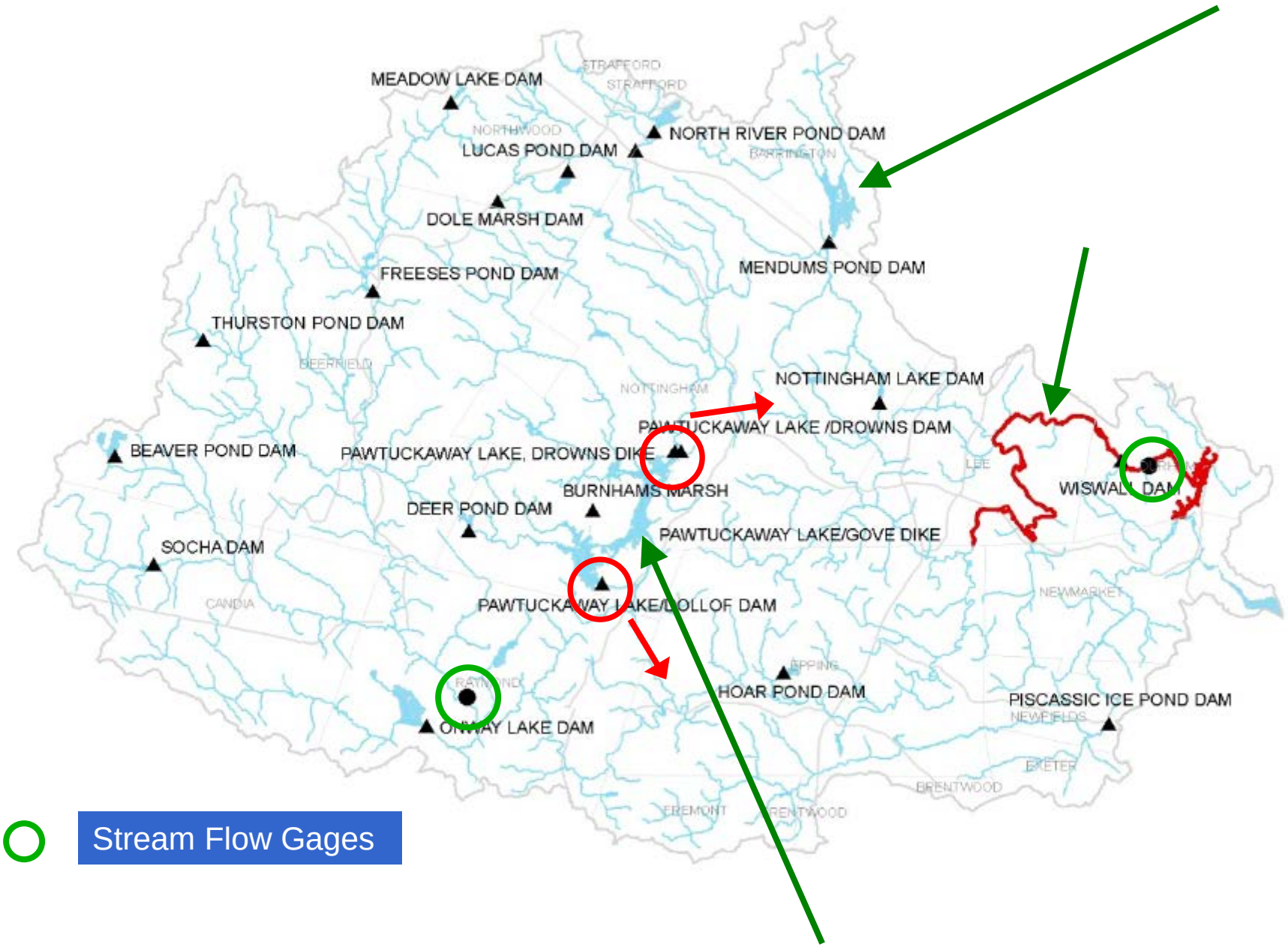
# How do you spell relief?: Release pulses for Lamprey River flow protection

