Improvements to the Cheat River Watershed’s Fisheries in Response to Reductions in Acid Mine Drainage Pollution

WV MINE DRAINAGE TASK FORCE SYMPOSIUM
March 26, 2014

Prepared by:
Frank Jernejcic - WV Division of Natural Resources
David Wellman - WV Division of Natural Resources
Rick Buckley - Office of Surface Mining
Doug Ferris - Friends of the Cheat
Purpose

Document improvements to the water quality and fisheries in Cheat Lake and Cheat River resulting from acid mine drainage (AMD) remediation projects funded through the Abandoned Mine Lands (AML), the WV Special Reclamation programs, and other participating partners.
Cheat River Watershed

- 1,424 mi² drainage area
- Elevations range from 800 ft to 4,500 ft
- Coal high in sulfur and other metals

Charleston

Cheat Lake

Cheat River Watershed

West Virginia
Cheat River

- Formed by Black Fork and Shavers Fork at Parsons, WV
- Mainstem flows 75 miles north to state line.
- 2nd largest Monongahela River tributary
- Average annual flow of 2,300 cfs
- November 4, 1985 flood: 200,000 cfs
Cheat Lake

- Located at base of the Cheat watershed
- 1,730 acres: 13 miles long
- Maximum depth 106 feet
- Operated for hydropower, not for flood control
- High angling and boating use
Many deep mines were developed beginning in the 1920's and ranged in size from small family owned mines to mines large enough to support company towns.

Subsequent strip mining has occurred on about 1% of the watershed area (U.S. Geological Survey, 1992).
AMD impacts 69 miles of Cheat mainstem and 53 streams listed on state 303D list
Surface Mining Control and Reclamation Act (SMCRA)

Two major programs: before and after 1977.

1. Regulation of active coal mines after 1977 (bond forfeitures). Special Reclamation Program.

2. AML Program – reclamation of mine sites prior to 1977. Priorities of public safety and health, not necessarily AMD.

U.S. Department of the Interior's Office of Surface Mining distributes federal money to states by SMCRA guidelines.
Special Reclamation Sites

Active chemical treatment methods often used at bond forfeited sites.

Alkaline materials introduced into water for neutralization.

64 complete projects

~$30 million
AML Sites

Passive treatment* methods often used at AML sites. Natural chemical and biological reactions used for neutralization.

66 sites reclaimed
~$16 million

173 unreclaimed

* longevity / maintenance?
1994 Cheat River Deep Mine Blowout

T & T mine
$ 30,000 month

No fish kill
Cheat Watershed Groups

Friends of Cheat organized in 1995 to restore and promote the Cheat watershed. Cultivated a wide range of support from watershed stakeholders.

Organized River of Promise in 1995 to reduce AMD and restore sport fisheries.

Signatories include state and federal agencies, industry, and conservation groups.
Muddy Creek 1996 – 2006
Mean pH: 4.2
Mean tons of acid/year: 4,000

Heavily AMD Impacted
Continuous Water Quality Monitoring

Is AMD treatment positively impacting Cheat River water quality???

Start in 2004
Continuous Water Quality Monitoring

Period of record: May 2004 – April 2013

~115,000 readings
**pH Depression**

Cheat Lake pH - May 7, 2009

- pH at 2-meters depth
- pH Depression

<table>
<thead>
<tr>
<th>Location</th>
<th>pH 2-meters depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>WQ1</td>
<td>5.5</td>
</tr>
<tr>
<td>Rubles Run</td>
<td>6.5</td>
</tr>
<tr>
<td>Morgans Run</td>
<td>7.7</td>
</tr>
<tr>
<td>WQ1a</td>
<td>5.7</td>
</tr>
<tr>
<td>WQ2</td>
<td>5.6</td>
</tr>
<tr>
<td>Sunset</td>
<td>6.0</td>
</tr>
<tr>
<td>Quarry Run</td>
<td>6.2</td>
</tr>
<tr>
<td>WQ3A</td>
<td>5.8</td>
</tr>
<tr>
<td>YSI @ Head of Lake</td>
<td>5.9</td>
</tr>
</tbody>
</table>

pH 6 - 9 suitable for fish

Upstream
Mean Daily pH vs Flow for Cheat River

- Mean Daily pH
- Mean Daily Flow, cfs

pH > 6.0 suitable for fish

Date


Mean Daily Flow, cfs

0 2,000 4,000 6,000 8,000 10,000 12,000 14,000 16,000
Mean Seasonal pH

- Albright
- Cheat Lake

Mean pH over the years 2004 to 2007.
Cheat Lake pH

>6.0 suitable for fish

Dead Lake

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1969</td>
<td>4.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1970</td>
<td>4.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1971</td>
<td>4.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1972</td>
<td>5.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2004</td>
<td>7.0</td>
<td>6.5</td>
<td>6.0</td>
</tr>
<tr>
<td>2005</td>
<td>6.8</td>
<td>6.0</td>
<td>6.0</td>
</tr>
<tr>
<td>2006</td>
<td>6.8</td>
<td>5.1</td>
<td>6.0</td>
</tr>
<tr>
<td>2007</td>
<td>6.6</td>
<td>6.4</td>
<td>6.0</td>
</tr>
</tbody>
</table>
Cheat Lake’s Fish Community

