

Water Use and Instream Flow

Lamprey River Symposium – 1/16/09

Wayne Ives - New Hampshire DES

- Fish collections were made at 43 sampling stations in the Designated River in August 2003 to support the Instream Flow Study
- Assessments of water use versus stream flow show that most of the time there is plenty of water, but when flows are low, water use may be of concern.
- The Lamprey Protected Instream Flow Study is in progress and draft protected flows are out for comments. A Water Management Plan will be developed for larger water users and dam owners to implement the protected flows.



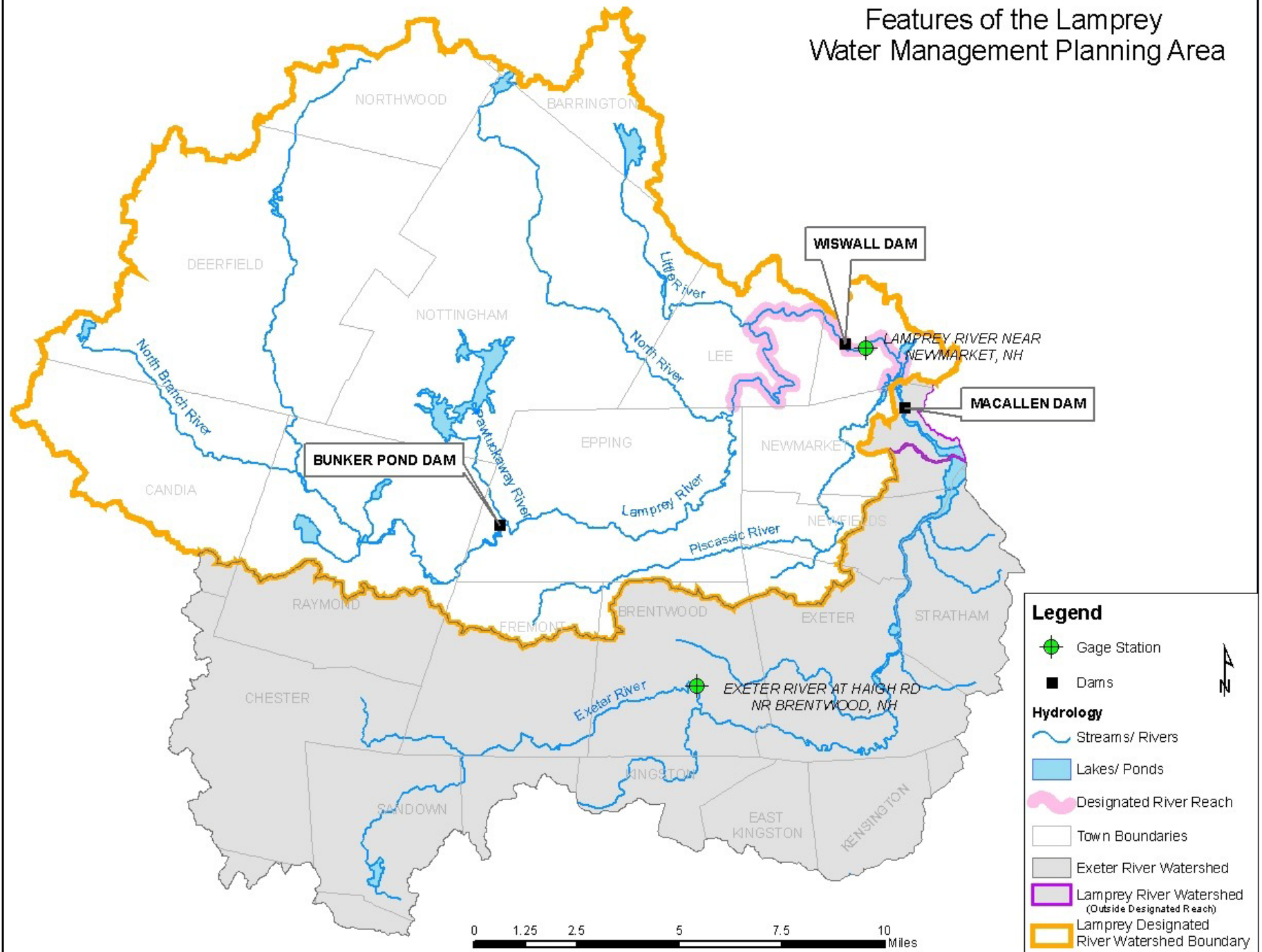
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January 16, 2009

