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[Glossary](#)  
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## FEATURES

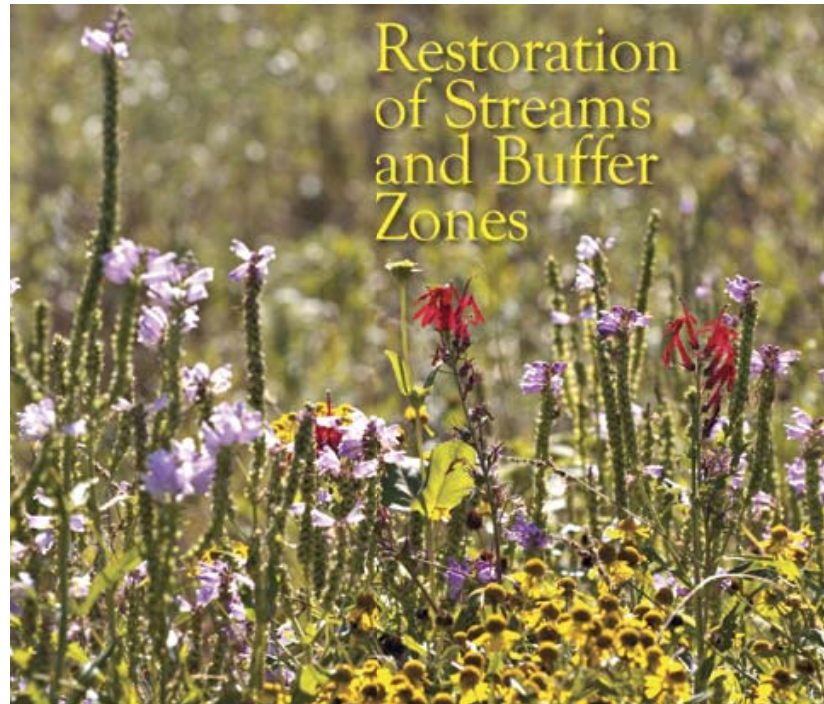


Photo: Kim Karpeles

### *Overcoming challenges in Maryland, Illinois, and Oregon*

By Janet Aird

Through the years, streams have been encased in concrete, dammed, widened, straightened, and rerouted. Their buffer zones—the no-man's land between streams and developed land—have been drained, developed, and otherwise destroyed. All these practices have led to flooding, erosion, and water-quality problems.

"A good portion of Illinois lies down in the Gulf of Mexico," says Jim Anderson, a natural resources manager for the Lake County Forest Preserve District in Illinois, because of the "toilet flush" system that rushes stormwater—and soil—to the nearest stream.

When restoring streams, it's important for a number of reasons to restore their buffer zones as well, says Chin Lien, P.E., senior engineering manager of water resources at Parsons Brinckerhoff Inc. in Baltimore, MD.

First, vegetative buffer zones, planted with native trees, shrubs, and perennials, create a spatial buffer to protect streams from being impacted by nearby residents or development. In agricultural areas, they create a physical barrier to protect streams from being trampled by farm animals.

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Buffer zones also filter stormwater runoff and prevent erosion. They reduce the amount of nutrients, such as fertilizer and pet waste, carried to streams by either groundwater or surface water. They provide habitat for native birds, butterflies, and small animals. And the ones on public land can give community members breathing space, too.

Communities faced with restoring their streams and buffer zones often face a daunting task. The following three projects are examples of how skill, creativity, cooperation, and tenacity restored their beauty as well as their functionality.

**Minebank Run Restoration Project**

In 1997, Baltimore County began restoring Minebank Run, a stream that had been lined with concrete, which was seriously eroding.



Photo: Parsons Brinckerhoff Inc.

A section of Minebank Run six years after initial construction

structure. The erosion was causing major water-quality problems, including sedimentation, as the river drained into Chesapeake Bay.

“The power of streams can destroy concrete,” says Lien. At Minebank Run, a tributary of the Gunpowder River, which empties into Chesapeake Bay in Maryland, some portions of the concrete channel had already been removed. Increased water flow into the stream had deteriorated the two remaining portions as well as a large concrete drop



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Lien supervised the Minebank Run Restoration Project, which took place between 1997 and 2000, when he was chief of water capital improvement projects for the Department of Environmental Protection and Resource Management for Baltimore County.

