

*Maine . . .
A Geographical
Perspective*

One of a series of information digests prepared by the University of Maine's Water Resources Program

and the

Margaret Chase Smith Center for Public Policy

This digest—a summary of information on Maine's lakes—is based on:

University of Maine research studies;

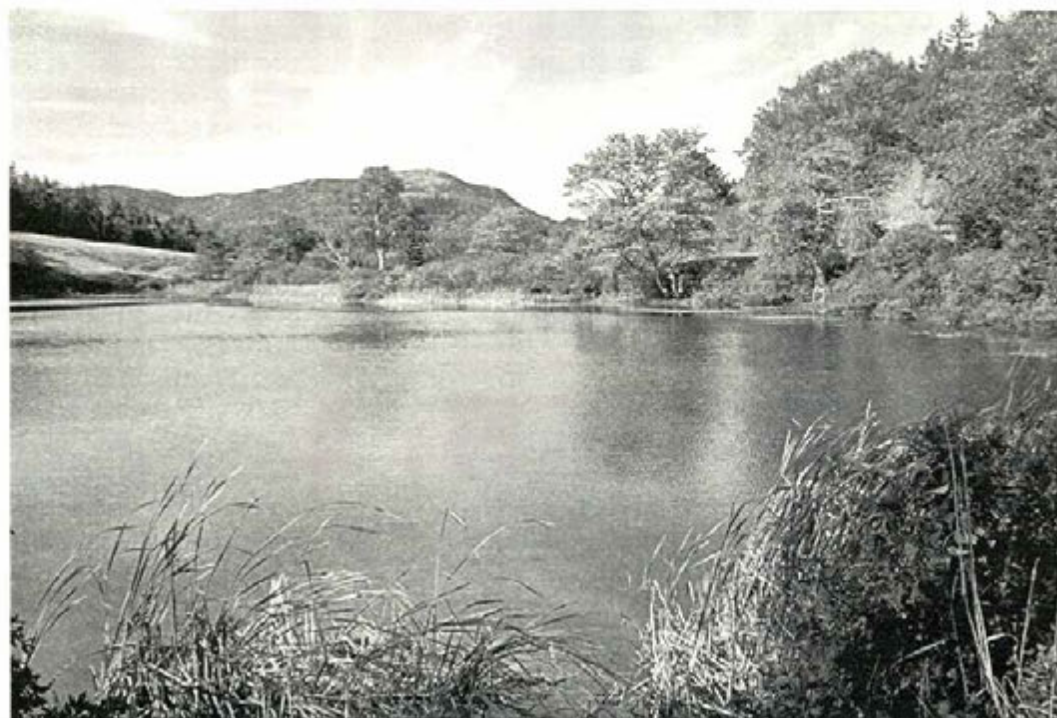
reports from Maine's State Planning Office, the Departments of Environmental Protection, Conservation, and Inland Fisheries and Wildlife, and Maine's Great Ponds Task Force;

and

the series of articles on Maine lakes published in the Maine Sunday Telegram in August, 1989.

This digest was prepared by Sherman Hasbrouck with the generous assistance of researchers and lake specialists at the University of Maine and in Maine State government.

March 1995



Long Pond near Seal Harbor on Mount Desert Island: Photo by the author.

A century ago someone suggested that Maine be called The Lake State. The suggestion did not take root—probably because the seacoast could hardly be ignored in any characterization of Maine.

Yet, Maine *is* a Lake State. Its thousands of lakes are as valuable a resource to Maine as are the State's seacoast and forest. The number and quality of our lakes are matched by only two or three other states. Some of Maine's lakes, like Moosehead, are very large. Many are lightly developed and used—with extensive areas of natural shoreline. And, importantly, most have little pollution from human developments and activities.

Economic studies of tourism indicate that the State's seacoast is a more important recreational resource than the lakes. Indeed, more out-of-state visitors come to the seashore than to inland Maine. Yet the lakes probably have as much recreational value for Maine people as does the seacoast—a value not measurable by expenditures on lodging places and restaurants.

Are the lakes—so important to the quality of life in Maine—facing a crisis? In the short term, the answer is no. Much was done in the 1970s and 1980s to protect Maine's lakes and other natural resources. We are greatly in debt to those responsible for the protective and remedial measures taken during that period.

However, a long-term gradual decline is taking place in Maine's lakes, a decline in natural values and lake water quality. The decline stems from development in lake watersheds and ongoing expansion in lake recreation. Moreover, some lakes *are* in a crisis. We need to pay attention to what is happening in and on our lakes and not rest on the accomplishments of the 1970s and 1980s.

BACKGROUND

Lakes are not abundant in the United States. Why?

