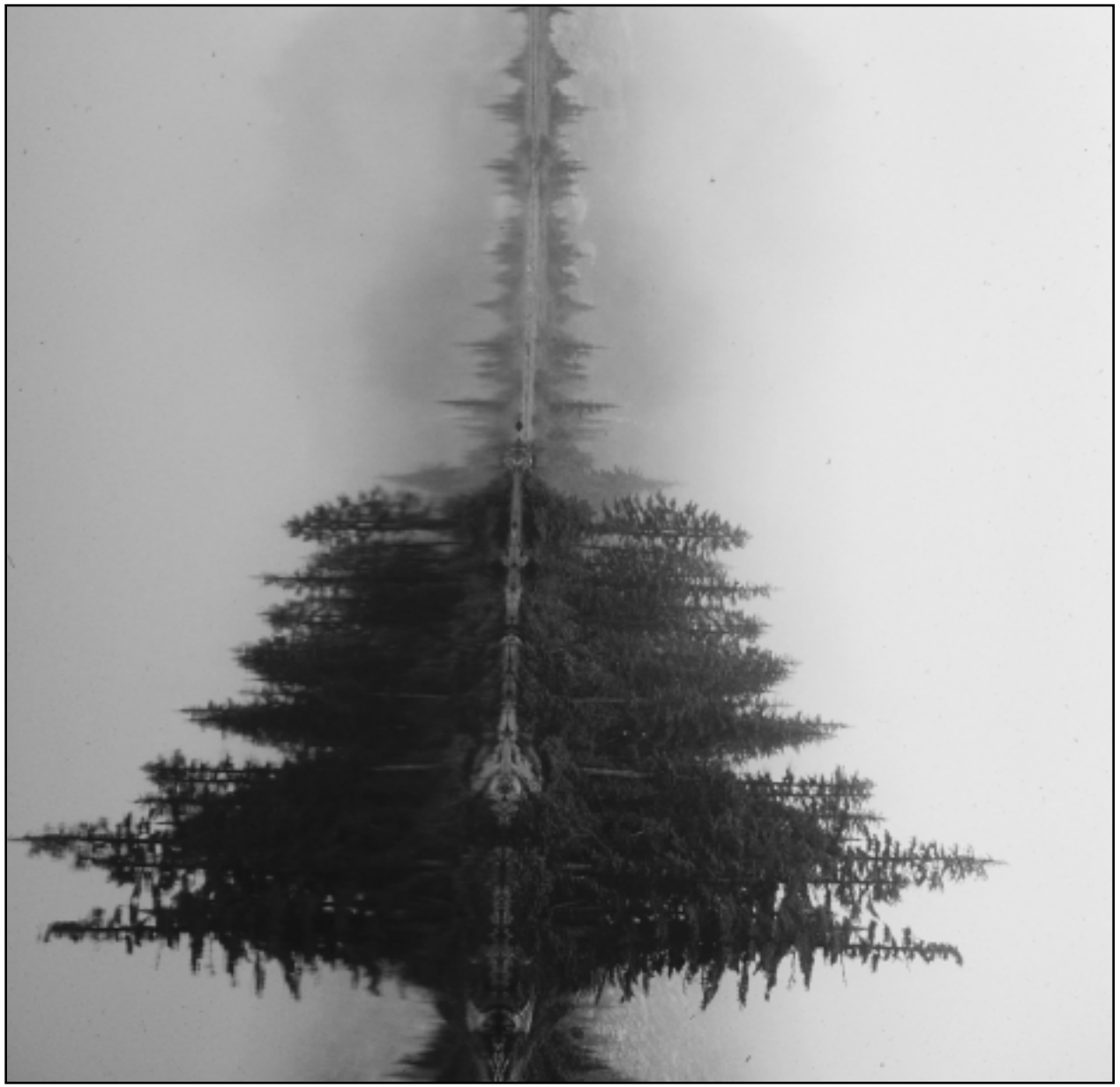
John H. McShane, Mt. Rainier National Park, WA



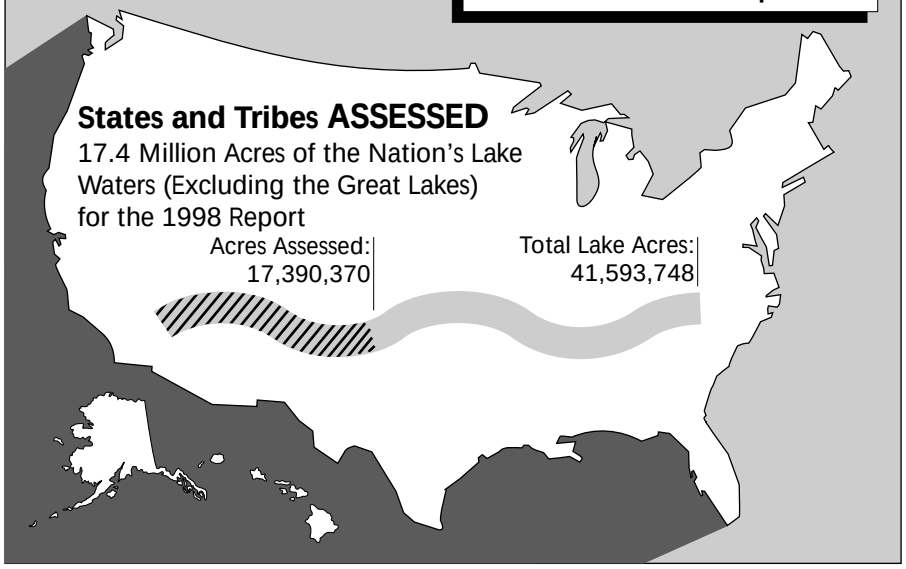
Lakes, Reservoirs, and Ponds

Forty-five states, Puerto Rico, and the District of Columbia (collectively referred to as states in the rest of this chapter) and two tribes rated lake water quality in their 1998 Section 305(b) reports (see Appendix B, Table B-1, for individual state and tribal data). These states and tribes assessed nearly 17.4 million acres of lakes, reservoirs, and ponds, which equals 42% of the 41.6 million acres of lakes in the nation (Figure 4-1). The states and tribes based 65% of their assessments on monitored data and evaluated 17% of the assessed lake acres with qualitative information. The states did not specify whether the remaining 18% of the assessed lake acres were monitored or evaluated.[a]

The number of assessed lake acres increased from 16.8 million acres to 17.4 million acres, a 3% increase from 1996 to 1998. This increase is due to greater monitoring coverage from a number of states including Arizona, Massachusetts, Montana, and Nevada. Wisconsin increased its assessed

States and Tribes
ASSESSED
42%
of their total lake acres[a] for the 1998 report

Figure 4-1



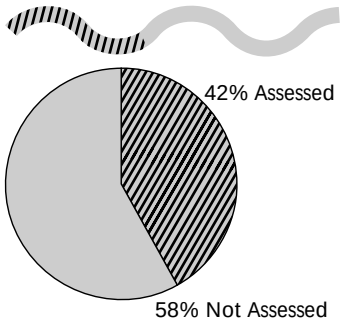
This figure compares the total acres of lakes, reservoirs, and ponds with the subset that were assessed by states for the 1998 water quality report.

