



# **The Other Half of the Instream Flow Pilot Program: Water Management Plans**

**For the NH Joint Water and  
Watershed Conference**

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# What is the ISF Pilot Program trying to do?

- Protection for:
  - habitat for aquatic and riparian species
  - human instream uses
  - human out of stream uses
- Manage flows
- Report to the legislature

# Thumbnail history

- ISF Rules were required
- A pilot process was chosen as a test
- The adopted rules described the methods and procedures
  - Flow protection is two steps – determining protected flows and defining management that will implement the flows to protect legislatively-described protected entities
  - The final results have to meet the requirements of the governing statutes (which brings in the Surface Water Quality Standards)

# What the Statutes say about ISFs (RSA 483)

- ensure the continued viability of NH rivers as valued **economic and social assets** for the benefit of present and future generations
- regulate the quantity and quality of instream flow ... to **conserve and protect** outstanding characteristics including recreational, fisheries, wildlife, environmental, ..., ecological, aesthetic, ... agricultural, and public water supply

# RSA 483 about ISFs (SWQ Rules)

- **complement and reinforce** existing state and federal water quality laws
  - maintain the chemical, **physical, and biological integrity** of surface waters
  - **protection and propagation** of fish, shellfish and wildlife, and for recreation
  - **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.

# ISF Protection Goals

## All boils down to a few things

- Fish\*
- Riparian wildlife and vegetation (RTE, unique ecosystems)\*

\*biological integrity

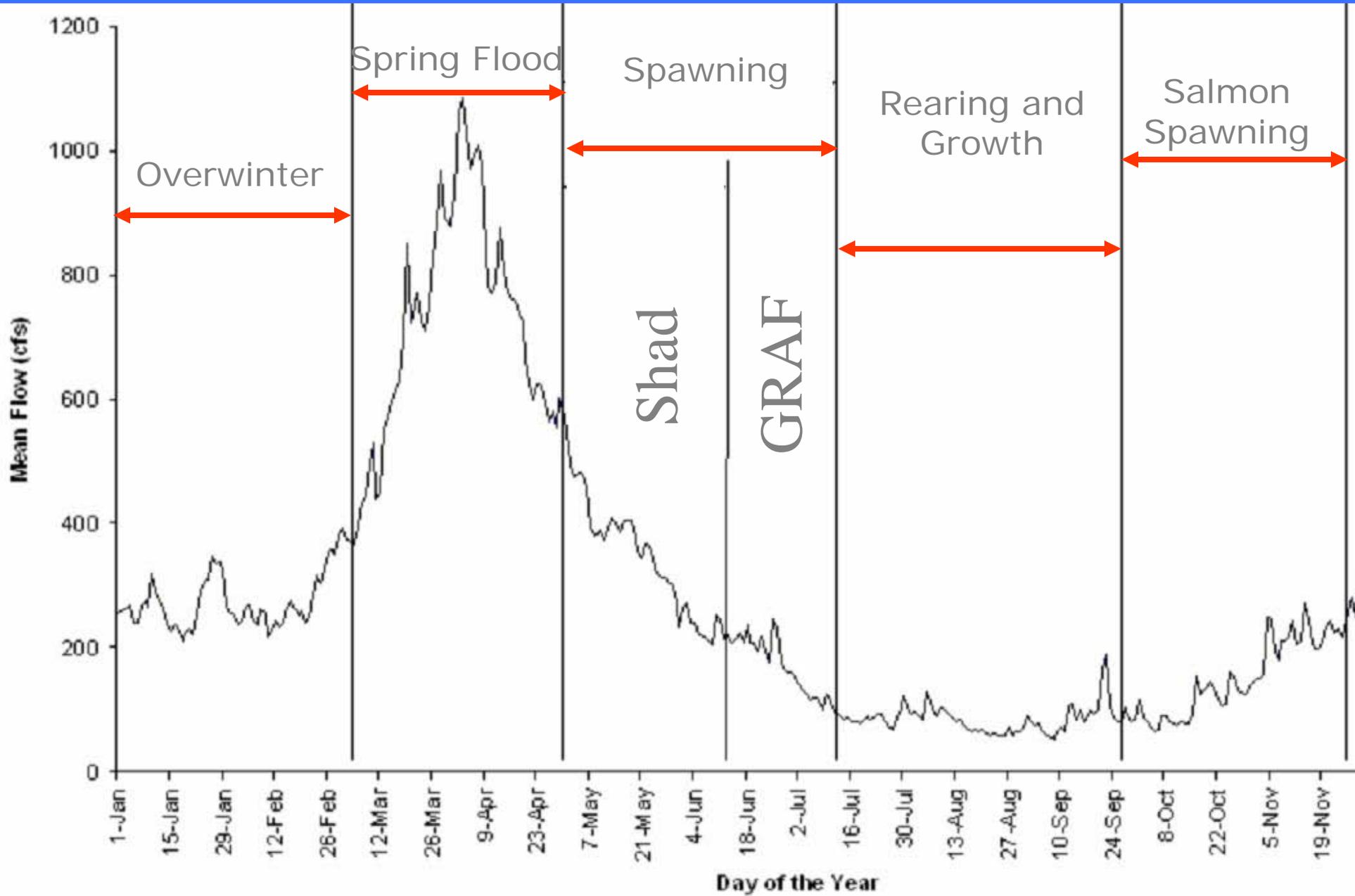
- Human uses (recreation, hydropower, public water supply, irrigation)

**Flow-dependency - criteria for instream flow protection was whether it needed a certain flow**

# Hours-long discussions

- 1) How many of you are familiar with the Natural Flow Paradigm?
  - Biological integrity is best supported by flows retaining their natural variability
  - Variability is as important as magnitude
  - Flow should be described using terms of timing, duration, frequency, rate of change, and magnitude
- 2) How many know how the Souhegan and Lamprey protected flows are configured?