48 species collected

1 atherinids
4 catostomids
10 centrarchids
1 clupid
11 cyprinids
2 esocids
4 ictalurids
2 moronidae
9 percids
1 percithyids
1 sciaenid
2 salmonids

White bass - *Morone chrysops*

Rainbow darter - *Etheostoma caeruleum*

Golden redhorse - *Moxostoma erythrum*

Channel catfish - *Ictalurus punctatus*
Cheat Lake's Fishery

1955 Cheat Lake Gill and Trap Net Survey

- Catfish: 80%
- Suckers: 13%
- Crappie: 4%
- Sunfish: 0%
- Black bass: 0%
- Carp: 0%

2006 Cheat Lake Gill Net Surveys by WVDNR

- Catfish: 39%
- Suckers: 16%
- Crappie: 1%
- Sunfish: 31%
- Black bass: 3%
- Carp: 0%
- Yellow Perch: 0%
- Walleye: 0%
Core 1959: “yellow perch and walleye became extinct by 1940 from the watershed”

Best yellow perch fishery in WV  2005
15 per day limit in 2006
### Walleye Stocking

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Walleye</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fry</td>
<td>1,700,00</td>
<td>1,000,000</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>.</td>
<td>2,700,000</td>
</tr>
<tr>
<td>Fingerling</td>
<td>.</td>
<td>.</td>
<td>50,000</td>
<td>44,000</td>
<td>46,000</td>
<td>25,000</td>
<td>6,800</td>
<td>87,712</td>
<td>31,775</td>
<td>.</td>
<td>291,287</td>
</tr>
</tbody>
</table>

Spring pH fluctuations affect walleye spawning success??
Telemetry study

29-inch Walleye
Cheat Lake Fish Monitoring

1997 - 2008 Cheat Lake Gill Nets

- **Total Catch**
- **CPUE**

- **No. of Collected Fish**
- **CPUE (fish/net-night)**


- **CPUE (fish/net-night):**
  - 1997: 0
  - 1998: 2
  - 2001: 4
  - 2005: 6
  - 2008: 12

- **No. of Collected Fish:**
  - 1997: 0
  - 1998: 50
  - 2001: 150
  - 2005: 300
  - 2008: 350
Cheat Lake Bass Tournaments, 1990 - 2013

Number of Tournaments

Cheat Lake Bass Tournaments
Cheat Lake Bass Tournaments
Cheat Lake Bass Tournaments

Cheat Lake Bass Tournament Success Rate, 1990 - 2013

No. Bass per Hour
Cheat Lake Bass Tournaments

Bass Tournament Success Rates, 2012

No. Bass per Hour

- Stonecoal
- Burnsville
- Cheat
- Summersville
- Sutton
- Tygart
Cheat River Fish Surveys

lower

High gradient
25 fpm

Low gradient
10 fpm

upper

Cheat River and tributaries
Lower Cheat Watershed
Upper Cheat Watershed
Upper Cheat River

- No of Species
- lbs of fish per acre

<table>
<thead>
<tr>
<th>Year</th>
<th>No of Species</th>
<th>lbs of fish per acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>1959</td>
<td>17</td>
<td>60</td>
</tr>
<tr>
<td>1973</td>
<td>20</td>
<td>27</td>
</tr>
<tr>
<td>1980</td>
<td>22</td>
<td>21</td>
</tr>
<tr>
<td>1994</td>
<td>24</td>
<td>58</td>
</tr>
<tr>
<td>1999</td>
<td>24</td>
<td>58</td>
</tr>
</tbody>
</table>

*Upper Cheat River, 1994*
Upper Cheat River

No. of Smallmouth Bass | lbs of Smallmouth Bass per acre

<table>
<thead>
<tr>
<th>Year</th>
<th>No. Smallmouth Bass</th>
<th>lbs of Bass per acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>1959</td>
<td>166</td>
<td>11</td>
</tr>
<tr>
<td>1973</td>
<td>24</td>
<td>5</td>
</tr>
<tr>
<td>1980</td>
<td>57</td>
<td>4</td>
</tr>
<tr>
<td>1999</td>
<td>289</td>
<td>18</td>
</tr>
</tbody>
</table>
## Lower Cheat River

<table>
<thead>
<tr>
<th>Year</th>
<th>All Species</th>
<th>Smallmouth Bass</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number Species</td>
<td>Number Individuals</td>
</tr>
<tr>
<td>1997</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2005</td>
<td>7</td>
<td>123</td>
</tr>
</tbody>
</table>

The best way to sample fish?
Conclusions

1. Seasonal mean pH values did not approach threshold criteria of 6.0;
2. pH is lowest during periods of high flow, specifically during the winter season. Could affect egg and fry development in April or May;
3. Increase in both sport and forage fishes have occurred in Cheat Lake and Cheat River;
4. Cheat Lake has become a fishing destination for recreational and tournament anglers.
The continuation of the Cheat Lake and Cheat River fisheries are dependent upon:

1. Maintenance of existing AMD remedial projects; and

2. Continual efforts to address sources of acid discharging from the multitude of remaining abandoned coal mines in the watershed.

3. Must maintain future funding!!
Muddy Creek—still a problem!!!

August 2013
Questions ?