



SUSAN SULLIVAN

CHAIRMAN

PETER EVANS

EXECUTIVE DIRECTOR

Ms. Nancy Sutley, Chair
US Council on Environmental Quality
722 Jackson Place, NW
Washington, DC 20503

May 17, 2010

Regarding: Interagency Climate Change Adaptation Task Force Progress Report

Dear Ms. Sutley,

We appreciate the importance of the assignment given the Interagency Task Force and the magnitude of gaining the support from the 20 federal agencies involved. The March 16 Progress Report appears to be a good step in the right direction and we are pleased to do what we can to support this effort.

The Interstate Council on Water Policy was established in 1959 and provides a forum for state, interstate and local water officials to help each other improve water planning and management capabilities and to speak out, as a group, to the need for federal policy and assistance on specific issues. What our members have in common is the responsibility for developing policy, managing programs and implementing projects that reduce the risk of flood and drought and balance the needs of human communities with the protection of water quality, wetlands and riparian areas and the species that depend upon them.

The following observations, questions and suggestions related to your March 16 Progress Report comments were developed in consultation with our members states, interstate organizations and management districts with the approval of the ICWP Board of Directors. In addition, we are pleased to provide you with a copy of the four “climate change decision examples” developed by our Interstate Water Organizations Committee to illustrate more specifically the challenges that non-federal water managers are facing in relation to climate change.

The three goals included in your Progress Report seem appropriate. However, with respect to the nine “gaps” that have been identified, it may be that the Task Force’s scope is unmanageably broad: it seems unrealistic to expect the 20 federal agencies to agree upon an effective plan to fill these nine identified “gaps” within a reasonable timeframe.

“Understanding the challenges at all levels of government” and the development of “Comprehensive and localized risk and vulnerability assessments” may be beyond the federal agencies’ capability in the next 5-10 years. On the other hand, providing a national communication framework for sharing information (baseline, trends, adaption

plans and measured results) and linking partners and resources would seem to be readily within the federal agencies' immediate capability and would rapidly assist other agencies in assessing risks and vulnerabilities and evaluating adaptation options. Developing a "robust approach to evaluating and applying lessons learned" also seems like an achievable and helpful objective.

ICWP endorses the Task Force recognition that local, tribal and state agencies need to be engaged as full partners in the assessment of information needs, climate trends, impact risks and vulnerabilities, and adaptation strategies. An advisory committee organized under the Interior Department with participation of all 20 federal agencies and strong representation of the non-federal agencies would seem appropriate.

The 9 "gaps" aren't explicitly identified in any particular order, but there should be a clear statement that baseline data collection is a crucial starting point. Identifying trends and impacts will not be possible without good measurement of baseline conditions. Perhaps this is implicit in the reference to "research" to identify "impacts," but this prerequisite has not been a priority and should be addressed directly. The federal agencies are essential partners in many data collection networks that address key indicators (e.g., precipitation, stream flow, snow pack, lake and reservoir levels, water quality, aquatic community health, etc). First and foremost, the federal agencies should assure that we (collectively) are recording and evaluating the necessary information.

The "gaps" and "strategy elements" discussions seem to presume that we will have the data needed to support the indicated assessments of trends, risks, vulnerabilities and adaptation alternatives. Has USGS (or any other of the Interagency Task Force participants) determined whether we are collecting the necessary air, water, soil and ecosystem measurements –or, if we aren't, what the dimensions of the gaps are?

With respect to the six elements of the national strategy contemplated by the Task Force, the ICWP believes that the right elements are included. Nonetheless, we offer the following observations, questions and suggestions for advancing their refinement.

Science Inputs: Integrating science into the decision process is, of course, an excellent idea, but we cannot assume the science is ready for our use. The USGS water data collection networks have been underfunded and dropping stations routinely for many years. Surprisingly, the Administration requested a further reduction in their budgets for FY-2011. If this is indicative of the science investment across Interior, Agriculture, EPA, NOAA, the Corps and other federal agencies, we will be integrating controversy and delay (rather than science) into the decision process.

The ICWP has developed a set of recommendations for the "federal toolbox" that the Corps began promoting last year and we are pleased to provide copies of those recommendations, even though they are not specific to climate change. The ICWP concurs in the Task Force's observation that "institutional changes are needed to enable the use of science that informs adaptation, including the translation of this science into decision support tools and policy." We continue to support the USGS's development of plans for a "national water census" (a. k. a., a national assessment of water uses and availability), but we are concerned that these initiatives will claim focus and resources within the Department and the Administration at the expense of the baseline data collection and maintenance that is foundational to these initiatives and many other federal

responsibilities. Working from a record of only 10 or 15 years of baseline won't support intelligent decision support tools –especially if we are anticipating climate change impacts and evaluating adaptation strategies.

Communications and Capacity-building & Coordination and Collaboration & Flexible Framework for Agencies: The ICWP concurs with the discussion of these vital elements and suggests that organizing a federal advisory committee under the FACA with strong participation by non-federal agencies would be an effective means for meeting the identified needs. Reliance upon existing organizations in this coordination, assessment and planning would seem like an excellent way to improve the efficiency (and the “buy-in”) the nation will need in order to adapt to climate change in a timely manner; examples of these existing organizations include interstate water commissions and associations¹.

