

*Proposed*

Protected Instream Flows for the  
Souhegan River Designated  
Reach

University of New Hampshire  
University of Massachusetts  
Normandeau Associates, Inc.

TRC Meeting 3 January 2007

# Objectives of Today's Meeting

- Review modifications to the previous PISF Report
- Approve of recommendations

# Primary Changes Since the Previous Draft

- Revised fish and synthesized PISF
- Revised probabilities of not meeting the desired PISF
- Addressed all public comments on previous draft (16)
- Added a detailed example for the fish PISF (Appendix 17)

# Revisions

- Factual Changes – 6 (mostly on unprescribed low range flows during GRAF spawning and flows associated with some dams)
- Clarifications – 22
- Editorial – 82

<b>Bioperiod</b> Approximate dates	<b>GRAF Spawning</b> June 15 - July 14
Concurrent Gauge (SR#) Watershed area (mi <sup>2</sup> ) Location	<b>Recommended flows</b>
	USGS 171 <b>Lower</b>
<b>Common flow (cfs)</b> <b>Common flow (cfsm)</b> Allowable duration under (days) Catastrophic duration (days)	39 0.23 17 25
<b>Critical flow (cfs)</b> <b>Critical flow (cfsm)</b> Allowable duration under (days) Catastrophic duration (days)	<b>239/19</b> <b>1.4/0.11</b> <b>13</b> <b>23</b>
<b>Rare flow (cfs)</b> <b>Rare flow (cfsm)</b> Allowable duration under (days) Catastrophic duration (days)	<b>325/19</b> <b>1.9/0.11</b> <b>10</b> <b>10</b>

