Future of the Lakes

Scenarios for the Future of Wisconsin's Northern Highland Lake District

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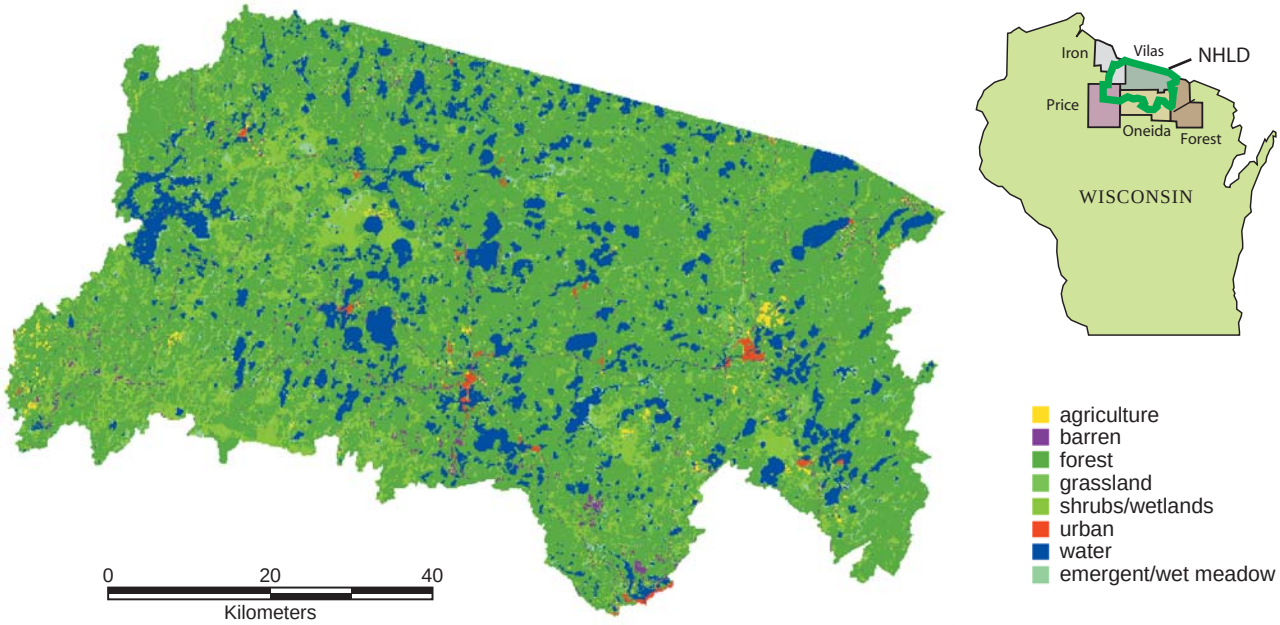
Illustrations by Bill Feeny

a project of the Center for Limnology
University of Wisconsin Madison
and the Resilience Alliance

More information: lakefutures.wisc.edu

June 2003



Note to Readers

This booklet presents 4 plausible futures for the Northern Highlands Lake District of Wisconsin. The storylines emerged from an assessment process and workshops conducted in an early stage of the Millennium Ecosystem Assessment. The paper by Peterson et al. (2003) presents more information about the Northern Highlands Lake District and the assessment process.

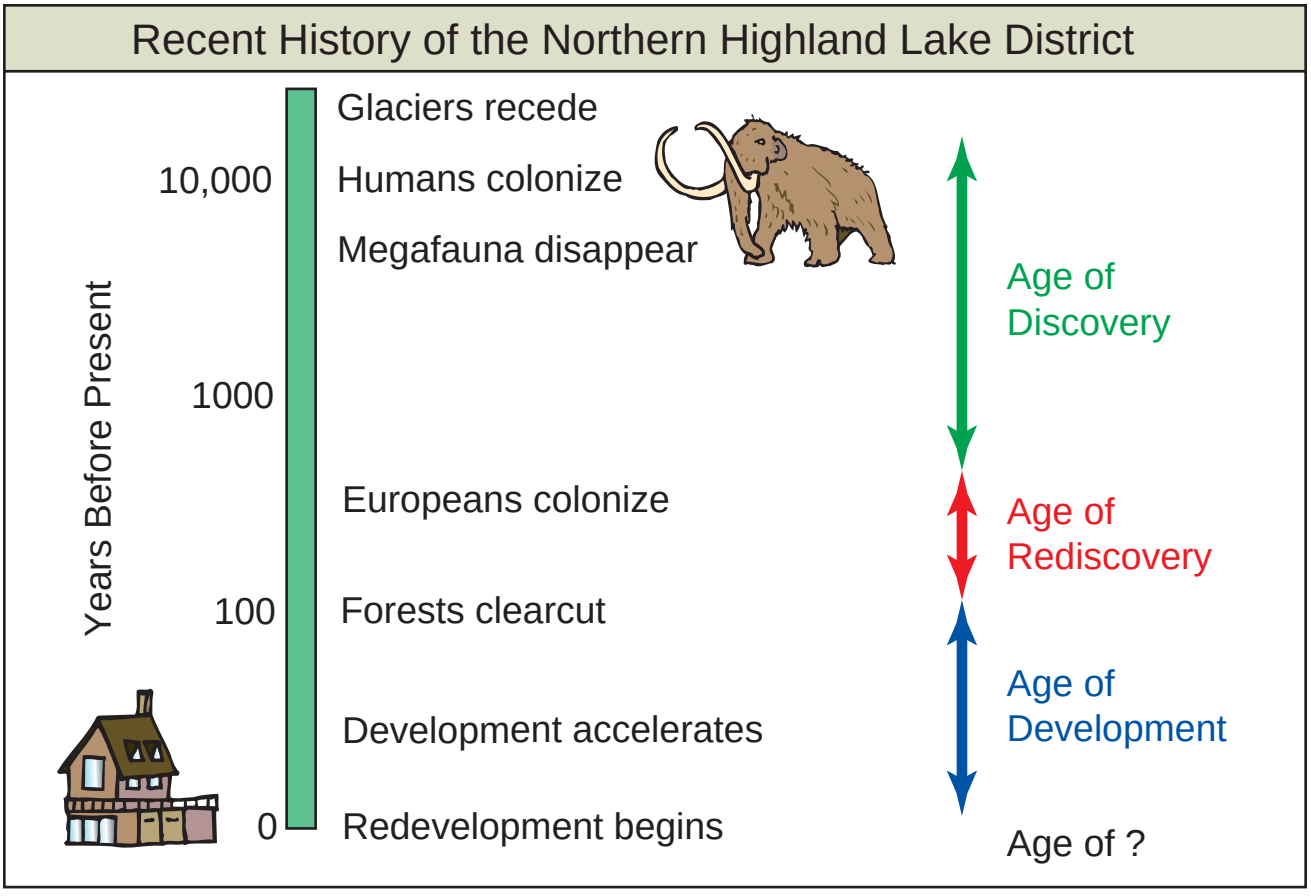
The booklet was initially published in paper form and distributed to decision-makers and interested citizens. The website lakefutures.wisc.edu served as a repository of information for the project. That website is no longer supported. However more than 40 years of data and publications about the Northern Highlands are available on a website that is regularly updated and maintained by the North Temperate Lakes Long-Term Ecological Research program:

https://lter.limnology.wisc.edu/

Steve Carpenter
Madison, Wisconsin
25 November 2023

Literature cited

Peterson, G. D. and others 2003. Assessing Future Ecosystem Services: a Case Study of the Northern Highlands Lake District, Wisconsin. Conservation Ecology **7: http://www.consecol.org/vol7/iss3/art1/**


Recent History of the Northern Highland Lake District
Years Before Present
10,000
1000
100
0
Glaciers recede
Humans colonize
Megafauna disappear
Europeans colonize
Forests clearcut
Development accelerates
Redevelopment begins
Age of Discovery
Age of Rediscovery
Age of Development
Age of ?

Introduction

The Northern Highlands Lake District of Wisconsin (NHLD) is in rapid transition. Such big transitions have happened before. Twelve thousand years ago as glaciers receded, lakes were formed. Archeological evidence suggests that humans began to inhabit the region soon thereafter. Huge animals, such as woolly mammoths, disappeared early in the era that we've labeled the Age of Discovery. Through the fur trade, Europeans entered the region about 500 years ago during the Age of Rediscovery. Following the arrival of Europeans, native populations decreased significantly, while newcomers took ownership of the land. Entering into the Age of Development, humans logged the forests to provide timber for the growing cities south of the NHLD.

Now we are entering a new age, in which woolly mammoths have been replaced by mammoth homes. Currently, the number and size of lakeshore buildings is expanding. At the same time, increasing numbers of recreational visitors are creating unprecedented pressures in the region. Property values are at an all-time high, with an increasing number of second homes, but few desirable areas left for new construction. Some people welcome the economic benefits of tourism, while others believe it interferes with their traditional Northwoods way of life. Tensions have risen over land use and shoreline management. Recreational activities continue to expand, ranging from quiet sports like fishing and canoeing to motor sports such as boating and ATV use. Warmer, shorter winters with less snow impact the tourism industry as well as the region's ecosystems. Invasive species and emergent diseases also threaten the quality of the environment in the region.

Many changes in the NHLD are happening simultaneously. This makes them more difficult to understand. With so many changes happening at once, it seems hard to think about the future in a cohesive way. The scenarios presented in this booklet are one attempt to think about the possible futures of the NHLD.

Looking toward the future: What are Scenarios?

