

FACETS of Freshwater

A quarterly newsletter for members and friends of the Freshwater Society

October 2008

Turning off the tap on wasteful lawn watering

Sprinkling is a big, and growing, part of summertime water use



Craig Otto conducts a lawn irrigation audit in Chanhassen.

The damp grass squeaks as Craig Otto strides through the lawn of a Chanhassen home. He spots a couple of sprinkler heads that are too far apart, and makes a note on his clipboard. He advises the homeowner that the overspray wetting her sidewalk is a potential liability problem, as well as a waste of water.

Later, he plunges a probe into the soft turf and pulls out a soil core. It shows moisture extending down nearly a foot.

"Now," Otto asks rhetorically, "if I am pulling water down to 11 inches, and we've only got roots down to 4 inches, what good am I doing with the extra 7 inches? The answer is, we're not doing any good."

Half of all the water put on lawns each year is wasted through evaporation or overwatering, according to the Environmental Protection Agency. The EPA estimate of the waste is a staggering figure: 1.5 billion gallons each day.

He concludes the underground irrigation system is putting out significantly more water than the lawn needs to stay green and healthy. "What I'm finding here," he says, "is this particular property is in need of some maintenance."

Otto, an expert on the design and operation of automated lawn irrigation systems, and another technician

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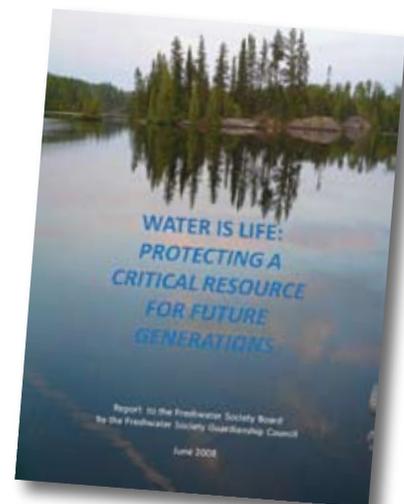
Freshwater Society advisory council urges ground water study, effort on nonpoint pollution

Minnesota needs a rigorous scientific study of ground water sustainability that will inspire consensus among water experts and citizens, a distinguished advisory group to the Freshwater Society has recommended.

The study should yield a common definition of the elusive concept of sustainability and agreement on how to go about measuring it, the group said.

The advisory group, the society's Guardianship Council, also urged that scientists and policy-makers encourage the recycling and reuse of water.

Guardianship Council... Continues on page 5



The Freshwater Society is a non-profit environmental organization dedicated to helping people understand, protect and conserve freshwater resources.

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From the desk of

Gene Merriam

President
Freshwater Society

I served in the state Senate in the late 1980s when Minnesota last suffered a severe drought and I remember well the concern we had about the sustainability of our water supply.

We worried whether low flows in the Mississippi River endangered the water supplies of Minneapolis and St. Paul. We debated whether it was prudent for Minnesotans to pump as much ground water as we do and whether our ground water supply would be adequate for the future.

Since the 1980s, two decades of above-average rainfall have dulled the urgency of public concern over sustainability. But fundamental questions have not been answered.

In 2005, when I was commissioner of the Minnesota Department of Natural Resources, the department issued a report noting that pumping of ground water was already shrinking surface waters in some areas.

This year, the Freshwater Society's Guardianship Council, a blue-ribbon advisory group, studied sustainability and concluded it is a moving target. Ground water experts don't agree on how to define sustainability—how to differentiate, for example, between all the water we theoretically could pump out of the ground and how much we can take without depleting the resource and without drying up surface waters.

Nor do the experts agree whether sustainability can adequately be modeled from relatively accessible data on precipitation and evaporation, or whether measuring sustainability will require drilling thousands more test wells and continuously monitoring aquifers in real time.

A number of efforts to assess sustainability are under way or have recently been completed by the U.S. Geological Survey, the state Environmental Quality Board, the Metropolitan Council and several sets of University of Minnesota researchers.

Within that context, I am proud the Freshwater Society is helping promote discussion of ground water sustainability. With two partners—the University of Minnesota's Water Resources Center and the Minnesota Ground Water Association—we are planning workshops on ground water sustainability.

The first workshop, to be held this fall, will focus on defining sustainability and determining the research that needs to be done. Our planning team includes representatives of the university, the ground water association, state agencies, the U.S. Geological Survey and the Metropolitan Council.

I hope these workshops will help us ultimately reach consensus, not just on how to talk about sustainability, but on what we—as individuals and as a state—need to do to achieve it.



Turning off the tap... *Continued from page 1*

working with him visited about 100 homes throughout Chanhassen this summer in a water conservation program aimed at helping the city avoid a repeat of 2007 when two municipal wells went dry during a July drought.

The “irrigation audits,” administered by the city and paid for with a \$21,000 grant from the Minnesota Pollution Control Agency, were part of an effort to promote conservation and demonstrate how Minnesotans can save a good portion of the billions of gallons of water they sprinkle on their lawns each summer.

Lawn sprinkling—driven by a demand for lush turf that stays green through the hottest, driest days of summer—is a big and growing part of Minnesota’s demand for water. Water managers say automated irrigation systems, commonly installed with homes built in Twin Cities suburbs over the last decade, are the leading cause of summertime water use that is forcing many communities to invest millions of dollars in new wells and is threatening underground water supplies in some areas.

