

# PUBLIC HEARING

## DRAFT

# Souhegan River Water Management Plan Report

## July 26, 2011



NHDES-R-WD-11-15



**DRAFT**

Souhegan River

Water Management Plan Report



23 June 2011

# Souhegan River Water Management Plan

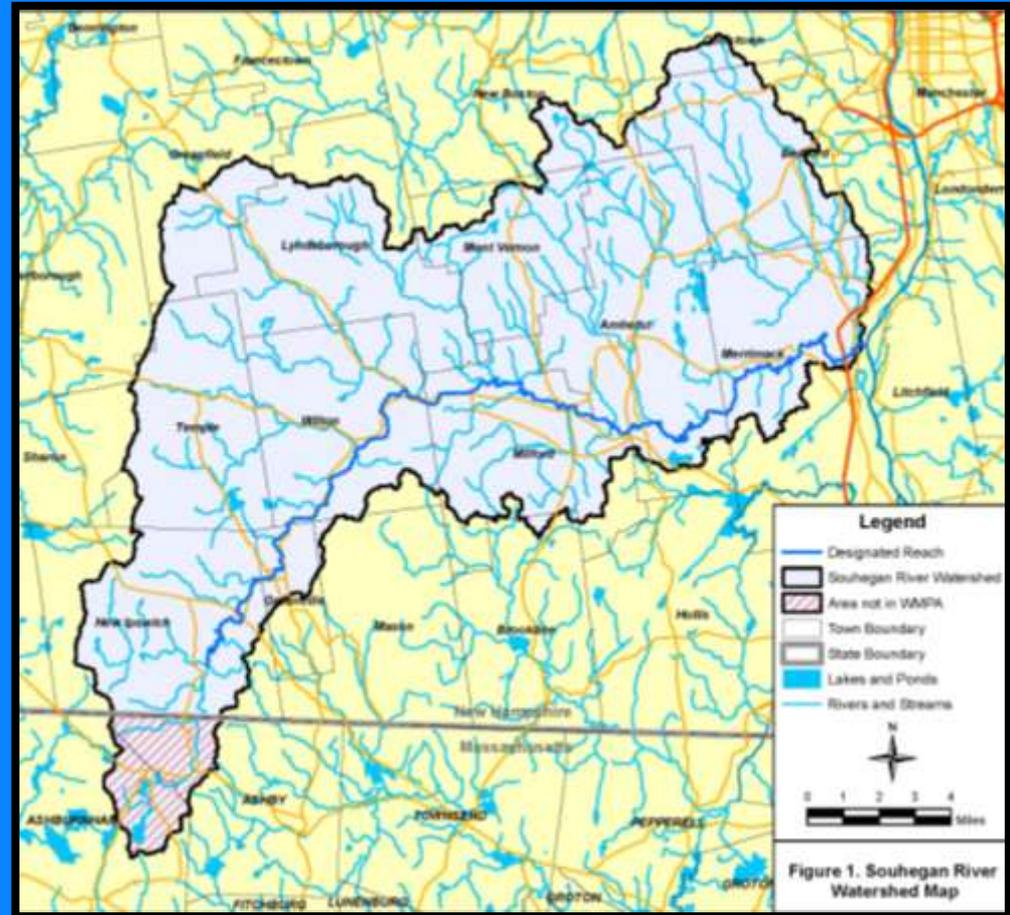
Env-Wq 1906.05 Water Management Plan  
Document:

- (a) The department shall prepare a water management plan document specifying the conservation measures and operational measures that will be implemented by each **affected water user** and **affected dam operator** in the **WMPA** to meet the protected instream flow requirements.

# Souhegan River Water Management Planning Area

**WMPA** encompasses:

- 211 sq. mile (96%) of drainage area.
- 17 towns
- State Designated River (31 mi.)



# Entities Encompassed by Water Management Plan

- **Dam Owners** - owner of a dam with an impoundment with a surface area greater than 10 acres - **ADO**.
- **Water Users** - registered 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 - **AWU**.



# Entities Encompassed by Water Management Plan

## Affected Dams, Ownership and Uses

### Municipal

- New Wilton Reservoir Dam (WS)
- Osgood Pond Dam (R)

### State Owned

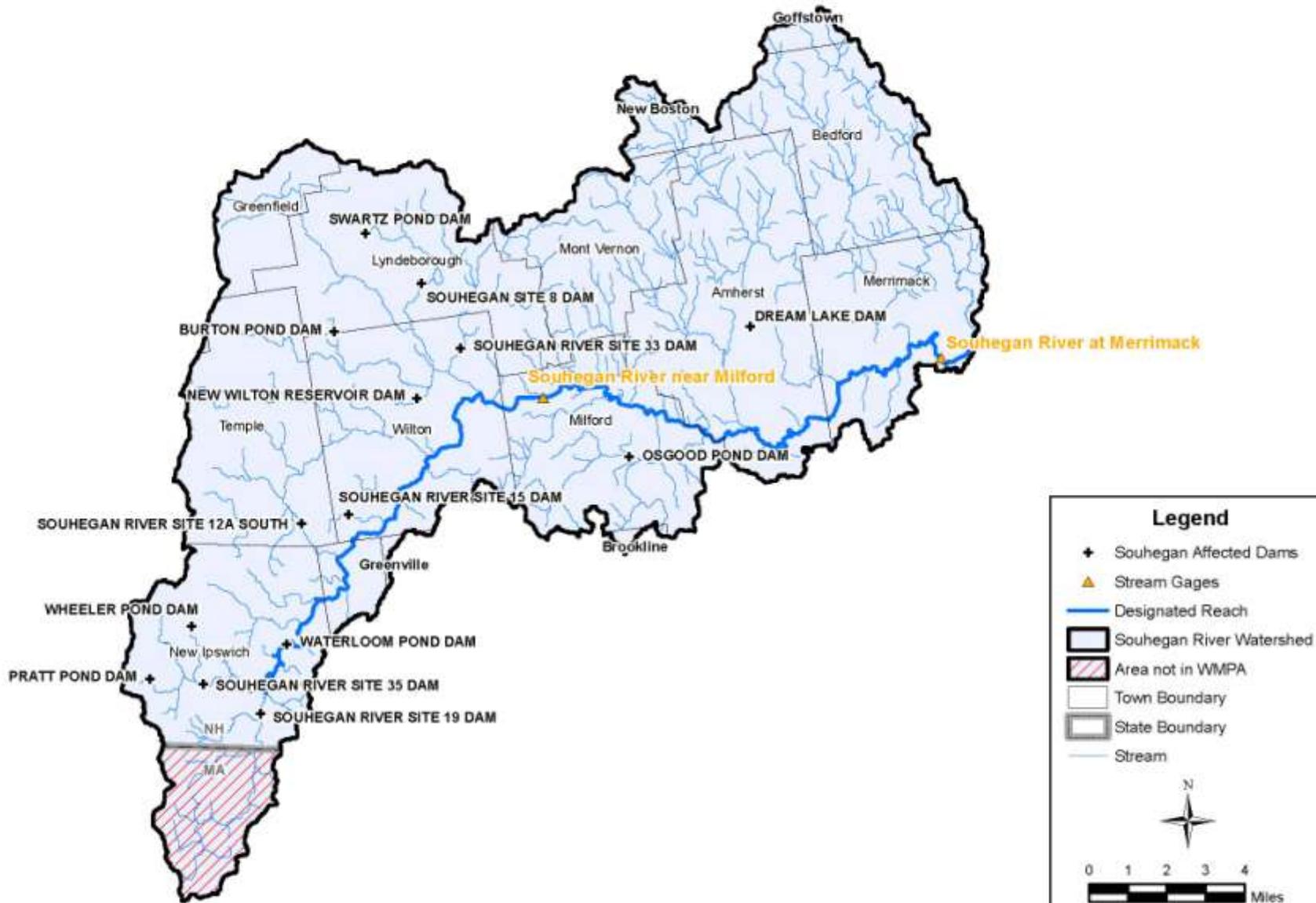
- Souhegan River Sites: 8, 12A South, 15, 19, 33 and 35. (All FC, but 12A also WS)

### Private

- Burton Pond Dam (R)
- Dream Lake Dam (R)
- Pratt Pond Dam (R)
- Swartz Pond Dam (R)
- Waterloom Pond Dam (HP)
- Wheeler Pond Dam (R)

FC- Flood Control  
HP- Hydropower

R - Recreation  
WS – Water Supply



**Legend**

- + Souhegan Affected Dams
- ▲ Stream Gages
- Designated Reach
- ▭ Souhegan River Watershed
- ▨ Area not in WMPA
- ▭ Town Boundary
- ▭ State Boundary
- Stream

N

0 1 2 3 4  
Miles

Figure 3. Location Map of Souhegan Affected Dams.

