

PUBLIC HEARING

DRAFT

Lamprey River Water Management Plan

May 11, 2011

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NHDES-R-WD-11-9



Lamprey River Water Management Plan Report



11 April 2011

Lamprey River Water Management Plan

- **The Lamprey River Water Management Planning Area.**
- **The protected instream flows.**
- **Entities encompassed by the Water Management Plan.**
- **Is there a present need for management ?**
- **Are the Lamprey River instream flows manageable?**

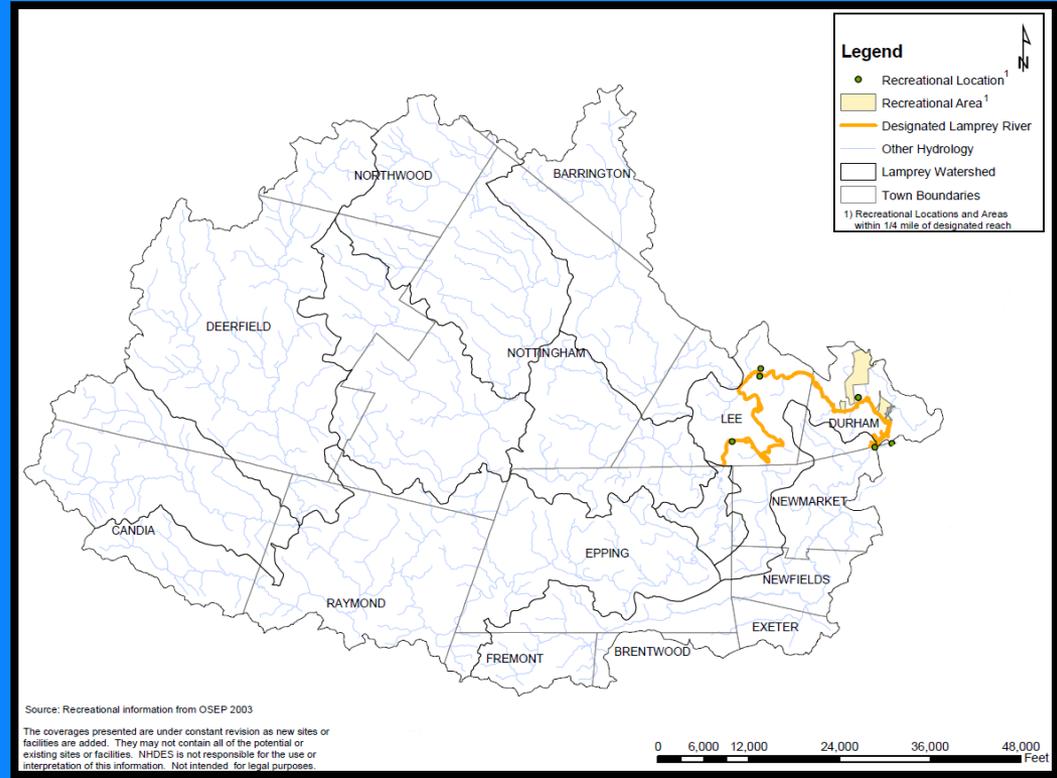
Lamprey River Water Management Plan

- **Strategies for maintenance of protected instream flows.**
- **Water Management Plan**
 - **Conservation Plans**
 - **Water Use Plans**
 - **Dam Management Plans**
- **Next steps in Water Management Plan process.**

Water Management Planning Area

Encompasses:

- 211 sq. mile drainage area.
- 14 towns
- State Designated River (12 mi.)
- Federal Wild and Scenic River (23.5 mi.)



Protected Instream Flows

Lamprey Protected Instream Flows for Fish			Common Flow				Critical Flow				Rare Flow			
Time of Year	Controlling IPUOCR Flows	Bioperiod	Common Flow (cfs)	Common Flow (cfsm)	Allowable Duration (days)	Catastrophic Duration (days)	Critical Flow (cfs)	Critical Flow (cfsm)	Allowable Duration (days)	Catastrophic Duration (days)	Rare Flow (cfs)	Rare Flow (cfsm)	Allowable Duration (days)	Catastrophic Duration (days)
Dec 9 – Feb 28	Flow	Overwintering	238	1.3	20	57	110	0.60	10	37	73	0.40	7	30
Mar 1 – May 4	Flow	Spring Flood	622	3.4	14	42	238	1.3	10	19	146	0.80	3	9
May 5 – Jun 19	Shad spawning	Clupeid Spawning	143	0.78	13	28	62 / 156	0.34 / 0.85	5	13	57 / 242	0.31 / 1.3	4	10
Jun 20 – Jul 4	GRAF spawning	GRAF Spawning	101 / 101	0.55 / 0.55	-- / 11*	15*	18 / 156	0.10 / 0.85	5*	10*	16 / 242	0.087 / 1.3	2*	3*
Jul 5 – Oct 6	Common Shiner	Rearing & Growth	104	0.57	46	82	18	0.10	15	32	16	0.087	5	15
Oct 7 – Dec 8	Atlantic Salmon	Salmon Spawning	90	0.49	17	55	40	0.22	11	33	20	0.11	6	11

Bold values are upper limits for instream flow for protection of GRAF spawning. Management activities should not create flow that exceed these magnitudes and durations.