- Much of the western half of the United States has too little rainfall and snow for lakes to form. The western mountain ranges block moisture-laden Pacific Ocean air from moving inland, and Gulf-Coast air doesn't circulate much into the "high plains."
- There are few lakes, too, in much of what is now the American South, Midwest and East. These areas get abundant rainfall. However, the landscapes are geologically old—worn down into a well-drained land with old lakes becoming wetlands and streams, and many wetlands converted to farmland.

There are two significant exceptions to the lack of lakes in the United States. One of these is the Great Lakes, a lake complex that is unique in the world. The Great Lakes basins were created in ancient times—partly by the earth's tectonic movements and partly by subsequent erosion.

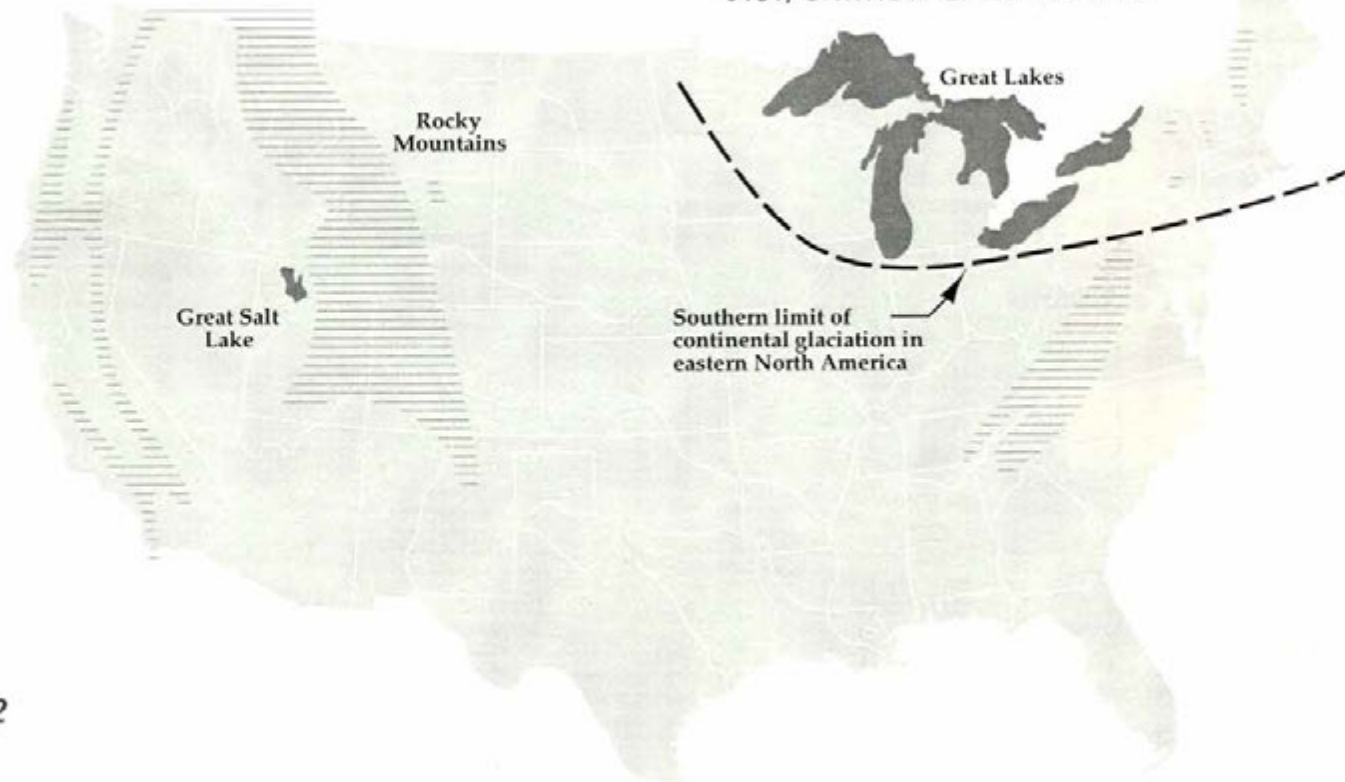
The other exception is a lake region in the north-eastern United States and Canada (above the dashed line in the map below). This region has two necessary ingredients: 1) abundant freshwater and 2) a geologically "young" landscape. It has been only some 12,000 years since the continental ice sheets of the last ice age retreated northward and finally melted away. Those ice sheets had gouged out basins in the land and blocked ancient drainage ways with deposits of glacial materials.

