

*Ian Berger, a landscape architect at MIT, is designing a wetland to cleanse polluted water before it flows to residential areas and the sea*

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A fisherman in the Pontine Marshes of Italy. The area became prosperous but highly polluted after a huge drainage project initiated by Mussolini in the 1930s. PHOTOS: NY TIMES NEWS SERVICE

Before Michele Assunto hauls in his fishing net from the banks of a reed-lined canal here, he uses a pole to push the garbage out of the way. "They really need to clean this up," he growls.

Where another canal empties into the sea here at the small community of Porto Badino, the only animals that can survive are giant rats, local officials say. Of course, the sea is not fit for swimming for 183m on each side of the outlet, they add with a shrug — yet bathers splash in the Mediterranean nearby.

In many parts of this affluent coastal region southeast of Rome and northwest of Naples, canals dumping effluent into the Mediterranean from farms and factories coexist with fishermen and beachgoers. There is little doubt that this area would need considerable work to return to a more pristine state. For places as far gone as this one, however, a new breed of landscape architects is recommending a radical solution: not so much to restore the environment as to redesign it.

"It is so ecologically out of balance that if it goes on this way, it will kill itself," said Alan Berger, a landscape architect at MIT who was excitedly poking around the smelly canals on a recent day and talking to fishermen like Assunto.

"You can't remove the economy and move the people away," he added. "Ecologically speaking, you can't restore it; you have to go forward, to set this place on a new path."

Designing nature might seem to be an oxymoron or an act of hubris. But instead of simply recommending that polluting farms and factories be shut, Berger specializes in creating new ecosystems in severely damaged environments: redirecting water flow, moving hills, building islands and planting new species to absorb pollution, to create natural, though "artificial," landscapes that can ultimately sustain themselves.

Berger, who is the founder of P-Rex, for Project for Reclamation Excellence, at the institute in Massachusetts, recently signed an agreement with the province of Latina to design a master ecological plan for the most polluting part of this region.

He wants the government to buy a tract of nearly 202 hectares in a strategic valley through which the most seriously polluted waters now pass. There, he intends to create a wetland that would serve as a natural cleansing station before the waters flowed on to the sea and residential areas.

Of course, better regulation is also needed, to curb the dumping of pollutants into the canal. But a careful mix of the right kinds of plants, dirt, stones and drainage channels would filter the water as it slowly passes through, he said. The land would also function as a new park.

## [ ENVIRONMENT ]

Berger was quick to acknowledge that the approach is vastly different from the kind normally advocated by established environmental groups like the World Wildlife Fund or the Nature Conservancy, which generally seek to restore land or preserve it in its natural state, often by closing down or cleaning up nearby polluters. In the Florida Everglades, for example, the state is buying and closing a sugar plant to preserve the environment. But that approach may not work in places that are already severely degraded, Berger said.

"The difference between me and WWF is that when I look at this place, I never think about going back," he said, referring to the wildlife fund. "The solution has to be as artificial as the place. We are trying to invent an ecosystem in the midst of an entirely engineered, polluted landscape."

At first glance, Latina does not look like an environmental disaster zone. Bordered by mountains to the east and the Mediterranean to the west, it is a place of spectacular rural vistas and even a few famous beach resorts, like Sabaudia.

But in many ways, Berger said, it is as damaged and distorted as the area around an abandoned mine in Breckenridge, Colorado, that he is also redesigning, as part of a Superfund cleanup underwritten by the Environmental Protection Agency.

Indeed, the entire environment here is a manufactured one already — and one that is successful, in economic terms at least.

Two thousand years of "water management" have turned the once-malaria-infested Pontine Marshes into a region, the province of Latina, that is among Italy's most prosperous. It is home to industrial parks, resorts filled with weekend homes, and farms — some of which make Italy the world's leading producer of kiwis.

Latina's prosperity is built on drained swampland, kept habitable by six pumps as huge and noisy as airplanes, put in place in 1934 by Mussolini. Each day they pull millions of liters of water — up to 36,000 liters a second — out of the soggy ground, directing it into an elaborate system of cement-lined canals that ultimately dump it into the sea.

The entire province would return to marshland in seven days if the pumps were turned off, Carlo Cervellin of the Pontine Marsh Consortium said. He is in charge of maintaining and regulating the immense machines, which are in a pump house at the lowest point in the province, in Mazzocchio.

Roman emperors and popes had tried for centuries to drain the marshes to allow better access to the sea along the famed Appian Way, all with limited success. The draining of the Pontine Marshes was one of Mussolini's engineering triumphs.

The area was still a sparsely inhabited malarial breeding ground when Mussolini brought in workers from northern Italy to create a public works project centered on the pumps that in some ways rivaled the construction of the Panama Canal. Many died in the process, and there was no environmental impact study.

"The goal was to pump water out as fast as possible," Berger said.

What emerged from the swamp was a triumph of Fascist determination as well as one of Italy's economic powerhouses. Mussolini built the city of Latina on the newly dried-out land, where it became a center of industry and farming.

But prosperous does not necessarily mean sustainable.

Berger came to Rome's American Academy in 2007 on a yearlong fellowship to study the history of the Pontine Marshes. It was only after he started to collect data on the land and the water that he realized how damaged the area was.

With the help of the local government in Latina, he collected thousands of aerial photographs as well as data from water and soil in an effort to document drainage patterns and the flow of water and pollutants.

"If there was ever a place to know exactly where your food is produced, it's here," he said. "I would only eat from uphill."

Pristine water enters the Latina plain from high mountain streams in the area of Ninfa; it becomes dirtier and dirtier as it heads toward the sea, picking up the runoff from a succession of factories, farms and homes.

Berger found that half of the water in the system was severely contaminated, he said, with phosphorus and nitrogen levels that get worse as it runs through the canals toward the coast.

"In terms of phosphorus, much of the water is in the raw-sewage range, and in terms of nitrates, it was in the swine effluent range — like being right downstream from a pig farm," he said.

By the time the water reaches the sea at some outlets, Berger's aerial photos show, it has become a plume of silt filled with pollutants. Pharmaceutical factories and large farms are along the canals. Farmers also use the water for irrigation.

Presented with his research, even local officials were surprised at the portrait of pollution that emerged, but they were impressed enough with the solution he proposed that they are continuing to work with him now that he is back in the US.

"He studied the zone from a different point of view than ours," said Carlo Perotto, the planning director for the province. "We had different people concerned with water, industry and agriculture. He opened a new way of thinking."

# In Italy, a redesign of nature to clean it up

