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Problems can become opportunities when the right people come together.

—Robert Redford, 1987

* Read pages 149-153.

CHAPTER 10

BUILDING PUBLIC AND PRIVATE PARTNERSHIPS

Whitney Tilt and Cindy A. Williams

The Beaverkill River, and its sister tributary, the Willowemoc, arise in the Catskill region of New York, a 2-hour drive north of New York City. The Catskills have long been a protected park, due in large part to their role as a municipal water source for New York City. The Beaverkill-Willowemoc is a legendary river system considered by trout aficionados as the “cradle of American fly-fishing.” For more than 150 years, fly-fishing legends from Theodore Gordon to Lee and Joan Wulff have called the Beaverkill-Willowemoc their home or have made annual pilgrimages to these waters.

Five hundred miles south, along the spine of the Appalachian Mountains in Tennessee, arise waters with names like North Chickamauga Creek and Horselick Creek. Although not hallowed among American trout anglers, these watersheds are treasured by today’s conservationists for their aquatic diversity of darters, madtoms, freshwater mussels, and other species.

In 1991 and again in 1993, drought and habitat degradation within the 260-square-mile Beaverkill-Willowemoc watershed led to fish kills, stressed trout populations, and rising concern about the overall health of the rivers (Rafle 1994). To the south, creeks like North Chickamauga and Horselick fared no better, as decades of acid mine drainage threatened their aquatic heritage.

Although these northern and southern watersheds are different in many aspects, their emerging problems have shared a common treatment, and this treatment has not fit the historical pattern of environmental protection. Rather than a top-down, command-and-control response funded by state and federal governments, activities have stayed largely within sight of the watershed. On the Beaverkill-Willowemoc, local activists and Trout Unlimited stepped forward to work cooperatively with state and local governments, highway departments, local zoning boards, and most importantly with the local landowners, shop owners, and citizens (Conyngham and McGurkin 1997, this volume).

For the Horselick and North Chickamauga creeks and other southern Appalachian watersheds, a partnership called the Southern Rivers Council was formed to address immediate conservation needs and to provide local officials and citizens with the information and tools necessary to protect, restore, and manage the watersheds. The partnership is funded with assistance from the U.S. Forest Service, National Fish and Wildlife Foundation, and a variety of other federal, state, and local organizations. The Council's initiative, called Restore Our Southern Rivers, is in initial implementation. Although it is too soon to evaluate the overall benefit to the aquatic resources of these rivers, the initiative remains a good example of conservation partnership.

FROM LARGESSE TO DOWNSIZING

Several chroniclers of the history of the U.S. conservation-environmental movement have described it as occurring in distinct eras or waves (Fox 1981; Wilkinson 1992; Shabecoff 1993). The first wave began at the close of the 1800s as the era of land and wildlife conservation and preservation, characterized by the thoughts and actions of Theodore Roosevelt and Gifford Pinchot. Beginning in the 1960s, Rachel Carson's *Silent Spring* inaugurated the second wave, commencing some 25 years of what arguably could be called the "environmental movement." This second wave spawned an impressive mass of policy and legislation, accompanied by constituent advocacy, congressional lobbying, and frequent litigation. The third wave arose in the mid-1980s during the Reagan Administration, accompanied by such buzz words as "market-based incentives," "regulatory flexibility," and "win-win" (Dowie 1995). Although conservation partnerships are as old as the conservation-environmental movement itself, partnerships are clearly one of the third wave's buzzwords.

The first three waves have been effective in achieving broad changes in public policy, behavior, and attitude. However, their achievements ultimately will fall short of long-term conservation goals unless the efforts are sustained, because there are untold Horselick Creeks in need of immediate and continuing attention across the country. Unfortunately, after years of increasing budgets during the 1970s and 1980s, federal and state agencies in the 1990s are increasingly hard-pressed to fund existing staff, conservation lands, and equipment, let alone new initiatives.

For the foreseeable future, the federal government will be forced to reconcile its budget. Although budgets for natural resource management are a relatively

insignificant portion of the federal budget—less than 1%—they are likely to bear a disproportionate burden in paying for a balanced budget. In fiscal year (FY) 1996, for example, the federal budget paid out less than US\$.01 for natural resource budgets, while spending \$.48 on Social Security, Medicare, and other benefits to individuals, \$.16 on defense, \$.15 to states and localities, and \$.16 on interest payments for the national debt (Office of the President 1995).