In addition to the creation of a FACA committee and interstate organizations, we would like to point out examples of positive coordination by multiple federal agencies for reaching a common goal. After the passage of the National Integrated Drought Information System (NIDIS) Act in 2006, the thirty-plus federal agencies and bureaus with an interest in drought programs have come together to provide timely, necessary drought planning information. Although the data presented on the www.drought.gov website originate from a variety of agency sources, the delivery of the data to the end user is accomplished in a “non-turf” way and is of tremendous value to on-the-ground water managers.

Similarly, the Regional Integrated Sciences and Assessments (RISA) program within NOAA delivers useful technical climate change information to the end user. We encourage the CEQ to emulate the efforts of the NIDIS and RISA programs in their final recommendations and direction to the agencies with a role in climate change.

Prioritization: The ICWP concurs with the indicated sense of urgency and the recognition of limited time and resources to affect our future. In that context, we recommend that the Task Force distinguish the subset that only federal agencies can accomplish from those that non-federal agencies, NGOs, the private sector and others can implement. Federal leadership will be most appreciated and helpful if it is applied first to the intelligent coordination and engagement of all the “resources” available.

Evaluation: Establishing appropriate “feedback” mechanisms to inform our data collection, interpretive science, alternatives evaluation, and adaption investments may be as important as assuring that we start with good baseline data! The ICWP urges the Task Force to design this capability so that it will serve policy makers, program managers and project operators at every level of government (and their constituents). This need is not exclusive to climate change, but it is specifically needed in the anticipation of, and adaptation to, climate change. This would be an excellent objective to put before the existing federal Advisory Committee on Water Information (ACWI).

¹ Existing interstate organizations include the Delaware River Basin Commission, the Great Lakes Commission and Great Lakes Council of Governors, Interstate Commission on the Potomac River Basin, Interstate Environmental Commission, Missouri River Association of States & Tribes, New England Interstate Water Pollution Control Commission, Ohio River Valley Water Sanitation Commission, Ohio River Basin Water Resource Association, Susquehanna River Basin Commission and Upper Mississippi River Basin Association.

We appreciate the Task Force's investment in developing these plans and would be pleased to provide additional information, if requested. Please feel free to contact our Executive Director, Peter Evans (phe@riverswork.com or 703-243-7383), if you have any questions.

With best regards,

A handwritten signature in black ink that reads "Susan Sullivan". The signature is written in a cursive, flowing style.

Susan Sullivan
Chairman
Interstate Council on Water Policy

Attached: ICWP's Climate Change Decision Examples
ICWP's Suggestions for the "Federal Toolbox"

Copies to: ICWP Board of Directors



ICWP CLIMATE CHANGE DECISION EXAMPLES

ICWP Climate Change Decision Example

Potential Runoff Changes Missouri River Basin

(1) Climate Change Issues – Missouri River Basin

- The Missouri River Basin includes six large mainstem reservoirs with a capacity to store up to 73 million acre feet. The reservoir system is operated by the USACE for flood control, irrigation, hydropower, navigation, recreation, water supply, water quality and fish and wildlife, which includes endangered species.
- A Master Water Control Manual includes rule curves and other operational criteria that determines reservoir releases based primarily on storage levels and variable runoff conditions ranging from floods to extensive droughts.
- There is concern that climate change may result in a significant reduction in runoff volume and a change in the timing of runoff in the Missouri River Basin that could severely impact reservoir operations and meeting project purposes.
- The USACE has recently initiated a congressionally authorized study to determine whether the Authorized Purposes of the Missouri River Projects should be changed to better meet future needs.
- The Missouri River Authorized Purposes Study (MRAPS) would be the ideal time to carefully review the potential impact of climate change on runoff in the Basin.

(2) User Community: Who cares and would benefit from this analysis?

- The USACE needs this information to properly operate the reservoir system.
- The USACE, USFWS and other Federal, State and Tribal agencies need this information to evaluate the impact on the Missouri River Recovery Program and ecosystem restoration.
- States, Tribes and interstate organizations need this information to evaluate the impact of current and potentially different authorized purposes, and to carry out their statutory duties to administer state laws related to water allocation and use.
- States and Tribes also need this information to manage fish and wildlife resources.
- Municipal, industrial, power generation, agricultural and recreational water users need this information to evaluate the potential impact on their operations, as well as planning and permitting of projects.
- Public and private stakeholders would also have the ability to evaluate the impacts to hydrologic conditions and thus to make informed decisions to their areas of interest.
- They all would benefit from the best available information so that good decisions can be made.

(3) Process - Integration of Models and other assessment tools with monitoring

- The USACE will likely include an analysis of climate change on runoff and reservoir operations in MRAPS. It should use the best scientific approaches possible from various sources, such as the Corps experts and the USGS.
- The ideal result would be the ability to simulate various operational scenarios with the results of the climate change runoff analysis so interested parties can fully understand the potential impacts of both changes in potential authorized purposes and runoff conditions.

(4) Outcomes: Management outcomes/decision that results from the development and use of appropriate climate change runoff prediction tools.

- Better informed government agencies at all levels, as well as stakeholders and the public. This should result in better decisions that are more transparent and based on better science.