“We’ve seen pretty high water use, and we’ve seen water use climbing over the years, and what I’ve determined is it’s pretty much these irrigation practices.”

—Klayton Eckles
Woodbury City Engineer

Chanhassen used the PCA grant for several conservation projects, including the irrigation audits performed by Otto’s firm, Irrigation Consultants and Control Inc. of Plymouth. There was no charge to homeowners who took part. Each of the participating homeowners got a written report, evaluating their sprinkling system on a zone-by-zone basis and recommending a monthly watering schedule for the April through October growing season.

Otto estimated that most of the lawn irrigation systems he examined in Chanhassen could be fine-tuned and upgraded in relatively inexpensive ways that would save 30 percent to 40 percent of the water they now use each year.

In Woodbury, across the metro area from Chanhassen, Klayton Eckles, the city engineer and deputy public works director, said in-ground lawn sprinkling systems have been the big factor in Woodbury’s water use increasing faster than its population has grown over the last several decades.

“We’ve seen pretty high water use, and we’ve seen water use climbing over the years,” Eckles said. “And what I’ve determined is it’s pretty much these irrigation practices.”

Household water consumption varies significantly across Minnesota, but usage in homes served by public water systems averaged about 70 gallons per person per day in 2007, according to Department of Natural Resources records. In rural communities and in older cities with many apartments, small residential lots and long-established lawns and trees per capita water use often is significantly less.

In Chanhassen, Woodbury and many other fast-growing suburbs—where the lots are large, the lawns are new, in-ground sprinkling systems are common and peer pressure favors a lawn that stays green all summer—per capita water use often is much higher. Chanhassen’s per capita residential water use was 97 gallons last year; Woodbury’s was 111 gallons.

“For the aesthetics of the lawn, you want a green lawn,” said Jill Miller, one of the Chanhassen residents whose sprinkler systems were evaluated by Otto. “It’s a hard balance. You want to have a green lawn, and you want to save water. Nobody wants your home to be the one they drive by and say ‘Oh, my goodness, look at the lawn.’”

Otto concluded that Miller was not applying too much water for July, when

Turning off the tap... Continues on page 4

What you can do to save water and have a green lawn

- If you are building a new home or laying new sod, be sure there is at least 6 inches of top-soil beneath the sod.
- Test your soil and consider adding compost as organic material. It will dramatically increase the absorption of water.
- Follow the Environmental Protection Agency’s WaterSense guidelines for landscaping: Limit the amount of turf you plant, don’t plant grass on steep slopes, don’t install ornamental water features.
- Microirrigation or drip systems, not sprinklers, should be used on planting beds and strips of grass that are less than 8 feet wide.
- Don’t over-water. Most lawns need only one inch of water each week, either from rain or from irrigation. Step on your grass—if it springs back, it doesn’t need watering.
- Water early in the morning to cut losses to evaporation. The middle of the day is the worst time.
- Cut grass no shorter than 2 inches. It will promote deeper roots that require less water.
- Install a weather-sensing controller or soil-moisture sensor as part of your automated sprinkling system. They will reduce over-watering.
- Aerate your lawn, as needed.
- When hiring an irrigator, look for a certified installer. The EPA offers a state-by-state list of WaterSense Irrigation Partners at www.epa.gov/watersense/pp/irprof.htm.

For more information, check out these websites

Water Conservation Toolbox at http://metro-council.org/environment/WaterSupply/conservationtoolbox_residential.htm

Environmental Protection Agency WaterSense program at www.epa.gov/watersense/index.htm

University of Minnesota Extension Service Low Input Lawn Care at www.extension.umn.edu/distribution/horticulture/DG7552.html

Irrigation Association Consumer Handbook at www.irrigation.org/Rsrcs/default.aspx?pg=consumer_info.htm#5

Turning off the tap on wasteful sprinkling... *Continued from page 3*

he visited her home. But he advised her that she could make her sprinkling system more efficient, and make her lawn greener in a few spots, by replacing broken, tilted and sunken sprinkler heads.

Miller said she was anxious to get bids on some of the repairs Otto recommended, and she praised Chanhassen for offering the free audits. "We don't want to become another Atlanta," she said.

In Woodbury, Eckles estimated that a typical household that has an automated sprinkling system uses 60,000 to 90,000 gallons of water over three months in the summer. Households without automatic sprinklers use 30,000 to 70,000 gallons per summer, he said.

The difference lawn sprinkling of all kinds makes in total water use in Woodbury shows up dramatically in a comparison of winter and summer citywide pumping: 5 million gallons a day in the winter, more than 20 million on a peak summer day.

Chanhassen, Woodbury, Elk River and many other communities are making major efforts to promote water conservation: imposing odd-even sprinkling bans that let homeowners water their lawns only every other day, raising water rates for big users and setting seasonal rates that charge more for water used during the summer. Many communities also offer rebates to people

who purchase water-saving washing machines and dish washers.

Elk River has distributed low-tech soil moisture testers and rain gauges to encourage homeowners to water only as much as their grass needs. Woodbury last year gave out about 200 higher-tech, \$100 rain sensors that shut off sprinkling systems when it is raining or has recently rained. State law requires the sensors on all irrigation systems, but there is little enforcement of the law.