Based on data contained in Appendix B, Table B-1.

THE STATES ASSESSED over 17 million acres of lakes for 1998.

Lake, Reservoir, and Pond Acres Assessed by the States and Tribes

1998 17,390,370 acres = 42% assessed
Total acres: 41,593,748[a]



1996 16,819,769 acres = 40% assessed
Total acres: 41,684,902[b]

1994 17,134,153 acres = 42% assessed
Total acres: 40,826,064[c]

1992 18,300,000 acres = 46% assessed
Total acres: 39,920,000[d]

[a]Source: 1998 state and tribal section 305(b) reports.
[b]Source: 1996 state and tribal section 305(b) reports.
[c]Source: 1994 state and tribal section 305(b) reports.
[d]Source: 1992 state and tribal section 305(b) reports.

Note: Figures do not add to 100% due to the rounding of individual numbers.

55% OF ASSESSED lake acres have good water quality.

lake acreage by using volunteer monitoring data.

These increases more than offset significant decreases in reported lake acres from a number of other states.

The states and tribes used recent monitoring data to assess 65% of their assessed lake acres (see Appendix B, Table B-2, for individual state and tribal information). Evaluated assessments, based on qualitative information or monitoring information more than 5 years old, were used for 17% of the assessed lake acres. States did not specify whether the remaining 18% of assessed lake acres were monitored or evaluated. Compared to the 1996 reporting cycle, states are using monitoring data for a smaller percentage of their assessments. In 1996, states used monitoring data in 74% of their lake assessments.

Differences among state assessment methods limit meaningful comparisons of lake information submitted by individual states. States devote varying resources to monitoring biological integrity, water chemistry, and toxic pollutants in fish tissues. The wide range in water quality rating reported by the states reflects both differences in water quality monitoring and differences in assessment methods.

The summary information presented in this chapter applies strictly to the portion of the nation's lakes assessed by the states and tribes. EPA cannot make generalizations about the health of all of our nation's lakes based on data extracted from the 305(b) reports. The primary reason the assessment data cannot be used to make general statements about national water quality is that states have not achieved comprehensive assessment of all lakes. Another factor is the monitoring design used to collect data. Many states and tribes direct their limited monitoring resources toward waters with suspected problems. As a result, the assessed lakes probably contain a higher percentage of polluted waters than all of the nation's lakes. A risk of this targeted monitoring approach is that healthy waters may deteriorate without anyone noticing.

Water Quality Assessment

States and tribes rate water quality by comparing data to standards. Water quality standards include narrative and numeric criteria that support specific designated uses. Standards also specify goals to prevent degradation of good quality waters.

States and tribes use their numeric and narrative criteria to evaluate whether the designated uses assigned to the waterbodies are supported. Designated uses reflect the goals of the Clean Water Act. They aim to protect human health and the biological integrity of aquatic ecosystems. The most common designated uses are:

- Aquatic life support
- Drinking water supply
- Recreation such as swimming, fishing, and boating
- Fish consumption.

After comparing water quality data to standards, states and tribes classify the waters into the following categories:

■ **Good/Fully Supporting:** Good water quality supports a diverse community of fish, plants, and aquatic insects, as well as the array of human activities assigned to a lake by the state. These waters meet applicable water quality standards, both criteria and designated use.

■ **Good/Threatened:** Good water quality currently supports aquatic life and human activities in and on the lake. These waters are currently meeting water quality standards, but states and tribes are concerned they may degrade in the near future. These concerns are based on a trend of increasing pollution or land use changes that may threaten future water quality.

■ **Fair/Partially Supporting:** Fair water quality supports aquatic communities with fewer species of fish, plants, and aquatic insects and/or pollution occasionally interferes with human activities. These waters are meeting water quality standards most of the time, but exhibit occasional exceedances. For example, runoff during severe thunderstorms may temporarily elevate fecal coliform bacteria densities and indicate that swimming is not safe immediately following summer storms.

■ **Poor/Not Supporting:** Poor water quality does not support a healthy aquatic community and/or prevents some human activities on the lake. These waters are not meeting water quality standards. For example, lake waters may be devoid of fish for more than a month each summer because excessive nutrients from runoff initiate algal blooms that deplete oxygen concentrations.

■ **Not Attainable:** The state has performed a use-attainability analysis and demonstrated that support of one or more designated beneficial uses is not attainable due to specific biological, chemical, physical, or economic/social conditions (see Chapter 1 for additional information).

Summary of Use Support

Most states and tribes rate how well a lake supports individual uses (such as swimming and aquatic life) and then consolidate individual use ratings into a summary table. This table divides assessed lake acres into those that are

■ **Good** – Fully supporting all of their uses or fully supporting all uses but threatened for one or more uses

■ **Impaired** – Partially or not supporting one or more uses

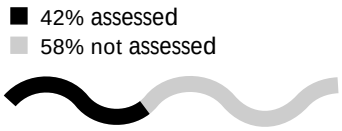
■ **Not attainable** – Not able to support one or more uses.

Forty-four states, two tribes, Puerto Rico, and the District of Columbia reported summary use support status for lakes in their 1998 Section 305(b) reports (see Appendix B, Table B-2, for individual state and tribal information). Montana reported individual use support status but did not report summary use support status. In this case, EPA used aquatic life use support status to summarize water

45% OF ASSESSED lake acres are impaired for one or more uses

Assessed Waters

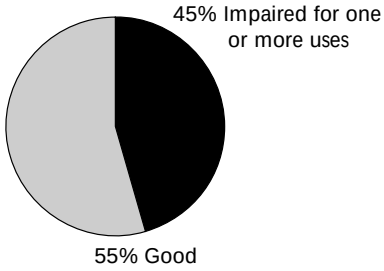
Total lakes = 41,593,748 acres[a]
Total assessed = 17,390,370 acres[b]



Of the assessed acres:

- 65% were monitored
- 17% were evaluated
- 18% were not specified

Assessed Water Quality



[a]Source: 1998 state and tribal Section 305(b) reports.

