Florida Tourism Industry Marketing Corp.

Restoring the Everglades: Challenges for Agriculture

One of the most ambitious environmental restoration efforts—the South Florida Ecosystem Restoration Project—is now underway to restore the natural functions of the Everglades watershed. The Florida Everglades watershed is among the world's most productive and biologically diverse wetland/estuarine ecosystems. But urban and agricultural development in south Florida, supported by past public policies, has resulted in significant damage to the Everglades' natural systems.

Restoration of natural systems, combined with a rapidly expanding urban sector, will place increasing demands on the agricultural sector to adjust traditional patterns of land and water use. But the precise demands on agriculture, and the appropriate mix of strategies to meet those demands, are not fully known. An economic analysis can aid in developing restoration strategies that balance resource allocations among competing uses. Economic analysis provides a framework to assess the tradeoffs and potential joint benefits between agricultural, urban, and environmental demands.

Development & Its Impacts

The historic Everglades basin—extending from the Kissimmee River drainage to the Florida Bay—was a vast system of hydrologically connected wetlands and a rich mosaic of smaller micro-ecosystems reflecting different topographic features and soil types, small-scale climatic variation, and frequent natural disturbances. Over the years, the various wetland plant communities provided an abundance of wildlife habitat and sufficient habitat diversity to sustain populations through natural disturbances such as flooding, drought, fire, and tropical storms. Waterflows through the watershed tended to follow a predictable seasonal pattern—critical to life cycles of native wildlife.

During the wet summer-to-fall season, Lake Okeechobee—the heart of the regional hydrologic system—would swell and overflow with heavy runoff from northern tributary basins, forming a vast, slow-moving "river of grass" through the Everglades marsh roughly 50 miles wide and extending 100 miles south to the Florida Bay and Gulf estuaries. As floodwaters receded during the dry season, moisture stored in the thick peat soils of the Everglades would help to maintain surface water in wetlands and deepwater sloughs, providing continued freshwater flows to the marsh and coastal estuaries throughout the year and across multiple dry years. The naturally low nutrient content of the water accounted for the rather sparse, open character of much of the Everglades marsh—providing well-oxygenated conditions for many aquatic species at the base of the food chain.

Human settlement and economic expansion have profoundly altered the Everglades. Wetland conversion for agricultural and urban uses substantially reduced available land for wildlife habitat, natural environmental functions, and opportunities for recreation and other services. Of the remaining wetlands, large areas are seriously degraded due to disruptions in natural water flows and impaired water quality, with dramatic effects on native wildlife, including changes in community composition, loss of biodiversity, and risk of extinction for many species. Moreover, the continued decline in natural systems threatens the

The Central & South Florida Project

The Central and South Florida Project (C&SFP) is the primary means of drainage, water supply, and flood control for agricultural, urban, and environmental purposes in south Florida. The U.S. Army Corps of Engineers (USACE) has had lead responsibility for project design and construction. The South Florida Water Management District, a regional public agency, manages the system in cooperation with the USACE.

Project construction extended from the mid-1950's through the mid-1980's—with main features essentially in place by the mid-1960's. Construction costs totaled $252 million between 1950 and 1985, 80 percent financed through the Federal government.

The C&SFP represents regional water management on a massive scale. Encompassing an 18,000-square-mile service area stretching from Orlando to the Florida Bay, the project includes more than 1,400 miles of canals and levees, with pumping stations, locks, floodgates and other water control structures.

Main components of the C&SFP infrastructure are the upper Kissimmee basin impoundments and channelized Kissimmee River; the Lake Okeechobee levee and pumping system; the Everglades Agricultural Area, a large area of the northern Everglades designated for agriculture; three Water Conservation Areas consisting of five pools managed primarily for water supply and flood-control purposes; and the perimeter levee through the eastern Everglades, providing flood protection to agricultural and urban areas, and serving as the westward limit for most development.