Watershed area for calculating cfsm is 183 square miles at the index location used. Index location is the gage USGS 01073500 LAMPREY RIVER NEAR NEWMARKET, NH

-- No Common Flow Allowable duration is described for this bioperiod because high flows and Catastrophic durations are limiting.

* GRAF Spawning and Clupeid Spawning bioperiods partly overlap, so durations during this bioperiod begin counting May 5 (previous bioperiod) but apply only during this bioperiod.

Proposed Protected Instream Flows from Final Lamprey River Protected Instream Flow Report dated July 13 2009.

Protected Instream Flows

Lamprey Protected Instream Flows for Natural Communities, Wildlife Habitats and Rare, Threatened or Endangered Wildlife and Plants

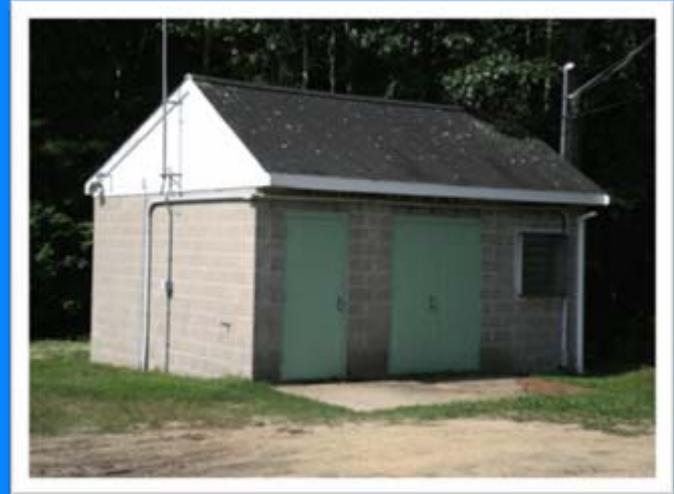
Wood Turtle - Winter Survival	>130 cfs seasonal mean - December 1 through February 28
Herbaceous Low Riverbank, mannagrass, hempweed - habitat maintenance	>500 cfs for one week or more - December 1 through April 30
Riverweed, Knotty Pondweed - growth and development	>100 cfs seasonal mean - May 1 through June 30
Wood Turtle - avoid nest flooding during management	<500 cfs daily mean - June 1 through October 15, except for natural events
Floodplain vernal pools - protection/isolation	<1,500 cfs daily mean - March 15 through July 31, except for natural events
Herbaceous Low Riverbank - growth and development	< or = 60 cfs daily mean - August through September, except for natural events

Lamprey Protected Instream Flows for Boating

Boating recreational use	>=275 cfs
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Entities Encompassed by Water Management Plan

- Dam Owners – owner of a dam with an impoundment having 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 and its tributaries – AWU.