Entitlement programs like Social Security and medical payments to individuals collectively compose the largest portion of the federal budget. So, it is not surprising that they also have the largest number of proponents and protectors. These numbers just cited should be viewed as an opinion poll indicating the relative value that society places on natural resource management. They also provide a poignant reminder of where conservation interests sit in the real world—not surprising, considering the size of the watershed restoration constituency relative to the constituency for competing interests (Tilt 1993).

So how will watershed and "ecosystem" interests obtain the necessary resources for river systems and creeks across the land? Three components are essential for effective conservation—education, investment, and partnerships.

EDUCATE AND INVEST

Survey after survey demonstrates that people who are informed and educated about the environment provide greater support for programs and actions that improve environmental quality (Gigliotti 1992; Hausbeck et al. 1992). Yet such support is difficult to tap, because the nation's environmental IQ still appears too low to achieve an environmentally responsible citizenry (Orr 1992). All too often, young and old alike lack the basic factual knowledge required to make environmentally sound decisions at home or work. Environmental literacy is not evidenced by parroting the refrains of *recycle*, *acid rain*, or *global warming*, but by demonstrating an understanding of how the environment functions, how humans fit into the environment, and how their actions affect it.

Effective and proven programs to increase the environmental knowledge of children and adults already exist throughout the country. However, a lack of coordination, sustained investment, and commitment has prevented these programs from achieving their full potential (Tilt 1996). Education is widely recognized as the vital first step that leads to conservation action. Yet, conservation interests that pay lip service to education have repeatedly failed to direct sufficient energy and funding to education. To use a watershed analogy, conservation education has been like a seasonal water course—small, vulnerable, and too often ignored.

Generous government spending is in apparent eclipse, and Congress is preoccupied with balancing the budget. In this difficult fiscal environment, conservationists have come to realize painfully that the federal government lacks the money to buy all the remaining lands necessary to conserve our fish and wildlife.

The Land and Water Conservation Fund (LWCF) is the nation's primary funding source for public land acquisition. It is funded largely by offshore

oil-leasing receipts. A look at recent expenditure trends under LWCF is illustrative.

- In 1978, \$805 million was appropriated to the U.S. Bureau of Land Management, U.S. Forest Service, U.S. Fish and Wildlife Service, and to the states for land acquisition (U.S. National Park Service, unpublished data).
- For the 5-year period FY1989 to 1993, an average of \$276 million per year was provided from LWCF (U.S. National Park Service, unpublished data).
- In FY1996, although the LWCF balance began the year at \$10.3 billion, only \$138 million—a scant 1.3%—was appropriated (Office of the President 1995). The reason is that LWCF funds are being commandeered for deficit reduction.

Future appropriations remain uncertain as budget concerns lead Congress to divert LWCF receipts to reduce the deficit.

Yet, even with full expenditure of LWCF and other dedicated accounts (such as the Federal Duck Stamp, used to fund acquisitions for the National Wildlife Refuge System), federal funds are insufficient for the conservation task. For example, an estimated 75% of the nation's wetlands are in private ownership. The federal government cannot be expected to buy them all and turn them into national wildlife refuges. Nor, as we are increasingly coming to realize, is such federal largesse a prescription for success. We have learned that lasting conservation achievement is like Tip O'Neil's politics: it must be local and have a strong foundation of community support. The challenge facing resource managers is to ensure that less government spending does not translate into less conservation. What is needed is a movement away from total dependence on federal funds to fix conservation problems and a movement toward shared responsibility and investment—hence the need for *public-private partnerships*.

Identifying funding sources and determining how to glean the money to support a restoration project can be difficult, especially for professionals trained in natural resource management rather than in fund-raising or partnership-building. Although numerous private organizations fund environmental projects, willing donors can be hard to find and worthy projects often exceed available funds. Increasingly, agencies and conservation organizations are recognizing the economic and political benefits of partnership agreements, as are states and local governments. *Partners become shareholders in restoration success* and share the economic cost of doing business by contributing money or in-kind contributions. The result is increased understanding and greater accomplishment than if the project were completed by a single party. Partners also learn to appreciate each other's perspectives, concerns, and limitations, and each party gains ownership in the project while becoming better neighbors.