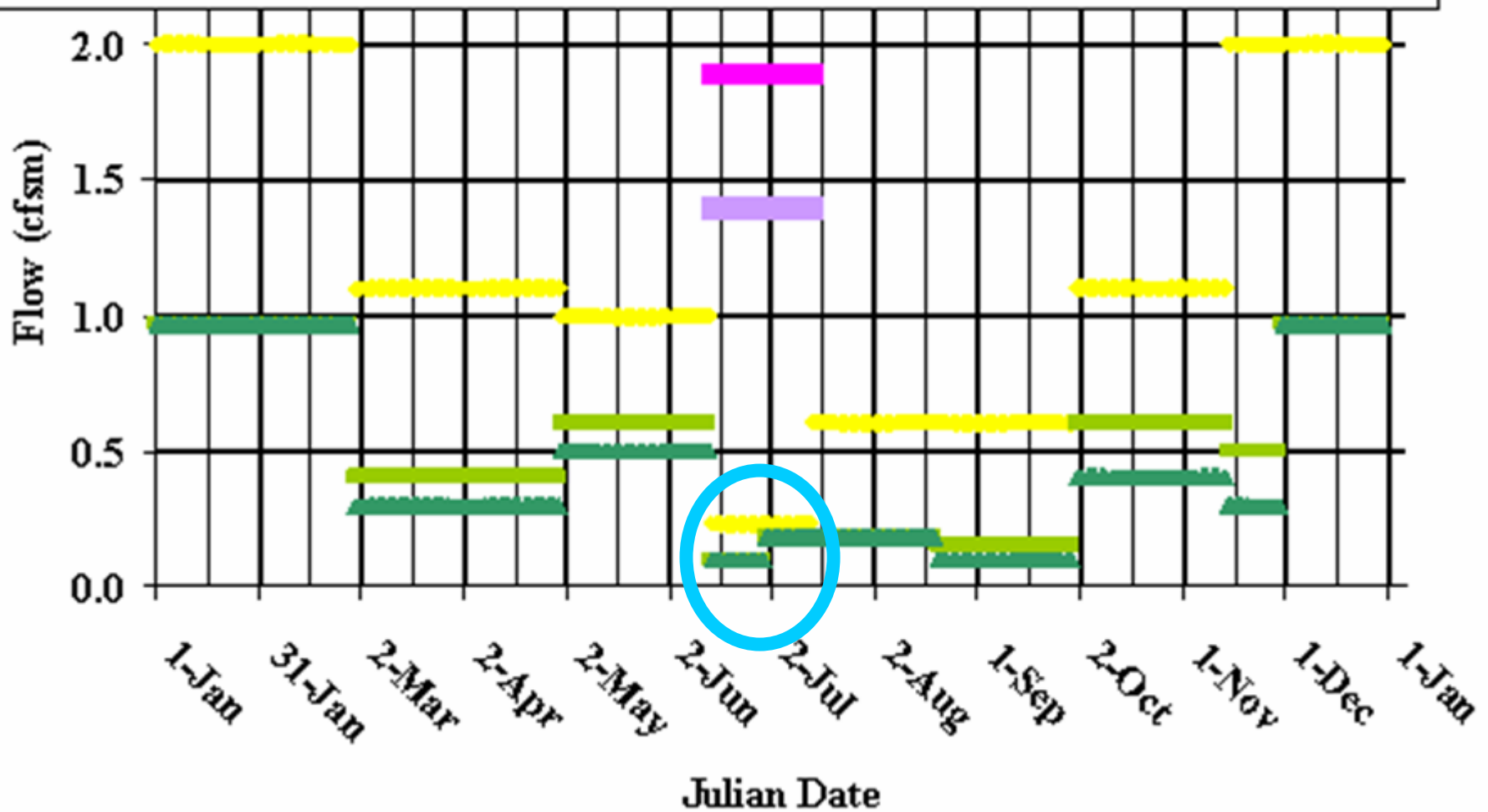
◆ Lower Common

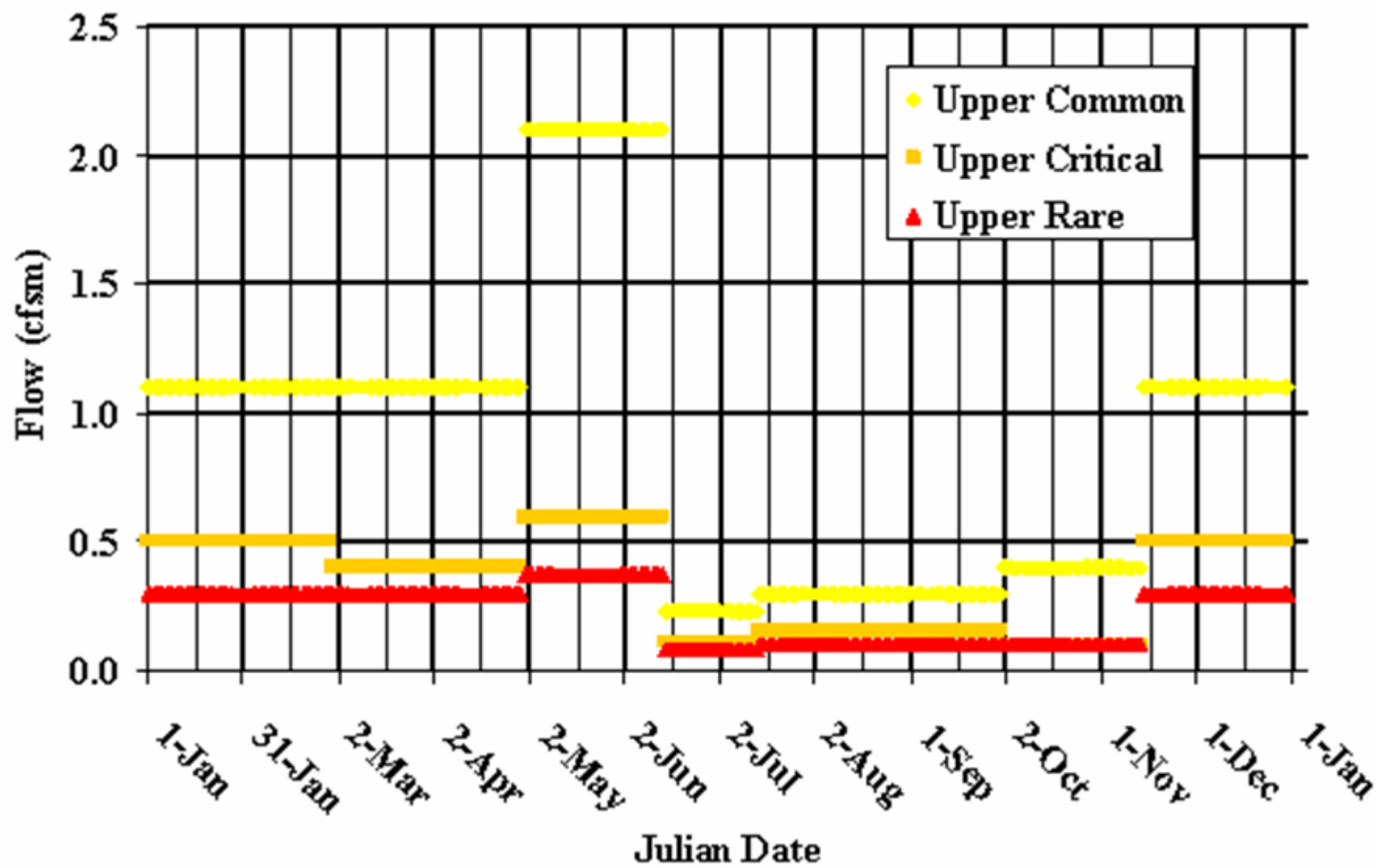
■ Lower Critical

▲ Lower Rare

■ Lower Critical High Flow

■ Lower Rare High Flow





# **Controlling Instream Flow IPUOCR for the Souhegan River Reaches**

<b>Time of Year</b>	<b>Controlling IPUOCR Critical</b>		<b>Controlling IPUOCR Rare</b>	
	<b>Upper</b>	<b>Lower</b>	<b>Upper</b>	<b>Lower</b>
Jan 1 – Feb 28	Fish overwinter	Wood Turtle hibernation	Fish overwinter	Wood Turtle hibernation
Mar 1 – Apr 30	Fish spring flood	Fish spring flood	Fish spring flood	Fish spring flood
May 1 – Jun 14	Shad spawning	Shad spawning	Shad spawning	Shad spawning
Jun 15 – Jun 30	GRAF spawning	GRAF spawning	GRAF spawning	GRAF spawning

<b>Time of Year</b>	<b>Controlling IPUOCR Critical</b>		<b>Controlling IPUOCR Rare</b>	
	<b>Upper</b>	<b>Lower</b>	<b>Upper</b>	<b>Lower</b>
Jul 1 – Jul 14	GRAF spawning	Oxbow and backwater marsh maintenance	GRAF spawning	Oxbow and backwater marsh maintenance
Jul 15 – Aug 21	GRAF rearing & growth	Oxbow and backwater marsh maintenance	GRAF rearing & growth	Oxbow and backwater marsh maintenance
Aug 22 – Sep 14	GRAF rearing & growth	GRAF spawning	GRAF rearing & growth	GRAF spawning

