# *FLOW 2008*: ACTION PLAN – LONG VERSION

**(includes remaining 10/9/08 participant comments)**

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Comment Summary and Clarifying Edits by Kathleen Williams[1]

At its 2008 Conference in San Antonio, the Instream Flow Council (IFC – www.instreamflowcouncil.org) tapped the knowledge and experience of more than 330 professionals from across North America to craft an Action Plan to improve instream flow problem-solving in the U.S. and Canada.

IFC requested conference facilitators to develop and implement a process whereby: "… conference participants will contribute to a document that … summarizes what a broad community of interested and involved instream flow practitioners considers to be the primary obstacles and opportunities related to improving instream flow/water management problem-solving in the U.S. and Canada, and … includes an action plan (with hows, whos, and whens) created by that community to move the discipline forward." The pre-conference survey and its results (http://www.instreamflowcouncil.org/flow2008/survey_summary.pdf) were intended to lay a foundation for the facilitation process. The Action Planning process began with interactive listing and prioritization of obstacles to, and opportunities for, improved problem-solving in the U.S. and Canada. Several interactive sessions followed, focused on developing and refining the Action Plan. The facilitators presented a "draft" Plan, allowed participants to individually comment on their copy, then asked the group to endorse (by standing) the draft Plan as they had edited it. Most stood. After the conference, the written comments were reviewed by IFC staff and, where needed edits were obvious (e.g., typos, spelling out acronyms, adding explanatory footnotes, etc.), or there was strong agreement (and no disagreement) amongst commenters, the Plan was edited accordingly. **The Action Plan was posted on IFC's website and sent to participants (see http://www.instreamflowcouncil.org/flow2008/docs/Action-Plan.pdf). This is the "long version", which retains the written comments not addressed.** The reason to retain un-responded-to comments in this version is that they may prove helpful to others working to implement the Plan. Some comments suggest resources; some express concerns about a recommendation; others laud a recommendation as a good idea. All provide additional perspective that may prove helpful.

It should be noted by all that this is NOT the IFC's "Plan" (though IFC will likely use it in many ways) – it belongs to the *FLOW 2008* participants who created it. We hope it is useful as those many and talented practitioners and stakeholders continue to further the instream/environmental flow discipline in their work and advocacy.

This Action Plan is divided into three parts. The first explores better ways of using science to manage water resources. The second examines strategies for strengthening public policy and enhancing public dialogue to ensure adequate instream flows. The overarching goal in both cases is to ensure that instream flow problems can either be avoided or resolved effectively. The third section of the Action Plan summarizes the ways in which participants from five different regions imagine they might advance the implementation of this Plan.

[1] In consultation with the IFC *FLOW 2008* Planning Team

# Part I: Better Ways of Integrating Science into Policy and Public Dialogue to Solve Instream Flow Problems

With regard to the use of science and scientific analysis most of the participants in the *FLOW 2008* conference agreed on five recommendations.

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**Recommendation #1: ENHANCE AND USE BIOLOGICAL RESPONSE MODELS**

Set parameters that define healthy rivers and lake systems. Expand the use of **biological response models** in setting these standards and link these to natural hydrological regimes whenever possible. Use basin by basin and river by river analyses to **establish instream/environmental flows**.

Comments on Recommendation #1:
- This will take too much time and is dependent on funding, knowledge, political will, etc. Recommendation #2 should be first. Move to overall Instream Flow Policy first, then refine with Recommendation #1.
- What about flow regimes?
- First line should be "Set biological and physical parameters…".
- Would this be done in a bottom-up, or top-down manner?
- Perhaps use parameters on a tiered approach – not just one standard of optimality.
- This is still emerging science with research underway. Consideration should be given to making this an international (beyond just US and Canada) effort. We can benefit from involving those in other countries.
- Models need to be peer-reviewed.
- We need to first determine how we are defining "healthy" rivers and lakes before we attempt to set parameters. This can be fairly contentious.
- Establish statewide adequate flows based on stream class and refine on a basin by basin review. This is needed to address riparian states.
- Reword recommendation to read: "Identify parameters that define healthy rivers and lake systems and for which criteria can be set. Use biological response models to set specific criteria and link these to natural hydrological regimes on appropriate hydrologic scales. … Criteria for these parameters should have the goal of describing flow regimes that support desired uses."
- Use degree of alteration.
- Add "hydrologic and" preceding "biological response models..."
- Replace "biological response" with "ecological response" in heading and throughout.
- Regarding "biological response models", I am not certain if this is the same as a natural reference condition approach, but I assume this is what is meant. If so, it might be better written.
- Needs to consider geomorphology/geology and especially water quality (i.e., water temperature and DO).
- Include how these will be implemented and make the distinction between dammed and undammed streams.

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***Who can do what to help?***

1. Responsible federal, state/provincial, regional/basin[2], and/or tribal agencies should acquire the biological and hydrological data needed to develop biological response models. States should work with U.S. Geological Survey (USGS) and universities to classify streams based on hydrology and geomorphology. A working group of states, provinces, regional and federal agencies, along with representatives of universities, non-governmental organizations (NGOs), and professional associations should conduct an inventory of existing biological response models.

[2] Where applicable in the remainder of this document, reference to state/provincial authorities or agencies also includes reference to applicable regional and/or river basin authorities or agencies.

Comments:
- Good idea.
- Need to set a committee focused on developing a priority list of flow-stressed watersheds that should be funded by Water Survey of Canada/Provincial funding assistance for water discharge gauging. Prioritize watersheds for this based on; high fisheries values (SARA species), scale of domestic water use, high recreational values, etc. In BC, coordinate provincial water stewardship, DFO, and public representatives to develop watershed-specific flow recommendations for priority watersheds.
- Add conservation organizations to first line.
- Add "and ecology" to end of second sentence. If river classifications will be the basis of flow-biology relationships, then the classification MUST consider all factors that would characterize the diversity of not just physical/hydrologic types, but major differences in ecological types.
- If states should work with USGS, provinces should work with whom?
- This should be done under the guise of/direction of the National Fish Habitat Action Plan.
- Perhaps what's needed is a central database/repository to archive data required to do this. I'm not sure the output needs to be a "model". We need to define the "relationship" first, then perhaps the model is one output from that exercise.
- Regarding classifying streams, shouldn't it be based on biology too? What biological communities are associated with stream types based solely on hydrology/geomorphology?
- Associate biological information to this classification in order to recognize biota distribution and potential needs. If possible, associate with water quality too; use GIS.
- Last sentence should be first sentence.
- Data acquired should be both inventory and field data (a synthesis of data is needed). The working group should rank or categorize these models.
- Investigate the use of reference conditions (unaffected sites, historical data, theoretical approaches) as an "anchor" for the bio-response model. (This is the approach used in water quality standards programs for aquatic life use.) Evan Hornig (cehornig@usgs.gov) is available to help with this.
- Add "biology," before "hydrology" in second sentence.
- Add "regional" agencies to the list and where relevant throughout document (e.g. Florida water management districts).
- Replace "biological and hydrological" with "ecological".
- Define what they want for a map product. USGS is not a good source nor are universities unless they have someone who has worked with the problem. Listen to the people who have worked with the problem (e.g., Faith Fitzgerald, Jon Phillips, USFS Western Region). Texas has a mapping program which is just starting.

## 2. University and agency partners should collaborate to conduct the research needed to develop and refine these models. This research should look at responses to flow regimes, not just low flows, and seek to quantify the uncertainty and variability involved.

Comments:
- These models must be in a format that can support management decisions.
- University people (me) would love to do this, and CAN, but we need $$$ and data access. Graduate students are good people for flow projects.
- Need to also seek input on the research agenda from water users.
- Start with a survey of models that have already been developed by a wide range of practitioners – not just Universities.
- Not just low flows, but also no flows for seasonal intermittent streams. There is a very poor understanding of species life history requirements in intermittent stream in many cases. It's a data gap.
- Need to be more specific – what "responses"?

## 3. Scientists should organize oversight committees (technical advisory committees) to assist in these efforts.

Comments:
- This should be a paid agency staff member that oversees Technical Advisory Committees.
- Needs explanation – why not "planners" instead of "scientists"?
- Which "scientists"? – state? Federal? University?

4. Interdisciplinary teams should finalize, implement and proof these models. This should include improving the precision and accuracy of ungauged stream flow models for making site specific estimates and improving geographic information system (GIS) capacity to integrate all ecological data at the same locations at the same scale.

Comments:
- Set up demonstration watersheds to ground-truth the models. Demonstration watersheds must have good flow data, good biological baseline information, and a high capacity to assess biological response.
- Make these available through existing databases (e.g., Environmental Protection Agency (EPA)).
- Where would these "interdisciplinary teams" come from?
- Replace "proof" with "validate".

