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June 8, 2023 | Joint Committee on Finance | Paper #817

State Laboratory of Hygiene -- Soil Health and Cyanobacterial Blooms Monitoring (UW System)

[LFB 2023-25 Budget Summary: Page 670, #20 and Page 671, #21]

CURRENT LAW

Soil Health

Wisconsin state statute requires that UW-Madison maintain a state soils laboratory. The UW-Madison soil and forage analysis lab is part of the UW-Madison Department of Soil Science within the College of Agriculture and Life Sciences (CALS). The lab provides a suite of soil testing for farm, lawn and garden, and turfgrass for farmers, gardeners, researchers, and others. It also offers individual lab tests quantifying single compounds or nutrients found in soil, forage, manure, and plants. Formerly housed at the CALS Marshfield Agricultural Research Station, the lab is now part of the Wisconsin State Laboratory of Hygiene (SLH) and located in a SLH facility in Madison.

Cyanobacterial Blooms Monitoring

The SLH Environmental Health Division provides environmental testing for the Department of Natural Resources (DNR) and other agencies. This includes water, wastewater, groundwater, air, sediment, solid wastes, and tissue testing for pesticides, nutrients, metals, radionuclides, industrial chemicals, air pollutants and pathogenic microbes. The SLH can screen for various toxins in samples collected from surface waters and drinking waters, including cyanobacteria toxins.

DISCUSSION POINTS

A. Soil Health

1. The soil and forage lab moved to the SLH facility in December, 2021. The prior facility in Marshfield was outdated and renovation costs were prohibitive. According to the soil lab director, the SLH facility offers more modern facilities and some new equipment, including a soil dryer. Before soil can undergo testing, it must be dried; quicker drying times and the more modern space have allowed for faster soil and forage test turnaround times. The lab processes thousands of samples per week. Soil test results include information about pH, organic matter, phosphorus, potassium, and micronutrients. Forage tests reveal the levels of fat, protein, and starch in a sample. The lab conducts tests on a fee-for-service basis for farmers, crop consultants, UW-Extension educators, homeowners and gardeners. In addition, approximately half of their tests are for research, including research samples for scientists at UW-Madison and other institutions. The lab also runs the Wisconsin Department of Agriculture, Trade and Consumer Protection's (DATCP's) soil lab certification program to assess and certify soil tests offered by private labs.

2. The soil and forage lab's budget is funded primarily from program revenue from soil testing fees, which generated $256,300 in revenue in fiscal year 2021-22 and generated $317,700 in revenue through March, 2023. Prior to 2020-21, the lab also received GPR support from UW-Extension of approximately $75,000 annually. Assembly Bill 43/Senate Bill 70 would provide $97,400 in 2023-24 ($70,700 salary and $26,700 fringe) and $129,800 ($94,200 salary and $35,600 fringe) in 2024-25 with 1.0 position for a soil health faculty position in the soil and forage lab. The position would be located in the SLH Environmental Health Division and have an academic appointment in the UW-Madison Department of Soil Science in CALS.

3. According to the soil lab director, the proposed position would assist in the collaboration of soil health research, testing, and outreach between government agencies, agriculture producers, local communities, and academic researchers. The position may teach at UW Madison and partner with other UW-Madison faculty and staff on research to further collective efforts to sustain and protect Wisconsin soil resources through better management, guidance, and regulation.

B. Cyanobacterial Blooms Monitoring

4. Cyanobacteria, also called blue-green algae, are microscopic single-cell organisms found naturally in all types of water, some of which produce toxins, called cyanotoxins. The algae are a group of photosynthetic bacteria some refer to as "pond scum". Blue-green algae generally grow in lakes, ponds, and slow-moving streams when water temperatures are warm and enriched with nutrients including phosphorus or nitrogen. Under the right environmental conditions, blue-green algae grow quickly and most species float to the surface and form floating mats, referred to as a "blue-green algae blooms." According to DNR, in Wisconsin, blue-green algae blooms generally occur between mid-June and late September but have been observed in winter in rare instances.

