Water Quality Along the Lost River from Lost Lake to Pine Lake

May 17, 2019

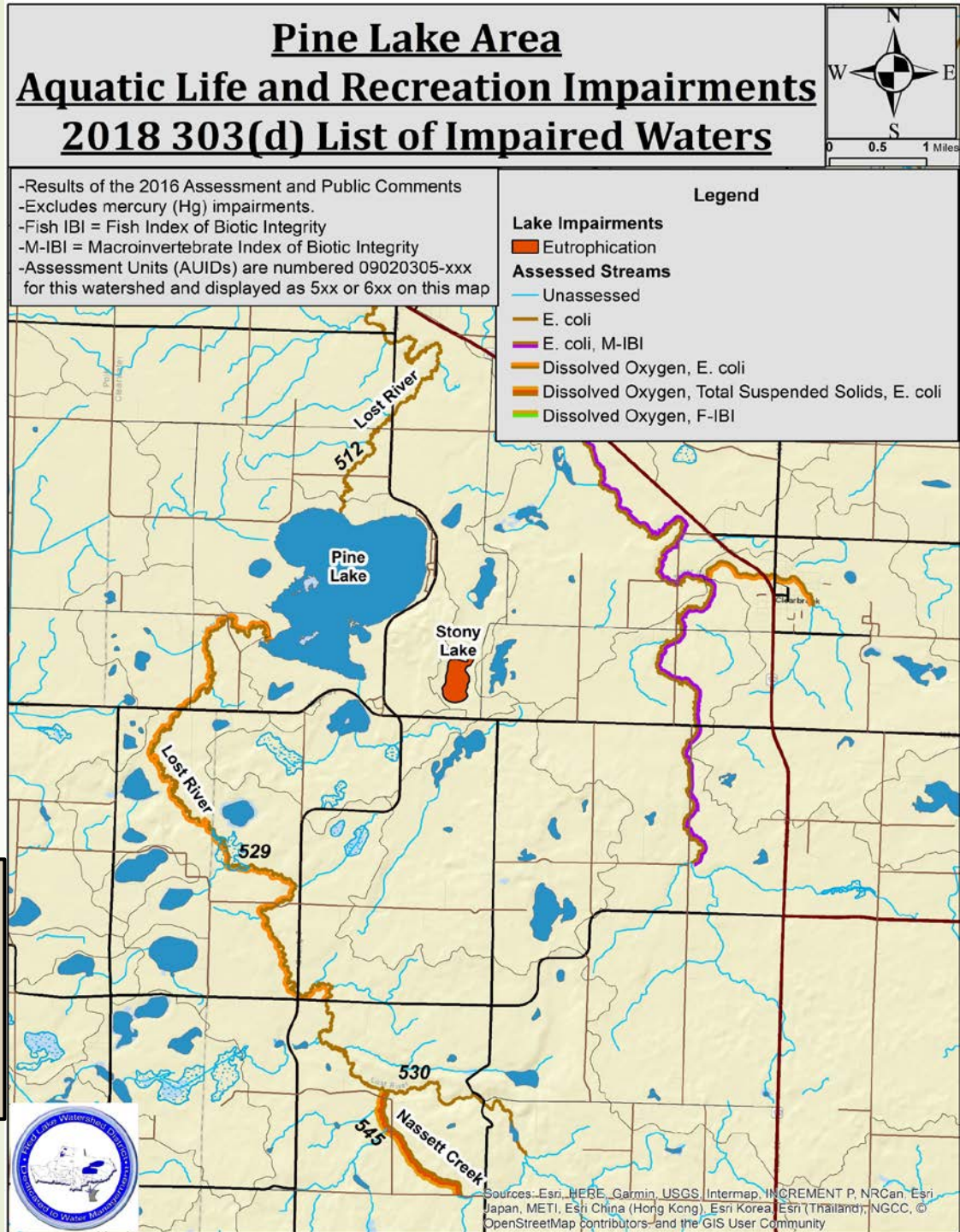
History of Monitoring in the Watershed of Pine Lake

- RLWD long-term water quality sampling near the inlet and outlet of Pine Lake
- River Watch monitoring on Nassett Creek and the Lost River
- 2009-11 RLWD and Bagley RW SWAG project identified *E. coli* impairments
- Lake sampling by volunteers and the Clearwater SWCD
- Biological sampling (fish and macroinvertebrates) by the MPCA in 2005, 2014, and 2015
- Habitat assessments
- New long-term sampling site on Nassett Creek
- Clearwater River WRAPS – investigative sampling, TMDLs
- Deployments of automated water level, dissolved oxygen, and temperature monitoring equipment

Evaluating Water Quality

- Dissolved Oxygen (Cold Water Streams): 7 mg/L
- Dissolved Oxygen (Warm Water Streams): 5 mg/L
- *E. coli:* 126 MPN/100mL monthly geometric mean
- Total Suspended Solids (Cold Water): 10 mg/L
- Total Suspended Solids (Central Region): 30 mg/L
- Lake eutrophication (total phosphorus, chlorophyll-a, Secchi depth)
- Fish (F-IBI) and Macroinvertebrate (M-IBI) Index of Biological Integrity
  - Varying impairment thresholds based on region and stream classification
  - Confidence interval (+/-, above and below threshold)
  - Fish IBI threshold for the Lost River = 42 (AUIDs 530 and 529)
  - Macroinvertebrate IBI threshold for the Lost River = 41 (AUID 529, 530 was not sampled)
- Minnesota Stream Habitat Assessments at biological monitoring sites