5. States/Provinces should work with The Nature Conservancy (TNC), Trout Unlimited (TU), USGS, the U.S. Fish and Wildlife Service (USFWS), and others to design and conduct studies to improve biological response curves and identify the best biological and hydrological variables for understanding and communicating biological response to stakeholders.

Comments:
- Add Forest Service Research to first line. And these parties should be the ones that should do #7, below, not IFC.
- Add Desert Fishes Council, American Fisheries Society, etc.
- Emphasis should be on the "communicating".
- Add EPA, Office of Research and Development (EPA-ORD)
- Replace "best" with "most responsive".
- Add EPA TALU.

6. Refer to and adhere to National Fish Habitat Action Plan Science and Data Report Collection, analyses and reporting criteria (www.fishhabitat.org). Also, resurrect, maintain, and add stream gauge, well logs, and lake/reservoir continuous measurement devices.

Comments:
- What about Canada?
- Delete "and adhere to".

7. The IFC or others should establish criteria and standards for uniform monitoring based on a biological model that can be applied nationally, with regional adjustments.

Comments:
- See related comment on #5, above.
- What type of monitoring - organism response to flows?
- Set up a web site that can serve as a clearinghouse and forum for sharing and collaborating on research.
- This should be a regulatory issue; not sure the IFC can do this.
- IFC has its policies in their 2004 book. These provide important guidelines including multidisciplinary science necessary. It is not IFC's function to establish criteria.
- Needs to be more profound; it should be able to support more than one limited model which may be outdated in the short-term. There needs to be a state/regional/national data standard to make use of the data being collected (needs to include metadata and mapping).

Add to list:
- Models should be peer reviewed with stakeholder agreement on consultants/reviewers.
- Need organizational framework to proceed.
- Review/catalogue available data.
- The impact of climate change should be studied. There are huge potential future impacts on underlying assumptions.
- Set a national research agenda on biological response to hydrologic alterations. Get the National Science Foundation to lead a multi-agency effort. This could be an outcome of the upcoming national water census.

### *What technical and institutional resources are available?*

Comment:
- what does “institutional” mean?

1. The USGS Hydrological Integrity Assessment Process (HIP).

2. USGS National Water-Quality Assessment (NAWQA) Program, Ecological Limits of Hydrologic Alteration (ELOHA) framework, university and state sampling databases.

Comments:
- Include Canadian databases?
- Add EPA; US Army Corps of Engineers
- Add EPA assessment databases
- ELOHA is a framework for developing bio response curves and integrating them into water management for instream flows. It was developed and endorsed by 10 organizations (including USGS, and the US Forest Service) of which TNC is only one.

3. Science and data report for the National Fish Habitat Action Plan.

4. Fisheries Co-op Programs can share information on complex modeling and Army Corps Hydrologic Engineering Center (HEC) modeling.

Comments:
- Add consultants – many have been using and developing these models.
- It is doubtful that coop units can share info on HEC modeling.
- After “complex” add, “population, habitat, hydrologic”.

5. Natural heritage databases can be helpful.

Comments on above list:
- I don’t see any Canadian contributions to doing this.
- There is research underway that needs to be pulled together.

Add to list:
- (here or as resource under Recommendation #2): Review of habitat vs. flow relationships in previous instream flow analyses.
- Watershed groups
- The Nature Conservancy and aquatic GAP (Geographic Analysis Program) river classifications. Don’t discount them because they are so complex and result in so many river types. They can be coarsened up as needed.
- Water Survey of Canada – WSC; Watershed Atlas databases (may vary across provinces).
- US Army Corps of Engineers Modeling Lab (Vicksburg?)
- Instream habitat simulation models (PHABSIM, MesoHabsim, River 2D, etc.)
- Water use reporting. (It’s implied later with management planning, but it should be stated explicitly.) Reporting must include surface water, groundwater, stormwater, etc.
- Stream Stats (USGS) regionalized discharge statistics
- Texas Instream Flow Program – www.twdb.state.tx.us/instreamflows.

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## **Recommendation #2**: **DEVELOP REGIONAL INSTREAM FLOW CRITERIA**

Where stream-by-stream criteria cannot be developed in time for adequate protection, develop **regional instream flow criteria for use by stream type**. This must be done in a scientifically credible way that ensures adequate environmental flows. In addition, sufficient flexibility must be maintained so that site-specific concerns and adjustments can be made.

Comments on Recommendation #2:
- What does “stream type” mean? Hydrologic stream type (i.e., snowmelt, rainfall, or..)? Biogeoclimatic zones, or ? How would it be defined?

- Regional criteria should be incorporated into national policy for the US Army Corps of Engineers.
- I'm still hazy on what constitutes "instream flow criteria". It does sound good, but I don't understand what the product would look like.
- Include hydrology, water quality, geology, biology, geomorphology, etc. in study
- Including specific criteria for main land uses at micro and basin level (e.g., irrigation, etc.).
- replace "adequate environmental flows" with "appropriate environmental flow regimes" (and maybe there is a better word than "appropriate").
- How would stream type be determined and at what level?
- After "by stream type" add "and based on biological information".
- Florida sets environmental flows on a stream-by-stream basis, therefore doesn't need regional criteria.
- Change "criteria" to "guidance in title and first sentence. "Criteria" signifies federal regulatory approval in the US. "Standard" indicates state level regulatory approval. "Guidance" allows flexibility and recognizes state of the science.
- Insert "strategically selected" before "river basin-by-basin basis,…"
- I am confused about "stream typing" and how this relates to Recommendation #1-1 (classification of streams). It would make more sense if these phrases were one in the same; otherwise, I don't know what the purpose of stream classifications would be.
- Reword first portion of first sentence to read, "Using information collected under Recommendation #1, develop…". If not, Recommendations #1 and #2 are polar opposites - #1 says go basin by basin and river by river, while #2 wants "regional".
- We have to ensure that this begins with a broad source classification. We (Ontario) have experienced finer stream segmentation/classification methods; it is not much fun. The trap is to want to characterize heterogeneity that is finer than the processes driving the responses.

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### *Who can do what to help?*

1. Resource agencies, working on a river basin-by-basin basis, should characterize biological and physical aspects of streams within each region. Then, in conjunction with a range of partners, interstate commissions or basin watershed managers should develop instream flow criteria for managing each defined stream type in each region and be prepared to verify the efficacy of these criteria over time.

Comments:
- Require assistance from IFC, research councils, etc., for this and for #1 below.
- Need stream classification systems to be able to generalize findings.
- Emphasize the "be(ing) prepared to verify" part.
- I encourage data-based clustering of regions.
- In first sentence, replace "biological" with "ecological".
- Use basin size, watershed characteristics, geomorphology and rainfall/ppt.

2. Stakeholder meetings should be organized, perhaps through Watershed Committees or Watershed Planning Groups, to refine the criteria developed in (1) above. These meetings should seek to generate procedures for approving deviations from established targets.

Add to above list:
- Develop national/bi-national protocols for how to do this work and how to set criteria. Not necessarily one size fits all, but a set of approaches. Resurrect the National River Basin Commission work and update reports prepared in the 1970s and 1980s.
- Preceding #2, add "Develop scientific approach for generalization from basin to state scale."
- Should look into compiling nationwide catalog of watershed groups whose actions/organizations were effective and what characteristics they had.

### *What technical and institutional resources are available?*

1. Existing planning efforts at the federal, state/provincial and local levels should yield helpful information that can be used to support implementation of Recommendation #2. Local knowledge should not be ignored.

Comments:
- add “science” before “planning”
- see related comment on #1 above.

2. A literature review of existing studies (i.e. of existing habitats and flow relationships) would be helpful.

Comments:
- That is huge!
- This sounds like it should be more of a compilation of the literature. Many states or regions have already done the reviews.
- Include habitat, biological, and flow relationships.
- Has been done – See studies published by Olden, Poff, Allan on regionalization of hydrology. Some listed at http://rydberg.biology.colostate.edu/~poff/PoffPublicationsPDF.htm.
- Should be a “compilation” instead of “literature review”.

3. Peer review by applied scientists should be emphasized to enhance the value of (1) and (2) above.

Comments:
- This is important.

Add to list:
- USGS Stream Stats (stream statistical program) and Nature Conservancy’s IHA (Indicators of Hydrologic Alteration).
- Develop research priorities to address priority gaps in biological, etc., data needed to develop flow criteria.
- USGS, universities
- Make maps (or GIS when possible) available.
- Not “emphasized”, “required”.
- Not “emphasized”, “required”.
- Instream flow criteria as developed through hydropower relicensing projects provide many case studies and illustrate pitfalls, complexity, and successful attempts at developing instream flow criteria.
- Statistical approaches applied in terrestrial ecology.
- NCDWQ Basinwide Planning Reports could be helpful models.