Wayne Ives, Instream Flow Specialist - NHDES

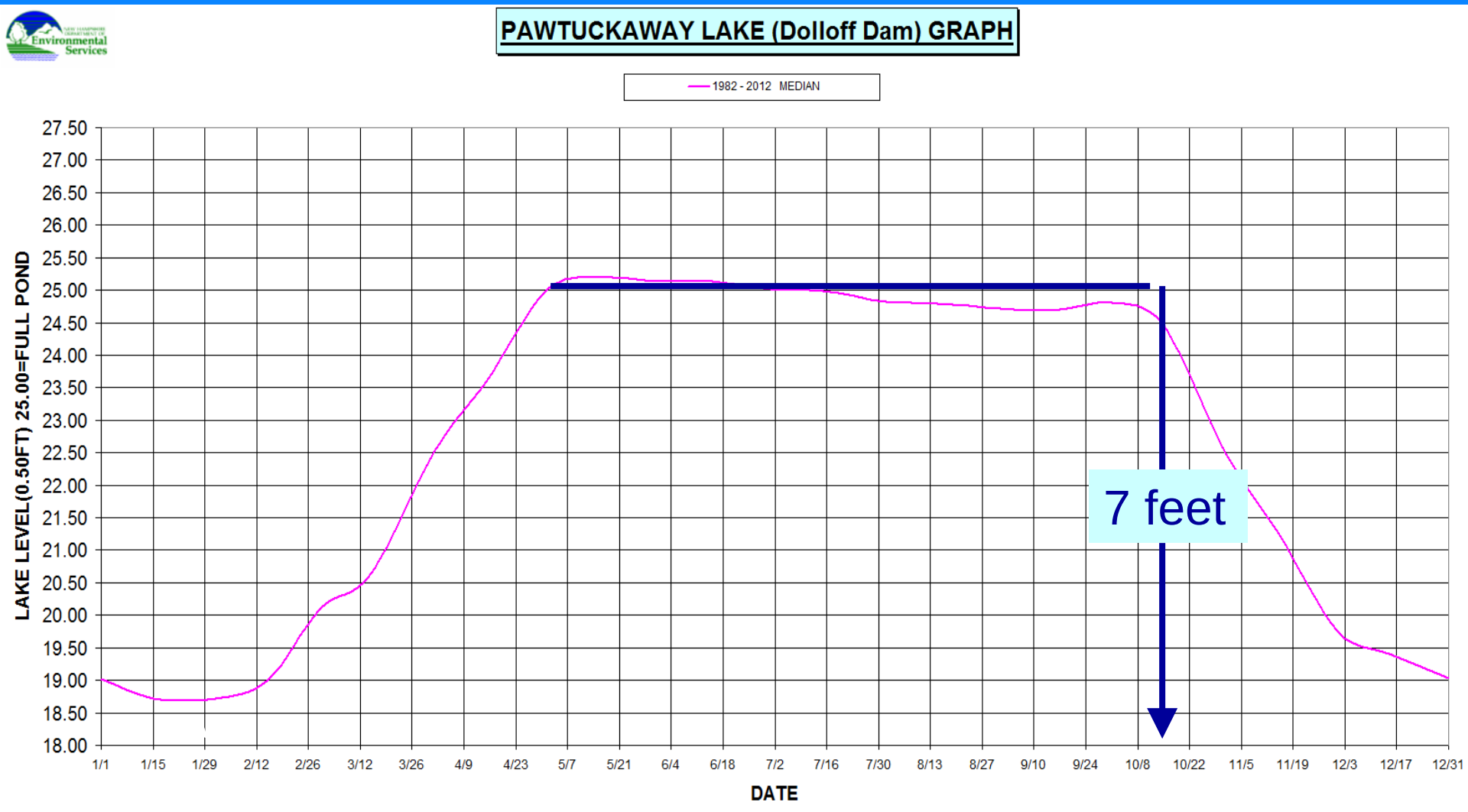
Lamprey River Symposium

January 10, 2013

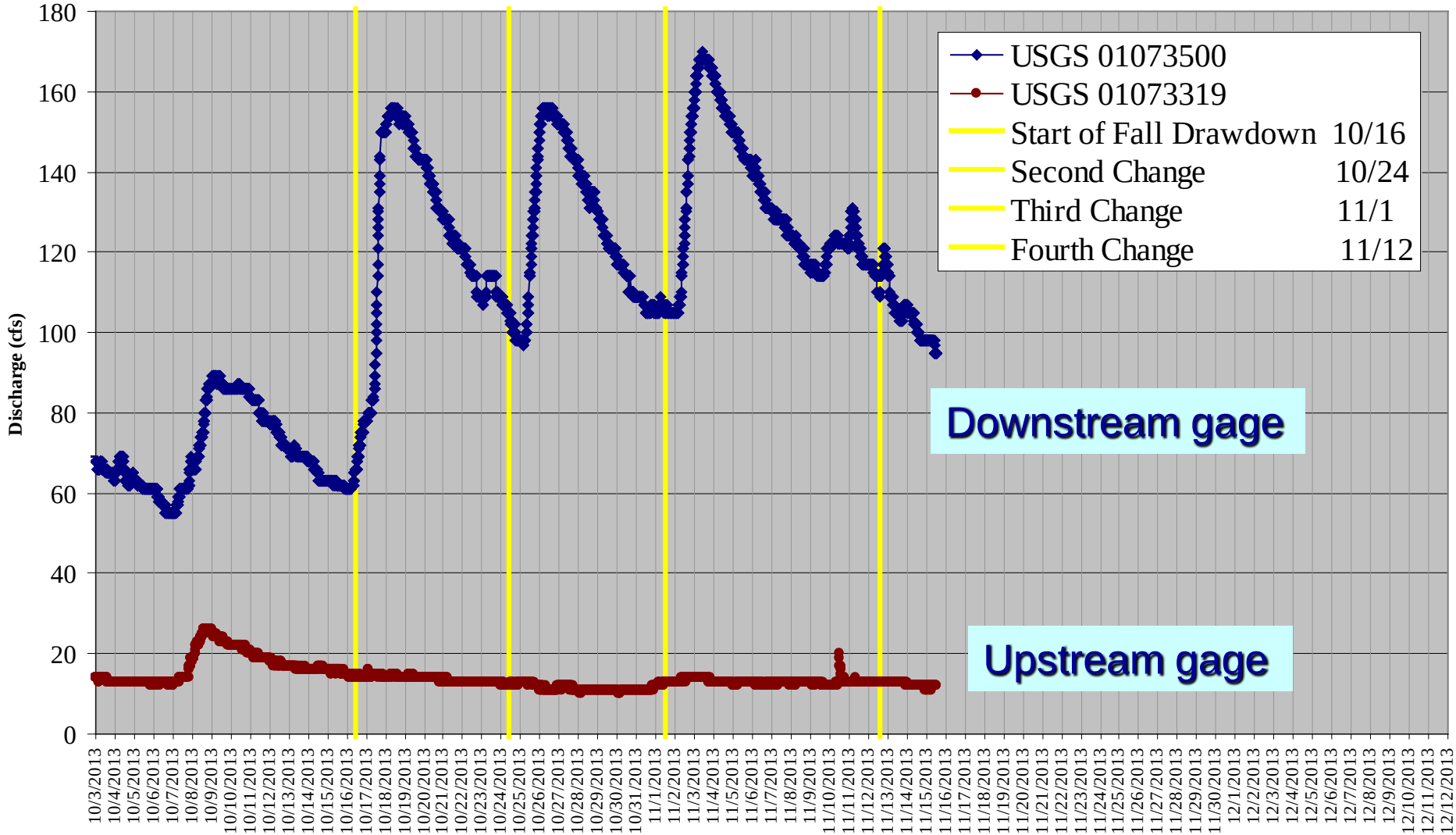



Stream Flow Gages

# DES historically operates the water level in Pawtuckaway Lake



# Value of stream flow gages
# Effects of 2013 lake drawdown on river flow



# Under the WMP

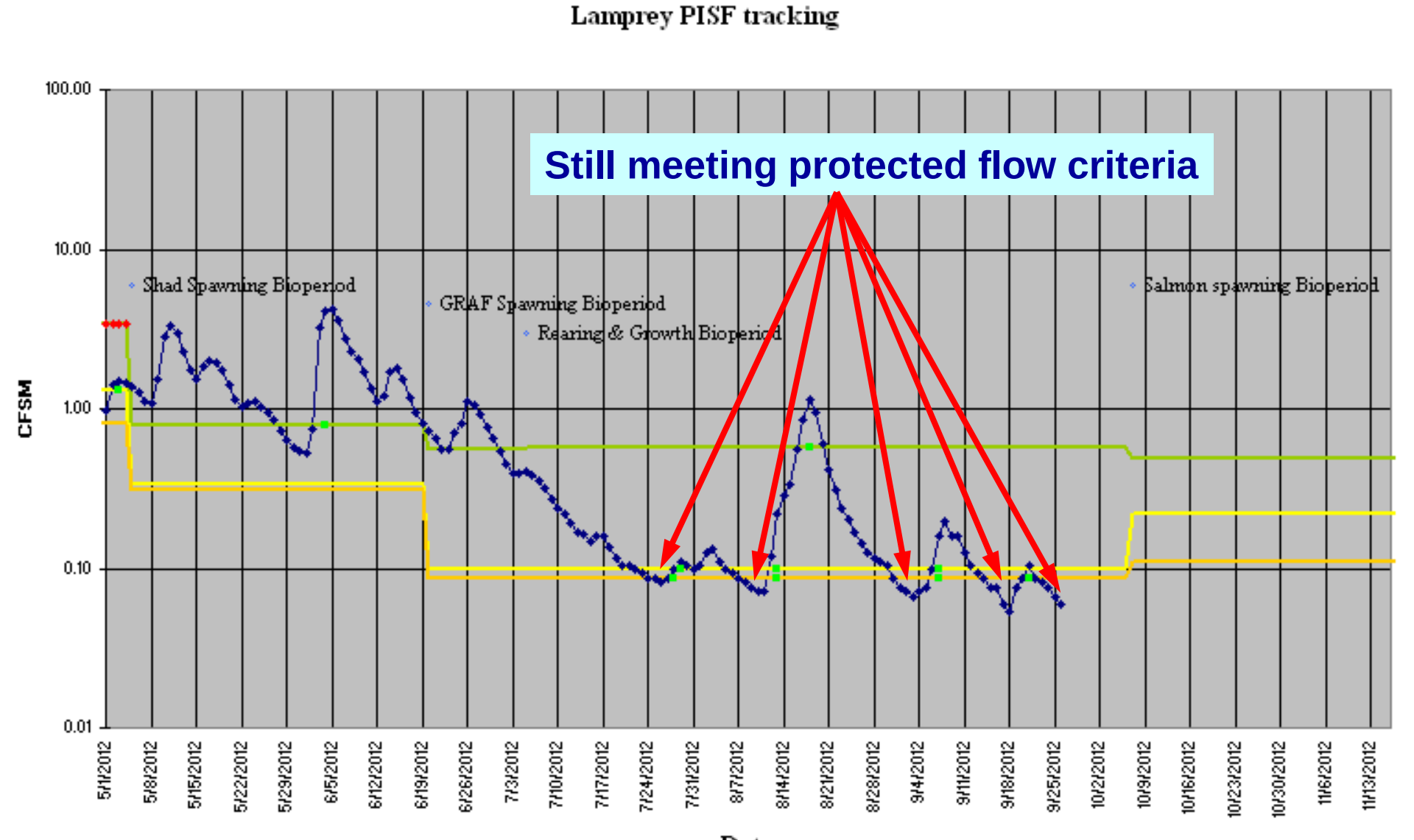
- DES will now modify its routine operations to manage downstream flows.
- Release of water to relieve stress in the river environment system
  - Summer - affects recreational water levels in Pawtuckaway Lake
  - Winter - affects the size of the annual fall drawdown

# Part of the Lamprey DR Protected Instream Flows (Oversimplified)

| Lamprey Protected Instream Flows for Fish | | | | | | |
|---|---|---|---|---|---|---|
| | Critical Flow | | | Rare Flow | | |
| Time of Year | Critical Flow (cfs) | Allowable Duration (days) | Catastrophic Duration (days) | Rare Flow (cfs) | Allowable Duration (days) | Catastrophic Duration |
| Dec 9 – Feb 28 | 110 | 10 | 37 | 73 | 7 | 30 |
| Mar 1 – May 4 | 238 | 10 | 19 | 146 | 3 | 9 |
| May 5 – Jun 19 | 62 | 5 | 13 | 57 | 4 | 10 |
| Jun 20 – Jul 4 | 18 | 5 | 10 | 16 | 2 | 3 |
| Jul 5 – Oct 6 | 18 | 15 | 32 | 16 | 5 | 15 |
| Oct 7 – Dec 8 | 40 | 11 | 33 | 20 | 6 | 11 |

**Key point: Different times of the year have different flow needs and durations. Management applies when durations below flow thresholds are exceeded.**

# Assessing hydrologic conditions by tracking daily stream flow and comparing with protected instream flow values.



# About releases for stream flow

- Goal is flow variability, not a single minimum flow rate, to maintain a natural pattern.
- Releases are used to create a relief flow for **two days** to support fish and other aquatic and riparian species.
- Applied only during rarely-occurring catastrophic conditions, at which time management is needed.

# Release flow considerations

- Effect of pulses on Lamprey River
  - Flow change supporting fish
  - Water quality – phosphorus, conductivity, pH, temperature, turbidity
- Effect of releases on lakes
  - Water level change (small)
  - Effects on habitat and water quality

# Conducted test releases

- Sept 2012 – summertime release test
  - 10.5 cfs
  - lake level down 0.06 feet
- December 2012 and January 2013 – (during drawdown) winter release tests at different starting points
  - 65 cfs
  - December lake level down 0.5 feet