Current Water Quality Conditions



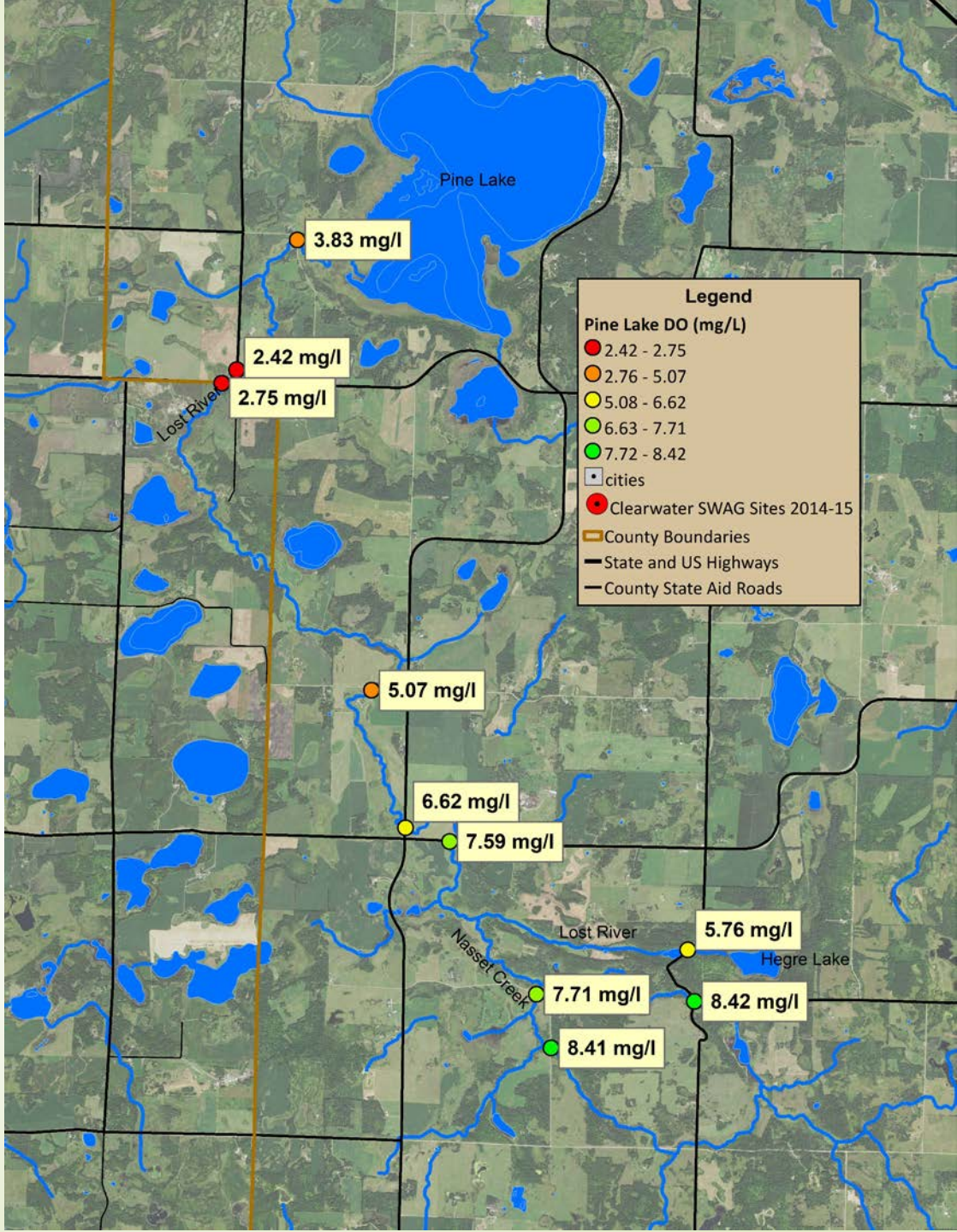
Nearly Impaired:

- AUID 530 (dissolved oxygen)
- AUID 512 (fish and macroinvertebrate index of biological integrity)

