## 1-Substrate

### Best Types

<table>
<thead>
<tr>
<th>Pool</th>
<th>Riffle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bidrs/Slabs (10)</td>
<td>Hardpan (4)</td>
</tr>
<tr>
<td>Boulders (9)</td>
<td>Detritus (3)</td>
</tr>
<tr>
<td>Cobble (8)</td>
<td>Muck (2)</td>
</tr>
<tr>
<td>Gravel (7)</td>
<td>Silt (2)</td>
</tr>
<tr>
<td>Sand (6)</td>
<td>Artificial (0)</td>
</tr>
<tr>
<td>Bedrock (5)</td>
<td>None (1)</td>
</tr>
</tbody>
</table>

**Comments:**

- Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species:
- Estimate % or note every type present
- Indicate presence 0 to 3:
  - Recent or no recovery (1)
  - Recent (2)
  - Moderate (3)
  - High (4)

**Number of Best Types:** 4 or more (2), 3 or less (0)

### Comments

- Low - Fast (1)
- Simple (1)
- Very complex (10)
- Complex (1)

- Indicate for reach
- Check one in each category

## 2-Instream Cover

<table>
<thead>
<tr>
<th>Cover Type</th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Undercut banks (1)</td>
<td>0 0</td>
</tr>
<tr>
<td>Overhanging vegetation (1)</td>
<td>0 0</td>
</tr>
<tr>
<td>Shallows (in slow water) (1)</td>
<td>0 0</td>
</tr>
<tr>
<td>Rootmats (1)</td>
<td>None (0)</td>
</tr>
</tbody>
</table>

**Comments:**

- Indicate for reach
- Primary Contact
- Secondary Contact

## 3-Channel Morphology

### Sinuosity

- High (4)
- Moderate (3)
- Low (2)
- None (1)

### Development

- Excellent (7)
- Good (5)
- Fair (3)
- Poor (1)

**Comments:**

- Indicate primary contact
- Indicate secondary contact

## 4-Bank Erosion & Riparian Zone

### Erosion

- None or little (3)
- Moderate (2)
- Heavy/Severe (1)

### Riparian Width

<table>
<thead>
<tr>
<th>L</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>None or little (3)</td>
<td>Moderate (2)</td>
</tr>
<tr>
<td>Moderate (2)</td>
<td>Heavy/Severe (1)</td>
</tr>
</tbody>
</table>

### Flood Plain Quality

**Comments:**

- Indicate for individual reach:
- Very low - (2-4)
- Moderate (6-10)
- High - Very high (10-6)

## 5-Pool/ glide and riffle/run quality

### Maximum Depth

- >1m (6)
- 0.7-1m (4)
- 0.4-0.7m (2)
- 0.2-0.4m (1)

- <0.2m (0) (metric=0)

**Comments:**

- Indicate for functional riffles:
- Best areas must be large enough to support a population of riffle-obligate species:
- Check one in each category

## 6-Gradient

### Drainage Area

- 1.226 ft/ mi
- 164,931 mi²

**Comments:**

- Indicate for functional riffles:
- Best areas must be large enough to support a population of riffle-obligate species:
<table>
<thead>
<tr>
<th>A-CANOPY</th>
<th>B-AESTHETICS</th>
<th>C-MAINTENANCE</th>
<th>D-ISSUES</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;85% - Open</td>
<td>Nuisance algae</td>
<td>Public /</td>
<td>WWTP /</td>
</tr>
<tr>
<td>55%&lt;85%</td>
<td>Invasive macrophytes</td>
<td>Active /</td>
<td>Hardened /</td>
</tr>
<tr>
<td>30%&lt;55%</td>
<td>Excess turbidity</td>
<td>Young - Succession - Old</td>
<td>Contaminated /</td>
</tr>
<tr>
<td>10%&lt;30%</td>
<td>Discoloration</td>
<td>Spray /</td>
<td>BMPs – Construction – Sediment</td>
</tr>
<tr>
<td>&lt;10% - Closed</td>
<td>Foam/Scum</td>
<td>Modified /</td>
<td>Logging /</td>
</tr>
<tr>
<td>Canopy Upstream Reading</td>
<td>Oil sheen</td>
<td>Leveed /</td>
<td>Bank/</td>
</tr>
<tr>
<td>35 Right</td>
<td>Trash/Litter</td>
<td>Moving - Bedload – Stable</td>
<td>False bank /</td>
</tr>
<tr>
<td>63 Middle</td>
<td>Nuisance odor</td>
<td>Armoured</td>
<td>Wash H2O /</td>
</tr>
<tr>
<td></td>
<td>Sludge deposits</td>
<td>Islands /</td>
<td>Acid /</td>
</tr>
<tr>
<td></td>
<td>CSOs/SSOs/Outfalls</td>
<td>Relocated /</td>
<td>Natural /</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Impounded /</td>
<td>Park /</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Flood Control /</td>
<td>Atmosphere /</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Snag /</td>
<td>Agriculture /</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Stream Drawing

6/3/2014 13:25:38 PM OWQ Biological Studies QHEI (Qualitative Habitat Evaluation Index), Page 2 of 2
## 1-SUBSTRATE

### BEST TYPES

<table>
<thead>
<tr>
<th>Substrate</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bidrs/Slbs (10)</td>
<td>10%</td>
</tr>
<tr>
<td>Boulders (9)</td>
<td>9%</td>
</tr>
<tr>
<td>Cobble (8)</td>
<td>8%</td>
</tr>
<tr>
<td>Gravel (7)</td>
<td>7%</td>
</tr>
<tr>
<td>Sand (6)</td>
<td>6%</td>
</tr>
<tr>
<td>Bedrock (5)</td>
<td>5%</td>
</tr>
</tbody>
</table>

**COMMENTS**

- Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species:

### OTHER TYPES

<table>
<thead>
<tr>
<th>Substrate</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardpan (4)</td>
<td>4%</td>
</tr>
<tr>
<td>Detritus (3)</td>
<td>3%</td>
</tr>
<tr>
<td>Muck (2)</td>
<td>2%</td>
</tr>
<tr>
<td>Slit (2)</td>
<td>2%</td>
</tr>
<tr>
<td>Artificial (0)</td>
<td>0%</td>
</tr>
</tbody>
</table>

**COMMENTS**

- (Score natural substrates; ignore sludge from point-sources)

**NUMBER OF BEST TYPES:**

4 or more (2)

3 or less (0)

## 2-INSTREAM COVER

### AMOUNT

- Check ONE (or 2 & average)

**COVERAGE:**

- Extensive >75% (11)
- Moderate 25-75% (7)
- Sparse 5-25% (3)
- Nearly absent <5% (1)

**COMMENTS**

- Illustrate presence 0 to 3:
  - 0 - Absent
  - 1 - Very small amounts or if more common of marginal quality
  - 2 - Moderate amounts, but not of highest quality or in small amounts of highest quality
  - 3 - Highest quality in moderate or greater amounts

## 3-CHANNEL MORPHOLOGY

### AMOUNT

- Check ONE in each category (Or 2 & average)

**COVER:**

- Maximum 20

**CHANNEL:**

- Maximum 20

**COMMENTS**

- Illustrate presence 0 to 3:
  - 0 - Absent
  - 1 - Very small amounts or if more common of marginal quality
  - 2 - Moderate amounts, but not of highest quality or in small amounts of highest quality
  - 3 - Highest quality in moderate or greater amounts

## 4- BANK EROSION & RIPARIAN ZONE

### AMOUNT

- Check ONE in each category for EACH BANK (Or 2 per bank & average)

**RIPIANAR WIDTH:**

- Maximum 10

**FLOOD PLAIN QUALITY:**

- Maximum 10

**COMMENTS**

- Illustrate presence 0 to 3:
  - 0 - Absent
  - 1 - Very small amounts or if more common of marginal quality
  - 2 - Moderate amounts, but not of highest quality or in small amounts of highest quality
  - 3 - Highest quality in moderate or greater amounts

## 5-POOL/GLIDE AND RIFFLE/RUN QUALITY

### AMOUNT

- Check ONE (ONLY)

**POOLS/GLIDES:**

- Maximum 12

**RECREATION POTENTIAL:**

- Primary Contact
- Secondary Contact

**COMMENTS**

- Illustrate presence 0 to 3:
  - 0 - Absent
  - 1 - Very small amounts or if more common of marginal quality
  - 2 - Moderate amounts, but not of highest quality or in small amounts of highest quality
  - 3 - Highest quality in moderate or greater amounts

## 6-GRADIENT

**AMOUNT**

- Maximum 10

**COMMENTS**

- Illustrate presence 0 to 3:
  - 0 - Absent
  - 1 - Very small amounts or if more common of marginal quality
  - 2 - Moderate amounts, but not of highest quality or in small amounts of highest quality
  - 3 - Highest quality in moderate or greater amounts
## OWQ Biological Studies QHEI (Qualitative Habitat Evaluation Index)

### A-CANOPY
- **>85% - Open**: Nuisance algae, Excess turbidity
- **55%<85%**: Invasive macrophytes, Discoloration
- **30%<55%**: Oil sheen, Foam/Scum
- **10%<30%**: Nuisance odor, Sludge deposits
- **<10% - Closed**: Trash/Litter, Sludge deposits

### B-AESTHETICS
- **>85% - Open**: Public
- **55%<85%**: Active
- **30%<55%**: Young - Succession - Old
- **10%<30%**: Spray

### C-MAINTENANCE
- **>85% - Open**: Private / Both / NA
- **55%<85%**: Historic / Both / NA
- **30%<55%**: Removed
- **10%<30%**: Dipped out / NA

### D-ISSUES
- **>85% - Open**: WWTP / NPDES
- **55%<85%**: Hardened / Contaminated / BMPs
- **30%<55%**: Urban / Hardened / Contaminated
- **10%<30%**: Erosion / Manure / BMPs

Canopy Upstream Reading
- **Right**
- **Middle**
- **Left**

### Stream Drawing

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### 1-SUBSTRATE

**BEST TYPES**
- Bldrs/Slabs (10)
- Boulders (9)
- Cobble (8)
- Gravel (7)
- Sand (6)
- Bedrock (5)

**OTHER TYPES**
- Hardpan (4)
- Detritus (3)
- Muck (2)
- Slit (2)
- Artificial (0)

**TOTAL**

<table>
<thead>
<tr>
<th></th>
<th>POOL</th>
<th>RIFFLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bldrs/Slabs</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Boulders</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Cobble</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Gravel</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Sand</td>
<td>55</td>
<td>0</td>
</tr>
<tr>
<td>Bedrock</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

**NUMBER OF BEST TYPES:**
- 4 or more (2)
- 3 or less (0)

#### COMMENTS

**1-INSTREAM COVER**
- Undercut banks (1)
- Overhanging vegetation (1)
- Shallows (in slow water) (1)
- Rootmats (1)

**TOTAL**

<table>
<thead>
<tr>
<th></th>
<th>POOL</th>
<th>RIFFLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Undercut banks</td>
<td>15</td>
<td>1</td>
</tr>
<tr>
<td>Overhanging vegetation</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Shallows (in slow water)</td>
<td>40</td>
<td>1</td>
</tr>
<tr>
<td>Rootmats</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

**AMOUNT**
- Check ONE (or 2 & average)
- Extensive >75% (11)
- Moderate 25-75% (7)
- Sparse 5-25% (3)
- Nearly absent <5% (1)

#### 3-CHANNEL MORPHOLOGY

**CHANNELIZATION**
- None (6)
- Recovered (4)
- Recovering (3)
- Recent or no recovery (1)

**STABILITY**
- High (3)
- Moderate (2)
- Low (1)

**TOTAL**

<table>
<thead>
<tr>
<th></th>
<th>POOL</th>
<th>RIFFLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>Recovered</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Recovering</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Recent or no recovery</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

**AMOUNT**
- Check ONE (Or 2 & average)
- Extensive >75% (11)
- Moderate 25-75% (7)
- Sparse 5-25% (3)
- Nearly absent <5% (1)

#### 4- BANK EROSION & RIPARIAN ZONE

**RIPARIAN WIDTH**
- None or little (3)
- Moderate (2)
- Heavy/Severe (1)

**FLOOD PLAIN QUALITY**
- Forest, Swamp (3)
- Shrub or Old field (2)
- Residential, Park, New field (1)
- Fenced pasture (1)
- Open Pasture/Rowcrop (0)

**AMOUNT**
- Check ONE in each category for EACH BANK (Or 2 per bank & average)
- Conservation Tillage (1)
- Mining, construction (0)
- Indicate predominant land use(s) past 100m riparian.

#### 5-POOL/GLIDE AND RIFFLE/RUN QUALITY

**MAXIMUM DEPT**
- >1m (6)
- 0.7-<1m (4)
- 0.4-<0.7m (2)
- 0.2-<0.4m (1)
- <0.2m (0)

**CHANNEL WIDTH**
- Pool width > riffle width (2)
- Pool width = riffle width (1)
- Pool width < riffle width (0)

**CURRENT VELOCITY**
- Torrential (-1)
- Slow (1)
- Very Fast (1)
- Intertidal (-1)
- Fast (1)
- Intermittent (-2)
- Moderate (1)
- Eddies (1)

**RECREATION POTENTIAL**
- Primary Contact
- Secondary Contact

**AMOUNT**
- Check ONE (ONLY)
- No Riffle (metric=0)

#### 6-GRADIENT

**DRAINAGE AREA**
- 3.917 ft/mi
- 5.350 mi²

**AMOUNT**
- Ely Very Low – Low (2-4)
- Moderate (6-10)
- High – Very high (10-6)

---

**QHEI Score:** 40

**Habitat Complete**
<table>
<thead>
<tr>
<th>A-CANOPY</th>
<th>B-AESTHETICS</th>
<th>C-MAINTENANCE</th>
<th>D-ISSUES</th>
</tr>
</thead>
<tbody>
<tr>
<td>♦ &gt;85% - Open</td>
<td>◇ Nuisance algae</td>
<td>◇ Public /</td>
<td>◇ WWTP /</td>
</tr>
<tr>
<td>♦ 55%&lt;85%</td>
<td>◇ Invasive macrophytes</td>
<td>◇ Active /</td>
<td>◇ Hardened /</td>
</tr>
<tr>
<td>♦ 30%&lt;55%</td>
<td>◇ Excess turbidity</td>
<td>◇ Young - Succession - Old</td>
<td>◇ Contaminated /</td>
</tr>
<tr>
<td>♦ 10%&lt;30%</td>
<td>◇ Discoloration</td>
<td>◇ Spray /</td>
<td>◇ BMPs – Construction – Sediment</td>
</tr>
<tr>
<td>♦ &lt;10% - Closed</td>
<td>◇ Foam/Scum</td>
<td>◇ Modified /</td>
<td>◇ Logging /</td>
</tr>
<tr>
<td>Canopy Upstream Reading</td>
<td>◇ Oil sheen</td>
<td>◇ Leveed /</td>
<td>◇ Bank/</td>
</tr>
<tr>
<td>Right</td>
<td>◇ Trash/Litter</td>
<td>◇ Moving - Bedload – Stable</td>
<td>◇ False bank /</td>
</tr>
<tr>
<td>89 Middle</td>
<td>◇ Nuisance odor</td>
<td></td>
<td>◇ Wash H2O /</td>
</tr>
<tr>
<td></td>
<td>◇ Sludge deposits</td>
<td>◇ Islands /</td>
<td>◇ Acid /</td>
</tr>
<tr>
<td></td>
<td>CSOs/SSOs/Outfalls</td>
<td>◇ Relocated /</td>
<td>◇ Natural /</td>
</tr>
<tr>
<td></td>
<td></td>
<td>◇ Impounded /</td>
<td>◇ Park /</td>
</tr>
<tr>
<td></td>
<td></td>
<td>◇ Flood Control /</td>
<td>◇ Atmosphere /</td>
</tr>
<tr>
<td></td>
<td></td>
<td>◇ Snag /</td>
<td>◇ Agriculture /</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>◇ Data Paucity</td>
</tr>
</tbody>
</table>

Stream Drawing
### 1-SUBSTRATE
**BEST TYPES**
- ☐ Bidirs/Slabs (10)
- ☐ Boulders (9)
- ☐ Cobble (8)
- ☐ Gravel (7)
- ☐ Sand (6)
- ☐ Bedrock (5)

**OTHER TYPES**
- ☐ Hardpan (4)
- ☐ Detritus (3)
- ☐ Muck (2)
- ☐ Silt (2)
- ☐ Artificial (0)

**TOTAL**
- 20

**POOL**
- 0

**RIFFE**
- 10

**COMMENTS**
- Estimate % or note every type present
- Check ONE (or 2 & average)

### 2-INSTREAM COVER
- 0: Absent
- 1: Very small amounts or if more common of marginal quality
- 2: Moderate amounts, but not of highest quality or in small amounts of highest quality
- 3: Highest quality in moderate or greater amounts (e.g., very large boulders in deep or fast water, large diameter log that is stable, well developed rootwad in deep / fast water, or deep, well-defined, functional pools.

<table>
<thead>
<tr>
<th>AMOUNT</th>
<th>CHECK ONE (OR 2 &amp; AVERAGE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extensive &gt;75%</td>
<td>11</td>
</tr>
<tr>
<td>Moderate 25-75%</td>
<td>7</td>
</tr>
<tr>
<td>Sparse 5-25%</td>
<td>3</td>
</tr>
<tr>
<td>Nearly absent &lt;5%</td>
<td>1</td>
</tr>
</tbody>
</table>

### 3-CHANNEL MORPHOLOGY
- **SINUOSITY**
  - High (4)
  - Moderate (3)
  - Low (2)
  - None (1)

- **DEVELOPMENT**
  - Excellent (7)
  - Good (5)
  - Fair (3)
  - Poor (1)

- **CHANNELIZATION**
  - None (6)
  - Recovered (4)
  - Recovering (3)
  - Recent or no recovery (1)

- **STABILITY**
  - High (3)
  - Moderate (2)
  - Low (1)

### 4- BANK EROSION & RIPARIAN ZONE
- **RIPIARAN WIDTH**
  - None or little (3)
  - Moderate (2)
  - Heavy/Severe (1)

- **FLOOD PLAIN QUALITY**
  - Forest, Swamp (3)
  - Shrub or Old field (2)
  - Residential, Park, New field (1)
  - Fenced pasture (1)
  - Open Pasture/Rowcrop (0)

### 5-POOL/GLIDE AND RIFFLE/RUN QUALITY
- **MAXIMUM DEPTH**
  - >1m (6)
  - 0.7-1m (4)
  - 0.4-0.7m (2)
  - 0.2-0.4m (1)
  - <0.2m (0)

- **CHANNEL WIDTH**
  - Pool width > riffle width (2)
  - Pool width = riffle width (1)
  - Pool width < riffle width (0)

- **CURRENT VELOCITY**
  - Torrential (-1)
  - Slow (1)
  - Very Fast (1)
  - Intertidal (-1)
  - Fast (1)
  - Intermittent (-2)
  - Moderate (1)
  - Eddies (1)

### 6-GRADIENT
- **DRAINAGE AREA**
  - 1.226 ft/ml
  - 150.342 mi²

- **CURRENT VELOCITY**
  - Very low – Low (2-4)
  - Moderate (6-10)
  - High – Very high (10-6)

- **RECREATION POTENTIAL**
  - Primary Contact
  - Secondary Contact

- **No Riffle** (metric=0)

- **COMMENTS**
  - Indicate predominant land use(s) past 100m riparian.

### QHEI Score:
- 55
<table>
<thead>
<tr>
<th>A-CANOPY</th>
<th>B-AESTHETICS</th>
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<th>D-ISSUES</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;85% - Open</td>
<td>Nuisance algae</td>
<td>Public / Private / Both / NA</td>
<td>WWTP / NPDES / CSO /</td>
</tr>
<tr>
<td>55%&lt;85%</td>
<td>Invasive macrophytes</td>
<td>Active / Historic / Both / NA</td>
<td>Hardened / Urban / Dirt &amp; Grime</td>
</tr>
<tr>
<td>30%&lt;55%</td>
<td>Excess turbidity</td>
<td>Young - Succession - Old</td>
<td>Contaminated / Landfill</td>
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<td>Spray / Removed</td>
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<td>&lt;10% - Closed</td>
<td>Foam/Scum</td>
<td>Modified / Dipped out / NA</td>
<td>Logging / Irrigation / Cooling</td>
</tr>
<tr>
<td>Canopy Upstream Reading</td>
<td>Oil sheen</td>
<td>Leveed / One sided</td>
<td>Bank/ Erosion / Surface</td>
</tr>
<tr>
<td>19 Right</td>
<td>Trash/Litter</td>
<td>Moving - Bedload – Stable</td>
<td>False bank / Manure / Lagoon</td>
</tr>
<tr>
<td>58 Middle</td>
<td>Nuisance odor</td>
<td>Armoured</td>
<td>Wash H2O / Tile / Quarry</td>
</tr>
<tr>
<td>CSOs/SSOs/Outfalls</td>
<td>Sludge deposits</td>
<td>Islands / Scoured</td>
<td>Acid / Mine / Stagnant</td>
</tr>
<tr>
<td>37 Left</td>
<td>CSOs/SSOs/Outfalls</td>
<td>Relocated / Cutoffs</td>
<td>Natural / Wetlands / Lawn</td>
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<tr>
<td></td>
<td></td>
<td>Impounded / Desiccated</td>
<td>Park / Golf / Home</td>
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<tr>
<td></td>
<td></td>
<td>Flood Control / Drainage</td>
<td>Atmosphere / Data Paucity</td>
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<tr>
<td></td>
<td></td>
<td>Snag /</td>
<td>Agriculture / Livestock</td>
</tr>
</tbody>
</table>

Stream Drawing
### 1-SUBSTRATE

**BEST TYPES**

<table>
<thead>
<tr>
<th>Substrate Type</th>
<th>Total</th>
<th>Pool</th>
<th>Riffle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bidts/Slbs (10)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boulders (9)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cobble (8)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Gravel (7)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sand (6)</td>
<td>20</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Bedrock (5)</td>
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</tbody>
</table>

**OTHER TYPES**

<table>
<thead>
<tr>
<th>Substrate Type</th>
<th>Total</th>
<th>Pool</th>
<th>Riffle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardpan (4)</td>
<td>20</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Detritus (3)</td>
<td>15</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Muck (2)</td>
<td>35</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Artificial (0)</td>
<td>10</td>
<td>x</td>
<td></td>
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</tbody>
</table>

**COMMENTS**

- Check ONE (or 2 & average)
- Estmate % or note type present
- Check 2-INSTREAM COVER

### 2-INSTREAM COVER

**AMOUNT**

- Heavy -2 (1)
- Moderate -1 (2)
- Normal (0)
- Free (1)

**COMMENTS**

- Indicate presence 0 to 3: 0-Absent; 1-Very small amounts or if more common of marginal quality; 2-Moderate amounts, but not of highest quality or in small amounts of highest quality; 3-Highest quality in moderate or greater amounts (e.g., very large boulders in deep or fast water, large diameter log that is stable, well developed rootwad in deep / fast water, or deep, well-defined, functional pools.

### 3-COMMENTARY

**AMOUNT**

- Extensive >75% (1)
- Moderate 25-75% (7)
- Sparse 5-25% (3)
- Nearly absent <5% (1)

### 4-BANK EROSION & RIPARIAN ZONE

**RIPARIAN WIDTH**

<table>
<thead>
<tr>
<th>EROSION</th>
<th>L</th>
<th>R</th>
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<tbody>
<tr>
<td>None or little</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Moderate</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Heavy/Severe</td>
<td></td>
<td>1</td>
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</table>

**FLOOD PLAIN QUALITY**

<table>
<thead>
<tr>
<th>CHANNELIZATION</th>
<th>STABILITY</th>
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</thead>
<tbody>
<tr>
<td>None (6)</td>
<td>High (3)</td>
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<tr>
<td>Recovered (4)</td>
<td>Moderate (2)</td>
</tr>
<tr>
<td>Recovering (3)</td>
<td>Low (1)</td>
</tr>
<tr>
<td>Recent or no recovery (1)</td>
<td></td>
</tr>
</tbody>
</table>

**COMMENTS**

- Indicate predominant land use(s) past 100m riparian.

### 5-POOL/GLIDE AND RIFFLE/RUN QUALITY

**MAXIMUM DEPTH**

- >1m (6)
- 0.7-1m (4)
- 0.4-0.7m (2)
- 0.2-0.4m (1)
- <0.2m (0) (metric=0)

**CURRENT VELOCITY**

- Torrential (-1)
- Slow (1)
- Very Fast (1)
- Interstitial (-1)
- Fast (1)
- Intermittent (-2)
- Mod. Stable (e.g. large gravel) (1)
- Eddies (1)

**RECREATION POTENTIAL**

- Primary Contact
- Secondary Contact

**COMMENTS**

- Indicate functional riffles; Best areas must be large enough to support a population of riffle-obligate species.