# Entities Encompassed by Water Management Plan

## Affected Water Users

### Agriculture

Peter de Bruyn Kops

### Aquaculture

Milford Fish Hatchery

### Bottled Water

Monadnock Mountain  
Spring Water

### Hydropower

Chamberlain Falls Dam

Otis Falls Dam

Water Loom Dam

Pine Valley Mill Dam

### Industrial

Pilgrim Foods

# Entities Encompassed by Water Management Plan

## Affected Water Users

### Irrigation

Amherst Country Club  
Ponemah Green  
Family Golf Center  
Souhegan Woods Golf  
Club

### Water Supply - Private

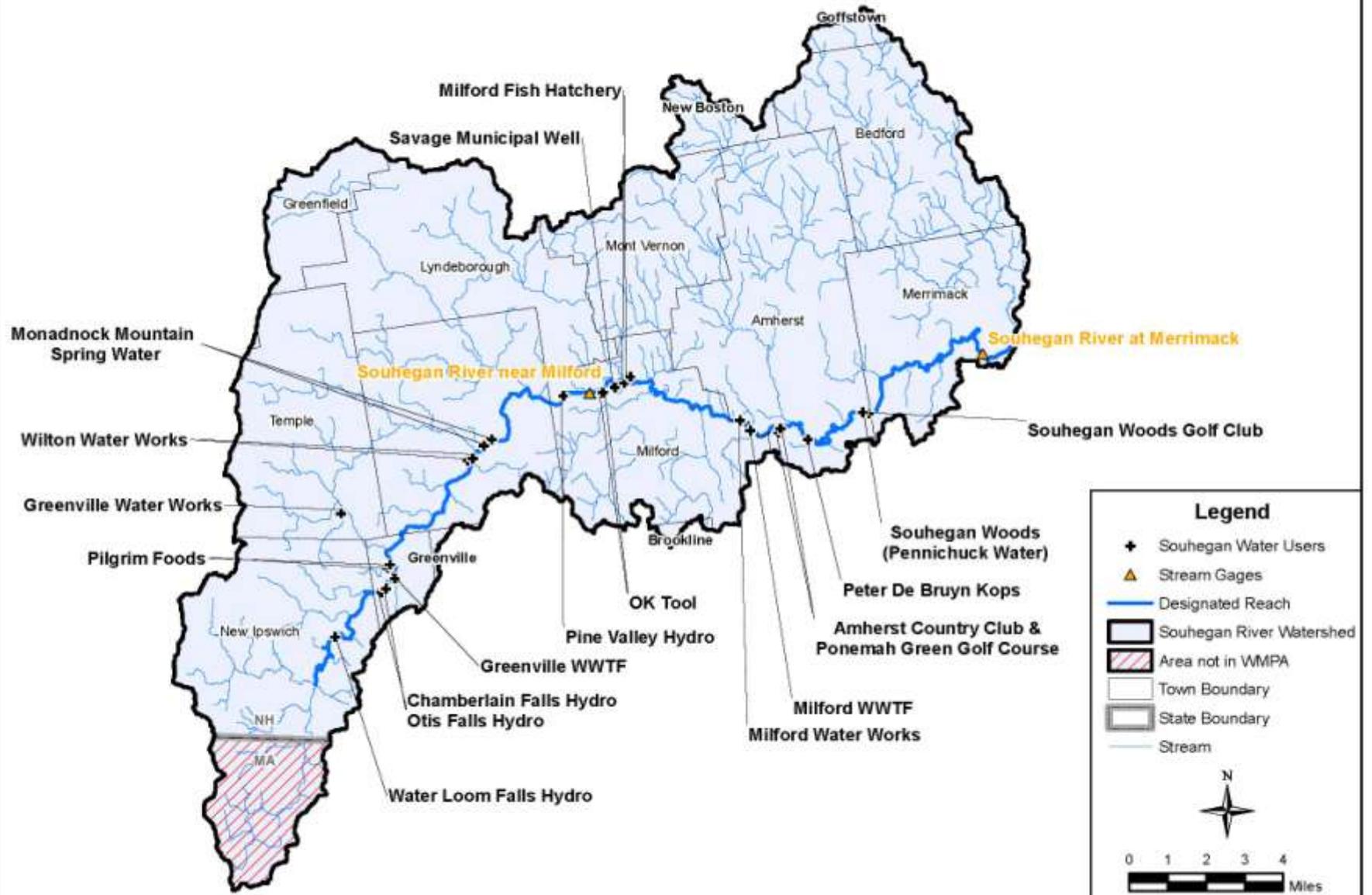
Pennichuck Water:  
Souhegan Woods

### Superfund Site

OK Tool  
Savage Well

### Water Supply - Public

Greenville Water Works  
Milford Water Works  
Wilton Water Works



**Legend**

- ✦ Souhegan Water Users
- ▲ Stream Gages
- Designated Reach
- ▭ Souhegan River Watershed
- ▨ Area not in WMPA
- ▭ Town Boundary
- ▭ State Boundary
- Stream

N

0 1 2 3 4  
Miles

**Figure 2. Souhegan Affected Water Users**

# **Is There a Present Need for Management?**

**Lines of evidence indicating present need for management:**

- Results of annual water use vs. streamflow assessment.**
- Results of Protected Instream Flow Study.**
- Population growth and water use in Souhegan River Water Management Planning Area.**

# Is There a Present Need for Management?

Results of annual water use vs. streamflow assessments by DES (2003 through 2006):

General Standard – value dependent on mean of monthly streamflows (MMF), which is then compared with aggregate water use (AgWU) along the river.

- If  $MMF > 4.0$  cfs/m, then AgWU compared to 0.16 cfs/m
- If  $MMF > 1.0$  cfs/m, then AgWU compared to 0.04 cfs/m
- If  $MMF > 0.02$  cfs/m, then AgWU compared to 0.02 cfs/m
- If  $MMF \leq 0.5$  cfs/m, then AgWU compared to 5% 7Q10

cfs/m - cubic feet per second per square mile

7Q10 – lowest continuous 7 day discharge with 10 year recurrence interval

# Is There a Present Need for Management?

Results of annual water use vs. streamflow assessments by DES (2003 through 2006):

- Months when aggregate water use exceeded General Standard most frequently; July (3x), August (4x) and September (4x).
- Reaches where aggregate water use exceeded General Standard most frequently:
  - Between Milford Fish Hatchery Wells & Return (7x)
  - Between Wilton Water Works & Merrimack River (5x)

# Is There a Present Need for Management?

**Table 1 - Instream Protected Flows for the Segments of the Souhegan River Designated as Protected Pursuant to RSA 483:15, XIII**

Upper Souhegan Protected Instream Flows for Fish			Common flow				Critical flow				Rare Flow			
Time of Year	Controlling IPUOCR Upper Souhegan Flows	Bisperiod	Common flow (cfs)	Common flow (cfm)	Allowable duration (days)	Catastrophic duration (days)	Critical flow (cfs)	Critical flow (cfm)	Allowable duration (days)	Catastrophic duration (days)	Rare flow (cfs)	Rare flow (cfm)	Allowable duration (days)	Catastrophic duration (days)
Jan 1 - Feb 28	Fish overwinter	Over-Wintering	204	2.0	35	30	51	0.50	15	30	31	0.30	5	10
Mar 1 - Apr 30	Spring flood	Spring Flood	389	3.8	28	36	113	1.1	12	16	82	0.80	5	7
May 1 - Jun 14	Shad spawning	Shad Spawning	215	2.1	25	40	61	0.60	10	15	38	0.37	4	7
Jun 15 - Jun 30	GRAF spawning	GRAF Spawning	24	0.23	20	27	11	0.11	10	20	8	0.08	10	15
Jul 1 - Jul 14	GRAF spawning													
Jul 15 - Aug 21	GRAF rearing & growth													
Aug 22 - Sep 14	GRAF rearing & growth	Rearing & Growth	31	0.30	30	42	16	0.16	15	35	10	0.10	5	30
Sep 15 - Sep 30	GRAF rearing & growth													
Oct 1 - Nov 14	Salmon spawning	Salmon Spawning	41	0.40	30	40	10	0.10	12	23	10	0.10	10	23
Nov 15 - Dec 1	Fish overwinter	Over-Wintering	204	2.0	35	30	51	0.50	15	30	31	0.30	5	10
Dec 2 - Dec 31	Fish overwinter													