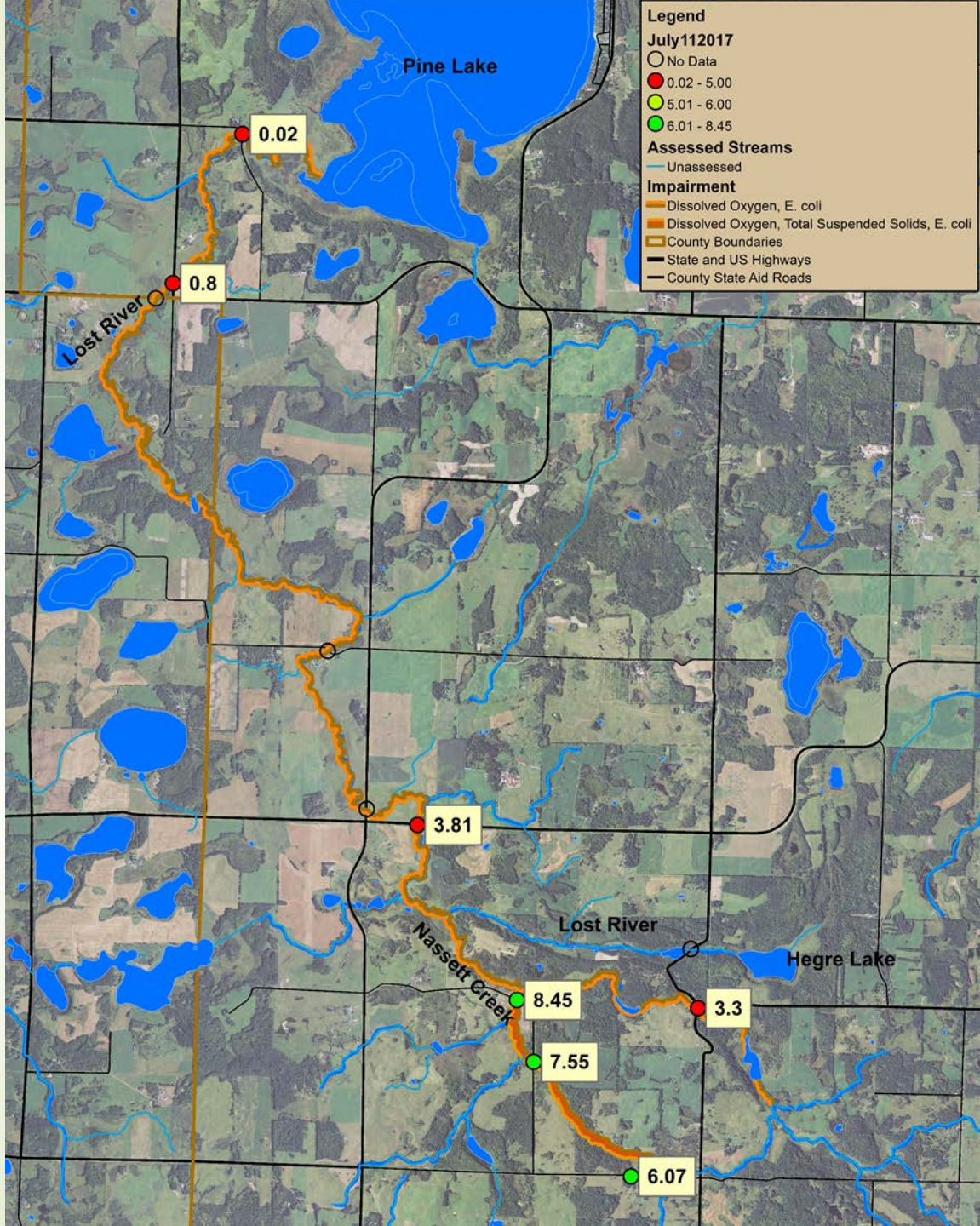
Pine Lake

- 25 µg/L average total phosphorus (meets <60 µg/L standard)
- 6.8 µg/L average chlorophyll-a (meets <20 µg/L standard)
- 2.28 meter average Secchi depth (better than the >1 meter standard)
- High fecal coliform concentrations were recorded in August 2007 samples

