

Water Quantity and Quality As Related to the Management Of Wild & Scenic Rivers



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Council Contact: Lon Kelly
Bureau of Land Management
Fairbanks, Alaska

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Water Quantity and Quality As Related to the Management Of Wild and Scenic Rivers

FOREWORD

This paper is designed to help managers protect water quantity and quality as they implement water resources management strategies for wild and scenic rivers (WSR). Two primary questions are addressed:

- What are the obligations of an agency managing a WSR with regard to water quantity and quality?
- What tools are available to a managing agency to help meet these obligations?

We emphasize two overarching operational principles:

- Collect baseline data during river studies and development of comprehensive river management plans (CRMP). Data on water quantity and quality will provide an excellent return on investment during adjudication of water rights and evaluation of water resources projects under Section 7 of the Wild and Scenic Rivers Act (Act). This data will also help ensure the managing agency is meeting the requirements of Section 10(a) to protect and enhance the values for which the river was designated.
- Develop strategies for management of water quantity and quality in a WSR through consultation with legal counsel early in the study, planning or adjudication process, and maintain an ongoing dialogue with legal staff concerning the implementation and evolution of such strategies.

INTRODUCTION

Long-term protection of WSR values requires river managers to identify objectives for both water quantity and quality, direction for which is found throughout the Act. Significantly, Section 13(c) of the Act creates a federal reserved water right for WSRs, and Section 1(b) establishes the protection of water quality as one of the threefold purposes of the Act.

The desire of land management agencies to preserve instream flow—that is, water that remains in a stream and is not consumed—has led to a great deal of research, policy guidance and

litigation, mostly on streams outside the National Wild and Scenic Rivers System (National System). Understanding and protecting flow regimes is evolving and will continue to do so. The body of research, policy guidance, legislation and litigation dealing with protection of water quality likewise continues to grow and mature.

Both water quality and quantity in WSRs is controlled pursuant to federal law. Water quality standards stem from the Federal Water Pollution Control Act of 1972 (a.k.a., Clean Water Act; CWA), as amended. Water quantity (instream flows) in WSRs is controlled by federal law—the standards of the WSRA itself and the federal reserved rights doctrine—but is generally determined in a state forum (e.g., state court or basin-wide adjudication).

This paper focuses on water resources issues specific to WSRs, while giving the reader enough general background to place these issues in the proper context. It does not discuss in detail water law or the legal aspects of water quality protection.

The reader will find information on the obligation of river managers to assess, protect and enhance the special water quantity and quality needs of each WSR. The sections that follow provide advice on developing water protection strategies for WSRs. Suggested steps include:

- Defining the water-related values to be protected;
- Documenting baseline conditions;
- Identifying potential threats and protection opportunities;
- Identifying an array of protection options in a management plan;
- Vetting the plan through legal counsel; and
- Deciding upon and implementing the best protection strategies.

STATUTORY BACKGROUND AND POLICY GUIDANCE

This section provides a brief overview of water-related guidance in the Act and agency-specific direction.

The Act

General direction to protect water quantity and quality is provided through the following sections of the Act.

Section 1(b): *It is hereby declared to be the policy of the United States that certain selected rivers of the Nation which, with their immediate environments, possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values, shall be preserved in free-flowing condition, and that they and their immediate environments shall be protected for the benefit and enjoyment of present and future generations. The Congress declares that the established national policy of dam and other construction at appropriate sections of the rivers of the United States needs to be complemented by a policy that would preserve other selected rivers or sections thereof in their free-flowing condition to protect the water quality of such rivers and to fulfill other vital national conservation purposes.*

Section 10 (a): *Each component of the national wild and scenic rivers system shall be administered in such a manner as to protect and enhance the values which caused it to be included in said system . . .*

Section 16(b): *“Free-flowing,” as applied to any river or section of a river, means existing or flowing in natural condition without impoundment, diversion, straightening, rip-rapping, or other modification of the waterway. The existence, however, of low dams, diversion works, and other minor structures at the time any river is proposed for inclusion in the national wild and scenic rivers system shall not automatically bar its consideration for such inclusion: Provided, that this shall not be construed to authorize, intend, or encourage future construction of such structures within components of the national wild and scenic rivers system.*

Limitations on water resources projects is outlined through Section 7(a) of the Act.

Section 7(a): *The Federal Power Commission [FERC] shall not license the construction of any dam, water conduit, reservoir, powerhouse, transmission line, or other project works under the Federal Power Act (41 Stat. 1063) as amended (16 U.S.C. 791a et seq.), on or directly affecting any river which is designated in section 3 of this Act . . . and no department or agency of the United States shall assist by loan, grant, license, or otherwise in the construction of any water resources project that would have a direct and adverse effect on the values for which such river was established, as determined by the Secretary charged with its administration. . . .*

Direction to collaborate with other entities is provided through the following sections.

Section 10(e): *The Federal agency charged with the administration of any component of the national wild and scenic rivers system may enter into written cooperative agreements with the Governor of a State, the head of any State agency, or the appropriate official of a political subdivision of a State for State or local governmental participation in the administration of the component. The States and their political subdivisions shall be encouraged to cooperate in the planning and administration of components of the system which include or adjoin State-or county-owned lands.*

Section 11 (b)(1): *The Secretary of the Interior, the Secretary of Agriculture, or the head of any other Federal agency, shall assist, advise, and cooperate with States or their political subdivisions, landowners, private organizations, or individuals to plan, protect, and manage river resources. Such assistance, advice and cooperation may be through written agreements or otherwise. This authority applies within or outside a federally administered area and applies to rivers which are components of the national wild and scenic rivers system and to other rivers. Any agreement under this subsection may include provisions for limited financial or other assistance to encourage participation in the acquisition, protection, and management of river resources.*

Direction on water quantity is found in Section 13 of the Act.