Humans are set apart from the rest of the animal world by our ability to learn how to learn. The word "learn" implies acquiring knowledge through study, practice, or instruction. Many scientists believe that this ability enables us to think ahead so that we can make decisions about what to do today. We try to anticipate the future when making decisions, but plans are always contingent on unexpected changes. We've all been surprised by something unexpected, and likely we will be surprised by unknown future events. Not knowing the future carries risks. How do we account for surprises that we cannot possibly predict? To reduce some of the risks associated with uncertainties, "looking ahead" has become formalized through a process called scenario planning.

Scenario planning began after WWII as a type of war game analysis. Scenario planning later became a part of business planning. The oil company Royal Dutch/Shell further developed scenario planning, which played a role in that company's success during and after the world oil price crises in the 1970s. More recently, scenarios have been used in global environmental assessments such as the

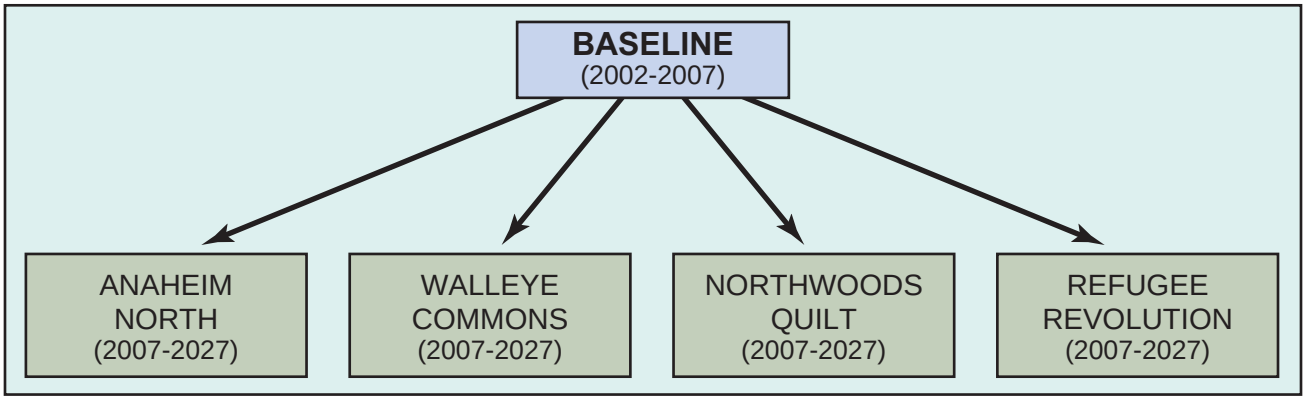
Millennium Ecosystem Assessment (http://www.millenniumassessment.org). Scenario planning has also been used during the transition to democracy in South Africa, and in community planning exercises in the USA, Europe, and Asia.

Scenarios have been useful in business planning, global problem-solving, and community development, but why use this approach in the NHLD? Remarkably, there have been few attempts to use scenarios to address ecological issues. The NHLD is one of the first projects of this type and will provide an important foundation for future ecology-based scenarios. More importantly, scenarios can help the people of the NHLD to think about how the region might best develop. There is a need for creative approaches to consider and plan for the future of the region. Scenarios help organize information, and they are easy to understand. Scenario planning is also a good way to open discussion among different groups of people who might not otherwise interact. Scenarios allow us to consider many possible futures instead of trying to predict a single result. These possible futures are not likely to come true exactly as described in the scenarios, but they let us think in broader terms about the impacts of the plans and choices we make.

Scenarios

Four different scenarios were developed for the NHLD through a series of workshops involving people from the University of Wisconsin, and northern Wisconsin. Each scenario grows out of from a shared baseline story, which summarizes events from 2002-2007. Then, each scenario traces a different sequence of events until 2027. The storylines are described as if looking backward from the year 2030.

Scenarios start from a common baseline, 2002-2007. Four scenarios describe events from 2007-2027.



Baseline

At the dawn of the 21st century, northern Wisconsin (specifically, the NHLD) was a good place to live or visit. There were diverse and beautiful lakes, rich forests, good people, and just enough stores to get what people needed without having a lot of what they don't want. But the traditional Northwoods environment was changing, as it had changed over the past decades. In the decade from 1990-2000 population grew by 15%, and property values doubled. During this time, there was an increase in the number of second homes in the area, as well as an increase in the size and extravagance of those homes. Despite the stock market decline and recession in the early years of the 2000s, property values continued to increase in the NHLD at a faster rate than in Wisconsin as a whole. Many retirees moved into the area. Health care improved. Development of service-oriented businesses increased, including sorts of businesses normally found in bigger cities, such as gourmet coffee shops and delicatessens.

On the Lac du Flambeau reservation, the casino brought new wealth. The number of tribal residents increased as tribal members returned to participate in the growing economy, and young people stayed because jobs were available. The number of pupils in the Lac du Flambeau Public School increased even as the school-age population in most of the NHLD declined. Living resources – fish and game – on tribal lands were flourishing.

Unlike in the past, the NHLD felt like it was filling up. There were confrontations in county boards over land use and shoreline regulations. Communication was poor between non-resident lakeshore property owners and local residents. The non-resident lakeshore owners did not vote in the NHLD and sometimes felt that they were subject to taxation without representation. Permanent residents of the NHLD were often less wealthy than the lakeshore owners, and felt that they provided services that the non-residents took for granted.

Over the years, the environment had been changing. Weather was more variable. Warm, wet winters reduced skiing and snowmobiling. There was debate about whether ATVs could or should fill the economic niche once filled by snowmobiles. There were conflicts between jet-ski lovers and haters. There were disagreements about how much of the landscape should be devoted to loud and motorized versus quiet and muscle-powered recreation activities. Invasive species ranging from weedy plants to rusty crayfish and rainbow smelt transformed local ecosystems. Removal of woody habitat from nearshore areas increased the vulnerability of lakes to intensive fishing. Game fish populations declined. Hatcheries became more important for maintaining fisheries, but also brought risk of disease. Many residents were unhappy about the replacement of old businesses – lodges, restaurants, and stores – by chains from outside the NHLD.

Stresses intensified when, as had long been planned, the road from southern Wisconsin to Minocqua was expanded into a four-lane highway to improve access during 2005. As expected, easy access brought more tourists and more part-time and full-time residents. Many factors explained the attractions of the traditional Northwoods area at this time: outdoor recreation, wildlife, fishing, rural friendliness, easy access from nearby cities, and fears of urban living deriving from an increased perception of risks associated with terrorism and war. However, the region was unable to assimilate these new people in the same way as it had in the past. There were no new home sites, lake front property was increasingly costly, and there were occasional traffic jams in towns. Increased tensions in politics, business, on the trails, and on lakes led to a general feeling that something had to change. But what should change? While local people and temporary visitors agreed that they loved the traditional Northwoods environment and that its essence was disappearing, there was little agreement about how and if those trends could be changed.

Baseline (2002-2007).

Immediate right: NHLD landscape showing four representative lakes.
Facing page: Cutaway views of the four lakes.

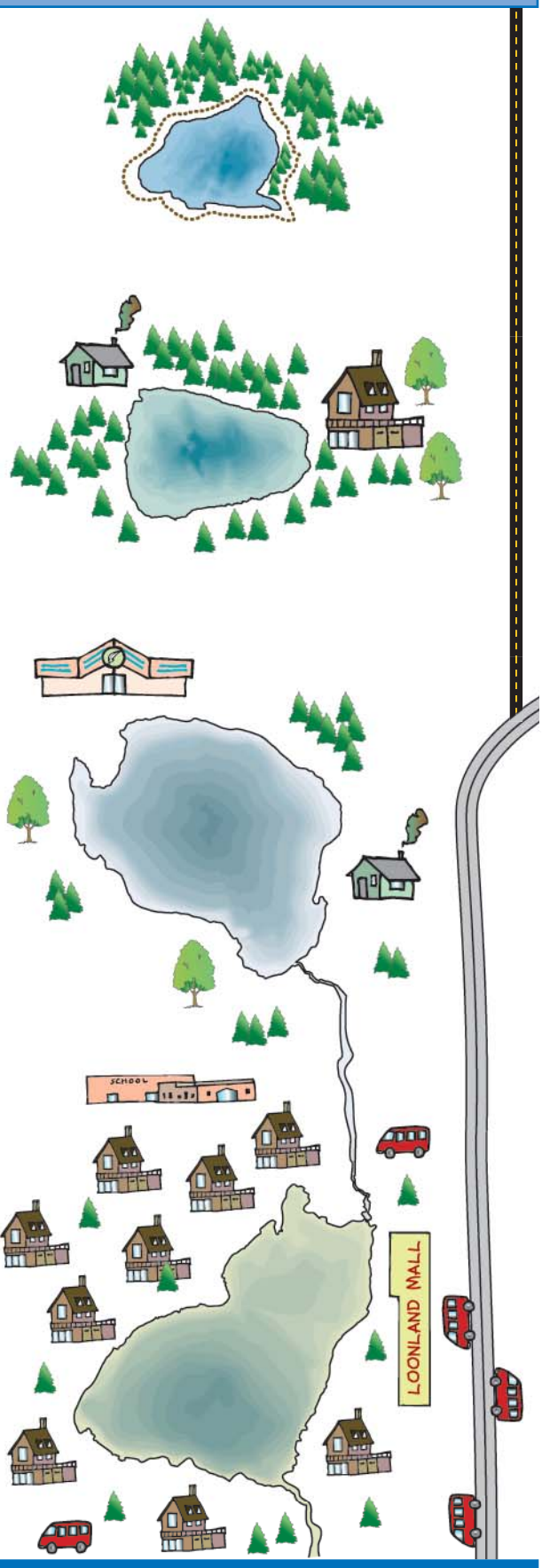
Lakes within a region are often very different from each other. Here, we illustrate four lakes from high to low elevation on the landscape. The highest lakes are fed by rainwater and groundwater, while the lowest lakes are connected by streams. Lakes higher in the landscape tend to be smaller and farther away from roads and other human impacts. Lakes lower in the landscape are larger and more developed, closer to roads and settlements.

