Burnett County Lakes & Rivers Association Newsletter

Fall/Winter 2003 Issue

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Lake Lines

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President's Column

Greetings from Burnett County's Beautiful Lakes & Rivers!

I am the new president of Burnett County Lakes & Rivers Association. The Association is going to try something a little different this year, and I am inviting your input.

- First, this association will be teaming up with Washburn County Lakes & Rivers in order to bring "current hot lakes & rivers issues" to the local association. Both county associations will be briefed monthly by local professionals. These issues will then be passed on to the individual lake associations to be dealt with as they see fit.
- Secondly, this year BCL&RA will work on three main issues. A Boater's Safety Course is planned county-wide for lake association members and their children and grandchildren (good refresher for boater's insurance!) The Association will work cooperatively with other county lakes associations to map and remove exotics like Purple Loosestrife. Work will be done with interested parties to clean up rivers & streams, with the goal of organizing "Rivers Associations" within Burnett County.
- Finally, two opportunities will be provided for members to learn more about Burnett County & Wisconsin Lakes & Rivers. The Association will have the Burnett County Lake Leaders meeting on May 15, 2004 at the B.C. Government Center, and will co-sponsor the 2004 NW Lake Leaders Conference, Friday, June 25 at Telemark Lodge, Cable, WI.

Several other issues have been discussed, but the hope is to highlight those mentioned above. As the new president and board of directors, we hope to assist the local associations achieve goals that individuals alone have difficulty obtaining.

The first step is to establish a communication network. All Burnett County Lake & Rivers Association leadership is invited to contact me via email at:Frkruger@discover-net.net. Please give your name, lake or river association name, & address. Responders will be advised of issues concerning "waters" only. I am sincerely looking forward to working with everyone over the next year.

Fred Kruger, President

From Buck Gooding—Burnett County Lakes & Rivers Treasurer

Government cuts of various organization budgets will influence the future of the Burnett County Lakes & Rivers Association newsletter. In the past, the funding we receive from UW-Extension has paid for the mailing of our newsletter to over 3,000 lake association members throughout Burnett County. We have provided this service for all lake association members, although not all associations have paid their $25.00 dues to BCLRA. However, with cuts in funding for this service, BCLRA will now be responsible for mailing costs, and only lake associations that have paid their dues will be eligible to receive the newsletter in the future.

The following lake associations have not paid their dues for the 2002-2003 year: Mud Hen, Big Bear, Clam, Burlingame, Des Moines, Lake 26 and Minnow Lake. Members of these lake associations will no longer receive the newsletter if the $25.00 dues are not paid by December 31, 2003. If you are a lake association member who wishes to continue receiving this newsletter, please urge your association to pay their BCLRA dues.

If you have questions, please call Buck Gooding at 715-656-7628.

First Notice

2004 Northwest Lake Leaders Conference

Telemark Lodge, Cable, WI

Friday, June 25, 2004

Formerly held at the Schwann Center at Minong. Please mark your calendar now for this informative event!!

Thank You

to retiring board members.

Lin Lehmicke
Greta Michaels
Shirley Sandquist

A sincere "Thank You" for your time and participation on the Burnett County Lakes & Rivers Association Board of Directors.

Your help in the future will always be appreciated.

Fred Kruger, President

Welcome to New BCLRA Board Members for 2003

David Dopkins, Frederic
Gordon Hesselroth, St. Paul
Roger Noe, Spooner

Burnett County Lakes & Rivers Association Board Members

Fred Kruger
President

Susan Wallin
Vice - President

Lois Dornfeld
Secretary

Ralph (Buck) Gooding
Treasurer

David Dopkins
Board of Directors

Gordon Hesselroth
Board of Directors

Jim McLaughlin
Board of Directors

Roger Noe
Board of Directors

Tom Twining
Board of Directors

Water Primer: Just the facts

By Randy Hunt, U.S. Geological Survey, Wisconsin District

"When drinking water, think of its source."
- Chinese proverb

Liquid water is what makes our planet unique and is essential for life as we know it. Many ancient civilizations were located on the banks of rivers or near seacoasts. Civilizations flourished with adequate water supplies, and then crumbled when the water supplies failed. Water itself is an amazing molecule. Water is known as a "universal solvent" for its ability to dissolve many solids. It exists in three different forms (ice, liquid, and vapor) at temperatures experienced by life on Earth. Aquatic life in Wisconsin would be very different if water did not have a unique property - its solid form (ice) is less dense than the liquid from which it forms. As a result, ice floats. If this was not the case, our lakes would freeze from the bottom up and everything within the lake would freeze completely whenever the temperature got below freezing. It is hard to imagine how good the fishing would be in such a world!

