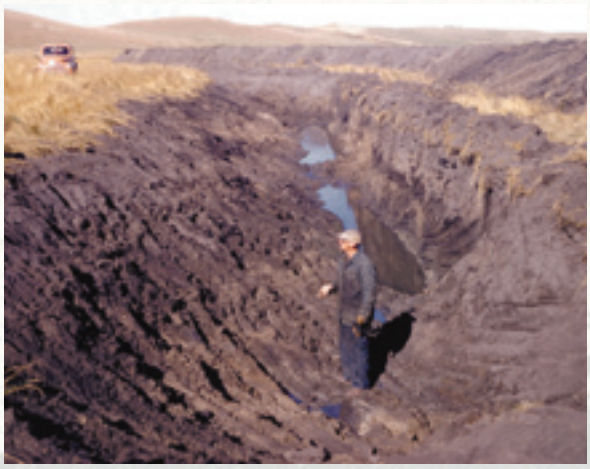
Shallow Lakes

Hope for Minnesota's Troubled Waters

FOR DECADES, SHALLOW LAKES HAVE BEEN TREATED AS LITTLE MORE THAN RECEPTACLES FOR UNTOLD AMOUNTS OF CONTAMINANTS FROM A VARIETY OF SOURCES.



IN ORDER TO FEED THE REGION'S GROWING POPULATION, THE PRAIRIE QUICKLY FELL TO THE PLOW. WHEN STILL MORE LAND WAS DESIRED FOR PLANTING CROPS, WETLANDS AND SHALLOW LAKES BECAME THE NEXT TARGET.

SHALLOW LAKES AND WETLANDS WERE ONCE PREDOMINANT ON MUCH OF THE MINNESOTA LANDSCAPE. THESE BASINS WERE ALSO ISOLATED FROM ONE ANOTHER AT THE TIME, WHICH PRECLUDED UNDESIRABLE FISH SPECIES FROM INVADING THEM.

Troubled Waters:

How it Happened

Flash back, a 100 years or so, to the late 1800s, early 1900s. The country is growing rapidly and it's hungry. In order to feed those hungry mouths, more cropland is needed. Since much of the prairie has already been converted, eyes turn to wetlands and shallow lakes. Soon, a frenzy of tiling and ditch digging is underway across the landscape.

In an amazing display of ingenuity and determination, hundreds of thousands of acres of prairie potholes and lakes in southern and western Minnesota alone are soon drained dry.

It took the depression and drought of the 1930s to temporarily curb the drainage mania. By the 1940s, however, it had resumed, buoyed by high grain prices and subsidized by the United States Department of Agriculture.

Between 1945 and 1953, another estimated 350,000 prairie potholes were drained in southern and western Minnesota. Today, of those that have survived, most are degraded to some extent or another.

The degradation of shallow lakes has been broad-based, cumulative, and persistent. Lakeshore development, the introduction of exotics and undesirable fish species, artificially high water levels, aquatic vegetation removal, excessive and polluted run-off, heavy recreational use, dredging—each has contributed to the diminishment of these valuable waters.

As a result, Minnesota's shallow lakes have become increasingly less beneficial for desired fish species, waterfowl and other wildlife. Their recreational and economic value has been reduced and the

environmental role they were meant to play seriously impaired.

LAKESHORE DEVELOPMENT PRESSURES CONTINUE TO INCREASE ON SHALLOW LAKES, FURTHER THREATENING THE FUTURE HEALTH OF THESE VALUABLE WATERS.

The Damage Continues

Prior to settlement, the majority of shallow lakes were self-contained basins, with reasonably clear, clean water and rich aquatic vegetation. But as the landscape changed, many of these water bodies became inter-connected by ditches, culverts and tile lines. These "aquatic highways" provided easy passage for unwelcome fish species such as black bullhead, fathead minnows and carp, especially during times of high flow.

As these fish species began to find their way into shallow lakes, the genie slipped out of the bottle and accelerated the downward spiral of shallow lakes. Other hydrological changes on the landscape made matters worse. Modifications to outlets, along with steadfast drainage and the expansion of impervious surfaces, have substantially increased the rate and amount of water flowing into shallow lakes.

Under the mistaken belief that a shallow lake can become something it was never meant to be—that is, a deep, clear, recreational boating lake—the public sometimes supports the maintenance of dams and other structures to keep water levels high. This leads to further deterioration of critical aquatic vegetation.

Shallow lakes and wetlands require fluctuating water levels to spur the growth of beneficial aquatic vegetation. When water levels are sustained at artificially higher levels, intentionally or not, the health of the shallow lake is compromised. And undesirable fish species, now able to survive winter thanks to the deeper water, begin to take over.