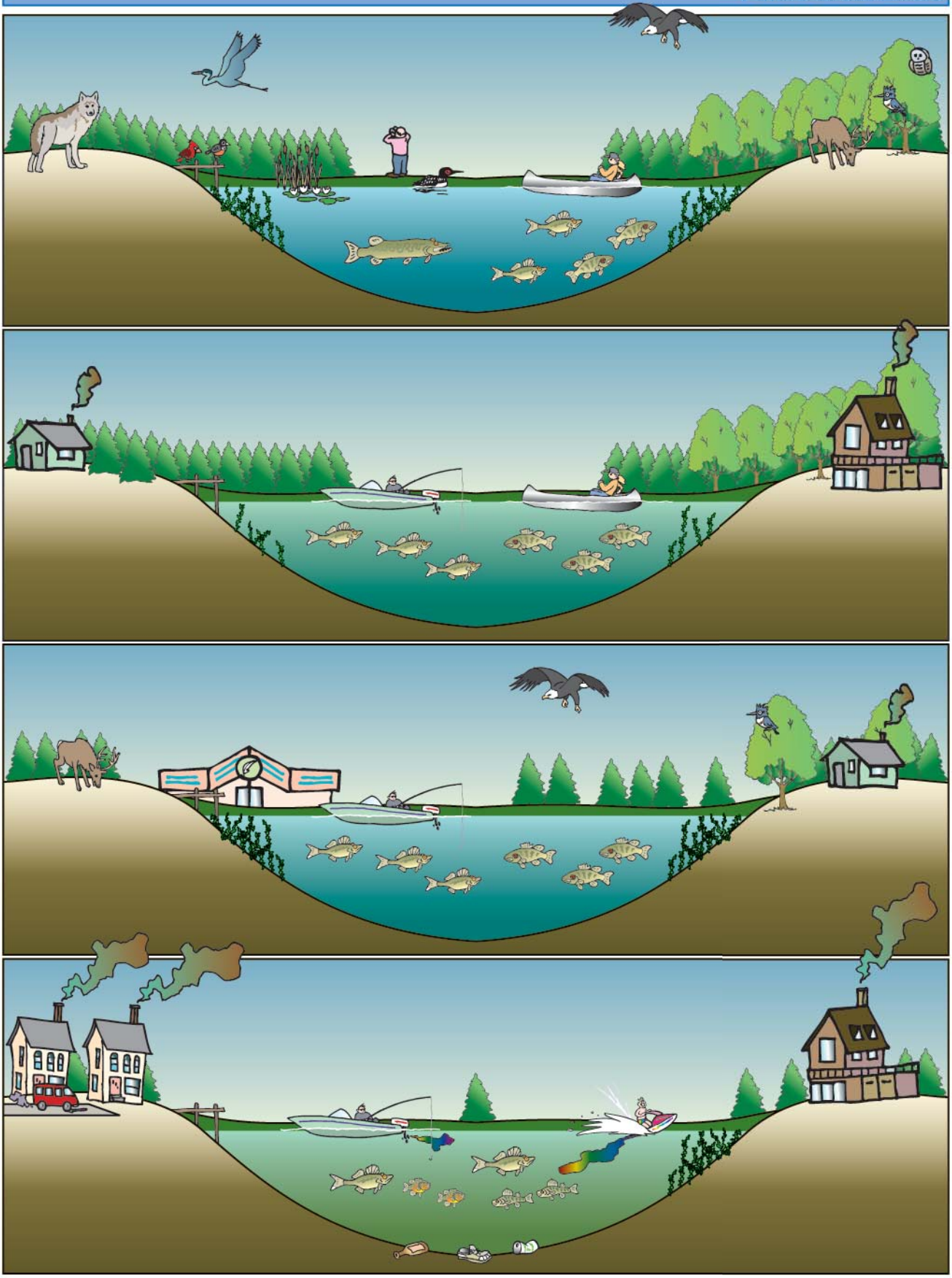
There are plenty of lakes where people can fish and enjoy nature. Wildlife is abundant around the more remote lakes. Lakes in the NHLD are scattered with small cabins and new, larger homes.

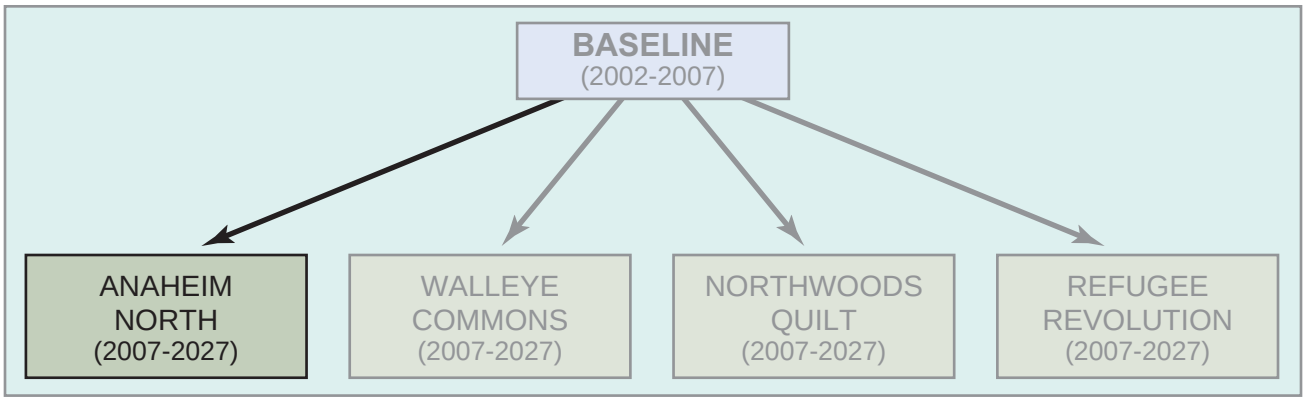
The Lac du Flambeau nation is experiencing economic growth, stimulated by revenues from the casino. Young families are coming back to stay.

Residents and tourists enjoy many outdoor activities such as boating, fishing and jet skiing.

The region is changing rapidly.







Scenario 1: Anaheim North

The expanded four-lane highway to Minocqua brought more tourists and more part-time and full-time residents to the NHLD. Increased population led to more tensions among competing uses for finite area of land and lakes from 2007 to 2012. Conflicts ranged over access to areas for quiet versus motorized recreation to debates about shoreland management practices. The tensions led to more rules and regulations, which in some cases made things worse. At the same time, the land and lakes were changing. The presence of chronic wasting disease in deer in the north forced the shooting of large numbers of this former game animal in an effort to control the epidemic. Invading species, such as highly toxic cyanobacteria and rainbow smelt, caused problems with water quality and fisheries. WDNR, facing budget cuts and an increasingly hostile public, lacked the fiscal resources and political credibility to develop innovative solutions for the growing natural resource problems in the NHLD.

In 2012, Rhinelander Airport was expanded to handle jumbo jets, and the new four-lane highway from Rhinelander to Minocqua opened in 2014. The addition of tourists and residents in the region led to increased building and turnover of landowners. Water parks, theme parks and associated strip malls had slowly become more common in the NHLD since about 2000, attracted by tax breaks provided by local government and the large number of visitors. Minocqua was the main focus of the building pressure, as large chains such as Home Depot and WalMart realized that they not only had access through the four-lane highway, but also a ready-made broad customer base. In 2017 a large theme park, Loon World, opened in Minocqua with nearly 500 new minimum-wage jobs. Municipalities struggled to provide services such as police and fire protection, roads, water and sewage treatment needed by an expanded recreational industry. The annual debate about raising property taxes was more acrimonious every year. Meanwhile, changes were taking place on the Lac du Flambeau reservation. The increasing tourism in the area offered an opportunity for the tribe to expand their casino into a larger gaming complex. At the same time, the tribe attempted to minimize environmental impacts of the increased numbers of visitors, and to maintain traditional uses of the land and lakes.

The numbers of tourists varied from year to year, depending on oil prices, the national and regional economy, and attitudes about safety and terrorism in international travel. In this turbulent business environment, some of the smaller recreational establishments failed but larger tourist attractions such as Loon World and the Lac du Flambeau Casino survived. Locally-owned businesses became less common as the national and international chains took over traditional niches in food, pharmaceuticals and hardware.

By 2027, the area was transformed. The population was almost double what it had been in 2000. The economy was larger than in 2002, and so was the size of businesses and the role of corporations based outside the NHLD. More jobs were available, especially minimum wage seasonal jobs. Much of the profit from tourism flowed out of the NHLD, while the tax burden stayed behind. As tax breaks for Loon World and similar businesses expired, the counties' budget situations improved but demand for social services largely offset those gains. The gap between rich and poor grew from 2002-2027. Urban sprawl was notable around Eagle River, Rhinelander, and Minocqua. Air, water, light and noise pollution were increasingly common problems. The level of trust and cooperation among people in the region declined to resemble that of other urban regions of the U.S., due to failing communication between groups.

Elements of the old Northwoods environment could still be found in small towns far from the major highways, and on the Lac du Flambeau reservation. Fish and game on public lakes and lands deteriorated after 2002 as WDNR's ability to protect the resource weakened. Some wilderness areas accessible only by hiking or canoe still offered abundant Fish and wildlife. Large private reserves provided quality fishing and hunting experiences to those who could afford it. Lac du Flambeau sold restricted access fishing as part of its casino complex. Conflicts between the tribes and the state over fish and wildlife were more frequent. Most local residents found their opportunities for fishing, hunting and enjoying the outdoors were more limited, and for many visitors the private recreation parks had replaced outdoor recreation.

