

**Appendices
to the
Report of the Instream Flow Pilot Program**

New Hampshire Dept. of Environmental Services

R-WD-15-1
December 1, 2015

Appendix A
Simplified Description of the Pilot Protected Instream Flow and
Water Management Plan Process

Appendix to the
New Hampshire Dept. of Environmental Services
Report of the Instream Flow Pilot Program
R-WD-15-1
December 1, 2015

Appendix A - Simplified Description of the Pilot Protected Instream Flow and Water Management Plan Process

Introduction

This appendix briefly reiterates descriptions of procedures and concepts previously published in the reports of the Instream Flow Pilot Program.¹ The information presented here serves as the context and foundation for understanding the new information presented in this 2015 evaluation of the Program.

The information below should provide a clear understanding of the underpinnings of flow protection as applied in the Pilot Program, including the conceptual model for stream flow protection, the activities conducted to identify the protected flows, and the purposes of water management plans.

Pilot Program

In 2002, New Hampshire's General Court required an Instream Flow Pilot Program to study and establish protected instream flows and water management plans on the Lamprey River and the Souhegan River. The Lamprey and Souhegan Rivers were two of the thirteen river segments at that time designated for protection under RSA 483, the Rivers Management and Protection Act (Rivers Act). The Lamprey and Souhegan were selected by the legislature for the Pilot Program because of their variety of water users, presence of dams, and moderate to small length of the designated river segment. NHDES then wrote administrative rules² for conducting the instream flow studies and developing water management plans on these pilot rivers.

One of the goals of the Rivers Act, as amended and modified by chapter law,³ is to establish and implement protected instream flow criteria. Administrative Rule Env-Wq 1901.01 states that the purpose of establishing and enforcing protected instream flows is to "maintain water for instream public uses and to protect the resources for which the river or river segment is designated." Env-Wq 1907.02 further provides that "protected instream flows established by the commissioner shall serve as water quality criteria for the purpose of administration of water quality standards by the department under the federal Clean Water Act."

The instream public uses cited in the Rivers Act incorporate the state's interests in surface waters, including but not limited to: navigation, recreation, fishing, storage, conservation, maintenance and enhancement of aquatic and fish life, fish and wildlife habitat, wildlife, the protection of water quality and public health, pollution abatement, aesthetic beauty, and hydroelectric energy production. The instream public uses, outstanding characteristics and resources (or protected entities) were initially identified and then field surveyed. The protected entities were then assessed for their flow dependency. Only those protected entities identified as being flow dependent were included for the assessment of their protected instream flows. The flow-dependent protected entities included: recreation (boating, fishing and swimming), the maintenance and enhancement of aquatic fish and life, fish and wildlife habitat, rare, threatened and endangered fish, wildlife, vegetation or natural/ecological communities, and public water supply.

¹ Attached by reference. See Appendices C, D, and E for physical and online report locations.

² Env-Wq 1900 Rules for the Protection of Instream Flow on Designated Rivers, also known as the Instream Flow Rules. <http://des.nh.gov/organization/commissioner/legal/rules/documents/env-wq1900.pdf>.

³ Legislation that applies to New Hampshire's Instream Flow Program can be accessed via <http://des.nh.gov/organization/divisions/water/wmb/rivers/instream/categories/rules.htm>.

Funding for the Pilot Program was provided by the New Hampshire General Court and later augmented by a grant from the National Oceanic and Atmospheric Administration. The funds were used to contract with consulting ecologists and hydrologists to conduct the instream flow assessments, fish studies and to develop the water management plans, as well as to fund NHDES' instream flow program staff. The studies were completed and protected flow criteria were defined. Water management plans were subsequently adopted in 2013 to implement actions that will maintain the flow criteria.

Conceptual Model for Flow Protection

Instream flow practitioners have universally embraced the concept that a key element of flow protection is the protection of the variability of natural flow patterns.⁴ Natural variability of stream flows determines the geomorphic and biologic characteristics of a river. The native riverine ecosystem contains multiple species, some of which thrive in wetter conditions and others in dryer conditions. Variability in the stream flow conditions allow these different species to coexist. Diversions, land use changes, discharges or withdrawals can alter the flow to which the native riverine ecosystem is adapted. If the river's flow is altered significantly, then the river community will be impaired.

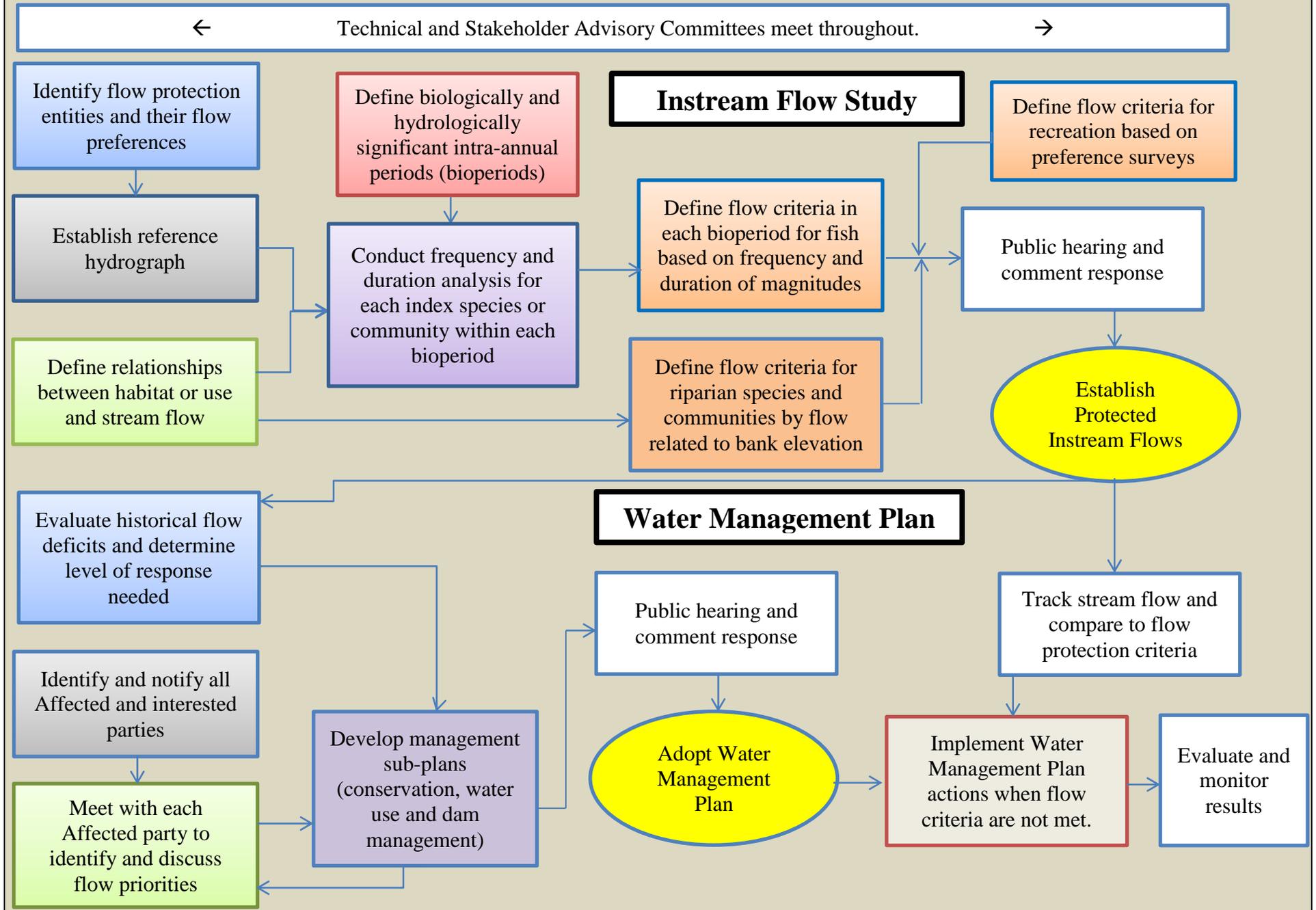
It is important to recognize that the natural river flow (even in the absence of any human intervention or water use) will not always meet all of the fish, plant and animal flow needs of a riverine ecosystem, nor should it. Native species within these communities are adapted to meet periods of stress that occur within the natural ranges of frequency and duration. The protection of the pattern of stream flow variability recognizes that rare natural extremes such as flood and droughts have important functions in supporting riverine ecosystems.

The application of this concept implies that the principal management objective is to allow streams to flow as close as possible to their natural flow pattern. Low flows and floods are expected to occur as natural conditions. Typical human influences tend to reduce flow variability by removing floods and droughts. This may make the availability of stream flow more reliable for human use, but is detrimental to biological integrity.

Protecting stream flow variability is necessary to insure that the ecosystem provides the variety of habitat conditions necessary to support the range of species that make up the river ecosystem. Water management measures are required where human uses increase the duration or frequency of flow conditions below specified protected flows and their associated durations.

⁴ <http://www.americanrivers.org/assets/pdfs/water-supply/the-natural-flow-regime.pdf?422fcb>

Figure A-1. General Process - NH Instream Flow Pilot



Protected Instream Flow Assessment

The protected flows and management plans for the pilot rivers were assessed by a multidisciplinary team of specialists (biologists, engineers, geologists, geographers, hydrologists and hydrogeologists) working collaboratively to evaluate the flow-dependent protected entities and their flow needs.

Figure A-1. General Process – NH Instream Flow Pilot shows elements of the Pilot Program's assessment and water management plan development. The assessment techniques differed depending on the type of entity. In general, the assessment methods can be divided between those used for the assessment of human uses (recreation) and those used for the assessment of the riverine ecosystem (fish and riparian wildlife and vegetation). Flow needs for the human recreation uses of boating and swimming were developed using questionnaires and surveys. Protected instream flows for fish were developed using Mesohabitat Simulation Model (MesoHABSIM), a habitat simulation model, and those for riparian wildlife and vegetation were developed using the Floodplain Transect Method.

Public Input

Public input was sought prior to commencing the instream flow study by convening committees representing local interest groups and people with technical knowledge applicable to water resource management. Public meetings were held to describe plans and interim results. Public hearings were held to review and obtain public comments on the instream flow studies and the Water Management Plans. Presentations were made in many forums describing the Instream Flow Program and its activities.

Protected Instream Flows

The protected instream flow criteria are described under the assumption that the ecosystem needs are best supported by maintaining the natural variability of stream flows. Human uses are also usually met under this same assumption of variability, although this does not mean that unlimited water withdrawals can be sustained. The protected flow assessments defined protected flows to maintain the natural variability of stream flows by using components of magnitude, timing, frequency and duration which are established at the critical thresholds for maintaining recreational and ecological uses.

The protected instream flows for boating were defined as the critical thresholds at which downstream passage is available, or the minimum flows required for white water boating. Flows for boating on the Lamprey and Souhegan rivers are understood by the public to be opportunistic, such that conditions will not always be suitable for either flat water or white water boating. Thus, the protected instream flows establish thresholds that maintain the pattern and frequency of historically available conditions for boating.

Protected instream flow criteria for fish and aquatic life were defined for six biologically significant annual seasons. Flow magnitude and duration criteria are defined at three tiers for each season to provide structure while also allowing flexibility in the pattern of flows.

Protected instream flow criteria for riparian wildlife and vegetation assess flow needs for species occupying the banks and margins of the river. Protected flows represent flows required for wetting floodplains, depositing nutrients, scouring river bottoms and banks to rejuvenate fish, animal and plant habitat and eliminate flood intolerant plants, and avoiding repeatedly flooding nesting habitat during low flows. Protected flows for wildlife and plants were only established when those flow

needs were not already met by the flows established for fish and aquatic life, which typically had the most stringent flow needs of all of the users.

The protected flows specifically defined for each of the Pilot Program rivers were established by the NHDES Commissioner in 2013 as the numerical translations of the narrative water quality standards for flow in Env-Wq 1700.

Water Management Plans

The protected instream flows are maintained by implementing a Water Management Plan. Recognizing that all users compete for a finite resource in times of low flow, the goal of the water management plan is to identify, quantify and organize water uses to minimize the impact on all. The impacts of any water uses on the magnitude, frequency and timing of flows that affect fish, riverine plants and wildlife, and boating recreation were considered during the Water Management Plan development process.

The Water Management Plan presents the actions to be taken in order to support and maintain the protected instream flows. The Plans were developed with oversight and input from a stakeholder advisory committee established for each river which included affected water users and dam owners. These committees met at public meetings during and after the development of the draft management plans. In addition, feedback from residents in the affected communities was gathered at formal public hearings and through written comments.

