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HALT the Homogeocene

a frightening future filled with too few species

By Francis E. Putz

Prior to the recent human population explosion, transitions between geological eons, eras, periods, and epochs were heralded by global changes such as onset of widespread glaciation, giant meteorite-induced faunal and floral changes, or breakup of a supercontinent. Only one organism, *Homo sapiens*, has the dubious distinction of having wrought so much change on the earth as to warrant the naming of a new epoch, the *Homogeocene*.

This epithet seems appropriate as the pri-mary change marking the end of the Holocene (current epoch) is the homogenization of the world's flora and fauna. Humans and human-dependent species now occupy the four corners of the earth. While human population numbers and impacts increase exponentially (e.g., Crosby *1987*, Brown et al. *1996)*, different human cultures and languages disappear at equally alarming rates. The effects of the onset of the Homogeocene have been particularly apparent in Florida, where rates of human population growth, deforestation, lake eutrophication, and other sorts of environmental degradation are among the highest in the world (Derr *1989)*. If a specific time were to be selected to mark the commencement of the Homogeocene in Florida, I would suggest the *1920s*, when, in the aftermath of a world war, highways and railroads catalyzed a series of land booms that continue to this day (Gannon *1993*, Mohl and Mormino *1996)*.

On the basis of pollen deposited and stored annually in the sediment at the bottom of lakes, together with archaeological evidence in Florida, the harbingers of the Homogeocene might be detected about *2000* years ago when signs of maize introduced from Mesoamerica indicate agricultural activity. Abundant charcoal deposited at the same time suggests that fire was one of the toots employed by these Paleolithic farmers (Pyne *1982)*. Pollen of some European domesticates and weeds appeared 400 to *500* years ago, but the majority of the landscape apparently changed in ways no more drastic than had been evidenced during the previous 10,000 years (Delcourt et al. *1993)*. In contrast, the rates and magnitudes of environmental change during the current century are unprecedented. Even the transition from oak to pine-dominated landscapes that occurred about *5,000* years ago, in the uplands of central Florida (Watts *1975)*, was nothing compared to what the peninsula has witnessed since Florida became famous as a destination for vacationers, entrepreneurs, retirees, and other immigrants.

A "sward" of cogongrass. Cogongrass invasion can result in forest conversion into grassland. Photo by Carol Lippincott.

A wide range of human activities which results in significant impacts to natural systems in Florida. Farmers and ranchers clear land for their crops and cattle. Natural forests are clearcut and replaced by intensively managed monoclonal tree farms. Prairies and flatwoods are ditched, diked, and drained. Muck farms, dairies, and septic tanks discharge nutrients into lakes. Suburban developers create landscapes that appeal to newcomers from Ohio, New Jersey, Cuba, Brazil, and other points both

north and south. The Florida that was once nearly completely forested is no more, and the destruction continues. Although many of the human impacts on Florida's ecosystems are intentional, some are inadvertent and could be avoided for the benefit of the environment and the economy. More insidious and harder to detect than outright destruction are ecological homogenization and other forms of deterioration of the remaining fragments of natural communities. As a result of a large number of historical and geographical factors combined with chance events, Florida was blessed with a wide variety of ecosystem types (Myers and Ewel 1990). Depending mostly on fire frequency, many upland sites support either scrub, sandhill, or hardwood hammock vegetation, distinct communities that resemble one another very little in either species composition or dynamics (Myers 1990, Ware et al. 1993). In the lowlands, an increasing duration of seasonal flooding and decreasing frequency of fire generally result in flatwood, cypress, hydric hammock, or bayhead communities with wet prairies or marshes in the really wet areas (Ewel 1990).

A few decades back, it was suggested that all of these community types are successionally related (Laessle 1942, Monk 1968, Veno 1976). It was hypothesized that in the absence of fire, Florida's uplands would gradually be transformed into hardwood hammock, our "climatic climax" (Clements 1916). Under fire-free conditions in wetter areas, it was proposed that the pines and cypress would fail to regenerate and broadleaved evergreens and other hardwoods would take over, with the result being hydric hammock or bayhead communities. The climatic-climax concept of Clements fell into disfavor some time ago (e.g., Whittaker 1953), but the successional transitions predicted by Laessle (1942) and others are nevertheless evident in much of Florida.

