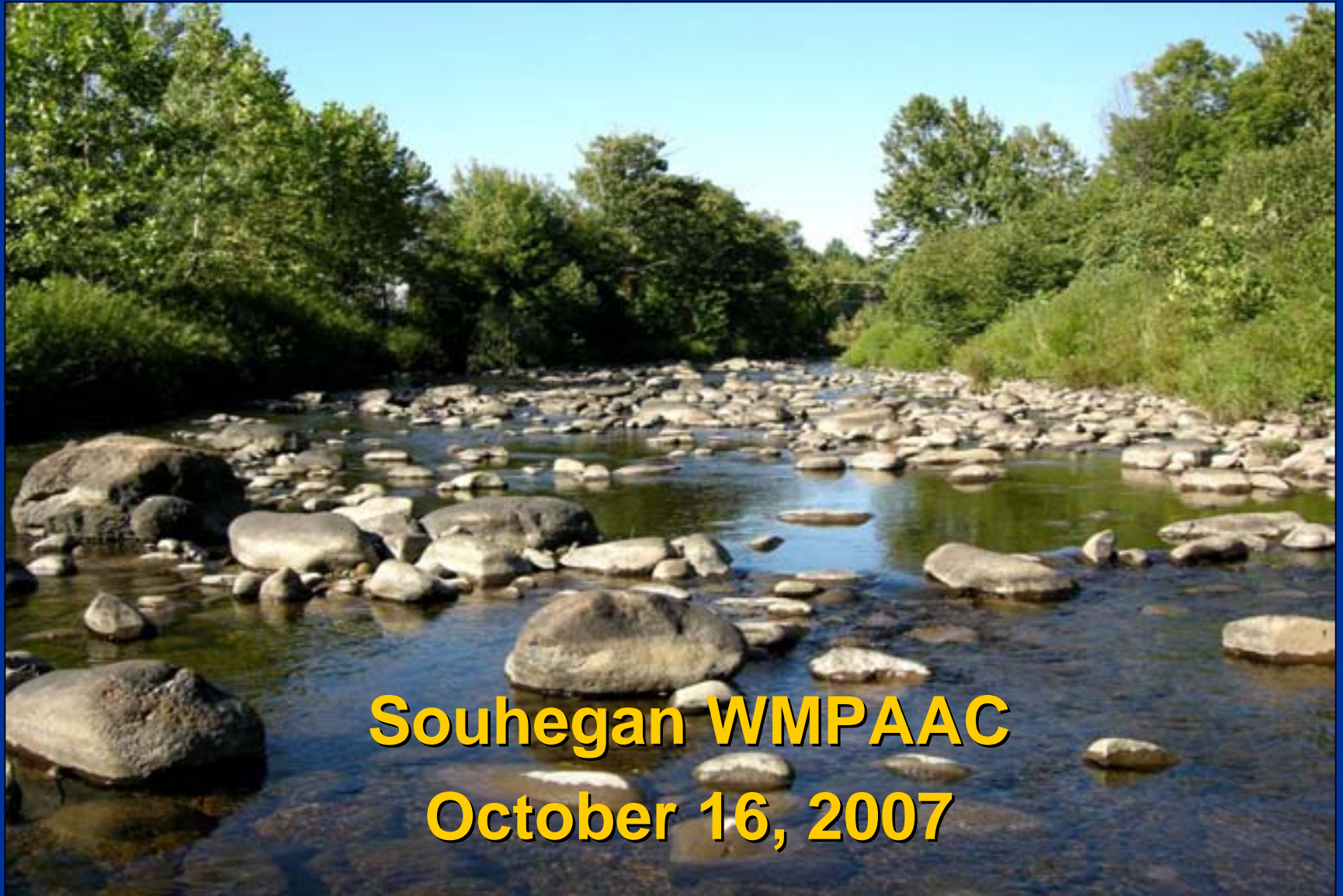


# Souhegan River Instream Flow Project



**Souhegan WMPAAC**  
**October 16, 2007**

# Souhegan Protected Instream Flow Report

Souhegan WMPAAC

October 16, 2007

# As of October 1, 2007

- The Souhegan PISF report is finished.
- We are preparing documentation to present it to the DES Commissioner.
- The Commissioner will establish the protected flows as Water Quality Standards.

# What is in the Report and how does it get established?

- The ISF Rules contain the requirements, drawn from legislation, for defining and establishing the PISFs.
- RSA 483 and Laws of 2002, Chapter 278.

# Env-Ws 1905 PROCEDURE FOR ESTABLISHMENT OF PROTECTED INSTREAM FLOWS

- **To establish protected instream flows the department shall:**
- Conduct a protected instream flow study and propose protected instream flows based on scientifically-accepted ecological methods.
- Make the study available for public review.
- Hold a public hearing and receive comments.

# The protected instream flow study shall identify and catalog:

- all instream public uses and all designated uses
  - all outstanding characteristics
  - all resources
- 
- Also, include an on-the-water stream survey of all resources that identifies and catalogs from direct observation ... fish, wildlife, plants, bugs, recreation, and all the above (IPUOCRs).

Also, The protected instream flow study shall:

- Identify and document methods for establishing a protected instream flow that conserve and protect the outstanding characteristics, instream public uses and resources identified

# What has been done to meet these requirements?

- Field survey conducted June 28-30, 2004
- IPUOCR Report – October 2004
- **Instream Protected Uses, Outstanding Characteristics, and Resources for the Souhegan River and Proposed Protective Flow Measures for Flow Dependent Resources**
- Documented protected entities and proposed assessment methods; comments and references

Also, The protected instream flow study shall:

- Determine and document a recommended, scientifically-based protected instream flow based on application of the methods identified.

# What makes up the PISF Report?

- Glossary and Table of Contents
- Executive Summary
- Main Report
- References
- Appendices

# Souhegan River PISF Report

- Appendix 1 – ADOs (Affected Dam Owners)
- Appendix 2 – AWUs (Affected Water Users)
- Appendix 3 – Hydrology
- Appendix 4 – Recreation Surveys
- Appendix 5 – Temperature
- Appendix 6 – Target Fish Community
- Appendix 7 – Fish Data
- Appendix 8 – Habitat Suitability Criteria

# Souhegan River PISF Report

- Appendix 9 - Habitat Survey
- Appendix 10 - HMU Maps
- Appendix 11a - Adult Suitability maps
- Appendix 11b - Spawning Suitability maps
- Appendix 12 - Rating Curves
- Appendix 13 - Habitat Time Series Analysis
- Appendix 14 - Verification of Model Transferability

# Souhegan River PISF Report

- Appendix 15 - Site 11
- Appendix 16 - Floodplain Transects
- Appendix 17 - Example Calculations
- Appendix 18 - Responses to Public Comments

