PHOSPHATE LAND RECLAIMED

PART II

by David J. Robertson

Stream relocation and the subsequent restoration of water quality and biological integrity is a particularly controversial aspect of wetland reclamation. In large measure, the Florida Department of Environmental Regulation is reluctant to issue dredge-and-fill permits for stream relocation and reclamation projects because no data exist to support or refute the claim that a stream in central Florida can be returned to an equivalent condition following mining.

Interest in experimental stream reclamation has increased recently, spawning four projects currently in progress and five others in various stages of planning and permitting. However, before 1982, there were only two attempts to reclaim stream channels, both undertaken by Mobil Chemical Company. One of these research projects was carried out at Sink Branch on a previously reclaimed section of Mobil's mine northeast of Fort Meade in Polk County. The project began in December 1979, when 300 meters of Sink Branch, a small tributary of the Peace River, was diverted from its original unmined channel into a parallel channel excavated on mined land to the north. The experimental site encompasses a narrow 2 1/2 acre ribbon of reclaimed land adjacent to the stream planted with nine common species of native wetland and upland trees including bald cypress; green ash, *Fraxinus pennsylvanica;* red maple, *Acer rubrum;* sweetgum, *Liquidambar styraciflua;* Florida elm, *Ulmus floridana;* sweetbay, *Magnolia virginiana;* dogwood, *Cornus foemina;* live oak, *Quercus virginiana;* and slash pine, *Pinus elliottii.* Some herbaceous aquatic vegetation was planted in the streambed. Mobil monitored tree survival for two years after revegetation was completed, but made no provisions for evaluating the success of the project after February 1981. The Institute has taken the initiative to supplement the existing data via an in-house research effort, "Sink Branch: Stream Relocation and Reclamation by the Florida Phosphate Industry." Preliminary results indicate that the disturbance has had little effect on the aquatic invertebrate community and water flowing out of the reclaimed channel is actually of higher quality than that entering the channel from upstream.

Kathy Piwowar

Kathy Piwowar, biologist for the Florida Institute of Phosphate Research, collecting sieve samples from Sink Branch.

UPLANDS

The reclamation of native upland

habitat generally is predicted on development of a tree canopy. Although successful reestablishment of a mature hammock or xeric system through intentional reclamation has yet to be demonstrated except on a very limited scale, several projects are under way that should lead to a better understanding of techniques that will accelerate the return to diverse native communities.

The actual planting of trees has only recently begun to receive the attention it deserves. Trees are very visible and important components of upland reclamation both for their aesthetic as well as ecosystems values. Research is currently under way to test the survival and growth of various tree species on three types of reclaimed soils. The Florida Division of Forestry is just completing the fourth year of a five-year project entitled "Development of Techniques for the Use of Trees in the Reclamation of Phosphate Lands." Eight plots have been established on reclaimed overburden throughout the central and north Florida phosphate districts to test planting stocks, planting techniques, and differences in species responses on overburden. Additional plots have also been created on sand tailings, sand-clay mix, and phosphatic clay settling areas. The overall objective of the project is to develop criteria and guidelines for the use of trees to recreate wetland, island, and upland habitat on mined areas.

A principal deterrent to extensive tree planting on reclaimed areas is the cost of planting seedlings. Direct seeding would be far more cost-effective and would allow more areas to be reforested at reasonable cost than is currently possible. FIPR has funded three grants seeking to improve the success of direct seeding ventures. An initial attempt in 1982 at direct seeding sand and slash pine trees, *P. clausa* and *P. elliottii*, on sand tailings conducted as a part of the Division of Forestry's project had limited success, probably because the seeds were distributed after the normal seeding period for these species. When the experiment was repeated again last winter, though, Forestry recorded extensive germination of sand pine. Timing appears to be critically important. The Center for Wetlands at the University of Florida is also investigating direct seeding, but from several different angles. With support provided by an FIPR Applied Research grant, "Enhancing Ecological Succession Following Phosphate Mining," Dr. Ronnie Best and his graduate researchers, Bill Dunn and Peter Wallace, have been collecting seeds from native sources, then testing techniques in the laboratory and greenhouse that will improve germination and survival of the seedlings. They have also been culturing soils to develop data on seed availability and viability in natural seed "banks." If their research proves to be promising, topsoil containing seeds, soil microbes, and mycorrhizal fungi could be scraped from areas about to be mined and used to inoculate areas under reclamation nearby similar to the "mulching" technique described earlier that is being widely used in herbaceous wetland reclamation. Using the results of laboratory, greenhouse, and microplot experiments the group recently established field trials on International Minerals and Chemicals, Agrico and Gardinier sites. Results of this research will be available in late summer. The Institute is also funding a project with Dr. Gil Almagro at the University of South Florida to determine if his process for "Pelletization of Seeds" with a coating of polymer, mycorrhizal fungi, and fertilizer will lead to better seedling survival and growth.

ECOSYSTEM RECLAMATION

While most reclamation research to date has concentrated on development of techniques to improve the success of plant establishment, little, if any, research has been conducted on the physical and biological parameters associated with reclaiming mined lands as complete, integrated landscape and hydrologic units. Reclamation planning for phosphate mined lands should be directed toward establishing whole landscape mosaics and drainage networks instead of piecemeal, mine-by-mine reclamation resulting in landforms with little diversity and perched lakes and wetlands with no interconnections. Results of a project recently funded by the Institute will provide guidelines for developing such integrated plans. This large and complex project, "Development of Techniques and Guidelines for Reclamation of Phosphate Mined Lands as Diverse Landscapes and Complete Hydrologic Units," was awarded to Drs. Mark Brown and Ronnie Best of the University of Florida in January. The investigators plan to characterize existing natural central Florida landscapes and the ecosystems that make up the landscapes. Once they have developed baseline data on relatively undisturbed conditions, Drs. Brown and Best will evaluate the effectiveness of the current reclamation rules for establishing post-mining facsimiles of natural systems. They also plan to apply the information they gather on native ecosystems to innovative reclamation projects with the phosphate industry. The goal of the program is to develop realistic techniques and guidelines that can be implemented industry-wide to recreate a post-mining landscape that has long-term ecological and hydrologic stability.

Although mining is often visualized as despoiling the landscape, reclamation provides the opportunity to return the land to diverse natural communities. In most cases, the phosphate mineralized lands in the center of the state were cleared of natural vegetation long ago to be used for grazing and citrus groves. Reclamation can be instrumental in incorporating wildlife habitat and natural areas back into the landscape.

BUTTERFLY BOOK

Charles Scribner's Sons has published a book called **The Audubon Society Handbook for Butterfly Watchers** by Robert Michael Pyle. The Handbook is dedicated to Marvyne Betsch, "a true friend of butterflies and all nature," and a member of FNPS in the Jacksonville area. Marvyne says it's a wonderful book, with chapters on butterfly watching, butterfly behavior and photography, rearing butterflies, butterfly gardening, and more. It can be ordered from Florida Audubon Society, 1101 Audubon Way, Maitland 32751, for $21.95 including tax and postage.

Florida Audubon also has a **Field Guide to Butterflies Coloring Book** for $4.15 including tax and postage.