

Overview:

Water Pollution in Pennsylvania

BY JOHN A. ARWAY

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(This article is adapted and updated from an article that originally appeared in Pennsylvania Angler in October 1996. Reprinted by permission.)

The most recent assessment of the water quality and biological conditions of Pennsylvania streams and rivers shows that 8,495 miles are believed to be supporting the federal Clean Water Act's "fishable/swimmable" goal; that's 10.2 percent of the state's 83,260¹ miles of streams. Stream uses were totally impaired in 4,407 miles of streams. In other words, 5.3 percent of our total stream miles cannot fully support swimming, fishing or both because of water pollution.

The pollution provisions of the Pennsylvania Fish and Boat Code provide the legal framework enabling Waterways Conservation Officers from the Pennsylvania Fish and Boat Commission to apprehend polluters and incur fines and penalties. The Commission also recovers damages to aquatic resources after water pollution occurs and fish and other aquatic life have been killed. A review of Bureau of Law Enforcement Water Pollution Reports, which include both pollution and watershed



Susquehanna River near Wilkes-Barre.



Monongahela River

disturbance cases, reveals that 561 cases were investigated in 1998. These cases resulted in 297 settlements or prosecutions totaling \$327,272 in penalties.

All of these penalties, of course, were assessed after the fact, after waterways in the state already had become polluted. A much better approach to dealing with water pollution is to prevent it from happening in the first place.

Pennsylvania's water pollution control program dates back to 1905, and the Commonwealth's first comprehensive water pollution control legislation, the "Clean Streams Law," was enacted in 1937. The Clean Streams Law has been strengthened over time by many legislative amendments. It has been used very effectively by the Pennsylvania Department of Environmental Protection (DEP) to control "point source pollution," which consists of sewage and

¹The 1998 DEP 305(b) report estimates the total stream miles as 83,261. The number of stream miles reported in 305(b) reports has changed significantly through the years. In 1984, only 12,962 miles were reported — those listed as major streams in a 1917 publication. By 1986, an in-house estimate of 50,000 total stream miles was cited. From 1992 to 1996, EPA-calculated total stream miles were used. These were done at the 1:100,000 scale. The 1996 305(b) report listed 53,962 miles. The 83,261 miles reported in 1998 were calculated using an in-house GIS system at the 1:24,000 scale, which shows more streams.

industrial wastes. An analysis of Commission Water Pollution Report records and DEP water quality assessment reports reveals that the overall environmental health of Pennsylvania streams has been stable or slightly improving over the past 15 years—largely because of reductions in point source pollution.

Today's water pollution problems, however, are dominated by "nonpoint sources" such as abandoned mines, agriculture and other activities that produce polluted runoff. Toxic substances are also a great concern because of the potential risks they pose to natural resources and public health. The fact that these substances can now be measured in very low concentrations (parts per trillion or even parts per quadrillion) has added to the public's concern.

The following is a discussion of the major sources of water pollution affecting Pennsylvania's rivers and streams.

■ Nonpoint Source (NPS) Water Pollution

Nonpoint source pollution accounts for over 77 percent of the total water pollution problem in Pennsylvania, according to the Pennsylvania Department of Environmental Protection in a 1998 report to the U.S. Environmental Protection Agency (USEPA). The largest source of NPS pollution in Pennsylvania is abandoned mine drainage, which accounts for 1,764 miles (40 percent) of degraded water. Not only is it the largest source of NPS pollution, but abandoned mine drainage is, in fact, the largest source of pollution affecting stream quality in the Commonwealth. A Commission estimate of the value of recreational fishing activities that are lost to the Commonwealth due to abandoned mine drainage pollution is \$67 million per year.

Yet another nonpoint source of water pollution is agriculture. The second largest source of pollution affecting stream quality in Pennsylvania after abandoned mine drainage, agriculture contributes to 1,328 miles (30 percent) of degraded streams. Other sources of nonpoint pollution include urban and stormwater runoff (10 percent), construction activities (3 percent), and acid rain (2 percent).

Abandoned Mine Drainage

Abandoned mine drainage can include both alkaline and acid mine drainage components. However, acid mine drainage (AMD) is responsible for more degraded stream miles in the Commonwealth than any other pollutant. Acid mine drainage is a byproduct of the surface and deep mining of coal.

