

The Western Pennsylvania weather forecast was calling for thunderstorms for the afternoon of July 21, 2003, and a team from the engineering and contracting firm W. M. Brode could feel the winds picking up in Kinzua Bridge State Park, in McKean County. Their column-by-column restoration of the historic Kinzua viaduct, stretching 2,053 feet across a tree-lined ravine, would have to continue the next day. The wind made their normally precarious work 300 feet above ground downright dangerous.

The Pennsylvania Department of Conservation and Natural Resources (DCNR) had contracted with W. M. Brode in the early spring to do an emergency, multimillion-dollar repair on the railroad bridge. Built of iron in 1882 and rebuilt with steel in 1900 to accommodate heavier trains, Kinzua was once the highest railroad bridge in the world. In June 2002, after an inspection found considerable rust and deterioration in the bridge's steel understructure, the department stopped tourist trains from taking visitors over Kinzua bridge. Several weeks later it halted pedestrian traffic too.

On the afternoon of July 21, the predicted storm kicked up in eastern Ohio and traveled across Pennsylvania, producing impressive thunderstorms and high winds. In Kinzua Bridge State Park the storm was especially powerful. According to the National Weather Service, an F-1 tornado touched down and took a sure and clear path through the visitor areas of the park and the gorge. The winds ripped off the tops of scores of trees and downed hundreds of others. Falling limbs pierced holes in a comfort station, damaged a picnic area and crushed a small maintenance shed, injuring a ranger who was trapped inside. The damage in the gorge was more dramatic, as the storm rolled over a line of trees in the valley and plowed straight into the Kinzua viaduct.

"The tornado hit the bridge at its widest and weakest," says Terry Brady of the Pennsylvania DCNR. "We're almost sure that the bridge collapsed from the bottom. It started to lean to one side—started pulling up on its fastening bolts." Eleven of the bridge's 20 support columns toppled during the storm. The huge steel structures now



when bad things happen to good trails

by Kristen Kreisher Fletcher

lie twisted and prone in the gorge, their concrete supports still sticking in the ground like tombstones. On the side where six columns remain standing, the bridge stretches out to nowhere—its chewed-off edge jutting into the air.

Once a marvel of engineering and construction, Kinzua Bridge today is a testament to the power of nature, a force that can be fierce, fickle and seemingly cruel.

As in Kinzua, nature can create the most unpredictable



Natural disasters and storms bring unexpected expense, work and hazards to trails. They present a serious challenge to established trails, but are especially hard on young paths that are still gaining a foothold in their communities. The examples here show how the managers of Kinzua and other trails have coped with, repaired and learned from damage done by Mother Nature.

In the Wake of Disaster

The lesser-known corollary to “If you build it they will come” is, “If it falls down they may come in even greater numbers.” Workers at Kinzua labored to clear paths, secure the remains of the bridge and reopen the park to the public on August 1, 2003, only to be confronted with such a volume of visitors the DCNR had to spend \$10,000 on a new parking area. In the 19 days after it reopened, the park that saw 144,000 visitors in all of 2002 hosted about 21,000 people, Brady says.

Elsewhere in Pennsylvania Bob McKinley, manager of the Regional Trail Corporation that oversees the 43-mile Youghioghney River Trail, has been vexed by how to keep onlookers away from the site of a May landslide. The slide wiped out a 200-foot-long section of the trail that sits 70 feet above an industrial site. Fences and the possibility of a steep fall aren’t enough of a deterrent to the curious. To keep people away from the

of challenges for trail managers and for communities that support and depend on trails, parks and greenways.

Many trail caretakers have taken steps to prepare for the worst—building for hurricane resistance in the Florida Keys and examining seismic hazard maps before erecting bridges and structures on California trails. But even if an area is prone to a certain type of disaster, not every twist of nature can be predicted or guarded against. Who could plan for the forest fires in Colorado that chased away tourists, whose dollars supported the Rio Grande Trail? What could have been done to foresee the Missouri River flood that undid years of new construction on the Katy Trail? How could North Carolinians have known that ice storms would bury a recently cleared portion of the American Tobacco Trail with downed trees? Who would have guessed that Hurricane Bob would strip away the asphalt of the Shining Sea Bikeway on Cape Cod, Mass., leaving a beached sailboat in its stead?

drop-off, McKinley has erected barriers, posted signs on the path and run notices on the trail Web site. “People are constantly up there,” says a slightly exasperated McKinley. “They climb over fences!”