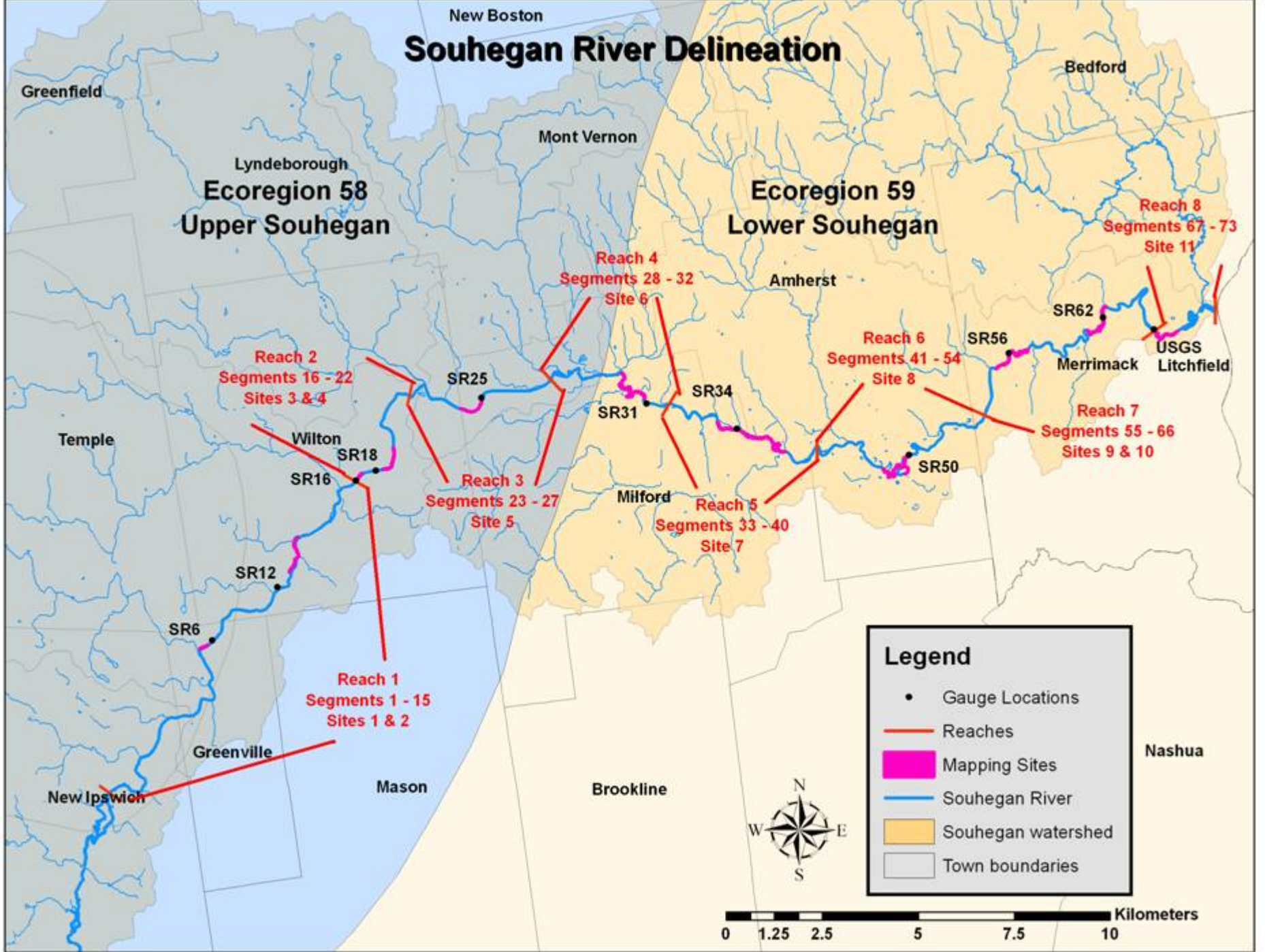
<b>Time of Year</b>	<b>Controlling IPUOCR Critical</b>		<b>Controlling IPUOCR Rare</b>	
	<b>Upper</b>	<b>Lower</b>		<b>Upper</b>
Sep 15 – Sep 30	GRAF rearing & growth	GRAF rearing & growth	GRAF rearing & growth	GRAF rearing & growth
Oct 1 – Nov 14	Salmon spawning	Salmon spawning	Salmon spawning	Salmon spawning
Nov 15 – Dec 1	Fish overwinter	Fish overwinter	Fish overwinter	Fish overwinter
Dec 2 – Dec 31	Fish overwinter	Wood Turtle hibernation	Fish overwinter	Wood Turtle hibernation

Questions?

# Souhegan River Delineation

Lyndeborough  
**Ecoregion 58**  
Upper Souhegan

Amherst  
**Ecoregion 59**  
Lower Souhegan



**Legend**

- Gauge Locations
- Reaches
- Mapping Sites
- Souhegan River
- Souhegan watershed
- Town boundaries



# Synthesized PISF

When comparing the PISF need for each IPUOCR for every day of the year, on the low flow end, the largest of the individual IPUOCR PISF controls: meeting that PISF means that all other PISF are met.

Human needs (recreation and hydropower) are the largest of the low flow PISF.