### 6-GRADIENT

**DRAINAGE AREA**

- 1,388 ft²
- 150,171 mi²

**COMMENTS**

- Very low – Low (2-4)
- Moderate (6-10)
- High – Very high (10-6)

### QHEI Score:

- 44
<table>
<thead>
<tr>
<th>A-CANOPY</th>
<th>B-AESTHETICS</th>
<th>C-MAINTENANCE</th>
<th>D-ISSUES</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;85% - Open</td>
<td>Nuisance algae</td>
<td>Public /</td>
<td>WWTP /</td>
</tr>
<tr>
<td>55%-&lt;85%</td>
<td>Invasive macrophytes</td>
<td>Active /</td>
<td>Hardened /</td>
</tr>
<tr>
<td>30%-&lt;55%</td>
<td>Excess turbidity</td>
<td>Young - Succession - Old</td>
<td>Contaminated /</td>
</tr>
<tr>
<td>10%-&lt;30%</td>
<td>Discoloration</td>
<td>Spray /</td>
<td>BMPs – Construction – Sediment</td>
</tr>
<tr>
<td>&lt;10% - Closed</td>
<td>Nuisance algae</td>
<td>Modified /</td>
<td>Logging /</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Leveed /</td>
<td>Bank /</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Moving - Bedload – Stable</td>
<td>False bank /</td>
</tr>
<tr>
<td></td>
<td>Oil sheen</td>
<td>Armoured</td>
<td>Wash H2O /</td>
</tr>
<tr>
<td></td>
<td>Trash/Litter</td>
<td>Islands /</td>
<td>Acid /</td>
</tr>
<tr>
<td></td>
<td>Nuisance odor</td>
<td>Relocated /</td>
<td>Natural /</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Impounded /</td>
<td>Park /</td>
</tr>
<tr>
<td></td>
<td>Sludge deposits</td>
<td>Flood Control /</td>
<td>Atmosphere /</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Snag /</td>
<td>Agriculture /</td>
</tr>
<tr>
<td></td>
<td>CSOs/SSOs/Outfalls</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Canopy Upstream Reading
- 93 Right
- 100 Middle
- 33 Left

Stream Drawing
Sample # | bioSample # | Stream Name | Location |
--- | --- | --- | --- |
AB11725 | 130722301 | Tributary of Deep River | Shelby Street |

Surveyor | Sample Date | County | Macro Sample Type | QHEI Score: |
--- | --- | --- | --- | --- |
PDM | 7/22/13 | Lake | MHB | 34 |

1-SUBSTRATE

**BEST TYPES**

- Biots/Slabs (10)
- Boulders (9)
- Cobble (8)
- Gravel (7)
- Sand (6)
- Bedrock (5)

**TOTAL** | **POOL** | **RIFFLE**
--- | --- | ---
| 10 | x | x |

**OTHER TYPES**

- Hardpan (4)
- Detritus (3)
- Muck (2)
- Slit (2)
- Artificial (0)

**TOTAL** | **POOL** | **RIFFLE**
--- | --- | ---
| 10 | x | x |

**COMMENTS**

- Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species:
- (Score natural substrates; ignore sludge from point-sources)

2-INSTREAM COVER

- Indicate presence 0 to 3: 0-Absent; 1-Very small amounts or if more common of marginal quality; 2-Moderate amounts, but not of highest quality or in small amounts of highest quality; 3-Highest quality in moderate or greater amounts (e.g., very large boulders in deep or fast water, large diameter log that is stable, well developed rootwad in deep / fast water, or deep, well-defined, functional pools).

<table>
<thead>
<tr>
<th>Code</th>
<th>Substrate</th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Undercut banks (1)</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>Pools &gt; 70cm (2)</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>Rootwads (1)</td>
<td>10</td>
</tr>
<tr>
<td>0</td>
<td>Shallows (in slow water) (1)</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>Rootmats (1)</td>
<td>20</td>
</tr>
</tbody>
</table>

**COMMENTS**

- Indicate predominant land use(s)

3-CHANNEL MORPHOLOGY

**SINUOSITY**

- High (4)
- Moderate (3)
- Low (2)
- None (1)

**DEVELOPMENT**

- Excellent (7)
- Good (5)
- Fair (3)
- Poor (1)

**CHANNELIZATION**

- None (6)
- Recovered (4)
- Recovering (3)
- Recent or no recovery (1)

**STABILITY**

- None (6)
- Moderate (2)
- Low (1)

**COMMENTS**

- Indicate predominant land use(s)

4- BANK EROSION & RIPARIAN ZONE

- Check ONE in each category for EACH BANK (Or 2 per bank & average)

<table>
<thead>
<tr>
<th>Code</th>
<th>L</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>None or little (3)</td>
<td>Moderate (2)</td>
</tr>
<tr>
<td>0</td>
<td>Heavy/Severe (1)</td>
<td>Moderate (2)</td>
</tr>
<tr>
<td>0</td>
<td>None or little (3)</td>
<td>Moderate (2)</td>
</tr>
<tr>
<td>0</td>
<td>Heavy/Severe (1)</td>
<td>None (0)</td>
</tr>
</tbody>
</table>

**COMMENTS**

- Indicate predominant land use(s)

5- POOL/GLIDE AND RIFFLE/RUN QUALITY

<table>
<thead>
<tr>
<th>Code</th>
<th>MAXIMUM DEPTH</th>
<th>CHANNEL WIDTH</th>
<th>CURRENT VELOCITY</th>
<th>RECREATION POTENTIAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>&gt;1m (6)</td>
<td>Pool width &gt; riffle width (2)</td>
<td>Torrential (-1)</td>
<td>Primary Contact</td>
</tr>
<tr>
<td>0</td>
<td>0.7-&lt;1m (4)</td>
<td>Pool width = riffle width (1)</td>
<td>Very Fast (1)</td>
<td>Secondary Contact</td>
</tr>
<tr>
<td>0</td>
<td>0.4-&lt;0.7m (2)</td>
<td>Pool width &lt; riffle width (0)</td>
<td>Fast (1)</td>
<td>(circle one and comment on back)</td>
</tr>
<tr>
<td>0</td>
<td>&lt;0.2m (0)</td>
<td>Moderate (1)</td>
<td>Intermittent (-2)</td>
<td></td>
</tr>
</tbody>
</table>

**COMMENTS**

- Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species:

<table>
<thead>
<tr>
<th>Code</th>
<th>Effectiveness</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No Riffle (metric=0)</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Code</th>
<th>POOL/Current</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Maximum 10</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Code</th>
<th>RUN Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Maximum 10</td>
</tr>
</tbody>
</table>

6-GRADIENT

- Very low – Low (2-4) | % POOL: 40 | % GLIDE: #$
- Moderate (6-10) | % RUN: 60 | % RIFFLE: #$
- High – Very high (10-6) | | |

**COMMENTS**

- Indicate predominant land use(s)

- Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species:
## OWQ Biological Studies QHEI (Qualitative Habitat Evaluation Index)

**Circle some & COMMENT**

<table>
<thead>
<tr>
<th>A-CANOPY</th>
<th>B-AESTHETICS</th>
<th>C-MAINTENANCE</th>
<th>D-ISSUES</th>
</tr>
</thead>
<tbody>
<tr>
<td>◇ &gt;85% - Open</td>
<td>◇ Nuisance algae</td>
<td>◇ Public /</td>
<td>◇ WWTP /</td>
</tr>
<tr>
<td>◇ 55%&lt;85%</td>
<td>◇ Invasive macrophytes</td>
<td>◇ Active /</td>
<td>◇ Hardened /</td>
</tr>
<tr>
<td>◇ 30%&lt;55%</td>
<td>◇ Excess turbidity</td>
<td>◇ Young - Succession - Old</td>
<td>◇ Contaminated /</td>
</tr>
<tr>
<td>◇ 10%&lt;30%</td>
<td>◇ Discoloration</td>
<td>◇ Spray /</td>
<td>◇ BMPs – Construction – Sediment</td>
</tr>
<tr>
<td>◇ &lt;10% - Closed</td>
<td>◇ Foam/Scum</td>
<td>◇ Modified /</td>
<td>◇ Logging /</td>
</tr>
<tr>
<td>Canopy Upstream Reading</td>
<td>◇ Oil sheen</td>
<td>◇ Leveed /</td>
<td>◇ Bank/</td>
</tr>
<tr>
<td>Right</td>
<td>◇ Trash/Litter</td>
<td>◇ Moving - Bedload – Stable</td>
<td>◇ False bank /</td>
</tr>
<tr>
<td>0 Middle</td>
<td>◇ Nuisance odor</td>
<td>◇ Armoured</td>
<td>◇ Wash H2O /</td>
</tr>
<tr>
<td>CSOs/SSOs/Outfalls</td>
<td>◇ Sludge deposits</td>
<td>◇ Islands /</td>
<td>◇ Acid /</td>
</tr>
<tr>
<td>◇ Flood Control /</td>
<td>◇ CSOs/SSOs/Outfalls</td>
<td>◇ Relocated /</td>
<td>◇ Natural /</td>
</tr>
<tr>
<td>◇ Snag /</td>
<td></td>
<td>◇ Impounded /</td>
<td>◇ Park /</td>
</tr>
<tr>
<td></td>
<td></td>
<td>◇ Flood Control /</td>
<td>◇ Atmosphere /</td>
</tr>
<tr>
<td></td>
<td></td>
<td>◇ Snag /</td>
<td>◇ Agriculture /</td>
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</tbody>
</table>

**Stream Drawing**

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6/3/2014 13:25:38 PM OWQ Biological Studies QHEI (Qualitative Habitat Evaluation Index), Page 2 of 2
<table>
<thead>
<tr>
<th>Sample #</th>
<th>bioSample #</th>
<th>Stream Name</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>AB11726</td>
<td>130723101</td>
<td>Deep River</td>
<td>Ridge Rd, D/S of Lake George Dam, Hobart</td>
</tr>
</tbody>
</table>

### 1-SUBSTRATE

**BEST TYPES**

<table>
<thead>
<tr>
<th>BioSample</th>
<th>Stream Name</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>AB11726</td>
<td>Deep River</td>
<td>Ridge Rd, D/S of Lake George Dam, Hobart</td>
</tr>
</tbody>
</table>

**TOTAL**

- **POOL**
  - Bidrs/Slabs (10)
  - Boulders (9)
  - Cobble (8)
  - Gravel (7)
  - Sand (6)
  - Bedrock (5)

**RIFFLE**

- Hardpan (4)
- Detritus (3)
- Muck (2)
- Silt (2)
- Artificial (0)

**ORIGIN QUALITY**

- Limestone (1)
- Tills (1)
- Wetlands (0)
- Hardpan (0)
- Sandstone (0)
- Rip/Rap (0)
- Lacustrine (0)
- Shale (0)
- Coal fines (0)

**NUMBER OF BEST TYPES:**

- 4 or more (2)
- 3 or less (0)

**COMMENTS**

- Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species.

### 2-STREAM COVER

**AMOUNT**

- Check ONE (or 2 & average)
  - Extensive >75% (11)
  - Moderate 25-75% (7)
  - Sparse 5-<25% (3)
  - Nearly absent <5% (1)

**COMMENTS**

- Check ONE in each category (Or 2 & average)
  - Undercut banks (1)
  - Overhanging vegetation (1)
  - Shallows (in slow water) (1)
  - Rootmats (1)

### 3-CHANNEL MORPHOLOGY

**SINUOSITY**

- High (4)
- Moderate (3)
- Low (2)
- None (1)

**DEVELOPMENT**

- Excellent (7)
- Good (5)
- Fair (3)
- Poor (1)

**CHANNELIZATION**

- None (6)
- Recovered (4)
- Recovering (3)
- Recent or no recovery (1)

**STABILITY**

- High (3)
- Moderate (2)
- Low (1)

**AMOUNT**

- Check ONE (or 2 & average)
  - Extensive >75% (11)
  - Moderate 25-75% (7)
  - Sparse 5-<25% (3)
  - Nearly absent <5% (1)

**COMMENTS**

- Check ONE in each category (Or 2 & average)
  - Oxbows, Backwaters (1)
  - Aquatic macrophytes (1)
  -Logs and woody debris (1)

### 4- BANK EROSION & RIPARIAN ZONE

**AMOUNT**

- Conservation Tillage (1)
- Mining, construction (0)

**COMMENTS**

- Indicate predominant land use(s) past 100m riparian.

### 5-POOL/GLIDE AND RIFFLE/RUN QUALITY

**CURRENT VELOCITY**

- Torrential (-1)
- Slow (1)
- Very Fast (1)
- Intertidal (-1)
- Fast (1)
- Intermittent (-2)
- Moderate (1)
- Eddies (1)

**RECREATION POTENTIAL**

- Primary Contact
  - Secondary Contact (circle one and comment on back)

- No Riffle (metric=0)

**COMMENTS**

- Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species.

### 6-GRADIENT

**AMOUNT**

- Primary Contact
  - Secondary Contact (circle one and comment on back)

**COMMENTS**

- No Riffle (metric=0)
<table>
<thead>
<tr>
<th>A-CANOPY</th>
<th>B-AESTHETICS</th>
<th>C-MAINTENANCE</th>
<th>D-ISSUES</th>
</tr>
</thead>
<tbody>
<tr>
<td>◇ &gt;85% - Open</td>
<td>◇ Nuisance algae</td>
<td>◇ Public / private</td>
<td>◇ WWTP / NPDES</td>
</tr>
<tr>
<td>◇ 55%&lt;85%</td>
<td>◇ Invasive macrophytes</td>
<td>◇ Active / historic</td>
<td>◇ Hardened / urban</td>
</tr>
<tr>
<td>◇ 30%&lt;55%</td>
<td>◇ Excess turbidity</td>
<td>◇ Young - succession / old</td>
<td>◇ Contaminated / landfill</td>
</tr>
<tr>
<td>◇ 10%&lt;30%</td>
<td>◇ Discoloration</td>
<td>◇ Spray / removed</td>
<td>◇ BMPs - construction / sediment</td>
</tr>
<tr>
<td>◇ &lt;10% - Closed</td>
<td>◇ Foam/Scum</td>
<td>◇ Modified / one sided</td>
<td>◇ Logging / irrigation</td>
</tr>
<tr>
<td>Canopy Upstream Reading</td>
<td>Trash/Litter</td>
<td>◇ Leveed / dipping out / NA</td>
<td>◇ Bank / erosion</td>
</tr>
<tr>
<td>35 Right</td>
<td>◇ Nuisance odor</td>
<td>◇ Moving - bedload / stable</td>
<td>◇ False bank / manure</td>
</tr>
<tr>
<td>60 Middle</td>
<td>◇ Sludge deposits</td>
<td>◇ Islands / scoured</td>
<td>◇ Wash H2O / tile</td>
</tr>
<tr>
<td>37 Left</td>
<td>◇ CSOs/SSOs/Outfalls</td>
<td>◇ Relocated / cutoffs</td>
<td>◇ Acid / mine</td>
</tr>
<tr>
<td></td>
<td></td>
<td>◇ Impounded / desiccated</td>
<td>◇ Natural / wetlands</td>
</tr>
<tr>
<td></td>
<td></td>
<td>◇ Flood Control / drainage</td>
<td>◇ Park / golf</td>
</tr>
<tr>
<td></td>
<td></td>
<td>◇ Snag /</td>
<td>◇ Atmosphere / data paucity</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>◇ Agriculture / livestock</td>
</tr>
</tbody>
</table>

*Stream Drawing*
<table>
<thead>
<tr>
<th>Sample #</th>
<th>bioSample #</th>
<th>Stream Name</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>AB11727</td>
<td>130723102</td>
<td>Duck Creek</td>
<td>Front Street</td>
</tr>
</tbody>
</table>

**Surveyor** | **Sample Date** | **County** | **Macro Sample Type** | **QHEI Score:** |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>KJC</td>
<td>7/23/13</td>
<td>Lake</td>
<td>MHAB</td>
<td>31</td>
</tr>
</tbody>
</table>

### 1-SUBSTRATE

**BEST TYPES**

- **Bidrs/Slabs (10)**
- **Boulders (9)**
- **Cobble (8)**
- **Gravel (7)**
- **Sand (6)**
- **Bedrock (5)**

**TOTAL** | **POOL** | **RIFFLE** | **TOTAL** | **POOL** | **RIFFLE** |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**OTHER TYPES**

- **Limestone (1)**
- **Tills (1)**
- **Wetlands (0)**
- **Hardpan (0)**
- **Sandstone (0)**
- **Rip/Rap (0)**
- **Lacustrine (0)**
- **Shale (1)**
- **Coal fines (2)**

**Substrate**

- **Silt**
  - **Heavy (-2)**
  - **Moderate (-1)**
  - **Normal (0)**
  - **Free (1)**
  - **Extensive (-2)**
  - **Moderate (-1)**
  - **Normal (0)**
  - **None (1)**

**Check ONE (or 2 & average)**

**ORIGIN**

**QUALITY**

**NUMBER OF BEST TYPES:** 4 or more (2) or 3 or less (0)

### 2-INSTREAM COVER

**Indicate presence 0 to 3: 0-Absent; 1-Very small amounts or if more common of marginal quality; 2-Moderate amounts, but not of highest quality or in small amounts of highest quality; 3-Highest quality in moderate or greater amounts (e.g., very large boulders in deep or fast water, large diameter log that is stable, well developed rootwad in deep / fast water, or deep, well-defined, functional pools).**

<p>| | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Undercut banks (1)</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Overhanging vegetation (1)</td>
<td>0</td>
<td>0</td>
<td>20</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Shallows (in slow water) (1)</td>
<td>0</td>
<td>0</td>
<td>20</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

**COMMENTS**

### 3-CHANNEL MORPHOLOGY

**Check ONE in each category (Or 2 & average)**

<table>
<thead>
<tr>
<th>SINUOSITY</th>
<th>DEVELOPMENT</th>
<th>CHANNELIZATION</th>
<th>STABILITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>High (4)</td>
<td>Excellent (7)</td>
<td>None (6)</td>
<td>High (3)</td>
</tr>
<tr>
<td>Moderate (3)</td>
<td>Good (5)</td>
<td>Recovered (4)</td>
<td>Moderate (2)</td>
</tr>
<tr>
<td>Low (2)</td>
<td>Fair (3)</td>
<td>Recovering (3)</td>
<td>Low (1)</td>
</tr>
<tr>
<td>None (1)</td>
<td>Poor (1)</td>
<td>Recent or no recovery (1)</td>
<td>None (1)</td>
</tr>
</tbody>
</table>

**AMOUNT**

- **Check ONE (or 2 & average)**
  - **Extensive >75% (11)**
  - **Moderate 25-75% (7)**
  - **Sparse 5-25% (3)**
  - **Nearly absent <5% (1)**

### 4- BANK EROSION & RIPARIAN ZONE

**Check ONE in each category for EACH BANK (Or 2 per bank & average)**

<table>
<thead>
<tr>
<th>EROSION</th>
<th>RIPARIAN WIDTH</th>
<th>FLOOD FLAIN QUALITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>L R</td>
<td>L R</td>
<td>L R</td>
</tr>
<tr>
<td>None or little (3)</td>
<td>Wide &gt;50m (4)</td>
<td>Forest Swamp (3)</td>
</tr>
<tr>
<td>Moderate (2)</td>
<td>Moderate 10-50m (3)</td>
<td>Shrub or Old field (2)</td>
</tr>
<tr>
<td>Heavy/Severe (1)</td>
<td>Narrow 5-10m (2)</td>
<td>Residential, Park, New field (1)</td>
</tr>
<tr>
<td></td>
<td>Very narrow &lt;5m (1)</td>
<td>Fenced pasture (1)</td>
</tr>
<tr>
<td></td>
<td>None (0)</td>
<td>Open Pasture/Rowcrop (0)</td>
</tr>
</tbody>
</table>

**COMMENTS**

### 5-POOL/GLIDE AND RIFFLE/RUN QUALITY

**MAXIMUM DEPTH**

- **Check ONE (ONLY!)
  - >1m (6)
  - 0.7-1m (4)
  - 0.4-0.7m (2)
  - 0.2-0.4m (1)
  - <0.2m (0) (metric=0)

**CHANNEL WIDTH**

- **Check ONE (or 2 & average)
  - Pool width > riffle width (2)
  - Pool width = riffle width (1)
  - Pool width < riffle width (0)

**CURRENT VELOCITY**

- **Check ALL that apply
  - Torrential (-1)
  - Slow (1)
  - Very Fast (1)
  - Intermittent (-2)
  - Fast (1)
  - Moderate (1)
  - Eddies (1)

**RECREATION POTENTIAL**

- **Primary Contact (1)**
- **Secondary Contact (2)**

**Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species:**

- **No Riffle (metric=0)**

**MAXIMUM DEPTH**

- **Check ONE (ONLY!)
  - Best Areas >10cm (2)
  - Best Areas 5-10cm (1)
  - Best Areas <5cm (metric=0)

**RUN DEPTH**

- **Check ONE (or 2 & average)
  - Maximum >50cm (2)
  - Maximum <50cm (1)

**RIFFLE DEPTH**

- **Check ONE
  - Stable (e.g. cobble, boulder) (2)
  - Mod. Stable (e.g. large gravel) (1)
  - Unstable (e.g. sand, fine gravel) (0)

**COMMENTS**

### 6-GRADIENT

**DRAINAGE AREA**

- **(1,302 ft/mi)
  - Very low – Low (2-4)
  - Moderate (6-10)
  - High – Very high (10-6)

- **% POOL: 50 % GLIDE: #
  - % RUN: 50 % RIFFLE: #

**Gradient**

- **Maximum (10)**

---

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<table>
<thead>
<tr>
<th>A-CANOPY</th>
<th>B-AESTHETICS</th>
<th>C-MAINTENANCE</th>
<th>D-ISSUES</th>
</tr>
</thead>
<tbody>
<tr>
<td>◇ &gt;85% - Open</td>
<td>◇ Nuisance algae</td>
<td>◇ Public /</td>
<td>◇ WWTP /</td>
</tr>
<tr>
<td>◇ 55%&lt;85%</td>
<td>◇ Invasive macrophytes</td>
<td>◇ Active /</td>
<td>◇ Hardened /</td>
</tr>
<tr>
<td>◇ 30%&lt;55%</td>
<td>◇ Excess turbidity</td>
<td>◇ Young - Succession - Old</td>
<td>◇ Contaminated /</td>
</tr>
<tr>
<td>◇ 10%&lt;30%</td>
<td>◇ Discoloration</td>
<td>◇ Spray /</td>
<td>◇ BMPs – Construction – Sediment</td>
</tr>
<tr>
<td>◇ &lt;10% - Closed</td>
<td>◇ Foam/Scum</td>
<td>◇ Modified /</td>
<td>◇ Logging /</td>
</tr>
<tr>
<td>Canopy Upstream Reading</td>
<td>◇ Oil sheen</td>
<td>◇ Leveed /</td>
<td>◇ Bank/</td>
</tr>
<tr>
<td>Right</td>
<td>◇ Trash/Litter</td>
<td>◇ Moving - Bedload – Stable</td>
<td>◇ False bank /</td>
</tr>
<tr>
<td>Middle</td>
<td>◇ Nuisance odor</td>
<td>◇ Armoured</td>
<td>◇ Wash H2O /</td>
</tr>
<tr>
<td>Left</td>
<td>◇ Sludge deposits</td>
<td>◇ Islands /</td>
<td>◇ Acid /</td>
</tr>
<tr>
<td></td>
<td>◇ CSOs/SSOs/Outfalls</td>
<td>◇ Relocated /</td>
<td>◇ Natural /</td>
</tr>
<tr>
<td></td>
<td></td>
<td>◇ Impounded /</td>
<td>◇ Park /</td>
</tr>
<tr>
<td></td>
<td></td>
<td>◇ Flood Control /</td>
<td>◇ Atmosphere /</td>
</tr>
<tr>
<td></td>
<td></td>
<td>◇ Snag /</td>
<td>◇ Agriculture /</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>◇ Data Paucity</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>◇ Livestock</td>
</tr>
</tbody>
</table>

Stream Drawing
**1-SUBSTRATE**  
*Check ONLY Two substrate TYPE BOXES; estimate % or note every type present*

<table>
<thead>
<tr>
<th>Best Types</th>
<th>Total</th>
<th>Pool</th>
<th>Riffle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bidirs/Slabs (10)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boulders (9)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cobble (8)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gravel (7)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sand (6)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bedrock (5)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>NUMBER OF BEST TYPES:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**OTHER TYPES**

<table>
<thead>
<tr>
<th>Substrate</th>
<th>Origin</th>
<th>Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bedrock</td>
<td>None (1)</td>
<td>None (1)</td>
</tr>
<tr>
<td>Sand</td>
<td>Extensive (1)</td>
<td>Extensive (1)</td>
</tr>
<tr>
<td>Gravel</td>
<td>Moderate (2)</td>
<td>Moderate (2)</td>
</tr>
<tr>
<td>Boulders</td>
<td>Normal (0)</td>
<td>Normal (0)</td>
</tr>
<tr>
<td>Cobble</td>
<td>Free (1)</td>
<td>Free (1)</td>
</tr>
<tr>
<td>Muck</td>
<td>Coal fines (2)</td>
<td>Coal fines (2)</td>
</tr>
</tbody>
</table>

**COMMENTS**

**2-INSTREAM COVER**  
*Indicate for reach pools and riffles.*

<table>
<thead>
<tr>
<th>AMOUNT</th>
<th>Check ONE (or 2 &amp; average)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extensive</td>
<td>Moderate (2)</td>
</tr>
<tr>
<td>Primary Contact</td>
<td>Secondary Contact</td>
</tr>
</tbody>
</table>

