Wild Goose Lake Comprehensive Planning Report 2003

Prepared for the Wild Goose Lake Association

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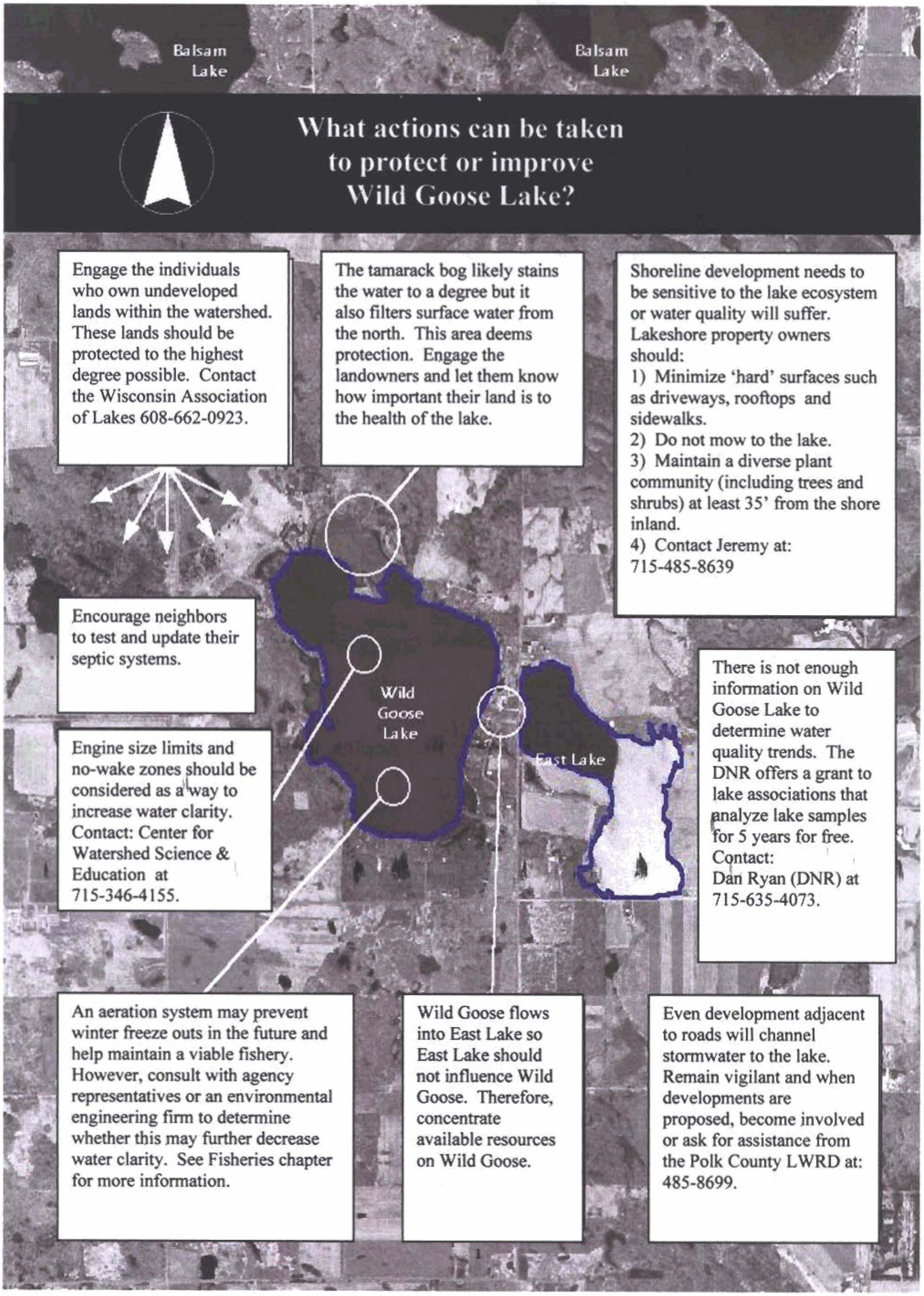


What actions can be taken to protect or improve Wild Goose Lake?

Engage the individuals who own undeveloped lands within the watershed. These lands should be protected to the highest degree possible. Contact the Wisconsin Association of Lakes 608-662-0923.

The tamarack bog likely stains the water to a degree but it also filters surface water from the north. This area deems protection. Engage the landowners and let them know how important their land is to the health of the lake.

Shoreline development needs to be sensitive to the lake ecosystem or water quality will suffer. Lakeshore property owners should:

1) Minimize 'hard' surfaces such as driveways, rooftops and sidewalks.
2) Do not mow to the lake.
3) Maintain a diverse plant community (including trees and shrubs) at least 35' from the shore inland.
4) Contact Jeremy at: 715-485-8639

Encourage neighbors to test and update their septic systems.

Engine size limits and no-wake zones should be considered as a way to increase water clarity. Contact: Center for Watershed Science & Education at 715-346-4155.

There is not enough information on Wild Goose Lake to determine water quality trends. The DNR offers a grant to lake associations that analyze lake samples for 5 years for free. Contact: Dan Ryan (DNR) at 715-635-4073.

An aeration system may prevent winter freeze outs in the future and help maintain a viable fishery. However, consult with agency representatives or an environmental engineering firm to determine whether this may further decrease water clarity. See Fisheries chapter for more information.

Wild Goose flows into East Lake so East Lake should not influence Wild Goose. Therefore, concentrate available resources on Wild Goose.

Even development adjacent to roads will channel stormwater to the lake. Remain vigilant and when developments are proposed, become involved or ask for assistance from the Polk County LWRD at: 485-8699.

Morphological Characteristics

Lake Area:
Wild Goose: 192 acres
East: 86 acres

Watershed Area:
Wild Goose: 1,462 acres
East: 1,732 acres (The Wild Goose watershed is considered in this area. Only 270 acres drains to East Lake without first filtering through Wild Goose.)

Watershed to Lake Area Ratio:
Wild Goose: 7.6 to 1
East: 20.1 to 1 (3.1 to 1 only considering the land that drains to East without first filtering through Wild Goose.)

Volume:
Wild Goose: 1,438 acre-feet (62,626,647 ft^3)
East: 1,050 acre-feet (45,738,000 ft^3)

Mean Depth:
Wild Goose: 8 feet
East: ~4.5 feet

Maximum Depth:
Wild Goose: 12 feet
East: ~9 feet

Fetch:
Wild Goose: 4,444 feet (0.8 miles)
East: 1,921 feet (0.4 miles)

Miles of Shoreline:
Wild Goose: 6.4 miles
East: 3.1 miles

DNR Classification of Lake Type:
Wild Goose: Seepage
East: Seepage

Littoral Area:
Wild Goose: 70 acres. Only 0-7 feet deep due to limited light penetration. 36% of surface area.
East: unknown

Annual Precipitation:
The annual precipitation in 2001 at the Amery_2_N station was 36.42 inches

Average Annual Evaporation:
44.15 inches per year. (This figure was from the closest station measuring mean pan evaporation in Minneapolis.)

Residence Time:
Wild Goose: 2 years
East: unknown

Mixing:
Wild Goose: polymictic
East: polymictic

Phosphorus Concentration:
Wild Goose: 50 ppm
East: unknown

N:P Ratio
Wild Goose: 34:1
East: unknown

Introduction to the Land and Water

Glaciers

The landscape around Wild Goose and East Lakes is the result of the most recent glacial advance which occurred about 12,000 years ago. As the glacier retreated it left debris including blocks of glacial ice buried or partially buried. As the ice melted in its pit or 'kettle' lakes were born. Both Wild Goose and East Lakes are 'kettle lakes' located on the northern edge terminal moraine with outwash from the moraine to the north.

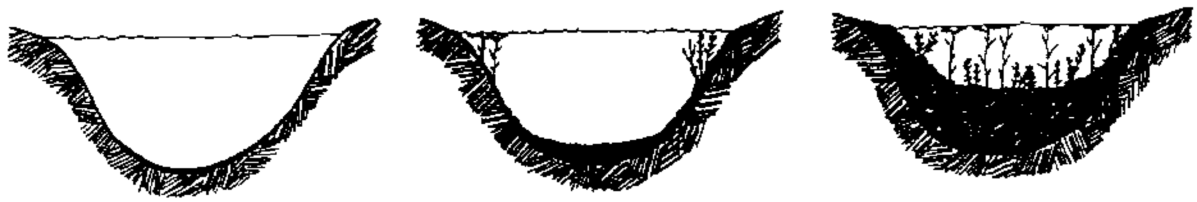
As the last glaciers receded river systems connected the glacial meltwater with the lakes that dotted the landscape. The landscape and the lakes 100 centuries ago were neither rich nor diverse in plants or wildlife. The soil and vegetation was stripped from the land by the glaciers and the water filling the rivers and lakes was low in nutrients. The closest "living" example of what Wild Goose and East Lakes looked like at this time is probably Lake Superior: cold, clean, and clear, but not very fertile.

Over the millennia soils material was carried here by wind and eroded from the landscape. The ecosystem matured over time to eventually resemble what we see today: mixed forests, occasional prairie open space, and lots of lakes, rivers, and wetlands. The soils material that brought the nutrients necessary to sustain such a diverse landscape continue to build today.

Lake aging process

When plants and trees die their decomposing structures nourish subsequent generations of plants and animals. Water, wind, and ice breakdown rocks and flatten hills. All of this material, both organic and inorganic, is pulled by gravity to the lowest point on the landscape, typically lakes. So lakes naturally fill in with this sediment until they are more land than water. In the interim they transition from clear open water to something a little greener and a little more fertile. It takes thousands of years but all lakes 'age' to become wetlands rich in nutrients and busy with wildlife.

Typical natural aging process of a lake



OLIGOTROPHIC
- Clear water, low productivity
- Very desirable fishery of large game fish

MESOTROPHIC
- Increased production
- Accumulated organic matter
- Occasional algal bloom
- Good fishery

EUTROPHIC
- Very productive
- May experience oxygen depletion
- Rough fish common

Introduction to the Land and Water

Human influence

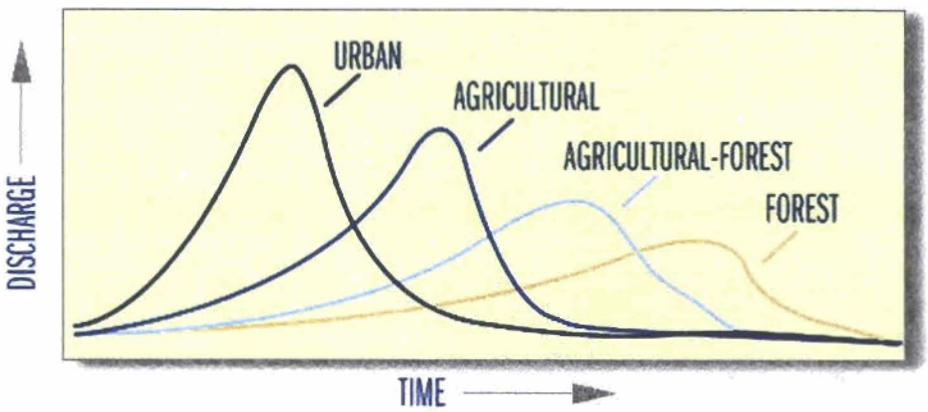
Human activity on the landscape has increased the rate at which lakes age. Logging was the first blow to this region's lakes. The removal of vast stands of trees left soil bare and vulnerable to erosion.

Farming was the second wave of development in this region. Originally farms were small and diverse. Due to the fragile nature of their tools and techniques early settlers generally worked with the land instead of against it. But mechanization soon changed the way people farmed. Powerful machines were able to work larger fields and larger fields required more chemical inputs to control weeds and insects. Wetlands and flood-prone areas were drained and cultivated. In general, farming opened up the fertile but fragile soils to the erosive forces of wind and rain thereby compromising the health of both land and water.

A third wave of major human influence is currently underway: residential development. The landscape is quickly being carved up from vast fields into relatively tiny lots complete with driveways and sod lawns. Construction erosion, runoff from lawn fertilizers, removing vegetation from both shorelines and lakes, septic system effluent, and simply runoff from roofs, driveways and roads all contribute nutrients and pollutants to lakes.

Humans have increased the rate at which lakes become green and fertile by 10, 100, and even 1,000 times. This is a threat that most people resonate with: the threat that their clean, clear lake will become green and stale in their lifetime. Humans cannot change the fact that lakes will change over time but they can affect the rate at which that change takes place. And ideally, like time itself, it will occur so slowly that it will be imperceptible in our lifetimes and the lifetimes of those to follow.

STORMWATER DISCHARGES FROM VARIOUS LAND COVERS



Natural Resources Research Institute, http://wow.nrri.umn.edu/wow/

Watersheds

A watershed, also called a drainage basin, is all of the land and water areas that drain toward a particular river or lake (see pages 9, and 11). Thus, a watershed is defined in terms of the selected lake (or river). There can be subwatersheds within watersheds. For example, a tributary to a lake has its own watershed, which is part of the larger total drainage area to the lake.

A lake is a reflection of its watershed (see page 9). More specifically, a lake reflects the watershed's size, topography, geology, landuse, soil fertility and erodibility, and vegetation. The impact of the watershed is evident in the relation of nutrient loading to the watershed; and lake surface area ratio.

The Wild Goose Lake watershed is primarily forested which bodes well for both lakes.

Introduction to the Land and Water

Forests tend to hold tightly onto nutrients as well as store water for the short term in the canopy thereby reducing runoff volume and erosion potential. Maintaining a high percentage of forest land in the watershed will help to guarantee good water quality in the future.

However, the area has a history of farming and grazing right up to the water's edge. Agricultural land use tends to increase the amount and rate of nutrient loading to adjacent lakes. This tends to have a deleterious affect to water quality especially on smaller lakes.

Currently, residential development is increasing the amount of impervious surfaces in the watershed. Impervious surfaces are hard surfaces such as rooftops, driveways, sidewalks and roads that do not allow water to percolate into the soil. The presence of impervious surfaces may be more harmful to Wild Goose Lake than farming as has been demonstrated in urban and suburban areas throughout the Midwest.

This region's proximity to the Twin Cities Metropolitan Area combined with other factors will likely increase the demand for rural residential property thereby fueling development in the watershed and converting farmland into houses. This is where the economics of watershed management factor. Many farmers are cashing in on opportunities to develop their land. This trend will continue unless growing crops and cattle becomes more economically viable than growing houses.

The ratio of watershed area to lake area also favors good water quality. Typically, water quality decreases with an increasing ratio of watershed area to lake area. This is obvious when one considers that as the ratio of watershed to lake area increases there are additional sources (and volumes) of runoff to the lake. In larger watersheds, there is also a greater opportunity for water from precipitation to contact the soil and leach minerals before discharging into the lake.

Wild Goose Lake has a relatively small watershed that is maintained by groundwater flow and is referred to as a *seepage lake* (discussed further below). In contrast, lakes fed primarily by inflowing streams or rivers are known as drainage lakes. Seepage lakes tend to have good water quality compared with drainage lakes. However, seepage lakes are often more susceptible to the ravages of acid rain because of their low buffering capacity as discussed in the section 'pH, alkalinity and acid rain.'

Groundwater

Wild Goose is considered a *seepage lake* by the Wisconsin Department of Natural Resources. Such lakes do not have an inlet or an outlet and only occasionally overflow. As landlocked waterbodies, the principal source of water is precipitation or runoff, supplemented by groundwater from the immediate drainage area. Since seepage lakes commonly reflect groundwater levels and rainfall patterns, water levels may fluctuate seasonally. Seepage lakes are the most common lake type in Wisconsin.