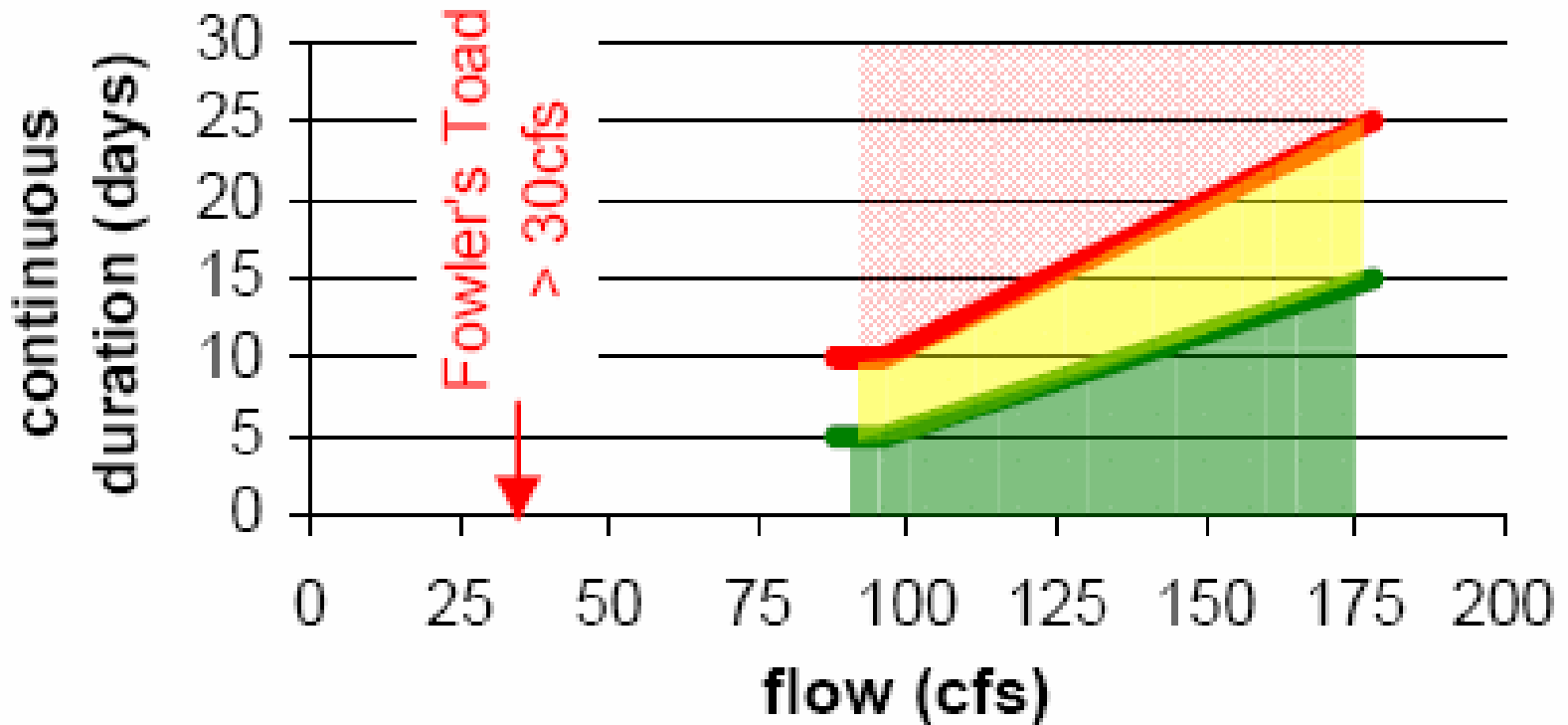
# Achievable Synthesized PISF

The river system has very little conservation storage (stored water that could be released over long periods) to meet human PISF.

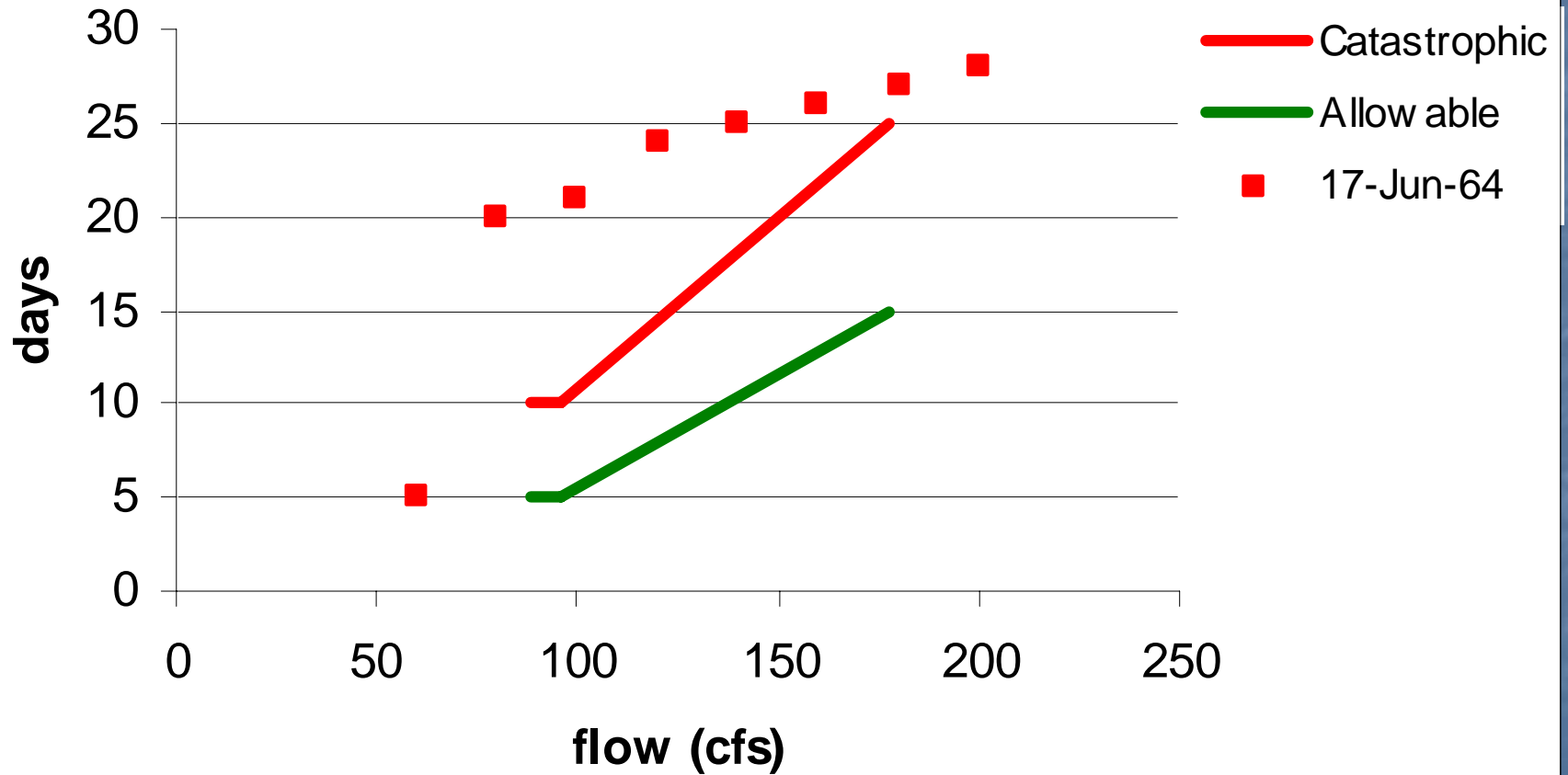
It was decided that the human PISF would be met as they have been historically: “run-of-river”, and therefore subsequent water management strategies will focus on the non-human, synthesized PISF.