Souhegan River  
Habitat Mapping  
Site 3



HMU  
maps

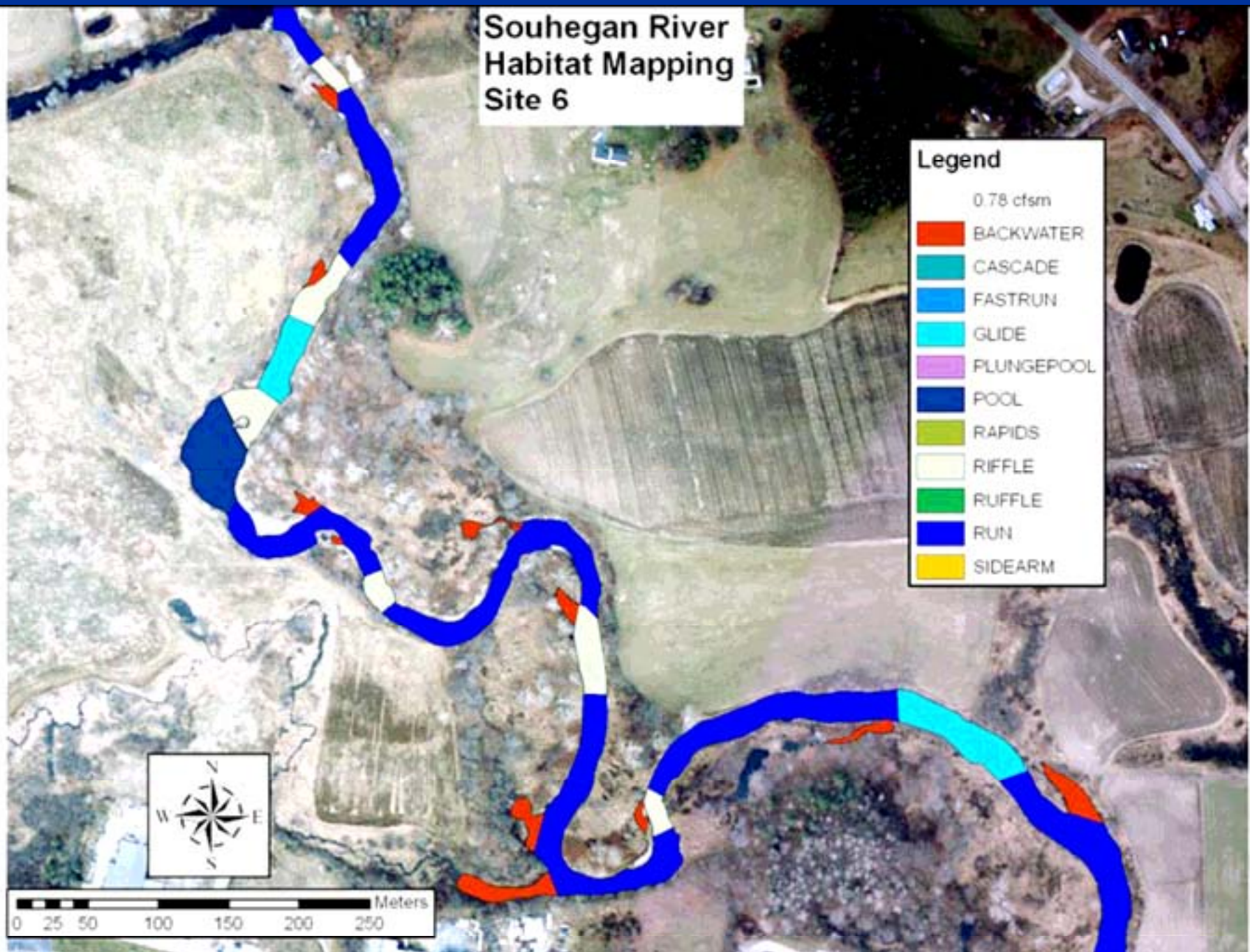
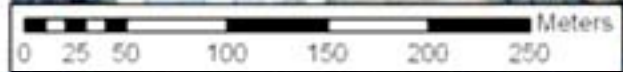
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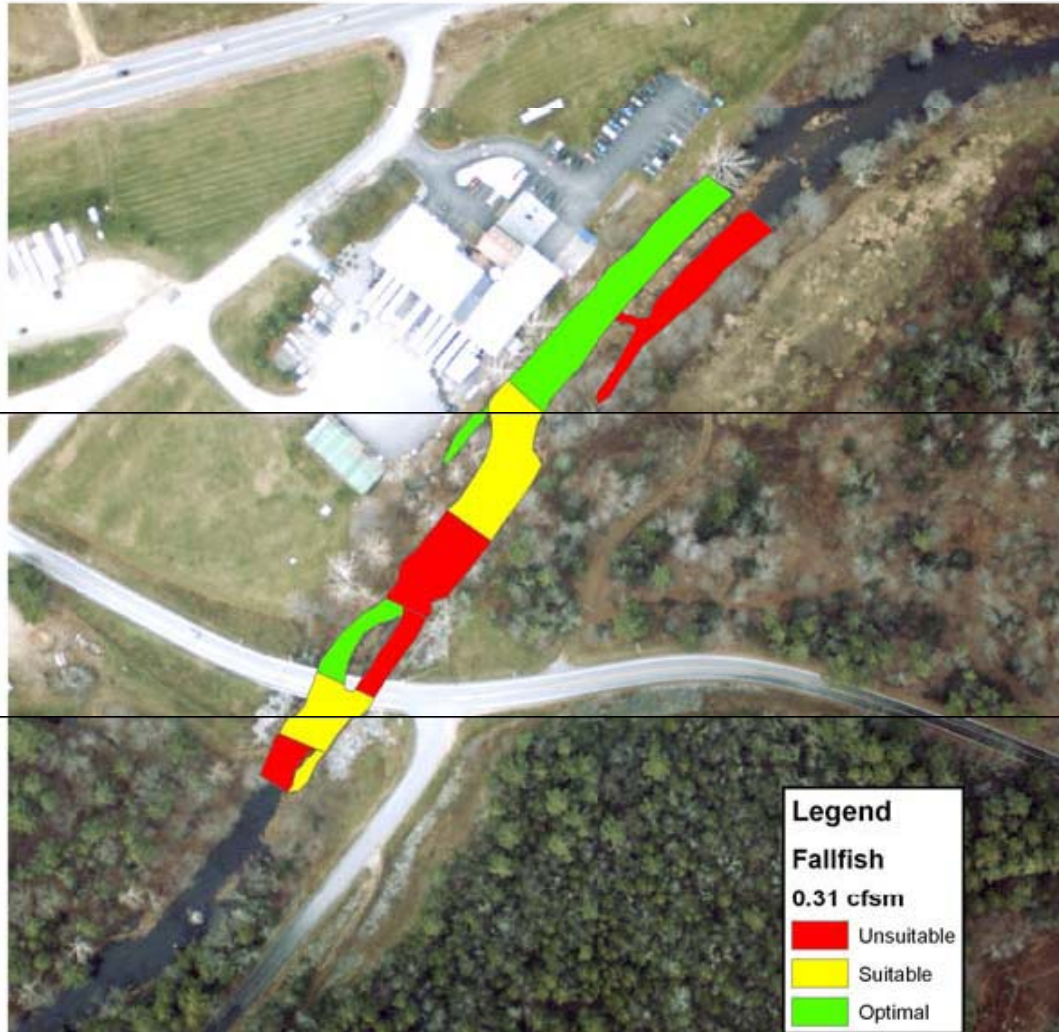