Lakes have short lives, however, compared to other landscape features (such as mountains). The lakes created at the end of the last ice age have been filling up with soil eroded from surrounding lands, silting of lake bottoms, and decomposed plant materials. The fate of most lakes—especially the shallower lakes—is to fill up and become wetlands and streams. (Maine lakes, for example, have typically accumulated 15 to 45 feet of sediments since deglaciation. Some sediments—in those areas once covered by the sea—were marine deposits.)

The Great Lakes have been immensely important to the development of both the United States and Canada. The great French explorers and fur traders of the 17th century (such as Jolliet, Marquette, and La Salle) canoed into the center of the continent by way of the St. Lawrence River, the Great Lakes, and the Mississippi. In the early 1800s, the Erie Canal connected the Hudson River to the Great Lakes—making possible an inexpensive inland waterway system linking the East first to the Ohio River Valley and, later, to the center of the continent.

Initially, people and manufactured goods moved westward on this inland waterway system and food products moved eastward. Later—even with the arrival of the railroads—the Great Lakes waterway system remained crucial to the settlement and industrialization of the nation. In our own time, movements of grain, coal, lumber, iron ore, and steel have continued to depend on that system.

U.S./CANADA LAKE REGION



The Great Lakes have been more than transportation links. Summer colonies, resorts, and city parks were built on the lakeshores. Commercial fishing brought whitefish and other kinds of fish to town and city markets. 24 million people came to depend on the Great Lakes for their drinking water.

Then, starting sometime in the 1960s, people began to see another side of the Great Lakes. The new industries and cities of the Midwest had been channeling their sewage and other wastes into the Great Lakes. Lake Erie, the shallowest and most vulnerable of the Great Lakes, was being severely impacted biologically. Water pollution was threatening beaches and resorts—not to mention the

water supply of lakeside communities. A marine species, the sea lamprey, moved through the St. Lawrence Seaway and into the Great Lakes—devastating fisheries.

Finally, with the environmental awakening of the 1970s, the problems of the Great Lakes were largely brought under control. Cities and industries have greatly reduced their pollution of the lakes. A solution was found to the sea-lamprey problem, and fish populations are recovering. The Great Lakes have by no means been returned to their original state, but they are no longer in critical condition.

In Maine . . .

the lakes were first used, as were the Great Lakes, as parts of transportation networks. Native Americans canoed Maine's rivers and lakes—to areas where caribou and other game were plentiful.

People of European descent settled and stayed primarily in coastal areas until the 1800s. Then, in the decades before the Civil War, the “lumber barons” created a new industrial system that linked forests with an inland waterway system capable of moving logs southward toward mills and ports. The lakes, of course, were crucial elements in the waterway system. They were places where logs could be temporarily collected and stockpiled for eventual transport down the streams and rivers. Many ponds and lakes were enlarged to facilitate such storage and movement. Some lakes were entirely human-made.

The next significant phase of Maine lake history came with the rise of the lake resorts in the late 1800s and early 1900s. A cool summer climate and superb fishing brought thousands of Easterners to Maine lakes. People came to Maine by railroad and steamship. They reached the lakes by railroad, and lake steamers took them to resorts and sporting camps elsewhere on the lake.

Some of the resorts were like summer palaces—with hundreds of rooms, big “sun rooms,” excellent dining facilities, and, typically, a veranda across the front of the resort. The Kineo House on Moosehead Lake was one of the well-known resorts. Another was the Rangeley Lake House. People were encouraged to visit Maine lakes by outdoor magazines and newspapers, by the popular authors who contributed articles to those publications, by “Maine guides”, and by the railroads and resorts who helped finance promotional materials.