The major sources of AMD are coal mines abandoned in the early 1900s that discharge millions of gallons of acidic water into our streams each year. Old and abandoned mines aren't the only problem, however. Even today, coal operators are abandoning their treatment systems, filing for bankruptcy, and leaving it to the Commonwealth to decide whether or not it's in the public interest to continue chemical treatment of their discharges.

Acidic discharges from coal mines are produced when soil and crushed rock containing iron pyrite, or fool's gold, are uncovered during mining. When these pyrites are exposed to air and water, a chemical reaction occurs that forms iron hydroxide and sulfuric acid. This acid then dissolves other minerals and metals from the surrounding rock. The dissolved elements ultimately find their way through the local groundwater into a nearby stream. As a result, polluted groundwater discharges resulting from mining activities can be very acidic, depending on the amount of pyrite in the uncovered soil and rock, also called the "overburden." The groundwater also can contain high levels of toxic metals such as iron, aluminum and manganese.

One of the most apparent signs of mine drainage is a yellow-orange staining, or "yellow-boy," left on stream bottoms. This results from the high levels of dissolved iron in groundwater coming into contact with oxygen that is either in the air or is dissolved in the surface water. The iron then becomes "oxidized." This can also happen with aluminum, which can make stream bottoms white, or manganese, which can make them black. The oxidation of toxic metals is the reason we have different-colored streambeds in different parts of the Commonwealth. Most of the metal "precipitates" either are directly toxic or fill in the spaces between the rocks in the stream bottom so that there is no place left for the aquatic invertebrates that fish feed on to live. The result: fish and other aquatic animals die.

Siltation is another source of pollution from mining,

especially when large surface areas are disturbed. During rainstorms the soils wash away from the mine sites into local streams. The soils then become sediment or siltation, and coat the stream bottoms in much the same way as metal precipitates pollute streams.

AMD pollution is a very serious problem in Pennsylvania and will continue to plague us for many years. There are no magical or simple solutions to solving this problem, but promising new technologies do exist. If we can stop the creation of additional AMD problems by applying and enforcing present environmental regulations, there is hope that we can restore a fishable/swimmable use to many of those 2,400-plus miles of streams that were once thought to be lost forever.

Oil and Gas Development

Oil and gas development includes the drilling and production of oil and natural gas deposits buried deep beneath the earth's surface. It occurs in more than 30 counties throughout the Commonwealth, but is concentrated mostly in the northwestern and southwestern parts of the state. It all began when Colonel Edwin Drake drilled our nation's first oil well in 1859 in Titusville, Venango County. Since then, the industry has grown substantially in response to society's demand for these fossil fuels, and the environmental effects have been significant.

Operating wells produce large volumes of brine (salty water), which contains a laundry list of toxic chemicals. These brines are discharged directly into many of our headwater native brook trout streams. They also leak from unlined pits designed to separate the oil from the brine. Untreated brine discharges and leaks contaminate ground and surface waters and can cause severe effects. Amazing as it sounds, Commission studies have found that some of our freshwater streams are saltier than seawater. Improved regulation of the oil and gas industry has compelled many developers to pollute less, but many operators still discharge directly into streams until they are caught.

Oil spills are another problem in the oil fields. In 1985, the USEPA estimated that the amount of oil spilled in a four-county area of the Allegheny National Forest in northwestern Pennsylvania qualified as a major oil spill; a U.S. Coast Guard was activated as a result. The Coast Guard team walked through individ-

ual watersheds in the area and identified all the places where oil was spilled or where brines were discharged. These places were then rated, and the most serious were systematically cleaned up by the USEPA.

Among the other pollution problems caused by oil and gas development in Pennsylvania is sedimentation resulting from forest clearing and the construction of miles of new dirt roads.

Agriculture

Agriculture is the number-one industry in Pennsylvania. And that's a good thing. The bad thing is that agricultural wastes such as manure, liquid and granular fertilizers, silo liquids, pesticides, and silt can be transported into streams during rainstorms or after snowmelt. These wastes can physically injure aquatic habitats by filling in stream channels. They may also be directly toxic to fish, other aquatic organisms and plants because of their chemical properties.