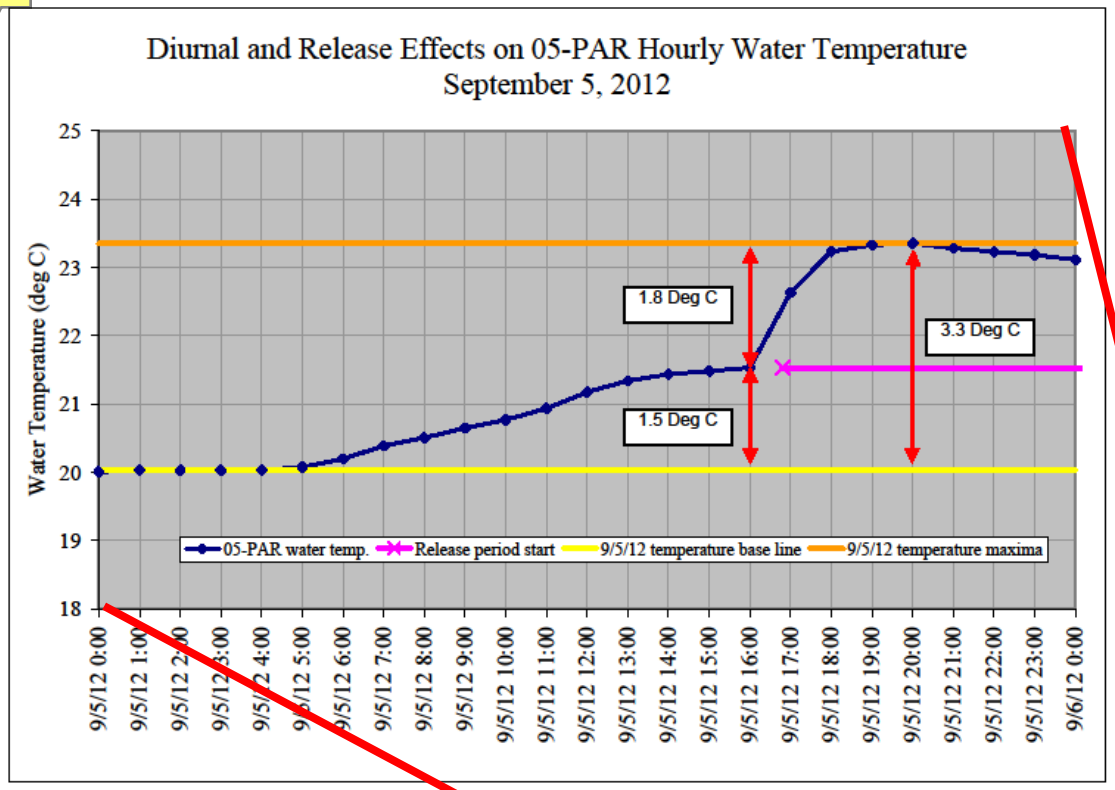
# September Release Test – Dolloff Dam

# 2012-09-05

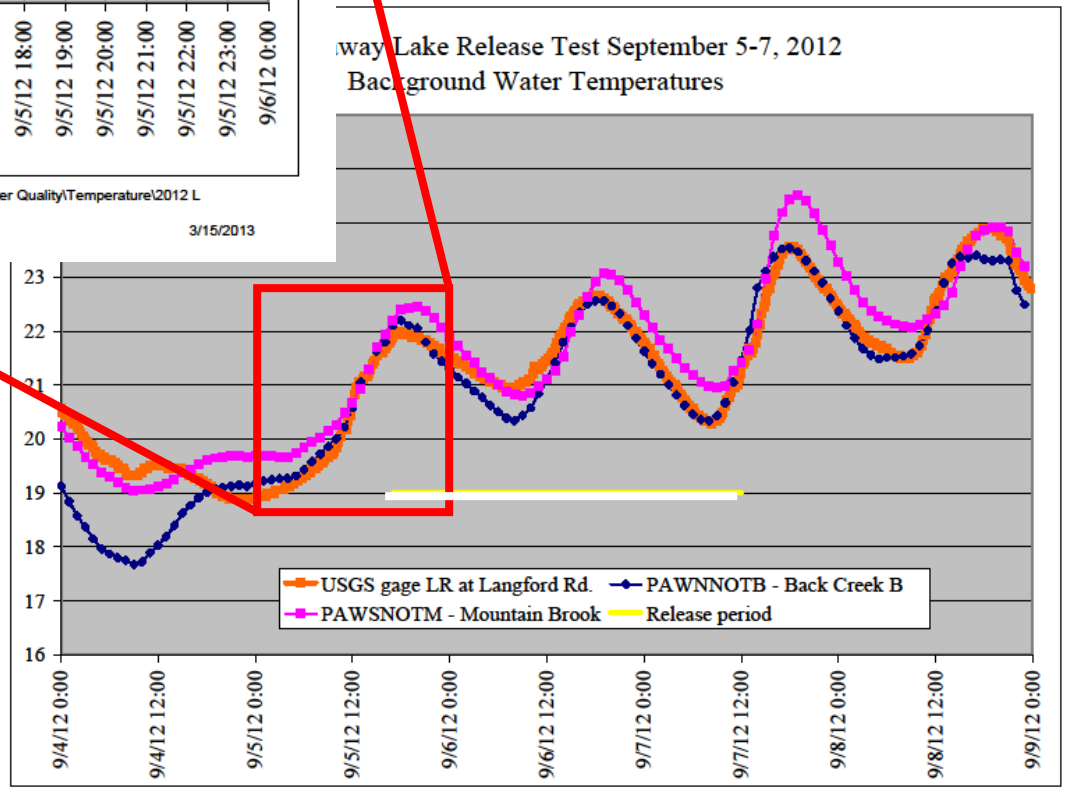
# Other issues relating to a flow release – specially-sized stoplogs

2012-09-05

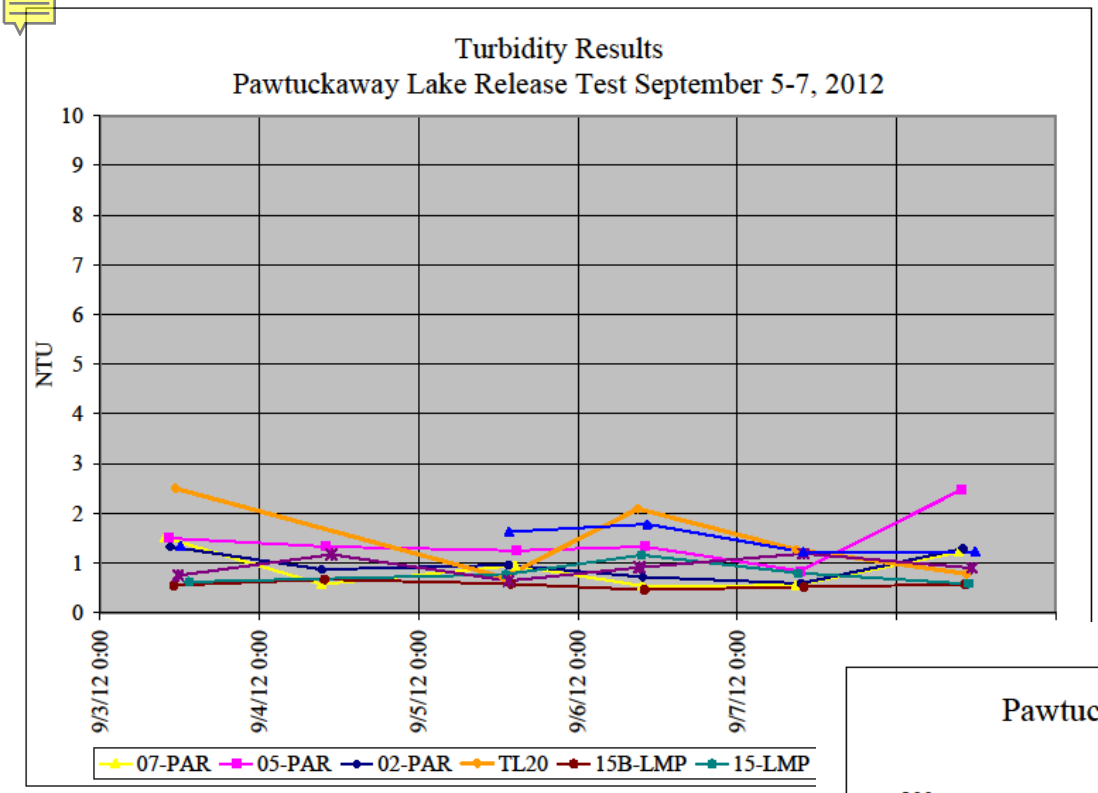
Alewife net tests whether fish will migrate early if there is a water release




