Pend Oreille River Temperature TMDL Allocations

J. Todd Kennedy
Tetra Tech

October 25, 2007
Pend Oreille River TMDL
Watershed Advisory Group
Presentation Overview

- Temperature TMDL Defined
- TMDL Allocation Process
- Critical Conditions & Compliance Points
- Loading Capacity and Existing Loads
- Load and Wasteload Allocations
- Other Considerations
Temperature TMDL Defined

- Temperature TMDL: allowable heat load that meets instream standards

- TMDL or loading capacity
  \[ = LA + WLA (+ MOS + NB) \]

- Heat load = flow \( \times \) temperature = \( \text{kcal/day} \)

\[
HeatLoad = Q \times \frac{28.3169L}{ft^3} \times \frac{1kg}{1L} \times \frac{86,400\text{sec}}{\text{day}} \times \frac{1\text{kcal}}{1^\circ C} \times T = \frac{\text{kcal}}{\text{day}}
\]
Allocation Process

• Based on output from 3 calibrated water quality models developed for the Pend Oreille River by PSU and Batelle

• Model results postprocessed and compliance with water quality targets evaluated by WDOE and IDEQ

• Tetra Tech translated this information into the necessary TMDL components
Critical Conditions and Compliance Points

- Determined by analyzing two years (2004-05) of daily maximums over the length of the river
- May through September
- Focus on period (day) of maximum impairment
- 2004 a critical year
- Compliance points selected by the States and Tribe
Idaho Compliance Areas

- Pend Oreille River Longitudinal Cross-section (1st priority)
- Pend Oreille River Bottom Water at 35 km below Railroad Bridge
- WA/ID State Line
Daily average bottom temperature at 35 km downstream from Lake Pend Oreille for the Natural (8) and Existing Conditions (1) Scenarios

(Figure from Draft Report of Annear et al., 2007)
Longitudinal temperature profile differences for Existing Conditions minus Natural Conditions on Aug 8, 2004
(Figure from Annear et al., 2007)
## Existing Loads - Idaho

<table>
<thead>
<tr>
<th>Target</th>
<th>Implementation Priority</th>
<th>Date of Maximum Impairment</th>
<th>Existing Temperature (ºC)</th>
<th>Existing Heat Load (kcal/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Idaho Cross Section</td>
<td>1</td>
<td>August 8, 2004</td>
<td>23.4</td>
<td>6.641E+11</td>
</tr>
<tr>
<td>Idaho Bottom 35 km</td>
<td>2</td>
<td>August 1, 2004</td>
<td>22.5</td>
<td>6.694E+11</td>
</tr>
<tr>
<td>WA/ID State Line</td>
<td>3</td>
<td>May 1, 2004</td>
<td>13.09</td>
<td>6.410E+11</td>
</tr>
</tbody>
</table>
Load Allocation - Idaho

- Since model simulations suggested an insignificant effect from bank shade, a load allocation is given for the Albeni Falls Dam only
- Allocation for Idaho Cross Section

<table>
<thead>
<tr>
<th>Compliance Area</th>
<th>Date of Maximum Temperature Impairment</th>
<th>Existing Temperature (ºC)</th>
<th>Existing Heat Load (kcal/day)</th>
<th>Allowable Temperature (ºC)</th>
<th>Allowable Heat Load (kcal/day)</th>
<th>Reduction Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Idaho Cross Section</td>
<td>8/08/2004</td>
<td>23.4</td>
<td>6.641E+11</td>
<td>22.3</td>
<td>6.329E+11</td>
<td>4.7%</td>
</tr>
</tbody>
</table>
Wasteload Allocations - Idaho

- Allocations to City of Sandpoint, City of Dover, and City of Priest River
- Based on current average temperatures and permitted flows
- Reserve allocation for future growth
- No reductions required
**Wasteload Allocations - Idaho**

<table>
<thead>
<tr>
<th>Facility</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td>City of Sandpoint WWTP</td>
<td>102</td>
<td>91</td>
<td>102</td>
<td>114</td>
<td>159</td>
<td>182</td>
<td>216</td>
<td>227</td>
<td>204</td>
<td>182</td>
<td>148</td>
<td>114</td>
</tr>
<tr>
<td>City of Dover WWTP</td>
<td>19</td>
<td>19</td>
<td>19</td>
<td>23</td>
<td>27</td>
<td>32</td>
<td>38</td>
<td>38</td>
<td>34</td>
<td>30</td>
<td>27</td>
<td>23</td>
</tr>
<tr>
<td>City of Priest River WWTP</td>
<td>9</td>
<td>10</td>
<td>10</td>
<td>11</td>
<td>14</td>
<td>16</td>
<td>19</td>
<td>19</td>
<td>18</td>
<td>15</td>
<td>13</td>
<td>11</td>
</tr>
<tr>
<td>Reserve for Future Growth</td>
<td>9</td>
<td>8</td>
<td>9</td>
<td>10</td>
<td>14</td>
<td>16</td>
<td>19</td>
<td>20</td>
<td>18</td>
<td>16</td>
<td>13</td>
<td>10</td>
</tr>
</tbody>
</table>