Groundwater is water that has filled pore spaces and open cracks underground. Gravity pulls rainwater and snowmelt down through the ground and pushes groundwater causing it to flow. Groundwater moves slowly under gravity through pore spaces from high pressure to low pressure until it discharges in a surface water body or a well. This means that groundwater is often controlled by the topography and well pumping. Well pumping reduces the pressure in the pores near the well and cause the groundwater to flow in to fill the empty space.

Introduction to the Land and Water

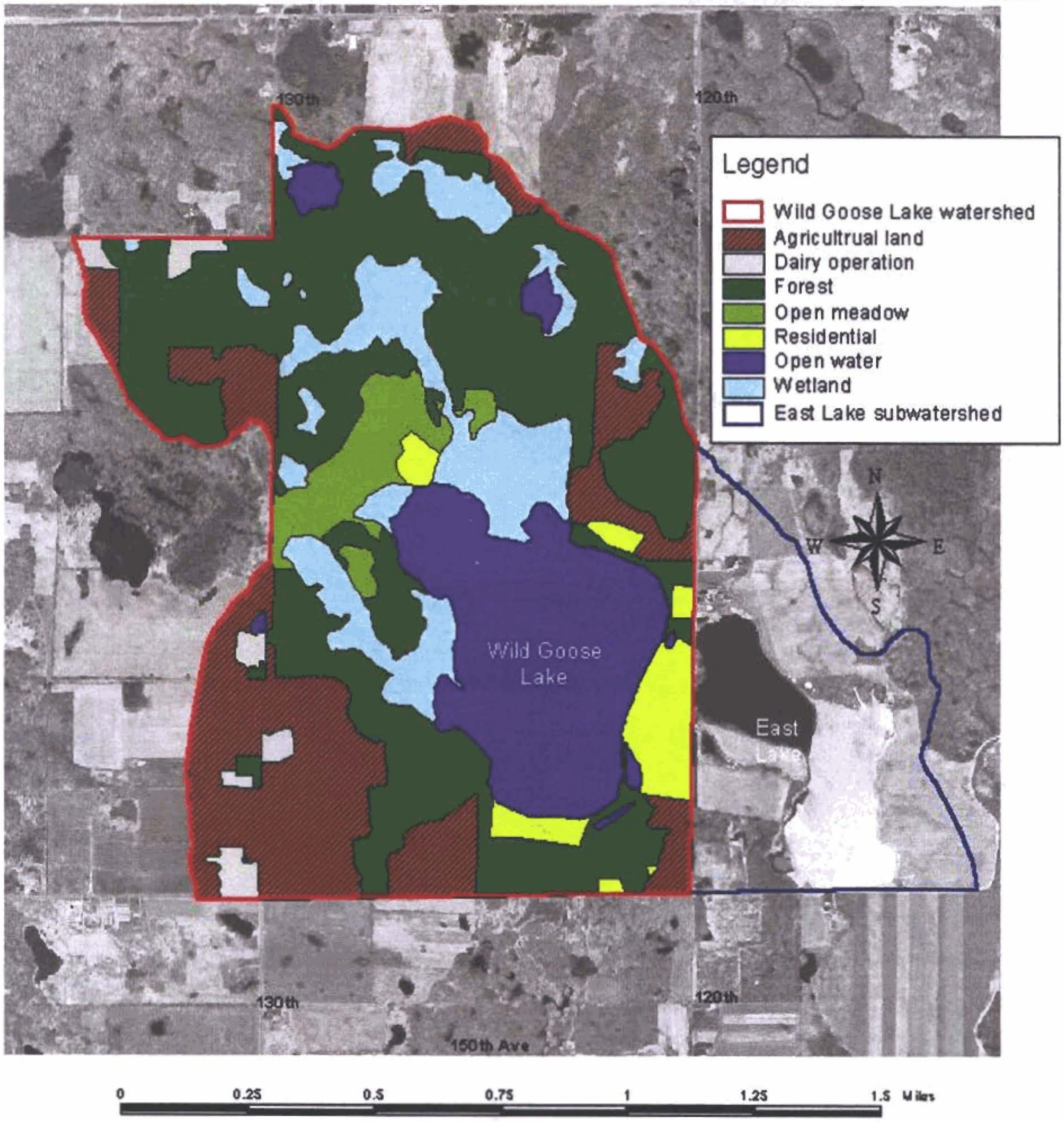
Nature, people. and money

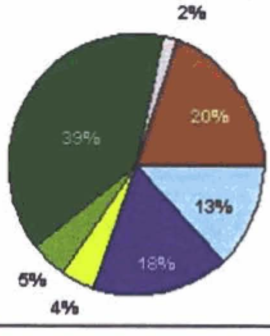
As a form of ecosystem management, watershed management encompasses the entire watershed system, from uplands and headwaters, to floodplain wetlands and river channels. It focuses on the processing of energy and materials (water, sediments, nutrients, and toxics) downslope through this system.

Of principle concern is management of the basin's water budget, that is the routing of precipitation through the pathways of evaporation, infiltration, and overland flow. This routing of groundwater and overland flow defines the delivery patterns to particular streams, lakes, and wetlands; and largely shapes the nature of these aquatic systems.

Watershed management requires the use of the social, ecological, and economic sciences. Common goals for land and water resources must be developed among people of diverse social backgrounds and values. An understanding of the structure and function--historical and current--of the watershed system is required, so that the ecological effects of various alternative actions can be considered. The decision process also must weigh the economic benefits and costs of alternative actions, and blend current market dynamics with considerations of long-term sustainability of the ecosystem.

Wild Goose Lake Watershed
Land Use





The pie chart to the left shows a relative comparison of land use areas within the Wild Goose Lake watershed. Note that this entire land mass drains to Wild Goose Lake before it flows into East Lake.

Water clarity

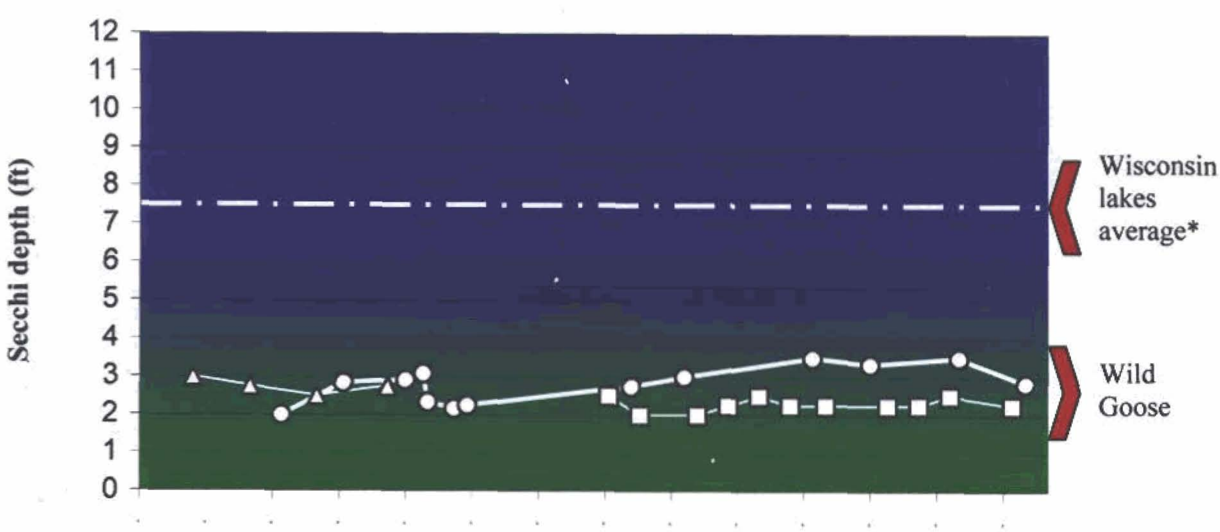
Generally lake water clarity varies throughout the year and even throughout the summer. Lake water is clearest during late fall, winter, and early spring. During these seasons there is typically little runoff from the neighboring landscape and the water is too cold to support prolific microorganism growth in the water column. As summer progresses runoff from rain and snowmelt carry suspended particles to the lake that reduce light penetration. Also, as the water warms microorganisms in the water column, such as algae, become dense enough to further limit light penetration. Then in the fall, as the water cools and biological processes slow, lakes again become clearer.

Water clarity is measured with a Secchi disk. This 8-inch disk is lowered from a boat usually at the deepest part of a lake until it just disappears from sight, then raised until it is just visible. The average of the two depths is recorded as the Secchi depth.

The Secchi depth of most lakes in this region vary by a few feet during the summer months. Wild Goose, however, varies by a matter of inches, not feet. Furthermore, these readings are some of the lowest when compared to other lakes in the region. This lack of water clarity is caused by a combination of factors (true-color, chlorophyll-a, total suspended sediments, and suspended organic matter) that all scatter or absorb light.

Determining which factor or factors affect the light regime is the key to formulating a management plan that maintains or improves the water clarity while maintaining the ecological integrity of the lake system. Water clarity is a primary issue based on input from several lakeshore property owners who have indicated that the turbid water is undesirable and disconcerting.

Wild Goose Secchi depth (1991, 1992, 2001)



*Lillie,R.A. and J.W. Mason. 1983. *Limnological Characteristics of Wisconsin Lakes.* WiDNR Tech. Bull. 138, Madison. Based on a sample of 595 Wisconsin Lakes.

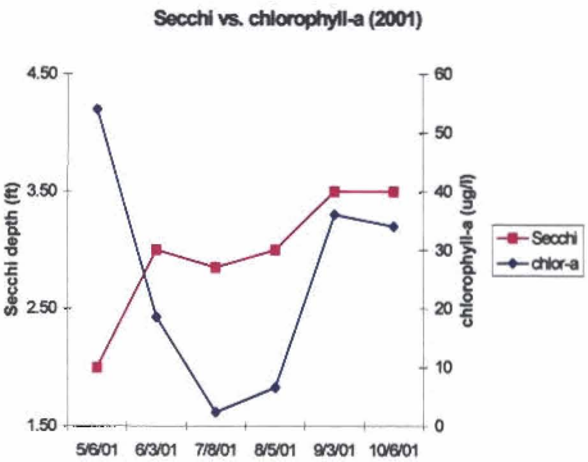
True-color

The average true-color of Wild Goose Lake between 1995-2001 was 20 units (mean = 19 units). This indicates that the lake water clarity is only slightly affected by the dissolved minerals and organic compounds that stain water like tea. Therefore, other factors also contribute to the low water clarity.

Chlorophyll-a

Chlorophyll is a measure of algae. Algae and other microorganisms are a natural part of lake ecosystems. These microscopic critters constitute the base of a lake's food chain just like plankton in the oceans.

In 2001 the chlorophyll-a levels in Wild Goose varied considerably throughout the summer but averaged 25.1 mg/l (median = 24.4) between May and October. This is high and has the potential to cause problems. Some types of algae, specifically blue-green algae, can be offensive (and at times overpowering) when they 'bloom' or die in great quantities and are then blown to shore. Dense algae growth in the water column also decreases water clarity and this is already occurring on Wild Goose to some extent. However, the chlorophyll-a levels fluxed considerably over 2001 yet the Secchi depth remained quite stable varying by only 1.5ft.



On August 14, 2002 an algae sample was taken on Wild Goose Lake and sent to the Wisconsin State Laboratory of Hygiene Phychology lab for identification. The sample was taken in the middle of the lake approximately one meter below the surface. The sample contained several species of green algae, cyanobacteria, and diatoms. All of the species identified were native to the Wisconsin. The three species of diatom (Bacillariophyta and Pyrrophycophyta families) present were: *Melosira spp.*, *Tabellaria spp.*, and *Peridinium wisconsinense* with concentrations of 62.1 cells/ml, 9.9 cells/ml, and 193.9 cells/ml respectively. These concentrations may account for the high chlorophyll a readings.

An alternative theory is that chlorophyll a measurements in mixed lakes, such as Wild Goose, may be slightly biased (overestimated) as a result of higher pheophytin levels (chlorophyll a degradation products) that may exist due to a continued mixing and recycling of organic matter. Because of this continued mixing, resuspention of dead phytoplankton or the contribution of littoral zone phytoplankton may also help account for the generally higher chlorophyll a levels associated with mixed lakes (*Scheffer, M. Ecology of Shallow Lakes. 1998.* Chapman & Hall, London).

If resuspention of organic matter can be reduced thereby increasing light penetration to the lake bottom, the benthic (lake bottom) surface may be quickly colonized by benthic algae. The resulting microbial community of algae and bacteria may form a soft shell that further reduces the probability of resuspention and form a barrier to diffusion between sediment and water. The growing benthic algae benefits from the high nutrient concentrations at the sediment surface and may take up nutrients that would otherwise be released to the water column (Scheffer, 1998). Also, a benthic algae oxygenates the upper sediment layer, facilitating the immobilization of phosphorous by iron.

By controlling the resuspention of sediment and the mixing of phytoplankton it is theoretically possible to increase water clarity in Wild Goose Lake.

TSS

TSS (total suspended solids) quantifies the amount of inorganic matter that is floating in the water column. Wind, waves, boats, and even some fish species can stir up lake bottom sediment. Fine sediment and especially clay can remain suspended for weeks. These particles scatter light and decrease water transparency.

TSS was measured only once in 2001 in Wild Goose Lake. The result was 14 mg/l which is not outrageously high and indicates that sediment is not likely the primary cause of turbid water. However, this one sampling event may not be indicative of the lake as a whole. More sampling throughout the summer months is necessary to draw more definite conclusions.

It is suggested that a program be developed that samples color, chlorophyll-a, and TSS at the same time and on a number of occasions throughout one or more years to determine which parameter (true color, chlorophyll a, or TSS) is affecting water clarity the most.

Phosphorus

The **total phosphorus** levels in Wild Goose are high enough to classify the lake as *eutrophic.* Eutrophic lakes are typically characterized by extremely low water clarity, nuisance aquatic plant growth that affects boating and recreation, and algal scums. Fortunately the lake does not appear to have fully crossed this threshold. This is at least partly due to the low water clarity which limits light penetration. Although plants and algae may have enough phosphorus to grow wildly, there isn't enough light to fuel such growth.

The **dissolved reactive phosphorus** (DRP) results are relatively low (~5 ug/l) which is a good sign for lake. DRP is the phosphorus that is immediately available in the water column to fuel plant and algae growth. The lake's low DRP is a contributing factor to its relatively high productivity but without the presence of nuisance algae blooms.

N:P ratio

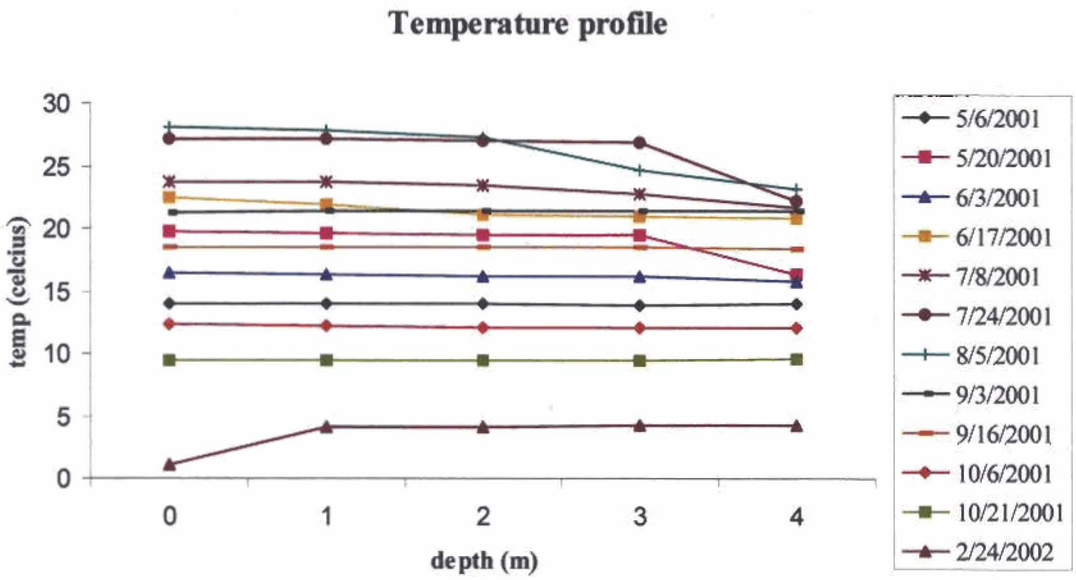
The N:P (or total nitrogen concentration to total phosphorus concentration) ratio for Wild Goose is 34:1. This means that the lake is sensitive to phosphorus inputs. Therefore, continued phosphorus inputs from the landscape and atmosphere will have negative effects on water quality. Conversely, continued nitrogen inputs will likely have little impact on water quality in the near future.

