CHAPTER 13

Natural Resources: Protecting Biodiversity

What you people call your natural resources our people call our relatives.
— Orien Lyons, faith keeper of the Onondaga

Why are “natural resources” so important?

If the reader were to undertake a sampling of master plans, comprehensive plans, general plans, or official plans of American and Canadian municipalities, he likely would find in most of these plans a chapter devoted to “Natural Resources.” Usually, such chapters would provide inventories of the various water bodies, wetlands, forests, open space areas, and wildlife habitat within the plan’s area of jurisdiction. States that mandate municipal comprehensive planning or what should be in a local plan, if undertaken, almost always include “natural resources” among the topics that a plan should cover, along with land use, housing, transportation, economic development, and public facilities. Most city, town, and regional planners assume that sound comprehensive planning should address the subject of “natural resources” — the term usually used in city, town, and regional planning to describe the above features. Most localities also have a “conservation commission” charged with the responsibility of overseeing, at the least, the natural resources of water and wetlands.

But why are forests, wetlands, streams, and wild creatures important to us, not to mention in, and of, themselves? Do we, as members of our communities and larger ecosystems, really and fully understand why? Water may
be the "natural resource" most widely understood in terms of its importance, at least in relation to human beings. Virtually everyone knows that water is essential to the lives of humans and other creatures; we need a sufficient quantity and quality of water to drink. It is primary to our own survival and secondary as a component of making and maintaining things we have come to believe as essential to our lives. We understand forests to be important because wood is also seen and used as an essential component in making and maintaining things we use and believe essential.

Over the last several decades, we citizens, as well as planning professionals, have come to better understand the subtle and complex roles that "natural resources" play in our lives and well-being. We understand that wetlands are a major contributor to fish breeding and flood control, for example. We know, although we often forget, that trees and vegetation produce the oxygen we breathe and absorb carbon dioxide that we exhale. Green plants are the basis of our entire food system. Many of us are aware that having open space, woodlands, babbling brooks, and singing birds nearby contributes to our quality of life. What we often forget, though, is that these aspects of nature are also our life-support system. Without enough oxygen to breathe, without enough green plants to support our food system, without enough potable water, there would be no us.

But how about the importance of other species on this planet, particularly the ones that we don't directly or indirectly eat? How about the importance of the multiplicity of those species?

These are questions about which courses have been taught, books have been written, scientific debates have raged, and activists have been jailed. The great biologist E.O. Wilson has said "... the question I am asked most frequently about the diversity of life [is]: if enough species are extinguished, will the ecosystems collapse, and will the extinction of most other species follow soon afterward? The only answer anyone can give is, possibly. By the time we find out, however, it might be too late. One planet, one experiment."

Some biologists and ecologists describe biodiversity as an insurance policy that protects against loss in any one area. According to these scientists, it is possible to lose a keystone species — a species whose role is vital to the survival of other species in an ecosystem. It may be easier to understand the importance of diversity in an area such as food cultivation. When a diversity of crops, as opposed to a single crop, is planted on a farm it drastically reduces the likelihood of that farm's entire produce being wiped out by a pest.

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In a sustainable society, nature is not subject to systematically increasing degradation by physical means.

— System Condition #3 of the Natural Step framework²
The complexity of nature is such that we may never really know the answers to these questions until it is too late. As two scientists have pointed out:

"[We] do not really know what we are losing when we lose species. Some ecologists have likened the loss of biodiversity to an airplane flight during which we continually pull out rivets as the plane cruises along. How many rivets can we pull out before disaster occurs?"

The lack of answers to these questions, however, is not stopping efforts around the world to protect threatened or endangered species and the natural areas that foster diversity of life — forests, water bodies, wetlands, wilderness areas. What follows are two stories of how a municipality and a region in Sweden are working to protect a native species, the salmon, in their respective ecosystems.

**Falkenberg protects its native salmon**

The city of Falkenberg and its River Åtran are said to offer the best salmon fishing in Sweden. The River Åtran, one of 23 rivers on Sweden’s west coast emptying into the North Sea, wends its way through the entire community of Falkenberg.

The salmon is an important symbol for Falkenberg. Salmon fishing has been an integral part of Falkenberg life since the 1600s, when it became one of the town’s prime sources of income. Sweden’s largest smoked salmon industry, which uses the same recipe since it was founded in 1826, is located in Falkenberg. During the 1980s, a sign went up in town quipping that salmon fishing “pays” for the Falkenberg mayor’s salary.

For many years in the mid-1900s, the indigenous species of salmon that spawned in the River Åtran declined and almost went extinct. Biologists determined that no other species of salmon in Sweden had the same genetic stock. The loss of this salmon species became an important bio-indicator to the community that something was wrong.