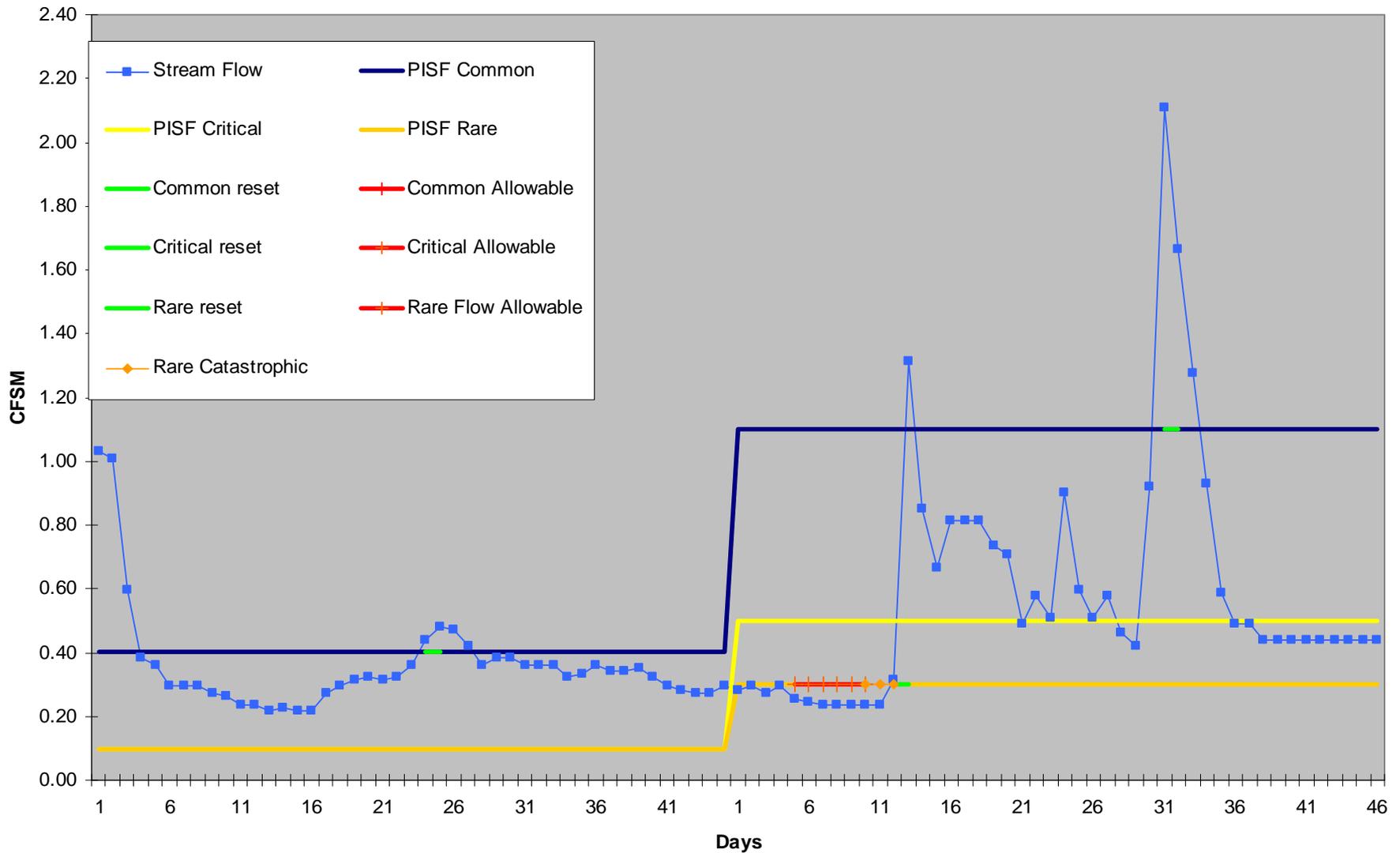
# Timing – Fish Bioperiods



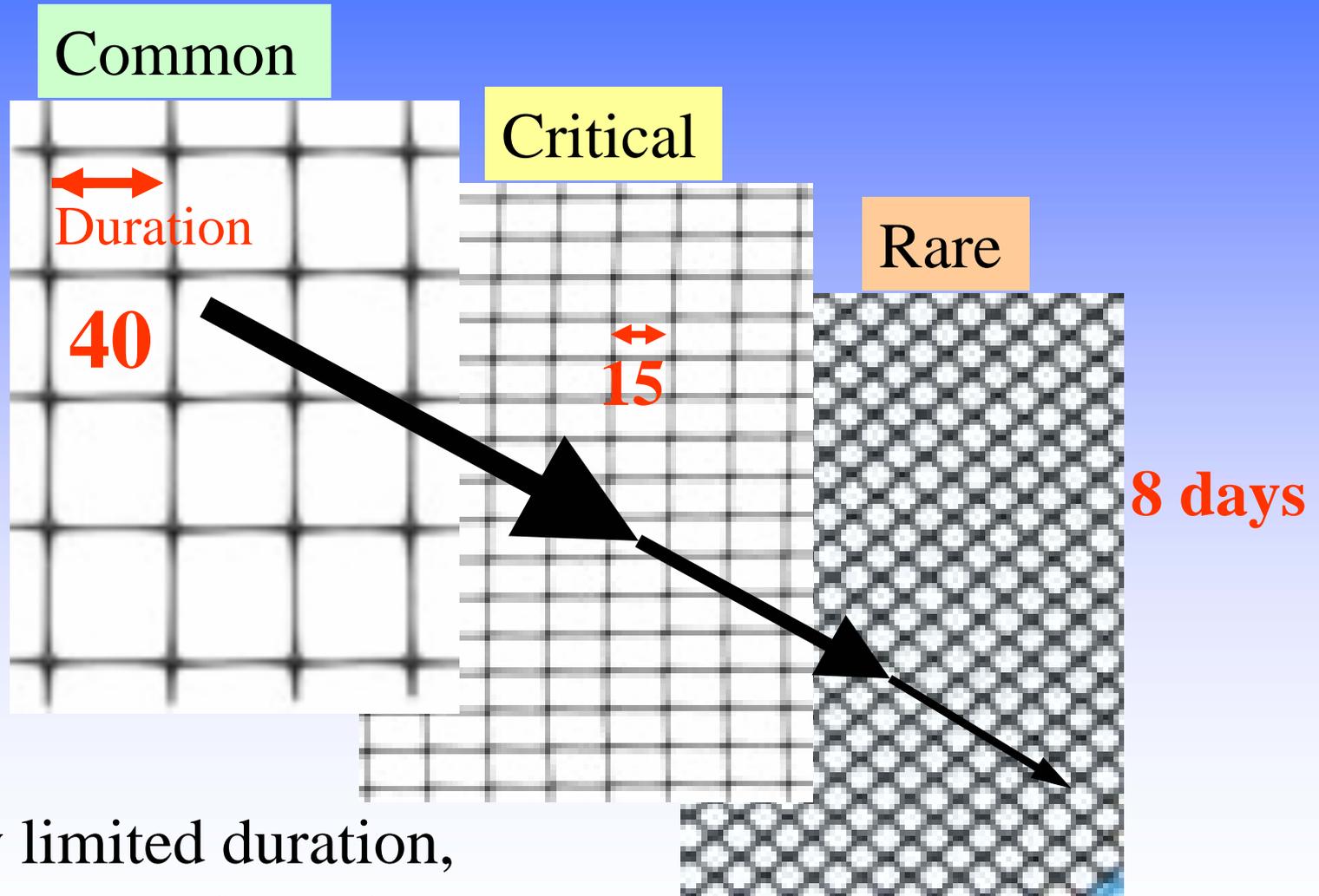
# Magnitudes and Durations based on frequency analysis for each Bioperiod

