

# Wildlife, Water Quality, and Florida's Beef Cattle Ranches

## A Long-range Research Plan for Economically & Ecologically Sustainable Cattle Ranching

Summary.—During 1994, three organizations (MacArthur Agro-ecology Research Center, University of Florida's Institute of Food and Agricultural Sciences, South Florida Water Management District) created a cooperative group to initiate a multi-disciplinary research program at the Buck Island Ranch in Highlands County, Florida. In 1996, the Florida Cattlemen's Association and the U.S. Natural Resources Conservation Service joined the group.

The goal of this research program is to reduce the nutrient concentrations in surface water leaving ranches, protect the natural biodiversity of ranches, and maintain the economic viability of the ranching industry in central Florida.

### INTRODUCTION

#### Florida's Ranches

Florida's semi-native cattle ranches support a diverse and productive community of wildlife and plants. The mosaic of habitats on these ranches includes open grasslands, forests, and wetlands. In addition to cattle, the grasslands support Eastern Meadowlarks year-round and Savannah Sparrows and Sedge Wrens in winter. The forests support a large Gray Squirrel population and numerous small forest birds. The wetlands support over 15 species of frogs and toads, numerous fishes, and invertebrates. These wetland species provide the food base for otters, foxes, owls, hawks, and numerous wading birds among others. But it is the mosaic of habitats that is most important in supporting such distinctive species as Sandhill Crane, Burrowing Owl, and Crested Caracara, as well as the widespread White-tailed Deer, Northern Bobwhite, and Wild Turkey. Maintaining Florida's ranches is critical for the protection of Florida's unique biodiversity.

#### Research Site

The BUCK ISLAND RANCH (10,300 acres) is 15 miles southeast of Lake Placid, Highlands Co., Florida. The Ranch, along a major drainage canal linking Lake Istokpoga to Lake Okeechobee, is centrally located in the Indian Prairie/Harney Pond Basin, one of five major tributary basins of the Lake Okeechobee Watershed.

The Ranch is on a long-term lease to Archbold Biological Station from the John D. and Catherine T. MacArthur Foundation. The Ranch is the main component of the MacArthur Agro-ecology Research Center, a division of Archbold. On the Ranch, cattle herds and citrus groves are maintained at full production levels for research purposes. The Ranch possesses diverse upland and wetland habitats, both natural and artificial, characteristic of today's Lake Okeechobee Watershed.

*Ranch employees use the Buck Island Ranch main road to move cattle between pastures.*



Ann M. Bancroft

## Water Quality Issues

Although the concentrations of phosphorus and nitrogen in the surface waters leaving individual ranches may not be excessively high, the extensive acreage of cattle ranches in the watershed means that ranches could be major contributors of these nutrients to Lake Okeechobee (see side bar). As of 1996, the phosphorus loads to the Lake are still well above target levels set by Florida's Surface Water Improvement and Management (SWIM) legislation. Reducing the phosphorus and nitrogen entering the Lake is a major environmental goal. Thus, it is important to know the amount of nutrient loading coming from ranches and to find economically sustainable ways to further reduce phosphorus and nitrogen loading to the Lake and eliminate the need for more stringent regulations.

## Finding Solutions

Finding economically sustainable management practices that reduce nutrients in surface water and yet protect the natural biodiversity found on Florida's cattle ranches is an essential conservation goal of governmental agencies. A multi-disciplinary research program was developed by a team of collaborators (The Group, see page 4) from MacArthur Agroecology Research Center (MAERC), South Florida Water Management District (SFWMD), University of Florida's Institute of Food and Agricultural Sciences (IFAS), Florida Cattlemen's Association, and U.S. Natural Resources Conservation Service. The objective of the research program is to develop a better understanding of the factors and management practices in beef cow/calf operations that affect surface water quality in the Lake Okeechobee Watershed.

## The Landscape Setting

LAKE OKEECHOBEE is a major hydrologic feature of southern Florida. The watershed begins in central Florida near Orlando, and the Lake supplies water resources downstream via the Everglades marsh to urban south Florida and to Florida Bay. Water quality in the Lake has declined steadily for the last 40 years due to urban development, channelization of the Kissimmee River, and the growth of intensive agro-business.

## The Program

Viable solutions will depend upon having credible data based on sound experimental design to address various management issues. Obtaining and integrating this information is a key aspect of the program. The major goal is the development of a long-term research plan to measure the effects of various stocking density (cows/acre) and other management practices on surface water quality. A second component is the use of sophisticated computer models and decision-support systems to evaluate the effects of various farm management practices on water quality, economic sustainability, and wildlife populations. These models should allow ranchers and managers to explore advantages and disadvantages of alternative management practices before implementing them.

*Cattle in a winter pasture at Buck Island Ranch.*



*G. Thomas Bancroft*

## RESEARCH

### Experimental Approach

The Group designed two large experimental pasture arrays at the Buck Island Ranch to examine the effects of stocking density on nutrient content in pasture runoff. In central Florida, ranchers often have two major pasture systems. Summer pastures are planted in bahia grass or other exotic grasses and are fertilized often. Winter pastures generally are dominated by native grasses and may not be fertilized. MAERC will construct 16 pastures, each as a separate hydrologic unit. Summer and winter pastures will be 50 and 80 acres, respectively. These pasture arrays will also allow for experiments on fertilization rates, grazing schemes, and other variables.