The goal was to improve water quality by restoring and stabilizing roughly 1.5 miles (7,000 linear feet) of the stream, which flows through mostly urban and suburban properties. The cost was approximately \$1 million to \$1.2 million.

**Stream Restoration**

“One of the criteria was that the restoration would not increase the flood level,” Lien says. “We cannot ignore the purpose of a concrete channel. It’s there for protection. We had to make sure that a stream restoration project that uses natural material could provide the same protection.”

The county and its consulting firm, Biohabitats Inc. in Baltimore, studied the stream’s watershed, taking into account the increase in stormwater the stream would have to handle if the population in the watershed increased. They identified its geomorphology, infiltrate hydrology, and hydraulics.

Then they removed the remaining concrete in the stream—approximately 1,200 feet—as well as what Lien calls “a unique old hydraulic drop structure.” From the outside, it looked like a huge, vertical concrete wall, he says. Water entered through an opening in the top, fell through, and came out the bottom. Its purpose may have been to slow down the flow of stormwater.

They maintained the stream’s width but reconfigured the channel by adding irregular curves, meanders, pools, riffles, and cascading rock structures in place of the old concrete drop structure. They used boulders, rocks, and

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stones for stabilization and placed rocks at the intersection of the bottom and the slope of the stream for toe protection. They partially buried root wads in some locations. They also planted native vegetation on the banks, a highly effective way to reduce erosion, Lien says.

"This was the most stable shape and form," he says. "The channel will change shape a little over time but not in a big way."

Then they aggressively planted a vegetative buffer zone.

### ***Buffer Zone***

The width of buffer zones in Baltimore County depends on how habitat-sensitive the stream is, Lien says. They can vary from 150 feet from the center of the channel for a natural trout stream to 100 feet from the center for a less habitat-sensitive stream.



Although a buffer zone may be owned by the county, often the residents who live adjacent to it "kind of take ownership of it," Lien says. "They know they don't own it, but they like to see it maintained the way they like."


In this case, a number of homeowners had grown their lawns to the edge of the stream. Some were even throwing their grass clippings into it.

"That's where public education comes in," he says.

### ***Community Relations***

Many of the county's stream restoration projects go through communities or neighborhoods, Lien says, and even when the county owns the stream and the adjacent land, these abut private property. There might be hundreds of property owners, all wanting to know what's going on behind their backyards.

As soon as the department identifies the need to restore a stream, it begins holding public meetings to introduce the study and the plan and to solicit input. The department holds more meetings as the design process continues to let residents know what the stream will look like, and it may hold more meetings during construction.



"Especially in Baltimore County, we make sure constituents have input," Lien says. "We tell them what a natural stream system really needs. We have a selection of trees to plant, including native willows and dogwoods, and give them a choice. Most of the time people understand and agree, and the county comes and revegetates. We want to have a good relationship with property owners. If they buy in, they help maintain the buffer zone."

In the Minebank Run project, the department dealt with about 50 to 60 homeowners, Lien says. "In general, we had a pretty good reception. They wanted the project, because they saw the degradation of the stream and the channel, and stream erosion was affecting their property.

"That's the key," Lien adds. "People have to see the problem." The county had an easement for access to the stream, but a lot of heavy equipment went through every day. The department continued its efforts to keep residents happy after construction began. In one situation, where a residence was located very close to the construction access road, Lien says, the county directed the construction contractor to power-wash the exterior of the home to remove the construction dust every week during construction.

### ***Funding***

Most of the funding for the project came from the county's waterway improvement program.

"Baltimore County is pretty unique in the sense that they have dedicated funds for this kind of environmental project," Lien says. "Every two years, citizens of the county approve a bond measure for it."

### **Challenges and Lessons Learned**

This project went quite smoothly, Lien says, because the department had learned a lot from previous ones. However, he says, every project presents a challenge.

On this one, for example, the department had to deal with an unfortunately placed sanitary sewer.

"We knew it was near the stream," Lien says, "but it had a manhole basically in the middle of the stream. We couldn't relocate it, so we had to put a rock structure around it to protect it and redirect the channel to the side."

Another challenge involved some difficult soil conditions, he says. There was a steep slope, and the material that workers were using to stabilize it kept crumbling. It took some experimenting to figure out how to place the rock structure correctly.