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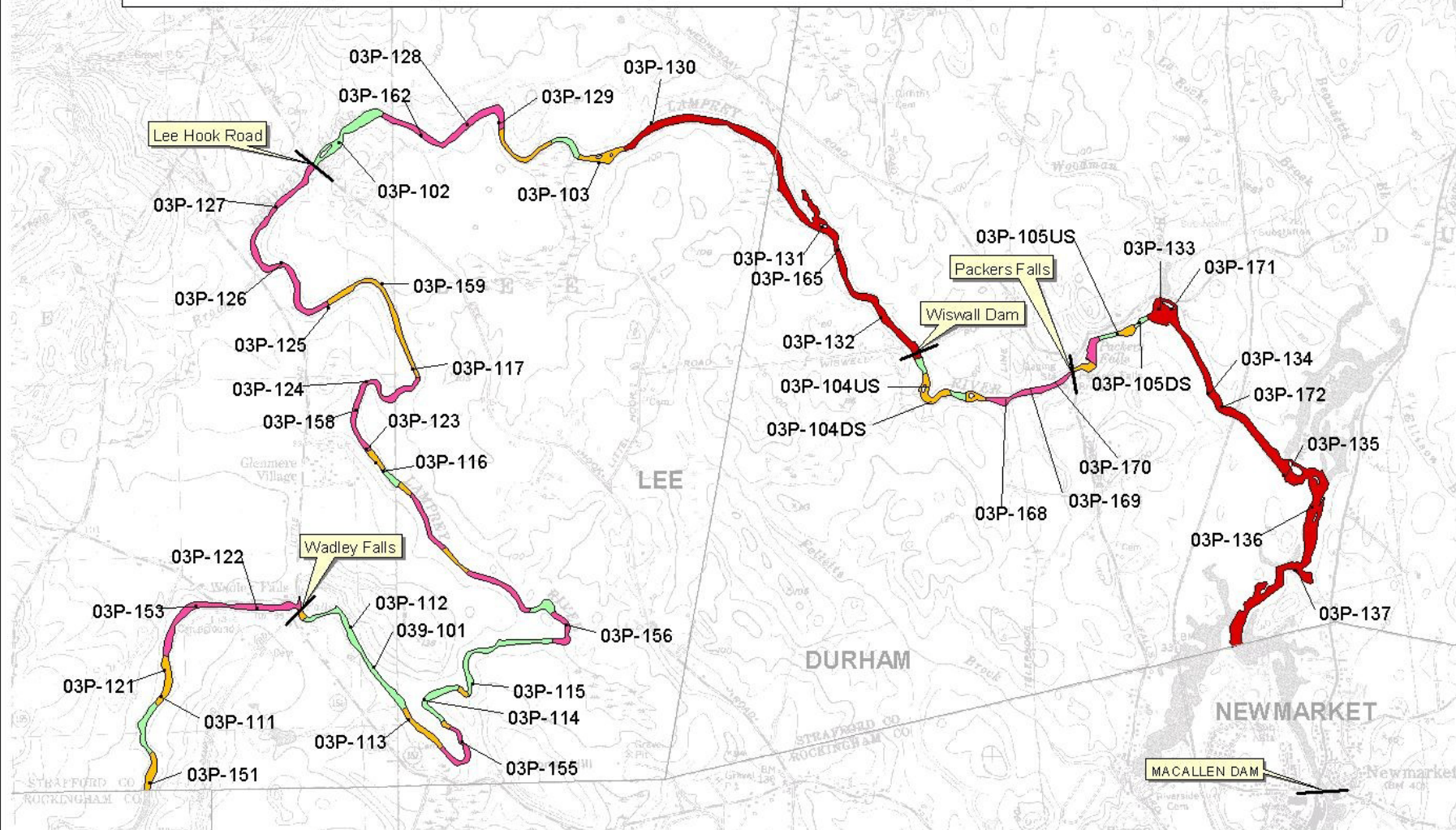
Features of the Lamprey Water Management Planning Area



Baseline Fish Community

- August 2003 – Collected fish
- Designated River Segment – 12 miles
- Electrofishing at 43 Stations
- Collection techniques based on habitat
- Some water quality measurements
- Some flow measurements

General Macrohabitat Conditions and Fish Collection Stations (BFC) Lamprey Designated River, Lee and Durham, New Hampshire



Sampling Methods



From reconnaissance of the
Lamprey River Designated
Reach on October 11, 2002,
by Wayne Ives, Dave Neils,
Paul Currier and Ken Edwardson.

Map prepared February 11, 2005 NHDES



1

0

1

Miles







2003 Baseline Fish Community

- Results
 - Over 6300 fish collected
 - Mixture of macrohabitat generalists and flow dependent/flow specialists
 - Dominant species - Common shiner (FD)
 - Riffles zones were most prolific

Assessing water use versus stream flow using the General Standard

- Done for all the Designated River
- Assessment of monthly use versus flow
- Includes withdrawals and returns and wells within 500 feet
- General Standard – makes comparison between rivers possible
- Planning tool for water management

General Standard

- Represents a portion of the stream flow
- Is not a biological standard
- Resource-conservative - provides a warning level assessment

General Standard

- GS is a set of criteria that standardizes stream flow for comparison of water use in different-sized rivers
- Describes water use thresholds based on monthly mean stream flow
 - 0.16 cfs when stream flow is >4.0 cfs
 - 0.04 cfs when stream flow is >1.0 cfs
 - 0.02 cfs when stream flow is >0.5 cfs
 - 5% of the 7Q10 when stream flow is ≤ 0.5 cfs

Daily streamflow data rendered as a GS value in CFSM

USGS 01073500 LAMPREY RIVER NEAR NEWMARKET, NH

DA(mi²) 183

7Q10 (cfs) 4.80

	Mean of daily stream flows (cfs)	Mean of monthly stream flows (POR) (cfs)	Median of monthly means (POR) (cfs)	Calculated monthly mean (cfsm)	General Standard (cfsm)
Jan-06	278	280	260	1.52	0.04
Feb-06	155	297	252	0.84	0.020
Mar-06	161	598	545	0.88	0.02
Apr-06	685	685	618	3.74	0.04
May-06	292	346	297	1.60	0.04
Jun-06	175	190	148	0.95	0.02
Jul-06	104	91	70	0.57	0.02
Aug-06	29	70	46	0.16	0.0013
Sep-06	54	72	47	0.30	0.0013
Oct-06	924	127	91	5.05	0.16
Nov-06	638	258	200	3.49	0.04
Dec-06	642	329	278	3.51	0.04