Manure and other fertilizers from farm fields that wash into streams and downstream reservoirs stimulate the growth of "nuisance aquatic vegetation." This aquatic vegetation can grow uncontrolled in downstream lakes and reservoirs. The growth is fueled by the fertilizers once intended to grow agricultural crops for our tables.



Adding to agriculture's impact on Pennsylvania water resources are pesticides, which include both herbicides and insecticides. Like fertilizers, they too can be washed from farm fields into nearby streams, but they have a much different effect. These chemicals were developed to control plant and animal pests. When they enter streams and other foreign environments, they cannot discriminate between a pest such as a potato bug and a brook trout. Pesticides can be very toxic to aquatic animals at very low levels and must be handled very carefully according to the label specifications. Many pesticides should be applied only by applicators certified by the Pennsylvania Department of Agriculture.

Yet another agriculture-related pollution problem that threatens water quality in Pennsylvania is livestock grazing in streams. Livestock allowed to graze freely through streams can cause streambank erosion

and sedimentation. A solution to the problem is to use streambank fencing to establish vegetative “buffer zones” next to streams. These buffer zones filter out sediments, nutrients and other agricultural pollutants before they reach the stream. They also decrease streambank erosion and provide important riparian (streambank) habitats for reptiles, amphibians and other wildlife.

Acid Deposition

Acid deposition is primarily the result of man-made emissions from fossil-fuel burning, automotive exhausts and other activities that produce sulfur dioxide (SO₂) and nitrogen oxide (NO_x) gases. These pollutants are sent into the atmosphere, where they are chemically changed and returned to the earth either as wet deposition (rain, sleet or snow) or as dry deposition in the form of sulfate and nitrate particles in dust. This deposition is declared acid when it has a pH lower than normal.

The pH of our rainfall in Pennsylvania averages around 4.1. This reading is many times more acidic than unpolluted rain. Because all surface water and ground water depend on precipitation for replenishment, nothing escapes at least some of the effects of acid deposition. Individual areas of the state may respond differently to acid deposition, depending on the region’s natural ability to “buffer,” or neutralize, the incoming acidity. This ability of a waterway to neutralize acids—called its “acid neutralizing capacity”—depends on the dissolved mineral content in the water.

Many watersheds in Pennsylvania, particularly those located in the mountainous Allegheny Plateau Region, have low acid-neutralizing capacities. Fish and other aquatic life found in these watersheds are adversely affected by the increased acidity. This acidity often increases toxic metal concentrations such as aluminum in the water (see AMD discussion, above). Acid deposition also affects forests, buildings, drinking water and human health and is potentially harmful to most living things.

In 1990, Congress approved new amendments to the Clean Air Act. These laws marked the first time Congress set out to control acid deposition. The legislation’s tighter controls on industry smokestacks and automobile emissions are expected to improve Pennsylvania’s affected streams, rivers and lakes; The

Pennsylvania Fish and Boat Commission and others, will continue to monitor the condition of our most vulnerable streams, lakes and rivers to determine the impact of these new controls. As citizens, we can do our part to limit air pollution by saving energy, promoting mass-transit and supporting strict automobile emission inspections.

■ Point Source Water Pollution

Point sources of water pollution affecting Pennsylvania’s rivers and streams include sewage discharges from municipal treatment operations and discharges of treated industrial wastes. While point sources of water pollution have been eclipsed by nonpoint sources as a threat to Pennsylvania’s water resources in recent decades, they still account for more than one-fifth of the water pollution problem in the Commonwealth today.

Municipal Point Sources (Sewage)

Domestic sewage treatment traditionally has resulted in effluent discharges to streams, rivers or large lakes. Sewage discharges typically contain suspended solids, nutrients (nitrogen and phosphorus), and chemicals that exert a biological oxygen demand on the receiving body of water. These discharges also can have disrupting thermal effects that increase water temperatures in rivers, streams and lakes. In addition, pesticides, toxic organic chemicals and metals are sometimes found in sewage discharges.

Successful removal of these substances varies with the type of treatment used. Primary treatment consists of the removal of insoluble materials such as grit, grease and scum from the water. Secondary treatment usually involves the use of microorganisms (bacteria) that consume organic materials in the wastewater. This a critically important step because organic materials, when discharged into a stream or river, compete for available oxygen with fish and other aquatic life. Tertiary treatment, often called advanced waste treatment, further reduces suspended solids and decreases levels of organic and inorganic compounds.

