the risks associated with innovation
- Better (more effective & useable) models for analysis, design and monitoring
- Better (quality/quantity) to feed the models
- A guide to language used by a range of water resource professionals
  (e.g. Nevada Water Words Dictionary http://water.nv.gov/Water%20Planning/dict-1/ww-index.htm)
- An integrated "toolbox" that comprises both surface and groundwater

2. Regulatory Focus

- Should include outstanding and exceptional waters (not just impaired)
- Accept the risk of failure that comes with innovation
- Promote collaboration w/researchers and educators
- Communicate effectively with decision makers
- More monitoring to provide data to support decision making

3. Improved Efficiency of Water Resource Use

- Need better data on water use
- What are the economic and cultural drivers affecting use patterns?
- Public need to understand the hydrologic cycle

4. Improved Public Support & Education for Water Resource Management

- Better understanding of individual impacts upon water resources
- Better understanding of societal impacts upon water resources
- Better qualified practitioners are needed
- More results-oriented planning activity (vs TMDL)
- A water lobbyist to advocate for the public good

5. Demographic Trends-Impact on Water Supply and Quality

- Location specific forecasting of urbanization impacts
- Involve social scientists in research and education
- Urban planning , and implementation, that reflects regional resource needs
- Real-cost allocation for implementation options
- Build stewardship among public for Water resources protection

6. Challenges of a Changing Climate

- Connect climate change research with terrestrial research
- Focus on technical (not political/social) issues
- Focus on local-scale impacts
- Update current models for future forecasting
- Lake level impacts on flooding and erosion
- Impact of climate change on design standards

7. Research Topics

- What is the impact on rain barrels and cisterns on groundwater hydrology?
- Facilitate collaboration with the private sector on research projects

- More value needs to be placed on applied research and outreach

Group C - (Paschke)
1. Middle Ground Needed: Academic Journals vs. Practical "Nomographs" - Academic journals are often too site-specific or too heavily theoretical to be useful to most practitioners. On the other hand, existing "nomographs" and established design rules are sometimes too simplistic to properly solve real world problems. They may make a problem look too easy, and may miss the fact that judgment is still needed to properly apply the method. A middle ground would be helpful, i.e. a research project that investigates and solves a real-world problem, and concludes with a well-crafted paper that is aimed at helping practitioners.

2. Dissect Past Failures - Our water professions (probably all professions) are not too eager to do this, but much can be learned from past mistakes or failures.

3. Examine Existing Methods and Assumptions - Some existing methods have become very widespread and ensconced in literature and codes, but they may not always be accurate for some applications. Example: the widely referenced SCS curve method. Research that examines the validity and clarifies existing methods and assumptions could be very valuable for practitioners.

4. Research to Address *Specific* Goals - As Stephen Covey says, begin with the end in mind. Consultants and other practitioners depend on someone (e.g. an owner) needing a solution to a specific problem. Research should be planned so that it addresses specific useful goals.

5. Holistic Vision Needed - The world of water (surface water, wastewater, water supply, groundwater, etc.) is a very broad and overlapping in nature. Research projects should use a holistic view. Universities may be well positioned to bring the multiple specialists required (e.g. chemistry, hydraulics, probability, social sciences, etc.) into a holistic project.