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## Recommendation #3: ENCOURAGE INTEGRATED LAND USE AND WATER MANAGEMENT

Encourage **integrated basin-wide land use planning and water management**. Use of common maps, codes and measurement scales will facilitate integration. Integration will depend in large part on setting and enforcing sustainable surface and groundwater demand limits.

Comments on Recommendation #3:
- Need to have an education/communication plan for the public to generate a public lobby force that puts pressure on senior government to facilitate this initiative.
- Include the concept of making data readily available to allow this to happen at the local level.
- The goal here should simply be to ensure legislation and regulatory requirements are integrated/coordinated with respect to environmental flows. Integrated water management planning is complex, a goal of many agencies, but a bit naive to suggest here.
- “Low Impact Development” has secondary and cumulative impacts! Need to establish performance standards and associated monitoring to verify land-use measures. Pay attention to DOA Phase I/II – stormwater impacts and percent impervious surfaces.

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### *Who can do what to help?*

1. States and provinces can develop integrated permitting systems that take into account a wider range of impacts than have been acknowledged in the past. They should also emphasize

cumulative impacts in ways they have not in the past. The overall aim should be to develop new regulations that maintain hydrological integrity (including impervious surface limits, infiltration and storm water controls, recharge requirements and the like). This is unlikely to happen unless public agencies with regulatory authority find effective ways of engaging the full range of stakeholders in assessing the advantages of integrated land use planning and water management.

Comments:
- Does "permitting" in first line mean land use permitting?
- I agree!
- Regarding cumulative impacts, include consumptive use ratio estimates of what stays in a system (i.e., irrigation is approximately (70%?) consumptive, water diversions are 100% consumptive).
- Make sure that instream flows are considered or included as a criterion or consideration in laws regulating development.
- Replace "can" with "should". The vision of the first sentence is a HUGE challenge.
- Add "watershed" to precede "hydrological" in third sentence.
- Need to account for global warming and growth-inducing activities.

2. Governors may want to appoint members to new regional planning entities (or add new members to existing ones) to encourage integration of land use planning and water management. To the extent that statutory changes are required to support efforts to link land use planning to water management, executive and legislative branch cooperation may be required to generate appropriate enabling legislation.

Comments:
- The above two suggestions are policy-oriented, not science.
- Replace "encourage" with "study and recommend" in first line.
- Work through the Governors' Association(s).
- Add "watershed" to precede "planning entities" in first sentence.
- Edit first sentence to read, "Lobby governors to appoint…".
- Following "Governors" add "and legislators".

3. Water districts can help by determining water availability and conditioning future development on water availability as well as encouraging restoration through conservation and reallocation.

Comments:
- Water availability should be determined at a much broader scale – states, provinces, large basins – and should account for cumulative water use and return flow and dam operation and land use, all integrated into a GIS computerized hydrologic model that doubles as a decision support system for enforceable instream management and enforcement.
- "Pay to Play" policies are needed.

4. Regional planning agencies can help to implement the state and provincial permitting requirements indicated in (2) above. They should work to establish regional growth management plans based on projected water demand and availability. They should also seek to review all development permits on a basin-by-basin basis or a watershed basis in a consistent time frame and to consider cumulative impacts. Regional agencies may need financial incentives and support to make this happen.

Comments:
- Add "watershed" to precede "planning" in first sentence.
- Project proponents should pay.

5. Academics who specialize in cross-jurisdictional data management (i.e. National Science Foundation Long Term Ecological Research (LTER-NSF)) have a role to play in implementing this recommendation.

6. IFC or others should organize a clearinghouse to gather and disseminate information about integrated land use and water management planning.

Comments:
- Replace “organize” with “coordinate establishing”.
- Delete - IFC has a limited role.
- Replace IFC with USGS.
- This is too big for IFC.
- This is important.

7. The US Environmental Protection Agency (EPA) and other federal agencies should encourage state agencies to move in the direction of integrated land use and water management planning.

Comments:
- #7 is already happening; needs to be more specific to instream flow.
- Take advantage of NPDES stormwater permits. They can be useful for urbanization effects on flow regimes (contact cehornig@usgs.gov for more info).
- This is important.
- After “state agencies” add “and land trusts and water trusts”.

Comments on above list:
- Need to do cumulative impact analysis – need tools from agencies and researchers (#1 below could cover it).

Add to above list:
- Develop models and research that better link land-use decisions to instream processes (quantity and quality).
- Review the flowcharts of land and water use allocation and use and management processes to find the gaps and links.
- Water permitting agencies need to address the cumulative effects of land use (e.g., conversion from forest to urban, conversion of pervious surface to impervious, etc.) within watersheds in terms of their negative effects on stream ecosystems.
- Identify and develop water management/natural resource goals that apply to multiple state programs, including water, wastewater, stormwater, and state or regional planning. Currently, separate state statutes have different and nonintegrated goals. The Clean Water Act water quality standards have this effect for water quality; there is no similar overarching mandate on quantity. Also applies to Recommendation #5.

### *What technical and institutional resources are available?*

1. There is a great deal of technical information already available that needs to be organized in new and more effective ways including Federal Emergency Management Agency (FEMA) maps, databases of land coverage, surface water and ground water data, aquifer maps, population and growth projections, Soil and Water Assessment Tool (SWAT) models, and other GIS systems.

Comments:
- SWAT (i.e., watershed models)
- Use national data standards for both the numeric and GIS data. Encourage data collections to be compatible. Collaborate with EPA, Department of Interior (DOI), Federal Energy Regulatory Commission (FERC) on this. Also applies to Recommendation #3.

2. Relevant state and local ordinances, as well as rules, regulations and guidance documents need to be gathered so that states, provinces and municipalities can learn how integrative approaches already in use in other places are working.

Comments:
- Add “court cases, legal opinions” after “rules,”.

3. Case studies of entities like Florida’s water management districts and New York City’s negotiated agreements with upstate (Catskills) land owners may help other states, provinces and municipalities learn more about the steps involved in encouraging integration of land use planning and water management.

Comments:
- Ontario’s conservation authorities may serve as other examples where this is happening on the landscape.
- This should be for the purpose of creating a database to consult.

Add to above list:
- Watershed characterization reports including all of the above are available from each Conservation Authority in Ontario (on their websites under the heading of Source Protection Program).
- CAPS (at University of Massachusetts)
- Association of Urban and Regional Planners
- Buy a copy of *Cadillac Desert* for those who haven’t read it.

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## Recommendation #4: DEVELOP BETTER TOOLS FOR ANALYSIS AND COMMUNICATION

**Better tools** are needed, including integrated models and conceptual diagrams, geographic information systems, and effective graphics, to make it easier to communicate and analyze flow options in ways that are meaningful to citizens and decision-makers. All models must be tested and validated to ensure their credibility.

Comments on Recommendation #4:
- Communication is the key; not better/more tools. You have to determine who is your target audience!
- (Darn) good idea!
- Add “/models” after “diagrams”.
- Change first sentence to “Application of better tools is needed,…”. These tools already exist; they are just poorly used.
- Add “and error bars displayed” at end of last sentence.
- As written, “models” suggest analytical tools that would be used for research. My assumption is that the intention was models as decision support tools. In this context it can be lumped as decision support, communication, and education tools.
- All should be well-grounded in conducting collaborative processes before engaging stakeholders. Use a facilitator when needed.

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### *Who can do what to help?*

1. IFC or others should work with a wide range of agencies to identify the most useful analytic and communication tools as well as the additional tools that are still needed.

- This is outside the scope of IFC.
- This is vague. IFC should hire a linguist to review common language and offer advice. Develop a clear water message and market it.

2. State/provincial water agencies should budget funds to develop better tools for analysis and work with private and public partners to develop tools for enhanced communication of technical and scientific findings to the public.

Comments:
- If possible, this should be a coordinated effort. It's not hard to envision a plethora of models being developed that essentially do the same thing. We need several good models/tools that are peer reviewed, accepted, and updated periodically. Comment also relates to #7, below.
- Reword to read, "Lobby state water agencies to budget funds…".
- This is vague.

3. Before more effective communication can occur, responsible agencies must learn more about how various publics perceive the risks associated with various biological/hydrological indicators.

Comments:
- Determine audience.
- Also need to consider others' land use, fisheries and water quality.

4. New educational materials must be developed to help stakeholders better understand the relationships between bio-systems and hydrology.
Comments:
- who should develop?
- This is important.
- Need a new academic field – EcoHydrology – and a new journal.
- Develop materials that can be part of educational curriculae, start early.

5. Agencies must work with stakeholders – including those who do not have science backgrounds -- to translate scientific information on water flow options into "plain language."

Comments:
- What is the definition of "plain language"?
- This is important.

6. Agencies should encourage joint projects with colleges and universities in various scientific and communication disciplines, inviting them to think of ways of reinventing or modifying various analytic and communication tools.

