Dam and seawall removal gets easier in MA

Alison Gillespie

A new law signed by Massachusetts Governor Deval Patrick on January 10 promises to make it much easier to remove a dam or repair a public seawall in that state, by creating a $17 million fund that would provide municipalities easy access to grants and revolving loan funds. Local environmental advocates and biologists argue that both such removal and repair projects are desperately needed and could ultimately benefit the state's watersheds.

There are more than 2800 dams inland and over 225 km of seawall along the Massachusetts coast, many of which are in need of repair, according to reports published in 2009 and 2011. A number of those seawalls protect important natural resources and critical infrastructure, says Stephen Long, The Nature Conservancy's Director of Government Relations (Boston, MA). "We hope for an integrated approach that looks at both the hard and the 'green' solutions", he adds, noting that the new funding sources can only be accessed by municipalities that want to repair existing public structures.

S Jackson

Many of the 2800 dams in Massachusetts have been labeled unsafe.

"We have very strong regulations here that would make it difficult to use the money to fortify things like beachfront mansions", explains Scott Jackson, Extension Associate Professor for the University of Massachusetts (Amherst). "Anytime that we get a severe storm, we have a dam failure somewhere in the state", he continues, adding that the funding can be used for both private and public dam removal projects on inland waterways. The difference is important, since some of the inland dams date to the early 1800s and their owners and descendants are no longer alive or even identifiable. Some of those dams were built to power grist mills or saw mills by farmers in need of alternate income, while others were erected by factory owners during the Industrial Revolution. Individual dams may be small but their cumulative impact on the environment is quite large, Jackson explains.

According to Tim Purinton, Director of the Massachusetts Division of Ecosystem Restoration (Boston), there are also major water-quality issues that the new legislation might help the state address more effectively. He calls dam removal a "very surgical" first step in many restoration projects, and one way the state can address climate change in the future, since removals eliminate warmer water impoundment areas behind dams and create refuges for species that need cooler water during heat waves or drought. "We don't just do a removal so that a fish can get from point A to point B", Purinton says. ■

Blue-green biofuel

Sarah Whitaker

The organisms that make the hot springs of Wyoming's Yellowstone National Park that beautiful blue–green color may hold within them the future of renewable energy. Cyanobacteria, also known as blue-green algae, need primarily sunlight, water, and carbon dioxide for survival and growth. Scientists are now investigating ways to exploit these primitive photosynthetic organisms as a renewable energy source, one that could decrease human dependency on fossil fuels.

Although cyanobacteria have been making their own energy through photosynthesis since the Precambrian, only in the past few decades have researchers recognized their potential for producing energy for human use. "Cyanobacteria can't make a useful product [for alternative energy purposes] by themselves but, with the appropriate pathways introduced, a useful chemical can be formed", says Shota Atsumi, Professor of Chemistry at the University of California (Davis). He and his colleagues have synthetically engineered strands of cyanobacteria to make a renewable precursor to fuel, including a gasoline additive, and plastic that could eventually replace traditional, non-renewable sources (*P Natl Acad Sci USA* 2013; doi:10.1073/pnas.1213024110).

While the Atsumi group's findings represent a big step forward, the challenge will now be to scale up production of the biofuel. But modifying the genetics of cyanobacterial strains can cause unintended cellular changes, which reduce their survival rate and limit productivity. Anne Ruffing, a Truman Fellow at Sandia National Laboratories (Albuquerque, NM), is also studying ways in which genetically modified cyanobacteria can be used for biofuel production. "The most surprising thing that we found were unexpected effects on the cell, such as changes in the photosynthetic process", she says.

There is still hope for future success, though, as Atsumi and his team have found that their particular strain of cyanobacteria is already producing more biofuel than traditional sources, despite only being in the early stages of development. At the same time, Ruffing has been working on another strain of cyanobacteria that is proving to be more productive. Both researchers intend to continue their respective investigations because, as Ruffing points out, "energy is one of the main problems facing humanity today". ■