# Souhegan River Habitat Mapping Site 6

- Legend**
- 0.78 cfsm
- BACKWATER
  - CASCADE
  - FASTRUN
  - GLIDE
  - PLUNGEPOOL
  - POOL
  - RAPIDS
  - RIFFLE
  - RUFFLE
  - RUN
  - SIDEARM



# Souhegan River Habitat Suitability Site 3



# Rating Curves

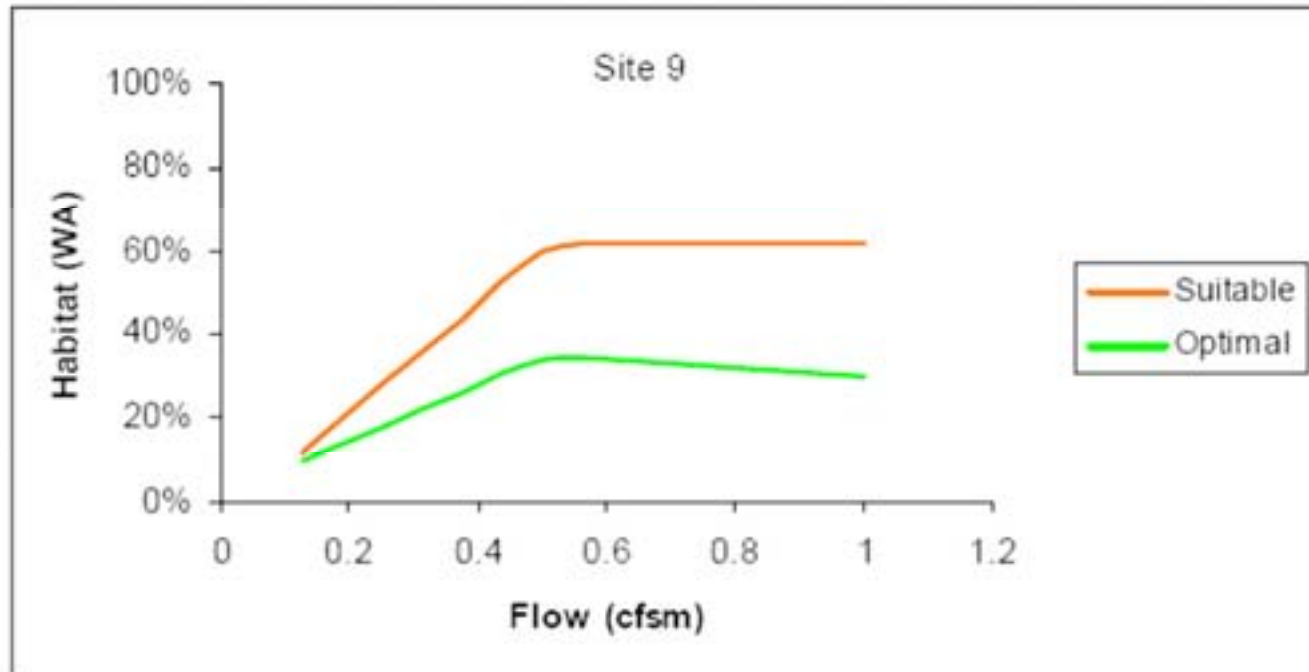
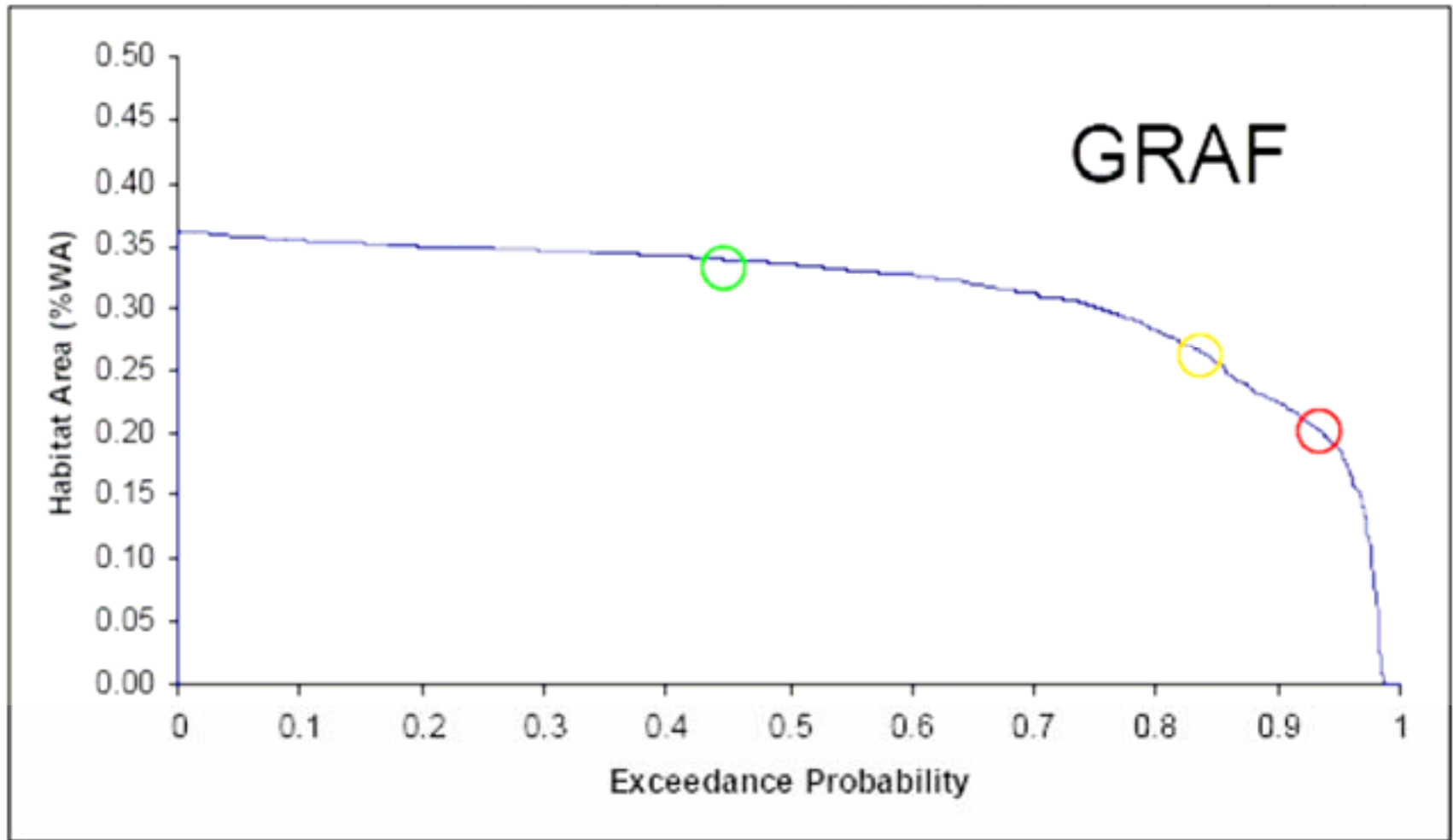


Figure 164: The suitable and optimal habitat rating curves for spawning American shad in Site 9.