5. While blue-green algae can cause aesthetic issues like discolored water, other impacts include reduced light penetration and potential health concerns. When algae reach bloom density levels, they can reduce light penetration which can adversely affect other aquatic organisms such as

other phytoplankton and aquatic plants as well as organisms that depend on those phytoplankton and plants such as zooplankton and fish. Blue-green algae sometimes produce toxins, naturally produced chemical compounds inside the cells of certain species of the algae. These toxins can cause illness in humans, pets, waterfowl, and other animals that come in contact with the algae. However, these chemicals are not produced at all times and it is difficult to tell when they are being produced. Laboratory analysis of water samples is the only way to be certain if the toxins are present.

6. In 2004 and 2005, DNR conducted a study to investigate the frequency, severity, and duration of blue-green algae blooms. Samples were collected from five lakes in each of five regions, five times over the course of each summer. DNR chose sample sites based on where blue-green algae blooms had occurred in the past or where they could potentially occur, based on nutrient concentrations. The study collected 187 samples in 2004 and 104 samples in 2005. Blue-green algae were present in 74% of samples collected. Four species of the algae were most commonly detected. A subset of the samples was analyzed for toxins including 45 samples in 2004 and 34 samples in 2005. Microcystin-LR (a hepatotoxin, which damages the liver) was the toxin most frequently detected and detected in the highest concentrations. It was detected in the northern, south central, and west central regions of Wisconsin. The toxin anatoxin-a (a neurotoxin) was detected in the northern and south central regions. DNR notes that this toxin was associated with a dog death in 2004. A cytotoxin (cell toxin) of concern was not detected in any of the samples. Currently, DNR is not conducting routine statewide monitoring for blue-green algae or blue-green algal toxins. Samples can be submitted by the public at their own cost to the SLH for testing. According to DNR, the Department plans to do more routine testing of blue-green algae, both on inland lakes such as Lake Winnebago and Wisconsin River impoundments, as well as on State Forest and State Park beaches, if staff time and funding permit.

7. Assembly Bill 43/Senate Bill 70 would provide one-time funding of $121,800 in 2023-24 to purchase instrumentation to facilitate more rapid testing of Wisconsin waters for cyanobacterial blooms. According to DNR, the equipment would consist of a FlowCam Cyano imaging particle analysis system. The FlowCam detects cyanobacteria, other algae, and particles in water samples. It uses the organism's florescent signature to differentiate cyanobacteria from other algae. The machine then uses a visual spreadsheet software to perform detailed image analysis to further organize the bacteria by taxonomy. This allows researchers to easily identify if toxic algae is present. If toxic algae is detected, then additional tests can be run. As the additional tests are more expensive, the Flowcam saves money by enabling the lab to run additional tests only for samples in which the toxic algae were detected. The proposed funding was based on a quote DNR received in March, 2022, and includes $113,800 for the instrument and associated equipment and $8,000 for a one-year maintenance package; the price was guaranteed through June 24, 2022. DNR indicates they have received an updated quote of $116,800 for the instrument and associated equipment and $8,000 for a one-year maintenance package for a total of $124,800. This price is guaranteed through August 1, 2023. [Alternative B1]

ALTERNATIVES

A. Soil Health

1. Provide $97,400 in 2023-24 and $129,800 in 2024-25 with 1.0 position for a soil health faculty position at the UW-Madison Soil and Forage Lab at the State Laboratory of Hygiene.

ALT A1	Change to Base	
	Funding	Position
GPR	$227,200	1.00

2. Take no action.

B. Cyanobacterial Blooms Monitoring

1. Provide one-time funding of $124,800 in 2023-24 to purchase instrumentation to facilitate more rapid testing of Wisconsin waters for cyanobacterial blooms.

ALT B1	Change to Base
GPR	$124,800

2. Take no action.

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