7. Public agencies must work to ensure that all the analytical and communication tools they use are subject to rigorous peer review.

Comments:
- suggestion to delete "rigorous".

8. Agencies should seek to generate systematic feedback from various stakeholders and public groups regarding the analyses and communication strategies that work best for them.

Add to list:
-To address longer term education requirements and to be more broad-based, develop a public school education program.
- With federal agencies, develop a national research agenda with region-specific sections.
- Ensure continued and expanded long-term flow monitoring programs (e.g., USGS).

### *What technical and institutional resources are available?*

1. There are good examples of stakeholder communication efforts that need to be documented so that others can learn from them.

2. IFC members need to commit the time and energy required to document best practices and identify the most useful tools for analyzing and communicating about instream flow.

Comments:
- suggestion that should be IFC as an organization, not its individual members.

3. Agencies should seek the assistance of social marketing and public relations firms to enhance their abilities to communicate with the public effectively.

Comments:
- The Water Matters website is an example. See www.waterontheweb.org for samples of curriculum for high school and college – to build upon.
- Use web pages, videos, press releases, field days/activities.

Add to above list:
- Work through watershed groups and also through local water consultants who work on instream flow issues (both of them have natural incentives to promote instream flows and convince public).
- IFC could compile education materials or references on its website.
- Encourage media participation.
- Catalogue available tools and explore regional use (e.g., Massachusetts sustainable yield estimator, Pennsylvania water analysis screening tool).
- Add "community based" to precede "social marketing…"
- Actograms and habitat meters.

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## Recommendation #5: DETERMINE WATER AVAILABILITY AND MINIMIZE THE HYDROLOGICAL IMPACT OF DEVELOPMENT

Require quantified estimates of water availability -- based on scientifically credible assessments of ecological need -- before allowing new development to proceed. Whenever possible, take steps to encourage low impact development that minimizes adverse hydrological effects.

Comments on Recommendation #5:
- replace "based on" with "with consideration to"
- GOOD LUCK!
- Tie this recommendation to #3, as it's a fallout of land planning.
- Should be a requirement for all counties, municipalities, etc. – may require state/province legislation to set the legal environment for this to happen.
- "Minimiz(ing) the hydrological impact of development" sounds obstructionist.
- At least in NY, land use management occurs at the town level where expertise is often minimal and budget resources don't exist – these people need to be engaged and provided with resources.
- Estimates should be generated by developers.
- Water is always "available" if you have money.
- Reword to read, "Require quantified estimates of water availability based on scientifically credible assessments. Evaluate ecological need before allowing new development to proceed. Encourage low impact development that minimizes adverse hydrological effects."
- After "water availability" add "and return flow".
- Using only "Hydrological" impact, ignores sediment, thermal, and biogeochemical regimes. This recommendation can be achieved using the reference condition approach presumed to be referenced in Recommendation #1. Replace "hydrological effects" in last line with "aquatic ecosystem impacts".
- Require actual values, not "estimates" – estimates don't work.

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### *Who can do what to help?*

1. State and provincial governments may need to develop new legislation mandating credible estimates of water availability and requiring that low hydrological impact development options be given regulatory priority. This can only be done if states and provinces determine water availability based on scientifically credible estimates of availability after ecological needs have been addressed. State-sponsored web sites should be created that link all instream flow projects

in each state and encourage the public to demand low impact development that minimizes adverse hydrological impacts. The only way that such efforts will be credible is if they are accompanied by the development of technically credible models for forecasting the impact of proposed development on instream flow and water demand.

Comments:
- Not only low-impact development, but also efficient use of water.
- Delete second sentence; incentives can be provided to "prevent" potential problems in the future.
- Use WAM models. The state-sponsored websites suggested have already been created.
- Regarding "low hydrological impact development options", and as with cumulative effects analyses, these estimates should includes some analysis of reasonably foreseeable actions, i.e., projected water use. This may even result in giving development preference to specific types of projects.
- Reword end of second sentence to read, "…based on protecting scientifically credible estimates of ecological needs."
- What about interbasin transfers, gray-water reuse, high-flow skimming, groundwater injection to circumvent or address development restrictions?

2. Municipalities and county governments should seek to adopt development standards requiring quantified estimates of water availability and favoring low-impact development. They should use municipally-sponsored web sites to make information on water availability generally accessible via the internet.

Comments:
- replace "favoring low-impact development" with "discouraging water-intensive development."

3. Water supply authorities should prepare and encourage retrofit programs favoring green infrastructure and low water impact building design.

4. Irrigation/conservancy/groundwater districts can develop water distribution plans at the local level that favor low-impact development.

Comments:
- They should also report on these.
- They can also work to improve irrigation efficiencies.

5. Applicants seeking land use and building permits should be encouraged to voluntarily submit credible quantified estimates of water demand associated with their proposals and demonstrate that they have incorporated low-impact building and subdivision designs. Applicants who make such efforts should be granted more favorable responses to their permit applications (to the extent that permitting authorities have discretion).

Comments:
- I am also on a local Planning Board – it is tough in a growing rural agricultural region to change the approach of local landowners and small engineering firms.
- Replace "encouraged to voluntarily" with "required". Add after first sentence, "Applicants should be required to show source of water from willing seller prior to issuance of permit."
- Don't use estimates, need actual values. Estimates leave a lot out; let's work toward getting real numbers.

6. Agencies and others should work with homebuilders and other developer organizations to encourage them to instruct their members on how to take better account of long-term water availability and instream flows in relation to their development efforts.

Comments:
- Include impact fees.

7. The Corps of Engineers, EPA and FERC should undertake regular monitoring efforts and report regularly on the extent to which scientifically-credible quantified estimates of water availability are being used and low water impact development is being encouraged.

Comments:
- Add Federal Department of Transportation to list of who should do regular monitoring.
- Not just monitoring, but follow-up as well.
- EPA and FERC don't do this. Who will pay for the "regular monitoring"? How will it be used? Need standards.

Add to above list:
- Get senior government to set up an environmental fund to assist regional districts and municipalities to develop plans for reducing impacts and an incentive package for making "on the ground" changes.
- Require federal water supply projects to meet instream flow thresholds prior to project authorizations.
- Bigger picture – First, identify flow regime targets. Then use the changes in land and water uses to achieve these targets. For example, converting irrigation to urban water use opens up opportunities to restore natural streamflow patterns, e.g., through strategically locating and timing return flows. Be strategic, not opportunistic. Contact ekendy@tnc.org with questions.

### *What technical and institutional resources are available?*

1. New models are emerging that can be used to forecast the impacts of climate change on instream flows and what these might mean for future land development.

Comments:
- These models are in their early stages, with much variability. We should exercise caution before relying too heavily on them. Their results may not stand up in court.

2. USGS can provide flow records to establish baseline conditions.

Comments:
- LEED (Leadership in Energy and Environmental Design) and other building standards are already available for public use.
- Do you mean "natural" instead of "baseline"?

Add to list:
- Involve water conservation groups (rain harvest/permaculture); water conservation industry associations; irrigation/farming interests (US Commission on Irrigation Development (USCID))
- Question: Is there a Canadian counterpart to USGS?
- Tools that can apply gauged stream information to those which are not gauged.
- There is growing work on defining the water "footprint" for industry and communities. Use this movement's effort to build a set of best practices by water use. See "Blue Water certification" on the Web.
- See Hydrology Futures LLC website for sample analyses that can be done today.
- Add EPA's webpages on Low Impact Development/Stormwater Phase I/II.

Suggestions for Additional Recommendations:
- Develop understanding of the linkages between aquifers and river baseflow as a component of instream flow recommendations. (Note: This was a theme throughout the conference and I was surprised to not see it listed as a recommendation. I missed the session that developed this piece of the Action Plan, so it may have been discussed, considered, and left out.)

General Comments on Part I:
- To be honest, I don't see the IFC using basic principles of change management. I also see the IFC as an insular group that needs to develop networks with decision makers (progressives) that can influence the change required. I also heard "irrigators" were not here. You need to be a more inclusive group to effect change. You can not effect change from outside, you must work with those within that are more progressive in nature – the influence must come from within – these are basic change management principles. I personally found Larry Susskind's work to be where we have to go - inclusive collaborative process. I believe a collaborative approach is the solution. The move to interest-based issue discussion will mean inclusion of more disciplines – water regulators, water users, etc.
- A legislation model – what would it look like? What would be model code? It would be helpful to have attributes of a legal outline, including language to use.

- There is routine reference in here to engaging academic expertise. There are a lot of excellent practitioners in the private consulting community that are already doing many of these things. They need to be involved in all of these development efforts. They will often be those that help the users/regulated community to comply or shape their operations. …There is a lot of emphasis on use of academic resources. This work needs the quality control and rigorous management and documentation and adherence to schedules that occur under permitting and projects that have the potential to move to litigation.
- The Plan needs restoration measures too – not just analyses and protection.
- The Plan needs a specific implementation mechanism for each action, with clearly identified organizations that are responsible for implementation, along with timeframes.
- Regulated communities need to be included and integrated into this process.
- Overall guidance should be to obtain water from willing sellers; collaborate with the water right holders; provide private incentives.