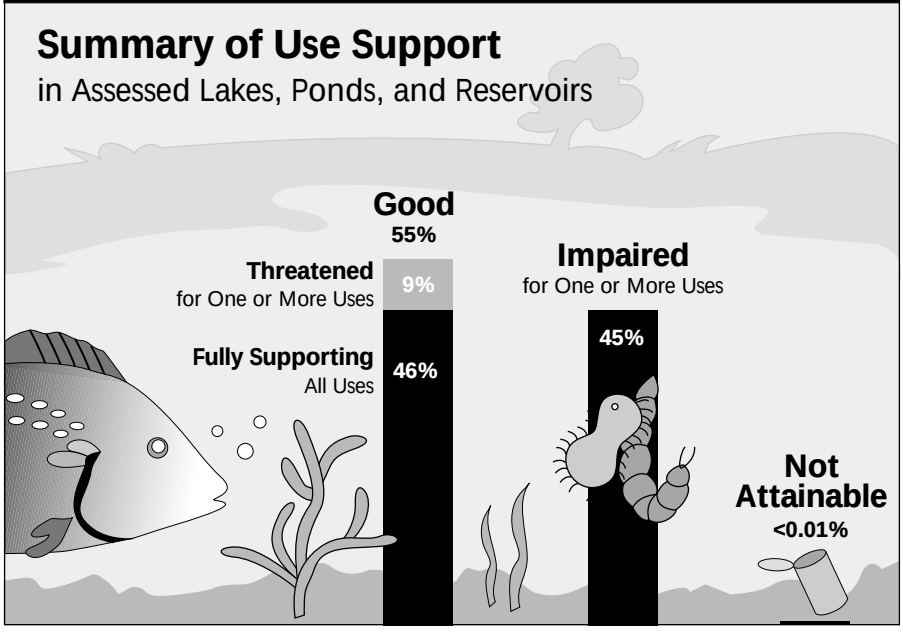
quality conditions in Montana's lakes.

It is important to note that seven states did not include the effects of statewide fish consumption advisories for mercury when calculating their summary use support status in lakes. Connecticut, Massachusetts, Michigan, New Hampshire, New Jersey, North Carolina, and Vermont excluded the impairment associated with statewide mercury advisories in order to convey information that would have been otherwise masked by the fish consumption advisories. If these advisories had been included, all of the states' lakes would have received an impaired rating. (See discussion of mercury in "Pollutants and Stressors Impacting Lakes, Reservoirs, and Ponds" on page 86.)

New York also excluded the effects of a statewide PCB/chlordane/mirex/DDT fish consumption advisory for lakes in its summary data.

The states and tribes reported that 55% of their assessed 17.4 million lake acres have good water quality (Figure 4-2). Waters with good quality include 46% of the assessed lake acres that fully support all uses and 9% of the assessed lake acres that fully support all uses but are threatened for one or more uses. Some form of pollution or habitat degradation impairs the remaining 45% of the assessed lake acres.

Figure 4-2



This figure presents the status of the assessed acres of lakes, reservoirs, and ponds. Of the more than 17 million acres of lakes, reservoirs, and ponds assessed, 55% fully support their designated uses and 45% are impaired for one or more uses. Nine percent of the assessed waters are fully supporting uses but threatened.

Based on data contained in Appendix B, Table B-2.

Individual Use Support

Individual use support assessment provides important details about the nature of water quality problems in our nation's surface waters. The states establish specific designated uses for waterbodies through their water quality standards. The states consolidate their more detailed uses into six general use categories so that EPA can present a summary of the state and tribal data. The standard uses consist of aquatic life support, fish consumption, primary contact recreation (such as swimming and diving), secondary contact recreation (such as boating), drinking water supply, and agricultural use.

Forty-two states, one tribe, Puerto Rico, and the District of Columbia reported individual use support status of their lakes, reservoirs, and ponds (see Appendix B, Table B-3, for individual state and tribal information). The reporting states and tribe assessed aquatic life use and swimming use most frequently. They identified more impacts on aquatic life use and swimming use than the other individual uses (Figure 4-3). These states and tribes reported that fair or poor water quality impacts aquatic life in over 3.5 million lake acres (29% of the 12.2 million acres assessed for aquatic life support), and swimming criteria violations impact 2.8 million lake acres (20% of the 14.4 million acres assessed for swimming use support).

Figure 4-3

Individual Use Support in Lakes, Reservoirs, and Ponds

Designated Use	Acres Assessed	Percent: Good (Fully Supporting)	Good (Threatened)	Fair (Partially Supporting)	Poor (Not Supporting)	Not Attainable
Aquatic Life Support	12,245,274	58	13	23	6	<1
Fish Consumption	7,838,388	54	5	35	6	<1
Primary Contact – Swimming	14,413,872	69	11	15	5	<1
Secondary Contact	7,322,828	78	8	10	4	<1
Drinking Water Supply	8,418,286	82	4	9	5	0
Agriculture	4,705,329	89	4	3	4	0

This figure presents a tally of the acres of lakes, reservoirs, and ponds assessed by states for each category of designated use. For each category, the figure presents a summary of the proportion of the assessed waters rated according to quality.

Based on data contained in Appendix B, Table B-3.

Many states did not rate fish consumption use support because they have not included fish consumption as a use in their standards. However, through separate tracking of state fish consumption advisories, EPA estimates that about 6.5 million lake acres were under advisories in 1998. EPA encourages the states to designate fish consumption as a separate use in their waterbodies to promote consistency in future reporting.

Water Quality Problems Identified in Lakes, Reservoirs, and Ponds

When states and tribes rate waters as impaired, they also attempt to identify the causes and sources of impairment. Figures 4-4 and 4-5 identify the pollutants and sources of pollutants that impair the most acres of assessed lakes.

The following sections describe the leading pollutants/stressors and sources of impairment identified in lakes. It is important to note that the information about pollutants/stressors and sources is incomplete. The states and tribes do not always report the pollutants/stressors or source of pollutants impacting every impaired lake. In some cases, they may recognize that water quality does not fully support a designated use, but may not have adequate data to document the specific pollutant or stressor responsible for the impairment. Sources are even more difficult to identify than pollutants and stressors.

