Lake Waves

A Quarterly Newsletter

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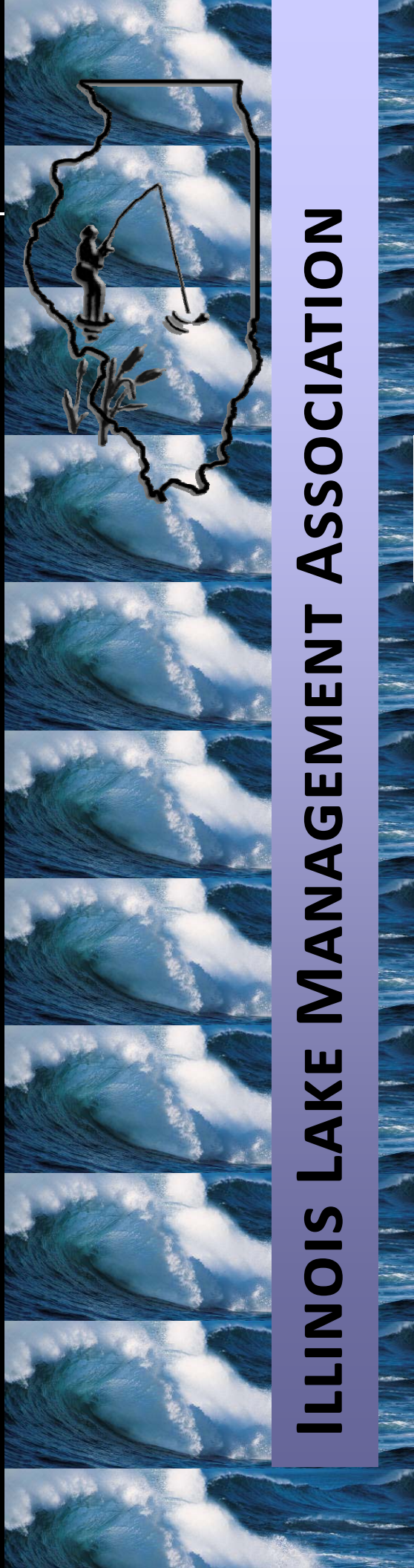
Rain

a problem and a solution

What's on Tap



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Editor's Notes..

Problems always boil down to timing, expenditures, and perspective. Stormwater runoff is a problem in nearly every urban environment and it significantly impacts our water resources. Dealing with stormwater runoff is a tricky issue as there is the combination of managing the existing infrastructure and trying to implement new systemic changes on how runoff is handled. Perspective plays an important role in the stormwater issue, more so than I think is generally granted. All around the country (and the world) municipalities are increasingly dealing with flooding and drought in the same year. Our past paradigm of managing stormwater centered on one simple rule: How fast can we get the runoff from the parking lots and streets into the rivers. The old saying of reaping what you sow remains intact. We got a little too good at moving the water through the system and have significantly impacted ground water recharge across the country.

The understanding of stormwater management has changed dramatically over the past 20 years but instituting the necessary changes to improve the systems both on a policy and a practical level has proved a great challenge. The perspective of the general public and most developers has not moved beyond the old paradigm where the only concern is the expediency of getting water off their property. Educating the public and policy makers on the connection between stormwater runoff and water quality in our rivers and lakes is still a work in progress. In this issue we highlight a few articles on rain gardens and rain harvesting. These management tools serve to reduce the quantity and increase the quality of runoff entering the stormwater system.

- Bryan Cross

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RAIN GARDENS 101

Putting some Science behind the Device

By: Brian Valleskey

With the advent and mass promotion of stormwater Best Management Practices (BMPs) over the last few years, there has been a growing interest in the use of rain gardens as a tool to cleanse stormwater runoff and help control runoff volume. While a rain garden can be an effective tool to achieve some of these tasks, it is often understated as to the actual science, and beyond that just how effective can a rain garden be as a supplemental stormwater treatment device.

The first rain gardens were created to mimic natural water retention areas on undeveloped land. The rain gardens for residential use were developed in 1990 in Prince George's County, Maryland when a developer had the idea of replacing traditional stormwater retention with biorentention. Through collaboration with the local planning and environmental resources department, thorough implementation of a rain garden system was utilized. Several studies have been implemented throughout the years to reinforce the benefit of the system.[1]

So that we can directly relate to the benefits of rain gardens, bioretention, and other such similar stormwater BMP practices, it is important to define a few parameters associated with stormwater volume and some associated pollutants. While these examples are not meant to be exact, and are quite variable depending on design and geography, it will provide a context in which the effectiveness of rain gardens can be evaluated.