Excessive quantities of solids and nutrients (primarily nitrates and phosphates) can cause excessive plant growth such as large blooms of microscopic algae.

Additionally, high solids and nutrient loads can affect aquatic insect communities by causing sensitive organisms to disappear and be replaced by more pollution-tolerant forms such as aquatic worms and midges. Sewage discharges can also negatively affect coldwater streams by increasing water temperatures.

Sewage pathogens are often removed in the treatment process by chlorination or exposure to ultraviolet light. Chlorine, however, is itself a problem in many discharges because it is often used in excessive quantities. A very effective biocide designed to kill bacteria that live in sewage, chlorine can also kill non-targeted aquatic animals, including fish, when it is improperly applied.

Sewage has been the primary target of Pennsylvania's water pollution control program in the past because of problems associated with malfunctioning septic systems. Much progress has been made in the collection, centralized treatment and discharge of sewage. As a result, we've seen significant improvements in water quality and fisheries in our large rivers such as the Delaware near Philadelphia and the Three Rivers area in and around Pittsburgh. However, municipal sources remain the third largest source of stream pollution in Pennsylvania, degrading more than 400 miles of streams. New sewage disposal techniques that appear promising include spray irrigation of treated sewage to land and artificial wetland treatment systems. Wetlands are composed of a variety of plant and animal communities that can perform many of the tertiary treatment functions of a sewage treatment plant but in a natural environment.

Industrial Point Sources

The Pennsylvania DEP permits and regulates the discharge of treated industrial wastes through the National Pollutant Discharge Elimination System (NPDES) program. Permit engineers in regional DEP offices use water quality standards set by law (25 PA Code, Chapter 93) and site-specific data on the water quality and flow of the receiving stream to set discharge limits for individual point sources of pollution. The Chapter 93 standards are based on the stream's designated use (aquatic life, water supply, or recreation) and use numerical water quality criteria designed to protect those uses.

The Pennsylvania Fish and Boat Commission and

DEP work cooperatively to decide how individual streams should be designated. They also decide when criteria should be strengthened or lowered based on the best available scientific data. This procedure ensures that aquatic communities are protected whenever a discharge is permitted. Unfortunately, however, we cannot predict accidents, equipment failure or even negligence that might result in excessive discharges. When these occur, the frequent result is damage to aquatic communities.

Monitoring Contaminants in Fish

Pennsylvania's monitoring of toxic pollutants in fish tissue began in 1976. The purpose of this monitoring is to gather information so that the Pennsylvania Fish and Boat Commission, the DEP and the Pennsylvania Department of Health can advise the public to limit or cease consuming fish caught in contaminated areas. The three agencies compare the concentrations of various toxic compounds found in fish tissue with "Action Levels" set by the Food and Drug Administration.

Beginning in 1993, the Commission's Summary of Fishing Regulations and Laws provided to every licensed angler contains a table of all consumption advisories (do no eat) and no-kill zones.

PCBs and chlordane are the primary pollutants that cause a stream or river to be listed as contaminated. However, individual listings for other toxins such as mercury and dioxin also occur. Most of the listed waters are large rivers that are highly industrialized and contain many point and nonpoint sources of toxic discharges. Most of the chemicals of concern are extremely persistent and will remain in our environment well into the future.

Municipal, Residual, Hazardous and Radioactive Wastes

Another important source of water pollution in Pennsylvania is waste produced by households and industry. Each year, Pennsylvanians produce about 9 million tons of municipal wastes, or common household garbage. However, much of this trash does not go to the local landfill. It ends up in our streams and rivers as litter. Having to contend with broken bottles, rusty cans and other trash while swimming, fishing or playing in a stream is no fun. Yet, some people continue to use our streams as their personal garbage cans. They fail to see that a small stream is an important part of a larger ecosystem—one that we also live in.

Regional Law Enforcement Headquarters— Pennsylvania Fish and Boat Commission

NORTHWEST REGION. 11528 State Highway 98, Meadville, PA 16335; 814-337-0444. Butler, Clarion, Crawford, Erie, Forest, Lawrence, Mercer, Venango and Warren counties.

