Indian Head River Project

5-6-2005

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INDIAN HEAD RIVER PROJECT

Whitman-Hanson Regional High School
RiverNet Club
2005
RiverNet Club

We are a group of students interested in local rivers. Some of us have worked with RiverNet in Middle School with Ms. Kofton. We are continuing the research on the Indian Head River that the Hanson Middle School has done in the past.
RiverNet Club

Students
Steve, Jacob, Liam, Winnie, Eddie, Liz, Amanda, Alexandra, Tim
Purpose

- To discover whether or not water quality has improved over the past four years.
- To compare two study sites along the river.
Indian Head River
RiverNet Program

Study Sites

2 October 2004
There have been high nitrate readings in the past.
Land Use

Forest 60.9 %
Agriculture 0.5%
Residential 28.8%
Commercial/Industrial 2.4%
Wetlands 1.6 %
Other 5.5%
Watershed

Watershed Area – 29 square miles.
There are 40 stream miles in the watershed and 159 road miles.
10% imperviousness
<table>
<thead>
<tr>
<th>Date</th>
<th>pH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oct. 2001</td>
<td>6.9</td>
</tr>
<tr>
<td>Oct. 2002</td>
<td>7.2</td>
</tr>
<tr>
<td>Oct. 2003</td>
<td>6.3</td>
</tr>
<tr>
<td>Mar. 2004</td>
<td>6.8</td>
</tr>
<tr>
<td>Sept. 2004</td>
<td>7.2</td>
</tr>
</tbody>
</table>
Indian Head River pH Readings
Site B Curtis Crossing

Date | pH
--- | ---
Oct. 2001 | 6.9
Oct. 2002 | 6.7
Oct. 2003 | 6.4
Mar. 2004 | 6.9
Sept. 2004 | 6.9
Indian Head River
RiverNet Program

Fecal Coliform Test Sites

Site A

Site B

1 2 3 4

Fecal Coliform Test Sites

Indian ws.shp
Indian_ponds.shp
Indian_streams.shp
MA Towns

2 October 2004
Fecal Coliform Comparison 10/22/04

Fecal Coliform Colonies per 100 mL

Site of Test

Site 1 Site 2 Site 3 Site 4

Site 1: 60 colonies
Site 2: 40 colonies
Site 3: 50 colonies
Site 4: 10 colonies
Fecal Coliform Comparison Between Sites A and B in the Indian Head River April 1 and October 22, 2004

Note: At Site B there was not a plate count with 20-60 colonies per 100 mL in Oct. 2004.
Changes in Total Discharge
Indian Head River 2001-2004

<table>
<thead>
<tr>
<th>Year</th>
<th>Site A</th>
<th>Site B</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>7</td>
<td>22.5</td>
</tr>
<tr>
<td>2002</td>
<td>6.9</td>
<td>18.6</td>
</tr>
<tr>
<td>2003</td>
<td>27.3</td>
<td>33.3</td>
</tr>
<tr>
<td>2004</td>
<td>19.77</td>
<td>27.07</td>
</tr>
</tbody>
</table>
Comparison of Phosphorus Load For Two Study Sites
Indian Head River
2003-2004

Study Site
Load in g/day
9/25/2003
10/20/2003
2/12/2004
3/31/2004
9/22/2004

Site A
Site B

Load in g/day
9/25/2003
10/20/2003
2/12/2004
3/31/2004
9/22/2004
N:P Ratios

- Site A: 638:1
- Site B: 210:1
Dissolved Oxygen Indian Head River
Site A    9/22-9/23, 2004

[Graph showing dissolved oxygen levels over time from 8.6 to 9.4 mg/l with a peak on 9/21 and a slight decrease on 9/22, indicating a potential event or change in environmental conditions.]
Comparison of Dissolved Oxygen from 5 PM September 22 to 3 PM September 23, 2004

Legend:
- SteA
- SteB
Temperature Comparison
Indian Head River Site A 2001-2004
Temperature Comparison  Indian Head River
Site B 2001-2004

Temperature (degrees Celsius)

Time

18:00 20:00 22:00 0:00 2:00 4:00 6:00 8:00

2001
2002
2003
2004
### Comparison of Dissolved Oxygen and Temperature

**Indian Head River Site A 2001-2004 6PM- 8AM**

<table>
<thead>
<tr>
<th>Year</th>
<th>Percent Saturation</th>
<th>Degrees C°</th>
<th>Dissolved Oxygen</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>84.7</td>
<td>0</td>
<td>16.5</td>
</tr>
<tr>
<td>2002</td>
<td>82.9</td>
<td>8.8</td>
<td>9.7</td>
</tr>
<tr>
<td>2003</td>
<td>89.5</td>
<td>9.4</td>
<td>10</td>
</tr>
<tr>
<td>2004</td>
<td>95.8</td>
<td>18.7</td>
<td>8.92</td>
</tr>
</tbody>
</table>

- **Percent Saturation**
- **Degrees C°**
- **Dissolved Oxygen**

---

**Legend:**
- Dark blue bar: Percent Saturation
- Green bar: Degrees C°
- Light orange bar: Dissolved Oxygen
Comparison of Dissolved Oxygen and Temperature
Indian Head River Site B 2001-2004 6pm-8am

Year
- 2001
  - Percent Saturation: 85.3
  - Degrees C°: 15.7
  - Dissolved Oxygen: 8.4
- 2002
  - Percent Saturation: 89.1
  - Degrees C°: 7.8
  - Dissolved Oxygen: 10.7
- 2003
  - Percent Saturation: 104.5
  - Degrees C°: 10.3
  - Dissolved Oxygen: 11.4
- 2004
  - Percent Saturation: 97.4
  - Degrees C°: 17.5
  - Dissolved Oxygen: 9.32
Macroinvertebrates Site A
Macroinvertebrate collection Site B 10/7/04
Macroinvertebrates
Indian Head River October 7, 2004
Site A