(5) Metrics for tracking success and measuring performance (Return on Investment)

- Better decisions should result in more social and economic benefits from project operations.

(6) Value added from advances in technology, assessment tools, or process

- The tools and process used in the Missouri River Basin could be adapted for use in other major river basins.

(7) Gaps and needs from improved outcomes

- Current water control manuals and operations are typically based on past hydrological records and analysis without the benefit of considering future changes that may occur as a result of climate change. At some point this may lead to the inability to meet authorized project purposes and damage to economic and ecosystems that rely on the project.

ICWP Climate Change Decision Examples

Reduce Impacts of Climate Change in the Delaware River Basin Commission

(1) Climate Change Issues – Delaware River Basin

- Potential climate change impacts include sea level rise, greater storm intensity, extended drought periods, reduced water quality, changing seasonality of river flows and changing aquatic and terrestrial vegetation and wildlife. These changes can significantly affect potable and industrial water supplies, increase areas of flood inundation and destruction, exceed our current drought preparedness strategy, reduce resiliency provided by vegetative buffers, headwater forests and estuary wetlands, and negatively impact endangered species. This is especially true when coupled with the demands of increased population, changing land use patterns, increased impervious cover, and forest loss due to development and natural gas well drilling. Development of a Climate Change Strategy will help the Delaware River Basin (DRB) community be better prepared and resilient

(2) User Community: Who cares and would benefit from this analysis?

- Development of a Climate Change adaptation strategy will allow the basin community to be proactive, reducing potential impacts and long-term costs.

(3) Process - Integration of Models and other assessment tools with monitoring

- Sea level rise modeling and assessment through EPA's Climate Ready Estuary Program based on forecasts by Dr. Raymond Najjar of The Penn State University.
- River models developed for the U.S. Supreme Court Decree Parties.
- Work with Penn State, USGS and NOAA to model and test the impacts of the scenarios (minimal change to worst case).
- Scenarios include changing temperature, precipitation, flow seasonality, sea level rise and population changes.

4) Outcomes: Management outcomes/decision that results from the development and use of appropriate climate change runoff prediction tools.

- Strategy to increase resiliency in the Basin: Foci include water supplies, flood inundation, drought preparedness and aquatic resources.
- Priorities will be set for required projects that can be completed by federal agencies such as the Corps of Engineers, state agencies, and private sector.

(5) Metrics for tracking success and measuring performance (Return on Investment)

- Defined projects/programs/policy changes necessary to prepare the Basin community for major changes to water resources.
- Better informed government agencies at all levels, as well as stakeholders and the public. This should result in better decisions that are more transparent and based on better science.
- NOAA NWS is responsible for forecasting meteorological changes and effects in the Basin. This study facilitates an analysis of future critical impacts potentially caused by climate changes and population changes.

(6) Value added from advances in technology, assessment tools, or process

- The tools and process used in the Delaware River Basin could be adapted for use in other major river basins.

(7) Gaps and needs from improved outcomes

- While the tools are generally available (down scaling of global climate models, large river hydrodynamics; lidar digital elevations etc.) there needs to be a strategy development process that engages decision makers at all levels of government and posits specific climate change scenarios. What is needed are resources to convene state and federal agencies and key stakeholders to development a place based solutions matrix. River Basin Commissions are ideally suited to that task.

ICWP Climate Change Decision Example Colorado River Basin Water Supply and Demand Study

(1) Climate Change Issues – Colorado River Basin

- The Colorado River Basin experiences extreme variability in its annual yield and, as a result, a reservoir system capacity of over 60M acre feet (approximately 4 times the average annual water flow of the River) has been developed. The reservoirs are operated by the Bureau of Reclamation pursuant to the 1929 Boulder Canyon Project Act, 1956 Colorado River Storage Project Act, 1968 Colorado River Basin Project Act, and other federal statutes, interstate water compacts and an international treaty between the US and the Republic of Mexico. (See, <http://cwcb.state.co.us/WaterSupply/InterstateCompacts/ColoradoRiverBasin/LawOfTheRiver/>)
- Exclusive flood control surcharge (1.5 MAF) exists in Hoover Dam above elevation 1219.6 that is operated by the Corps of Engineers.
- There is concern that climate change may result in significant changes in runoff volume and timing that could severely impact reservoir operations and meeting project purposes.
- Using Fiscal Year 2009 funding, Reclamation has initiated the first three basin studies under its Water Conservation Initiative. The three basin studies include the the Colorado River Basin Water Supply and Demand Study (\$1 million Reclamation, \$1 million matching) covering portions of Arizona, California, Colorado, Nevada, New Mexico, Utah and Wyoming.
- The Bureau of Reclamation's Upper Colorado and Lower Colorado Regions, in collaboration with representatives of the seven Colorado River Basin States, submitted a Proposal in June 2009 to fund the "Colorado River Basin Water Supply and Demand Study" under Reclamation's Basin Study Program. In September 2009, the Study was selected for funding; its estimated \$2 million cost will be equally shared by the Basin States (non-federal Cost Share Partners) and Reclamation.
- The comprehensive Study, which is being conducted between January 2010 and January 2012, will define current and future imbalances in water supply and demand in the Colorado River Basin and the adjacent areas of the Basin States that receive Colorado River water for approximately the next 50 years, and will develop and analyze adaptation and mitigation strategies to resolve those imbalances.
- The Study will characterize current and future water supply and demand imbalances in the Basin and assess the risks to Basin resources. Resources include water allocations and deliveries consistent with the apportionments under the Law of the River; hydroelectric power generation; recreation; fish, wildlife, and their habitats (including candidate, threatened, and endangered species); water quality including salinity; flow and water dependent ecological systems; and flood control.