For decades, the quality of the River Åtran’s water had been deteriorating due to industrial discharges and acid rain. Acid rain is a particular threat to salmon, as it affects the ability of their gills to function in salt water. By the late 1970s, the river had become one thousand times more acidic than the salmon could tolerate, according to a Falkenberg municipal ecologist. In 1978, the Falkenberg municipal government decided to put lime in the river to offset this acidification in order to help the salmon survive. This
continues today. Now, over 4,000 salmon are migrating up the river every year to spawn.

However, another threat to the river’s native salmon species materialized in the form of invaders. Many farm-raised salmon were escaping, and continue to escape, from salmon farms in Norway and Denmark. These salmon, which are bred to grow large for the market, escape to the southern Baltic Sea. The farm-raised salmon are a different strain from wild Atlantic salmon and the indigenous River Åtran salmon. These farm-raised salmon, too, were traveling up the River Åtran to spawn, and were interbreeding with the river’s indigenous salmon species. The city of Falkenberg realized that, if nothing was done, the river’s indigenous species could be lost forever, since its particular genetic code would be irreparably altered over generations. The city again took action.

Falkenberg launched an initiative to protect the genetic stock of its indigenous salmon species. The city hired two ecologists to physically inspect every salmon that traveled up the River Åtran to spawn, and to intercept the invaders.

To accomplish this, the ecologists set up an interception station at the lower end of a dam of a former flour mill on the river. Salmon traveling upriver are herded into a holding pool at the foot of the dam. From this pool, the ecologists transfer the salmon into a tank that is then hoisted to the upstream side of the river. During spawning season, this is carried out daily. Before throwing the salmon into the river upstream of the dam, the ecologists check to make sure that the salmon is the correct genetic type. The indigenous salmon are placed in the upstream river to continue their journey to spawn. Nonindigenous salmon end up on dinner plates, including those of households in need.

The native salmon preservation project is one result of Falkenberg’s city planning objectives to preserve biodiversity throughout its community. The city’s goals are to manage its lakes, rivers, streams, and publicly owned and leased lands in ways that preserve and improve their ecosystems and biodiversity. The city has made plans to set aside a major wetland as a public nature preserve and to restore eight additional wetlands. Falkenberg is
working with other municipalities in a regional water management association, a coastal water control organization, and regional salmon and fishing management associations. The River Åtran has become an index river for salmon species monitoring in Sweden.

In other protective efforts, Falkenberg requires that all agriculture carried out in designated water protection areas must be organic agriculture. The city is also working on a conservation plan for its forests and has set aside three areas, including an old growth forest of spruce trees, for permanent protection. The city is moving toward the elimination of all pesticides and artificial fertilizers in the maintenance of its parks and green areas.

The changes in regional farming practices moving away from pesticide use, and in regional businesses finding alternatives to chemical use in their operations and production, have contributed to a vast increase in the multiplicity of wildlife found in Falkenberg, according to one of the city's ecologists. Overall, he says, the biodiversity of species found in Falkenberg today is estimated to be ten times greater than its level ten years ago. For more about Falkenberg and its sustainable development work, see Chapter 5. For more about organic agriculture practices, see Chapter 11.

**Kalix: From sustainable practices to restorative ones**

The town of Kalix is located at the mouth of the Kalix River on the coast of the Baltic Sea. (The villages of Kalix are discussed in Chapter 9.) Of the country's four major rivers, the Kalix River is one of two that have no hydroelectric plants and no dams. Hence, it is more accessible to salmon traveling upstream to spawn in its fresh waters. The Kalix River is 280 miles long. Kalix's history and culture have evolved around the Kalix River watershed, land that is drained by the river and its tributaries. Fishing, especially, has united the people that live in this watershed region.

Kalix is part of a fisheries district, populated by 18,500 people, that oversees rivers, water quality, and fishing within the region. Forestry and fishing are two of its main industries. The fisheries district is looking at sportfishing and ecotourism as future industries. During the 1980s, there were no salmon at all in the Kalix River, according to a fisheries district officer. Overfishing in the Baltic Sea, river fishing with net strung across the river to trap fish, and bulldozing the river bottom to clear channels for log flotation all depleted the populations of salmon, brown trout, and other indigenous fish species of the river.
Now, the Kalix River is the second largest producer of salmon in the Baltic region, producing 250,000 salmon per year. Its neighbor to the east, the Tornio River, which forms the boundary between Sweden and Finland, is producing 500,000 salmon per year. The average weight of a salmon caught is 17.5 pounds, according to the district officer, because of the robust herring in the Baltic Sea upon which they feed. Once, every river along the Finnish coast was a salmon river. Now, every river is dammed. The other Baltic Sea countries — for example, Germany, Denmark, and Latvia — have no salmon rivers left. All have been destroyed with dams and pollution, says the fisheries district officer.

With the collapse of the salmon population in the Baltic Sea, whitefish has become a favorite. The salmon population, however, is coming back. Since 1994, the salmon population in the Kalix River has been steadily increasing.