Water Use Available Through Registration and Reporting Program

2003 Souhegan Water Use in CFS

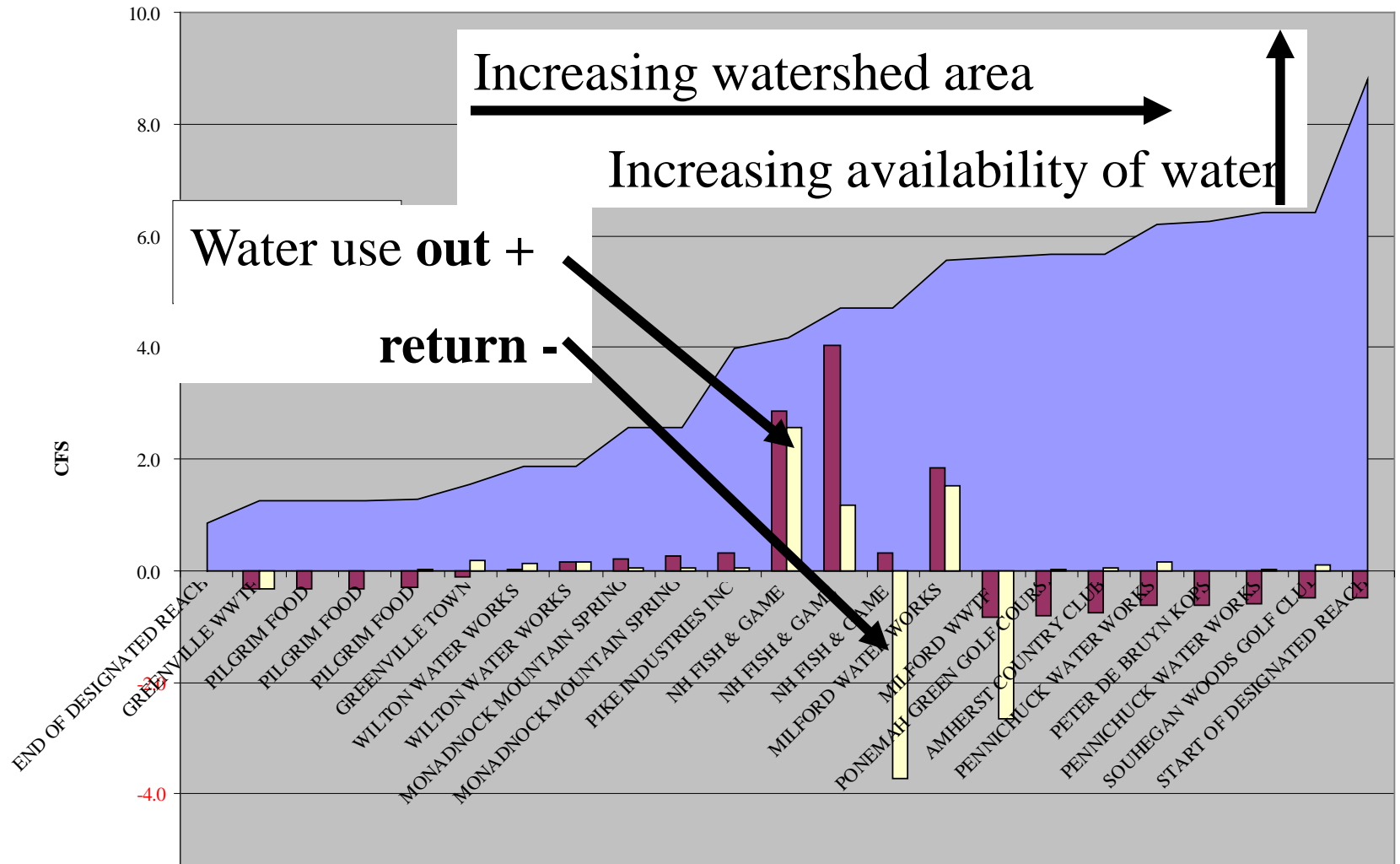
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Water User IDs