# Habitat levels versus exceedance probability



July 15 - Sept. 30, 1947 - 1997

**Table ES3. Instream Flows for fish (bold values are flows not to be exceeded)**

Bioperiod Approximate dates	Rearing & Growth July 15 - Sept. 30		Salmon Spawning Oct. 1 - Nov. 14		Over-Wintering Nov. 15 - Feb. 28	
	Recommended flows		Recommended flows		Recommended flows	
Concurrent Gauge (SR#)	SR 25	USGS	SR 25	USGS	SR 25	USGS
Watershed area (mi <sup>2</sup> )	102	171	102	171	102	171
Location	Upper	Lower	Upper	Lower	Upper	Lower
Common flow (cfs)	31	103	41	184	204	342
Common flow (cfsm)	0.3	0.6	0.4	1.1	2.0	2.0
Allowable duration under (days)	30	20	30	23	35	35
Catastrophic duration (days)	42	40	40	40	50	50
Critical flow (cfs)	16	26	10	96	51	86
Critical flow (cfsm)	0.16	0.15	0.1	0.6	0.5	0.5
Allowable duration under (days)	15	15	12	12	35	15
Catastrophic duration (days)	35	20	23	40	50	30
Rare flow (cfs)	10	17	10	70	31	51
Rare flow (cfsm)	0.1	0.1	0.1	0.4	0.3	0.3
Allowable duration under (days)	5	5	10	5	35	5
Catastrophic duration (days)	30	10	23	10	50	10
Bioperiod Approximate dates	Spring Flood March 1 - April 30		Shad Spawning May 1 - June 14		GRAF Spawning June 15 - July 14	
	Recommended flows		Recommended flows		Recommended flows	
Concurrent Gauge (SR#)	SR 25	USGS	SR 25	USGS	SR 25	USGS
Watershed area (mi <sup>2</sup> )	102	171	102.3	171	102.3	171
Location	Upper	Lower	Upper	Lower	Upper	Lower
Common flow (cfs)	389	650	215	178	24	39
Common flow (cfsm)	3.8	3.8	2.1	1.0	0.23	0.23
Allowable duration under (days)	28	28	25	15	20	17
Catastrophic duration (days)	36	36	40	25	27	25
Critical flow (cfs)	113	188	61	96	11	<b>239/26</b>
Critical flow (cfsm)	1.1	1.1	0.6	0.6	0.11	<b>1.4/0.15</b>
Allowable duration under (days)	12	12	10	5	10	<b>13/15</b>
Catastrophic duration (days)	16	16	15	10	20	<b>23/20</b>
Rare flow (cfs)	82	188	38	88	8	<b>325/17</b>
Rare flow (cfsm)	0.8	0.8	0.37	0.5	0.08	<b>1.9/0.1</b>
Allowable duration under (days)	5	5	4	5	10	<b>10/10</b>
Catastrophic duration (days)	7	7	7	10	15	<b>10/10</b>

- Emboldened values for lower Souhegan GRAF spawning are the upper limit for the instream flow. The lower limits are set at the cfsm values from the upper Souhegan
- Overwintering durations for the upper Souhegan were set at the values from the lower Souhegan, since little field information exists.

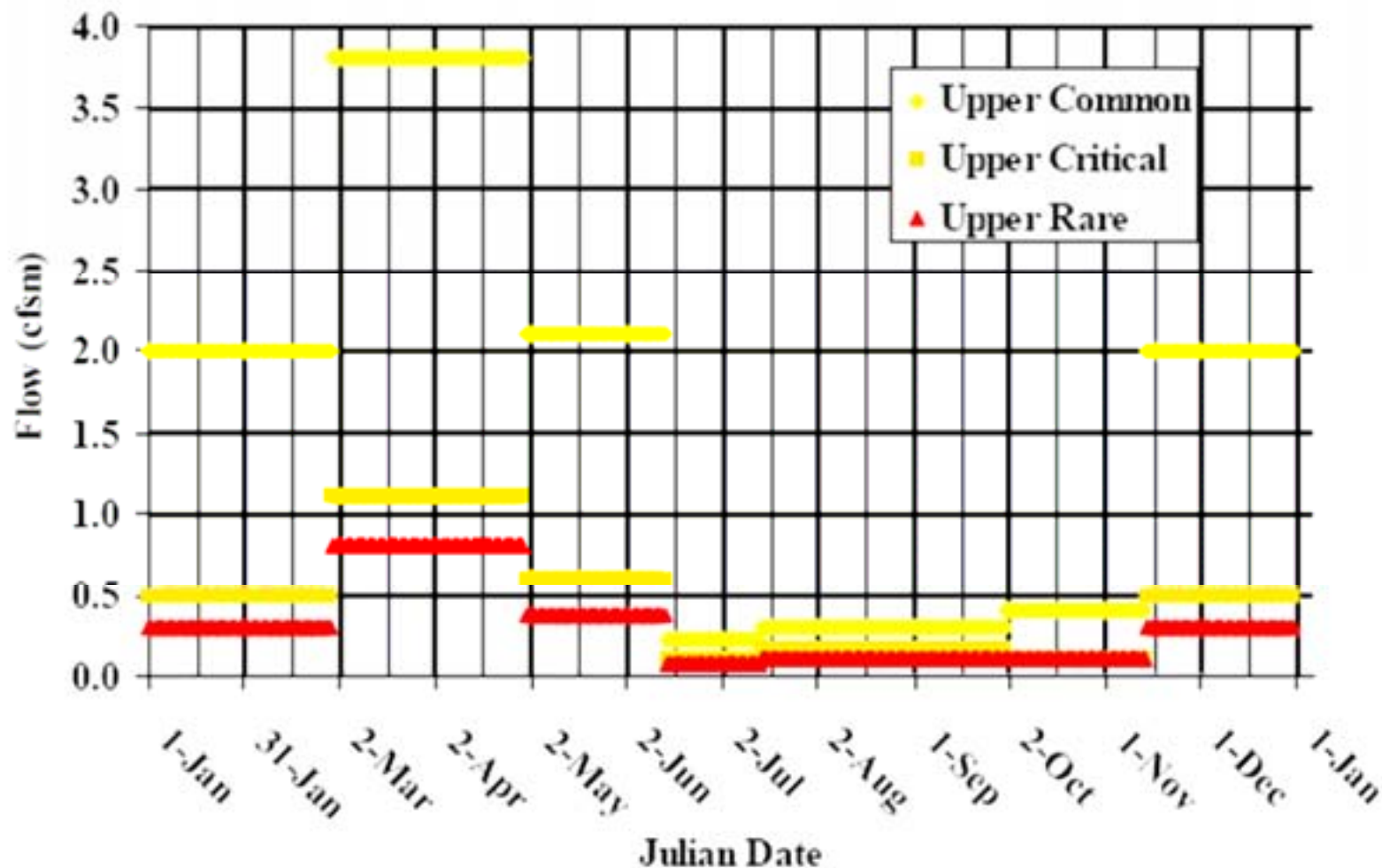


Figure ES3. Synthesized PISF for the Upper Souhegan River.