In addition, eight states did not include the effects of statewide lake fish consumption advisories when reporting the pollutants and sources responsible for impairment. As a result, the pollutants associated with the advisories (mercury for seven states and PCBs/chlordane/mirex/DDT for one state) are significantly underrepresented by the values presented in this report. Similarly, the sources associated with these pollutants, often atmospheric deposition or contaminated sediments, are underrepresented.

Pollutants and Stressors Impacting Lakes, Reservoirs, and Ponds

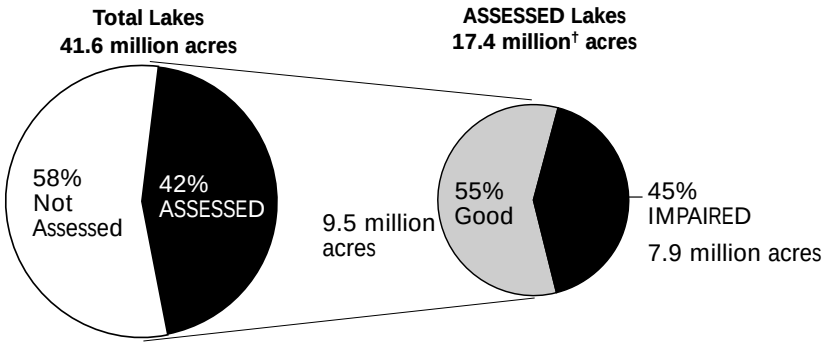
Forty-six states and tribes reported the number of lake acres impacted by individual pollutants and stressors, such as invasive aquatic plants (see Appendix B, Table B-4, for individual state and tribal information).

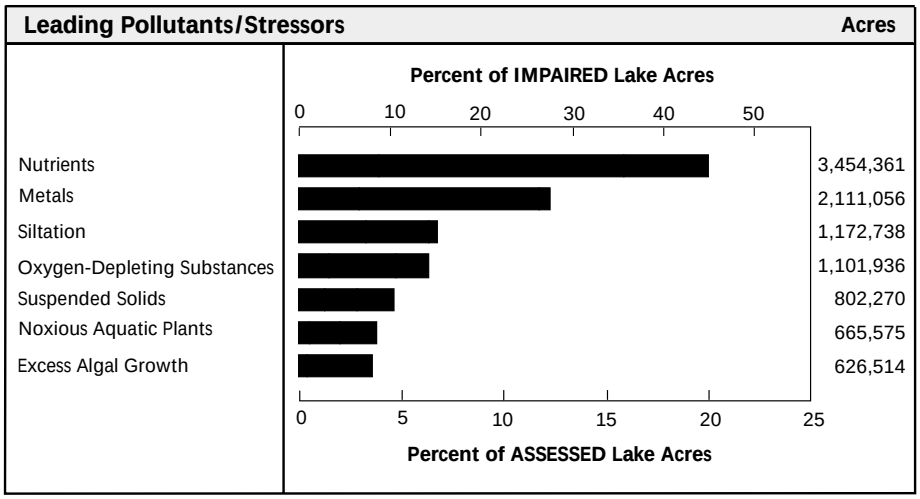
The states, tribe, District of Columbia, and Puerto Rico identified more lake acres polluted by nutrients than any other pollutant or stressor (Figure 4-4). They reported that excess nutrients pollute 3.5 million lake acres (which equals 20% of the assessed lake acres and 44% of the impaired lake acres).

Healthy lake ecosystems contain nutrients in small quantities from natural sources. Extra inputs of nutrients (primarily nitrogen and phosphorus) disrupt the balance

Figure 4-4

Leading POLLUTANTS in Impaired Lakes*





States assessed 42% of the total acres of lakes, reservoirs, and ponds for the 1998 report. The larger pie chart on the left illustrates this proportion. The smaller pie chart on the right shows that, for the subset of assessed waters, 55% are rated as good and 45% as impaired. When states identify waters that are impaired, they describe the pollutants or processes causing or contributing to the impairment. The bar chart presents the leading causes and the number of lake, reservoir, and pond acres impacted. The percent scales on the upper and lower x-axis of the bar chart provide different perspectives on the magnitude of the impact of these pollutants. The lower axis compares the acres impacted by the pollutant to the total ASSESSED acres. The upper axis compares the acres impacted by the pollutant to the total IMPAIRED acres.

Based on data contained in Appendix B, Table B-4.

* Eight states did not include the effects of statewide fish consumption advisories when reporting the pollutants and sources responsible for impairment. Therefore, certain pollutants and sources, such as metals and atmospheric deposition, may be underrepresented.

† Includes acres assessed as not attainable.

Note: Percentages do not add up to 100% because more than one pollutant or source may impair a lake.

The pollutants/processes and sources shown here may not correspond directly to one another (i.e., the leading pollutant may not originate from the leading source). This may occur because a major pollutant may be released from many minor sources. It also happens when states do not have the information to determine all the sources of a particular pollutant/stressor.

According to the states, **NUTRIENTS** are the most common pollutants affecting assessed lakes. Nutrients

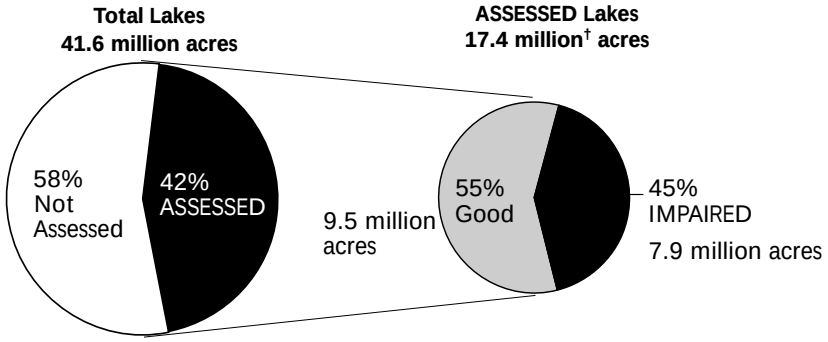
- Are found in 20% of the assessed lakes (see Figure 4-4)
- Contribute to 44% of reported water quality problems in impaired lakes.

