Comprehensive Management of Lakes and Rivers: The Lamprey River/Pawtuckaway Lake Management Plan

Water and Watershed Conference – PSU
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Lamprey River vs. Pawtuckaway Lake

- Proposed use of water from lakes to provide relief pulses for the river
  - Aquatic life
- Lakeshore residents concerned about water levels in summer & winter
  - Recreation
  - Dock damage
DES historically operates the water level in Pawtuckaway Lake.

7 feet
Value of stream flow gages
Effects of 2013 lake drawdown on river flow

Discharge (cfs)

USGS 01073500
USGS 01073319
Start of Fall Drawdown  10/16
Second Change                10/24
Third Change                   11/1
Fourth Change                  11/12

Upstream gage

Downstream gage
Applying flow protection 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)

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

<table>
<thead>
<tr>
<th>Time of Year</th>
<th>Critical Flow</th>
<th>Rare Flow</th>
<th>Allowable Duration (days)</th>
<th>Catastrophic Duration (days)</th>
<th>Allowable Duration (days)</th>
<th>Catastrophic Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dec 9 – Feb 28</td>
<td>110</td>
<td>73</td>
<td>10</td>
<td>37</td>
<td>7</td>
<td>30</td>
</tr>
<tr>
<td>Mar 1 – May 4</td>
<td>238</td>
<td>146</td>
<td>10</td>
<td>19</td>
<td>3</td>
<td>9</td>
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<tr>
<td>May 5 – Jun 19</td>
<td>62</td>
<td>57</td>
<td>5</td>
<td>13</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>Jun 20 – Jul 4</td>
<td>18</td>
<td>16</td>
<td>5</td>
<td>10</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Jul 5 – Oct 6</td>
<td>18</td>
<td>16</td>
<td>15</td>
<td>32</td>
<td>5</td>
<td>15</td>
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<tr>
<td>Oct 7 – Dec 8</td>
<td>40</td>
<td>20</td>
<td>11</td>
<td>33</td>
<td>6</td>
<td>11</td>
</tr>
</tbody>
</table>
Assessing hydrologic conditions by tracking daily stream flow and comparing with protected instream flow values.

Still meeting protected flow criteria
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
  - Expect lake level down 0.05 feet

- **December 2012** – winter release test
  - at different starting point (during drawdown)
  - 65 cfs
  - Expect lake level down 0.65 feet
September Release Test – Dolloff Dam
2012-09-05

Other issues relating to a flow release – specially-sized stoplogs
Alewife net tests whether fish will migrate early if there is a water release.
Upstream diurnal temperature variation ~2.5-3 °C

Test temperature variation 3.3 °C
Turbidity met standards

Lake’s Sp.C. is lower than Lamprey’s
Winter Release Test
Starting at -4.8 ft
December 2012
Dolloff Dam
67 cfs increase
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

Lake level relative to full (feet)

-5.82

Release period

-5.32

Drawdown pause period

-4.82

Expected water level after release

-3.82

Actual water level after release
Lake level at -4.8 feet
2013 surveys to assess if changing drawdown affects nutrients and plant growth
Water Quality and the Drawdown

DOLLOFF DAM
12 ug/L Phosphorus

DROWNS DAM
26 ug/L Phosphorus

30%
70%
Dolloff Dam – 3 stoplog bays
Drowns Dam – 1 stoplog bay
No flow at Drowns Dam when lake is -5.4 ft.

Jan 9, 2013 photo
Pawtuckaway Water Balance

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

The management plan reverses this.
Flow at -4.8 ft
November 26, 2012
Flow Below Drowns Dam
November 26, 2012 at -4.8 ft
Water is released all winter if lake level is kept higher
Results - Actions under the Lamprey WMP for relief flow operations

- Larger proportion of drawdown is from Drowns Dam (70+% until level is below outlet)
- Phase in winter water levels for docks; so winter relief flows are delayed until 2017-18
- Loon nesting period limits on lake level change between May 15 and July 15
- Defined maximum summer lake level change
- Alewife barriers

ALSO:
- Continued temperature measurements
January 23, 2013

NH Lakes Management Advisory Committee
and
NH Rivers Management Advisory Committee

COMPREHENSIVE SURFACE WATER RESOURCE MANAGEMENT

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BACKGROUND

The goal of water resource management is to balance competing demands between users and uses of water. Two of the programs defined by the New Hampshire legislature to manage and protect surface water resources for natural and human uses are the Rivers Management and Protection Program\(^1\) and the Lakes Management and Protection Program\(^2\), which were created to protect surface water resources and promote their management for natural and human uses. A component of the Rivers Management and Protection Program, the Instream Flow Pilot Program has the potential to affect lake operations in its management of stream flows and conversely, lake level management can impact stream flows. Committee members from these two programs recognized that conflicts will arise when management to improve conditions for one waterbody may negatively impact another waterbody. This document provides recommendations to balance the management effects on surface waters of the state.
Comprehensive Surface Water Resource Management

GUIDING PRINCIPLES – in brief

1. Achieve Designated Uses in all surface waters.
2. Water resources management includes all waters and uses.
3. Imitate natural water conditions to meet WQ Standards.
4. Watershed-specific evaluations are necessary.
5. Infrastructure to support sustainable water use.
6. Management based on the public trust and riparian rights doctrines.
7. Follow water resource emergencies by the development of avoidance strategies.
How DES will apply the Guiding Principles

• Consider in DES decision-making
• Consider by DES when existing laws and rules are amended
• Help staff explain how we implement our statutory obligations
Summary

• Test releases showed stream flow can be managed effectively.
• The Instream Flow Program’s increased focus on water management has lead to more discussion about the balancing of conflicting interests.
• The results include specific plans and ongoing studies for Pawtuckaway and a set of guiding principles for comprehensive water resource management.
Comments or questions?

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