Rangeland Reclamation in Central Florida

Janine L. Callahan and James W.H. Cates

Rangeland can be described as land where the vegetation is predominantly grasses, grasslike plants, forbs, or shrubs that is capable of being grazed and which is generally not fertilized, cultivated, or irrigated. In Florida, wire grass, broomsedge, and carpet grass are the predominant grasses while saw palmetto, sand live oak, staggerbush, fetterbush, and blueberry are the most common shrubs. This is the primary habitat type of several distinct wildlife species, including Audubon's caracara, the Florida burrowing owl, and the Florida sandhill crane. Many other species, such as box turtles, black racers, eastern harvest mice, and spotted skunks, are also found in this habitat type.

The Society for Range Management has estimated that rangeland covers more than 40% of the earth's total land area. Native vegetation grazable by livestock (which includes grasslands, shrublands, and grazable forests) covers more than 63% of the continental United States (Avery 1975). Extensive areas of native rangeland formerly occurred in several counties in central Florida.

Phosphate was discovered in Florida in the 1880's. Since that time, the Florida phosphate industry has become one of the largest industries in the state and the largest producer of phosphate rock in the world. The activities of the phosphate and agricultural industries in central Florida have resulted in vast areas of native grasslands being converted to improved pastures. In recent years, open water areas and agro-economic use lands have increased from less than 1% to 9% and from 32% to 56%, respectively. At the same time, native rangelands have decreased from 28% to 6% and forested uplands have decreased from 26% to 13% (Marion and King 1989).

Cattle can graze in both improved pasture and rangeland, but more species of wildlife can find food, water, nesting, and cover in rangelands than in improved pastures. In addition to cattle grazing and wildlife habitat, rangeland is also important in watershed protection (by influencing runoff and infiltration rates), erosion prevention, fire management, recreation, hunting and fishing, and timber production (Avery 1975). Coordinating these various uses maximizes the benefits that can be realized.

In spite of its many benefits, rangeland reclamation in lands mined for phosphate has been limited. One reason is that Florida Department of Natural Resources has not yet declared rangeland to be critical habitat and its preservation or full replacement has not been mandated by State regulations. Without stringent requirements or incentives to ensure its reclamation by the mining companies, very little rangeland reclamation has taken place at this time.

The concern that exists regarding the expense and feasibility of revegetating upland habitats is another reason that rangeland reclamation has been limited. Reclaiming mined lands to a similar rangeland vegetation type requires either topsoiling, transplanting, direct seeding, or a combination of these methods. Concerns exist about the expense and feasibility of using these techniques to revegetate upland habitats. Topsoiling has been used successfully in wetland reclamation, but has had limited application in upland revegetation efforts. Transplanting has been hampered by the lack of dependable, continuous sources of plants, both from nurseries and undisturbed native areas. Good seed sources for many species in central Florida are lacking and most of the seed must be brought from other states. Heavy demands or shortages of seed in these states and the added cost of importing seed have restricted the use of this technique in central Florida.

Direct seeding with the exotic Bermuda and Bahia grasses is currently the most widely used revegetation practice in central Florida. Costs for this method range from $75 to $150 per acre. Estimated costs for transplanting upland native species range from approximately $100 to $750 per acre, while topsoiling ranges from $800 to $2,000 per acre (King and Marion 1989). EcoImpact (1980) estimated the cost for salvaging, storing, and spreading topsoil to be between $1,300 and $2,000 per acre. Transplanting, topsoiling, and direct seeding of native plants have been considered more expensive than seeding with exotic grasses, but there have been few data to support this belief.

To obtain data on the cost and feasibility of reclaiming rangeland, Estech, Inc., reclaimed an area in its Watson mine using topsoiling, transplanting, and seeding techniques. The mine is located in southwest Polk County, Florida, in the central portion of the state. The "program" (a term used to denote a specific mined area in a mine) encompassed 149 acres, of which 132 acres were mined. The range reclamation project, located in the western portion of the program, occupied 22 of the 60 acres that were reclaimed as non-forested uplands.

