

Fundamentals

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Scene 1. My office at the Savannah River Ecology Lab, Aiken, South Carolina. I am writing this column on Earth Day, 22 April 1996. This is the day in the USA when all concerned citizens gather in recognition of the earth: what it provides for us and the destruction we have offered in return. Thousands gather in parks, where speeches are made, bands play, children plant tree seedlings, adults learn of recycling and energy conservation, and politicians try to convince themselves and their constituents that they are indeed environmentalists (despite their generally abysmal and viciously destructive records in that area). Today, everyone is 'green' and everyone cares about the environment.

Scene 2. One week earlier, a stark conference room at a US Fish and Wildlife Service Office in Austin, Texas. I was attending a 1-day meeting to discuss the fate of *Etheostoma fonticola*, the fountain darter, a small fish native only to Comal and San Marcos Springs in Texas. There is a chance that this fish will no longer exist in the wild by the time you read this. You see, these springs, the largest in Texas, are drying up due to excessive water extraction from their source, the Edwards Aquifer, combined with a drought in the region. We met to develop a plan by which a representative genome may be salvaged in the hope that the springs will one day again be habitable.

Where do these two scenes intersect? Why bring them up together in this column? Their juxtaposition is a powerful reminder that humanity still does not understand that the fundamental building blocks and ecological processes on earth—our life lines and the things that keep humanity going—are being destroyed within just a few human generations. I suspect that few Earth Day celebrants have any idea of the tragedy occurring in the Edwards Aquifer and to those springs. It is not written in the music, the political speeches or the recycling brochures. The children who plant trees in Texas have not been told that the

water necessary for tree growth is limited and dwindling, probably because most adults do not know it either. The vital signs of the planet are weak and growing dimmer while the politicians babble hypocritically and the celebrants express mild concern while promising to recycle their newspapers.

Let's return to those Texas springs for a moment. Fed by the Edwards Aquifer, a major aquifer in south-central Texas, the springs are home to no less than five endangered or threatened species and several candidate species. In addition to the fountain darter, the Texas blind salamander *Typhlomolge rathbuni*, Texas wild rice *Zizania texana*, and San Marcos gambusia *Gambusia georgei* are all endangered (the latter probably extinct), and the San Marcos salamander *Eurycea nana* is threatened. Three invertebrates have been proposed for listing: Peck's Cave amphipod *Stygobromus pecki*, Comal Springs riffle beetle *Heterelmis comalensis* and the Comal Springs dryopid beetle *Stygoparnus comalensis*. Endemism in these systems is high, and there are possibly more species to be discovered in the extensive cave systems of the aquifer. The springs are also important water sources for the larger rivers they feed.

The upsetting thing to me is the *fundamental nature* of this problem, the fact that an entire system is collapsing through human abuse. These species are not in danger of extinction through a single development project in a limited habitat, or due to forest clearing in a zone of endemism. Those causes are local and could be controlled or reversed, given the political will. Rather, they are in trouble because of extensive and fundamental misuse of a major piece of the planet. The Edwards Aquifer is huge, and these springs are large. San Marcos Spring has never dried in human history, while Comal Spring dried once, during a severe drought and with groundwater pumping, in the 1950s. Both springs typically produce a flow of hundreds of cubic feet per second, not a trivial amount of water by any standard. And yet, humanity, through uncontrolled growth in the region and excessive use of groundwater, has managed to endanger these springs, their biota, and their ability to

support human needs. We have succeeded in altering a large ecosystem in a major way and I find this alarming.

Of course, this is not an isolated instance of such a broad-scale assault on a large system. Many other examples exist in the USA, including degradation of the entire southern half of Florida (the everglades, Florida Bay and the coral reefs), the demise of old-growth temperate rain forests and their watersheds of the Pacific Northwest, the choking death of Chesapeake Bay and its once famous oyster, blue crab and striped bass fisheries, the 90 per cent loss of riparian forests of the arid southwestern USA and the 99 per cent destruction of native grasslands of California. Global changes of epic proportions include the collapse of one marine fishery after another, changes in atmospheric ozone layer levels, and increases in greenhouse gases. These are all large, non-trivial entities whose basic characteristics are being altered, and that is the scary part; we are destroying the fundamentals of life, not just eliminating individual parts. What is quite maddening is that the value of these systems to humanity apparently is not perceived by most citizens. The Edwards Aquifer supports several major cities and huge agricultural interests, yet the most common response to a declining aquifer level is to dig deeper wells and pump more water!

What is the solution to such madness? I am not sure. They say that 'ignorance is bliss', and many people seem to be blissful in their ignorance of our environmental predicaments. Aldo Leopold knew this 50 years ago when he stated that a person with an ecological education 'lives alone in a world of wounds.' Certainly an ecological education of the populace is a big step toward a solution, but that will be a major effort and I do not know if it is enough. Environmental awareness in the USA has expanded greatly over the last 30 years, yet it seems to fall dismally short of true understanding of the real problems and possible solutions. People focus on recycling and tree planting, which, although important, do not begin to address fundamental problems such as habitat destruction, loss of biological diversity and a human population out of control

and consuming resources as though it were participating in a one-time liquidation sale. A major, global effort is necessary to expose that 'world of wounds' to a much larger circle, to bring those fundamental issues to the forefront. Without an understanding of the basic and expansive nature of these problems, a global mobilization to truly address them is unlikely.

Scene 3. Anytown, USA, Earth Day. US Senators and Congressmen are planting trees, stocking fish, visiting zoos and delivering speeches that proclaim their support for the environment and indicate how 'green' they really are. For most, this is an unusual and awkward experience, the first time since last 22 April they have spoken *for* the environment. Many have voted against every environmentally related bill or issue that has come before them and some have systematically attempted to dismantle every environmental protection law in this country within their legislative reach; witnessing so much hypocrisy in one day is nauseating. As the vital signs of the planet grow weaker, as fundamental processes such as aquifer recharge continue to decline, and as major ecosystems around the world disappear, politicians falsely proclaim their concern, citizens celebrate the earth's goodness and decry pollution, and children go on planting trees. And the human population spirals upward while the fundamentals continue to disappear from under us, above us, and on every side.

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The (dis)information age – a reply

I was greatly disappointed that *Oryx* chose to run 'The (dis)information age' by Gary Meffe (29 [3], 152–153) and Sidney Holt's reply (29