The National Fish and Wildlife Foundation, a private, nonprofit conservation organization established by Congress in 1984, is proof that shared investment pays dividends. The Foundation works to conserve fish and wildlife resources by providing federal challenge grants, which in turn must be matched by nonfederal funds. The operating premise is simple: the federal government gets leverage for

TABLE 10.1.—National Fish and Wildlife Foundation (NFWF) projects and funding history, 1986 to 1996. Funds are provided by a variety of federal agencies in the U.S. Departments of Agriculture, Interior, Defense, State, and Commerce. Matching funds consist of federal contributions from the National Fish and Wildlife Foundation and nonfederal challenge funds from more than 600 partners.

Year	Number of projects	NFWF federal matching funds (\$)	Challenge funds (\$)
1986	15	97,164	1,556,859
1987	20	187,160	799,673
1988	57	2,846,734	5,678,138
1989	130	5,142,147	19,242,433
1990	73	2,160,510	6,667,084
1991	143	6,186,834	17,034,768
1992	177	5,748,496	18,486,381
1993	209	5,357,984	17,567,689
1994	298	9,027,380	34,069,240
1995	319	9,912,603	47,283,087
1996	343	13,953,660	45,007,199
Total	1,784	60,620,672	213,392,551

its increasingly tight dollar, grantees get much-needed seed money, and the project gets done faster and more economically.

In awarding challenge grants, the Foundation employs the buy-in strategy. If a project is viable, then other parties should be willing to invest in it, especially local partners who will help the project endure. The Foundation and its conservation partners have consistently proven this axiom. For the period 1986 to 1996, 1,784 grants totaling \$60 million in federal matching funds have been awarded to over 600 organizations. For each federal dollar committed, two additional dollars have been raised by the Foundation and its conservation partners. The total exceeds \$213 million to conservation practitioners at local, state, and regional levels (Table 10.1). When we consider contributed services and other funds that are attracted to projects as a direct or indirect result of Foundation challenge grants, the return for federal dollars exceeds \$400 million.

PARTNERSHIP BASICS

A constant theme in the history of the National Fish and Wildlife Foundation has been partnerships. The Foundation has spent a decade experimenting with them. In part, this experience is reflected in two documents: "Partnerships: Innovative Strategies for Wildlife Conservation" (Trauger et al. 1995) and *Conservation Partnerships: A Field Guide to Public-Private Partnering for Natural Resource Conservation* (Management Institute for Environment and Business 1993).

Broadly defined, a partnership is a collection of entities (often individuals, not necessarily institutions) where each brings to the table some enlightened self-interest mixed with a combination of *time*, *talent*, and *treasury*. Partners need not agree on politics or the weather, but they are bound by a common interest in the project at hand (Trauger et al. 1995). As for time, talent, and treasury, time should never be underestimated as a valuable asset, for a

partnership is hard work and time-consuming. Partnerships are low-technology by nature and there are few, if any, shortcuts. Talent can range from watershed restoration expertise to accounting acumen. Treasury can come from a partner's own pocket or reside in a partner's ability to ask others.

Partnerships must be homegrown. Too often, conservation efforts are developed and implemented by outside parties, without the benefit of local input. Even today, conservation projects are often conducted by well-meaning government agencies and conservation interests without the involvement and ownership of local stakeholders.

There is no single recipe for a successful partnership. Like a favorite recipe, partnerships built with the same ingredients do not necessarily produce the same outcome each time. However, partnerships do share some constants. The following discussion of these constants is adapted from Management Institute for Environment and Business (1993), Tilt (1996), and Trauger et al. (1995).

Warning Label

Like many buzzwords in conservation—from ecosystem management to sustainable development—it is important to first read the warning labels. Partnerships are a tool, and like all tools there are times when they are effective and times when other tools may be more productive. Partnerships are like a living organism—they need constant nourishment and hard work to grow. Egos and turf must be checked at the door. For government agencies, participants need to determine early on that a partnership is the proper path to take or whether a more formal arrangement, such as a contractual agreement, is appropriate.

Worthy Project

A good partnership is founded on a solid conservation need. Some projects lend themselves more readily to partnerships than others. For example, habitat acquisition and restoration are often more attractive to a prospective donor than a research project to collect data for 10 years.