Each Water Management Plan includes three sets of management sub-plans: Conservation Plans, Water Use Plans, and Dam Management Plans. As river flows reach progressively lower flows and longer duration thresholds, more actions under the sub-plans take effect. Each of the sub-plans presents the activities recommended to best meet the needs of users and resources while at the same time meeting the protected instream flows. Conservation Plans are used to reduce overall water demand. Conservation is applied year round to reduce losses or waste. Water Use Plans reduce and spread water use impacts during low flows. Water Users that directly or indirectly withdraw water from the river or its tributaries may have to reduce their water use or find alternate sources during low flow periods. A *de minimis* withdrawal amount is divided among water users providing water at all times for basic services. Dam Management Plans describe two-day relief pulses that mimic a natural rain storm and are employed during rarely-occurring low flow conditions when management is needed to relieve stress in the river environment by restoring the flow pattern. Water use changes and relief pulses are applied when flow conditions do not meet the protected flow criteria. Human health and safety are always given precedence during application of management actions.

In some cases there are costs associated with implementing the Management Plans. Cost was a consideration when developing the sub-plans with the water users and dam owners. All water users are required to implement water conservation practices. However, water users who directly impact stream flows will have greater water use management requirements. Some of the overall cost of the Pilot Program will be borne by NHDES as the owner and operator of many of the dams being used to manage stream flows.

Implementation of Water Management Plans

Many actions are needed to implement the components of the Water Management Plans after their adoption. Some water users or dam owners may take months or years to complete preparations for meeting the actions under their plans. The Instream Flow Pilot Program allows up to five years for implementation of more extensive responses contingent on the users or owners making good faith efforts to complete preparations.

For example, water users may need to prepare for actions under their water use plans even to the point of developing and permitting alternate water sources. Water users complete and submit their proposed Water Conservation Plans to the NHDES Drinking Water and Groundwater Bureau for review and approval prior to implementation. The full implementation of the Souhegan Water Management Plan was delayed by lack of funding to retrofit the outlets of state-owned flood control dams.

Management will be applied when the stream flow pattern deviates from the adopted flow criteria. Implementation of management actions is based on tracking daily mean river flows at a USGS stream flow gage and comparing them to the protected instream flows. The protected flow criteria will also be tracked and assessed for long-term trends in flow changes. Watershed-wide impacts such as land use changes may require watershed-wide responses such as addressing increasing watershed impervious surface area.

Since the proposed water management actions are new approaches to the management of water resources, adaptive management will also be applied when needed. The hydrograph will be reviewed and the Water Management Plan's success in meeting flow objectives will be evaluated. When long-term biological monitoring can be implemented, these results will be compared to management plan goals and analyzed for trends. If the results of the evaluation indicate that parts of the plan need revision, then NHDES will work with the Affected Water Users and Affected Dam Owners to address these issues.

NHDES expects that water management plans will require periodic revision. A plan may be revised to improve its effectiveness or to accommodate new water users or dam owners. Individual management plans will be updated to incorporate changed water use patterns or other new information. During the implementation of these plans, adjustments to management actions will be made as needed to support existing and future human uses as equitably as possible.

Appendix B
Statutory Authority for Instream Flow
and Other Statutory and Rule References

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Appendix B - Statutory Authority for Instream Flow and Other Statutory and Rule References

Statutes describing the 2015 Instream Flow Report requirements

The excerpts listed below are from the Instream Flow Pilot legislation as described in Chapter 278, Laws of 2002 and revised in 2009 and 2013.

278:3 Instream Flow Technical Review Committees; Establishment; Duties.

III. The commissioner of the department of environmental services shall:

(a) By September 1, 2013, adopt and implement the protected instream flows and water management plans relative to the Lamprey River and the Souhegan River.

[Laws of 2013, Chapter 241 - <http://www.gencourt.state.nh.us/legislation/2013/HB0588.pdf>]

(b) Two years after the adoption and implementation of the protected instream flow levels and water management plans for the Lamprey River and the Souhegan River, issue a report that includes observed and projected impacts of the protected instream flows and water management plans on water users, wildlife, recreation, and other interests along the rivers, and any recommendations for proposed legislation. Within 60 days of the issuance of such report, the department shall hold a public hearing jointly with the senate energy, environment and economic development committee and the house resources, recreation and development committee and provide a public comment period of 30 days. The department shall consider the public comments received when formulating any revisions to the protected instream flow levels and water management plans for the Lamprey River and the Souhegan River.

[Laws of 2009, Chapter 201 - <http://www.gencourt.state.nh.us/legislation/2009/HB0102.html>]

(c) By December 1, 2015, submit a final report that details the activities and results of the pilot program, including the impacts of the protected instream flows and water management plans on water users, wildlife, recreation, and other interests along the rivers, a plan for implementing protected instream flows and water management plans for other rivers designated under RSA 483:15, and any recommendations for proposed legislation. The report shall also include a summary of public comments received, the completed instream flow studies, and the adopted protected instream flow levels and water management plans and shall be submitted to the senate energy, environment and economic development committee, the house resources, recreation and development committee, the senate president, the speaker of the house of representatives, the governor, the committee to study the impact of water withdrawals on instream flows established under 2000, 242:1, and the state library.

[Laws of 2013, Chapter 241 - <http://www.gencourt.state.nh.us/legislation/2013/HB0588.pdf>]

Statutes describing instream flow protection in New Hampshire	
Clean Water Act	(http://www.epw.senate.gov/water.pdf)
RSA 483	Rivers Management and Protection Act – instream flow protection required (http://www.gencourt.state.nh.us/rsa/html/NHTOC/NHTOC-L-483.htm) 483:9-c Establishment of Protected Instream Flows. – I. The commissioner, in consultation with the advisory committee, shall adopt rules under RSA 541-A specifying the standards, criteria, and procedures by which a protected instream flow shall be established and enforced for each designated river or segment.
Chapter 242:1, Laws of 2000	Impact Of Water Withdrawals On Instream Flows Study Committee (SB 330) (http://www.gencourt.state.nh.us/statstudcomm/details.aspx?id=1528&rbl=1&chkcs=1&chksc=1&txtbillnumber=sb330)
Chapter 278, Laws of 2002	Instream Flow Pilot Legislation <ul style="list-style-type: none"> • Pilot on Lamprey and Souhegan • Technical Review Committee • Water Management Planning Area Advisory Committee (http://des.nh.gov/organization/divisions/water/wmb/rivers/instream/documents/ch278.pdf)
Chapter 319, Laws of 2003	Sections that pertain to Instream Flow Pilot Program are Section 319:48 through 319:51 (http://www.gencourt.state.nh.us/legislation/2003/HB0004.html)
Chapter 5, Laws of 2008	Sections that pertain to Instream Flow Pilot Program are Sections 5:2 through 5:4 (http://www.gencourt.state.nh.us/legislation/2008/HB1601.html)
Chapter 5, Laws of 2008	Sections that pertain to Instream Flow Pilot Program are Sections 5:2 through 5:4 (http://www.gencourt.state.nh.us/legislation/2008/HB1601.html)
Chapter 201, Laws of 2009	Sections that pertain directly to Instream Flow Pilot Program are Sections 201:3, 201:4, 201:19 and 201:20 (http://www.gencourt.state.nh.us/legislation/2009/HB0102.html)
Chapter 63, Laws of 2011	Time Extension (http://www.gencourt.state.nh.us/legislation/2011/HB0063.html)
Chapter 241, Laws of 2013	Time Extension; including report requirements : (c) By December 1, 2015, submit a final report that details the activities and results of the pilot program, including the impacts of the protected instream flows and water management plans on water users, wildlife, recreation, and other interests along the rivers, a plan for implementing protected instream flows and water management plans for other rivers designated under RSA 483:15, and any recommendations for proposed legislation. The report shall also include a summary of public comments received, the completed instream flow studies, and the adopted protected instream flow levels and water management plans and shall be submitted to the senate energy, environment and economic development committee, the house resources, recreation and development committee, the senate president, the speaker of the house of representatives, the governor, the committee to study the impact of water withdrawals on instream flows established under 2000, 242:1, and the state library. (http://www.gencourt.state.nh.us/legislation/2013/HB0588.pdf)

Describing Water Quality Standards applicable to instream flow protection

<p>State of NH - Consolidated Assessment and Listing Method</p>	<p>Designated uses - p. 5 3.1.2 Designated Uses “Designated uses are the desirable uses that surface waters should support such as swimming (i.e., primary contact recreation) and fishing (i.e., aquatic life). As discussed in Section 2.2, State statute (RSA 485-A:8) is somewhat general with regards to designated uses for New Hampshire surface waters. Further review and interpretation of the regulations (Env-Wq 1700), however, reveals that the general uses can be expanded and refined to include the seven specific designated uses shown in Table 3-4.” http://des.nh.gov/organization/divisions/water/wmb/swqa/documents/calm.pdf</p>
<p>Antidegradation "What is Antidegradation?"</p>	<p>Env-Wq 1702.02 “Antidegradation” means a provision of the water quality standards that maintains and protects existing water quality and uses. http://des.nh.gov/organization/commissioner/legal/rules/documents/env-wq1700.pdf “What is Antidegradation?” NHDES Fact Sheet WD-WMB-23 http://des.nh.gov/organization/commissioner/pip/factsheets/wmb/documents/wmb-23.pdf</p>
<p>Water quality criteria Env-Wq 1700</p>	<p>Surface Water Quality Regulations</p> <ul style="list-style-type: none"> • Biological integrity • Chemical integrity • Physical integrity • Designated Uses <p>http://des.nh.gov/organization/commissioner/legal/rules/documents/env-wq1700.pdf</p>
<p>Rules for the Protection of Instream Flow on Designated Rivers - Env-Wq 1900</p>	<p>Protected Flow Studies Water Management Plans</p> <ul style="list-style-type: none"> • Conservation Plan • Water Use Plan • Dam Management Plan <p>http://des.nh.gov/organization/commissioner/legal/rules/documents/env-wq1900.pdf</p>

Table 3-4 (from 2012 NH CALM*): Designated Uses for New Hampshire Surface Waters		
Designated Use	DES Definition	Applicable Surface Waters
Aquatic Life	Waters that provide suitable chemical and physical conditions for supporting a balanced, integrated and adaptive community of aquatic organisms.	All surface waters
Fish Consumption	Waters that support fish free from contamination at levels that pose a human health risk to consumers.	All surface waters
Shellfish Consumption	Waters that support a population of shellfish free from toxicants and pathogens that could pose a human health risk to consumers	All tidal surface waters
Drinking Water Supply After Adequate Treatment	Waters that with adequate treatment will be suitable for human intake and meet state/federal drinking water regulations.	All surface waters
Primary Contact Recreation (i.e. swimming)	Waters suitable for recreational uses that require or are likely to result in full body contact and/or incidental ingestion of water	All surface waters
Secondary Contact Recreation	Waters that support recreational uses that involve minor contact with the water.	All surface waters
Wildlife	Waters that provide suitable physical and chemical conditions in the water and the riparian corridor to support wildlife as well as aquatic life.	All surface waters

* - CALM = Consolidated Assessment and Listing Methodology - a framework for states to document how they collect and use water quality data and information for environmental decision making.
<http://des.nh.gov/organization/divisions/water/wmb/swqa/documents/calm.pdf>

Water Conservation and Water Registration statutes and rules	
RSA 485: NEW HAMPSHIRE SAFE DRINKING WATER ACT	<p>485:61 Rules for Water Conservation. –</p> <p>I. The department shall adopt rules, pursuant to RSA 541-A, for water conservation practices for water users. These rules shall strike a reasonable balance between environmental, energy, and economic impacts and be consistent with current industry standards and practices for different types of water users.</p> <p>II. The water conservation rules in paragraph I of this section shall apply to all new permit applicants and applications for water withdrawals subject to the provisions of RSA 485:3, RSA 485:48, RSA 485-C:21 and section 401 of the Clean Water Act.</p> <p>III. Water conservation rules shall be consistent with applicable state or federal rules and regulations. Source. 2002, 142:2, eff. July 12, 2002. http://www.gencourt.state.nh.us/rsa/html/1/485/485-61.htm</p>
PART Env-Wq 2101 WATER CONSERVATION	<p>Env-Wq 2101.02 Applicability.</p> <p>(a) As specified in RSA 485:61, II, these rules shall apply to “all new permit applicants and applications for water withdrawals subject to the provisions of RSA 485:3, RSA 485:48, RSA 485-C:21 and section 401 of the Clean Water Act.”</p> <p>(b) Pursuant to Laws of 2002, 142:3, effective July 12, 2002, the “rules developed under RSA 485:61 shall apply to all new water withdrawal permit applications approved under RSA 485:61, II on or after the effective date of this act.” http://des.nh.gov/organization/commissioner/legal/rules/documents/env-wq2101.pdf</p>
RSA 488: WATER MANAGEMENT	<p>488 Water Management</p> <p>488:3 Registration Required. –</p> <p>I. No person shall withdraw or discharge a cumulative amount of more than 20,000 gallons of water per day, averaged over any 7-day period, or more than 600,000 gallons of water over any 30-day period, at a single real property or place of business without registering the withdrawal or discharge with the department. Transfers of such volume of water shall also be registered. Registration shall be in addition to any required permits. http://www.gencourt.state.nh.us/rsa/html/NHTOC/NHTOC-L-488.htm</p>
PART Env-Wq 2102 WATER USE REGISTRATION AND REPORTING	<p>Env-Wq 2102.01 Purpose. The purpose of these rules is to implement RSA 488 by establishing requirements relative to documenting the identity and location of water uses and collecting accurate water use data to support management of the state’s water resources.</p> <p>Env-Wq 2102.02 Applicability.</p> <p>(a) The rules in this part shall apply to any person required to register a water use under RSA 488:3, I, namely any person whose cumulative incoming water or cumulative outgoing water exceeds an average of 20,000 gallons of water per day in any 7-day period, or exceeds a total volume of 600,000 gallons in any 30-day period. http://des.nh.gov/organization/commissioner/legal/rules/documents/env-wq2102toc.pdf</p>

Appendix C
The Completed Instream Flow Studies

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Appendix C - The Completed Instream Flow Studies

Souhegan River Protected Instream Flow Report

The Souhegan River Protected Instream Flow Report, dated 26 February 2008, with its associated appendices, is here incorporated by reference.