# Test temperature variation 3.3 ºC

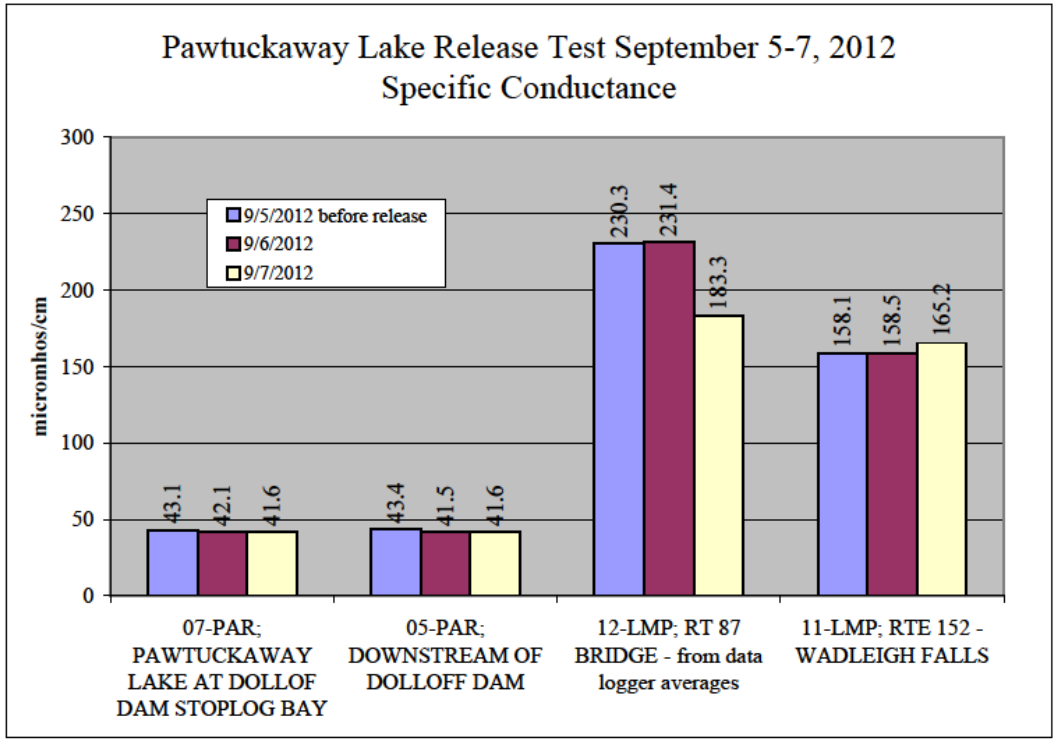



# Upstream diurnal temperature variation ~2.5-3 ºC




# Turbidity met standards

# Lake's Sp.C. is lower than Lamprey's



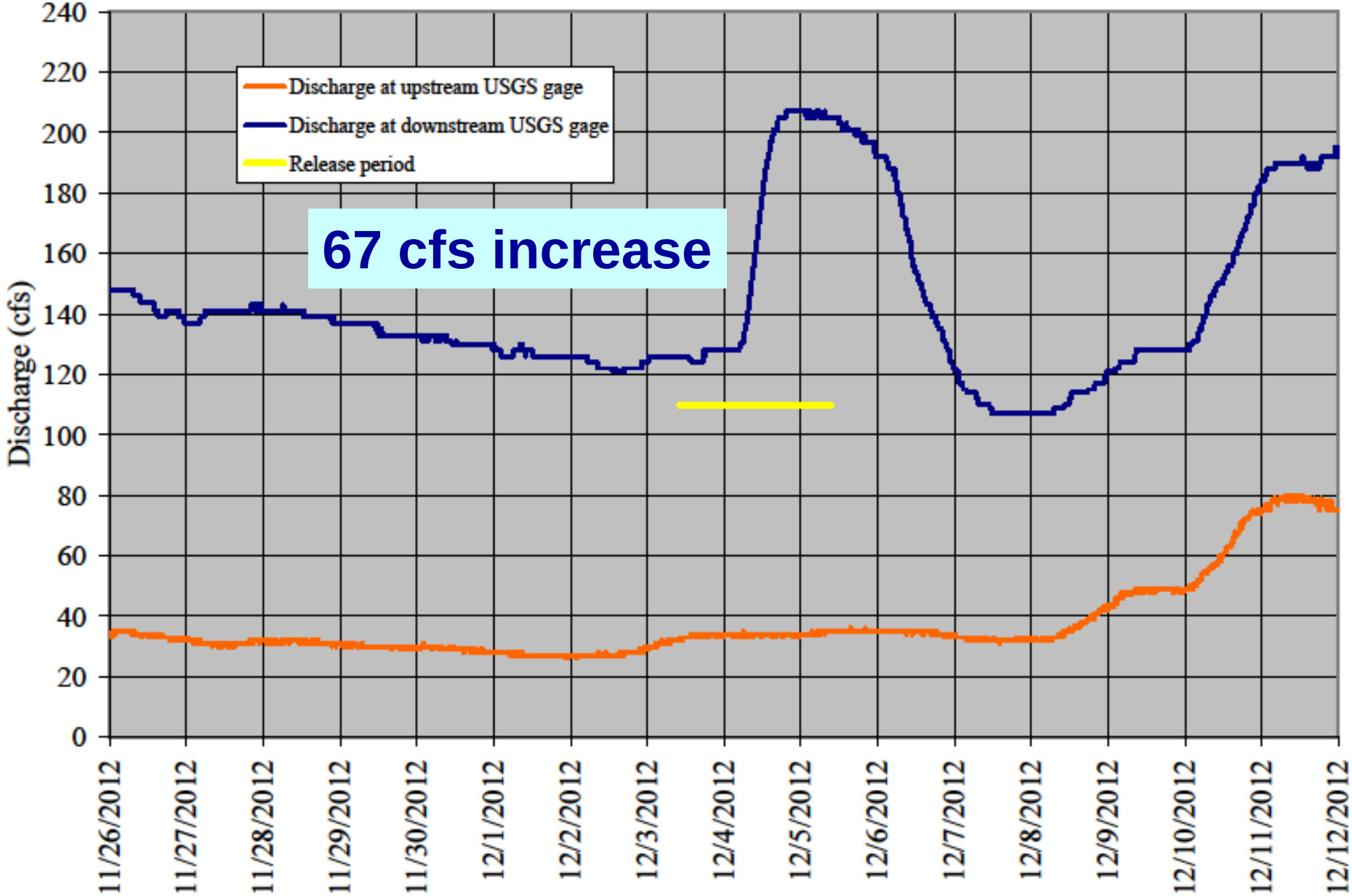