Equity and Participation

The fastest way for a partnership to falter is for the sponsor to treat funding partners differently, based on the perceived value of their contribution, or to withhold project information from them. Before launching a project, the sponsor must know the interest of each partner and why the partner is involved. Partnerships depend on mutual respect and an evenly distributed workload. All partners must be willing to listen openly to ideas advanced by other partners.

Embrace Nontraditional Partners

Given the need for new sources of funding and broader constituencies, conservationists need to embrace new, nontraditional players. The resources that these nontraditional partners can contribute to watershed restoration are enormous. As conservationists, we spend too much time speaking to each other and

not enough time reaching out to forge alliances with new partners. A great source of new partners is the rank and file of those perceived to be against natural resource conservation. Once you are successful in converting a former opponent, you now have a powerful ally and persuasive force for converting others to your cause.

Leverage

Leverage is one of the most appealing aspects of a partnership. Examine its appeal from the funder's viewpoint. Funders, be they Congress or local family trusts, are continually bombarded by requests. Each applicant claims that their project is vital and dependent on the funder's attention. Multiply this claim severalfold and even the most conscientious funder grows numb. Alternatively, partnerships provide a perfect platform for joint funding and cost-sharing. Such projects come with an endorsement that other interests view the project to be of sufficient value that they are also willing to invest. Cost-sharing tests the hypothesis that if a project is viable, more than a single donor should be willing to fund it. And cost-sharing has one other important element: constituency. The building of funding partnerships is akin to building constituencies.

Flexibility

Partnerships must be flexible. If the participants bind a partnership too tightly with regulations, it will fail as one or more partners get fed up with red tape and delays. If an agency finds itself overly constrained by regulations, a different relationship may be needed (e.g., contract or grant). For state and federal agencies, the ability to be flexible is one of their greatest challenges.

The paradox facing government agencies is that they are being requested by governors, department secretaries, and the President to be creative and to increase efficiency and effectiveness through partnerships—but meanwhile, rules and policies that govern the conduct of government personnel and financial transactions remain rigid, restrictive, and seemingly unassailable. Clearly, the rules that govern government have not kept pace with this call to partner. A look at some existing legislation, policy, and fiscal procedures is illustrative.

Legislation

Many state and federal agencies lack the direct authority to enter into cooperative arrangements with nongovernmental entities. Others find they can enter into cooperative funding arrangements only on their own lands or within their legislative boundaries. This can be a major impediment for watersheds that encompass a checkerboard of federal, state, and private lands. Such restrictions may prevent partnering outright, or they may allow cooperative programs to be pursued only within an agency's respective arena. As such, legislative restraints may be a major obstacle for watershed restoration projects.

Federal legislation can inadvertently stifle productive partnerships. For example, the Federal Advisory Committee Act was designed to foster openness in government actions. But it can impede the ability of federal agencies to use

nonfederal expertise in a timely manner. Two examples where appellants used the Act to thwart conservation measures are attempts by the U.S. Fish and Wildlife Service to develop a status report on the Alabama sturgeon, and the U.S. National Park Service's attempts to remove mountain goats from Olympic National Park. The Federal Advisory Committee Act has been noted by at least one court to be "an uncomfortably broad statute . . . that would, if literally applied, stifle virtually all non-public consultative communication between policy making federal officials and a group of two or more other people, any one of whom is not in government service" (Lein 1994).

Policy

Numerous agreements exist between federal agencies that address how one agency will work with another. It seems baffling that agencies within the federal government require a written document to allow them to "partner" with a sister agency. However, such agreements are necessary because each agency has different mandates and procedural guidelines specific to its mission. Not surprisingly, there are occasions when federal policy endorses a program or strategy that outlines specific activities which run contrary to other agency mandates.

For example, Executive Order 12962 of 7 June 1995 endorsed a "Recreational Fisheries Stewardship Initiative." Unfortunately, the initiative implied the need to favor recreational fishing opportunities over the Endangered Species Act, with the end result of further muddying agency directives. Such a policy also sustained the perceived conflict between recreational fisheries and the conservation of native fishes under the Endangered Species Act. Obviously, achieving balance will be difficult in some cases where endangered species are in direct conflict with sport fish species, many of which are the basis for million-dollar industries.