The Souhegan River Protected Instream Flow Report is available online under Task 7 at <http://des.nh.gov/organization/divisions/water/wmb/rivers/instream/souhegan/study.htm>.

Compact discs containing the report in .pdf format are available from NHDES.

Paper copies of the Souhegan River Protected Instream Flow Report are available for review at the NHDES Public Information Center in Concord, the Wadleigh Memorial Library in Milford, the Merrimack Public Library, and the New Ipswich Public Library.

Lamprey River Protected Instream Flow Report

The Lamprey River Protected Instream Flow Report, dated 13 July 2009, with its associated appendices, is here incorporated by reference.

The Lamprey River Protected Instream Flow Study report is available online under Task 7 at <http://des.nh.gov/organization/divisions/water/wmb/rivers/instream/lamprey/study.htm>.

Compact discs containing the report in .pdf format are available from NHDES.

Paper copies of the Lamprey River Protected Instream Flow Report are available at the NHDES Public Information Center in Concord, the Lee Public Library, and the Durham Public Library.

Appendix D
Established Protected Instream Flows

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Appendix D – Established Protected Instream Flows

Souhegan River Established Protected Instream Flows

The Souhegan River Protected Instream Flows were formally established by the NHDES Commissioner on April 1, 2008 and amended on August 30, 2013. The Protected Instream Flows are here incorporated by reference.

Declaration of the Establishment of Protected Instream Flows for the Souhegan Designated River
http://des.nh.gov/organization/divisions/water/wmb/rivers/instream/souhegan/documents/pisf_signed.pdf

Instream Protected Flows for the Segments of the Souhegan River Designated as Protected Pursuant to RSA 483:15, XIII (Table 1)
http://des.nh.gov/organization/divisions/water/wmb/rivers/instream/souhegan/documents/pisf_table1.pdf

Souhegan River Instream Protected Flows - Definitions
http://des.nh.gov/organization/divisions/water/wmb/rivers/instream/souhegan/documents/pisf_table1att.pdf

Compact discs containing the documents referenced above in .pdf format are available from NHDES.

The table of Instream Protected Flows for the Segments of the Souhegan River is incorporated into the Souhegan River Protected Instream Flow Report. Paper copies of this report are available for review at the NHDES Public Information Center in Concord, the Wadleigh Memorial Library in Milford, the Merrimack Public Library, and the New Ipswich Public Library.

Lamprey River Established Protected Instream Flows

The Lamprey River Protected Instream Flows were formally established by the NHDES Commissioner on August 30, 2013. The Protected Instream Flows are here incorporated by reference.

Declaration of the Establishment of Protected Instream Flows for the Lamprey Designated River
<http://des.nh.gov/organization/divisions/water/wmb/rivers/instream/lamprey/documents/20130830lr-pisf-establ.pdf>

Instream Protected Flows for the Segments of the Lamprey River Designated as Protected Pursuant to RSA 483:15, I (Table 1)
<http://des.nh.gov/organization/divisions/water/wmb/rivers/instream/lamprey/documents/20110608lr-pisf-table1.pdf>

Lamprey River Instream Protected Flows - Definitions
<http://des.nh.gov/organization/divisions/water/wmb/rivers/instream/lamprey/documents/20110608lr-pisf-attach.pdf>

Compact discs containing the documents referenced above in .pdf format are available from NHDES.

The table of Instream Protected Flows for the Segments of the Lamprey River is incorporated into the Lamprey River Protected Instream Flow Report. Paper copies of this report are available for review at the NHDES Public Information Center in Concord, the Lee Public Library, and the Durham Public Library.

Appendix E
Adopted Water Management Plans

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Appendix E – The Adopted Water Management Plans

Souhegan River Water Management Plan

The Souhegan River Water Management Plan, dated 30 August 2013, with its associated appendices, is here incorporated by reference.

The Souhegan River Water Management Plan is available online under Task 12 at <http://des.nh.gov/organization/divisions/water/wmb/rivers/instream/Souhegan/water-management-plan.htm>.

Compact discs containing the report in .pdf format are available from NHDES.

Paper copies of the Souhegan River Water Management Plan report are available for review at the NHDES Public Information Center in Concord, the Wadleigh Memorial Library in Milford, the Merrimack Public Library, and the New Ipswich Public Library.

Lamprey River Water Management Plan

The Lamprey River Water Management Plan, dated 28 August 2013, with its associated appendices, is here incorporated by reference.

The Lamprey River Water Management Plan is available online under Task 12 at <http://des.nh.gov/organization/divisions/water/wmb/rivers/instream/lamprey/water-management-plan.htm>.

Compact discs containing the report in .pdf format are available from NHDES.

Paper copies of the Lamprey River Water Management Plan are available at the NHDES Public Information Center in Concord, the Lee Public Library, and the Durham Public Library.

Appendix F
Protected Entities Defined

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Appendix F - Protected Entities Defined

The attached paper was developed in 2004 for the Pilot Program. The paper was developed to identify and define the types of protected entities listed in RSA 483 – The New Hampshire Rivers Management and Protection Program Act. The paper was presented for review and accepted by the Souhegan and Lamprey Technical Review Committees. The Pilot Program evaluated whether these entities were present on the Souhegan and Lamprey Designated Rivers. Instream flow protections were determined for the flow-dependent instream public uses as required by RSA 483. The paper was revised recently to update the names of rules that were renamed.

RSA 483:9-c, Establishment of Protected Instream Flows, requires that “instream flows be established and enforced to maintain water for instream public uses and to protect the resources for which the river or segment is designated,” but continues by saying that the instream flow shall respect riparian interests on each designated river or segment, as long as the instream flows remain “consistent with the purposes of this chapter.” The statement of policy section says the state shall regulate the quantity and quality of instream flow along certain protected rivers or segments of rivers to conserve and protect outstanding characteristics.

The list below shows that RSA 483 describes many competing interests, but the final sentence in the 483:1 Statement of Policy gives a priority to the assemblage. “If conflicts arise in the attempt to protect all valued characteristics within a river or stream, priority shall be given to those characteristics that are necessary to meet state water quality standards.” RSA 483’s intent to “complement and reinforce existing state and federal water quality laws” sets the state’s surface water quality regulations firmly as directives for the instream flow program under this act.

New Hampshire water quality standards applicable to flow include Env-Wq 1703.01(d) which states “Unless the flows are caused by naturally occurring conditions, surface water quantity shall be maintained at levels adequate to protect existing and designated uses.” Designated uses are described in the 2012 Consolidated Assessment and Listing Methodology (and are proposed for inclusion without changes in revisions to the water quality standards). Designated uses that are flow dependent include wildlife, and chiefly aquatic life support. All other uses may have some interest in water, but are not flow dependent.

Further, in addition to restoration for existing and designated uses, New Hampshire water quality standards require in Env-Wq 1703.01 (b) that “All surface waters shall be restored to meet the water quality criteria for their designated classification including existing and designated uses, and to maintain the chemical, physical, and biological integrity of surface waters” and in (c) that “All surface waters shall provide, wherever attainable, for the protection and propagation of fish, shellfish and wildlife, and for recreation in and on the surface waters.” The key elements of these are the reiteration of protections for aquatic life and wildlife in (c) and the need to restore surface waters to maintain biological integrity.⁵

⁵ Physical integrity is not defined in rule or statute. Chemical integrity is assumed to be quantified by existing statutes and water quality rules.

Biological integrity is also defined in the surface water quality rules, Env-Wq 1702.07, as “the ability of an aquatic ecosystem to support and maintain a balanced, integrated, adaptive community of organisms having a species composition, diversity, and functional organization comparable to that of similar natural habitats of a region.” The requirement that biological communities have characteristics similar to those in natural habitats appears to express an objective of providing flow conditions that support an ecosystem similar to a natural ecosystem.

**DEFINED FOR PISF STUDY –
INSTREAM PUBLIC USES, OUTSTANDING CHARACTERISTICS, AND RESOURCES**

The following table represents the Department’s understanding of the meaning of the Instream Public Uses, Outstanding Characteristics, and Resources that are listed in RSA 483 that the New Hampshire legislature has identified as criteria for the Protected Instream Flow. These definitions shall be used by the Protected Instream Flow contractor to identify Instream Public Uses, Outstanding Characteristics, and Resources on the Designated River.

In the table below, the Department has matched similar components of Instream Public Uses, Outstanding Characteristics, and Resources that are listed in various parts of RSA 483. Definitions of each entity have been given that describe the entities as they are relevant to instream flow protection. Wherever possible, the definitions were drawn from descriptions in the rules for Designated River nomination criteria under Env-C 700 RIVERS MANAGEMENT AND PROTECTION PROGRAM. [This document revised from original dated February 13, 2004.]

Instream public uses	Outstanding characteristics	Resources	Definition
<i>Env-Ws 1905.02 Protected Instream Flow Study. The protected instream flow study shall:</i>			
(c) For each segment, identify and catalog all instream public uses on the designated river listed under RSA 483:9-c.I, and designated uses under the federal Clean Water Act;	(b) For each segment, identify and catalog all outstanding characteristics listed under RSA 483:1;	(d) For each segment, identify and catalog all resources for which the river or segment is designated pursuant to RSA 483:6 IV a.	
include the state's interests in surface waters, including, but not limited to, navigation; recreation; fishing; storage; conservation; maintenance and enhancement of aquatic and fish life; fish and wildlife habitat; wildlife; the protection of water quality and public health; pollution abatement; aesthetic beauty; and hydroelectric energy production	including recreational, fisheries, wildlife, environmental, cultural, historical, archaeological, scientific, ecological, aesthetic, community significance, agricultural, and public water supply so that these valued characteristics shall endure as part of the river uses to be enjoyed by New Hampshire people	Whether the river, or segment or segments of such river, contain or represent either a significant statewide or local example of one or more of the following: (1) Scenic or recreational resource. (2) Open space or natural resource. (3) Fisheries, wildlife, vegetation, and rare species or habitat. (4) Cultural,	

Instream public uses	Outstanding characteristics	Resources	Definition
		historical, or archaeological resource. (5) Hydrological or geological resource. (6) Water quality. (7) Scientific resource. (8) Community resource. (9) Current and projected withdrawals, discharges, or both, by public utilities and commercial or industrial users.	
Navigation			Navigation means use of the river for non-recreational, transportation purposes.
Recreational	Recreational	Recreational resource	Recreational use or resource means use of the river for swimming, boating or significant shoreland recreation, including, but not limited to, hiking, camping, picnicking, and bird watching.
Fishing	Fisheries	Fisheries	Fishing and Fisheries means recreational and commercial uses of the river for fishing identified by the presence of fish that are caught for recreation or commercial use.
		Open space resource	Open space means flow-dependent, characteristics of open space including, but not be limited to, national forest lands, state parks and forests, municipal parks, and conservation easements. There may be little or no flow-related issues concerning maintenance of open space.
		Natural resource	Natural resource means geologic, wildlife, endangered or threatened animals, wildlife habitat, wildlife travel corridor, vegetation/natural communities, fish resources, aquatic habitat for fish populations, a fishery that relies on natural reproduction or a stocking program, anadromous fish or a restoration effort, Class A waters or water quality equal to Class A or a Class B water or water quality equal to Class B, open space, natural flow characteristics. This category should only be invoked where the resource does not fit into another category.
Storage			Storage means the natural or man-made attributes of a river for water storage. Only Community