Knowledge of the basic scientific foundations of water science is vital to our common understanding of how this resource works. Water has been studied for centuries, with the first measurements of precipitation taken around 2,500 years ago. The first aqueduct and canal projects date back to the ancient Egyptians, about 5,000-5,500 years ago. But water was often mysterious to the ancients. During the time of Plato and Aristotle there was much debate on where rivers obtain their water. Now we know that there is a global "water cycle" where water is evaporated from the oceans, falls to the earth as snow and rain, and moves back through our aquifers (the upper parts of the Earth that hold and transport water) and rivers to the atmosphere and ocean. While much has been learned that can be useful for understanding the Waters of Wisconsin, some myths about water have also come up from time to time. The purpose of this section is to "prime the pump" by covering some of the principles that govern water, and providing some perspective to the science and myths that surround this all-important resource.

Four Misconceptions

The great Wisconsin naturalist James Hall Zimmerman ("Jim Zim") distilled observations from 40 some years in the field to "Four Misconceptions" about our wetlands that also apply to all our Waters of Wisconsin. While many are at least partly aware of these myths, they serve as a starting point for understanding our water resources.

1. *"All water resources are alike"*

From a practical standpoint, it is desirable to lump our water resources into a few categories. But in reality there can be vast differences in the sources of water, and how vulnerable an individual lake, river, wetland or aquifer is. For example, there are over 100 types of wetlands in the United States; there are 14 wetland types in Wisconsin alone. Some are primarily rain-fed; some have significant groundwater sources. Others have important stream inputs; others do not. Lakes, streams and aquifers also have different conditions that result from different sources of water. Cold-water streams are associated with higher groundwater inflows; warm-water streams are often derived from surface water sources. Deep, clear-water lakes are often groundwater fed. Deep aquifers supply water from storage or leakage from overlying rocks while shallow aquifers supply water derived from precipitation that infiltrates the ground and other water sources (streams, lakes, wetlands). How a water resource will respond to a stress (for example, a nearby pumping well) will be different depending on what supplies its water.

2. *"Our water resources can stand alone"*

The water body can appear to be an isolated feature in the surrounding landscape. But, in reality, it is connected to the larger landscape through overland flows during snowmelt and heavy rains, and by the less visible groundwater system that underlies the land. Moreover, many animals depend on conditions on both sides of this edge during different times of their life. So, what happens on the land, even though it is not directly adjacent to the water body of interest, can still have an effect on the quality of our water resources. This connection is why we often hear about the need to protect and manage our water resources by watershed or basin. It is one of the reasons that wetlands are often called the "kidneys of the landscape." Wetlands take pulse inputs from within the basin (water, sediments, nutrients, and contaminants) and either trap and transform the inputs, or release them to the downstream system at a much-reduced rate. Thus, when we lose wetlands in a basin, it is like losing our "kidneys" without access to dialysis!

3. *"Our water resources do not change over time"*

We view our water resources being essentially unchanged since the glaciers receded 10,000 years ago. But, this is not the case. Natural erosion and deposition have cut some valleys deeper while slowly filling other lakes and wetlands. Water levels in a lake, stream, or wetland vary from year to year due to changes in annual precipitation. Human activities have accelerated many of these natural processes.