# Part II: Policy Improvement Strategies[3]

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## Management Strategies[4]

Provide incentives to reallocate water from existing uses to instream uses. Offer grants to encourage more efficient irrigation. Purchase or lease water rights from willing sellers, including land owners where land is not good for farming.

Develop institutions that integrate instream flow planning efforts. Examples include Ontario's conservation authorities and state councils of government. Organize water planning on a watershed scale. Encourage these new institutions to share costs between state and local governments in an effort to generate greater buy-in across scales.

Comments on the Recommendation:
- Reword first sentence to read, "Determine where and when instream flows will improve ecosystems, and then provide incentives to reallocate water from existing uses to those instream needs."
- Add to end of first sentence in second paragraph "and water trusts to help achieve goals".
- Reword first sentence of second paragraph to read "…integrate instream flow into land use planning efforts."
- The first paragraph is not applicable in parts of the Northeast/Mid-Atlantic. We do not allocate water; it is a public trust.
- Recommendation should include promoting water conservation generally.
- Replace "Develop institutions" with "Identify existing institutions and adjust their charge to include".
- Purchasing water rights from marginally productive lands may require purchasing the land too.
- Restate/Add: Develop legal goals/frameworks that allow/require continued improvement in degraded waters. The Clean Water Act does this for water quality but there is no similar requirement for water quantity – Could be a national law requiring states to set these – so it doesn't change state primacy b ut does require state action. Similar to mandate for Water Quality Standards under the Clean Water Act.
- Everything until "Organize water planning…" is applicable to allocation states. Water planning on a watershed scale is a different concept that should be considered by all states. Sharing costs (last sentence) is yet a third concept.
- Another example for second paragraph is the Delaware Commission.
- Regarding entities sharing costs in the last line, add "federal".
- Regarding "develop institutions", use existing groups?

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### *Who should do what to implement these management strategies?*

[3] Part II is drafted in a different format than Part I (i.e., multiple unnumbered recommendations beneath five topical headings). Rather than attempting to reconcile formats and risk a resulting change in meaning, IFC staff left the format differences in place.

[4] Note that references to water rights, water right transactions, donated water, etc., in this section are primarily applicable to states/provinces with prior appropriation or stream allocation programs.

1. Lobby for federal, state and provincial laws that provide such incentives. For example, USDA offers incentives through the Farm Bill for land conservation. Modification of the Farm Bill might make it possible to use these funds to acquire water rights from willing owners. Also, the North American Waterfowl Management Plan provides money to buy land and water rights for habitat improvement. The National Fish Habitat Action Plan could provide funding to acquire important water and land rights for fish habitat.

Comments:
- Add to end of last sentence, "and to develop regional instream flow plans"?
- Who should do this?
- Is this a collaborative "lobby"?
- Yes, but not so easy to modify the Farm Bill.

2. Provide state and federal funding to local organizations to purchase or lease water rights. For example, Columbia Basin Water Transaction Program might be a model for facilitating such transactions including the purchase of water rights. Catalogue incentives such as creative leasing option, dry year contracts, partial year or contingent contracts, and mitigation banks.

Comments:
- Replace "Catalogue" with "Promote".
- Replace "Provide state and federal funding to local organizations" with "Use taxation".

3. It would be easier to implement these management strategies if the government resolved some of the uncertainty over who has/retains the right to the conserved water.

Comments:
- Add to end ", and distinguishes between water diverted and water consumed". Diverted water can have its timing and location changed; only "consumed" water can be "saved".
- Agree. Need to resolve concerns about acquired water being used anyway under free use principle.
- Yes.
- Add to end, "or if national policy encouraged protection of instream flows."
- Not applicable in some areas, and very detrimental to the conference's goals to view water as a commodity because you will lose the ability to keep it.
- Reword to read, "It would be easier to … if the uncertainty over who owns water is resolved by the designated legal system."

4. Advocate changes in land use planning and zoning regulation (e.g., density bonuses?) in exchange for the set aside of water rights for instream use.

Comments:
- "Water rights" not applicable in some areas.
- This is risky; standards are needed.

5. Tap non-governmental entities to broker transaction of water rights and handle water bank negotiations.

Comments:
- A water trust could be helpful.
- Water rights and this action are <u>not</u> applicable in the Northeast!
- Reword to read, "Support non-governmental entities as brokers for sale of water rights and water bank negotiations."

6. Link the availability of funding for the purchase of water rights to the formal adoption of instream flow targets defined using a system of common metrics of ecological integrity.

Comments:
- This is too nebulous.
- "Water rights" not applicable in the northeast.
- Is this action about properly documenting the scientific basis for spending public funds?

7. Create water trusts so that those with appropriations can contribute, thereby altering the "use or lose" mentality.

Comments:
- Food and Water Watch is working to create a national Clean Water Trust Fund.

8. Extend federal tax credits to owners who donate water. Create a more organized and consistent means of determining the taxable value of water. A coalition of NGOs and agencies (TNC, TU, Sierra Club) should lobby Congress to ensure that such tax deductions are added to the law.

Comments:
- Clarify that reference to taxable value is for the West. Water should not be taxed in the East.
- May not need to be "federal" tax credits only; could be municipal/local.
- Regarding the last sentence, NO! State law, not federal.
- Yes.
- Term leases for water banking?
- This is not really applicable to Canada. Water has no "value" – it's a common resource. Perhaps a royalty system or user pay to encourage efficiency?

9. Create federal or state programs to support efforts to enhance the efficiency of irrigation. States and municipalities should create a partnership to fund water conservation efforts to share returned water to municipalities and instream flows. The goal would be to encourage more efficient irrigation and water use.

Comments:
- Greater efficiency is needed (and possible!), but gains are often plowed into new consumption. We need greater legal teeth to reserve a portion of the gains.
- Add to the end of the last sentence ", or a change in crops".
- These programs need to assess the cumulative impacts.
- Encourage or require water rate structures with higher rates for large or inefficient users.
- Need to be willing to pay for the available water.
- NO – too simple. More efficient irrigation means more water consumption and less water available for rivers. Need to consider return flows.

10. Local and state and federal agencies should implement a cost-sharing program for water efficiency. User fees should be established to assist in purchasing water rights.

Comments:
- User fees should only apply to the West.
- Stop referring to "water rights"!
- Replace "Local and state and federal agencies…" with "The new watershed agencies…". Add to the end, "Watershed agencies should have the ability to collect and distribute fees/taxes.
- Instead of user fees, could be a royalty system. Add "and fund monitoring and conservation initiatives" to end of last sentence.

11. Change FERC and National Environmental Policy Act (NEPA) baseline conditions so that it considers natural conditions, not existing development.

Comments:
- That is a state issue not federal; and it won't happen.
- This is extremely difficult.

12. State and federal legislatures should develop watershed management districts and/or boost citizen oversight boards for the state and involve them in instream flow and public outreach.

Add to above list:
- Require water users to mitigate impacts on aquifers and rivers by funding acquisition of instream water rights. Facilitate mitigation efforts and the creation of associated funding sources by establishing local and regional programs such as mitigation water banks (e.g., Deschutes Mitigation Bank).
- Remove incentives/subsidies for development, industry recruitment, agriculture in areas where water sources are over-tapped. Include highway funding in this list of subsidies.
- Deny agricultural subsidies (crop support payments) to farmers who do not use water efficiently or who do not use Best Management Practices to conserve water.
- Link crop support payment plans to efficient water use and water conservation.

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**Law and Policies**

Create or restructure a comprehensive legal framework to address water quality and instream flow.

Modify water law to address over-allocation.

Comments on the recommendations:
- Regarding the first paragraph, integrate the clarification into existing Clean Water Act legislation like the Clean Water Restoration Act.
- Federal Clean Water Act programs for stormwater and wastewater should include hydrologic protection and restoration as goals. Would drive state and local action.

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***Who should do what to implement these new laws and policies?***

1. States and provinces should adopt legislation regulating instream flows if such laws are not already in place. They should also consider promulgating additional regulations and rules under existing legislation.

Comments:
- Add to end, “to improve the legal process to protect or acquire instream flow water rights.
- Add to end of first sentence, “ and for regional watershed entities to manage water resources”.
- Begin first sentence with “Congress,”.
- Replace “regulating” with “protecting” or “preserving”.

2. Convene a national resource council to prepare a collaboratively derived template for action. Members should be drawn from all stakeholding groups on a regional basis.

Comments:
- Too broad.
- Be careful what you ask for!!
- Such a committee is being organized to address the Appalachicola-Chattahoochee-Flint issue between Florida, Georgia, and Alabama.