Water Use Amounts

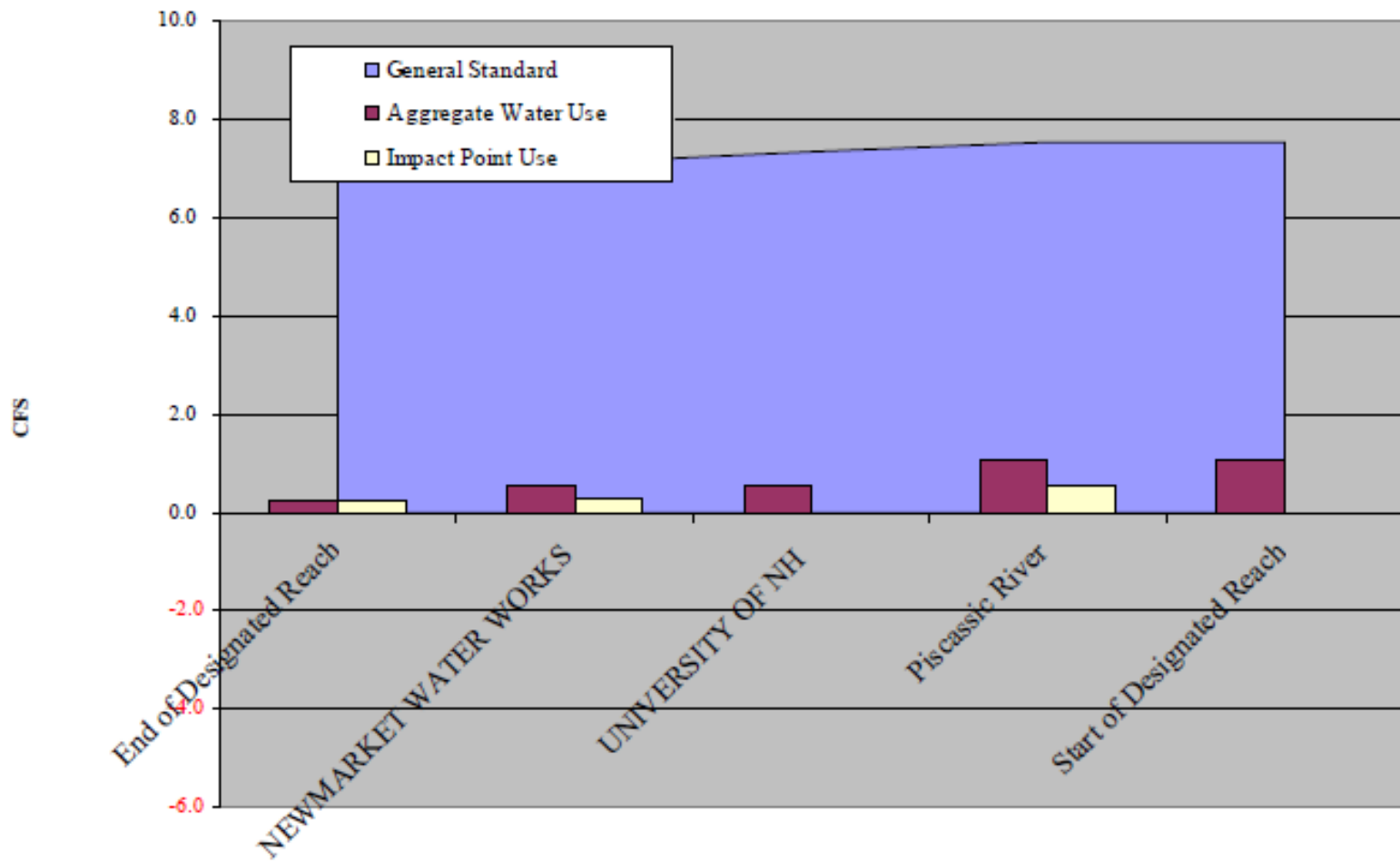
Location in the watershed

May 2003 Souhegan

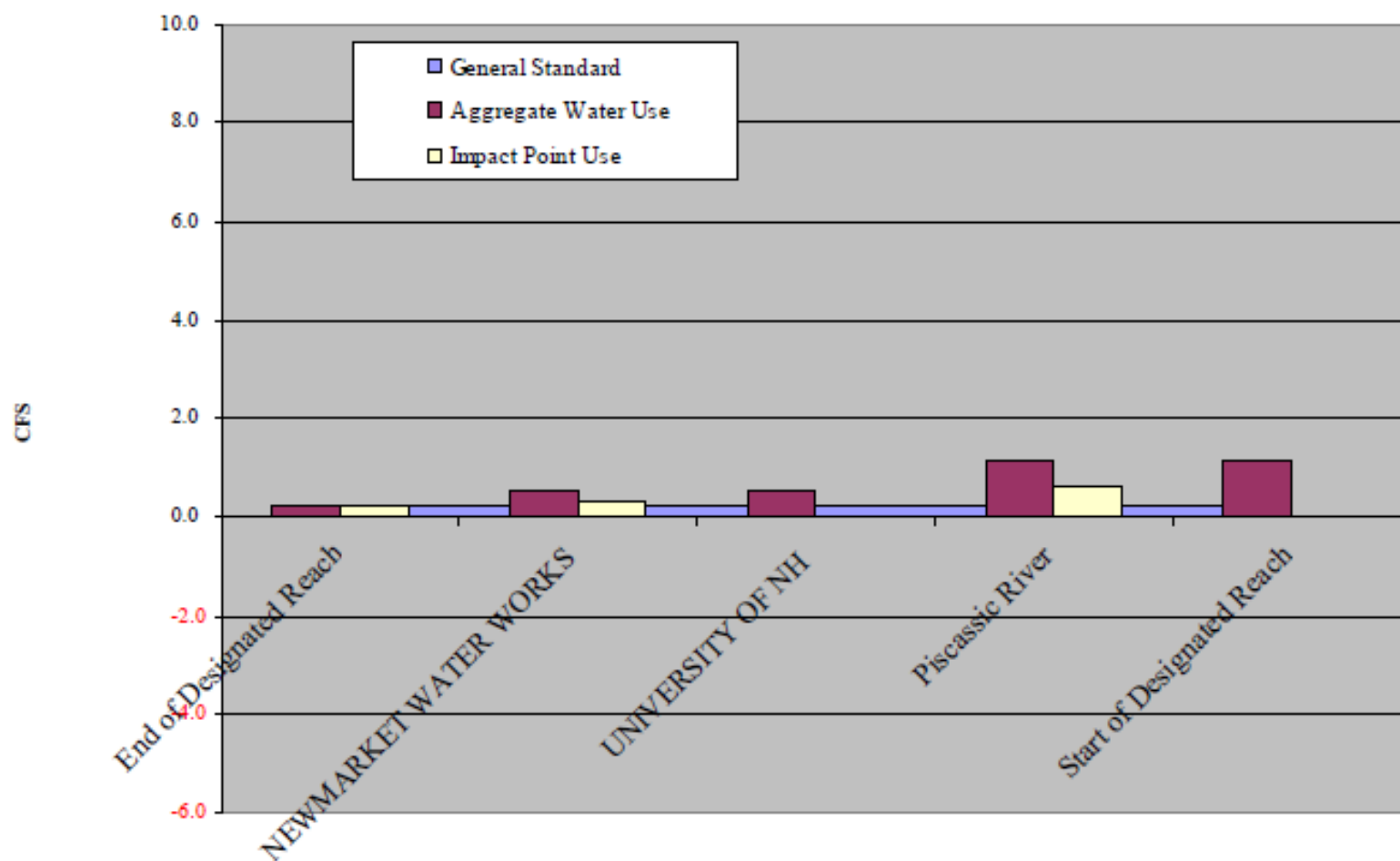


Stream flow versus water use assessed monthly

April 2006 Lamprey



August 2006 Lamprey



Standard setting tool for assessing water quality related to diversions

2003 Lamprey Estimated Monthly Margin of the Aggregate Water Use															
USERNAME	FACILITY	WUSD_ID	DA on DR (SQ MILE)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
End of Designated Reach	Water use U/S of Designated River		172.95	6.6	3.2	27	7.0	7.0	6.7	(0.24)	(0.14)	(0.15)	6.6	6.7	6.8
NEWMARKET WATER WORKS	NEWMARKET WATER WORKS	20057 20057-S02	178.38	6.7	3.3	28	7.1	7.1	6.7	(0.60)	(0.47)	(0.48)	6.4	6.7	6.6
UNIVERSITY OF NH	WATER WORKS	20066 20066-S02	183.73	6.9	3.4	29	7.3	6.5	6.1	(1.5)	(1.4)	(1.4)	5.6	6.1	6.9
Piscassic River	Water use in Piscassic watershed		206.25	6.5	2.8	31	7.3	6.0	6.2	(2.0)	(1.8)	(1.8)	6.0	6.6	7.4
Start of Designated Reach			211.59	6.8	2.9	32	7.5	6.2	6.5	(2.0)	(1.8)	(1.8)	6.2	6.8	7.6

2004 Lamprey Estimated Monthly Margin of the Aggregate Water Use															
WU_NAME	FACILITY	WUSD_ID	DA on DR (SQ MILE)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
End of Designated Reach	Water use U/S of Designated River		172.95	6.5	(0.3)	6.4	27	6.7	6.9	0.22	(0.57)	3.1	3.1	6.4	6.4
NEWMARKET WATER WORKS	NEWMARKET WATER WORKS	20057 20057-S02	157.93	5.9	(0.3)	5.8	25	6.1	6.3	0.20	(0.60)	2.8	2.8	5.8	5.8
UNIVERSITY OF NH	WATER WORKS	20066 20066-S02	183.88	6.9	(0.2)	6.7	29	7.1	7.3	0.09	(0.88)	2.3	2.4	6.1	6.4