4. *"Our water resources function the same regardless of impacts"*

In Wisconsin, we have multiple uses for water and engineering technologies that allow us to modify the natural water flows. What is less known is that diverting, ponding, pumping, and using water affect the functioning of our natural water resources. One cannot expect a wetland to support rare and endangered species if its sources of water are changed by stormwater addition or nearby high capacity pumping. The water quality of a deep clear-water lake will change in response to nutrient additions from failing septic systems. Trout streams cannot support trout if its groundwater supply is limited by pavement and storm sewer interception in the basin, or sediments from improper development and agricultural practices cover the gravel spawning beds. While the quantity of function loss for a given impact is often not well understood, we should expect some loss in function.

Six Scientific Misunderstandings

These four misconceptions go hand in hand with scientific misunderstandings about our water resources. While there is some overlap with Jim Zim's ideas, it is worth elaborating the specific ideas below. Discussion of the future of the Waters of Wisconsin will be most productive if we start free of these misleading notions.

1. *"We have all the water we could ever need"*

From space one can see that the majority of the Earth's surface is covered by water. It is estimated that the volume of water on the earth is around 330 million cubic miles - enough to cover the entire Earth's surface to a depth of 1.5 miles! But, as you might expect, not all of the water is suitable for human consumption. The break down of the Earth's water supply is shown here.

Of these, usually only groundwater and surface water are considered suitable for human consumption. Even though the global percent-

age of these waters is low, this is still a large quantity of water.

In Wisconsin, we receive around 31 inches of precipitation a year, which equals 29 trillion gallons of water that fall as snow and rain. So why do we hear about possible water shortages in our water-rich state? Most of this water (around 75 percent) is transferred back to the atmosphere by evaporation and plant transpiration before it makes it to groundwater or surface water. However, even considering that most water does not make it to groundwater and surface water, there is a more subtle issue: water supply problems are not problems of amounts of water available statewide; rather, they are local supply problems. That is, water flows in the natural system in some cases cannot keep up with the local demands placed upon it. It is a problem of transport in that our ability to locally extract water exceeds the natural replenishment of water. So, while we truly have ample water in our state, we can still have water shortages in localized areas where more is being withdrawn than can be obtained from elsewhere in the natural system.

Supplies must also be put in context of current and future water use. While a person requires less than a gallon to live, our personal water usage in Wisconsin is much larger than this basic requirement, around 63 gallons per day for each person. And, if energy, industrial, and agricultural uses are factored in, our per capita usage approaches 260 gallons per day. When all this water use is put together Wisconsinites use 1.45 billion gallons of water each day!

With increasing population, recognition of water's multiple uses, and pressures on the water resources, water quantity issues will likely continue to be a topic of debate in the future.

2. *"Water doesn't move"*

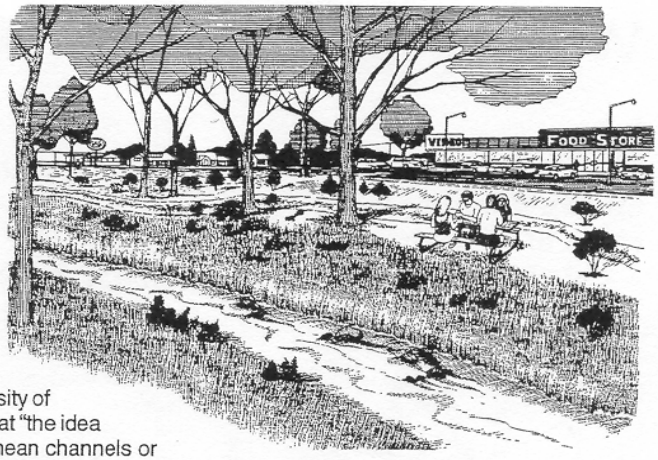
While it is easy to see water moving in a river or stream, it is less obvious that all water - including lake water and groundwater - moves. This movement follows well-established scientific principles that state that water moves from high to low energy. In Wisconsin, groundwater generally moves from higher areas in the landscape toward lower areas containing streams, rivers, and lakes, or toward low areas created by pumping. Surface water flows "downhill" (downstream) unless captured by a municipal or irrigation water intake.

While all water moves, it does not all move at the same rate. Where as in a stream it is not uncommon to see water moving at speeds of a foot or more per second, a speed of a foot per day is considered fast for groundwater flow! In fact, some shallow groundwater in the red clay areas of northern Wisconsin has been there since the time of the glaciers - 10,000 years ago! This leads to an important point about water resources - the rate of natural replenishment, and associated vulnerability (to contaminants), is different for different water resources.

