Water Management – Utica and Marcellus Shale
June 10, 2015

Water Sourcing in the Utica Shale

Ted Lozier
• Created in 1933, in accordance with ORC, Chapter 6101

• Largest conservancy district in Ohio, covers 1/5 of state and all or portions of 18 counties

• Manage 54,000 acres for public use
  * 16,000 acres of water surface at 10 lakes
  * 38,000 acres of land

• Partnership with U.S. Army Corps of Engineers (USACE)
  * USACE owns and operates dams
  * MWCD manages reservoirs behind dams

• Partnerships on every level of government for projects, programs, etc. – long-term and short-term
Responsible stewards dedicated to providing the benefits of flood reduction, conservation and recreation in the Muskingum River Watershed
To date, system has prevented over $11.1 billion in potential property damage and saved countless lives, while providing a water resource for multiple uses.
The Muskingum River Basin Reservoir System

Walhonding River Region
- North Branch Kokosing
- Pleasant Hill
- Charles Mill

Mohicanville
- Mohawk
- Beach City

Tuscarawas River Region
- Bolivar
- Atwood
- Leesville
- Dover
- Clendening
- Piedmont
- Tappan

Lower Muskingum River Region
- Dillon
- Wills Creek
- Senecaville
- Senecaville
- Marietta

Ohio River
Flood Reduction

- 14 Dams and Reservoirs

Dover Dam Pool of record in 2005

Elevation 907.35

Normal River Elevation 870
Recreation

- $10 million annual budget
- Parks
- Campgrounds
- Boat Launch Ramps
- Youth Camps
- Boat Clubs
- Residential Lots
- MOU with ODNR
Recreation

- 3.6 million visitors annually
- Host for 500+ yearly fishing tournaments
- $160 million Capital Improvement Plan over the next 5-7 years
- Initiated Master Planning for Trails
Conservation

- Forestry
- Agriculture
- Mineral Resources
- Water Resources
- Water Quality
MWCD Oil & Gas Program

Part of MWCD natural resources stewardship since 1933

MWCD has 275 conventional oil and gas wells producing royalties (about 120 of those are on MWCD property)
Utica Shale Leases

CLENDENING  6,485 acres

LEESVILLE  3,682 acres

SENECA  7,135 acres

PIEDMONT  6,498 acres
MWCD WATER SUPPLY

MUSKINGUM WATERSHED
CONSERVANCY DISTRICT
Water Supply from Reservoirs

- Both long-term and short-term agreements permitted by law
- MWCD lakes have more than 68 billion gallons of water
- USGS & Consultant: availability studies
- To date, nearly 284 million gallons supplied to oil and gas industry
- Elimination of nearly 78,000 tanker truck trips off roads near lakes
- New agreements proposed and approved
Ten MWCD Reservoirs total

- Atwood
- Beach City
- Charles Mill
- Clendening
- Leesville
- Piedmont
- Pleasant Hill
- Seneca
- Tappan
- Wills Creek

Six MWCD Reservoirs in the Oil and Gas well development areas

- Atwood
- Leesville
- Tappan
- Clendening
- Piedmont
- Seneca
MWCD Reservoir Capacity @ Normal Pool

• Atwood - 7.69 Billion gallons (23,600 Acre-Feet)

• Leesville - 6.35 Billion gallons (19,500 Acre-Feet)

• Tappan - 11.44 Billion gallons (35,100 Acre-Feet)

• Clendening - 8.64 Billion gallons (26,500 Ac-Ft)

• Piedmont - 11.25 Billion gallons (34,500 Ac-Ft)

• Seneca - 14.17 Billion gallons (43,500 Acre-Feet)
Gallons Per Inch at Normal Pool

• Atwood - 40.7 million gallons (970,000 Barrels)
• Leesville - 27.2 million gallons (648,000 Barrels)
• Tappan - 63.4 million gallons (1,510,000 Barrels)
• Clendening - 46.2 million gallons (1,100,000 Barrels)
• Piedmont - 61.7 million gallons (1,470,000 Barrels)
• Seneca - 92.3 million gallons (2,197,000 Barrels)
Number of days to pump 1 inch of water @ 2 million Gallons Per Day

- Atwood: 20.4 days
- Leesville: 13.6 days
- Tappan: 31.7 days
- Clendening: 23.1 days
- Piedmont: 30.8 days
- Seneca: 46.2 days
Lake Water Resources Characterization

- Partnered with USGS to install or upgrade:
  - 8 Stream Flow Discharge Gauges,
  - 6 Lake Gauges, and
  - 6 Weather stations.

