Kickapoo Environmental Office

The Green Clan

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Satellite Technology Helps Monitor Water Quality In Lakes - Tej Attili

New research reveals how scientists can monitor water quality in European lakes using sensors mounted on satellites. The technique is a promising and cost-effective new tool to classify and monitor the ecological status of lakes more reliably under the Water Framework Directive (WFD).

Chlorophyll-a is a pigment in phytoplankton (microscopic aquatic green plants and algae) that harvests sunlight, enabling phytoplankton to grow. Monitoring the concentration of chlorophyll-a in European lakes as an indicator of ecological health (or phytoplankton population) is an important part of the WFD[1].

In most European countries, sampling of chlorophyll-a in lakes is limited to a few locations and samples per year, depending on the budget and workforce. However, scientists know that changes in chlorophyll-a concentration occur over small distances (hundreds of meters) and short timescales (days to weeks). Therefore, relying on these occasional and quick measurements to assess the biological health of a lake is likely to lead to errors.

Scientists under the EULAKES[2] project revealed how chlorophyll-a can be detected by sensors mounted on satellites that orbit the earth. The concentration of chlorophyll-a can be estimated by measuring the amount of light leaving the surface of the water at particular wavelengths compared to natural sunlight, i.e. the color of the water. A satellite can 'sample' a large area simultaneously, providing a snapshot, to investigate how chlorophyll-a changes locally. An image of the same area can be produced every few days, to investigate how concentration changes with time.

The EULAKES scientists used over 200 satellite images to estimate chlorophyll-a concentration in inland waters for a region in the European Alps, covering 12 different sized lakes. The satellite images were acquired between 2003 and 2009 by the MERIS (Medium Resolution Imaging Spectrometer) sensor on board a European Space Agency satellite. The scientists identified features of the lakes that are difficult to detect with conventional sampling, such as short-term fluctuations in chlorophyll-a, sewage inflow (points of high nutrient input and persistent high chlorophyll-a) and rapidly changing conditions in the smaller lakes caused by wind mixing.

To compare with conventional WFD sampling, the scientists selected a point in the middle of each lake on a specific day (set by the WFD to represent each season). They compared the satellite-derived concentration at that point with 'ideal' reference values corresponding to the particular type of lake (i.e. high altitude, low nutrient), also set by the WFD. In most cases, the scientists found that the lakes were of 'high' or 'good' status. They then found that the outcome could change significantly if a different date was chosen within the same season. For example, the ecological status assigned to Lake Como changed from 'high' to 'moderate/poor' between two different dates. In Lake Geneva, the maximum spring chlorophyll-a concentration doubled from 5 mg/m^3 to 10 mg/m^3 in less than a week. The scientists compared the concentrations on the single dates specified by the WFD to represent each season against all the available satellite-derived chlorophyll-a values for that season. They found that the single value was not representative of the average seasonal concentration, in some cases capturing exceptionally high or low values.

The scientists recommend that remotely sensed measurement of chlorophyll-a should be exploited for more reliable monitoring of water quality in European lakes under the WFD. By establishing protocols to interpret the data, the technique could also ensure consistency between different Member States.

1. See: http://ec.europa.eu/environment/water/water-framework/index_en.html

2. EULAKES (European Lakes under Environmental Stressors) is co-financed by the European Regional Development Fund. See: www.eulakes.eu

Source: Bresciani, M., Stroppiana, D., Odermatt, D., Morabito, G & Giardino, C. (2011). Assessing remotely sensed chlorophyll-a for the implementation of the Water Framework Directive in European perialpine lakes. *Science of the Total Environment*. 409: 3083-3091.

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WORKING TOGETHER FOR A BETTER COMMUNITY

The Fall K-20 Clean Up Event held on September 29, 2011 was a huge success! We had 98 volunteers that signed in to help pick-up an estimated 2,156 pounds of trash and litter from the Kickapoo Veterans Memorial Highway! The success of this event is a great example of how a community can pull together and make a difference. Colorado Blue Spruce trees and lunch bags were given to the volunteers that day. We would like to thank everyone who helped and participated in this great event!

Illegal Dumping vs. Land Trust Applications *- Luke Terry*

Over the years many articles have been geared towards educating Tribal Members about how illegal dumping impacts the Reservation. These articles are usually short and hopefully deter those who participate in illegal dumping. When land has an illegal dump, abandoned building or even an open well an environmental hazard is present. Sometimes folks don't realize they're harming the environment by doing a certain action. This can cause issues that are costly to the Tribe when it occurs.

The Tribe is actively applying to put land into "Trust Status" with the federal government. By having land in Trust, the Kickapoo Tribe is in total control with the US Government acting as a fiduciary and land becomes exempt from state and local taxes. The fee to trust process can take many years to go through. Any trash or debris can cause this process to take even longer due to the clean up time and any testing to determine the site is safe. Illegal dumping can be a problem on fee land but trust land is required to be kept clean and free from dumping.

The Environmental Office sponsors three Community Clean Up events throughout the year where bulky items can be disposed of. Use the weekly RSP Trash Services to dispose of common trash. If you find yourself needing to get rid of a large item and have no means to dispose of this at the landfill, contact the Environmental Office. Also, try giving the item to a friend or family member; many of the items thrown away during the Community Clean Up's are still in good working condition.

Reminder

Free tire, electronic waste and metal disposal in the storage bays directly west of the Environmental Office. The storage bays are open 24-7 to drop off material. The metal is first come first serve for scrapping. If you need a tire for a project, take it. The only thing we ask is, that this area is for certain items only- NO TRASH. Call if you have question or need large items picked up from your residence.