Stratification: temperature and oxygen

Water profile monitoring indicates that Wild Goose Lake is subject to numerous *turnover* events throughout the summer months. This means that the lake never stratifies into distinct thermal layers during the summer; instead, it's likely that on any given date the lake will be the same temperature at the surface as near the bottom. This is to be expected in a shallow lake.

By late spring most deep lakes in this region have separated into two or three distinct layers with warmer water at the top and cooler water at the bottom. If this stratification persists, dissolved oxygen in the bottom of these lakes drops dramatically and may cause phosphorus to be released from the lake bottom sediments.

In 2001 wind (and perhaps boat traffic to a lesser degree) was sufficient enough to mix Wild Goose when it began to stratify. This kept the entire water column well-oxygenated most of the season. This maximized the amount of



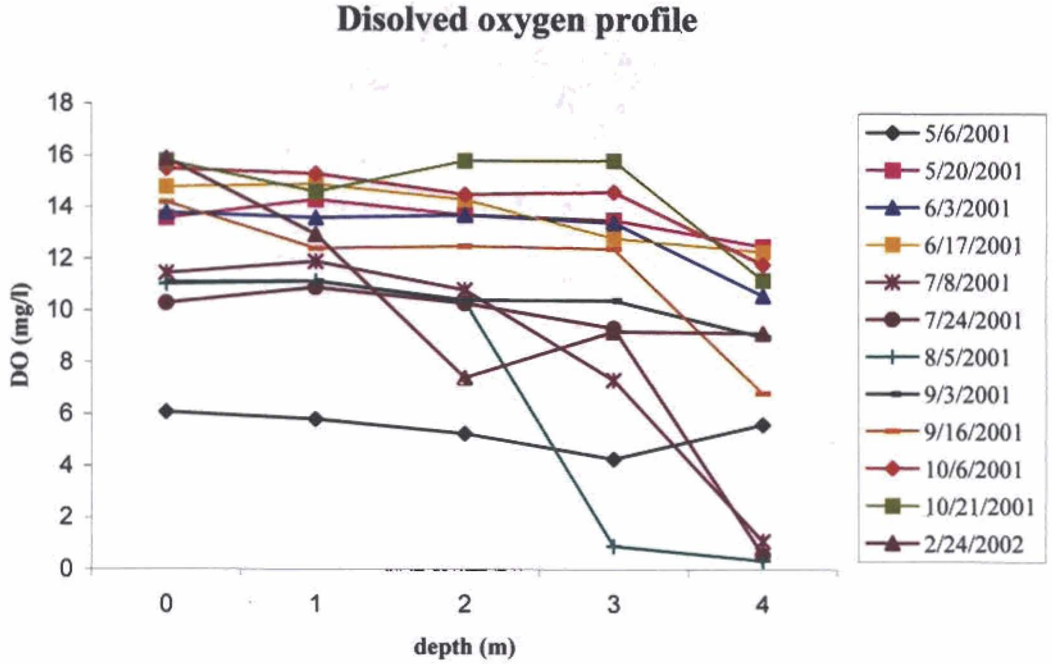
fish habitat in the lake and kept the lake bottom from becoming anoxic.

Ice cover prevents the lake from mixing during the winter. Throughout the winter oxygen is used by animals and as plants decompose at the lake bottom. Because there is no oxygen transfer between the air and the lake during winter and because plant respiration is limited in the winter months it is possible for the oxygen to be exhausted before ice out. If this occurs a certain percentage of the fish will die. This event is known as *winterkill*. Wild Goose is prone to occasional winterkill because it is relatively shallow. So the same characteristic that keeps the water well-oxygenated throughout the summer may not be capable of holding enough oxygen to make it through a particularly long or cold winter.

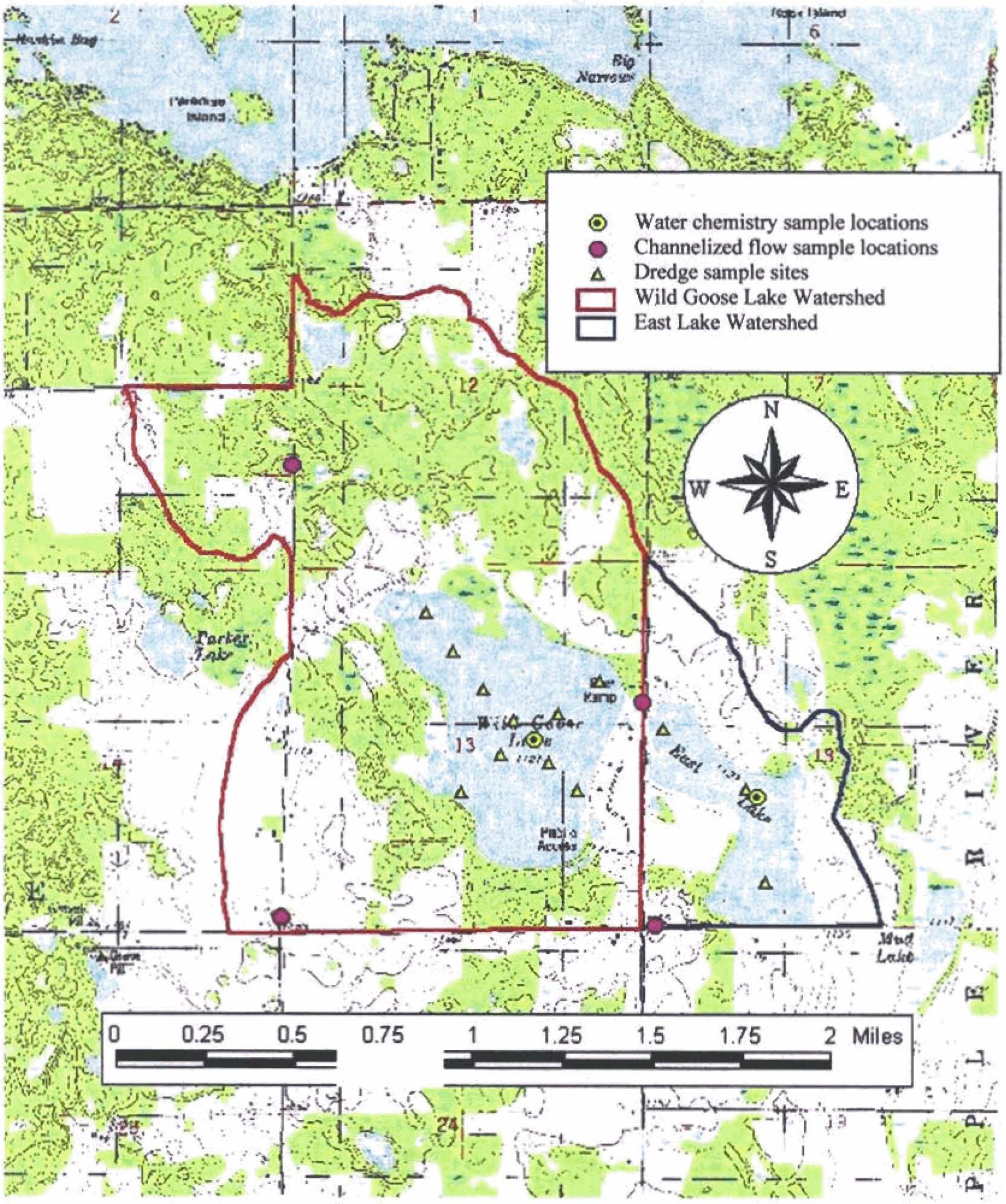
pH, alkalinity, and acid rain

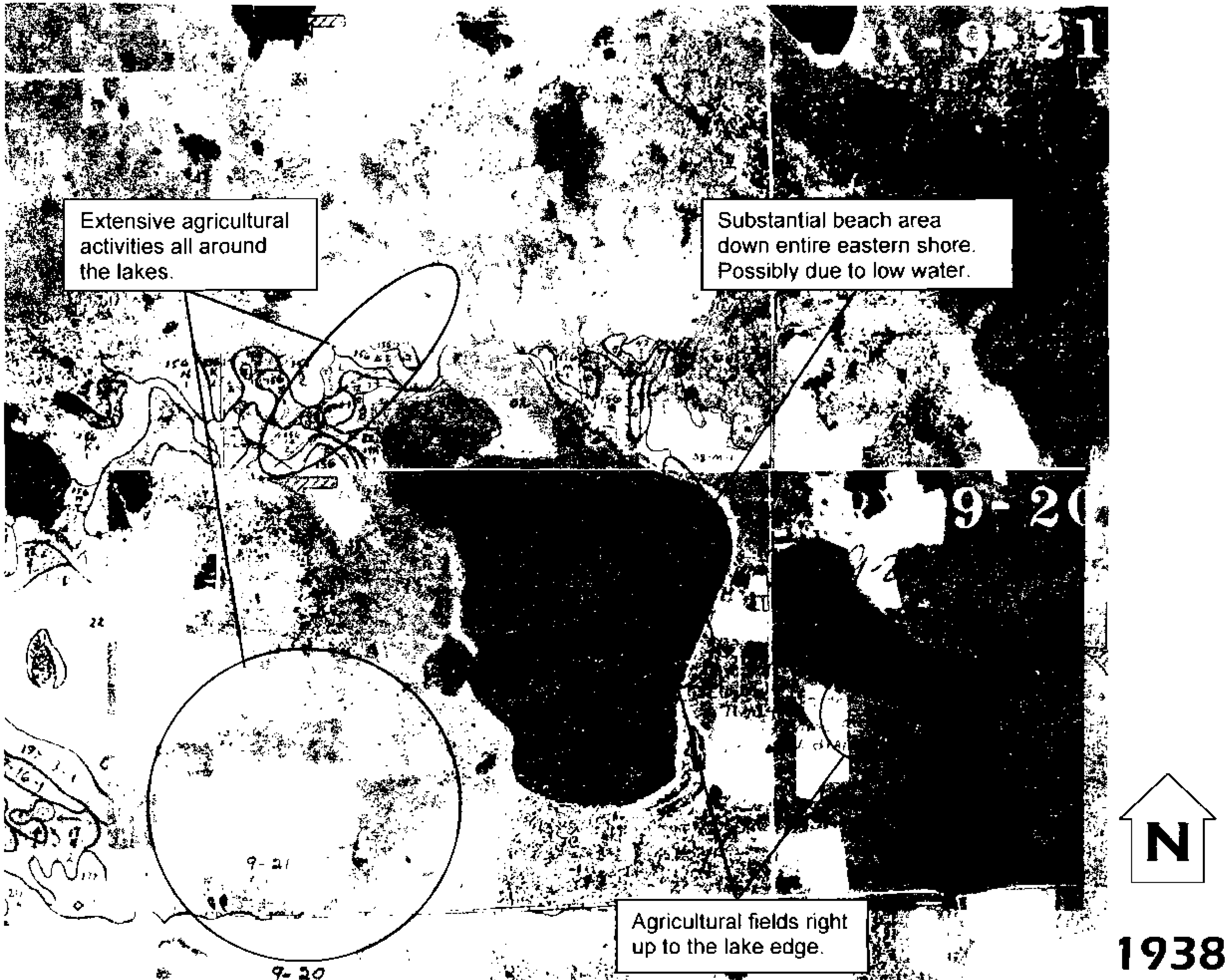
The average pH in Wild Goose Lake between 1995-2001 is 6.78 (median = 6.80). This is perfect for fish, aquatic plants, and wildlife. However, the lake's alkalinity (average = 9.42 mg/l $CaCO_3$, median = 8 mg/l $CaCO_3$) is quite low. This makes the lake particularly susceptible to the ravages of acid rain. A lake's alkalinity is a result of its geology so there's not much human influence to be considered with this parameter other than to resolve lakeshore erosion.

Lakes in this region already receive mercury deposits from the rain that primarily originate in the Twin cities Metropolitan Area as a result of automobile emissions and industrial pollution. (Incidentally, mercury levels are high enough that fish consumption advisories exist on all area lakes including Wild Goose Lake.) These same sources cause acid rain. And the same atmospheric forces that carry mercury on the wind to Polk County lakes carry acid rain. Acid rain has the potential to lower the pH of Wild Goose lake to the point that fish cannot survive – as has already occurred in Canadian provinces and some northern New England states.

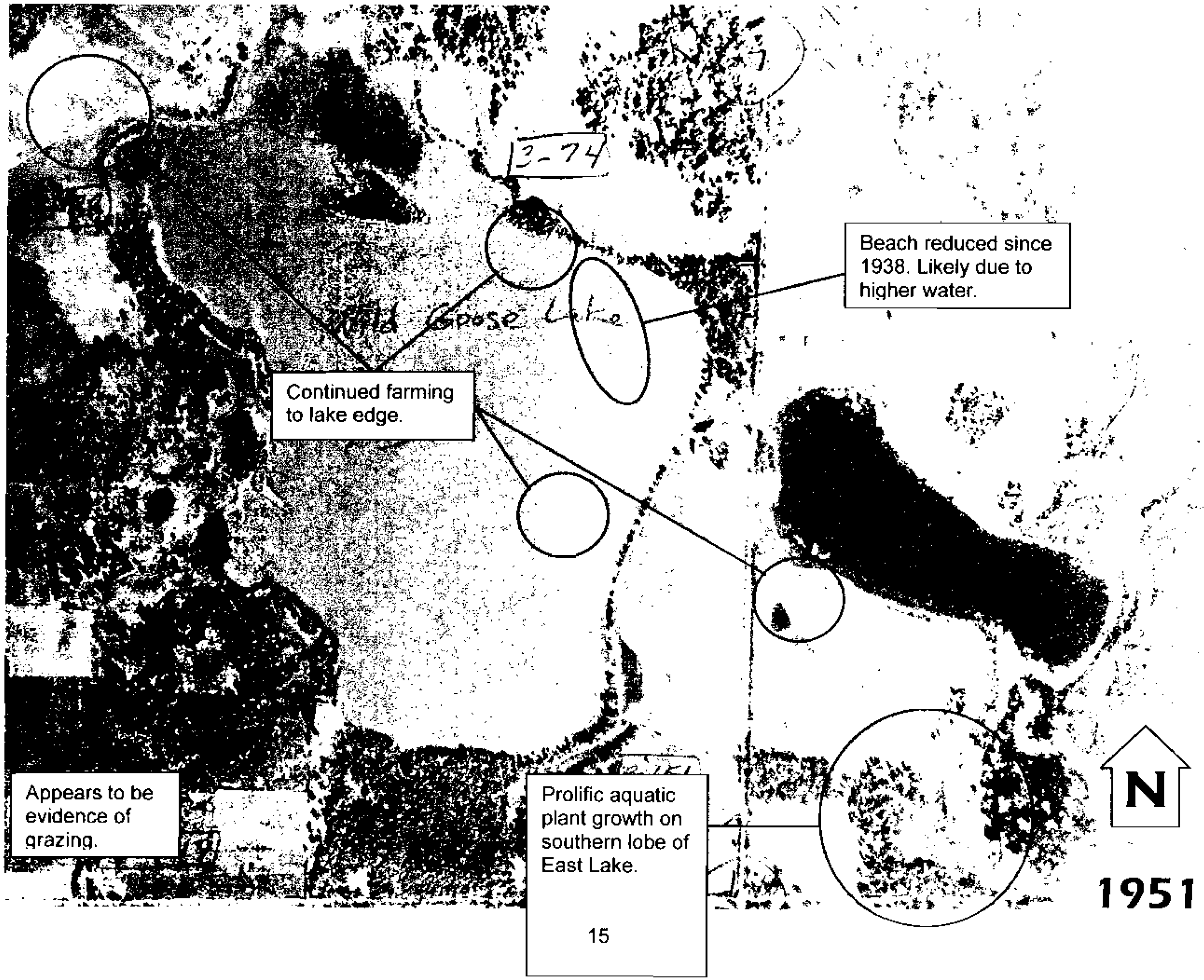

Disolved oxygen profile
18
16
14
12
10
8
6
4
2
0
DO (mg/l)
0
1
2
3
4
depth (m)
5/6/2001
5/20/2001
6/3/2001
6/17/2001
7/8/2001
7/24/2001
8/5/2001
9/3/2001
9/16/2001
10/6/2001
10/21/2001
2/24/2002