### **Results**

The department monitored the project for three years, Lien says. "The stream maintained its flow capacity without having any more erosion problems. It did very, very well."

Wildlife has returned to the stream. The pools are attracting ducks and geese. The stream has more fish now, too, Lien says; the pools and riffles are important features for them. The trees along the stream provide shade and cover, and the root wads provide additional shelter and habitat.

Most of the residents of the county embrace the idea of natural streams and buffers, Lien says.

"People have a higher awareness of our environment," he says. "I remember 20 years ago, when I talked to people about stream restoration. They thought I meant putting in concrete."

### **Rollins Savanna Forest Preserve Project**

In the 1980s and early 1990s, Lake County, IL, acquired parcels of mostly agricultural land. Today, 1,225 acres of this land make up the Rollins Savanna Forest Preserve. Mill Creek, a tributary to the Mississippi River, runs through it.



Photo: Kim Karpeles

A wetland at the Rollins Savanna Forest Preserve

"It was a great acquisition for the district," says Anderson, of the forest preserve district. "Twelve hundred acres is a lot of land that could be generating taxes."

The problem, he says, was that because much of the property had been wetland before it became agricultural, "Everything was tiled. It was



Crews removed 11 miles of agricultural drain tiles in the Rollins Savanna preserve.

designed to take water away as fast as possible.”

Anderson is responsible for the planning and implementation of land management practices in the district. He oversees restoration projects, including the Rollins Savanna Forest Preserve Project, which began in 2003. The project was designed to restore the preserve’s native oak woodland, its savanna, its prairie, and especially its wetlands.

The preserve is surrounded mainly by residential and commercial areas. Restoring

the buffer zone between the developed land and the creek slows the pulse of stormwater and allows it to filter slowly through the system. It also keeps some sediment out of the creek.

### ***Buffer Zone***

The district has removed more than 11 miles of agricultural drain tiles and restored more than 450 acres of the preserve, including the corridor along Mill Creek and 200 acres of wetland. It is also controlling invasive species and has planted native trees, shrubs, and seeds throughout the restored areas.

The work has also included digging detention basins to store stormwater, which further slow the flood pulse. The district has removed the top 12 to 14 inches of soil, made the contours for the basins, replaced the topsoil, and planted them with natives.

The soil underneath is an impermeable layer of clay 36 inches deep, but the topsoil stores a lot of water, Anderson says. It’s also easier for native plants to grow in soil that isn’t compacted. Unlike plants such as bluegrass, they grow into the clay layer, storing water and holding soil in place.

“Natives are nature’s incredible sponge,” he says.

### ***Funding/Support***

The project cost \$1.5 million, Anderson says. “I think we had about \$600,000 in grant funds. Whenever a grant source comes up or someone makes me aware of one, I look into it.”

Networking was crucial in finding funding and support for the project, he says. The US Fish and Wildlife Service (FWS), which has an office in Chicago, was a leader in fostering relationships between agencies, organizations, and the district. The FWS also provided technical assistance and funding, as did the Natural Resources Conservation Service (NRCS), the Illinois Department of Natural Resources (IDNR), and Ducks Unlimited.

Chicago Wilderness, an organization made up of about 200 public and private agencies, also led fundraising efforts. The project received funds from a 1999 Forest Preserve bond referendum, the Conservation Fund, the National Fish and Wildlife Foundation, the Northeastern Illinois Wetlands Conservation



Account, and the North American Wetlands Conservation Act. Ducks Unlimited prepared the plans to restore the wetlands and removed the drainage tiles.

"All these different partnerships have fostered this networking," Anderson says. "They're all partners in the program."

In the middle of the restoration, two road-widening projects began, Anderson says. This added the Lake County Division of Transportation (DOT) to the mix.

"Generally, the DOT comes to us for wetland projects," he says. The county has a watershed ordinance covering water storage, detention, and quality, which states that any project on public land has to retain the first half-inch from a rain or snow event if an area of 5,000 square feet or more is disturbed.

"It's kind of a forced relationship," Anderson says. "When they do projects on privately held land, they just buy the land. This road-widening project involved a lot of public land."

Again, Anderson says, networking and personal relationships, fostered this time by the Lake County Stormwater Management Commission, helped.