# Winter Release Test

## Starting at -4.8 ft

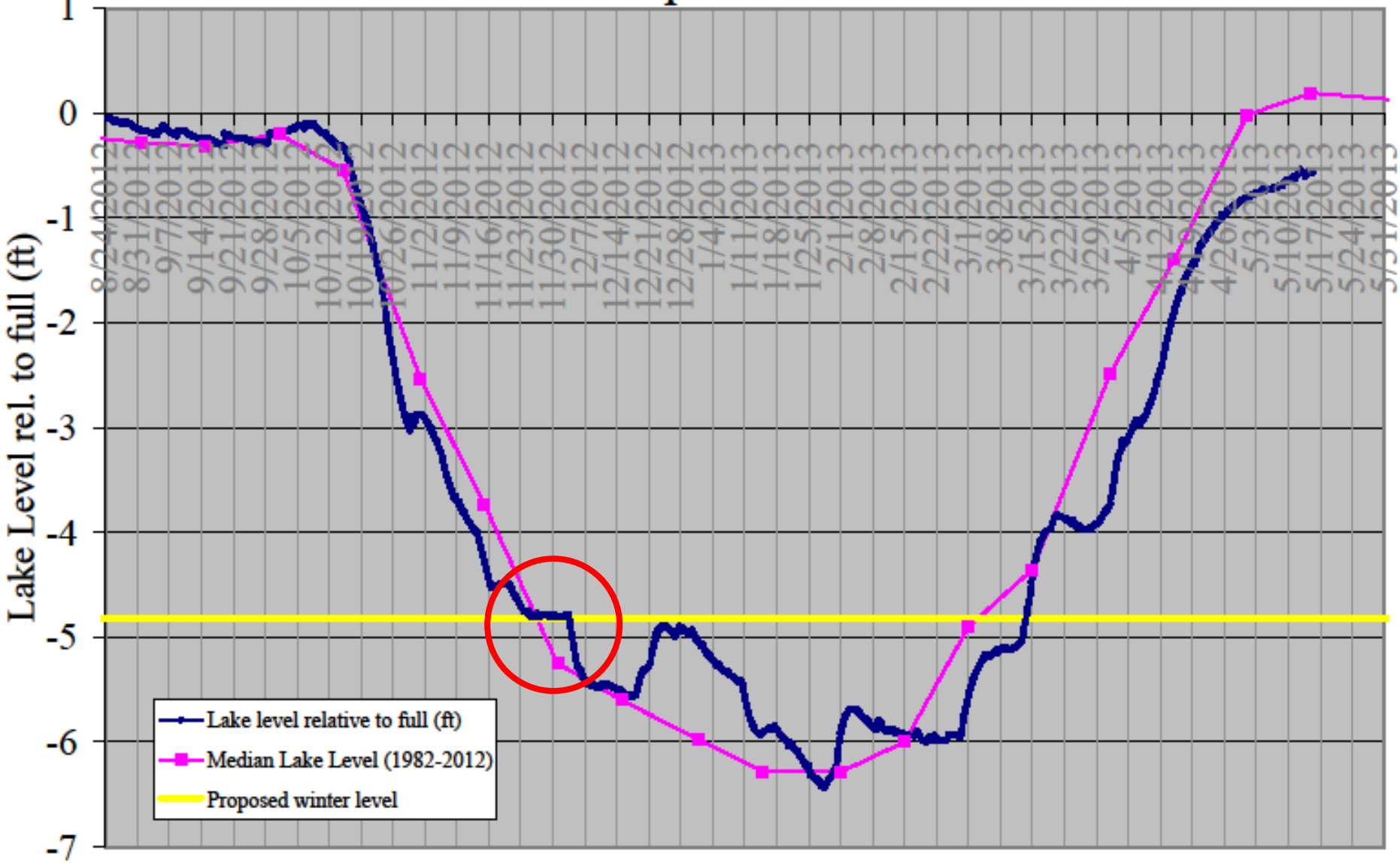
## December 2012

## Dolloff Dam

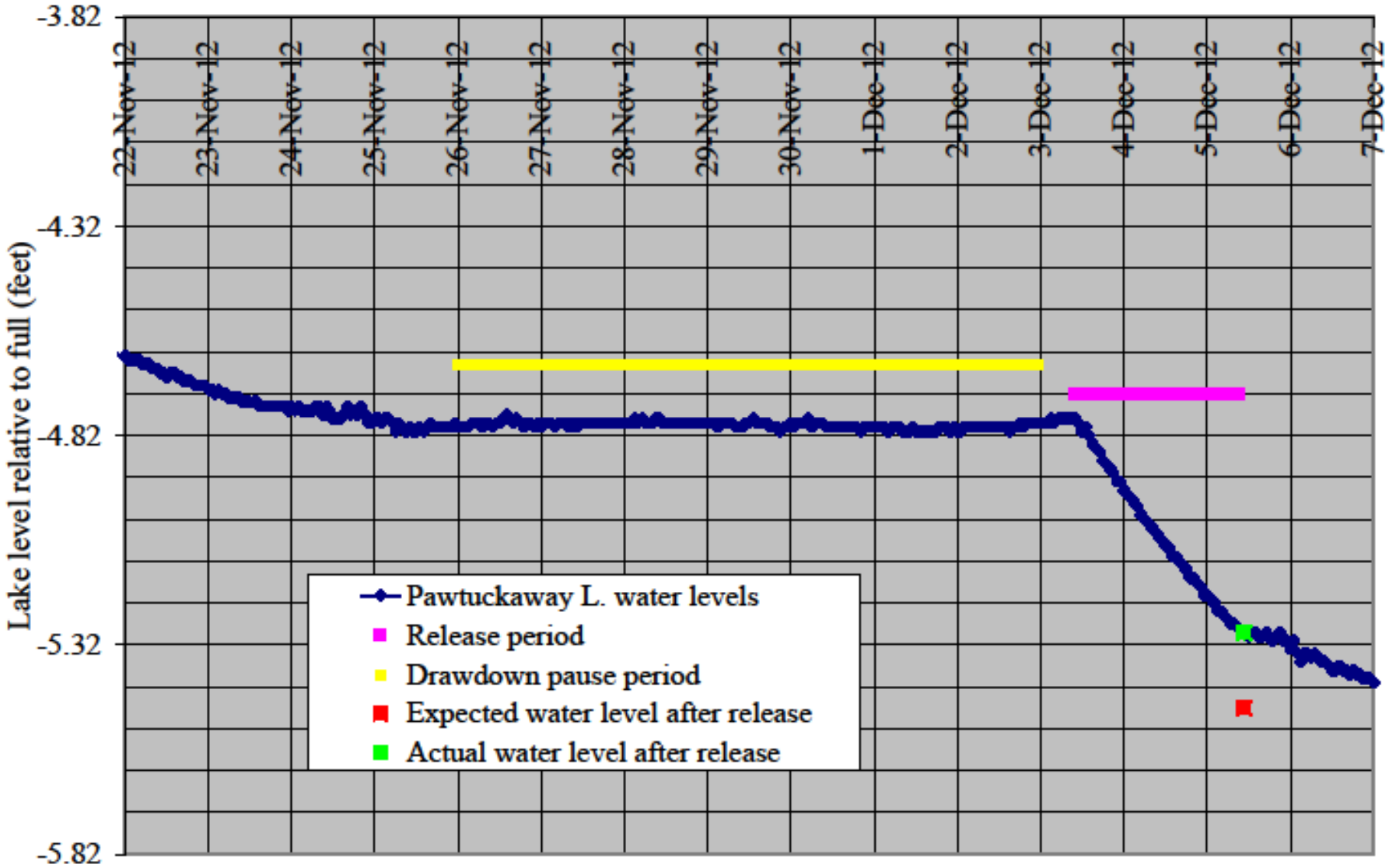
# Comparison of flow at upstream and downstream USGS flow gages on Lamprey River



# Pawtuckaway Lake Levels Relative to Historical Median