- **Magnitude**
  - Common – Middle range of flows, preferred habitat level for flow-dependent fish species community
  - Critical – Low flows, not much quality habitat
  - Rare – Very low flows, very little habitat remaining
- **Duration** – (Allowable range – flow magnitudes commonly less)
  - Persistent – not common, 2-3 year recurrence
  - Catastrophic – very uncommon, decadal recurrence

# Souhegan River Stream Flow versus PISF magnitude and durations



# Pair magnitudes with their natural durations at historically-significant frequencies



Lets only limited duration,  
low-flows get through

# Now we are ready to discuss Water Management Plans

- Two goals – maintain protected flows to protect biological integrity; and protect and conserve resources like PWS
  - To what and to whom do they apply?
  - What are they intended to do?
  - How are they intended to work?

# DESIGNATED RIVERS

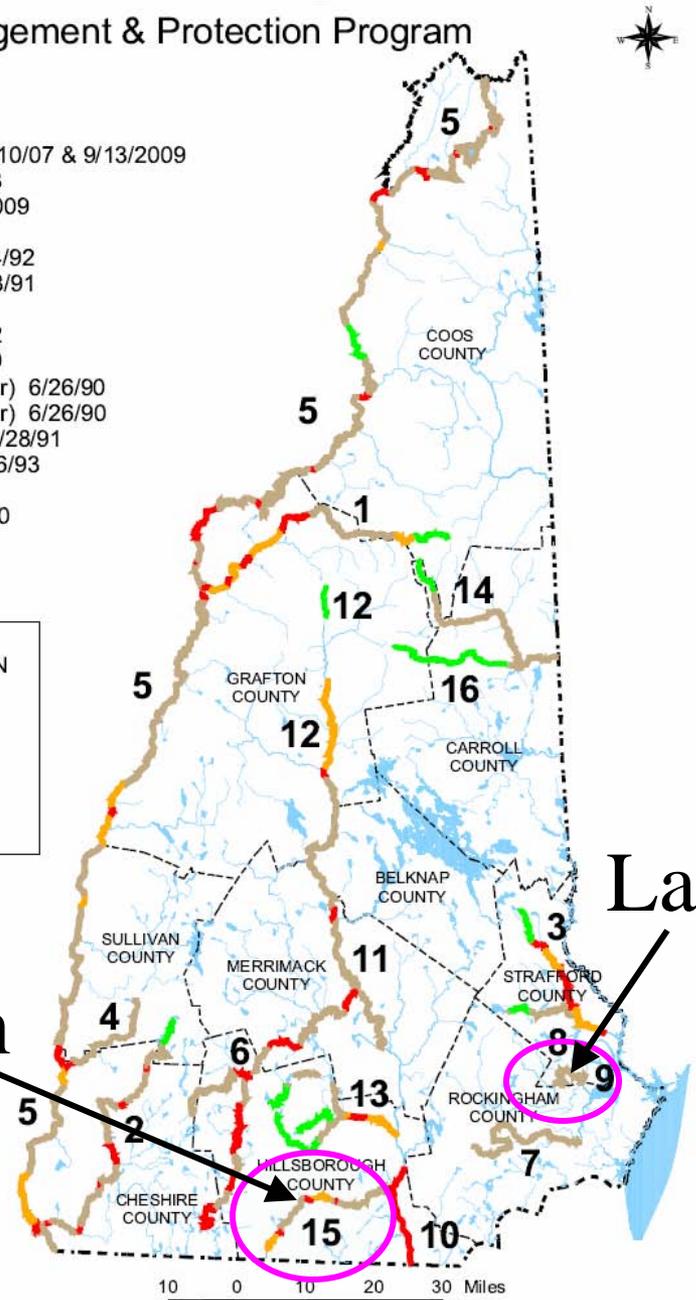
## NH Rivers Management & Protection Program

### Designated Rivers

1. Ammonoosuc River 8/10/07 & 9/13/2009
2. Ashuelot River 6/07/93
3. Cochecho River 7/21/2009
4. Cold River 7/20/99
5. Connecticut River 7/14/92
6. Contoocook River 6/28/91
7. Exeter River 8/11/95
8. Isinglass River 6/30/02
9. Lamprey River 6/26/90
10. Merrimack River (Lower) 6/26/90
11. Merrimack River (Upper) 6/26/90
12. Pemigewasset River 6/28/91
13. Piscataquog River 7/16/93
14. Saco River 6/26/90
15. Souhegan River 5/28/00
16. Swift River 6/26/90