It is important to know that a rain garden is not a flood control or flood prevention device, and although rain gardens have been shown to help reduce some nuisance flooding, this BMP's focus is primarily on water quality and runoff reduction. Stormwater runoff volume increases as the amount of impervious cover of the site increases due to the inability of water to come into contact with soil. For example, a residential subdivision may increase total runoff from an existing prairie or farm field anywhere from 200 – 400%, whereas a commercial development laden with large parking lots may increase total runoff anywhere from 400 – 900% (these are not exact numbers, but demonstrate the point the more an area is developed the more runoff is generated). There is also an increased release of various pollutants associated with development such as heavy metals, hydrocarbons and oils, and thermal pollution. The use and proper design of rain gardens can help mitigate these impacts to a degree.

There are hundreds of rain gardens and similar type BMP treatment devices throughout northeastern Illinois alone, but there is no standard for rain garden design. Current stormwater ordinances encourage use of these controls without providing or requiring the designer to verify effectiveness of the BMP control. This is where problems begin to surface. BMPs need to be sized to effectively cleanse incoming water and assist in its redistribution below ground. Too much water and the garden can become damaged or destroyed. BMP designers often refer to Facility Area Ratio (FAR) when designing rain gardens. The FAR refers to the relationship of area of the BMP (rain garden for example) to the upstream tributary area. It is important that the tributary area not overload the BMP, reducing its effectiveness and lifespan. Rain gardens have to be carefully thought out and properly designed if they are to be effective.

Tools such as RECARGA (http://dnr.wi.gov/runoff/models/) and WinSLAMM (http://winslamm.com) can be used to effectively size a rain garden to reduce stormwater runoff, and reduce pollutant load. While there is thorough documentation of rain garden and BMP effectiveness in other parts of the U.S., there is little in Illinois. Following criteria set forth by the State of Wisconsin Department of Natural Resources (WDNR) in Natural Resources Administrative Code 151 (NR 151), Cowhey Manhard, Ltd has used these modeling tools on projects involving residential and industrial type developments, along with roadway designs to evaluate the effectiveness of the BMPs. The goal was to determine the reduction in the amount of total annual runoff at these project sites due to proximity to high quality resources (downstream, onsite, or nearby). Coordination of this work was thoroughly investigated by the US Army Corps of Engineers (USACE) and the US Fish & Wildlife Service.

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Results of the study varied by land development type, as expected. This is likely due to each development type presenting varying degrees of impervious surfaces (parking lots vs. driveways). All results did indicate that a more holistic, environmentally conscious design can show significant benefits in stormwater volume control and pollutant dispersal when compared to conventional site development techniques. The table below summarizes the benefits:

Land Use	% Particulate Reduction	% Runoff Reduction
Roadway	97.9% [2]	34.8% [2]
Industrial	98.6% [2]	13.9% [2]
Residential	100.0% [3]	100.0% [3]
Commercial	Not Modeled	21.0% [4]

Particulate solids are typically modeled through the parameter total suspended solids (TSS) which simply refers to the amount of dirt/debris/sediment contained within a sample or volume of water. Water samples are run through a filter to separate the solids from the water and weighed. Percent volume reduction is performed by calculating the runoff from a typical site design and comparing it to the BMP or runoff reduction design using total annual rainfall amounts.

There is a certain amount of detail that has been left out of the above modeling descriptions and table results. Results for the Residential design may be atypical as the available rainfall dataset contained several rainstorms, but none providing a rainfall in excess of a 2 year, 24 hour storm event for the area (3.12”). Regardless, the trend in stormwater runoff reduction and pollutant transport is notable. While long term results have yet to be obtained in NE Illinois, regional examples of similar nature support the model design through university and agency monitoring efforts.