Entities Encompassed by Water Management Plan

Affected Dam Owners

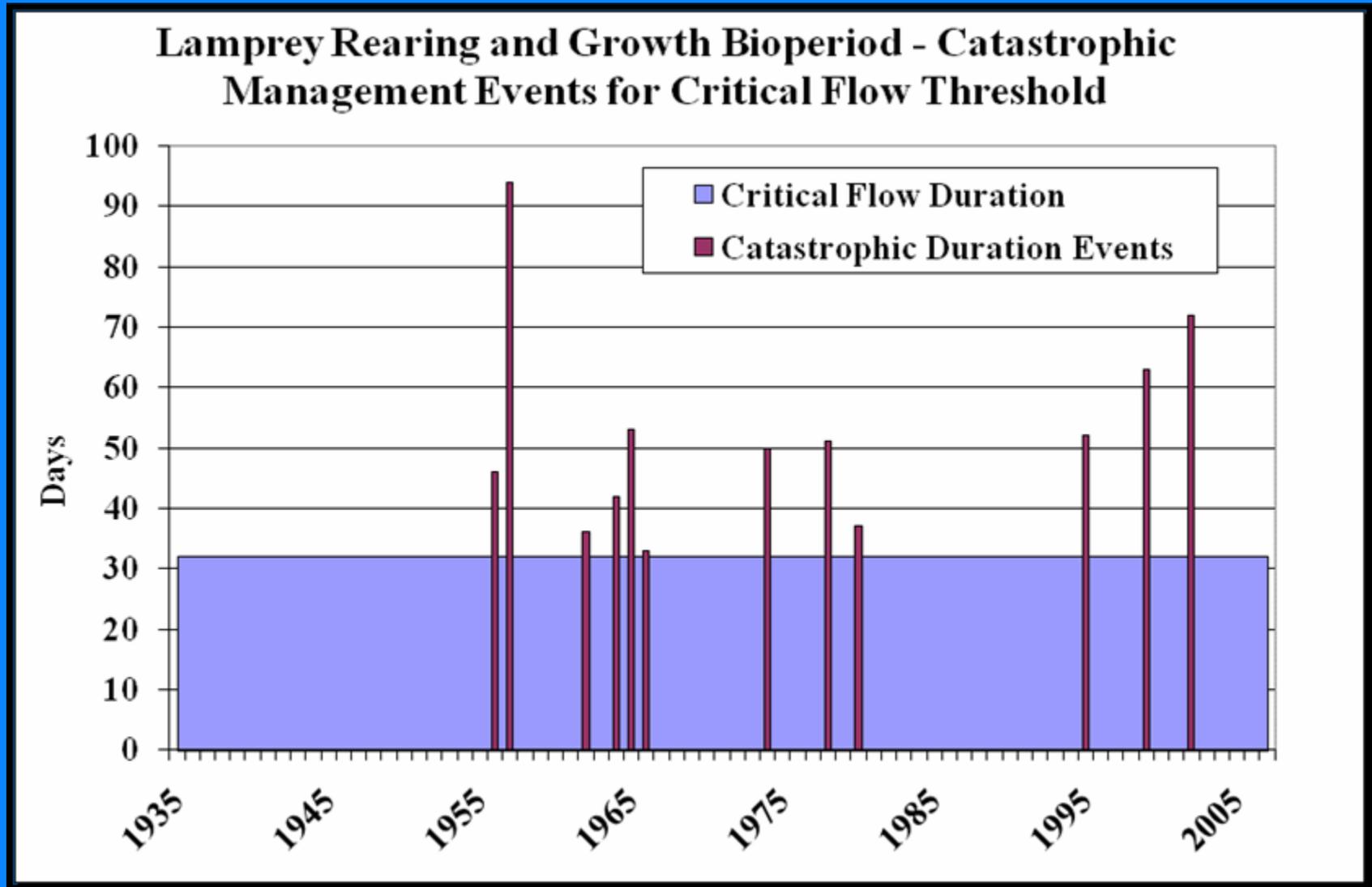
NHDES ID #	NAME
037.03	SOCHA DAM
061.02	FREESES POND DAM
061.07	BEAVER POND DAM
061.18	THURSTON POND DAM
071.04	WISWALL DAM
078.07	HOAR POND DAM
171.01	PISCASSIC ICE POND DAM
183.08	LUCAS POND DAM
183.16	MEADOW LAKE DAM
183.18	DOLE MARSH DAM
184.01	MENDUMS POND DAM
184.02	PAWTUCKAWAY LAKE/DOLLOF DAM
184.03	PAWTUCKAWAY LAKE/GOVE DIKE
184.04	PAWTUCKAWAY LAKE /DROWNS DAM