Reclamation began in February 1985 and consisted of leveling the spoils and backfilling the mined out area with overburden. Contouring was completed in October 1985. In early November 1985, topsoil from a donor area near the program was carried by pan scrapers to the recipient area. The 3-acre site from which the topsoil was removed

Authors are with the Florida Department of Natural Resources, Bureau of Mine Reclamation, 1677 Highway 17 South, Bartow, Florida 33830 and 2051 E. Dirac Dr., Tallahasee, Florida 32310, respectively.

Figure 1.

Figure 2.

Figure 3.

Figure 4.

was rangeland that had been disturbed to some extent by cattle grazing (Fig. 1). In the northern portion of the donor area, saw palmetto and prickly pear dominated, while gallberry was the predominant species in the south. The topsoil was deposited in the recipient area in three strips approximately 330 ft wide × 560 ft long at an average depth of 8 in. Two strips without topsoil, averaging 430 ft × 560 ft, were left between the topsoiled sections (Fig. 2). This stage of reclamation in the 22-acre project required 100 hours of labor at $65/hour, for a total of $6,500.

In late November, 1985, bushy beardgrass, chalky bluestem, blueberry, pokeberry, blue maidencane, and soft rush were transplanted from south of the program into the non-topsoiled sections of the project. The cost for this portion of the study was $1,120 (80 hours of labor at $14/hour). In December 1985, 25 lb of Alamo switchgrass and 1 lb of lopsided Indiangrass donated by the Florida Game and Fresh Water Fish Commission were planted on the middle, non-topsoiled section of the project. Two months later, 2,200 improved south Florida slash pine bare-root seedlings were planted in the western end of the reclamation project at a cost of $500.

Vegetation development was monitored by the Florida Institute of Phosphate Research (FIPR) in Bartow, Florida. Study plots were established in 8 areas (3 in the donor area, 5 in the recipient areas). Measurements of plant species and percent cover were collected in February and October 1986 and January and November 1987. (A more detailed analysis of the sampling methods and an updated report of the results are to be published by the FIPR staff following the final collection of data in November 1990).

Two years after revegetation efforts had been completed, 176 species (145 herbs or shrubs, 31 grasses) were recorded in the recipient and/or donor areas. Cover of typical rangeland species (wire grass, broomsedge, carpet grass, saw palmetto, oak, staggerbush, fetterbush, and blueberry) was low in both the donor and recipient areas. Sedge, gallberry, panic grass, and saw palmetto were the dominant species in the 3 donor sites. Panic grass, flattopped goldenrod, sedge, and Bahia grass were the dominant species in the topsoiled sections. An unidentified grass and Bahia grass were the dominant species in the non-topsoiled sections. Aeschynomene, senna, dog fennel, hairy indigo, knotroot foxtail, and smutgrass were also fairly common in the recipient area (Fig. 3).

Of the species that were transplanted into the non-topsoiled sections, pokeberry, blueberry and soft rush did not become established. Chalky bluestem, bushy beardgrass, and blue maidencane were found in limited areas. The Alamo switchgrass and lopsided Indiangrass did not germinate, probably because the seed was 3 years old when planted.

In September 1988, the 22-acre study project and the remainder of the reclaimed upland acreage was determined to have successfully complied with the reclamation requirements of the Florida Department of Natural Resources. While the species in the recipient sites were not identical in density and composition to those in the donor sites, this project was considered a success since it did develop into grazable land where the vegetation was dominated by grasses, grasslike plants, forbs, and shrubs (Fig. 4).

The area was also successful in terms of reclamation costs. The total expense for revegetating this 22-acre project was $8,120. At an average of $295/acre for topsoiling and $74/acre for transplanting ($51/acre for herbaceous vegetation and $23 for tree species), revegetation costs for this project were significantly less than the average $1,400/acre for topsoiling and $425/acre for transplanting reported by King and Marion (1989).

Although no major technological problems exist, there is room for improvement in understanding plant nutrient needs, plant successional trends, long-term maintenance, and vegetation species selection. Further research to determine the best methods for propagating and transplanting native rangeland species will improve the efficacy of topsoiling, transplanting, and direct seeding and further decrease the costs involved.

Reclamation design plans have been and will continue to be improved by the phosphate companies and regulatory agencies. Rangeland reclamation, as well as other reclamation projects, will benefit from this combination of increased research and experience. Although not a universal panacea, topsoiling, transplanting, and direct seeding in upland areas appear to be viable methods for replacing rangeland in mined areas in central Florida.

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