Another example of how too much water can create problems can be seen in various wild rice lakes, one of the most valuable and beneficial lake types in Minnesota. Ditching and loss of nearby wetlands, as well as beaver dams on lake outlets, can cause frequent high water pulses that uproot wild rice, lowering the lake's wildlife values and leaving a niche for less desirable plant species to fill.

Much of the vegetation that once buffered our basins and waterways has also disappeared. As a result, additional sediments, nutrients, and other pollutants have an easier pathway to the water.

Upsetting the Aquatic Applecart

The very ecology and function of a shallow lake becomes distorted when aquatic vegetation growth is hindered. Eventually, the entire predator—prey balance of a lake can be turned on its head. While a lake's regression from "well" to "ill" can be almost inconspicuous, it is nevertheless insidious and steady.

· First, as aquatic vegetation disappears, so also do the tiny invertebrates such as zooplankton that depend on these plants for food and refuge. This, in turn, deprives fish and birds that feed on these invertebrates and aquatic plants of a critical food source.

· Invertebrates such as zooplankton feed heavily on phytoplankton (algae). With the loss of their aquatic plant refuges, invertebrates become much easier prey for fish, thus further depleting their populations.

· As zooplankton disappears and nutrient loading increases, algae begin to flourish.

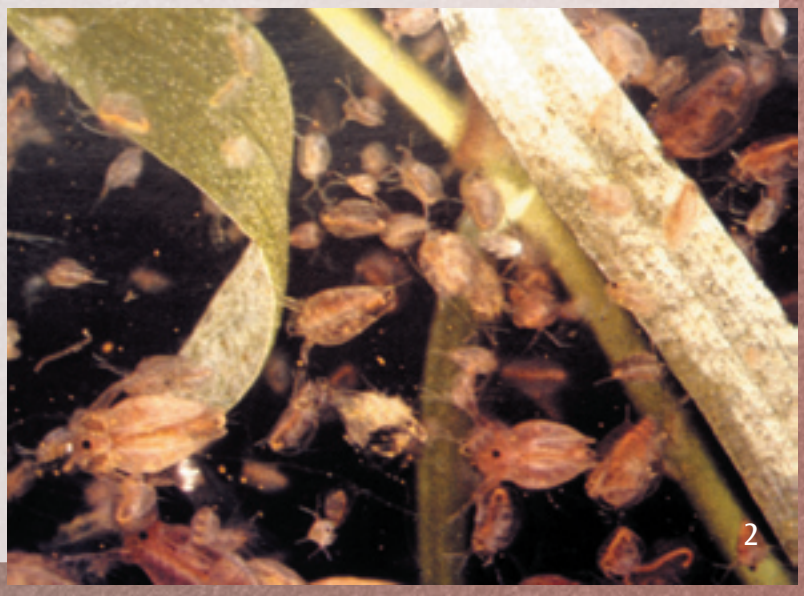
· Additionally, the loss of aquatic plants allows wave action to stir up sediment that these plants previously held in place.

· Eventually, fish that can survive in dirty water (i.e. carp and black bullhead) begin to dominate walleye and other preferred game species. Carp and black bullhead further stir up the lake bottom.

· The end result is dirty, algae-infested, pea-green water.

Water is the most precious, limited natural resource we have. Unfortunately, we have too often failed to treat it as such.

INVERTEBRATES SUCH AS DAPHNIA ARE CRITICAL TO THE HEALTH OF SHALLOW LAKES AND THE FISH AND WILDLIFE DEPENDENT UPON THEM.



SHALLOW LAKES ARE NATURALLY RICH IN NUTRIENTS AND SUPPORT ABUNDANT PLANT GROWTH, SUCH AS THE FILAMENTOUS ALGAE SHOWN IN THIS PHOTO.

Shallow Lakes Get No Respect

They might be called the Rodney Dangerfield of Minnesota lakes. Shallow lakes, it seems, too often get no respect.

"Whaddaya doin' this weekend," she asks?

"Goin' up to the lake," he responds.

"The lake." As though there is just one big, deep, clear lake in Minnesota. And, of course, that lake is located "up" there, as in "up north."

In fact, there are lakes scattered all over Minnesota, 10,000 to 15,000 of them, depending on who's counting. And here in the land of sky blue waters, many of those lakes are not blue. They're often green or brown (or a combination thereof) and many are quite shallow.

The value of shallow lakes (economically, spiritually, environmentally) has been well documented. Nevertheless, this valuable resource continues to suffer from misunderstanding and abuse.

Understanding Minnesota's Lakes

The contrast among Minnesota's lake types is dramatic, products of the glaciers that scoured the region 10,000 years ago. In northeastern Minnesota, the lake basins were scraped from granite and other hard bedrock. These deep, clear lakes have steep, rocky shores and few nutrients. They're referred to as oligotrophic (low nutrient levels.)