184.05	NORTH RIVER POND DAM
184.08	NOTTINGHAM LAKE DAM
184.11	DEER POND DAM
184.19	PAWTUCKAWAY LAKE, DROWNS DIKE
201.01	ONWAY LAKE DAM

Entities Encompassed by Water Management Plan

Affected Water Users

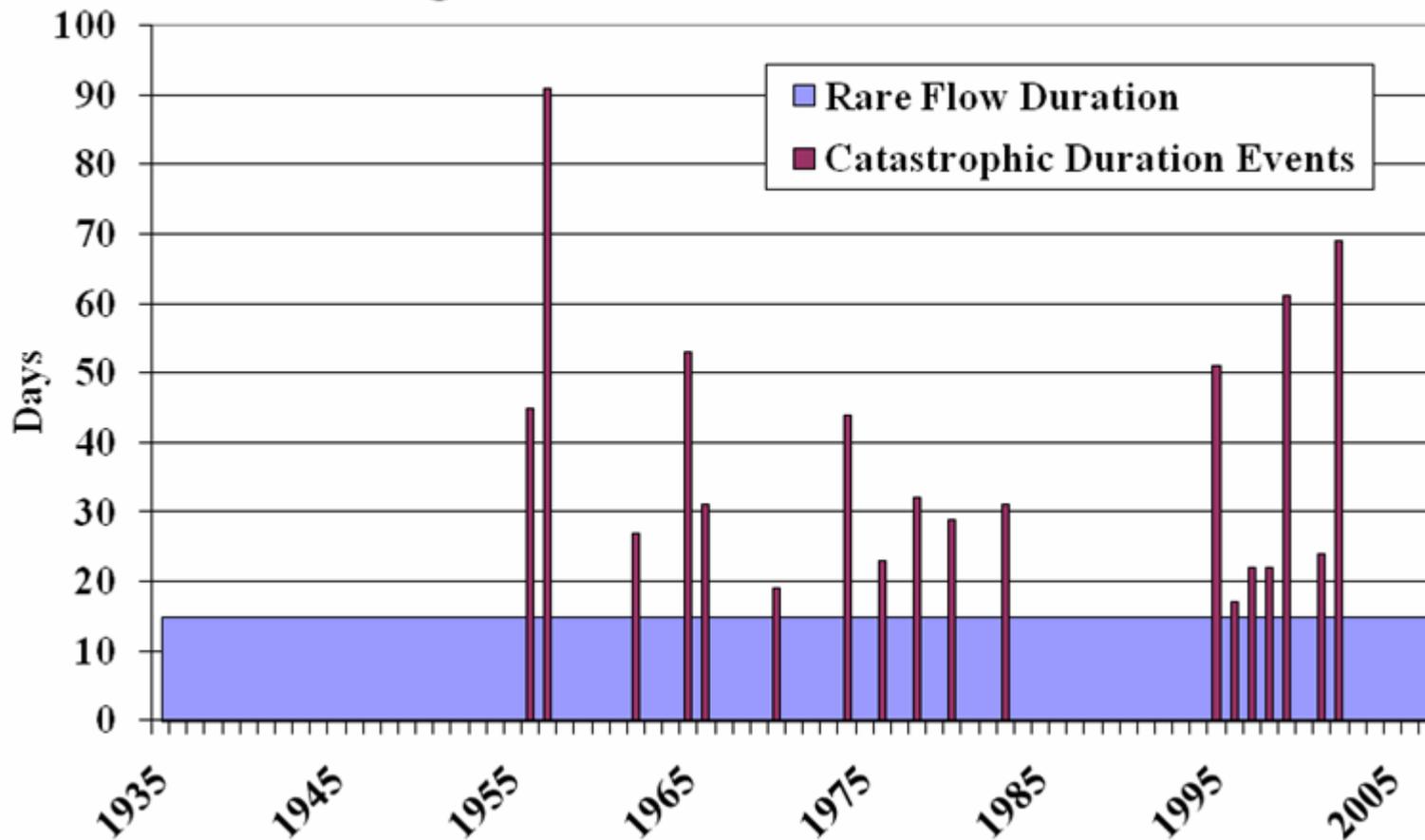
DES Registration ID	Name of Water User	Description of Water User
20045	EPPING WATER WORKS	EPPING WATER WORKS
20061	RAYMOND WATER DEPARTMENT	WATER WORKS
20066	UNIVERSITY OF NH	WATER WORKS
20747	SCENIC NURSERY INC	SCENIC NURSERY INC