Instream public uses	Outstanding characteristics	Resources	Definition
			Rivers are subject to new dam construction.
Wildlife	Wildlife	Wildlife	Wildlife for this purpose shall mean species that rely on flow and flow to regions, including, but are not limited to, waterfowl breeding or wintering areas, freshwater wetlands or riparian habitat, and saltwater wetlands associated with estuarine systems
		Rare species or habitat	Rare species are identified by lists of plants and animals or fish available from NHI and by the nomination papers. Rare habitats are habitats that support rare species or are rare ecosystems.
		Vegetation	Vegetation means native, flow-dependent species
	Environmental		Flow-dependent issues not included in other categories are unlikely.
Conservation			Flow-dependent issues not included in other categories are unlikely.
	Cultural	Cultural resource	Cultural resources or characteristics mean on-going river corridor management planning effort or other local efforts to protect or manage the river, the existence of a riverside park or other public area, or community support for riverfront revitalization as demonstrated by acts such as the filing of a petition, establishment of a municipal committee or citizen group, or fundraising activities.
		Historical resource	Flow-dependent issues are unlikely.
	Archaeological	Archaeological resource	Flow-dependent issues are unlikely.
Maintenance and enhancement of aquatic and fish life			Maintenance and enhancement of aquatic and fish life means the web of aquatic species that make up a balanced, integrated, and adaptive community of organisms having a species composition, diversity, and functional organization comparable to that of similar natural habitats of a region.
		Hydrological resource	Hydrologic resource means natural flow characteristics meaning the river is free-flowing, such that the river is 100 percent free-flowing with no man-made dams, diversions, or other modifications which affect the river's natural flow or the river is largely free-flowing without characteristics of impoundment excluding low dams, diversion works and other minor modifications.
		Geological resource	A geologic resource meaning a national, regional, state, or local geologic resource as determined by the state geologist or as listed in a national or

Instream public uses	Outstanding characteristics	Resources	Definition
			state resource assessment. Flow-dependent issues are unlikely.
Fish habitat			Fish habitat means regions which are important to the survival of fish populations. Such regions include, but are not limited to, aquatic life spawning beds and feeding areas, freshwater wetlands or riparian habitat, and saltwater wetlands associated with estuarine systems.
Wildlife habitat			Wildlife habitat means habitat for game and non-game wildlife populations. Such regions include waterfowl breeding or wintering areas, freshwater wetlands or riparian habitat, and saltwater wetlands associated with estuarine systems.
	Historical		Flow-dependent issues are unlikely.
	Scientific	Scientific resource	It is not clear what is desired to be protected by this item.
Protection of water quality and public health		Water quality	Water quality and public health are the flow-dependent characteristics that maintain water quality of the river including, but not limited to and the maintenance of chemical and physical water quality parameters that support designated and existing uses. Identify water quality as Class A or Class B.
	Community significance	Community resource	Community river resource means a natural, managed, cultural, or recreational resource or use thereof associated with a river that is recognized by local residents or a municipal document accepted by the municipality, such as a master plan or a water resource management plan, as being important to a community adjacent to a river. "Recognized by local residents" for the purposes of this definition means that there are community projects, activities or events based on the river or its corridor such as river clean-ups, canoe races, or a riverfest. Community significance shall not include hydroelectric power generation.
Pollution abatement		Current and projected discharges by a public utility, commercial or industrial user	Pollution abatement and discharges include wastewater treatment facilities or industrial treatment facilities and aspects of flow affecting assumptions of flow for dilution and dispersal of waste in mixing zones and the rivers overall capacity to mitigate natural and non-point source contamination.
	Ecological		Ecology is a natural ecological community as determined by the NH natural heritage inventory.
Aesthetic beauty	Aesthetic	Scenic resource	Scenic sites shall include, but not be limited to, designated viewing areas, scenic vistas, and

Instream public uses	Outstanding characteristics	Resources	Definition
Hydroelectric energy production			<p>overlooks.</p> <p>Hydroelectric energy production is an existing hydroelectric facility on any classification of designated river, or a former hydroelectric facility site that has been unused for fewer than six years on a Rural or Rural-Community river. The description of potential site of hydroelectric facilities on Community rivers is beyond the scope of this project and should be clearly stated as such in the PISF report.</p>
	Agricultural		<p>Agriculture as defined by RSA 21:34:a. http://gencourt.state.nh.us/rsa/html/i/21/21-34-a.htm</p>
	Public water supply	Withdrawals by a public utility, commercial or industrial user	<p>A public water supply is an existing source of public drinking water that meets the Department's description of a public water system as stated in Env-Dw 103.43 "Public water system" means "public water system" as defined in RSA 485:I-a, XV, as reprinted in Appendix B.</p> <p>"XV. "Public water system" means a system for the provision to the public of piped water for human consumption, if such system has at least 15 service connections or regularly serves an average of at least 25 individuals daily at least 60 days out of the year. Such term includes (1) any collection, treatment, storage, and distribution facilities under control of the operator of such system and used primarily in connection with such system, and (2) any collection or pretreatment storage facilities not under such control which are used primarily in connection with such system. Any water system which meets all of the following conditions is not a public water system:</p> <p>(a) Consists only of distribution and storage facilities (and does not have any collection and treatment facilities);</p> <p>(b) Obtains all of its water from, but is not owned or operated by, a public water system; and</p> <p>(c) Does not sell water to any person."</p> <p>The identification of all projected water supplies is beyond the scope of this project and should be clearly stated as such in the PISF report.</p>
Clean Water Act designated uses			<p>Use of the river shall not degrade the flow-dependent uses as instream public uses of the DR designated by the state under the CWA. The state's designated uses and criteria defining support of these uses are in the following</p>

Instream public uses	Outstanding characteristics	Resources	Definition
			<p>paragraphs taken from the CALM.</p> <p><u>Aquatic Life</u> Waters that provide suitable chemical and physical conditions for supporting a balanced, integrated and adaptive community of aquatic organisms. Applicable to all surface waters.</p> <p><u>Fish Consumption</u> Waters that support fish free from contamination at levels that pose a human health risk to consumers. Applicable to all surface waters.</p> <p><u>Shellfish Consumption</u> Waters that support a population of shellfish free from toxicants and pathogens that could pose a human health risk to consumers. Applicable to all tidal surface waters.</p> <p><u>Drinking Water Supply</u> Waters that with conventional treatment will be suitable for human intake and meet state/federal drinking water regulations. Applicable to all fresh surface waters.</p> <p><u>Primary Contact Recreation</u> (i.e. swimming) Waters suitable for recreational uses that require or are likely to result in full body contact and/or incidental ingestion of water. Applicable to all surface waters.</p> <p><u>Secondary Contact Recreation</u> Waters that support recreational uses that involve minor contact with the water. Applicable to all surface waters.</p> <p><u>Wildlife</u> Waters that provide suitable physical and chemical conditions in the water and the riparian corridor to support wildlife as well as aquatic life. Applicable to all surface waters.</p>

*Revised with rules effective June 1, 2014.

CALM= New Hampshire's Consolidated Assessment and Listing Methodology

CWA = Clean Water Act

DR = designated river

PISF=protected instream flow

Appendix G
COMPREHENSIVE SURFACE WATER RESOURCE MANAGEMENT
by
NH Lakes Management Advisory Committee
and
NH Rivers Management Advisory Committee

Appendix to the
New Hampshire Dept. of Environmental Services
Report of the Instream Flow Pilot Program
R-WD-15-1
December 1, 2015

January 23, 2013

**NH Lakes Management Advisory Committee
and
NH Rivers Management Advisory Committee**

COMPREHENSIVE SURFACE WATER RESOURCE MANAGEMENT

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BACKGROUND

The goal of water resource management is to balance competing demands between users and uses of water. Two of the programs defined by the New Hampshire legislature to manage and protect surface water resources for natural and human uses are the Rivers Management and Protection Program¹ and the Lakes Management and Protection Program,² which were created to protect surface water resources and promote their management for natural and human uses. A component of the Rivers Management and Protection Program, the Instream Flow Pilot Program has the potential to affect lake operations in its management of stream flows and conversely, lake level management can impact stream flows. Committee members from these two programs recognized that conflicts will arise when management to improve conditions for one waterbody may negatively impact another waterbody. This document provides recommendations to balance the management effects on surface waters of the state.

"Public waters" in New Hampshire are prescribed by common law as great ponds (natural waterbodies of 10 acres or more in size), tidal waters, and public rivers. These common law public waters are held by the State in trust for the people of New Hampshire. The fundamental goals of the Rivers Management and Protection Program and the Lakes Management and Protection Program are to protect the quality and appropriate uses of New Hampshire's rivers and lakes. Withdrawal and use of water resources, lake management, as well as land use changes and development may result in altering the natural fluctuations in water levels in lakes and shifting flow patterns in rivers. These alterations have been shown to diminish water quality in lakes and rivers.³ Continued and expanded demand for water requires holistic planning and management to remediate and mitigate the effects of altered flow and lake level conditions in order to protect water resources.

The Clean Water Act and state water quality rules require that Surface Water Quality Standards be met for both rivers and lakes. Effective water resources management requires coordinated management of the lakes and rivers within a watershed. Currently, rivers and lakes are managed separately as individual waterbodies or river segments and with differing criteria. The result is a patchwork of protection within a watershed, conflicting outcomes and inconsistent public participation. These recommendations are intended to guide DES in resolving conflicts between lake and river water quality and quantity needs.

¹ New Hampshire Rivers Management and Protection Program, <http://www.gencourt.state.nh.us/rsa/html/L/483/483-mrg.htm>.

² New Hampshire Lakes Management and Protection Program, <http://www.gencourt.state.nh.us/rsa/html/L/483-A/483-A-mrg.htm>.

³ http://www.vtwaterquality.org/wqd_mgtplan/stressor_flowalt.htm

Applicable Regulatory Authority

Water quality and Designated Uses are maintained and protected through the Water Quality Standards, which include RSA 485A:8, Classification of Water, and Env-Wq 1700, Surface Water Quality Regulations. The Rivers and Lakes Management and Protection Programs, in RSA 483 and RSA 483-A respectively, reinforce the obligation to protect water quality in these waterbodies. Relevant sections of these regulations may be found in the Appendix.

Surface Water Quality Standards

RSA 485A:8⁴ establishes that all New Hampshire surface waters must be classified as either Class A or Class B waters, and establishes certain minimum surface water quality criteria for each classification. The Surface Water Quality Regulations in Env-Wq 1700⁵ provide further direction to safeguard New Hampshire's waters through protection criteria for: 1) Designated Uses; 2) Antidegradation provisions; and 3) the establishment of additional water quality criteria, including both numeric and narrative water quality standards.

Designated Uses⁶ represent the uses that a waterbody should support. The Designated Uses for New Hampshire waters are:

1. Aquatic life
2. Fish and shellfish consumption
3. Drinking water supply
4. Primary and secondary contact recreation (swimming and boating)
5. Wildlife

Surface Water Quality Regulations describe numeric and narrative water quality standards. The water quality criteria include water quality and water quantity conditions necessary to protect the biological and aquatic community in surface waters. Narrative criteria for stream flow and water levels must be defined numerically. Numeric criteria are being developed for river flows under the Instream Flow Pilot Program and draft guidance for evaluating lake level fluctuation limits are being developed as described below.

Antidegradation provisions protect and maintain the quality of state surface waters by establishing a process for review and justification of proposed activities that would increase pollutant loads, degrade water quality, or otherwise adversely affect the uses of a waterbody. Any activity that is proposed and would potentially result in significant lowering of water quality must show that the activity is necessary for important economic or social development in the area where the waterbody is located.⁷

Rivers

The Rivers Management and Protection Program Act identifies protections for Designated Rivers under the Rivers Program. The Program's intent is to support water quality laws which include maintaining the levels adequate to protect Designated Uses.

⁴ <http://www.gencourt.state.nh.us/rsa/html/L/485-A/485-A-8.htm>

⁵ <http://des.nh.gov/organization/commissioner/legal/rules/documents/env-wq1700.pdf>

⁶ NH's Designated Uses are described in the NH Consolidated Assessment and Listing Methodology <http://des.nh.gov/organization/divisions/water/wmb/swqa/documents/calm.pdf>

⁷ DES Fact Sheet - What is Antidegradation? <http://des.nh.gov/organization/commissioner/pip/factsheets/wmb/documents/wmb-23.pdf>

The Act also describes an Instream Flow Program to be applied to certain designated rivers. RSA 483:9c of the Rivers Management and Protection Act⁸ requires development of criteria to establish protected instream flows along with a management plan to implement those flows. A protected instream flow is the amount of water needed to support the instream human and natural uses that depend on the river. The Instream Flow Program translates the narrative standards in the Surface Water Quality Regulations into numeric thresholds.

Instream Flow Rules adopted in 2003⁹ describe the methods for applying flow management including requirements for conservation and water use changes by water users and for management of impoundments by dam owners. Flow criteria are developed from site specific studies of river resources and characteristics to generate numerical flow standards. These rules did not include guidance for management of lakes other than management would be negotiated with the dam owner, although other stakeholders' input must be considered during the development of the process and the specific management plans. Stakeholders include the NH Department of Fish and Game and the Department of Resources and Economic Development, among others. No specific process was described for protection of lake interests under the Instream Flow Rules. However, the Lakes Management and Protection Program Act and the Surface Water Quality Rules apply to all aspects of the Instream Flow management.