Lakes in central Minnesota lie in sand, gravel and other glacial debris. The basins are shallower and the landscape less jagged than in the northeast. Fairly rich in fish and nutrients, these lakes are called mesotrophic (moderate nutrient levels.)

In southern Minnesota farm country, the lakes are even more shallow and nutrient-rich. Land erosion contributes to the already high nutrient and sediment levels in these lakes.

The value of shallow lakes (economically, spiritually, environmentally) has been well documented.

Nevertheless, this valuable resource continues to suffer from misunderstanding and abuse.

PERIODS OF LOW WATER ARE ESSENTIAL FOR SHALLOW LAKES TO THRIVE. WHEN WATER LEVEL FLUCTUATIONS ARE NOT ABLE TO OCCUR NATURALLY DUE TO THE CONSIDERABLE ALTERATIONS HUMANS HAVE MADE ON THE LANDSCAPE, BIOLOGISTS OFTEN UTILIZE WATER CONTROL STRUCTURES TO CAUSE PERIODIC DRAWDOWNS.

These highly fertile, saucer-shaped lakes are referred to as eutrophic (high nutrient levels.)

The Nature of Shallow Lakes

Shallow lakes, typically, fall into the eutrophic category, although some might also be mesotrophic. Generally speaking, shallow lakes have the following characteristics.

Vegetation:

Aquatic plant growth is abundant due to high nutrient content (phosphorous, nitrogen, and minerals) and the shallowness of the water. Aquatic plants need both nutrients and sunlight to grow. These plants provide excellent food and habitat for zooplankton, insects, fish, waterfowl and other wildlife. They also lock up sediments, helping keep the water more clear.

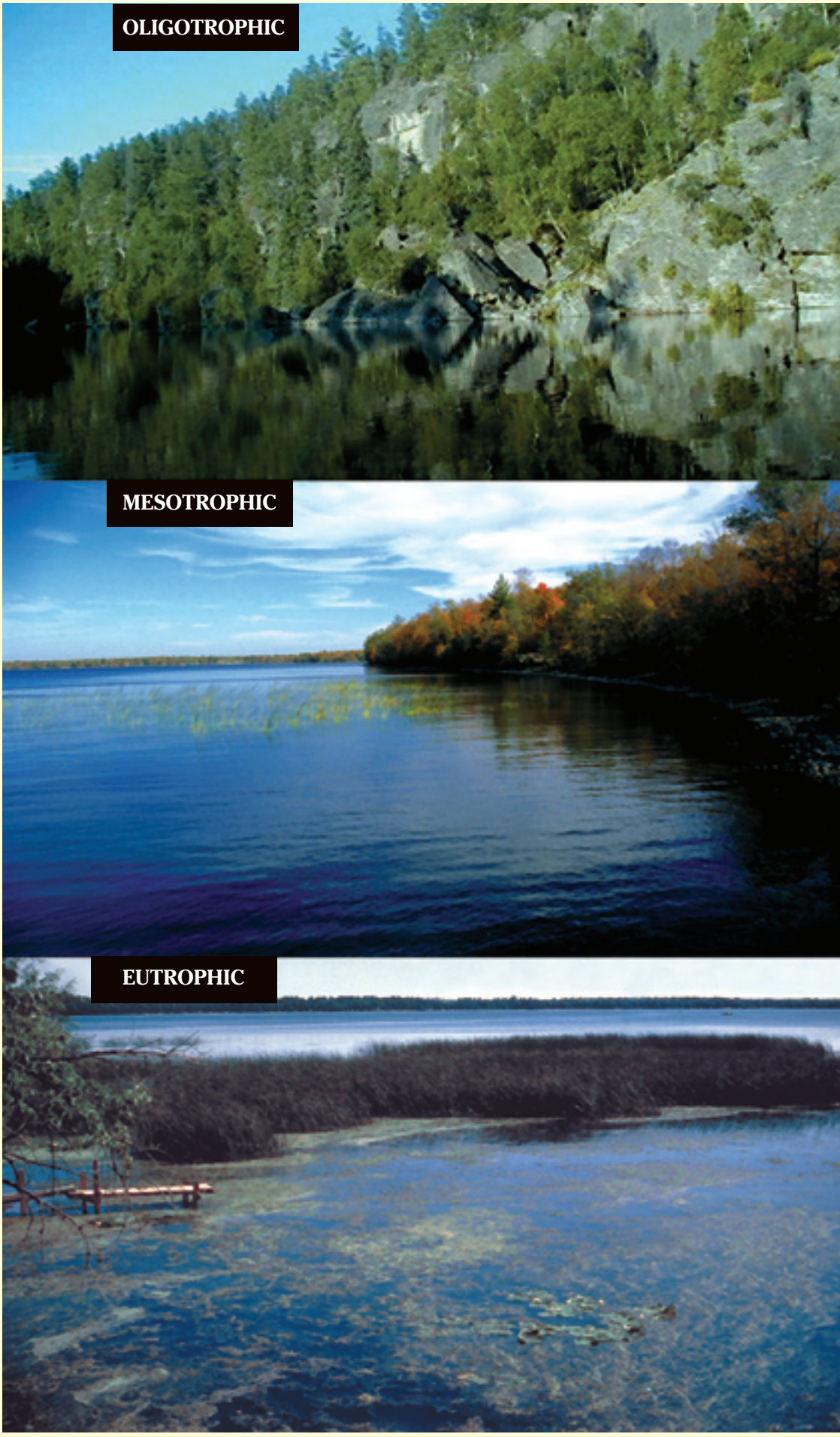
Depth:

Shallow lakes (and deeper wetlands) are often less than 10 feet deep, although in some cases they might be as deep as 15 feet. Most lakes do have some shallow lake components to them in bays.

Shoreline zone:

Technically referred to as the littoral zone, this zone is evident by the stands of emergent aquatic plants such as cattails, bulrush, and reeds that are present, as well as submerged plants such as coontail and water lily. Healthy shallow lakes have plants growing throughout the entire basin, creating an extended littoral zone.

Nutrient/sediment mixing: Sediment and nutrients in shallow lakes, unlike in deeper lakes, are constantly mixing. Water in deeper lakes stratifies during the summer months;



WHAT HAPPENS IN A SHALLOW LAKE'S WATERSHED LARGELY DETERMINES WHAT WILL HAPPEN IN THE LAKE, GOOD OR BAD. PLANTING NATIVE GRASSES IN STRATEGIC LOCATIONS CAN MINIMIZE OR EVEN PREVENT HARMFUL RUN-OFF FROM REACHING THE LAKE AFTER RAINFALLS OR DURING THE SPRING MELT.

nutrients in the bottom sediments remain trapped by the cold layer of water, which does not mix with the warm top layer of water. Not so in a shallow lake where there is not much of a temperature difference and nutrients and sediments can easily be stirred up by wind, wave action and undesirable fish species.

Fluctuating water levels:

Shallow lakes can often benefit from periods of low water that stimulates beneficial aquatic plant growth. When water levels remain too high, too long, plant growth can be stymied and water quality deteriorates. Algae growths usually result from such conditions.

Fish:

Low water conditions can help set the stage for winterkills that can decrease or eliminate populations of undesirable fish species such as carp and black bullhead. While shallow lakes can support populations of game fish, low levels of dissolved oxygen and winterkills tend to limit their numbers.

Land use impacts:

Farm chemicals, run-off from impervious sources such as roads, parking lots and roofs, and soil particles that flow into a shallow lake will eventually cause the lake to become seriously degraded. Shallow lakes can be more susceptible to such run-off than their deeper water cousins.

Surface water use:

Surface water use can sometimes be as important as land use management in maintaining a healthy shallow lake. Aquatic vegetation can suffer from too many docks, boats and outboard motors on a lake.

It's important to note that shallow lakes, even though they share common characteristics, are each unique in their own way. The surrounding terrain and land use practices, local ordinances, and lake use are some of the considerations to be taken into account when developing a management plan. A "one size fits all" approach to shallow lake management does not work.

"Children of a culture born in a water-rich environment, we have never really learned how important water is to us. We understand it, but we do not respect it."

William Ashworth, *Nor Any Drop to Drink,* 1982.

We live in a society that still tends to measure the value of the natural world primarily in economic terms. We have yet to figure out how to put a price tag on the emotional, spiritual and physical gifts it has to offer.

Why They Matter

We can, for instance, approximate how much a drained wetland might yield in crops per acre. We can figure out the price a woodlot or piece of lakeshore property would bring if it were developed and put on the market.

SHALLOW LAKES CAN BE EXCELLENT LOCATIONS FOR WILDLIFE OBSERVATION. TO ADDRESS THE GROWING POPULARITY OF THIS OUTDOOR ACTIVITY, SPECIAL OBSERVATION POSTS HAVE BEEN CONSTRUCTED AT VARIOUS LOCATIONS, SUCH AS THIS DOCK AND BLIND AT FABLED SWAN LAKE IN NICOLLET COUNTY.

But we have no idea what the sound of a rooster pheasant crowing on a spring morning is worth. Nor can we put a price tag on the wide-eyed expression on a youngster's face while reeling in a fish, or a sunset painting the still surface of a lake in a rainbow of color.

The challenge now is to convert the growing awareness of shallow lake values into action.