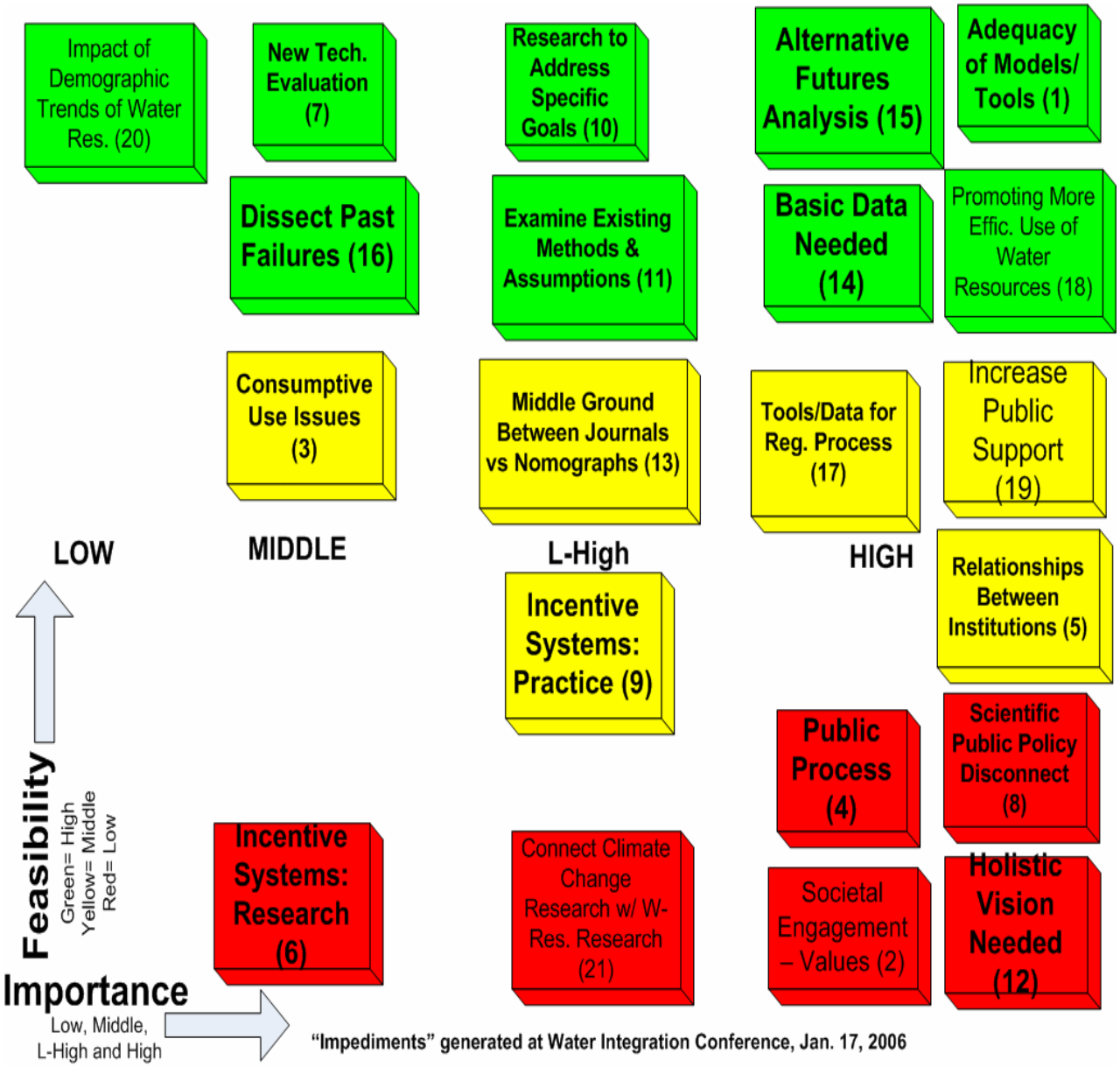
6. Basic Data Needed - Some agencies may be cutting back on basic data collection due to funding cuts. But this basic data (stream flows, groundwater surface profiles, etc.) is crucial for the long term understanding of our water resources. There may be a growing need for basic data that can be collected as part of research projects.

7. Analysis of Alternative Future Scenarios - We must focus not just on "how to cope with the problem", but rather "how to avoid / minimize the problem". For example, society's choices on land use – this is one of the large independent variables impacting water resources. It has become fashionable to do low-impact developments in some circles, but hiow effective are they? Are they primarily just for very high-end homes? We should examine alternative scenarios so that we can show the effects (or lack thereof) of cultural changes. For example, what if a water utility implemented a major water conservation campaign for its users? How would this offset the need to supplement base flows by other means?

Whole group exercise: Impediments and Next Steps

(Harris)

Water Research Impediments: The following impediments identified in water management research and practice in urban(izing) areas along with their relative importance and feasibility as rated by participants by a show of hands. They are organized by relative importance, and feasibility.



[DSL note: "Feasibility" seemed dependant upon the expertise and experience of the participants. In particular, many of the researchers and practitioners have experienced frustration with public process and education. The few outreach experts in the group assigned high feasibility to those factors, based on their own experience.]

Afternoon Session
Small groups addressed the question: What can this group of practitioners and researchers recommend and do to facilitate the research needed to address these technical impediments?

Group A (Eagan)

- Use of multidisciplinary groups (e.g. WDNR SOC process)
- Workshops of experts (e.g. EPA conferences)
- Web-based information clearing houses
- Wisconsin-based NRC model—unbiased, multidisciplinary, Scale statewide and local
- Multidisciplinary projects (e.g. Power plant cooling)
- Use senior faculty to lead change in the academic incentive systems
- Connect to existing National and state resource organizations
- A consortia or center model—(multi-campus) WRI
- Water lobbyist
- Mandatory continuing education for engineers
- Line item in the state/federal budget
- Expansion and elevation of the State infrastructure (ASCE) report card
    - Bring in natural functions as well
    - Enhances the asset notion
    - Reaches the public directly
- Have annual WOW conference
- Mandatory environmental awareness training in college campuses

Group B (Liebl)
<u>W. R. Scenario Building - Developing an Holistic Vision of W. R. Management</u>

1. Examine existing methods and assumptions
2. Basic data is needed
3. Develop descriptive models
4. Create alternative futures analysis
5. Use analyses to promote effective use of water resources

Outcome: More effective public involvement and outreach education.
Approach: Organize a WINRC w/mission: Integrate Disciplines, Knowledge and Implementation

- Facilitate communication between disciplines
- Be an authoritative voice to policy makers and private sector
- Act as a clearinghouse for new information
- Identify and fund research needs
- Be a source of credible information for communities, public, practitioners