- Hydropsychidae: 13%
- Gammaridae: 7%
- Philopotamidae: 4%
- Psephenidae: 2%
- Pelecypoda: 62%
- Chironomidae: 5%
- Asellidae: 5%
- Gastropoda: 0%
Percent Composition of Macroinvertebrates
Indian Head River
Site A    2003

- Hydropsychidae: 40%
- Gammaridae: 31%
- Philopotamidae: 24%
- Psephenedae: 2%
- Pelecypoda: 2%
- Elmidae: 1%
Macroinvertebrates Indian Head River
October 7, 2004 Site B

<table>
<thead>
<tr>
<th>Taxon</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydropsychidae</td>
<td>82%</td>
</tr>
<tr>
<td>Philopotamidae</td>
<td>14%</td>
</tr>
<tr>
<td>Pelecypoda</td>
<td>3%</td>
</tr>
<tr>
<td>Psephenidae</td>
<td>1%</td>
</tr>
<tr>
<td>Gastropoda</td>
<td>0%</td>
</tr>
</tbody>
</table>
Percent Composition Macroinvertebrates Indian Head River Site B 2003

- Hydropsychidae: 47%
- Philopotamidae: 32%
- Pelecypoda: 10%
- Psephenedae: 6%
- Gammaridae: 2%
- Asselliidae: 1%
- Hirudinea: 1%
- Elmidae: 1%
- Hydromidae: 1%
- Gammaridae: 2%
- Crayfish: 0%
Macroinvertebrates and Tolerance Indian Head River 10/7/04

- Composition
- Tolerance to Pollution

<table>
<thead>
<tr>
<th>Family</th>
<th>Composition</th>
<th>Tolerance to Pollution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Picrotubulus</td>
<td>61.4</td>
<td></td>
</tr>
<tr>
<td>Holosticta</td>
<td>13.2</td>
<td></td>
</tr>
<tr>
<td>Syncaridae</td>
<td>6.9</td>
<td></td>
</tr>
<tr>
<td>Limnidae</td>
<td>5.3</td>
<td></td>
</tr>
<tr>
<td>Syncaridae</td>
<td>5.3</td>
<td></td>
</tr>
<tr>
<td>Polycentropodida</td>
<td>4.2</td>
<td></td>
</tr>
<tr>
<td>Assorbicula</td>
<td>1.6</td>
<td></td>
</tr>
<tr>
<td>Polycentropodida</td>
<td>1.6</td>
<td></td>
</tr>
<tr>
<td>Prophysa</td>
<td>0.005</td>
<td></td>
</tr>
<tr>
<td>Tanastrauren</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Chironominae</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Chironominae</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Chironominae</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Chironominae</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Chironominae</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Chironominae</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Chironominae</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Chironominae</td>
<td>7</td>
<td></td>
</tr>
</tbody>
</table>

$X$ Comparison 0-100; Tolerance 1-10
Macroinvertebrates and Tolerance
Indian Head River Site B 10/7/04

%Composition

- Hydropsychidae
  - Tolerance: 81%

- Philopotamidae
  - Tolerance: 14.3%

- Pelecypoda
  - Tolerance: 3.2%

- Psephenidae
  - Tolerance: 1.1%

- Gastropoda
  - Tolerance: 0.4%
<table>
<thead>
<tr>
<th>Year</th>
<th>Family Biotic Indices</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>3.89</td>
</tr>
<tr>
<td>2002</td>
<td>5.14</td>
</tr>
<tr>
<td>2003</td>
<td>3.43</td>
</tr>
<tr>
<td>2004</td>
<td>5.9</td>
</tr>
</tbody>
</table>
Family Biotic Indices-Indian Head River
Site B: 2001-2004

Year | 2001 | 2002 | 2003 | 2004
--- | --- | --- | --- | ---
<table>
<thead>
<tr>
<th>Range</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0-3.75</td>
<td>Excellent</td>
</tr>
<tr>
<td>3.76-4.25</td>
<td>Very Good</td>
</tr>
<tr>
<td>4.26-5.00</td>
<td>Good</td>
</tr>
<tr>
<td>5.01-5.75</td>
<td>Fair</td>
</tr>
<tr>
<td>5.76-6.50</td>
<td>Fairly Poor</td>
</tr>
<tr>
<td>6.51-7.25</td>
<td>Poor</td>
</tr>
<tr>
<td>7.26-10.00</td>
<td>Very Poor</td>
</tr>
</tbody>
</table>

(Culp and Halliwell 1999)
Conclusions

The Indian Head River meets all criteria for Class B warm water fisheries according to the parameters tested.
Conclusions

Water quality appears better at Site B than Site A.
Conclusions

The macroinvertebrate analysis at Site A rated fairly poor which indicated a deterioration in substrate conditions from 2003.
Conclusions

The water chemistry results at Site A, however, are acceptable. The problem appears to be in the sediment.
Conclusions

Greater flow and discharge may be an important variable in the dissolved oxygen and macroinvertebrate data.
Conclusions

Nitrate readings were in the acceptable range in October 2004.
Recommendations

To further determine the sources of nitrates in the system, water samples should be collected at more locations and at different times of the year.
Recommendations

Monitoring should continue for macroinvertebrates, flow, discharge, and water chemistry to observe variations over time.
Recommendations

Weather data should be noted for the week before data is collected.
Thanks

We wish to express our sincere gratitude to Dr. Curry and Kim McCoy for all their work and support.

Thanks to Ms. Kofton for all the data from years past and information about the river.
Thanks

Thanks also to sponsors of the RiverNet Program and Watershed Access Lab.
Executive Summary

Click here to access the summary.
The End