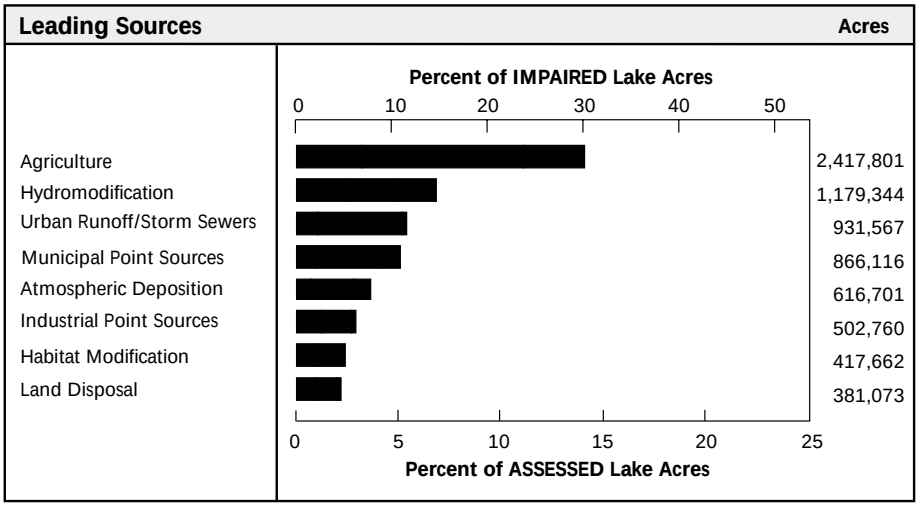
According to the states, **AGRICULTURE** is the leading source of pollution in assessed lakes. Agricultural pollution problems

- Affect 14% of the assessed lakes
- Contribute to 31% of reported water quality in impaired lakes (see Figure 4-5).

Figure 4-5

Leading SOURCES of Lake Impairment*‡





States assessed 42% of the total acres of lakes, reservoirs, and ponds for the 1998 report. The larger pie chart on the left illustrates this proportion. The smaller pie chart on the right shows that, for the subset of assessed waters, 55% are rated as good and 45% as impaired. When states identify waters that are impaired, they also describe the sources of pollutants associated with the impairment. The bar chart presents the leading sources and the number of lake, reservoir, and pond acres impacted. The percent scales on the upper and lower x-axis of the bar chart provide different perspectives on the magnitude of the impact of these sources. The lower axis compares the acres impacted by the source to the total ASSESSED acres. The upper axis compares the acres impacted by the source to the total IMPAIRED acres.

Based on data contained in Appendix B, Table B-5.

* Eight states did not include the effects of statewide fish consumption advisories when reporting the pollutants and sources responsible for impairment. Therefore, certain pollutants and sources, such as metals and atmospheric deposition, may be underrepresented.

† Includes acres assessed as not attainable.

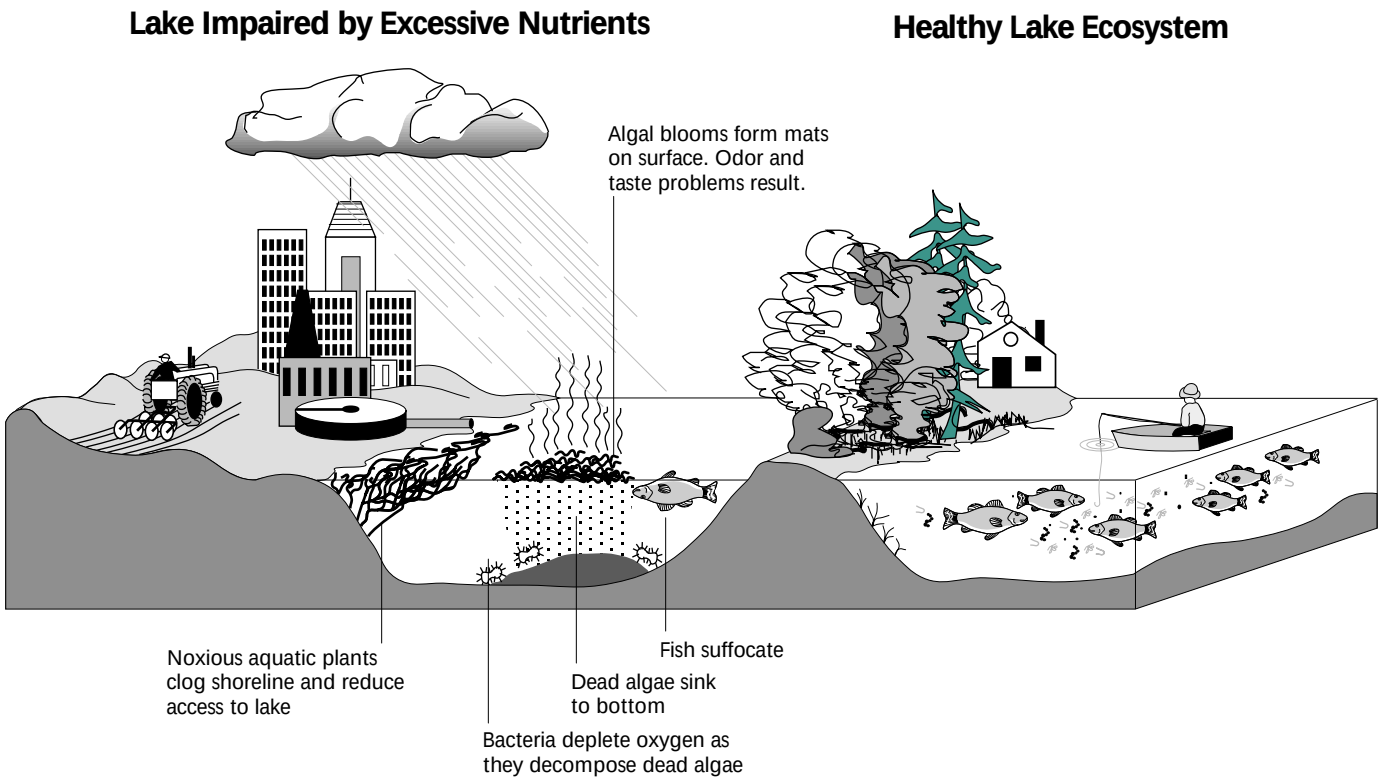
‡ Excluding unknown, natural, and "other" sources.