Is There a Present Need for Management ?



Is There a Present Need for Management ?

Lamprey Rearing and Growth Bioperiod - Catastrophic Management Events for Rare Flow Threshold



Can We Manage Lamprey River Flows Through the Control of Withdrawals?

Description	Flow (gpd)	Flow (cfs)
Total Withdrawals	438,000	0.68
Direct Surface Withdrawal	100,000	0.155
June 20 – October 6 Critical PISF	11,630,000	18
June 20 – October 6 Rare PISF	10,340,000	16
7Q10	2,750,000	4.25
De minimis flow	135,600	0.21

- **Direct surface withdrawals are only 1% of the smallest instream flows, however 4% of 7Q10.**
- **Management of surface withdrawals is significant when the river is at low flows, but not a stand alone strategy.**

If Flow Cannot be Managed by Reduction of Withdrawals, What Else is Possible?

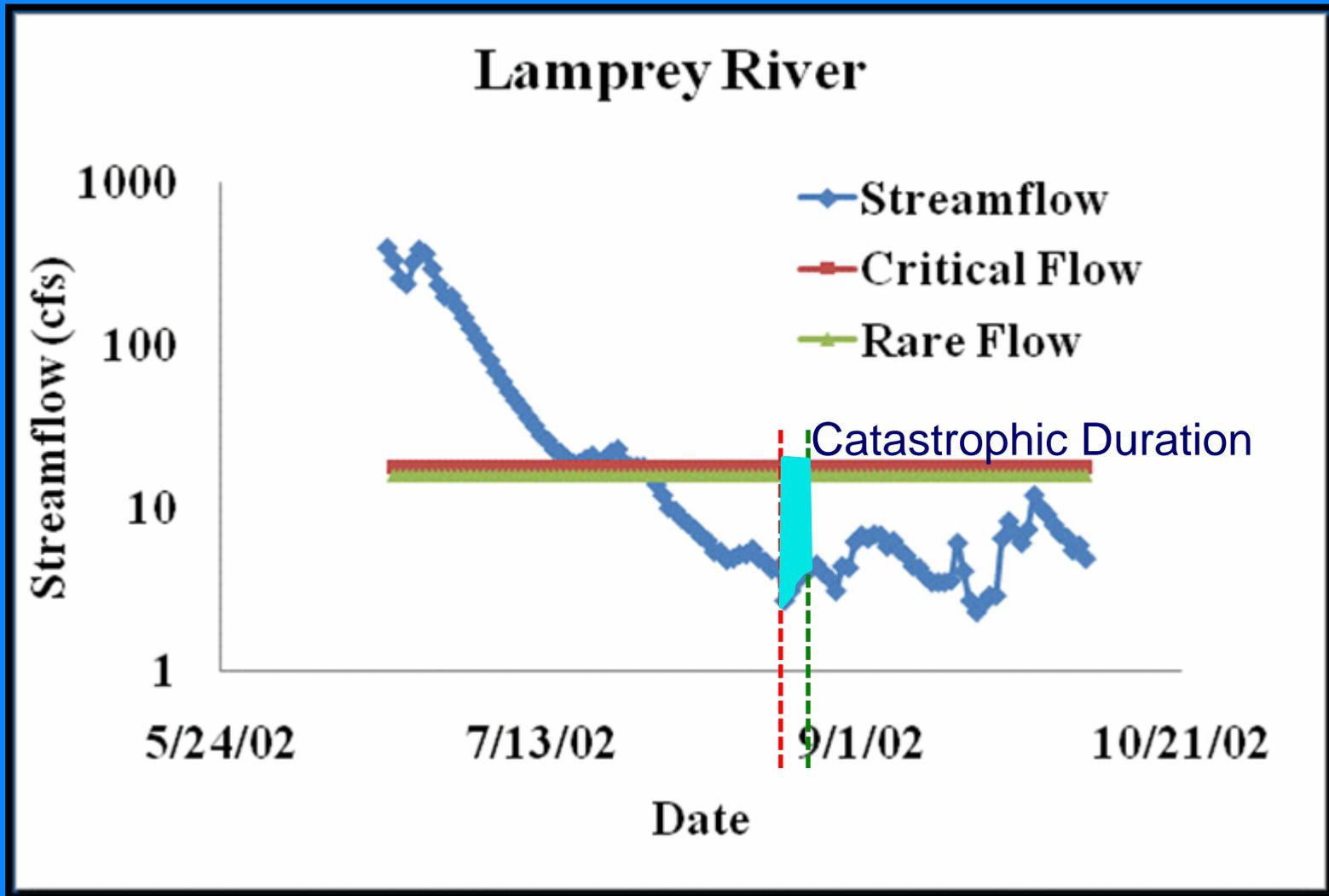
Storage behind dams



How Much Water Is Needed?

- Over the long term, precipitation breaks long periods of low flows for about two days.
- To mimic this process, two days of relief flow from stored water is planned.

The Relief Flow Volume

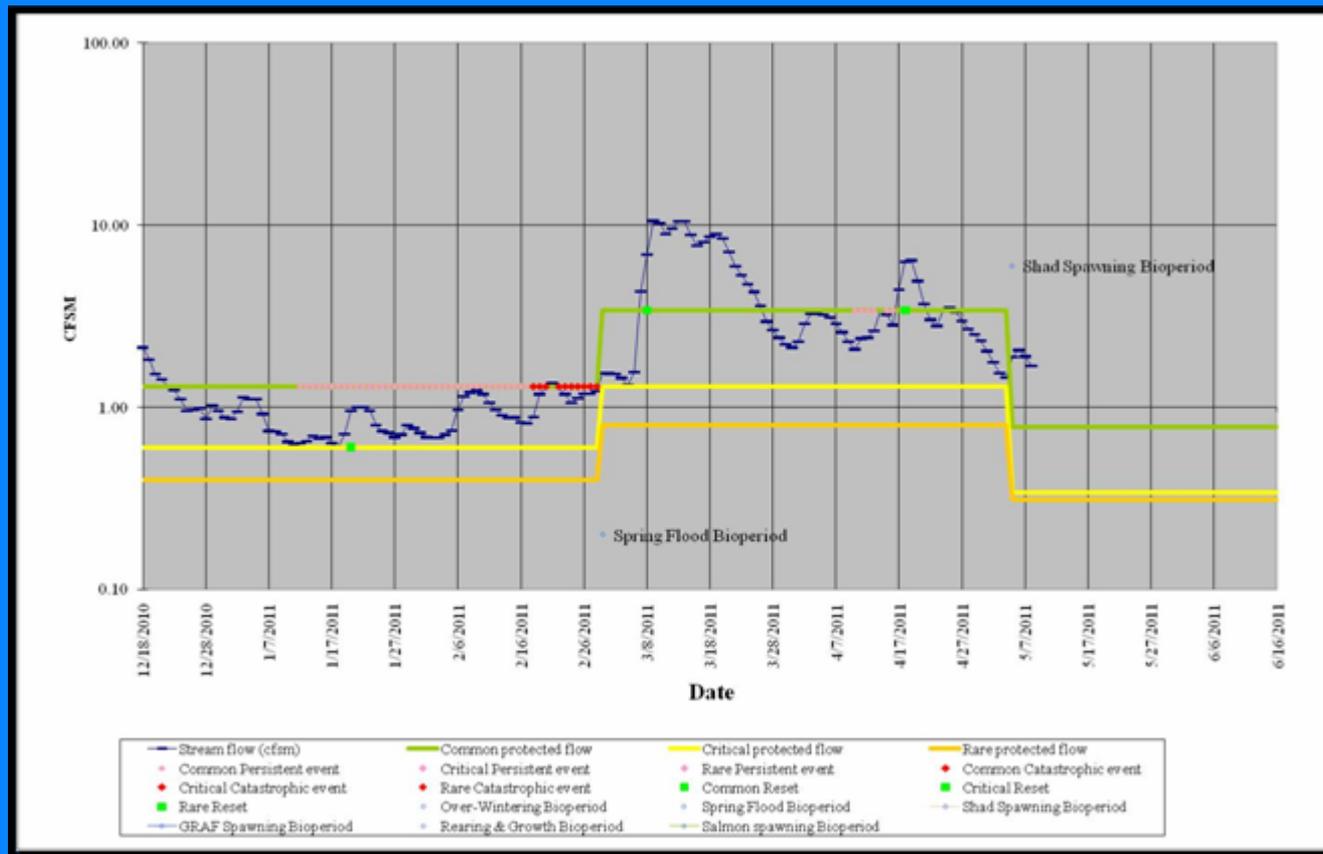


Employment of Relief Flows

- Relief flows will be employed when catastrophic events (as flows and durations) occur twice in a bioperiod over a ten year period.
- 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 PISF

- Implement the Lamprey River WMP.
- Implement the flow tracking system.