**3-CALCULATION MORPHOLOGY**

*Check ONE in each category (Or 2 & average)*

**SINUOSITY**
- High (4)
- Moderate (3)
- Low (2)
- None (1)

**DEVELOPMENT**
- Excellent (7)
- Good (5)
- Fair (3)
- Poor (1)

**CHANNELIZATION**
- None (6)
- Recovered (4)
- Recovering (3)
- Recent or no recovery (1)

**STABILITY**
- High (3)
- Moderate (2)
- Low (1)

**4-BANK EROSION & RIPARIAN ZONE**

*Check ONE in each category for EACH BANK (Or 2 per bank & average)*

**Erosion**
- None or little (3)
- Moderate (2)
- Heavy/Severe (1)

**Riparian WIDTH**
- L | R
  - None or little (3)
  - Moderate (2)
  - Heavy/Severe (1)

**FLOOD PLAIN QUALITY**

<table>
<thead>
<tr>
<th>AMOUNT</th>
<th>Check ONE (or 2 &amp; average)</th>
</tr>
</thead>
<tbody>
<tr>
<td>None (1)</td>
<td>None (1)</td>
</tr>
<tr>
<td>Rare</td>
<td>Moderate (2)</td>
</tr>
<tr>
<td>Primary Contact</td>
<td>Secondary Contact</td>
</tr>
</tbody>
</table>

**5-POOL/GLIDE AND RIFFLE/RUN QUALITY**

<table>
<thead>
<tr>
<th>Maximum Depth</th>
<th>Check ONE (ONLY)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;1m (6)</td>
<td>Moderate (6)</td>
</tr>
<tr>
<td>0.7-&lt;1m (4)</td>
<td>Very small amounts or if more common of marginal quality</td>
</tr>
<tr>
<td>0.4-&lt;0.7m (2)</td>
<td>Small amounts, but not of highest quality</td>
</tr>
<tr>
<td>0.2-&lt;0.4m (1)</td>
<td>None (1)</td>
</tr>
</tbody>
</table>

**CURRENT VELOCITY**
- Slow (1)
- Very Fast (1)
- Intermittent (2)
- Eddies (1)

**RECREATION POTENTIAL**
- Primary Contact
- Secondary Contact

**6-4DRAINAGE AREA**
- Very Low – Low (2-4)
- Moderate (6-10)
- High – Very high (10-6)

**Gradient**
- Maximum (10)

<table>
<thead>
<tr>
<th>Gradцион</th>
<th>Pool/Current</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>12</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Riffle Depth</th>
<th>Check ONE (ONLY)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;20cm (2)</td>
<td>Moderate (6)</td>
</tr>
<tr>
<td>3-5cm (1)</td>
<td>None (2)</td>
</tr>
<tr>
<td>0.2-&lt;0.2m (metric=0)</td>
<td>None (1)</td>
</tr>
</tbody>
</table>

**COMMENTS**

**AMOUNT**
- Primary Contact
- Secondary Contact

**6-4DRAINAGE AREA**
- Very Low – Low (2-4)
- Moderate (6-10)
- High – Very high (10-6)

**Gradient**
- Maximum (10)
<table>
<thead>
<tr>
<th>A-CANOPY</th>
<th>B-AESTHETICS</th>
<th>C-MAINTENANCE</th>
<th>D-ISSUES</th>
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<tr>
<td>&gt;85% - Open</td>
<td>Nuisance algae</td>
<td>Public /</td>
<td>WWTP /</td>
</tr>
<tr>
<td>55% - &lt;85%</td>
<td>Invasive macrophytes</td>
<td>Active /</td>
<td>Hardened /</td>
</tr>
<tr>
<td>30% - &lt;55%</td>
<td>Excess turbidity</td>
<td>Young - Succession - Old</td>
<td>Contaminated /</td>
</tr>
<tr>
<td>10% - &lt;30%</td>
<td>Discoloration</td>
<td>Spray /</td>
<td>BMPs – Construction – Sediment</td>
</tr>
<tr>
<td>&lt;10% - Closed</td>
<td>Foam/Scum</td>
<td>Modified /</td>
<td>Logging /</td>
</tr>
<tr>
<td>Canopy Upstream Reading</td>
<td>Oil sheen</td>
<td>Leveed /</td>
<td>Bank /</td>
</tr>
<tr>
<td>Right</td>
<td>Trash/Litter</td>
<td>Moving - Bedload – Stable</td>
<td>False bank /</td>
</tr>
<tr>
<td></td>
<td>Nuisance odor</td>
<td>Armoured</td>
<td>Wash H2O /</td>
</tr>
<tr>
<td></td>
<td>Sludge deposits</td>
<td>Islands /</td>
<td>Acid /</td>
</tr>
<tr>
<td></td>
<td>CSOs/SSOs/Outfalls</td>
<td>Relocated /</td>
<td>Natural /</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Impounded /</td>
<td>Park /</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Flood Control /</td>
<td>Atmosphere /</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Snag /</td>
<td>Agriculture /</td>
</tr>
<tr>
<td>36 Middle</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Left</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

Stream Drawing

6/3/2014 13:25:38 PM OWQ Biological Studies QHEI (Qualitative Habitat Evaluation Index), Page 2 of 2
Sample #  bioSample #  Stream Name  Location
AB11729  130722306  Duck Creek  750 W

Surveyor  Sample Date  County  Macro Sample Type  QHEI Score:
PDM  7/22/13  Porter  MHAB  45

1-SUBSTRATE

BEST TYPES

- Bidrs/Slabs (10)
- Boulders (9)
- Cobble (8)
- Gravel (7)
- Sand (6)
- Bedrock (5)

OTHER TYPES

TOTAL  POOL  RIFFLE

TOTAL  POOL  RIFFLE

- Hardpan (4)
- Detritus (3)
- Muck (2)
- Silt (2)
- Artificial (0)

NUMBER OF BEST TYPES:

- 4 or more (2)
- 3 or less (0)

COMMENTS

2-INSTREAM COVER

- Undercut banks (1)
- Overhanging vegetation (1)
- Shallows (in slow water) (1)
- Rootmats (1)

AMOUNT

- Undercut banks (1)
- Overhanging vegetation (1)
- Shallows (in slow water) (1)

COMMENTS

3-CHANNEL MORPHOLOGY

SINUOSITY

- High (4)
- Moderate (3)
- Low (2)
- None (1)

DEVELOPMENT

- Excellent (7)
- Good (5)
- Fair (3)
- Poor (1)

CHANNELIZATION

- None (6)
- Recovered (4)
- Recovering (3)
- Recent or no recovery (1)

STABILITY

- High (3)
- Moderate (2)
- Low (1)

EMBEDDEDNESS

- Free (1)
- Moderate (-1)
- Extensive (-2)

SILO

- Heavy (-2)
- Normal (0)
- Free (1)

COMMENTS

4- BANK EROSION & RIPARIAN ZONE

EROSION

- None or little (3)
- Moderate (2)
- Heavy/Severe (1)

COMMENT

RIPARIAN WIDTH

L  R

- None or little (3)
- Moderate (2)
- Heavy/Severe (1)

FLOOD PLAIN QUALITY

L  R

- Forest, Swamp (3)
- Shrub or Old field (2)
- Residential, Park, New field (1)
- Fenced pasture (1)
- Open Pasture/Rowcrop (0)

Riparian

- Conservation Tillage (1)
- Mining, construction (0)

RECREATION POTENTIAL

- Primary Contact
- Secondary Contact

COMMENTS

5-POOL/GLIDE AND RIFFLE/RUN QUALITY

MAXIMUM DEPTH

- 1m (6)
- 0.7-1m (4)
- 0.4-0.7m (2)
- 0.2-0.4m (1)
- <0.2m (0)

CHANNEL WIDTH

- Pool width > riffle width (2)
- Pool width = riffle width (1)
- Pool width < riffle width (0)

CURRENT VELOCITY

- Torrential (-1)
- Slow (1)
- Very Fast (1)
- Intermittent (-2)
- Eddies (1)

RECREATION POTENTIAL

- Primary Contact
- Secondary Contact

COMMENTS

6-GRADE

DRAINAGE AREA

(15.843 ft/mi)

(6.517 mi²)

- Very low - Low (2-4)
- Moderate (6-10)
- High - Very high (10-6)

% POOL: 80  % GLIDE: $% RUN: 20  % RIFFLE: $

COMMENTS

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<table>
<thead>
<tr>
<th>A-CANOPY</th>
<th>B-AESTHETICS</th>
<th>C-MAINTENANCE</th>
<th>D-ISSUES</th>
</tr>
</thead>
<tbody>
<tr>
<td>◦ &gt;85% - Open</td>
<td>◦ Nuisance algae</td>
<td>◦ Public /</td>
<td>◦ WWTP /</td>
</tr>
<tr>
<td>◦ 55%&lt;85%</td>
<td>◦ Invasive macrophytes</td>
<td>◦ Active /</td>
<td>◦ Hardened /</td>
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<td>◦ 30%&lt;55%</td>
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<td>◦ Young - Succession - Old</td>
<td>◦ Contaminated /</td>
</tr>
<tr>
<td>◦ 10%&lt;30%</td>
<td>◦ Discoloration</td>
<td>◦ Spray /</td>
<td>◦ BMPs – Construction – Sediment</td>
</tr>
<tr>
<td>◦ &lt;10% - Closed</td>
<td>◦ Foam/Scum</td>
<td>◦ Modified /</td>
<td>◦ Logging /</td>
</tr>
<tr>
<td>Canopy Upstream Reading</td>
<td>◦ Oil sheen</td>
<td>◦ Leveed /</td>
<td>◦ Bank/</td>
</tr>
<tr>
<td>Right</td>
<td>◦ Nuisance odor</td>
<td>◦ Moving - Bedload – Stable</td>
<td>◦ False bank /</td>
</tr>
<tr>
<td>3 Middle</td>
<td>◦ Sludge deposits</td>
<td></td>
<td>◦ Wash H2O /</td>
</tr>
<tr>
<td></td>
<td>◦ CSOs/SSOs/Outfalls</td>
<td>◦ Islands /</td>
<td>◦ Acid /</td>
</tr>
<tr>
<td>Left</td>
<td></td>
<td>◦ Relocated /</td>
<td>◦ Natural /</td>
</tr>
<tr>
<td></td>
<td></td>
<td>◦ Impounded /</td>
<td>◦ Park /</td>
</tr>
<tr>
<td></td>
<td></td>
<td>◦ Flood Control /</td>
<td>◦ Atmosphere /</td>
</tr>
<tr>
<td></td>
<td></td>
<td>◦ Snag /</td>
<td>◦ Agriculture /</td>
</tr>
</tbody>
</table>

Stream Drawing

6/3/2014 13:25:38 PM OWQ Biological Studies QHEI (Qualitative Habitat Evaluation Index), Page 2 of 2
### 1-Substrate

**BEST TYPES**
- ◇ Bidrs/Slabs (10)
- ◇ Boulders (9)
- ◇ Cobble (8)
- ◇ Gravel (7)
- ◇ Sand (6)
- ◇ Bedrock (5)

**TOTAL**

- ◇ 4 or more (2)
- ◇ 3 or less (0)

**COMMENTS**

#### 2-Instream Cover
- Indicate presence 0 to 3: 0-Absent; 1-Very small amounts or if more common of marginal quality; 2-Moderate amounts, but not of highest quality or in small amounts of highest quality; 3-Highest quality in moderate or greater amounts (e.g., very large boulders in deep or fast water, large diameter log that is stable, well developed rootwad in deep / fast water, or deep, well-defined, functional pools.

<table>
<thead>
<tr>
<th>Cover</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Undercut banks</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Overhanging vegetation</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Shallows (in slow water)</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

**COMMENTS**

#### 3-Channel Morphology

- Sinuosity: High (4), Moderate (3), Low (2), None (1)
- Development: Excellent (7), Good (5), Fair (3), Poor (1)
- Channelization: None (6), Recovered (4), Recovering (3), Recent or no recovery (1)
- Stability: High (3), Moderate (2), Low (1)

<table>
<thead>
<tr>
<th>Channel</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cover Maximum</td>
<td>20</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### 4-Bank Erosion & Riparian Zone

- Erosion: None or little (3), Moderate (2), Heavy/Severe (1)
- Riparian Width: L, R
- Flood Plain Quality: L, R

<table>
<thead>
<tr>
<th>Riparian</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Erosion</td>
<td>None or little (3)</td>
<td>Moderate (2)</td>
<td>Heavy/Severe (1)</td>
</tr>
<tr>
<td>Riparian</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flood Plain Quality</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**COMMENTS**

#### 5-Pool/Glide and Riffle/Run Quality

- Maximum Depth: Check ONE (ONLY)
- Channel Width: Check ONE (or 2 & average)
- Current Velocity: Check ALL that apply
- Recreational Potential: Primary Contact, Secondary Contact

<table>
<thead>
<tr>
<th>Pool/Current</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum</td>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>

**COMMENTS**

#### 6-Gradient

- Drainage Area: (1.48 ft/ml)
- Grade: % POOL: 40, % GLIDE: $\#

<table>
<thead>
<tr>
<th>Gradient</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum</td>
<td>10</td>
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</tr>
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**COMMENTS**

---

### OWQ Biological Studies QHEI (Qualitative Habitat Evaluation Index)

<table>
<thead>
<tr>
<th>Sample #</th>
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<tbody>
<tr>
<td>Surveyor</td>
<td>KJC</td>
</tr>
<tr>
<td>Date</td>
<td>7/22/13</td>
</tr>
<tr>
<td>County</td>
<td>Lake</td>
</tr>
<tr>
<td>Macro Sample Type</td>
<td>MHAB</td>
</tr>
<tr>
<td><em>Habitat Complete</em></td>
<td>46</td>
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<td>A-CANOPY</td>
<td>B-AESTHETICS</td>
</tr>
<tr>
<td>----------</td>
<td>--------------</td>
</tr>
<tr>
<td>◇ &gt;85% - Open</td>
<td>◇ Nuisance algae</td>
</tr>
<tr>
<td>◇ 55%&lt;85%</td>
<td>◇ Invasive macrophytes</td>
</tr>
<tr>
<td>◇ 30%&lt;55%</td>
<td>◇ Excess turbidity</td>
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<tr>
<td>◇ 10%&lt;30%</td>
<td>◇ Discoloration</td>
</tr>
<tr>
<td>◇ &lt;10% - Closed</td>
<td>◇ Foam/Scum</td>
</tr>
<tr>
<td>Canopy Upstream Reading</td>
<td>◇ Oil sheen</td>
</tr>
<tr>
<td>14 Right</td>
<td>◇ Nuisance odor</td>
</tr>
<tr>
<td>49 Middle</td>
<td>◇ Sludge deposits</td>
</tr>
<tr>
<td>34 Left</td>
<td>◇ CSOs/SSOs/Outfalls</td>
</tr>
<tr>
<td></td>
<td>◇ Trash/Litter</td>
</tr>
<tr>
<td></td>
<td>◇ Nuisance odor</td>
</tr>
<tr>
<td></td>
<td>◇ Sludge deposits</td>
</tr>
<tr>
<td></td>
<td>◇ CSOs/SSOs/Outfalls</td>
</tr>
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Stream Drawing

6/3/2014 13:25:38 PM OWQ Biological Studies QHEI (Qualitative Habitat Evaluation Index), Page 2 of 2
<table>
<thead>
<tr>
<th>Sample #</th>
<th>bioSample #</th>
<th>Stream Name</th>
<th>Location</th>
<th>Surveyor</th>
<th>Date</th>
<th>County</th>
<th>Macro Sample Type</th>
<th>QHEI Score:</th>
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</thead>
<tbody>
<tr>
<td>AB11731</td>
<td>130722308</td>
<td>Sprout Ditch</td>
<td>70th Avenue</td>
<td>PDM</td>
<td>7/22/13</td>
<td>Lake</td>
<td>MHAB</td>
<td>57</td>
</tr>
</tbody>
</table>

### 1-SUBSTRATE

**BEST TYPES**

<table>
<thead>
<tr>
<th>Substrate</th>
<th>Total</th>
<th>Pool</th>
<th>Riffle</th>
<th>Substrate</th>
<th>Total</th>
<th>Pool</th>
<th>Riffle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bidrs/Slbs (10)</td>
<td></td>
<td></td>
<td></td>
<td>Hardpan (4)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boulders (9)</td>
<td>10</td>
<td></td>
<td></td>
<td>Detritus (3)</td>
<td>15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cobble (8)</td>
<td>40</td>
<td></td>
<td></td>
<td>Muck (2)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gravel (7)</td>
<td>25</td>
<td></td>
<td></td>
<td>Slit (2)</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sand (6)</td>
<td></td>
<td></td>
<td></td>
<td>Artificial (0)</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bedrock (5)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**COMMENTS**

- Estimate % or note every type present

### 2-INSTREAM COVER

**BEST TYPES**

<table>
<thead>
<tr>
<th>Substrate</th>
<th>Total</th>
<th>Pool</th>
<th>Riffle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Undercut banks (1)</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Overhanging vegetation (1)</td>
<td>0</td>
<td>30</td>
<td>2</td>
</tr>
<tr>
<td>Shallows (in slow water) (1)</td>
<td>0</td>
<td>0</td>
<td>30</td>
</tr>
</tbody>
</table>

**COMMENTS**

- Check ONE (or 2 & average)

### 3-CHANNEL MORPHOLOGY

**SINUOSITY**

<table>
<thead>
<tr>
<th>Development</th>
<th>Channelization</th>
<th>Stability</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>High (4)</td>
<td>Non or little (3)</td>
<td>None (6)</td>
<td>Extensive &gt;75% (11)</td>
</tr>
<tr>
<td>Moderate (3)</td>
<td>Moderate (10-50m) (3)</td>
<td>Recovered (4)</td>
<td>Moderate to 25-75% (7)</td>
</tr>
<tr>
<td>Low (2)</td>
<td>Narrow 5-10m (2)</td>
<td>Recovering (3)</td>
<td>Sparse 5-25% (3)</td>
</tr>
<tr>
<td>None (1)</td>
<td>Very narrow &lt;5m (1)</td>
<td>Recent or no recovery (1)</td>
<td>Nearly absent &lt;5% (1)</td>
</tr>
</tbody>
</table>

**DEVELOPMENT**

<table>
<thead>
<tr>
<th>Channelization</th>
<th>Stability</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wide &gt;50m (4)</td>
<td>High (3)</td>
<td>Extensive &gt;75% (11)</td>
</tr>
<tr>
<td>Moderate 10-50m (3)</td>
<td>Moderate (2)</td>
<td>Moderate to 25-75% (7)</td>
</tr>
<tr>
<td>Narrow 5-10m (2)</td>
<td>Low (1)</td>
<td>Sparse 5-25% (3)</td>
</tr>
<tr>
<td>Very narrow &lt;5m (1)</td>
<td>None (6)</td>
<td>Nearly absent &lt;5% (1)</td>
</tr>
</tbody>
</table>

**Stability**

- Check ONE (or 2 & average)

### 4-BANK EROSION & RIPARIAN ZONE

**RIPARIAN WIDTH**

<table>
<thead>
<tr>
<th>Erosion</th>
<th>L</th>
<th>R</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>None or little (3)</td>
<td></td>
<td></td>
<td>Extensive &gt;75% (11)</td>
</tr>
<tr>
<td>Moderate (2)</td>
<td></td>
<td></td>
<td>Moderate to 25-75% (7)</td>
</tr>
<tr>
<td>Heavy/Severe (1)</td>
<td></td>
<td></td>
<td>Sparse 5-25% (3)</td>
</tr>
</tbody>
</table>

**FLOOD PLAIN QUALITY**

<table>
<thead>
<tr>
<th>Floodplain Quality</th>
<th>L</th>
<th>R</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forest, Swamp (3)</td>
<td></td>
<td></td>
<td>Extensive &gt;75% (11)</td>
</tr>
<tr>
<td>Shrub or Old field (2)</td>
<td></td>
<td></td>
<td>Moderate to 25-75% (7)</td>
</tr>
<tr>
<td>Residential, Park, New field (1)</td>
<td></td>
<td></td>
<td>Sparse 5-25% (3)</td>
</tr>
<tr>
<td>Fenced pasture (1)</td>
<td></td>
<td></td>
<td>None (6)</td>
</tr>
<tr>
<td>Open Pasture/Rowcrop (0)</td>
<td></td>
<td></td>
<td>Nearly absent &lt;5% (1)</td>
</tr>
</tbody>
</table>

**Comments**

- Indicate predominant land use(s) past 100m riparian

### 5-POOL/GLIDE AND RIFFLE/RUN QUALITY

**MAXIMUM DEPTH**

<table>
<thead>
<tr>
<th>Width</th>
<th>Current Velocity</th>
<th>Recreational Potential</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;1m (6)</td>
<td>Torrential (-1)</td>
<td>Primary Contact</td>
<td>Use large enough to support a population of riffle-obligate species</td>
</tr>
<tr>
<td>0.7-1m (4)</td>
<td>Very Fast (1)</td>
<td>Secondary Contact</td>
<td></td>
</tr>
<tr>
<td>0.4-0.7m (2)</td>
<td>Intermittent (-2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.2-0.4m (1)</td>
<td>Eddies (1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;0.2m (0)</td>
<td>None</td>
<td>No Riffle (metric=0)</td>
<td></td>
</tr>
</tbody>
</table>

**CHANNEL WIDTH**

<table>
<thead>
<tr>
<th>Width</th>
<th>Current Velocity</th>
<th>Recreational Potential</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pool width &gt; riffle width (2)</td>
<td>Slow (1)</td>
<td>Primary Contact</td>
<td></td>
</tr>
<tr>
<td>Pool width = riffle width (0)</td>
<td>Intermittent (-2)</td>
<td>Secondary Contact</td>
<td></td>
</tr>
<tr>
<td>Pool width &lt; riffle width (0)</td>
<td>Eddies (1)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**CURRENT VELOCITY**

- Check ALL that apply

### 6-GRADIENT

<table>
<thead>
<tr>
<th>Drainage Area</th>
<th>Gradient</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>19.999 ft/mi</td>
<td>Very low - Low (2-4)</td>
<td>Use large enough to support a population of riffle-obligate species</td>
</tr>
<tr>
<td>3.628 m³</td>
<td>Moderate (6-10)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>High – Very high (10-6)</td>
<td></td>
</tr>
</tbody>
</table>

**Comments**

- Check ONE (ONLY)

---

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**OWQ Biological Studies QHEI (Qualitative Habitat Evaluation Index)**

<table>
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</thead>
<tbody>
<tr>
<td>◇ &gt;85% - Open</td>
<td>◇ Nuisance algae</td>
<td>◇ Public /</td>
<td>◇ WWTP /</td>
</tr>
<tr>
<td>◇ 55%&lt;85%</td>
<td>◇ Invasive macrophytes</td>
<td>◇ Active /</td>
<td>◇ Hardened /</td>
</tr>
<tr>
<td>◇ 30%&lt;55%</td>
<td>◇ Excess turbidity</td>
<td>◇ Young - Succession - Old</td>
<td>◇ Contaminated /</td>
</tr>
<tr>
<td>◇ 10%&lt;30%</td>
<td>◇ Discoloration</td>
<td>◇ Spray /</td>
<td>◇ BMPs – Construction – Sediment</td>
</tr>
<tr>
<td>◦ &lt;10% - Closed</td>
<td>◇ Foam/Scum</td>
<td>◇ Modified /</td>
<td>◇ Logging /</td>
</tr>
<tr>
<td></td>
<td>◇ Oil sheen</td>
<td>◇ Levedd /</td>
<td>◇ Bank/</td>
</tr>
<tr>
<td></td>
<td>◇ Trash/Litter</td>
<td>◇ Moving - Bedload – Stable</td>
<td>◇ False bank /</td>
</tr>
<tr>
<td></td>
<td>◇ Nuisance odor</td>
<td>◇ Armoured</td>
<td>◇ Wash H2O /</td>
</tr>
<tr>
<td></td>
<td>◇ Sludge deposits</td>
<td>◇ Islands /</td>
<td>◇ Acid /</td>
</tr>
<tr>
<td></td>
<td>◇ CSOs/SSOs/Outfalls</td>
<td>◇ Relocated /</td>
<td>◇ Natural /</td>
</tr>
<tr>
<td></td>
<td></td>
<td>◇ Impounded /</td>
<td>◇ Park /</td>
</tr>
<tr>
<td></td>
<td></td>
<td>◇ Flood Control /</td>
<td>◇ Atmosphere /</td>
</tr>
<tr>
<td></td>
<td></td>
<td>◇ Snag /</td>
<td>◇ Agriculture /</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>◇ Drainage</td>
</tr>
</tbody>
</table>

**Canopy Upstream Reading**
- Right
- Middle
- Left

*Stream Drawing*
### Sample # 1

<table>
<thead>
<tr>
<th>Surveyor</th>
<th>Sample Date</th>
<th>County</th>
<th>Macro Sample Type</th>
<th><em>Habitat Complete</em></th>
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<tbody>
<tr>
<td>PDM</td>
<td>7/22/13</td>
<td>Lake</td>
<td>MHAB</td>
<td></td>
</tr>
</tbody>
</table>

### 1-SUBSTRATE

#### BEST TYPES

- **Bidrs/Slabs (10)**
- **Boulders (9)**
- **Cobble (8)**
- **Gravel (7)**
- **Sand (6)**
- **Bedrock (5)**