Woodbury, not only has an odd-even sprinkling schedule, but it bans sprinkling between noon and 5 p.m., when water is most likely to be lost to evaporation. The city aggressively enforces its rules on lawn watering, and it fines violators \$25 for a first offense, \$50 for a second offense, \$100 for a third and \$200 for a fourth.

"We've had three-time losers," Eckles said. "I don't know that we've had any four-time losers."

Woodbury's biggest effort to reduce water use and water waste was a tiered water rate structure, put in place last year, that requires the top 10 percent or so of residential water users to pay significantly more than they had in the past.

The rates are unchanged for households using up to 60,000 gallons per quarter. Above 60,000 gallons, customers used to pay \$1.88 per 1,000 gallons.

Since last year, Woodbury has had three new rates that kick in as household use climbs. The top rate of \$4.88 per thousand gallons is charged for use over 150,000 gallons.

A household using 200,000 gallons—a huge, but not unheard of, amount of water in three months—would have paid \$349 under the old fee structure, and \$649 under the new.

Eckles said the new fees had little impact on water use in 2007 because most Woodbury residents didn't see their summer water bills until after the sprinkling season had ended. This year, the season has been rainier and residents have had less need to water their lawns. Nevertheless, he said the impact of the higher fees has been noticeable.

From May through July this year, Woodbury's water use was 210 million gallons less than last year, a 16 percent reduction. "We certainly know some people are changing their behavior," Eckles said.

A new state law, enacted this year, requires metro-area public water systems to adopt, by 2010, a "conservation rate structure" that uses fees, discounts or time-of-day water rates to encourage conservation. Outstate water systems are required to adopt conservation rates by 2013.

Daily Residential Water Use (gallons per person)

Apple Valley	91	Eagan.....	97	Oakdale	88
Blaine	90	Eden Prairie	109	Plymouth	96
Bloomington	91	Edina.....	110	Rochester	65
Brooklyn Center	92	Inver Grove Heights.....	74	Saint Cloud.....	71
Brooklyn Park.....	118	Lakeville.....	112	Saint Louis Park.....	81
Burnsville.....	96	Mankato.....	62	Saint Paul*	51
Coon Rapids	104	Maple Grove.....	113	Shakopee	100
Cottage Grove.....	98	Minneapolis	62	Woodbury.....	111
Duluth	40	Minnetonka	94		

*St. Paul's residential usage comes from the St. Paul regional water system. It does not include water used by residents of some large apartment buildings.
Source: Department of Natural Resources

Lawn watering is a big and growing part of water use in Minnesota. The Department of Natural Resources urges cities to aim for water usage of no more than 75 gallons per person per day.

Legacy amendment would boost spending on clean water

This year's general election on November 4 offers a unique opportunity for Minnesota voters to protect and preserve fresh water and the environment for future generations.

A constitutional amendment on the ballot proposes increasing the state sales tax by three-eighths of one percent—seven and a half cents on a \$20 purchase. The increase would produce about \$300 million a year to fight pollution in lakes and rivers, protect drinking water, expand parks and trails, improve fish and wildlife habitat and support arts and culture.

The new money from the Clean Water, Land and Legacy Amendment would augment, not replace, existing state spending.

The money would be apportioned this way:

- 33 percent to a new Outdoor Heritage Fund to protect wetlands, prairies, forests and fish and game habitat.
- 33 percent to a new Clean Water Fund to restore water quality in lakes and rivers and to protect ground water from degradation. At least 5 percent of the fund's revenue must be spent on protecting drinking water.
- 14.25 percent to a new Parks and Trails Fund to support regional and state parks and trails.
- 19.75 percent to a new Arts and Cultural Heritage Fund.

The board of directors of the Freshwater Society voted this spring to endorse passage of the amendment. Freshwater President Gene Merriam

speaks in favor of the initiative in a video produced by Vote Yes Minnesota, the group coordinating efforts to win approval of the amendment. To see the video, go to www.yesformn.org.

When the Freshwater board endorsed the amendment, Todd Bolin, the board's chairman said: "If you love either being on or by the water in this state, you need to know that 40 percent of Minnesota's lakes, rivers and streams are impaired by pollutants. Add to that, the fact that more than 80 percent of water bodies haven't even been evaluated yet, and you realize that clearly we're not spending enough as a society on the issue of clean water."

The Freshwater Society's Guardianship Council also strongly endorsed passage of the amendment.

Guardianship Council urges... *Continued from page 1*

In late 2007, the Freshwater Society established the council and asked it to examine Minnesota's ground and surface waters, question state water policies, challenge water use habits and recommend ways that individuals and society can protect water for future generations.

In a report to the Freshwater Society board in June, the council concluded Minnesota's biggest freshwater challenges are the sustainability of ground water and the nonpoint source pollution of surface waters, chemicals washed into lakes and rivers from multiple sources.

During seven months of research and debate, the council reviewed a series of often-contradictory official reports over the last four decades on the sustainability of ground water. Some of the reports concluded Minnesota and the metropolitan area had plenty of ground water for the foreseeable future. Some of the reports predicted a looming shortage of ground water.