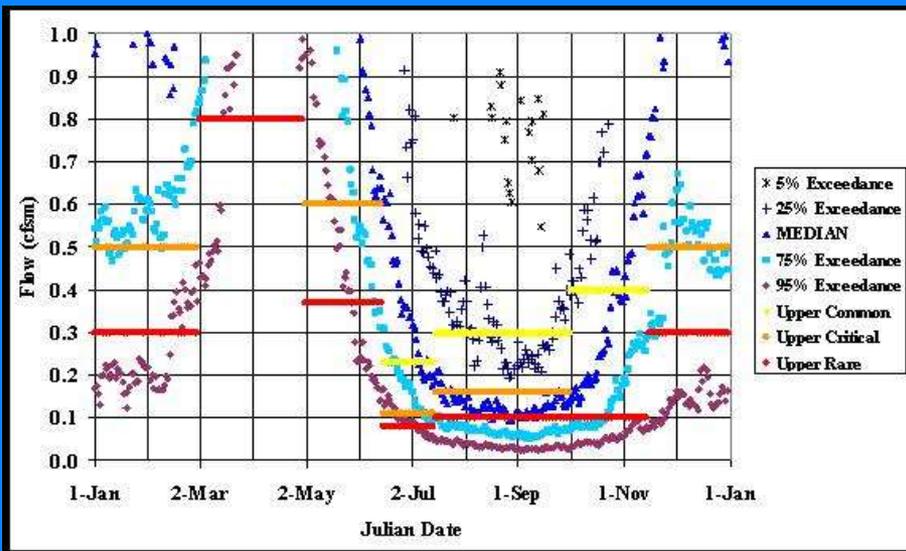
Lower Souhegan Protected Instream Flows for Fish			Common flow				Critical flow				Rare Flow			
Time of Year	Controlling IPUOCR Lower Souhegan Flows	Bisperiod	Common flow (cfs)	Common flow (cfm)	Allowable duration (days)	Catastrophic duration (days)	Critical flow (cfs)	Critical flow (cfm)	Allowable duration (days)	Catastrophic duration (days)	Rare flow (cfs)	Rare flow (cfm)	Allowable duration (days)	Catastrophic duration (days)
Jan 1 - Feb 28	Wood Turtle hibernation	Over-Wintering	342	2.0	35	30	86	0.50	15	30	31	0.30	5	10
Mar 1 - Apr 30	Spring flood	Spring Flood	650	3.8	28	36	188	1.1	12	16	137	0.80	5	7
May 1 - Jun 14	Shad spawning	Shad Spawning	178	1.0	15	25	36	0.60	5	10	88	0.50	5	10
Jun 15 - Jun 30	Outbow and backwater marsh maintenance	GRAF Spawning	39	0.23	17	25	<b>239 / 26</b>	<b>1.4 / 0.15</b>	<b>13 / 15</b>	<b>23 / 20</b>	<b>325 / 17</b>	<b>1.9 / 0.10</b>	<b>10 / 10</b>	<b>10 / 10</b>
Jul 1 - Jul 14	Outbow and backwater marsh maintenance													
Jul 15 - Aug 21	Outbow and backwater marsh maintenance													
Aug 22 - Sep 14	Outbow and backwater marsh maintenance	Rearing & Growth	103	0.60	20	40	26	0.15	15	20	17	0.10	5	10
Sep 15 - Sep 30	GRAF rearing & growth	Salmon Spawning	184	1.1	23	40	36	0.60	12	40	50	0.40	5	10
Oct 1 - Nov 14	Salmon spawning													
Nov 15 - Dec 1	Fish overwinter	Over-Wintering	342	2.0	35	30	86	0.50	15	30	31	0.30	5	10
Dec 2 - Dec 31	Wood Turtle hibernation													

**Bold values are upper limits for instream flow for protection of GRAF spawning. Flows should not be created that exceed these magnitudes and durations.**

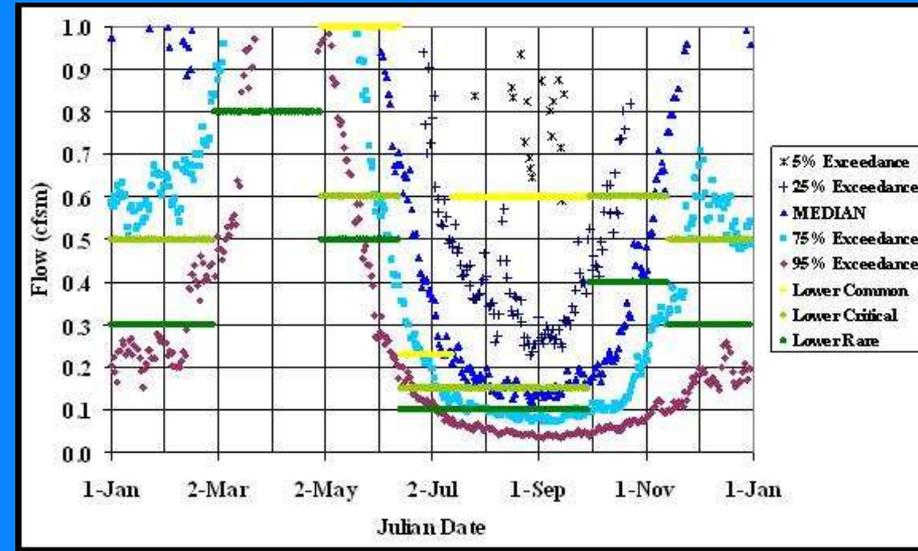
Souhegan Protected Instream Flows for Natural Communities, Wildlife Habitats and Rare, Threatened or Endangered Wildlife and Plants	
Wild Scum and Wild Olive	>18.7 cfm on a frequency of once every 2-10 years
Twisted Red Pine (Hale) (upper Souhegan only)	>2.8 cfm once every 1-3 years (December through April)
Wood Turtle (lower Souhegan only)	>5.85 cfm (June through September)
Wood Turtle (lower Souhegan only)	Flow should exceed the average flow of the last two weeks of the previous November (December through February)
Fowler's Toad (lower Souhegan only)	>2.335 cfm at least once to fill wetlands (March through May); and >0.175 cfm at least monthly to maintain breeding pools (June through mid-August)
Silver Maple Floodplain Forest (lower Souhegan only)	>11.7 cfm once every 1-3 years
Sycamore Floodplain Forest (lower Souhegan only)	>17.5 cfm once every 1-3 years
Outbow-Backwater Marsh (lower Souhegan only)	>3.5 cfm at least once to fill (March through April)

# Is There a Present Need for Management?

## Results of Protected Instream Flow Study:



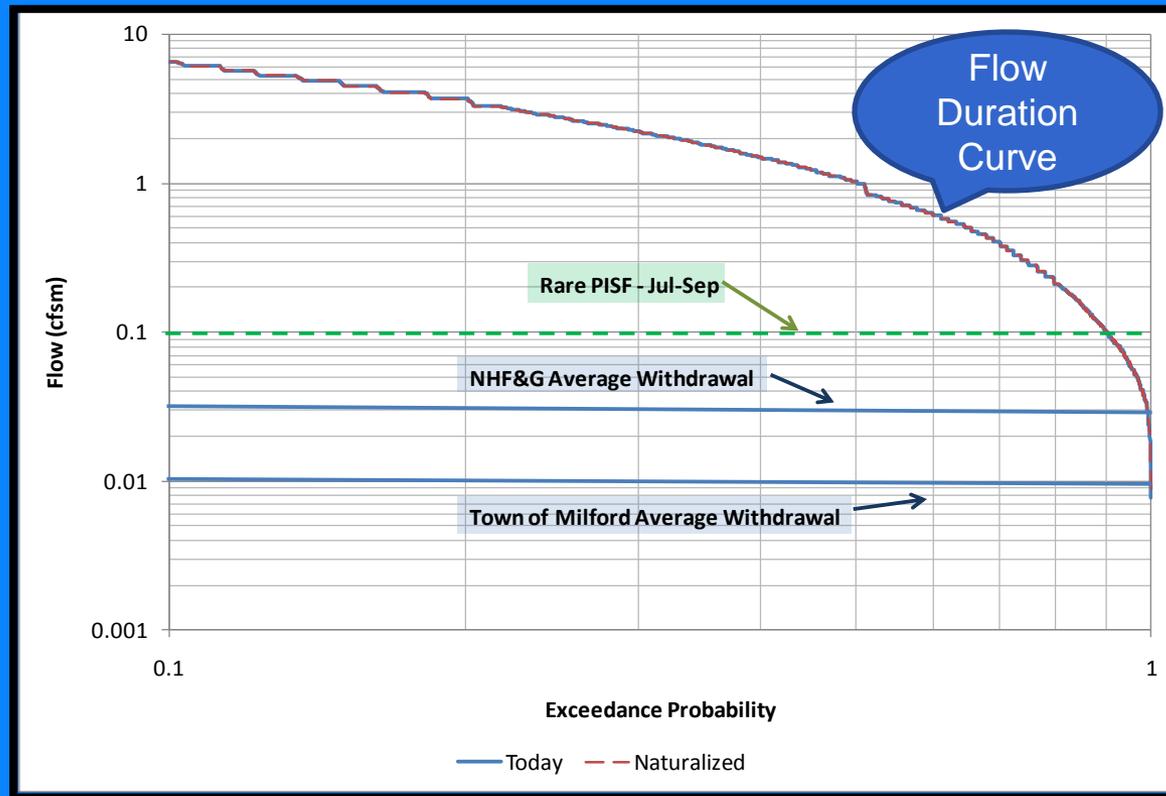
Comparison of Upper Souhegan River instream flows to daily flow frequencies.



Comparison of Lower Souhegan River instream flows to daily flow frequencies.