### RIVER CLASSIFICATION

- Community
- Rural-Community
- Rural
- Natural



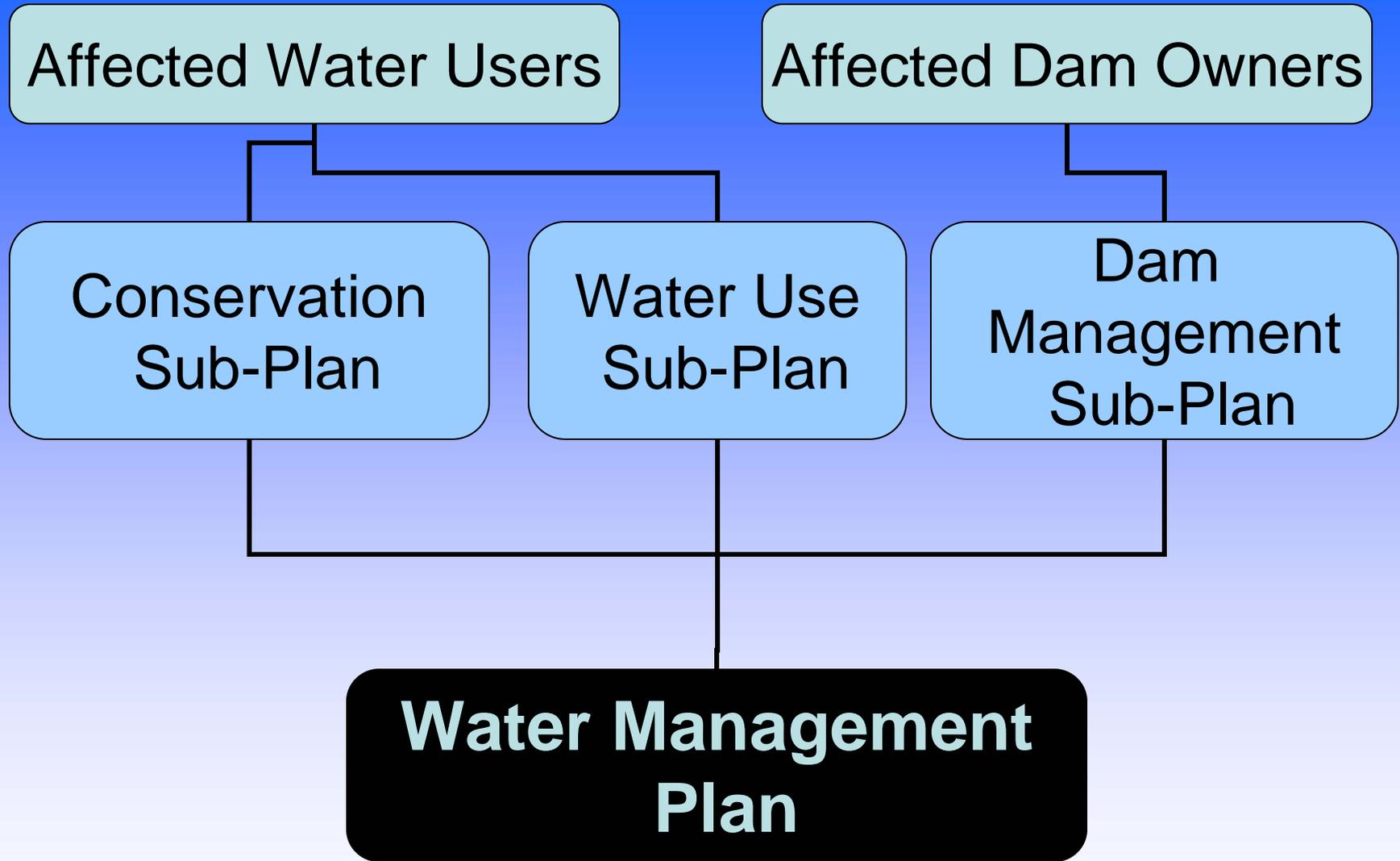
ISF Pilot  
Program  
applies to  
Lamprey (9)  
and Souhegan  
(15)

Lamprey

Souhegan



10 0 10 20 30 Miles



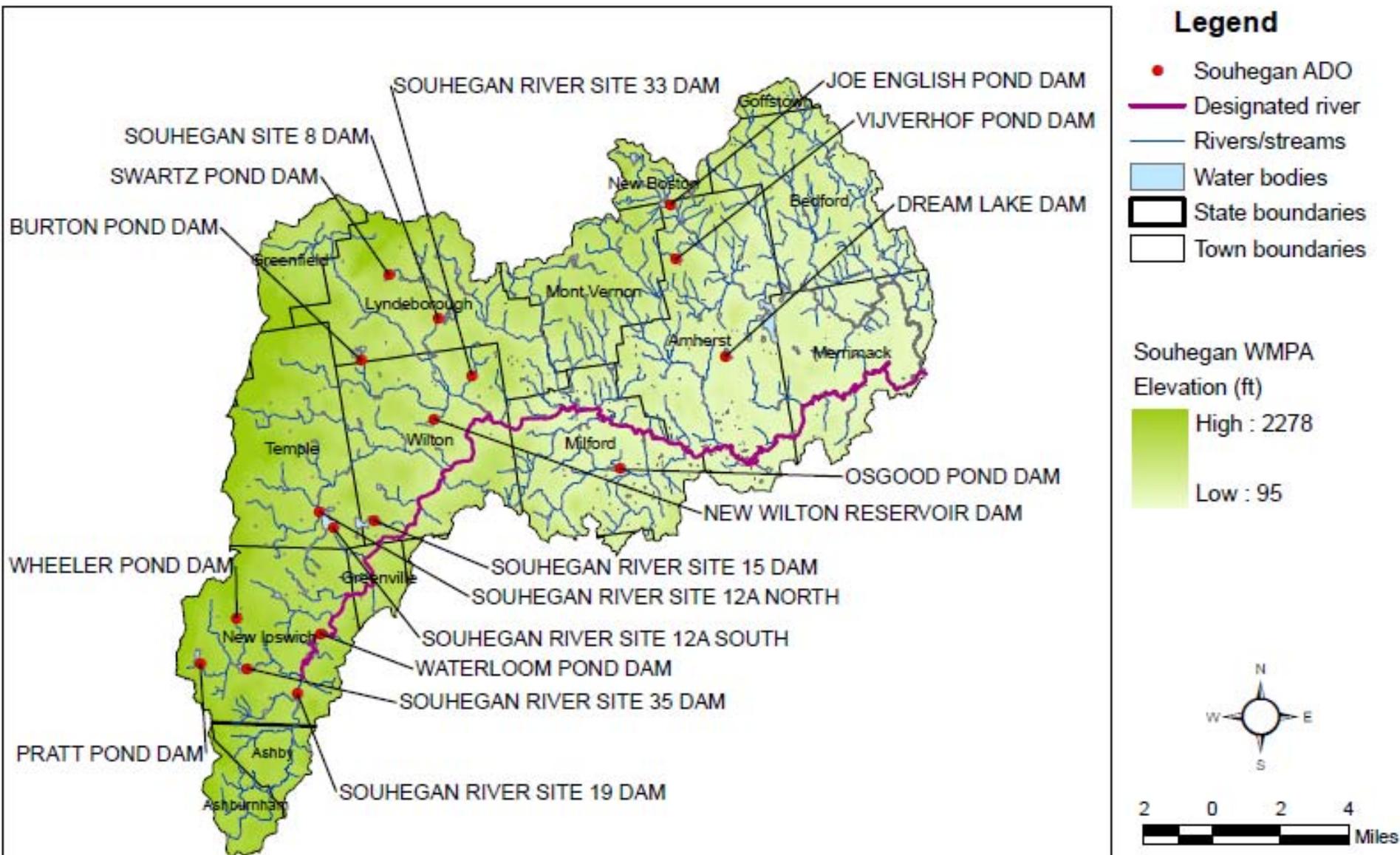
# Who is part of the WMP?

