Connecticut's Stream Flow Standard: Balancing Human and Ecological Needs for Water

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A great variety of perspectives regarding the heated topic of water were raised in the interdisciplinary conference "Water Scarcity and Conflict" hosted by the Center for Conservation Biology and Environmental Studies on April 3rd-4th, 2009. Lee Dunbar, Assistant Director of the Planning and Standards division of the DEP Water Protection and Land Reuse Bureau presented one particularly intriguing side of the issue, the policy-based, legal perspective of the Connecticut DEP. This branch of the DEP is responsible for the development and implementation of policy regarding water use, conservation, and allocation in the state of Connecticut and, as Dunbar explained, has faced this challenge with a remarkably well-developed system.

Dunbar's speech, regarding streamflow regulations and wildlife water needs, was summed up, he said, in one word: balance. Balance, that is between the human and ecological needs for water, and the tightrope which policymakers must tread to avoid the potential pitfalls of irresponsible management and losing a balanced system. To present the Connecticut DEP's methods, he would explain in depth recent revisions to stream flow standards as started in 2005 and first drafted this year, and the effects these would have on the rules regarding water use and conservation in the state.

The speech began with a brief history of events and acts passed which have affected stream flow regulation in the recent past. The first of these was the minimum stream flow Act of 1971, which enforced a minimum volume of water for streams and rivers in specific watersheds, meant to protect fish stock. Eight years later, in 1978, the first regulations in minimum stream flow (MSF) were imposed and then, in 1982, the Diversion Policy Act was passed, which required the registration of all diversions of water from their normal course. In 2002, the Waterbury vs. Washington case arose regarding the town's diversion of the Shepaug River, in which the town was found not to be violating the Connecticut Environmental Protection Act because it met minimum streamflow requirement for the system. The next year, the DEP reviewed its stream flow standards and revised regulations two years later in 2005 in response to a statute from the same year. The very same year, the Fenton River was desiccated, further highlighting the necessity of refinement in water use regulation.

This year (2009), the first draft of the new regulations was put forth by the DEP to undergo public review and revisions, as dictated by the 2005 statute, which intended for regulations to be expanded beyond stocked rivers to all river and stream systems in the state. The statute (officially PA 05-142) also calls for standards which balance the needs of humans with fish and wildlife, using the best available science to preserve and protect wildlife and public recreation while allowing for utilitarian use to the maximum extent practicable.

To address such a "tall order" the DEP created two workgroups: the science and technical

workgroup, composed of experts in the fields of ecology, geology, hydrology, and other sciences, and the policy and implementation workgroup, which is cognizant of the interests of municipalities, utilities, and advocacy groups in the creation and implementation of planned policies. A Commissioner's Advisory group was also formed, which was intended to elucidate the potential impact of regulations on all parties that might be affected, including utilities, farmers, and industries. The idea behind the group was to set requirements on owners and operators of facilities which would affect streamflow. Rather than imposing harsh regulations immediately and causing potentially devastating stress on the infrastructure, the goal was to implement changes over time in a series of phases. Those influencing streamflow would also be given the choice of adopting a flow management plan, which would allow a personalized agreement of maximum release or uptake into and from stream systems.

Dunbar next explained the general structure of the regulations, which would consist of stream and river classification, creation of operation rules for facilities, and time allowed for full compliance to regulations. Before explaining these specific phases, he moved to a few key concepts with which listeners (and readers) should be familiar to understand the regulations being passed.

Dunbar emphasized the importance of recognizing biological stress on a riparian community, that the "biological condition" of an ecosystem can deteriorate rapidly under heavy human influence, and that this deterioration is directly proportional to changes applied by human systems on these rivers and streams. A stream or river system, as the term is used here, is formally defined by the DEP "as the water in the river or stream channel upstream of any point on that stream or river, including all tributary streams that drain into the channel, and the subsurface groundwater that contributes flow to sustain flow in the stream." Considering this definition and what was discussed prior, it becomes evident that the state and condition of a stream or river system will depend on the magnitude and frequency of human-induced stress, and that not all streams in an area will be the same. On the contrary, they may vary dramatically in their conditions and thus in the management needed to sustain them. Dunbar was quick to reiterate that it's not possible to restore all systems, and that what is sought in policy implementation is the *balance* between human and ecological needs, rather than a complete restoration of all riparian systems.

With this concept in mind, the DEP tackled the first portion of their regulatory process, classification of all stream systems within the state of Connecticut. In classifying the varying streams in Connecticut, the DEP considered several distinct factors, which included size and location of present and future groundwater withdrawals, dams and impoundments, water and wastewater discharges, existing and proposed development, and presence of flow-sensitive aquatic life, among others.