Fund-Raising

Federal employees and most state employees are officially prohibited from fund-raising in general, and specifically where such efforts will augment their budgets. The U.S. Fish and Wildlife Service and other federal land management agencies have no general authority to "supplement" their appropriations from Congress by actively soliciting gifts of money and materials. On the other hand, these same agencies have a growing number of initiatives that encourage federal agencies to enter into cooperative partnerships with states and the private sector. These partnerships range from "Bring Back the Natives" (native fish restoration) to "Partners in Flight" (neotropical migratory bird conservation).

Such efforts often include cost-sharing and other activities that could be defined as "supplementing" agency budgets. The potential conflict is clear, and the proper avenue for federal employees engaged in such partnerships is poorly defined. A clear policy for such activities should be articulated by the secretaries of the U.S. Department of the Interior, U.S. Department of Agriculture, U.S. Department of Commerce, and U.S. Department of Defense.

Fiscal Controls

Anyone who has managed a federally funded project knows first-hand the procedures and regulations that accompany it. Although many of the controls and provisions can be reduced to Accounting 101, still others threaten to overwhelm partners in a sea of red tape and confusing regulations. When confronted with this maze of financial requirements, ranging from the Davis Bacon Act (establishing wage rate for federally funded construction projects) to Office of Management and Budget circulars, partners who are not accustomed to such procedures may wish they had chosen another profession. On the state level, agencies are typically under a completely different set of restrictions that they must impose in turn.

If cooperating partners are not guided skillfully through this regulatory maze, the partnership's ability to succeed is questionable. For the fisheries biologist, range conservationist, and geographic information system mapper to succeed, there often must be a contracting officer and lawyer willing to help them make it happen.

Case Studies of Public-Private Partnerships

Many of the factors just described found fertile soil in the southern Appalachian Mountains, where restoration of neglected and degraded streams awaited strong community partnerships of the Southern Rivers Council.

Southern Rivers Council.—In the southeastern United States, nine federal and numerous state and local agencies share management of aquatic ecosystems. These aquatic ecosystems encompass the richest and most diverse aquatic faunas and habitats in North America, possessing 490 of the 790 U.S. freshwater fish species. Of these, 21% are extinct or imperiled (Warren and Burr 1994).

Although the Southwest United States contains the greatest number of North American fish species that are listed as endangered or threatened (Williams et al. 1989), the greatest freshwater diversity exists in the Southeast. For example, of the 297 mussel species occurring in North America, 248 of them (84%) occur in the Southeast (Williams et al. 1993). The region is also rich in other aquatic faunas, including aquatic insects, crayfishes, and crustaceans.

Over time, it became apparent that a cooperative partnership should be formed, dedicated to the repair and wise use of aquatic ecosystems in this region. With guidance from the National Fish and Wildlife Foundation, the U.S. Forest Service and other agencies determined that they should develop a mechanism to fund watershed restoration projects that would enhance, repair, and restore selected aquatic ecosystems.

The first meeting of what is now the Southern Rivers Council included representatives from the U.S. Forest Service; U.S. Army Corps of Engineers; Tennessee Valley Authority; U.S. Fish and Wildlife Service; U.S. Geological Survey, Biological Resources Division; Office of Surface Mining; U.S. National Park Service; U.S. Environmental Protection Agency; and the Tennessee Aquarium. Participants were scientists and agency personnel who had some adminis-

trative authority and backgrounds in fisheries, aquatic ecology, botany, rangeland conservation, hydrology, and soils. The mission of the Southern Rivers Council emerged: to provide an opportunity and a method for success for on-the-ground restoration projects, beginning with open communication (Pringle et al. 1993; Tangley 1994).

There is no formal membership in the Southern Rivers Council; it simply comprises people who have a commitment to aquatic ecosystems. Anyone who shares the Council's commitment to restoration of aquatic ecosystems is invited to participate. The Southern Rivers Council continues to grow through new contacts, and in February 1995 it began to include representatives from different conservation organizations and universities. State and local government agencies have increasingly joined in the Council's discussion of projects.

Early in its development, the Southern Rivers Council designated a committee to review project proposals prior to their being submitted to the National Fish and Wildlife Foundation for funding consideration. The review committee is made up of one resource professional from each participating federal agency. Between July and November 1994, the Council secured \$125,000 from the Foundation for seven projects designed to control the introduction of sediments into river systems and to stabilize riparian areas by using vegetation that, in turn, would lead to improved water quality and physical habitat for aquatic-dependent organisms.