Thus, water can be thought of this way, it is not a non-renewable resource like oil and gas, but neither is it a completely renewable resource like solar energy. Slow rates of groundwater replenishment also have real-world consequences.

3. *"Our water comes from Canada, mostly from underground rivers"*

One of the great natural scientists, T.C. Chamberlin from the University of Wisconsin, stated in 1885 that "the idea that there are vast subterranean channels or caverns in which artesian water flow like a river has been long since abandoned. These are matters of common scientific knowledge." However, these myths have surprising resiliency. In fact, most of the groundwater that we use does not come from underground rivers but comes from areas close to the wells that pump it. The quality of our surface-water supplies is controlled by the quality of the surface-water body from where it is pumped. Thus, how we use our land controls the quality of our water.



4. *"Surface water can be treated separately from groundwater"*

Traditionally, discussion and management of water is separated into groundwater and surface water components. But, in reality, nearly all surface water features interact with the groundwater system. Rather than separate components, groundwater and surface water form a continuum in our landscape that extends from areas where the water is below the ground to areas where the water is above the ground. Thus, water is linked across time and space. Most surface water can be thought of as a visible expression of the groundwater system, and much of the groundwater system can be thought of as a hidden supply to the surface water system. As a result of this interconnection, any discussion about water must include both the groundwater and surface water components.

5. *"Water can be used without any effect"*

A basic principle of water science is that water cannot be created or destroyed; what flows into a system has to flow out or the storage within the system (represented by water levels) has to change. This system response is like a household financial budget.

Any imbalance is made up by a change in lake or aquifer storage, as shown by changes in lake or aquifer water levels.

The upshot of this principle is that there is no unused water - all water is being used by some thing or someone. Because water is responsible for many of those things we find dear in Wisconsin, actions that remove, redistribute, or transform water will likely be felt by the natural system.

The ability of natural groundwater and surface-water systems to redistribute water illustrates a common misconception regarding the idea of a water budget. Indeed, water science has tried during different times in its history to address what has been called the "water budget myth." It is a common misconception that the amount of water available for use by people is equal to the amount of replenishment over a given area.

In order to assess the effects of water withdrawals a more holistic view of the water system - groundwater and surface water - is needed.

6. *"The past can predict the future"*

In the past, we could stress our aquatic systems without seeing a noticeable change in the quality of the water resource. But, now we know that there are "cumulative" effects such that the same stress applied later in time to an already stressed system can have a much larger impact.

Given these cumulative effects, how systems responded to the stresses of our ancestors may not give us a good indication of how they will respond as we and our descendants stress them.

We also know some actions cause major effects immediately, like introduction of exotic species. Invasive species can change the entire character of our aquatic ecosystems as well as our ability to use them for recreation or drinking water. Find out what species threaten Wisconsin waters on page 7.

Although there are misconceptions and misunderstandings, a scientific framework gives us the dimensions of what is possible, as well as a firm foundation from which to look at the past, present, and future of the Waters of Wisconsin. Of course, there is more than just science that enters into this discussion. Indeed, as Loren Eisley once noted:

"If there is magic in this world it is to be found in water."

Randy Hunt, U.S. Geological Survey, Wisconsin District, 8505 Research Way, Middleton, WI 53562, e-mail: rjhunt@usgs.gov ❖

The "500 lbs. Algae Adage"…

Where did it come from?

by Ron Struss, University of Minnesota Extension Educator

Have you heard this adage?: One pound of phosphorus can produce from 300 to 500 pounds of algae. You probably have. It is much quoted in articles and during presentations when the "greening" of lakes is discussed. It means a pound of the nutrient phosphorus entering a lake (or river) from wastewater or stormwater runoff can promote the growth of up to 500 pounds of "pea soup" algae.