Section 13 (b): *The jurisdiction of the States and the United States over waters of any stream included in the national wild, scenic or recreational river area shall be determined by established principles of law. Under the provisions of this Act, any taking by the United States of a water right which is vested under either State or Federal law at the time such river is included in the national wild and scenic rivers system shall entitle the owner thereof to just compensation. Nothing in this Act shall constitute an express or implied claim or denial on the part of the Federal Government as to exemption from State water laws.*

Sections 13 (c): *Designation of any stream or portion thereof as a national wild, scenic or recreational river area shall not be construed as a reservation of the waters of such streams for purposes other than those specified in this Act, or in quantities greater than necessary to accomplish these purposes.*

Section 13 (d): *The jurisdiction of the States over waters of any stream included in a national wild, scenic or recreational river area shall be unaffected by this Act to the extent that such jurisdiction may be exercised without impairing the purposes of this Act or its administration.*

Direction on water quality is found in Section 12.

Section 12 (c): *The head of any agency administering a component of the national wild and scenic rivers system shall cooperate with the Administrator, Environmental Protection Agency and with the appropriate State water pollution control agencies for the purpose of eliminating or diminishing the pollution of waters of the river.*

Departments of the Interior and Agriculture Interagency Guidelines for Eligibility, Classification and Management of River Areas (Interagency Guidelines)

The 1982 Interagency Guidelines offer some general water resource management guidance. The Interagency Guidelines define water flow sufficiency for a determination of eligibility, stating “Flows are sufficient if they sustain or complement the outstandingly remarkable values for which the river would be designated.” They also address water quality to a limited extent, referring to consistency with the CWA and requiring water quality to be maintained and “. . . where necessary, improved to levels which meet Federal criteria or federally approved state standards for aesthetics and fish and wildlife propagation.” The Interagency Guidelines do not address how to assess water quantity or quality, do not describe methods to determine minimum flow needs, and do not suggest legal and administrative options suitable for protection of water quantity or quality.

Existing Agency Direction

The federal agencies managing WSRs have similar guidance, varying in phrasing and in the fine points of implementation.

Bureau of Land Management (BLM)

The BLM Manual (BLM 7250) provides policies and guidance for use in acquiring, perfecting title to, and protecting water rights necessary for multiple-use management of the public lands. The BLM recognizes that states have the authority and responsibility for the allocation and management of water resources within their boundaries, except as specified by Congress. It is BLM policy to cooperate with states to protect federal reserved water rights and appropriative rights to which the United States is entitled under state law. In doing so, the BLM only secures those water rights necessary to carry out public land management purposes through the statutory and administrative procedures established under state laws. The BLM cooperates with state governments to protect all water uses as designated under state law for public land management purposes, including meeting state water quality requirements needed to support beneficial uses. Where Congress has withdrawn and reserved public lands by statute for a specific federal purpose, or where public lands have been withdrawn administratively for a specific federal purpose, the BLM may assert a federal reserved water right to appurtenant and unappropriated

water as of the date of the reservation only in the minimum amount necessary to fulfill the primary purposes of the reservation (BLM 2000).

The BLM Manual (BLM 7240) provides policies and guidance for managing water quality to meet or exceed both federal and state standards. The BLM's water quality objectives include establishment and maintenance of land use practices that assure the protection of water supplies from chemical, physical and biological deterioration. The BLM's management guidelines direct field units to employ best management practices and use standard data collection and analysis techniques. Protection of presently high quality water is necessary. BLM offices in states that do not have anti-degradation water quality standards are encouraged to protect high-quality waters equivalent to a policy of anti-degradation. When necessary, BLM officials should seek to establish the highest water quality standards consistent with multi-resource land management objectives.

National Park Service (NPS)

NPS Management Policies: 2001, Chapters 4.6.1 *Protection of Surface Waters and Groundwaters*, 4.6.2 *Water Rights*, and 4.6.3 *Water Quality*, outline NPS guidance on water quantity and quality for units of the National Park System, including WSRs.

- 4.6.1 “The Service will perpetuate surface waters and groundwaters as integral components of park aquatic and terrestrial ecosystems.”
- 4.6.2 “Water for the preservation and management of the national park system will be obtained and used in accordance with legal authorities. The Park Service will consider all available authorities on a case-by-case basis and will pursue those that are most appropriate to protect water-related resources in parks. While preserving its legal remedies, the Service will work with state water administrators to protect park resources, and will participate in negotiations to seek the resolution of conflicts among multiple water claimants. Water essential for Service needs will be purchased if it is not otherwise available.”
- 4.6.3 “The pollution of surface waters and groundwaters by both point and nonpoint sources can impair the natural functioning of aquatic and terrestrial ecosystems, and diminish the utility of park waters for visitor use and enjoyment. The Service will determine the quality of park surface and groundwater resources and avoid, whenever possible, the pollution of park waters by human activities occurring within and outside of parks. The Service will:
- Work with appropriate governmental bodies to obtain the highest possible standards available under the Clean Water Act for the protection of park waters;

- Take all necessary actions to maintain or restore the quality of surface waters and groundwaters within the parks consistent with the Clean Water Act and all other applicable federal, state, and local laws and regulations; and
- Enter into agreements with other agencies and governing bodies, as appropriate, to secure their cooperation in maintaining or restoring the quality of park water resources.”