McKinley stresses that a trail manager’s primary responsibility when something happens to the trail is always user safety. The well-being of trail users also was the first thing on the mind of David Dionne, superintendent of trails and greenways for Anne Arundel County, Md., when heavy rains on August 8, 2003, caused an inadequate drainpipe to rupture and wash downstream about 15 yards of the Baltimore & Annapolis Trail. “The first priority is always visitor safety,” says Dionne. “You don’t leave a big hole out there.” He says the next step, after putting up necessary signs and establishing detours around the area, is to assess the extent of the damage.

For Dionne, there was little question that the trail would be repaired. The B&A is among the most visited

trails in the nation. But the unexpected \$30,000 cost of the repairs was not built into the trail budget. McKinley, who received a commitment from Allegheny County for labor and equipment rental, is still wondering where to find \$50,000 to make needed repairs to the Youghiogheny.

The Cost of Repairs

The Kinzua bridge repair costs facing the Pennsylvania DCNR are even greater. Brady says an agency panel is examining three possible options: rebuilding the bridge at a pricetag of approximately \$46 million; leaving the site much as it is as a testament to what happened; and clearing the site of the debris and bridge remnants. Community groups are raising money to support the bridge restoration and on August 23, 2003, the Federal Emergency Management Agency (FEMA) announced that federal disaster funds have been made available to McKean County and several other western Pennsylvania communities. Brady says an influx of federal funds could favorably influence any one of the options under consideration.

For other trails, a disaster keeps away the cautious or renders a trail unusable for a period of time, often to the detriment of the community. In August 2002, the nation watched as thousands of acres of Colorado burned. The 33-mile Rio Grande Trail, which will extend when completed from Aspen to Glenwood Springs, was far from the wildfires, but it suffered their effects as would-be visitors saw news of the blaze and stayed away from the area.

The Rio Grande Trail is operated and maintained by the Roaring Fork Transportation Authority (RFTA), which also operates regional bus service for residents and tourists. A percentage of the revenue from the bus lines and a portion of the sales tax in the area support the trail. Since the fire, "the tax revenue is down; the fare revenue is down," says Michael Hearms, RFTA director of properties and trails. As a result, there is far less funding for construction and planning on the new sections of the trail and for maintaining the old. "[Tourism] is how we live around here," says Hearms.

The Katy Trail in Missouri opened its first sections in 1990 and was progressing nicely according to Larry Larson, district supervisor for the Missouri Department of Natural Resources, when the Missouri River flooded a huge portion of the trail in 1993. Much of a 180-mile section from Saint Charles to Boonville, both developed and undeveloped, was damaged by high water. Although the area is prone to flooding, the 1993 floods were remarkable for both the height of the water and how long it stayed elevated. The high water also lifted off and washed away several trestles that trail developers had placed over the railroad bridges. The developers had relied on gravity to keep the massive structures down; they have since been secured.

According to Larson, the floods set back the development of the Katy about four years as trail builders were forced to go back over completed trail sections to scrape off mud, replace the crushed limestone surface and shore up areas eroded by floodwaters. Scott Schulte, a superintendent with the trail, says the floods also were financially ruinous for some of the businesses that were beginning to grow up around the trail. Many of the bike rental shops, bed-and-breakfasts and restaurants never came back, he says. Repairs to the Katy were made using FEMA funds, state appropriations and private donations. Although it should have been finished years earlier according to the original timeline, all but 13 of the Katy's

You can't control the disaster,



238 miles now have been completed, and trail managers are preparing for large crowds during the Lewis and Clark bicentennial celebrations.

Rising From Disaster

The Katy is not the only trail to have risen from disaster. Managers of the Shining Sea Bikeway in Falmouth, Mass., repaired the trail after Hurricane Bob blew sand, rocks, debris and even a sailboat onto the path and destroyed a bridge. Kevin Lynch, chairman of the Bikeways Committee, says the storm took the pavement off the trail section closest to the beach: "A storm surge got under it and picked it up like a flapjack." With support from the community and federal funds for hurricane relief, the committee was able to repair the path and bridge, regrade the trail surface and replace signs.