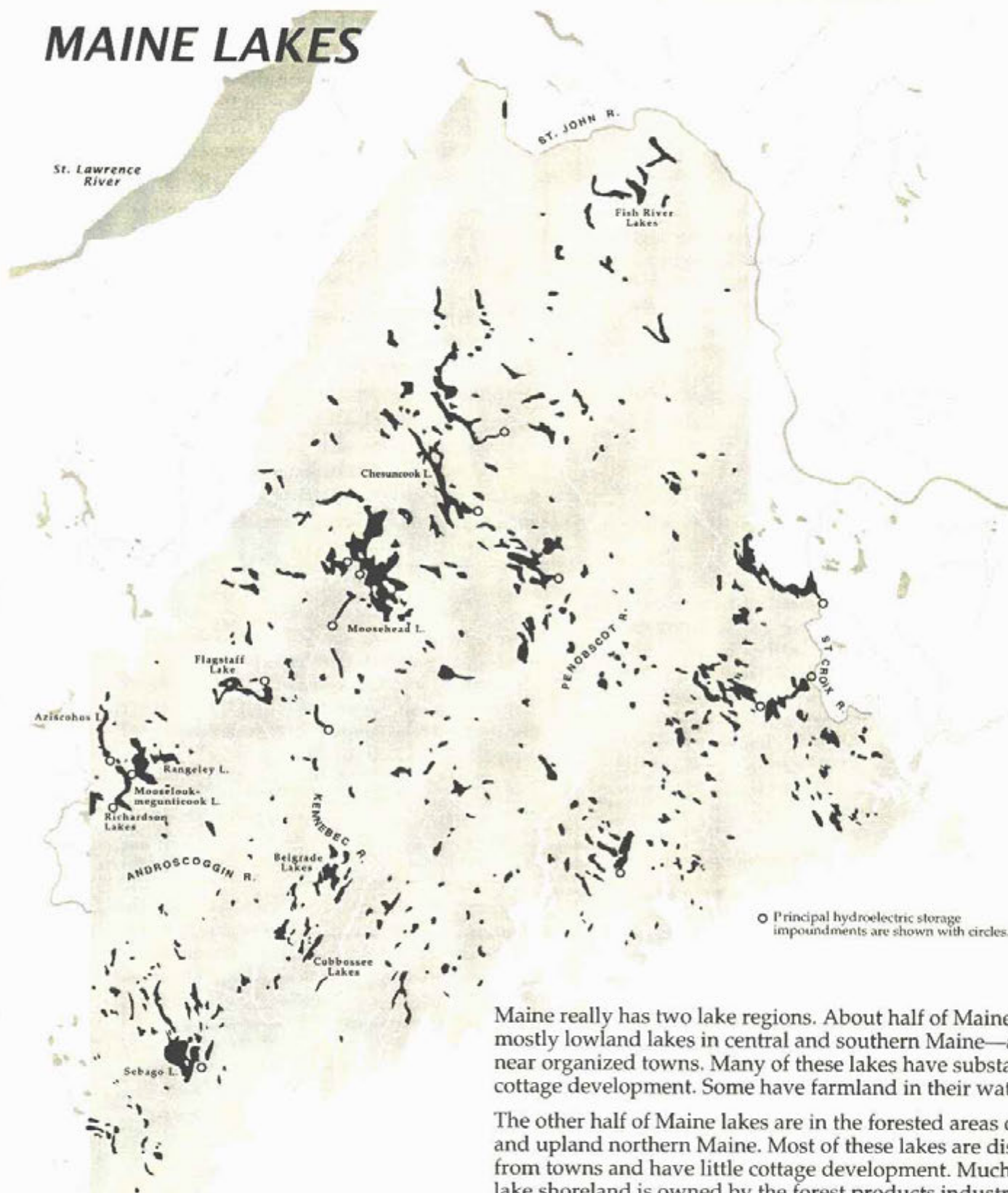
The era of the great lake resorts in Maine came to an end after World War I. The Depression of the 1930s and World War II certainly were factors. The increasing scarcity of “trophy” fish may also have contributed to the collapse of the resorts. But it was primarily the internal combustion engine that changed forever the way people travel to and enjoy lakes. The automobile and highway system opened up lakeshores to thousands of families. And the motor boat gave new kinds of pleasure and displeasure to lakeshore living.



From W. Hay's "Through Maine by Camera" (late 1920s).

The former Kineo House on Moosehead Lake

MAINE LAKES



○ Principal hydroelectric storage impoundments are shown with circles.

Maine really has two lake regions. About half of Maine lakes—mostly lowland lakes in central and southern Maine—are in or near organized towns. Many of these lakes have substantial cottage development. Some have farmland in their watersheds.

The other half of Maine lakes are in the forested areas of eastern and upland northern Maine. Most of these lakes are distant from towns and have little cottage development. Much of the lake shoreland is owned by the forest products industry.

Maine's lakes are not isolated bodies of water but rather parts of watersheds that include other lakes as well as streams and rivers. Indeed, some lakes are so close and interconnected that they share common features and problems. Such lake clusters (or "chains") include the Cobbossee Lakes and Belgrade Lakes near Augusta and the Fish River Lakes in northern Maine.

Note: The map above and other maps in this digest show only lakes over 100 acres in size.

Some Basic Information on Maine Lakes

- There are 5,785 lakes in Maine (if one counts every body of permanent standing water down to one acre in size). These lakes exceed in number and total area the lakes of all the other New England States combined.
- A more meaningful number is that of “great ponds”—the 2,600 or so lakes that are more than 10 acres in size. Our state government owns the waters and bottoms of these lakes.
- Many Maine lakes are large. 267 lakes are more than one square mile in size. Sebago Lake covers 45 square miles and Moosehead Lake 117 square miles.
- The lakes are important habitats for “north-country” fish and wildlife (such as loons, eagles, ducks, cormorants, and moose).