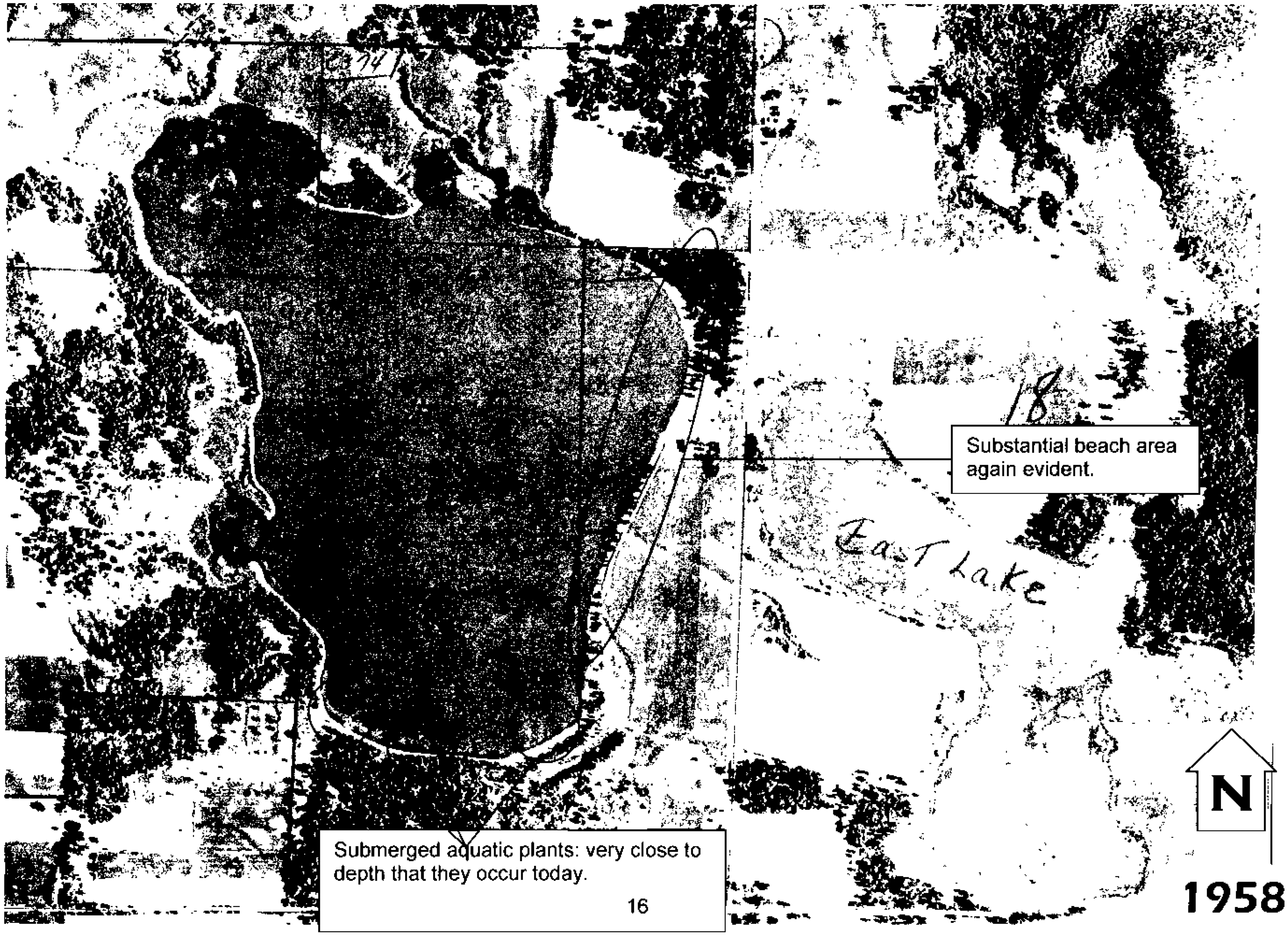
Sample Locations

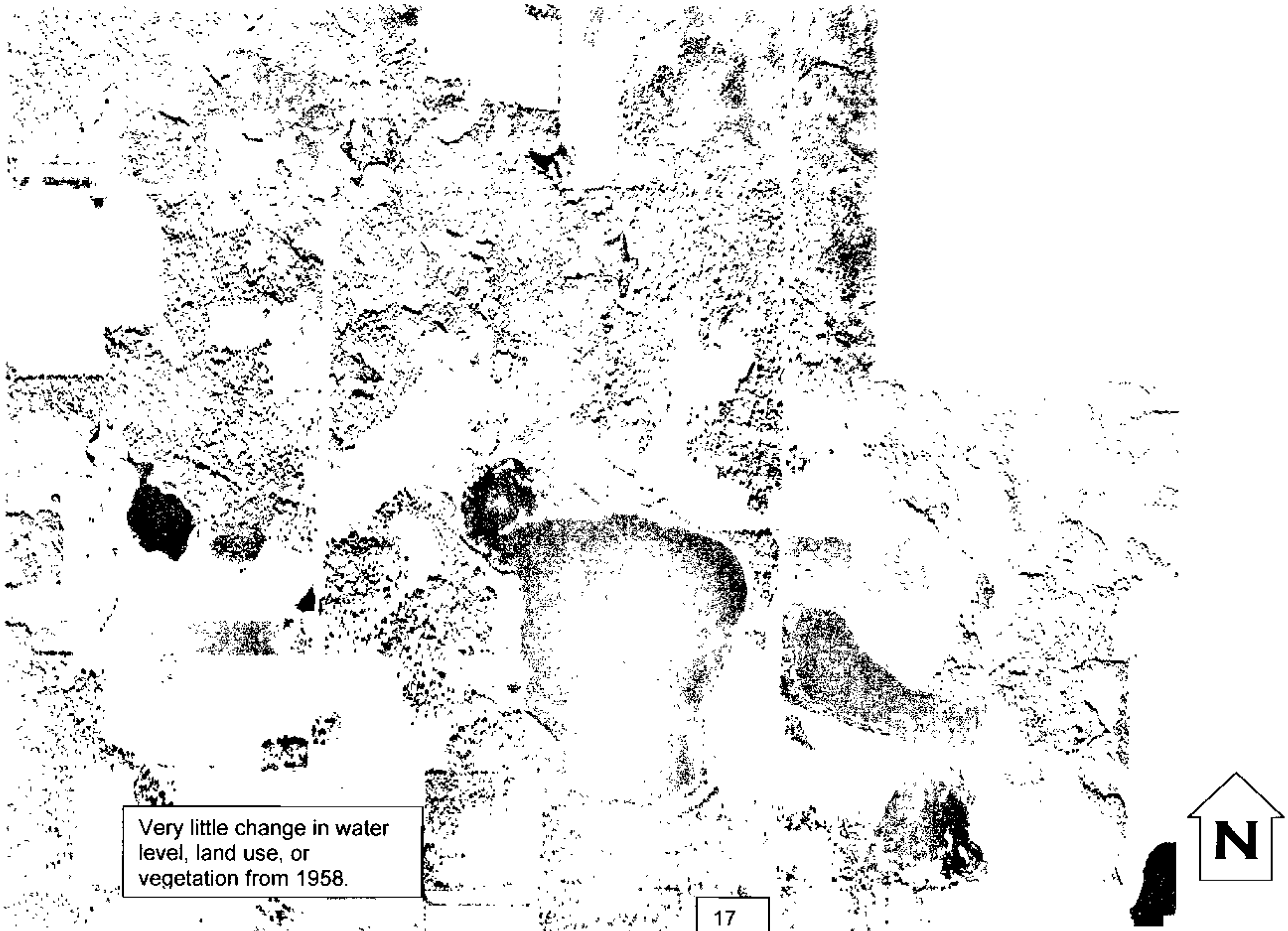



Extensive agricultural activities all around the lakes.
Substantial beach area down entire eastern shore. Possibly due to low water.
Agricultural fields right up to the lake edge.
9-21
9-20
9-21
9-20
N

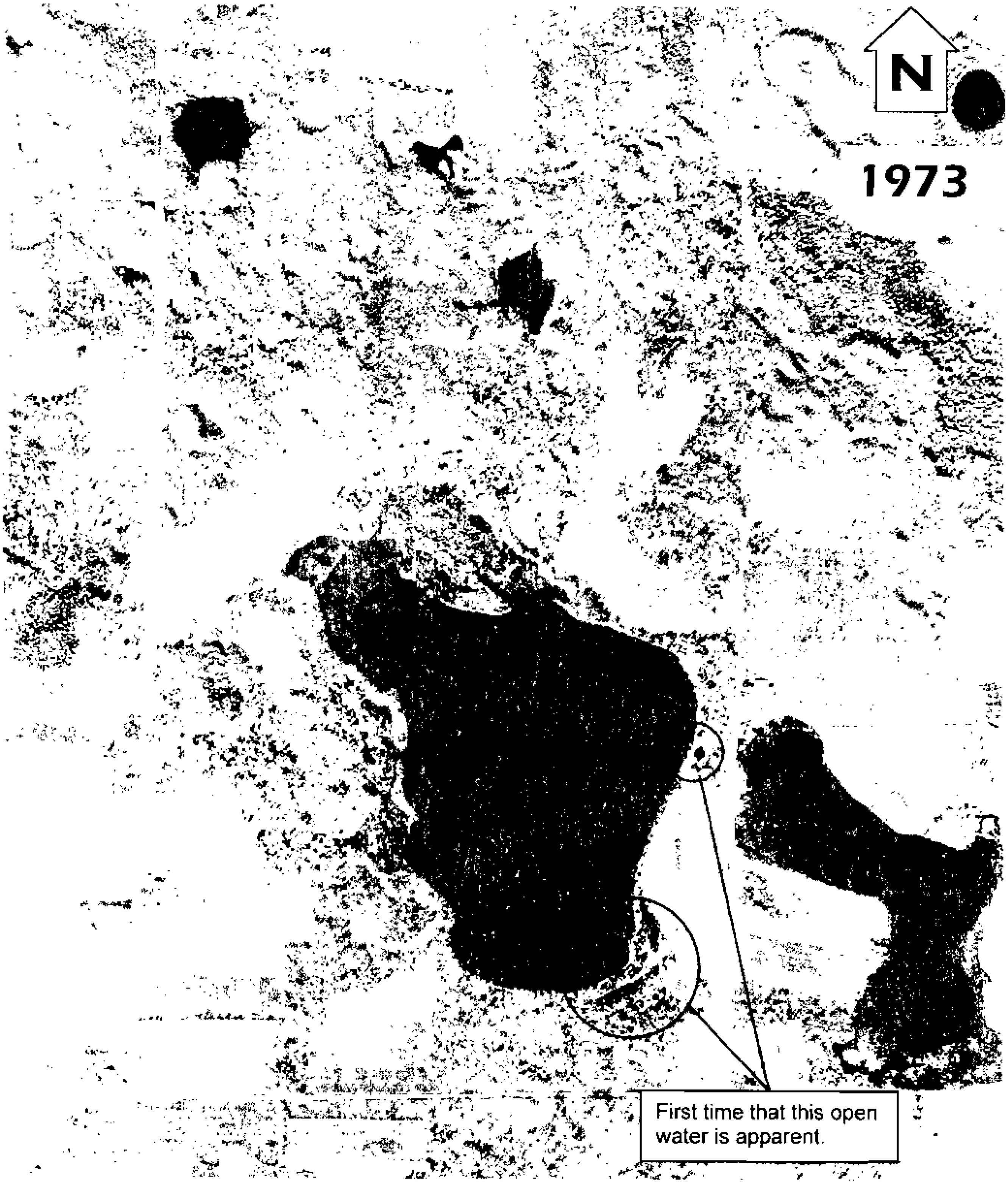
1938

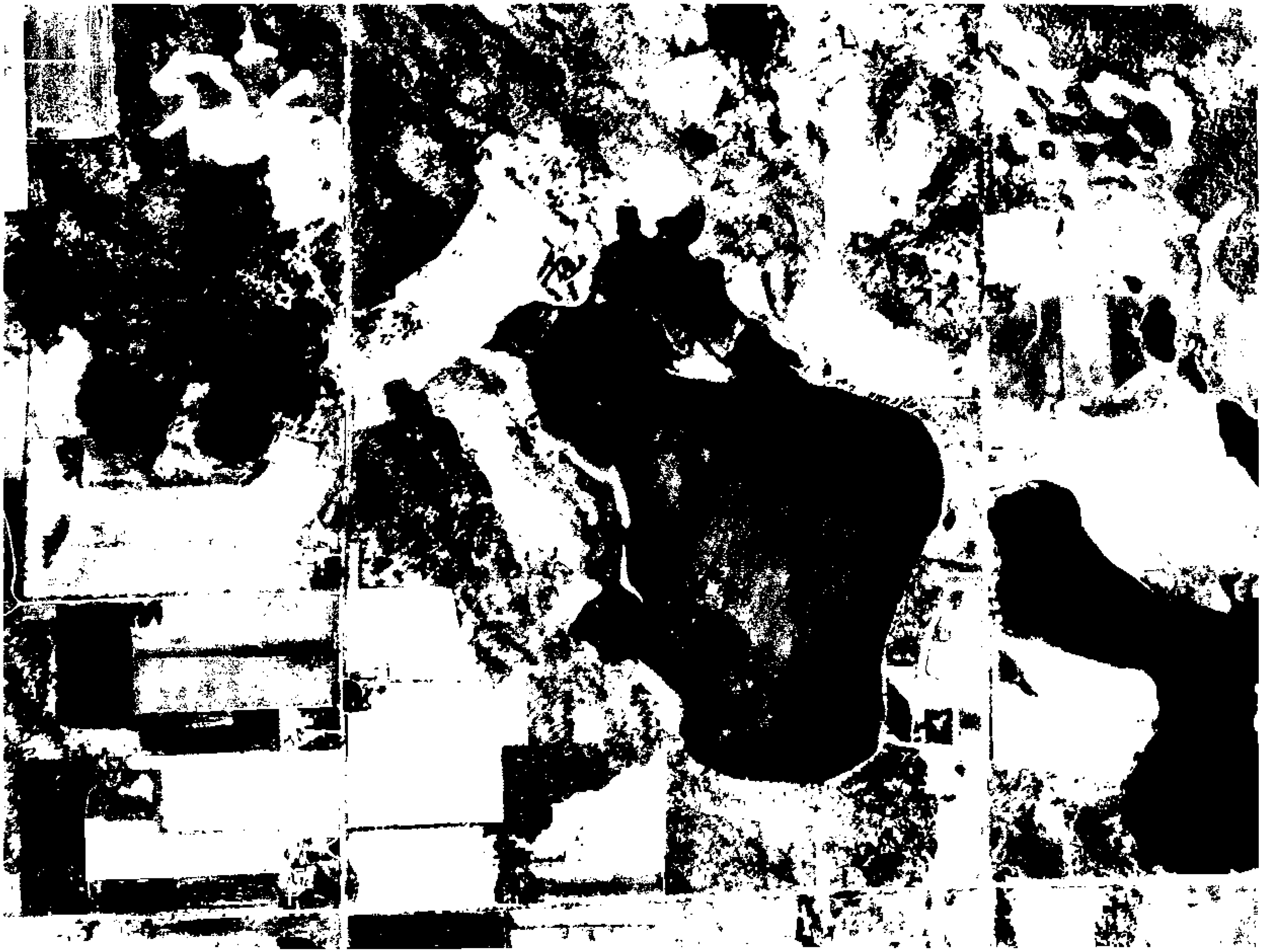

3-74
Wild Goose Lake
Beach reduced since 1938. Likely due to higher water.
Continued farming to lake edge.
Appears to be evidence of grazing.
Prolific aquatic plant growth on southern lobe of East Lake.
N
1951