United States Fish and Wildlife Service (FWS)

USFWS policy is to secure water supplies of adequate quantity and quality for protection, restoration, enhancement and management of USFWS lands and facilities and for other congressionally authorized objectives such as protection of endangered species and maintenance of instream flows. It is the USFWS’s policy to comply with state laws, regulations and procedures in obtaining and protecting water rights, both for USFWS facilities and for trust fish and wildlife resources on lands not owned by the United States (403 FW 1). Where application of state statutes and regulations does not permit federal purposes to be achieved, federal reserved water rights will be quantified and asserted to accomplish the primary purpose of the reservation.

The USFWS (561 FW 3) protects and restores the chemical, physical and biological quality of the nation’s water resources to promote the conservation of fish and wildlife resources and to protect public health, the environment, and the productive capacity of species’ populations. In order to accomplish this, the USFWS complies with all applicable federal, state, interstate, regional and local regulations. It is also the policy of the USFWS (507 FW 5) to become actively involved in the early stages of developing water quality standards. In addition, the USFWS advocates an ecosystem approach to the development and review of water quality standards. Because water quality standards are adopted on a state-by-state basis, the standards often fail to consider beneficial uses beyond artificial (political) boundaries. By identifying all uses for an entire watershed, USFWS personnel can help ensure that the natural ecological potential of that watershed will be fully realized.

The USFWS (002 FW 5) ensures compliance with contaminant laws on USFWS lands and facilities, including required cleanups; identifies and assesses potential contaminant problems on lands proposed for USFWS acquisition; identifies and assesses contaminants on and off USFWS lands, including monitoring and investigation of toxic chemical effects on USFWS trust resources; evaluates hazardous materials disposal and sites; responds to oil spills and toxic substance releases; assesses and restores damaged resources; provides consultation on pesticide use; reviews project, permit, and area-wide plans and resolves their adverse effects; develops criteria for wildlife, water quality and sediments; assesses and controls point and nonpoint source pollution; and assesses effects associated with atmospheric deposition of toxic chemicals and acid precipitation on inland and coastal ecosystems.

United States Forest Service (USFS)

USFS policy is to rely on reservation doctrine for lands reserved from the public domain and for the purposes of the reservation (Forest Service Manual (FSM) 2541.03). The manual specifically identifies the Act as a reservation authority (FSM 2541.21), with the caveat that the legal complexities under this and other reservation authorities require consultation with the Chief's office and the Office of the General Counsel. Such claims are subject to adjudication proceedings in state courts, with the United States served under the McCarran Amendment to become a party of a state adjudication (FSM 2541.36).

To protect the water quality of designated rivers, USFS direction requires that a water quality-monitoring plan be developed as a part of the CRMP. The river manager is to consider watershed improvement projects as necessary to protect and enhance river values (FSM 2354.42c).

Broad direction relative to water quality management is found in USFS Manual 2532, specifically to protect and, where needed, improve the physical, chemical, biological and aesthetic quality of the water resource consistent with the purposes of the national forests and national water quality goals. A number of specific policies are enumerated, including application of best management practices to all USFS management activities for control of nonpoint sources of water pollution and for compliance with established state or national water quality goals.

BASELINE INFORMATION

Significant management issues and major controversies are often exacerbated by a lack of technical data and resource knowledge. Every WSR—even those with no apparent water-related issues or conflicts—should have baseline inventories and some level of ongoing monitoring of water quantity and quality. Valid and reliable baseline information is the foundation for effective water resource management decisions and is essential to the development of successful strategies to protect and enhance water resource values. In particular, a long-term flow record is an invaluable aid in developing a water rights claim and will also be very useful if it should become necessary to pursue an injunctive action to stop some activity that might harm river values. Partnerships with local, state and federal agencies can be very helpful in gathering baseline information.

The most important baseline information for the management of water resources within a WSR is a narrative description of the characteristics that made it a worthy addition to the National System (free-flow, water quality, and “outstandingly remarkable values” (ORVs)) and how these characteristics are affected by water quantity and quality. Ideally, this description would be developed during the study process. If the ORVs are not detailed in the pre-designation study,

they should be developed in the CRMP. Preferrably, a detailed study should be prepared prior to any adjudication to quantify the relationship between river values, water quantity, and water quality. The adequacy of this documentation should be considered and deficiencies addressed when CRMPs are initially prepared and subsequently revised.

A river manager should, to the greatest extent possible, take the following actions to protect water resource values for a WSR:

1. Ensure adequate, formal documentation of the ORVs.
2. Install and operate gages where flow data are not available.
3. Establish an ongoing water quality monitoring program.

Water Quantity

The basic objective in gathering flow information is the development of flow hydrographs for stations along the river. These flow hydrographs should represent the entire water year and cover as many years as possible. Typically, mean monthly or weekly flow is measured, computed, or estimated at several sites along the designated reach. Methods for flow measurements and the development of hydrographs are well documented (c.f. Benson et al. 1967, and Dalrymple et al. 1967).