Kalix’s industries include a sawmill and a paper mill located on the Kalix River. Historically, the logging industries would float logs down the river to the sea. During the 1940s, tractors started pushing rocks out of the bottom of the river. This drastically changed the face of the river, and its ecosystems, into a canal; pools and spawning places for salmon were lost. The Kalix River has been fortunate with respect to pollutants. There is one copper mine in the region. In the last 10 to 20 years, pollution from heavy metals has been relatively low. However, the river does contain heavy metal sediments from industrial pollution that occurred in the 1950s and 1960s. The Swedish environmental protection agency decided to leave those sediments in place for fear of dispersing these toxic substances further. Kalix and other local authorities have good controls regulating the use and discharge of phosphates, says the fisheries district officer. Too much nitrogen is a problem, he adds. Several local authorities are creating wetlands to help reduce nitrogen in sewage effluent.

In 1974, the logging industry began trucking logs south, instead of floating them down the river, because it was cheaper. Since then, the town of Kalix, concerned regional agencies, and organizations have been working to find ways of restoring the river to a more natural state. The national government is spending millions to help restore the country’s rivers. Among other things, it is an investment in sportfishing. One effort underway is restoring gravel and river bottom vegetation, often by hand, to create spawning places for salmon. These and other fish need deep beds of gravel for spawning. Two years after the first loads of gravel were brought to areas of the river, many fish, including trout, that had almost become extinct returned to the river.
In order to reduce the risk of disease transmission from farmed salmon to wild salmon, it is forbidden to start a fish farm or bring in any fish from Norway into the Kalix River. Farmed fish are treated with chemicals to prevent disease but wild stock are not. Farmed fish also breed with wild salmon and weaken and change the genetic stock of the indigenous population. Almost every river in Norway has a fish farm, says the fisheries district director. Invasive fish species are a huge problem here. Studies in Scotland and Ireland show that, in mouths of rivers where there are fish farms, the wild fish get sick, he points out. Finns are still putting cultivated salmon into the Tournio River, he adds. This is affecting the genetic population of the river.7

SUMMARY
Falkenberg and the Kalix region understand the importance of their salmon species to their local economies and to the character of their regions. They have come to understand which human activities brought about the threatened extinction of those species — invasion of exotic species in one case and destruction of habitat and breeding grounds in the other. They are taking steps not only to halt those destructive activities but also to restore what has been destroyed before. They have moved beyond sustainable practices to restorative practices.

National efforts in Sweden
In many Swedish municipalities, according to the Falkenberg ecologists, pressure from an aware public and environmental groups has spurred on local politicians to hire ecologists to address biodiversity protection. There are also national laws requiring municipalities to attend to natural resource preservation. For example, in 1994, the Swedish parliament adopted a national preservation strategy that requires, among other things, that each locality be responsible for how its own activities and policies contribute toward preservation of biodiversity. In 1995, Sweden’s national departments for environment, housing, building and planning, fisheries, agriculture, and forestry each prepared an action plan for preserving biodiversity in its own area of jurisdiction. In 1998, the European Union Commission presented a strategy for biodiversity throughout the European Union.8 Protecting biodiversity is also one of Sweden’s 15 national environmental goals, adopted in 1999.
North American examples
In both Canada and the United States, many local governments are working, often in partnerships with state, provincial, and non-profit organizations, to protect the biodiversity of critical ecosystems within their regions. In Canada, for example, a remarkable coalition has formed to protect the biodiversity of the Rideau River, flowing over 60 miles throughout Ontario. The City of Ottawa and the Regional Municipality of Ottawa-Carleton are working with 35 other public and private organizations to restore and preserve one of Ontario’s most prominent rivers, brought to a biological crisis through years of pollution, over-development, and overfishing. The Rideau River coalition is working to protect the shoreline from more development, eliminate sources of water pollution, and combat an invasive zebra mussel population.9

In the United States, another remarkable coalition is working to protect wetlands in the Berkshire region of western Massachusetts that are among the rarest wetlands of their type in the world. The towns of Stockbridge, Lee, and the regional planning commission have teamed up with the state highway department, turnpike authority, state environmental agencies, a university, and an international non-profit conservancy organization. These towns and agencies are working together in a systematic initiative to protect rare wetlands and bogs in the 120,000-acre Taconic region spanning Massachusetts, Connecticut, and New York. The Nature Conservancy, a key member of this coalition, has identified the Taconic wetlands as one of the highest quality calcium-rich sweetwater wetlands in the world, home to over 150 rare and endangered species, one of the highest concentrations in New England. Among the many preservation actions, the partnership is working to remove the invasive phragmire plants threatening the fragile ecosystems of these wetlands.10

In the end, our society will be defined not only by what we create, but by what we refuse to destroy.
— John Sawhill, former president, The Nature Conservancy 11