Streams were given one of four classes, numbered 1-4. Rivers given a classification of "1" are considered the most pristine, are undisturbed to date, and support populations of flow-sensitive aquatic life or where data provided by USGS gages indicate persistent natural streamflow rate. These systems receive the most stringent standards, which insist that natural streamflow rate may not be altered for human use. Class 2 systems are those that may receive standards that allow greater human alteration and may accommodate slightly more intense levels of development and

withdrawal while still sustaining a viable biological community. Ecosystems are thus determined to be less flow-sensitive and be in reduced risk of damage from human interference. Streamflow standards, consequently, allow minimal deviation from natural stream patterns as a result of human activity. Class 3 systems are also called “working rivers” and constitute those rivers where human use already has a significant impact on steamflow, and where flow may be controlled by releases from storage reservoirs. Because these streams are regulated in their streamflow, they may still not provide adequate water to support viable riparian ecosystems, but will be required to do so with the new standards. Standards for these water systems allow them to deviate significantly from natural flow conditions as long as streams are still capable of supporting wildlife. Class 4 systems are those in which human influence has resulted in significant deviation from natural streamflow patterns, so large that it may render a system's ability to support an aquatic community dubious. Such systems may also be characterized by the fact that restoration to natural streamflow rates would cause economic difficulties for consumers. Standards are at their most lax for these systems, in which any deviation of streamflow is acceptable so long as it is proved to be justified for legitimate human necessity.

Dunbar explained that streamflow rate was measured with a “Q” value (usually in units cubic-feet-per-second or cubic-feet-per-second-per-square-mile) and is often interpreted with a percentage that follows the number, which represents the percentage of days in which that flow rate is exceeded at a particular location.

An important, related topic concerning the calibration of streamflow standards is the idea of bioperiods, which are defined as time periods during the course of the year in which certain biological activities of ecosystems require seasonal change in streamflow. Owners or operators influencing streamflow during these times should thus be asked to maintain the Q (and percentage) value appropriate for the current bioperiod. The “target” flow is thus not a single, constant value, but like many things in nature, a moving target, thus adding to the difficulty of the DEP's task.

The DEP estimated it would take approximately five years to complete the classification of rivers in all basins of Connecticut and they would, in the process, construct a map which displayed all river systems and their classifications to the public for review. These first five years of the regulation process, the first phase of implementation, would thus consist of data collection, analysis, and classification of rivers. At the same time, efforts would be made to encourage the conservation and proper management of water during times of critical water shortage and the use of low-impact architecture and construction in developed areas to reduce human impact on water and stream systems.

The next phase, during years 5-10, consists of the creation of a comprehensive, basin-wide management plan and an assessment of what new supplies and equipment will be required for operators and owners to reach full compliance with streamflow regulations. The DEP will also evaluate the need for system changes which allow the movement of water between sites that are water-deprived and those with an overabundance of water. Another crucial step in this phase of the implementation process is to increase public awareness of the changes being made to encourage public feedback and input as well as cooperation with the new rules.

During the third and final phase, the DEP plans to implement any changes to the infrastructure of stream management dictated by planning and assessment in the previous phase to ensure that standards can be met successfully. This would likely include designing and financing new facilities in the water supply system with the goal of increasing storage capacity and water transfer capability. By the third phase, all water users are required to comply fully with the standards assigned to them. Dam owners and operators must obey specifically stricter release rules, sensitive to rain conditions, to minimize effect on streamflow patterns. Thus, the process of implementation is finalized by the adaptation of infrastructure to fully match the policies which will require its cooperation.

In the short time allotted for a speech, Dunbar was able to deliver a truncated yet informative summary of the difficulties lawmakers face in policy formation and implementation and how the DEP has solved these issues in their own work. In short, the department makes use of a variety of perspectives—scientific, political, and economic—and works to strike a balance between the necessities of each, not to mention the needs of both people and the surrounding ecosystems. The DEP focused on the creation of a clear and understandable policy that is still flexible enough to provide adequate time for compliance and to fit the dynamic nature of the water systems it attempts to control.

Resources:

McCarthy, Gina. “Steam Flow: The Next Two Decades / Balancing Human Use and Ecological Health” © 2009 State of Connecticut Department of Environmental Protection, Hartford, CT. http://www.ct.gov/dep/cwp/view.asp?a=2719&q=434018&depNav_GID=1654

Additional Resources: (contributed by Erica Hildebrand ’10)

CT Public Act 05-142: http://www.cga.ct.gov/2005/act/Pa/2005PA-00142-R00SB-01294-PA.htm
Connecticut Department of Environmental Protection website: http://www.ct.gov/dep/site/default.asp
Reservoir stratification: http://www.toledo-bend.com/LCOnline/04articles/Sr09-01.html
UConn Water Use Study: http://www.ctiwr.uconn.edu/ProjFenton/FENTON%20RIVER%20Final%20Report.pdf
Washington vs. Waterbury information: http://www.wrb.ri.gov/wapacmeetings/waterrights/waterwar.pdf