Flow hydrographs are basic to an understanding of how other resource values are affected by flows. Good historic data can be critical to identifying flow regimes necessary to protect channel and floodplain characteristics. Baseline flow information may already be available through the U.S. Geological Survey (USGS) or state agency gauging programs.

WSRs are to be preserved in their “free-flowing condition,” and it is desirable to know and protect the natural variation in the flow regime. This information will be essential to maintenance of the riparian area and the river channel itself.

Another valuable piece of information is a record of upstream appropriations. River managers should monitor upstream appropriations to help determine whether declining flows are due to natural reasons or upstream diversions.

Water Quality

The objective of baseline water quality measurements is the characterization of the condition and variability of the water in the stream at the time of designation or in its normal state. Measurements should focus on physical and biological factors that describe conditions at the time of designation, thereby establishing the baseline for protection and enhancement. Parameters that typically would be measured include conductivity, dissolved solids, suspended solids, dissolved oxygen, fecal coliform, turbidity, and temperature. A monitoring strategy should be developed with consideration to any anticipated threats to water quality. River managers should use monitoring efforts to document conformance with the appropriate CWA standards and to monitor the most significant threats to water quality from existing land uses within the basin. For example, grazing is likely to affect coliform, turbidity and temperature, while mining is likely to contribute to heavy metals concentrations—areas with one use, but not the other, would have different baseline data strategies.

Water quality baseline data will be critical for describing suspected impacts from changes in management practices within the basin. By monitoring water quality parameters, the managing agency can help the Environmental Protection Agency (EPA) and the U.S. Army Corps of Engineers (ACOE) meet their responsibilities under the CWA. Methods for measuring water quality are well documented by USGS handbooks on techniques for water resources investigations (from the USGS Water Resources Division) and recommended methods for water data acquisition (from the USGS Office of Water Data Coordination).

PROCESS FOR DETERMINING THE WATER QUANTITY AND QUALITY NECESSARY TO PROTECT RIVER VALUES

The resource value-based approach focuses on using scientific methods to determine critical resources and their water-related needs. Variations on this theme are employed if and when it becomes necessary to identify the quantity and quality of water required to protect river values. As originally described by Jackson et al. (1989), the process was directed at water quantity, but it can be applied to water quality issues as well. In outline, these are the steps:

- Step 1: Preliminary assessment and study design.
- Step 2: Description of water quantity and quality dependent values.
- Step 3: Description and quantification of hydrology and geomorphology.
- Step 4: Description of the effects of water quantity and quality on resource values.

Step 5: Identification of water quantity and quality required to protect values.

Step 6: Development of a strategy to meet water quantity and quality requirements, as a joint effort by agency staff, legal counsel, and other cooperators.

It may not be necessary to complete all the steps. Lacking threats, it may be prudent to continue to collect more baseline information prior to starting a quantification study process or addressing problems of water quality. The managing agency of each WSR should complete Step 2 of the process—that is, to describe water quantity- and quality-dependent values—at the earliest possible time.

DEVELOPING A STRATEGY

River managers should work closely with other agencies, state and local governments, and nongovernmental groups to meet objectives for water quality and quantity. At the federal level, the EPA, ACOE and Federal Energy Regulatory Commission (FERC) have significant authority to manage water. State agencies have the authority to regulate activities that affect water resources, and state law generally provides for judicial or administrative adjudication of water rights.

For each WSR, a strategy should be developed responsive to foreseeable threats after consulting agency-specific guidance and seeking advice from the Office of the Solicitor or the Office of the General Counsel, as appropriate to the agency. The development of any strategy requires the agency to know what the flow or water-quality dependent values are and how these values are affected by changes in flow or water quality.

Water Quantity

WSRs do have a federal reserved water right (c.f. *Potlatch Corp. v. United States*, 12P.3d 1256, 1258 (ID 2000) (Idaho Supreme Court)). Federal reserved rights must be asserted by the United States in general stream adjudications properly initiated pursuant to the McCarran Amendment (43 U.S.C. § 666).

Some water resources assessments focus on assertion and defense of a federal reserved water right. Evaluating and implementing additional nonwater right protection mechanisms, such as cooperative agreements with reservoir operators, is generally advisable and has proven a valuable adjunct to traditional instream flow studies and water rights adjudication.

Water Quality

The EPA and ACOE are the agencies with primary responsibility for establishing water quality standards for rivers pursuant to the CWA, regulating discharges, and enforcing federal water quality laws. However, the EPA often delegates much of its authority to state agencies; thus river managers must work through both federal and state agencies to provide for pollution control and abatement.

The on-the-ground program of the river-managing agency will generally focus on identifying, monitoring and reporting violations of water quality standards to the appropriate federal or state agency. Working with local groups and governments to secure zoning favorable to protection of water quality can be effective, especially in areas where unregulated run-off results in water pollution.

In situations where specific water quality problems have been identified, river managers have many allies to help improve conditions. For example, on the Sudbury, Assabet and Concord Rivers in Massachusetts, outside funding was available for a detailed study of an ongoing eutrophication problem. Models were developed for hydrology, nutrient loading, point sources, and other components of the problem. These models and an extensive public process led to a strategy to limit phosphorus and other nutrient loading through “nutrient trading” involving municipal systems, maintenance and monitoring of treatment facilities, and public education.