While Best Management Practices (BMPs) are slowly becoming standard stormwater treatment practices in IL, there are few local resources defining a standard design method for addressing stormwater runoff control and pollutant transport. It is important to consider a sizing method for various techniques such as large rain gardens or bio-infiltration to validate the ability of the device to perform a useful function in the watershed and stand the test of time. ILMA

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1) U.S. Environmental Protection Agency (EPA), Washington, D.C. Non-Point Source News-Notes. August/September 1995. Issue#42. “Urban Runoff”.
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AUTHOR INFO

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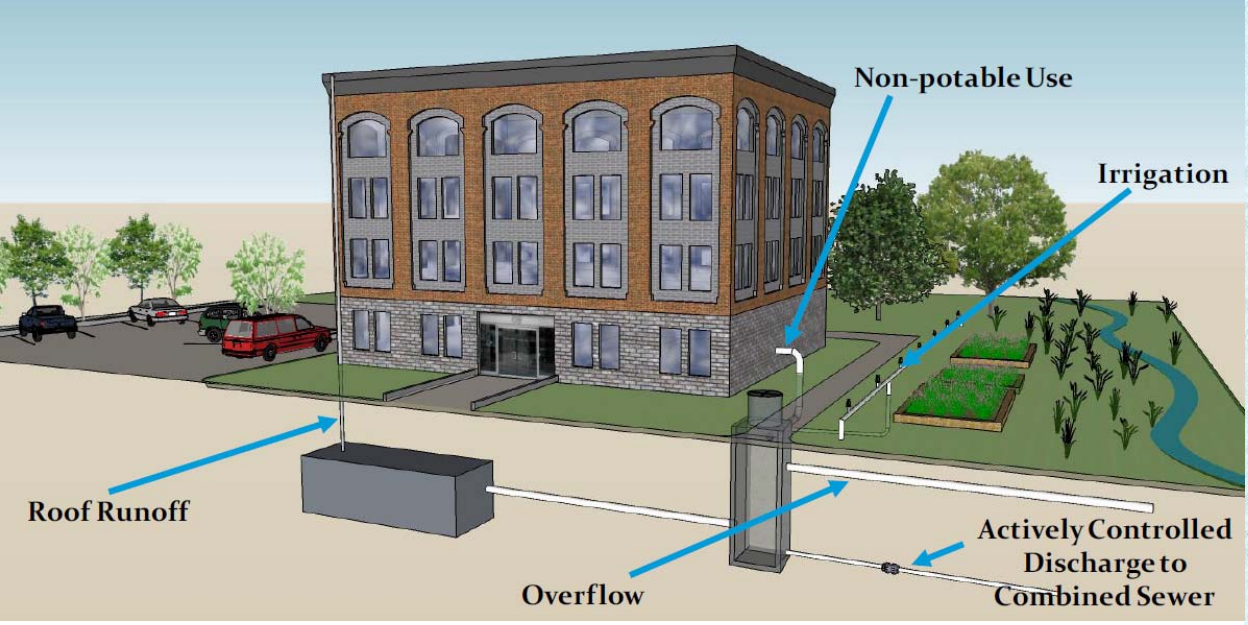
Do Your Duty!

Dear ILMA members,

This is your reminder to respond to your ballot forms for electing new ILMA board members. Ballots were sent out in November and need to be postmarked by December 31. If you have not received your ballot or have misplaced it, contact Michelle Nicol (michelle.nicol@cwlp.com). This is your voice, let it be heard!

ALSO, in preparation for the upcoming conference the Board of Directors are looking for nominations for the **Lake Guardian and Frank Loftus Lake Stewardship Awards**. The Lake Guardian Award recognizes lake professionals and volunteers who over the years have demonstrated an exceptional effort throughout the State of Illinois to preserve the quality of Illinois Lakes. The Frank Loftus Award recognizes personal volunteer effort and commitment, dedication and stewardship efforts to address local lake issues. If you can think of any person (or group) that merits consideration for these awards please contact Bob Dill (dill@otterlakewater.net) or visit our website (www.ilma-lakes.org) under the 'membership corner' tab.

LASTLY, if you are a college student or know a college student who likes money, this is a reminder **ILMA scholarship applications** are due in by December 31st. ILMA awards three scholarships: two $1,000 Illinois Undergraduate/Graduate Scholarships and the $500 Robert Esser Student Achievement Scholarship. The scholarship applications are available on the website under the 'about ILMA' tab.



Regional Applications of Rain Water Harvesting (RWH) Systems for Sustainable Water Resources Management

By: M. Bardol of Geosyntec Consultants, Ltd
(revised and reprinted with permission)

Sustainable water resources management is no longer just commendable; rather, it is increasingly expected of cities and municipalities. The emphasis on one strategy alone, such as providing additional stormwater storage, utilization of reclaimed water, or water conservation education programs is not likely to adequately protect water resources. Several complimentary strategies may be required to demonstrate a comprehensive approach to sustainable water resources management.