#### OTHER TYPES

- **Hardpan (4)**
- **Detritus (3)**
- **Muck (2)**
- **Silt (2)**
- **Artificial (0)**

#### NUMBERS OF BEST TYPES:

- 4 or more (2)
- 3 or less (0)

### 2-INSTREAM COVER

- **Undercut banks (1)**
- **Overhanging vegetation (1)**
- **Shallows (in slow water) (1)**
- **Rootmats (1)**

### 3-CHANNEL MORPHOLOGY

#### SINUOSITY

- **High (4)**
- **Moderate (3)**
- **Low (2)**
- **None (1)**

#### DEVELOPMENT

- **Excellent (7)**
- **Good (5)**
- **Fair (3)**
- **Poor (1)**

#### CHANNELIZATION

- **None (6)**
- **Recovered (4)**
- **Recovering (3)**
- **Recent or no recovery (1)**

### 4- BANK EROSION & RIPARIAN ZONE

#### EROSION

- **None or little (3)**
- **Moderate (2)**
- **Heavy/Severe (1)**

#### RIPARIAN WIDTH

- **Wide >50m (4)**
- **Moderate 10-50m (3)**
- **Narrow 5-10m (2)**
- **Very narrow <5m (1)**
- **None (0)**

#### FLOOD PLAIN QUALITY

- **Forest, Swamp (3)**
- **Shrub or Old field (2)**
- **Residential, Park, New field (1)**
- **Fenced pasture (1)**
- **Open Pasture/Rowcrop (0)**

### 5-POOL/GLIDE AND RIFFLE/RUN QUALITY

#### MAXIMUM DEPTH

- **>1m (6)**
- **0.7-1m (4)**
- **0.4-0.7m (2)**
- **0.2-0.4m (1)**
- **<0.2m (0)**

#### CHANNEL WIDTH

- **Pool width > riffle width (2)**
- **Pool width = riffle width (1)**
- **Pool width < riffle width (0)**

#### CURRENT VELOCITY

- **Torrential (-1)**
- **Very Fast (1)**
- **Fast (1)**
- **Moderate (1)**
- **Eddies (1)**

### 6-GRADIENT

#### DRAINAGE AREA

- **(9.787 ft/ni)**
- **(66.707 m²)**

#### RECREATION POTENTIAL

- **Primary Contact**
- **Secondary Contact**

### QHEI Score:

- **80**

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## OWQ Biological Studies QHEI (Qualitative Habitat Evaluation Index)

**Circle some & COMMENT**

<table>
<thead>
<tr>
<th>A-CANOPY</th>
<th>B-AESTHETICS</th>
<th>C-MAINTENANCE</th>
<th>D-ISSUES</th>
</tr>
</thead>
<tbody>
<tr>
<td>◇ &gt;85% - Open</td>
<td>◇ Nuisance algae</td>
<td>◇ Public /</td>
<td>◇ WWTP /</td>
</tr>
<tr>
<td>◇ 55%&lt;85%</td>
<td>◇ Invasive macrophytes</td>
<td>◇ Active /</td>
<td>◇ Hardened /</td>
</tr>
<tr>
<td>◇ 30%&lt;55%</td>
<td>◇ Excess turbidity</td>
<td>◇ Young - Succession - Old</td>
<td>◇ Contaminated /</td>
</tr>
<tr>
<td>◇ 10%&lt;30%</td>
<td>◇ Discoloration</td>
<td>◇ Spray /</td>
<td>◇ BMPs – Construction – Sediment</td>
</tr>
<tr>
<td>◇ &lt;10% - Closed</td>
<td>◇ Foam/Scum</td>
<td>◇ Modified /</td>
<td>◇ Logging /</td>
</tr>
<tr>
<td></td>
<td>◇ Oil sheen</td>
<td>◇ Leveed /</td>
<td>◇ Bank/</td>
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<tr>
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<td>◇ Trash/Litter</td>
<td>◇ Moving - Bedload – Stable</td>
<td>◇ False bank /</td>
</tr>
<tr>
<td></td>
<td>◇ Nuisance odor</td>
<td>◇ Armoured</td>
<td>◇ Wash H2O /</td>
</tr>
<tr>
<td></td>
<td>◇ Sludge deposits</td>
<td>◇ Islands /</td>
<td>◇ Acid /</td>
</tr>
<tr>
<td></td>
<td>◇ CSOs/SSOs/Outfalls</td>
<td>◇ Relocated /</td>
<td>◇ Natural /</td>
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<td>◇ Impounded /</td>
<td>◇ Park /</td>
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<td>◇ Flood Control /</td>
<td>◇ Atmosphere /</td>
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<td>◇ Snag /</td>
<td>◇ Agriculture /</td>
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<td>◇ Data Paucity</td>
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**Canopy Upstream Reading**

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<th>41 Middle</th>
<th>22 Left</th>
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<td>Trash/Scum</td>
<td>Sludge deposits</td>
<td>CSOs/SSOs/Outfalls</td>
</tr>
<tr>
<td>Nuisance odor</td>
<td>Excess turbidity</td>
<td>Discoloration</td>
</tr>
<tr>
<td>Invasive macrophytes</td>
<td>Foam/Scum</td>
<td>Oil sheen</td>
</tr>
<tr>
<td>Nuisance algae</td>
<td>Oil sheen</td>
<td>Trash/Scum</td>
</tr>
<tr>
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<td>Modified /</td>
<td>Moving - Bedload – Stable</td>
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<tr>
<td>Excess turbidity</td>
<td>Leveed /</td>
<td>Armoured</td>
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<tr>
<td>Excess turbidity</td>
<td>Moving - Bedload – Stable</td>
<td>Islands /</td>
</tr>
<tr>
<td>Excess turbidity</td>
<td>Modified /</td>
<td>Relocated /</td>
</tr>
<tr>
<td>Excess turbidity</td>
<td>Leveed /</td>
<td>Impounded /</td>
</tr>
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<td>Excess turbidity</td>
<td>Flood Control /</td>
<td>Drainage</td>
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<td>Snag /</td>
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<td>Surveyor</td>
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<td>County</td>
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<td>7/23/13</td>
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</table>

### 1-SUBSTRATE

**BEST TYPES**

- **Brids/Slabs (10)**
- **Boulders (9)**
- **Cobble (8)**
- **Gravel (7)**
- **Sand (6)**
- **Bedrock (5)**

**OTHER TYPES**

- **Hardpan (4)**
- **Detritus (3)**
- **Muck (2)**
- **Silt (2)**
- **Artificial (0)**

**TOTAL POOL**

<p>| | | |</p>
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**TOTAL RIFFLE**

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</table>

**NUMBER OF BEST TYPES:**

- 4 or more (2)
- 3 or less (0)

**COMMENTS**

- Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species:

**DRAINAGE AREA:**

- (2.912 mi²)

**RECREATION POTENTIAL**

- No Riffle (metric=0)

**CURRENT VELOCITY**

- **Primary Contact**
- **Secondary Contact**

**CHANNEL WIDTH**

<p>| | | |</p>
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</tbody>
</table>

**CHANNEL RUN SUBSTRATE**

- **Stable (e.g. cobble, boulder) (2)**
- **Mod. Stable (e.g. large gravel) (1)**
- **Unstable (e.g. sand, fine gravel) (0)**

**Ripple/Run EMBEDDEDNESS**

- **None (2)**
- **Low (1)**
- **Moderate (0)**
- **Extensive (-1)**

**CURRENT VELOCITY**

- **Trential (-1)**
- **Slow (1)**
- **Very Fast (1)**
- **Intertidal (-1)**
- **Fast (1)**
- **Intermediate (-2)**
- **Moderate (1)**
- **Eddies (1)**

**RECREATION POTENTIAL**

- No Riffle (metric=0)

**CURRENT VELOCITY**

- **Trential (-1)**
- **Slow (1)**
- **Very Fast (1)**
- **Intertidal (-1)**
- **Fast (1)**
- **Intermediate (-2)**
- **Moderate (1)**
- **Eddies (1)**

**RECREATION POTENTIAL**

- No Riffle (metric=0)

**CURRENT VELOCITY**

- **Trential (-1)**
- **Slow (1)**
- **Very Fast (1)**
- **Intertidal (-1)**
- **Fast (1)**
- **Intermediate (-2)**
- **Moderate (1)**
- **Eddies (1)**
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<td>Modified /</td>
<td>Logging /</td>
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<td>Moving - Bedload – Stable</td>
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</tr>
<tr>
<td>1 Middle</td>
<td>Nuisance odor</td>
<td>Armoured</td>
<td>Wash H2O /</td>
</tr>
<tr>
<td>Left</td>
<td>Sludge deposits</td>
<td>Islands /</td>
<td>Acid /</td>
</tr>
<tr>
<td>CSOs/SSOs/Outfalls</td>
<td>CSOs/SSOs/Outfalls</td>
<td>Relocated /</td>
<td>Natural /</td>
</tr>
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<td>Impounded /</td>
<td>Park /</td>
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<tr>
<td></td>
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<td>Flood Control /</td>
<td>Atmosphere /</td>
</tr>
<tr>
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<td></td>
<td>Snag /</td>
<td>Agriculture /</td>
</tr>
</tbody>
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| | | | |}

**Stream Drawing**
**1-SUBSTRATE**

<table>
<thead>
<tr>
<th>BEST TYPES</th>
<th>OTHER TYPES</th>
<th>ORIGIN QUALITY</th>
<th>SUBSTRATE</th>
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</thead>
<tbody>
<tr>
<td>◇ Bidrs/Slbs (10)</td>
<td>◇ Hardpan (4)</td>
<td>◇ Limestone (1)</td>
<td>◇ 10</td>
</tr>
<tr>
<td>◇ Boulders (9)</td>
<td>◇ Detritus (3)</td>
<td>◇ Tills (1)</td>
<td>Maximum 20</td>
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<td>◇ Cobble (8)</td>
<td>◇ Muck (2)</td>
<td>◇ Wetlands (0)</td>
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</tr>
<tr>
<td>◇ Gravel (7)</td>
<td>◇ Silt (2)</td>
<td>◇ Hardpan (0)</td>
<td></td>
</tr>
<tr>
<td>◇ Sand (6)</td>
<td>◇ Artificial (0)</td>
<td>◇ Rip/Rap (0)</td>
<td></td>
</tr>
<tr>
<td>◇ Bedrock (5)</td>
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<td>◇ Lacustrine (0)</td>
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</table>

**2-INSTREAM COVER**

<table>
<thead>
<tr>
<th>COMMENTS</th>
<th>AMOUNT</th>
</tr>
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<tbody>
<tr>
<td>Indicate presence 0 to 3: 0-Absent; 1-Very small amounts or if more common of marginal quality; 2-Moderate amounts, but not of highest quality or in small amounts of highest quality; 3-Highest quality in moderate or greater amounts (e.g., very large boulders in deep or fast water, large diameter log that is stable, well developed rootwash in deep / fast water, or deep, well-defined, functional pools.)</td>
<td>Check ONE (or 2 &amp; average)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ITEM</th>
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<tr>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
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**COMMENTS**

**3-CHANNEL MORPHOLOGY**

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<thead>
<tr>
<th>SINUOSITY</th>
<th>DEVELOPMENT</th>
<th>CHANNELIZATION</th>
<th>STABILITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>* High (4)</td>
<td>◇ Excellent (7)</td>
<td>◇ None (6)</td>
<td>◇ High (3)</td>
</tr>
<tr>
<td>◇ Moderate (3)</td>
<td>◇ Good (5)</td>
<td>◇ Recovered (4)</td>
<td>◇ Moderate (2)</td>
</tr>
<tr>
<td>◇ Low (2)</td>
<td>◇ Fair (3)</td>
<td>◇ Recovering (3)</td>
<td>◇ Low (1)</td>
</tr>
<tr>
<td>◇ None (1)</td>
<td>◇ Poor (1)</td>
<td>◇ Recent or no recovery (1)</td>
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</table>

**COMMENTS**

**4- BANK EROSION & RIPARIAN ZONE**

<table>
<thead>
<tr>
<th>EROSION</th>
<th>RIPARIAN WIDTH</th>
<th>FLOOD PLAIN QUALITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>R</td>
<td>L</td>
</tr>
<tr>
<td>* None or little (3)</td>
<td>Wide &gt;50m (4)</td>
<td>Forest. Swamp (3)</td>
</tr>
<tr>
<td>◇ Moderate (2)</td>
<td>Moderate 10-50m (3)</td>
<td>Shrub or Old field (2)</td>
</tr>
<tr>
<td>◇ Heavy/Severe (1)</td>
<td>Narrow 5-10m (2)</td>
<td>Residential, Park, New field (1)</td>
</tr>
<tr>
<td></td>
<td>Very narrow &lt;5m (1)</td>
<td>Fenced pasture (1)</td>
</tr>
<tr>
<td></td>
<td>None (0)</td>
<td>Open Pasture/Rowcrop (0)</td>
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</table>

**COMMENTS**

**5-POOL/GLIDE AND RIFFLE/RUN QUALITY**

<table>
<thead>
<tr>
<th>MAXIMUM DEPTH</th>
<th>CHANNEL WIDTH</th>
<th>CURRENT VELOCITY</th>
<th>RECREATION POTENTIAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>◇ &gt;1m (6)</td>
<td>Pool width &gt; riffle width (2)</td>
<td>Torrential (-1)</td>
<td>Primary Contact</td>
</tr>
<tr>
<td>◇ 0.7-&lt;1m (4)</td>
<td>Pool width = riffle width (1)</td>
<td>Very Fast (1)</td>
<td>Secondary Contact</td>
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<tr>
<td>◇ 0.4-&lt;0.7m (2)</td>
<td>Pool width &lt; riffle width (0)</td>
<td>Fast (1)</td>
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<tr>
<td>◇ 0.2-&lt;0.4m (1)</td>
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<td>Moderate (1)</td>
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<tr>
<td>◇ &lt;0.2m (0)</td>
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<td>Eddies (1)</td>
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**COMMENTS**

**6-GRADIENT**

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<tr>
<th>DRAINAGE AREA</th>
<th>GRADE</th>
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<tbody>
<tr>
<td>23,493 ft/mi</td>
<td>◇ Very low – Low (2-4)</td>
</tr>
<tr>
<td>2,364 mi²</td>
<td>◇ Moderate (6-10)</td>
</tr>
<tr>
<td>% POOL: 20</td>
<td>◇ High – Very high (10-6)</td>
</tr>
<tr>
<td>% GLIDE: $</td>
<td>% RUN: 80</td>
</tr>
<tr>
<td>% RIFFLE: #</td>
<td>Gradient Maximum: 10</td>
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**QHEI Score:** 52

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<td>30%–&lt;55%</td>
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Stream Drawing
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<thead>
<tr>
<th>Sample #</th>
<th>bioSample #</th>
<th>Stream Name</th>
<th>Location</th>
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<tbody>
<tr>
<td>AB11735</td>
<td>130723303</td>
<td>Tributary of Deep River</td>
<td>93rd Avenue</td>
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</table>

**QHEI Score:** 53

### 1-SUBSTRATE

**BEST TYPES**

- **Total**, **Pool**, **Riffle**
  - **Bildrs/Slabs (10)**
  - **Boulders (9)**
  - **Cobble (8)**
  - **Gravel (7)**
  - **Sand (6)**
  - **Bedrock (5)**

**OTHER TYPES**

- **Total**, **Pool**, **Riffle**
  - **Hardpan (4)**
  - **Detritus (3)**
  - **Muck (2)**
  - **Silt (2)**
  - **Artificial (0)**

**NUMBER OF BEST TYPES:**
- 4 or more (2)
- 3 or less (0)

**COMMENTS**

- Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species:

- (Score natural substrates; ignore sludge from point-sources)

### 2-INSTREAM COVER

**Indicate presence 0 to 3:**
- 0-Absent
- 1-Very small amounts or if more common of marginal quality
- 2-Moderate amounts, but not of highest quality or in small amounts of highest quality
- 3-Highest quality in moderate or greater amounts (e.g., very large boulders in deep or fast water, large diameter log that is stable, well developed rootwad in deep / fast water, or deep, well-defined, functional pools).

- **Undercut banks (1)**
- **Overhanging vegetation (1)**
- **Rootmats (1)**
- **Shallows (in slow water) (1)**

**AMOUNT**

- Check ONE (or 2 & average)
  - **Extensive >75%** (11)
  - **Moderate 25-75%** (7)
  - **Sparse 5-25%** (3)
  - **Nearly absent <5%** (1)

**COMMENTS**

### 3-CHANNEL MORPHOLOGY

**Check ONE in each category**

- **SINUOSITY**
  - **High (4)**
  - **Moderate (3)**
  - **Low (2)**
  - **None (1)**

- **DEVELOPMENT**
  - **Excellent (7)**
  - **Good (5)**
  - **Fair (3)**
  - **Poor (1)**

- **CHANNELIZATION**
  - **None (6)**
  - **Recovered (4)**
  - **Recovering (3)**
  - **Recent or no recovery (1)**

- **STABILITY**
  - **High (3)**
  - **Moderate (2)**
  - **Low (1)**

**AMOUNT**

- **Channel Maximum:** 20

### 4- BANK EROSION & RIPARIAN ZONE

**Check ONE in each category for EACH BANK**

- **RIPIARAN WIDTH**
  - **L**
    - **None or little** (3)
    - **Moderate** (2)
    - **Heavy/Severe** (1)
  - **R**
    - **Wide >50m (4)**
    - **Moderate 10-50m (3)**
    - **Narrow 5-10m (2)**
    - **Very narrow <5m (1)**
    - **None (0)**

- **FLOOD PLAIN QUALITY**
  - **L**
    - **Forest, Swamp (3)**
    - **Shrub or Old field (2)**
    - **Residential, Park, New field (1)**
    - **Fenced pasture (1)**
    - **Open Pasture/Rowcrop (0)**
  - **R**
    - **Conservation Tillage (1)**
    - **Urban or Industrial (0)**
    - **Mining, construction (0)**

**COMMENTS**

- Indicate predominant land use(s)
- past 100m riparian

### 5-POOL/GLIDE AND RIFFLE/Run QUALITY

<table>
<thead>
<tr>
<th>MAXIMUM DEPTH</th>
<th>CHANNEL WIDTH</th>
<th>CURRENT VELOCITY</th>
<th>RECREATION POTENTIAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check ONE (ONLY!)</td>
<td>Check ONE (or 2 &amp; average)</td>
<td>Check ALL that apply</td>
<td><strong>Primary Contact</strong></td>
</tr>
<tr>
<td>&gt;1m (6)</td>
<td>Pool width &gt; riffle width (2)</td>
<td>Torrential (-1)</td>
<td><strong>Secondary Contact</strong></td>
</tr>
<tr>
<td>0.7-&lt;1m (4)</td>
<td>Pool width &gt; riffle width (1)</td>
<td>Very Fast (1)</td>
<td>(circle one and comment on back)</td>
</tr>
<tr>
<td>0.4-&lt;0.7m (2)</td>
<td>Pool width &lt; riffle width (0)</td>
<td>Fast (1)</td>
<td></td>
</tr>
<tr>
<td>0.2-0.4m (1)</td>
<td></td>
<td>Moderate (1)</td>
<td></td>
</tr>
<tr>
<td>&lt;0.2m (0) (metric=0)</td>
<td></td>
<td>Eddies (1)</td>
<td></td>
</tr>
</tbody>
</table>

**COMMENTS**

- Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species:

- **Pool/Current Maximum:** 4

- **No Riffle (metric=0)**

### 6-GRADIENT

<table>
<thead>
<tr>
<th>DRAINAGE AREA</th>
<th>% POOL: 20</th>
<th>% GLIDE: #</th>
<th>GRADIENT Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>(15.289 ft/mi)</td>
<td></td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>(3.505 m³)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Very low – Low (2-4)**
- **Moderate (6-10)**
- **High – Very high (10-6)**

- **% RUN: 80**

- **% RIFFLE: #**

- **Riffle/Run Maximum:** 8

- **Gradient Maximum:** 10

---

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<table>
<thead>
<tr>
<th>A-CANOPY</th>
<th>B-AESTHETICS</th>
<th>C-MAINTENANCE</th>
<th>D-ISSUES</th>
</tr>
</thead>
<tbody>
<tr>
<td>◆ &gt;85% - Open</td>
<td>◆ Nuisance algae</td>
<td>◆ Public /</td>
<td>◆ WWTP /</td>
</tr>
<tr>
<td>◆ 55%−&lt;85%</td>
<td>◆ Invasive macrophytes</td>
<td>◆ Active /</td>
<td>◆ Hardened /</td>
</tr>
<tr>
<td>◆ 30%−&lt;55%</td>
<td>◆ Excess turbidity</td>
<td>◆ Young - Succession - Old</td>
<td>◆ Contaminated /</td>
</tr>
<tr>
<td>◆ 10%−&lt;30%</td>
<td>◆ Discoloration</td>
<td>◆ Spray /</td>
<td>◆ BMPs – Construction – Sediment</td>
</tr>
<tr>
<td>◆ &lt;10% - Closed</td>
<td>◆ Oil sheen</td>
<td>◆ Modified /</td>
<td>◆ Logging /</td>
</tr>
<tr>
<td>Canopy Upstream Reading</td>
<td>◆ Foam/Scum</td>
<td>◆ Leveed /</td>
<td>◆ Bank /</td>
</tr>
<tr>
<td>Right</td>
<td>◆ Oil sheen</td>
<td>◆ Moving - Bedload – Stable</td>
<td>◆ False bank /</td>
</tr>
<tr>
<td>9 Middle</td>
<td>◆ Trash/Litter</td>
<td>◆ Armoured</td>
<td>◆ Wash H2O /</td>
</tr>
<tr>
<td>◆ Trash/Litter</td>
<td>◆ Nuisance odor</td>
<td>◆ Islands /</td>
<td>◆ Acid /</td>
</tr>
<tr>
<td>◆ Sludge deposits</td>
<td>◆ Slumps</td>
<td>◆ Relocated /</td>
<td>◆ Natural /</td>
</tr>
<tr>
<td>◆ CSOs/SSOs/Outfalls</td>
<td>◆ Scoured</td>
<td>◆ Impounded /</td>
<td>◆ Park /</td>
</tr>
<tr>
<td>◆ Flood Control /</td>
<td>◆ Cutoffs</td>
<td>◆ Desiccated</td>
<td>◆ Atmosphere /</td>
</tr>
<tr>
<td>◆ Snag /</td>
<td>◆ Drainage</td>
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<td>◆ Agriculture /</td>
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<td>◆ WWTP /</td>
<td>◆ CSO /</td>
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<td>◆ NPDES /</td>
<td>◆ Dirt &amp; Grime</td>
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<td>◆ Industry</td>
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<td>◆ Cooling</td>
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<td>◆ Mine /</td>
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<td></td>
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<td>◆ Wetlands /</td>
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<td></td>
<td>◆ Golf /</td>
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<td></td>
<td></td>
<td>◆ Data Paucity</td>
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<td>◆ Livestock</td>
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<td>◆ Home</td>
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<tr>
<td></td>
<td></td>
<td>◆ Flow</td>
<td></td>
</tr>
</tbody>
</table>
### 1-SUBSTRATE

**BEST TYPES**

- Hardpan (4)
- Detritus (3)
- Muck (2)
- Slit (2)
- Artificial (0)

**TOTAL**

<table>
<thead>
<tr>
<th></th>
<th>POOL</th>
<th>RIFFLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
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<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
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</tr>
</tbody>
</table>

**OTHER TYPES**

**TOTAL**

<table>
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<th>POOL</th>
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</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Limestone (1)
- Tills (1)
- Wetlands (0)
- Hardpan (0)
- Sandstone (0)
- Rip/Rap (0)
- Lacustrine (0)
- Shale (-1)
- Coal fines (-2)

**NUMBER OF BEST TYPES:**

- 4 or more (2)
- 3 or less (0)

**COMMENTS**

- Estimate % or note every type present

**AMOUNT**

- Heavy (2)
- Moderate (1)
- Normal (0)

- Moderate (1)
- Normal (0)
- None (1)

**SILT**

- Heavy (-2)

**EMBEDDEDNESS**

- Extensive (-2)

- Moderate (-1)

- Normal (0)

- None (1)

**MAXIMUM**

- 11

**Channel**

- Maximum 20

**Remarks**

- Include predominant land use(s) past 100m riparian.

**QHEI Score:**

59

---

### 2-STREAM COVER

**Indicate presence 0 to 3:**

- Absent; 1-Very small amounts or if more common of marginal quality; 2-Moderate amounts, but not of highest quality or in small amounts of highest quality; 3-Highest quality in moderate or greater amounts (e.g., very large boulders in deep or fast water, large diameter log that is stable, well developed rootwad in deep / fast water, or deep, well-defined, functional pools).

**5 1 Undercut banks (1)**

**30 1 Pools > 70cm (2)**

**0 0 Oxbows, Backwaters (1)**

**0 0 Rootwads (1)**

**30 3 Aquatic macrophytes (1)**

**5 0 Shallows (in slow water) (1)**

**30 3 Logs and woody debris (1)**

**COMMENTS**

- Include predominant land use(s) past 100m riparian.

**AMOUNT**

- Extensive >75% (11)

- Moderate 25-75% (7)

- Sparse 5-25% (3)

- Nearly absent <5% (1)

**REMARKS**

- Include predominant land use(s) past 100m riparian.