SOUTHWEST REGION. 236 Lake Road, Somerset, PA 15501; 814-445-8974. Allegheny, Armstrong, Beaver, Cambria, Fayette, Greene, Indiana, Somerset, Washington and Westmoreland counties.

NORTHCENTRAL REGION. Box 187 (Fishing Creek Road), Lamar, PA 16848; 717-726-6056. Cameron, Centre, Clearfield, Clinton, Elk, Jefferson, Lycoming, McKean, Northumberland (west of Rt. 147), Potter, Snyder, Tioga and Union counties.

SOUTHCENTRAL REGION. 1704 Pine Road, Newville, PA 17241; 717-486-7087. Adams, Bedford, Blair, Cumberland, Dauphin, Franklin, Fulton, Huntingdon, Juniata, Lebanon, Mifflin, Perry and York counties.

NORTHEAST REGION. Box 88 (Main Road), Sweet Valley, PA 18656; 717-477-5717. Bradford, Carbon, Columbia, Lackawanna, Luzerne, Monroe, Montour, Northumberland (east of Rt. 147), Pike, Sullivan, Susquehanna, Wayne and Wyoming counties.

SOUTHEAST REGION. Box 8 (Brubaker Valley Road), Elm, PA 17521; 717-626-0228. Berks, Bucks, Chester, Delaware, Lancaster, Lehigh, Montgomery, Northampton, Philadelphia and Schuylkill counties.

YOU CAN ALSO CALL THE COMMISSION'S CLEAN WATER HOTLINE AT 1-800-854-7365. THE HOTLINE OPERATES 8 AM TO 4 PM WEEKDAYS. AT OTHER HOURS, A RECORDER WILL TAKE YOUR MESSAGE.

YOU MAY ALSO CALL THE DEPARTMENT OF ENVIRONMENTAL PROTECTION'S EMERGENCY NUMBER AT 1-800-541-2050. THIS NUMBER OPERATES 24 HOURS AND DAY, 7 DAYS A WEEK.

NOTE: These phone numbers are for reporting water pollution only. For other Fish and Boat Commission business, or for more information, call (717) 657-4518. If you would like technical information about how pollution affects aquatic life, contact: Pennsylvania Fish and Boat Commission, Division of Environmental Services, 450 Robinson Lane, Bellefonte, PA 16823; phone: 814-359-5147.

Although many of today's mandatory recycling requirements and incentives are preventing trash of value from entering our streams and rivers, not all materials are recyclable. Many concerned citizens and conservation groups voluntarily remove trash from streams and rivers each year. We can all do our part in keeping our waterways free of trash by practicing proper disposal and recycling, cleaning up after others, and reporting violators.

Another category of wastes, residual wastes, range from municipal-type wastes produced in bulk by one industry to "near hazardous" materials. The Pennsylvania DEP regulates residual wastes somewhat differently than it does municipal wastes because residual wastes can contain a wide variety of waste forms. About 16 million tons of residual wastes are generated annually in Pennsylvania.

Posing an even greater threat to human health and the environment are hazardous wastes. The Pennsylvania DEP, in consultation with the USEPA, maintains a list of wastes that qualify as hazardous because of certain properties such as ignitability and corrosivity. About 0.8 million tons of hazardous wastes are produced every year in the Commonwealth.

Yet another category of dangerous wastes are radioactive wastes, which give off harmful rays that can destroy tissues in living organisms and can cause serious physical defects. Three Mile Island along the Susquehanna River just south of Harrisburg was the site of the worst commercial nuclear accident in U.S. history. On March 28, 1979, failure of the cooling system of the

nuclear facility's Number Two Reactor led to overheating and partial melting of its nuclear core. Some radioactive gases and water were released from the plant, but no signs of damage to the fishery were ever measured.

Conclusion

Although much progress has been made in cleaning many of Pennsylvania's waterways and restoring a fishable use, we now face the challenges of monitoring the "uptake" of toxic chemicals in fish living in many of these waterways. Important decisions must be made about the fate and effects of these chemicals on the health of fish, as well as these chemicals' effects on the health of the anglers and their families who consume the fish.