Note: Percentages do not add up to 100% because more than one pollutant or source may impair a lake.

of lake ecosystems (Figure 4-6). Excessive nutrients stimulate population explosions of undesirable algae and aquatic weeds. The algae sink to the lake bottom after they die, where bacteria decompose them. The bacteria consume dissolved oxygen in the water while decomposing the dead algae. This, in turn, deprives fish and other organisms of oxygen. Fish kills and foul odors may result if dissolved oxygen is depleted.

After nutrients, the states reported metals as the second most common pollutant in assessed lake acres, impairing 2.1 million lake acres (12% of the assessed lake acres and 27% of impaired lake acres). States consistently report metals as a major cause of impairment to lakes. This is mainly due to the widespread detection of mercury in fish tissue samples. It is difficult to measure mercury in ambient water. Most states rely on fish tissue samples to indicate mercury contamination, since mercury bioaccumulates in tissue. States are actively studying the extent of the mercury problem, which is complex because it involves atmospheric transport from power-generating facilities, waste incinerators, and other sources.

Figure 4-6



Nutrients cause nuisance overgrowth of algae as well as noxious aquatic plants, which leads to oxygen depletion via plant respiration and microbial decomposition of plant matter. If not properly managed and controlled, sources such as agriculture, industrial activities, municipal sewage, and atmospheric deposition can contribute to excessive nutrients in lakes.

In addition to nutrients and metals, the states report that siltation pollutes 1.2 million lake acres (7% of the assessed lake acres and 15% of the impaired lake acres), enrichment by organic wastes that deplete dissolved oxygen in lake waters impacts 1.1 million lake acres (6% of the assessed lake acres and 14% of the impaired lake acres), and suspended solids impact 802,270 acres (5% of the assessed lake acres and 10% of the impaired lake acres). While siltation generally refers to the deposition of sediment in the bottom of a waterbody, suspended solids hang in the water column.

Often, several pollutants and processes impact a single lake. For example, an activity such as removal of shoreline vegetation may accelerate erosion of sediment and nutrients into a lake. In such cases, the states and tribes count a single lake acre under each pollutant and process category that impacts the lake acre. Therefore, the lake acres impaired by each pollutant and process do not add up to 100% in Figures 4-4 and 4-5.

This presentation ranks pollutants and stressors by the geographic extent of their impacts (i.e., the number of lake acres impaired by each pollutant or stressor). However, less abundant pollutants or stressors may have more severe impacts than the leading pollutants listed above. For example, extreme acidity (also known as low pH) can eliminate fish in isolated lakes, but acid impacts on lakes are concentrated in northeastern lakes and mining states and are not widespread across the country as a whole. The individual state 305(b) reports provide more detailed information about the severity of pollution in specific locations.

Trophic States

Oligotrophic	Clear waters with little organic matter or sediment and minimum biological activity.
Mesotrophic	Waters with more nutrients and, therefore, more biological productivity.
Eutrophic	Waters extremely rich in nutrients, with high biological productivity. Some species may be choked out.
Hypereutrophic	Murky, highly productive waters, closest to the wetlands status. Many clearwater species cannot survive.
Dystrophic	Low in nutrients, highly colored with dissolved humic organic matter. (Not necessarily a part of the natural trophic progression.)

In 1998, 32 states reported that 17% of the 7,373 lakes they assessed for trophic status were oligotrophic, 33% were mesotrophic, 38% were eutrophic, 12% were hypereutrophic, and less than 1% were dystrophic.

The Eutrophication Process

Eutrophication is a natural process, but human activities can accelerate eutrophication by increasing the rate at which nutrients and organic substances enter lakes from their surrounding watersheds. Agricultural runoff, urban runoff, leaking septic systems, sewage discharges, eroded streambanks, and similar sources can enhance the flow of nutrients and organic substances into lakes. These substances can overstimulate the growth of algae and aquatic plants, creating conditions that interfere with the recreational use of lakes and the health and diversity of native fish, plant, and animal populations. Enhanced eutrophication from nutrient enrichment due to human activities is one of the leading problems facing our nation's lakes and reservoirs.

Sources of Pollutants Impacting Lakes, Reservoirs, and Ponds

Forty-five states and tribes reported sources of pollution related to human activities that impact some of their lakes,

reservoirs, and ponds (see Appendix B, Table B-5, for individual state information). The states reported that agriculture is the most widespread source of pollution in the nation's assessed lakes (Figure 4-5). Agriculture generates pollutants that degrade aquatic life or interfere with public use of 2.4 million lake acres (14% of the assessed lake acres and 31% of the impaired lake acres).

Of the 35 states and tribes that reported impairment from agriculture, 16 reported the number of lake acres impacted by specific types of agricultural activities:

- Nonirrigated Crop Production – crop production that relies on rain as the sole source of water.

- Irrigated Crop Production – crop production that uses irrigation systems to supplement rainwater.

- Specialty Crop Production – crop production that involves growing food items other than small grains or forage crops (e.g., avocados, cucumbers, blueberries, and cranberries) as well as ornamental plants. Specialty crops may involve more intensive production practices (e.g., fertilizer, pesticides, and irrigation).

- Range Grazing – land grazed by animals that is seldom enhanced by the application of fertilizers or pesticides, although land managers sometimes modify plant species to a limited extent.

- Pasture Grazing – land upon which a crop (such as alfalfa) is raised to feed animals, either by grazing the animals among the crops or harvesting the crops. Pasture land is actively managed to encourage selected plant species to grow, and fertilizers or pesticides may be applied more often on pasture land than range land.

- Animal Feeding Operations – either Concentrated Animal Feeding Operations (permitted, point source) or Confined Animal Feeding Operations (nonpoint source).

  – Concentrated Animal Feeding Operations (permitted, point source) – facilities in which animals are confined, fed, and maintained for some period of time throughout the year where discharges are regulated through the National Pollutant Discharge Elimination System.

  – Animal Feeding Operations (nonpoint source) – facilities in which animals are confined, fed, and maintained for some period of time throughout the year that are considered nonpoint sources according to the Clean Water Act.