Tools for Building a Strategy to Protect and Enhance Water Quantity and Quality

Assertion of Federal Water Rights Claims

During McCarran Amendment water right adjudications, the federal government will assert federal reserved water rights claims and any appropriated water rights already held by the federal government.

Some states allow the federal government to apply for and hold water rights for instream flows.¹ In Alaska, the BLM was granted a water right for instream flow in Beaver Creek under state law.

¹ As of the date of this paper, these states allow the federal government to hold state instream flow rights: Alaska, Arizona, California, Montana, Nevada, and, in limited situations and for WSRs only, Idaho and Wyoming.

Exercise of Regulatory Authority of the River-Administering Agency

Land management actions, such as floodplain management, control of access, or protection of riparian vegetation may help achieve river management objectives.

Federal land management agencies can also affect instream flow through issuance or denial of rights-of-way requested for water-related facilities. For example, the Federal Land Policy and Management Act of 1976 (FLPMA) specifies that, in considering requests for rights-of-way for “reservoirs, canals, ditches . . . pipelines, tunnels and other facilities and systems for the impoundment, storage, transportation or distribution of water” (Section 1761), agencies will ensure that each right-of-way contains conditions to “minimize damage to scenic and esthetic values and fish and wildlife habitat and otherwise protect the environment” (Section 1765).

Section 7 of the Act² provides the river-administering agency with oversight over the exercise of regulatory and discretionary authority for water resources projects assisted by the FERC, ACOE, and other federal agencies.

Development and Implementation of Cooperative Agreements

Federal river managers are authorized to enter into cooperative agreements with state agencies, Indian tribes, and others. In some cases where the federal agency is prohibited under state laws from holding state instream flow rights, a cooperative agreement may provide sufficient protection for flows.

Agreements or binding contracts between instream water interests and major water users or reservoir operators may be used to manage instream flows or supplement a reserved water right or a water right appropriated under state law.

Water Resources Protection Through Hydropower Licensing

When there is adequate documentation and scientific justification, it is possible to incorporate terms and conditions in FERC licenses that will protect flows in designated river segments affected by hydropower projects. This authority stems from Section 4(e) of the Federal Power Act. River-administering agencies also have authority to evaluate hydroelectric project proposals affecting designated rivers under Section 7(a) of the Act.

² A complete discussion of Section 7 of the Act and permitting requirements related to hydropower and other federally assisted instream modifications is contained in *Wild and Scenic Rivers Act: Section 7*, a technical paper of the Interagency Wild and Scenic Rivers Coordinating Council.

Implementation of Federal Environmental Legislation

NEPA: The National Environmental Policy Act of 1969 requires careful consideration of environmental impacts, mitigation and alternatives for activities that may significantly affect the quality of the human environment. Federal actions are broadly defined to include not only construction, but also licensing, permitting and funding a project. Considerations obviously would include instream flow or water quality for any project that may alter water resources of an existing eligible, suitable or designated WSR.

CWA: The CWA, as amended, allows consideration of reservoir storage and releases not only for maintaining downstream water quality, but also for recreation, esthetics and fish and wildlife. Water quality is regulated and managed under the auspices of the CWA, with the state generally responsible for implementation. The clause from the CWA, “. . . restore and maintain the chemical, physical, and biological integrity of national water quality standards,” provided the basis for the EPA’s development of national water quality standards. From federal policy, which specifies minimum requirements, states are directed to develop a statewide water quality management plan, including an anti-degradation policy. Not all states have fully delegated authority to implement the CWA, and in many states two permits are issued for discharges, one by the state and one by the EPA. EPA standards are minimums, and if a state does not raise its discharge standards to meet the minimum, state control will be effectively preempted.

State Instream Flow Program

Prior appropriation states: Federal agency application for state-law based instream flow water rights for WSRs is not always possible under prior appropriation water law. States may require that the water be withdrawn from the river and put to a “beneficial use.” This usually includes municipal, domestic, agricultural, livestock, hydropower or other commercial or industrial uses. In these states, federal agencies hold state water rights that are typically limited to claims for uses involving stock tanks and reservoirs, administrative or recreational facilities, or hydropower developments.

However, a number of prior appropriation doctrine states have passed legislation that specifically allows protection and maintenance of water in the channel as instream flow or nonconsumptive water rights. Approximately 12 western states have some sort of legislation recognizing beneficial uses for recreation, esthetics, fish or wildlife, and in some cases, water quality needs. Usually state departments dealing with fish, wildlife, recreation or environmental protection may apply for and hold instream flow water rights. In some states, federal agencies, individuals and organizations may also seek instream flow rights.

Riparian states: Recognizing that many rivers in the East and Midwest are fully or even over-allocated, several riparian states have enacted legislation that grandfathers existing withdrawals,

but sets high standards for future ones. Instream uses to maintain water quality and protect habitat are generally protected, and there is a strong presumption that inter-basin transfers should not be allowed. These programs have implications for regional water supply and wastewater treatment facilities. WSR managers can use these programs to advocate for instream flows in urbanizing areas of the east.

State Water Quality Programs

EPA Guidelines recognize Outstanding National Resource Waters (40 CFR 131.12(a)(3); ONRW) and waters of ecological significance. States vary in the way they comply with the CWA and in their water classification definitions, but these are the same in outline. The state of Oregon provides a typical example. Oregon, through its Department of Environmental Quality, sets forth state plans for management of the quality of public waters. This State's anti-degradation policy recognizes three categories:

Outstanding resource waters are those waters designated by the Environmental Quality Commission (EQC) where existing high-quality waters constitute an outstanding state or national resource based on their extraordinary water quality or ecological values, or where special water quality protection is needed to maintain critical habitat areas.