(2) User Community: Who cares and would benefits from this analysis?

- Federal, State, Tribal and local agencies need this information to evaluate the impacts on the water supply and water demand imbalances that will be faced in future years within the Colorado River Basin.
- States, Tribes and interstate organizations need this information to evaluate the impact of current and potentially different authorized purposes, and to carry out their statutory duties to administer state laws related to water allocation and use.
- States and Tribes also need this information to manage fish and wildlife resources.

- Municipal, industrial, power generation, agricultural and recreational water users need this information to evaluate potential impact on their current operations and to make timely and appropriate decisions , as well as planning and permitting of projects.
- Public and private stakeholders would also have the ability to evaluate the impacts to hydrologic conditions and thus to make informed decisions to their areas of interest.
- Best available information is required so that good decisions are made.

(3) Process - Integration of Models and other assessment tools with monitoring

- In assessing future supply, potential impacts to as a result of climate change through 2060 will be analyzed. Project changes to runoff at the 29 CRSS natural flow points using at least 3 different methodologies will be quantified, based on: 1) observed historic record, 2) paleo record and 3) downscaled climate information.
 - Observed Historic Record: The Indexed Sequential Method (ISM) will be used to resample observed historic record and generate future inflow scenarios.
 - Paleo-Conditioning: Paleo-conditioning techniques will be applied to blend the observed historic record and paleo record and generate future inflow scenarios that are comprised of magnitudes of the historic record and state information from the paleo record. This methodology generates sequences with increased variability compared to sequences generated directly from the historic record.
 - Downscaled Climate Information: Runoff has been generated through a Reclamation research project in collaboration with AMEC Earth & Environmental. There is uncertainty and limitations with respect to steps taken to generate runoff from Global Climate Models (GCM) projections, i.e. emission scenarios, GCMs, downscaling, bias-correcting, temporal disaggregation, etc. Summarize current research with respect to effects of climate change on future Basin runoff and compare findings.

(4) Outcomes: Management outcomes/decision that results from the development and use of appropriate climate change runoff prediction tools.

- The Colorado River Basin Water Supply and Demand Study provides an ideal example of the collaborative process that Reclamation and its cost-sharing partners will employ under the Basin Study Program component of the Department of the Interior's Water Conservation Initiative.
 - The study encompasses the Colorado River Basin (upper and lower) and those areas of the seven basin states -- Wyoming, Colorado, Utah, New Mexico, Arizona, Nevada, and California (Basin States) -- that receive Colorado River water. Cost-share partners include each of the seven Basin States.
 - The proposal is to complete a comprehensive review of water supply and current and long-term demands through 2060 within the Colorado River Basin; to assess options for resolving water supply imbalances; and to develop recommendations for future consideration to address current and projected imbalances.
 - Paramount to the study is an assessment of the potential impacts of climate variability and climate change on water supplies and demands, including impacts on hydropower.
- Better informed government agencies at all levels, as well as stakeholders and the public. This should result in better decisions that are more transparent and based on better science.

(5) Metrics for tracking success and measuring performance (Return on Investment)

- If water supply augmentation occurs as a result or direct outcome of the study then the Colorado River Basin States will likely judge the Colorado River Basin Water Supply and Demand Study to have been a success.
- Better decisions should result in more social and economic benefits from project operations.
- Federal leadership is critical to widespread acceptance and implementation of effective strategies to mitigate the impacts of climate change. Reclamation will implement projects to help water users adapt to climate change through the Water Conservation Initiative (WCI).

(6) Value added from advances in technology, assessment tools, or process

- The tools and processes used in the Colorado River Basin will be adapted for use in other major river basins.
 - Through the Basin Study Program, Reclamation will partner with basin stakeholders to conduct comprehensive studies to evaluate the impacts of climate change and define options for meeting future water demands in river basins in the West.
 - The Basin Studies will identify adaptation strategies to resolve basin-wide water supply issues, including changes to the operation of water supply systems, modifications to existing facilities, development of new facilities, or non-structural changes.
 - The Basin Studies will build on previously-developed West-wide risk assessments (prepared as a part of the DOI's previous Water 2025 Initiative) to develop basin-specific strategies to help meet water demands. By encouraging input from basin stakeholders, the Basin Studies will also build capacity and collaboration in the process of identifying water management solutions.

(7) Gaps and needs from improved outcomes

- Current water control manuals and operations are typically based on past hydrological records and analysis without the benefit of considering future changes that may occur as a result of climate change. At some point, the inability to meet authorized project purposes will contribute to further damage to economic and ecosystems that rely on the Colorado River water supply.