"We have a good, rewarding relationship [with the Lake County DOT]," he says. "They've come to realize there might be better ways to do things than send everything to the nearest stream. It can be cheaper for them. They're also seeing us as partners. When they impact wetlands, they have to mitigate. In most cases, we can help them."

It's gotten to the point that the DOT keeps the district informed about what it expects to need, Anderson says. Then he looks at how the DOT's requirements could fit in with what the district has planned.

In this project, because the district was already creating detention basins for water storage, the DOT wasn't required to. Instead, Anderson says, the DOT restored a stretch of land along the road that serves as a water-quality basin. The DOT is also focusing on removing invasive species and planting natives.

### **Challenges**

Working with multiple groups tends to slow a project down, Anderson acknowledges. The IDNR, which provided funding for habitat restoration, had concerns about endangered species. The FWS developed an advisory committee, and "they always bring surprises."

Now, Anderson says, the district is more proactive, taking information to the public, asking and answering questions, and listening to concerns.

"We have a very good public relations department," he says.

Another issue that slowed them down was permitting. Ducks Unlimited provided the engineering to develop the wetlands. The organization is very good at putting water structures in the middle of a field in remote, non-urban settings, Anderson says, but wasn't familiar with the regulatory processes in Lake County.

"Stormwater regulations are onerous here," he says. "It was a little difficult working through that. We now know that's a primary concern we need to be aware of up-front. We can be a little more prepared. We always learn a lesson from anything that goes wrong."

### Results

The preserve opened to the public in 2004. It has 5.5 miles of trails, restrooms, drinking water, picnic shelters, an observation blind, and a native seed nursery.

The project is a great success, Anderson says. "It's doing exactly what we thought it would. The water is there, so that's working. The wildlife is there, so that's working. It's turned into one of the best wetlands and bird habitats in northeastern Illinois."

### Three Creeks Community Restoration Project

"People move up here because of the quality of life and the environment," says Bob Storer, environmental policy specialist for the Clackamas County Water Environment Services (WES) in North Clackamas County, OR. "But in some locales, we're loving these resources to death."



Photo: Clackamas County Water Environment Services

Root wads were used in the Three Creeks restoration.



Photo: Clackamas County Water Environment Services

Volunteers plant native species in the Three Creeks area.

The Three Creeks area, a 90-acre county-owned site bounded by commercial and high-density residential areas, was one of those locales. At the confluence of Mt. Scott, Phillips, and Dean creeks, tributaries of Kellogg Creek and the Willamette River, the wetlands, ponds, prairies, uplands, and forests once had been home to a variety of native fish and wildlife.

Increased stormwater from development activities had eroded the creek banks, causing water-quality problems. Dams blocked miles of habitat for

threatened or endangered native species of fish such as Coho salmon, steelhead, and cutthroat trout. Trash and waste from transient camps caused further water-quality problems, and invasive plants overran the native ones.

The turnaround began about nine years ago when the Endangered Species Act came into full swing, Storer says. The WES initiated the Three Creeks Community Restoration Project, which focused on improving water quality and fish habitat and creating a greater awareness of the area. This has included stabilizing the creeks and restoring the buffer zone.

### Creek Stabilization

Because of large increases in urbanization, more stormwater was entering the creeks than they could handle, Storer says. Streambeds were downcutting, banks were eroding, and sediment was flowing into the water.

"In terms of water quality and the health of streams, sediment is one of the biggest problems," he notes. "Sediment can be very stressful for fish. It can make it harder for them to obtain oxygen through their gills and can bury their eggs." Pollutants can adhere to sediment particles, and they can fill in stream channels, contributing to flooding problems.

The WES pulled back the top half of the eroding banks so the slopes were 3:1 or less and then put down tree trunks that were at least 20 feet long with their

root wads attached. Properly placed, these stabilize banks and slow the velocity of water, and they can redirect water to the middle of the channel. They also give fish places to hide and escape from swiftly flowing water.

“People like to arm stream channels with riprap,” Storer says. That protects the banks, but it transfers the energy of the water downstream, and it doesn’t provide any quality habitat for fish.

In 2003, the WES removed an earthen dam across Mt. Scott Creek, which had a pond behind it that had filled in with sediment. The dam probably was built by a farmer for irrigation, Storer says, but it was damaged, and the WES was afraid it would collapse in a large storm event.