Not only have I heard this adage, I have repeated it to others—which led me to ask, *where did it come from, and is it TRUE?*

Steve Heiskary, limnologist with the Minnesota Pollution Control Agency, put me on the trail of the "algae adage" origins by directing me to *Limnology,* a standard textbook by Robert G. Wetzel. While it is not known who first coined the adage, the rationale for it is laid out in a section titled *Effects of Phosphorus Concentration on Lake Productivity* (Second Edition, page 285). A main reference for the section is J.R. Vallentyne's book *The Algal Bowl - Lakes and Man* (Ottawa Department of the Environment, 1974).

Core to the rationale is the "law of the minimum," that is, the nutrient that is in the shortest supply in relation to a plant's needs will control the growth of that plant. The "law of the minimum" can be illustrated using a baking example: A pound cake takes a pound of flour, a pound of butter, a pound of sugar and four eggs. If you have ten pounds of flour, butter and sugar, but only four eggs, you can only bake one cake. The eggs are the limiting factor to baking more.

The limiting factor for algae growth in most Wisconsin lakes is the nutrient phosphorus. It is not limiting because algae need so much of it, but rather because it is usually in very short supply. The average ratio of the phosphorus needs of algae to what is available in water is 80,000 to 1.

According to J.R. Vallentyne, a 500 pound "batch" of wet algae requires:

1 pound phosphorus
7 pounds nitrogen
40 pounds carbon

Since there is usually more than adequate levels of nitrogen and carbon in lake and river water, for every pound of phosphorus added, another 500 pound batch of wet algae can be produced. Since 500 pounds is the theoretical maximum that can be produced, the range of 300 to 500 pounds is typically used when the adage is quoted. I did not find how the 300 lower limit was set - it is likely the best estimate of the specialist who first coined the adage. The 300 pound to 500 pound range is wet weight algae; in dry weight the range is 60 to 100 pounds.

All types of algae can experience periods of rapid growth known as "blooms." In Wiscon-

sin lakes, however, blooms of blue green algae, also know as cyanobacteria, draw the most notice. They form surface scum, are smelly, and occasionally produce toxins harmful to drinking livestock and pets.

Blooms of blue green algae are a classic case of too much of a good thing. We owe lots to blue green algae for both past and present good. Similar to bacteria in structure, these simple organisms are credited for first using chlorophyll to make food from sunlight and for boosting oxygen in the Earth's early atmosphere. In lakes today, they form the base of the food web that feeds increasing larger and larger animals - including you if you were lucky enough to hook a lunker this season.

A number of states around the country, including Wisconsin, are in various stages of developing nutrient standards, specifically a TP (total phosphorus) standard, for surface waters within the state. These states are proposing a variety of approaches. Some are developing regionally based criteria based on classes of waters; others are developing standards that are based on very site-specific characteristics. Some states, such as Maine and North Carolina, have already established and implemented numeric criteria for phosphorus. For example, North Carolina recently passed legislation imposing strict limits on the discharge of nitrogen and phosphorus into Nutrient Sensitive Waters (NSW). Stay tuned for new developments in this area.

Information from 'A Sampling of the States' Nutrient Criteria Development Plans', 16th Annual Conference, North American Lake Management Society.

A Year Of Water

Water is increasingly becoming a source of tension in many parts of the world as countries compete to meet minimum requirements with respect to their populations' drinking water supply and sanitation needs. The United Notions declared the year 2003 as the International Year of Freshwater to draw attention to the plight of nearly 3 million people who die every year from diseases associated with unsafe water and the 1l2 billion individuals who lack access to a safe drinking water supply. By 2025 it is predicted that nearly two thirds of the world's population will live in countries with serious water shortages.

Closer to home, the 2003 Wisconsin Year of Water continues to unfold in the face of a somewhat undecided future for the waterways of Wisconsin. Many waters still do not meet minimum water quality standards and beaches continue to close from bacterial contamination. Shorelines continue to be developed with abandon and groundwater continues to be depleted at unsustainable rates. These are only some of the issues that are under consideration this year through an effort led by the Wisconsin Academy of Sciences, Arts and Letters. The Waters of Wisconsin initiative has already generated a report consisting of recommendations for more thoughtful policies in water use, management and protection. For more information on Wisconsin's year of water and to read the WOW report, go to www.wisconsinyearofwater.org/.

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