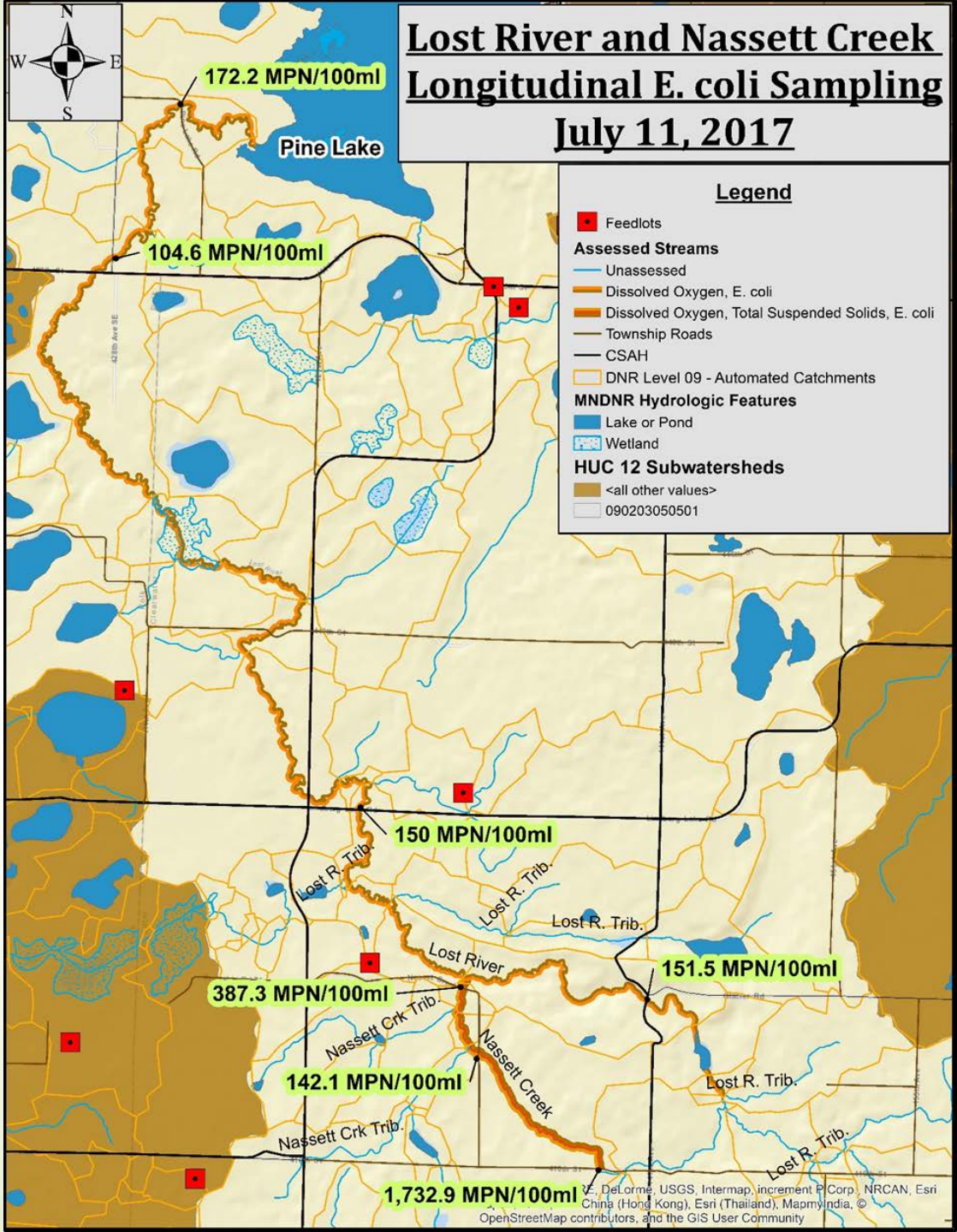
June 26, 2015 Dissolved Oxygen Snapshot



July 11, 2017 Dissolved Oxygen Snapshot



July 11, 2017 *E. coli* Snapshot



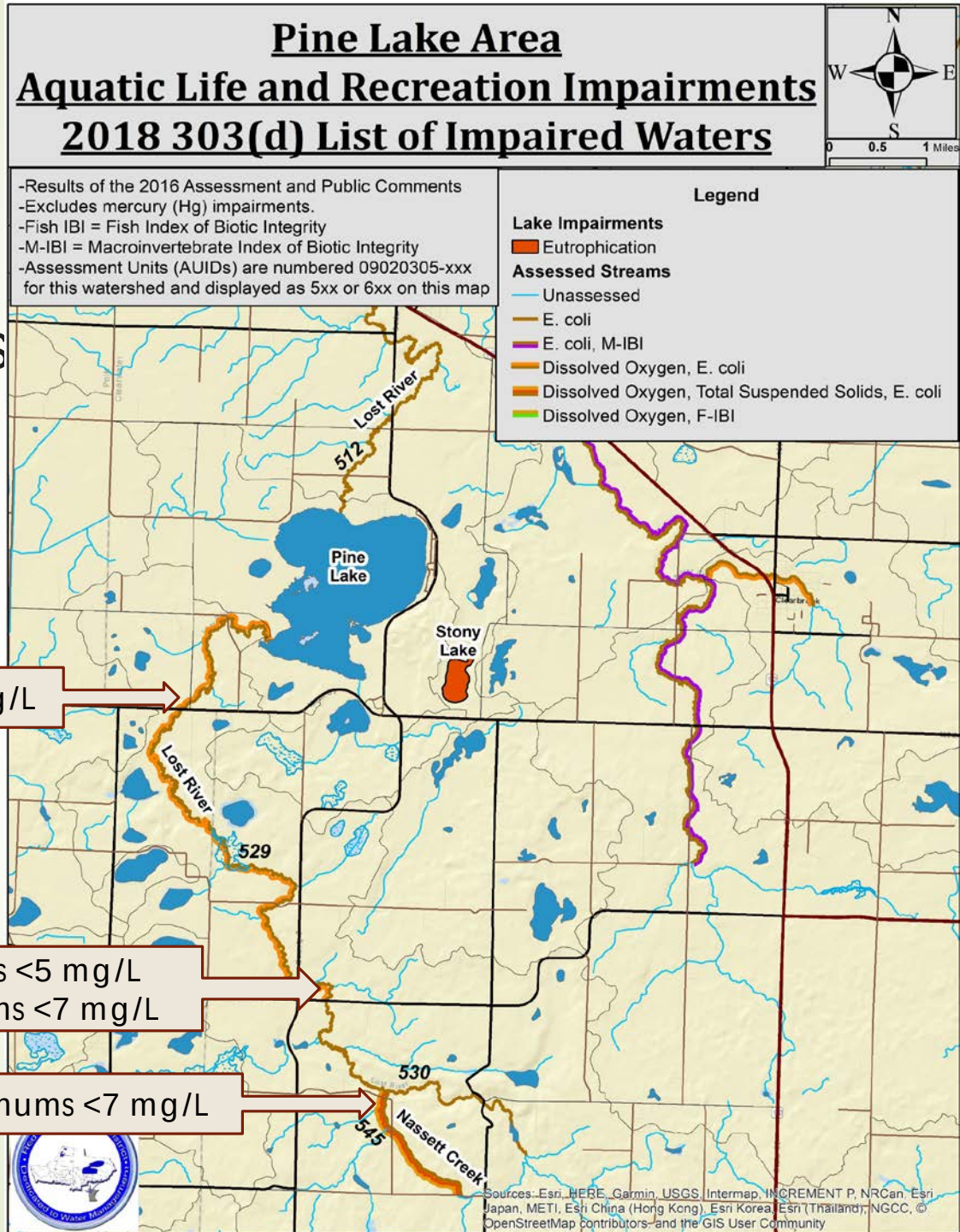
Dissolved Oxygen Logger Deployments

- Percentage of daily minimums that fail to meet standards (5 mg/L or 7 mg/L) should be < 10%