For pyrogenic communities, including most forest types in Florida, fire prevention is a disturbance to which species respond in somewhat predictable ways. For example, when fire is suppressed, hardwoods replace the more fire-tolerant or even fire-dependent pines and cypress, as predicted. But communities resulting from fire suppression are in many ways unique - they are not simply geo-graphically new manifestations of communities long established elsewhere in Florida. Novel mixtures of native species are developing in response to the novel disturbance of fire prevention. Where exotic species are part of the picture, as they are most everywhere in Florida, the resulting communities are absolutely new to the planet. If these new ecosystem types simply represented additions to Florida's natural diversity, cogent arguments could be made in their defense. Unfortunately, where these novel communities develop, numerous native species, many of which are endemic, are replaced by common species or cosmopolitan weeds.

Fire prevention and invasion by non-native species are the two major forces that will lead to the essential loss of the few natural communities that avoid the ravages of bulldozers in Florida. As forests dwindle in size and become increasingly hemmed in by housing developments and roads, the likelihood of lightning induced fires decreases. Parking lots, swimming pools, and watered lawns are very effective fire breaks. Animals that venture out of nature preserves stand a good chance of being run over, thus joining the"flattened fauna" (roadkill) for which we now have identification guides (Knutson 1987, Hostetler 1996).

Perhaps the hardest hit natural areas in Florida have been and continue to be those that are pine dominated. During the present inter-glacial, pines and their associates may have been abundant in Florida for only 5000 years or so (Watts and Stuiver 1980), but as recently as 1920 pine forests and pine savannas covered nearly 90% of Florida's uplands (Ware et al. 1993). Pine prominence was due to widespread and frequent fires, both anthropogenic and lightning induced. Without fire, pines, wiregrass, gopher tortoises, and perhaps 400 other species soon disappear (e.g., Noss 1989, Landers et al. 1995). Stop fire and watch grey squirrels replace fox squirrels, laurel oaks replace turkey oaks and bluejack oaks, box turtles replace gopher tortoises, and sapsuckers replace red-cockaded wood-peckers.

"Fire prevention and invasion by non-native species ... will lead to the essential loss of the

Laurel oaks quickly invade pine flatwoods in urban settings where fire is prevented. Photo by the author,

Humans bring to Florida many species of plants and animals that have significant, unintended effects on the natural environment. (e.g., Simberloff et al. 1997) Hydrilla, water hyacinth, and other escaped aquarium plants clog lakes, cats ear birds, dogs eat gopher tortoises, paper mulberry trees shade out sparkleberries, and cogongrass crowds out just about everything. Cogongrass is a particularly problematic exotic because it spreads faster, grows taller, burns hotter, and regenerates faster than any of the hundreds of pyrogenic native species that it quickly replaces in the otherwise beleaguered remnants of pine forest. The problem with invasive exotics is challenging in part because many people either do not believe that their beloved cats, dogs, and flowering plants can menace the environment or they do not want to have their horticultural options constrained and their pets restrained. Too few people recognize the beauty of a sandhill, do not know how easy it is to use controlled burns to maintain hundreds of flowering plants, and do not see the tragedy of letting sandhills die by omission of fire or commission of the rototiller.

Even with continued habitat fragmentation and prevention of fires in the remaining forest fragments that are ineffectively protected from exotic species invasion, Florida's forests will not become completely homogeneous. There will be Melaleuca forests where marsh grasses and sedges once provided homes for wading birds. Low-lying coastal forests that are not inundated by rising sea levels will support dense thickets of Brazilian pepper. Australian "pines" (*Casuarina* spp.) will line oceanfronts and invade dunes. Long into the next century in some swamps, cypress trees will continue to tower over the bays and other hardwoods that will even-tually succeed them in a most Clementsian way. Many other swamps, especially those connected by streams, are likely to become Chinese tallow forests (Bruce et at. 1995), per-haps draped by Japanese climb-ing ferns and air potato vines. Other horticultural escapees will vie with fire-intolerant native hardwoods, like laurel and water oaks, for dominance of the uplands. Envision a paper mulberry and mimosa overstory festooned with air potatoes, an understory of introduced ardisias, and an herb layer of Asian tradescantia. On drier sites, especially where there are occasional fires,

picture a thicket of the spinescent tropical soda apple or a monocultural sward of South-east Asian cogongrass - no trees, no blazing stars, no deer tongue, no deer, no turkey oaks, no turkeys, no gopher apples, no gopher tortoises, and no fox squirrels. Visit Ocala National Grassland and Fire Ant Preserve! [Yikes! - Ed.]