- “Affected Dam Owner” means an owner of a dam with an impoundment with a surface area greater than **10 acres** in the watershed area of a designated river.
- “Affected Water User” means a water user **required to be registered** ..., and having a withdrawal or return location **within 500 feet** of a designated river or within 500 feet of a river or stream in its tributary drainage area.
- Hydroelectric dams as AWUs and not ADOs

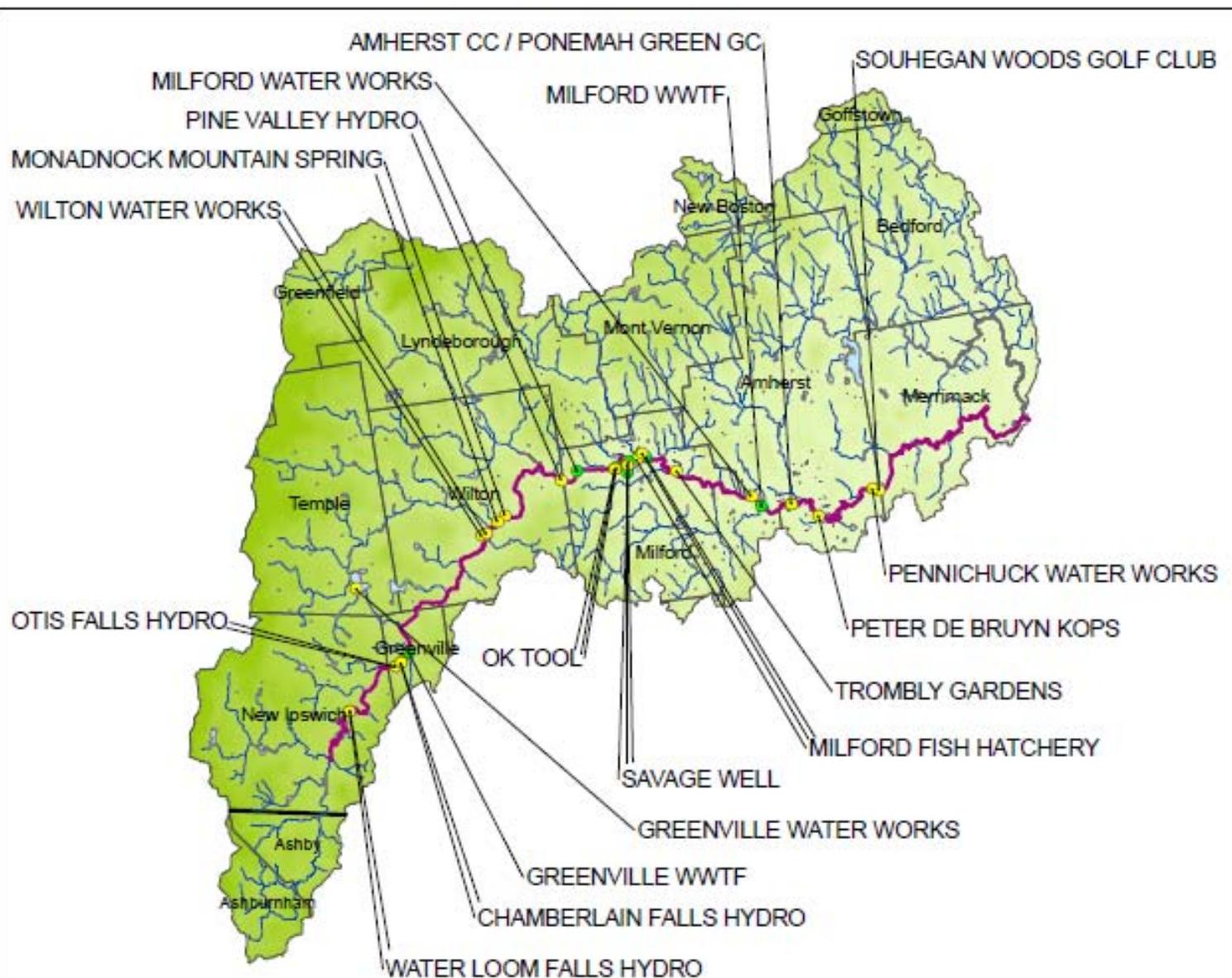
# Application of WMPs

- WMPs are applied to the whole watershed
- All AWUs and ADOs have a plan
- Because AWU and ADO uses affect different parts of the watershed and have different water use conditions, so their WMPs are going to be different

# Souhegan River Water Management Planning Area Affected Dam Owners



# Souhegan River Water Management Planning Area Affected Water Users

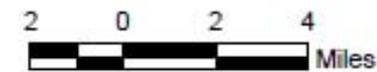
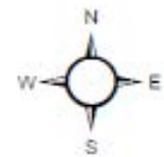


## Legend

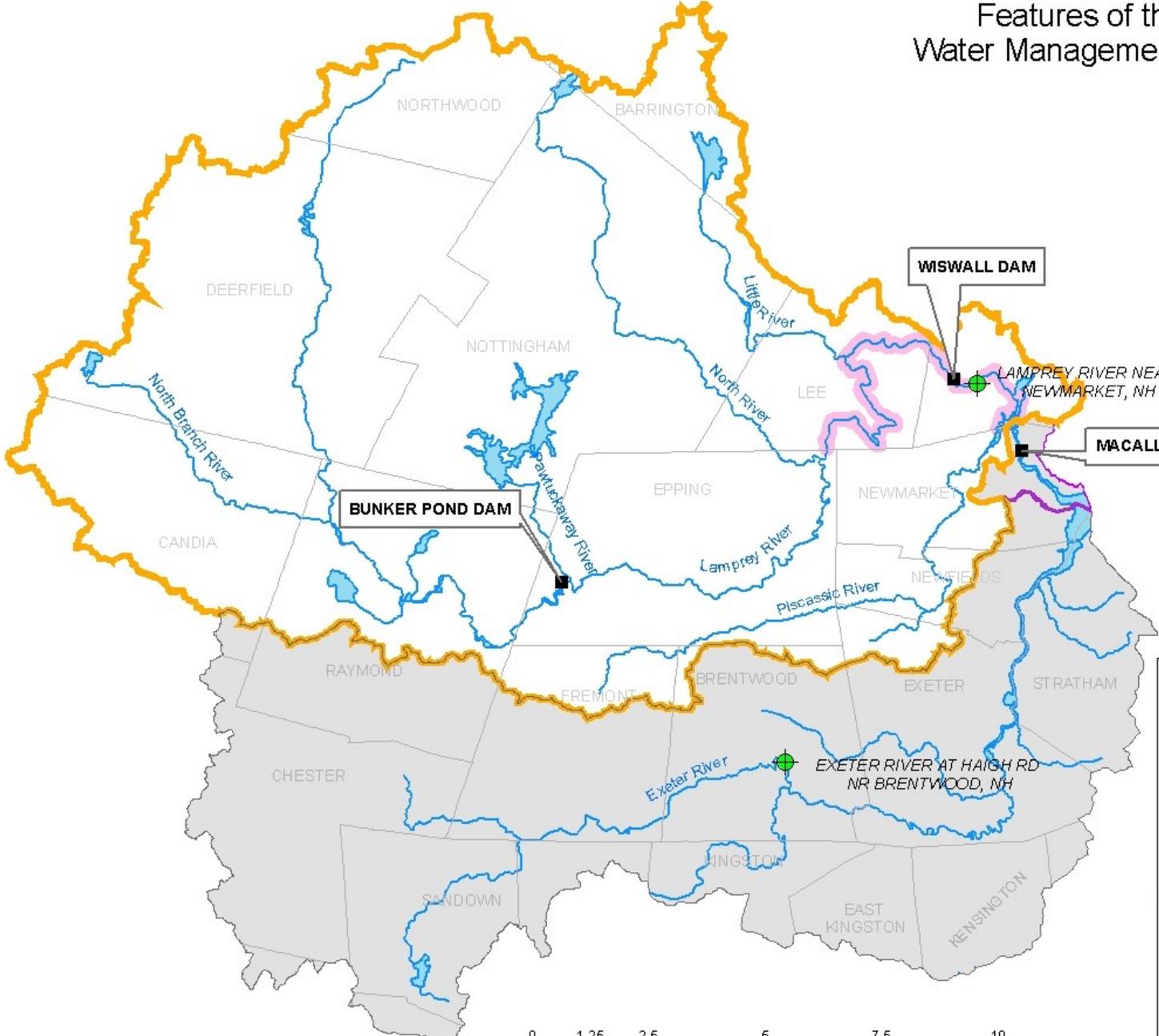
- AWU source
- AWU discharge
- Designated river
- Rivers/streams
- Water bodies
- State boundaries
- Town boundaries

