Florida Native Plant Society

Conserve, Preserve, and Restore the Natural Hydrological Regimes of Florida's Native Plant Communities

Policy Statement

To protect, preserve, and restore our native plants and native plant communities, we must maintain the physical environment that supports them. The Florida Native Plant Society supports strong regulations and individual and community actions that will maintain or improve the natural hydrological regimes upon which our native plants rely.

Background

Florida possesses enormous biological diversity in a landscape with little vertical relief. In most parts of the state, small changes in topography result in major changes in the plant communities present. Each of these plant community types has a characteristic hydrological regime that can vary from almost desert-like to permanently inundated. When the hydrological regime is altered, whether from changes in climate or from human-mediated changes in the water table or flooding regime, the plant community present shifts toward one whose component species are adapted to the post-alteration hydrological regime.

The effects of gradual shifts in vegetation patterns due to natural climate shifts are rarely recognized within individual lifetimes but are well documented over periods of thousands and even hundreds of years by numerous pollen studies. The relative abundance of pollen deposited in lakes over time can be assessed in layers and has shown that the typical composition of uplands around those lakes has changed dramatically in relatively short time periods that are presumed related to rainfall regime (Watts and Hansen 1994). In this century, land clearing and drainage are believed to have shifted the meso-scale circulation patterns, especially the afternoon sea breeze fronts that are strongly associated with the locations where summer thunderstorms occur (Marshall et al. 2004). While we may not know with any certainty what the changes will be, we can anticipate that these gradual shifts will continue to occur both as a result of natural climatic fluctuations and as a result of anthropomorphically induced climatic change.

Effects due to human alterations of hydrological regimes have occurred on both a long term, and on a short term basis as a result of manipulations of the hydrology that result in changes to the water table. On a long term basis, Florida was once considered to be approximately 50% wetland (Kautz 1998). As early as the mid-1800s (Grunwald 2006), both government projects and individual citizens began ambitious programs of draining swamps and low uplands, dredging rivers, and creating canals. Many areas that are uplands today were once wetlands, and some areas that are very dry uplands today were once likely much more mesic. Many of the well known drainage projects (such as channelization of the Kissimmee River and drainage of the Everglades south of Lake Okeechobee) were begun in the 1800s (though at least the Kissimmee River channelization was not complete until the 1960s). Other projects, such as installation of numerous large agricultural drainage ditches, were initiated in the 1930s and some continued into the 1970s (Dahl and Allord 1996).

Humans readily recognize the effects of changes that occur within our lifetimes, especially when they occur relatively quickly. Beginning in the 1950s with the invention of air conditioning, Florida began an enormous period of growth that has been accompanied by a variety of hydrological changes many of which have been documented to affect our native plants and native plant communities. Many of these changes have been associated with growth of cities and expansion of agriculture. For example, there is a gradually shifting history of how we manage stormwater in developed areas and on farmland. Historically, we drained those areas as quickly as possible into natural lowlands (large swamps, streams). Because this caused flooding downstream, Florida developed current regulations that require the detention of stormwater in on-site ponds and controlled rates of release to prevent downstream flooding. These regulations (as of 2008) do not however, protect the water balance. While the rate of outflow is controlled, the volume of outflow is not. More water leaves the developed site than occurred historically. The end result is less water retained on site, less water infiltrating the ground, localized drops in the water table, and reduced recharge of aquifers. The cumulative effect of this process has been an estimated average decline in groundwater levels of one foot. The effect is certainly highly variable as some large areas have received little or no ditching while others have been altered repetitively. Based on data from Kautz et al. (2007), up to 57% of the state is characterized by native plant communities that grow in soils that were historically saturated at least into the root zone (up to 27% - low uplands), or periodically to permanently inundated above the surface (30% - wetlands). Since this acreage is broadly distributed across the state, there must a huge but largely unknown acreage of wetlands and low uplands that have most likely been altered by drainage. As no pre-drainage studies were done, we have no direct means to determine the magnitude of the effects, especially to low uplands. Some things we do know: many of our rare plants are associated with plant communities susceptible to drainage, and these species are typically absent today. As a demonstration, consider the difference between Picayune Strand, which was severely ditched, and Fakahatchee Strand which was highly altered but which escaped most of the ditching. Fakahatchee Strand is noted for its diversity of rare plants including orchids, ferns, and bromeliads whereas Picayune Strand is largely devoid of them and large areas that were once wetland now mostly function as uplands.