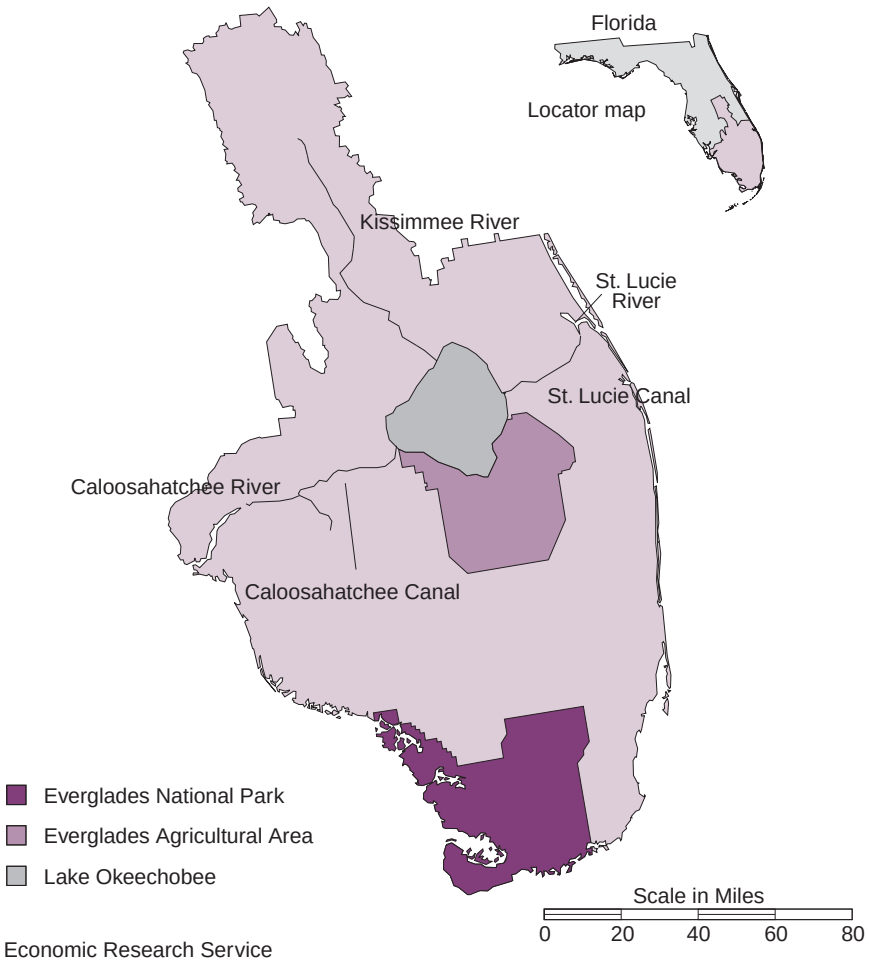
long-term prosperity of local economies dependent on tourism, fishing, and adequate freshwater supplies.

Wetland conversion. Land development for agriculture and urban expansion—supported by earlier public policy to reclaim wetlands for economic uses—has diminished the wetland resources in south Florida by an estimated 1.1 million acres, about one-half of the original wetland expanse. Early development activities during the 1920's and 1930's focused on land reclamation and drainage for agriculture. Construction of the Central and Southern Florida Project permitted an acceleration of wetland conversion after the mid-1950's. North of the Everglades, extensive diking and channelization eliminated historic floodplain wetlands, and large tracts of wetland/upland prairie were converted to improved pasture.

South of Lake Okeechobee, 700,000 acres of marsh—roughly one-fourth of the historic Everglades—has been developed for irrigated production of sugarcane and other crops in the Everglades Agricultural Area (EAA) since the 1950's. Extensive seasonal wetlands in southeast Florida were drained and developed for high-valued fruit and vegetable production and residential development. While agricultural development on private lands remains a factor in wetland conversion—particularly the expansion of citrus in southwest Florida—urban growth in the coastal areas of south Florida is expected to account for most future wetland losses. Although public ownership and state and local controls over much of the central and southern Everglades have restricted land development, much of the remaining wetland has been degraded.

Water-flow modifications. Highly regulated water systems—initially to support agriculture and increasingly for urban development—have vastly altered the quantity, distribution, and timing of water flows throughout the Everglades watershed. Alteration of historic flow patterns has degraded much of the remaining undeveloped wetlands, and is perhaps the single most important factor underlying ecosystem decline in south Florida. Managed water releases through the Everglades marsh system have been limited in most years, with much of the northern basin runoff diverted to sea for flood-control purposes. Natural patterns of high and low flows have been replaced with rapid fluctuations in water depth and loss of flow variability across the years.