Anaheim North.

Immediate right: NHLD landscape showing four representative lakes.
Facing page: Cutaway views of the four lakes.

Rapid development has transformed the NHLD. Increased tourism has brought more people to the region.

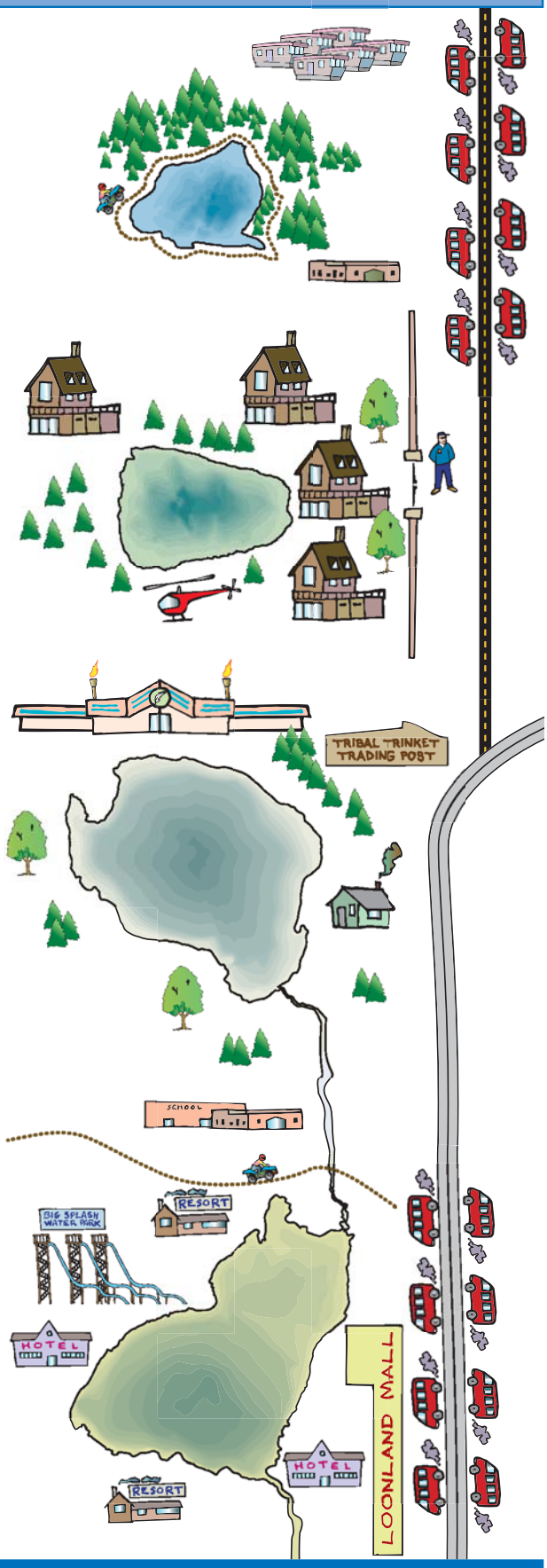
The role of government in resource management has decreased. Invasive species are abundant in many of the lakes. Water quality has degraded to varied degrees throughout the region.

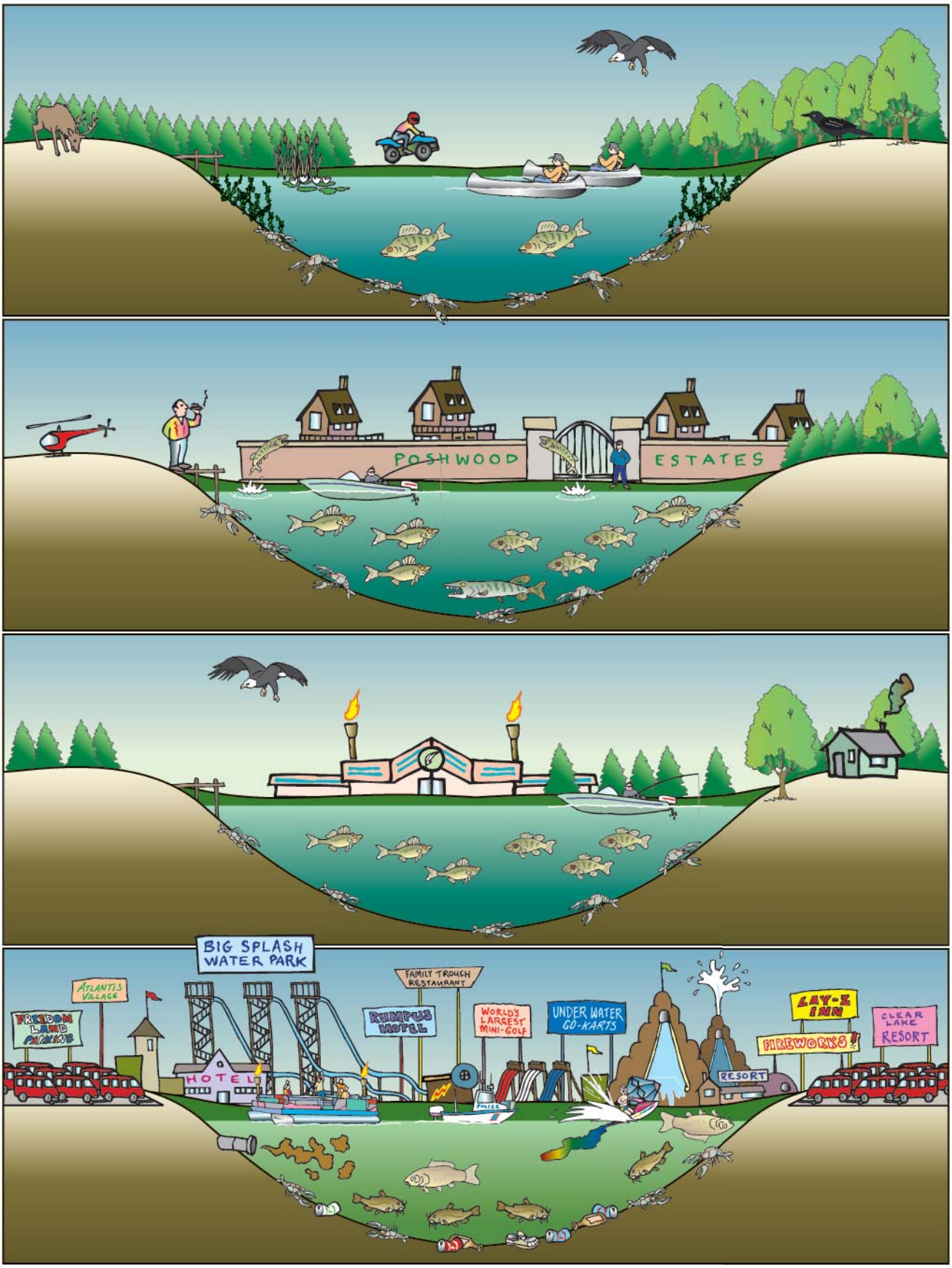
Some isolated lakes still provide opportunities for quality fishing and hunting, although people find that their opportunities are more limited.

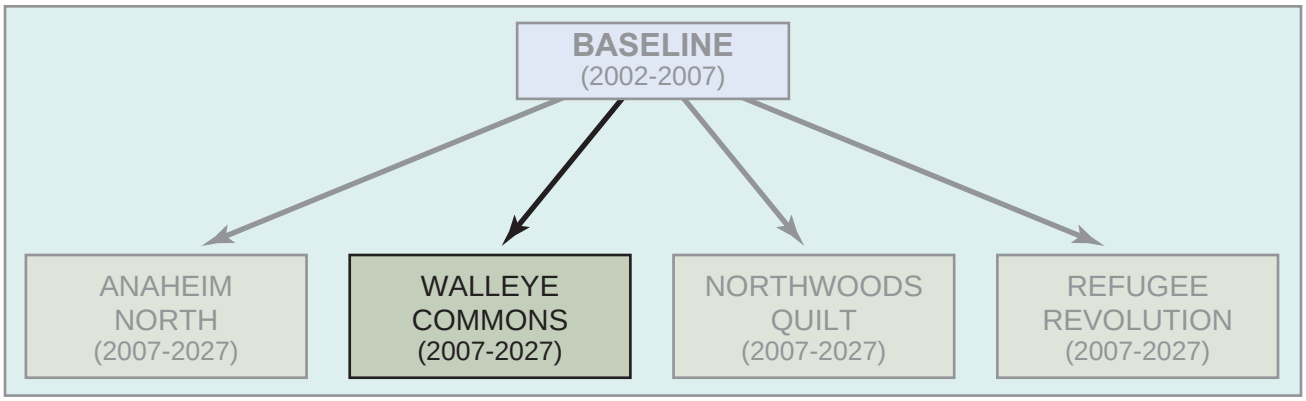
In the search for lakefront property, new residents build large homes on more remote lakes that were previously less accessible.

The Lac du Flambeau nation is experiencing rapid economic growth from casino revenues, while tribal management tries to maintain the natural resources on the reservation.

Larger lakes that are lower on the landscape experience most of the building development. Waterparks and resorts are common. Economic growth brings large international retail chains into the region.