Indirect drainage also affects native plants and native plant communities. The effects of lowered water tables due to agricultural and potable water supply pumping of water from the underlying aquifer have been well documented, at least for wetlands and in areas where the average groundwater level has been greatly reduced. Indirect drainage is typically local to regional in scope, and it can vary from almost unrecognizable to reductions in average water levels of 15 ft or more. In 2000, Florida used approximately 8200 million gallons per day (mgd), or nearly 3 trillion gallons per year, withdrawn primarily from groundwater sources with about 53% of this used for agriculture (Hutson et al. 2004 revised 2005). Documented impacts to wetlands have included reduced hydroperiods and dramatic shifts in the frequency and seasonality of wetland inundation. In the worst of the documented cases, organic soils have oxidized leaving tree roots exposed and trees stressed, produced increased mortality as a result of disease and destructive fires that burn through dry muck, and (ironically) altered periods of extreme dryness and flooding. Other documented effects have included invasion by nuisance non-native species, loss of native species that have little tolerance for altered hydrology, and shifts in dominance toward species tolerant of shorter hydroperiods. We have excellent documentation on the effects of water table lowering on cypress swamps and marshes (for instance, see Rochow 1995, Southwest Florida Water Management District 2001). It is easy to find examples of seepage slopes that no longer seep, of springs that no longer flow, and of marshes that are now hardwood forests. Not studied have been effects on low uplands, but it is probable that many low uplands with soils that were saturated on at least an occasional basis have been altered.

Hydrological alterations that result in longer periods of soil saturation or inundation also cause changes in our native plant communities. Flooding is often more immediately lethal to native plants and native plant communities than drainage. Almost all plants have some tolerance to drought and most can persist for extended periods of dryness. Few upland plants can handle extended periods of flooding. Physiologically, flooding results in a lack of oxygen availability to the roots, and most upland plants die relatively quickly if flooded. Many plants that can handle flooding, including trees such as cypress, cannot reproduce in standing water. If periodic inundation is shifted to permanent inundation, even most wetland species eventually disappear leaving only species adapted to aquatic environments. The best known example is the Ocklawaha River where 28 miles of river were flooded and an estimated 7,500 acres of floodplain forest, most adapted to periodic but short term periods of inundation, were permanently flooded (USDA Forest Service 2002); another is Flatford Swamp in Sarasota County were floodplain swamp mortality was attributed to agricultural irrigation. Poorly known are the effects of less extensive and more subtle forms of inundation. For example, some irrigation practices can result in flooding of nearby streams, and are often associated with addition of nutrients to those systems. Invasion by nuisance species and mortality of the original plant community is a typical result. Flooding can cause stress including decreased stem density, tree size, and shift composition towards clonal species in hardwood swamps (Ernst and Brooks, 2003; Ford and Brooks 2002). For an example of more subtle changes, studies have shown that logging reduces evapotranspiration (there is no canopy to transpire) and results in a higher groundwater table (for example, Bliss and Comerford 2002, Riekerk 1989, Sun et al. 2000). In some cases, wetland plants have colonized historic uplands from which the canopy has been removed! The impoundment and management of coastal marshes for mosquito control changed the hydrology, vegetation, and other biota of these systems (e.g., Brockmeyer et al. 1997).

All these types of changes have been documented. All changes are cumulative – while any one change may be minimal for a given locality, the effects of many small changes may be significant. The cumulative nature of changes, especially when added to variation in rainfall and land management practices makes them difficult to interpret We may never be able to determine, for instance, the relative importance of maintaining an appropriate water table or maintaining an appropriate burn regime to occurrence of pine lily (*Lilium catesbaei*) in low flatwoods.

Protection of most of our existing natural lands, including those lands that have been purchased for conservation, depends on our protecting their natural hydrological regimes. Where these areas have been severely affected by large scale hydrological alteration, such as the Everglades, hydrological restoration may be required if they are to persist.

The Florida Native Plant Society recognizes that the landscape of Florida is not unaltered and that in many cases there is neither potential nor reason to attempt a return to historic hydrological conditions. However, maintaining natural hydrological conditions in the natural plant communities that remain, and restoring some semblance of natural hydrology to major damaged ecosystems to restore them to a functional condition are priorities.

Conclusions

1. Water management laws and regulations must place a priority on preserving natural hydrological regimes and recognize practices that degrade natural hydrological regimes as "contrary to the public interest;"
2. Quantities of water sufficient to support ecological function within the natural environment must be reserved to ensure that our native plants and native plant communities are fully protected;
3. Engineering requirements that more effectively maintain the water balance of areas that are being developed or converted to intensive agriculture should be implemented;

4. State and local regulations should require and promote sustainable water use practices in our communities (for example, landscaping that can survive on ambient rainfall, requiring more open space and green space);
5. State, regional, and local planning procedures requiring that development (growth) occur only where adequate water is available without harming the natural resources should be strengthened;
6. Water conservation measures should address both indoor and outdoor usage;
7. Natural lands important for recharge, protection of water quality, and the protection of rivers and springsheds should be actively acquired and protected;
8. To the extent feasible, the hydrology of natural ecosystems that were altered should be restored;
9. Public conservation lands should not be used for water supply purposes, including the extraction of either ground or surface water, except for lands specifically acquired for water production;
10. Funding for restoration programs must be adequate to meet restoration needs;
11. Educational programs that teach citizens about the natural history of Florida and the relationship of their actions to the long term hydrological health of our natural systems should be developed and implemented;
12. Requirements that agriculture, forestry, and industry use effective best management practices and water conservation measures must be strengthened.
13. Discouraging significant uses of water that are "frivolous" and detrimental to natural systems.

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