# Is There a Present Need for Management?

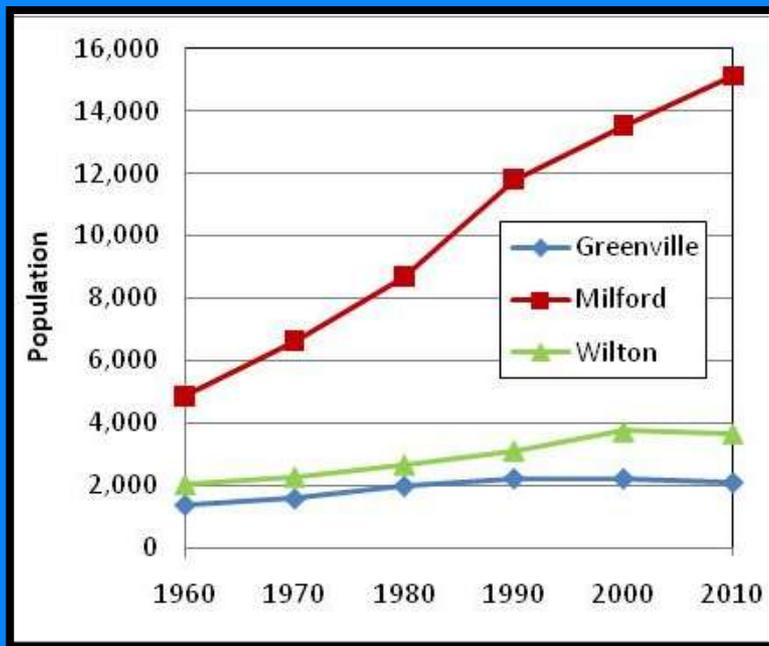
## Results of Protected Instream Flow Study:



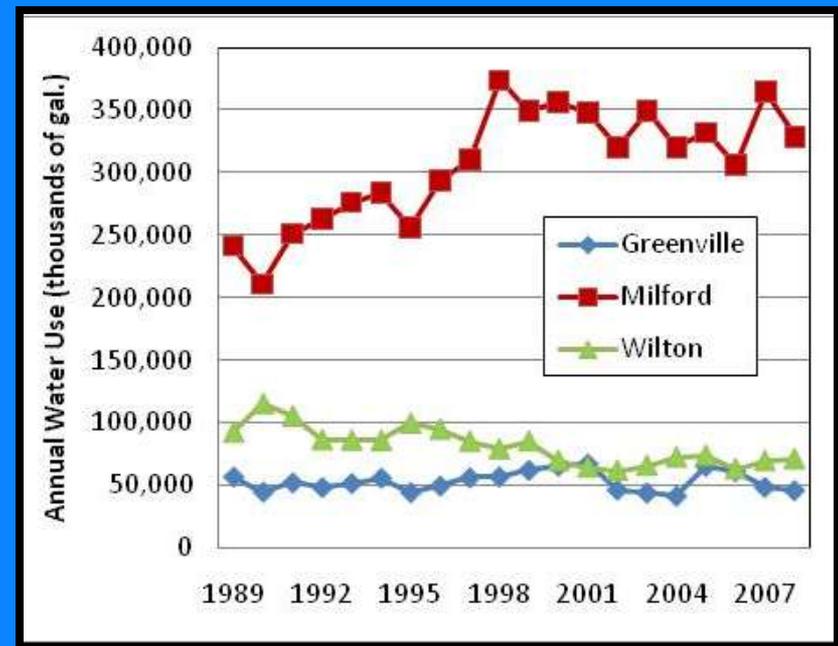
Comparison of withdrawals in the Lower Souhegan River section.

# Is There a Present Need for Management?

## Population growth and water use:



Greenville: 52% (720)  
Milford: 211% (10,252)  
Wilton: 82% (1,652)  
**Overall: +12,624**



Greenville: - 19% (-11,066)  
Milford: 36% (87,367)  
Wilton: - 23% (-21,416)  
**Overall: +54,885**

# **Are the Protected Instream Flows Manageable?**

**If streamflow in the Souhegan Designated River is below the protected instream flow values for greater than their Catastrophic duration what are the available management options?**

- A. Pray for rain**
- B. Reduce water use from river**
- C. Add water to the river from storage**
- D. All of the above**

# Are the Protected Instream Flows Manageable?

Reduce water use:

Description	Flow (gpd)	Flow (cfs)
Total Water Use		
Average	3,923,162	6.07
Maximum	6,605,390	10.22
Direct Withdrawals on SDR		
Average	161,580	0.25
Maximum	1,085,818	1.68
June 15 - Sept. 30 Critical PISF (Lower SDR)	16,804,320	26
June 15 - Sept. 30 Rare PISF (Lower SDR)	10,987,440	17
7Q10 at Merrimack Gage	8,337,528	12.9
De minimis flow (5% of 7Q10)	420,108	0.65

**Note: although maximum direct withdrawals are roughly 10% of Rare PISF, still cannot manage PISFs solely by water use reductions!**

# **Are the Protected Instream Flows Manageable?**

**Add water to the river from storage creating relief flows:**

- Store and release water from selected dams to provide two-day relief flow to support protected instream flow.**
- Sufficient flow to be provided to raise flow levels on Souhegan Designated River above Critical flow limit for two days. Resets duration and flow counter for flow tracking.**

# **Are the Protected Instream Flows Manageable?**

## **Relief Flow Analysis:**

- UNH and DES performed analyses of historical Souhegan flow data compared with protected instream flow values to determine flow deficit values for each bioperiod.**
- DES performed analysis to determine ability of selected flood control dams to store and release relief flows.**

# Are the Protected Instream Flows Manageable?

## Relief Flow Analysis (UNH):

<b>Upper Souhegan River</b>	<b>Common</b>	<b>Critical</b>	<b>Rare</b>
Bioperiod with largest median deficit flow	SF	SF	SF
Deficit Flow (cfsm)	1.188	0.161	0.160
Deficit Flow at Wilton Road (cfs)	121.18	16.42	16.32
Storage Volume needed for two days of deficit flow (AF)	480.70	65.15	64.74
<b>Lower Souhegan River</b>			
Bioperiod with largest median deficit flow	SF	SS	SF
Deficit Flow (cfsm)	1.119	0.261	0.186
Deficit Flow at USGS gage (cfs)	191.35	44.63	31.81
Storage Volume needed for two days of deficit flow (AF)	759.07	177.05	126.17

SF – Spring Flood bioperiod

SS – Salmon Spawning bioperiod

# Are the Protected Instream Flows Manageable?

## Relief Flow Analysis (DES):

BP	Common Persistent		Common Catastrophic		Critical Persistent		Critical Catastrophic		Rare Persistent		Rare Catastrophic		Max Critical or Rare Catastrophic	Max Critical or Rare Catastrophic plus 20%
	90%ile	90%ile + 20% buffer	90%ile	90%ile + 20% buffer	90%ile	90%ile + 20% buffer	90%ile	90%ile + 20% buffer	90%ile	90%ile + 20% buffer	90%ile	90%ile + 20% buffer		
1	920	1104	940	1128	81	98	89	107	16	19	79	95	89	107
2	1688	2026	800	960	77	93	70	84	97	117	55	66	70	84
3	456	547	150	180	147	176	63	76	123	148	65	78	65	78
4	83	100	23	28	39	46	44	53	19	23	30	36	44	53
5	333	400	353	424	38	45	46	55	14	17	48	57	48	57
6	633	759	555	666	307	369	206	248	210	252	198	238	206	248
<b>Sum</b>	<b>4114</b>	<b>4936</b>	<b>2822</b>	<b>3386</b>	<b>689</b>	<b>827</b>	<b>518</b>	<b>622</b>	<b>479</b>	<b>575</b>	<b>475</b>	<b>570</b>	<b>522</b>	<b>627</b>

BP	Start	End	Bioperiod
1	15-Nov	28-Feb	Over-Wintering
2	1-Mar	30-Apr	Spring Flood
3	1-May	14-Jun	Shad Spawning
4	15-Jun	14-Jul	GRAF Spawning
5	15-Jul	30-Sep	Rearing & Growth
6	1-Oct	14-Nov	Salmon Spawning

**Two-Day Relief Flow Volume in Acre-Feet**

# Are the Protected Instream Flows Manageable?

## Relief Flow Analysis:

- DES Dam Bureau evaluated feasibility of using two existing flood control dams (Sites 19 and 35) to store and release relief flows.
- Used 210 ac-ft and ran NRCS SITES model with 9 hour ramp up time 48 hour release and 9 hour ramp down.
- Site 19 has 499 ac-ft of storage, while Site 35 has 118 ac-ft for total of 617 ac-ft.