## Souhegan WMPA

Elevation (ft)



# Features of the Lamprey Water Management Planning Area

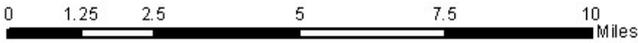


**Legend**

- Gage Station
- Dams

**Hydrology**

- Streams/ Rivers
- Lakes/ Ponds
- Designated River Reach
- Town Boundaries
- Exeter River Watershed
- Lamprey River Watershed (Outside Designated Reach)
- Lamprey Designated River Watershed Boundary



# How will a WMP work?

- Protected flows have been defined, now what do we need to manage for?
- Task 8 – Water use problems - areas, times of year, types of year
  - **Souhegan** - mostly low consumptive use of water except in a few segments
  - **Lamprey** - mostly low consumptive use of water except in a couple cases

# Conservation Sub-Plan

- One tier to reduce overall and peak demand
- Possible higher tier of short-term actions to address more critical times
- Includes:
  - Rate structures
  - Metering
  - Changing processes or equipment
  - Irrigation methods
  - Recycling

# Considerations for Conservation Plans

- One tier or two tiered conservation plans?
  - Two-tiered conservation efforts did not result in measurably improved flows in the Souhegan.
- All AWUs should have conservation actions.  
How much is appropriate?
  - Proactive conservation efforts
  - Cost/Benefit

# Considerations for Conservation Plans

- Env-Wq 2101 Water Conservation Rules – (effective 5/14/2005)
  - Conservation methods by water user type
  - Became the basis for conservation plans

# What's in a Conservation Plan?

- Water Source and Uses – (description)
- Location map
- Water Use Patterns
- Graphs and tables of monthly water use patterns for each source and the facility
- Water Conservation Measures – (existing)
- Water Conservation Alternatives and Costs
- Conservation Implementation Schedule

# Water Use Sub-Plan

- Operational controls and structures to attain PISFs
- Includes:
  - Additional storage including GW surcharging
  - Modified pumping regime (rates, timing)
  - Alternative short-term water supplies
  - Return water to river to reduce consumptive use

(Rate of change)

# What's in a Water Use Plan?

- Water use data and information to define water use patterns and needs
- A description of the potential for water use modification, sharing or both
- An estimate of implementation costs
- An implementation schedule

# Dam Management Sub-Plan

- Storage and release to meet PISF (relief flows) & to offset withdrawals
- Evaluate existing obligations and expectations
  - recreation
  - flood control (federal \$s?)
  - flowage rights (contractual)
  - downstream user agreements (HE, WS, etc.)
- Evaluate physical limits - storage volumes, structural, and release mechanisms
- Other effects on water quality and habitat



Some dams are  
better suited to  
operations

Modifications  
will be  
needed



**Surface area of impoundment**

**at maximum impoundment = 115 acres**

**Drainage area = 11.4 sq. miles**



**Surface area of impoundment**

**at maximum impoundment = 10.6 acres**

**Drainage area = 0.25 sq. miles**



# What else are we doing to evaluate dams?

- Temperature monitoring
- Fish sampling in the outlet streams below the dams
- Assessment of effects of additional storage in the impoundments on existing wetlands
- Flow and water quality measurements during the annual fall dam releases



If a dam is opened...



...what is the  
resulting change  
in stream flow?

(Rate of change)