“We basically reshaped the stream channel to make it more natural, planted thousands of plants, and put in large wood and boulders to stabilize the channel and provide habitat for fish,” he says.

### **Buffer Zone**

The transient camps were causing water-quality problems, Storer says.

“It’s a big site, and there are no recreational uses on it. Transients can get entrenched. Over the years, we’ve spent a lot of time, energy, and money to move them out and give them additional resources. We’ve taken tons and tons of garbage out. In the winter, when the river floods, human feces and garbage were all getting into the stream system.”

With the assistance of grant funds, the sheriff’s department began extra patrols, and the transients left. “We used to take out 5 tons of stuff every six months,” Storer says. “We haven’t needed to clean up in a year.”

Volunteers have removed several acres of invasive plants. One group alone, the Tsunami Crew, has logged more than 15,000 hours and planted more than 20,000 native plants in the last eight and a half years.

“Native plants can do a really good job of stabilizing streambanks and preventing erosion,” Storer says. “Many are good at filtering or taking up pollutants. They adapt easily to the environment and provide habitat for birds and other wildlife. Once they get established, they can pretty well survive on their own. They don’t get out of hand like non-natives or exotics.”

The trees come from a variety of sources. Most are purchased from native plant nurseries. Some are from other areas, and some are donated. Some of the willows are cuttings from trees that were already in place; Storer describes how the tops can be harvested and planted in the ground.

### ***Funding and Support***

“A large part of my job is to foster new partnerships and maintain old ones,” Storer says. “We certainly can’t do this work alone. We can work smarter and more effectively with partners and stakeholders.”

During the past nine years, the WES has partnered with more than a dozen agencies, volunteer groups, and individuals. It gets support from local, state, and federal governments, and in 2006 it received a \$25,000 grant from the regional government agency, Metro.

The project has received help or funding from county departments including Code Enforcement, the Parks Department, the Development Agency, community service crews, the sheriff’s office, and the WES, as well as North



Clackamas Parks and Recreation District and Waste Management.

Volunteers, from retirees to people who are employed full-time, have devoted hundreds of hours to removing non-native plants and planting natives, Storer says. They include Friends of Trees, the Tsunami Crew, and the Friends of Kellogg and Mt. Scott Creek Watersheds.

"It's really unbelievable how dedicated these nonprofit groups and people are. They're absolutely committed to that site. They've basically revegetated most of the site's riparian areas—20,000 trees. It's amazing when I think of it."

The number of volunteers keeps increasing, Storer says. "We're holding a volunteer recognition event and sent out 1,500 invitations. Five years ago it probably wasn't half that."

The WES also partnered with the NRCS on a biostabilization training project, which was completed in 2006. About 50 people from around the country attended classroom training sessions and worked on a project that stabilized about 100 feet of a creek.

### **Outlook**

"This is basically a natural open space area with an unbelievable diversity of habitats," Storer says of the Three Creeks area. "It's totally surrounded by humanity and impervious surfaces. It's like an oasis."

The question, he says, is what will become of it in the future?

The roads department has capacity problems, but with more roads, or larger roads, will come more cumulative stormwater runoff. Increased development will bring the same. This is a problem especially because of the area's impermeable clay soils.

Storer would like to see more thoughtful, low-impact designs and development practices on new developments and projects and more long-term, effective mitigation when those developments affect wetlands and other sensitive areas.

Another challenge is keeping transient camps from causing damage to the area. The problem can be solved partly by encouraging the public to use the area, which would expose more people to the native habitats and recreational and educational opportunities. It would also achieve another of Storer's goals: for the public to develop a sense of ownership and stewardship of the watershed. On the other hand, he says, the area needs to be protected from too much use.

"It's a very challenging balancing act," he says.

He'd also like to obtain long-term, sustainable funding to continue restoration, monitoring, and maintenance of the area.

"The ultimate future challenge is how to accommodate 1 million additional people here during the next two decades and not significantly impact our water resources or wipe out critical fish and wildlife habitats," Storer says. "I don't want to see all our efforts wasted. It's too critical and sensitive a resource area."

*Janet Aird is a California writer specializing in agricultural and landscaping topics.*

**SW March/April 2008**

**Return To  
Table of  
Contents**

---

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