The council also examined the conflicting ways in which ground water is measured and managed in Minnesota. Some agencies study and model underground water supply on a broad aquifer-wide basis. The Minnesota Department

of Natural Resources, which issues permits for wells and regulates pumping, makes its decisions on a localized well-by-well basis.

The council recommended that the Freshwater Society support and sponsor efforts to conduct a study of sustainability—examining both ground water quality and quantity—that would yield consensus among experts and citizens on how much water Minnesota has and how much can be pumped each year without damaging surface waters.

On the issue of surface water pollution, the council noted a frequently cited statistic: Fewer than 20 percent of Minnesota's lakes and rivers have been fully tested for pollutants; of those tested, 40 percent fail to meet water quality standards. The council urged that the process of testing for pollution and then finding ways to clean it up be accelerated dramatically.

The council also recommended:

- State policy-makers should undertake a serious discussion of our current pricing structure under which water is essentially free, provided to both individuals and businesses for only the

cost of pumping and transporting it.

- Minnesotans should aggressively work to halt climate change and should prepare now for demands that water from Lake Superior or from the state's aquifers be exported to dry regions.
- Environmental education should receive a greater emphasis in state education standards.

GUARDIANSHIP COUNCIL

ROBERT ELDE, dean of the University of Minnesota College of Biological Sciences

LUELLA GROSS GOLDBERG, board member of several large corporations

MICHAEL KILGORE, director of the University of Minnesota Center for Environmental and Natural Resources Policy

LONNI MCCAULEY, executive director of the League of Women Voters Minneapolis

RONALD NARGANG, former director of the Minnesota Chapter, Nature Conservancy

MICHAEL OSTERHOLM, director of the University of Minnesota Center for Infectious Disease Research and Policy

JACK PICHOTTA, founder of the Wolf Ridge Environmental Learning Center

PAIGE WINEBARGER, member of the Minnesota Pollution Control Agency board

Who's on Board...

Todd Bolin, Freshwater Chair, finds water a calming influence

Todd Bolin, the chair of the Freshwater Society Board of Directors, has lived almost all his life on the shores of Lake Minnetonka and takes a swim in the lake nearly every night after work, six months out of the year.

"It's a little bit of a joke around the neighborhood," he said. "It may be late April, and it may be early to mid-October."

Bolin, who is beginning his third year as board chair, is president and CEO of Bolin Marketing, a Minneapolis firm with \$20 million a year in annual billings and a list of clients that includes the Carlson Companies, Cargill, Bremer Banks and General Mills.

The evening swims at his home in Deephaven and the opportunities to closely observe the changing moods of the lake help him relax after high-intensity days at work. "It is really very calming," he said. "My priorities are certainly focused on being in and around water. The blood pressure just kind of goes down at the end of the day."

In his volunteer work as a member and chair of the Freshwater Board, Bolin has been a calming influence himself—guiding and coaching the society through an ambitious re-imagining of its vision and role.

Bolin became chair after a debate among board members in 2005 over whether to merge with two other environmental organizations or to remain independent. He favored merger at the time. But when the merger was voted down, he was chosen by board members to lead the society through a strategic planning process aimed at defining a new mission for the society that would live up to its illustrious past.

The organization was founded in 1968, built a multi-million-dollar freshwater research laboratory on Lake



Todd Bolin, Freshwater Society Board Chair

Minnetonka and donated it to the University of Minnesota. In 1995, however, the university returned the building to the society. After several years without a major tenant, most of the building's extensive lab space has now been rented to private companies.

Bolin, whose professional expertise is marketing, said he recognized that one of the greatest assets the Freshwater Society already had was a well-known and well-respected name. "Building a brand—that's my business," he said. "And we already had it."

Bolin guided and coached the Freshwater Society through an effort to re-imagine its role.

He says the year-long planning process, which involved the appointment of a high-profile advisory group—the Guardianship Council—was an effort by the society to define a new, expanded mission that would be worthy of the brand's legacy.

"We absolutely wanted to play in a

bigger space," he said. "We were looking for a way to be consequential."

Bolin credits other board members, especially Bruce Bomier, for coming up with the idea for the society to appoint the Guardianship Council. His own role, Bolin said, was to encourage and reassure board members that the process could succeed.

Bolin said the Society, by virtue of the planning effort, now has a sense of what it can be. Two of its main goals, he said, are:

- To serve as a "convener" of efforts to research water policy issues and suggest solutions.
- To become a source and pipeline of information about freshwater issues.

"The piece that I really get jazzed about is becoming that go-to resource for information about anything freshwater," he said.

Bolin, who is 49 years old, earned an undergraduate degree in economics at Stetson University and a master's in business administration at Duke before joining the marketing firm his father had founded. He and his wife, Terry, have been married 27 years. They have two sons: Colby, a senior at Southern Methodist University, and Brady, a freshman at the University of St. Thomas.

He is a nine-handicap golfer, and for the last two years was the volunteer

chair of communications for the U.S.

Women's Open held this summer at Interlachen Country Club, where he is a member.

He also is an avid photographer.

But his life, outside of work, is centered on water and the lake. "Just about everything we do revolves around the lake in some manner," he said. "It doesn't mean we're always out on it in a boat, but we're most at home just being around it."