**QHEI Score:**

59

---

### 3-CHANNEL MORPHOLOGY

**Sinuosity**

- High (4)
- Moderate (3)
- Low (2)
- None (1)

**Development**

- Excellent (7)
- Good (5)
- Fair (3)
- Poor (1)

**Channelization**

- None (6)
- Recovered (4)
- Recovering (3)
- Recent or no recovery (1)

**Stability**

- High (3)
- Moderate (2)
- Low (1)

**Remarks**

- Include predominant land use(s) past 100m riparian.

**QHEI Score:**

59

---

### 4- BANK EROSION & RIPARIAN ZONE

**Erosion**

- None or little (3)
- Moderate (2)
- Heavy/Severe (1)

**Riparian Width**

- Wide >50m (4)
- Moderate 10-50m (3)
- Narrow 5-10m (2)
- Very narrow <5m (1)
- None (0)

**Flood Plain Quality**

- Forest, Swamp (3)
- Shrub or Old field (2)
- Residential, Park, New field (1)
- Fenced pasture (1)
- Open Pasture/Rowcrop (0)

**Remarks**

- Include predominant land use(s) past 100m riparian.

**QHEI Score:**

59

---

### 5- POOL/GLIDE AND RIFFLE/RUN QUALITY

**Maximum Depth**

- >1m (6)
- 0.7-1m (4)
- 0.4-0.7m (2)
- 0.2-0.4m (1)
- <0.2m (0)

**Channel Width**

- Pool width > riffle width (2)
- Pool width = riffle width (1)
- Pool width < riffle width (0)

**Current Velocity**

- Torrential (-1)
- Slow (1)
- Very Fast (1)
- Intertidal (-1)
- Fast (1)
- Intermittent (-2)
- Moderate (1)
- Eddies (1)

**Remarks**

- Include predominant land use(s) past 100m riparian.

**QHEI Score:**

59

---

### 6-GRADIENT

**Drainage Area**

- 3.348 ft/ml
- 44,481 mi²

**Remarks**

- Include predominant land use(s) past 100m riparian.

**QHEI Score:**

59

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<td>49 Right</td>
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<td>◇ Moving - Bedload – Stable</td>
<td>◇ False bank /</td>
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<tr>
<td>85 Middle</td>
<td>◇ Nuisance odor</td>
<td>◇ Armoured</td>
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<td>83 Left</td>
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<td>◇ CSOs/SSOs/Outfalls</td>
<td>◇ Relocalated /</td>
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<td>◇ Landfill</td>
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<td>◇ Quarry /</td>
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<td>◇ Stagnant</td>
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<td>◇ Home</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>◇ Flow</td>
</tr>
</tbody>
</table>
**1-SUBSTRATE**

**BEST TYPES**
- Cubes/Slabs (10)
- Boulders (9)
- Cobble (8)
- Gravel (7)
- Sand (6)
- Bedrock (5)

**OTHER TYPES**
- Hardpan (4)
- Detritus (3)
- Muck (2)
- Slit (2)
- Artificial (0)

**TOTAL POOL RIFFLE**
- 35
- 10
- 5
- 15
- 30

**COMMENTS**

Indicate presence 0 to 3: 0: Absent; 1: Very small amounts or if more common of marginal quality; 2: Moderate amounts, but not of highest quality or in small amounts of highest quality; 3: Highest quality in moderate or greater amounts (e.g., very large boulders in deep or fast water, large diameter log that is stable, well developed rootwad in deep / fast water, or deep, well-defined, functional pools).

0  Undercut banks (1)
30% Oxbows, Backwaters (1)
40% Cover

**2-INSTREAM COVER**

*Check ONE (or 2 & average)*
- Extensive >75% (1)
- Moderate 25-75% (7)
- Sparse 5-25% (3)
- Nearly absent <5% (1)

**3-CHEMICAL MORPHOLOGY**

*Check ONE in each category (Or 2 & average)*
- High (4)
- Moderate (3)
- Low (2)
- None (1)

**4- BANK EROSION & RIPARIAN ZONE**

*Check ONE in each category for EACH BANK (Or 2 per bank & average)*
- None or little (3)
- Moderate (2)
- Heavy/Severe (1)

**COMMENTS**

For each bank, check ONE: EROSION, RIPARIAN WIDTH, FLOOD PLAIN QUALITY.

**5-POOL/GLIDE AND RIFFLE/RUN QUALITY**

*Check ONE (ONLY)*
- Very low – Low (2-4)
- Moderate (6-10)
- High – Very high (10-6)

*Check ONE (or 2 & average)*
- None (2)
- Low (1)
- Moderate (0)
- Extensive (-1)

**COMMENTS**

For functional riffles, best areas must be large enough to support a population of riffle-obligate species.

**6-GRADIENT**

*Check ONE (ONLY)*
- Very low – Low (2-4)
- Moderate (6-10)
- High – Very high (10-6)

*Check ONE (or 2 & average)*
- None (2)
- Low (1)
- Moderate (0)
- Extensive (-1)

**COMMENTS**
### OWQ Biological Studies QHEI (Qualitative Habitat Evaluation Index)

**Circle some & COMMENT**

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<thead>
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<td>◇ Invasive macrophytes</td>
<td>◇ Active / Historic / Both / NA</td>
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<td>◇ Foam/Scum</td>
<td>◇ Modified / Dipped out / NA</td>
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<td>◇ Oil sheen</td>
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<td>◇ Nuisance odor</td>
<td>◇ Armoured / Slumps</td>
<td>◇ Wash H2O / Tile /</td>
</tr>
<tr>
<td>Left</td>
<td>◇ Sludge deposits</td>
<td>◇ Islands / Scoured</td>
<td>◇ Acid / Mine /</td>
</tr>
<tr>
<td></td>
<td>◇ CSOs/SSOs/Outfalls</td>
<td>◇ Relocated / Cutoffs</td>
<td>◇ Natural / Wetlands /</td>
</tr>
<tr>
<td></td>
<td></td>
<td>◇ Impounded / Desiccated</td>
<td>◇ Park / Quarry /</td>
</tr>
<tr>
<td></td>
<td></td>
<td>◇ Flood Control / Drainage</td>
<td>◇ Atmosphere / H2O table /</td>
</tr>
<tr>
<td></td>
<td></td>
<td>◇ Snag /</td>
<td>◇ Agriculture / Home /</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>◇ Livestock / Flow</td>
</tr>
</tbody>
</table>

**Stream Drawing**

6/3/2014 13:25:38 PM OWQ Biological Studies QHEI (Qualitative Habitat Evaluation Index), Page 2 of 2
1-SUBSTRATE

<table>
<thead>
<tr>
<th>BEST TYPES</th>
<th>OTHER TYPES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bidrs/Slabs (10)</td>
<td>Hardpan (4)</td>
</tr>
<tr>
<td>Boulders (9)</td>
<td>Detritus (3)</td>
</tr>
<tr>
<td>Cobble (8)</td>
<td>Muck (2)</td>
</tr>
<tr>
<td>Gravel (7)</td>
<td>Silt (2)</td>
</tr>
<tr>
<td>Sand (6)</td>
<td>Artificial (0)</td>
</tr>
<tr>
<td>Bedrock (5)</td>
<td></td>
</tr>
</tbody>
</table>

**NUMBER OF BEST TYPES:** ◇ (4) or more (2) ◆ 3 or less (0)

**COMMENTS**

2-INSTREAM COVER

<table>
<thead>
<tr>
<th>AMOUNT</th>
<th>Check ONE (or 2 &amp; average)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extensive &gt;75% (11)</td>
<td>Moderate 25-75% (7)</td>
</tr>
<tr>
<td>Sparse 5-25% (3)</td>
<td>Nearly absent &lt;5% (1)</td>
</tr>
</tbody>
</table>

**TOTAL POOL RIFFLE**

<table>
<thead>
<tr>
<th>Pool</th>
<th>Riffle</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>25</td>
<td>2</td>
</tr>
</tbody>
</table>

**SILT**

| Substrate | | |
|-----------|-----------|
| Heavy (-2) | Moderate (-1) |
| Normal (0) | Free (1) |

**EMBEDDEDNESS**

<table>
<thead>
<tr>
<th>EMBEDDEDNESS</th>
<th>Extensive (-2)</th>
<th>Moderate (-1)</th>
<th>Normal (0)</th>
<th>None (1)</th>
</tr>
</thead>
</table>

**MAXIMUM DEPTH**

<table>
<thead>
<tr>
<th>Depth</th>
<th>Check ONE ONLY!</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;1m (6)</td>
<td>Pool width &gt; riffle width (2)</td>
</tr>
<tr>
<td>0.7-&lt;1m (4)</td>
<td>Pool width = riffle width (2)</td>
</tr>
<tr>
<td>0.4-&lt;0.7m (2)</td>
<td>Pool width &lt; riffle width (0)</td>
</tr>
<tr>
<td>0.2-&lt;0.4m (1)</td>
<td></td>
</tr>
<tr>
<td>&lt;0.2m (0) (metric=0)</td>
<td></td>
</tr>
</tbody>
</table>

**CHANNEL/RIFFLE WIDTH**

<table>
<thead>
<tr>
<th>L</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>None or little (3)</td>
<td></td>
</tr>
<tr>
<td>Moderate (2)</td>
<td></td>
</tr>
<tr>
<td>Heavy/Severe (1)</td>
<td></td>
</tr>
</tbody>
</table>

**FLOOD PLAIN QUALITY**

<table>
<thead>
<tr>
<th>L</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forest, Swamp (3)</td>
<td>Shrub or Old field (2)</td>
</tr>
<tr>
<td>Residential, Park, New field (1)</td>
<td>Fenced pasture (1)</td>
</tr>
<tr>
<td>Open Pasture/Rowcrop (0)</td>
<td></td>
</tr>
</tbody>
</table>

**RECREATION POTENTIAL**

| No Riffle (metric=0) | | |

5-POOL/GLIDE AND RIFFLE/RUN QUALITY

<table>
<thead>
<tr>
<th>DEPTH</th>
<th>Check ONE (ONLY!)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Best Areas &gt;10cm (2)</td>
<td></td>
</tr>
<tr>
<td>Best Areas 5-10cm (1)</td>
<td></td>
</tr>
<tr>
<td>Best Areas &lt;5cm (metric=0)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>RUN DEPTH</th>
<th>Check ONE (or 2 &amp; average)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum &gt;50cm (2)</td>
<td>Stable (e.g. cobble, boulder) (2)</td>
</tr>
<tr>
<td>Maximum &lt;50cm (1)</td>
<td>Mod. Stable (e.g. large gravel) (1)</td>
</tr>
<tr>
<td>Unstable (e.g. sand, fine gravel) (0)</td>
<td></td>
</tr>
</tbody>
</table>

**RECREATION POTENTIAL**

<table>
<thead>
<tr>
<th>Primary Contact</th>
<th>Secondary Contact</th>
</tr>
</thead>
<tbody>
<tr>
<td>(circle one and comment on back)</td>
<td></td>
</tr>
</tbody>
</table>

6-GRADIENT

| DRAINAGE AREA (1.36 ft/ml) | | |
|----------------------------|-----------|
| Very low – Low (2-4) | | |
| Moderate (6-10) | | |
| High – Very high (10-6) | | |

| Pool/Current | | |
|--------------|-----------|
| Maximum (6) | | |

**RECREATION POTENTIAL**

| No Riffle (metric=0) | | |

**RIFFLE/Run Embedd| Best Areas >10cm (2) | | |
| Best Areas 5-10cm (1) | | |
| Best Areas <5cm (metric=0) | | |

<table>
<thead>
<tr>
<th>Gradient</th>
<th>Check ONE (or 2 &amp; average)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very low – Low (2-4)</td>
<td></td>
</tr>
<tr>
<td>Moderate (6-10)</td>
<td></td>
</tr>
<tr>
<td>High – Very high (10-6)</td>
<td></td>
</tr>
</tbody>
</table>

| Gradient | | |
|----------|-----------|
| Maximum (10) | | |

| RECREATION POTENTIAL | | |
| No Riffle (metric=0) | | |

**COMMENTS**

- Indicate predominant land use(s) past 100m riparian.
- Indicate functional riffles; Best areas must be large enough to support a population of riffle-obligate species.

**COMMENTS**

- Estimate % or note every type present.
- Indicate for reach.

**COMMENTS**

- Indicate predominant land use(s) past 100m riparian.
- Indicate functional riffles; Best areas must be large enough to support a population of riffle-obligate species.

**COMMENTS**

- Estimate % or note every type present.
- Indicate for reach.
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<thead>
<tr>
<th>A-CANOPY</th>
<th>B-AESTHETICS</th>
<th>C-MAINTENANCE</th>
<th>D-ISSUES</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;85% - Open</td>
<td>Nuisance algae</td>
<td>Public /</td>
<td>WWTP /</td>
</tr>
<tr>
<td>55% - &lt;85%</td>
<td>Invasive macrophytes</td>
<td>Active /</td>
<td>Hardened /</td>
</tr>
<tr>
<td>30% - &lt;55%</td>
<td>Excess turbidity</td>
<td>Young - Succession - Old</td>
<td>Contaminated /</td>
</tr>
<tr>
<td>10% - &lt;30%</td>
<td>Discoloration</td>
<td>Spray /</td>
<td>BMPs – Construction – Sediment</td>
</tr>
<tr>
<td>&lt;10% - Closed</td>
<td>Foam/Scum</td>
<td>Modified /</td>
<td>Logging /</td>
</tr>
<tr>
<td>Canopy Upstream Reading</td>
<td>Oil sheen</td>
<td>Leveed /</td>
<td>Bank/</td>
</tr>
<tr>
<td>Right</td>
<td>Trash/Litter</td>
<td>Moving - Bedload – Stable</td>
<td>False bank /</td>
</tr>
<tr>
<td>86 Middle</td>
<td>Nuisance odor</td>
<td>Armoured</td>
<td>Wash H2O /</td>
</tr>
<tr>
<td>CSOs/SSOs/Outfalls</td>
<td>Sludge deposits</td>
<td>Islands /</td>
<td>Acid /</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Relocated /</td>
<td>Natural /</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Impounded /</td>
<td>Park /</td>
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<tr>
<td></td>
<td></td>
<td>Flood Control /</td>
<td>Atmosphere /</td>
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<td></td>
<td></td>
<td>Snag /</td>
<td>Agriculture /</td>
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<td></td>
<td>Data Paucity</td>
</tr>
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<td></td>
<td></td>
<td>Livestock</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>CSO /</td>
</tr>
<tr>
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<td>NPDES /</td>
</tr>
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<td></td>
<td></td>
<td></td>
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<td>Landfill</td>
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<td>Cooling</td>
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<td></td>
<td></td>
<td>Erosion</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Manure /</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Tile /</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Mine /</td>
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<td>Quary /</td>
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<td></td>
<td></td>
<td></td>
<td>Stagnant</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Golf /</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Home</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Flow</td>
</tr>
</tbody>
</table>

Stream Drawing
**1-SUBSTRATE**

**BEST TYPES**
- **Total**
  - Pool
  - Riffle

**OTHER TYPES**
- **Total**
  - Pool
  - Riffle

**COMMENTS**
- Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species:

**NUMBER OF BEST TYPES:**
- 4 or more (2)
- 3 or less (0)

**AMOUNT**

**2-INSTREAM COVER**

- Undercut banks (1)
- Overhanging vegetation (1)
- Shallows (in slow water) (1)
- Rootmats (1)

**COMMENTS**

**3-CHANNEL MORPHOLOGY**

- **SINUOSITY**
  - High (4)
  - Moderate (3)
  - Low (2)
  - None (1)

- **DEVELOPMENT**
  - Excellent (7)
  - Good (5)
  - Fair (3)
  - Poor (1)

**CHANNELIZATION**

- None (6)
- Recovered (4)
- Recovering (3)
- Recent or no recovery (1)

**STABILITY**

- None (6)
- Moderate (2)
- Low (1)

**AMOUNT**

**4- BANK EROSION & RIPARIAN ZONE**

- **EROSION**
  - None or little (3)
  - Moderate (2)
  - Heavy/Severe (1)

- **RIPARIAN WIDTH**
  - Wide >50m (4)
  - Moderate 10-50m (3)
  - Narrow 5-10m (2)
  - Very narrow <5m (1)
  - None (0)

- **FLOOD PLAIN QUALITY**
  - Forest, Swamp (3)
  - Shrub or Old field (2)
  - Residential, Park, New field (1)
  - Fenced pasture (1)
  - Open Pasture/Rowcrop (0)

**RECREATION POTENTIAL**

- Conservation Tillage (1)
- Mining, construction (0)

**5-POOL/GLIDE AND RIFFLE/RUN QUALITY**

- **MAXIMUM DEPTH**
  - >1m (6)
  - 0.7-<1m (4)
  - 0.4-<0.7m (2)
  - 0.2-<0.4m (1)
  - <0.2m (0)

- **CHANNEL WIDTH**
  - Pool width > riffle width (2)
  - Pool width = riffle width (1)
  - Pool width < riffle width (0)

- **CURRENT VELOCITY**
  - Torrential (-1)
  - Slow (1)
  - Very Fast (1)
  - Intertidal (-1)
  - Fast (1)
  - Intermittent (-2)
  - Moderate (1)
  - Eddies (1)

**RECREATION POTENTIAL**

- Primary Contact
- Secondary Contact

**6-GRADIENT**

- **DRAINAGE AREA**
  - 1.36 ft/ml
  - 7.238 m

- **Gradient**
  - Very low – Low (2-4)
  - Moderate (6-10)
  - High – Very high (10-6)

**QHEI Score:** 27
## OWQ Biological Studies QHEI (Qualitative Habitat Evaluation Index)

### Circle some & COMMENT

<table>
<thead>
<tr>
<th>A-CANOPY</th>
<th>B-AESTHETICS</th>
<th>C-MAINTENANCE</th>
<th>D-ISSUES</th>
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</thead>
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<td>◇ Spray /</td>
<td>◇ BMPs – Construction – Sediment</td>
</tr>
<tr>
<td>&lt;10% - Closed</td>
<td>◇ Foam/Scum</td>
<td>◇ Modified /</td>
<td>◇ Logging /</td>
</tr>
<tr>
<td></td>
<td>◇ Oil sheen</td>
<td>◇ Leved /</td>
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<tr>
<td></td>
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<td>◇ Agriculture /</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>◇ Data Paucity</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>◇ Livestock</td>
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<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

### Canopy Upstream Reading
- Right
  - 65 Middle
  - Left

### Stream Drawing

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### 1-SUBSTRATE

**BEST TYPES**

- Boulders/Slabs (10)
- Cobble (8)
- Gravel (7)
- Sand (6)
- Bedrock (5)
- Natural substrate (1)

**TOTAL**

- **POOL**
  - **RIFFLE**
  - **TOTAL**
  - **POOL**
  - **RIFFLE**

**ORIGIN**

- Sediment (1)
- Sand (2)
- Gravel (3)
- Silt (2)
- Artificial (1)

**QUALITY**

- 1
- 2
- 3
- 4
- 5
- 6

**COMMENTS**

- Stabilized stream bed
- Artificial substrate

---

### 2-STREAM COVER

**Indicate presence 0 to 3:**

- 0: Absent
- 1: Very small amounts or if more common of marginal quality
- 2: Moderate amounts, but not of highest quality or in small amounts of highest quality
- 3: Highest quality in moderate or greater amounts (e.g., very large boulders in deep or fast water, large diameter log that is stable, well developed rootwad in deep water, or deep, well-defined functional pools.

<table>
<thead>
<tr>
<th>Cover</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>20</td>
</tr>
</tbody>
</table>

**COMMENTS**

- Natural substrate
- Artificial substrate

---

### 3-CHANNEL MORPHOLOGY

**Check ONE in each category**

<table>
<thead>
<tr>
<th>SINOUSITY</th>
<th>DEVELOPMENT</th>
<th>CHANNELIZATION</th>
<th>STABILITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>High (4)</td>
<td>Excellent (7)</td>
<td>None (6)</td>
<td>High (3)</td>
</tr>
<tr>
<td>Moderate (3)</td>
<td>Good (5)</td>
<td>Recovered (4)</td>
<td>Moderate (2)</td>
</tr>
<tr>
<td>Low (2)</td>
<td>Poor (1)</td>
<td>Recovering (3)</td>
<td>Low (1)</td>
</tr>
<tr>
<td>None (1)</td>
<td>Poor (1)</td>
<td>Recent or no recovery (1)</td>
<td>Moderate (2)</td>
</tr>
</tbody>
</table>

**AMOUNT**

- **Extensive >75% (1)**
- **Moderate 25–75% (7)**
- **Sparse 5<25% (3)**
- **Nearly absent <5% (1)**

**COMMENTS**

- Natural substrate
- Artificial substrate

---

### 4- BANK EROSION & RIPARIAN ZONE

**Check ONE in each category for EACH BANK**

- **Erosion**
  - None or little (3)
  - Moderate (2)
  - Heavy/Severe (1)

- **Riparian Width**
  - L R

- **FLOOD PLAIN QUALITY**

<table>
<thead>
<tr>
<th>L R</th>
<th>Forest Swamp (3)</th>
<th>Shrub or Old field (2)</th>
<th>Residential, Park, New field (1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>L R</td>
<td>Fenced pasture (1)</td>
<td>Open Pasture/Rowcrop (0)</td>
<td>Wetlands (0)</td>
</tr>
</tbody>
</table>

**AMOUNT**

- **Primary Contact**
- **Secondary Contact**

**COMMENTS**

- Natural substrate
- Artificial substrate

---

### 5-POOL/GLIDE AND RIFFLE/RUN QUALITY

**MAXIMUM DEPTH**

- **CHANNEL WIDTH**
  - **CURRENT VELOCITY**
  - **RECREATION POTENTIAL**

<table>
<thead>
<tr>
<th>Pool/Current</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>12</td>
</tr>
</tbody>
</table>

**COMMENTS**

- Natural substrate
- Artificial substrate

---

### 6-GRADIENT

**Drainage Area**

- 5.959 ft/mi

<table>
<thead>
<tr>
<th>Gradient</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>12</td>
</tr>
</tbody>
</table>

**COMMENTS**

- Natural substrate
- Artificial substrate

---

### QHEI Score:

<table>
<thead>
<tr>
<th>QHEI Score:</th>
<th>24</th>
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</thead>
<tbody>
<tr>
<td>A-CANOPY</td>
<td>B-AESTHETICS</td>
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<tr>
<td>----------</td>
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<td>Oil sheen</td>
</tr>
<tr>
<td>Canopy Upstream Reading</td>
<td>Foam/Scum</td>
</tr>
<tr>
<td>Right</td>
<td>Trash/Litter</td>
</tr>
<tr>
<td>Middle</td>
<td>Nuisance odor</td>
</tr>
<tr>
<td>CSOs/SSOs/Outfalls</td>
<td>Sludge deposits</td>
</tr>
<tr>
<td></td>
<td>CSOs/SSOs/Outfalls</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
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</tr>
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<td></td>
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</tr>
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<td></td>
</tr>
<tr>
<td>96</td>
<td></td>
</tr>
<tr>
<td>Left</td>
<td></td>
</tr>
</tbody>
</table>

Stream Drawing
### 1-SUBSTRATE

**BEST TYPES**
- Bidrs/Slabs (10)
- Boulders (9)
- Cobble (8)
- Gravel (7)
- Sand (6)
- Bedrock (5)
- Other Substrate (9)

**TOTAL**

<table>
<thead>
<tr>
<th>Substrate</th>
<th>Pool</th>
<th>Riffle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bidrs/Slabs</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Boulders</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Cobble</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>Gravel</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>Sand</td>
<td>45</td>
<td>45</td>
</tr>
<tr>
<td>Bedrock</td>
<td>45</td>
<td>45</td>
</tr>
</tbody>
</table>

**ORIGIN**
- Boulders (4)
- Detritus (3)
- Muck (2)
- Silt (2)
- Artificial (0)

**QUALITY**
- Limestone (1)
- Tills (1)
- Wetlands (0)
- Hardpan (0)
- Rip/Rap (0)
- Lacustrine (0)
- Shale (1)
- Coal fines (2)

**Substrate**
- Maximum 13

**COMMENTS**
- Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species:
- Check ONE (2 & average)

### 2-INSTREAM COVER

- Indicate presence 0 to 3: 0-Absent; 1-Very small amounts or if more common of marginal quality; 2-Moderate amounts, but not of highest quality or in small amounts of highest quality; 3-Highest quality in moderate or greater amounts (e.g., very large boulders in deep or fast water, large diameter log that is stable, well developed rootwad in deep / fast water, or deep, well-defined, functional pools.

**AMOUNT**
- Check ONE (2 & average)

### 3-CANAL MOGRAPHY

**SINUOSITY**
- High (4)
- Moderate (3)
- Low (2)
- None (1)

**DEVELOPMENT**
- Excellent (7)
- Good (5)
- Fair (3)
- Poor (1)

**CHANNELIZATION**
- None (6)
- Recovered (4)
- Recovering (3)
- Recent or no recovery (1)

**STABILITY**
- High (3)
- Moderate (2)
- Low (1)

**COMMENTS**
- Check ONE in each category (Or 2 & average)

### 4-BANK EROSION & RIPARIAN ZONE

- Indicate presence 0 to 3: 0-Absent; 1-Greater amounts (e.g., very large boulders in deep or fast water, large diameter log that is stable, well developed rootwad in deep / fast water, or deep, well-defined, functional pools.