3. Consider national legislation in the United States (a Water Resources Management and Conservation Act) that would examine differences between Eastern and Western water policy and recommend state changes.

Comments:
- NO! Why does Eastern and Western water policy need to be the same? This is putting too much power into federal hands.
- Highly unlikely.

- Too ambiguous.
- NO! We do NOT want Western water policy applied in the East OR the thought of equating our water bodies with those in the West.
- The Civil War again, but East/West.
- This is likely too controversial to be productive. Same with #4.
- States have authority over water allocations. Also applies to next action.
- Because of state's rights this may not work. However, National Instream Flow Policy similar to the Clean Water Act might be feasible. #9 is a good suggestion and gets at this.

4. Such a legal framework would need to cover land use, zoning, utility and agricultural law as well as water.

Comment:
- Changing agricultural law is not going to happen.

5. Where still being used as instream flow criteria, we need legislation to get beyond 7Q10/NPDES (National Pollutant Discharge Elimination System) flows toward environmental flows.

Comments:
- Add to end, "and move conceptually to no net loss/no net effect as an evaluation criterion.
- Incorporate into Clean Water Restoration Act.
- Insert "state" before "legislation".

6. Need a new system to adjudicate existing claims and rights in light of the need to meet water quality and quantity standards.

Comment:
- Do #6 and #7 conflict?

7. Provide authority to state water right administrative bodies to certify compliance with water quality standards and water quantity targets.

Comment:
- National Clean Water Act and EPA should require water quantity/quality relationships to receive EPA funding and state assumption of CWA programs.

8. Federal legislation is needed to give more direction to states to develop hydro-ecological assessments (re. ELOHA approach).

Comments:
- States need to do this for themselves. One size fits all does not work.
- Some states do address water quality and that federal legislation is the CLEAN WATER ACT!
- Replace "give more direction to" with "incentivize (i.e., fund)".
- Replace "hydro-ecological" with "ecological flow".

9. The federal government should enact laws directing states to develop programs to address water quality and instream flow issues, based on river and basin needs. The legislation should provide the funding and other resources that states will need to implement their goals and establish deadlines for achieving milestones.

Comments:
- In Canada, Feds will have to "work cooperatively", as there would be a question of jurisdiction.
- Funding would provide good leverage to gain cooperation from provinces.
- Agree, but mechanisms to ensure this happens need to be in place. Otherwise, provinces will take the funds and spend them on other things.
- Would be nice, but not an excuse for states not to do this on their own (e.g., Florida Water Management Districts example).

- Regarding “directing”, should provide incentives – a carrot not a stick.
- Very good.
- Clean Water Act 1972/1977 – Fishable/Swimmable standard – “fishable” means that water is needed for fish.
- There are limits as to what the Feds can dictate to the states—if something like this was tied to Clean Water Act or Endangered Species Act issues, maybe….otherwise, probably not.

Comments on the above list:
- Way too much “what can the feds do for me” mentality!
- Actions 3-8 are “what”s not “who”s.
- IFC needs to coordinate with TNC and others (Heinz Center, American Water Resources Association, American Fisheries Society, and so on) to establish a North American Commission on Water Policy) similar to the “World Commission on Dams” effort. Let’s think on a larger scale! We must address water issues, research, policy, now – we will have a severe water crisis (similar to today’s financial crisis) within 20 years – if we fail to establish policy/regulatory framework.

Add to above list:
- The Canadian Council of Ministers of Environment currently focuses on water quality. They should expand to include instream considerations.
- States should develop procedures for designating wet, average, and dry water years and pro-rate permits accordingly.
- Create a model instream flow code that offers language and options for instream flow protection, eliminating impediments to trust transfers, and addresses other instream flow legal issues.
- Pass new laws that link environmental flows and groundwater management.

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## Information and Public Education

Develop or refine water curricula for schools. Use this as a means to encourage a long-term generational shift in appreciation for the importance of instream flow.

Bring together stakeholders to support specific policy changes and build support and alliances before taking issues or proposals to the legislature.

Comments on Recommendation:
- Evaluate public values of water – look for inconsistency between stated values and actions. Assess status of public understanding of instream flow issue.
- Yes! on the first paragraph.
- The first paragraph fails to capture the full meaning of the education recommendation of the Southeastern region – education for kids should not only be in the schools. It should also include actually getting kids outdoors and specifically out on rivers and streams.
- We need to articulate solutions and bring these to the public and stakeholders. Ideally, we could estimate the cost of achieving goals so people could agree that they are willing to pay to achieve these results.

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### *Who should do what to implement these information and public education suggestions?*

1. Use public-private partnerships to bring together stakeholders at a watershed scale. We need more technical and passionate scientists interacting with the various state and provincial legislatures.

Comments:
- Please recognize that “stakeholders” involves much more than legislatures – there are landowners, ranchers, etc.
- Add to end, “and have ‘translators’ to convey science in ‘political speak’/process”.
- Good idea.
- Yes! especially at the watershed scale.
- Regarding “passionate” scientists – aren’t scientists supposed to be objective?

2. Create state offices of environmental education. Educate state agencies about their role as conveners of instream flow stakeholder processes.

Comments:
- Better to amend existing school curricula. Also applies to action below.
- Education and outreach is a part of our state environmental department.
- Agencies can also serve as adult educators regarding environmental flows.
- States should collaborate with NGOs (TU, TNC, etc.) to develop curricula and to deliver them to schools and the public.

3. Require natural resource classes in schools. IFC or others should partner with national entities (e.g., children and nature networks, Project WET (Water Education for Teachers), school districts) to develop/refine curricula that address the impacts of water use on ecosystems. This should be integrated into school curricula wherever possible. Include elements of math and science classes that explain how to calculate water footprints.

Comments:
- Use TU's Trout in the Classroom Program as a model.
- Good idea.
- Yes! on the first sentence. Regarding the rest, some of this already exists at regional/watershed level.
- This process should be continued through all levels of education.
- Develop curriculum; make it available and market it – Don't try to force. Engage national educational organizations.
- Regarding second line, IFC is not the entity to do this.
- Include school field trips to illustrate good and bad examples of water stewardship.
- States dictate K-12 curricula. Need to work with state education in each state to change curricula in schools.
- IFC has limited role, staff, and money.

4. Organize summer programs and camps that focus specifically on water education and appreciation. Corporate sponsors and others should be sought along with federal funding.

Comments:
- Good idea.
- After "Organize", add ", weekend, and after-school". Need to get kids onto rivers and streams, not only provide school curricula. NGOs may play a role (e.g., Sierra Club Inner City Outings program, which takes inner city kids canoeing, kayaking, etc.).
- IFC is not capable of playing this role.
- IFC has limited role, staff, and money.

5. Expand/Refine Project WET modules on instream flow.

Comments:
- Good idea.
- Yes!
- I have an interactive water allocation computer program from an earlier version of the WET manual. I am willing to share if Project WET agrees (fred.tarver@ncmail.net).

6. Develop a video game to teach instream flow concepts: PhabSim City! Develop regional and national clearinghouse for the distribution of teaching modules on water.
Comments:
- Not "PhabSim City", please!
- Good idea – use technology better, e.g., UTube.
- Really? Who would do it?

7. Initiate a social marketing initiative. Build national awareness that there is a water crisis looming in portions of the US-Canada. Educate the public about the link between population demands and the availability of water resources. Educate the public about individual responsibilities and the consequences of their actions.

Comments:
- Good idea.
- There is not a “water crisis” in all areas. Many areas are “water rich” while others are naturally “water poor”. Trying to convince people in the former areas may be more difficult.
- There is a water crisis in the South and West, NOT in the Northeast. Focus public outreach on the need to be good water stewards. Yes! regarding last sentence.

8. Create/Refine a water footprint calculator to show causes and effects. Educate through model communities.

Comments:
- Good idea.
- Yes!
- Replace “calculator” with “model”.

Comments on above list:
- Children’s groundwater festivals have been organized in Ontario for over 13 years (based on an idea in Nebraska). The Waterloo-Wellington festival has delivered water stewardship concepts to over 50,000 9-12 year olds during this period.
- Need legislative mandates or teachers will not be able to use any programs developed. Move away from standardized testing.