POSHWOOD ESTATES
BIG SPLASH WATER PARK
ATLANTIS VILLAGE
FREEDOM LAND PARKING
HOTEL
FAMILY TROUGH RESTAURANT
RUMPUS HOTEL
WORLD'S LARGEST MINI-GOLF
UNDER WATER GO-KARTS
LAY-Z INN
FIREWORKS
RESORT
CLEAR LAKE RESORT
POLICE



Scenario 2: Walleye Commons

In the early 2000s, regulations in the NHLD were rolled back. State government, crippled by financial crisis, removed many shoreland management regulations and could not afford to enforce others. County boards removed many building restrictions. Some landowners welcomed the increased flexibility. On many lakes, however, conflict arose over large shoreline construction projects that impacted all property owners on the lake. Some lake associations tried to standardize practices, but they were unable to enforce rules. Battles over the character of the shoreline increasingly went to court where settlement took years of expensive litigation.

Along with this social disruption, the effects of the changing environment resulted in the loss of business for resorts, restaurants and bars. Snowmobiling and cross-country skiing diminished as winters became warmer, shorter and less snowy. Summer weather was unusually dry and after massive insect outbreaks killed extensive areas of forest in 2009-2010, a surprising series of extensive forest fires destroyed homes and resorts, leading to further declines in tourism. Deer hunting had all but vanished from the NHLD by 2010, due to the spread of chronic wasting disease. Fishing declined for several reasons, including excessive harvest, deterioration of shoreline habitat, and spread of rainbow smelt and rusty crayfish. In 2009-2012, a series of massive blooms of a newly arrived toxic cyanobacterium sickened swimmers and caused massive fish kills on lakes in the Minocqua area. The stresses were not as severe on tribal lands and lakes, due to responsive management by the tribes.

These ecological and social crises led to a number of attempts by individual groups to organize better ways of managing the landscape. However, despite some initial successes at creating new plans, no effective action was taken. Attempts at innovative management were frequently bottled up in litigation.

The cycle of crisis and failure led to a spiraling decline in tourism and migration from the NHLD. New retirees chose to live in places that were warmer, friendlier, or offered better outdoor recreation. Although long-time residents chose to remain in the region, a lack of economic opportunities led to

the steady out-migration of young people. As people left, property values and the tax base declined, diminishing the ability of counties and towns to maintain roads and provide services. Teachers were laid off and schools deteriorated. The increasingly rundown nature of the NHLD further discouraged tourism. Many people in the tourist industry gave up and relocated.

The people at Lac du Flambeau, however, wanted to stay. Casino revenues declined, but some of the profits were used to buy checkerboarded tracts of land within the reservation boundaries at favorable prices. Counties were willing to sanction land sales, despite losses in tax revenue, because they needed immediate economic relief. The Lac du Flambeau tribal members continued to expand their land holdings. Although economic decline hit the reservation hard in some ways, the cultural revival of the late 20th century continued. An expanding network of Native American cultural connections combined with an increase in cultural tourism provided essential support to the tribe. The population of tribal members living on the reservation was increasing as off-reservation members returned because of job opportunities.

In 2027, the resident population of the NHLD was much smaller than the population in 2000, and about the same as the population of the region in 1900. There were far fewer summer visitors than in 2000. The Native American representation had grown from 10% to about 40% of the population. Through persistence and innovation, a Native American cultural renaissance was underway. With it came different ways of living with the land and lakes. Vegetation was slowly recovering from the fires, and the deer herd was slowly rebuilding. Experimental management had re-established excellent fishing on some lakes. Over the NHLD as a whole, fish communities were variable, with novel mixes of native and introduced species. Toxic algae blooms still occurred on some of the lakes, but water quality was slowly getting better. Although the economy was much smaller than it was in 2000, many residents felt that their rural lifestyle and the gradually improving environment of the NHLD more than compensated for their low incomes.

Walleye Commons.

Immediate right: NHLD landscape showing four representative lakes.
Facing page: Cutaway views of the four lakes.

As businesses failed and tourism declined, people visited cottages less and less-frequently, and properties were sold. People left the region.

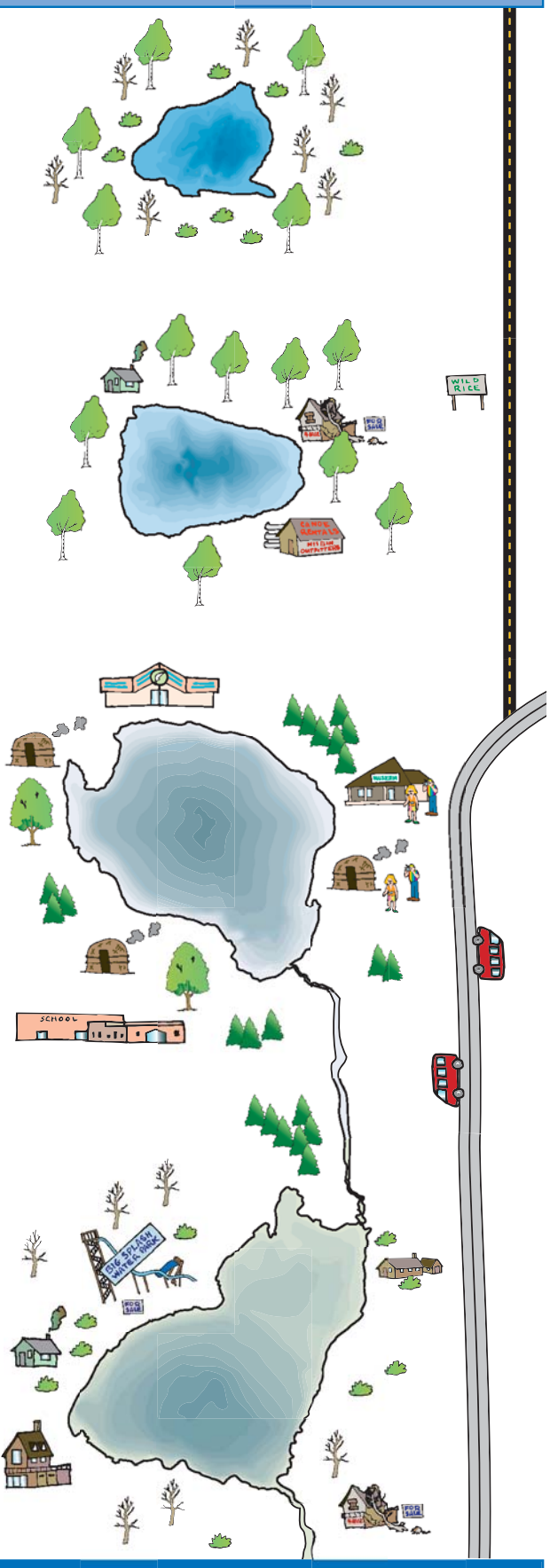
High in the watershed, forest fires reduced forest cover around upland lakes. Wildlife remain, but few tourists visit.

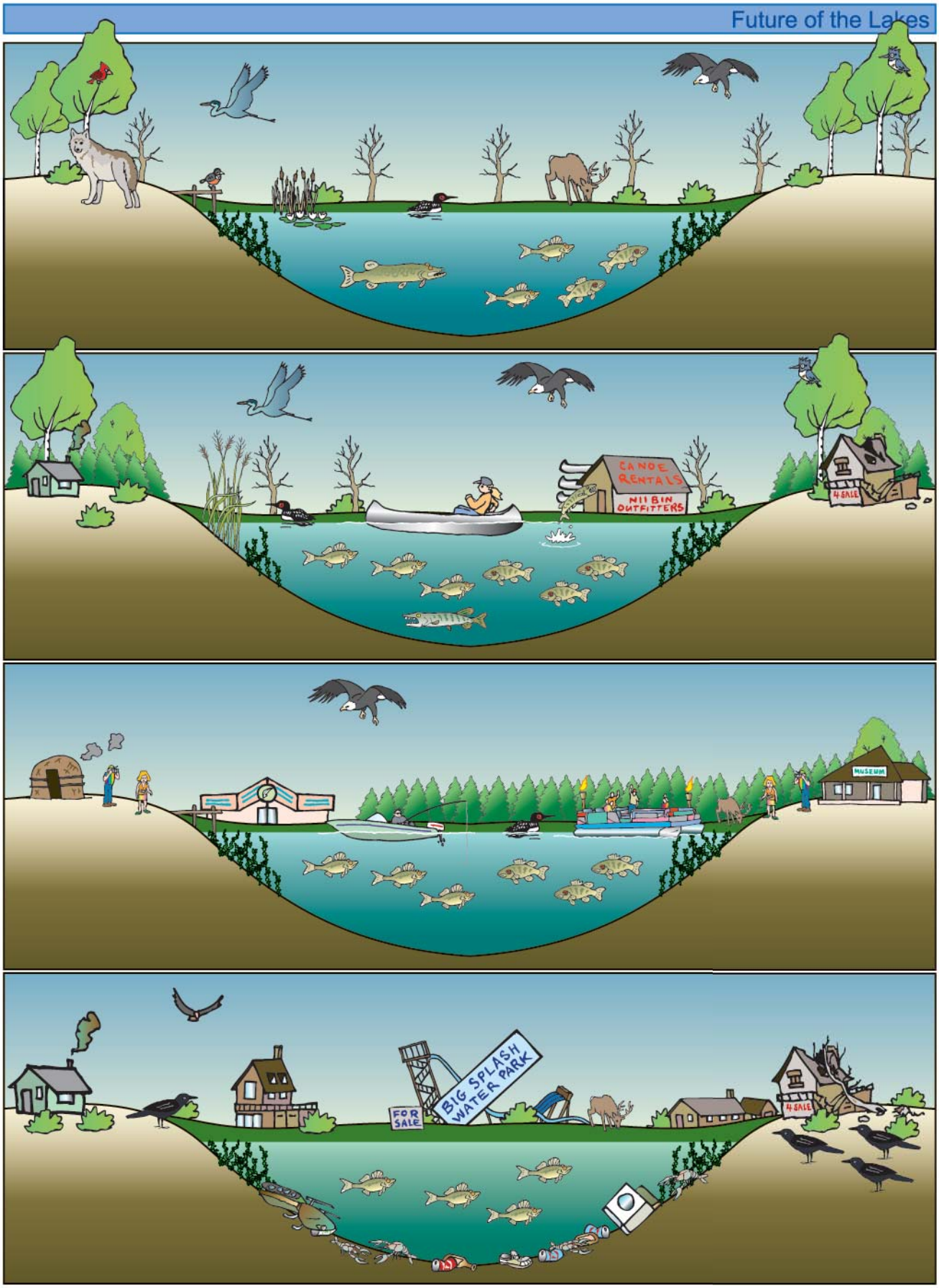
Isolated lakes have had their surrounding forest reduced by fire, and some of the original cottages have not been kept up by their owners. Fish populations have recovered and there is some nature tourism.