82% of 117 2014 daily minimums <5 mg/L

0% of 47 2018 daily minimums <5 mg/L
51% of 47 2018 daily minimums <7 mg/L

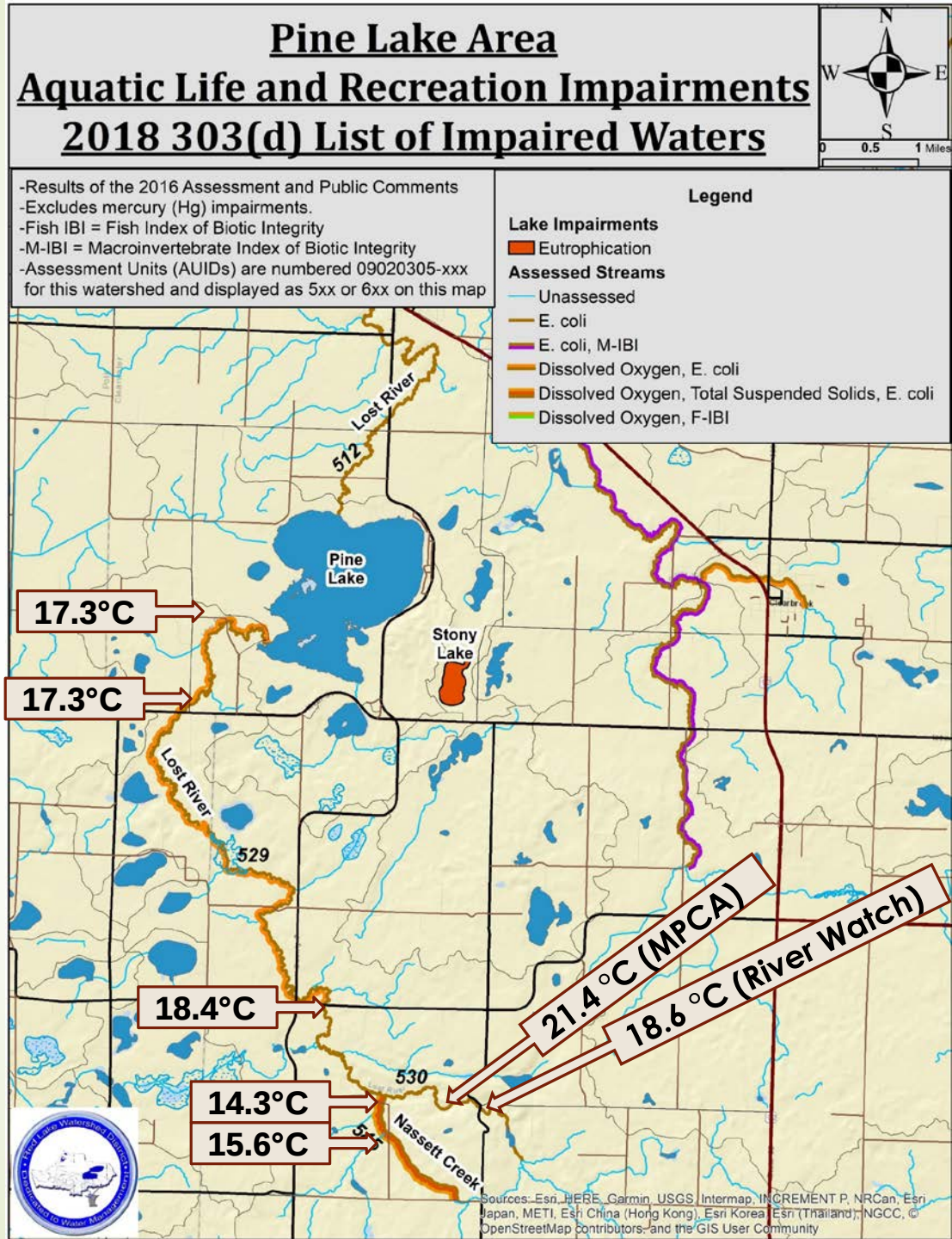
0% of 54 2017daily minimums <7 mg/L



Average Temperatures (2009-2018, May-Sept.)

--20ºC Threshold for cold/warm waters

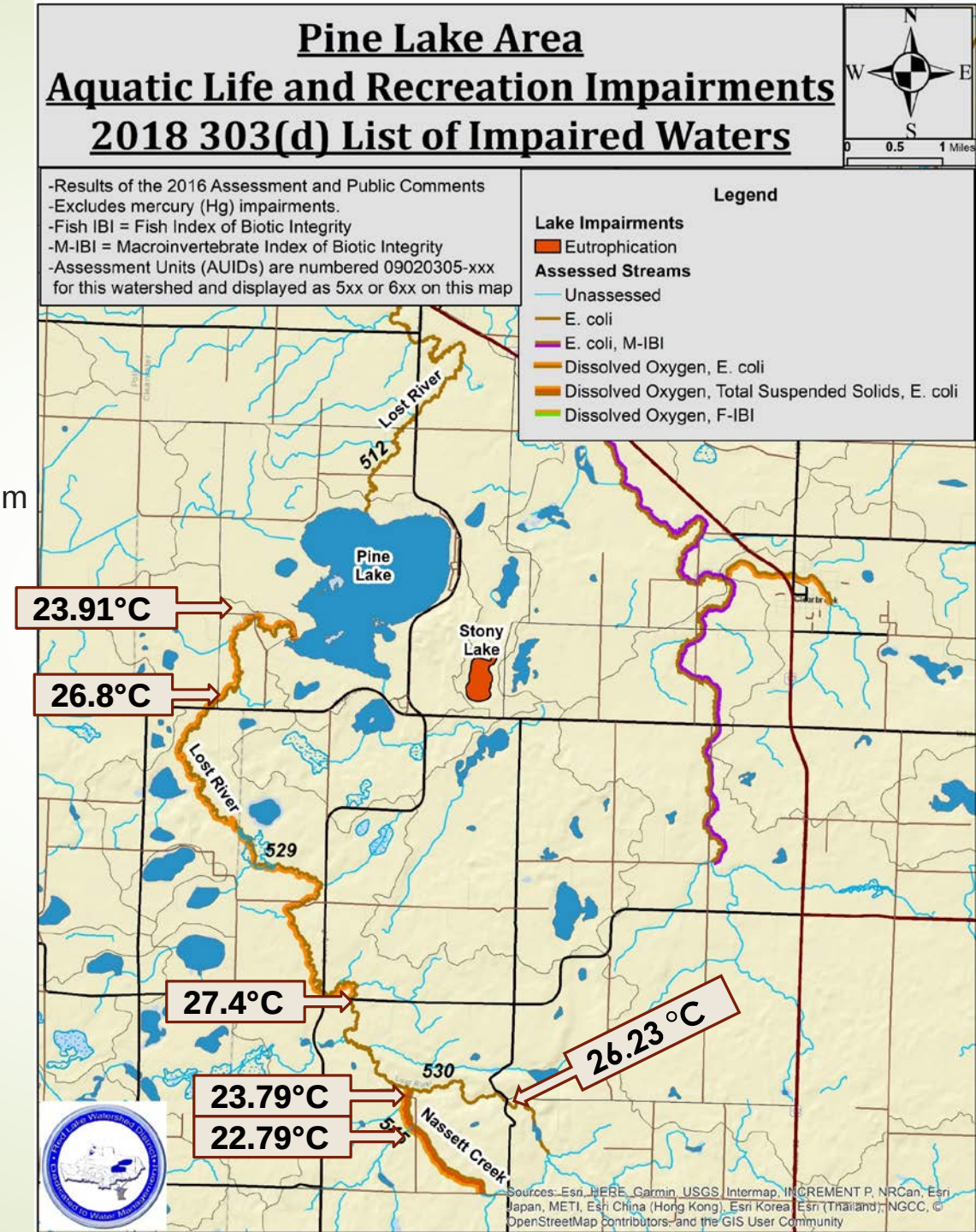
--25°C lethal temperature for trout



Maximum Temperatures (2009-2018, May-Sept.)