Major advances in the ways in which we identify chemical pollutants allow us to detect concentrations in parts per trillion or even parts per quadrillion. Similar advances in aquatic and human health toxicology allow us to protect both our water resources and the public more effectively because of our advanced knowledge about the health risks posed by these toxic compounds. In fact, new human health-based risk assessment guidelines supported by medical experts in the Great Lakes states should soon replace the outdated "Action Levels" used by the U.S. Food and Drug Administration.

If you have concerns that water pollution is occurring in your area, or if you have information about a suspected incidence of pollution, contact the Commission office nearest you (see sidebar, page 6). Together, we can clean up Pennsylvania's rivers and streams so that they remain a wonderful and enjoyable resource for years to come. ■



What does the future hold?

Pennsylvania's 21st Century Environment Commission, convened by Governor Ridge on July 1, 1997, outlined the future of Pennsylvania's environment. With the help of thousands of Pennsylvanians, the Commissioners—who represented businesses, environmental organizations, academics, philanthropies, and local and state governments—created a vision for Pennsylvania that is committed to cultural values, strong communities, and a stewardship ethic among all citizens.

The Commission outlined five major environmental needs:

1. Promoting responsible land use;
2. Conserving natural resources for sustainable use;
3. Making a healthy environment for healthy people;
4. Developing a new foundation for teamwork; and
5. Promoting environmental education, training, and stewardship.

While all of these factors contribute to the overall health of the watersheds, the Commission also explicitly outlined goals relating specifically to water quality. These include protecting surface water quality and restoring degraded systems, balancing water consumption with water supply, and developing comprehensive watershed management strategies.

For more information about the 21st Century Environment Commission and their recommendations, visit their web site: www.21stcentury.state.pa.us

Overview:

The Economic Benefits of Restoring and Protecting Pennsylvania's Waterways

Watershed Protection Pays

BY BRAD CLEMENSON

Clemenson is Communications Director in the office of U.S. Congressman John Murtha

Individuals and groups working to restore and protect rivers or develop river-based recreation activities often make impassioned arguments about why a local stream or river ought to be cleaned up, protected, enhanced or made more accessible. Their pitch may inspire conservationists, outdoor enthusiasts and others of like mind, but let's be blunt: some people think fish are slimy, some have no interest in how many bugs are in the water, and some question whether we should spend any money at all on streams. As a result, waterways advocates need to articulate stream benefits in terms that build support among a broad spectrum of the community—especially elected officials, business and economic-development leaders.

Often, the secret to winning over skeptics is to articulate the economic impact and benefits of stream protection and restoration activities. The fact is, streams and rivers that are clean and healthy offer a wealth of recreational opportunities—including fishing, boating, bird watching, picnicking and wildlife observation—as well as opportunities for people simply to “get away from it all.” When trails, greenways, boat ramps and parks are built along streams, more people come to use and enjoy these resources. And when people come, they spend money.

Adding It Up: The Economic Impact

Pennsylvania has lost many jobs in recent decades from the decline of the steel and coal industries. This makes citizens and government and business leaders in the Commonwealth especially sensitive to and supportive of activities that can help spur job creation and retention. By clearly articulating the economic benefits of Pennsylvania waterways—as



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well as their role in improving quality of life and creating and supporting jobs—we can go a long way to building popular support for stream protection and restoration.

People come to streams not just to fish. They come to boat. They come to cool off on hot summer days. They come to picnic. They come to walk or hike, often with or without good trails. They come to ride bicycles if a suitable road or trail parallels the stream. They come to watch birds, deer or other wildlife. And sometimes they come just to relax and sit beside the water.

Of course, these activities may be limited or virtually nonexistent on streams that are badly polluted, that offer little or no access, and that aren't promoted as recreation resources. But on streams that are clean and accessible and that are promoted as such, these activities can create a wealth of economic benefits for the surrounding community. Even dirty streams, in fact, have been known to attract people if they have particularly exciting scenery or boating opportunities.

Dollars spent by recreational users of streams or stream corridors have direct impact in grocery stores, sporting-goods shops, restaurants, campgrounds,

lodging facilities, gasoline stations and other businesses. Spending by these businesses, in turn, creates indirect impact as they buy products or materials to resell, have things delivered, and pay sign-makers and brochure publishers, accountants, bank interest and fees, phone and electric bills, taxes, and so on. The indirect impact reaches diverse sectors of the economy, including trucking, farming and manufacturing. Recreation supports jobs making products that range from binoculars to boats, and from bug spray to beef.