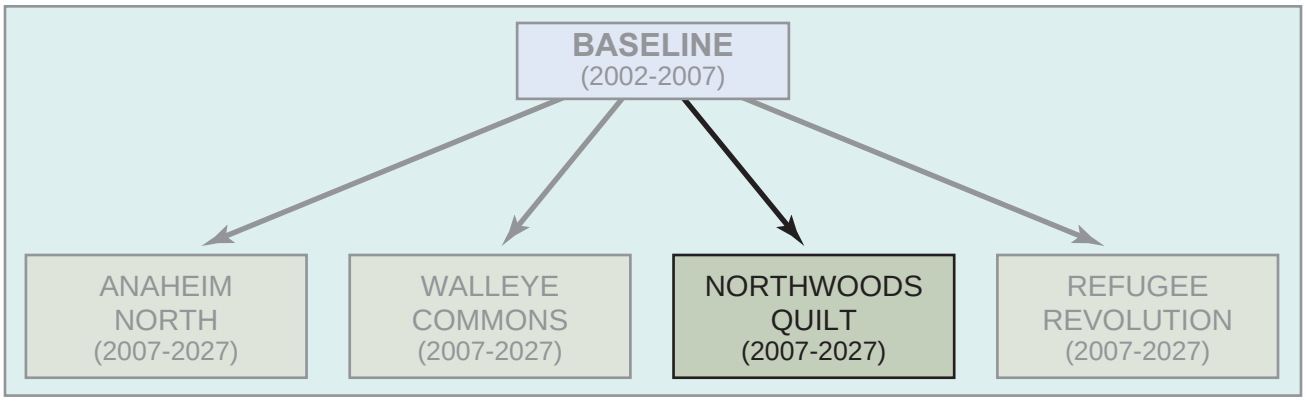
Tourism is centered around Lac du Flambeau, as people visit the reservation to learn about the Ojibwa way of life. A museum and sweat lodges provide novel experiences for tourists.

Abandoned development and poorly maintained roads have left the larger lakes resembling a gradually recovering junkyard. However, the lakes now contain a variety of undesirable species.

Residents who remain regret the lower incomes and lack of convenient shopping, but enjoy having the region to themselves.




CANOE RENTALS
NII BIN OUTFITTERS
4 SALE
MUSEUM
FOR SALE
BIG SPLASH WATER PARK
4 SALE



Scenario 3: Northwoods Quilt

Improvements in transportation, shipping, and telecommunications in the 2000s and early 2010s greatly expanded the locations in which people could live and work. Many people, especially experienced midlife professional people in their 50s and 60s, took advantage of the opportunity and moved to the NHLD, enjoying a more relaxed lifestyle, working part-time out of their homes, and spending more time with their families. To these new residents, sustaining the wild character of the area, the very thing that drew them there in the first place, was important. The influx of new arrivals led to the need for more hospitals, better telecommunications and more specialized shops.

As more and more people moved to the NHLD, residents realized that the quality of life was deteriorating due to pressures created by the increasing population. Newly relocated retirees had their own ideas about the area and with time to spare, these residents became active in the decision-making bodies of the community. Discouraged by their powerlessness as taxpayers, out-of-state summer residents turned to non-governmental organizations to express their concerns. Although conflict was increasing, lake associations became more effective as forums for public debate and decision-making as people increasingly became fed up with local problems. The tribes attempted to insulate themselves from these debates, by focusing on the twin challenges of diversifying the tribal economy and maintaining the generally high quality of natural resources on the Reservation.

Motivated by the growing social and political tensions and some sound economic arguments, lake associations approached the county planners to develop a land use plan for the region. The outcome designated different lakes for specific uses in a fairly rigid manner. Power boating and jet-skis were restricted to some lakes while canoeing and ‘silent uses’ were restricted to others. The DNR removed some public access to certain lakes and increased facilities at others. The initial successes of this plan led the DNR to devolve more responsibility for planning and regulation to lake associations, freeing state resources for use in the invention and support of creative management methods as well as additional monitoring and survey work. The DNR made a concerted.effort

to create flexibility for NHLD residents and provide scientific information that would facilitate better public decisions. In conjunction with the DNR's allocation of power to local groups, the state authorized a NHLD Watershed Commission with taxing and regulatory authority.

By 2027, the NHLD was more diverse than in 2002. The population had grown by about half. The economy was more diverse as tourism was supplemented by small local businesses, many operated by part-time residents, that provided services in globally-distributed markets. Although debates about rights and responsibilities of residents versus lake authorities continued, increased communication between groups through public forums and debates was beginning to show a significant impact on local decision-making. Enforcement of the different lake use plans was still a challenge, and a focus on lake management had led to sprawl along the roadsides of the north. However, as people began to see changes in the lakes, they increasingly supported regional management efforts. The lake uses were becoming more diverse, as different lakes were dedicated to different groups of users and different menus of ecosystem services. The dedication of lakes to particular uses and control of access points by lake associations was showing reductions in the spread of invasive species among lakes. The NHLD was buffered from ecological disturbance by the diversifying composition of its landscape. The diversity of recreational and economic activity continued to attract well-educated, innovative residents who contributed to the diversity of the economy and added to the sense of optimism that the NHLD could thrive as a national center of green ecotourism.

Northwoods Quilt.

Immediate right: NHLD landscape showing four representative lakes.
Facing page: Cutaway views of the four lakes.

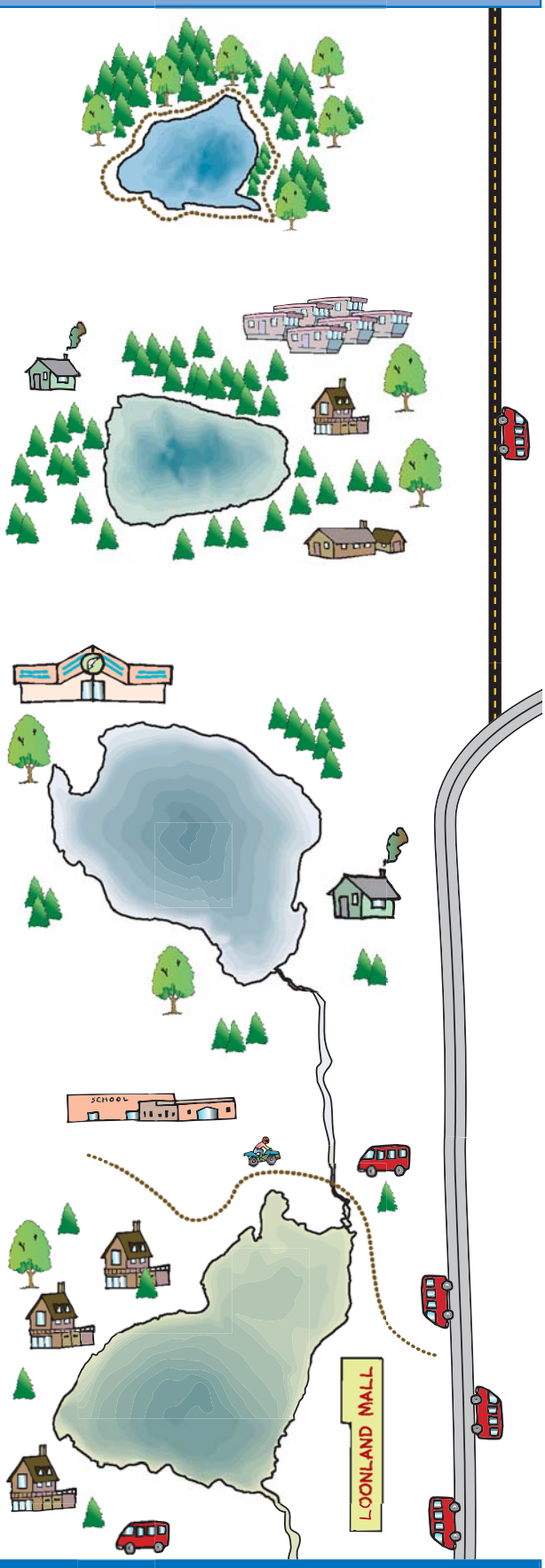
Different groups of people have conflicting views about how to manage the NHLD.