High-quality waters are those waters that meet or exceed levels that are necessary to support the propagation of fish, shellfish and wildlife; recreation in and on the water; and other designated beneficial uses. They "shall be maintained and protected" unless the EQC chooses, after full satisfaction of the intergovernmental coordination and public participation provisions of the continued planning process, to lower water quality for necessary and justifiable economic or social development.

Water quality limited waters are those waters that do not meet instream water quality standards during the entire year or defined seasons, even after the implementation of standard technology.

State water quality standards apply to federal lands. The agencies must implement state-approved best management practices (BMPs) to achieve these standards, monitor to see if BMPs meet the standards and, if not, revise practices accordingly. The emphasis placed on WSRs and related water quality requires a greater sensitivity in monitoring the implementation and effectiveness of BMPs in order to protect beneficial uses and special values associated with a designated WSR segment. However, none of this will automatically preclude activities upstream. It is imperative that the river-administering agency ensure any water quality changes resulting from activities upstream are minimized, of short duration, and do not affect the long-term beneficial uses and purposes for which the river was designated.

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Appendix A: An Introduction to Instream Flow Studies

Evolution of the Process

Instream flow methods were first developed by biologists and hydrologists working for agencies with regulatory responsibilities related to water development and management (Stalnaker and Arnette 1976). Most of the empirical evidence gathered to date has focused on fish habitat requirements. More recently, there has been emphasis on the relation between stream flow and woody riparian vegetation and between stream flow and river recreation (Orth 1987; Brown 1992; Shelby et al. 1992). Water management problem-solving has matured from setting fixed minimum flows with no specific aquatic habitat benefit to incremental methods in which aquatic habitats are quantified as a function of stream discharge (National Biological Survey 1995).

There has also been movement towards the definition of a water budget to optimize flows for certain flow-related resources through the water year and to provide for flood events necessary for channel maintenance and the protection of riparian vegetation and soils. This has been especially important in the design and operation of federally funded water projects, where flows may be regulated to provide for channel maintenance or to support other river values such as recreational boating.

There are several formal processes an agency could follow in planning an instream flow study. The traditional six-step process described by Jackson et al. has been applied successfully to several designated WSRs over the past 10 years. An outgrowth of Jackson's approach is the less linear methodology described by Muller (1999), which has been applied to help manage more complex situations (Figure 1).

Methods

Methods for describing the relationship of flow to resource values have been divided by the National Biological Survey (1995) into "standard-setting" and "incremental" methods. Standard-setting methods are easier and cheaper to use and are appropriate to identify thresholds below which water should not be diverted. Standard-setting methods include the Tennant method (Tennant 1976), the wetted perimeter technique (Nelson 1980), the Arkansas method (Filipek et al. 1987), and physical habitat simulation (PHABSIM) as first described by Bovee and Milhous (1978). Incremental methods attempt to describe how resources are affected by incremental changes in flow over varying time periods. The most well-known incremental method is the continually evolving Instream Flow Incremental Methodology or IFIM (National Biological Survey 1995).

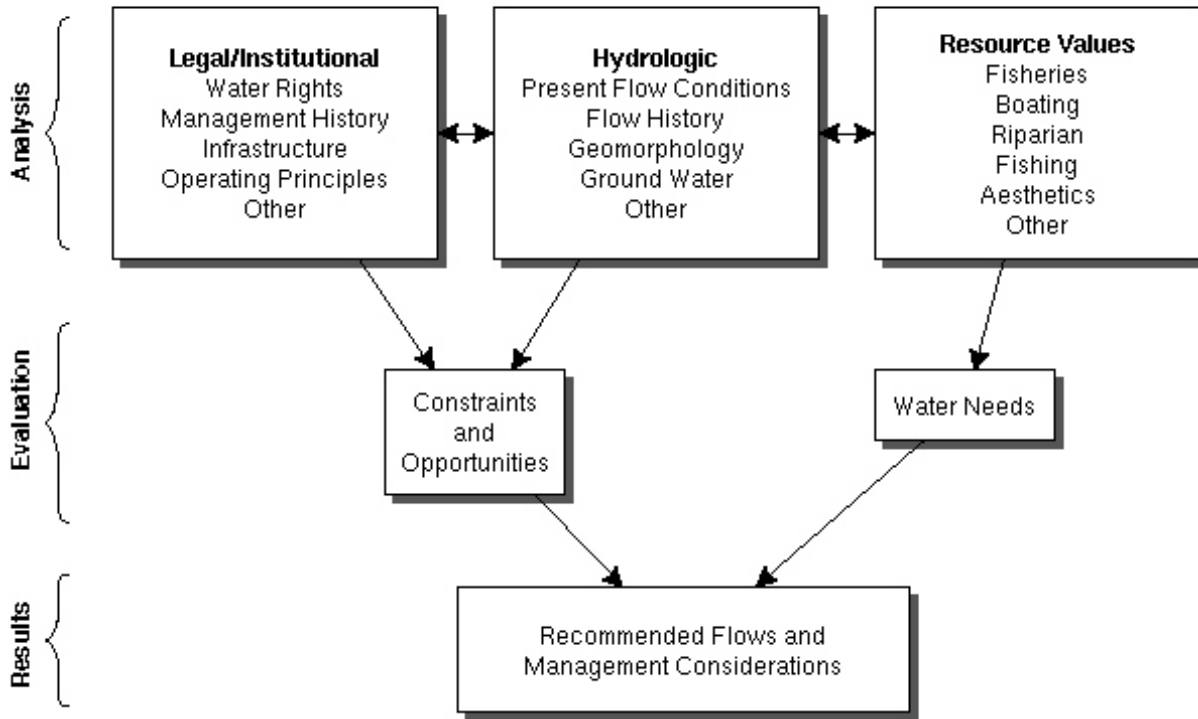


Figure 1. Instream flow needs assessment process for complex river management situations (after Muller 1999).