ICWP Climate Change Decision Example

Ecosystem Flows Study and Low Flow Monitoring Plan for the Susquehanna River Basin

(1) Climate Change Issues – Susquehanna River Basin (basin)

- The Susquehanna River Basin Commission (Commission) regulates withdrawals of surface water and groundwater in excess of 100,000 gallons per day (gpd) and consumptive (depletive) uses of water in excess of 20,000 gpd.
- To provide partial mitigation for the growing number of withdrawals and consumptive uses in the basin, the Commission has entered into agreements with the U.S. Army Corps of Engineers (USACE) for the release of water from Cowanesque and Curwensville Lakes in Pennsylvania, and from Whitney Point Lake in New York during low flow periods.
- The Commission also has entered into an agreement with the Pennsylvania Department of Environmental Protection (PADEP) to provide treated water from the Barnes and Tucker underground coal mine complex to the West Branch Susquehanna River.
- The Commission is pursuing additional sources of water to be released during low flow periods as mitigation for consumptive water use.
- Climate change predictions for the basin include an increase in the frequency and severity of heavy rainfall – raising the likelihood of flooding – and, at the opposite extreme, an increase in the frequency of summer droughts.
- The Commission is currently working with The Nature Conservancy and USACE on the Susquehanna Ecosystem Flows Study, which will assist in developing goals for flow management at various locations throughout the basin.
- This summer, the Commission will begin work under its Low Flow Monitoring Plan, which involves both a pilot study in the Juniata Subbasin and establishment of nineteen sentinel stations consistent with key locations identified in the Susquehanna Ecosystem Flows Study.
- The monitoring plan targets riffle sections and includes macroinvertebrate, periphyton, water quality, and native freshwater mussel monitoring during base flow conditions as well as during more extreme low flow events. Fishery monitoring will be included for the Juniata Pilot, and public comments regarding recreation impacts will be solicited via the SRBC website.
- The Susquehanna Ecosystem Flows Study and low flow monitoring are needed to assess habitat and ecosystem resilience to low flows, provide valuable information for development of adaptation strategies, and help the Commission better manage water withdrawals and consumptive uses as conditions change in the basin.

(2) User Community: Who cares about and would benefit from the Susquehanna Ecosystem Flows Study and the Low Flow Monitoring Plan?

- The work will benefit all water users in the basin.
- The Susquehanna Ecosystem Flows Study will assist the Commission and other agencies in setting subbasin and basinwide goals for flow management.
- The flow management goals will be considered by the Commission in reviewing requests for withdrawals and consumptive uses, in setting flow-by requirements for withdrawal projects, and in providing water to augment stream flows where it is needed most during periods of low flow.

- Flow management goals will help regulatory and planning groups protect the environment and recreational uses. The goals also will help municipal and industrial water users target appropriate areas for water resource development.
- The Low Flow Monitoring Plan will benefit water users and the environment by providing water quality, biological, habitat, and recreational data to document impacts occurring during actual low flow events. Few datasets of this type are currently available for the basin.
- The Low Flow Monitoring Plan will provide data needed by resource agencies and others to perform adaptive management as withdrawals and consumptive uses increase and climate change occurs.

(3) Process - Integration of Models and other assessment tools with monitoring

- The Low Flow Monitoring Plan will complement the Susquehanna Ecosystem Flows Study, as well as the Commission's existing Consumptive Use Mitigation Plan and the Commission's Comprehensive Plan for the Water Resources of the Susquehanna River Basin.
- The work will provide data needed to model various low flow release scenarios, provide appropriate mitigation, and facilitate adaptive management.
- Additional data from the Commission's regulatory project review database (Hydra) and the Commission's water quality database will assist in future modeling efforts, including a cumulative impact analysis of consumptive water uses in the basin.

(4) Outcomes: Management outcomes/decisions that result from the Susquehanna Ecosystem Flows Study and the Low Flow Monitoring Plan

- The work will increase the efficiency of the Commission and others in developing adaptation strategies and ecosystem resilience to meet the water resource needs of industry, municipalities, the public, and the environment as climate change occurs.
- It will assist in coordinating the present and future management of interstate water resources and will provide better information regarding the water resource needs of the basin as climate and streamflow conditions change.
- Coupled with an ongoing study of the freshwater inflow needs of the Chesapeake Bay being led by the State of Maryland, the work should assist in developing adaptation strategies for to the basin as well as the Chesapeake Bay restoration effort.

(5) Metrics for tracking success and measuring performance (Return on Investment)

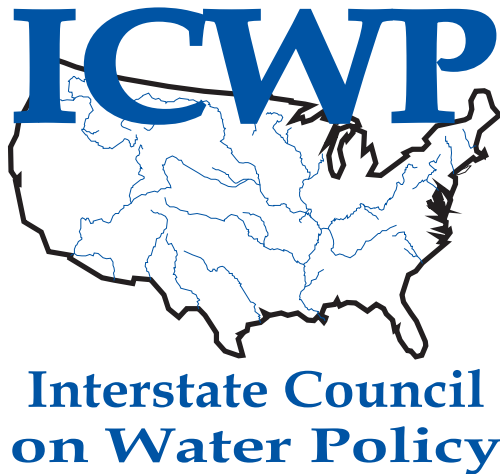
- A report will be prepared annually to describe base flow conditions monitored under the Low Flow Monitoring Plan. The report will be expanded for those years when low flow conditions and additional data collections occur.
- Water Quality data for the annual reports will be formatted into tables by station and compared to state standards and other limits.
- Macroinvertebrate, fish community, and periphyton data reduction will use procedures and metrics similar to those described in the U.S. Environmental Protection Agency's 1999 Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers.
- Habitat assessment scores of sites will be calculated according to existing Commission protocols.
- Trend analyses may be performed after data have been collected for at least 5 years.