Lakes

The intent of the Lakes Management and Protection Program Act (RSA 483-A) is to identify management measures to enhance the environmental, biological, social and economic assets as well as the public health and recreational enjoyment of lakes. The Program strives to recommend lake protection activities, provide technical assistance, and support water quality laws. Some of these laws include provisions for maintaining adequate lake levels to protect Designated Uses.

At this time there are no numerical water quality criteria for managing impoundment and lake levels, but draft guidance has been developed.¹⁰ Under the draft lake fluctuation guidance the range of variability of natural lake levels is used as one of the guidelines for management. The natural variability represents the range of conditions that are known to support the natural ecosystem. Assessments of other uses of the lake, such as recreation, are also part of developing a lake's management. The final management plan balances these components to meet water quality standards and support existing uses.

The draft guidance is being developed for evaluating lake level fluctuations to meet biological and aquatic community integrity when determining whether to issue or deny Water Quality Certification for proposed water withdrawals and hydrologic modifications per RSA 485-A:12, III and IV. This draft guidance describes an assessment process for evaluating the effect of changes to lake levels when a change to lake management is proposed. The assessment process evaluates the proposed changes in comparison with the range of natural water level changes and with the limits of antidegradation provisions. Using the natural range of variability for management of lake levels parallels the proposed New Hampshire protected instream flow management criteria for rivers.

The concept of natural lake level fluctuations is being used in other states. For example, Chapter 587 of Maine law requires the natural variation of water level as a permit condition. "Water level requirements take into account natural variation of water levels that occur in Maine lakes and ponds, and the uses and

⁸ RSA 483:9-c Establishment of Protected Instream Flows - <http://www.gencourt.state.nh.us/rsa/html/l/483/483-9-c.htm>. The RMPP Act was modified in Chapter 278, Laws of 2002, creating a pilot program to apply instream flow protection initially only to the Lamprey and Souhegan Designated Rivers.

⁹ Chapter Env-Wq 1900 Rules For The Protection Of Instream Flow On Designated Rivers; readopted in 2011 with amendment; <http://des.nh.gov/organization/commissioner/legal/rules/documents/env-wq1900.pdf>

¹⁰ Draft lake level fluctuation assessment process is called "Process for Determining Appropriate Water Level Fluctuations in Impoundments for Water Quality Certifications"; current version revised July 17, 2012.

characteristics assigned by the water quality classification program. Water level is managed to provide variation that takes into account expected seasonal levels shown to protect aquatic resources and other water quality standards. Flows or water levels established by regulatory permit shall be based on the results of a site-specific flow or water level study, taking into account the need for natural variation of flow and natural variation of water level.”¹¹

Approach

The fundamental goal of water management is to attain Surface Water Quality Standards in all surface waterbodies while providing sufficient water to support a variety of appropriate uses. Attaining standards includes restoring surface waterbodies to maintain physical, chemical and biological integrity¹² such that Designated Uses are protected. Supporting biological integrity in rivers means maintaining flows that mimic the natural patterns to which an ecosystem is adapted.¹³ Similarly, lake level changes that are maintained within the range of natural variation will be most supportive of ecological needs and water quality criteria.

These recommendations establish guidelines for applying instream flow protections to rivers together with management for lake level protections such that each may be supported. Management must balance water quality standards on both lakes and rivers with existing uses. These recommendations take into account and accept that the water level of most waterbodies in New Hampshire has been altered by damming and results in new baseline conditions. In such scenarios where the dam will remain, these new reference water levels will be considered when proposing management changes. Thus, while lake levels are not generally managed within a range of natural variation, as management plans are developed they should strive to use a natural lake level variability as a framework to represent universal water quality protections.

Implementation of these concepts may require the development, on a site-specific basis, of numeric thresholds for lake levels or river flows that indicate attainment of Water Quality Standards. In addition, site-specific conditions may be further evaluated under the Antidegradation provisions of the Surface Water Quality Regulations in order to maintain existing high quality conditions.

Water is a finite, but reusable and renewable, resource. Fortunately, water may be used many times as it moves from its headwaters to the sea. Sustainable water management can take advantage of this because most water use is not consumptive. Water that is used and returned to be used again provides for more sustainable use. However, upgrades and repairs to aging infrastructure must be designed to return the used water as close as possible to the withdrawal site in order to reduce losses and leakage, and to support the reuse of water within a watershed.

¹¹ Maine Department of Environmental Protection, Chapter 587: IN-STREAM FLOWS AND LAKE AND POND WATER LEVELS, <http://water.epa.gov/scitech/swguidance/standards/wqslibrary/upload/06-096-CMR-587-2011-06.pdf>.

¹² Env-Wq 1703.01(b)

¹³ Poff, N. L. et al. 1997. The Natural Flow Regime. *BioScience* Vol. 47, No. 11: pp. 769-784. http://www.fs.fed.us/stream/Poffetal_1997.pdf

GUIDING PRINCIPLES

Together, the New Hampshire Lakes and Rivers Management Advisory Committees recommend the following principles for DES evaluation of water resource management decisions. The committees believe these principles should be followed because adherence to these principles will ensure balanced and sustainable water use and attainment of water quality standards for river flows and lake levels. These Guiding Principles are intended to be applied simultaneously and their order below does not represent a hierarchy.

1) Support Designated Uses in all surface waters.

Water resource management should result in the maintenance and restoration of Designated Uses of all surface waters. Attainment of water quality standards requires protection of Designated Uses, which are affected by both water quality and water quantity. Standards include the requirement to restore both river flows and lake levels to maintain chemical, physical, and biological integrity. Where surface water quality will be degraded, this degradation shall not exceed the limits of the Antidegradation provisions. Under Antidegradation provisions, water quality should be maintained well above the minimum standards that support Designated Uses. Thus, all parties should strive to maximize the water quality and quantity conditions and Designated Uses of all water resources.

2) Water resources management includes all waters and uses.

All lakes, impoundments, rivers, and water withdrawals and water returns in a watershed should be included in a comprehensive water resources management program. Water bodies and water uses all occur within the context of a larger watershed-wide water resource. Management of lakes has the capacity to deprive or to supply water to the downstream river. Balancing the roles of both rivers and lakes in the management of the water resource is necessary to meet water quality goals. Management must not unduly damage one resource to protect or enhance another. Watershed plans should be developed, and where they exist, should address attaining water quality standards by including lakes, impoundments, rivers, water withdrawals and water returns as interrelated management components, not as independent entities.

3) Imitate natural water conditions to meet Surface Water Quality Standards.

Imitating natural water level conditions in lakes and river flow conditions in rivers is the most appropriate way to ensure Water Quality Standards for aquatic life are protected. Naturally, neither river flows nor lake levels are static over time. Most organisms cannot adapt and survive as quickly as changes, such as alteration of river flows and lake levels, are made to their essential habitats. It takes many centuries or longer for fish and other aquatic organisms to genetically adapt to the natural range of variation in such conditions. However, water levels and flows in almost all lakes and rivers in the state have become managed to some extent. Maintenance of physical and biological integrity in rivers is supported by flows that mimic the natural variation of flows described with components of timing, magnitude, frequency, duration and rate of change. Similarly, natural lake level fluctuations that can be expected to maintain biological integrity should follow patterns of natural variability. Management should be applied that adequately mimics a more natural hydrologic condition of flow and water level variability such that water quality standards of the affected waterbodies are not compromised.

4) Watershed-specific evaluations are necessary.

Watershed-specific evaluations are necessary to take into account varying lake and river conditions as well as stakeholder concerns. Lake water quality conditions range from low-nutrient, coldwater lakes to nutrient-rich, warmwater lakes. In addition, lakes show varied shoreline, littoral and benthic conditions which can affect

ecosystem values. Lakes are also managed for a variety of societal purposes that include, but are not limited to, water supply, hydropower generation, recreation and other interests. Similarly, rivers have varying aspects that encourage or dissuade various activities. Management actions must be based on the site-specific ecological uses and societal values in order to protect the Designated Uses.

5) Use infrastructure to support sustainable water use.

Well designed and implemented water infrastructure construction can provide a higher level of sustainable water use. Sustainable water use requires planning and investment that support current and future infrastructure needs in order to return water to the environment locally, reduce losses, and enable reuse of the resource water. Water is lost from a watershed when it is exported to another watershed, evaporated or returned to a location downstream from where it was withdrawn. These losses comprise consumptive uses that can be reduced by retaining water within the watershed, reusing water, or both. In addition, loss of water as a result of leaks and infrastructure breakage represent water that is displaced. Planning for infrastructure improvements in much of the water supply distribution network and water treatment systems provides an opportunity to incorporate upgrades that will ensure greater long-term sustainability of water resources. Infrastructure decisions should be made that support non-consumptive use by improving systems' abilities to treat and return water locally, conserve water, repair leaks to reduce losses, and increase the reuse of water.

6) Base water management on the public trust and riparian rights doctrines.

Water resources management decisions should be based on the public trust and riparian rights doctrines¹⁴ (also known as the 'reasonable use doctrine') rather than establishing specific allocations of water for specific users. These doctrines allow riparian owners to make any reasonable use of water that does not unduly interfere with the competing rights and interests of other riparian owners or the public trust. The reasonable use doctrine as it exists in New Hampshire recognizes that water availability is finite and that all riparian and littoral land owners, along with the general public, have a right to share the available water. The water in excess of the volume and flow necessary to meet the Water Quality Standards may be used by these land owners so long as they respect the needs of downstream users by sharing what is available. Increased demand for water will require balancing usage among all existing and new users to sustain their riparian rights under the reasonable use doctrine.

7) Follow water resource emergencies by developing avoidance strategies.

Emergency conditions¹⁵ that endanger human health and safety will be managed to protect life and property. Meeting emergency conditions may require violating Water Quality Standards for periods of time. However, following the emergency, steps should be taken to avoid repetition of these emergency conditions. Adaptive management plans must address the cause or the frequency, or both, of future emergencies. General concepts for avoiding emergency water supply conditions or water quality impairments include, but are not limited to, identification and development of alternate water supplies, storage of water through artificial recharge or impoundments, conservation of water, and water reuse technologies.

¹⁴ <http://xml2.des.state.nh.us/blogs/lmac/wp-content/uploads/2010/11/20101112.FINAL-Public-Trust-Doctrine-and-Lake-Management-in-New-Hampshire3.pdf> See also Appendix under Re: Riparian Rights.

¹⁵ RSA 4:45 and RSA 483:9-c, IV

APPENDIX – Excerpts from Relevant NH Statutes and Regulations

Surface Water Quality Regulations Excerpts

Env-Wq 1701.02 Applicability.

- (a) These rules shall apply to all surface waters.
- (b) These rules shall apply to any person who causes point or nonpoint source discharge(s) of pollutants to surface waters, or who undertakes hydrologic modifications, such as dam construction or water withdrawals, or who undertakes any other activity that affects the beneficial uses or the level of water quality of surface waters.

Env-Wq 1703.01 Water Use Classifications.

- (b) All surface waters shall be restored to meet the water quality criteria for their designated classification including existing and designated uses, and to maintain the chemical, physical, and biological integrity of surface waters.
- (c) All surface waters shall provide, wherever attainable, for the protection and propagation of fish, shellfish and wildlife, and for recreation in and on the surface waters
- (d) Unless the flows are caused by naturally occurring conditions, surface water quantity shall be maintained at levels adequate to protect existing and designated uses.

Env-Wq1703.19 Biological and Aquatic Community Integrity:

- (a) The surface waters shall support and maintain a balanced, integrated, and adaptive community of organisms having a species composition, diversity, and functional organization comparable to that of similar natural habitats of a region.
- (b) Differences from naturally occurring conditions shall be limited to non-detrimental differences in community structure and function.

Env-Wq 1702.07 “Biological integrity” means the ability of an aquatic ecosystem to support and maintain a balanced, integrated, adaptive community of organisms having a species composition, diversity, and functional organization comparable to that of similar natural habitats of a region.

Env-Wq 1708.02 Applicability. Antidegradation shall apply to:

- (c) Any increase in flow alteration over an existing alteration; and
- (d) Any hydrologic modifications, such as dam construction and water withdrawals.

Rivers Law Excerpts

RSA 483 Rivers Management and Protection Act

483:1 Statement of Policy. – . . .The state shall . . . regulate the quantity and quality of instream flow along certain protected rivers or segments of rivers to conserve and protect outstanding characteristics including recreational, fisheries, wildlife, environmental, hydropower, cultural, historical, archaeological, scientific, ecological, aesthetic, community significance, agricultural, and public water supply so that these valued characteristics shall endure as part of the river uses to be enjoyed by New Hampshire people. If conflicts arise in the attempt to protect all valued characteristics within a river or stream, priority shall be given to those characteristics that are necessary to meet state water quality standards.