Substantial beach area again evident.
East Lake
Submerged aquatic plants: very close to depth that they occur today.
N
1958


Very little change in water level, land use, or vegetation from 1958.
17
N

1965

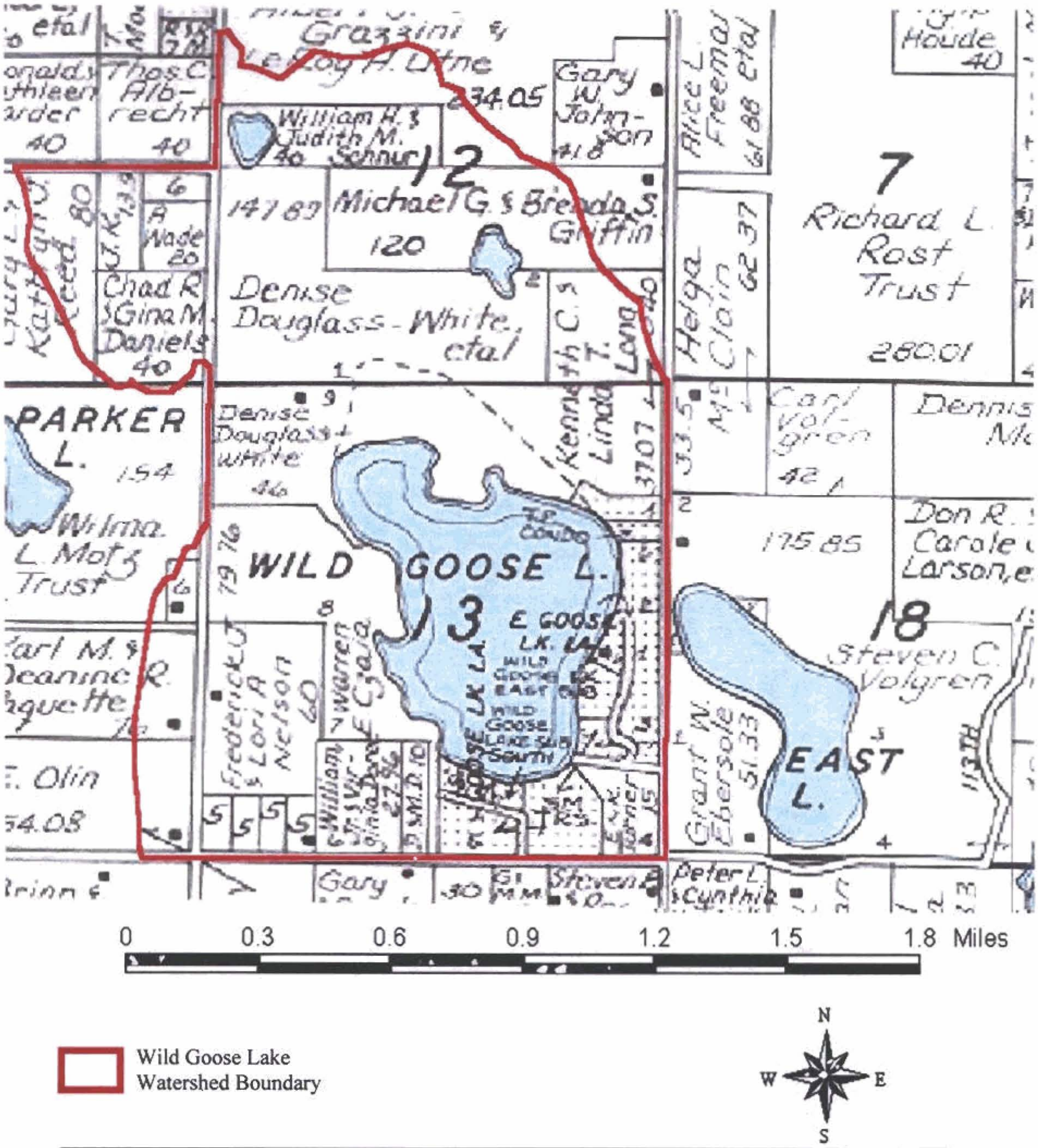

N
1973
First time that this open water is apparent.



N

1992

Land Ownership



This map was copied from the 2000 Polk County Plat Book. Check with the Polk County Register of Deeds for the most recent information on land ownership.

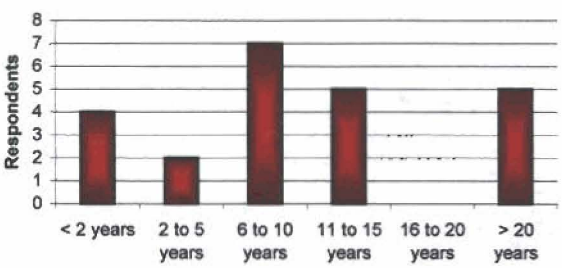
Sociologic Landowner Survey

In summer 2001 a sociological landowner survey was sent to property owners within the Wild Goose and East Lakes watershed. The survey was designed to assess landowner objectives, concerns and ideas as well as to forecast future change-of-ownership trends.

Biographic data

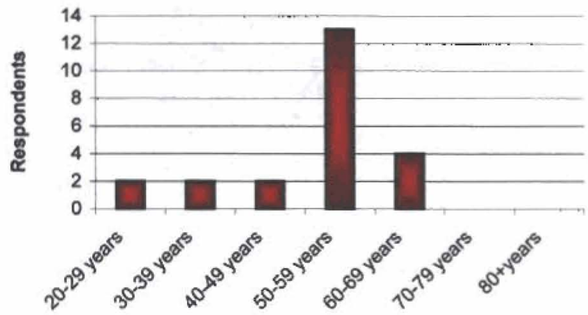
Although 10 respondents (43%) have owned their property for more than twenty years, 13 respondents (57%) have owned their property for ten years or less. This is a typical pattern of ownership as compared to other watersheds surveyed in Polk County. This survey does not specify whether the newer property owners bought existing homes or built new homes on previously undeveloped lots.

How many years have you owned property on or near Wild Goose Lake?

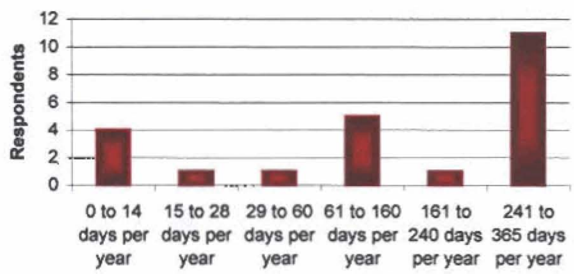


The age of the head of household is most interesting. Fifty-seven percent (57%) of respondents indicated that the head of household was 50-59 years old. This is quite low compared to other lakes in the area. Only 22% of respondents indicated that the primary wage earner was retired. So it is not unreasonable to assume that the 50-59 year-olds are gearing up for a retirement on the lake. Many of these people will be entertaining families and friends especially during the summer. The future will likely bring more recreational pressure on the lake.

What is the age of the head of household?



How many days in an average year is the property occupied?

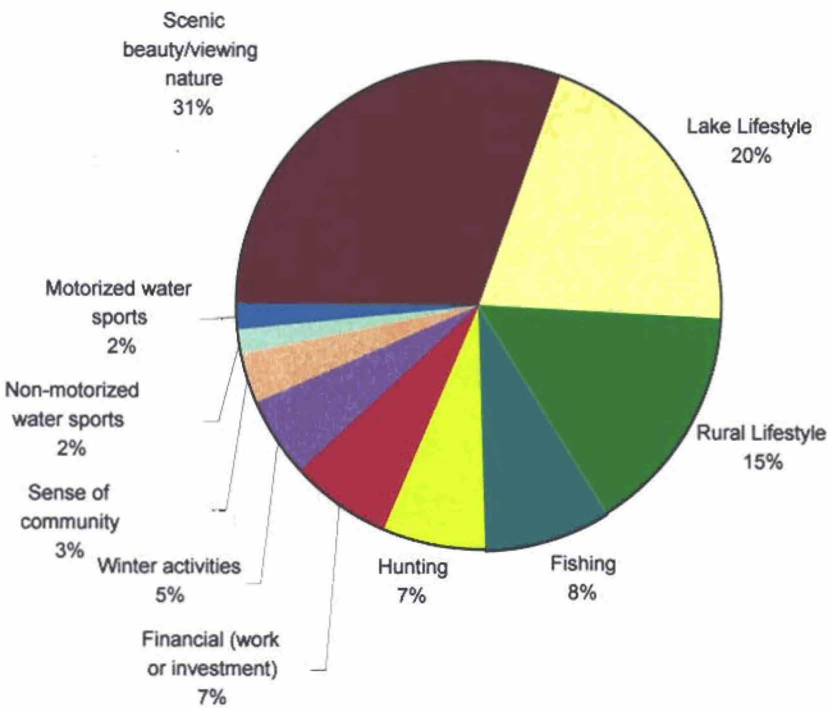


Sociologic Landowner Survey

Reasons for owning property

Property owners are attracted to the area for the aesthetics offered by rustic and natural surroundings as well as the amenities associated with living on a lake.

*What is the most important reason that you own property on or near Wild Goose Lake?**



**Respondents ranked their top three reasons for owning property on or near the lakes. The pie chart is a tally of all the issues ranked as the foremost reason.*

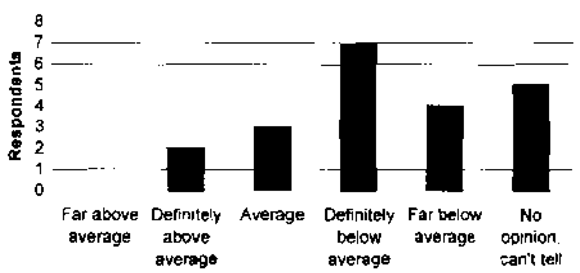
Sociologic Landowner Survey

Perceptions regarding water quality

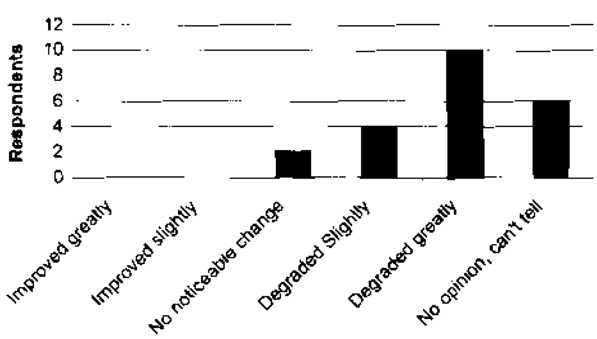
A narrow majority of respondents (52%) described the water quality of Wild Goose Lake as below average. Only 24% described the lake as average or above average. The balance had no opinion. Furthermore, a majority of respondents (64%) feel the water quality has degraded since their tenure on/near the lake. Remember that most respondents have owned their property for 10 years or less.

There were many respondents who offered no feedback on this portion of the survey. Education and outreach in this area may help people to better recognize indicators of natural resource health or at least prompt people to consider the lake in an ecosystem context.

How would you describe the current water quality of Wild Goose Lake?

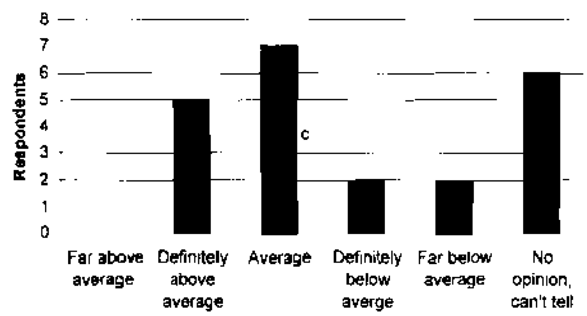


Since you have lived on or near the lake, how would you describe the change in water quality?



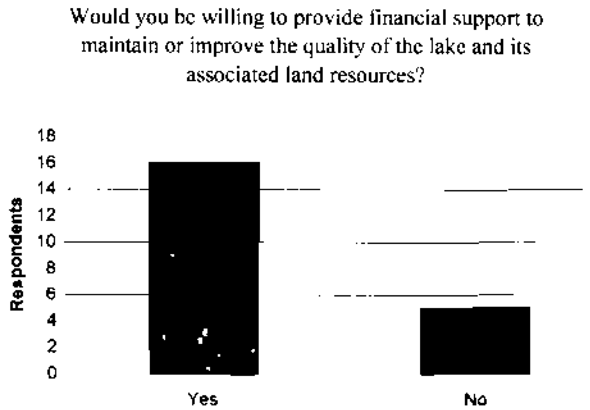
Fifty-five percent (55%) of respondents felt the quality of the shoreline was average or above average while only 18% felt the shoreline was below average. These numbers are in sharp contrast to perceptions about water quality. But again a notable percentage of respondents offered no opinion on the topic signaling a need for education so that people feel comfortable gauging the quality of shoreline habitat.

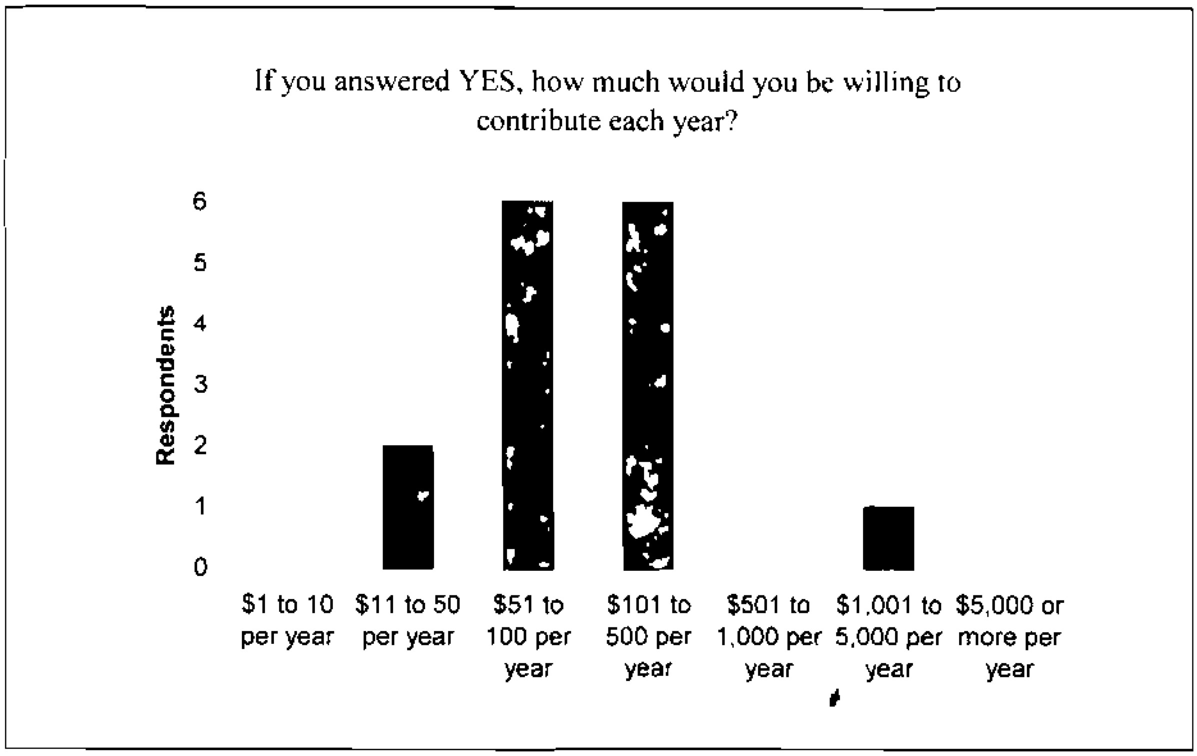
How would you describe the quality of the shoreline of Wild Goose Lake?