# **Are the Protected Instream Flows Manageable?**

## **Employment of Relief Flows:**

- When catastrophic events (as flows and durations) occur twice in a bioperiod over a decade.**
- Also when third consecutive persistent flow occurs in a bioperiod (=catastrophic condition).**
- Dam management will be employed to maintain this frequency.**

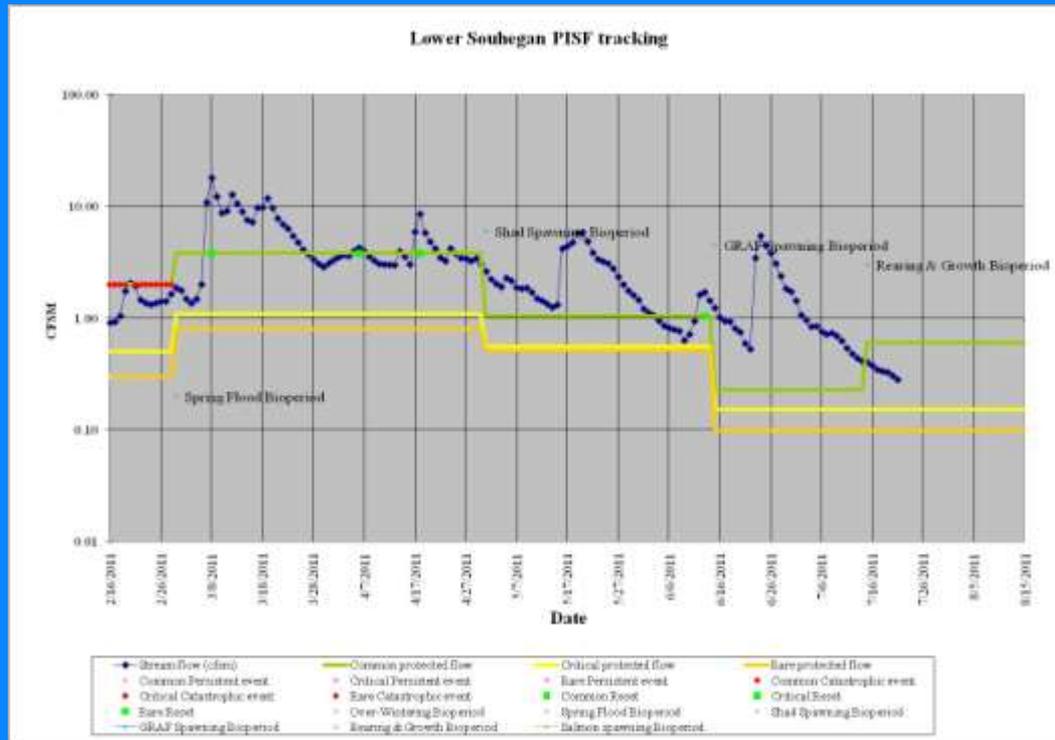
# **Strategies for Maintenance of the Protected Instream Flows**

**Conservation, water use and dam management are the core strategies for maintaining the protected instream flows:**

- Reduce water losses and unnecessary water use through conservation.**
- Shift, spread and reduce impacts of water use during summer/early fall bioperiods through water use management.**
- Offset catastrophic flow conditions by dam management and relief flows.**

# Strategies for Maintenance of the Protected Instream Flows

- Assessing hydrologic conditions by tracking daily streamflow and comparing with protected instream flow values. Tracking tool developed by DES and available online.



# Strategies for Maintenance of the Protected Instream Flows

- Under Instream Flow Rules (Env-Wq 1903.01) the **de minimis** amount is always available for off-stream water use regardless of river conditions.
  - De minimis amount is equal to 5% of 7Q10, which is the lowest continuous 7-day flow having a 10 year recurrence interval.
  - 7Q10 of Souhegan River at the USGS gage in Merrimack is 12.9 cfs, so de minimis is 0.65 cfs or 416,876 gallons per day.

# **Souhegan River Water Management Plan**

**Protected instream flows to be maintained by implementation of Water Management Plan with objective of:**

- Maintaining flows for instream public uses.**
- Supporting off-stream public water supplies and agriculture.**
- Maintaining the natural variability and range of flows.**

# Souhegan River Water Management Plan



# Conservation Plans

## Elements of Individual Plans:

- Identification of water source and uses.
- Description of water use patterns.
- Description of existing water conservation measures.
- Discussion of water conservation alternatives.
- Conservation implementation schedule.

# Conservation Plans

## Basic Water Conservation Requirements:

- Outlined in Water Conservation Rules (Env-Wq 2100) Part Env-Wq 2101 Water Conservation and/or Part Env- Wq 2102 Water Use Registration and Reporting.
- Requirements are water use type specific: agricultural, commercial, industrial and water suppliers (systems).
- Minimum for all – accurately measure water use and report.

# Conservation Plans

## Basic Water Conservation Requirements for Agriculture:

- Measure volume of water used by source.
- Measurements must be accurate within 10%.
- Where appropriate, follow irrigation practices as discussed in New Hampshire Department of Agriculture's "Irrigation: Best Management Practices for Agriculture in New Hampshire" dated March 1998.

# Conservation Plans

## Proposed Water Conservation Actions:

- The agricultural water user has implemented many of the recommended water conservation practices.
- Needs to verify accuracy of estimated water use. DES to assist. If method does not meet 10 percent accuracy, will need to meter.
- Consider more objective basis for irrigation scheduling and increase use of micro-irrigation.

# Conservation Plans

## Basic Water Conservation Requirements for Aquaculture (subtype agriculture):

- Measure water used by sources.
- Measurements must be accurate within 10%.
- Where appropriate, follow water conservation practices as discussed in DES Environmental Fact Sheet (WD-DWGB-26-12) “Water Efficiency Practices for Aquaculture”.

# Conservation Plans

## Proposed Water Conservation Actions:

- Hatchery not a modern re-circulation design, so potential for major improvements limited.
- Already performs recommended basic water conservation practices.
- To ensure accurate measurement of water use, recommend a meter testing and calibration program be implemented.
- Recommend directly measuring discharge from facility to identify system water gains (losses).

# Conservation Plans

## Basic Water Conservation Requirements for Bottled Water and Food Production (ICI\*):

- Meter water sources and maintain meters.
- Measurements must be accurate within 10%.
- Minimize discharge of unused water.
- Use best management practices for water conservation.

\* ICI – Industrial, Commercial, and Institutional Water User

# Conservation Plans

## Proposed Water Conservation Actions:

- **Monadnock Mountain Spring Water and Pilgrim Foods have implemented most basic water conservation measures.**
- **Recommend testing and calibration of water meters to ensure accuracy.**
- **Recommend having formal water audit performed to identify any opportunities for additional water conservation.**

# Conservation Plans

## Basic Water Conservation Requirements for Hydropower:

- Estimate and report water use.
- Estimated water use must be accurate within 10 percent of actual use.
- Direct return and non-consumptive use, so no proposed water conservation actions for Chamberlain Falls, Otis Falls, Pine Valley and Waterloom Pond dams.

# Conservation Plans

## Basic Water Conservation Requirements for Irrigation: (ICI\* - Golf Courses)

- Meter water sources and maintain meters.
- Measurements must be accurate within 10%.
- Where appropriate, follow water conservation practices presented in DES Environmental Fact Sheet (WD-DWGB-26-6) “Water Efficiency Practices for Golf Courses”.

\* ICI – Industrial, Commercial, and Institutional Water User

# Conservation Plans

## Proposed Water Conservation Actions:

- **Amherst Country Club/Ponemah Green Family Golf Center and the Souhegan Woods Golf Club have implemented most basic water conservation measures.**
- **Document source water meter(s) being maintained per industry accepted practices.**
- **Continue to follow and where practicable improve on current water conservation best management practices.**

# Conservation Plans

## Basic Water Conservation Requirements for Public Water Suppliers:

- Meter water sources and users.
- Maintain all meters so measurements are accurate within 10%.
- Read source meters at least once every 30 days and user meters at least every 90 days.
- Implement water audit and leak detection programs.

# Conservation Plans

## Basic Water Conservation Requirements for Public Water Suppliers:

- **Estimate unaccounted-for-water and reduce to below 15%.**
- **Implement pressure reduction consistent with industry standards.**
- **Adopt a water rate structure that promotes water conservation.**
- **Implement water conservation educational outreach initiative.**

# Conservation Plans

## Proposed Water Conservation Actions:

- **Greenville Water Works, Milford Water Works, Pennichuck Water (Souhegan Woods) and Wilton Water Works have implemented many water conservation measures.**
- **Greenville and Wilton – need to determine thier unaccounted-for-water, implement a regularly scheduled leak detection program and expand water conservation educational outreach to Town web site (Greenville) or adopt formal water conservation policy (Wilton).**

# Conservation Plans

## Basic Water Conservation Requirements for Superfund Remediation Sites:

- Meter water sources and maintain all meters.
- Operation of systems part of remediation plans for both sites and pumped water treated and either recycled to groundwater or discharged to river.
- Proposed water conservation action for OK Tool: test and calibrate meters annually, no actions currently proposed for Savage Well.

# Conservation Plans

Water Management Actions for all Souhegan River **Affected Water Users:**

- Submittal and approval of Water Conservation Plan to DES's Drinking Water and Groundwater Bureau.
- Exceptions: agriculture, hydropower and remediation (Savage Well).
- Implement final conservation plans by June 2012.

# Souhegan River Water Management Plan



# Water Use Plans

## Elements of Individual Plans:

- Define water use patterns and needs of the **Affected Water User (AWU)**.
- Potential for water use modification, sharing or both to meet protected instream flows.
- Coordination with Dam Management Plans to maintain protected instream flows.
- Develop implementation schedule and evaluate any costs.