Lamprey River Water Management Plan

WMP to Implement PISFs

- **Maintain flows for instream public uses.**
- **Support off-stream public water supplies and agriculture.**
- **Reduce impacts, spread impacts, offset impacts.**
- **Towards maintaining the natural variability and range of flows.**

Lamprey River Water Management Plan



Conservation Plans

Basic Water Conservation Requirements:

- Outlined in Water Conservation Rules (Env-Wq 2100) Part Env-Wq 2101 Water Conservation and Part Env-Wq 2102 Water Use Registration and Reporting.
- Requirements are water use type specific; agricultural and public water suppliers or large community water systems.

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 for Agriculture:

- **Measure volume of water used by source.**
- **Measurements must be accurate within 10%.**
- **Follow Best Management Practices recommended by Department of Agriculture (March 1998) with emphasis on irrigation scheduling, monitoring of need and maximizing efficiency.**

Conservation Plans

Basic Water Conservation Requirements for Public Water Suppliers:

- **Meter water sources and users.**
- **Maintain all meters.**
- **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

Water Management Action:

- **Submittal and approval of Water Conservation Plan to DES Drinking Water and Groundwater Bureau.**
 - **Epping – Plan approved by DES.**
 - **Raymond – Draft plan in progress.**
 - **Scenic Nursery – DES assisting.**
 - **UDWS – Draft plan submitted 2008.**
- **Implement final conservation plans by June 2012.**

Lamprey 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 PISF.**
- **Coordination with Dam Management Plans to maintain protected instream flows.**
- **Develop implementation schedule and evaluate any costs.**

Water Use Plans

Scenic Nursery - Agricultural:

- **Sources:** shallow well, pond and temporary direct withdrawal from Lamprey River. Direct withdrawal 11% of total water use (average use 186,000 gal/yr or <0.001 cfs).
- **Proposed management action** – when flows fall below 16 cfs (Rare) from June 20 to October 6 (GRAF and Rearing and Growth bioperiods) withdrawal from river limited to de minimis flow available (5% of 7Q10 – 0.21 cfs or 94 gallons/minute).

Water Use Plans

Epping and Raymond - PWS:

- Sources for both PWS are groundwater, not direct withdrawals from river.
- Epping - one bedrock well on tributary may induce infiltration, but use has declined to less than 10% of total supply.
- Raymond – three wells in stratified drift along river, may not induce infiltration, but do intercept potential recharge.

Water Use Plans

Epping and Raymond - PWS:

- Greatest system use occurs during summer/fall bioperiods that have lowest protected flows.
- Proposed management actions: (June 20 - October 6)
 - Voluntary **restriction** of outdoor water use at flows below 18 cfs (Critical).
 - Enforced **ban** of outdoor water use when flows fall below 16 cfs (Rare) for greater than 15 days (Catastrophic).

Water Use Plans

Epping and Raymond - PWS:

- **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 PISF for two consecutive days.**

Water Use Plans

UDWS - PWS:

- Sources for UDWS include Lee Well, Oyster River and Lamprey River. Well and Oyster River outside Lamprey River watershed.
- Lamprey withdrawal from Wiswall Reservoir upstream of Wiswall Dam. Was emergency supply, now main supply source when flows on Lamprey > 45 cfs.
- Maximum capacity of withdrawal is 2.8 cfs (1,260 gpm or 1.8 mgd).

Water Use Plans

UDWS - PWS:

- **Greatest system use (due to increased UNH demand) occurs during late summer/fall bioperiods that have lowest protected flows.**
- **Proposed management actions: (June 20 – October 6)**
 - **Voluntary water conservation measures above normal practices when flow falls below 18 cfs (Critical) and when system demand is $\geq 75\%$ of max. available capacity. Stage 1 Alert + Stage 1 Actions.**

Water Use Plans

UDWS - PWS:

- Proposed management actions:
 - Mandatory water conservation measures (**restrictions** and **bans**) when flow is below 18 cfs for longer than 15 days and when system demand is $\geq 80\%$ of max. available capacity. Stage 2 Alert + Stage 2 Actions.
Restrictions – limited watering lawns + gardens (lawn watering odd/even days)
Bans - vehicle washing + filling pools

Water Use Plans

UDWS - PWS:

- Proposed management actions:
 - Mandatory water conservation measures (**restrictions** and **bans**) when flow is below 16 cfs for longer than 15 days and when system demand is $\geq 85\%$ of max. available capacity. Stage 3 Alert + Stage 3 Actions.
Restrictions – limited watering gardens
Bans - lawn watering, vehicle washing + filling pools

Water Use Plans

UDWS - PWS:

- Proposed management actions:
 - Mandatory outdoor water use **ban** when flow is below 16 cfs for longer than 25 days (catastrophic duration + 10 days) and when system demand is $\geq 85\%$ of max. available capacity. Stage 4 Alert + Stage 4 Actions.
- Restrictions/bans lifted when naturally occurring flow on river is greater than PISF for two consecutive days.