The 16 states and tribes that reported the number of lake, reservoir, and pond acres impacted by specific types of agricultural activities identified the most acres impaired by range grazing. These states and tribes reported that range grazing degrades 596,452 acres (25% of the 2,417,801 acres impaired by agriculture). Following range grazing, the states and tribes report that nonirrigated crop production degrades 553,064 acres (23% of the 2,417,801 acres impaired by agriculture). The states and tribes also report that irrigated crop production degrades 410,204 acres (17% of the 2,417,801 acres

Acid Effects on Lakes

Increases in lake acidity can radically alter the community of fish and plant species in lakes and can increase the solubility of toxic substances and magnify their adverse effects. In 1998, 17 states reported that, of the 3,317 lakes assessed for acidity, 2% exhibited acidity and 17% were threatened by acidity. An additional three states did not provide the number of lakes assessed for acidity, but reported that 430 lakes exhibited acidity. Most of the states that assessed acidic conditions are located in the Northeast, upper Midwest, and the South.

Only 10 states identified sources of acidic conditions. Alabama, Colorado, Kansas, Kentucky, Maryland, Montana, Oklahoma, and Tennessee reported that acid mine drainage resulted in acidic lake conditions or threatened lakes with the potential to generate acidic conditions. Other identified sources were atmospheric deposition and natural conditions.

impaired by agriculture), pasture grazing degrades 345,011 acres (14% of the 2,417,801 acres impaired by agriculture), animal feeding operations pollute 99,936 acres (4% of the 2,417,801 acres impaired by agriculture), and specialty crop production degrades 98,165 acres (4% of the 2,417,801 acres impaired by agriculture). See Chapter 3 for a discussion of how these sources impair water quality.

After agriculture, the states reported hydrologic modifications as the second most common source of impairment in assessed lake acres, degrading 1.2 million lake acres (7% of the assessed lake acres and 15% of the impaired lake acres). Hydrologic modifications include flow regulation and modification, dredging, and construction of dams. These activities may alter a lake's habitat in such a way that it becomes less suitable for aquatic life. For example, flow regulation and modification for the purpose of flood control, drinking water supply, or hydropower can cause fluctuation in lake levels that destabilizes the shoreline habitat.

In addition, the states report that pollution from urban runoff and storm sewers degrades 931,567 lake acres (5% of the assessed lake acres and 12% of the impaired lake acres), municipal sewage treatment plants pollute 866,116 lake acres (5% of the assessed lake acres and 11% of the impaired lake acres), and atmospheric deposition of pollutants impairs 616,701 lake acres (3% of the assessed lake acres and 8% of the impaired lake acres).

As in 1996, more states reported lake degradation from atmospheric deposition than in past reporting cycles. This is due, in part, to a growing awareness of the magnitude of the atmospheric deposition problem. Researchers have found significant impacts to ecosystem and human health from atmospherically delivered pollutants.

The states listed additional sources that impact several hundred thousand lake acres, including habitat modifications, land disposal of wastes, flow regulation, resource extraction, contaminated sediments, highway maintenance and runoff, drainage and filling of wetlands, and forestry activities.

Dear Night,

I must tell you, silence
is no longer the virtue it once was, rather
it only reminds us how small and alone we
really
are. Next time you wish us to celebrate a
cosmic event, please,
be more direct. A comet, or a meteor shower,
even some good old-fashioned fireworks. The star
was a nice touch, I must admit:
more suited to the taste of poor mortals than this
awful,
divine,
stillness.

River of Words 1999 Grand Prize Winner (Poetry, Grades 10-12)
Sarah Dooley, Age 16, GA

River of Words 1998 Grand Prize Winner (Art, Grades 10-12)
Kristina Fisher, *Moon River*, Grade 12, NM

Washington State's New Lake Nutrient Criteria

The Washington State Department of Ecology recently adopted lake nutrient criteria as part of revisions to the state's Surface Water Quality Standards. The new criteria establish a three-step approach for identifying and protecting lakes that are threatened or impacted by excess nutrients. The state plans to implement the criteria through its watershed process.

Trophic State –- a classification of the productivity of a lake ecosystem

Ecoregions – areas of relative homogeneity in ecological systems or in relationships between organisms and their environments

Why Limit Nutrients?

While nutrients such as phosphorus and nitrogen are needed for plant growth, an excess of nutrient inputs to a lake can result in unwanted amounts of plants and algae. Excess nutrients are a major cause of impairment to Washington's lakes. The nutrient criteria will serve to protect or restore lakes that are threatened or impacted by excess nutrients.

A Three-Step Approach

Washington has adopted a three-step approach to establishing lake nutrient criteria:

Step 1 – Set an action value for each ecoregion

Step 2 – Use site-specific studies for lakes exceeding the action value

Step 3 – Use trophic states to protect high-quality lakes.

The first step in the nutrient criteria process relies on total phosphorus action values established for each of the major ecoregions within the state. The action value is a total phosphorus value established at the upper limit of the trophic state in each ecoregion. Washington used EPA's *Ecoregions of the Pacific Northwest* to establish the ecoregions used in this project. Action values for nitrogen were not established because most lakes in Washington are phosphorus limited. Phosphorus limitation means that the amount of phosphorus in the lake, rather than nitrogen or both nitrogen and phosphorus, controls the growth of algae. Only a very few lakes are nitrogen limited and can be addressed through lake-specific studies.

If monitoring shows that the phosphorus level in a lake exceeds the action value, then the second step may be used to identify acceptable total phosphorus levels. The

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lake-specific study is intended to quantify existing nutrient concentrations, determine existing characteristic uses, and potential uses.

However, if monitoring data show that a lake's total phosphorus is lower than the action value, the third step may be used to help protect these higher quality lakes. For these lakes, the upper range of the applicable trophic state may be used as the proposed criteria.

Involving the Public

Public involvement is vital to the success of Washington's lake nutrient criteria program. Through the state's watershed process, members of the public propose lakes in need of nutrient criteria. These stakeholders—which include homeowner groups, lake management districts, and local governments—often coordinate the monitoring needed to determine if the lake exceeds its action value. These groups may also be involved with conducting lake-specific studies. Funding for both lake monitoring and lake-specific studies may come from Clean Water Act Section 319 grants or through the state's Centennial Clean Water Fund program.

Once the state has proposed a specific nutrient standard for a lake, the public is invited to review and comment on the proposed criteria as part of the formal process for revising and adopting water quality standards. The public is also involved during the formal adoption process. State law requires workshops, hearings, and responsiveness summaries as part of this process.

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New Jersey Bond to Support Lake Restoration Projects

In the November 1996 general election, the citizens of New Jersey passed the *Port of New Jersey Revitalization, Dredging, Environmental Cleanup, Lake Restoration, and Delaware Bay Area Economic Development Bond Act of 1996*. This Act included $5 million for lake restoration activities at public, private, and state-owned lakes.