South Florida Ecosystem and Major Natural Resource Areas



Economic Research Service

Landscape fragmentation—due to canals, levees, roads, and other structures—has further disrupted the natural flow of water from Lake Okeechobee through the Everglades. Land subsidence due to drainage has limited the basin's capacity to store and regulate water flows, while reducing the gradient necessary to route water southward. As a result, reduction of freshwater inflow to southern estuaries has increased saline concentrations and is believed to be a major factor in the declining marine life of Florida Bay.

Water quality impairment. Degraded water quality from agriculture and other land uses is a serious concern in areas of the watershed. Water quality can have significant impacts on native wildlife—either directly through adjustments in toxicity and oxygen concentrations—or indirectly through changes in plant communities and animal organisms required to support aquatic systems.

Nutrient runoff from livestock operations and urban development in the northern drainage area has contributed to high phosphorus concentrations, low dissolved oxygen levels, and large blooms of algae in Lake Okeechobee. Irrigation drainage flows containing chemical fertilizers and pesticides have impaired water quality in some discharge areas of the northern and

eastern Everglades. Sediment from farm fields and canals has caused silting damage in coastal estuaries. In addition, drainage of organic soils releases naturally occurring nitrogen and phosphorus to the environment. Finally, wetland conversion has limited the land's capacity to filter pollutants and sediment, while water diversions alter pollutant concentrations.

Adjustments in Agriculture Will Aid Restoration

Agriculture is a major industry in south Florida, accounting for more than half of U.S. cane sugar production and a significant share of winter vegetables, citrus fruits, and other products. While the south Florida economy has diversified in recent decades, agriculture remains an important source of income to the region—providing about $1.5 billion in annual sales. Current options to restore ecologic functions in south Florida could affect the area's agricultural production in several ways.

Increased freshwater inflows to the Everglades marsh would be accomplished, in part, through wet-season water retention on agricultural lands. Some restrictions on water supply and flood control for agricultural purposes would likely be required to meet environmental and expanding urban needs. Much of the land sought for environmental restoration—flow-ways, filtration ponds, water preserves, and wildlife corridors/buffers—would have to be obtained through acquisition of private land currently in crop production or pasture. Changes in farming practices and input use will be required to achieve state water management and water quality standards.

Cropland reductions. Land acquisition is a high-priority activity under the south Florida restoration program. The 1996 Farm Act allocated $200 million from the Treasury to the Secretary of the Interior for south Florida restoration, to be used for land acquisition and other purposes. Specific land-acquisition needs potentially affecting agriculture include reservoir-storage development, flow-way construction, constructed wetlands, canal system improvements, and wildlife management areas.

Government Efforts to Restore the Everglades

Growing concern over recent decades about the degradation of natural systems in south Florida led to increasingly insistent calls for public action. In 1983, the state of Florida initiated the first of a series of regional restoration projects designed to protect and restore key features of south Florida's natural landscape—the Kissimmee River, Lake Okeechobee, Big Cypress Swamp, the Water Conservation Areas, and Everglades National Park. The litigation that followed over legal and financial responsibilities of private, state, and Federal entities in the recovery process led to the Everglades Forever Act, passed by the Florida Legislature in 1994.

Principal elements of the act include directives to restrict pollutant discharges in the northern Everglades, to restore more natural hydrologic flows through the Everglades marsh system, and to establish financing mechanisms for recovery programs. The act also reaffirmed a strong Federal commitment to the south Florida restoration effort.

The Federal Restoration Task Force, founded in 1993, has sought to integrate ecosystem restoration efforts across principal Federal and state agencies and Native American tribal governments engaged in restoration efforts in south Florida. The Governor's Commission for a Sustainable South Florida was established in 1994 to define broad principles for south Florida ecosystem restoration and to prioritize restoration activities.

The U.S. Army Corps of Engineers, in cooperation with the South Florida Water Management District, is directing a major Reconnaissance Study of the Central and South Florida Project water control system to identify operational and structural modifications to meet long-term regional water needs. The intent of the study is to provide broad strategies guiding hydrologic restoration while maintaining or enhancing other authorized project purposes.

However, large-scale buy-out of agricultural interests to meet all environmental needs may not be economically feasible. Other potential means of acquiring land-use rights include land exchanges, short-term or permanent easements, and temporary transfer of use rights (wet-year flood retention/dry-year water storage) on an as-needed basis. Easements, long-term contracts, and other avenues for restoration may play a more prominent role in south Florida under the Everglades restoration program. The removal of a large amount of acreage from agricultural production could have significant economic costs to the region; equivalent environmental benefits may be possible through other farm-level adjustments that aid restoration.