While many instream flow studies focus on biological variables, Shelby et al. (1992) tabulated 31 studies determining relations between recreation-related variables and flow, demonstrating increased attention to the importance of recreation use in determining instream flow needs.

Establishment of Flow Recommendations

Once the key flow-dependent values have been identified, and the effects of various flow regimes on these values have been described, the planning team identifies the flow requirements for each resource. Identified minimum required flows will typically vary through the water year and with location along the stream. When identified minimum flows for different variables are in conflict, a simple decision rule is often invoked which calls for the higher of the conflicting flows to be recommended. Standard-setting methods are typically focused on identifying minimal required flows for particular resource values, and their outputs are easily translated into flow recommendations. For recreational resources, an approach known as normative theory can be used to identify minimum required flows, as described by Whittaker et al. (1993). Incremental methods require expert interpretation and adjustments to be useful. Incremental methods are considered to be powerful tools for negotiations, which often occur in water rights adjudications.

Appendix B: Case Studies

Farmington River, Connecticut

The West Branch of the Farmington River in northwestern Connecticut was studied for potential designation as a WSR under Section 5(a) of the Act starting in the late 1980s, leading to its designation in 1994. The study was conducted by the NPS and was initiated by local communities concerned about the effects of potential water withdrawals from the river. In 1981, the Hartford Metropolitan District Commission (MDC), water supplier to the greater Hartford area, had proposed a diversion to connect West Branch reservoirs with the reservoir on the Farmington's East Branch that provided the bulk of the MDC's existing supply. In authorizing the WSR study, Congress directed the NPS to address the water supply issue.

During the 5(a) study, the NPS, in cooperation with the federal advisory committee appointed for the study, conducted a comprehensive instream flow study. The flow study was designed to provide information on the following questions:

- How do changes in instream flows affect the Farmington's fish, recreational and scenic resources? (These are the Farmington's flow-dependent ORVs.)
- What flows are needed to maintain these resources?
- Is there sufficient water in the Farmington basin, under varying precipitation conditions, to allow for withdrawals from the West Branch while maintaining those resources?

Methodology

The Farmington Instream Flow Study was performed by consulting firms selected by a technical advisory committee (TAC), with members from the federal advisory committee, Connecticut Department of Environmental Protection, MDC and NPS. The consultants used flow data from a 20-year period of record on the main stem, West Branch, and a major tributary to create mean monthly flows for each of these three sites. Flows were calculated both for regulated conditions, based on actual dam releases for the period of record, and estimated unregulated flows that would have occurred without the dams. Monthly regulated and unregulated flow predictions at each gage were then developed for normal, dry and drought conditions using representative years from the period of record. For study sites not near the gauging stations, flows were estimated based on gauging station data corrected for the drainage area at the study site.

Fish habitat in weighted usable area (WUA) was assessed at 17 transect sites using the IFIM. Habitat needs for several life stages of Atlantic salmon, brown trout, brook trout, American shad, smallmouth bass, and longnose dace were assessed. Three alternative flow scenarios to maintain and protect fisheries resources were developed: 1) the optimum habitat scenario, defined as the maximum WUA for the target species/life stage; 2) the near-optimum habitat scenario, defined as within five percent of maximum WUA; and 3) the intermediate scenario, a hybrid of the other two scenarios that compensated for deficiencies in WUA for adult brown trout during certain months under the near-optimum habitat scenario. Based on its expert assessment of the validity of the resulting WUA data, the TAC determined that adult brown trout and juvenile Atlantic salmon should serve as surrogates for the fisheries community as a whole.

For recreational and scenic values, flows needed to maintain and enhance user experience were assessed. Recreational activities included: fishing, both bank and wading; tubing; downriver canoeing; and play boating. For each of these activities, as well as for scenic enjoyment, the evaluation identified both the minimum flow needed for an acceptable experience and the optimum range of flows that provides the highest quality experience. Data were collected through surveys of weekend users during the spring, summer and fall of 1991; during an intensive three-day field evaluation conducted by experts and local volunteers under a range of controlled releases; and, for scenery, by videotaping flows during the controlled releases. The videotapes were later viewed by impartial audiences which indicated the flows they considered to be the most scenic.

The researchers used a 30-year period of record to determine how much recreational opportunity existed historically for each recreational activity during normal, dry and drought years. For both minimum and optimum conditions, they then calculated the net annual volume of water needed to provide the historical recreational opportunity for each activity under different precipitation conditions.