Piscassic River	Water use in Piscassic watershed		206.25	7.2	(0.7)	7.1	32	6.5	6.8	(1.3)	(1.9)	2.3	2.4	6.6	6.8
Start of Designated Reach			211.59	7.4	(0.7)	7.3	33	6.7	7.0	(1.3)	(1.8)	2.4	2.5	6.8	7.0

2005 Lamprey Estimated Monthly Margin of the Aggregate Water Use															
WU_NAME	FACILITY	WUSD_ID	DA on DR (SQ MILE)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
End of Designated Reach	Water use U/S of Designated River		172.95	6.7	3.2	3.4	7.4	6.8	3.6	3.3	0.04	(0.01)	27	6.9	6.9
NEWMARKET WATER WORKS	NEWMARKET WATER WORKS	20057 20057-S02	178.03	6.6	3.0	3.2	7.3	6.7	3.4	3.1	(0.28)	(0.30)	28	6.8	6.8
UNIVERSITY OF NH	WATER WORKS	20066 20066-S02	183.88	6.9	3.1	3.3	7.5	7.0	3.5	3.2	(0.27)	(0.29)	29	7.0	7.0
Piscassic River	Water use in Piscassic watershed		188.66	6.6	2.8	2.9	7.3	6.7	3.1	2.7	(0.86)	(0.82)	29	6.7	6.8
Start of Designated Reach			188.66	6.6	2.8	2.9	7.3	6.7	3.1	2.7	(0.86)	(0.82)	29	6.7	6.8

2006 Lamprey Estimated Monthly Margin of the Aggregate Water Use Below the General Standard															
WU_NAME	FACILITY	WUSD_ID	DA on DR (SQ MILE)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
End of Designated Reach	Water use U/S of Designated River		172.95	6.9	3.3	3.2	6.7	7.3	3.4	3.4	0.00	0.12	27	6.9	6.8
NEWMARKET WATER WORKS	NEWMARKET WATER WORKS	20057 20057-S02	178.03	6.8	3.1	3.0	6.6	7.2	3.2	3.1	(0.31)	(0.21)	28	6.8	6.7
UNIVERSITY OF NH	WATER WORKS	20066 20066-S02	183.88	7.0	3.3	3.2	6.8	7.4	3.3	3.2	(0.30)	(0.20)	29	7.0	6.9
Piscassic River	Water use in Piscassic watershed		188.66	6.7	2.9	2.7	6.5	7.1	2.8	2.8	(0.90)	(0.76)	29	6.6	6.6
Start of Designated Reach			188.66	6.7	2.9	2.7	6.5	7.1	2.8	2.8	(0.90)	(0.76)	29	6.6	6.6