# Water Use Plans

## Affected Water Users

Affected Water User	Water User ID	Annual Water Use (cubic feet per second)			Monthly Water Use (cubic feet per second)		
		Max	Min	Average	Max	Min	Average
Amherst CC/Ponemah Green	20190/20624	0.146	0.036	0.103	0.854	0	0.102
Chamberlain Falls Dam	20230	31.675	8.918	19.846	60.200	0	20.000
Greenville Water Works	20047	0.286	0.175	0.229	0.389	0.099	0.232
Milford Fish Hatchery	20218	4.386	1.000	3.404	5.180	0.170	3.740
Milford Water Works	20100	1.584	0.894	1.299	1.918	0.420	1.296
Monadnock Mountain Spring Water	20621	0.145	0.028	0.083	0.187	0.023	0.084
OK Tool	20832	NA	NA	NA	NA	NA	NA
Otis Falls Dam	20229	33.139	10.526	23.367	68.300	0.010	23.100
Pennichuck Water - Souhegan Woods	20659	0.092	0.034	0.064	0.172	0.007	0.063
Peter De Bruyn Kops	20383	0.002	0	0.0004	0.009	0	0.0004
Pilgrim Foods	20681	0.073	0.012	0.0525	0.111	0	0.0610
Pine Valley Hydro	20782	90.729	48.852	77.269	167.600	0	76.590
Savage Well	20833	NA	NA	NA	NA	NA	NA
Souhegan Woods Golf Club	20523	0.241	0.074	0.148	0.816	0	0.147
Water Loom Dam	20228	28.302	11.715	20.747	49.100	0.021	20.800
Wilton Water Works	20065	0.489	0.261	0.344	0.583	0	0.344

Notes:

NA - Not available

# Water Use Plans

## Agricultural – Peter de Bruyn Kops:

- **Water sources:** domestic well, pond and temporary direct withdrawal from Souhegan Designated River. Direct withdrawal 11% of total water use (average use 186,000 gal/yr or <0.001 cfs).
- **Proposed Water Use Plan actions:**
  - **When flow <26 cfs (Critical) for longer than 20 days (Catastrophic duration) direct withdrawal should be reduced by 25 percent (June 15 – Sept 30).**

# Water Use Plans

**Agricultural – Peter de Bruyn Kops:**

- **Proposed Water Use Plan actions:**
  - **When flow  $<17$  cfs (Rare) for longer than 10 days (Catastrophic duration) direct withdrawal from river limited to de minimis amount (June 15 – Sept 30).**
  - **De minimis = 0.65 cfs or 416,876 gallons per day, divided equally among active direct users.**

# Water Use Plans

## Agricultural – Peter de Bruyn Kops:

- These conditions rescinded when naturally occurring flows exceed Critical or Rare thresholds for two consecutive days, as measured at the USGS gage in Merrimack.

# Water Use Plans

## Aquaculture – Milford Fish Hatchery:

- **Water sources: two gravel packed wells, River Well and Field Well.**
- **River Well pumping induces 22% of its water from river and Field Well pumping induces 35% of its water from river.**
- **Based on reported monthly use (1989 to 2008), daily water use ranges from 0.17 cfs to 5.18 cfs, with an average of 3.74 cfs.**

# Water Use Plans

## Aquaculture – Milford Fish Hatchery:

- High groundwater use occurs during summer/fall bioperiods that have lowest protected flows (June 15 to Sept 30).
- Proposed Water Use Plan actions:
  - Manage existing operations and wells to reduce water use and potential impact to river when flows <17 cfs (Rare).

# **Water Use Plans**

## **Aquaculture – Milford Fish Hatchery:**

- **Proposed Water Use Plan actions (cont.):**
  - **Additional evaluation of the interaction of the Milford Fish Hatchery and Milford Water Works wells with the Souhegan Designated River is needed to better understand potential impacts.**

# Water Use Plans

## Bottled Water – Monadnock Mountain Spring Water:

- **Water sources: two gravel packed wells, Intervale Well and Mansur Well.**
- **Wells do not induce flow from river.**
- **No Water Use Plan actions are currently proposed.**

# **Water Use Plans**

**Hydropower – Otis Falls, Chamberlain Falls,  
Pine Valley and Waterloom Pond dams:**

- All dams are operated as run of river, so inflow equals outflow.**
- All dams already required to maintain minimum flows established by FERC.**
- Proposed Water Use Plan actions are that dams continue to operate as run-of-river and pass any relief flows un-attenuated.**

# Water Use Plans

## Industrial – Pilgrim Foods:

- **Water sources:** connection to Town water, a gravel packed well that was leased from the Town (no longer used) and two on site wells.
- **On site wells produce <15 gpm with minimal impact to river or tributary stream that flows across the site.**
- **No Water Use Plan actions are currently proposed.**

# Water Use Plans

## Irrigation – Amherst CC/Ponemah Green:

- **Water source: direct withdrawal from the Souhegan Designated River at the Amherst County Club.**
- **Water withdrawal supplies irrigation system to both facilities. Managed by Amherst CC.**
- **Based on reported monthly use (1989 to 2008), daily water use has ranged from 0 cfs to 0.85 cfs, with an average of 0.18 cfs for April through October.**

# Water Use Plans

## Irrigation – Souhegan Wood Golf Club:

- **Water source: direct withdrawal from the Souhegan Designated River.**
- **Based on reported monthly water use (1991 to 2008), daily water use has ranged from 0 cfs to 0.82 cfs, with an average of 0.25 cfs for April through October.**

# Water Use Plans

## Irrigation – Amherst CC/Ponemah Green and Souhegan Woods Golf Club:

- **Greatest system use occurs during summer/fall bioperiods that have lowest protected flows (June 15 to Sept 30).**
- **Proposed Water Use Plan actions:**
  - **When flow <26 cfs for longer than 20 days (Critical/Catastrophic), or <17 cfs (Rare threshold) before this, direct withdrawal limited to de minimis.**

# Water Use Plans

**Irrigation – Amherst CC/Ponemah Green and Souhegan Woods Golf Club:**

- **De minimis amount = 0.65 cfs or 416,876 gallons per day divided equally among active direct water users.**
- **These conditions rescinded when naturally occurring flows exceed Critical threshold for two consecutive days as measured at USGS gage in Merrimack.**

# Water Use Plans

Irrigation – Amherst CC/Ponemah Green and Souhegan Woods Golf Club:

- Alternatives to supplement de minimis:
  - Sharing of de minimis flow; alternating and scheduling of use.
  - Development of alternative supplies; on-site storage ponds or new well(s).

# Water Use Plans

## Public Water Supplies - Greenville:

- Only Greenville uses surface water (Tobey Reservoir) as its primary source.
- Greenville water treatment facility capable of treating 250,000 gallons of water per day. System includes 750,000 gallons of storage.
- Based on reported monthly water use (1999 to 2008), daily water use has ranged from 0.10 cfs to 0.39 cfs, with an average of 0.23 cfs.

# Water Use Plans

## Public Water Supplies - Milford:

- Source two gravel packed wells along Souhegan Designated River. Also purchase water from Pennichuck Water (<15%). System storage 1.25 million gallons.
- Wells pumped at 700 gpm. 60% of Curtis Well #2 pumping induced from river.
- Based on reported monthly water use (1989 to 2008), daily water use has ranged from 0.42 cfs to 1.92 cfs, with an average of 1.30 cfs.

# Water Use Plans

## Public Water Supplies - Wilton:

- Source two gravel packed wells along Souhegan Designated River. System storage 616,000 gallons.
- Wells pumped at 400 to 450 gpm. Abbott Well may induce 30% of pumping from river.
- Based on reported monthly water use (1989 to 2008), daily water use has ranged from 0.00 cfs to 0.58 cfs, with an average of 0.35 cfs.

# Water Use Plans

## PWS: Greenville and Wilton

- Greatest system use occurs during summer/fall bioperiods that have lowest protected flows (June 15 to Sept 30).
- Proposed Water Use Plan actions:
  - When daily mean discharge at the USGS gage near Milford is  $<11$  cfs (June 15- July 14) or  $<16$  cfs (July 15 to Sept. 30) DES will issue an **Alert**. Towns will inform water users they should implement voluntary water conservation measures.

# Water Use Plans

## PWS: Milford

- Greatest system use occurs during summer/fall bioperiods that have lowest protected flows (June 15 to Sept 30).
- Proposed Water Use Plan actions:
  - When daily mean discharge at the USGS gage in Merrimack  $< 26$  cfs DES will issue an **Alert**. Milford will inform water users they should implement voluntary water conservation measures.

# Water Use Plans

PWS: Greenville and Wilton

- Proposed Water Use Plan actions:
  - **Restriction** of outdoor water use when flows  $<11$  cfs (Critical) for longer than 20 days (Catastrophic duration) during June 15 – July 14 or  $<16$  cfs (Critical) for longer than 35 days (Catastrophic duration) during July 15 – Sept. 30.

# Water Use Plans

PWS: Greenville and Wilton

- Proposed Water Use Plan actions:
  - **Ban** of outdoor water use when flows <8 cfs (Critical) for longer than 15 days (Catastrophic duration) during June 15 – July 14 or <10 cfs (Critical) for longer than 30 days (Catastrophic duration) during July 15 – Sept. 30.