More than half a century ago, Aldo Leopold lamented the "land ethic" of the time in *A Sand County Almanac*: "Land use ethics are still governed wholly by economic self-interest; just as social ethics were a century ago." As a result, our shallow lakes have suffered.

The profound weakness in such a system, Leopold stated, is that most "members of the land community have no economic value. Wildflowers and songbirds are examples. Of the 22,000 higher plants and animals native to Wisconsin, it is doubtful that 5 percent can be sold, fed, eaten or otherwise put to economic use."

THE TRILL OF THE RED-WINGED BLACKBIRD, THE SUDDEN SPLASH OF A MUSKRAT, THE WHOOSH OF A FLOCK OF WIDGEON, AN AUTUMN SUNRISE SETTING THE WORLD AGLOW. THESE ARE BUT A FEW OF THE PLEASURES THAT DRAW THOUSANDS OF DUCK HUNTERS TO MINNESOTA'S SHALLOW LAKES EACH FALL.

While it may seem that little has changed since Leopold's time, there are indications that shallow lakes are beginning to receive the respect they deserve, for both their intrinsic value and the

economic benefits they provide. Why do shallow lakes matter?

Flood Mitigation and Water Quality:

Shallow lakes and wetlands can store and meter out water, thus helping to lessen flood impacts. They are natural treatment systems that enable the plant and animal life to trap and clean the water that enters them. Problems arise, however, when a shallow lake becomes the primary treatment source for all of the fouls that come off the land. When there are not sufficient upstream retention and detention systems (natural or man-made), the shallow lake becomes overwhelmed by volume and pollution loads. Flood waters can be the most polluted of all waters entering a shallow lake.

Fish and Wildlife:

From waterfowl to perch, healthy shallow lakes provide homes for a myriad of fish and wildlife species, not to mention invertebrates, amphibians and countless other forms of life.

Local Economies:

Outdoor recreation expenditures can be a significant boon to local economies, from hotels and restaurants to sporting good stores and gas stations. Furthermore, several studies have shown a direct correlation between water quality and the value of lakeshore property. The value of lakeshore property rises in relation to the lake's water quality. And the higher the value of lakeshore property, the higher the tax base for local needs.

The challenge now is to convert the growing awareness of shallow lake values into action. Just as regular oil changes can avoid expensive engine repairs, preventive maintenance for a shallow lake is far easier and less expensive.

FISHING IS A FAVORITE PAST TIME FOR MANY, YOUNG AND OLD ALIKE. WHEN PROPERLY MANAGED, SOME SHALLOW LAKES CAN PROVIDE EXCELLENT FISHING FOR PANFISH, WALLEYE, NORTHERN PIKE, PERCH AND BASS.

HEALTHY SHALLOW LAKES ARE PRIME LOCATIONS FOR OUTDOOR RECREATION AND EXPENDITURES IN PURSUIT OF OUTDOOR RECREATION CAN BE REAL BOONS TO LOCAL ECONOMIES.

AS MORE AND MORE PEOPLE DISCOVER THE NATURAL SPLENDORS FOUND AT SHALLOW LAKES, PROVIDING ACCESS FOR A DIVERSE PUBLIC IS RECEIVING INCREASED ATTENTION FROM BOTH GOVERNMENT AGENCIES AND PRIVATE ORGANIZATIONS.

What Can You Do?

"We must maintain that which is not defiled, enhance that which is degraded, and restore that which has been destroyed…None of this can be done if the people of this nation leave the decisions and efforts to government and industry alone."

Edmund Muskie, U.S. Senator – January 30, 1969.

Growth in government conservation has been occurring for decades. But there is a limit to what government can or should do when it comes to protecting and enhancing our natural resources. Aldo Leopold voiced concern about the continual shift of conservation responsibility from the individual to government decades ago when he asked: "What is the ultimate magnitude of the enterprise? Will the tax base carry its eventual ramifications? At what point will governmental conservation, like the mastodon, become handicapped by its own dimensions?"

Government can assist and even lead but in the end it will be private citizens, in particular private landowners, working together in their own backyards that will determine the fate of our natural resources. So, what can you do?

Learn

It is difficult to care deeply about anything we don't know and understand. Only until people begin to learn about the natural world around them will they begin to truly appreciate and love it, and to fight passionately to protect it. Expand your own knowledge of the natural world and the issues that impact it. And take time to introduce your friends and neighbors to the outdoors.

Action

Trying to save the rain forests or an endangered species are noble endeavors. But equally noble are the efforts of local citizens working to preserve a piece of shoreland habitat, or planting trees or native grasses. Become familiar with local zoning ordinances. Should some be changed and who are the local decision-makers that you can go to with concerns? Persistent, well-informed local action is where it all begins.

Strength in Numbers

"Even weak men when united are powerful."

