KEEPING OUR WATER SAFE

Principal Investigator Professor Robert K. Vincent, Bowling Green State University (E-Mail: rvincen@bgnet.bgsu.edu); Assoc. Prof. Kevin Czajkowski, University of Toledo.

Many cities in the U.S. get their drinking water from lakes and rivers, which makes the quality of that water vital to America. Toxic algae blooms constitute one of the threats to safe drinking water in Lake Erie and elsewhere. Blue-green algae, which become toxic when they transition to the spore stage, can produce neurotoxins that attack the central nervous system, and hepatotoxins that attack the liver. These chemicals are not destroyed by chlorine. In Brazil, 60 people were killed by a toxic algae bloom that formed on the drinking water reservoir of a single hospital. Besides chlorophyll, which is a common pigment that makes most vigorous vegetation green in color, blue-green algae contain the pigment phycocyanin. Therefore, mapping phycocyanin content shows us where toxic algae blooms are located, from very early stages (as shown in Figure 1), to the full-blossom stage that occurred in August, 2002 (not shown here).

For the first time in history, it is now possible to monitor the content of phycocyanin in surface waters from satellite (LANDSAT TM data) with computer algorithms (rules of application) developed by OhioView research. This will help

- Warn water utilities of cities, such as Toledo and Cleveland, that an early toxic algae bloom is occurring.
- Track the progress of the toxic algae bloom.
- Determine where the last of the bloom occurred, which may be where the algae sink to the bottom and lie dormant during winter, seeding a possible bloom the next year.

OhioView researchers are now working on similar algorithms to map the content of total coliform bacteria and E. coli bacteria (a type of coliform) in surface waters from LANDSAT satellite data, particularly in Lake Erie and its tributaries. That would be a second and third step toward the use of satellite remote sensing to keep our drinking water safe.

FOR FURTHER READING:

Vincent, R.K., X. Qin, R. M. L. McKay, J.Miner, K. Czajkowski, J. Savino, and T. Bridgeman, Phycocyanin Detection from LANDSAT TM Data for Mapping Cyanobacterial Blooms in Lake Erie, Remote Sensing of Environment, Vol. 89, No. 3, pp 381-392, 2004.

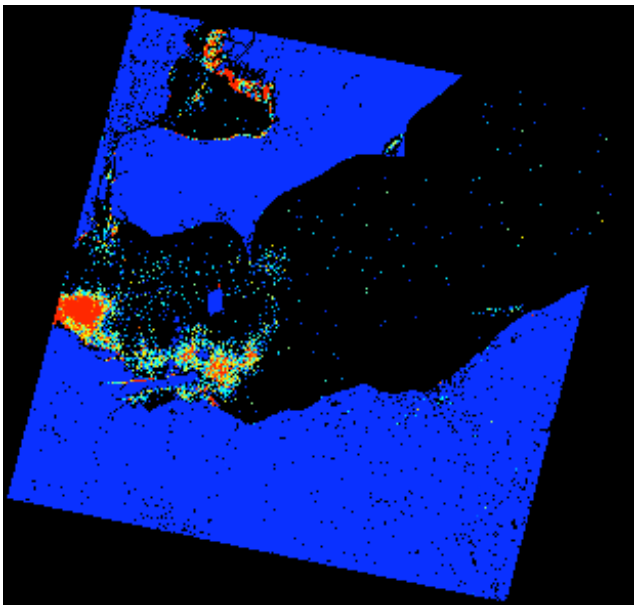

Figure 1. Phycocyanin image from model of July 1, 2000 applied to LANDSAT 7 data of Lake Erie collected on July 16, 2002, with color key given below.

Color	Phycocyanin Content (Micrograms/Liter)
Red	5.6-13.1
Yellow	4.1-5.5
Yellow-green	3.0-4.0
Blue-Green	1.4-2.9
Blue	0.1-1.3
Darkest Blue	0 (Land)
White	0 (Water)

Figure 2. Color key for Phycocyanin image in Figure 1 above.