Passwords

Since pioneer days, dams at Grays Bay have regulated flow from Lake Minnetonka

For more than 150 years, a dam at Grays Bay in Lake Minnetonka has performed the critical function of managing water levels in the lake.

The lake is a major recreational lake with 112 miles of shoreline. It is a glacial ice-block lake with many channels, deeps and shallows, marshes and wide-open area. Consistent water levels on the lake are most desirable and even necessary at times.

Lake Minnetonka waters reach the Gulf of Mexico via Minnehaha Creek, over the creek's famous Minnehaha Falls, to the Mississippi River and on south to the Gulf. The Grays Bay Dam plays a large part in determining the volume of water that starts the drainage process to the Gulf.

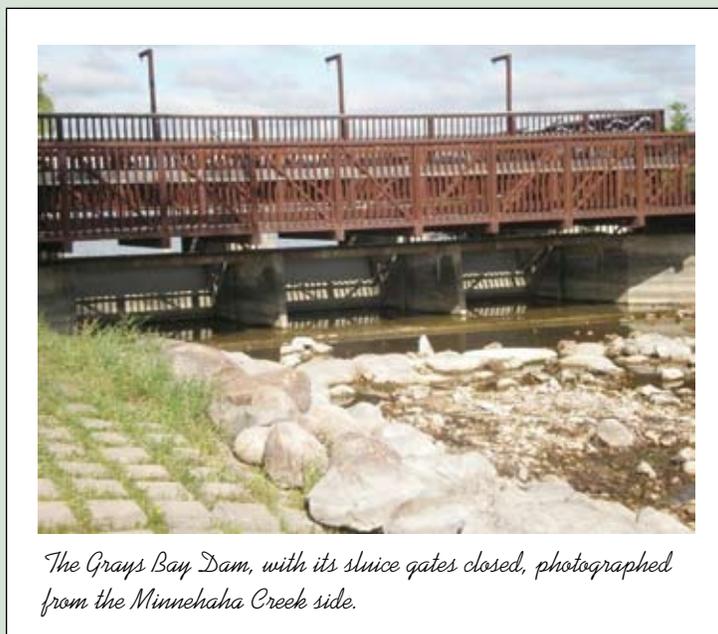
The current Grays Bay Dam, the latest in a series of dams constructed in the bay over the years, is very small in relation to many dams in the world.

There are about 46,000 large dams in the world today. A "large" dam is one with a face height of from 100 to 175 feet. They are generally constructed of dirt, rock or concrete. China leads the world with 22,000 large dams. The United States is next with about 7,000; India with about 4,300; Japan with 2,700; Spain with 1,200 and Canada with 800.

James Syvitski of the University of Colorado-Boulder states there has been one large dam completed every single day for 100 years. China's Three Gorges Dam on the Yangtze River (finished but not in full operation until next year) is the world's largest dam and is 50 times larger than the Fort Peck Dam in Montana, which is the largest dam in the U.S. Some experts believe the weight of water

concentrated behind large dams is affecting the speed of the earth's rotation.

The water level of Lake Minnetonka has historically been a fluctuating figure and a moving target. Managing the lake level wasn't attempted until the first elemental dam was constructed at the east end of Grays Bay in 1852, about the time of European settlement in the area. Water levels prior to 1852 are guesses.



The Grays Bay Dam, with its sluice gates closed, photographed from the Minnehaha Creek side.

About 40 years ago, I drew a chart with yearly high-low water data dating back to 1819. Many years ago, Mr. Don Dayton found a blueprint in the basement of a house he was renting in the Kenwood neighborhood of Minneapolis. The blueprint was a chart of Lake Minnetonka high/low water levels dating back to 1819 and extending to 1925. It was compiled by an employee of a local surveying company. Water levels prior to 1852 apparently were deduced from shoreline-tree growth. After 1852, some semblance of accuracy commenced.

Water enters Lake Minnetonka via rainfall, ground water seepage, creek and stream inflows, bottom springs and

general runoff. Water leaves the lake via evaporation and transpiration (at least 30 inches per year), flowage to Minnehaha Creek from Grays Bay, leakage downwards and sideways, and water use by residents and companies.

With the installation in 1852 of the first Grays Bay Dam, upstream from the present location of Burwell School in Minnetonka Mills, a series of improve-

ments and new dams followed. Those efforts to manage Lake Minnetonka waters became more important as the lake was used for seasonal recreation and year-around living and as the hydropower of the Minnehaha Creek flowage was developed for industry.

A sawmill was built in 1852 and burned in 1854. A rebuilt sawmill with a second-story furniture factory burned in 1860. In 1868, a "high dam" was built to raise Lake Minnetonka and the Minnehaha Creek water levels by about three feet to accommodate shallow-draft barges carrying wheat to a

flour mill.

A three-and-one-half-story flour mill was built in 1869 and reached peak production of 400 barrels per day of "Snow Ball" flour. The flour mill closed in the mid-1880s and the buildings were torn down late in the 1890s. To accommodate future industry, Minnehaha Creek was

Passwords...Continues on page 9

Dick Gray, founder of the Freshwater Society, has written the Passwords column since 1968. The columns are based on Gray's belief that we must use our vast knowledge to work toward the preservation of water.