Friedrich Schiller (1729-1805).

Talk to your friends and neighbors, organize, and exercise your right to be heard. When there is strong, local advocacy for change, policymakers are much more inclined to take positive environmental action. Attract media attention to help nurture the climate of public opinion.

"Never doubt that a small group of thoughtful, committed citizens can change the world. Indeed, it's the only thing that ever has."

Margaret Mead (1901-1978) quoted in John M. Richardson, ed., *Making it Happen,* 1982.

TAKE ADVANTAGE OF OPPORTUNITIES WHERE YOUNG PEOPLE CAN PARTICIPATE IN AND LEARN ABOUT THE NATURAL WORLD AND THE FUN TO BE HAD OUTDOORS. KIDS ARE THE FUTURE.

AS DEVELOPMENT AROUND SHALLOW LAKES CONTINUES TO INCREASE, THE NATURAL SHORELAND VEGETATION THAT ONCE PROTECTED THESE BODIES OF WATER CONTINUES TO DECREASE. CONVERTING THESE NATURAL AREAS INTO SUBURBAN-STYLE LAKESHORE LOTS IS AKIN TO FEEDING POISON TO THE GOOSE THAT LAYS THE GOLDEN EGG. BUFFERS OF NATURAL VEGETATION BETWEEN HOMES AND CABINS AND THE WATER ARE CRITICAL TO THE LAKE'S HEALTH.

WISE LAND USE PRACTICES SUCH AS CONTOUR AND FILTER STRIPS CAN MAKE A BIG DIFFERENCE. LOCATE AREAS IN YOUR OWN OPERATION WHERE EROSION AND RUN-OFF ARE OCCURRING AND DETERMINE WHAT STEPS YOU CAN TAKE TO PREVENT IT FROM CONTINUING. ENCOURAGE OTHERS TO DO THE SAME.

Shallow Lakes Case History:
Lake Christina

CANVASBACKS AND OTHER DIVING DUCKS ARE ONCE AGAIN RETURNING TO LAKE CHRISTINA.

The story of Lake Christina, a fabled 4,000-acre lake 20 miles southeast of Fergus Falls, Minnesota, illustrates the sometimes complex nature of shallow lake management.

A renowned waterfowl migration habitat, Lake Christina once served as a migratory stop-over for up to 20% of the continent's canvasback population. That began to change, however, after a water control structure was built between Lake Christina and adjoining Pelican Lake in 1937. By the 1960s, Lake Christina had fallen on hard times.

A dam located on the outlet of Pelican Lake (immediately downstream of Lake Christina) caused water levels at both lakes to be 1-2 feet higher than normal. This allowed fish easier access to Christina and also prevented regular fish kills from occurring.

As increasing fish populations such as bigmouth buffalo, bullhead, carp, crappie, perch and minnow began feeding heavily on the invertebrates, eventually the invertebrate population was unable to control algae. Water quality deteriorated, the invertebrate population plummeted, and critical aquatic plants began to die off. Without the rooted vegetation they love, the diving ducks began to abandon Lake Christina.

In 1987, the Department of Natural Resources (DNR) treated the lake with the chemical rotenone to kill off fish. An electric fish barrier was also constructed at the lake's outlet during the 1980s. The lake soon returned to a clear water state with good stands of aquatic vegetation. And the ducks returned.

From 1988 until about 2000, Lake Christina was in "pretty good shape," said Tom Carlson, a DNR waterfowl habitat specialist in Fergus Falls who has worked on Lake Christina for more than 25 years. Over time, however, fish populations, unchecked by winterkills and aided by the wet years of the 1990s, rebounded. Christina began another decline.

In 2003, another rotenone treatment was applied and three new water control structures with fish barriers were constructed on waterways flowing into the lake. Lake Christina is once again staging a major comeback. Aquatic plants are returning in dramatic fashion and the water quality is improving steadily.

PRIOR TO TREATING LAKE CHRISTINA WITH ROTENONE IN 2003, THREE NEW WATER CONTROL STRUCTURES AND TWO MORE FISH BARRIERS WERE CONSTRUCTED ON WATERWAYS FLOWING INTO THE LAKE. BECAUSE UNIQUE CIRCUMSTANCES PREVENT THE LAKE LEVEL FROM BEING MANAGED VIA DRAWDOWNS, THE INLET STRUCTURES ARE BEING UTILIZED TO MANAGE THE AMOUNT OF WATER ENTERING THE LAKE AT STRATEGIC TIMES.

Management of Lake Christina is unique from many other shallow lakes, Carlson noted. The outlet of Lake Christina empties into Pelican Lake and the two lakes are at the same elevation. "The outlet of Pelican Lake and the direct connection of Christina to Pelican hinders our ability to achieve a drawdown in Christina, a primary management tool for shallow lakes," Carlson said.