--20ºC Threshold for cold/warm waters

--25°C lethal temperature for trout

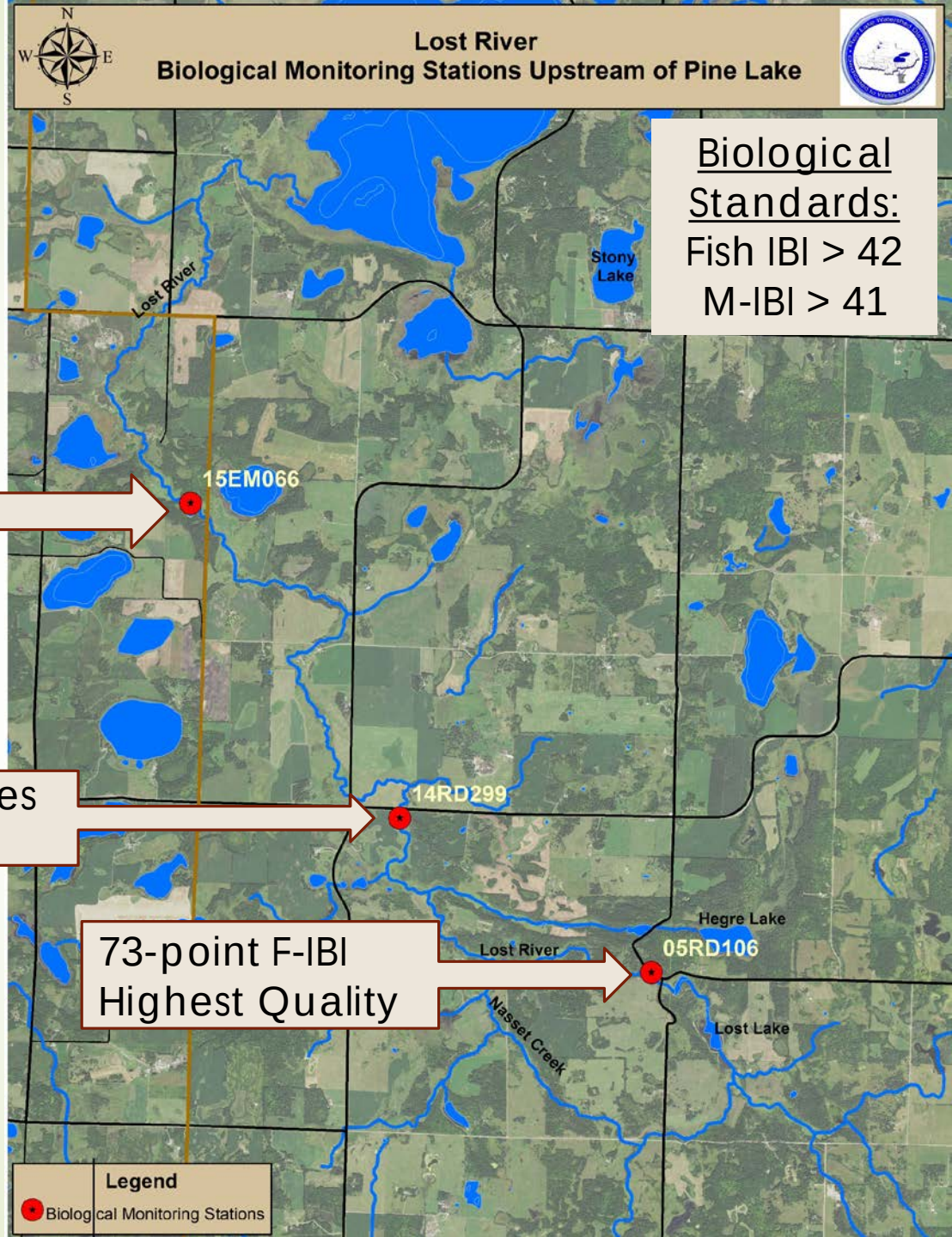


MPCA Biological Monitoring

66-point F-IBI
74-point M-IBI
Highest Quality

29 & 45-point F-IBI Scores
Nearly Impaired

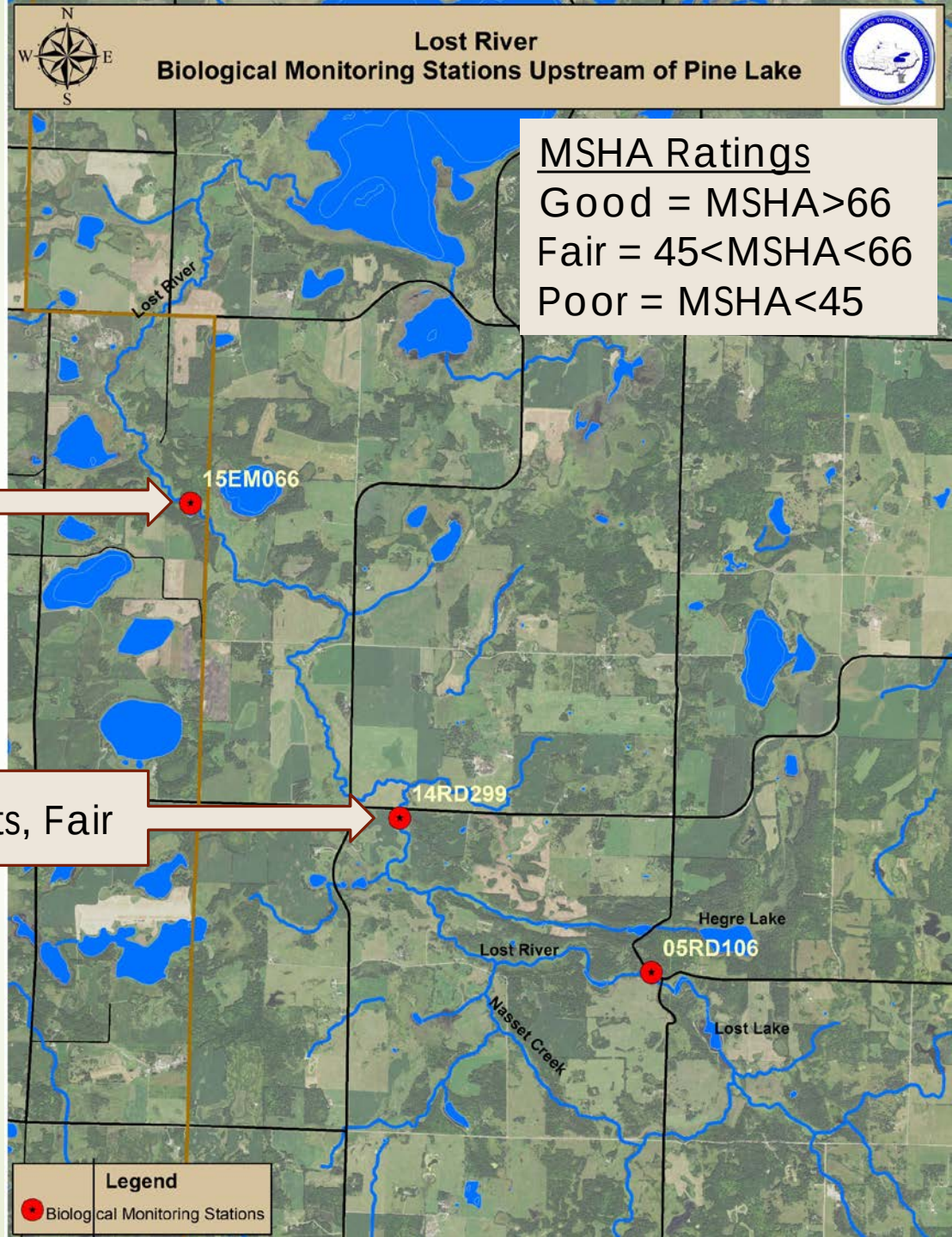
73-point F-IBI
Highest Quality



MPCA Habitat Assessment

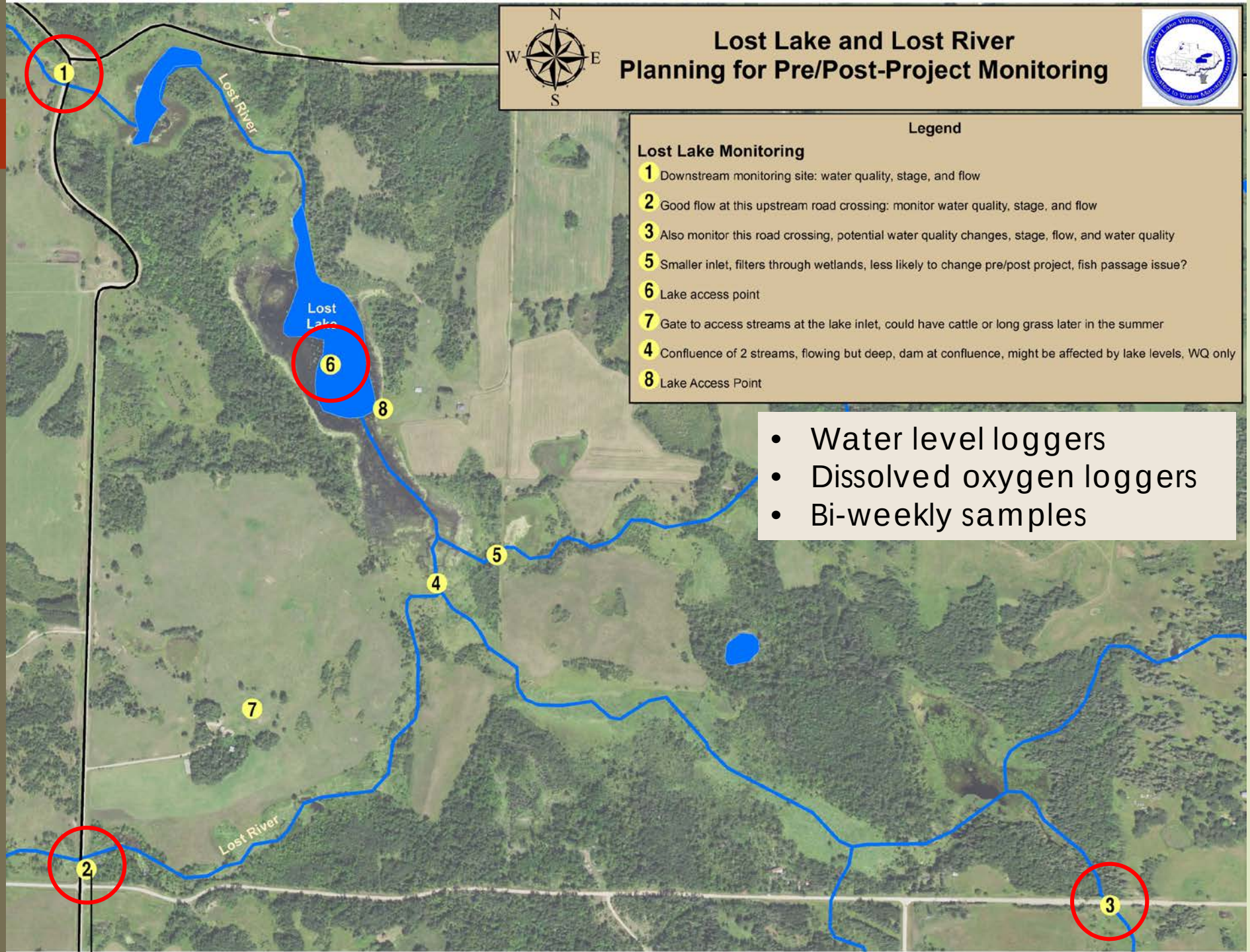
53 points, Fair

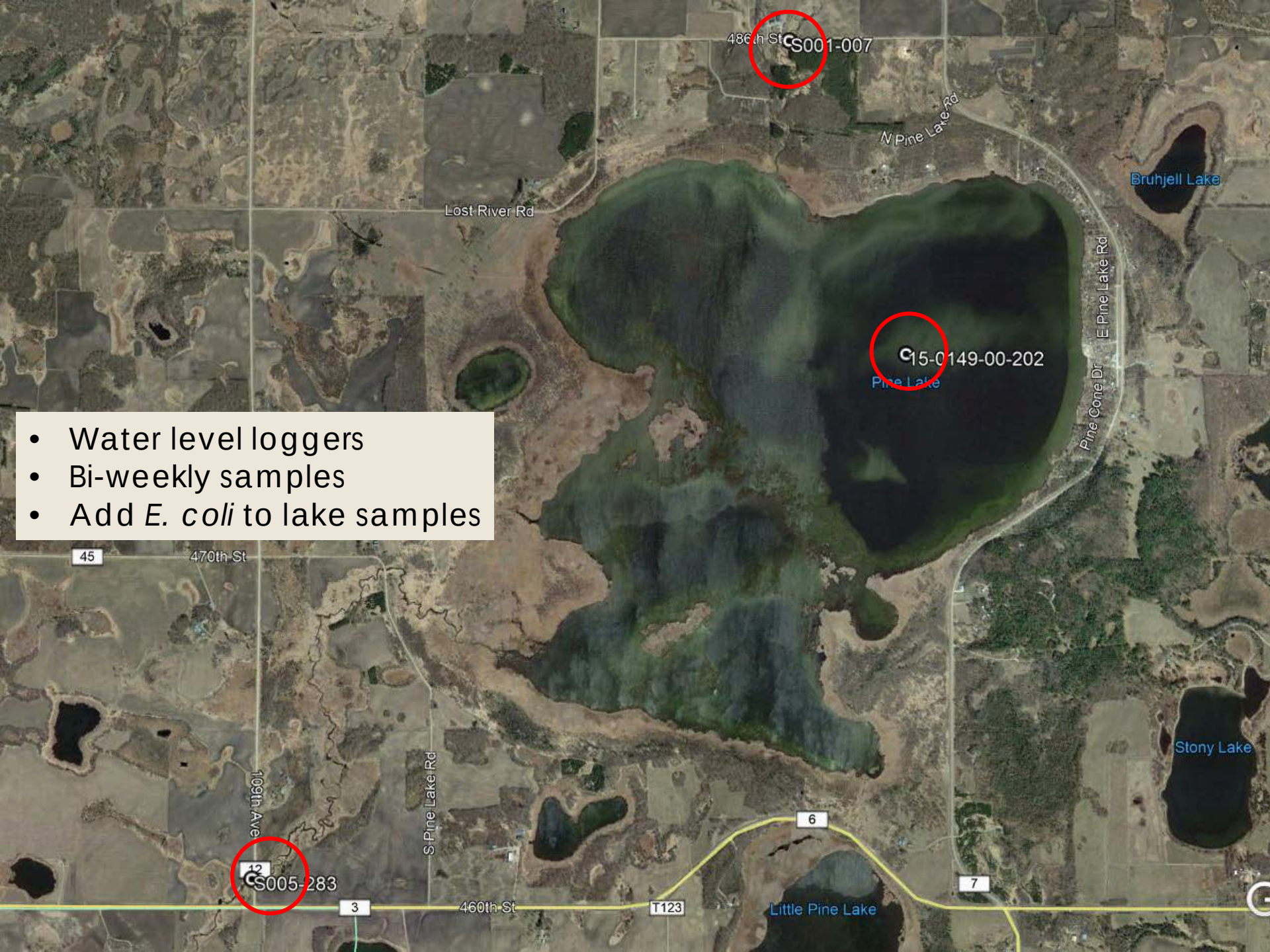
48.7 points, Fair



Biological Timeline for the Lost River Designated Trout Stream Reach (From MPCA notes)

- 1940s – Trout introduced
- 1947 – 1975 – Stocked with brook trout
- Natural reproduction has not been documented