Stormwater discharges from changing, urbanized landscapes contribute to surface water quality pollution. Some states are encouraging or requiring stormwater capture and onsite use as a means to retain stormwater onsite, thereby reducing stormwater discharges and subsequent pollution of surface waters.

Case Study: Missouri

Geosyntec Consultants (Geosyntec) was retained by a public housing developer to design and construct rainwater harvesting (RWH) systems in Missouri providing a total of 77,500 gallons of storage at seven sites. All RWH systems were sized to capture 1.1 inches of rainfall from each of the collection areas. Larger storage volumes could not be installed due to site constraints, rendering larger storage volumes cost-prohibitive.

The water resource management strategies implemented in Missouri include stormwater treatment, storage, and onsite use, and potable water demand reduction. The project design features implemented include biofiltration, distributed real-time controls (DRTC), which allows for remote control of on-site equipment, and weather-based irrigation controls (WBC). The illustration at the beginning of this article is typical of

RWH systems installed in Missouri. The harvested rainwater (runoff) was collected from roofs and/or paved parking lots. Harvested rainwater from paved areas was treated via biofiltration prior to storage and subsequent landscape irrigation use. The RWH system was designed such that flows above component capacities passively overflow to the existing combined stormwater and sanitary sewer system (CSS). Following storage, harvested rainwater is pumped to the existing irrigation system and is used as the primary irrigation source. If rainwater is not available for irrigation use, potable water is used as the secondary source for irrigation.

A crucial component of the RWH systems installed in Missouri is the DRTCs, which effectively combine stormwater management and RWH storage for non-potable use. The DRTCs include a weather forecast data feed so that the RWH system can release the stored water prior to a significant precipitation event, making storage available for the forecasted event and releasing water to the combined sewer when it can accept the water without causing an overflow. Utilization of DRTCs is particularly beneficial in urban environments with CSSs where wet weather flows can overwhelm storm sewers resulting in combined sewer overflows (CSOs). By integrating RWH applications with stormwater control infrastructure, multiple benefits of storm sewer flow reductions and water conservation are achieved with a single, cost effective system.

Development and implementation of diverse stormwater management systems such as RWH systems can sometimes require a certain degree of public outreach. As limited elements of even standard stormwater practices are not well known by the common public, a more robust system of chambers, pipes, and computer control switches seemed even more confusing. As the installation of the RWH system continued to take place and local citizens became more aware of the use and purpose of the devices, a certain degree of accomplishment became apparent. The implementation of the system seemed to overwhelmingly have a positive effect and increased awareness in the environmental impact of RWH systems and sustainable stormwater management in general[1]. In future situations such as these, albeit with a private venture, agency interaction should be considered to promote the utilization of public outreach programs in the importance of implementing sustainable stormwater technologies.

Being within a CSS, the intent of the RWH systems in Missouri was to improve surface water quality by reducing stormwater flows to the CSS, and to provide an alternative water source to reduce potable water demands. The RWH systems function to improve surface water quality by shifting and flattening peak runoff flows thereby potentially reducing CSO volumes. While the intent of typical stormwater detention basins is to shift and flatten peak runoff flows, the RWH systems in Missouri are actively operated with DRTCs to maximize utilization of available stormwater storage volume for controlling discharges during peak runoff conditions. Typical stormwater detention basins are passively controlled, operating less efficiently (lower utilization of storage volume) than an actively controlled RWH system.

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Besides the surface water quality benefits of improved stormwater management, the RWH systems also provide water conservation benefits. Since the harvested rainwater is used for landscape irrigation, the RWH systems provide an alternative water source to potable water. Potable water was the primary water source for irrigation of all sites in Missouri. Detailed irrigation system evaluation was performed to optimize the irrigation system performance and minimize irrigation water demands. Recommendations from the irrigation system evaluation included irrigation system repairs and installation of WBCs across all sites. Implementation of irrigation system repairs and installation of WBCs also results in reduced potable water demands.

