Science Roundup

by I. Jack Stout

A cascade of vegetation science publications of interest to FNPS members has appeared recently. The themes are diverse and include studies of endangered species, plant responses to prescribed burning, and descriptions of plant communities. It will take two or three Science Roundup columns to review the stack of papers I have accumulated.

Fire Ecology

The Tall Timbers Research Station (Route 1, Box 678, Tallahassee 32312) has just published the proceedings of the 19th Tall Timbers Fire Ecology Conference, titled *Fire in Wetlands: A Management Perspective.* This nicely edited volume is available from the station at a cost of $23.50. The bulk of the contributions to this work are by North American authors, but studies from Australia and Venezuela are also represented.

Fourteen papers and a collection of abstracts round out the volume.

Fire ecologists and land managers in Florida will be interested in reading Ariel Lugo's discussion of fire and wetland management.

Likewise, L. K. Kirkman reviews the impact of fire and hydrological regimes with specific reference to depressional wetlands in the coastal plain.

A contribution by Cecil Frost is rich in data and ideas concerning presettlement fire regimes in southeastern marshes, peatlands, and swamps.

Fire in cypress swamps is nicely explained by Kathy Ewel.

Sydney Bacchus (a contributor to *The Palmetto*) presents a strong case for looking at hydrology when considering burns in or near dewatered wetlands.

Recent work on fire effects and management in the Upper St. Johns River Basin Marsh is presented by Mary Ann Lee, Kimberli Ponzio, and Brian Ormiston.

Torreya

The Florida torreya (*Torreya taxifolia*) is nearly as enigmatic in its behavior as the Franklin tree (*Franklinia alatamaha*), a small tree reported from Georgia over 200 years ago and never seen again by the scientific community. Historically, the Florida torreya was found along a 35 km section of the Apalachicola River from Bristol, Florida, north to Decatur County, Georgia, with one outlying population near Lake Ocheesee in Jackson County, Florida. In contrast to the Franklin tree, *Torreya* did not disappear after its discovery in the mid-1800s and was a fairly common understory tree in the ravine forests along the bluffs (east side) of the Apalachicola River until a sudden decline of the species occurred in the 1950s.

None other than R. K. Godfrey and H. Kurz reported on the status of *Torreya* in 1962. At that time, no adult individuals were known to remain among the scattered populations. The cause of the decline was believed to have been one or more fungal pathogens; however, none was ever identified as the primary cause of the decline.

Wilson Baker surveyed the populations in 1982, which enabled the U.S. Fish and Wildlife Service to list the species as endangered in 1984 and to publish a recovery plan in 1986.

In 1988, approximately 30 years after the decline of *Torreya*, Mark Schwartz (then a Ph.D. candidate at Florida State University) and Sharon Hermann (a Research Biologist at Tall Timbers Research Station) initiated a study of the species to determine the cause of the decline (Schwartz et al., 1993). Fewer than 2000 individuals remain in the historic range. The largest individual recorded was 3.25 m tall, whereas individuals 15 to 20 m in height were common prior to the decline. Schwartz and Hermann conclude the current population probably developed from seeds that germinated 20 to 30 years ago, and that none was from stump sprouts. A lack of reproductive-age females (dioecious species) over the last 15 to 20 years means that some groups of individuals in the extant population must reach sexual maturity to avoid extinction in the wild.

Some hope is offered by the discovery of fewer than 10 trees which appear to be approaching maturity. Four of these trees are sexually mature males. Schwartz and Hermann were not able to determine if fungal pathogens, alone or in combination with other agents, were the reason growth to maturity was so rare among the individual *Torreya*.

In a more detailed study (Schwartz et al., 1995), several alternative hypotheses were examined to understand the

lack of recovery of *Torreya*. Compelling evidence was found to be lacking for the following hypotheses based on biotic agents as causes of the declines: 1. introduced pathogens, 2. pathogen vectors, and 3. fungal pathogens as epiphenomena.

Further work concentrated on abiotic triggers (stresses) which might predispose *Torreya* to native pathogens: 1. water stress, 2. microclimatic warming, 3. regional warming, 4. hydrologic change, and 5. fire. Detailed examinations of the first four of these stress hypotheses did not suggest explanations for the decline.

The fire suppression hypothesis (5), however, proved to be suggestive of how the decline may have occurred. Historically, fires along the river bluffs resulted in smoke settling in the ravines at the end of the day. Smoke may have suppressed the development of fungus otherwise capable of being foliar pathogens of *Torreya*. Several laboratory tests of the indirect effect of smoke on a fungus commonly found on the needles of *Torreya* were suggestive of the hypothesized cause and effect relationship.

Schwartz et al. were quick to admonish against any rush to judge the experiments as proof of the relationship in the field. In their conclusions, they regard the fire hypothesis as plausible at best. They suggest additional work should explore limitations on root function and the effects of air pollution.

As work continues on recovering *Torreya* in the wild, *ex situ* propagation of the species is being coordinated by The Center for Plant Conservation.

Indian River Lagoon

A number of interesting papers on biodiversity of the Indian River Lagoon have recently appeared in the *Bulletin of Marine Science*, Volume 57, Number 1, 1995. This collection of papers and abstracts derive from a symposium on the subject conducted at the Florida Institute of Technology, Melbourne, in 1994.

FNPS member Paul Schmalzer reviews the history of plant studies with emphasis on marsh systems and mangroves (Schmalzer 1995). Despite extensive modifications made to the marsh systems by past mosquito control efforts, Schmalzer reports no plant species have been lost from the region. Nonetheless, ecosystem processes have been modified by the development.

In another paper, Vicky Larson (Larson 1995) documents the loss of native plant communities.

Rock-plowed Wetlands

The science and art of restoring wetlands in the Everglades region continues to evolve. Nancy Dalrymple and coauthors (Dalrymple et al. 1993) address the question of how to restore native vegetation to limestone rock and marl substrates that formerly supported short hydroperiod sawgrass prairies.

Restoration may follow a land-use pattern in which rock plowing is done before agricultural activity. Dalrymple et al. show that it is necessary to remove the surface rock and soil and to reduce the elevation slightly below the pre-disturbance elevation. This extends the hydroperiod and results in revegetation of the formerly rock-plowed site to native wetland plants as opposed to exotics.

One site restored in this manner was inhabited by less than 20% nonwetland plants, whereas an otherwise similar site left with a rock-plowed surface supported 61% nonwetland plants. Exotics such as Brazilian pepper (*Schinus terebinthifolius*) typically form monocultures on abandoned rock-plowed land.

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Dalrymple, N. K., G. H. Dalrymple, and K. A. Fanning. 1993. Vegetation of restored rock-plowed wetlands of the East Everglades. *Restoration Ecology*, December 1993, pages 220-225.

Larson, V. 1995. Fragmentation of the land-water margin within the northern and central Indian River Lagoon watershed. *Bulletin of Marine Science*, 57(1): 267-277.

Schmalzer, P. A. 1995. Biodiversity of saline and brackish marshes of the Indian River Lagoon: historic and current patterns. *Bulletin of Marine Science*, 57(1): 37-48.

Schwartz, M. W., and S. M. Hermann. 1993. The continuing population decline of *Torreya taxifolia* Arn. *Bulletin of the Torrey Botanical Club*, 120 (3): 275-286.

Schwartz, M. W., S. M. Hermann, and C. S. Vogel. 1995. The catastrophic loss of *Torreya taxifolia*: assessing environmental induction of disease hypotheses. *Ecological Applications*, 5(2): 501-516.