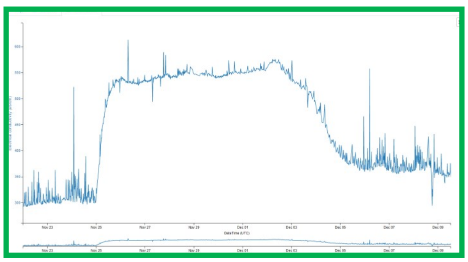
Remote sensing of two Les Cheneaux creeks: Initial findings



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Les Cheneaux Watershed Council

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Findings to date: Remote sensing probes were installed in Pearson Creek and Beavertail Creek at the end of October, 2020, in a collaborative program involving LSSU, the ISD and Cedarville High School. Data recorded by the probes will be used to compare water characteristics of the two creeks over time. These creeks differ in that Beavertail drains from a pristine upland area vs Pearson that is fed by an upland area as well, but which also flows through pastureland and experiences bi-annual lagoon discharges from the Clark Township Wastewater Treatment plant.

Each probe station consists of a multifunctional electronic probe , a data recorder/transmitter and a solar cell to power the unit. These particular probes record water temperature, level and conductivity at 15 minute intervals. Data can be remotely reviewed and/or downloaded on demand.

Data collected between the time of installation and 9 Dec are shown in Figs. 1 and 2. Water temperature and water level data have been unexceptional since installation but conductivity readings have shown measurable differences. Simply, conductivity is a measure of dissolved solids and minerals in the water. The terms conductivity and salinity are used interchangeably.

The elevated hump observed for Pearson from 25 Nov through 4 Dec reflects the time polished water from a wastewater treatment plant lagoon was discharged on a continuous basis during this 9-10 day period. Conductivity has not yet returned to the level observed prior to lagoon discharge. Residual dissolved solids and minerals appear to still be present at a level higher than pre-discharge as they leach from grasses and other surfaces between the Pearson discharge site and the probe location. These residual conductivity levels are expected to subside over time.

Conductivity recordings from Beavertail differ from Pearson in that there was no extreme excursion as observed for Pearson during the treatment plant discharge. Conductivity has, however, gradually increased in Beavertail since the probes were activated. Precise reason(s) for the upward trend in conductivity is unclear at this time. Factors that influence conductivity/salinity in freshwater systems include: precipitation, temperature, range in soil types (clay, loam) and bedrock types: limestone vs granite. Any or all of these variables could have affected the observed change in the Beavertail upward conductivity trend, year to date (Ref. 1,2). Time and experience with probe responses will enable more precise data interpretation.

Note the difference in reporting scales for the two creeks. Pearson waters had conductivity ratings of over 500 µS/cm vs Beavertail that had a maximum conductivity of around 300 µS/cm. The term µS/cm (microSiemens/centimeter) is a common measure of conductivity, or salinity. Higher the conductivity values indicate greater amounts of dissolved organics and minerals and organics present in the water being monitored.

During the first year of monitoring, students will be able to see a graphic representation of constant change in the waters of these two creeks. They will see the effects of dry vs wet periods, snowmelt and temperature on the water level, water temperature and conductivity provided by the probes. Relating weather events to the response of stream water will be yet another opportunity for students to learn about the dynamics of natural systems and, hopefully, stir interest in many of them to pursue studies in the sciences. Clark Township officials can also benefit by reviewing probe conductivity data to better monitor characteristics of their lagoon discharges. For instance, they may be able to determine when snowmelt water infiltrates their wastewater handling system and then take measures to counter any negative effects.

Figs. 3 and 4 show locations of the Pearson and Beavertail Creek probes; their positions relative to one another is shown in Fig. 5. Other MI probe sites are shown in Fig. 6. and sites involved in the entire U.S. program and in Central America are seen in Fig. 7.

Project support: The MiWaterNet program is led by Dr. A. Moerke, Lake Superior State University, through the Center for Freshwater Research and Education (CFRE). Funding for probe stations was from grants provided by CFRE, the Michigan STEM (MiSTEM) program and the Department of Great Lakes and Energy through the Students to Stewards program. Kevn St. Onge is the EUP Regional Director of the Eastern Upper Peninsula Intermediate School District and Mitchel Mast is the Cedarville High School Science Instructor.

Background information: Much is known and written about conductivity/salinity of freshwaters and is easily accessed via online searches. Two articles to begin learning more about this area for salinity in general and for wastewater treatment plants are included in this brief note as references 1 and 2.