- Real time data availability to better analyze water resources to predict available water supplies within each reservoir.
USACE Water Levels - Muskingum River Basin

http://www.mwcd.org/levels
# USACE Water Levels - Muskingum River Basin

<table>
<thead>
<tr>
<th>PROJECT</th>
<th>Pool (Feet)</th>
<th>Summer Pool (Feet)</th>
<th>Outflow (cfs)</th>
<th>Max Outflow (cfs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATWOOD</td>
<td>927.76</td>
<td>928.00</td>
<td>-</td>
<td>670.00</td>
</tr>
<tr>
<td>BEACH CITY</td>
<td>948.88</td>
<td>948.00</td>
<td>97.16</td>
<td>1968.00</td>
</tr>
<tr>
<td>BOLIVAR</td>
<td>899.37</td>
<td>DRY</td>
<td>360.03</td>
<td>2400.00</td>
</tr>
<tr>
<td>CHARLES MILL</td>
<td>998.19</td>
<td>997.00</td>
<td>223.71</td>
<td>1470.00</td>
</tr>
<tr>
<td>CLENDENING</td>
<td>897.91</td>
<td>898.00</td>
<td>50.93</td>
<td>540.00</td>
</tr>
<tr>
<td>DILLON</td>
<td>737.50</td>
<td>737.00</td>
<td>196.66</td>
<td>6500.00</td>
</tr>
<tr>
<td>DOVER</td>
<td>867.72</td>
<td>DRY</td>
<td>700.54</td>
<td>4703.00</td>
</tr>
<tr>
<td>LEESVILLE</td>
<td>963.17</td>
<td>963.00</td>
<td>24.10</td>
<td>270.00</td>
</tr>
<tr>
<td>MOHAWK</td>
<td>808.64</td>
<td>DRY</td>
<td>220.91</td>
<td>7145.82</td>
</tr>
<tr>
<td>MOHICANVILLE</td>
<td>934.60</td>
<td>DRY</td>
<td>211.21</td>
<td>1300.00</td>
</tr>
<tr>
<td>NORTH BRANCH</td>
<td>1121.39</td>
<td>1121.00</td>
<td>24.19</td>
<td>0.00</td>
</tr>
<tr>
<td>KOKOSING</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PIEDMONT</td>
<td>912.93</td>
<td>913.00</td>
<td>45.37</td>
<td>445.00</td>
</tr>
<tr>
<td>PLEASANT HILL</td>
<td>1020.44</td>
<td>1020.00</td>
<td>98.20</td>
<td>1200.00</td>
</tr>
<tr>
<td>SENECAVILLE</td>
<td>832.48</td>
<td>832.20</td>
<td>17.89</td>
<td>710.00</td>
</tr>
<tr>
<td>TAPPAN</td>
<td>899.11</td>
<td>899.30</td>
<td>23.41</td>
<td>707.00</td>
</tr>
<tr>
<td>WILLS CREEK</td>
<td>741.93</td>
<td>742.00</td>
<td>108.02</td>
<td>5718.00</td>
</tr>
<tr>
<td>ZOAR</td>
<td>902.17</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

[http://www.mwcd.org/levels](http://www.mwcd.org/levels)
Water Level Gauges - Muskingum River Basin

MWCD Lake Gauges
Water Supply from Reservoirs Impacts Consideration

- Short term withdrawals (4 withdrawal periods)
- Lake refill period
- Recreation priority during season
- Lake level triggers for curtailment / cessation
- Maximum withdrawal rates and quantities
- Intake and pipeline review / approval
- Spill containment / backflow prevention
- Noise level requirements
- Erosion & Sediment Control