The Southern Rivers Council has much to show for its efforts so far.

- The Council's largest watershed project (in stream miles recovered and dollars spent) has been the remediation of acid mine drainage and restoration in the North Chickamauga Creek (Tennessee) watershed.
- Significant improvement of the Abrams Creek watershed of the Great Smoky Mountains National Park has reduced sediment input and restored habitat for many unique and threatened or endangered fish species. In fact, two extirpated fish species have been successfully reintroduced into the Abrams Creek watershed.
- Sediment runoff caused by flooding and illegal off-highway vehicle roads has been reduced in the Nantahala National Forest (North Carolina) and Daniel Boone National Forest (Kentucky). These projects have protected habitat for several listed and rare species.
- Habitat has been improved for recreational fisheries in the Hiwassee River (North Carolina) and Horselick Creek (Kentucky) drainages (Bowling et al. 1997, this volume).

The Council seeks to involve all parties who are interested in restoring southern aquatic systems and watersheds to participate and submit project proposals. What began as a core of 30 individuals has grown to a coalition of more than 100. As a result of the Foundation's challenge funding and other cost-sharing programs, the Council is soliciting increased participation by private landowners, conservation groups, and state and local governments. In turn, this buy-in strategy has proven critical to building coalitions and expanding the

Council's restoration effort. The Council's continued growth and success depends on maintaining its core membership while expanding to include active participation by additional state and other partners.

North Chickamauga Creek Restoration.—The North Chickamauga Creek watershed is just north of Chattanooga, Tennessee. As in many southern Appalachian locations, coal was once mined on Walden Ridge South, which includes the headwaters of North Chickamauga Creek. Congress passed the Surface Mining Control and Reclamation Act of 1977 to address the heritage of mine-related problems throughout much of the Appalachians from Pennsylvania south to Georgia. These abandoned mine lands continue to be the cause of significant erosion and water quality problems (Udall 1966; Office of Surface Mining 1996). The water quality of North Chickamauga Creek has been severely affected by acid mine drainage, and to a lesser degree by erosion, municipal sewage, and raw sewage.

The Office of Surface Mining identified the North Chickamauga Creek watershed as a potential national model to demonstrate the Appalachian Clean Streams Initiative in 1995. This designation was due in large part to a partnership that combined activism from the Friends of the North Chickamauga Creek Greenway, expertise offered by the Tennessee Valley Authority, and funding connections of the Southern Rivers Council.

Because of acidic water conditions, the North Chickamauga Creek no longer supports a warmwater fishery or provides adequate habitat for many aquatic species that are native to the ecosystem. The goal for the project is to restore the natural pH of the streamwater to within normal limits in the upper 18 stream miles so that the native aquatic communities can become reestablished.

The North Chickamauga Creek project has been funded in two phases: (1) locating mine discharge points and measuring pH values, and (2) continuing reclamation and installing passive water restoration systems. Here is a look at the activities in each phase.

In the first phase, mine discharge sites were identified and prioritized by pH value, discharge velocity, and overall threat to the watershed from the discharge. Anoxic (absence of oxygen) limestone drains and wetlands were designed and constructed to buffer the acidic water that seeps from some of the mines. The drains were constructed by placing a plastic liner in a trench, filling it with coarse limestone rock, topping it with another layer of plastic, and covering with soil. Acidic water was then diverted through the drain in the absence of oxygen. As the now-neutralized water leaves the drain and is exposed to oxygen, the iron particles settle out of suspension and cover the bottom substrate.

Scientists at the Tennessee Valley Authority are experimenting with other methods to treat oxygenated acid mine drainage in the North Chickamauga Creek watershed (Brodie et al. 1993). One system with promise is the successive alkaline-producing system (Kepler and McCleary 1994).

The second phase of this project involves continued land reclamation and installation of passive water restoration systems. Constructed wetlands and alkaline-producing systems were placed on the high-priority sites. The Friends of

the North Chickamauga Creek Greenway have raised public awareness of the watershed's condition and are demonstrating the benefits of environmental education that promotes stream restoration. For example, one local high school has begun monitoring water quality below some of the constructed wetlands as their school project. These data can be used to monitor the success or failure of the mitigation efforts and to teach students the importance of maintaining a healthy environment.