### Research Herds

The experimental design will evaluate four stocking densities in two pasture types (with two herds at each rate). Stocking densities are 35, 20, 15, and no cow/calf pairs. These densities go from slightly higher than typical for these pastures to lower than typical. Each test herd will occupy summer pastures during May–November and winter pastures during November–April/May. Each study animal will remain with the same herd for the life of the project. The 140 "Braford" cows (4–9 yrs. old) in this study will be selected randomly from one of the commercial herds at Buck Island Ranch. During the study, replacement females will be selected from the same herd.

### Biological Monitoring

Stocking densities influence the amount of grass consumed in a pasture and may affect the growth rates of grasses. The density of cows likely influences the viability of a given pasture as habitat for various wildlife and plants. IFAS will study the rate of growth and consumption of grasses in each pasture. The quantity and quality of forage available to the cattle has important economic consequences for a ranch. Surveys conducted by IFAS of birds, frogs, toads, and snakes in pastures will provide an index of wildlife use relative to cow stocking rates.

### Surface Water Measurement

MAERC will construct small berms and collection ditches around each experimental pasture. Flumes to measure surface water flow will be placed at the sole outflow of each pasture, and each will contain an automatic water sampler. Water samples will be collected based upon timing and volume of surface water runoff, and analyzed for phosphorus and nitrogen content and other parameters. The nutrient information, combined with flow volumes, will determine loading rates for phosphorus and nitrogen relative to stocking rates. This information supplies an understanding of nutrient loading from beef cow/calf operations and will be essential for calibration and verification of the computer models. Weather data from the summer/winter pastures will provide information to estimate

evapotranspiration and to calculate a water budget.

### Economic Understanding

Information on economic implications of alternative management scenarios is vital to developing programs that improve water quality while maintaining the economic sustainability of ranches. Cattle conception rates, weaning percentages, and weaning weights are three variables that have major influence on the income of a beef cow/calf operation. Alternative stocking densities may cause cows to consume more or less winter supplement or minerals. Similarly, the condition of a breeding female may affect her long-term viability to the rancher. These critical production variables will be monitored by MAERC and used to evaluate the consequences of alternative management prac-



Dr. George Tanner of IFAS explains techniques for monitoring forage growth and consumption in pastures.

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## INTEGRATING RESEARCH AND ECONOMICS

Integrating information on water quality, biological parameters, and economics is essential for the development of management practices that are both economically and ecologically sustainable. A computer model (LOADSS, Lake Okeechobee Agricultural Decision Support System), developed by IFAS for evaluating effects of land-use changes on runoff in the dairy industry and on water quality, will be modified for use in the beef cow/calf industry. IFAS will modify this system for beef cattle ranchers and water managers, allowing them to evaluate alternative management scenarios. This system will consider information on stocking rates, forage type, soil type, rainfall, fertilization practices, and food supplementation in its evaluation of possible nutrient runoff. *Integrating the factors that influence water quality and wildlife populations with the economic implications of alternative management practices is a major objective of this overall program.*

## SUMMARY

Over the course of this study, we will 1) gain an understanding of the influence of cattle stocking rates on the quality and quantity of water leaving summer and winter pastures, 2) develop cattle-production information for evaluation of alternative management practices, and 3) monitor the health of wildlife populations in a pasture landscape. *We earnestly hope this research will help develop management practices for the cattle industry that are both environmentally sustainable and economically sound.*

## The Research Group

During 1994, three organizations (MAERC, IFAS, SFWMD) created a COOPERATIVE GROUP to outline a series of research programs examining the relationships between management practices, environmental issues, and the economic sustainability of beef cow/calf operations in central Florida. A 1994 Memorandum of Understanding (MOU) initiated the program. These partners have committed considerable resources to the program. In 1996, the FCA joined the MOU Advisory Committee and the NRCS is becoming involved in site characterization. The expanded partnership ensures the comprehensiveness of the research program.

**Archbold Biological Station's MacArthur Agro-ecology Research Center** (MAERC) is committed to conducting and stimulating long-term research on the relationship between cattle ranching, citrus production, and the native ecological systems of central Florida. MAERC operates the 10,300-acre Buck Island Ranch as a commercial beef cow/calf operation and citrus grove.

The **University of Florida's Institute of Food and Agricultural Sciences** (IFAS) is organized into 21 Departments and 13 Research and Education Centers to develop and support environmentally and economically sustainable agriculture in Florida. IFAS faculty bring a wide range of expertise in range sciences, agricultural engineering and economics, soil and water chemistry, wildlife biology, and animal science to the effort.

The **South Florida Water Management District** (SFWMD) is a state agency with responsibility for water supply, flood protection, water quality, and environmental protection for the interconnected Kissimmee/Lake Okeechobee/Everglades/Florida Bay Ecosystem. The District has a large research program, and conducts environmental research and modeling within the system.

The **Florida Cattlemen's Association** (FCA) is an organization of over 4,000 members concerned with various aspects of beef production in Florida. They provide important and realistic insights for the research program because FCA members are the actual owners and managers of cattle ranches.

The **U.S. Natural Resources Conservation Service** (NRCS) is the U.S. Department of Agriculture agency responsible for helping people conserve, improve, and sustain our natural resources. For over 60 years, the agency (formerly the Soil Conservation Service) has provided science-based technical assistance to Florida ranchers and encouraged them to adopt voluntary approaches to range management. The NRCS brings expertise on range management/soil dynamics to the research group.



Joyce Voneman



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*Barred Owls and Crested Caracaras are common birds on ranches in central Florida. These birds nest in the palm and oak hammocks and forage in the surrounding pastures and isolated wetlands. These two bird species prey on vertebrates and invertebrates found in the wetlands and pastures. The mosaic of habitats appears to be extremely important for these species.*



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