Literature cited:

1. Fondreist Environmental, Inc. 2014. Conductivity, salinity and total dissolved solids. Fundamentals of environmental measurements.
2. Levlin, E. 2008. Conductivity measurements for controlling municipal wastewater treatment. Dept of Land and Water Resources engineering, KTH, S-100. Stockholm, Sweden.

Fig 1. Pearson Creek conductivity 1 Nov - 9 Dec 2020.

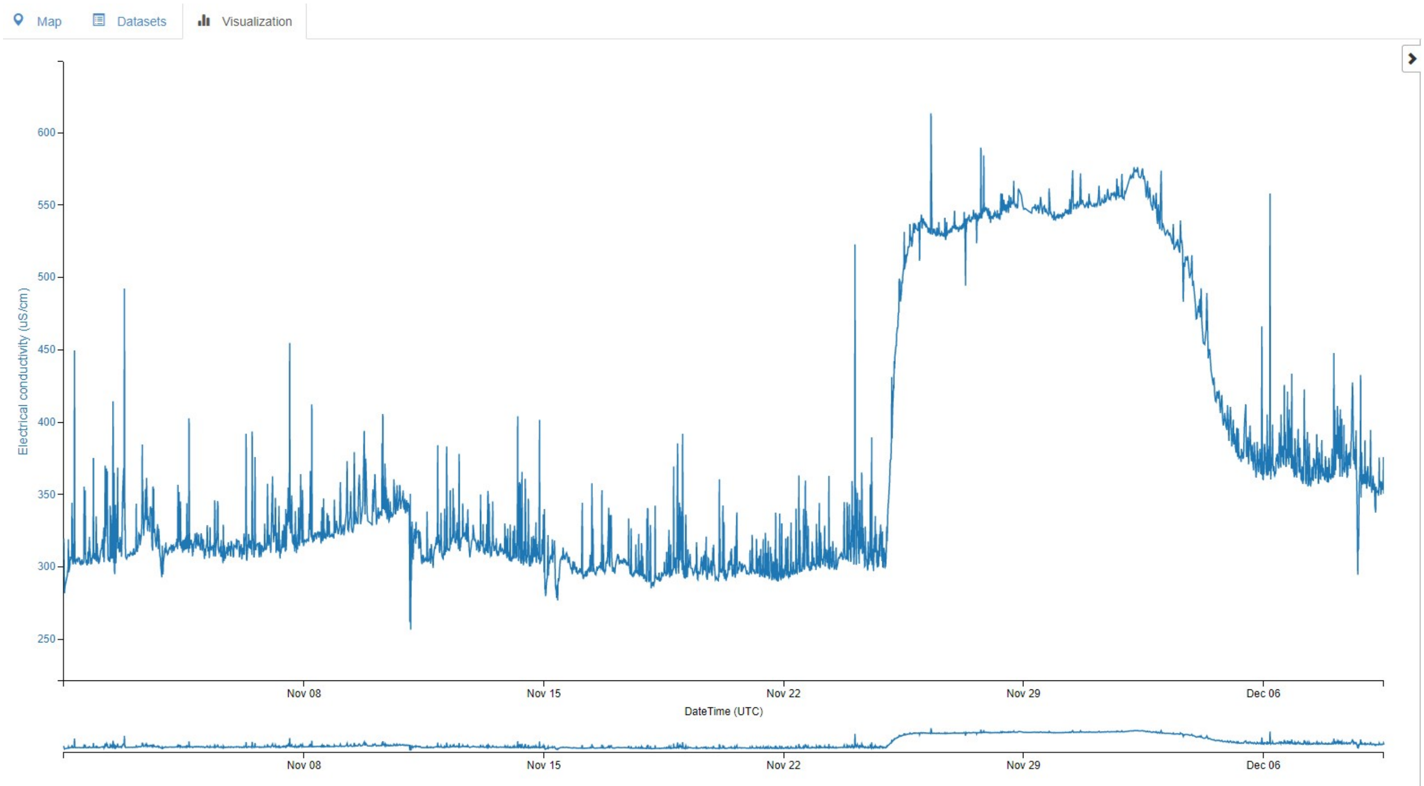


Fig 2. Beavertail Creek conductivity 1 Nov - 9 Dec 2020.