In support of this project, the National Fish and Wildlife Foundation provided a \$70,000 challenge grant which was matched by \$100,000 from the Tennessee Aquarium, the McClellan Foundation, Bowaters Corporation, and the Tennessee Department of Conservation and Environment. The federal partner for this project was the Office of Surface Mining.

Two additional projects have been proposed to monitor the effects of the completed reclamation. The success or failure of the anoxic limestone drains, successive alkaline-producing systems, and constructed wetlands placed in the North Chickamauga Creek watershed will determine if additional mitigation efforts will be funded. Once success has been determined, the technology and partnership structures developed on North Chickamauga Creek can be used in other watersheds affected by acid mine drainage.

Horselick Creek Restoration.—The Horselick Creek watershed is an area of unique biological diversity located primarily on the Daniel Boone National Forest, in western Kentucky. This 40,000-acre watershed is relatively remote and not extensively developed at present. National Forest lands comprise approximately 15,000 acres, The Nature Conservancy owns 2,000 acres, and the remainder of the watershed is in private ownership.

Horselick Creek has many unique features, including tremendous biodiversity of both aquatic and terrestrial species, threatened and endangered species, unique vegetation, caves and other karst features, and a rich troglodytic fauna (cave-dwelling or underground-dwelling) that includes several endemic invertebrates. The most significant populations of two federally listed mussels occur in Horselick Creek—the little-wing pearl mussel and Cumberland bean pearl mussel (D. Biggins, U.S. Fish and Wildlife Service, personal communication).

Impacts to the ecosystem are primarily related to sediment loading from roads, off-highway vehicle trails, livestock, and agricultural practices. Raw sewage from residences in the area is also a problem, as well as some road crossings which prevent fish migration (e.g., culverts, submerged concrete slabs). The goals of the Horselick Creek restoration are (1) to restore water quality; (2) to reduce and eliminate sediment input by closing off-highway vehicle trails and some county roads where possible; (3) to stabilize and vegetate streambanks; and (4) to remove unnatural barriers to fish migration.

The Foundation provided \$10,000 in federal challenge funds to be matched by The Nature Conservancy. The U.S. Forest Service and the U.S. Environmental Protection Agency are the federal partners for this project. Efforts are underway to broaden the partnership through inclusion of the Kentucky State Nature

Preserves Commission, Kentucky Department of Fish and Wildlife Resources, Kentucky Department of Transportation, and local landowners.

Publicity for the project has increased local landowner participation, cooperation, and ownership in the restoration efforts. Private landowners can see physical improvements that reduce erosion and increase their property values, creating a strong incentive to assist in recovery of the watershed. One partner demonstrates the need to reach out to nontraditional partners. The local Toyota manufacturing plant graciously has provided 3 years of water-quality laboratory analysis, including periodic testing for insecticide and herbicide residues.

CONCLUSION

It remains a great irony that U.S. residents are more attuned to the decline of distant tropical rain forests than they are to the loss of natural resources in our own backyards. Rare fish, endangered freshwater mollusks, and endemic aquatic insects are poorly known and little appreciated, even when they occur in nearby streams (Williams and Neves 1992). Yet every day we are reminded that each species possesses a unique biochemical makeup and potential contribution to society. For example, some fish eggs and mussels use an underwater glue; certain darters emit a chemical that protects their eggs from fungus; and paddlefish and mussels apparently have natural defense mechanisms that are resistant to cancer and virus (TVA 1995). We have barely plumbed the societal riches contained within this backdoor biodiversity. As natural resource managers, we must work toward a better understanding and increased awareness of our own region's unique habitats and their tremendous biodiversity.

As noted earlier in this chapter, with improved understanding and education comes concern over the degradation of our watersheds and the knowledge necessary for their restoration. Concerned citizens are beginning to form partnerships around the country to improve water quality, restore fisheries, and repair environmental damage from past land use practices. Once such coalitions are formed, increasing capabilities through investment and new partners can help to offset dwindling agency funding for natural resource protection and restoration.

Ultimately, an improved understanding by the public of the value of healthy watersheds also will lend political muscle to support agency spending at levels greater than the paltry 1%, which our natural resources now receive. This renewed commitment, when added to the power of partnerships, will greatly enhance the capabilities and effectiveness of watershed restoration—not only for the Beaverkill-Willowemoc, Horselicks, and Chickamaugas, but throughout the country.