# Protected flows from transect method

Species	Timing and value of instream flow
Wood Turtle (lower Souhegan only)	<5.85 cfsm (June through September) > 0.97 cfsm (December through February)
Fowler's Toad (lower Souhegan only)	>2.335 cfsm at least once to fill wetlands (March through May) >0.175 cfsm at least monthly to maintain breeding pools (June through mid-August)
Wild Senna and Wild Garlic	>18.7 cfsm on a frequency of once every 2-10 years
Twisted Sedge/Fern Glade (upper Souhegan)	>2.8 cfsm once every 1-3 years (December through April)
Silver Maple Floodplain Forest (lower Souhegan only)	>11.7 cfsm once every 1-3 years
Sycamore Floodplain Forest (lower Souhegan only)	>17.5 cfsm once every 1-3 years
Oxbow/Backwater Marsh (lower Souhegan only)	>3.5 cfsm at least once to fill (March through April) >0.2 cfsm at least monthly in summer (May through September)

# Establishment of Protected Instream Flows

- Within 60 days of the close of the public comment period, the department shall issue a decision establishing protected instream flows.
- The decision shall be in writing.
- Shall state the scientific basis for the established flows.

# Establishment of Protected Instream Flows

- Shall include an assessment of how the established flows will meet applicable water quality standards.
- Include an assessment of hydropower impacts.
- Summarize the comments received.
- Explain how the comments affected the decision.

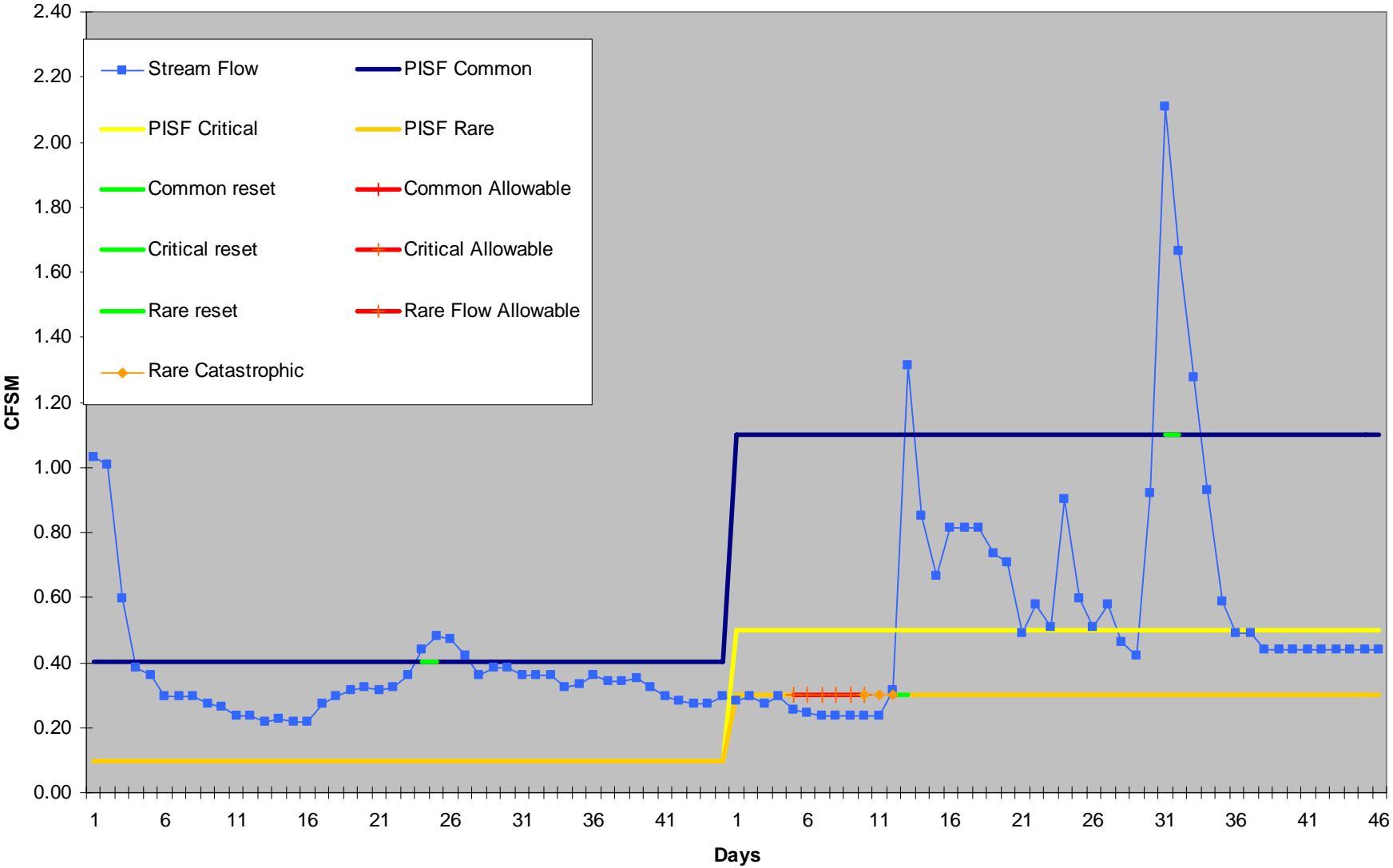
# The department shall provide copies of the decision to:

- The list of persons identified in Env-Ws 1905.03(e);
- Anyone who submitted written comments on the proposed flows; and
- Anyone who requested to receive a copy of the notice of the established flows.

# WMP implementation

- Web page in production to notify AWUs and ADOs of stream flow status relative to PISF.
- Automatic projection of stream flow to web page as a graphic.
- Repeated in a table showing status of stream flow relative to PISF.

# Souhegan River Stream Flow versus PISF magnitude and durations



# Legislation to Extend Pilots

- Both programs going longer than planned (January 2009).
- Souhegan PISF report process took over a year.
- 2008-H-2086-R (Prime Sponsor: Rep. Mike Kappler) relative to reporting dates for the Instream Flow Pilot Program.
- Adds two years to all deadlines.