# Water Use Plans

PWS: Milford

- Proposed Water Use Plan actions:
  - **Restriction** of outdoor water use when flows  $<26$  cfs (Critical) for longer than 20 days (Catastrophic duration) during June 15 – September 30.
  - **Ban** of outdoor water use when flows  $<17$  cfs (Rare) for greater than 10 days (Catastrophic duration) during June 15 – September 30.

# Water Use Plans

**PWS: Greenville, Milford and Wilton**

- **Outdoor water uses affected:**
  - **watering of gardens and lawns**
  - **washing of cars, trucks, RVs, etc.**
  - **using water from a hose to rinse or clean property areas**
  - **using municipal water to fill swimming pools**
- **Restrictions/bans lifted when naturally occurring flow on river is greater than Critical or Rare threshold for two consecutive days.**

# Water Use Plans

## Public Water Supplies – Souhegan Woods:

- Souhegan Woods source well not shown to have impact on Souhegan Designated River.
- Pennichuck Water already manages outdoor water use with odd/even lawn watering.
- Supplemental water provided by Merrimack Village District, source not in watershed. Can impose additional water use restrictions.
- No Water Use Plan actions currently proposed.

# Water Use Plans

Remediation - OK Tool and Savage Well

- No withdrawal or induced recharge from Souhegan Designated River.
- No Water Use Plan actions currently proposed.

# Financial Assistance

**\$\$\$ for AWUs (Agricultural and Public Water Systems only) may be available from Federal and State sources:**

- **Natural Resources Conservation Service (NRCS) – Agricultural Management Assistance (AMA), Conservation Innovation Grants (CIG) and Conservation Stewardship Program (CSP).**
- **Federally funded state managed programs such as: Drinking Water State Revolving Loan Fund, Local Source Water Protection Grants and Watershed Restoration Grants.**

# Souhegan River Water Management Plan



# Dam Management Plans

## Elements of Individual Plans:

- Summarize dam characteristics, operations and limitations.
- Assess potential water availability.
- Discuss potential impacts of dam management.
- Discuss potential for dam management to meet instream flow requirements.
- Propose dam management activity, schedule and estimate costs of Plan.

# Dam Management Plans

## Screening of Affected Dams:

- **Storage volume available for flow management.**
- **Size of contributing drainage area.**
- **Distance to Souhegan Designated River.**
- **Condition of existing dam to support flow management.**

# Dam Management Plans

## Screening of Affected Dams:

- Dams dropped from further consideration:
  - 3 of 6 state owned
  - both municipally owned
  - all 6 privately owned
- Dams under consideration:
  - Souhegan River Site 12A South Dam (CS)
  - Souhegan River Site 19 Dam (PS)
  - Souhegan River Site 35 Dam (PS)

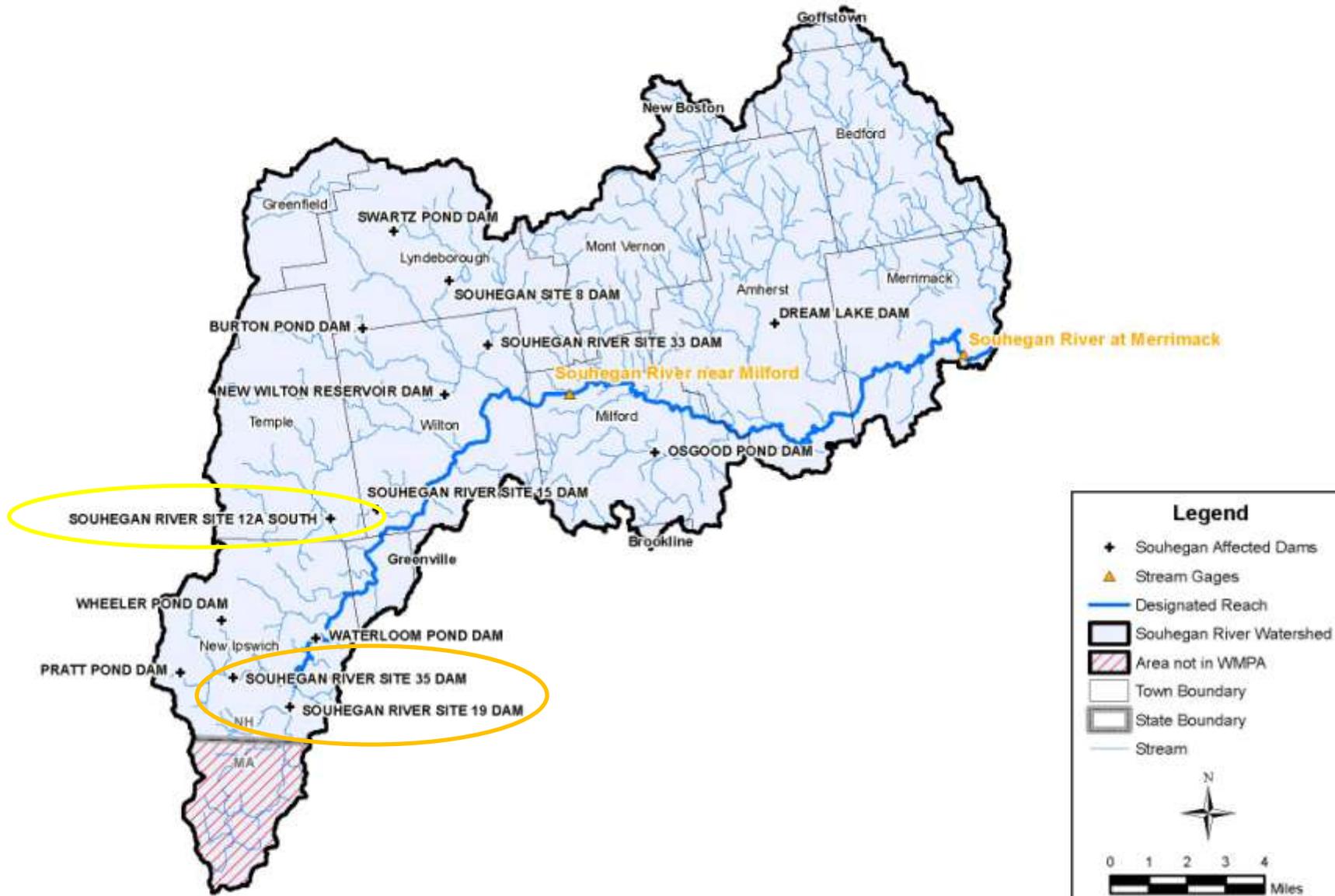


Figure 3. Location Map of Souhegan Affected Dams.

# Dam Management Plans

## Attributes of Affected Dams

Affected Dams	State Dam ID #	Impoundment Area (acres)	Drainage Area (sq. mi.)	Maximum Storage (ac-ft)	Permanent Storage (ac-ft)	Delta Storage (ac-ft)	Distance from SDR (mi.)	Functional Outlet (Y or N)
<b>Private Dams</b>								
Burton Pond Dam	147.17	40	0.46	350	300	50	6	N
Dream Lake Dam	007.15	10.4	0.25	36.24	15.44	20.80	4	Y
Pratt Pond Dam	175.03	35	0.74	110	58	52	4.2	Y
Swartz Pond Dam	147.31	10.6	0.25	42.2	21	21	7.2	N
Waterloom Pond Dam	175.09	75	23.1	665	420	245	0	Y
Wheeler Pond Dam	175.23	11	0.23*	32.89	10.89	22.00	4.1	N
<b>Municipal and State Dams</b>								
New Wilton Reservoir Dam	254.09	22.1	0.4	335	240	95	2.5	Y
Osgood Pond Dam	159.04	24.16	5.24	270	57	213	2.1	Y
Souhegan River Site 8 Dam	147.28	40	4.7	2721	180	2541	4.5	Y
Souhegan River Site 12A South Dam	234.11	108	5.6	3310	690	2620	1.6	Y
Souhegan River Site 15 Dam	254.30	69	1.1	708	74	634	1.2	Y
Souhegan River Site 19 Dam	175.19	25	11.4	2072	85.3	1986.7	0.63	Y
Souhegan River Site 33 Dam	254.34	12	1	900	24	876	1.8	Y
Souhegan River Site 35 Dam	175.21	24.9	6.4	1787	37	1750	2.5	Y