Results and Analysis

Allocation scenarios were developed depicting the annual volumes of water required for each of the following:

- The three different flow scenarios for fisheries;
- The historical numbers of minimum and optimum days that existed during normal, dry and drought conditions for the different recreational uses;
- A fisheries enhancement pool;
- Flushing flows (during normal rainfall years only);

- Dam releases required to meet downstream power generation needs under a riparian agreement; and
- Two hypothetical rates of withdrawal (10 and 20 million gallons per day) for water supply.

Based on the defined scenarios, it appeared that during dry and normal years there would be sufficient flow to support all resources and uses, including the hypothetical water supply withdrawals. However, during drought conditions, even though the MDC would likely exercise its right to reduce or suspend riparian releases and financially compensate the riparian owner, there would still be insufficient water to provide for the optimum fisheries scenario, fisheries enhancement pool, historical levels of recreation, and the water supply withdrawals. All of these uses could be met during a drought under either the near-optimum or intermediate fisheries scenario.

An important assumption associated with the instream flow study was that upstream reservoirs have the capacity to store all the water predicted to be available in any given year. The study was based on a number of other assumptions and simplifications, and all who were involved recognized that its results merely provided an indication as to whether future water withdrawals might be compatible with WSR designation, as opposed to a detailed assessment of a specific withdrawal proposal's impacts on the Farmington's ORVs. Despite these and other limitations, by conducting the instream flow study during the WSR study, the study team achieved several desirable objectives:

- Documentation of flows that supported the Farmington's three flow-dependent ORVs before the date of designation. These data provide baseline conditions against which the impacts of any proposals to change the river's flow regime can be assessed. The *Upper Farmington River Management Plan*, under which the designated reach is managed, incorporates these baseline data in setting resource management standards.
- Information for key decision-makers on the designation issue, including the State and regional interests who are now responsible for co-managing the river with the NPS. The flow study helped support the finding that the WSR study segment was suitable for designation, resulting in the Secretary of the Interior's recommendation to Congress to designate the river.
- Information regarding opportunities for providing resource-enhancing flows through the reallocation of existing water by the agencies responsible for dam operation within the basin.

As of the date of this paper, no proposals have been made to develop the West Branch of the Farmington River for water supply purposes. Should a diversion ever be proposed, the impacts of reduced flows on the Farmington's free-flowing character, water quality, and ORVs would be assessed under Section 7 before federal involvement in the diversion (through permits or financing) would be allowed.

For more information about the Farmington Instream Flow Study, please consult *An Instream Flow Study of the Mainstem and West Branch of the Farmington River* (NPS, June 1992).

Metolius Wild and Scenic River, Oregon

The Metolius WSR was added to the National System in October of 1988. Located in central Oregon, the Metolius has extremely high water quality for its entire length. It is the largest spring-fed river in the region, with unique cold-water temperatures that decrease downstream and consistent, sustained flow levels. Protection of the river's hydrologic and geologic values was one of the key issues in the development of the CRMP.

Since the river's designation, the USFS has been measuring water temperature and turbidity at 18 monitoring stations on the mainstem and major tributaries. Temperature is monitored from June through September, with turbidity monitored during any significant discharge event; point sources of turbidity are traced upstream and identified. The Oregon Department of Environmental Quality (DEQ) also conducts monitoring of surface water quality at one location on the river. This sampling is done six or more times per year, with parameters monitored that include pH, ammonia, nitrates, total phosphates, alkalinity, field alkalinity, field conductivity, total solids, total suspended solids, total organic carbon, bacteria (enterococci and coliforms), biological oxygen demand, chemical oxygen demand, temperature, turbidity and dissolved oxygen. With completion of the CRMP (1997), the USFS, in partnership with a local environmental group—Friends of the Metolius—is monitoring water quality at six additional locations. This monitoring is focused on pH, nitrates, phosphates and bacteria.

Water-quality concerns include possible contamination due to septic systems (summer-home area), horse use, logging, grazing and dispersed recreational camping along the tributaries. Some drinking wells in the summer-home area have tested positive for fecal coliform. While monitoring had not indicated any cause for concern, the environmental document for the CRMP noted there are many significant inflows to the river between the sources of domestic pollution and the water quality monitoring station that might serve to dilute pollution.

Methodology

To protect the water quality of the Metolius, standards were established in the CRMP to meet or exceed (in cases where baseline monitoring indicates an improvement is possible/necessary) existing water quality. Other resources are managed to provide high levels of protection to water quality. The USFS committed to developing baseline data from which to establish the need for higher standards and identify actions to ensure the standards are met. In addition, the chosen alternative included the possibility of recommending designation of the Metolius as an outstanding resource water as an additional, interagency means of ensuring no water quality degradation will occur.

Results and Analysis

The water quality data collected by the State and as a result of the USFS-Friends of the Metolius partnership has been presented to the DEQ. This information was presented to determine if collected data were adequate to distinguish naturally occurring nutrients from those contributed by development. The DEQ suggested the USFS and partners establish a longer baseline period to provide greater future resolution in evaluating water quality parameters and from which to identify human-caused pollution.

The USFS is currently looking to match limited federal dollars with other partners to:

- Focus monitoring on the developed portion of the WSR.
- Sample and test a significant sample of the domestic water supplies.
- Complete an inventory of the current condition of existing summer-home septic systems.

This data will be used to determine if there are sources of water pollution from the existing development and also to assess the magnitude of any future problems from aging septic systems and other future development. The USFS also continues to work with the State regarding nomination of the Metolius as an outstanding resource water.