

wonder that the domestic market for phytoremediation is expected to grow from well under \$100 million in 2000 to between \$235 million and \$400 million by 2005.

The downside to phytoremediation is that it takes time for the plants to do their work. Such

techniques, says Kirkwood, “will make sense only if there are appropriate growing conditions, contaminant densities, and aeration of the soil.” But phytoremediation can also allow contaminated sites to be partially inhabited even while the cleanup is going on.

## *The Daughterless Gene*

“The Plot to Kill the Carp” by Todd Woody, in *Wired* (Oct. 2002), 520 Third St., 3rd Fl., San Francisco, Calif. 94107-1815.

Eight years ago, Australian wildlife officials were alarmed to discover environmentally destructive European carp—which are already dominant in mainland Australia’s waterways—swimming among the rare native fish in Tasmania’s Lake Crescent. Carp, writes Woody, a Sydney-based journalist, are “the Borg of the fish world.” Uprooting aquatic vegetation, they turn clear-running water muddy, depriving native fish of food, light, and oxygen.

Authorities held the rapidly multiplying Lake Crescent invaders in check by lowering the lake’s water levels and denying them space to spawn. But Australian scientists now believe they have a better solution: “daughterless” genes.

“Biologists have long known that female fish develop when an enzyme called aromatase transforms androgen into estrogen,” notes Woody. If aromatase were chemically blocked, fish could be made to produce only males. Biologist Ron Thresher and his colleagues developed a gene to do exactly that. As carp injected with daughterless genes produce single-sex offspring, “the population of each targeted river or lake will eventually drive itself to extinction.”

That’s the idea, at least. The scientists have

already proved they can develop a daughterless gene for the zebra fish, a two-inch cousin of the carp. Next comes the destructive, fast-breeding mosquito fish. If that effort is successful, work on the daughterless carp will begin.

Skeptics such as Bob Phelps, director of the Australian Gene Ethics Network, worry about the unknowable consequences of releasing “millions of genetically engineered fish into complex ecological systems.” Woody describes “the nightmare scenario: Daughterless carp somehow escape to other parts of the world and breed with dozens of closely related species. Or they evolve in unforeseen ways into superpests.” Thresher, however, says the daughterless carp would be introduced to a target population only gradually over many years, so there would be plenty of time to halt the process if something went awry.

With the continuing spread of destructive alien species around the world, defensive genetic technologies are also likely to spread, says Woody. Scientists and regulators who are dealing with the influx of alien species in North America’s Great Lakes, for example, are interested in the new technologies as a way of dealing with invaders such as the big head carp, a 50-pound monster from China.

### ARTS & LETTERS

## *How Blue Can You Get?*

“A Distinctly Bluesy Condition” by Carlo Rotella, in *The American Scholar* (Autumn 2002), 1785 Massachusetts Ave., N.W., 4th Fl., Washington, D.C. 20036.

Buddy Guy’s blues guitar playing, “as instantly recognizable as his voice, can be shrewdly pent up, but when he lets himself go—which is most of the time—it soars

wildly over the top in a torrent of fast, loud, often distorted notes that regain their purity when sustained on a bent string pinned to the fingerboard.” That’s one of the characteristics