# Souhegan River Water Management Plan

- **Who's affected?**
  - Dam Owners
  - Water Users
- **What's the plan?**
  - Water Conservation
  - Water Use
  - Dam Management
- **How can I help?**
- **What's the schedule?**



# Souhegan River Water Management Plan

## Who's affected?

**Dam Owners** – an affected dam owner (ADO) means an owner of a dam with an impoundment with a surface area greater than 10 acres in the watershed of the designated river (Env-Ws 1902.02)



Osgood Pond Dam - Milford

# Souhegan River Water Management Plan

## Affected Federal, Municipal and Private Dams

- Burton Pond (40 ac)
- Dream Lake (10.4 ac)
- Joe English Pond (36 ac)
- New Wilton Reservoir (22.1 ac)
- Osgood Pond (24.2 ac)
- Pratt Pond (35 ac)
- Swartz Pond (10.6 ac)
- Vijverhof Pond (34 ac)
- Waterloom Pond (75 ac)
- Wheeler Pond (11 ac)

# Souhegan River Water Management Plan Affected State Owned Dams

Souhegan River Site:

- 8 Dam and Dikes (40 ac)
- 12A North & South Dams (108 ac)
- 15 Dam (69 ac)
- 19 Dam (25 ac)
- 33 Dam (12 ac)
- 35 Dam (24.9 ac)

# Souhegan River Water Management Plan

## Affected dam uses include:

- Flood Control (6 total)
- Hydropower (One - Waterloom Pond Dam)
- Recreation (8 total)
- Water Supply (Two - New Wilton Reservoir Dam and Site 12 Dam/Tobey Reservoir)

# Souhegan River Water Management Plan



# Souhegan River Water Management Plan

## Who's affected?

**Water Users** – an affected water user (AWU) means:

- a water user required to be registered under Env-Wr 700, or successor rules, and
- having a withdrawal or return location within 500 ft of a designated river or within 500 ft of a river or stream in its tributary drainage area.



Pike Industries

# Souhegan River Water Management Plan

## Water User Registration and Reporting

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. (RSA 488:3)

# Souhegan River Water Management Plan

## Agriculture

- Peter de Bruyn Kops

## Aquaculture

- Milford Fish Hatchery

## Bottled Water

- Monadnock Mountain Spring Water

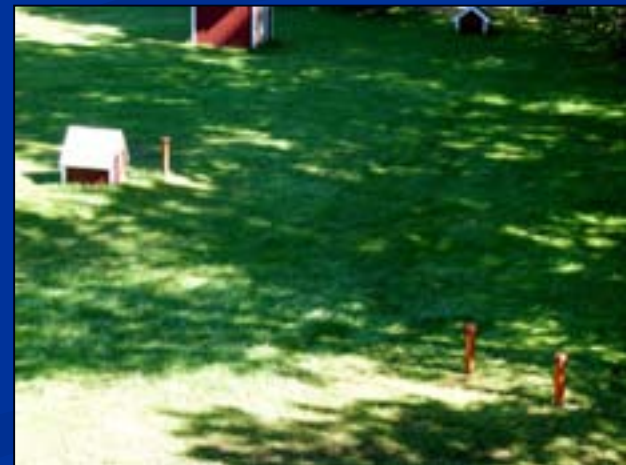
## Hydropower

- Chamberlain, Otis and Waterloom Dams
- Pine Valley Mill Dam

## Irrigation

- Amherst Country Club
- Ponemah Green Golf Course
- Souhegan Woods Golf Club

# Souhegan River Water Management Plan



Otis Falls Dam – Above  
Souhegan Woods Golf Club – Upper Right  
Monadnock Mountain Spring – Lower Right