Multiple benefits of stormwater management and water conservation were demonstrated for the Missouri case study by the use of DRTCs for the RWH system, and through an irrigation system evaluation and installation of WBCs. Cisterns storing a total of 77,500 gallons of rainwater were installed across seven sites for RWH, and harvested rainwater became the primary irrigation source. DRTCs were installed at each RWH system to discharge harvested rainwater in advance of oncoming storm events, maximizing available cistern volume and thus reducing CSO volumes.

The benefits of the RWH systems in Missouri include improving surface water quality by reducing stormwater flows to the CSS, and providing an alternative water source to reduce potable water demands. A cost-effective method to improve surface water quality by reducing CSOs may be retrofitting existing detention basins with DRTCs.

ACKNOWLEDGEMENTS
The authors would like to acknowledge Mr. Marc Leisenring, P.E. of Geosyntec Consultants for his work on the modeling results referenced in this manuscript.

REFERENCES

1. Matthew R. Bardol, personal communication, August 28th, 2011. Matthew provided onsite construction coordination and project oversight for installation of the system.

C.K. Ishida, E. Strecker, T. Stober, M. Bardol, and M. Quigley

The above article was revised and edited from its original content for brevity. Credit for the content of the original article goes to the above listed authors from regional offices of Geosyntect Consultants, Ltd.

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The following proposal has been submitted to the Illinois Department of Natural Resources by Greg Whitledge and he is looking for locations interested in participating. A candidate lake has no connection to other water bodies, is relatively small, and with minimal public access. A small pond would be perfect.

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Zequanox™ is a product being developed and tested by Marrone BioInnovations™ for environmentally friendly biological control of zebra and quagga mussels. Zequanox™ contains a killed strain of *Pseudomonas fluorescens*, a common species of bacteria that occurs naturally in water and soil, and selectively kills quagga and zebra mussels. Tests of Zequanox™ in the laboratory and at power plants and dams to date have indicated >70% mortality of zebra and quagga mussels exposed to this product. Laboratory trials have also indicated no effects of Zequanox™ on fishes (bluegill, fathead minnow, and brown trout) or non-target aquatic invertebrates (*Hyalella* and *Daphnia*). Exposure to Zequanox™ also caused no mortality to blue mussels (*Mytilus edulis*) or any of six native North American unionids (*Pyganodon grandis, Lasmigona compressa, Strophirus undalatus, Lampsilis radiata, Pyganodon cataracta,* and *Elliptio complanata*) in tests conducted to date. While investigations of the efficacy of Zequanox™ as a selective *Dreissenid* control agent in the laboratory and at power plants indicate its potential applicability to field settings, this product has not yet been tested in open waters such as lakes, rivers, or constructed waterways (harbors, canals). Additional evaluation of Zequanox™ under field conditions would be valuable to more fully assess its applicability as a mussel control agent in water bodies within Illinois and the Great Lakes region.

We propose to conduct a field trial to assess the efficacy of Zequanox™ for controlling zebra mussel infestations in Illinois lakes. The Zequanox™ for this trial will be supplied by Marrone BioInnovations, and Zequanox™ application will be conducted by personnel from Marrone in cooperation with the Illinois DNR. Typical product application rates are in the range of 25-50 mg/L. Personnel from Dr. Whitledge's lab at SIUC will also be present at the time of application and will conduct a study (described below) to monitor the response of zebra mussels and non-target organisms to the Zequanox™ application.

Zequanox™ application will be conducted during spring 2012 at a lake in northeastern Illinois that is not connected to other lakes or rivers and is known to have an established zebra mussel population. The specific site to be used for the trial will be selected and agreed upon by IDNR and Dr. Whitledge. Pre-treatment sampling to characterize zebra mussel abundance and size structure and other lake characteristics will be conducted monthly during summer and fall 2011, resuming in spring 2012 approximately 4-6 weeks prior to Zequanox™ application. Mean zebra mussel veliger density and mean densities of other zooplankton taxa will be quantified on each date using vertical tows with a Wisconsin-style zooplankton net (48 µm mesh) at several locations (≥3, depending on lake size) within the lake, including sites near hard substrates where adult zebra mussels are present. Zooplankton samples will be preserved in 70% ethanol and placed on ice in the field for transport and subsequent processing in the lab. Mean density and size-frequency distribution of live zebra mussels on selected fixed, hard substrates (randomly selected portions of the surface area of each structure examined) and macrophyte samples will also be determined on each date at various locations within the lake. Lengths of adult mussels collected will be measured to the nearest mm along the longest axis of the shell. Water quality data to be collected at each zooplankton sampling site on each date will include turbidity (NTU), secchi depth, conductivity/TDS, and chlorophyll-A concentration. Additionally, zebra mussel colonization rate on artificial substrates (concrete blocks submerged at a depth of ~6 ft. and marked with a float) at 6-8 locations throughout the lake will be assessed; artificial substrate samplers will be placed in the lake for 4-6 week periods in late summer/early fall 2011 and again 4-6 weeks prior to Zequanox™ application. Samplers will be retrieved at the end of each of these 4-6 week periods.