The wages and salaries paid to people employed at these businesses—both those serving visitors and those selling to recreation-based enterprises—create an induced impact, which reaches every sector of the economy. Of course, some of the dollars spent on

recreation will leave the local economy, especially those spent on durable goods or groceries produced somewhere else. But the money that gets passed on from a business to a wage earner or to another local business providing services to the first business may spin through the local economy several times. This is what economists refer to as a “multiplier” effect. A typical multiplier for recreation dollars is 1.5 to 3.0, which means that each dollar spent by a river visitor will be spent 1.5 or 3.0 times, on average, before it leaves the local economy.

In terms of total dollars, the impact of recreational spending on a local economy can be enormous, depending on the resource. A 1993 study of nine counties for the Southwestern Pennsylvania Heritage Preservation Commission estimated that people from inside the region spent 794,384 days fishing and/or boating in the region, while the total for people from outside the region was 563,772 days. According to the analysis by Penn State University faculty, the average spending per day exceeded \$26 for each regional and nonregional fisherman and boater. Direct expenditures by people fishing and boating thus were \$35.6 million, including \$14.7 million spent by people from outside the nine counties.

Focusing on the \$14.7 million spent by “outsiders,” the study’s designers created a regional model showing how these dollars moved through the economy. Of the \$14.7 million total, \$4.5 million immediately left the regional economy to pay for gasoline or other products produced elsewhere, while \$10.2 million stayed within the region, including \$5.3 million to cover services and

\$2.6 million on wholesale and retail trade. This \$10.2 million then generated \$17.7 million in secondary impacts, including wages and salaries, for a total economic impact of \$27.9 million. These figures are impressive enough, but the total economic impact of the region’s streams and rivers was even higher because people who came to waterways but did not fish or boat were counted separately, as was spending on vacation homes.

And let’s not forget the \$20.9 million spent fishing and boating by people who call the nine-county region their home. It may not be coming from outside the regional economy, but the money clearly has a major impact within local communities that attract thousands of visitors from other communities and cities within the region.

Other studies have found equally impressive impacts from recreation activities:

- The Pennsylvania Fish and Boat Commission has determined that warm-water fishermen spend on average about \$28 per day of fishing, while trout fishermen spend on average \$42 per day. Put the fishermen on larger boats on Raystown Lake, and the average daily impact per visit, according to an Army Corps of Engineers assessment, is \$76.
- Rivers that attract large numbers of whitewater rafters for guided excursions, such as the Gauley River in West Virginia, have produced economic impacts ranging from \$60 to \$133 per person per day, according to another study.
- A study of canoeing on the St. Croix River in Maine showed average daily spending of \$15, while studies of people using the hiking and biking trails along rivers in Western Pennsylvania have shown average daily expenditures ranging from \$9.29 per day by the average user of the Youghiogheny River Trail to \$25.85 per user day on the Oil Creek State Park bike trail.

Projecting exact economic impacts in a particular community contemplating a stream or river restoration project is difficult. The number of users and their expenditures will vary depending on the quality of the resource, the type of activity, accessibility, the local and regional population, and the availability of similar resources within the community or region. The best



advice is to hire an economist to conduct a study. Some groups have succeeded in convincing faculty members at nearby colleges or universities to develop economic-impact analyses as class projects. If that's not possible, then you might want to locate a study of a similar resource in a similar community on the assumption that the local impacts should be roughly comparable.

Quality of Life Attracts and Retains Jobs

The firm of Cushman and Wakefield is in the business of helping companies find locations for new plants and other corporate facilities. Here, according to the firm, are the most important factors leading a company to select one site over all the dozens or hundreds of other potential locations it is considering:

1. Access to markets
2. Availability of skilled labor
3. Quality of life

More recently, the Kiplinger Letter reported on July 11, 1997, that the top factors in location decisions were quality labor at a reasonable price and quality of life.

The fact that "access to markets" leads the Cushman and Wakefield study and not the Kiplinger Letter's does not necessarily put the two at odds. The difference between the two reports reflects the stages of corporate decision-making. Communities that have the basic sewer and water infrastructure and that meet company-specific needs for rail, airport or highway access can make the "first cut" in the corporate site-selection process. In the next stage of the process, more subtle factors about the community come into play. The first of these is the quality and quantity of the local workforce. The second is quality of life. On these points the two reports agree.