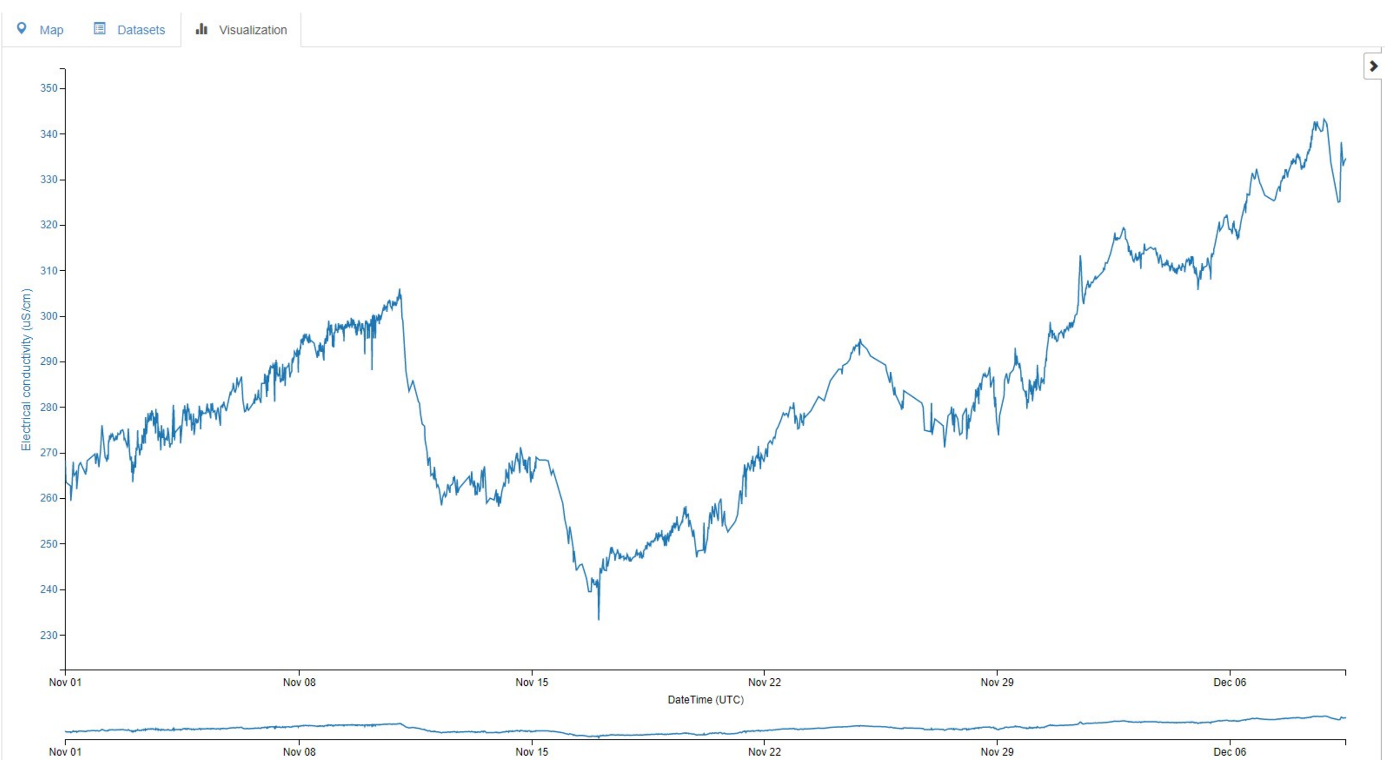


Fig. 3. Pearson Creek sensor position