Water Use Plans

UDWS - PWS:

- **Proposed management actions:**
 - **Withdrawal from Lamprey limited to Wiswall Reservoir storage when flow falls flows fall below 16 cfs (Rare) for greater than 15 days (Catastrophic).**
 - **Maximum reservoir drawdown cannot exceed 18 inches below the Wiswall Dam spillway and maximum water level change cannot exceed one inch of drawdown per day. Inflow must equal outflow.**

Water Use Plans

UDWS - PWS:

- Proposed management actions:
 - De minimis volume (5% of 7Q10 – 0.21cfs or 94 gallons per minute) available for withdrawal.

Lamprey 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 Lamprey Designated River.**
- **Condition of existing dam to support flow management.**

Dam Management Plans

Screening of Affected Dams:

- Dams dropped from further consideration:
 - 7 of 10 state owned
 - 3 of 4 municipally owned
 - 4 of 5 privately owned
- Dams under consideration:
 - Mendums Pond and Pawtuckaway Lake dams
 - Contingency dams – Freezes Pond and Onway Lake dams

Dam Management Plans

Attributes of Selected Affected Dams

		Drainage	Impoundment	Maximum	Permanent	Delta	Distance	Functional
		Area	Area	Storage	Storage	Storage	Upstream	Outlet
Affected Dam	Dam ID #	(sq. mi.)	(acre)	(ac-ft)	(ac-ft)	(ac-ft)	(miles)	
Dollof Dam	184.02	21	900	4320	3564	756	14	Yes
Drowns Dam	184.04	21	900	4320	3564	756	10	Yes
Freeses Pond Dam	61.02	8.58	55.3	432	192	240	28	Yes
Mendums Pond Dam	184.01	6.97	265	3330	1960	1370	7	Yes
Nottingham Lake Dam*	184.08	14.6	41	266	172	94	3.5	Yes
Onway Lake Dam	201.01	8.45	192	881	305	576	19	Yes
Wiswall Dam*	71.04	183	30	500	360	140	On	Yes
Note:	Data from NHDAMS data sheets except for Nottingham Lake Dam data taken from application to reconstruct the dam.							
	* - not proposed for dam management, but operations must allow passage of relief flow.							

Dam Management Plans

Water Management Action:

- **Selected dams will operate impoundments to store water following DMP guidelines.**
- **DES will identify Critical and Rare management events:**
 - **All catastrophic events (some will fail)**
 - **Third consecutive persistent event**
- **DES will notify downstream dam owners of pending release to allow passage of relief flow.**

Dam Management Plans

Relief Flow Concept:

- **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 Lamprey Designated River above Rare or Critical flow limit for two days. Resets duration and flow counter for flow tracking.**

Dam Management Plans

Relief Flow Analysis:

- **That flow necessary to increase the Lamprey River flow to at or just above the PISF.**
- **Volume calculated for two-day period.**
- **Volume of relief flows based on:**
 - **Results of Task 8 analysis performed by UNH.**
 - **Probability that volume of water sufficient to raise stream flow above PISF.**

Dam Management Plans

Relief Flow Analysis:

- Prevent excessive catastrophic events.
 - Nine out of 10 years – one failure is within natural flow parameters (definition of catastrophic).
 - Manage ALL Catastrophic events using 90th percentile volumes.
 - Should result in success in nine of 10 years.