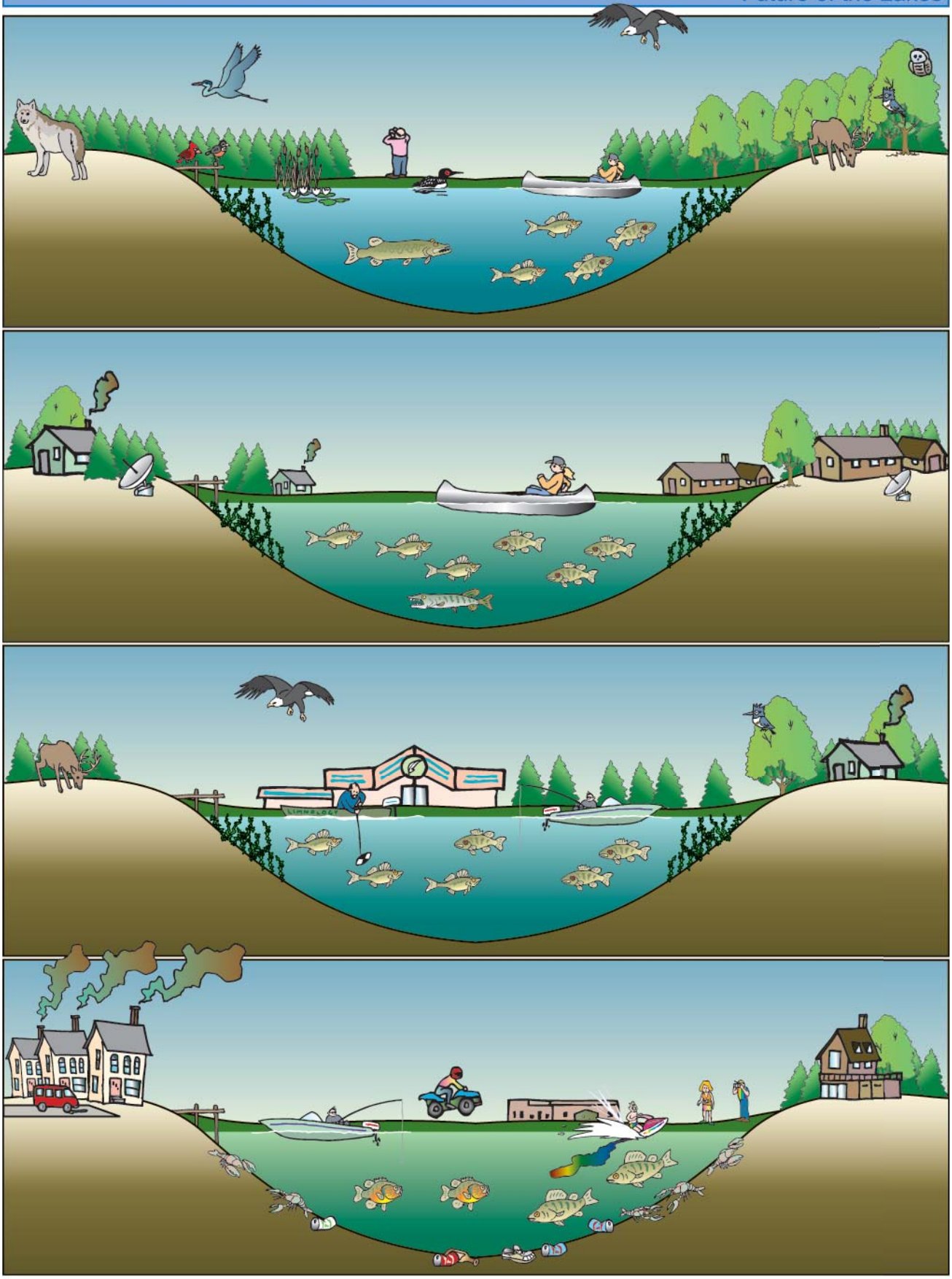
People become fed up and state government gives way to local management. Lakes are designated for different uses. Motorized sports are common on some lakes. Only silent activities such as canoeing and nature-watching are allowed on others. As a result, the lakes have variable features depending on the regulations set for individual lakes.

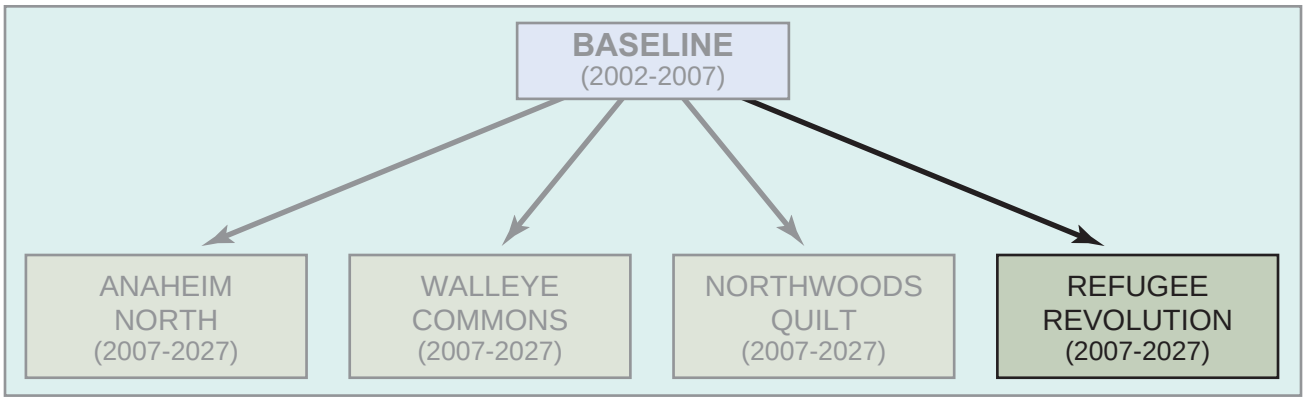
Some recent arrivals to the NHLD work out of their homes by telecommuting.

Management of tribal lands and resources remains separated from that of the rest of the region.

As recent retirees steadily move into the region, services and shopping opportunities increase. Larger, lakefront homes replace smaller cabins on some lakes.







Scenario 4: Refugee Revolution

In April 2010, a private plane flying over Chicago exploded in midair, dispersing two tanks of radioactive dust in a wide cloud across the Loop District. As investigators rushed to the area, uneasiness turned to fear when the dirty bomb was followed by a massive truck bomb that leveled the Chicago Board of Trade. People feared for their safety in population centers of the upper Midwest. Within a few weeks, thousands of owners of second homes started the tourist season early in the NHLD. The population of the NHLD doubled virtually overnight. While residents of the NHLD were accustomed to an influx of visitors each summer, this situation was different. The refugees from urban terrorism were in the NHLD to stay.

The influx of refugees stressed the infrastructure of the NHLD, as schools, hospitals, police and fire services struggled to cope with a much larger resident population. The newcomers brought new demands, new needs, and new jobs. The NHLD was more crowded than usual in the summer of 2010. Pressure increased on all natural resources of the region.

Social conflicts intensified through 2010 and on into 2011. While local residents mostly empathized with the newcomers, they were also wary about changes to their way of life. The refugees brought with them new ideas and different values that were not always consistent with the outlook of the local residents. All levels of government struggled to cope with the changes in the NHLD by providing infrastructure and economic support for the new residents, and helping the NHLD to assimilate the new residents. There was significant turnover as some of the refugees left for other areas that were closer to family and friends. Fearful of future terrorist attacks, many of the former urban dwellers chose to make a new life in the NHLD. The population flux over the next several years and uncertainty about future population numbers made it even more difficult for decision-makers to administer changes. The transition was difficult, but gradually progress was made.

As part of an expanded war on terrorism, the nation drew more heavily on the resources of the NHLD. The NHLD became a crucial source of fresh water, as radioactive contamination from the dirty bomb had forced closure of Lake Michigan for municipal water supplies. Eventually the radioactive contamination spread to the downstream Great Lakes Huron, Erie and Ontario, causing the U.S. and Canada to draw more heavily on water supplies from the highlands of the Great Lakes region. Great Lakes fish stocks were also contaminated. Aquaculture developed in the NHLD to provide fish for national and international markets. With aquaculture came water pollution and disease problems. The WDNR restricted aquaculture to the lakes lower in watersheds, while the less polluted lakes higher in watersheds were engineered for water extraction. The state authorized commercial deer harvest for the first time in 2014. Forest management and tree harvest intensified. The rapid increase in new residents led to the rapid development of a strict system of regulations.

The reservation was also struggling to deal with the effects of resource stresses. In some respects, the Lac du Flambeau were able to manage their business affairs and natural resources in ways that were separated from the pressures from outside the Reservation. However, through the interconnectedness of the hydrologic system and increased air and noise pollution in the area, tribal lands and waters were under increasing environmental pressures. While the tribal economy grew faster, air pollution, water pollution, changing climate and shifting water tables forced the tribe to devote more resources to environmental management and mitigation.

By 2027, the year-round population of the NHLD was more than double the population in 2000. Most lived in a city sprawling from Rhinelander to Merrill along the Wisconsin River, where many worked in light industry or service sectors of the economy. The refugees were assimilated in an economic expansion driven by relocation of economic activity from other cities, including Chicago which would remain uninhabitable for decades. Some of the low-lying lakes were used for aquaculture, with associated water quality problems. Farther upland, watersheds were managed to protect water supplies and generate forest products, fish and cranberries. Although the NHLD was more urbanized than in 2002, elements of the traditional Northwoods values were found in the smaller communities north of the urban center. Fish and game harvests were controlled more rigidly than in 2002, but people still enjoyed fishing and hunting in the smaller upland lakes and more remote forests of the NHLD. Outdoor recreation was a smaller part of the economy. Recreational ecosystems had been replaced by working ecosystems.

Refugee Revolution.

Immediate right: NHLD landscape showing four representative lakes.
Facing page: Cutaway views of the four lakes.

The population of the NHLD has increased substantially.