Lamprey Instream Flow Program

- Proposed Protected Instream Flows are out for comment
- Public Hearing held in Lee January 14
- Comment period open until COB March 2

PISF Generalized Process

- PISF Study
 - Define protection goals
 - Assess river conditions and define conditions to meet goals
 - Establish numerical flow standards
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- WMP
 - Evaluate problem reaches
 - Evaluate management options
 - Integrate options into a plan

ISF Protection Goals

All boils down to a few things

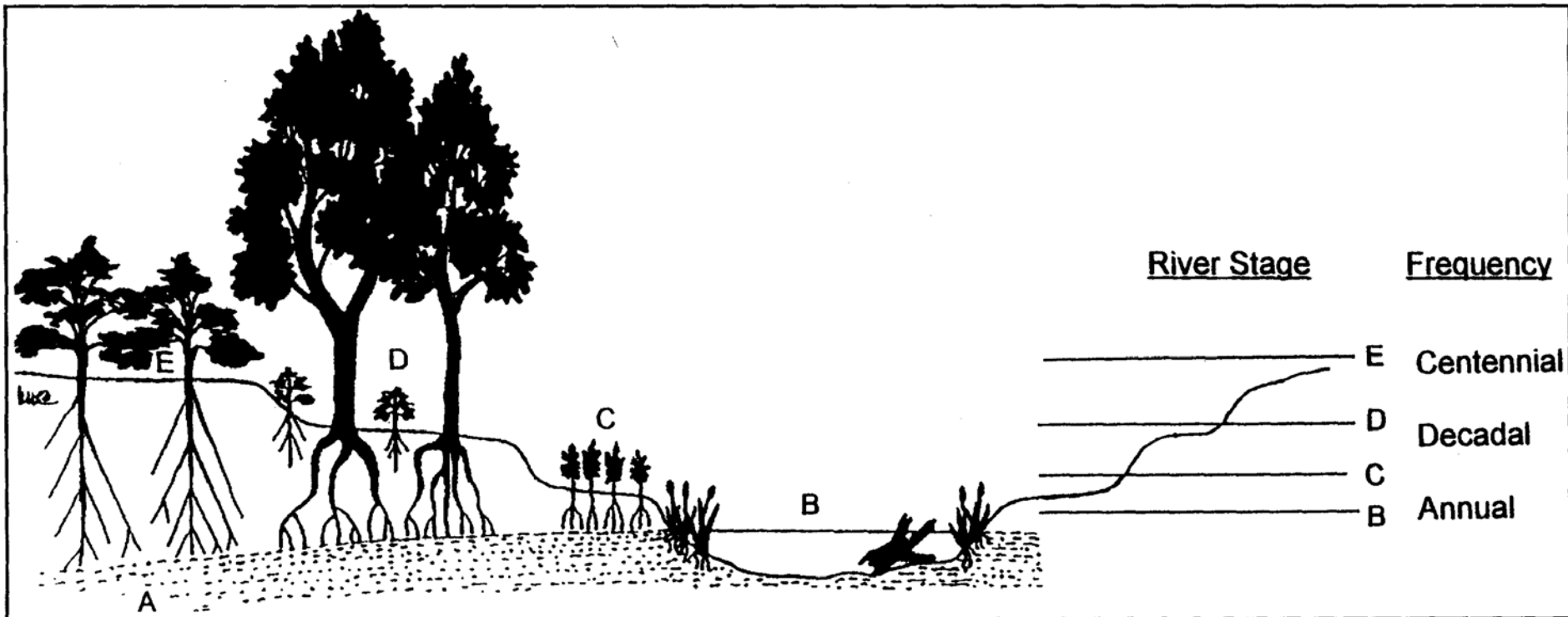
- Human uses (recreation, PWS, hydropower)
- Fish*
- Riparian wildlife and vegetation (RTE, unique ecosystems)*

*Biological Integrity - 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.