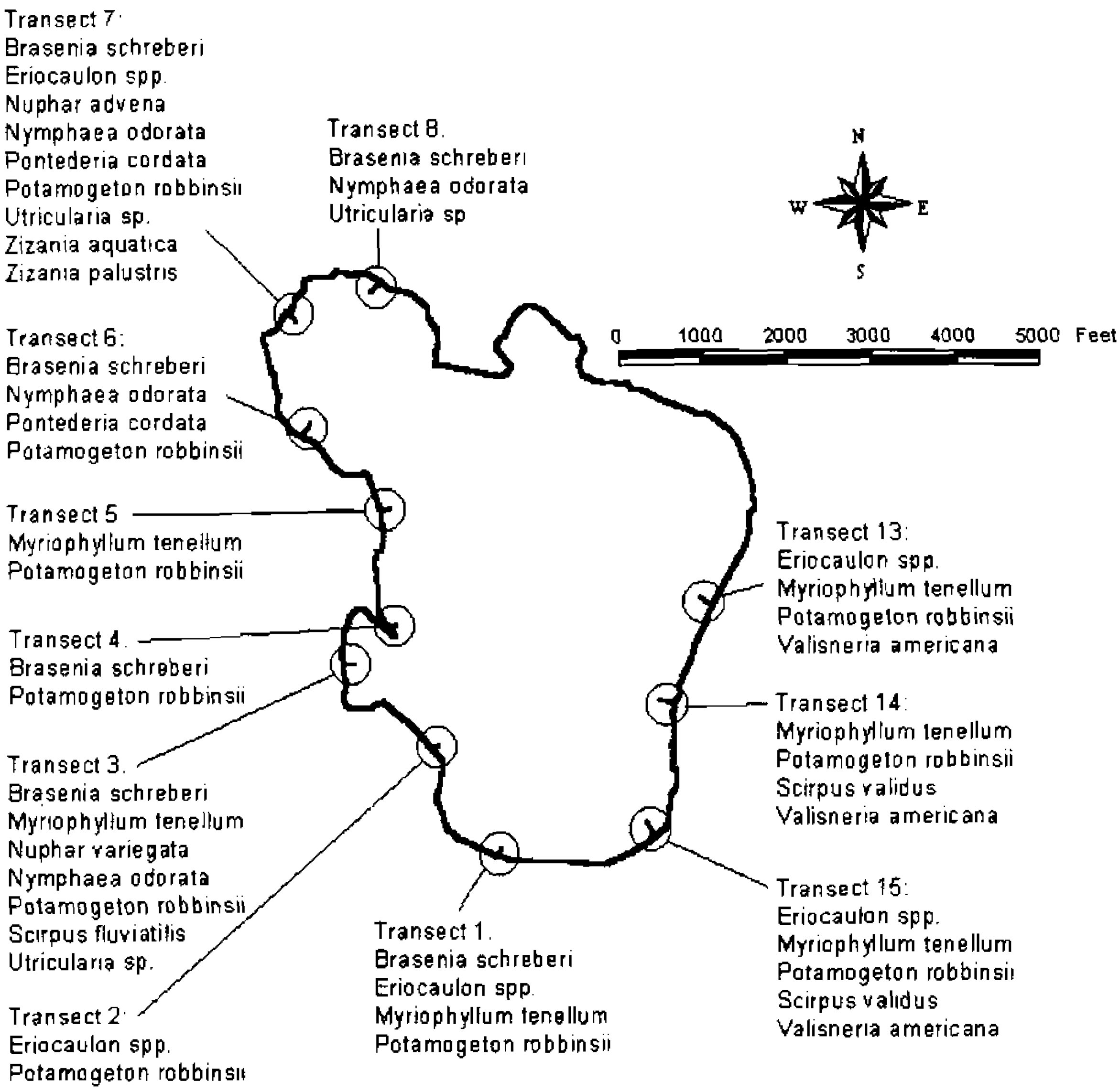
Willingness to provide financial support

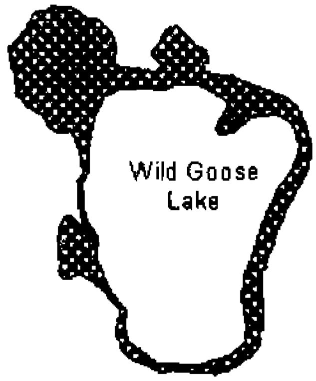
The willingness of property owners to financially support the maintenance or improvement of Wild Goose Lake and its associated land resources is strong especially considering that 35% of respondents do not own shoreline property. Seventy-six (76%) of respondents are willing to provide annual financial support. Of those, 40% are willing to contribute between $51 and $100 per year. A whopping 40% would offer annual contributions in the $101-500 range. That sort of commitment to protect or improve the lake is remarkable when compared to other such surveys on area lakes.





Aquatic Plant Survey and Litoral Zone





The area in green is referred to as the 'litoral zone.' The litoral zone is the most important area for aquatic wildlife. This is where sunlight is able to reach the lake bottom, young fish find refuge, and the dynamics play out between the land and the water. As many as 90% of the living things in lakes and rivers are found along their shallow margins and shores. (Source: Rideau Canal, Parks Canada)

Terrestrial Plant Survey

Transects were laid out 40 feet from the water perpendicular to the shoreline. More detailed information is available in the Appendix.

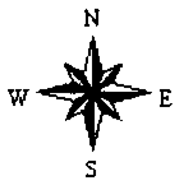
Transect 4:
Bergamot
Bidens
Blackberry
Carex
Cinquefoil
Cordgrass
Forb (3 unknown spp)
Galium
Goldenrod
Grass (unknown sp)
Hawkweed
Hazelnut
Milkweed (common)
Plantain
Prickly ash
Prunus
Quackgrass
Red Maple
Reed canary grass
Smartweed
Spikerush
Steeple bush
Stick-tights (beggartick)
Strawberry
Timothy
Tussock sedge
Wild lettuce
Wood sorrel
Wood violet
Yarrow

Transect 6:
Arrowhead
Big leaf aster
Blue flag iris
Blueberry
Boneset
Elderberry
Forb (2 unknown spp)
Grass (3 unknown spp)
Hazelnut
Holly
Jewelweed
Lilly-of-the-valley
Pennsylvania sedge
Red maple
Red oak
Rice cut grass
Sedge (3 unknown spp)
Shrub (prunus spp)
White Oak
White pine

Transect 8:
Tamarack bog

(not surveyed – bog difficult to navigate)

Transect 10:
Big leaf aster
Blueberry
Calico aster
Canada blue joint
Carex spp.
Chokecherry
False lilly-of-the-valley
False solomon's seal
Hazelnut
Hog peanut
Lilly-of-the-valley
Mountain mint
Oak
Pennsylvania sedge
Prairie cord grass
Prickly ash
Raspberry
Sarsparilla
Spirea spp.
Stick-tights (beggartick)
Strawberry
White pine



Transect 2:
Birch
Canada blue joint
Clover
Common wood violet
Dogbane
Elderberry
Hemlock
Milkweed (common)
Plantain
Ragweed
Reed canary grass
Smartweed
Turf grass
Wild lettuce
Wood sorrel

Fisheries

The following excerpt is from a memo from Rick Cornelius (DNR Fisheries Biologist) dated 1/11/02. The complete memo is included in the appendix.

Introduction

Because of its shallow depth, Wild Goose Lake is subject to occasional winterkills. The most serious documented winterkill occurred in 1976, when considerable numbers of northern pike, bluegills, yellow perch, black crappies, and bullheads were observed dead on the shoreline. Because of the number of dead bullheads, which are tolerate to low oxygen, the winterkill was considered severe. Largemouth bass and northern pike were restocked following the 1976 winterkill.

The only previous fish survey of Wild Goose Lake occurred in 1993. A moderate bass population was found, and bluegills were common. Only one northern pike was captured, which corroborated the stories of local anglers who said that the northern pike population never recovered from the 1976 winterkill. Additional northern pike stocking took place in 1993, when 182,000 fry were stocked, and in 1997, when 910 fingerlings were stocked.

To update information on the fish population of Wild Goose Lake, an electrofishing survey was conducted on the evening of May 8, 2001. Effort was 0.96 hours of electrofishing covering 1.99 miles of shoreline. In addition, small fish were sampled using four mini-fyke nets and by using a stream shocker to sample 10 shoreline sites on June 26, 2001.

Results and discussion

During spring electrofishing, a total of 39 largemouth bass ranging in size from 11.0 to 20.4 inches in length were captured. The bass catch per effort of 41 per hour indicates that bass are common, and the 2001 bass CPE was considerably higher than in 1993. The bass size distribution was good, with 44% of the captured bass being 14.0 inches or larger. Young of the year bass were common in the mini-fyke nets (Table 2). Growth of largemouth bass is below average for northwest Wisconsin.

A total of 6 northern pike were captured ranging in size from 18.5 to 29.4 inches in length. Northern pike CPE was higher in 2001 than in 1993. However, northerns are typically poorly sampled by electrofishing. Growth of northerns was about average.

Bluegills were by far the most numerous panfish captured. The bluegill size distribution was fair, with a percent stock density of 40% and an RSD-7 of 4%. This is better than the bluegill size distribution found in 1993, which had a PSD of 35% and an RSD-7 of 0%. Young of the year bluegills were common in the mini-fyke nets.

Panfish collected in fewer numbers were pumpkinseeds, yellow perch, black crappies, and warmouth. Golden shiners and white suckers were also captured. Growth data was not collected on panfish.

Conclusions and recommendations

Wild Goose Lake has a fairly desirable fish population. Largemouth bass and northern pike numbers appear greater in 2001 than in 1993. The size distribution of the bluegill population, while only fair, is better in 2001 than in 1993.

Prior to the 1976 winterkill, Wild Goose Lake reportedly had a very good, self-sustaining northern pike population. While the current northern pike population may not be at pre-1976 levels, the population is large enough that it should be self-sustaining. Northern pike spawning habitat is available in the shallow, heavily vegetated bays on the north and west sides of the lake, and the habitat in these bays should not be altered (Figure 1). These bays also provide feeding and nursery areas for fish, and provide habitat for a number of wildlife species. Sensitive areas should be designated on Wild Goose Lake.

Wild Goose Lake has not had a documented serious winterkill since 1976. Late winter dissolved oxygen readings have generally been good. However, since winterkills have occurred in the past, it is probably only a matter of time until another one occurs.

A compressed air aeration system would help prevent future winterkills. However, when winterkills are as infrequent as they are on Wild Goose Lake, it is a hard call as to whether the expense of an aeration system is justified. Equipment costs would probably be $3,000 to $5,000 and annual electric costs would probably be in the $400 to $600 range. The Polk County Sportsmen's Club has helped fund aeration systems on several Polk County lakes. Ultimately it is the decision of lakeshore property owners as to whether or not to initiate an aeration project.

No change in current fishing regulations is recommended. No fish stocking should be necessary unless another winterkill occurs.

Fisheries

According to DNR Fisheries Biologist, Rick Cornelius, "Northern pike spawning habitat is available in the shallow, heavily vegetated bays on the north and west sides of the lake, and the habitat in these bays should not be altered. These bays also provide feeding and nursery areas for fish, and provide habitat for a number of wildlife species."

Modeling

The Wisconsin Lake Modeling Suite (WiLMS) was used to model current conditions, pre-development conditions, and projected development conditions for Wild Goose Lake. Phosphorous the key parameter in the modeling scenarios because it is the limiting nutrient for algal growth in most lakes. Wild Goose Lake was modeled for 12%, 20% and 45% reductions in phosphorous loading.

The following tables and graphs were based on annual external source loading estimates and the Nurnberg model for estimating gross internal loading. The models that appeared to be the best "fit" for Wild Goose Lake were the Reckhow Natural Lake Model (1979) and the Vollenweider Lake Model (1982). The Reckhow model calculates growing season observations. The Vollenweider calculates a spring turnover and growing season average. Both models calculate an estimated phosphorous concentration in the water column (mg/m^3).

Table 1. Wild Goose Lake Current Conditions Prediction

Annual Total P Loading	Reckhow, 1979 Natural Lake Model Predicted P []	Vollenweider, 1982 Lake Model Predicted P []
190.1 kg	19 ug/l	53 ug/l

Table 2. Wild Goose Lake Projected Development Conditions Prediction

Annual Total P Loading	Reckhow, 1979 Natural Lake Model Predicted P []	Vollenweider, 1982 Lake Model Predicted P []
230 kg	23 ug/l	62 ug/l

Table 3. Wild Goose Lake Undeveloped Conditions Prediction

Annual Total P Loading	Reckhow, 1979 Natural Lake Model Predicted P []	Vollenweider, 1982 Lake Model Predicted P []
37.2 kg	3 ug/l	10 ug/l

Tables 1, 2 and 3 indicate that prior to European settlement of this area Wild Goose Lake had a phosphorus concentration of 10 ug/l versus the modeled and observed concentration today of 50 mg/l. Therefore, an overall in-lake phosphorus concentration of 10 mg/l is a potential management goal (however unlikely as described below). Such a level would likely increase water clarity and ensure a quality lake for generations.

The projected development condition bodes grim for Wild Goose Lake. The predicted 62 ug/l in-lake phosphorus concentration will likely bring algal scums. The projected development condition assumes that all forest land (39% of the Wild Goose Lake watershed) will be converted into low density rural residential (~1 house per 2 acres). Although it may be unlikely that all the existing forest land will be converted to such a land use it is not unreasonable to assume that 40% of the developable forest land and crop land will eventually be converted. Under the current zoning law it is possible for such a conversion to occur.

Restoring the watershed to a predevelopment condition and reducing the in-lake phosphorus concentration to 10 ug/l is an unlikely scenario based on both environmental and economic restraints. (***However it is heartening to know that limiting nutrient inputs to the lake will likely result in improvements***.) Therefore, the lake was modeled at 12%, 20% and 45% reductions in external phosphorus loading.

Such reductions may be possible through the implementation of best management practices (BMPs), chemical treatment of the lake, lake aeration, or some combination of these management options. Limiting horsepower and/or speed limits on the lake could also further reduce internal phosphorus loading.