In January 1998, regulations were promulgated and adopted for the disbursement of the funds provided for in the Act. The state developed regulations modeled after EPA's Clean Water Act Section 314 Clean Lakes Program, and allocated funding for Phase I and Phase II type projects. New Jersey's regulations define Phase I Diagnostic-Feasibility Study as two-part studies to determine a lake's current condition and to develop possible methods for lake restoration and protection. The two parts of the study are the diagnosis of water quality conditions, including determination of pollutant loading sources, and the development of a feasible management/restoration plan to address water quality conditions at the lake. Phase II Implementation Projects are defined as the implementation of any water quality improvement process(es) that have been recommended by a Phase I Diagnostic-Feasibility Study.

The regulations also include a prioritization methodology to award funds. One of the factors considered most in the prioritization process is public participation. Local interest and involvement are considered to be the critical element in a successful lake restoration project. Project applicants are required to solicit public comment on any projects and to encourage public involvement.

Applications were solicited and requests worth approximately $22 million were received as part of 57 applications. The New Jersey Department of Environmental Protection had originally proposed awarding the funds in two separate funding cycles. However, due to the number and amount of requests, a decision was made to award all funds ($5 million) immediately.

The appropriation process was completed in January 1999. The Department of Environmental Protection is currently preparing the associated agreements for the recipients of the funds.

Sources of EPA Support for State Lake Protection and Restoration Projects

Support for Lake Projects Through the CWA Section 319(h) Grant Program

On July 9, 1998, EPA issued *Guidance on the Use of Clean Water Act and Safe Drinking Water Act Authorities to Address Management Needs of Lakes and Reservoirs*, which emphasized the eligibility of lake and reservoir restoration and protection activities for funding under Section 319 of the Clean Water Act (CWA) and also encouraged greater use of the CWA State Revolving Fund (CW-SRF) and the Safe Drinking Water Act (SDWA) programs to implement priority lake and reservoir management projects. This guidance referred to the earlier May 1996 Nonpoint Source Program guidance that included a separate section on "Lake Protection and Restoration Activities." This section encourages states to use Section 319 funding for "eligible activities that might have been funded in previous years under Section 314 of the Clean Water Act."

In November 1996, EPA also issued a set of *Questions and Answers on the Relationship Between the Section 319 Nonpoint Source Program and the Section 314 Clean Lakes Program*. These Questions and Answers clarified that "Phase I, II, and III projects, and lake water quality assessments which were previously done under the Section 314 Clean Lakes Program are eligible for funding under Section 319(h) grants." However, the Section 319 guidance stresses that "(l)ake protection and restoration activities are eligible for funding under Section 319(h) to the same extent, and subject to the same criteria, as activities to protect and restore other types of waterbodies from nonpoint source pollution." There are several key criteria that lakes-related work needs to meet to be eligible for funding under Section 319:

- The activity must be included in a state nonpoint source management program. Thus, state lake managers and lake communities will need to ensure that critical lake nonpoint source control needs are included in any updated state nonpoint source management programs.

■ States may use Section 319 funds to update state nonpoint source management programs and nonpoint source assessments, including Phase I Clean Lakes Diagnostic-Feasibility Studies and statewide lake water quality assessments, subject to the following limitation: The guidance provides that states may use up to 20% of their Section 319(h) funds to update and refine their programs and assessments.

EPA Regional Clean Lakes Coordinators, EPA Regional Nonpoint Source Coordinators, and their counterparts at the state/local level are working together to ensure that critical lake nonpoint source management needs are addressed through Section 319. Key actions include ensuring that lake management needs are included in updated state nonpoint source management programs so that these activities are grant eligible and ensuring that high-priority lake management activities are included in annual work programs for Section 319(h) grants.

Support for Lake Projects Through the Clean Water State Revolving Fund

EPA has also been encouraging greater use of the CW-SRF to address nonpoint source problems.

In creating the CW-SRF, Congress provided broad eligibility; states can fund virtually any type of water quality project, including nonpoint source, wetlands, estuary and other types of watershed projects, as well as the more traditional municipal wastewater treatment systems. Lake managers can seek funding for projects under the CW-SRF as long as the problem is identified in state nonpoint source management programs. So, lake managers will want to make sure that priority lake management needs are identified in the updated state nonpoint source management programs.

The CW-SRFs have in excess of $27 billion in assets and since 1988 have funded more than $900 million in nonpoint source projects. EPA has established a goal of moving 10% of the Revolving Fund disbursements to nonpoint source projects. Thus, in addition to the funds available under the Section 319 Nonpoint Source Program, an enormous potential exists for using the CW-SRF to fund lake and reservoir restoration and protection projects as well as projects for other waterbody types.

Support for Lake Projects Through Safe Drinking Water Act Initiatives

The Safe Drinking Water Act Amendments of 1996 include new provisions that can be used to help protect and restore lakes and reservoirs that are sources of drinking water.

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Under the Amendments, EPA issued guidance for State Source Water Assessment and Protection Programs in August 1997 and, as of summer 1999, most states have submitted their programs for EPA review and approval. Also, many states have already started to undertake source water assessments for a number of public water supplies, many of which draw water from lakes or reservoirs. These assessments will help identify local needs for protection and/or restoration activities, and these activities can be funded by a variety of sources, including the Section 319 Nonpoint Source Program; the Drinking Water State Revolving Fund created by the 1996 Amendments to the Safe Drinking Water Act, which can make loans and grants for source water protection; and the separate Clean Water State Revolving Funds.

EPA anticipates that many of the principles developed as part of the existing Wellhead Protection Program for ground water systems will be applicable to surface water systems. Among other options, states may design source water protection programs that build on wellhead components such as source water area delineation, contaminant source inventories, management measures, and contingency planning. Approaches for lake assessment and diagnostic techniques developed under the Clean Water Act should also provide models.

Developing a new water supply can be very expensive. Source water protection can be a cost-effective prevention strategy for ensuring safe drinking water supplies for new and existing supply systems. A poor water supply also increases the costs of treatment for both large and small water systems. To address source water protection, the new law creates a program to ensure that states conduct assessments, coordinated with existing information and programs, to determine the vulnerability of sources of drinking water to contamination. Delineating source water protection areas and inventorying sources of contamination ensure that communities know the threats to their drinking water and can develop and implement appropriate protection efforts.