Lakes can be classified in a number of ways. The following pages will identify those used for water supply; those that are developed with cottages and homes on their shores; those that have outstanding fisheries; and those that are in conservation areas.

With respect to **hydrology**, most Maine lakes—around 90%—are “drainage” lakes. That is, much of the water entering and leaving the lakes is surface water. About 5% of Maine lakes—all small—are “seepage” lakes, in which most water entering and leaving the lake is groundwater. Lakes of other types include those that are *primarily* human-made.

Many natural lakes—over 500—have been enlarged by dams. Man dams were constructed long ago to facilitate river log drives. Others, built more recently, serve hydropower needs.

With respect to “**lake aging**,” Maine’s Department of Environmental Protection (DEP) finds, in data from 1733 lakes, that

- 8% of the lakes are “oligotrophic”—cold, clear, and relatively free of algae and other plant life;
- 57% are “mesotrophic”—a little murky with higher levels of biological activity; yet not so active as to be near the threshold of having algae blooms; and
- 38% are “eutrophic”—so advanced in lake aging and nutrient levels that they are near or over the threshold of experiencing algae blooms.

Note: The criteria used by the DEP in their classification differ somewhat from those used by Maine’s Department of Inland Fisheries and Wildlife (DIFW), and both differ from criteria used in other parts of the nation (where lakes are generally more degraded than those in Maine).

With respect to human uses of lake waters and shorelands:

- A substantial number of people and businesses in Maine depend upon lakes and ponds for their **drinking water**, cleaning, and other water uses.
- **Hydroelectric power** is generated at the outlets of some lakes. Other lakes are “**storage lakes**,” where water is held back during periods of rain and snowmelt for later release to downstream hydroelectric plants. These lakes provide a flood-control function to some extent.

The map opposite shows the principal hydro-power impoundments. A few, like Aziscohos and Flagstaff Lakes are primarily human-made. Most are natural lakes enlarged by dams.

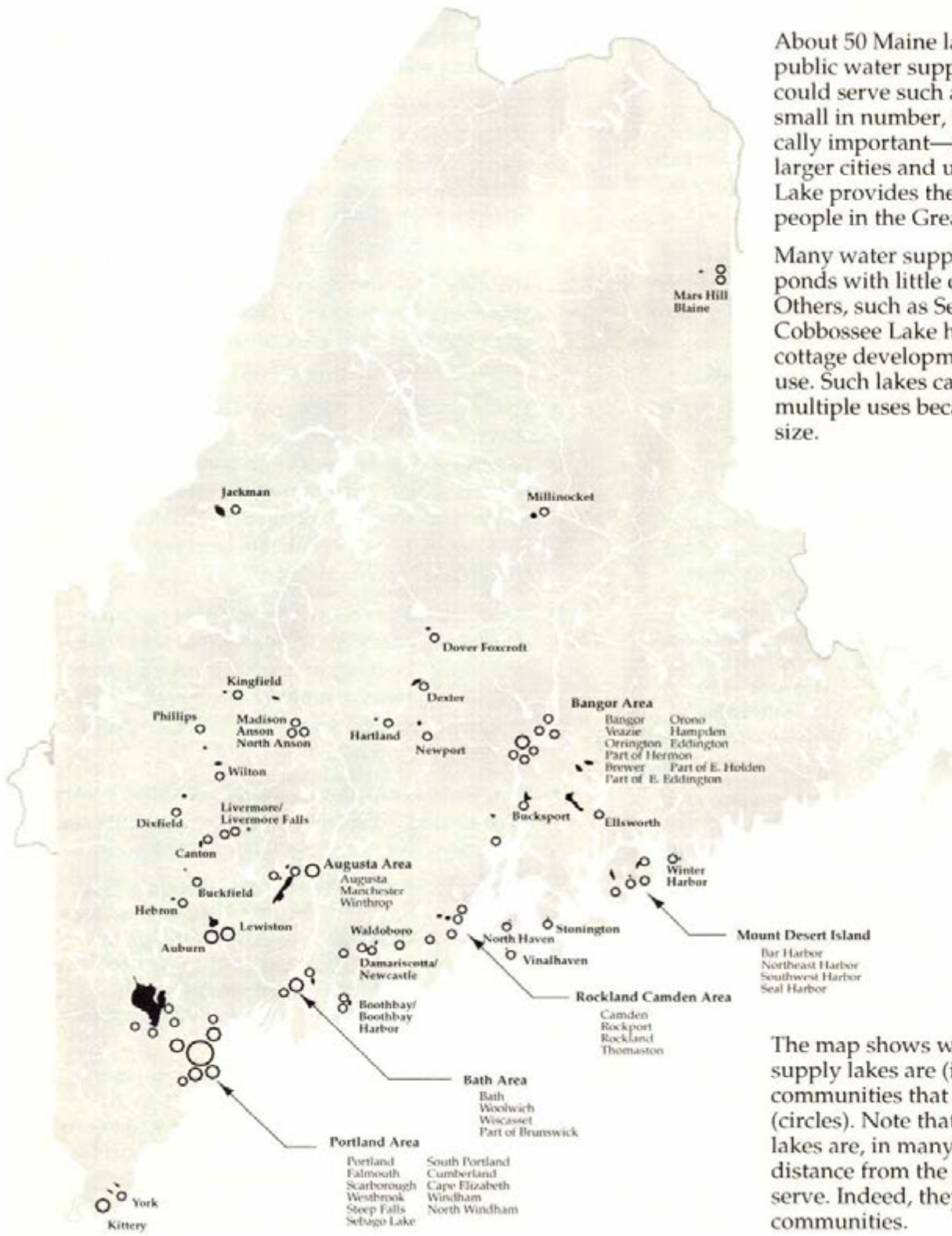
- The era of the great lake resorts has been followed, in our own time, by a major expansion in **lakeshore development** and water-based recreation. The current number of year-round homes and summer cottages on Maine lakes is not known, but it is probably between 100,000 and 200,000 and increasing.
- Lakes are the places where many of our **recreational activities** take place—some active, like swimming, boating, and fishing; others passive like dozing away a summer afternoon or simply looking at natural scenes and at other people enjoying themselves.
- Hundreds of **children’s camps** on Maine’s lakes have given generations of children experiences in outdoor living and recreational fellowship.