Natural Flow Paradigm

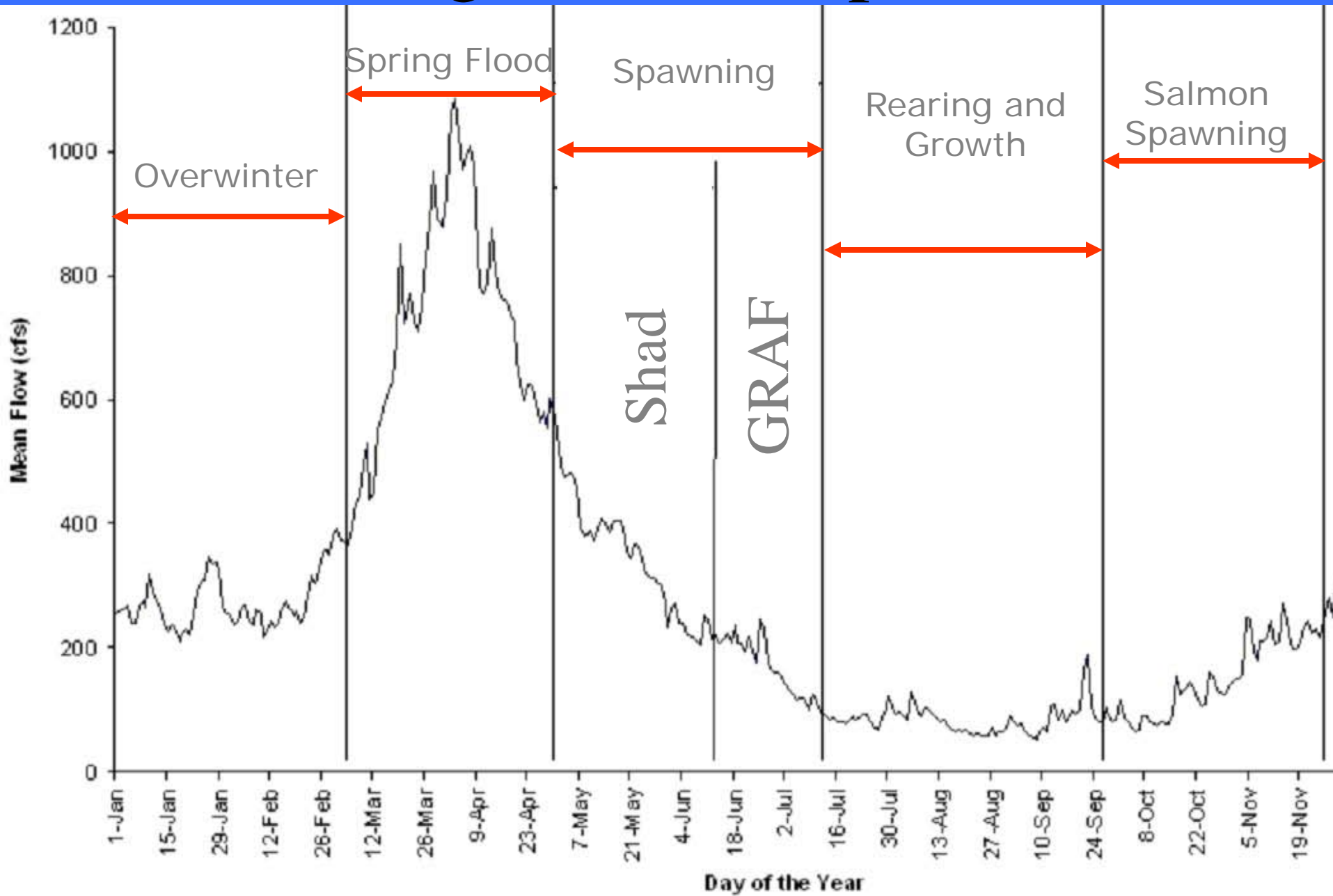
- DES uses the Natural Flow Paradigm (Poff et al. 1997) as a framework to meet surface water quality standards for quantity.
- NFP says: Ecosystems are adapted to natural variability in flow
- NFP says: to define stream flow (or PISF) -- must describe not only the **magnitude**, but also: **timing, duration, frequency, rate of change**
- **Maintain flow variability**