# What's in a Dam Management Plan?

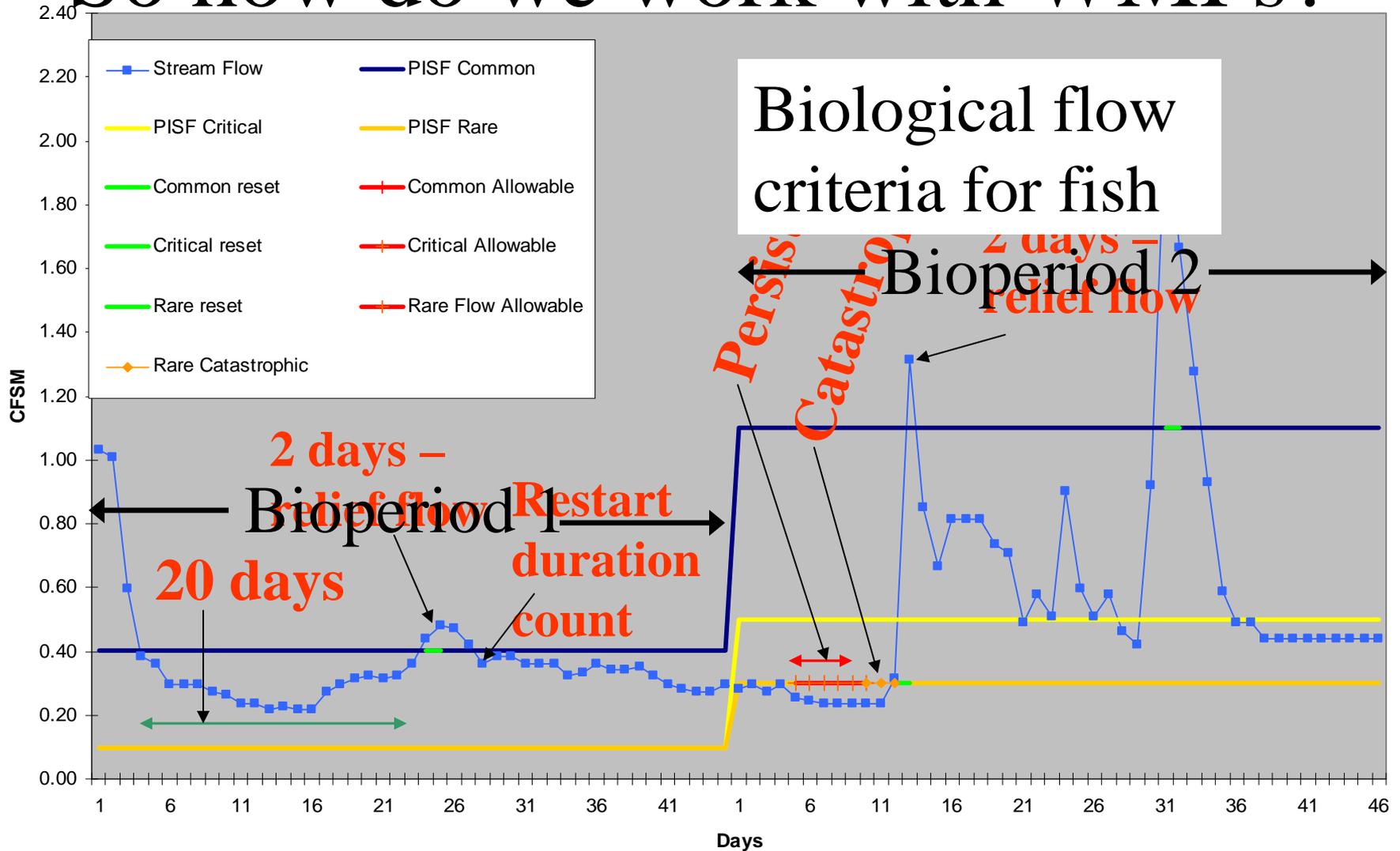
- Dam Design – sizes and construction details
- Minimum Flow, Flowage Rights or Contractual Obligations
- Riparian Property Obligations or Agreements
- Water Quality Requirements or Limits
- Assessment of Potential Water Availability
- Potential Impacts of Augmentation Flows
- Potential for Dam Management to Meet Instream Flow Requirements
- Dam Management Activity Proposed
- An Estimate of Implementation Costs
- Schedule for Dam Management Plan Implementation

# How are WMPs intended to work?

- Reduce and flatten water use watershed wide using the conservation plans
- Balance the water use plans and the dam management plans to manage the remaining needs.
- “...so that the net effect of implementation of all individual [AWU and ADO] plans is maintenance of the protected instream flows.”

Souhegan River Stream Flow versus PISF magnitude and durations

# So how do we work with WMPs?



# WMP results go through a public review process

- Meet with ADOs and AWUs
- Draft WMP with costs and schedules for their review
- Reviewed by the Water Management Planning Area Advisory Committee
- Public hearing and comment period
- DES revisions and adoption of the final WMP

That was for biological integrity-

What about the other statutory protections?

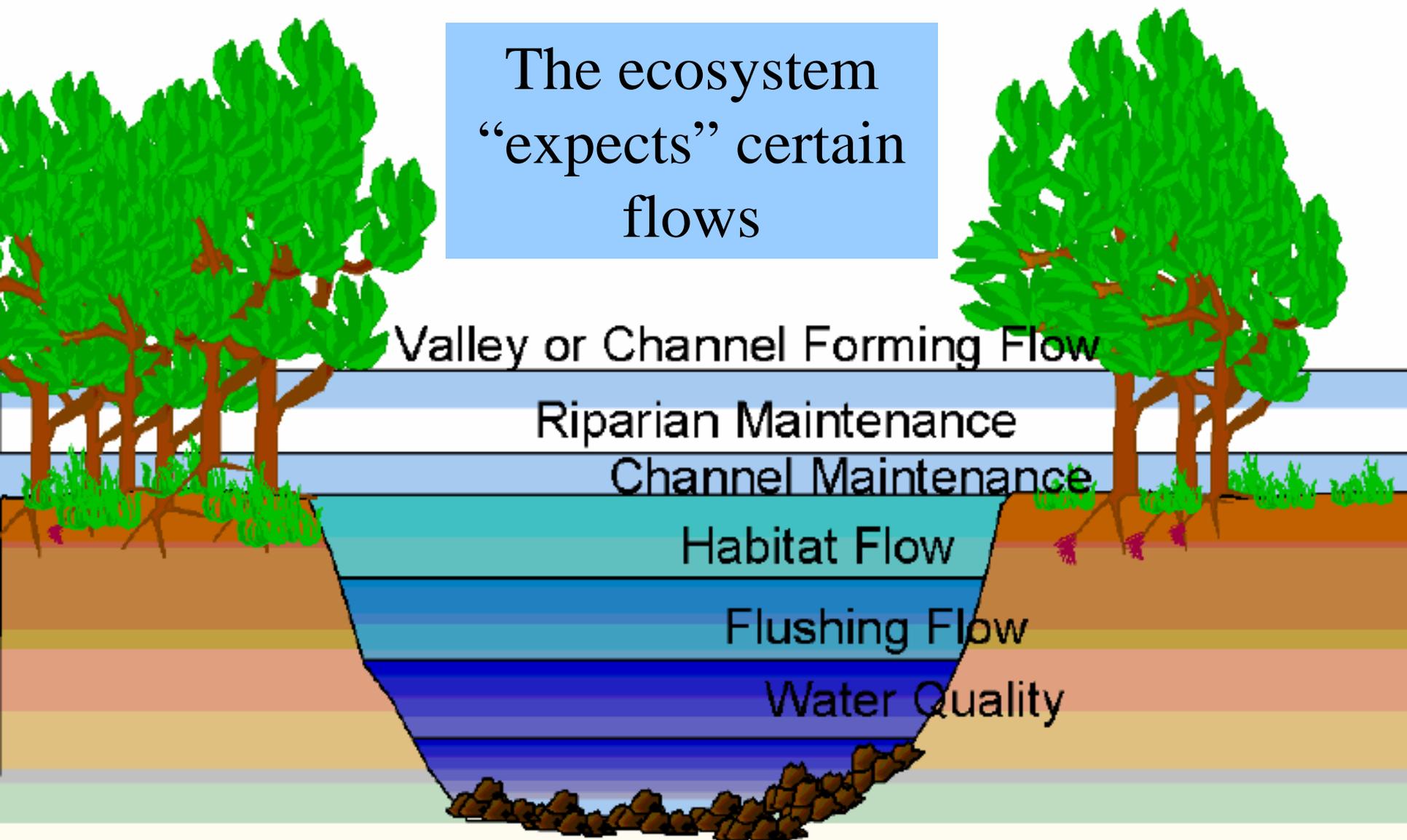
- Each protected instream flow shall be **established and enforced** to maintain water for instream public uses **and to protect the resources** for which the river or segment is designated.
- Includes off-stream water uses for irrigation and public water supply; and instream uses like aesthetic characteristics and boating
- Are irrigation and PWS flow-dependent? Do they have a protected instream flow?