# Souhegan River Water Management Plan

## Mining

- Wilton Quarry – Pike Industries

## Water Supply - Private

- Amherst Village District
- Badger Hill
- Souhegan Woods

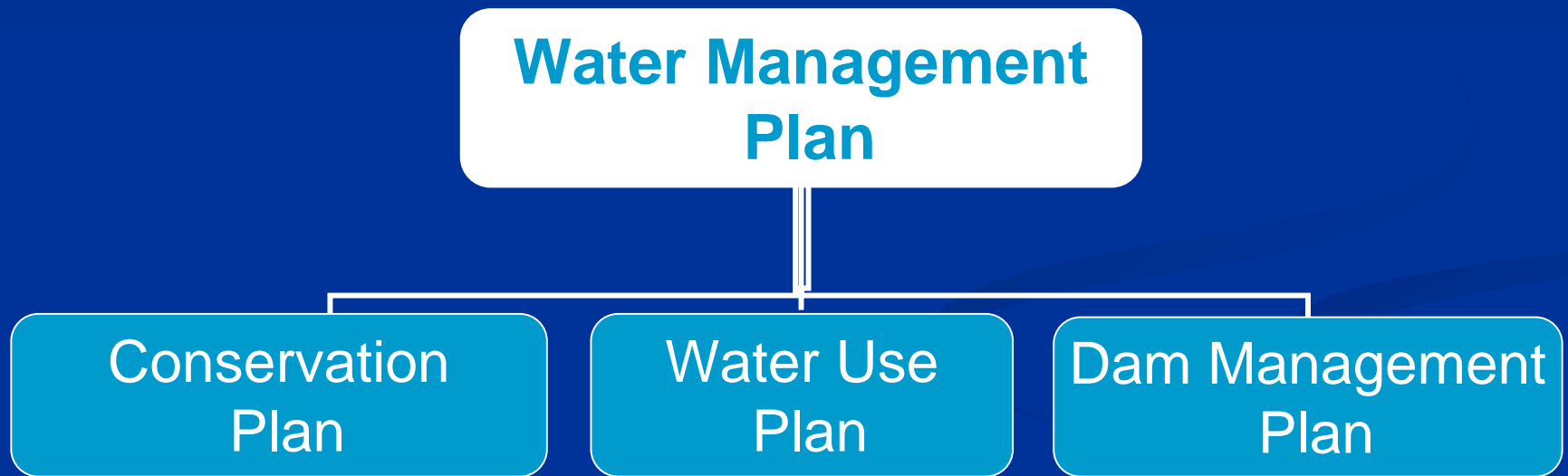
## Water Supply - Public

- Greenville Water Works
- Milford Water Works
- Wilton Water Works

## Sewage Treatment

- Greenville WWTF
- Milford WWTF
- Wilton WWTF

# Souhegan River Water Management Plan



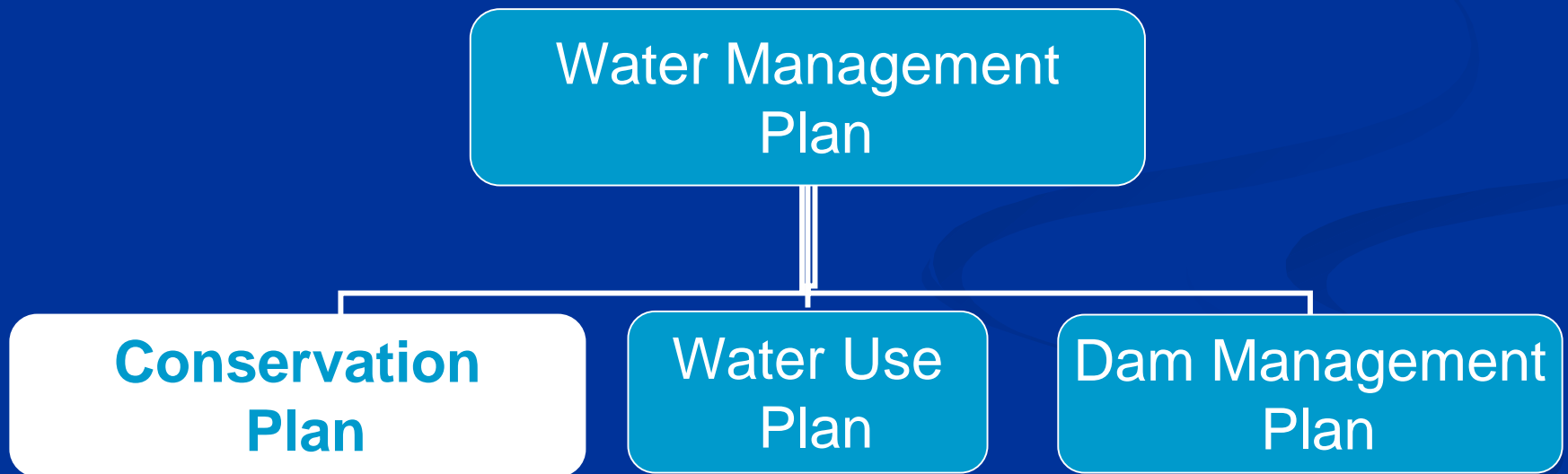
# Souhegan River Water Management Plan

## Water Management Plan Process:

- Develop sub-plans.
- Notify each ADO and AWU in the Water Management Planning Area (WMPA) that a WMP is being prepared and is enforceable.
- Encourage ADO and AWU participation.
- Meet with ADO and AWU to discuss protected instream flow requirements.
- Public review, hearing and comment on WMP.

# Souhegan River Water Management Plan

## Components of the Water Management Plan



# Souhegan River Water Management Plan

## Conservation Plan

- Applies to all AWUs in the WMPA.
- Focus on:
  - Water supply and demand
  - Water conservation

# Souhegan River Water Management Plan

## Conservation Plan

- Identify all AWUs in the WMPA.
- Determine AWU types within the WMPA and identify conservation measures and best management practices (BMPs) applicable to each type.
- For each AWU prepare a report water use patterns, needs and potential for conservation.

# Souhegan River Water Management Plan

## Conservation Plan

- For each AWU develop a conservation implementation plan and schedule with quantitative water use reduction targets.
- Perform an economic assessment of the conservation implementation plan.

# Souhegan River Water Management Plan

## Status of Conservation Plans

- Obtained water use records (through 2004) from NHDES and performed site visits.
- Developed water use questionnaire, sent to AWUs and received completed forms from AWUs.
- Profiles of individual AWUs prepared and included in Protected Instream Flow Report.

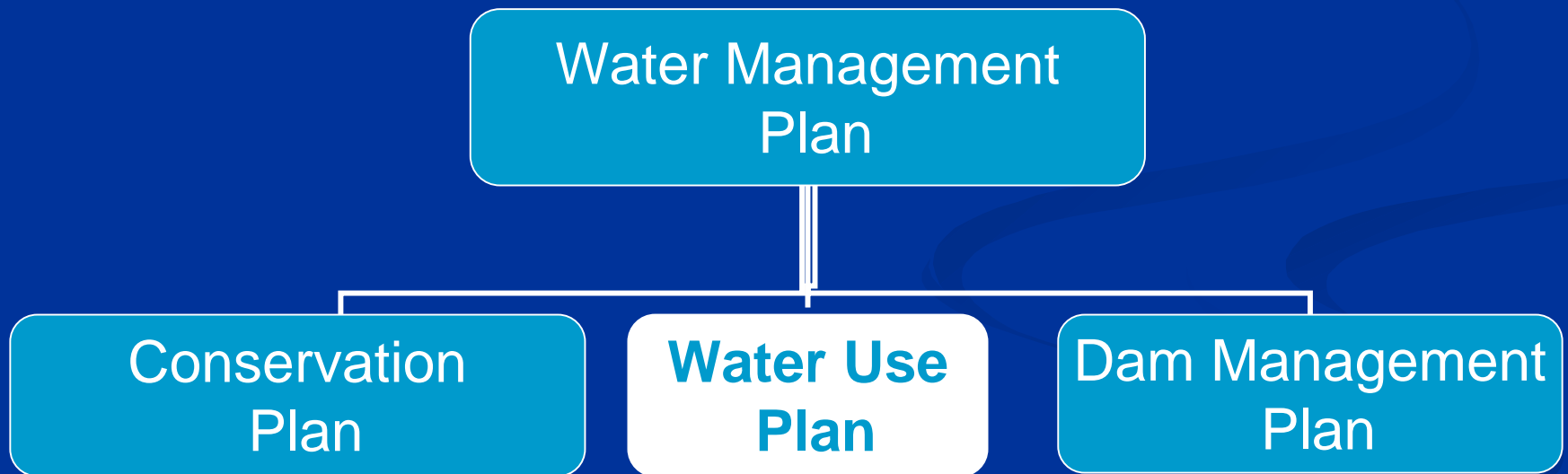
# Souhegan River Water Management Plan

## Status of Conservation Plans

- Need to complete draft versions of individual Conservation Plans (CP) for AWU review.
- Complete individual CPs, incorporate into overall CP and then use in development of the WMP.

# Souhegan River Water Management Plan

## Components of the Water Management Plan



# Souhegan River Water Management Plan

## Water Use Plan

- Applies to all AWUs in the WMPA
- Focus on:
  - Water use patterns and need
  - Water use modification and/or sharing

# Souhegan River Water Management Plan

## Water Use Plan

- Include data and information from Conservation Plans to define water use patterns and needs of each AWU in the WMPA.
- For each AWU include a report describing the potential for water use modification, sharing or both to meet PISF.

# Souhegan River Water Management Plan

## Water Use Plan

- With assistance from Public Utilities Commission (PUC) assess the effect of the PISF on each existing hydroelectric facility (four facilities).
- For each AWU in the WMPA, include an individual Water Use Plan so that the net effect of implementation of all individual plans, in coordination with the implementation of Dam Management Plan, is maintenance of the PISF.

# Souhegan River Water Management Plan

## Water Use Plan

- For each AWU include an implementation schedule for the individual water use plan.
- The department will:
  - Coordinate negotiations among ADOs and AWUs to meet PISFs.
  - Prepare economic assessment of the cost to implement the plan.