Notes

\* - Estimated



Contingency Site



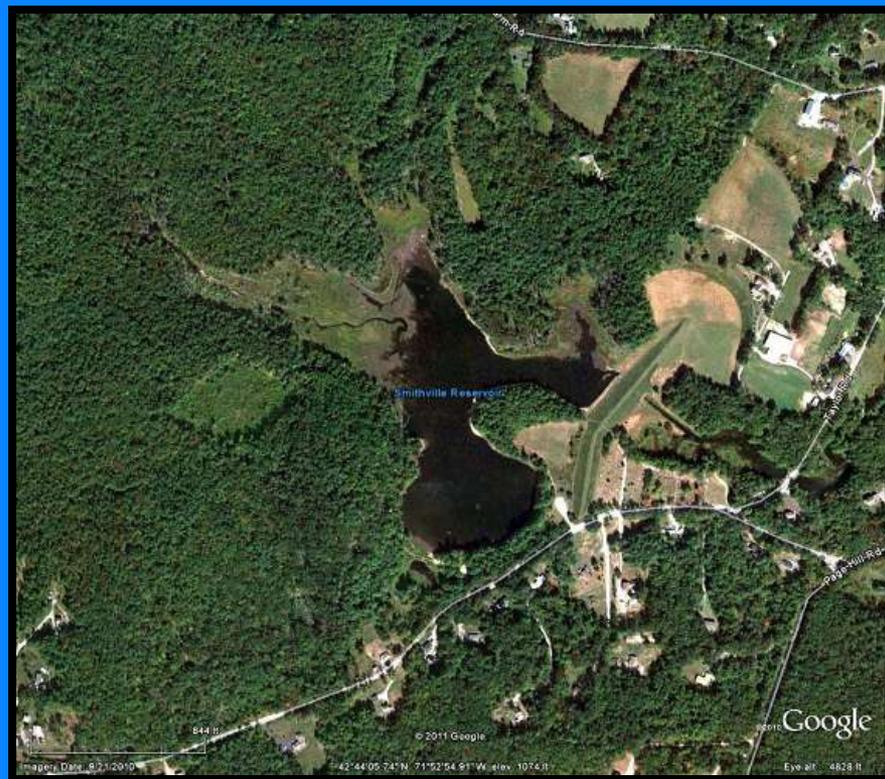
Primary Site

# Dam Management Plans

## Souhegan River Sites 19 and 35



Impoundment Area: 25 acres  
Potential Storage: 1987 ac-ft



Impoundment Area: 24.9 acres  
Potential Storage: 1750 ac-ft

# Dam Management Plans

## Potential Issues:

- **NRCS supports proposed use of flood control dams, but must reserve volume for flood control storage.**
- **Although State of New Hampshire owns the dams they are located on private property and deeded easements would need to be renegotiated to allow for longer storage.**

# Dam Management Plans

## Potential Issues:

- **Downstream dams to allow relief flows to pass un-attenuated.**
- **Outlets at all three dams would need to be retrofitted to allow for proposed releases. Estimated cost: \$136,000 per site.**
- **Retention of water for relief flows may impact wetlands at Souhegan River Site 19 and 35. Extent of impact dependent upon magnitude and frequency of change in water level.**

# WMP Implementation

- **Affected Water Users** and **Affected Dam Owners** will document management actions taken to meet their Plans.
- DES will conduct audits of management activities taken by **AWUs** and **ADOs**.
- Adaptive management may be needed to address effectiveness of Plans.
- If management actions not meeting expectations, **AWUs** and **ADOs** may apply for a waiver to review their management actions.

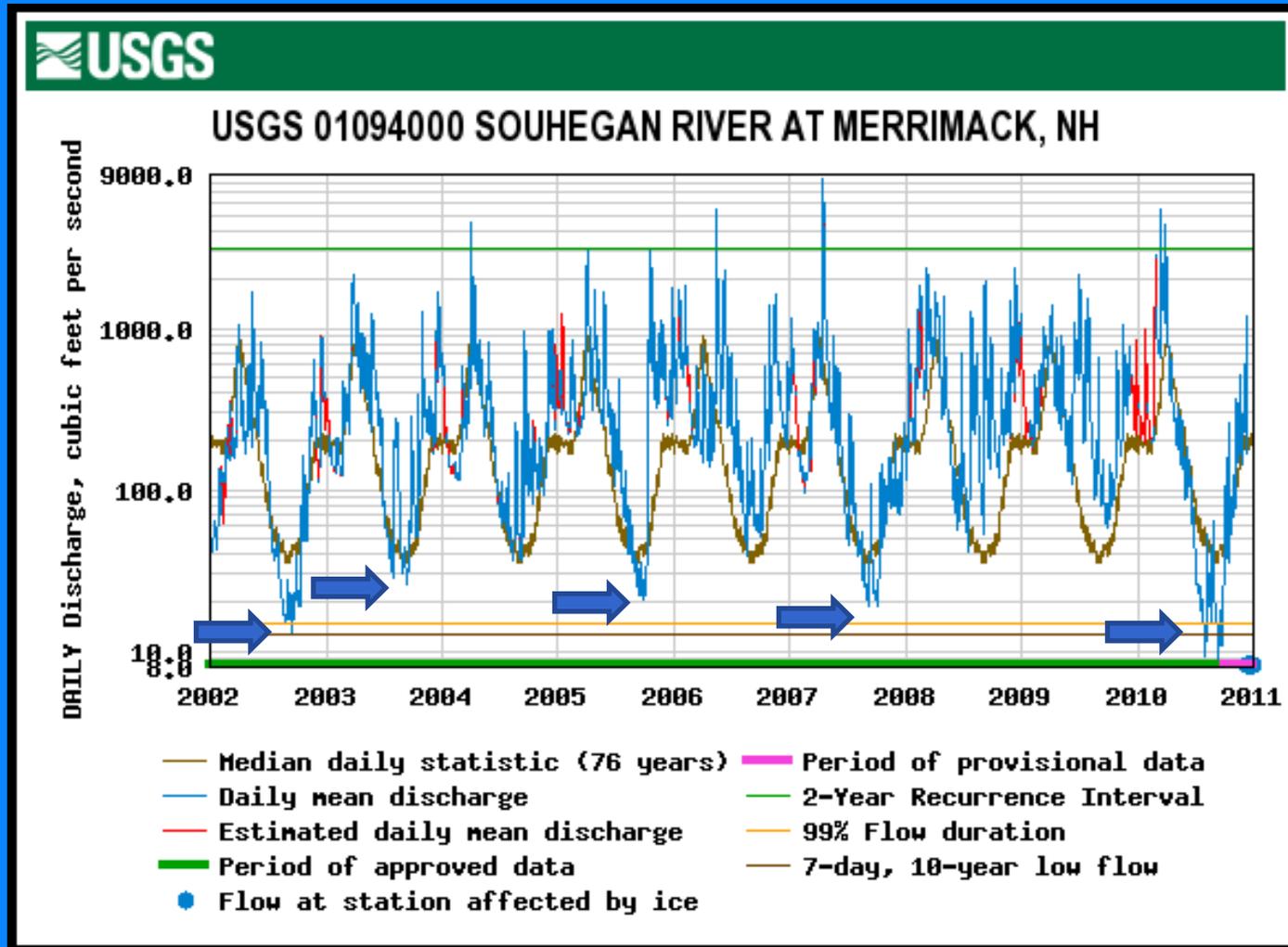
# WMP Implementation

## Water User Type

<u>Action Threshold</u> (Lower SR)				
Q <26 cfs	No Action	No Action	No Action	<b>Alert,</b> Voluntary Conservation
Q <26 cfs, >20 days	Reduce by 25%	No Action	De Minimis	Outdoor Water Use <b>Restriction</b>
Q <17 cfs	-	-	De Minimis	-
Q <17 cfs, >10 days	De Minimis	Manage or Reduce Well Pump	De Minimis	Outdoor Water Use <b>Ban</b>

# WMP Implementation

## What if WMP in Place 2002 -2010?



# WMP Implementation

2002

2003

2005

2007

2010



No Action

No Action

No Action

No Action

**De Minimis**  
**12 days**



No Action

No Action

No Action

No Action

**Reduced Pumping**  
**12 days**



**De Minimis**  
**8 & 5 days**

No Action

No Action

No Action

**De Minimis**  
**8, 2 & 22 days**



**1 Alert**

**2 Alerts**

**2 Alerts**

**3 Alerts**

**3 Alerts**  
**Outdoor Ban**  
**12 Days**

# WMP Implementation

- DES will conduct formal negotiations with private landowners at selected flood control sites to revise existing flowage rights for storage of relief flow water.
- Re-design and modification of the outlet structures will be required to release relief flows and will require funding.
- DES will work with **AWUs** that directly withdraw water from Souhegan Designated River to develop sustainable off-stream water sources.

# **WMP Implementation**

- **DES will establish a long-term monitoring program with a schedule for a review of the Plan to assess its effectiveness and incorporate any modifications as needed.**

# **Next Steps in the Water Management Plan Process**

- **Public comment period (30 days) at 4 pm on August 25.**
- **Review comments, revise draft plan and issue final version.**
- **Consideration of Water Management Plan for adoption by DES commissioner.**
- **Legislative review of pilot project (2013).**

A man wearing a blue cap, a dark vest over a light shirt, and blue jeans stands on a rocky bank of a river, fishing. The river is surrounded by lush green trees and foliage. The water is dark and reflects the surrounding greenery.

# Comments or questions?

Submit written comments  
by 4 pm, August 25 to:

Mr. Wayne Ives, P.G.  
NHDES

P.O. Box 95  
29 Hazen Drive  
Concord, NH 03302-0095

Phone and email:

271-3548  
[wayne.ives@des.nh.gov](mailto:wayne.ives@des.nh.gov)