**RECONNECTION POTENTIAL**
- Primary Contact
- Secondary Contact

**AMOUNT**
- Check ONE in each category for EACH BANK (Or 2 per bank & average)

### 5-POOL/GLIDE AND RIFFLE/RUN QUALITY

**MAXIMUM DEPTH**
- Check ONE (ONLY)

**CHANNEL WIDTH**
- Check ONE (or 2 & average)

**CURRENT VELOCITY**
- Check ALL that apply

**RECREATION POTENTIAL**
- Indicate predominant land use(s) past 100m riparian.

**COMMENTS**
- Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species:

### 6-GRADIENT

**DRAINAGE AREA**
- Check ONE (ONLY)

**COMMENTS**
- Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species:
## OWQ Biological Studies QHEI (Qualitative Habitat Evaluation Index)

**A-CANOPY**
- >85% - Open
- 55%<85%
- 30%<55%
- 10%<30%
- <10% - Closed

**B-AESTHETICS**
- Nuisance algae
- Invasive macrophytes
- Excess turbidity
- Discoloration
- Foam/Scum
- Oil sheen
- Trash/Litter
- Sludge deposits
- CSOs/SSOs/Outfalls

**C-MAINTENANCE**
- Public /
- Active /
- Young - Succession - Old
- Spray /
- Modified /
- Leveded /
- Moving - Bedload – Stable
- Armoured
- Islands / 
- Relocated /
- Impounded /
- Flood Control /
- Snag /
- Private / Both / NA
- Historic / Both / NA
- Removed
- Dipped out / NA
- One sided
- Scoured
- Cutoffs
- Desiccated
- Drainage

**D-ISSUES**
- WWTP /
- Hardened /
- Contaminated /
- BMPs – Construction – Sediment
- Logging /
- Bank/
- False bank /
- Wash H2O /
- Acid /
- Natural /
- Park /
- Atmosphere / 
- Agriculture / 
- NPDES / 
- Urban / 
- Contaminated / 
- Irrigation / 
- Erosion / 
- Manure / 
- Mine / 
- Wetlands / 
- Golf / 
- Data Paucity
- Livestock
- CSO / 
- Dirt & Grime
- WWTP /
- NPDES /
- Urban /
- Contaminated /
- Irrigation /
- Erosion /
- Manure /
- Mine /
- Wetlands /
- Golf /
- Data Paucity
- Livestock
- CSO /
- Dirt & Grime
- Landfill
- Cooling
- Surface
- Lagoon
- H2O table
- Quarry /
- Stagnant
- Lawn /
- Home
- Flow

---

**Canopy Upstream Reading**
- Right
- 38 Middle
- Left

---

**Stream Drawing**
sample # bioSample # stream name location
ab11742 130722404 Tributary of main Beaver Dam Ditch Summit Street

* habitat complete

1-substrate

check only two substrate type boxes: estimate % or note every type present

check one (or 2 & average)

BEST TYPES

<table>
<thead>
<tr>
<th>type</th>
<th>total</th>
<th>pool</th>
<th>riffle</th>
<th>total</th>
<th>pool</th>
<th>riffle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bidrs/slabs</td>
<td>10</td>
<td></td>
<td></td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>boulders</td>
<td></td>
<td>9</td>
<td></td>
<td>70</td>
<td></td>
<td></td>
</tr>
<tr>
<td>cobble</td>
<td>8</td>
<td>20</td>
<td></td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>gravel</td>
<td>5</td>
<td></td>
<td></td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bedrock</td>
<td>5</td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

other types

<table>
<thead>
<tr>
<th>type</th>
<th>total</th>
<th>pool</th>
<th>riffle</th>
<th>total</th>
<th>pool</th>
<th>riffle</th>
</tr>
</thead>
<tbody>
<tr>
<td>hardpan</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>detritus</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>muck</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>slit</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>artificial</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

number of best types: 4 or more (2)
3 or less (0)

comments

2-instream cover

indicate presence 0 to 3: 0: Absent; 1: Very small amounts or if more common of marginal quality; 2: Moderate amounts, but not of highest quality or in small amounts of highest quality; 3: Highest quality in moderate or greater amounts (e.g., very large boulders in deep or fast water, large diameter log that is stable, well developed rootwad in deep / fast water, or deep, well-defined, functional pools.

<table>
<thead>
<tr>
<th>type</th>
<th>amount</th>
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</thead>
<tbody>
<tr>
<td>undercuts</td>
<td>0-0</td>
</tr>
<tr>
<td>overhanging vegetation</td>
<td>0-0</td>
</tr>
<tr>
<td>shallows (in slow water)</td>
<td>0-0</td>
</tr>
<tr>
<td>rootmats</td>
<td>0-0</td>
</tr>
</tbody>
</table>

comments

3-channel morphology

check one in each category (or 2 & average)

<table>
<thead>
<tr>
<th>parameter</th>
<th>high (4)</th>
<th>moderate (3)</th>
<th>low (2)</th>
<th>none (1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>sinuosity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>development</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>channelization</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>stability</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4-bank erosion & riparian zone

check one in each category for each bank (or 2 per bank & average)

<table>
<thead>
<tr>
<th>parameter</th>
<th>L</th>
<th>R</th>
<th>L</th>
<th>R</th>
<th>L</th>
<th>R</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>riparian width</td>
<td>none</td>
<td>or</td>
<td>none</td>
<td>or</td>
<td>none</td>
<td>or</td>
<td>none</td>
</tr>
<tr>
<td>forest</td>
<td>swamp</td>
<td>3</td>
<td>shrub</td>
<td>or</td>
<td>old</td>
<td>field</td>
<td>2</td>
</tr>
<tr>
<td>residential</td>
<td>park</td>
<td>new</td>
<td>field</td>
<td>1</td>
<td>fenced</td>
<td>pasture</td>
<td>1</td>
</tr>
<tr>
<td>open</td>
<td>pasture</td>
<td>or</td>
<td>rowcrop</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

comments

5-pool/glide and riffle/run quality

check one (only)

<table>
<thead>
<tr>
<th>parameter</th>
<th>maximum depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>channel width</td>
<td>check one (or 2 &amp; average)</td>
</tr>
<tr>
<td>current velocity</td>
<td>check all that apply</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>riffle depth</th>
<th>run depth</th>
<th>riffle/run embeddedness</th>
</tr>
</thead>
<tbody>
<tr>
<td>best areas</td>
<td>maximum</td>
<td>none</td>
</tr>
<tr>
<td>&gt;10cm (2)</td>
<td>&gt;50cm (2)</td>
<td>(metric=0)</td>
</tr>
<tr>
<td>&gt;5-10cm (1)</td>
<td>&gt;25cm (1)</td>
<td>low (1)</td>
</tr>
<tr>
<td>&gt;5cm (metric=0)</td>
<td>&gt;20cm (metric=0)</td>
<td>moderate (0)</td>
</tr>
</tbody>
</table>

comments

6-gradient

<table>
<thead>
<tr>
<th>parameter</th>
<th>pool/current</th>
</tr>
</thead>
<tbody>
<tr>
<td>drain area</td>
<td>4037 ft/1</td>
</tr>
<tr>
<td>gradient</td>
<td>6</td>
</tr>
</tbody>
</table>

comments
<table>
<thead>
<tr>
<th>A-CANOPY</th>
<th>B-AESTHETICS</th>
<th>C-MAINTENANCE</th>
<th>D-ISSUES</th>
</tr>
</thead>
<tbody>
<tr>
<td>◇ &gt;85% - Open</td>
<td>◇ Nuisance algae</td>
<td>◇ Public /</td>
<td>◇ WWTP /</td>
</tr>
<tr>
<td>◇ 55%&lt;85%</td>
<td>◇ Invasive macrophytes</td>
<td>◇ Active /</td>
<td>◇ Hardened /</td>
</tr>
<tr>
<td>◇ 30%&lt;55%</td>
<td>◇ Excess turbidity</td>
<td>◇ Young - Succession - Old</td>
<td>◇ Contaminated /</td>
</tr>
<tr>
<td>◇ 10%&lt;30%</td>
<td>◇ Discoloration</td>
<td>◇ Spray /</td>
<td>◇ BMPs – Construction – Sediment</td>
</tr>
<tr>
<td>◇ &lt;10% - Closed</td>
<td>◇ Foam/Scum</td>
<td>◇ Modified /</td>
<td>◇ Logging /</td>
</tr>
<tr>
<td></td>
<td>◇ Oil sheen</td>
<td>◇ Leveed /</td>
<td>◇ Bank/</td>
</tr>
<tr>
<td></td>
<td>◇ Nuisance odor</td>
<td>◇ Moving - Bedload – Stable</td>
<td>◇ False bank /</td>
</tr>
<tr>
<td></td>
<td>◇ Sludge deposits</td>
<td>◇ Armoured</td>
<td>◇ Wash H2O /</td>
</tr>
<tr>
<td></td>
<td>◇ CSOs/SSOs/Outfalls</td>
<td>◇ Islands /</td>
<td>◇ Acid /</td>
</tr>
<tr>
<td></td>
<td></td>
<td>◇ Relocated /</td>
<td>◇ Natural /</td>
</tr>
<tr>
<td></td>
<td></td>
<td>◇ Impounded /</td>
<td>◇ Park /</td>
</tr>
<tr>
<td></td>
<td></td>
<td>◇ Flood Control /</td>
<td>◇ Atmosphere /</td>
</tr>
<tr>
<td></td>
<td></td>
<td>◇ Snag /</td>
<td>◇ Agriculture /</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Canopy Upstream Reading</td>
<td></td>
<td>Private / Both / NA</td>
<td></td>
</tr>
<tr>
<td>Right</td>
<td></td>
<td>Historic / Both / NA</td>
<td></td>
</tr>
<tr>
<td>25 Middle</td>
<td></td>
<td>Removed</td>
<td></td>
</tr>
<tr>
<td>Left</td>
<td></td>
<td>Dipped out / NA</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>One sided</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stream Drawing</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### 1-Substrate

**BEST TYPES**
- Indicate presence 0 to 3: 0-Absent; 1-Very small amounts or if more common of marginal quality; 2-Moderate amounts, but not of highest quality or in small amounts of highest quality; 3-Highest quality in moderate or greater amounts (e.g., very large boulders in deep or fast water, large diameter log that is stable, well developed rootwad in deep/fast water, or deep, well-defined, functional pools).

<table>
<thead>
<tr>
<th>Substrate Type</th>
<th>Code</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bidrs/Slabs</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Boulders</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Cobble</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Gravel</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Sand</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Bedrock</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

**TOTAL POOL**
- 0

| TOTAL RIFFLE | 0 |

**OTHER TYPES**

<table>
<thead>
<tr>
<th>Substrate Type</th>
<th>Code</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detritus</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Muck</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Slit</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Artificial</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

**TOTAL POOL**
- 0

| TOTAL RIFFLE | 0 |

**COMMENTS**

- Indicate for functional riffles: Best areas must be large enough to support a population of riffle-obligate species.

### 2-Instream Cover

- Check ONE (or 2 & average)

<table>
<thead>
<tr>
<th>AMOUNT</th>
<th>Code</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extensive &gt;75%</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>Moderate 25-75%</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Sparse 5-&lt;25%</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Nearly absent &lt;5%</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

### 3-Channel Morphology

- Check ONE in each category (Or 2 & average)

<table>
<thead>
<tr>
<th>SINUOSITY</th>
<th>Code</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>High (4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderate (3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low (2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>None (1)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**DEVELOPMENT**
- Check ONE (or 2 & average)

<table>
<thead>
<tr>
<th>DEVELOPMENT</th>
<th>Code</th>
<th>Comments</th>
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<tbody>
<tr>
<td>Excellent (7)</td>
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<tr>
<td>Good (5)</td>
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</tr>
<tr>
<td>Fair (3)</td>
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<td></td>
</tr>
<tr>
<td>Poor (1)</td>
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</table>

**CHANNELIZATION**
- Check ONE (or 2 & average)

<table>
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<th>CHANNELIZATION</th>
<th>Code</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>None (6)</td>
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</tr>
<tr>
<td>Recovered (4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recovering (3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recent or no recovery (1)</td>
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<td></td>
</tr>
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</table>

**STABILITY**
- Check ONE (or 2 & average)

<table>
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<tr>
<th>STABILITY</th>
<th>Code</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>High (3)</td>
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<td></td>
</tr>
<tr>
<td>Moderate (2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low (1)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 4-Bank Erosion & Riparian Zone

- Check ONE in each category for EACH BANK (Or 2 per bank & average)

**RIPIARIAN WIDTH**
- Check ONE (or 2 & average)

<table>
<thead>
<tr>
<th>RIPIARIAN WIDTH</th>
<th>Code</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>None or little (3)</td>
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<tr>
<td>Moderate (2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heavy/Severe (1)</td>
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<td></td>
</tr>
</tbody>
</table>

**FLOOD PLAIN QUALITY**
- Check ONE (or 2 & average)

<table>
<thead>
<tr>
<th>FLOOD PLAIN QUALITY</th>
<th>Code</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forest, Swamp (3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shrub or Old field (2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Residential, Park, New field (1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fenced pasture (1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Open Pasture/Rowcrop (0)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**EROSION**
- Check ONE (or 2 & average)

<table>
<thead>
<tr>
<th>EROSION</th>
<th>Code</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>None (0)</td>
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**L R**
- Check ONE (or 2 & average)

<table>
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<tr>
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<th>Comments</th>
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<tbody>
<tr>
<td>None</td>
<td>0</td>
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</tr>
<tr>
<td>Moderate</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Heavy</td>
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**RECREATION POTENTIAL**
- CheckOne (or 2 & average)

<table>
<thead>
<tr>
<th>RECREATION POTENTIAL</th>
<th>Code</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary Contact</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Secondary Contact</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 5-Pool/Glade and Riffle/Run Quality

- Check ONE (ONLY)

<table>
<thead>
<tr>
<th>MAXIMUM DEPTH</th>
<th>Code</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;1m (6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.7-&lt;1m (4)</td>
<td></td>
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<tr>
<td>0.4-&lt;0.7m (2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;0.2-0.4m (1)</td>
<td></td>
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**CHANNEL WIDTH**
- Check ONE (ONLY)

<table>
<thead>
<tr>
<th>CHANNEL WIDTH</th>
<th>Code</th>
<th>Comments</th>
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<tbody>
<tr>
<td>Pool width &gt; riffle width (2)</td>
<td></td>
<td></td>
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<tr>
<td>Pool width = riffle width (1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pool width &lt; riffle width (0)</td>
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**CURRENT VELOCITY**
- Check ALL that apply

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<tr>
<th>CURRENT VELOCITY</th>
<th>Code</th>
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<tbody>
<tr>
<td>Torrential (1)</td>
<td></td>
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<tr>
<td>Slow (1)</td>
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<tr>
<td>Very Fast (1)</td>
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<tr>
<td>Intermittent (2)</td>
<td></td>
<td></td>
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<tr>
<td>Fast (1)</td>
<td></td>
<td></td>
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<tr>
<td>Moderate (1)</td>
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<tr>
<td>Eddies (1)</td>
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**RECREATION POTENTIAL**
- Check ONE (ONLY)

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<th>Comments</th>
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<tr>
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<td></td>
</tr>
<tr>
<td>Secondary Contact</td>
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**POOL/GLADE**
- Check ONE (ONLY)

<table>
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<tr>
<td>Low</td>
<td>2</td>
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<tr>
<td>Moderate</td>
<td>6-10</td>
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<tr>
<td>High</td>
<td>10-20</td>
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### 6-Gradient

- Check ONE (ONLY)

<table>
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<tr>
<td>0</td>
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<tr>
<td>&gt;0.2-0.4m (1)</td>
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<table>
<thead>
<tr>
<th>DRAINAGE AREA</th>
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<th>Comments</th>
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<tr>
<td>Very low</td>
<td>2-4</td>
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<tr>
<td>Moderate</td>
<td>6-10</td>
<td></td>
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<tr>
<td>High</td>
<td>10-20</td>
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## OWQ Biological Studies QHEI (Qualitative Habitat Evaluation Index)

Circle some &

**COMMENT**

<table>
<thead>
<tr>
<th>A-CANOPY</th>
<th>B-AESTHETICS</th>
<th>C-MAINTENANCE</th>
<th>D-ISSUES</th>
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</thead>
<tbody>
<tr>
<td>◇ &gt;85% - Open</td>
<td>◇ Nuisance algae</td>
<td>◇ Public /</td>
<td>◇ WWTP /</td>
</tr>
<tr>
<td>◇ 55%&lt;85%</td>
<td>◇ Invasive macrophytes</td>
<td>◇ Active /</td>
<td>◇ Hardened /</td>
</tr>
<tr>
<td>◇ 30%&lt;55%</td>
<td>◇ Excess turbidity</td>
<td>◇ Young - Succession - Old</td>
<td>◇ Contaminated /</td>
</tr>
<tr>
<td>◇ 10%&lt;30%</td>
<td>◇ Discoloration</td>
<td>◇ Spray /</td>
<td>◇ BMPs – Construction – Sediment</td>
</tr>
<tr>
<td>◇ &lt;10% - Closed</td>
<td>◇ Foam/Scum</td>
<td>◇ Modified /</td>
<td>◇ Logging /</td>
</tr>
<tr>
<td></td>
<td>◇ Oil sheen</td>
<td>◇ Leveed /</td>
<td>◇ Bank/</td>
</tr>
<tr>
<td></td>
<td>◇ Nuisance odor</td>
<td>◇ Moving - Bedload – Stable</td>
<td>◇ False bank /</td>
</tr>
<tr>
<td></td>
<td>◇ Sludge deposits</td>
<td>◇ Armoured</td>
<td>◇ Wash H2O /</td>
</tr>
<tr>
<td></td>
<td>◇ CSOs/SSOs/Outfalls</td>
<td>◇ Islands /</td>
<td>◇ Acid /</td>
</tr>
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<td></td>
<td></td>
<td>◇ Relocated /</td>
<td>◇ Natural /</td>
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<td></td>
<td>◇ Impounded /</td>
<td>◇ Park /</td>
</tr>
<tr>
<td></td>
<td></td>
<td>◇ Flood Control /</td>
<td>◇ Atmosphere /</td>
</tr>
<tr>
<td></td>
<td></td>
<td>◇ Snag /</td>
<td>◇ Agriculture /</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>◇ NPDES /</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>◇ Urban /</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>◇ Landfill</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>◇ Cooling</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>◇ Surface</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>◇ Lagoon</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>◇ H2O table</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>◇ Quarry /</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>◇ Stagnant</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>◇ Lands /</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>◇ Home</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>◇ Livestock</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>◇ Flow</td>
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**Canopy Upstream Reading**
- Right
  - 92 Middle
- Left

**Stream Drawing**
**OWQ Biological Studies QHEI (Qualitative Habitat Evaluation Index)**

<table>
<thead>
<tr>
<th>Sample #</th>
<th>bioSample #</th>
<th>Stream Name</th>
<th>Location</th>
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<tr>
<td>AB11744</td>
<td>130723107</td>
<td>Tributary of Main Beaver Dam Ditch</td>
<td>101st Avenue</td>
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</table>

**Surveyor**

<table>
<thead>
<tr>
<th>Date</th>
<th>County</th>
<th>Macro Sample Type</th>
<th>QHEI Score:</th>
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<tbody>
<tr>
<td>7/23/13</td>
<td>Lake</td>
<td>MHAB</td>
<td>27</td>
</tr>
</tbody>
</table>

**1-SUBSTRATE**

- **BEST TYPES**
  - Bldrs/Slabs (10)
  - Boulders (9)
  - Cobble (8)
  - Gravel (7)
  - Sand (6)
  - Bedrock (5)

- **TOTAL**
  - POOL
  - RIFFLE

- **OTHER TYPES**
  - Hardpan (4)
  - Detritus (3)
  - Muck (2)
  - Slit (2)
  - Artificial (0)

- **NUMBER OF BEST TYPES:**
  - 4 or more (2)
  - 3 or less (0)

**COMMENTS**

**2-INSTREAM COVER**

- **AMOUNT**
  - Check ONE (or 2 & average)
    - Extensive >75% (11)
    - Moderate 25-75% (7)
    - Sparse 5-25% (3)
    - Nearly absent <5% (1)

- **ENTRY QUALITY**
  - Check ONE (or 2 & average)
    - Excellent (7)
    - Good (5)
    - Fair (3)
    - Poor (1)

**3-CHANNEL MORPHOLOGY**

- **SINUOSITY**
  - High (4)
  - Moderate (3)
  - Low (2)
  - None (1)

- **DEVELOPMENT**
  - Excellent (7)
  - Good (5)
  - Fair (3)
  - Poor (1)

- **CHANNELIZATION**
  - None (6)
  - Recovered (4)
  - Recovering (3)
  - Recent or no recovery (1)

- **STABILITY**
  - High (3)
  - Moderate (2)
  - Low (1)

**4- BANK EROSION & RIPARIAN ZONE**

- **RIPARIAN WIDTH**
  - L
  - R
  - None or little (3)
  - Moderate (2)
  - Heavy/Severe (1)

- **EROSION**
  - None of the above

- **RECREATION POTENTIAL**
  - Primary Contact
  - Secondary Contact

**5-POOL/GLIDE AND RIFFLE/RUN QUALITY**

- **MAXIMUM DEPTH**
  - Check ONE (ONLY)
    - >1m (6)
    - 0.7-1m (4)
    - 0.4-0.7m (2)
    - 0.2-0.4m (1)
    - <0.2m (metric=0)

- **CHANNEL WIDTH**
  - Pool width > riffle width (2)
  - Pool width = riffle width (1)
  - Pool width < riffle width (0)

- **CURRENT VELOCITY**
  - Torrential (-1)
  - Slow (1)
  - Very Fast (1)
  - Intertidal (-1)
  - Fast (1)
  - Intermittent (-2)
  - Moderate (1)
  - Eddies (1)

**6-GRADIENT**

- **DRAINAGE AREA**
  - 2.593 ft/ml
  - 1.536 m²

- **RECREATION POTENTIAL**
  - No Riffle (metric=0)

**COMMENTS**

**Estimate % or note every type present**

- L   R
  - Maximum >50m (4)
  - Moderate 10-50m (3)
  - Narrow 5-10m (2)
  - Very narrow <5m (1)
  - None (0)

- L   R
  - Forest Swamp (3)
  - Shrub or Old field (2)
  - Residential, Park, New field (1)
  - Fenced pasture (1)
  - Open Pasture/Rowcrop (0)

- L   R
  - Conservation Tillage (1)
  - Urban or Industrial (0)
  - Mining, construction (0)

- Pool/Current
  - Maximum

- Gradient
  - Maximum

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## OWQ Biological Studies QHEI (Qualitative Habitat Evaluation Index)

### A-CANOPY
- >85% - Open
- 55%-<85%
- 30%-<55%
- 10%-<30%
- <10% - Closed

### B-AESTHETICS
- Nuisance algae
- Invasive macrophytes
- Excess turbidity
- Discoloration
- Foam/Scum
- Oil sheen
- Trash/Litter
- Sludge deposits
- CSOs/SSOs/Outfalls
- Moving - Bedload – Stable
- Armoured
- Islands /
- Relocated /
- Impounded /
- Flood Control /
- Snag /

### C-MAINTENANCE
- Public /
- Active /
- Young - Succession - Old
- Spray /
- Modified /
- Leveed /
- Moving - Bedload – Stable
- Armoured
- Islands /
- Relocated /
- Impounded /
- Flood Control /
- Snag /
- Private / Both / NA
- Historic / Both / NA
- Removed
- Dipped out / NA
- One sided
- Desiccated
- Drainage

### D-ISSUES
- WWTP /
- Hardened /
- Contaminated /
- BMPs – Construction – Sediment
- Logging /
- Bank/
- False bank /
- Wash H2O /
- Acid /
- Natural /
- Park /
- Atmosphere /
- Agriculture /
- NPDES /
- Urban /
- Contaminated /
- Irrigation /
- Erosion /
- Manure /
- Mine /
- Wetlands /
- Golf /
- Data Paucity
- Livestock
- CSO /
- Dirt & Grime
- Landfill
- Cooling
- Surface
- Lagoon
- H2O table
- Quarry /
- Stagnant
- Lawn/
- Home
- Flow

### Canopy Upstream Reading
- 74 Middle
- Left

### Stream Drawing
1-SUBSTRATE

**BEST TYPES**
- Bldrs/Slabs (10)
- Boulders (9)
- Cobble (8)
- Gravel (7)
- Sand (6)
- Bedrock (5)

**TOTAL**
- Pool
- Riffle

**OTHER TYPES**
- Hardpan (4)
- Detritus (3)
- Muck (2)
- Slit (2)
- Artificial (0)

**NUMBER OF BEST TYPES:**
- 4 or more (2)
- 3 or less (0)

**COMMENTS**

2-INSTREAM COVER

**AMOUNT**
- Undercut banks (1)
- Overhanging vegetation (1)
- Shallows (in slow water) (1)
- Rootmats (1)

**COMMENTS**

3-CHANNEL MORPHOLOGY

**CHANNEL WIDTH**
- None (0)
- Poor (1)
- Good (5)
- Excellent (7)

**STABILITY**
- None (6)
- Recovered (4)
- Recovering (3)
- Recent or no recovery (1)

**COMMENTS**

4- BANK EROSION & RIPARIAN ZONE

**CHANNEL**
- Forest, Swamp (3)
- Shrub or Old field (2)
- Residential, Park, New field (1)
- Fenced pasture (1)
- Open Pasture/Rowcrop (0)

**Riparian**
- Conservation Tillage (1)
- Mining, construction (0)
- Indicate predominant land use(s) past 100m riparian.