Add to above list:
- Develop research grants to promote innovative manufacturing processes that require significantly less or no water consumption. Also add to Research section below.
- Foster a conservation ethic, including instream flows.
- Develop education materials that teachers can use at the elementary school level. This must be a collaborative effort between scientists and experts in education or communication.
- Get weather shows to include hydrologic data (e.g., aquifer levels) in daily forecasts, right alongside pollen, ozone, etc.
- Promote fishing for children so they grow into citizens who care (catch and release perhaps). Provide liability insurance/guidance for schools, etc., to protect them from lawsuits when Johnny slips on a rock.
- Publicize and connect with EarthGauge – part of the National Environmental Education Foundation and the American Meteorological Society to facilitate news/weather broadcasts to engage with expert scientists for basic environmental info.
- Highlight water success stories while discussing some specific challenges.
- Provide training for teachers, or other professionals, to come in on a regular basis to teach a class on environmental flows (e.g., 1-hour each month). Include hands-on activities appropriate for each age group.
- Water utilities should explicitly present (graphically) historical water use on water bills so customers understand what they are paying for and how their usage compares to their historical usage and region’s usage.

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## Partnerships and Stakeholder Engagement

Develop regional and local water budgets that include instream flow needs; integrate these with the permitting process for new development.

Pursue proactive land use planning within water constraints, not “grow here and hope we can find water.” Instead, ask, “Can the watershed and water source support additional growth and if so, where?”

Create stakeholder advisory groups and assign skilled facilitators to help them. Adopt approaches to stakeholder involvement that generate negotiated solutions that balance all interests.

Comments on the Recommendation:
- “Integration” in first paragraph should be via GIS-based decision support systems.
- In second paragraph, not just “can?” but “where?”

- Add to end of last paragraph, “Educate stakeholders to interpret bioresponse curves to inform them of the tradeoffs they need to understand to negotiate successfully. Focus negotiations on ecological goals.”
- I do not like the term “water budgets”. Regarding second paragraph, retrofits in the Northeast/Mid-Atlantic. Regarding last paragraph, add “in your region” to the end of the last sentence.
- Instead of “Can the watershed…”, “How can growth be best accommodated within constraints…”. We will lose credibility with politicians if we talk about limiting growth. WORDING IS IMPORTANT!
- Replace “accommodate” with “support”.

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**Who should do what to implement these recommendations about partnerships and stakeholder engagement?**

1. Where they do not exist, create combined land and water planning boards with oversight authority (granted by the legislature).

Comments:
- This won’t work; they have different legislative authorities. Build collaborative base to deal with these issues.
- Could also develop better communications between land planning boards and environmental conservation commissions that have the expertise in ecological issues.

2. Encourage land use planning along watershed boundaries.

Comments:
- Yes.
- Yes!
- Yes.
- Could use the Ontario Source Protection Program as a model.
- Reword to read “Encourage land use and water supply planning along the same watershed boundaries.”

3. Where applicable, create regional water banks and regional water planning budgets. Screen projects at the watershed level. Identify stressed sub-watersheds. Categorize sustainability of water supplies in stressed sub-watersheds. Such collaborative efforts would require databases, decision support systems and desktop instream flow need (IFN) standards to enable a process of developing water budgets.

Comments:
- What’s a water bank? This sounds like a western thing – keep it in the west.
- How would the categorizing the sustainability of municipal water supplies work?
- No on water banks in the Northeast! Don’t use term “water budgets”.

4. Where they do not exist, create intrastate regional planning commissions that encourage and enable various levels of government at different scales to work together.

Comments:
- Yes.

5. Create Environmental Flow Advisory Councils.

Add to above list:
- Those involved in specific water use/instream flow issues should strive to get all necessary stakeholders involved.
- Reestablish the river basin commissions and update/modernize the plans completed in the 70s and 80s – these tackled many of these issues and guide many water and wastewater decisions. Water budget could be part of these plans.

## Research

Undertake large-scale coordinated research projects at multiple scales. Tackle research problems using multi-disciplinary groups of researchers.

Comments on the Recommendation:
- This is costly. Are there other ways? Maybe synthesis of present knowledge and education of stakeholder groups?
- "large-scale" = detailed scale in watersheds.
- Need data standards and compatibility so all data collected for this purpose will be "available" to workers.

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### *Who should do what to implement research strategies?*

1. Increase the number of disciplines involved. Encourage cooperation among agencies and academics. Try to set national research priorities and develop a shared budget for meeting them. This should be done by a consortium of agencies and organizations including IFC, TNC, USGS, and independent university centers.

Comments:
- Regarding the number of disciplines involved, aren't those required already involved?
- Add EPA-ORD to list of entities in last line.
- Yes.
- Add to end of second sentence "and the public". "National" should be "regional" in the third sentence.
- What might be missing is the value of monitoring programs as part of an extensive experimental design that collectively feed into a research program.
- States, not IFC, should be involved in this.
- Add industry – many research projects are undertaken in industry.

2. The National Science Foundation (NSF) and USGS should establish a national research program to evaluate river needs. This should be focused on applied research and emphasize what we have learned from adaptive management programs.

3. Take advantage of existing NSF-funded coordinated national research initiatives and networks (National Ecological Observatory Network (NEON), Consortium of Universities for the Advancement of Hydrologic Science Inc. (CUAHSI), Long Term Ecological Research network sites(LTERs)).

4. The water resource institutes, the National Academy of Sciences, the National Center for Ecological Analysis and Synthesis, the Heinz Center should encourage research collaboration.
Comments:
- Need a Canadian equivalent, since Canada doesn't have private foundations or trusts to the same extent as in the US.
- How are you going to tell a Foundation to operate? Delete.

5. The research community should be encouraged to analyze FERC relicensing data.

Comments:
- Add to end of last sentence, "and to develop regional instream flow plans"?
- Ask energy people to tell you. Don't reinvent the wheel.

6. Create a national water research center with regional offices that partners with universities, industry and other government agencies to set research priorities.

Comments:
- Good suggestion!
- That is a CUAHSI-type initiative.
- Yes.
- Yes.

7. Encourage economists to value the ecosystem services that are really the target of instream flow research.

Comments:
- Yes.
- Contact the Brookings Institution.
- May not be high priority without legal/taxation system to require payment for these services.

8. Encourage more systematic research on user pay systems.

9. Encourage large-scale research projects that look at water needs across numerous urban areas.

10. Examine existing baselines and try to predict changing circumstances, such as the impact of climate change on species movement. Explore the impact of species interaction and interdependence on overall aquatic health.

Comments:
- Costly; look to cheap quick wins.
- Good luck trying to predict the impact of climate change! Most tools are not sophisticated enough to predict linkages and impacts with existing conditions, let alone predict "species movement" associated with climate change or the time scale of that change.
- Replace "baselines" with "natural flows".

Add to above list:
- See science actions – create a national research agenda that includes region-specific priorities. Focus on bio response, tools and criteria development.
- Identify cost-effective data collection that can be done at the local/regional/state level.

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## Funding/Monetary Incentives

Adopt user pays strategies. Direct the revenues collected in this way to pay for scientific studies and ISF monitoring.

Comments on the Recommendation:
- Add to end", as well as conservation and efficiency measures, and restoration where required".
- I agree with "user pay", but we need to mention the caveats – address the emotional concerns of water as a basic human right and equitable access to water. Also address concern about "commoditizing" the resource (at least for Canada, where the Crown owns the resource and people can only obtain (or pay) for the right to divert the resource, not the resource itself).
- This is out of my realm of understanding! I do not understand the context for this strategy. User pay for what? Either clarify this last strategy or remove it. Funding for what?
- How are you going to collect/administer the revenue? This may not be realistic?
- Water should be priced so that it more accurately reflects the ecosystem services provided.
- Need national water use charge like gas tax, with funding dedicated to water protection and river restoration.
- There must be public agency buy-in and funding.

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### *Who should do what to implement these funding strategies?*

1. Offer rebates to domestic water users and irrigators for low levels of water use.

Comments:
- This sounds like conservation. How would it raise funds?
- Add "Where charges already exist" to the beginning of the sentence.
- Yes.
- This won't work in the Northeast.
- People shouldn't be rebated for something they don't pay for in the first place.
- Rebates and "feebates". Use graduated fee systems (e.g., 1-10,000 gal/day fee is $1/gallon; more than 10,000 gallons/day assessed at $2/gallon, etc.).

2. Assess surcharges to water customers for ISF purposes, scale them based on the amount of water they have been able to conserve.

Comments:
- This won't happen in the Northeast.
- This is not clearly stated. It give the impression that the recommendation is to penalize people who have conserved water by assessing surcharges on them. In sure that's not what was intended.
- Add that could also "reduce assessment" for those that conserve.
- Must include incentives to conserve; surcharges will be inherently discouraging.

3. Water administrators should assess fines for non-compliance with permitted uses or conditions. These funds should be put toward ISF purposes.

Comments:
- Some already do this.
- Good luck with that; we can't even enforce current regulations!

4. Scale water charges to reflect green/low impact development so that wasteful development patterns pay more.

Comments:
- Delete action #4.
- Delete.
- Yes.
- Reword as "Scale water charges… development to penalize wasteful development patterns."

Comments on the above list:
- Stop punishing people! Give incentives! You attract more flies with honey!