and Proposed Winter Level



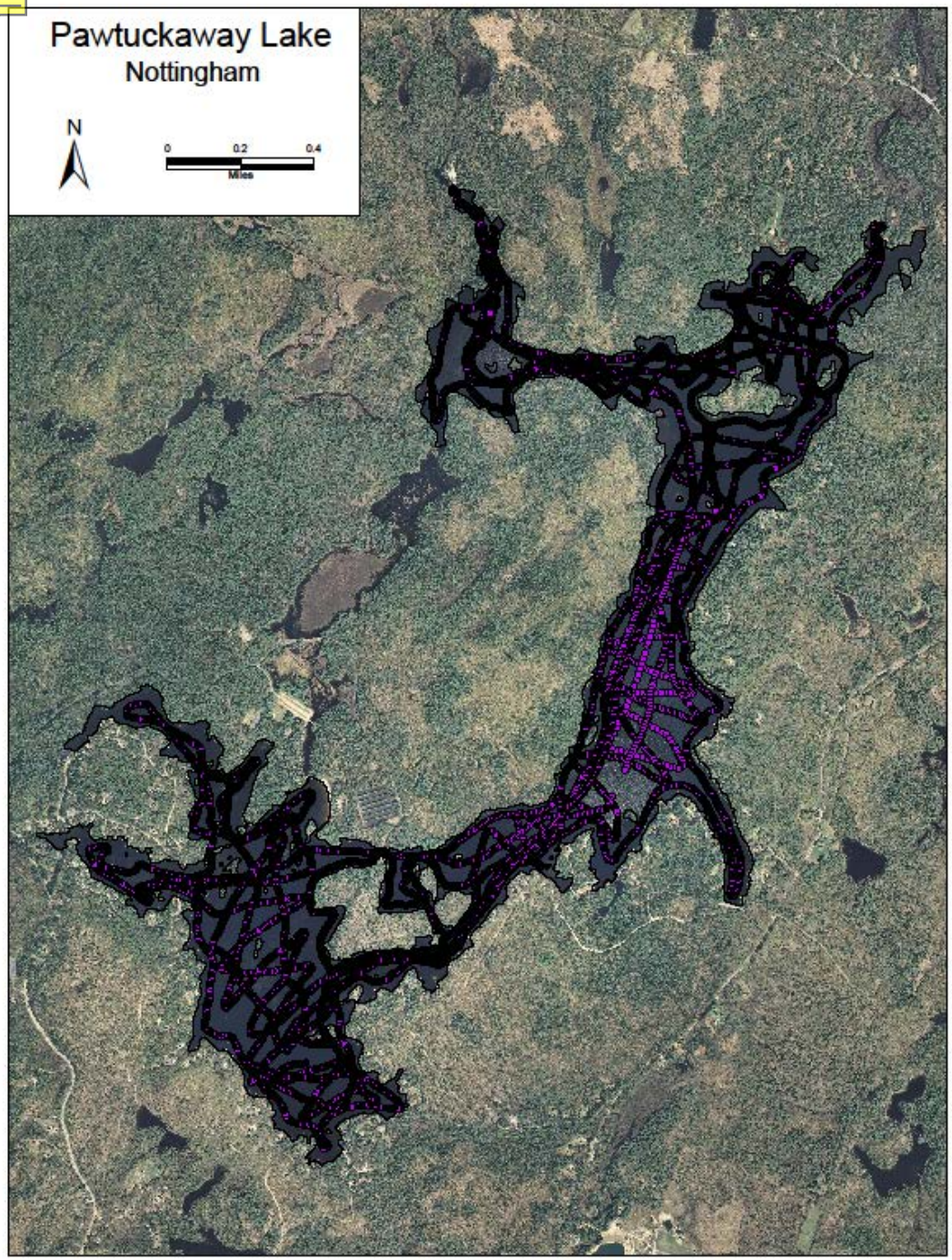
# Pawtuckaway Lake Water Level Relative to Full Lake Level
## Approx. -4.82 feet during pause from November 26 through December 2 and showing effect of the release beginning December 3 at 10:30 am