(6) Value added from advances in technology, assessment tools, or process

- As mentioned previously, the work will facilitate adaptive management as additional monitoring data are collected.
- Data sondes may also be deployed to collect continuous water quality data during individual low flow events.

(7) Gaps and needs for improved outcomes

- Maintenance and expansion of the existing USGS stream gaging system will be critical, to allow development of appropriate adaptive management strategies as climate change and the accompanying alterations in hydrology occur.



ICWP “FEDERAL TOOLBOX” IDEAS

CONSTRUCTIVE NEXT STEPS TOWARDS

**BUILDING STRONG COLLABORATIVE
RELATIONSHIPS FOR A SUSTAINABLE WATER
RESOURCES FUTURE**

ICWP “Federal Toolbox” Ideas
for the
National Water Resources Collaborative Next Steps

March 16, 2010 Draft

Cumulative Impacts Assessment Support Tool

1. Water Resource Issues

- Regional impacts from human activities are often ignored in favor of site-specific review and evaluation.
- Impacts from the same or similar activities may accumulate in the environment, based on spatial and temporal factors, and lead to measurable changes to environmental media. These “cumulative impacts” may result in irreparable damage to the environment, including water systems, land and air.
- Cumulative impacts often go unnoticed as human activities that may cause disturbance occur in a more gradual timeframe, at least in human time scales, and tend to “creep up” on us.
- Cumulative impacts are important to recognize and address in planning for two reasons:
 - a. Costly consequences – once the cumulative damage is done it is expensive to remedy.
 - b. Irreversible consequences – once the impacts cross a critical threshold of environmental tolerance they may be irreversible at least on a human scale of time.
- Specific issues addressed by the cumulative impact assessment support tool would be water resources related. Examples from the Mid-Atlantic River Basin systems include:
 - a. Cumulative impacts from natural gas well drilling in the basin headwaters. These would include impacts on water supply from additional water demands, landscape alteration from well pad development, and water quality from discharges.
 - b. Cumulative impacts from discharges of point and non-point sources of pollution on waterways designated by states or interstates as high quality waters.

2. User Community: Who cares and would benefit from this analysis?

- The U.S. Fish & Wildlife Service has identified Landscape Conservation Cooperatives as a vehicle to address national-scale stressors to collaboratively develop science-based recommendations and decision support tools to facilitate implementation of on-the-ground conservation.
- State, tribe and interstate agencies as well as county and municipal government and watershed organizations need an assessment of cumulative impacts in order to evaluate and maintain water supplies, landscape integrity and water quality in rivers and streams.
- Case Study- Delaware River Basin: Regarding impacts from natural gas well drilling, much of the new drilling interest in the Upper Delaware is targeted at reaching the natural gas found in the Marcellus Shale formation. Once believed to be uneconomical, new horizontal drilling and extraction methods, coupled with higher energy costs, have given energy companies reason to take a new interest in mining the natural gas deposits within the Marcellus Shale. However, these new extraction methods require large amounts of

fresh water to fracture the formation to release the natural gas. A significant amount of water used in the extraction process is recovered, but this "frac water" includes natural gas and chemicals added to facilitate the extraction process, as well as brine and other contaminants released from the formation, resulting in water quality concerns from their discharge. Finally, alterations to the landscape to access drilling sites may impact runoff quality on site-specific and cumulative basis.

3. Process: Integration of Models and other assessment tools with monitoring

- Analytical and GIS tools will provide the basis for assessment of cumulative impacts. Cumulative impact analysis of water supply, landscape alterations and water quality will be performed using GIS and other computer modeling methods.
- To assess cumulative impacts increased loadings into high quality waters, an assessment tool to evaluate the impact of expanded and new discharges is needed. The tool will be composed of two major components, monitoring and model development. Monitoring would focus on conventional nutrients. Parameters, like Dissolved Oxygen (DO), total and inorganic phosphorus, biological oxygen demand (BOD), organic and inorganic nitrogen, and TSS from the waterbody and existing point source discharges would be monitored. These collected data may be used to develop load and response relationships and be used in the second component, the development of water quality model. A river water quality model is based on the EPA-supported Qual2K modeling platform. This model can also be used to provide guidance to the expanded and new discharges on the design conditions to maintain the existing water quality.
- Case Study- Delaware River Basin: To assess cumulative impacts from natural gas well drilling, the impacts of drilling and operating the estimated 30,000 Marcellus shale natural gas wells on water supply, natural landscapes and water quality in the Delaware River Basin may be performed. These impacts may be analyzed under three alternative scenarios: 1) broad-scale development, 2) buffered development, and 3) selective development applying a high level of environmental protection.