Hib Hill—Freshwater Society Co-Founder

In 1968, Hib Hill, a man with a passion for the environment and freshwater, helped found the organization that became the Freshwater Society and built a world-class research laboratory on Lake Minnetonka.

Hill and Dick Gray, another of the founders, had achieved successful careers in business and academia, but they shared a fascination with the natural environment, particularly freshwater. Both men felt a need to explore the biological mechanisms of ecosystems and to encourage others to protect them.

Hill had an enduring curiosity. “Without questions, there will be no answers” was a favorite adage of his. Gray, in an interview, said: “Without Hib Hill, there would be no Freshwater Biological Institute.”

Hill’s life was always connected with the environment, particularly water. He grew up on the shores of Crystal Bay of Lake Minnetonka, where his mother and father, Minnesota’s first state epidemiologist, instilled the importance of curiosity in their children.

While studying civil engineering at the University of Minnesota, Hill remained connected to water—he swam on the varsity swim team in 1922 when the university won the Big 10 conference championship.

After graduation, Hill taught civil engineering at the university from 1924 to 1928 and went to work for the U.S. Engineer’s office in St. Paul. In 1936, he began his career at Northern States Power Company as superintendent of the St. Anthony Falls Water Power Company. Meanwhile, he met and married Rachel Hanna and they started a family. Within the next dozen years, daughters Rachel, Susan, and Mary completed their family.

In 1942, at the beginning of World War II, Hill left NSP to join the U.S. Army Corps of Engineers. While in the Army, he traveled a great deal and drafted plans for airfields, military hospitals and other facilities. He worked on the feasibility of an underwater gas pipeline between England and France and on the construction of concrete filled barges sunk along the Normandy coast to provide temporary harbors for D-Day inva-

active in retirement, advising the U.S. States Atomic Energy Commission and serving on the Minnesota State Board of Health.

Most important, his interest in nature, especially in water ecosystems, continued to expand, and he dedicated himself to limnology. He wanted to understand the environment and teach others to preserve nature and learn from the natural processes that affected the lakes.

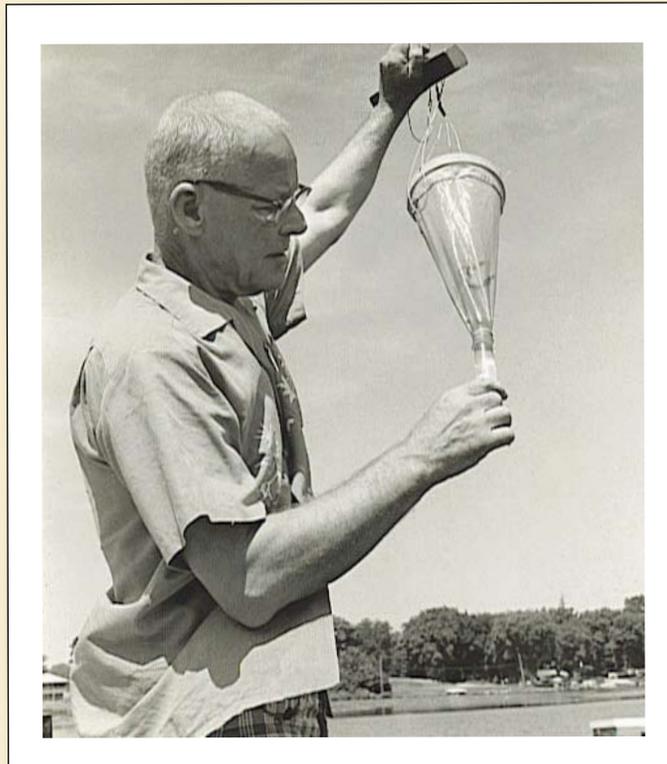
Hib and Rachel Hill moved to a house on Lotus Lake, west of Minneapolis, that at the time was considered a country location. He found great beauty and interest in the details of his natural surroundings. In a memoir, he wrote:

“The woods were full of overwhelming surprises. The bursting leaves in the spring. The first flowers of the spring, hepaticas beneath last fall’s leaves. Indian pipe in the dense woods. One stumbled over Dutchman’s breeches, blood roots, varieties of violets. Anemones paved our front yard. Primrose, trillium, phlox, columbine, the list was endless. We never exhausted it. We newly discovered many flowers,

but we never tired of looking at those we did know.”

At Lotus Lake, Hill taught himself to scuba dive and he constructed an underwater camera. His interest in wood and metal working allowed him to build his own research equipment.

With Rachel at his side, he conducted studies on several area lakes. He published many articles, including several in professional journals on a new species of algae he discovered. Through weekly newspaper columns, lake research reports, and *Reflections on Water*—a publication that covered a year in the life of a lake—he tried to explain the interesting



sion supply ships.

In 1945, upon completion of his military service, Hill earned the Legion of Merit Medal.

After World War II, the Hill family returned to their home in Edina and Hill returned to NSP where he became chief engineer in 1951 and vice president of engineering in 1962. His expertise on the construction and safe operation of dams, locks, and power plants gave him many opportunities to consult in the United States and around the world, including Panama, Pakistan, and Turkey. He retired from NSP in 1965 but remained very

things one can find in a lake by looking below the surface. The day-to-day events around and beneath lake waters fascinated him.

