Interstate Council
on Water Policy

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 Coorperatives 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. <u>Value added</u> 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. <u>Gaps and needs</u> 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.

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March 1, 2010 Draft

StreamStats as Cornerstone for Ecological Flows Conflict Resolution

(1) <u>Water Resource Issues</u>:

- 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) <u>User Community</u>: 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) <u>Process</u> (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

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March 18, 2010 Draft

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

(1) <u>Water Resource Issues</u>:

- 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) <u>User Community</u>: 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) <u>Process</u>: 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) <u>Outcomes</u>: 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) <u>Metrics</u> 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) <u>Value added</u> 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) <u>Gaps and needs</u> 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.

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March 1, 2010 Draft

Adaptive Management Support Tool

1) **<u>Water Resource Issues</u> – 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) **<u>User Community</u>: Who cares and would benefits 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) **<u>Process</u> - 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) **<u>Outcomes</u>: 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) **<u>Metrics</u> for tracking success and measuring performance (Return on Investment)**
   - Better decisions should result in more social and economic benefits from project operations.

6) **<u>Value added</u> 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) **<u>Gaps and needs</u> from improved outcomes**