Cropping shifts. Changes in cropping patterns and crop type may help to integrate agricultural production with natural hydrologic systems, enhancing on-farm water storage and slowing soil subsidence. Researchers are developing new sugarcane varieties with greater tolerance for shallow water tables and extended flooding. Rice—currently grown in rotation with sugarcane on limited acreage in the EAA—has been recommended as a cost-effective means of controlling soil loss because it is a flood-tolerant crop with peak irrigation demands during the wet summer season, and it has comparatively low fertilizer requirements.

Other possible enterprises include aquatic cover crops and partial conversion to wet-pasture beef-cattle production or to aquaculture. Adjustments in cropping patterns will depend on the economic viability in large-scale production, restrictions on expansion of alternative enterprises, compensation incentives to encourage adoption, and effects on water quality.

Improved management practices. On-farm resource management—or the managed allocation of land, water, chemicals, and other purchased inputs within the farming system—is a key element of the Everglades restoration program. USDA—

in coordination with the South Florida Water Management District and the Florida Department of Environmental Protection—helps identify agricultural best management practices (BMP's) to reduce production impacts on natural systems, and provides technical assistance and cost sharing to promote BMP adoption.

Management of applied fertilizers and pesticides—involving assessment of crop needs and improved application and timing techniques—is essential in meeting water quality standards. Water-table management is required to minimize soil subsidence, reduce release of soil nutrients, and enhance ground-water storage. Recommended practices include timed pumping of water based on rainfall events, and installation of canal riser controls to maintain higher average water tables and reduced depth fluctuations. Drainage management—involving water retention and re-use—can minimize pollutant loadings into the regional water system.

Improved soil and water management practices across the Everglades watershed have already had significant beneficial impacts on natural systems. Adoption of BMP's in the 1980's for dairy, livestock, and poultry production has contributed to improved water quality and reduced algal blooms in Lake Okeechobee. Improved practices for sugarcane production in the EAA have reduced phosphorus discharges into the northern Everglades by 68 percent over the 1979-88 base period, well ahead of regulatory schedules. An initial evaluation of a 4,000-acre filtration pond indicates that 40,000 pounds of phosphorus per year were successfully removed from EAA drainage flows prior to discharge into the regional drainage system.

Balanced Approach Is Needed

The environmental benefits of maintaining a strong agricultural sector need to be considered when assessing the benefits and costs of alternative restoration measures. Agriculture may be the most environmentally benign use of developed land and, in some cases, may produce larger benefits than nonmanaged uses.

Agricultural lands often serve as a buffer to encroaching urban development, and can restrict the spread of exotic and nuisance species to undeveloped areas. Cropland soils may be managed to store wet-season water supplies, reducing flood impacts downstream. Under proper management, crop production can also improve water quality by removing excess nutrients from ground and surface waters. Land management practices—such as filterstrips, set-asides, flooding of fallow fields, and drain-water retention—provide important wildlife habitat benefits. Finally, a strong agricultural sector will remain an important source of revenue for ongoing restoration initiatives.

Efforts to restore the south Florida ecosystem will depend on success in recreating essential functions of the natural system while providing for managed growth and economic activity. The role of agriculture will depend ultimately on tradeoffs in benefits among agricultural, urban, and environmental uses of land and water resources. An economic assessment of relative benefits and costs that arise from future resource allocations is essential to achieve a balance between agricultural producers, the regional economy, and environmental quality.

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Upcoming Reports—USDA's Economic Research Service

The following reports will be issued electronically on dates and at times (ET) indicated.

September

15	*Cotton & Wool Outlook (4 pm)***
	*Feed Outlook (4 pm)***
	*Oil Crops Outlook (4 pm)***
	*Rice Outlook (4 pm)***
	*Wheat Outlook (4 pm)***
16	*Tobacco**
17	*Europe Data Update*
	Livestock, Dairy, & Poultry (12 noon)
19	*Sugar & Sweeteners**
22	*Agricultural Outlook**
23	*U.S. Agricultural Trade Update**
30	*Agricultural Income & Finance**

*Release of summary, 3 pm.
**Available electronically only.