One of the pleasures of living on or traveling to a lake is getting away from the problems of our “normal” lives. Unfortunately, we can’t totally get away. Wherever people congregate, frictions and problems develop. Many problems are minor and easily resolved. Others are serious, especially when they are not resolved and accumulate.

There is, unfortunately, a degree of anarchy in the management of our lakes. Where a lake is in an organized town, local governments tend to defer to year-round residents and treat lightly the concerns of summer residents and non-resident lake users. Some lakes are shared by more than one municipality and thus lack unified management. Shortages of money hinder Maine’s state government from addressing problems of statewide significance.

The rest of this digest will take a closer look at the problems that have been developing on Maine lakes.

LAKES AS WATER SUPPLY



About 50 Maine lakes are used for public water supply, and many others could serve such a purpose. Though small in number, these lakes are critically important—especially to Maine’s larger cities and urban areas. Sebago Lake provides the water for 160,000 people in the Greater Portland area.

Many water supply lakes are small ponds with little or no recreational use. Others, such as Sebago Lake and Cobbossee Lake have considerable cottage development and recreational use. Such lakes can accommodate multiple uses because of their depth and size.

The map shows where the water-supply lakes are (in black) and the communities that depend on them (circles). Note that the water-supply lakes are, in many cases, a substantial distance from the communities they serve. Indeed, they are often in other communities.

Why are lakes so important as sources of water in Maine?

- Maine, as we've noted, has abundant rainfall and many lakes.
- Lakes have received much less sewage pollution than rivers. Indeed, lakes are inherently unable to accommodate sewage and other pollutants because their flushing rates are low, compared to rivers and streams.
- Groundwater is often not abundant enough for large populations. It is also often high in iron and manganese and "hard."
- It is easier to deal with some contamination incidents (such as oil spills) if the affected water is on the surface rather than underground.

While public water systems using lake water generally provide the highest-quality, most efficient, and most secure supplies of water, such systems aren't practical in many rural areas where houses are scattered over a large area or where a clean lake is not available. Such areas generally depend on private or town wells.

How Safe is Water from Lakes?

It is strange to think that the modern era of safe water began only a little over a century ago. Up to the Civil War and even more recently, people did not know that typhoid fever, cholera, and other diseases were caused by microscopic organisms and transmitted through water. Disinfection of public water, primarily with chlorine, followed soon after and ushered in the modern era of water treatment. Other treatment methods came to include settling and coagulation of sediments in the water—along with measures taken to reduce pollution in lakes and other water sources.

Now, most of us living in the United States and other "first-world" nations assume that the water from our public water systems is safe to drink—whether it comes from surface waters or from public wells. The assumption is generally a sound one, but we need to note some exceptions that may be significant to the people affected . . .

Giardia ("*giardia lamblia*") is a microscopic parasite that can live in the intestines of both animals and humans. At one phase of its life-cycle, the organism becomes a cyst that is excreted from the body along with other wastes. Feces containing such cysts are washed into lakes and streams. Animals or people may ingest the parasite when they drink the water.