Dam Management Plans

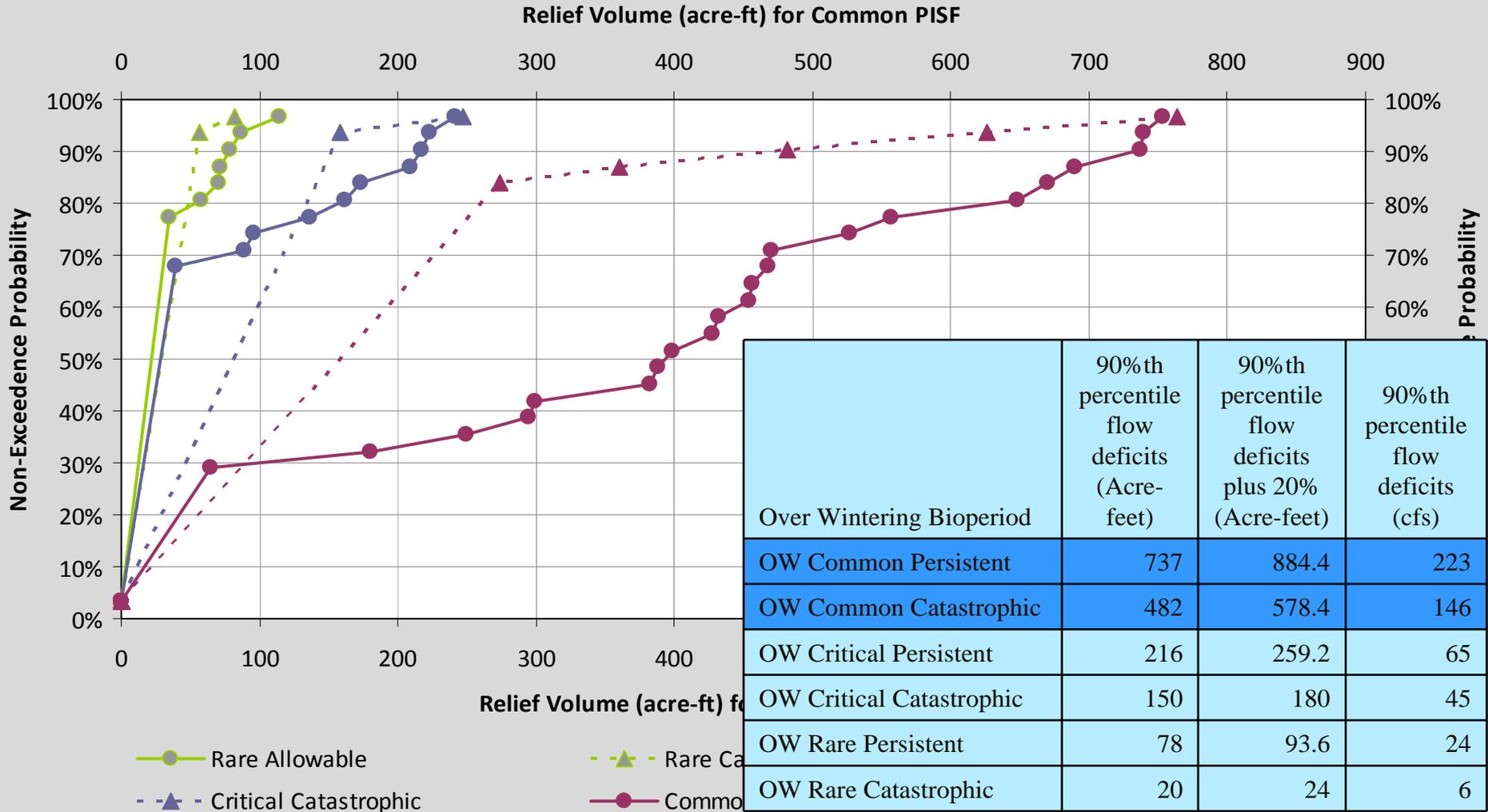
Water Management Action Relief Volumes

Is 90th Percentile plus 20% enough?

- Goal is to prevent all but 1 event in 10 years (90% success rate).
- Selected the 90th percentile of 30 years of historical flow deficits.
- Added 20% as a buffer for unknown losses.
- Most deficits will be smaller than the worst-case (90%) event.

Dam Management Plans

Relief Volume of Water on the Lamprey River During the Overwintering Bioperiod for Today's Flows at the USGS Newmarket Gage



Dam Management Plans

Decisions Regarding Managing Protected Instream Flows

- **Critical** and **Rare** events represent acute impacts on fish habitat when durations repeatedly exceeding persistent or when catastrophic.
- Events represent acute stresses that should be limited (but not entirely avoided).
- Plan is to actively manage the **Critical** and **Rare** events based on maintaining their historical frequency.

Dam Management Plans

Decisions Regarding Managing Protected Instream Flows

- **Common** flows are large enough that they cannot be managed with changes to existing water use or existing infrastructure.
- Loss of **Common** flows are likely a result of watershed scale activities – impermeable surfaces, land use changes, ?storm drain I/I.
- Loss of **Common** flows is a chronic problem with impacts accumulating over years.
- Propose to track the **Common** events for possible management on a watershed scale that could affect these activities.

Dam Management Plans

Table 2 - Flow releases meeting 90 percent of the historical 30-year Protected Instream Flow deficits (1976-2005)

Bioperiod name	Period	Volume needed to meet 90% of historical deficits (ac-ft)	Volume needed to meet 90% of historical deficits with 20% buffer (ac-ft)	Equivalent two-day flow release (cfs)	Change in water level from full pool using releases that meet 90% of historical deficits w/ 20% buffer (feet)	Water source
Overwintering	Dec 9 – Feb 28	216	259	65	1.53' - retained in storage	Mendums Pond not used. Pawt. Pond retained from fall drawdown.
Spring Flood	Mar 1 – May 4	-	-	-	-	No active management planned
Clupeid Spawning	May 5 – Jun 19	118	141.6	36	0.14	from storage and drawdown
GRAF Spawning	Jun 20 – Jul 4	20	24	6	0.02	from storage and drawdown
Rearing & Growth	Jul 5 – Oct 6	47	56.4	14	0.05	from storage and drawdown
Salmon Spawning	Oct 7 – Dec 8	75	90	23	7' annual dd - 1.53' = reduced to 5.47'	from fall drawdown release
Sum of Clupeid to R&G		185	222	-	0.21	
Sum		476	571			

Change in water level is based on a starting point of full pool. Lower starting points will result in larger changes in water level.

Sum of water level change assumes that each of the bioperiods needs one relief flow during the summer.

Assumes the end of the Spring Flood bioperiod's water level starts with a full recreational pool.

Mendums 265 Acres at full recreational pool

Pawtuckaway 783 Acres at full recreational pool

Next Steps in the Water Management Plan Process

- **Public comment period (30 days)**
- **Review comments, revise draft plan and issue final.**
- **Consideration of Water Management Plan for adoption by DES Commissioner (60 days).**
- **Project ends September 30, 2011.**
- **Legislative review of pilot project (2013).**

Comments or questions?



Project Contacts

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