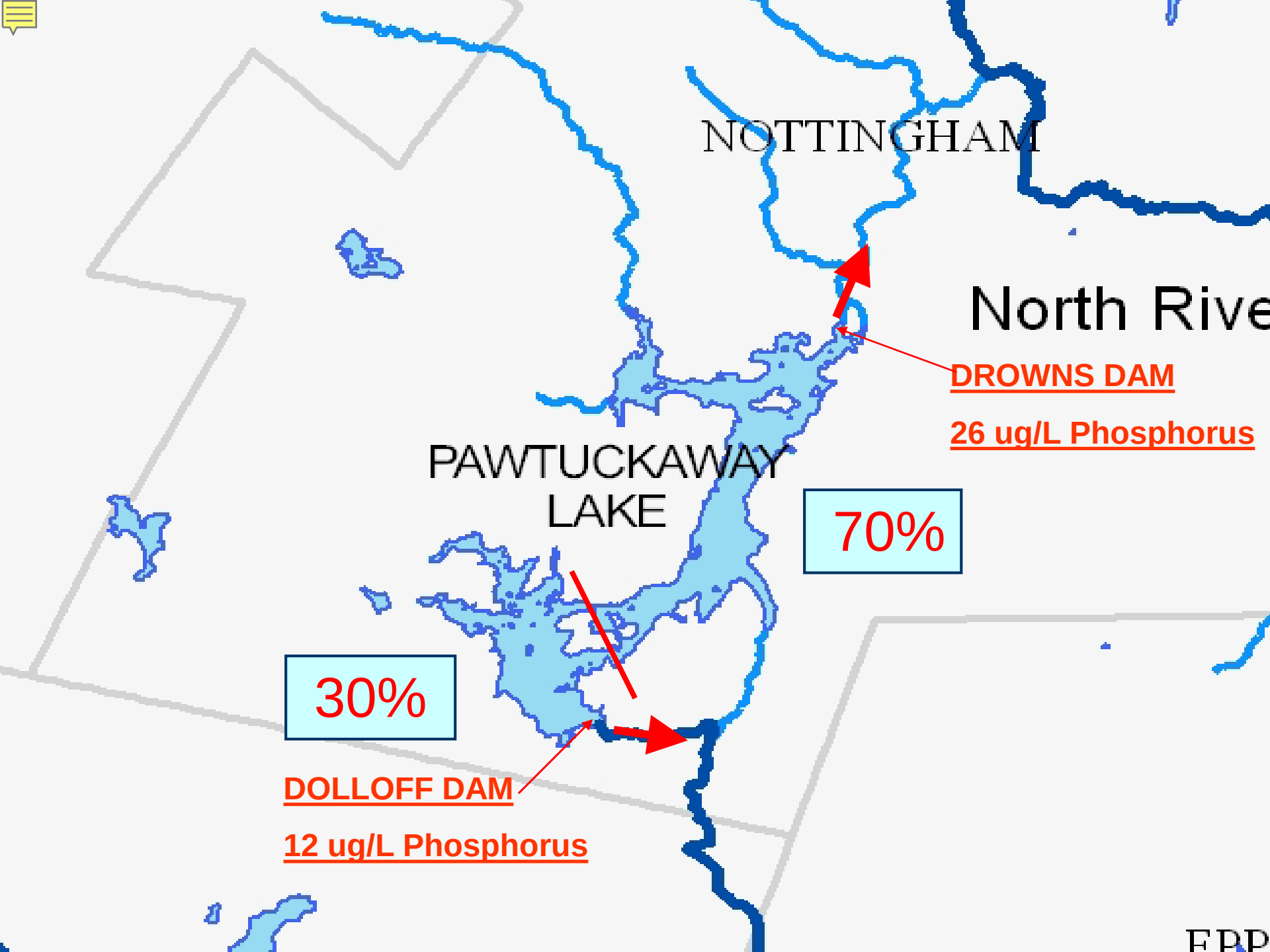

H:\Water Quality\Instream Flow\Lamprey\Lamprey WMP operations\2012 winter dd stop 4.82 ft\20121129 Pawtuckaway Pause water levels.xls
DES PL station data Chart 2

4/5/2013

# Lake level at -4.8 feet




**Surveys to assess how nutrients and drawdown affect plant growth**


NOTTINGHAM
North Rive
DROWNS DAM
26 ug/L Phosphorus
PAWTUCKAWAY
LAKE
70%
30%
DOLLOFF DAM
12 ug/L Phosphorus


# Dolloff Dam – 3 stoplog bays


# Drowns Dam – 1 stoplog bay

# No flow at Drowns Dam when lake is -5.4 ft

# Jan 9, 2013 Release test photos


Downstream Below Drowns Dam
Jan 9, 2013

# Pawtuckaway Water Balance

- Dolloff released more water and outflow continued all winter from the south end of the lake (12 ug/L phosphorus).
- Drowns released less water -- none for 82 days from December into February -- from the north (26 ug/L phosphorus).
- Result is phosphorus-laden water spends more time in lake

Management plan changes reverse this.

**Flow at -4.8 ft November 26, 2012**

# Water is released all winter if lake level is kept higher

Flow Below Drowns Dam
November 26, 2012 at -4.8 ft

# Results - Actions under the Lamprey WMP for relief flow operations

- Larger proportion of drawdown is from Drowns Dam
- Defined maximum summer lake level change
- Alewife barriers
- Loon nesting period limits on lake level change
- Winter relief flows delayed until 2017-18

ALSO:

- Continued temperature measurements

# Results - DES PLIA Partnership Agreement

- Larger proportion of drawdown is from Drowns Dam
- Monitoring of phosphorus and aquatic plants
- Two more winter release tests
- Notifications, meetings and articles
- Dam operations plan
- Evaluation of adaptive management

# Comments or questions?


Wayne Ives, P.G.
NHDES
P.O. Box 95
29 Hazen Drive
Concord, NH 03302-0095
271-3548
Wayne.Ives@des.nh.gov