People infected by *Giardia* may experience something like a "60-day diarrhea," although effects vary from person to person. In recent years there have been *Giardia* outbreaks in two Maine towns.

A disease-carrying microorganism similar to *Giardia* is *Cryptosporidium*. This too is a microscopic parasite that gets into water in the cyst form. It too causes diarrhea that may be severe and may be dangerous for some people (such as cancer chemotherapy patients). In 1993 over 400,000 people in Milwaukee, Wisconsin were struck by this disease. There has been only one known outbreak in Maine (a minor one transmitted in cider).

Normal water treatment (with chlorine) does not kill the cysts of these two parasites. A higher level of disinfectant can kill the cysts, but such treatment results in bad-tasting water. The cysts can be removed or killed by: 1) filtering, or 2) disinfecting the water supply with ozone. Both treatment methods are expensive, but are increasingly being used in Maine.

Other kinds of bacteria and viruses can get into lake water, for example through human wastes from lakeshore cottages and boats. These pathogens are generally killed by the treatment in public water supplies.

In recent years considerable changes have taken place with respect to federal and state regulation of water systems. The Safe Drinking Water Act, enacted by Congress in 1974, was strengthened in 1986. Public water systems must now meet strict standards of water testing and treatment. Water districts must test their water regularly for a wide range of contaminants, and some systems have had to install or upgrade filter systems. In addition, water districts using lake water have to be particularly vigilant in protecting their lakes and watersheds from contaminating events.

What about lakeshore cottages and businesses?

Most lakeshore campgrounds, children's camps, and eating places now get their water from drilled wells rather than their lakes.

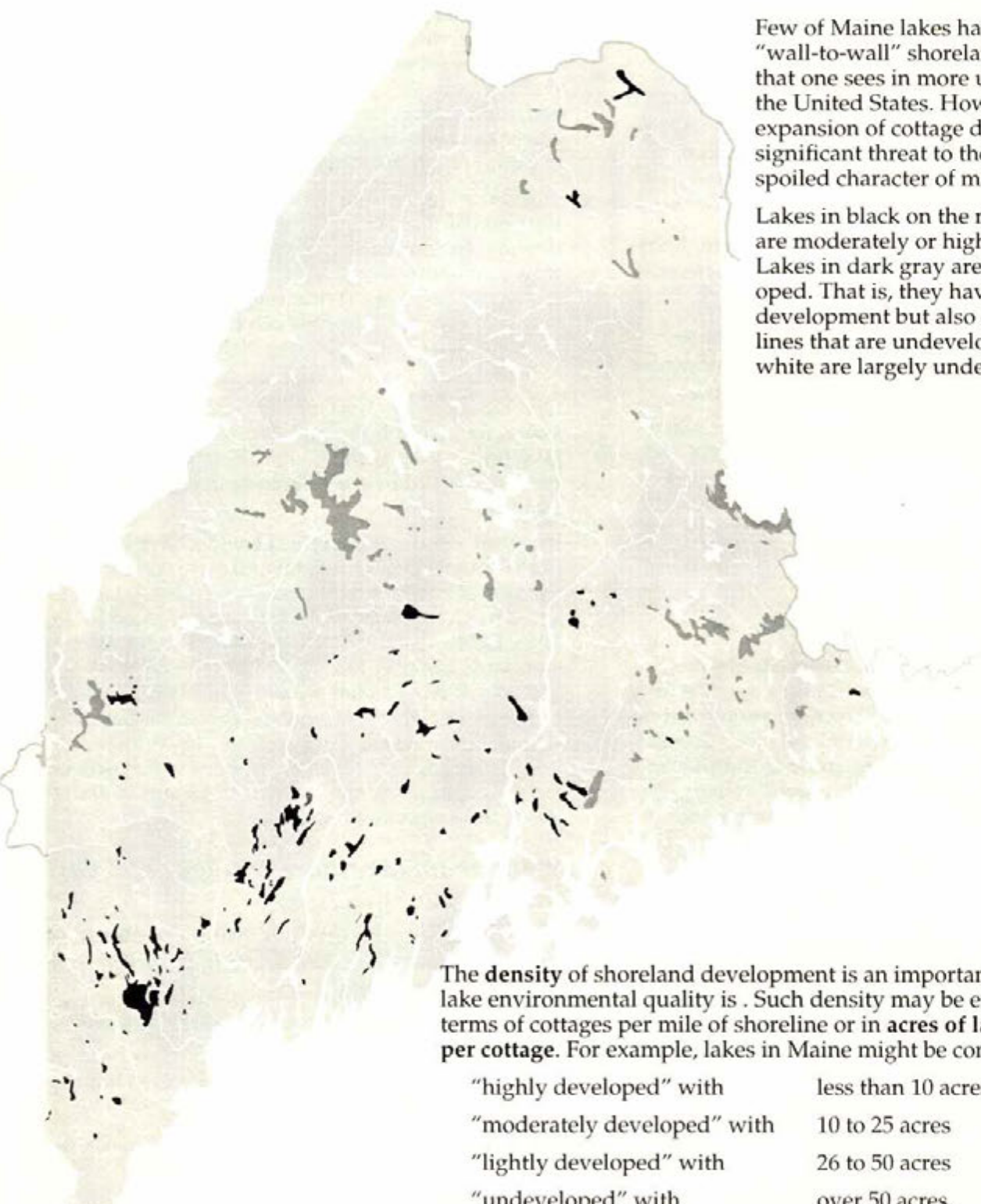
As far as lakeshore homes and cottages are concerned . . .