Modeling

Table 4. Wild Goose Lake Current Conditions Prediction with a 12% phosphorous reduction

Annual Total Loading	Reckhow, 1979 Natural Lake Model Most Likely P[]	Vollenweider, 1982 Lake Model Most Likely P []
170.1 kg	17 ug/l	48 ug/l

Table 5. Wild Goose Lake Current Conditions Prediction with a 20% phosphorous reduction

Annual Total P Loading	Reckhow, 1979 Natural Lake Model Most Likely P []	Vollenweider, 1982 Lake Model Most Likely P []
156.7 kg	21 ug/l	45 ug/l

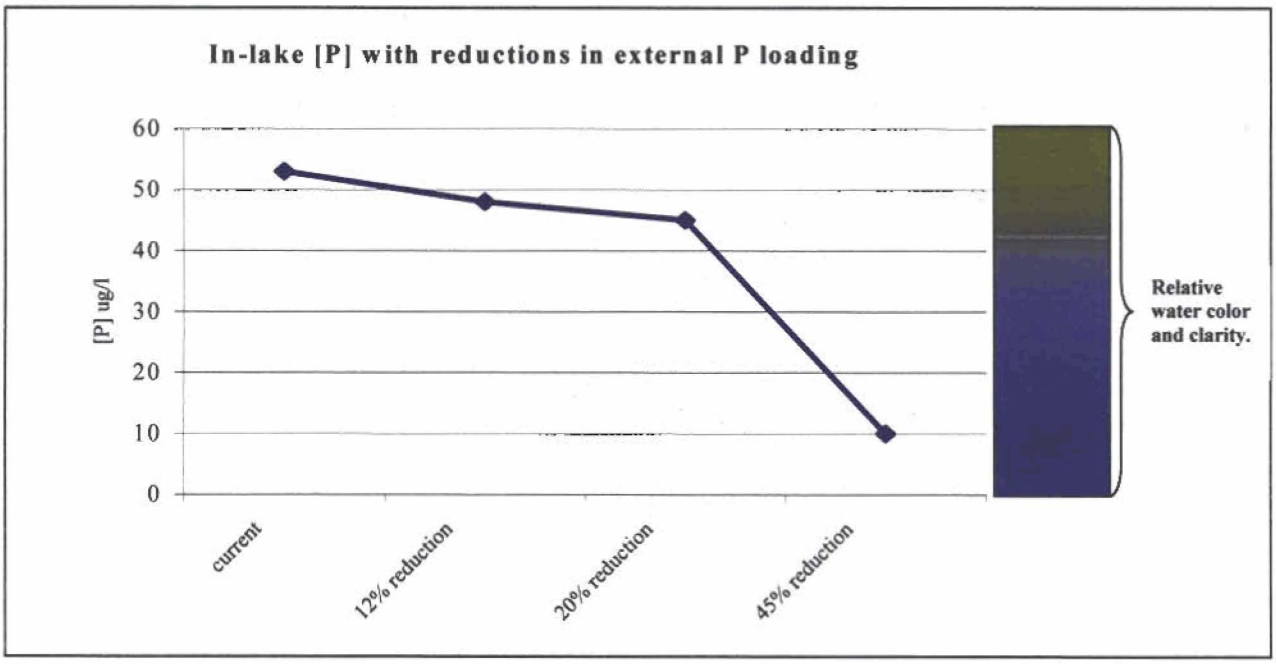
Table 6. Wild Goose Lake Current Conditions Prediction with a 45% phosphorous reduction

Annual Total P Loading	Reckhow, 1979 Natural Lake Model Most Likely P []	Vollenweider, 1982 Lake Model Most Likely P []
115.0 kg	11 ug/l	34 ug/l

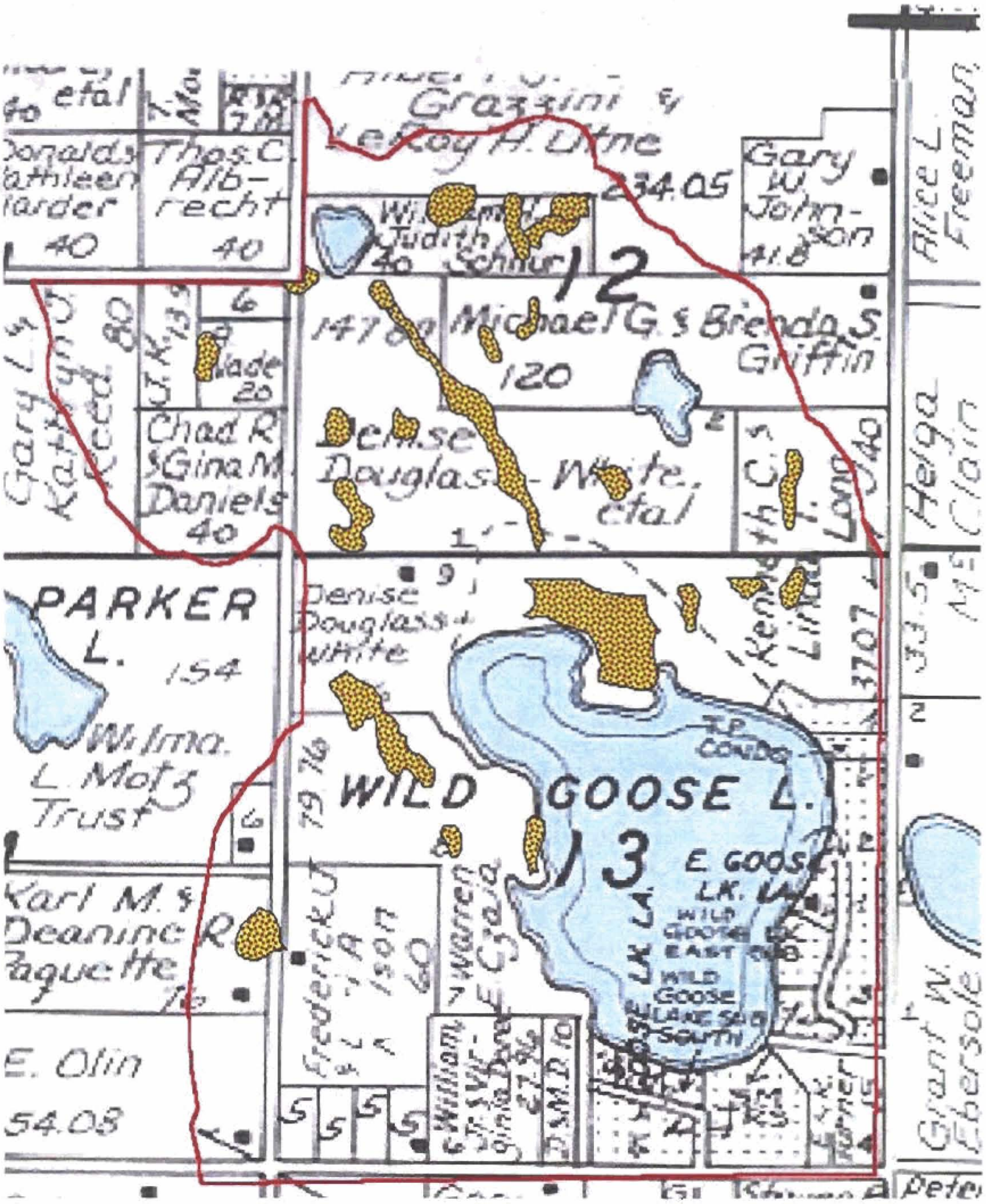
A 45% reduction of phosphorous loading from external sources would significantly affect total phosphorous concentrations in Wild Goose. Such a reduction would classify the lake as mildly eutrophic. A perceived improvement in water clarity may not likely be noticeable even though the lake chemistry would shift towards something that would more closely resemble predevelopment conditions. The graph at the bottom of the page illustrates the total phosphorus concentration based on 12%, 20% and 45% reductions in external phosphorous loading.

Phosphorus may be further reduced within the water column reducing internal loading through horsepower and motor restrictions. Such activity resuspends sediment and, consequently, nutrients and makes them available to plants and algae.

The empirical models in WiLMS estimates that internal loading makes up approximately 33% of the total phosphorous in the water column. Therefore, a significant reduction in the internal loading will have the greatest effect on the in-lake phosphorous concentration in combination with upland BMPs such as shoreline restoration.



Wet Soils Unsuitable for Buildings



The areas highlighted on this map have severe building limitations due to wet soils. These sites are prime targets for preservation – primarily because they are difficult to develop. Other sites may be identified for preservation at a future date based on scenic beauty, wildlife habitat, groundwater recharge area, or any number of factors. Wet soils are simply a logical first step.

Appendix A
Water chemistry

Methods

Volunteers took in-lake water chemistry samples every month from April to November 2001. These samples were taken near the center of the lake to get an idea of the chemistry of the lake as a whole. Modeling and testing later showed that Wild Goose did not stratify for long, if at all, so the water chemistry samples should indeed be indicative of the entire lake.

The samples where taken using a Van Dorn water sampler. Two Samples where taken on each sampling date. One was taken one meter from the surface and one was taken one meter off the bottom as not to stir sediments. These samples were then sent to the Wisconsin State Lab of Hygiene for analysis as per their protocols.

Assessment

One of the problems with sampling was the inadvertent inclusion of bottom sediment in the bottom-water samples. There were some bottom-water samples that tested over 1,000 ug/l of phosphorus. This level is out of sync with other parameters, the history, and the appearance of the lake. This is always a risk when using this type of equipment on shallow lakes.

Overall the sampling on Wild Goose went very well and most of the samples appear accurate. The water chemistry should continue to be studied through the state's Adopt-a-Lake program so that trends can be determined before the lake undergoes negative changes. With continued development in the region and the threat of airborne pollutants lake managers and residents must remain vigilant.

Appendix B
Algae analysis

On August 14, 2002 an algae sample was taken on Wild Goose Lake and sent to the Wisconsin State Laboratory of Hygiene Phychology lab for identification.

The samples were taken in the middle of the lake approximately one meter below the surface with a Van Dorn sampler. The samples were poured into 250 ml bottles and put on ice before being Priority Mailed to the lab.

Several species of green algae, cyanobacteria, diatoms, and one species of pyrrophyte were all identified (see table). All of the species identified were native to the state.

See the section *Chlorophyll-a* on page 12-13 for a full analysis.

Family	*Genus/Species*	# of colonies in sample
Chlorophycota (green algae)	*Pediastrum*	3
	Scenedesmus	8
	Selenastrum	20
	Staurastrum	12
Cyanophycota (blue-green algae or cyanobacteria)	*Anabaena*	29
	Aphanocapsa	620
	Aphanothece	3
	Chrooccus	12
	Dactylococcopsis	75
Bacillariophyta (diatoms)	*Melosira**	25
	*Tabellaria**	4
Pyrrophycophyta	*Peridinium wisconsinense***	78

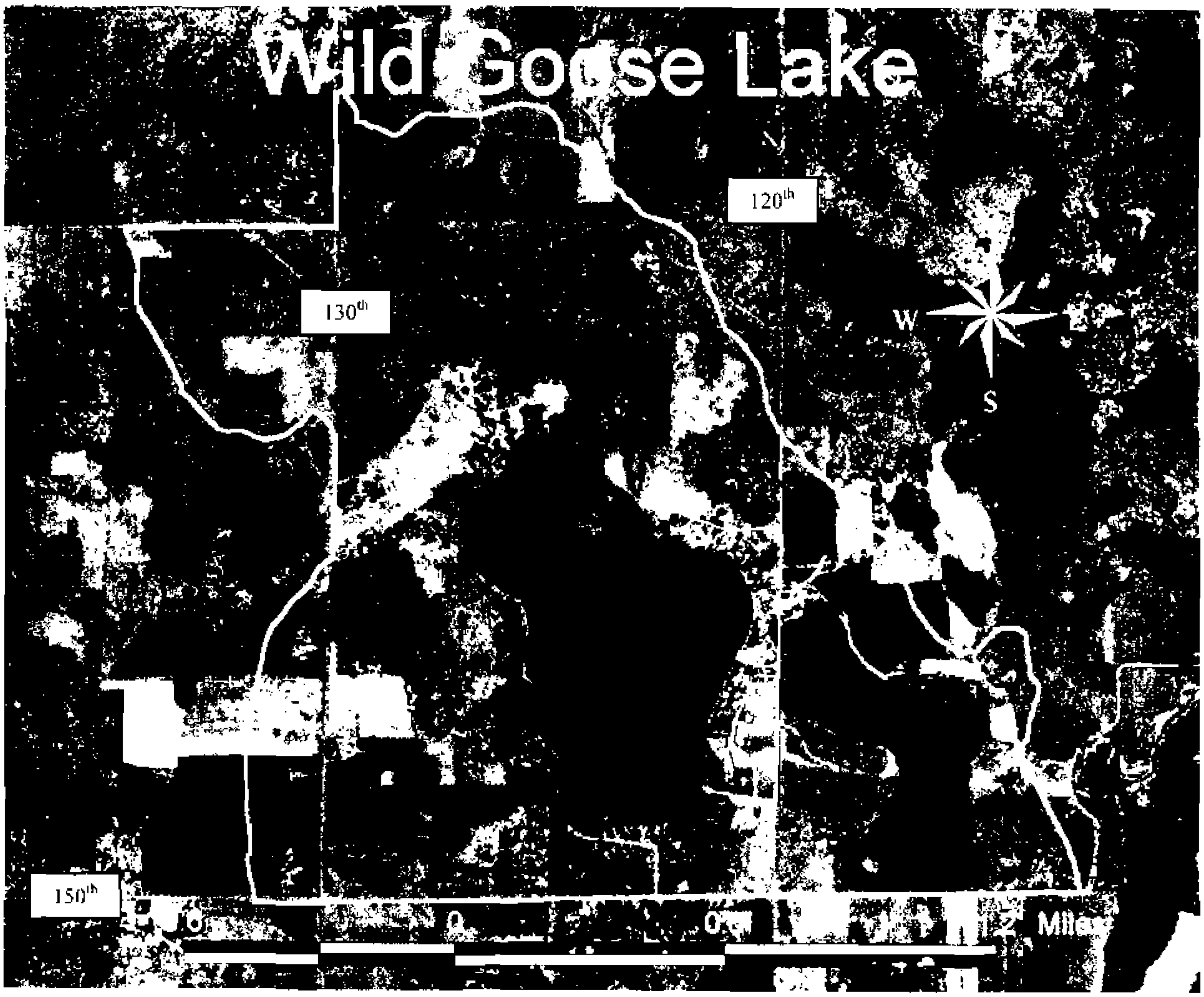
*Not common during time of the year that sample was taken due to typical low silica content in lake.
**Not common throughout the state: only in northern lakes

Appendix C
Sociologic Landowner Survey

Wild Goose Lake -- Property Owner Survey, 2001

The following survey is a component of the Wild Goose Lake Planning Grant. Your responses are very important and will help guide the future management of Wild Goose Lake and its watershed.

What is the Wild Goose Lake Watershed? The area on the map within the white line is the Wild Goose Lake watershed. A watershed is an area of land that drains to a certain point on the landscape. All rain and snowmelt that originates within the white line drains to Wild Goose Lake. Therefore, many activities within the watershed have a direct effect on the water quality of the lake.



The Wild Goose Lake Planning Grant is currently being undertaken by the Wild Goose Lake Association, Polk County Land & Water Resources Department, and the Wisconsin Department of Natural Resources

Appendix D

Aquatic plant survey

Methods

Rooting depth was first determined by raking the lake bottom. The depth was determined to be approximately 2.4 meters. This is fairly consistent with an estimation of light penetration based off the equation: $E = 0.016Chl + 1.3/\sqrt{Sd}$ (where *Chl* equals chlorophyll a concentration, *Sd* equals the secchi depth, and *E* is the light penetration). Light penetration was determined to be 2.05 meters. The deeper rooting depth may be due to light scattering from organic material and suspended solids in the water column (Scheffer, 1998).

When a rooting depth was established fifteen sampling points were selected spaced fairly evenly around the lake. Transect lines were set at shore and a 100' tape measure was stretched seaward to the rooting depth or at 100 feet, whichever came first. (Note: Transects 10-12 were not completed due to equipment failure and time constraints).