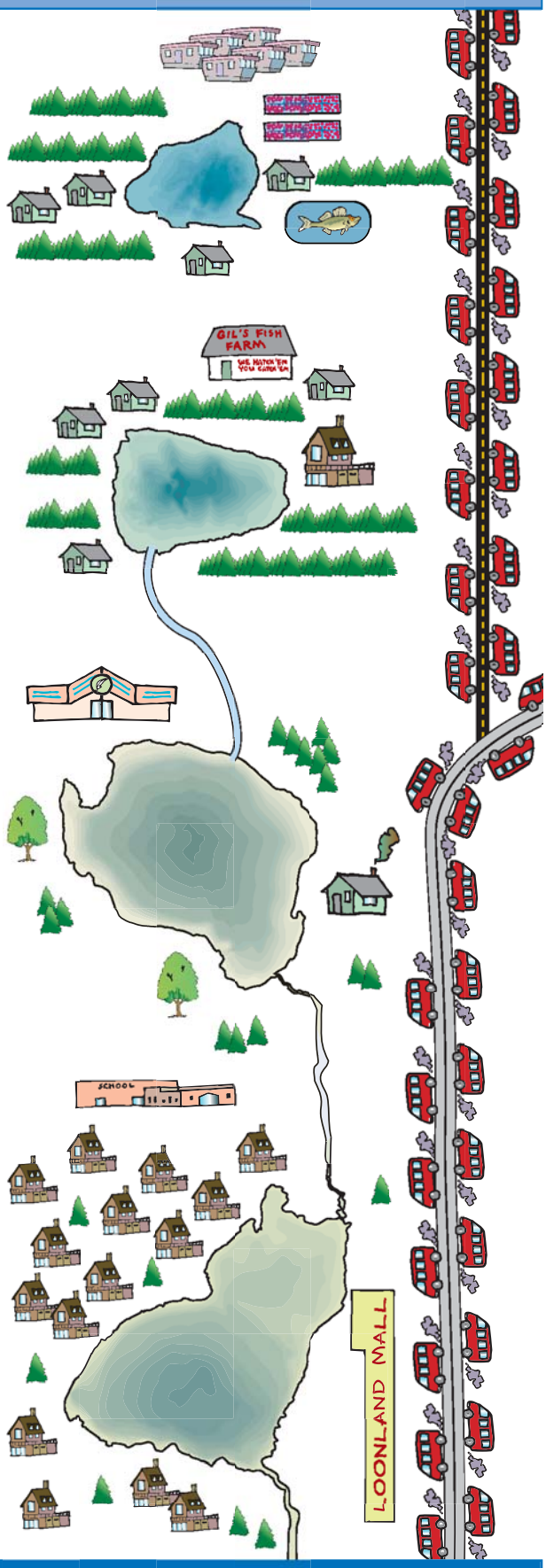
State and federal governments have a greater role in management. Pollution is closely regulated, but has nevertheless increased in many lakes. There are more problems with invasive species, such as rusty crayfish.

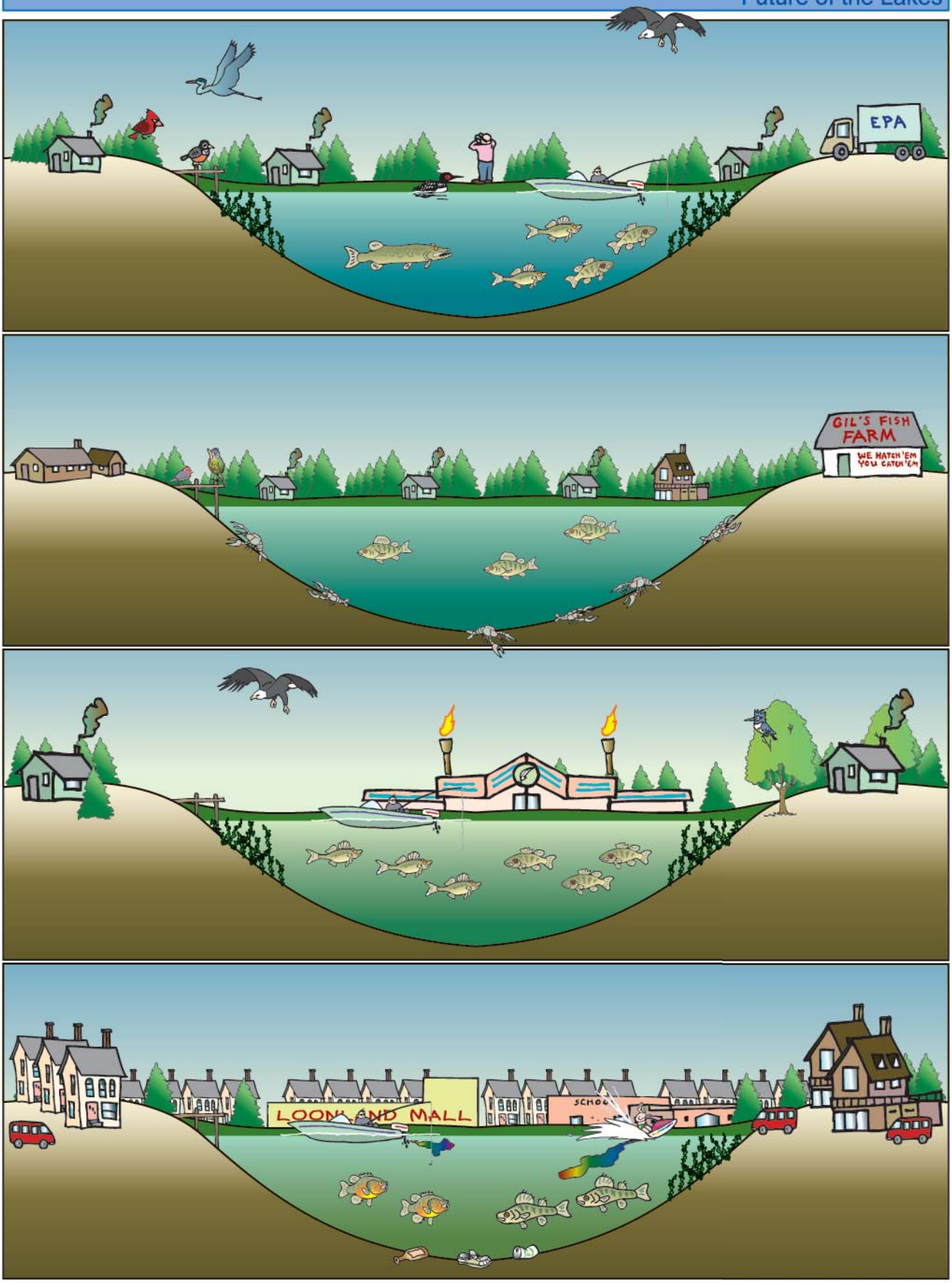
Wildlife is still abundant around the more remote lakes, although some species, such as otters and wolves, have disappeared from the NHLD.

Much of the landscape has been converted to working ecosystems, such as forest plantations, cranberry bogs and fish hatcheries. Even some lake fishes are harvested commercially.

The tribes are doing well economically, and have been relatively successful in managing development on tribal lands.

Development is heavy, especially around the lower lakes. There are more buildings and cars. High-density housing is more common. Shopping opportunities have increased, and so has the presence of large retail chains based outside the NHLD.




EPA
GIL'S FISH FARM
WE HATCH 'EM YOU CATCH 'EM
LOON END MALL

Summary

While the events described in the scenarios are plausible, we doubt that any scenario will come true. It is possible, however, that the future will contain a mix of the events described in the scenarios. Since the future is created by the plans we make today, it will be interesting to consider the possible futures described in this report when making decisions for the NHLD. None of us know today how the future will turn out, but when we think in broad terms as described in the scenarios, we may be able to better cope with surprises in the future.

Suggestions for further reading

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Cover: *The Northern Highlands Lake District is located in northern Wisconsin, USA. This region includes large portions of Oneida and Vilas counties, as well as portions of Iron, Forest, Lincoln and Price counties, as well as parts of Gogebic county, Michigan. Lakes are the defining landscape feature of the region, with thousands of lakes varying in size and shape. Illustration modified from Peterson et al. (2003).*

Citation for this document:
Carpenter, S.R., E.A. Levitt, G.D. Peterson, E.M. Bennett, T.D. Beard, J.A. Cardille and G.S. Cumming. 2003. *Scenarios for the Future of the Northern Highland Lake District*. Center for Limnology, University of Wisconsin, Madison, Wisconsin, U.S.A. https://github.com/SRCarpen/NorthernHighlandFutures

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About the Resilience Alliance: Our assessment of the NHLD is part of a program of the Resilience Alliance (RA; URL http://www.resalliance.org), an international research group that studies regional change. Members of the RA have met for several years to assess the past and current conditions in the NHLD. In March 2002, the RA presented a short course on Theories for Sustainable Futures: Understanding and Managing for Resilience in Human-Ecological Systems in Northern Wisconsin in Minocqua, Wisconsin (URL http://limnology.wisc.edu/course). The RA held a workshop ("Envisioning Futures of the Northern Highland Lake District") in September 2002 to develop scenarios about the NHLD that would explore alternative visions for the future of the region (URL http://limnology.wisc.edu/nhld/). Through the short course, workshop, and other conversations, many NHLD residents and visitors have contributed to the scenarios.

Acknowledgements: We thank many individuals throughout the NHLD for their ideas and comments during the development of these scenarios. This project was funded by the J.S. MacDonnell Foundation, in cooperation with the University of Wisconsin Center for Limnology, the North Temperate Lakes Long-Term Ecological Research program, and the Wisconsin Department of Natural Resources.