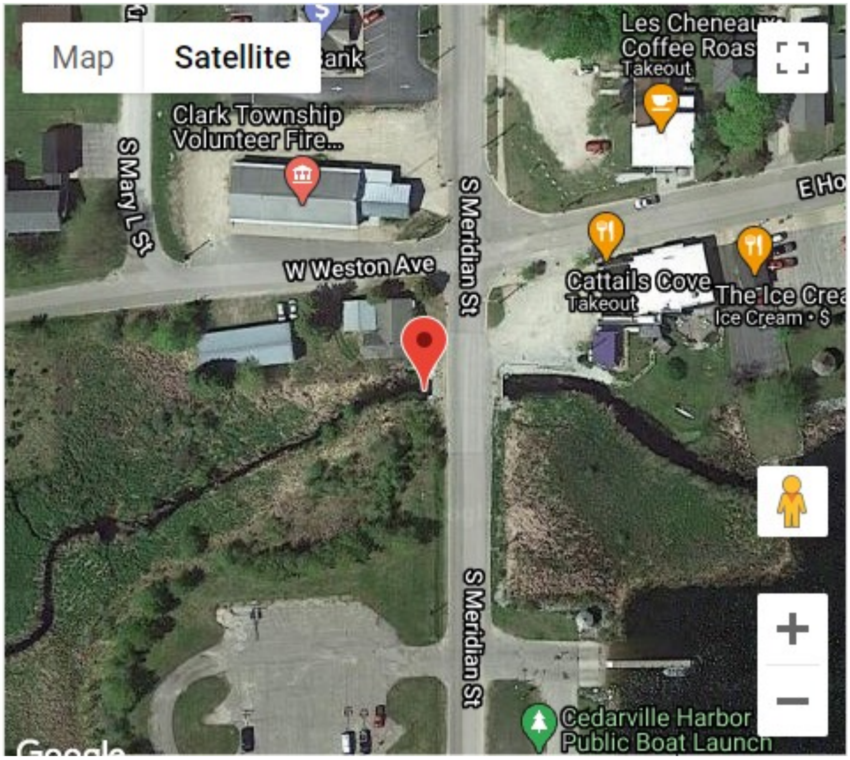
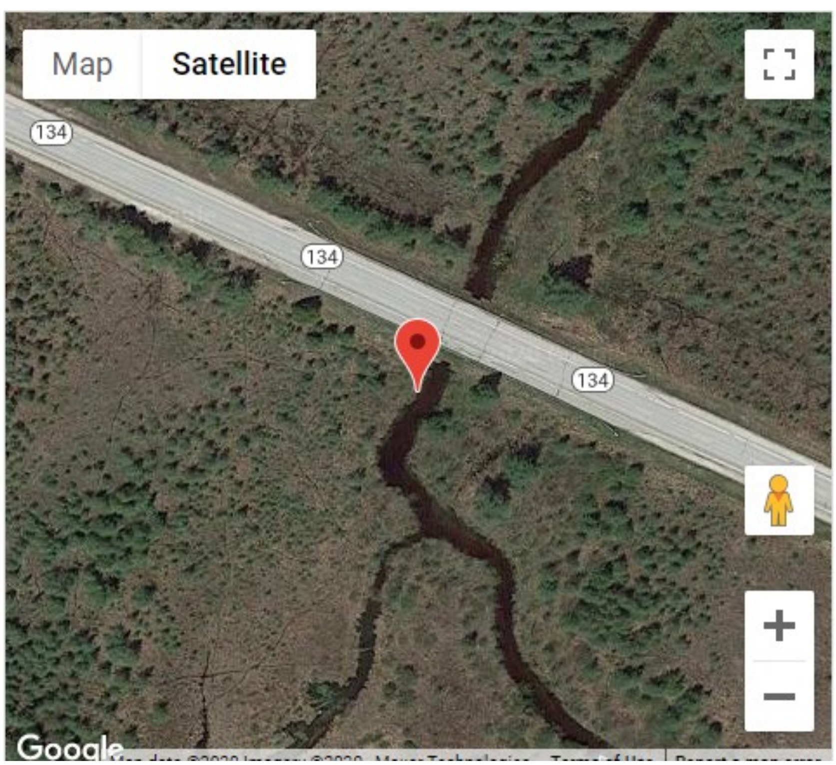