483:2 Program Established; Intent. – There is established within the department of environmental services the New Hampshire rivers management and protection program.

It is the intent of the legislature that the New Hampshire rivers management and protection program shall complement and reinforce existing state and federal water quality laws, and that in-stream flows are maintained along protected rivers, or segments thereof, in a manner that will enhance or not diminish the enjoyment of outstanding river characteristics. . . .

Lakes Law Excerpts

RSA 483-A Lakes Management and Protection Act

483-A:1 Statement of Policy. – New Hampshire's lakes are one of its most important natural resources; vital to wildlife, fisheries, recreation, tourism, and the quality of life of its citizens. It is the policy of the state to insure the continued vitality of New Hampshire lakes as key biological, social, and economic assets, while providing that public health is ensured for the benefit of present and future generations. The state shall encourage and assist in the development of management plans for the waters as well as the shoreland to conserve and protect valued characteristics, including recreational, aesthetic, and those of community significance, so that these valued characteristics shall endure as part of lake uses to be enjoyed by the citizens of New Hampshire. If conflicts arise in the attempt to protect the valued characteristics of a lake, priority shall be given to those characteristics that are necessary to meet state water quality standards.

483-A:3 Program Established; Intent. – There is established the New Hampshire lakes management and protection program within the department of environmental services. It is the intent of the legislature that the New Hampshire lakes management and protection program shall complement and reinforce existing state and federal water quality laws. It is also the intent of the legislature that, through said program, the scenic beauty and recreational potential of lakes shall be maintained or enhanced, that wildlife habitat shall be protected, that opportunity for public enjoyment of lake uses be ensured, and that littoral interests shall be respected.

Riparian Rights

The riparian rights doctrine is a common law theory that states “a riparian owner has a right to the beneficial use of the water of a river or a stream passing through or adjacent to his land. . . . An upstream riparian owner may divert water from its channel for any lawful use, so long as he returns it to the channel above the land of the next downstream riparian owner in substantially the same condition as when it reached the upstream riparian owner’s land.” *Wisniewski v. Gemmill*, 123 N.H. 701,705 (1983).

New Hampshire holds in trust its lakes, large natural ponds, navigable rivers and tidal waters for the use and benefit of the people of the State. *State v. Sunapee Dam Co.*, 70 N.H. 458, 460 (1900). The uses and benefits subject to the public trust are not limited to navigation and fishery, but include other benefits. Various cases have held that the public trust encompasses “all useful and lawful purposes”, “what justice and reason require”, and “to boat, bathe, fish, fowl, skate and cut ice.” See *Opinion of the Justices*, 139 N.H. at 90-91.

Appendix H
Public Comments

Appendix to the
New Hampshire Dept. of Environmental Services
Report of the Instream Flow Pilot Program
R-WD-15-1
December 1, 2015

Appendix H – Public Comments

This appendix summarizes the comments received on the draft (September 1, 2015) Report of the Instream Flow Pilot Program. NHDES made the draft report available on its Instream Flow Program website at <http://des.nh.gov/organization/divisions/water/wmb/rivers/instream/report.htm>. Paper copies and compact discs were provided to the Wadleigh Memorial Library in Milford and the Durham Public Library. Paper and compact disc copies of the report were also available from the NHDES Public Information Center in Concord.

As required by Laws of 2009, Chapter 201, NHDES held public hearings jointly with the New Hampshire Senate Energy and Natural Resources Committee⁶ and the House Resources, Recreation and Development Committee. NHDES provided public notification of the hearings on its on-line calendar and on the Instream Flow webpage, and the hearings were also listed in the legislative calendar. The NHDES Instream Flow Program also sent targeted emails to its notification groups publicizing the hearings.

Public hearings on the Draft Report of the Instream Flow Pilot Program

Location: LOB Room 305/307, 33 North State Street, Concord, NH

Date: September 22, 2015

Time: 9:30 - 11:30 AM

Location: Milford Police Training and Community Room, 19 Garden Street, Milford, NH

Date: September 22, 2015

Time: 4:30 - 6:30 PM

Location: NH Fish and Game Region 3 Office, 225 Main Street, Durham, NH

Date: September 23, 2015

Time: 6:30 - 8:30 PM

Oral comments were recorded during the three public hearings. Where the comments had not been already addressed by the draft report, the report was amended to address these questions or the NHDES response is recorded below. The public comment period remained open from September 1, 2015 through October 25, 2015.

Written comments were received from the following individuals and organizations.

Jim McClammer

Rivers Management Advisory Committee (Kenneth Kimball, Chair)

Lakes Management Advisory Committee (David Packard, Chair)

Ashuelot River Local Advisory Committee (Barbara Skuly, Chair)

Souhegan River Local Advisory Committee (George May, Chair)

The following statements summarize the comments received.

- The comments all support further application of instream flow protections on other Designated Rivers.
- Most comments recognize the need for substantial funding to develop additional instream flow protections.

⁶ Successor to the Senate Energy, Environment and Economic Development Committee

- Some comments ask if there is a shortcut to applying interim minimum flow standards or some other means in the short-term until river-specific instream flow protections can be completed.
- One comment recommends that because of past and ongoing studies there, the Connecticut River be the next river to be assessed for instream flow protection.
- Comments recommend avoiding delay in implementation in order to reduce costs and competition between users.
- Comments support funding for additional staff to carry out the Instream Flow Program.
- A comment addresses advisory committees and the role of the Rivers Management Advisory Committee and the Lakes Management Advisory Committee.
- A comment advises adding detail to the description of the Program’s notification process.
- A comment recommends describing increased coordination between the Dam Bureau’s management activities and those of the Instream Flow Program.

RESPONSES TO ORAL COMMENTS

Following are the responses to key elements of oral comments received at the Legislative Office Building, Room 305/307, 33 North State Street, Concord, NH; September 22, 2015 9:30 - 11:30 AM.

LOB-1 – What legal authority is DES given to suggest voluntary conservation or command private dam owners to change water levels?

This question is addressed under the Report section called “Use of privately owned dams in flow management.” The required authority is given to NHDES by RSA 483 and the surface water quality standards (Env-Wq 1700). RSA 483:1 says “The state shall ... regulate the quantity and quality of instream flow along certain protected rivers or segments of rivers.” The state also may manage water levels in ponds including the changes resulting from a release for relief pulses. The legislature further gave NHDES the authority to adopt rules to specify “the standards, criteria, and procedures by which a protected instream flow shall be established and enforced for each designated river or segment.” The Instream Flow Rules include the requirements for conservation plans and the operations of dams to help maintain the protected instream flows. There are limits on the use of water stored from ponds. The operation of dams for instream flow protection should not impair the water quality of the impoundment itself, cause unreasonable impacts on the economic value of the pond, nor diminish the reasonable expectations to enjoy the use of the pond.

LOB-2 – Is there any federal money to help with the next Instream Flow Designated Rivers or is that up to the SB 330 committee to find?

NHDES is exploring grant and loan opportunities to support state and private implementation of stream flow protection actions. This process will extend into next year.

LOB-3 – Would a town in two watersheds have two management plans? What about moving water between watersheds?

A town that operates its water supply system in two Designated River watersheds would have two watershed management plans. These plans would be coordinated so that management is appropriate for both the system and the customers. This is a complexity of water management plans that has been discussed with the Raymond Public Works Director. Raymond’s water supply

system operates in both the Lamprey and Exeter watersheds. Actions by customers in the Exeter watershed may affect the Lamprey River. The town will need to decide how to apply management actions affecting both watersheds, such as outside water use reductions. A town may apply a management action to the town as a whole or apply management specifically to the customers in a particular watershed. Water management plans are developed in partnership so that NHDES and the town can identify these details and work out a solution.

Issues such as this may arise after a plan is written because of changes either in the extent of a public supply's distribution system, its water sources or discharges, or the designation of another river. Towns may decide to apply management uniformly to all residents, or divide the population between those on one part of their system or another. Water management plans would then be revised to meet each watershed's stream flow protection goals and the town's operational needs.

LOB-4 – Are there other states where the cost of something like this, particularly the ongoing costs, are borne by the water users?

Other states appear to support the instream flow study and management plans without direct contributions from the water users. NHDES understands that water users in other states are expected to fund and conduct actions to meet flow restrictions or to develop alternate water supplies. NHDES plans to discuss this and other instream flow protection issues with the other New England states' instream flow staff in 2016.

LOB-5 – A commenter foresaw a problem when scientists are expected to conduct outreach. Further, the commenter stated there are no costs identified for augmenting the outreach program. These may be needed especially when considering an accelerated timeframe for instream flow implementation when lake front owners may be only present seasonally and not always available. Further, lakes communities may not recognize a program applying to rivers as affecting them. These people need to be included in a thorough way, early and often.

NHDES will develop an outreach plan at the outset of each Designated River's instream flow program effort. NHDES anticipates that instream flow staff will be responsible for outreach, and that additional funding needs will be minimal. Funding may be needed if an alternate outreach program is applied.

The Pilot Program demonstrated to NHDES the need to clearly communicate the program's potential impacts to lake communities early in the process. As part of the development of the outreach plan, NHDES will invite assistance from existing lakes organizations on how best to reach lake community residents.

LOB-6 – NHDES has recommended that Local Rivers Management Advisory Committees (LRMAC) take on the role of stakeholder advisory committee, but they are not always inclusive of the lakes communities.

The proposed subcommittee of the LRMAC would be expanded beyond LRMAC members and river interests. NHDES anticipates that it would include members of the LRMAC and include other interests within the watershed, in particular lake front property owners. The report has been expanded to more clearly describe this approach.

LOB-7 – What about the impact of water management plans on groundwater, particularly during droughts?

The purpose of water management plans is to reduce, delay, or spread the impacts of a withdrawal. Use of an alternative groundwater source is one way to do to achieve all three of these goals.

Shifting to a groundwater source that is sufficiently separated from the river will both reduce and delay the impact on river flow because the withdrawal removes water from storage in the surrounding aquifer, not directly from the river. A groundwater well spreads the impact of the withdrawal on a stream in both time and space by inducing groundwater recharge from a wider segment of the river, as compared to the point impact of a surface withdrawal.

New large groundwater withdrawals require a permit that includes an assessment of the impacts of pumping on surface water bodies. This permit process conditions the withdrawals during times of low flows in such a way that the surface waters are protected. Alternate groundwater supplies that are sited further away from rivers will reduce, delay and spread the impact on stream flow.

LOB-8 – What if there is conflict between water users, is there a process by which this is addressed?

Based on the stream flow conditions, each water user's facility will have its own water management plan to follow. Water users are not generally competing with each other for stream flow under the Instream Flow Program. At some flow level, there may be a requirement that water users not withdraw water from the river and to use an alternate water supply. Even during the lowest flows, however, there is a small withdrawal amount allowed (the *de minimis* amount) that is apportioned between some users. Conflict could arise over how the *de minimis* amount is used. The use of the *de minimis* allows some water use by users with a direct impact on stream flow. This should be considered as a stopgap measure until they have determined their drought-condition needs and developed alternate water supplies. There is no mechanism for allowing more use than the *de minimis* if demand is greater as a result of new water users entering the Program.

LOB-9 – You can regulate flows with a certain range, but with possible extreme flows, there may be flows that you cannot control. Would the water management plans define water user priorities for allocations? Are we heading towards western-style water rights?

The Instream Flow Program is the opposite of allocations. Everyone, including new users, has reasonable use of the available water. The protected instream flows identify when the use violates water quality standards. This process does not provide an allocation to anyone, rather, it levels the playing field for all users. When a water quality threshold is reached, all water users implement management plan actions commensurate with their water use impact on stream flow. Instream flow water management plans may be suspended when the commissioner determines that a public water supply emergency exists which affects public health and safety (RSA 483:9-c, IV).

LOB 9a – If not western-style water rights, how about a geographical priority of riparian water users? Should they have a preferential right to use water?

The instream flow statutes include no prioritization for water use.

LOB-10 – Lake level management plans (a.k.a. Lake Level Investigations, which are developed through the NHDES Dam Bureau) could be a tool for building a nexus for identifying these other uses and as a communication tool for explaining to lake interests the connection between lake levels and downstream flows.

Lake Level Investigations (LLI) assess the purposes and functions of lake and determine an appropriate lake level, or in some cases, seasonal lake level changes. An LLI is carried out by the NHDES Dam Bureau on state-operated lakes. A balance between the proposed magnitude of change in lake water level and the effort required to conduct an LLI should be considered when deciding to develop an LLI. While the LLIs only apply to state-owned facilities, the components of an LLI could be applied when evaluating lakes that have dams under municipal or private ownership. NHDES Dam Bureau would not have the authority to implement the lake level changes identified by the LLI, but the assessment could help to inform the instream flow management process.

LOB-11 – Were Local River Management Advisory Committees a significant part of this process?