4. Outcomes: What management outcomes/decisions that result from the development and use of a cumulative impact support tool

- Government agencies at all levels and the most directly affected stakeholders and the public will be better informed regarding the cumulative impacts of human activities on water resources.
- As tools are implemented under alternative scenarios described above, agencies and interested third parties can evaluate the potential for impacts so that acceptable activities can be decided.
- The tools may be continued to be used over time to evaluate the impact of recent development on water resources. Additional monitoring and/or modeling would be needed to update cumulative impact assessments.

5. Metrics for tracking success and measuring performance (Return on Investment)

- As the cumulative impact assessment tools, supplemented by updated datasets, are applied over time, a comparison can be made with expected results from initial tool application.

- Environmental measurements would be used to evaluate cumulative impacts from the activities as they are developed.
- Better decisions should result in more socio-economic benefits from more careful development of land and water resources.

6. Value added from advances in technology, assessment tools or process

- Modeling frameworks, monitoring techniques and GIS tools are mature and evolving in a positive direction towards giving more relevant results from which decisions can be made.
- Advances in technology in all these areas are expected as time goes on.
- Cumulative impact assessments will be a valuable tool for government and non-government organizations and individuals interested in protecting the environment.

7. Gaps and needs for improved outcomes

- In order to fully assess potential cumulative impacts, additional land and water resources data are needed to populate computer models, GIS databases and other assessment tools.
- Previous cumulative impact studies performed in other parts of the country/world may inform the process of performing cumulative impact assessments.
- Agency regulations, guidance documents and other tools are needed to require and/or promote the use of cumulative impact tools in advance of land and water resources development.

ICWP “Federal Toolbox” Ideas
for the
National Water Resources Collaborative Next Steps

March 1, 2010 Draft

***StreamStats* as Cornerstone for Ecological Flows Conflict Resolution**

(1) Water Resource Issues:

- Diversions from surface and ground waters by humans alters the hydrology of streams to the point that ecological health and ecological functions are lost
- Challenge is to maximize human use of water without damaging ecological system beyond socially-acceptable limits
- Crises in some states has resulted in setting thresholds based on hydrologic statistics
- Limitation is that the key hydrologic statistics are unavailable without cumbersome and time-consuming individual calculations
- *StreamStats* could provide systematic and automated statistical estimation for all stakeholders

(2) User Community: Who cares and benefits from these products?

- State and inter-state agencies set policies for water allocations and pass-by requirements
- Municipal, industrial, power generation, and agricultural water users would likewise be able to use *StreamStats* during both planning and permitting phases of projects
- Public and private stakeholders would also have the ability to evaluate the impacts to hydrologic conditions and thus to make informed decisions on the environmental threats posed by water supply development
- They all require an ability to estimate meaningful hydrologic statistics at any point in a stream network (exact match to *StreamStats* functionality)

(3) Process (coupling monitoring, models and other tools for enhanced assessment that benefits management decisions from the watersheds to near-shore to coasts)

Networks: Integration across multiple networks and programs

Integration of Models and other assessment tools with monitoring

Integrated Water-Quality Assessment

- *StreamStats* exists for many states and due to its standardize structure, expansion of coverage simply involves expanding the current scope to estimate key low-flow statistics
- Scientific underpinnings exist for many states and regions and could be expanded, where needed, utilizing published USGS approaches
- Ideal product would be the estimation of full flow duration curves for any point in a domain, and the subsequent estimation of a daily flow time series for all point in the stream network
- *StreamStats* tool then provides foundation for policy reviews and revisions, permitting decisions, and ground-truthing agency decisions

(4) Outcomes: Management outcomes/decision that results from the assessment and (or) development of dynamic management tools: Applications to support or inform decision-making (preferably in real-time and in predictive mode)

- Fully developed *StreamStats* tool facilitates both the revision of instream flow policies to better protect ecological resources while at the same time permitting transparent and scientifically-based requirements for water allocation decisions

(5) Metrics for tracking success and measuring performance (Return on Investment)

- State and National coverage for basic low-flow hydrologic statistics
- Extent of daily flow time series estimation ability within ungaged stream networks

(6) Value added from advances in technology (i.e. sensors), assessment tools, or process

- Long history of USGS gaging investment can be translated into a powerful tool directly applicable to decision-making and policy development
- *StreamStats* software currently being developed but frequently missing relevant statistics for Ecological Flows conflict resolution

(7) Gaps and needs from improved outcomes

- Only rudimentary statistics (e.g., Q7-10) are typically being estimated during decision-making, leading to widespread damage to stream ecosystems
- An ability to estimate a full suite of ecologically-relevant statistics opens the door to better decision-making and restructuring in-stream flow policies nationwide

ICWP “Federal Toolbox” Ideas
for the
National Water Resources Collaborative Next Steps

March 18, 2010 Draft

**Expand NRCS SNOTEL to the Eastern US:
Snow Survey & Water Supply Forecasting**

(1) Water Resource Issues:

- SNOTEL provides a reliable and cost effective means of collecting snowpack and other meteorological data needed to produce water supply forecasts and support the resource management activities.
- Provides broad coverage of high-elevation watershed locations over a real time operation network
- The SNOTEL network can provide data for climate studies, air and water quality investigations, climate change, and endangered species habitat analysis.