However, a recent engineering study has indicated a drawdown might yet be feasible. In the meantime, the new inlet structures will be utilized. "We need to keep fish populations in check and the new structures will help us do that," Carlson said.

During winter periods of low oxygen levels in Christina, fish tend to congregate near the inlet flows where there are higher dissolved oxygen levels. "By using the new structures to prevent flow into the lake when the rest of the lake's oxygen levels are low, we'll be able to trigger periodic fish die-offs," Carlson explained. "That will give us cleaner water and more invertebrates." And that will bring back the ducks.

Minnesota DNR, Ducks Unlimited, Inc. (DU), the U.S. Fish and Wildlife Service (USFWS) and the Christina Ina Anka Lake Association collaborated on the project and helped secure nearly $1,000,000 through various programs to fund the effort.

"When local citizens, conservation groups, and state and federal agencies join hands, you can begin to leverage what you have in ways you wouldn't be able to alone," Carlson stated. "It's remarkable what can be accomplished through such a partnership."

TOM CARLSON, DNR WATERFOWL HABITAT SPECIALIST AT FERGUS FALLS, HOLDS UP A HEALTHY SAMPLING OF SUBMERGED AQUATIC VEGETATION (BUSHY PONDWEED) FOUND DURING A 2004 PLANT SAMPLING OF LAKE CHRISTINA. PRIOR TO A ROTENONE TREATMENT IN 2003, THERE WAS VERY LITTLE SUBMERGED VEGETATION IN THE LAKE. AS THE VEGETATION QUICKLY RETURNED TO LAKE CHRISTINA FOLLOWING THE TREATMENT, SO DID IMPROVED WATER QUALITY AND WATERFOWL.

Shallow Lakes Case Study:
Big Slough

How successful have the restoration efforts been at Big Slough lake in Murray County? "You could see small pebbles in 5 feet of water after the rotenone project was completed," exclaimed Mark Gulick, Minnesota DNR wildlife manager at Talcot Lake Wildlife Management Area (WMA). "Presently the water quality is excellent for a shallow lake in agriculture country. Even in the summer, when water quality usually deteriorates, water quality still exceeded three feet."

Once completely drained by a county ditch, Big Slough has been restored. It is situated partially in the state Hiram Southwick WMA and partially in the federal Big Slough Waterfowl Production Area. The story of Big Slough is of a lost treasure rediscovered and brought back to life through a collaborative effort by several agencies and organizations:

The state purchased the first parcel in 1952 (570 acres) and restored approximately 300 acres for the Southwick WMA by constructing a ¾ mile dike.

The USFWS purchased another 812 acres in 1995; DU, DNR, USFWS and other partners then installed a water control structure and additional dike that allowed for restoration of 500 of those new acres.

Following completion of the water control structure, the USFWS began to raise the lake about 8 inches per year to encourage aquatic vegetation response. In recent years, water depths in the basin have been about 3 feet. Depths in the bull ditch, however, have been about 5½ feet, too deep to winterkill fish.

During the summer of 2003, DNR and DU installed a fish barrier on an existing sheet pile structure, located on USFWS property about 200 feet downstream of the water control structure, to prevent fish from re-entering the lake.

During the winter of 2003-2004, DNR applied rotenone to the entire Big Slough watershed, including the 550 acres of North and South Badger lakes (these two shallow designated wildlife lakes are located two miles upstream of Big Slough and water flows through them before entering Big Slough.) By de-watering the basins and applying the rotenone through the ice, it was only necessary to treat about 30 acre feet rather than over 2,000 acre feet, a significant cost-saving. The fish kill was extensive.

BY DE-WATERING BASINS IN THE BIG SLOUGH WATERSHED AND THEN APPLYING THE FISH-KILLING CHEMICAL ROTENONE THROUGH THE ICE DURING THE WINTER OF 2003-2004, THE MINNESOTA DNR WAS ABLE TO ACCOMPLISH ITS' MISSION AT A CONSIDERABLE COST-SAVING. RATHER THAN TREATING MORE THAN 2,000 ACRE FEET OF WATER, ONLY ABOUT 30 ACRE FEET HAD TO BE TREATED.

THE ROTENONE TREATMENT RESULTED IN AN EXTENSIVE KILL OF UNDESIRABLE FISH SPECIES THAT HAD BEEN A MAJOR PROBLEM AT BIG SLOUGH.

A MECHANICAL FISH BARRIER CONSTRUCTED BY THE MINNESOTA DNR AND DUCKS UNLIMITED ON U.S. FISH AND WILDLIFE SERVICE LAND DOWNSTREAM OF THE WATER CONTROL STRUCTURE IN 2003 PRECLUDES FISH FROM RE-ENTERING BIG SLOUGH.