The Local River Management Advisory Committees (LRMACs) are stakeholder groups defined under the Rivers Management and Protection Program to address issues within the Designated River's corridor. The Instream Flow Pilot Program was advised by legislatively-defined stakeholder groups (Water Management Planning Area Advisory Committees) that included members from the LRMACs, but the LRMAC itself was not, in its entirety, directly involved. NHDES recommends that the LRMACs take a larger role in the process in the future by creating a subcommittee to address instream flow issues. This subcommittee would include members representing watershed-wide, non-LRMAC interests including those outside the Designated River corridor.

Following are the responses to key elements of oral comments received at the Milford Police Training and Community Room, 19 Garden Street, Milford, NH; September 22, 2015 4:30 - 6:30 PM.

MIL-1 – I understand that ecosystem modeling is difficult, you are using a statistical analysis to create a hydrograph to mimic flow, how widely is such as approach in use?

The flow-habitat assessment model used during the Pilot is a modification of a U.S. Geological Survey model which is one of most widely-used models in the world. New Hampshire has rounded out the instream flow protection methods by also identifying criteria for recreational uses and riparian species. While no other states have taken this exact approach, many have similar components.

MIL-2 – How do low-flow conditions impact the application of physical and chemical water quality standards such as 7Q10?

Low flows affect water quality, but it is difficult to separate the effects of low flows from other causes affecting water quality. 7Q10 is a very low stream flow that does not protect flow dependent instream public uses such as fish or recreation. Maintaining the natural flow pattern will support water quality standards that use 7Q10-based criteria.

The Program addresses water quality changes that may occur as a result of instream flow management. The Pilot and ongoing assessments are examining the effects of relief pulses on water temperature and other water quality criteria. A test release in 2013 demonstrated that despite releasing warm water, the conditions in the receiving stream did not exceed the normal diurnal water temperature range. Other water quality parameters (turbidity, pH, specific conductance, nitrogen concentrations) were not affected by the 2013 test release. Analysis of the relief pulses which occurred under actual low-flow conditions in the fall of 2015 will be conducted over the next year. Finally, the changes in management in the Lamprey watershed appear to be increasing the phosphorus export from Pawtuckaway Lake where an improvement in lake quality is anticipated.

MIL-3 – How much is it to procure and place a stream flow gage? We need sharper numbers for cost estimates.

The Instream Flow Program uses U.S. Geological Survey (USGS) stream flow gage stations. USGS installs stream flow gages in appropriate settings, provides maintenance during each year to protect the quality of the flow measurements, and provides stream flow data online in real time. The table below shows the costs for USGS to install and maintain a stream flow gage. USGS sometimes is able to support a portion of these costs with a federal match.

Table H-1. FY2015 cost of USGS stream gages

	Total (2016)	USGS match if available	State contribution using match
Installation - for equipment and labor	\$14,800	\$6,590*	\$8,210*
Maintenance	\$13,790	\$6,140	\$7,650

*At same rates as the current match (45% USGS/ 55% State)

NHDES recognizes two funding needs to meet Instream Flow Program goals. One is an allowance for inflation to cover cost increases for the existing gages that NHDES already supports with general funds. Without this allowance, gage closings are threatened each time costs increase. Cost increases vary annually. NHDES recommends adding 5% per year to the funding applied to existing stream gages. Second is funding to add new stream gages for instream flow management to the existing network. NHDES is assessing the locations that are necessary to support instream flow studies and water management plans. Designated Rivers without any gages are obvious choices, but there are also Designated Rivers where a single gage is inadequate to measure stream flow and water use over their entire length. NHDES will complete a comprehensive assessment to evaluate the data needs for water management that will include reviewing the 2006 Stream Gage Task Force’s findings and alternatives to USGS gages.

A third funding need that is related to stream flow data needs is the need for 30 or more years of stream flow data to conduct instream flow modeling. NHDES has received a proposal from USGS and believes that these data could be generated for all the streams in the state for \$75,000 to \$125,000. These data would be invaluable for many programs managing water quality and other water resource assessments.

This information has been added to the report.

MIL-4 – With the availability of Department of Fish & Game and other water resources programs' existing staff, would it be better to hire new NHDES staff instead of consultants? Staff could not only complete the work but ensure implementation.

In the draft Report, NHDES recommended a revised division of labor in the development of instream flow measures in which the State would hire consultants to conduct the protected instream flow studies and NHDES staff would create the water management plans and conduct the public participation. NHDES reviewed this recommendation with the following considerations: 1) availability of agency staff; 2) required levels of staffing and expertise; 3) maintaining the separation of the instream flow study from the water management plan; and 4) cost difference between alternatives.

Other staff availability – The commenter stated an assumption that other staff are available from the Department of Fish & Game or other water resources programs to support the instream flow studies. The Instream Flow studies would require focused and sustained efforts from staff over a period of years to develop protected instream flow criteria. Some assistance from other departments and programs is usually available on an as-available basis, but cannot be counted on for a high level of effort because these staff are already busy with their own work. Staff support for instream flow studies from other programs should not be considered available, except to help with occasional advice or discrete tasks. Additional NHDES staff would need to be hired to conduct the instream flow studies.

Required levels of staffing and expertise – Instream flow studies are specialized and detailed projects. In the Report, NHDES has recommended two additional staff to develop and implement water management plans and to conduct monitoring and assessments. In order to add the capability to conduct the instream flow studies in-house, NHDES would need to add an additional two staff qualified and experienced in instream flow assessments.

Instream flow studies are not learn-as-you-go projects. Knowledge and experience in integrating the fields of biology, statistics and habitat/hydraulic modeling are required. Whoever conducts the protected instream flow studies will require specialized skills, experience and equipment that NHDES does not presently have. The people who conduct the instream flow studies would ideally have a solid background in fisheries biology, hydrology, statistics, geographical information systems (GIS) and modeling as well as the instream flow field techniques necessary to collect and analyze the appropriate data. To assess riparian communities they would need to have expertise in plant and wildlife ecology. They would also need expertise in hydrogeologic practices and theories to collect field data and to interpret existing pumping test records to evaluate the effects of well pumping on stream flow. These requirements suggest that NHDES would need to hire experienced instream flow practitioners away from consulting firms or academia.

Maintaining separation of studies from management action development – The Instream Flow Program has two components: an instream flow study to develop protected instream flow criteria and a water management plan. A separation between the two components was intended by the rules to prevent the concerns about achieving management actions to be used to weaken the flow criteria. The instream flow criteria should be developed separately and without regard to the consequences on the management actions that would be required to implement these flows.

The Pilot Rules required that protected instream flows be established prior to adoption of the water management plan. During the Pilot, the consultants achieved separation between the two components by first defining the protected instream flows and then developing water management plans. Moving forward, NHDES has recommended a more rapid approach where NHDES begins the water management plans at the same time as consultants are conducting the instream flow studies. This would maintain the scientific integrity of the instream flow studies. If NHDES were to conduct both parts of the process, some sort of internal “firewall” would need to be developed between the two efforts. Maintaining a separated process could have the effect of slowing progress by excluding staff working on water management plans from the instream flow study process.

Cost difference –Annual costs between the two approaches appear similar, but the cost must be put in context with the production of instream flow studies and with additional NHDES administrative costs that are not quantified here.

Consultant costs to conduct instream flow studies were estimated for each river based on the number of river miles making use of the cost structure of the Souhegan and Lamprey Designated Rivers. The consultant who worked on the pilot rivers stated, with certain caveats discussed in the Report, that these costs are appropriate.

The report includes NHDES’s estimate for instream flow studies at an average yearly consulting cost of \$195,000 per river for the first eleven rivers. The in-house cost to conduct instream flow studies is similar in cost for two additional NHDES staff with equipment, mobilization and supplemental field staff. These costs are explored below.

Incentives to attract applicants with the necessary skill sets to the NHDES Instream Flow Program would require full-time, permanent staff positions. Ideally, these staff would be hired at labor grades commensurate with the skills needed for the studies. NHDES expects that two or more additional staff at a minimum labor grade of 27 would be needed to provide the necessary skills and experience and meet the workload. The salary range for each position is \$51,772 to \$70,063 per year. The benefits package at the state adds 51.5% to the salary to yield a full cost of about \$78,000 to \$106,000 per year per position. Minimum annual funding of \$156,870 would be required to hire two NHDES staff for this work. NHDES would also need additional seasonal staff for supporting the field work. As many as six seasonal interns would be needed at times during the field season.

Equipment, supplies and mobilization would be an additional NHDES cost. Consultants provide their own equipment and supplies. NHDES would need to identify and then purchase equipment and supplies to conduct instream flow studies. Equipment needs would at a minimum include tools to collect and record fish communities, stream flow measurement tools, one or more instream flow software tools, digital field mapping tablets, piezometers and installation tools, and water level measuring devices or recorders, and elevation surveying equipment. As larger rivers are assessed, boats would be required. Field vehicles are frequently unavailable during the summer, so the program may need a dedicated vehicle to support the field program and meetings with water users and dam owners.

Advantages and disadvantages of each approach

In summary, it appears that the state could hire staff to conduct instream flow studies at about the same cost as hiring consultants. Either approach would require NHDES management time whether

as direct supervision in the case of employees or contract management for consultants. The key benefit of consultants is that the kinds of firms that do this sort of work can apply a wide variety of expert staff to the individual components of an instream flow study. Together, a combination of individuals brings a broader wealth of talent and experience than could be hired by the state in one or two individuals. In addition, the costs of a consultant contract are fixed and more predictable. The effectiveness of consultant-driven instream flow studies could be substantially improved by providing the flexibility of a multi-river, longer-term contract.

The key benefits of using internal staff are the flexibility to direct work as needs emerge and building the long-term capacity for instream flow studies. Any cost savings from hiring NHDES staff may be only a marginal and short-term savings. Two permanent positions, supplementary seasonal staff, equipment and mobilization costs are equal to or exceed the cost estimate for consultants within a few years. Turnover would defeat one of the advantages of hiring in-house NHDES staff, which is retaining the institutional memory of each instream flow study. Attracting and retaining staff with the necessary skills will depend on sufficient and durable funding. Without stable funding this benefit is not likely to be realized.

Both approaches would move more quickly with more funding. The number of instream flow studies NHDES staff could complete would be limited by the output of the available staff. Staff will take time to bring on board and to train, so the ramping up time is longer. Consultants output would be limited only by funding available for contracts, but could be ramped up more quickly. NHDES staff resources are not as easily scalable.

MIL-5 – There is trepidation from users that water use will be restricted. Can water users be involved in creation of management plans so they feel their water use is gaining protection instead?

Water users are involved in developing their water use plans. One goal of these plans is to identify ways for water users to have the water that they need under any stream flow condition. This may require water users to develop alternate water supplies if their current withdrawal has a significant impact on stream flow. Each water use plan is unique to the user, so NHDES and the user can be flexible in crafting a water use plan that is practical and meets management goals. Future new water users wishing to avoid management actions will seek locations with more plentiful water resources and develop non-consumptive water uses to support their needs.

Following are the responses to key elements of oral comments received at NH Fish and Game Region 3 Office, 225 Main Street, Durham, NH September 23, 2015 Time: 6:30 - 8:30 PM.

DUR-1 – How is the natural flow and flora and fauna defined relative to human history. What is the baseline?

The Instream Flow Program does not attempt to recreate pre-colonial fish or riparian conditions. However, the program does attempt identify the best existing conditions as the criteria for meeting biological integrity, which is a water quality standard requiring that an aquatic ecosystem be able to support and maintain a balanced, integrated, adaptive community of organisms having a species composition, diversity, and functional organization comparable to that of similar natural habitats of a region. The fish communities from the best examples of rivers similar to the Designated River are used to identify a Target Fish Community. The Target Fish Community is the goal for fish

communities in the Designated River. There are no historical data sufficient to establish reference conditions for riparian plant communities or wildlife. These must rely on existing conditions on the Designated River.

WRITTEN COMMENTS

Following are the responses to key elements of written comments received from the following people and organizations: Jim McClammer, the Rivers Management Advisory Committee (RMAC), the Lakes Management Advisory Committee (LMAC), the Souhegan River Local Advisory Committee (George May), and the Ashuelot River Local Advisory Committee (Barbara Skuly).

Jim McClammer – Consideration should be given to assessing the Connecticut River for Instream flow next. This is because much of the information that will be necessary to determine flow requirements is being collected as part of the FERC relicensing of 3 hydroelectric dams. In addition determining instream flow requirements is part of the CRJC River Management Plan.

Prioritization of the Designated Rivers will be discussed further with the legislature. However, NHDES believes that approaching the Designated Rivers from the tributary Designated Rivers before the Designated Rivers they flow into will result in fewer requirements to adjust the water management plans. Several other Designated Rivers are tributaries to the Connecticut River.

RMAC-1 – The RMAC generally supports the recommendations on fiscal and staff resources needed to achieve implementation of the Pilot Program.

Thank you for your comment.

RMAC-2 – The RMAC generally supports the proposed prioritization of rivers to be considered as next candidates for instream flow implementation.