(2) User Community: Who cares and benefits from these products?

- Federal, state, and local government entities; private industry; and citizens through the internet and other distribution channels.
- Data would be useful to researchers, river and reservoir managers, emergency managers for natural disasters such as floods and droughts, recreational area managers, and power generation companies.

(3) Process: Integration of Models and other assessment tools with monitoring

- SNOTEL data to inform NWS forecasting
- Inform water resources planning for near-term water supply planning, flood operations and river basin flow management decisions

(4) Outcomes: Management outcomes/decision that results from the assessment and (or) development of dynamic management tools: Applications to support or inform decision-making (preferably in real-time and in predictive mode)

- Operation of reservoir and diversion systems based on SNOTEL data.
- Influence surface-water dependent decisions

(5) Metrics for tracking success and measuring performance (Return on Investment)

- State and National coverage of SNOTEL sites
- Use of information in water supply planning and reservoir operations management

(6) Value added from advances in technology (i.e. sensors), assessment tools, or process

- Basic SNOTEL stations provide snowpack water content data via a pressure-sensing snow pillow. They also collect data on snow depth, all-season precipitation accumulation, and air temperature with daily maximums, minimums, and averages.

- Enhanced SNOTEL stations are equipped to take soil moisture and temperature measurements at various depths.
- Information is used in river forecasting to assess flooding potential from pending heavy rainfall with snow melt.

(7) Gaps and needs from improved outcomes

- SNOTEL does not exist in the Eastern US. The NRCS currently installs, operates, and maintains SNOTEL in the Western United States and Alaska (13 states).
- Data from the SNOTEL network can be used to develop operating protocols for accounting for snow pack storage in reservoir operations.

ICWP “Federal Tool Box” Ideas
for the
National Water Resources Collaborative Next Steps

March 1, 2010 Draft

Adaptive Management Support Tool

1) Water Resource Issues – Watersheds & Regions (Nationwide)

- The “watershed approach” and “integrated water resource management” involve a larger and more diverse group of decision makers in the process of understanding the challenges, their interrelation, the alternatives for remediation, the monitoring network and indicators available for tracking progress, the distribution of responsibilities for implementing elements of the plan, and reconciling the expected results with the measured results.
- The science supporting the assessment of and response to water resource management challenges is advancing and requires considerable understanding and acceptance among government and community leaders and the general public.
- New complications arise over time (e.g., changing needs and land uses, interstate and tribal agreements, wetland conservation, endangered species recovery, TMDLs, not to mention budget constraints), leading to potential confusion and creating opportunity for obstruction which must be overcome if the community interests are to be served.

2) User Community: Who cares and would benefit from this analysis?

- States, Tribes and interstate organizations need this information to evaluate the alternatives for maintaining adequate water supplies, protecting water quality, avoiding flood and drought damage, maintaining healthy ecosystems and fisheries, enhancing navigation and recreation opportunities and managing the public funds invested to meet these responsibilities.
- Municipal, industrial, power generation, agricultural and recreational water users need this information to evaluate the potential impact on their operations, as well as planning and permitting of projects.
- Public and private stakeholders would also have the ability to evaluate the impacts to hydrologic conditions and thus to make informed decisions to their areas of interest.
- Officials who need to understand the basis for concerns/requirements, the options for resolving them, the plans and commitments agreed to for implementation, the metrics and schedules for evaluating progress, and the results that are achieved.

3) Process - Integration of Models and other assessment tools with monitoring

- Create an internet-based, GIS tool that provides a framework for efficient access to the
 - Identification and assessment of the water-related challenges facing the community (include links to the science reports that support the assessment)
 - Characterization the alternatives for resolving those challenges (include links to the project proposal & assessment documents);
 - Identification of the metrics established for monitoring the essential parameters (including links to the baseline and monitoring data)

- Documentation of the commitments made to remedial measures with the expected results (include links to the supporting documentation); and
- Schedule for meeting the milestones and updating the plan.

4) Outcomes: What management outcomes/decision that result from the development and use of an adaptive management support tool.

- Government agencies at all levels, the most directly affected stakeholders and the public will be better informed. This should result in better decisions that are arrived at more efficiently, more transparently, based on better science (and economics) and with stronger public acceptance.
- When selected actions prove to be less effective, more difficult or more expensive than estimated, the basis for revising the plans should be less susceptible to confusion, obfuscation or manipulation.
- When there is opportunity for greater involvement by the community, such as businesses, private property owners and community organizations, the reliability of tracking their commitments and accomplishments should be improved. Sharing the credit for the results should also promote greater public support.

5) Metrics for tracking success and measuring performance (Return on Investment)

- Better decisions should result in more social and economic benefits from project operations.

6) Value added from advances in technology, assessment tools, or process

- Despite the wide variety of watershed circumstances and challenges across the nation, a fairly standard tracking/reference framework should be readily transferable from one region and community of interests to another.
- The diverse programs already underway at many scales to respond to challenges across the US should provide many useful ideas for incorporation into a nationally-supported support tool.
- The national investment should be especially helpful in bringing increased effectiveness to the watershed and community efforts that aren't as well organized and funded.

7) Gaps and needs from improved outcomes