**COMMENTS**

5-POOL/GLIDE/RUN SUBSTRATE

**CURRENT VELOCITY**
- Torrential (-1)
- Slow (1)
- Very Fast (1)
- Intermittent (-2)
- Fast (1)
- Moderate (1)
- Eddies (1)

**RECREATION POTENTIAL**
- Primary Contact
- Secondary Contact

**COMMENTS**

6-GRADIENT

**DRAINAGE AREA**
- 2,898 ft/mi
- 2,347 mi²

**COMMENTS**

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**QHEI Score:** 25

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OWQ Biological Studies QHEI (Qualitative Habitat Evaluation Index)
## OWQ Biological Studies QHEI (Qualitative Habitat Evaluation Index)

Circle some &

**COMMENT**

<table>
<thead>
<tr>
<th>A-CANOPY</th>
<th>B-AESTHETICS</th>
<th>C-MAINTENANCE</th>
<th>D-ISSUES</th>
</tr>
</thead>
<tbody>
<tr>
<td>✧ &gt;85% - Open</td>
<td>✧ Nuisance algae</td>
<td>✧ Public /</td>
<td>✧ WWTP /</td>
</tr>
<tr>
<td>✧ 55%&lt;85%</td>
<td>✧ Invasive macrophytes</td>
<td>✧ Active /</td>
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<tr>
<td>✧ 30%&lt;55%</td>
<td>✧ Excess turbidity</td>
<td>✧ Young - Succession - Old</td>
<td>✧ Contaminated /</td>
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<td>✧ Discoloration</td>
<td>✧ Spray /</td>
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</tr>
<tr>
<td>✧ &lt;10% - Closed</td>
<td>✧ Foam/Scum</td>
<td>✧ Modified /</td>
<td>✧ Logging /</td>
</tr>
<tr>
<td>Canopy Upstream Reading</td>
<td>Trash/Litter</td>
<td>✧ Leveed /</td>
<td>✧ Bank/</td>
</tr>
<tr>
<td>Right</td>
<td>✧ Nuisance odor</td>
<td>✧ Moving - Bedload – Stable</td>
<td>✧ False bank /</td>
</tr>
<tr>
<td>98 Middle</td>
<td>✧ Sludge deposits</td>
<td>✧ Armoured /</td>
<td>✧ Wash H2O /</td>
</tr>
<tr>
<td>Left</td>
<td>✧ CSOs/SSOs/Outfalls</td>
<td>✧ Islands /</td>
<td>✧ Acid /</td>
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<td></td>
<td>✧ Relocated /</td>
<td>✧ Natural /</td>
</tr>
<tr>
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<td></td>
<td>✧ Impounded /</td>
<td>✧ Park /</td>
</tr>
<tr>
<td></td>
<td></td>
<td>✧ Flood Control /</td>
<td>✧ Atmosphere /</td>
</tr>
<tr>
<td></td>
<td></td>
<td>✧ Snag /</td>
<td>✧ Agriculture /</td>
</tr>
<tr>
<td></td>
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<td>✧ Drainage</td>
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Stream Drawing

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<table>
<thead>
<tr>
<th>1-SUBSTRATE</th>
<th>BEST TYPES</th>
<th>OTHER TYPES</th>
<th>ORIGIN</th>
<th>QUALITY</th>
<th>Substrate</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>TOTAL POOL</td>
<td>RIFFLE</td>
<td>Hardpan (4)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>TOTAL POOL</td>
<td></td>
<td>Detritus (3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>TOTAL POOL</td>
<td></td>
<td>Limestone (1)</td>
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<td>TOTAL POOL</td>
<td></td>
<td>Tills (1)</td>
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<tr>
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<td>TOTAL POOL</td>
<td></td>
<td>Wetlands (0)</td>
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<tr>
<td></td>
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<td>TOTAL POOL</td>
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<td>Sandstone (0)</td>
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<td>Rip/Rap (0)</td>
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<td>Lacustrine (0)</td>
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<td></td>
<td>TOTAL POOL</td>
<td></td>
<td>Shale (1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>TOTAL POOL</td>
<td></td>
<td>Coal fines (2)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>TOTAL POOL</td>
<td></td>
<td>None (1)</td>
<td></td>
</tr>
</tbody>
</table>

**COMMENTS**

2-INSTREAM COVER [Circle one and comment on back] Check ONE (or 2 & average)

AMOUNT

- Extensive >75% (11)
- Moderate 25-75% (7)
- Sparse 5-25% (3)
- Nearly absent <5% (1)

3-CHANNEL MORPHOLOGY [Circle one in each category (Or 2 & average)]

**COMMENTS**

4- BANK EROSION & RIPARIAN ZONE [Circle one in each category for EACH BANK (Or 2 per bank & average)]

**COMMENTS**

5-POOL/GLIDE AND RIFFLE/RUN QUALITY [Check one (ONLY)]

**COMMENTS**

6-GRADIENT (6.888 ft/ml)

**COMMENTS**

#OWQ Biological Studies QHEI (Qualitative Habitat Evaluation Index)#
<table>
<thead>
<tr>
<th>A-CANOPY</th>
<th>B-AESTHETICS</th>
<th>C-MAINTENANCE</th>
<th>D-ISSUES</th>
</tr>
</thead>
<tbody>
<tr>
<td>◇ &gt;85% - Open</td>
<td>◇ Nuisance algae</td>
<td>◇ Public / Private / Both / NA</td>
<td>◇ WWTP / NPDES / CSO /</td>
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<tr>
<td>◇ 55%&lt;85%</td>
<td>◇ Invasive macrophytes</td>
<td>◇ Active / Historic / Both / NA</td>
<td>◇ Hardened / Urban / Dirt &amp; Grime</td>
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<tr>
<td>◇ 30%&lt;55%</td>
<td>◇ Excess turbidity</td>
<td>◇ Young - Succession - Old</td>
<td>◇ Contaminated / Landfill</td>
</tr>
<tr>
<td>◇ 10%&lt;30%</td>
<td>◇ Discoloration</td>
<td>◇ Spray / Removed</td>
<td>◇ BMPs – Construction – Sediment</td>
</tr>
<tr>
<td>◇ &lt;10% - Closed</td>
<td>◇ Oil sheen</td>
<td>◇ Modified / Dipped out / NA</td>
<td>◇ Logging / Irrigation / Cooling</td>
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<tr>
<td></td>
<td>◇ Nuisance odor</td>
<td>◇ Leveed / One sided</td>
<td>◇ Bank/ Erosion / Surface</td>
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<tr>
<td></td>
<td>◇ Trash/Litter</td>
<td>◇ Moving - Bedload – Stable</td>
<td>◇ False bank / Manure / Lagoon</td>
</tr>
<tr>
<td></td>
<td>◇ Sludge deposits</td>
<td>◇ Armoured / Slumps</td>
<td>◇ Wash H2O / Mine / Quarry / H2O table</td>
</tr>
<tr>
<td></td>
<td>◇ CSOs/SSOs/Outfalls</td>
<td>◇ Islands / Scoured</td>
<td>◇ Acid / Wetlands / Quarry /</td>
</tr>
<tr>
<td>Canopy Upstream</td>
<td></td>
<td>◇ Relocated / Cutoffs</td>
<td>◇ Natural / Golf / Home</td>
</tr>
<tr>
<td>Reading Right</td>
<td></td>
<td>◇ Impounded / Desiccated</td>
<td>◇ Park / Data Paucity / Flow</td>
</tr>
<tr>
<td></td>
<td></td>
<td>◇ Flood Control / Drainage</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>◇ Snag /</td>
<td></td>
</tr>
</tbody>
</table>

Stream Drawing

Canopy Upstream Reading
- Right
- Middle
- Left

100 Middle
<table>
<thead>
<tr>
<th>Surveyor</th>
<th>Sample Date</th>
<th>County</th>
<th>Macro Sample Type</th>
<th>QHEI Score:</th>
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<tbody>
<tr>
<td>TED</td>
<td>7/23/13</td>
<td>Lake</td>
<td>MHAB</td>
<td>35</td>
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</table>

### 1-SUBSTRATE

**BEST TYPES**

<table>
<thead>
<tr>
<th>TOTAL</th>
<th>POOL</th>
<th>RIFFLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bidirs/Slabs (10)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boulders (9)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cobble (8)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gravel (7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sand (6)</td>
<td>70</td>
<td>x</td>
</tr>
<tr>
<td>Bedrock (5)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**OTHER TYPES**

- Hardpan (4)
- Detritus (3)
- Muck (2)
- Silt (2)
- Artificial (0)

**NUMBER OF BEST TYPES:** 4 or more (2)

**COMMENTS**

1-SUBSTRATE: Indicate presence 0 to 3: 0-Absent; 1-Very small amounts or if more common of marginal quality; 2-Moderate amounts, but not of highest quality or in small amounts of highest quality; 3-Highest quality in moderate or greater amounts (e.g., very large boulders in deep or fast water, large diameter log that is stable, well developed rootwad in deep/fast water, or deep, well-defined, functional pools.

- Undercut banks (1)
- Overhanging vegetation (1)
- Shallows (in slow water) (1)
- Rootmats (1)

### 3-CHANNEL MORPHOLOGY

**SINUOSITY**

- High (4)
- Moderate (3)
- Low (2)
- None (1)

**DEVELOPMENT**

- Excellent (7)
- Good (5)
- Fair (3)
- Poor (1)

**CHANNELIZATION**

- None (6)
- Recovered (4)
- Recovering (3)
- Recent or no recovery (1)

**STABILITY**

- High (3)
- Moderate (2)
- Low (1)

**AMOUNT**

- Check ONE (or 2 & average)
- Extensive >75% (11)
- Moderate 25-75% (7)
- Sparse 5-<25% (3)
- Nearly absent <5% (1)

### 4- BANK EROSION & RIPARIAN ZONE

**RIPARIAN WIDTH**

<table>
<thead>
<tr>
<th>L</th>
<th>R</th>
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</thead>
<tbody>
<tr>
<td>*</td>
<td>None or little (3)</td>
</tr>
<tr>
<td>*</td>
<td>Moderate (2)</td>
</tr>
<tr>
<td>*</td>
<td>Heavy/Severe (1)</td>
</tr>
</tbody>
</table>

**FLOOD PLAIN QUALITY**

<table>
<thead>
<tr>
<th>L</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>*</td>
<td>Forest, Swamp (3)</td>
</tr>
<tr>
<td>*</td>
<td>Shrub or Old field (2)</td>
</tr>
<tr>
<td>*</td>
<td>Residential, Park, New field (1)</td>
</tr>
<tr>
<td>*</td>
<td>Fenced pasture (1)</td>
</tr>
<tr>
<td>*</td>
<td>Open Pasture/Rowcrop (0)</td>
</tr>
</tbody>
</table>

**RECREATION POTENTIAL**

- Check ONE (or 2 & average)
- Primary Contact
- Secondary Contact

### 5-POOL/GLIDE AND RIFFLE/RUN QUALITY

**MAXIMUM DEPTH**

- Check ONE (ONLY)
- >1m (6)
- 0.7-<1m (4)
- 0.4-<0.7m (2)
- 0.2-<0.4m (1)
- <0.2m (metric=0) (0)

**CHANNEL WIDTH**

- Pool width > riffle width (2)
- Pool width = riffle width (1)
- Pool width < riffle width (0)

**CURRENT VELOCITY**

- Torrential (-1)
- Slow (1)
- Very Fast (1)
- Intermittent (-2)
- Fast (1)
- Moderate (1)
- Eddies (1)

**RECREATION POTENTIAL**

- Primary Contact
- Secondary Contact

**RIFFLE DEPTH**

- Best Areas >10cm (2)
- Best Areas 5-10cm (1)
- Best Areas <5cm (metric=0)

**RUN DEPTH**

- Maximum >50cm (2)
- Maximum <50cm (1)

**RIFFLE/EMBEDDEDNESS**

- None (2)
- Low (1)
- Moderate (0)
- Extensive (-1)

**AMOUNT**

- Check ONE (2 & average)
- No Riffle (metric=0)

### 6-GRADIENT

- Very Low – Low (2-4)
- Moderate (6-10)
- High – Very high (10-6)

**DRAINAGE AREA**

- 3.986 ft/ml
- 2.131 m²

**COMMENTS**

- No Riffle (metric=0)
<table>
<thead>
<tr>
<th>A-CANOPY</th>
<th>B-AESTHETICS</th>
<th>C-MAINTENANCE</th>
<th>D-ISSUES</th>
</tr>
</thead>
<tbody>
<tr>
<td>◦ &gt;85% - Open</td>
<td>◦ Nuisance algae</td>
<td>◦ Public /</td>
<td>◦ WWTP /</td>
</tr>
<tr>
<td>◦ 55%&lt;85%</td>
<td>◦ Invasive macrophytes</td>
<td>◦ Active /</td>
<td>◦ Hardened /</td>
</tr>
<tr>
<td>◦ 30%&lt;55%</td>
<td>◦ Excess turbidity</td>
<td>◦ Young - Succession - Old</td>
<td>◦ Contaminated /</td>
</tr>
<tr>
<td>◦ 10%&lt;30%</td>
<td>◦ Discoloration</td>
<td>◦ Spray /</td>
<td>◦ BMPs – Construction – Sediment</td>
</tr>
<tr>
<td>◦ &lt;10% - Closed</td>
<td>◦ Foam/Scum</td>
<td>◦ Modified /</td>
<td>◦ Logging /</td>
</tr>
<tr>
<td>Canopy Upstream Reading</td>
<td>◦ Oil sheen</td>
<td>◦ Leveed /</td>
<td>◦ Bank/</td>
</tr>
<tr>
<td>Right</td>
<td>◦ Nuisance odor</td>
<td>◦ Moving - Bedload – Stable</td>
<td>◦ False bank /</td>
</tr>
<tr>
<td>31.2 Middle</td>
<td>◦ Sludge deposits</td>
<td>◦ Armoured</td>
<td>◦ Wash H2O /</td>
</tr>
<tr>
<td>CSOs/SSOs/Outfalls</td>
<td>◦ CSOs/SSOs/Outfalls</td>
<td>◦ Islands /</td>
<td>◦ Acid /</td>
</tr>
<tr>
<td>◦ Flood Control /</td>
<td>◦ Relocated /</td>
<td>◦ Armoured</td>
<td>◦ Natural /</td>
</tr>
<tr>
<td>◦ Snag /</td>
<td>◦ Impounded /</td>
<td>◦ Scoured</td>
<td>◦ Park /</td>
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<tr>
<td>◦ Drainage</td>
<td>◦ Desiccated</td>
<td></td>
<td>◦ Atmosphere /</td>
</tr>
<tr>
<td></td>
<td></td>
<td>◦ Data Paucity</td>
<td>◦ Agriculture /</td>
</tr>
<tr>
<td></td>
<td></td>
<td>◦ Livestock</td>
<td></td>
</tr>
</tbody>
</table>
### 1-SUBSTRATE

**BEST TYPES**
- **Bldrs/Slabs (10)**
- **Boulders (9)**
- **Cobble (8)**
- **Gravel (7)**
- **Sand (6)**
- **Bedrock (5)**

**OTHER TYPES**
- **Hardpan (4)**
- **Detritus (3)**
- **Muck (2)**
- **Slit (2)**
- **Artificial (0)**

**NUMBER OF BEST TYPES:**
- 4 or more (2)
- 3 or less (0)

### 2-INSTREAM COVER

**AMOUNT**
- Check ONE (or 2 & average)
  - Extension >75% (11)
  - Moderate 25-75% (7)
  - Sparse 5-25% (3)
  - Nearly absent <5% (1)

**COMMENTS**
- Indicate presence 0 to 3: 0-Absent; 1-Very small amounts or if more common of marginal quality; 2-Moderate amounts, but not of highest quality or in small amounts of highest quality; 3-Highest quality in moderate or greater amounts (e.g., very large boulders in deep or fast water, large diameter log that is stable, well developed rootwad in deep / fast water, or deep, well-defined, functional pools).

### 3-CANALIZATION MORPHOLOGY

**SINUOSITY**
- **High (4)**
- **Moderate (3)**
- **Low (2)**
- **None (1)**

**DEVELOPMENT**
- **Excellent (7)**
- **Good (5)**
- **Fair (3)**
- **Poor (1)**

### 4-BANK EROSION & RIPARIAN ZONE

**EROSION**
- **None or little (3)**
- **Moderate (2)**
- **Heavy/Severe (1)**

**WIDTH**
- **Wide >50m (4)**
- **Moderate 10-50m (3)**
- **Narrow 5-10m (2)**
- **Very narrow <5m (1)**
- **None (0)**

**FLOOD PLAIN QUALITY**
- **Forest Swamp (3)**
- **Shrub or Old field (2)**
- **Residential, Park, New field (1)**
- **Fenced pasture (1)**
- **Open Pasture/Rowcrop (0)**

**RECREATION POTENTIAL**
- **Primary Contact**
- **Secondary Contact**

### 5-POOL/GLIDE AND RIFFLE/RUN QUALITY

**MAXIMUM DEPTH**
- Check ONE (ONLY)
  - >1m (6)
  - 0.7-<1m (4)
  - 0.4-<0.7m (2)
  - 0.2-<0.4m (1)
  - <0.2m (0)

**CHANNEL WIDTH**
- **Pool width > riffle width (2)**
- **Pool width = riffle width (1)**
- **Pool width < riffle width (0)**

**CURRENT VELOCITY**
- **Trentual (-1)**
- **Slow (1)**
- **Very Fast (1)**
- **Interstistial (-1)**
- **Fast (1)**
- **Intermittent (-2)**
- **Moderate (1)**
- **Eddies (1)**

**RECREATION POTENTIAL**
- **Primary Contact**
- **Secondary Contact**

### 6-GRADIENT

**DRAINAGE AREA**
- (14.199 ft/mi)
- (2.642 mi²)

**COMMENTS**
- Indicate for functional riffles: Best areas must be large enough to support a population of riffle-obligate species: (check one and comment on back)
### A-CANOPY
- >85% - Open
- 55%-<85%
- 30%<55%
- 10%-<30%
- <10% - Closed

Canopy Upstream Reading
- Right
- 100 Middle
- Left

### B-AESTHETICS
- Nuisance algae
- Invasive macrophytes
- Excess turbidity
- Discoloration
- Foam/Scum
- Oil sheen
- Trash/Litter
- Sludge deposits
- CSOs/SSOs/Outfalls

### C-MAINTENANCE
- Public /
- Active /
- Young - Succession - Old
- Spray /
- Modified /
- Leveed /
- Moving - Bedload – Stable
- Armoured
- Islands /
- Relocated /
- Impounded /
- Flood Control /
- Snag /
- Private / Both / NA
- Historic / Both / NA
- Removed
- Dipped out / NA
- One sided
- Scoured
- Cutoffs
- Desiccated
- Drainage

### D-ISSUES
- WWTP /
- Hardened /
- Contaminated /
- BMPs – Construction – Sediment
- Logging /
- Bank/
- False bank /
- Wash H2O /
- Acid /
- Natural /
- Park /
- Atmosphere /
- Agriculture /
- NPDES /
- Urban /
- Landfill
- Irrigation /
- Erosion /
- Manure /
- Tile /
- Mine /
- Wetlands /
- Golf /
- Data Paucity
- Livestock
- CSO /
- Dirt & Grime
- Industry
- Cooling
- Surface
- Lagoon
- H2O table
- Quarry /
- Stagnant
- Lawn /
- Home
- Flow
### 1-SUBSTRATE

**BEST TYPES**
- Bidrs/Slabs (10)
- Boulders (9)
- Cobble (8)
- Gravel (7)
- Sand (6)
- Bedrock (5)

**TOTAL**
- Pool
- Riffle

**OTHER TYPES**
- Hardpan (4)
- Detritus (3)
- Muck (2)
- Silt (2)
- Artificial (0)

**ORIGIN**
- Limestone (1)
- Tills (1)
- Wetlands (0)
- Hardpan (0)
- Sandstone (0)
- Rip/Rap (0)
- Lacustrine (0)
- Shale (1)
- Coal fines (2)

**SILT**
- Heavy (-2)
- Moderate (-1)
- Normal (0)
- Free (1)

**EMBEDDEDNESS**
- Extensive (-2)
- Moderate (-1)
- Normal (0)
- None (1)

**NUMBER OF BEST TYPES:**
- 4 or more (2)
- 3 or less (0)

**COMMENTS**
- Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species:
- Estimate % or note every type present
- Check ONE (or 2 & average)

### 2-INSTREAM COVER

- Indicate presence 0 to 3: 0-Absent; 1-Very small amounts or if more common of marginal quality; 2-Moderate amounts, but not of highest quality or in small amounts of highest quality; 3-Highest quality in moderate or greater amounts (e.g., very large boulders in deep or fast water, large diameter log that is stable, well developed rootwad in deep or fast water, or deep, well-defined, functional pools.

<table>
<thead>
<tr>
<th></th>
<th>Substrate</th>
<th>Origin</th>
<th>Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Undercut banks (1)</td>
<td></td>
<td></td>
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<tr>
<td>10</td>
<td>Pools &gt; 70cm (2)</td>
<td>0</td>
<td>Oxbows, Backwaters (1)</td>
</tr>
<tr>
<td>10</td>
<td>Overtime (1)</td>
<td>1</td>
<td>Rootwads (1)</td>
</tr>
<tr>
<td>10</td>
<td>Shallows (in slow water) (1)</td>
<td>0</td>
<td>Logs and woody debris (1)</td>
</tr>
<tr>
<td>0</td>
<td>Rootwads (1)</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

**COMMENTS**
- Indicate predominant land use(s)
- Check ONE in each category (Or 2 & average)

### 3-CHANNEL MORPHOLOGY

**SINUOSITY**
- High (4)
- Moderate (3)
- Low (2)
- None (1)

**DEVELOPMENT**
- Excellent (7)
- Good (5)
- Fair (3)
- Poor (1)

**CHANNELIZATION**
- None (6)
- Recovered (4)
- Recovering (3)
- Recent or no recovery (1)

**STABILITY**
- High (3)
- Moderate (2)
- Low (1)

**AMOUNT**
- Check ONE (or 2 & average)
- Extensive >75% (11)
- Moderate 25-75% (7)
- Sparse 5-25% (3)
- Nearly absent <5% (1)

### 4- BANK EROSION & RIPARIAN ZONE

**EROSION**
- None or little (3)
- Moderate (2)
- Heavy/Severe (1)

**RIPTARIAN WIDTH**
- L R
- None (0)
- Moderate (1)
- Heavy (2)

**FLOOD PLAIN QUALITY**
- L R
- Forest, Swamp (3)
- Residential, Park, New field (1)
- Fenced pasture (1)
- Open Pasture/Rowcrop (0)

**RECREATION POTENTIAL**
- Primary Contact
- Secondary Contact

**Riparian**
- Conservation Tillage (1)
- Mining, construction (0)

**COMMENTS**
- Indicate for reach – pools and riffles.
- Check ONE in each category for EACH BANK (Or 2 per bank & average)

### 5-POOL/GLIDE AND RIFFLE/RUN QUALITY

**MAXIMUM DEPTH**
- Check ONE (ONLY)
- >1m (6)
- 0.7-1m (4)
- 0.4-0.7m (2)
- 0.2-0.4m (1)
- <0.2m (0)

**CHANNEL WIDTH**
- Pool width > riffle width (2)
- Pool width = riffle width (1)
- Pool width < riffle width (0)

**CURRENT VELOCITY**
- Torrential (-1)
- Slow (1)
- Very Fast (1)
- Interstitial (-1)
- Fast (1)
- Intermittent (-2)
- Moderate (1)
- Eddies (1)

**RECREATION POTENTIAL**
- Primary Contact
- Secondary Contact

**COMMENTS**
- Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species:
- Check ONE (ONLY)
- No Riffle (metric=0)

### 6-GRADIENT

- Drainage Area (2.388 ft/mi)
- Very Low – Low (2-4)
- Moderate (6-10)
- High – Very high (10-6)

- % POOL: 5
- % GLIDE: #
- % RUN: 95
- % RIFFLE: #

**COMMENTS**
- Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species:
- Check ONE (or 2 & average)
- No Riffle (metric=0)
<table>
<thead>
<tr>
<th>A-CANOPY</th>
<th>B-AESTHETICS</th>
<th>C-MAINTENANCE</th>
<th>D-ISSUES</th>
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<tr>
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<td>◇ Public /</td>
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<td>◇ 55%–&lt;85%</td>
<td>◇ Invasive macrophytes</td>
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<td>◇ 30%–&lt;55%</td>
<td>◇ Excess turbidity</td>
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<td>◇ Contaminated /</td>
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<tr>
<td>◇ 10%–&lt;30%</td>
<td>◇ Discoloration</td>
<td>◇ Spray /</td>
<td>◇ BMPs – Construction – Sediment</td>
</tr>
<tr>
<td>◇ &lt;10% - Closed</td>
<td>◇ Foam/Scum</td>
<td>◇ Modified /</td>
<td>◇ Logging /</td>
</tr>
</tbody>
</table>

Canopy Upstream Reading
- Right: 98.8 Middle
- Left: 98.8 Middle

Stream Drawing
<table>
<thead>
<tr>
<th>Sample #</th>
<th>bioSample #</th>
<th>Stream Name</th>
<th>Location</th>
<th>QHEI Score:</th>
</tr>
</thead>
<tbody>
<tr>
<td>AB11751</td>
<td>130723406</td>
<td>Tributary of Turkey Creek</td>
<td>73rd Avenue</td>
<td>30</td>
</tr>
</tbody>
</table>

### 1-SUBSTRATE

**BEST TYPES**
- Bidirs/Slabs (10)
- Boulders (9)
- Cobble (8)
- Gravel (7)
- Sand (6)
- Bedrock (5)

**OTHER TYPES**
- Hardpan (4)
- Detritus (3)
- Muck (2)
- Silt (2)
- Artificial (0)

**COMMENTS**
- Estimate % or note every type present.
- Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species.

### 2-INSTREAM COVER

**AMOUNT**
- Check ONE (or 2 & average)
  - Check ALL that apply
  - Extensive >75% (1)
  - Moderate 25-75% (7)
  - Sparse 5-<25% (3)
  - Nearly absent <5% (1)

**COMMENTS**
- Check ONE in each category (Or 2 & average)
- Indicate presence 0 to 3; 0: Absent; 1: Very small amounts or if more common of marginal quality; 2: Moderate amounts, but not of highest quality or in small amounts of highest quality; 3: Highest quality in moderate or greater amounts (e.g., very large boulders in deep or fast water, large diameter log that is stable, well developed rootwad in deep / fast water, or deep, well-defined, functional pools.