# Lower American Shad

(1 May - 14 Jun)



# Lower Souhegan SHAD SPAWNING 1 May - 14 June



# Storage

- Present total volume of conservation and flood storage in the basin = 13,427 AF (MAXIMUM),  
7,200 AF in NH DES facilities
- Average annual water volume needed to meet common flow = 293,204 AF
- Average annual water volume needed to meet critical flow = 69,023 AF
- Average annual water volume needed to meet rare flow = 59,572 AF

# The Challenge: Time to Fill 10,000 AF

- At 300 cfs = 17 days
- At 100 cfs = 50 days
- At 50 cfs = 101 days
- At 10 cfs = 504 days

# Days of Augmentation for 1,000 AF

- 80 cfs (avg. common deficit flow) = 6 days
- 30 cfs (avg. critical deficit flow) = 17 days
- 27 cfs (avg. rare deficit flow) = 19 days

# Available Flow for Management

- Average August flow from all surface water withdrawals is 2 cfs.
- At times (specific days or time of day) flow attributable to withdrawals is higher.
- Most larger withdrawals are in lower section of river
- Some withdrawals return flow to river
- Some groundwater withdrawals return as surface discharges

Site	Description	7Q10 (cfs)	Median August Flow (cfs)	0.5 cfsm (cfs)	0.1 Q <sub>avg</sub> (cfs)	0.3 Q <sub>avg</sub> (cfs)
SR6	Handicap Access Fish Ramp - Greenville	2.8	6.8	12.0	5.1	11.9
SR12	High Energy Bank - Greenville	3.1	7.6	13.6	5.7	13.4
SR16	Upstream of Monadnock Water	1.1	6.9	22.3	3.8	21.9
SR18	Intervale Road - Wilton	2.0	8.7	22.5	5.3	22.2
SR25	Wilton wastewater pumping station	4.2	13.8	29.7	9.4	29.3
SR31	Shopping Center Mall - Milford	4.0	18.3	48.8	11.2	48.0
SR34	Electric Substation - Milford	3.1	17.0	50.6	9.8	49.7
SR50	Boston Post Road - Amherst	5.2	23.5	61.5	14.4	60.5
SR56	Tomalison Farm - Amherst	5.3	24.4	64.5	14.9	63.4
SR62	Turkey Hill Road - Amherst	10.3	32.9	69.3	22.6	68.4
USGS	USGS Gage	13.0	41.0	85.7	28.2	84.6