Reflecting on the impacts of development over the years at his home on Lotus Lake, he wrote:

"In the 17 years we were at Lotus Lake there were marked changes in the wildlife we saw. Originally there were large flocks of wood ducks on the lake... By the end of the period no wood ducks landed on the lake... The mink disappeared, as did the civet cats and the raccoons. The deer visited us no more. Fishing in the lake resulted in catches near zero, the result of over-fishing. All of the things that had attracted us to Lotus Lake had in many cases disappeared or grossly deteriorated."

Hill's desire to study water and interpret environmental impacts was fulfilled with the establishment of the Gray Freshwater Biological Institute. With Dick Gray and others, he convinced community and government leaders of the vital need to study and protect the world's freshwater resources. In 1968, they raised millions of dollars to build a freshwater research laboratory.

The University of Minnesota conducted extensive research and trained many freshwater scientists at the Institute.

In the spring of 1980, Hib and Rachel Hill moved from Lotus Lake to an apartment with a view of Lake Calhoun, the beach where Hib was a lifeguard some 60 years before. Hill died in 1983, but his curiosity and knowledge of our environment remain in his writings. They continue to urge society to protect and understand what lies below the surface.

His legacy is also observed in the mission of the Freshwater Society. This year, as the Freshwater Society recognizes 40 years of service to our freshwater resources, the goals of the founders continue to inspire the organization. Protection and responsible management of our ground water and surface water are imperative. The value of our water, as Hill recognized as a young man and appreciated his entire life, should lead all of us to be stewards of our environment.

Passwords *Continued from page 7*

deepened and a new dam built in 1893, upstream from the first Grays Bay Dam.

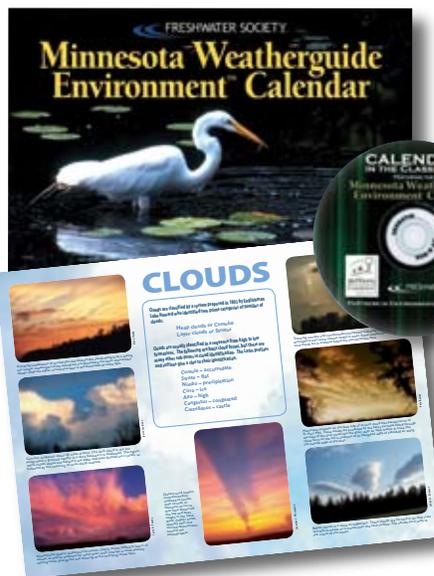
In 1897, a legislative act declared the mean water level of Lake Minnetonka to be 929.4 feet above sea level (1903 datum base) and a new earthen dam was built at the outlet of Grays Bay to Minnehaha Creek. It was made of wood planks, was 700 feet long and had a 130-foot wide spillway. This was repaired in 1932 and again in 1944. In 1980, a concrete dam with sluice controls replaced the earth and wooden old Grays Bay Dam. A new era in water-management of Lake Minnetonka waters had arrived.

Maintaining reasonable high and low water levels in Lake Minnetonka has been a problem since the old Grays Bay Dam of 1893 was installed. Levels fell to about 7-1/2 feet below "normal" levels during the drought and it was not uncommon for heavy rains to raise water levels a foot or two overnight. The new sluice dam went into operation early in 1981 and is composed of two parts:

a "fixed-crest structure to serve as a high-water overflow at the site of the old dam," and a "concrete control structure which will serve as the primary outlet for the Lake" by way of sluices that can be opened and closed.

Water management has been a critical factor in the life of Lake Minnetonka to maintain shorelines and water depths through channels, and to allow the proper positioning of buoys for safe boating. At the same time, the amount of water released into Minnehaha Creek for the benefit of those on or using the Creek remains an issue to be faced during times of above-normal or below-normal rainfalls and during spring snow-melts. Over the last 26 years or so, efforts to control outlet waters flowing from Lake Minnetonka into Minnehaha Creek have generally satisfied upstream and downstream inhabitants. The Minnehaha Creek Watershed District has done a fine job of operating the Sluice Dam and has demonstrated proper water management policies while balancing those political factors involved.

Calendar in the Classroom Program



The Minnesota Weatherguide Environment Calendar, published by the Freshwater Society, is the perfect addition to any classroom. The factual scientific charts, documents, and images pertaining to Minnesota compliment a wide spectrum of Minnesota Academic Standards. Along with the calendar, Minnesota Weatherguide Teacher's Curriculum provides step-by-step, hands-on lesson plans in topics like Meteorology, Astronomy and Phenology.

For more information on obtaining the curriculum, calendars and training for your school, contact: www.freshwater.org, 952-471-9773 or 888-471-9773.

Minnesota students create expressions of water



Water is Life art contest winners are pictured with Freshwater Society founder Dick Gray. Winners, from left, are: Hunter Bodene-Yost, Laura Marti, Stephanie Erlandson, Julia Iverson and Christine White.

The 2008 *Water is Life* Art Scholarship Program, sponsored by the Freshwater Society, produced hundreds of extraordinary works of art from across Minnesota.