High and low flows have biological functions that support the ecosystem

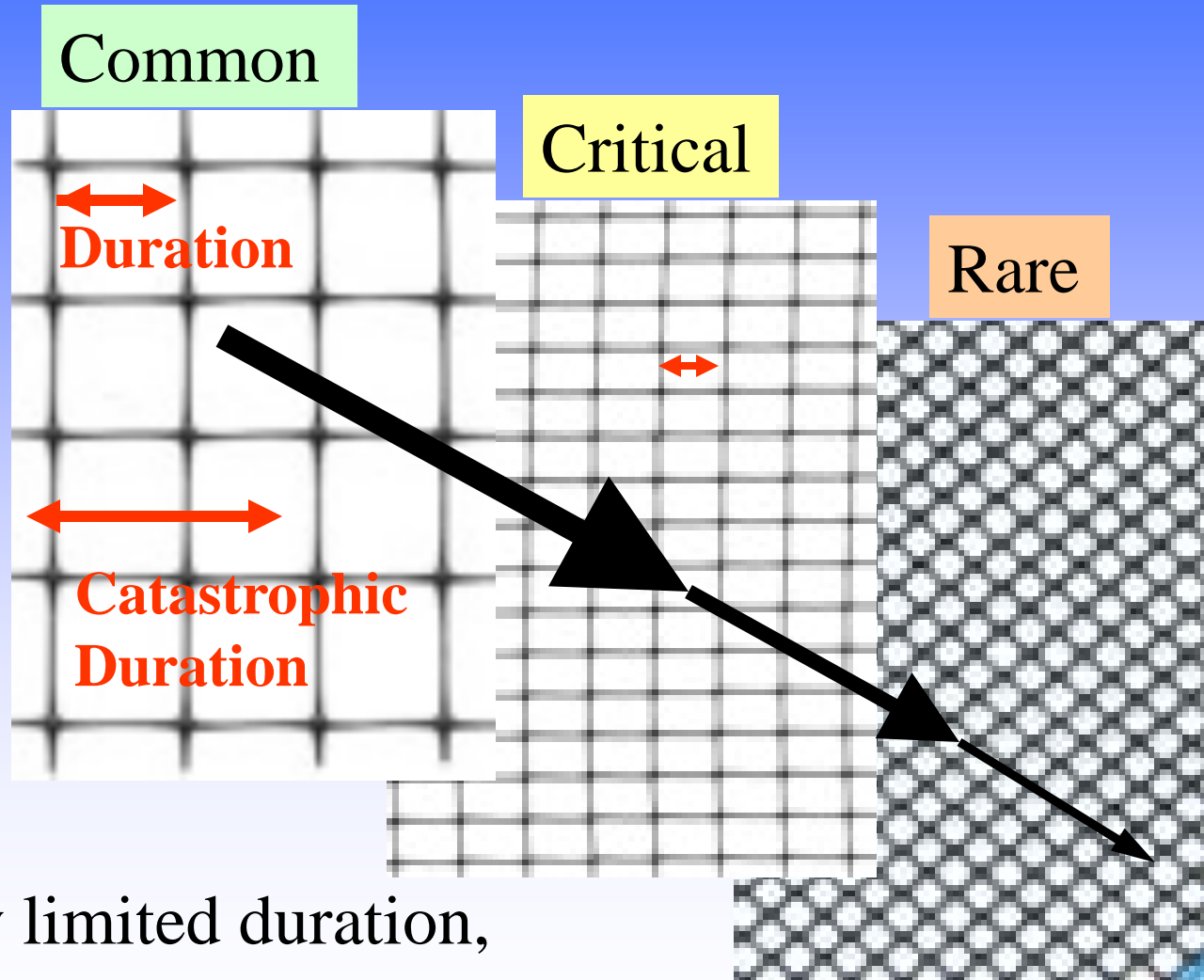


Magnitude, timing and frequency are important flow components in the natural range of flows.

Timing – Fish Bioperiods



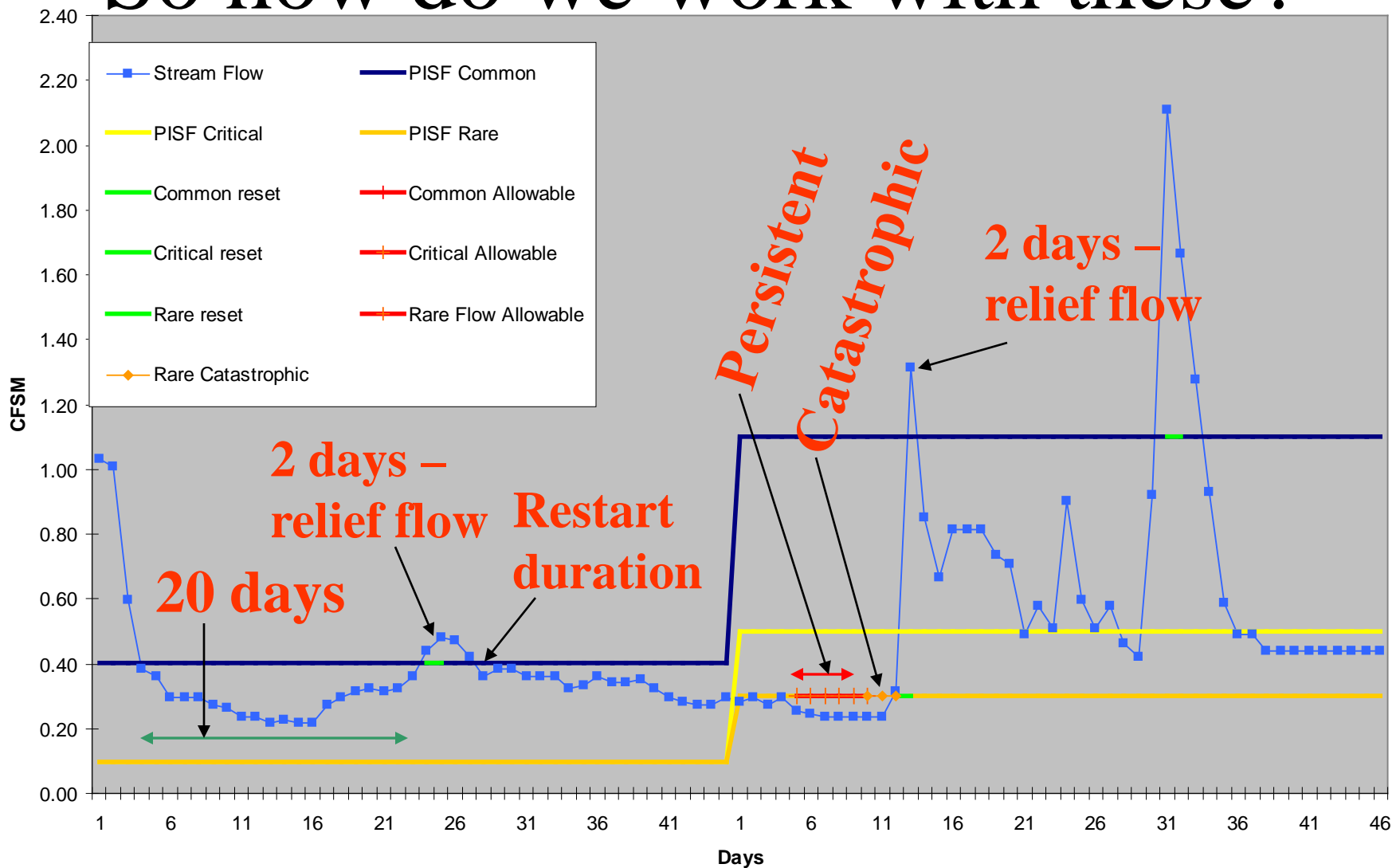
Pair magnitudes with their natural durations at historically-significant frequencies



Lets only limited duration,
low-flows get through

Souhegan River Stream Flow versus PISF magnitude and durations

So how do we work with these?



PISFs to WMP

- Finalize PISF Report and establish PISF as WQ standards
- Water Management Plan - Individual plan for each AWU and ADO
 - Water conservation plan (AWUs)
 - Water use plan (AWUs)
 - Impoundment operation plan (ADOs)



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