Lynch says it's imperative to get the community involved to make the importance of the trail known. "Because trails are the new kids on the block they often don't get the first chunk of money that comes available," stresses Jeff Ciabotti, Rails-to-Trails Conservancy (RTC) director of trail development. Strong community advocacy and support, however, can help call attention to the needs of a trail. Also helpful can be a

dedicated corp of volunteers like the ones who helped clear a three-mile portion of the American Tobacco Trail after the December 2002 ice storms in North Carolina covered it with downed trees. According to Bill Bussey, president of the Triangle Rails-to-Trails Conservancy, the same committed residents who labored to get the trail section clean and safe for Durham cyclists and pedestrians in November 2002, gave their time again to get the trail reopened just weeks after the ice storm hit.

St. Cuthbert's Way, a 62-mile pedestrian trail between Melrose, Scotland, and Lindisfarne on the northeast coast of England, was able to recover after a tree brought down by flood waters smashed into a 200-foot suspension

**but you can plan and
prepare for it**



Pennsylvania's Kinzua Bridge (left) was devastated by a tornado. This fire in Maryland's Rock Creek Park was the result of arson. The trestle was repaired and is now on the Georgetown Branch Interim Trail.

bridge in 1997, only months after the trail had opened. Roger Smith, an access and tourism consultant, says that through local fundraising efforts and support from the European Community and local agencies, the Scottish Border Paths group and England's Till Valley Tourism Project joined forces to build a stronger and higher bridge for \$200,000 and reopen the full trail in the spring of 1999. The moral of the story, he says, is, "Be prepared for the unexpected."

But that's not always easy when a trail is struggling just to gather the funds for development and maintenance. In addition, many trail managers find that the grants available to help build new trails aren't often viable or available fast enough when disaster strikes.

Dionne says that impact fees from a new housing community upstream from the pipe that burst on the B&A trail in Maryland should have been made available to the trail for updating the drainage system. He explains that the area produces more runoff water now that it is covered with driveways and roofs instead of woods. Dionne argues that the developer used the trail as a selling point for those homes, so something should have come back to the trail. RTC's Ciabotti shares Dionne's view, saying, "Impact fees are something trails should consider as a source of funding if they're not already."

Planning for the Worst

Ciabotti also stresses that trail developers should consider every contingency, including storms, when constructing and planning a trail. "You can't control the disaster, but you can plan and prepare for it," he says. That means doing a thorough investigation of the trail corridor, giving special thought to the possibility of water damage.

Ciabotti says managers should examine the area after a rainstorm and consider groundwater, drainage, climate, vegetation and geology. "All of those things will have an impact on durability and may point you to a particular trail surface and design," he says.

Rich Fitterer with Dokken Engineering in California says his firm plans trails to accommodate what is often called the 100-year storm, or the most extreme weather a region is likely to see in a century. Accordingly, Dokken's engineers design bridges tall enough to clear even a severely flooded river or stream. They build bridge foundations to withstand considerable erosion. The firm also designs for earthquake resistance in areas prone to seismic events.

Trail managers can look to outside resources such as the U.S. Army Corps of Engineers, FEMA, and Erosion Control Strategies for New Trails for more information on planning, budgeting and building for storm resistance. RTC also can provide guidance or put managers in touch with managers of trails facing similar concerns.

Jose Papa, who is working with the Florida Keys Overseas Heritage Trail to build the trail that will stretch 106 miles from Key Largo to Key West, says his group is designing the trail with hurricane resistance in mind. Kiosks and signs along the trail will be built to meet Florida's codes for wind resistance. The builders also are using thick asphalt on the trail to improve longevity and storm resistance, and have elevated parts of the trail above the shoreline.

Ironically, Kinzua Bridge State Park was trying to prepare for the worst when the worst smacked into it. The fallen bridge now provides a startling message of the importance of respecting Mother Nature, and planning for the rains, winds and storms that may come.

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