Five Minnesota high school students won scholarships in the 2008 contest. The scholarships were awarded in May at a reception at the Gray Freshwater Center, where naturalist Jim Gilbert was the keynote speaker.

This year's winners were:

- Hunter Bodene-Yost, Watershed High School, Minneapolis.

- Laura Marti, Loyola Catholic School, Mankato.
- Stephanie Erlandson, Henning High School, Henning.
- Julia Iverson, Kasson-Mantorville High School, Kasson.
- Christine White, Mankato East High School, Mankato.

The five were chosen from 24 semi-finalists selected at six regional events in April. All the semi-finalists were recognized with a certificate of participation, a trophy and a \$100 scholarship. In 2009, there will be seven regional contests,

and six overall winners will receive \$500 scholarships.

Now in its fifth year, the contest has a theme of *Water is Life*, and each contestant is required to submit a statement of up to 250 words explaining how his or her art reflects the theme. Contestants this year portrayed issues ranging from freshwater conservation and stewardship to the degradation and scarcity of water.

A new category of videography has been added for the 2009 contest. A separate scholarship will be awarded specifically for this art form. Other media eligible for the contest include: photography, sculpture, drawing, mixed media, and painting.

Each year, the semi-finalists' art is displayed in a variety of venues, included the Minnesota State Capitol, galleries and other public spaces. Minnesota Gov. Tim Pawlenty has recognized the program as "a great tool to promote the sustainability of our state's freshwater resources."

For information on the 2009 *Water is Life* Art Scholarship Program, visit www.freshwater.org.

ART DISPLAY SCHEDULE

September 14–October 5
Minnesota State Capitol
(North Corridor)

November 1–30
Orono City Hall

December 1–31
Normandale Office Park
8400 Normandale Lake Blvd
Bloomington



Artist Hunter Bodene Yost, Watershed High School, Minneapolis
"To represent a world without water... I stripped the color away and made... gnarled, barren trees. To show the beauty and life-giving power that water holds, I gave color to the reflection."



Artist Christine White, Mankato East High School
"I let color symbolize life. Wherever the water falls turns to color or, in this case, comes to life, while everything else in the picture stays dormant and lifeless."

Weatherguide Calendar FUNDRAISER

Reach
Your
Goal. . .

The Freshwater Society offers the *Minnesota Weatherguide Environment Calendar*™ for use as a fundraiser product to all non-profit organizations. Some of the current groups selling calendars are: YMCA, Boy/Cub Scouts, church groups, 4-H groups, senior programs, PTA/PTO, and many others.

To obtain additional information or to sign your school or non-profit organization up for this fundraiser, please contact The Freshwater Society 952-471 9773 or toll-free 888 471 9773 or by email at: freshwater@freshwater.org



Check us out!

The Freshwater Society's website—www.freshwater.org—has been redesigned, and we are offering more and better web content.

Click on **What's New** for a new, more-comprehensive digest of the best regional, national and international articles about water, water pollution, conservation, invasive species and other topics.

If you didn't read the digest for the week of Sept. 21, you may have missed articles on: Mercury reductions in Minnesota; a small decline in the loss of Arctic Ocean ice this year, green roofs taking root across the United States, a federal study finding increased nitrates in some wells, a link between felt-soled waders and the spread of aquatic nuisance species, and a new stream laboratory at the University of Minnesota.

Take a look at what we have to offer.

HELP US SAVE PAPER AND POSTAGE

Would you prefer to receive your *Facets* newsletter electronically, rather than by mail? If so, email us at freshwater@freshwater.org

A Message from the Society

Freshwater is a scarce and vital resource that is in increasing demand. Contamination, pollution, and over-use are a few of the many challenges that continue to threaten freshwater resources. The Freshwater Society works to foster active stewardship among all citizens, conduct public education and awareness of freshwater issues, and promote sound public policies that protect freshwater. We invite you to join in this vital work. As a member of the Society you will receive:

- *Facets of Freshwater*, a quarterly membership newsletter covering a wide variety of topics related to freshwater
- 20% discount on the 2009 *Minnesota Weatherguide Environment Calendar*, and
- discounts on Freshwater Society sponsored events.

MEMBERSHIP

Become a member by filling out the form below or simply go to www.freshwater.org and click on **BECOME A MEMBER**.

I share your concerns and wish to become a member of the Freshwater Society at the following level of annual support:

Junior	\$12 US
Senior	\$12 US
Educator	\$25 US
Individual	\$40 US
Supporting	\$100 US
Corporate	\$250 US
Benefactor	\$500 US
Life (single Payment)	\$1000 US

Include \$5.00 U.S. additional mailing fee for outside the U.S.

FORM OF PAYMENT

Check payable to FRESHWATER SOCIETY

Credit Card: VISA MASTERCARD

_____ - _____ - _____ - _____ Expiration date: ____/____/____

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SEND TO:



2500 Shadywood Road
Excelsior, MN 55331
or fax: 952-471-7685

THE FRESHWATER SOCIETY IS A NON-PROFIT ENVIRONMENTAL ORGANIZATION
DEDICATED TO HELPING PEOPLE UNDERSTAND, PROTECT, AND MANAGE FRESHWATER RESOURCES.

Protect freshwater for future generations with **2009 WEATHERGUIDE CALENDARS!**



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TODAY!**



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