On the day of treatment, we will conduct a visual survey of the lake to examine for the presence of affected, non-target organisms (primarily fish and benthic macroinvertebrates). We will also conduct a visual survey of the lake to examine for the presence of affected, non-target organisms (primarily fish and benthic macroinvertebrates). Benthic macroinvertebrate samples will be collected from several locations in the lake's littoral zone and examined in the field for the presence of dead or moribund individuals.

One day following the Zequanox™ application, Zebra mussel veliger/zooplankton sampling and adult zebra mussel surveys will be conducted (as described above). Additionally, the proportion of dead vs. live zebra mussels on substrates (permanent structures, macrophyte samples, and concrete blocks place in the lake) will be determined from the adult zebra mussel survey. Veliger and adult zebra mussel surveys and water quality monitoring will be repeated at monthly intervals post-treatment (late spring through early fall 2012) when the lake water temperature is > 10°C. Additionally, we will set out clean substrates (concrete blocks) as described above on the day following the Zequanox™ application to determine post-application colonization rates of adult mussels on these substrates. Pre- and post-treatment differences in zebra mussel veliger and adult densities, adult zebra mussel size structures, and colonization rates on artificial substrates, as well as zooplankton community structure and water quality parameters will be compared using appropriate statistical techniques. A final report for the project will be completed and submitted to IDNR by December 31, 2012.

Call to all ILMA Members

You can Help!!

Within North America, nearly 75% of the approximate 700 species of aquatic snails are considered extinct, endangered, threatened, or vulnerable. However, little is known about the historical or current distributions of snails in Illinois. Most published records of occurrences in Illinois are decades old or unverifiable due to a lack of voucher specimens. A critical first step to understanding their distribution and conservations status is to amass reliable data on their historical and present occurrences. Kevin Cummings and I are working on the distribution of Illinois aquatic snails and would like your help. We have sampled many streams in Illinois but haven't visited many wetlands or lakes, especially the kettle lakes of northern Illinois. Many snail species have ranges limited to northern Illinois. If you come across any snails (either live or dead) when collecting in Illinois waters, please pick up a few shells (up to 10) of each kind, preserve them if possible (ethanol is preferable but rubbing alcohol works as well), and write down the collecting info (state, county, body or water, lat/long, date, collectors). We can arrange for the transfer of specimens at the end of the field season. We would appreciate if you could pass along this request to others working in Illinois waters. Please do not hesitate to contact me if you have any questions.

Jeremy Tiemann - Illinois Natural History Survey
1816 South Oak Street - Champaign, IL 61820
Office telephone: (217) 244-4594
Email: jtiemann@illinois.edu

Examples of snails being sought:

Planorbids (left) and physids (right) are native species commonly found on vegetation of lakes and slow moving streams. (Size of both snails = 0.5 to 1 inch).

ODDS & ENDS

One less load, leave that towel on the rack

When staying in a hotel and you see the signs in the guestrooms, “Help save the environment, leave your towel on the rack.” try to keep any skepticism in check. Many travelers may view this as a marketing ploy as it may seem more of an interest in the bottom line of saving water, a major operating expense, rather than saving the environment.

Whether the intent by the hotel is for the profit margin or for the environment, it can make a big difference. According to the Alliance for Water Efficiency, each towel set (hand, bath, and face) requires about 6 to 8 gallons of water to launder. Bed linens require an additional 6 to 8 gallons. According to the AWE’s estimates, a 200 room hotel, with 75% occupancy and 60% towel reuse participation, could save over 3,000 gallons of water per day or over 1,000,000 gallons per year. That is a lot of water that adds up , and for no effort on our part.

Firewood and fish?

By now we should have all seen the signs, “Don’t transport firewood”. A fisherman may see that sign and think it doesn’t apply to them, but firewood has quite a bit to do with fish. In the summertime, and in the wintertime for that matter, campfires provide a nice place to gather after a long day of fishing...a place where you can share a little "truth" about the big fish that got away.