- A small number are able to connect to public water systems.
- Some homes and cottages (no one knows how many) have drilled wells.
- Some people use lake water for cleaning but rely on bottled (or boiled) water for drinking and cooking.
- Some use their lakewater for drinking and take their chances on the waterborne diseases described above. Such people are living somewhat dangerously.

LAKESHORE COTTAGES AND HOMES

Few of Maine lakes have the kind of "wall-to-wall" shoreland development that one sees in more urbanized parts of the United States. However, long-term expansion of cottage development is a significant threat to the special unspoiled character of many Maine lakes.

Lakes in black on the map are those that are moderately or highly developed. Lakes in dark gray are lightly developed. That is, they have some cottage development but also extensive shorelines that are undeveloped. Lakes in white are largely undeveloped.



The density of shoreland development is an important measure of lake environmental quality is . Such density may be expressed in terms of cottages per mile of shoreline or in **acres of lake surface area per cottage**. For example, lakes in Maine might be considered

"highly developed" with	less than 10 acres (per cottage)
"moderately developed" with	10 to 25 acres
"lightly developed" with	26 to 50 acres
"undeveloped" with	over 50 acres.

The difference in cottage density between northern and southern Maine lakes is striking. Of course, the difference has mainly to do with population density and access. The lakes in central and southern Maine are in populated areas with well-developed road systems. Those in northern and eastern Maine are distant from populated areas and poor in highway access.

The improved quality of lakeshore cottage developments is one of the great environmental success stories of the last quarter-century—comparable to the cleanup of the nation’s rivers.

There were not many cottages on any Maine lakes until the arrival of the “automobile era” early in this century. Even then, in the early 1900s, people in Maine did not have the leisure or the money to invest in cottages, and out-of-state people did not have the highway access they now have. This changed after World War II. Thousands of cottages were built on Maine lakes from the late 1940s up through the 1960s.

Although many of these lakes were in organized towns and cities, the developments were often unplanned and uncontrolled. Cottages were often put on small-size lots—often on or very close to the shoreline. Natural vegetation was often completely removed. Access roads were inadequate (for fire protection, for example). And sewage systems were often substandard.

By the 1960s it was clear that Maine’s lakes were seriously threatened by uncontrolled development. Political leaders and state agencies responded to this crisis by adopting a series of laws and regulations. These included

- a new plumbing code that set standards for private sewage systems;
- a state minimum-lot-size law that controlled land divisions pending adoption of necessary controls by local governments;
- a “Site Law,” which required state review and approval of developments over 20 acres;
- regulations on shoreline alteration (such as dredging) and
- “Shoreland Zoning”—a state law requiring that each city or town adopt shoreland regulations conforming to state-set standards—or be superseded by state regulations (to be administered by the city or town).

These regulations achieved their aims to a high degree. The quality of new lakeshore development is far better than it was a generation ago. However, the steps described above have fallen short in one major respect: that of enforcement.

Luckily, in our society most people conform to our laws. But some people don’t. In some places owners have violated community laws by

- stripping the vegetation from land between their cottages and the lake;
- dredging inlets for their boats;
- converting their cottages to year-round homes without bringing their sewage systems into conformity with state requirements; and
- building porches or additions into the required set-back area.

It is not easy to bring enforcement actions against such owners. Code enforcement is improving, but local and state governments often lack the staff to oversee lakeshore development. Local officials and neighbors are sometimes reluctant to confront owners who violate the law.

Hopes for reducing code violations will depend, to some extent on education and on building a stronger ethic of landowner responsibility. Local lake associations can strengthen such an ethic. They can also monitor and highlight violations—as well as support local code enforcement officers and town governments in their enforcement responsibilities.

The laws and regulations on shoreland development—even if fully enforced—are only a partial answer to the long-term protection of Maine’s lakes. They are an important part, however.