There are numerous ways to avoid some of this homogeocenic monotony in Florida. First and foremost, we need to foster widespread aesthetic apreciation of Florida's natural ecosystems. If the public does not firmly embrace the ecosystem management efforts of their nextdoor neighbors and , other land stewards, exotic grasses are likely to reign supreme. These grasses and other invasive non-indigenous species that these beautiful natives require neither should be outlawed, at least in the seedsheds of nature preserves. Invasive exotics should be treated as nuisances or pollutants, providing legal recourse for litigious landscapers.

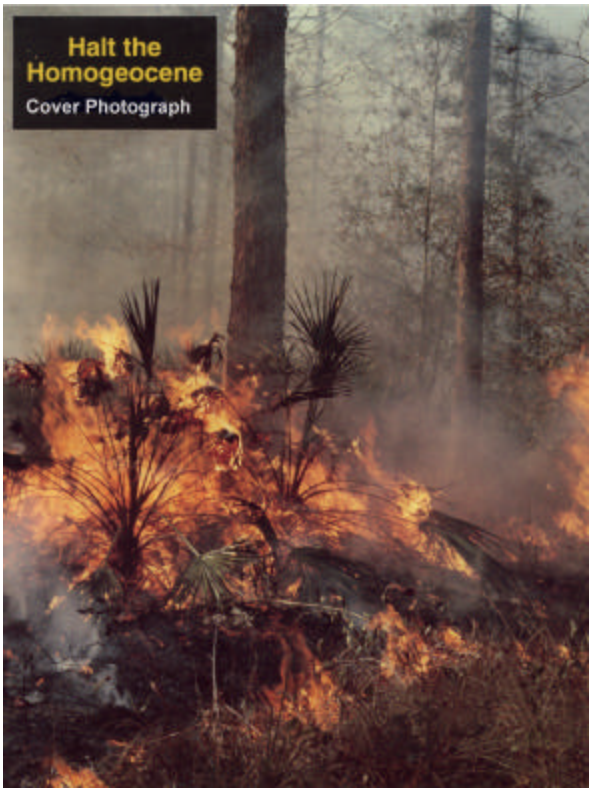
Incentives should be provided for land stewards who encourage native species and natural ecosystem processes, especially fire. To promote the maintenance and restoration of natural ecosystems, Florida's already advanced controlled burning laws should be further developed (Brenner and Wade 1992). Even in suburban settings, external combustion on remnant sandhills at two-three year intervals could replace the weekend roar of internal combustion lawn-mowers and ing than manicured lawns, gardens, and tra- weed-wackers. The biodiversity benefits andcost savings of burning would be substantial. Gardeners will be pleased to learn thatin a well developed sandhill there can be asmany as 100 species of flowering plants in an area the size of a riding lawnnower, and these beautiful natives require neither fertilization nor irrigation.

Forest managers who renounce the monomaniacal focus on volume yields and adopt more naturalistic silvicultural methods should be rewarded in the marketplace through programs such as certification of forest products from well-managed lands (Landers et al. 1995, Viana et al. 1996). Environmentally sound forest management should be encouraged because substantial environmental benefits derive from keeping forests in production, especially where the alternative is further fragmentation and suburban sprawl.

Although natural areas require less tending than manicured lawns, gardens, and traditional. golf courses, they still require active management. The need for natural areas management increases as landscape fragmentation interrupts the natural processes that maintain the structure and composition of natural communities. As the perimeterto-core area ratio increases, what happens outside of natural areas becomes increasingly important and management efforts have to extend beyond preserve borders. But we must acknowledge that ecosystems naturally change. Many Paleoindian archeological sites in Florida, for example, are presently under water. Changes in higher elevation areas in Florida have been no less dramatic (Delcourt et al. 1993).

Perhaps it is unreasonable to try to maintain all native species in even the smallest of natural areas (Kellman 1996), but the negative consequences of not burning and not preventing the encroachment of invasive exotics are quite clear. It may be relatively easier to maintain the ecological integrity of large blocks of natural vegetation, but small preserves in areas densely populated by humans can serve as effective demonstrations of the potential benefits of restoration and maintenance of natural biological communities.

With hundreds of people moving to Florida every day, most arriving without any sense of the beauty of natural scrub or sandhill, thwarting the Homogeocene is going to be a major and continuing battle. The right land use policies, supported by environmental edu-cation and research, could do much to maintain some of natural Florida well into the next century. Once people are aware of the benefits of controlled burns and the advantages of encouraging rather than fight-ing against natural processes and native



Longleaf pine sandhills require frequent low-intensity fire. Photo by the author.

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