Add to above list:
- Involve regulated community in efforts to answer questions important to them and seek funding for research and policy development.
- Consider a sales tax on water-use related items – toilets, faucets, etc. – the proceeds of which would be put toward instream flow purposes.
- Permitting agencies should adopt an annual water use fee policy.
- All new water applicants should pay for assessment and only be permitted when there is available capacity over instream flow needs.

Overall comments on Part II:
- Need a Conservation section. Include as an action, "Develop water conservation/incentive programs for domestic, , agricultural, and industrial uses."
- I see a lot of strategies here being a "they" strategy ("they" being government). More "we" strategies are needed – i.e., what can "we" do personally? The reliance is heavily weighted toward legislation, rather than collaborative efforts. The latter influence the former.
- Need to re-evaluate the strategies into timeframes – what can be accomplished now and what will take more time. Look for quick wins, easy and cheap. Measure of progress; need to report out.
- This is not applicable at a national level, and it is unrealistic. Research goals can be set nationally, but not water policy. Furthermore, the way the West and South look at water is completely different than the North, where we believe water is a public right not property!
- These are related strategies that must be sequenced within the context (geographic and social, economic, resource) of the planned action, but generally might follow: (1), (2) Information and public education, in concert with partnerships and stakeholder engagement, generate support for (3) laws and policies to effect a new approach to

sustainable use of water, requiring (4) funding to establish new (5) management strategies, necessitating (6) research to close knowledge gaps which must be delivered via (1) and (2) (i.e., circles back).
- Editorial suggestion – eliminate excessive precatory language.
- Spell out all acronyms.

## Part III: Regional Roundtables

As the last interactive breakout of the conference, *FLOW 2008* participants divided into regional groups according to the following:

- Western US - AK, AZ, CA, CO, HI, ID, MT, NM, NV, OR, UT, WA, WY and U.S. Pacific Islands,
- Central US – IA, IL, IN, KS, MI, MN, MO, ND, NE, OH, SD, WI,
- Southeastern US – ALM AR, FL, GA, KY, LA, MS, NC, OK, SC, TN, TX, VA, WV, and other US Territories,
- Northeastern US – CT, DE, MA, MD, ME, NH, NJ, NY, PA, RI, VT, and
- Canadian Provinces and Territories.

Despite the suggested divisions above, anyone could attend the session of their choice. The question posed to these groups by their respective facilitators: "Given the 'action items' that have been generated so far, what can we work on together – as a region -- to advance this agenda?" Unlike Parts I and II, there was no post-session opportunity for participants to review and comment on the text captured by regional facilitators.

### Western US

- Develop mechanisms to reallocate water uses
  - WHO – assist and build network of Water Trusts – Columbia Basin Water Transactions Program (see www.CBWTP.org)
- Develop model code to help state develop instream flow laws – to avoid litigation
  - WHO – IFC convene a Blue Ribbon Task Force
- Assess and summarize state instream flow laws and regulations/provide examples of state programs that work
  - WHO -- IFC
- Fund water efficiency project
  - WHO – fishhabitat.org
  - WHO: Natural Resources Conservation Service (NRCS) and others who fund agriculture producers
  - WHO: DOI, Bureau of Reclamation
- Promote and support state actions on instream flows
  - Coordinate with state instream flow coordinator in your state
  - Develop and implement state water trusts
  - Develop growth management policies tied to water supply
  - Develop a "no net loss" policy
  - Implement existing laws
- Pick a regional project
  - Use and build on Western Native Trout Initiative
  - Build on other existing groups – e.g., National Fish Habitat Plan participants; Interstate Council on Water Policy, etc.

- Create a regional organization
    - Create compacts (like the Great Lakes Compact)
    - Secure funds for a western version of Southeastern Instream Flow Network (SIFN)
        - WHO – Bob Deibel, USFS; IFC (see also references to working with others)
- Other
    - Create Regional/National Instream Flow Plan and Organization of stateholder group that includes powerful water rights holders, regulatory agencies, NGOs and other key stakeholders.
    - Find ways to fund NGOs who assist states with instream flow laws.
    - Define how we know when we have reached our instream flow goals
    - Develop incentive-based mechanisms for water transfers
    - Require mitigation program for all new water users – if you take water out of the system you need to mitigate
    - Require a portion of water conserved via improving agricultural efficiencies to go to an instream flow trust
    - Utilize existing resources: USFS, Western Native Trout Initiative, TU, TNC, Columbia Basin Water Transactions Program, etc

**Central US**

- Included 14 participants and 7 of 8 states
- Focused on Recommendation # 1 in Science Action Items … then generalized
- Complete regional classification of streams (Actions 1 and 2)
    - WHO – IFC should identify potential partners, such as EPA, the Association of Fish and Wildlife Agencies (AFWA), basin associations
    - WHO – individual IFC members should take action
- IFC should engage advocacy groups to support "action items" – including TNC, TU, American Rivers, etc.

**Southern US**

- Develop model(s) that regions and states can use for developing educational outreach for schools (including curriculum development) and for outreach programs to get people on rivers … use existing models/resources where necessary
    - WHO – SIFN (Southern Instream Flow Network)

- Develop one-page instream flow educational document for legislators on science
    - WHO – SIFN should develop bullet points that states/legislators can use

- Provide citizen outreach and coordinate information
    - WHO – SIFN should send emails to southeast conference participants to spearhead sharing information on what works in terms of public outreach and other information in instream flow – including research available, relevant land-use planning information tied to water use constraints

- Other
    - Compile state of science, policy, and regulations regionally; explore the value creating a web site
    - Advance national policy on instream flow
    - Promote proactive land-use planning tied to water use constraints … educate each other
    - Create a web site for regional instream flow resources
    - Work regionally on research

**Northeastern US**

**Legal and Policy Issues**

- Identify potential policy/legal tools to accomplish Action Plan goals. Goals should include flow restoration.
- Organize a Workshop at which a regional group of legal and policy experts can assess the current state of laws and policies for flow protection and report back to scientists in plain English. Provides foundation for discussion across science and legal. Understand what is the legal framework across states, not necessarily about tightening laws.
- Include goals of optimize/restore/revisit previous water use decisions/allocations in water management decisions and programs (should include ability to change uses in over-allocated basins)
- Should aim for a legal framework that can work using watershed boundaries (including inter-state basins).
- Include review of land-use and utility laws and how they affect water management and water laws
- Distribute existing EPA review of case law on CWA and flow issues (C. App)
- Examine whether we need new authority to look at existing water permits.
- Look at Pennsylvania model of technical assistance—integrating wastewater, stormwater into management approach.
    - WHO -- IFC could be lead on the legal review—and sponsor the workshop.

**Outreach and Education**

- Try to develop common outreach materials to build public support. Water budgets at the state level have proven to be useful for outreach to date and should be used more often.
- Try to speak with one voice regionally
- Link to global warning to help outreach
- NGO campaign to public with a concept like "Let it Flow"
- Workshop on "water words" so that we can use language that works with the public.

**Land use and Local Issues**

- How do we get retrofits for fixing existing problems into land use and other decision-making?
- Can we develop model water bank legislation and water fees for restoration?

- Should move to template/guidance for model bylaws for local zoning; look into state enabling legislation for planning reforms for water protection.

**Science for Instream Flow Criteria (to meet Recommendations 1, 2, 4, 5)**

- Get regional water and biological scientists together to develop a regional research plan based on the goals above.
- Get federal/state/academic agencies together to coordinate their existing research plans.
- Can use state's pooled State Wildlife Grant funds to push this research agenda forward (e.g., via the Northeast Association of Fish and Wildlife Agencies)
- NGOs will have a significant role of building and supporting this agenda.
- Can work through AFWA to get this done.
- Take advantage of existing university networks, like cooperative fish and wildlife units that are interested and run with them. A strong agenda may bring in additional partners as it builds.
- Should include regulated community—they can assist in getting momentum and funding. Regulated community is interested in good data, especially when you link it back to the biological community. Public-private partnership.
    - WHO – Rushing Rivers and TNC are potential leaders for convening the science workshop.

## Canada

**Context**:

- Different provinces are at different stages in:
    - the development of legislation to protect instream flows and water management policies in general
    - the status of coordination and implementation between Federal legislation (e.g., the Fisheries Act) and Provincial policies and legislation
    - the degree to which existing legislation and regulations are enforced
- There is significant interest in:
    - enabling the sharing of experiences in science and policy across jurisdictions
    - Improving the grassroots level of understanding of critical water management issues

**Action**:

Investigate the development of a **National Water Forum / Lobby** comprised of NGOs, Public and Private sector participants, with an aim to:

- Develop and disseminate information to raise the level of public awareness
- Develop and share policies and science directed toward instream /environmental flow management
- Improve the consistency of implementing Federal legislation across the Provinces and Territories

Comments on overall Action Plan:
- Thanks for doing this!