- No longer managed as a trout stream
- 2005 – Sampled near CSAH 20 – No coldwater species, 21.4º C summer average temperature
- 2014 - Sampled near CSAH 18 – 19.3º C summer average temperature
- 2015 – Sampled near CSAH 18 – 18.6º C summer average temperature
- MPCA proposed use class change: "The Lost River, from Unnamed Creek to the north line of T148 R38W S20, as well as its tributaries designated as Class 2A, is proposed to be reclassified as Class 2B waters."


Lost Lake and Lost River
Planning for Pre/Post-Project Monitoring
N
W
E
S
Legend
Lost Lake Monitoring
1 Downstream monitoring site: water quality, stage, and flow
2 Good flow at this upstream road crossing: monitor water quality, stage, and flow
3 Also monitor this road crossing, potential water quality changes, stage, flow, and water quality
5 Smaller inlet, filters through wetlands, less likely to change pre/post project, fish passage issue?
6 Lake access point
7 Gate to access streams at the lake inlet, could have cattle or long grass later in the summer
4 Confluence of 2 streams, flowing but deep, dam at confluence, might be affected by lake levels, WQ only
8 Lake Access Point
Lost River
Lost Lake
Lost River
• Water level loggers
• Dissolved oxygen loggers
• Bi-weekly samples



- Water level loggers
- Bi-weekly samples
- Add *E. coli* to lake samples