Who: Academics
Extension
Professional Orgs
Government
Private sector

Group C (Paschke)

1. A Mini-NRC?

   Is there a need for a "mini-NRC"? That is, a smaller, Wisconsin based group of academic and design professionals that would provide input and information. Possible functions:

   - Informing organizations about research needs and providing information relevant for rulemaking bodies. (note: *informing*, not "guiding")
   - Preparing "white papers" summarizing individual issues. For example; "Here's the state of the art on this issue. Here's where we are now. Here's what could be done if funding existed. And here's why we should be thinking (or alternatively not worrying) about this particular issue."
   - Very important – this group must be known as impartial and have a broad base. Must not be overly influenced by outside interests, or be thought of as "a creature of" some business or trade group.
   - Need to quantify an issue. Example, can't just recite that "infiltration is good". Rather, should determine… how important is it? how costly is it? specific pros & cons? costs/benefits? alternative scenarios?, etc.
   - Note. The " NRC" is the national research council. They are related to the National Academy of Sciences. Another entity, the NSF (National Science Foundation) looks to the NRC for input and information. But the NSF is the group that actually makes the funding decisions.
   - Where should such a group "fit"?

2. Lots of Existing Organizations.

   Recognize possible roles of existing professional organizations that deal with water issues.

   - American Society of Civil Engineers (ASCE). About 2,000 members in Wisconsin. About 140,000 nationwide. A broad group, including many different disciplines (structural, geotechnical, water, wastewater, storm water, transportation, etc.). Their "Infrastructure Report Card" is attached.
   - American Water Resources Association (AWRA). Main focus is the science and technical aspects of surface water and storm water. Wisconsin section holds two large technical meetings each year with technical papers.
   - Wisconsin Academy of Sciences, Arts and Letters. They organized the 2003 "Waters of Wisconsin" initiative, including a conference in Madison and publication of a report and transactions.
   - American Water Works Association (AWWA) and the local Wisconsin Water Association. An organization focusing on potable water supply systems, owners and consultants.
   - Water Environment Federation (WEF) and their local Central States Water Environment Association. An industry group focusing on wastewater collection and treatment, biosolids, water reuse. Members include treatment plant owners, managers and operators, wastewater consultants, equipment manufacturers, academics, etc.
   - Organization of Clean Water Agencies (formerly Association of Metropolitan Sewerage Agencies). Includes owners/operators of municipal wastewater systems.
   - Wisconsin DNR. The official government agency in charge of waters in the state. They hold public hearings and often form ad hoc technical advisory councils for input as specific rules are being drafted. Are they getting the input they need?
   - Water Resources Institute. A state-level research group located on the UW Madison campus. They are funded as part of a federal program. There is a similar group in each state under this program. They provided part of the funding for today's workshop.
   - Regional Planning Committees. State organized committees in charge of planning for multi-county regions across Wisconsin. For example, SEWRPC – Southeast Wisconsin Regional

Planning Committee. Has a staff of about 80. Works closely with the various municipal and political entities in the region.

- Madison area storm water group – 19 communities joined together in a joint approach to the NR 216 storm water permitting process for their area.

3. The Informal Approach.

Assuming this workshop does not assemble a formal new entity, we could use an informal approach. That is, getting this group together for an annual informal workshop. Learning from each other about our respective activities in the broad world of water, water resources, wastewater, potable water, etc. This helps to empower each of us to take action on an individual basis in our fields. For example, individuals appearing at a public hearing to offer expertise.

Whole group exercise: Ideas for Action: Selected Areas for Implementation

(Harris)

Participants selected the following areas after hearing reports from three break-out groups about how to best organize for further action.

1. **Statewide Institute or Center (**Ken Potter, Ken Bradley, Paul McGinley)
Talk with the directors of WRI, AWRA about this idea
Review Other states organization of water institutes/centers

2. **Scenario—"Alternatives Futures Project"** (Ken Bradley, Mike Hahn)
Scope what would be in the scenario so that it would be robust and yet useful for public policy discussions. Look into who might fund such a project (e.g. SEWRPC)

3. **Wisconsin Infrastructure Report Card** (Ned Paschke, Rob Montgomery, Mike Hahn)
Review work from last report (2003) and see if this kind of initiative is worthwhile to build on
Could this be a joint effort with ASCE---contact Robert and Mike with ideas as they are on the committees

4. **Interdisciplinary Participation in all Efforts (**David Liebl)
Create master list of water resource organizations by asking all attendees to e-mail organizations they belong

5. **White Paper Or Clearinghouse On Specific Questions:** No Follow-Up

6. **Research Consortia:** No Follow-Up

Next Steps*:*
"If we were to convene again in six months, what would we have to have in place for you to participate?"

- A list of impediments and follow-up ideas will be created that detail the work done at this conference
- A particular research need will be selected for possible work/presentation
- Ask speaker to attend who is out of water management field (example: invite the author of "Tipping Point" to speak)
- Create strategy or mission for how to follow-up with this effort

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