Thank you for your comment.

RMAC-3 – The final report should make specific recommendations on how Env-Wq 1900 should be modified for applying a standard-setting approach on an interim basis for all designated rivers until the site-specific approach can occur.

Two comments recommended that interim minimum flow standards should be applied until river-specific, protected instream flows can be developed. The Report includes a lengthy discussion of the limits of minimum flows and other standard-setting approaches. This discussion is summarized below and other aspects of the commenters' statements are addressed.

This commenter noted that it has taken 25 years to complete instream flow protections on the two pilot rivers. While it is technically true that instream flow legislation was written 25 years ago, it is misleading to apply these years to the Pilot Program's results. The 25 year period begins when the instream flow legislation was passed in 1990 and includes fourteen years, from 1990 through 2004, spent first debating the approach, then creating the Pilot approach and acquiring funding for the program. Many of those early years passed without any significant advancement in instream

flow protection. It should also be noted that over ten of those years were spent in unsuccessful attempts to develop a standard-setting approach.

The Pilot Program was not conducted to quickly come to a conclusion, but rather to purposefully identify and address technical and societal concerns that surfaced during the assessment of a complicated subject. The Pilot Program worked through the details of developing the methods used to assess the complex interactions between water users and water resources. The methodology now exists to implement the program in a much more timely fashion. Moving forward, the focus will be on the rapid employment of the Pilot methods complemented by thoughtful, intentional and comprehensive public involvement, rather than spending time on methods development.

This commenter also stated that when the Instream Flow Pilot Rules were adopted, they contained an interim standard setting approach. This is partially correct. Env-Wq 1903.02 includes criteria to evaluate past water use using criteria taken from a standard-setting approach. These criteria were used by NHDES to compare water use among the Designated Rivers. Nothing in the criteria provides instream flow protection, because there is no way to link those water uses to ecosystem or recreational flow needs. NHDES's past proposal to manage stream flow based on these standard-setting criteria was categorically rejected by the legislature and the public in 2000. This rejection of the standard-setting criteria led directly to the development of the Pilot Program using river-specific criteria.

The commenter implies that these standard-setting criteria could perform the same or similar interim role as the approved instream flow protections that the Pilot created for the Souhegan and Lamprey Rivers. However, the criteria as applied were a "look back" assessment technique not a real-time management tool. As such, it is unclear the value of these as criteria for ecosystem protection. Furthermore, dam management would be unspecified without knowledge of the stream flows needed to support the biological functions downstream since the interim standard setting approach does not address riverine biology. The recommendation for an interim approach suggests that there is an easy way to protect instream flows. As the report points out, no shortcuts have been identified that meet the program's statutory goals.

Furthermore, it is not clear that developing a new standard-setting approach would result in protections any quicker than by using the Pilot approach. NHDES believes that the creation and approval of new interim instream flow criteria based on a standard-setting approach would require significant resources to develop, test and implement. We estimate that the development of interim standards would take several years of testing and discussion with the public. Based on NHDES's experiences during the 1990s and early 2000s, this is likely to be a controversial issue and one in which agreement will require significant negotiation. If such agreement were to take place, water management plans would still need to be written and discussed thoroughly in each of designated rivers. It is not clear how that process would be any faster than utilizing the Pilot methods.

The development of an alternate standard-setting approach would directly compete for resources with river-specific instream flow studies that could be performed on designated rivers. Given the staffing constraints that already exist in the program, NHDES does not believe that both the development of a new standard-setting approach and implementation of the Pilot methods could be accomplished at the same time. A choice would need to be made as to the focus of the program.

The plan in this report for applying instream flow protection on other Designated Rivers anticipates a staggered, two-year process for each river operating on two rivers at a time. One year of the process will be spent developing the instream flow protections, and the second year will be spent on intense public participation in the development of the water management plans (describing the water conservation, water use and dam management plans).

It should be noted that a key accomplishment of the Pilot Program was the development of a scientific and stakeholder process that is publicly supported and environmentally sound. Water users, dam owners and key stakeholders took part in the development of the methods and implementation plans. The value of developing this process should not be underestimated.

Finally, there exist water user-specific protections under other programs to limit impacts of withdrawals on stream flows. NHDES presently applies interim protections on surface water through the Clean Water Act Section 401 Water Quality Certifications (401 WQC) and the Large Groundwater Withdrawal Permitting Program. Both of these include protections to surface waters from the effects of withdrawals and flow modifications. The Report of the Instream Flow Pilot Program documents an example of how a 401 WQC assessment resulted in restrictions on water withdrawals, restrictions that were subsequently relaxed by utilizing the Pilot methods. This example shows how the existing regulatory framework is complemented by the development of protected instream flows as was accomplished through the Pilot Program.

RMAC-4 – The RMAC is willing to work with NHDES in the recommended RSA 483 changes and funding needs outlined in Chapter 1.

Thank you.

LMAC-1 – Site-specific flow criteria developed by the Pilot Program are more scientifically defensible and appropriate than a set minimum flow standard to all watersheds and rivers. Site-specific flow criteria also better account for the program's impact on lakes used to supplement instream flows.

Thank you for your comment.

LMAC-2 – The site-specific method of the Pilot Program required significant years and resources to accomplish.

The years spent conducting the Pilot Program accomplished far more than mere completion of the instream flow studies and water management plans. A great deal of time during the Pilot was demonstrating the concepts of instream flow protection and effects of the plans. These years have demonstrated how well the Program can work and lead to acceptance of the Pilot studies and plans that should translate to future instream flow protections on the other Designated Rivers.

LMAC-3 – The necessary funding may not be expeditiously appropriated, causing the Program to stall in its expansion to other watersheds.

This is true. Additional funding and staff are needed to maintain the existing program and to advance instream flow protection on other rivers.

LMAC-4 – The LMAC strongly suggests that the program include the use of interim minimum flow standards – or some other means – until site-specific criteria are developed for each watershed. The LMAC is prepared to support an effort by NHDES to develop an interim strategy.

See discussion in RMAC-3.

LMAC-5 – The LMAC feels that the RMAC, with LMAC input as appropriate, provides adequate state-wide oversight for the Instream Flow Program. The LMAC requests NHDES to reconvene the joint Instream Flow Subcommittee⁷ to further the development and progress of the program and reflect this activity in the final report.

NHDES will continue to request guidance from both the RMAC and the LMAC in developing statewide instream flow initiatives. If a question affecting the interaction of rivers and lakes arise, NHDES will request that the RMAC and LMAC reconvene a joint subcommittee to address its resolution. This discussion has been included in the final report.

LMAC-6 – The LMAC feels that the Summary of Program Recommendations should clearly identify the local, short-term, and river-specific nature of these “stakeholder advisory committees.”

The Recommendations section of the report has been revised to indicate that the recommended subcommittee for advising the instream flow process would be river-specific in nature. The duration of the group is proposed to begin at the outset of the instream flow investigations and continue for at least one year into the implementation of water management plans. After this period, the Local River Management Advisory Committee for the Designated River would determine whether to continue to support the subcommittee. This discussion has been included in the final report.

LMAC-7 – The LMAC recommends that more detail be added to the final report about communication with stakeholders based on the experiences from formulation and implementation of these two ISF programs.

NHDES intends to develop river-specific public input plans to initiate instream flow protection on other Designated Rivers. The specifics of these plans will be developed later, but the intent will be to identify people whose interests will be affected, and to ensure that they are aware of the plan’s development and have opportunities to understand and direct that plan.

NHDES has clearly spelled out the intention to provide individual notification to interested people of significant management actions in addition to providing continuous online information available to everyone. NHDES has, in some cases, expanded its notifications to include routine management outside the Instream Flow Program. A notification plan has been developed for the Lamprey Designated River and will be updated. A similar plan will be developed for the Souhegan Designated River. In addition, NHDES is developing a Standard Operating Procedures document for standardizing the development and distribution of press releases, updates and other notifications as part of the Instream Flow Program’s notification process.

⁷ The Instream Flow Subcommittee was made up of members of the Rivers Management Advisory Committee and the Lakes Management Advisory Committee.

LMAC-8 – The LMAC recommends that coordination of activities, particularly with the Dam Bureau, that may impact stakeholders be noted in the final report and taken into account with current and successive ISF programs.

NHDES is working towards coordinating the Instream Flow Program management actions and Dam Bureau’s routine and extraordinary management activities with the interests of stakeholders affected by these activities. Because dams have multiple purposes, the Water Management Plans will not describe all aspects of dam operations. Dam Bureau has been operating these dams for decades to meet a variety of interests. Only those actions affecting management for instream flow protections are incorporated in the plans.

Management compromises to meet the instream flow and dam management goals are more easily reached on dams owned and operated by NHDES, such as those in the Lamprey watershed. In other watersheds, NHDES may not be the owner of the dams, and owners have the privilege of operating the dams to suit their own interests. The water management plans will address only those operations affecting instream flow protection, and not the operations by the dam owner during normal or high flow conditions.

LMAC-9 – The LMAC supports the requests for funding that are vital to the ongoing development of this legislatively mandated program.

Thank you for your comment.

Souhegan River Local Advisory Committee – The pilot efforts should serve as a basis for other protected rivers in the state using the steps outlined in the report for implementing protected flows.

Thank you for your comment.

Ashuelot River Local Advisory Committee – The Ashuelot River Local Advisory Committee strongly supports the implementation of the development of protected instream flows for the remainder Designated Rivers in NH. We believe this provision is a critical piece afforded by the NH Rivers Management and Protection Program. The Draft Report of the Instream Flow Pilot Program makes it clear that this task is both lengthy as well as costly. However, the consequences of delaying further implementation can be more costly as the demand for usage water resources will increase over time, with the likelihood of competing interests championing their favored uses. We support the funding of additional staffing to assure the groundwork created by the pilot program continues and the remaining rivers receive the protection promised by their inclusion in the RMPP.

Thank you for your comment.

Other Report revisions following review by NHDES staff

NHDES revised the report concerning their recommendations for future work with the **Impact of Water Withdrawals On Instream Flows Study Committee** (SB330) after the members determined at their meeting on October 15, 2015 that they would not attempt to extend subcommittee beyond its legislative endpoint of December 15, 2015 into the next phase of the Instream Flow Program.

NHDES clarified text in the report to more clearly state the role of the NHDES Drinking Water and Groundwater Bureau in Water Conservation Plans. This Bureau does not write the plans, but rather reviews, approves and enforces water users' plans.

At the October 15, 2015 meeting of the Impact Of Water Withdrawals on Instream Flows Study Committee (SB330), a question of the cost of the program was raised. NHDES provides the following estimate of the Instream Flow Program's annual costs for the next five years in Table H-2. Actual timing of certain activities is dependent on completing preceding activities.

Table H-2. Estimated Instream Flow Program Costs – Years 1 through 5

Year 1 ISF Budget	Year 2 ISF Budget	Year 3 ISF Budget	Year 4 ISF Budget	Year 5 ISF Budget
Conduct Target Fish Community study and report \$125,000	Conduct Target Fish Community study and report \$125,000			
Develop tool for reference hydrology data \$75,000 - \$125,000	Allowance for gage price inflation @ 5% per year \$ 9,350	Allowance for gage price inflation @ 5% per year \$ 9,818	Allowance for gage price inflation @ 5% per year \$10,308	Allowance for gage price inflation @ 5% per year \$10,824
Designated River selection process and public input process (Existing staff)	Prepare for first instream flow study -- Hire first ISF employee \$81,500	Begin WMP #1 -- Hire second ISF employee -Two ISF employees \$163,000	Complete WMP #1 begin #2 Two ISF employees \$163,000	Complete WMP #2 begin #3 Two ISF employees \$163,000
Rewrite/adopt ISF Rules and manage Lamprey & Souhegan (Existing staff)	Manage program on Lamprey & Souhegan (Existing staff)	Manage program on Lamprey & Souhegan (Existing staff)	Manage Lamprey, Souhegan and river 1 (Existing and new staff)	Manage Lamprey, Souhegan, river 1 and river 2 (Existing and new staff)
	Hiring process for consultant to conduct ISF studies (Existing staff)	Conduct Instream Flow Study 1 \$195,000	Conduct Instream Flow Study 2 \$195,000	Conduct Instream Flow Study 3 \$195,000
Convene experts to discuss gaging needs and alternatives (Existing staff)	Finalize gaging plans and develop budgets (Existing staff)	Implement gaging plans (cost TBD)	Implement gaging plans (cost TBD)	Implement gaging plans (cost TBD)
Operating budget - Total				
\$250,000	\$215,850	\$367,818	\$368,308	\$368,824
Capital budget request				
Souhegan dam retrofit (1 dam) \$151,200	Souhegan dam retrofits (2 dams) \$302,400			
Year 1 Total	Year 2 Total	Year 3 Total	Year 4 Total	Year 5 Total
\$401,200	\$518,250	\$367,818	\$368,308	\$368,824