Fig. 4. Beavertail Creek sensor position



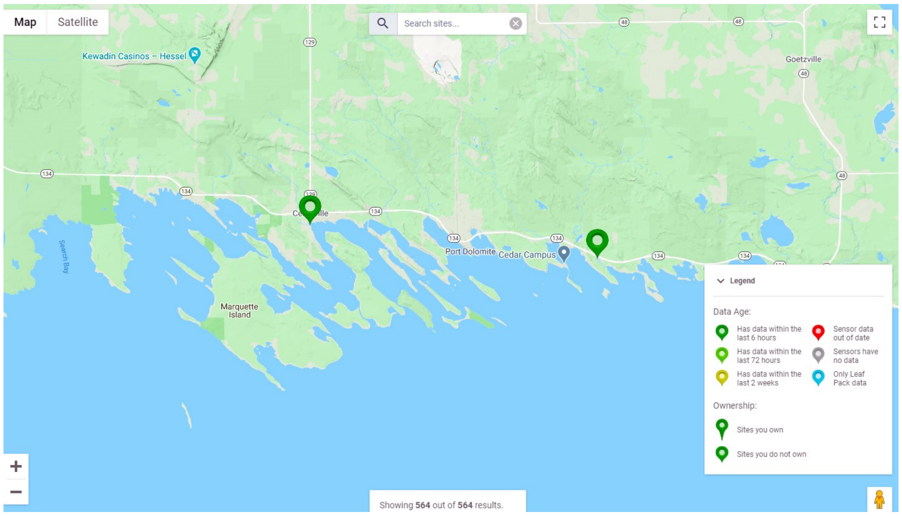


Fig. 5. Two Les Cheneaux monitoring sites

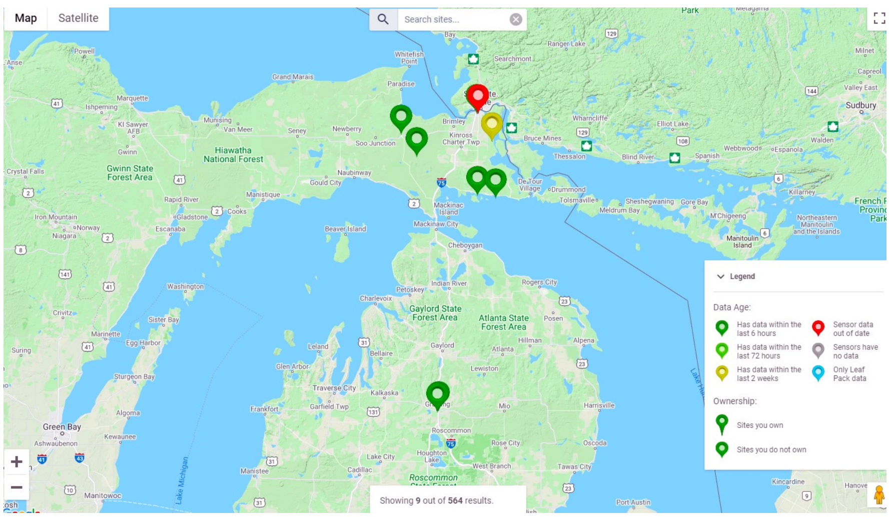


Fig. 6. Other Michigan monitoring sites.

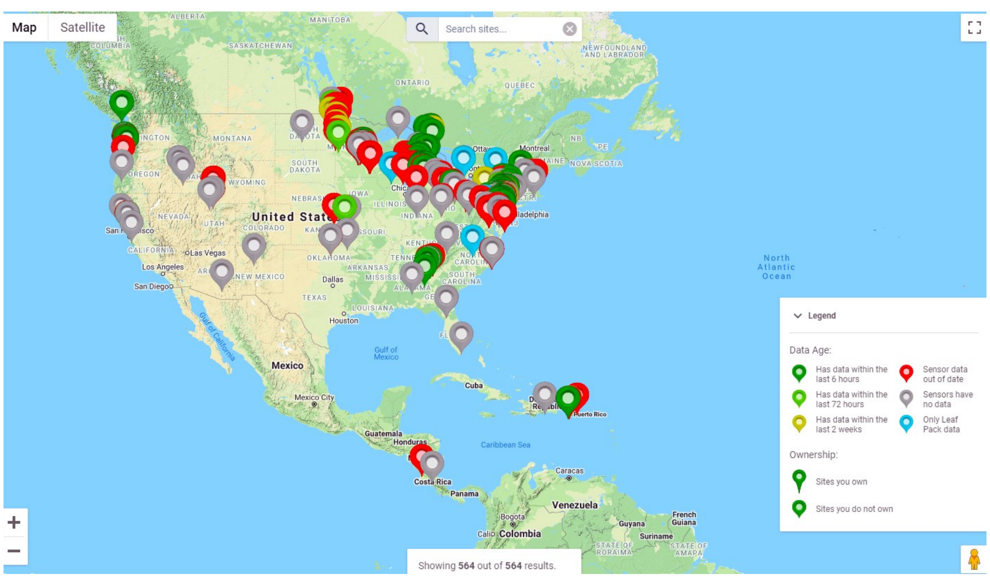


Fig. 7. Other U.S. and Central America monitoring sites.