### 3-CHANNEL MORPHOLOGY

**SINUOSITY**
- High (4)
- Moderate (3)
- Low (2)
- None (1)

**DEVELOPMENT**
- Excellent (7)
- Good (5)
- Fair (3)
- Poor (1)

**CHANNELIZATION**
- None (6)
- Recovered (4)
- Recovering (3)
- Recent or no recovery (1)

**STABILITY**
- High (3)
- Moderate (2)
- Low (1)

**COMMENTS**
- Check ONE in each category (Or 2 & average)
- Indicate predominant land use(s) past 100m riparian.

### 4- BANK EROSION & RIPARIAN ZONE

**RIPARIAN WIDTH**
- L R
  - None or little (3)
  - Moderate (2)
  - Heavy/Severe (1)

**FLOOD PLAIN QUALITY**
- L R
  - Forest Swamp (3)
  - Shrub or Old field (2)
  - Residential, Park, New field (1)
  - Fenced pasture (1)
  - Open Pasture/Rowcrop (0)

**COMMENTS**
- Check ONE in each category for EACH BANK (Or 2 per bank & average)

### 5-POOL/GLIDE AND RIFFLE/RUN QUALITY

**MAXIMUM DEPTH**
- Check ONE (ONLY)
  - >1m (6)
  - 0.7-<1m (4)
  - 0.4-<0.7m (2)
  - 0.2-<0.4m (1)
  - <0.2m (0) (metric=0)

**CHANNEL WIDTH**
- Pool width > riffle width (2)
- Pool width = riffle width (1)
- Pool width < riffle width (0)

**CURRENT VELOCITY**
- Torrential (-1)
- Very Fast (1)
- Fast (1)
- Moderate (1)
- Eddies (1)

**RECREATION POTENTIAL**
- Primary Contact
- Secondary Contact

**COMMENTS**
- Pool/Current
  - Maximum
  - Check ONE (ONLY)
  - Check ONE (or 2 & average)
  - No Riffle (metric=0)

### 6-GRADIENT

**DRAINAGE AREA**
- Very low – Low (2-4)
- Moderate (6-10)
- High – Very high (10-6)

**COMMENTS**
- Gradient
  - Maximum
  - Check ONE (or 2 & average)
  - No Riffle (metric=0)
## OWQ Biological Studies QHEI (Qualitative Habitat Evaluation Index)

Circle some &

**Comment**

### A-CANOPY
- >85% - Open
- 55%<85%
- 30%<55%
- 10%<30%
- <10% - Closed

Canopy Upstream Reading
- Right
- 99.8 Middle
- Left

### B-AESTHETICS
- Nuisance algae
- Invasive macrophytes
- Excess turbidity
- Discoloration
- Foam/Scum
- Oil sheen
- Trash/Litter
- Nuisance odor
- Sludge deposits
- CSOs/SSOs/Outfalls

### C-MAINTENANCE
- Public /
- Active /
- Young - Succession - Old
- Spray /
- Modified /
- Leveed /
- Moving - Bedload – Stable
- Armoured
- Islands /
- Relocated /
- Impounded /
- Flood Control /
- Snag /
- Private / Both / NA
- Historic / Both / NA
- Removed
- Dipped out / NA
- One sided
- Scoured
- Cutoffs
- Desiccated
- Drainage

### D-ISSUES
- WWTP /
- Hardened /
- Contaminated /
- BMPs – Construction – Sediment
- Logging /
- Bank/
- False bank /
- Wash H2O /
- Acid /
- Natural /
- Park /
- Atmosphere /
- Agriculture /
- NPDES /
- Urban /
- Landfill
- Irrigation /
- Erosion /
- Manure /
- Tile /
- Mine /
- Wetlands /
- Golf /
- Data Paucity
- Livestock
- CSO /
- Dirt & Grime
- Industry
- Cooling
- Surface
- Lagoon
- H2O table
- Quarry /
- Stagnant
- Lawn /
- Home
- Flow

---

*Stream Drawing*
1- SUBSTRATE

<table>
<thead>
<tr>
<th>BEST TYPES</th>
<th>OTHER TYPES</th>
</tr>
</thead>
<tbody>
<tr>
<td>◦ Bidrs/Slabs (10)</td>
<td>◦ Hardpan (4)</td>
</tr>
<tr>
<td>◦ Boulders (9)</td>
<td>◦ Detritus (3)</td>
</tr>
<tr>
<td>◦ Cobble (8)</td>
<td>◦ Muck (2)</td>
</tr>
<tr>
<td>◦ Gravel (7)</td>
<td>◦ Silt (2)</td>
</tr>
<tr>
<td>◦ Sand (6)</td>
<td>◦ Artificial (0)</td>
</tr>
<tr>
<td>◦ Bedrock (5)</td>
<td>◦ None (0)</td>
</tr>
</tbody>
</table>

**COMMENTS**

2- INSTREAM COVER

<table>
<thead>
<tr>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>◦ Extensive &gt;75% (11)</td>
</tr>
<tr>
<td>◦ Moderate 25-75% (7)</td>
</tr>
<tr>
<td>◦ Sparse 5-25% (3)</td>
</tr>
<tr>
<td>◦ Nearly absent &lt;5% (1)</td>
</tr>
</tbody>
</table>

3- CHANNEL MORPHOLOGY

<table>
<thead>
<tr>
<th>SINUOSITY</th>
<th>DEVELOPMENT</th>
<th>CHANNELIZATION</th>
<th>STABILITY</th>
<th>Substrate</th>
</tr>
</thead>
<tbody>
<tr>
<td>High (4)</td>
<td>Excellent (7)</td>
<td>None (6)</td>
<td>High (3)</td>
<td>1</td>
</tr>
<tr>
<td>Moderate (3)</td>
<td>Good (5)</td>
<td>Recovered (4)</td>
<td>Moderate (2)</td>
<td></td>
</tr>
<tr>
<td>Low (2)</td>
<td>Fair (3)</td>
<td>Recovering (3)</td>
<td>Low (1)</td>
<td></td>
</tr>
<tr>
<td>None (1)</td>
<td>Poor (1)</td>
<td>Recent or no recovery (1)</td>
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<td></td>
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</table>

**COMMENTS**

4- BANK EROSION & RIPARIAN ZONE

<table>
<thead>
<tr>
<th>Riparian Width</th>
<th>Flood Plain Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>L R</td>
<td>L R</td>
</tr>
<tr>
<td>None or little (3)</td>
<td>Forest. Swamp (3)</td>
</tr>
<tr>
<td>Moderate (2)</td>
<td>Shrub or Old field (2)</td>
</tr>
<tr>
<td>Heavy/Severe (1)</td>
<td>Residential. Park. New field (1)</td>
</tr>
<tr>
<td></td>
<td>Fenced pasture (1)</td>
</tr>
<tr>
<td></td>
<td>Open Pasture/Rowcrop (0)</td>
</tr>
</tbody>
</table>

**COMMENTS**

5- POOL/GLIDE AND RIFFLE/RUN QUALITY

<table>
<thead>
<tr>
<th>Pool/Current</th>
<th>Recreational Potential</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum 12</td>
<td>Primary Contact</td>
</tr>
<tr>
<td></td>
<td>Secondary Contact</td>
</tr>
</tbody>
</table>

**COMMENTS**

6- GRADIENT

**COMMENTS**

<table>
<thead>
<tr>
<th>Gradient</th>
<th>% POOL: $%</th>
<th>% GLIDE: $%</th>
<th>% RUN: $%</th>
<th>% RIFFLE: $%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum 10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**COMMENTS**

6/3/2014 13:25:38 PM OWQ Biological Studies QHEI (Qualitative Habitat Evaluation Index), Page 1 of 2
## Qualitative Habitat Evaluation Index (QHEI)

### A-CANOPY
- **>85%** - Open
- **55%-<85%**
- **30%-<55%**
- **10%-<30%**
- **<10%** - Closed

**Canopy Upstream Reading**
- **Right**
- **Middle**
- **Left**

### B-AESTHETICS
- Nuisance algae
- Invasive macrophytes
- Excess turbidity
- Discoloration
- Foam/Scum
- Oil sheen
- Trash/Litter
- Sludge deposits
- CSOs/SSOs/Outfalls

### C-MAINTENANCE
- Public /
- Active /
- Young - Succession - Old
- Spray /
- Modified /
- Moving - Bedload – Stable
- Armoured
- Islands /
- Relocated /
- Impounded /
- Flood Control /
- Snap /
- Private / Both / NA
- Historic / Both / NA
- Removed
- Dipped out / NA
- One sided
- Scoured
- Cutoffs
- Desiccated
- Drainage

### D-ISSUES
- WWTP /
- Hardened /
- Contaminated /
- BMPs – Construction – Sediment
- Logging /
- Bank/
- False bank /
- Wash H2O /
- Acid /
- Natural /
- Park /
- Atmosphere /
- Agriculture /
- NPDES /
- Urban /
- Landfill
- Irrigation /
- Erosion /
- Manure /
- Tile /
- Mine /
- Wetlands /
- Golf /
- Data Paucity
- Livestock
- CSO /
- Dirt & Grime
- Industry
- Cooling
- Surface
- Lagoon
- H2O table
- Quarry /
- Stagnant
- Lawn /
- Home
- Flow

---

**Stream Drawing**

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### 1-SUBSTRATE

<table>
<thead>
<tr>
<th>BEST TYPES</th>
<th>OTHER TYPES</th>
<th>ORIGIN</th>
<th>QUALITY</th>
<th>Substrate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bidirs/Slabs (10)</td>
<td>Hardpan (4)</td>
<td>Limestone (1)</td>
<td>Heavy (-2)</td>
<td>13</td>
</tr>
<tr>
<td>Boulders (9)</td>
<td>Detritus (3)</td>
<td>Tills (1)</td>
<td>Moderate (-1)</td>
<td>Maximum 20</td>
</tr>
<tr>
<td>Cobble (8)</td>
<td>Muck (2)</td>
<td>Wetlands (0)</td>
<td>Normal (0)</td>
<td></td>
</tr>
<tr>
<td>Gravel (7)</td>
<td>Silt (2)</td>
<td>Hardpan (0)</td>
<td>Free (1)</td>
<td></td>
</tr>
<tr>
<td>Sand (6)</td>
<td>Artificial (0)</td>
<td>Sandstone (0)</td>
<td>Extensive (-2)</td>
<td></td>
</tr>
<tr>
<td>Bedrock (5)</td>
<td></td>
<td>Rip/Rap (0)</td>
<td>Moderate (-1)</td>
<td></td>
</tr>
</tbody>
</table>

**Comments**

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species:

**COMMENTS**

- Best Areas >5cm (2)
- Best Areas >10cm (2)
- Best Areas 5-10cm (1)
- Best Areas <5cm (metric=0)

**Number of Best Types**: 4 or more (2)

### 2-INSTREAM COVER

<table>
<thead>
<tr>
<th>AMOUNT</th>
<th>Check ONE (or 2 &amp; average)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extensive &gt;75% (11)</td>
<td></td>
</tr>
<tr>
<td>Moderate 25-75% (7)</td>
<td></td>
</tr>
<tr>
<td>Sparse 5-25% (3)</td>
<td></td>
</tr>
<tr>
<td>Nearly absent &lt;5% (1)</td>
<td></td>
</tr>
</tbody>
</table>

**Comments**

- Undercut banks (1)
- Overhanging vegetation (1)
- Shallows (in slow water) (1)
- Rootmats (1)

**Channel Width**

- Maximum <50cm (4)
- Moderate 10-50cm (3)
- Narrow 5-10cm (2)
- Very narrow <5cm (1)
- None (0)

**Comments**

- Forest Swamp (3)
- Shrub or Old field (2)
- Residential, Park, New field (1)
- Fenced pasture (1)
- Open Pasture/Rowcrop (0)

**Riparian Width**

- Conservation Tillage (1)
- Mining, construction (0)

**Recreational Potential**

- primary contact
- secondary contact

**Gradient**

- Very low – Low (2-4)
- Moderate (6-10)
- High – Very high (10-6)

**Pool/Current**

- Maximum

**Run Depth**

- Maximum >50cm (2)
- Maximum <50cm (1)
- Unstable (e.g. sand, fine gravel) (0)

**Comments**

- Torrential (-1)
- Very Fast (1)
- Fast (1)
- Moderate (1)
- Low (1)
- Not applicable

**Recreational Potential**

- Primary Contact
- Secondary Contact

- No riffle (metric=0)

**Riffle/Run EMBEDDEDNESS**

- None (2)
- Low (1)
- Moderate (0)
- Extensive (-1)

**Comments**

- Very low – Low (2-4)
- Moderate (6-10)
- High – Very high (10-6)

**Pool/Current**

- Maximum

**6-GRADIENT**

- 17.016 ft/ mi
- 5.973 m²

---

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<table>
<thead>
<tr>
<th>A-CANOPY</th>
<th>B-AESTHETICS</th>
<th>C-MAINTENANCE</th>
<th>D-ISSUES</th>
</tr>
</thead>
<tbody>
<tr>
<td>◇ &gt;85% - Open</td>
<td>◇ Nuisance algae</td>
<td>◇ Public /</td>
<td>◇ WWTP /</td>
</tr>
<tr>
<td>◇ 55%&lt;85%</td>
<td>◇ Invasive macrophytes</td>
<td>◇ Active /</td>
<td>◇ Hardened /</td>
</tr>
<tr>
<td>◇ 30%&lt;55%</td>
<td>◇ Excess turbidity</td>
<td>◇ Young - Succession - Old</td>
<td>◇ Contaminated /</td>
</tr>
<tr>
<td>◇ 10%&lt;30%</td>
<td>◇ Discoloration</td>
<td>◇ Spray /</td>
<td>◇ BMPs – Construction – Sediment</td>
</tr>
<tr>
<td>◇ &lt;10% - Closed</td>
<td>◇ Foam/Scum</td>
<td>◇ Modified /</td>
<td>◇ Logging /</td>
</tr>
<tr>
<td>Canopy Upstream Reading</td>
<td></td>
<td>◇ Leveed /</td>
<td>◇ Bank/</td>
</tr>
<tr>
<td>Right</td>
<td>◇ Trash/Litter</td>
<td>◇ Moving - Bedload – Stable</td>
<td>◇ False bank /</td>
</tr>
<tr>
<td>0 Middle</td>
<td>◇ Nuisance odor</td>
<td>◇ Armoured</td>
<td>◇ Wash H2O /</td>
</tr>
<tr>
<td>Left</td>
<td>◇ Sludge deposits</td>
<td>◇ Islands /</td>
<td>◇ Acid /</td>
</tr>
<tr>
<td></td>
<td>◇ CSOs/SSOs/Outfalls</td>
<td>◇ Relocated /</td>
<td>◇ Natural /</td>
</tr>
<tr>
<td></td>
<td></td>
<td>◇ Impounded /</td>
<td>◇ Park /</td>
</tr>
<tr>
<td></td>
<td></td>
<td>◇ Flood Control /</td>
<td>◇ Atmosphere /</td>
</tr>
<tr>
<td></td>
<td></td>
<td>◇ Snag /</td>
<td>◇ Agriculture /</td>
</tr>
<tr>
<td></td>
<td></td>
<td>◇ Desiccated</td>
<td>◇ Data Paucity</td>
</tr>
<tr>
<td></td>
<td></td>
<td>◇ Drainage</td>
<td>◇ Livestock</td>
</tr>
</tbody>
</table>

- ◇ WWTP /
- ◇ Hardened /
- ◇ Contaminated /
- ◇ BMPs – Construction – Sediment
- ◇ Logging /
- ◇ Bank /
- ◇ False bank /
- ◇ Wash H2O /
- ◇ Acid /
- ◇ Natural /
- ◇ Park /
- ◇ Atmosphere /
- ◇ Agriculture /
- ◇ Data Paucity
- ◇ Livestock

- ◇ NPDES /
- ◇ Urban /
- ◇ Landfill
- ◇ Cooling
- ◇ Erosion /
- ◇ Manure /
- ◇ Tile /
- ◇ Mine /
- ◇ Wetlands /
- ◇ Golf /
- ◇ Data Paucity
- ◇ Livestock

- ◇ CSO /
- ◇ Dirt & Grime
- ◇ Industry
- ◇ Cooling
- ◇ Surface
- ◇ Lagoon
- ◇ H2O table
- ◇ Quarry /
- ◇ Stagnant
- ◇ Lawn /
- ◇ Home
- ◇ Flow
### 1-SUBSTRATE

**Check ONLY Two substrate TYPE BOXES:** estimate % or note every type present

<table>
<thead>
<tr>
<th>BEST TYPES</th>
<th>OTHER TYPES</th>
</tr>
</thead>
<tbody>
<tr>
<td>◯ Bidrs/Slabs (10)</td>
<td>◯ Hardpan (4)</td>
</tr>
<tr>
<td>◯ Boulders (9)</td>
<td>◯ Detritus (3)</td>
</tr>
<tr>
<td>◯ Cobble (8)</td>
<td>◯ Muck (2)</td>
</tr>
<tr>
<td>◯ Gravel (7)</td>
<td>◯ Silt (2)</td>
</tr>
<tr>
<td>◯ Sand (6)</td>
<td>◯ Artificial (0)</td>
</tr>
<tr>
<td>◯ Bedrock (5)</td>
<td>◯ Water (0)</td>
</tr>
</tbody>
</table>

**NUMBER OF BEST TYPES:** ◯ 4 or more (2)  ◯ 3 or less (0)

**COMMENTS**

### 2-INSTREAM COVER

Indicate presence 0 to 3: 0-Absent; 1-Very small amounts or if more common of marginal quality; 2-Moderate amounts, but not of highest quality or in small amounts of highest quality; 3-Highest quality in moderate or greater amounts (e.g., very large boulders in deep or fast water, large diameter log that is stable, well developed rootwad in deep / fast water, or deep, well-defined, functional pools.

<table>
<thead>
<tr>
<th>AMOUNT</th>
<th>Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check ONE (or 2 &amp; average)</td>
<td>◯ Extensive &gt;75% (11)</td>
</tr>
<tr>
<td></td>
<td>◯ Moderate 25-75% (7)</td>
</tr>
<tr>
<td></td>
<td>◯ Sparse 5-&lt;25% (3)</td>
</tr>
<tr>
<td></td>
<td>◯ Nearly absent &lt;5% (1)</td>
</tr>
</tbody>
</table>

**COMMENTS**

### 3-CHANNEL MORPHOLOGY

<table>
<thead>
<tr>
<th>SINUOSITY</th>
<th>DEVELOPMENT</th>
<th>CHANNELIZATION</th>
<th>STABILITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>◯ High (4)</td>
<td>◯ Excellent (7)</td>
<td>◯ None (6)</td>
<td>◯ High (3)</td>
</tr>
<tr>
<td>◯ Moderate (3)</td>
<td>◯ Good (5)</td>
<td>◯ Recovered (4)</td>
<td>◯ Moderate (2)</td>
</tr>
<tr>
<td>◯ Low (2)</td>
<td>◯ Fair (3)</td>
<td>◯ Recovering (3)</td>
<td>◯ Low (1)</td>
</tr>
<tr>
<td>+ None (1)</td>
<td>◯ Poor (1)</td>
<td>◯ Recent or no recovery (1)</td>
<td></td>
</tr>
</tbody>
</table>

**COMMENTS**

### 4- BANK EROSION & RIPARIAN ZONE

**RIPARIAN WIDTH**

<table>
<thead>
<tr>
<th>L R</th>
<th>None or little (3)</th>
<th>Moderate (2)</th>
<th>Heavy/Severe (1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>L R</td>
<td>Wide &gt;50m (4)</td>
<td>Moderate 10-50m (3)</td>
<td>Narrow 5-10m (2)</td>
</tr>
<tr>
<td>L R</td>
<td>Very narrow &lt;5m (1)</td>
<td>None (0)</td>
<td></td>
</tr>
</tbody>
</table>

**FLOOD PLAIN QUALITY**

<table>
<thead>
<tr>
<th>L R</th>
<th>Forest. Swamp (3)</th>
<th>Shrub or Old field (2)</th>
<th>Residential, Park, New field (1)</th>
<th>Fenced pasture (1)</th>
<th>Open Pasture/Rowcrop (0)</th>
</tr>
</thead>
<tbody>
<tr>
<td>L R</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**COMMENTS**

### 5-POOL/GLIDE AND RIFFLE/RUN QUALITY

**MAXIMUM DEPTH**

<table>
<thead>
<tr>
<th>MAXIMUM DEPTH</th>
<th>CHANNEL WIDTH</th>
<th>CURRENT VELOCITY</th>
<th>RECREATION POTENTIAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>◯&gt;1m (6)</td>
<td>◯ Pool width &gt; riffle width (2)</td>
<td>◯ Torrential (-1)</td>
<td>◯ Primary Contact</td>
</tr>
<tr>
<td>◯0.7-&lt;1m (4)</td>
<td>◯ Pool width = riffle width (1)</td>
<td>◯ Very Fast (1)</td>
<td>◯ Secondary Contact</td>
</tr>
<tr>
<td>◯0.4-&lt;0.7m (2)</td>
<td>◯ Pool width &lt; riffle width (0)</td>
<td>◯ Fast (1)</td>
<td></td>
</tr>
<tr>
<td>◯0.2-&lt;0.4m (1)</td>
<td>◯ None (0)</td>
<td>◯ Moderate (1)</td>
<td></td>
</tr>
<tr>
<td>◯&lt;0.2m (0) (metric=0)</td>
<td>◯ None (0)</td>
<td>◯ Eddies (1)</td>
<td></td>
</tr>
</tbody>
</table>

**COMMENTS**

### 6-GRADIENT

<table>
<thead>
<tr>
<th>DRAINAGE AREA</th>
<th>GRADIENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1.44 ft/ml)</td>
<td>(37.922 mi²)</td>
</tr>
<tr>
<td>◯ Very low – Low (2-4)</td>
<td>% POOL: 20 % GLIDE: $#</td>
</tr>
<tr>
<td>◯ Moderate (6-10)</td>
<td>% RUN: 80 % RIFFLE: $#</td>
</tr>
<tr>
<td>◯ High – Very high (10-6)</td>
<td></td>
</tr>
</tbody>
</table>
### OWQ Biological Studies QHEI (Qualitative Habitat Evaluation Index)

**A-CANOPY**
- >85% - Open
- 55%–<85%
- 30%–<55%
- 10%–<30%
- <10% - Closed

**B-AESTHETICS**
- Nuisance algae
- Invasive macrophytes
- Excess turbidity
- Discoloration
- Foamy/Scum
- Oil sheen
- Trash/Litter
- Sludge deposits
- CSOs/SSOs/Outfalls

**C-MAINTENANCE**
- Public /
- Active /
- Young - Succession - Old
- Spray /
- Modified /
- Leveed /
- Moving - Bedload – Stable
- Armoured
- Islands /
- Relocated /
- Impounded /
- Flood Control /
- Snag /
- Private / Both / NA
- Historic / Both / NA
- Removed
- Dipped out / NA
- One sided
- Scoured
- Cutoffs
- Desiccated
- Drainage

**D-ISSUES**
- WWTP /
- Hardened /
- Contaminated /
- BMPs – Construction – Sediment
- Logging /
- Bank/
- False bank /
- Wash H2O /
- Acid /
- Natural /
- Park /
- Atmosphere /
- Agriculture /
- NPDES /
- Urban /
- Landfill
- Irrigation /
- Erosion /
- Manure /
- Tile /
- Mine /
- Wetlands /
- Golf /
- Data Paucity
- Livestock
- CSO /
- Dirt & Grime
- Industry
- Cooling
- Surface
- Lagoon
- H2O table
- Quarry /
- Stagnant
- Lawn /
- Home
- Flow