Firewood can transport nuisance species such as the Emerald Ash borer which has killed over 50 million ash trees in sixteen States and Provinces. The Asian Longhorned beetle is less selective but equally as destructive; it will attack birch, chestnut, green ash, willow, mulberry, and maple as well as other varieties. After being accidently introduced in the 1990's, Asian Longhorned beetles are now found throughout the US and Canada. In New York City alone, over 4,000 trees have been removed due to infestation. Officials are keeping their eyes on 66,000 more.

Trees help keep sediment and pollution out of rivers. Trees help to maintain cooler water temperatures. Trees stabilize banks. Tree roots often become habitat for fish. Their leaves, when they drop, become food for invertebrates. Invertebrates, when they grow, become food for fish. So trees do a lot for fish.

Help keep them around.

No more E-trash

Public Act 97-0287 - Electronic Products Recycling & Reuse Act

On January 1, 2012 (yea, that is this January) it becomes illegal to dispose of most electronic equipment in the trash. The law establishes a statewide system for recycling and/or reusing computers, monitors, televisions, and printers discarded from residences by requiring electronic manufacturers to participate in the management of discarded and unwanted electronic products.

So what do we do now when we want to get rid of that cell phone, TV, or broken printer? If you don’t know where a local drop-off is, the Illinois Environmental Protection Agency posts a listing of registered recyclers on its website:

www.epa.state.il.us/land/electronic-waste-recycling/index.html

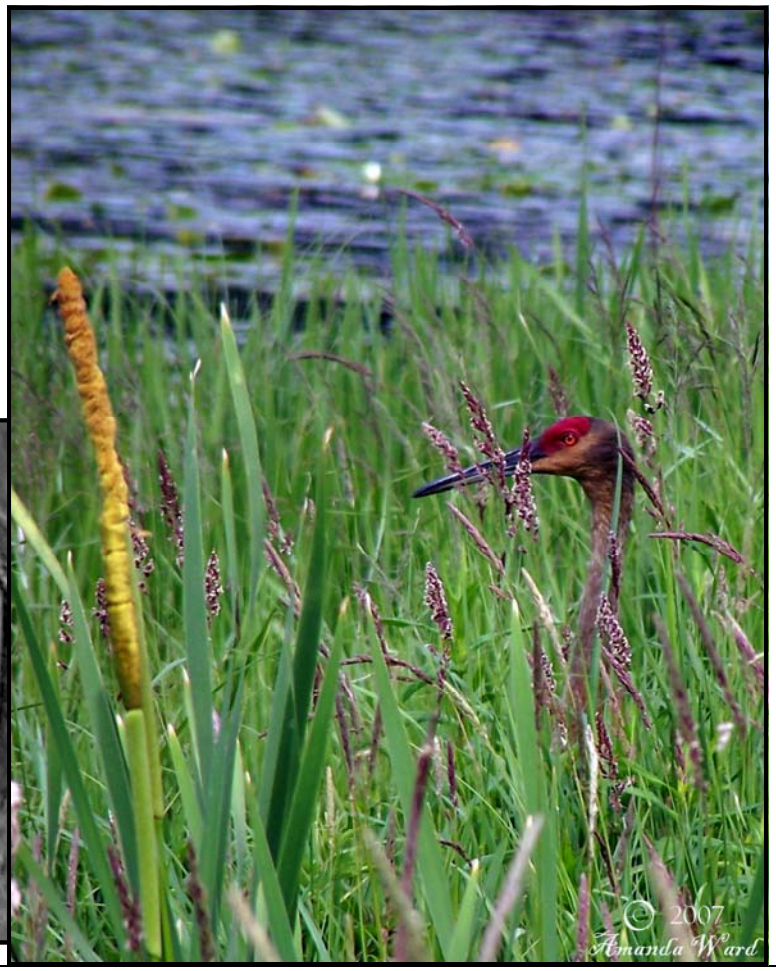
This law will help to keep extremely toxic chemicals out of our landfills while promoting recycling of materials. If you haven’t created any new year resolutions yet, add recycling e-waste to your list.

***I**llinois*
***L**akes*
***M**anagement*
***A**ssociation*

27th Annual Conference

Northern Illinois University
Holmes Student Center
DeKalb, IL

March 1st—3rd, 2012



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