The Jessen and Lounds rake method was used to sample. This involves using a rake with a handle and making a *figure eight* in an area that is approximately 1 m^2. The rake is then turned 180° and brought to the surface where the sample can be assessed.

These samples were assessed by identifying every species on the rake head, and the approximate percentage of the tines covered by each species (*e.g. Potamogeton robbinsii* 40%). This can give estimation of species composition and/or dominance on a site and micro-community composition based on water depth. The presence of a species in a sample was then used in a floristic quality equation.

Data

See the map Aquatic Plant Survey and Litoral Zone on page 31 for data.

Assessment

Floristic quality is a rapid assessment metric designed to evaluate the closeness that the flora of an area is to that of an undisturbed condition. It can be used to identify natural areas, compare the quality of different sites or locations within a single site, monitor long-term floristic trends, and monitor habitat restoration efforts. This assessment is important, as in Wisconsin there is a demand by the Department of Natural Resources (DNR), local governments, and riparian landowners for considering the quality of lake plant communities in a variety of planning, zoning, sensitive area designation, and aquatic plant management decisions (Nichols, 1999).

Using the equation $I = \overline{C}\sqrt{N}$ (where *I* is the floristic quality, $\overline{C}$ is the average coefficient of conservation and $\sqrt{N}$ is the square root of the number of species) the floristic quality of Wild Goose Lake was determined to be 27.94. The average for this area of the state (North Central Harwood Forest) was 17 to 24.4 with a median of 20.9. Wild Goose's index is probably quite high because of the abundance of sensitive species: *Eriocaulon aquaticum*, *Myriophyllum tenellum*, *Potamogeton robbinsii*, and *Utriculatia vulgaris* (sensitive designation after Davis and Brinson, 1980) (Nichols et. al., 2000).

Conclusion

The rich aquatic plant community of Wild Goose Lake is most likely an invaluable part of the lake's ecosystem (particularly to invertebrates and fish) and needs to be protected. The aquatic plant community should continue to be monitored in order to ensure a healthy ecosystem and gauge the effectiveness of management techniques.

Appendix E
Terrestrial plant survey

Introduction

Vegetative communities have long been studied in Wisconsin for information about wildlife habitat, species diversity, and hydrology and evapotranspiration within a watershed.

Polk County lies in a vegetative tension zone that is a mix of northern and southern vegetative communities. These communities include northern mesic forest, southern mesic forest, southern oak forest, pine forest, pine barrens, lowland hardwood forest, and sedge meadow. Wild Goose falls into the northern mesic forest portion of the county, however, there are several micro-communities within the watershed.

Methods

Several sites were chosen at random and sampled in an effort to best represent the vegetation around the lake. The survey was done by staff from the Polk County LWRD and the Wisconsin DNR. (Note: Transects were not completed on the east and south shores due to time constraints.)

At each site a transect line was drawn from the ordinary high water mark 40 feet inland. This distance was used because the local *Shoreland Protection Zoning Ordinance* only protects vegetation 35 feet from the OHWM. A 1-m^2 metal frame was placed every ten feet and all the species within the square were identified. In addition the percentage of forbs, grass, shrubs, trees, and other material(e. g. rock, coarse woody debris) were calculated within the square.

Data

Data can be found on the *Terrestrial Plant Survey* map on page 33.

Conclusions

Wild Goose Lake's watershed has several micro communities: pine forest, goldenrod meadow, northern mesic forest, and a tamarack bog/floating sedge meadow. This diverse mix of communities should be maintained and enhanced. At developed portions of the shoreline restoration may re-establish these communities.

Native plant communities increase a soil's field capacity (ability to hold water) through their deep root systems and ability to transpire water. This process reduces pollution that would otherwise end up in the lake.

The micro-communities cited above also provide habitat for many species of wildlife. Particular interest was placed on assessing the riparian habitat within the Wild Goose Lake watershed in response to steady and intense development pressure on lakeshores in this region. Protecting native vegetation near the shore is the only way to secure a plentiful and diverse wildlife population on and near Wild Goose Lake.

Appendix F
Fish survey

TO: Bill Smith

FROM: Rick Cornelius

DATE: January 11, 2002

SUBJECT: Fish Survey, Wild Goose Lake (2600400), Polk County - 2001

Introduction and Methods

Wild Goose Lake is 182 acres in size and has a maximum depth of 12 feet and a mean depth of 8 feet. This landlocked lake is located in central Polk County. Residential development on the lakeshore is moderate, and a township public boat landing is located on the southeast side of the lake. D.N.R.-owned islands are located on the north end and west side of the lake.

The water of Wild Goose Lake is somewhat turbid, and has an MPA of 20 ppm. Moderate algae blooms occur, and Secchi disk readings averaged 2.3 feet in 1991 and 2.8 feet in 1992. Littoral substrate is primarily sand, gravel, and muck. Several wetland areas are associated with the lake, mostly on the north and west sides.

Because of its shallow depth, Wild Goose Lake is subject to occasional winterkills. The most serious documented winterkill occurred in 1976, when considerable numbers of northern pike, bluegills, yellow perch, black crappies, and bullheads were observed dead on the shoreline. Because of the number of dead bullheads, which are tolerate to low oxygen, the winterkill was considered severe. Largemouth bass and northern pike were restocked following the 1976 winterkill.

The only previous fish survey of Wild Goose Lake occurred in 1993. A moderate bass population was found, and bluegills were common. Only one northern pike was captured, which corroborated the stories of local anglers who said that the northern pike population never recovered from the 1976 winterkill. Additional northern pike stocking took place in 1993, when 182,000 fry were stocked, and in 1997, when 910 fingerlings were stocked.

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Results and Discussion

During spring electrofishing, a total of 39 largemouth bass ranging in size from 11.0 to 20.4 inches in length were captured. The bass catch per effort of 41 per hour indicates that bass are common, and the 2001 bass CPE was considerably higher than in 1993 (Table 1). The bass size distribution was good, with 44% of the captured bass being 14.0 inches or larger. Young of the year bass were common in the mini-fyke nets (Table 2). Growth of largemouth bass is below average for northwest Wisconsin (Table 3).

A total of 6 northern pike were captured ranging in size from 18.5 to 29.4 inches in length. Northern pike CPE was higher in 2001 than in 1993. However, northerns are typically poorly sampled by electrofishing. Growth of northerns was about average.

Bluegills were by far the most numerous panfish captured. The bluegill size distribution was fair, with a percent stock density of 40% and an RSD-7 of 4%. This is better than the bluegill size distribution found in 1993, which had a PSD of 35% and an RSD-7 of 0%. Young of the year bluegills were common in the mini-fyke nets.

Panfish collected in fewer numbers were pumpkinseeds, yellow perch, black crappies, and warmouth. Golden shiners and white suckers were also captured. Growth data was not collected on panfish.

Conclusions and Recommendations

Wild Goose Lake has a fairly desirable fish population. Largemouth bass and northern pike numbers appear greater in 2001 than in 1993. The size distribution of the bluegill population, while only fair, is better in 2001 than in 1993.

Prior to the 1976 winterkill, Wild Goose Lake reportedly had a very good, self-sustaining northern pike population. While the current northern pike population may not be at pre-1976 levels, the population is large enough that it should be self-sustaining. Northern pike spawning habitat is available in the shallow, heavily vegetated bays on the north and west sides of the lake, and the habitat in these bays should not be altered (Figure 1). These bays also provide feeding and nursery areas for fish, and provide habitat for a number of wildlife species. Sensitive areas should be designated on Wild Goose Lake.

Wild Goose Lake has not had a documented serious winterkill since 1976. Late winter dissolved oxygen readings have generally been good (Table 4). However, since winterkills have occurred in the past, it is probably only a matter of time until another one occurs.

A compressed air aeration system would help prevent future winterkills. However, when winterkills are as infrequent as they are on Wild Goose Lake, it is a hard call as to whether the expense of an aeration system is justified. Equipment costs would probably be $3,000 to $5,000, and annual electric costs would probably be in the $400 to $600 range. The Polk County Sportsmen's Club has helped fund aeration systems on several Polk County lakes. Ultimately it is the decision of lakeshore property owners as to whether or not to initiate an aeration project.

No change in current fishing regulations is recommended. No fish stocking should be necessary unless another winterkill occurs.

Approved:

Phil Anderson: ____________________

Tom Beard: ____________________

cc: Cumberland office
Bureau of Fish & Habitat
Local Warden
Steve AveLallemant

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Department of Natural Resources

LAKE ELECTROFISHING DATA COLLECTION SHEET (3.0 in. - 13.1 in.)
Form 3600-190 4-92

Lake: Wild Goose	MWB Code: 2600400	Date: 05-06-01	County: Polk County	Collector: Lund
Target Fish:	Survey Type:	Mark Given	Water Temp:	Time:
Adverse Conditions: Poor conductivity and poor water clarity		Water Conduct:		Station:
Volts: 490	Amps: 1.5	Current Type: AC	Pulse Rate:	Duty Cycle:
Gear Type: Boomshocker	Start Time:	End Time: 0.96 hours		Distance Shocked: 1.99 miles
# of Dippers: 2	Entire Shoreline Shocked: Yes	Dip net mesh size: 3/8		Water Clarity: Turbid

Species	BG	PS	Y.P.	B.C.	War		BG	PS	Y.P.	B.C.
Inches						Inches				
3.0	8					8.1		1		
3.1	1					8.2				1
3.2	4					8.3				
3.3	2					8.4				
3.4	5		1			8.5				
3.5	1					8.6				
3.6						8.7				
3.7	3					8.8				
3.8	1					8.9				
3.9	2					9.0				
4.0	8				1	9.1				
4.1	6					9.2				
4.2	8					9.3				
4.3	8					9.4				
4.4	9					9.5				
4.5	4					9.6				
4.6	5					9.7				
4.7	2	1				9.8				
4.8	4					9.9				
4.9	6					10.0				
5.0	6					10.1				
5.1	4					10.2				
5.2	5			1		10.3				
5.3	6		1			10.4				
5.4	4					10.5				
5.5	5	1				10.6				
5.6	10					10.7				
5.7	11					10.8				
5.8	14					10.9				
5.9	6	1				11.0				
6.0	14					11.1				
6.1	7					11.2				
6.2	13	1				11.3				
6.3	13					11.4				
6.4	15	2				11.5				
6.5	9					11.6				
6.6	5					11.7				
6.7	6					11.8				
6.8	9	2				11.9				
6.9	4					12.0				
7.0	3			1		12.1				
7.1		1				12.2				
7.2	3	3				12.3				
7.3	2					12.4				
7.4	2					12.5				
7.5		2				12.6				
7.6						12.7				
7.7						12.8				
7.8				2	1	12.9				
7.9				1		13.0				
8.0				1		13.1				
Totals-	263	15	2	7	2					

Other fish: (can include rarely caught species and fish greater than 13.1 inches) Golden Shiner - present White Sucker - present

Department of Natural Resources

LAKE ELECTROFISHING DATA COLLECTION SHEET
Form 3600-185 Rev.4-92

Lake: Wild Goose	MWB Code: 2600400	Date: 05/08/01	County: Polk	Collector: Lund
Target Fish:	Survey Type:	Mark Given:	Water Temp:	Time:
Adverse Conditions: poor water quality		Water Conduct: Poor		Station:
Volts: 490	Amps: 1.5	Current Type: AC	Pulse Rate:	Duty Cycle:
Gear Type: Boomshocker	Start Time:	End Time: 0.96 hr.	Distance Shocked: 1.99mi	
# of Dippers: 2	Entire Shoreline Shocked: yes	Dip net mesh size: 3/8		Water Clarity: turbid

Species: Size Range	Largemouth bass	Northern pike		
3.0 - 3.4				
3.5 - 3.9				
4.0 - 4.4				
4.5 - 4.9				
5.0 - 5.4				
5.5 - 5.9				
6.0 - 6.4				
6.5 - 6.9				
7.0 - 7.4				
7.5 - 7.9				
8.0 - 8.4				
8.5 - 8.9				
9.0 - 9.4				
9.5 - 9.9				
10.0 - 10.4				
10.5 - 10.9				
11.0 - 11.4	1			
11.5 - 11.9	2			
12.0 - 12.4	1			
12.5 - 12.9	3			
13.0 - 13.4	11			
13.5 - 13.9	4			
14.0 - 14.4	7			
14.5 - 14.9	4			
15.0 - 15.4				
15.5 - 15.9	3			
16.0 - 16.4				
16.5 - 16.9				
17.0 - 17.4	1			
17.5 - 17.9				
18.0 - 18.4				
18.5 - 18.9		1		
19.0 - 19.4	1			
19.5 - 19.9		1		
20.0 - 20.4	1	2		
20.5 - 20.9				
21.0 - 21.4				
21.5 - 21.9				
22.0 - 22.4				
22.5 - 22.9				
23.0 - 23.4		1		
23.5 - 23.9				
24.0 - 24.4				
24.5 - 24.9				
25.0 - 25.4				
25.5 - 25.9				
26.0 - 26.4				
Total	39	6		

Size Range	Species: NP	
27.0 - 27.4		
27.5 - 27.9		
28.0 - 28.4		
28.5 - 28.9		
29.0 - 29.4	1	
29.5 - 29.9		
30.0 - 30.4		
30.5 - 30.9		
31.0 - 31.4		
31.5 - 31.9		
32.0 - 32.4		
32.5 - 32.9		
33.0 - 33.4		
33.5 - 33.9		
34.0 - 34.4		
34.5 - 34.9		
35.0 - 35.4		
35.5 - 35.9		
36.0 - 36.4		
36.5 - 36.9		
37.0 - 37.4		
37.5 - 37.9		
38.0 - 38.4		
38.5 - 38.9		
39.0 - 39.4		
39.5 - 39.9		
40.0 - 40.4		
40.5 - 40.9		
41.0 - 41.4		
41.5 - 41.9		
42.0 - 42.4		
42.5 - 42.9		
43.0 - 43.4		
43.5 - 43.9		
44.0 - 44.4		
44.5 - 44.9		
45.0 - 45.4		
45.5 - 45.9		
46.0 - 46.4		
46.5 - 46.9		
47.0 - 47.4		
47.5 - 47.9		
48.0 - 48.4		
48.5 - 48.9		
49.0 - 49.5		
49.5 - 49.9		

F-H

Table 1. Electrofishing Catch Per Effort of Gamefish and Panfish, Wild Goose Lake

	Catch per Effort (Number/Hour)					
Date	LM Bass	N. Pike	Bluegill	Pumpkinseed	Crappie	Perch
09-23-93	26	1	128	5	8	4
05-08-01	41	6	274	16	7	2

Table 2. Fish Captured Using Mini-Fyke Nets, Wild Goose Lake, 2001

Date: June 25-26,2001
Net Nights: 4

Species	Young of the year	Other	Total
Bluegill	145	51	196
Largemouth bass	165	0	165
Pumpkinseed	0	6	6
Warmouth	0	2	2
Yellow perch	7	1	8

Table 3. Age-Length Relationships of Gamefish, Wild Goose Lake, 2001

Age	Number	Average Length	Range	NW Wisc Average
Largemouth Bass				
5	2	11.6	11.3 - 11.9	13.0
6	3	12.2	11.5 - 12.7	15.0
7	10	13.3	12.5 - 14.0	16.2
8	6	14.6	13.3 - 15.5	17.5
9	2	14.3	14.3 - 14.3	18.5
10	2	17.6	15.8 - 19.3	19.0
12	1	20.4	20.4	--
Northern Pike				
3	2	19.0	18.5 - 19.5	18.9
4	2	21.7	20.0 - 23.3	19.7
5	1	20.1	20.1	21.7
7	1	29.3	29.3	26.3