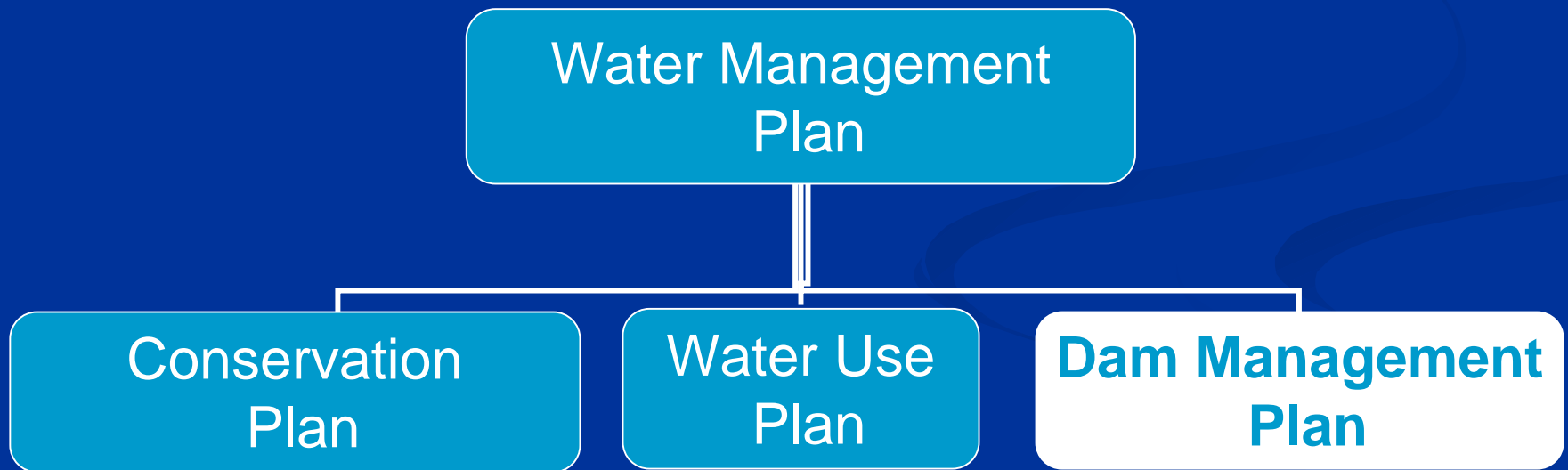
# Souhegan River Water Management Plan

## Status of Water Use Plan

- Developing format of draft report for submittal to DES.
- No other progress on this task at this time.

# Souhegan River Water Management Plan

## Components of the Water Management Plan



# Souhegan River Water Management Plan

## Dam Management Plan

- Applies to all ADOs in the WMPA
- Focus on:
  - Water storage and operation
  - Ability of facility to provide augmentation flows

# Souhegan River Water Management Plan

## Dam Management Plan

- Obtain information from department sources, site visits and interviews with each ADO or their operator on dam characteristics and operations, such as:
  - Dam construction and dimensions
  - Design flows and storage
  - Control structures and operation

# Souhegan River Water Management Plan

## Dam Management Plan

- For each affected dam prepare a report describing:
  - Potential water available for release to maintain PISF.
  - Ecological and other impacts to the impoundment and downstream river reaches due to augmentation flows.
  - Potential for dam management to meet PISF requirements.

# Souhegan River Water Management Plan

## Dam Management Plan

- For each affected dam prepare an individual Dam Management Plan (DMP). DMP to document net effect of implementation of all individual plans in coordination with implementation of the Water Use Plan (WUP) is the maintenance of PISF.
- Develop implementation schedule for individual DMP.

# Souhegan River Water Management Plan

## Dam Management Plan

- DES to meet with each ADO to explain PISF.
- DES to coordinate negotiations with ADOs and AWUs towards water use and dam management that meet PISF and existing uses of reservoirs.
- Economic assessment of implementation costs and schedule.

# Souhegan River Water Management Plan

## Status of Dam Management Plans

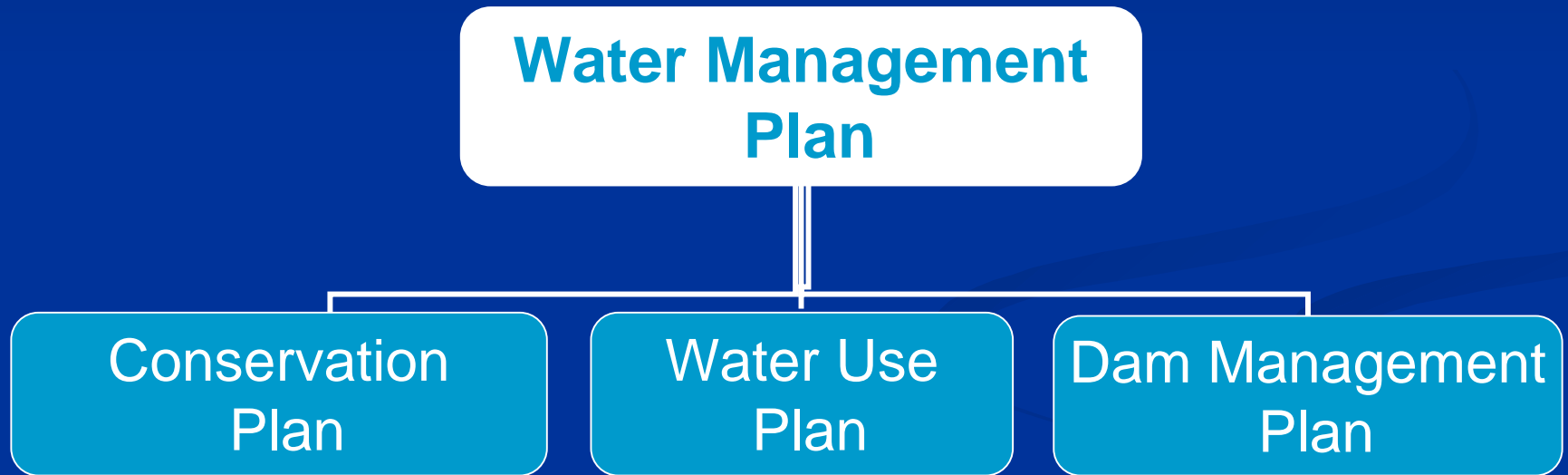
- Obtained dam records from NH Dam Bureau and performed site visits.
- Developed individual dam profiles.
- Developed and distributed questionnaire for hydropower dams and have received responses.

# Souhegan River Water Management Plan

## Status of Dam Management Plans

- Prepared draft questionnaire for non hydropower affected dams and have received comments from DES. Will send to ADOs soon.
- Met with NH Dam Bureau to discuss flood control structures in WMPA.
- Developed draft DMP format and received comments from DES.

# Souhegan River Water Management Plan



# Souhegan River Water Management Plan

## Water Management Plan

- Integrates information from individual CPs, WUPs and DMPs.
- Specifies conservation and operational measures to be implemented by each AWU and ADO to meet PISF requirements.
- Develops implementation schedule.
- Identify and evaluate financial assistance available to agriculture or public water supply AWUs to meet plan.

# Souhegan River Water Management Plan

## How Can I Help?

- Stay informed.
- Contribute to the process:
  - Attend meetings and ask questions.
  - Respond to requests for information.
  - Review and comment on draft reports.

# Souhegan River Water Management Plan

## What's the Schedule?

- Complete draft individual sub-plans by Winter/Spring 2008.
- Complete WMP report by Summer 2008.
- Final Reviewed WMP by January 2009.



# Souhegan River Water Management Plan

## Contacts:

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