Many states and regions are capitalizing on their outdoor recreation opportunities in promoting themselves as sites for industry. The New England States' Governors Association has hailed "Open Space" as the key to the region's quality of life. The San Antonio Riverwalk and the American River Bike Trail in Sacramento are cited frequently as recreational

What's In It for Your Community?

Recreation and stream conservation can create a number of benefits for your community, including:

- Dollars spent on recreation create and sustain businesses, that employ people and purchase a broad spectrum of goods and services in the community.
- Recreational amenities contribute to enhanced quality of life, an increasingly important factor in business decisions about where to locate jobs-producing facilities. Recreational amenities also can help communities retain a quality workforce, yet another key to attracting business.
- Opportunities for exercise, recreation and stress reduction help reduce health costs to a community.
- Stream and river restoration can lead to reductions in public utility costs as cleaner water supplies mean less spending on purification and treatment or new water resources.
- Recreational amenities typically contribute to higher property values.
- Flood damages often are reduced as communities pay more attention to restoring and protecting streams.

resources that have helped attract jobs.

Some Western Pennsylvania counties now are using this approach as well. Armstrong County has adopted the slogan, "Best Thing Next to Pittsburgh," and is aggressively promoting its open space and the scenic Allegheny River as reasons to locate there. The Cambria-Somerset region's promotions cite access to nine state parks within an hour as a reason to consider the area.

Other Economic Benefits

In addition to quality of life improvements and increased spending on recreation, stream restoration activities can result in a number of other economic benefits. For example, people want to live near these assets, to take advantage of recreation opportunities that cost little or nothing. And that helps drive up real-estate values—a clear benefit to current property owners.

In addition, public costs for utilities often are reduced by stream restoration because of the need for less purification and treatment of water supplies. The Hooversville Borough in Somerset County, for example,

is benefiting twice over from a mine-drainage treatment project on Oven Run, a tributary of the Stonycreek River. Not only is the community getting a cleaner stream, but it is also reducing the cost of treatment and maintenance for the community water supply.

Another mine-drainage treatment project, also in Somerset County, is enabling a community to avoid the high cost of developing a backup water-supply system and providing extra water capacity to enable the community to continue to grow. After the community of Farrelton lost its water supply to mine drainage and was forced to buy water from the neighboring township, the Quemahoning Creek Project was launched to clean up the drainage. The result: the old water treatment system has become the new backup system—at major cost savings. And because the neighboring township's water system was near capacity, the restored Farrelton water source will enable future community growth.

The benefits of stream and river restoration are equally clear in larger communities and cities. In Pittsburgh, about a million people still get their drinking water from the Allegheny River. Over the years, the water quality of the river has improved significantly, which has greatly reduced local treatment costs. Nevertheless, the Allegheny still contains some iron and other corrosive minerals. Cleaning up the remaining pollution would further reduce treatment costs for Pittsburgh residents.

Fewer expenditures on health care and natural disaster clean-up are among the other benefits of stream and river restoration activities. Stream-based recreation can help reduce health costs by providing opportunities for people to exercise, relax and reduce stress. In addition, stream and river restoration can help reduce loss of life and property damages from flooding. How? By creating recreation and wetland areas along rivers that receive minimal damage from floods and provide open land to retain flood flows.

“Everybody Benefits”

A prime example of the multiple economic benefits that stream restoration can bring to a community can be found in Kittanning, a small town along the banks of the Allegheny River in Armstrong County. With a large park in development along the river

including an amphitheater for concerts, a dock for boats, and other amenities, economic activity in Kittanning picked up noticeably. In anticipation of the visitors and riverfront activity, a new bed and breakfast opened up, a meat shop and other business moved in, many downtown businesses were restoring their storefronts, and the community was buzzing about the new development.

The Kittanning story shows how quality of life attracts business. It makes the community a great place to live and contributes to community pride. The benefits of clean streams and rivers thus go far beyond the insects and the fish that grow and multiply when afforded the proper aquatic environment. Everybody benefits—businesses, residents, everybody. ■