# Back to our conceptual model the Natural Flow Paradigm

- Variability, not just volume, is important to support ecological integrity.
- There are good times and bad times for each species.
- Low flows and floods are expected to occur as natural conditions and occur within the range of natural flows.
- Aquatic life is adapted to natural conditions with patterns of high and low flows.

# Different Flows Perform Different Functions...

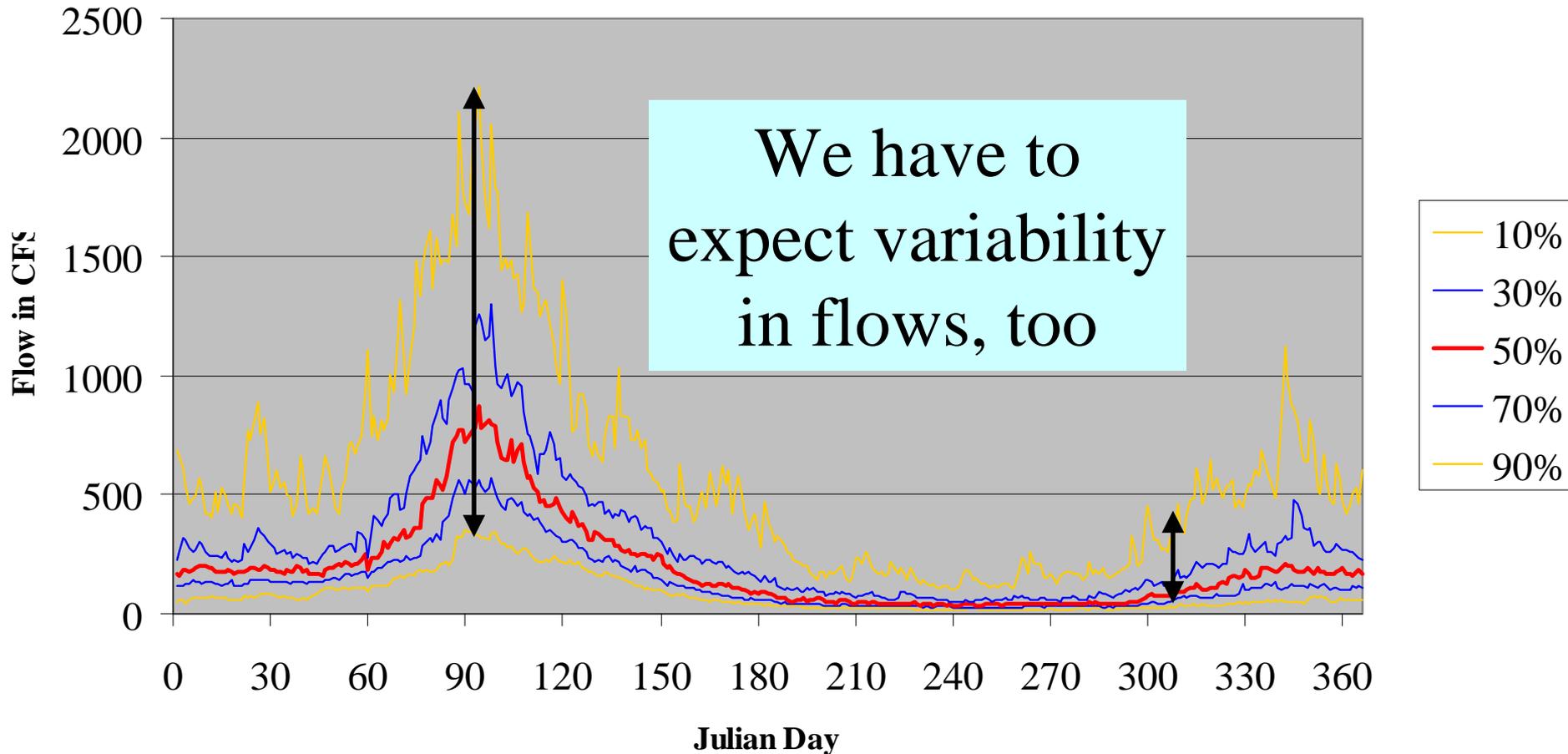
The ecosystem  
“expects” certain  
flows



# What are the expectations for instream and off-stream human uses???

- What is needed for flows to maintain boating uses?
  - Boaters don't expect whitewater conditions year round.
- Aesthetics?
  - Photographers and scenic viewers don't expect flows to be sedate during the spring melt; high and low flows.
- Hydropower?
  - Hydropower recognizes that flows are going to fall within certain ranges that limit their power production.
- Water supplies and irrigation?
  - Flow is finite, so only some of it is available for consumptive use. (Is this the sticking point?)

## Souhegan Stream Flow Percentiles



There will be times when water is limited.

# Meeting human uses under the Natural Flow Paradigm

- Variability, not just volume, is important to **aesthetic characteristics**.
- There are good times and bad times for **hydropower, boating, and water supply**.
- Low flows and floods are expected to occur as natural conditions and occur within the range of natural flows **supporting boating and HP**.
- **Hydropower, boating, and water supply** will adapt to natural conditions with patterns of high and low flows.

# The NFP supports human water uses

- Protected flows for biological integrity are developed under the NFP.
- Variability protects biological integrity.
- Variability provides opportunity for off-stream water use to the extent that the stream can provide it.
- Management will be needed at times to offset or reduce consumptive uses

# Conclusion

- If we want to maintain biological integrity, we can/must do it under the NFP
- If the WMP meets biological integrity needs, human instream uses' needs also will be met
- We can operate the WMPs to help support the off-stream uses
- This will require extra effort to manage flows in the watershed

# Done! Questions???

## Links

<http://des.nh.gov/organization/divisions/water/wmb/rivers/instream/index.htm>

- NH DES
  - Water Division
    - River Management and Protection Program
      - Instream Flow Program
        - [Wayne.Ives@des.nh.gov](mailto:Wayne.Ives@des.nh.gov)