Heat load allocations for each NPDES permitted source by month (million kcal/day).
WA/Kalispel Compliance Areas

- **Box Canyon Reservoir** – Waters of Washington State from ID to Kalispel, and downstream from Kalispel to Box Canyon Dam
- **Kalispel Reservation** – Shared Tribal and State waters described by RM 72.1 to 63.7
- **Boundary Reservoir** – Below Box Canyon dam to Boundary Reservoir dam
- **Below Boundary Dam** – Boundary dam to International border
Pend Oreille River, Box Canyon Reservoir, Longitudinal Profile of Temperature Impairments

Temperature (deg C) vs River Mile

- Existing - Natural: May 7, 2004
- Loading Capacity: May 7, 2004
- Existing - Natural: Aug 24, 2004
- Loading Capacity: Aug 24, 2004
Pend Oreille River - Boundary Reservoir
(August 25, 2004)

Temperature Difference (deg C)

Existing - Natural
Loading Capacity

River Mile
Pend Oreille River, Box Canyon Dam, Maximum Temperatures at Segment 318 (near Tiger)
# Existing and Allowable Loads – WA and Kalispel

<table>
<thead>
<tr>
<th>Compliance Area</th>
<th>Date of Maximum Impairment</th>
<th>Existing Temperature (°C)</th>
<th>Existing Heat Load (kcal/day)</th>
<th>Allowable Temperature (°C)</th>
<th>Allowable Heat Load (kcal/day)</th>
<th>Reduction Needed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Box Canyon Reservoir</td>
<td>8/24/2004</td>
<td>22.22</td>
<td>6.651E+11</td>
<td>20.00</td>
<td>5.986E+11</td>
<td>10.0%</td>
</tr>
<tr>
<td>Kalispel Reservation</td>
<td>5/7/2004</td>
<td>14.41</td>
<td>1.100E+12</td>
<td>12.85</td>
<td>9.809E+11</td>
<td>10.8%</td>
</tr>
</tbody>
</table>
Load Allocations – WA and Kalispel

Pend Oreille River above Box Canyon Dam, 2004

- NPDES discharges
- Tributaries
- Mainstem Vegetation
- Upstream Conditions
- Loading Capacity
- Box Canyon Dam

Temperature Impairment (deg C)

Load Allocations – WA and Kalispel
## Load Allocations – WA and Kalispel

<table>
<thead>
<tr>
<th></th>
<th>Box Canyon Reservoir</th>
<th>Kalispel Reservation</th>
<th>Boundary Reservoir</th>
<th>Below Boundary Dam</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date of Maximum Existing:</td>
<td>8/24/04</td>
<td>5/7/04</td>
<td>8/25/04</td>
<td>8/25/04</td>
</tr>
<tr>
<td>River Mile Location of Maximum (Model Segment)</td>
<td>34.6 (358)</td>
<td>64.2 (168)</td>
<td>17.7 (106)</td>
<td>16.8 (113)</td>
</tr>
<tr>
<td>NPDES</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Tributaries</td>
<td>1%</td>
<td>17%</td>
<td>2%</td>
<td>1%</td>
</tr>
<tr>
<td>Mainstem Vegetation</td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
</tr>
<tr>
<td>Dam</td>
<td>97%</td>
<td>65%</td>
<td>77%</td>
<td>20%</td>
</tr>
<tr>
<td>Upstream Sources</td>
<td>0%</td>
<td>17%</td>
<td>20%</td>
<td>78%</td>
</tr>
</tbody>
</table>

NPDES:
- Existing: Below Boundary Dam:
- 8/25/04
- River Mile Location of Maximum (Model Segment):
  - 34.6 (358)
  - 64.2 (168)
  - 17.7 (106)
  - 16.8 (113)
Wasteload Allocations – WA and Kalispel

- Allocations based on current temperatures and current flows
- Reserve allocations for future growth
- No reduction required
Other Considerations

- Seasonality
- Margin of Safety
- Background
- Reserve Capacity
- Reasonable Assurance
Additional Questions?

Contact Information:

• jessica.koenig@tetratech.com
  703.385.6000 x107

• todd.kennedy@tetratech.com
  919.485.8278 x111