The sago pondweed response in Big Slough and both Badger lakes has been "excellent" and aquatic plant diversity "much improved," Gulick stated. The outstanding water quality also provided an opportunity to reintroduce wild celery and locally trapped, large fairy shrimp, favorite duck foods.

In the spring of 2004, blue bills and other waterfowl began to arrive in large numbers.

The combination of the fish barrier and water control structure will prevent fish from re-entering Big Slough and provide the means to control water levels to spur aquatic vegetation growth.

Gulick said he is often asked, "why is it necessary to tamper with 'natural systems.'" The answer, of course, is that we are working with extremely altered ecosystems. The natural hydrology of the prairie landscape has been degraded and changed so much by humans that we have to use intensive management techniques.

Jon Schneider, DU Minnesota Conservation Programs Manager, applauds the Big Slough project as another example of "a strong partnership among local citizens, conservation organizations and state and federal agencies that is resulting in improved habitat and cleaner water. Big Slough is back and that's something for all of us to celebrate."

What To Know...

ABOUT WORK IN SHALLOW LAKES AND WETLANDS IN MINNESOTA

WORK IN SHALLOW LAKES AND WETLANDS IN MINNESOTA IS REGULATED BY VARIOUS AGENCIES AND LOCAL GOVERNMENTS.

MINNESOTA PUBLIC WATERS PERMIT PROGRAM

- The Minnesota DNR regulates alterations of public waters. Contact DNR area hydrologist.
- Public waters inventory maps: http://www.dnr.state.mn.us/waters/watermgmt_section/pwi/maps.html
- Information: http://www.dnr.state.mn.us/waters/watermgt_section/pwpermits/requirements.html
- Contact: http://www.shorelandmanagement.org/contact/index.html

MINNESOTA WETLAND CONSERVATION ACT

- Other than public waters, local governments regulate draining and filling in most wetlands and excavation in some.
- National wetland inventory maps are available at: http://nationalmap.usgs.gov/nmjump.html (Note: NWI maps are not suitable for regulatory purposes.)
- Information: http://www.bwsr.state.mn.us/wetlands/wca/index.html
- Contact: Soil and Water Conservation District, or go to: http://www.bwsr.state.mn.us/directories/WCA.pdf

FEDERAL CLEAN WATER ACT SECTION 404 PROGRAM

- U.S. Army Corps of Engineers (St. Paul District) regulates dredging and filling in most rivers, lakes and wetlands.
- National Wetland Inventory Maps: http://nationalmap.usgs.gov/nmjump.html (Note: NWI maps are not suitable for regulatory purposes.)
- Information: http://www.mvp.usace.army.mil/regulatory/
- Contact: Corps Project Manager: http:www.mvp.usace.army.mil/regulatory/default.asp?pageid=687

MINNESOTA SHORELAND REGULATIONS

- Local governments regulate shoreline development under minimum state standards.
- Information: http://www.dnr.state.mn.us/shorelandmgmt/guide/standards.html
- Contact: Local zoning officials. See http://www.shorelandmanagement.org/contact/index.html

MINNESOTA AQUATIC PLANT MANAGEMENT PROGRAM

- DNR regulates control of aquatic plants in public waters.
- Information: http://www.dnr.state.mn.us/shorelandmgmt/apg/permits.html
- Contact: DNR area fisheries office. Also see http://www.shorelandmanagement.org/contact/index.html

MINNESOTA ENVIRONMENTAL REVIEW PROGRAM

- State or local governments responsible for analyzing environmental impacts.
- Information: http://www.eqb.state.mn.us/review.html
- Contact: Local planning and zoning officials.

CREDITS

Photography by Tom Conroy, MN DNR, Deborah Rose, MN DNR, with additional photography from MN DNR photo archive

Text written by Tom Conroy, MN DNR

Graphic design by Steve Seefeldt, MN DNR

FOR MORE INFORMATION, CONTACT:

Department of Natural Resources
500 Lafayette Road
St. Paul, MN 55155-4040
(651) 296-6157 (Metro Area)
1-888-MINNDNR (646-6367)
(MN Toll Free)

www.dnr.state.mn.us

This document is available in alternative formats by calling (651) 296-6157 (Metro Area) or 1-888-MINNDNR or Telecommunication Device for the Deaf/TTY: (651) 296-5484 (Metro Area) or 1-800-657-3929.

Printed using only vegetable-based ink on recycled paper containing a minimum of 10% post-consumer waste.

Minnesota Department of Natural Resources

Minnesota Pollution Control Agency

Minnesota Lakes Association

Minnesota Board of Water & Soil Resources

Ducks Unlimited

Minnesota Chapter of the American Fisheries Society