

## Rainmaking in Florida

While some parts of the United States are scheduled for floods this spring (SN: 3/20/71, p. 195), other areas are suffering from the opposite problem. In south and central Florida, below-normal rainfall has resulted in a severe drought. The area's Flood Control District (FCD) reports that as of mid-March major water storage areas were two to three feet below their scheduled levels.

Normal March rainfall for the area is about 2.5 inches. But this year, less than an inch fell during the first half of March. Since then, there has been a little rain, but not nearly enough to alleviate the drought.

Lake Okeechobee, which holds most of south Florida's water supply, was 2.63 feet below schedule. Further declines will make it increasingly difficult for the FCD to supply irrigation water, and if the level drops two more feet, it will be virtually impossible to release significant amounts of water to the Everglades and farm areas.

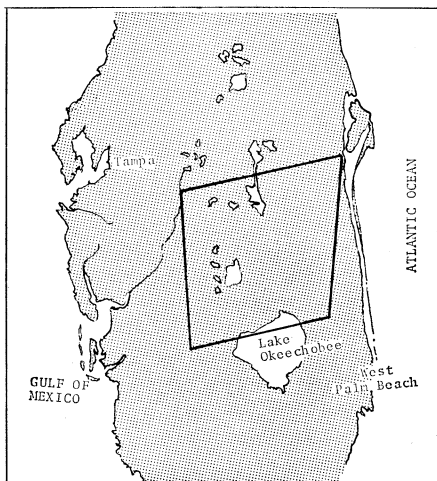
Water rationing has been ordered by Fort Lauderdale authorities and at one point the Cross-Florida Okeechobee Waterway is below navigable levels. Several large fires have swept tracts of the Everglades and south Florida prairie lands. The FCD estimates that further declines in water levels could lead to fouling of fresh wells by salt intrusion, wildlife losses, damage to the Everglades and severe shortages in private and industrial, as well as agricultural, water supplies.

In late 1970, the then Governor Claude R. Kirk Jr., asked the National Oceanic and Atmospheric Administration to help alleviate the water shortage by renewing its cloud-seeding experiments in Florida. His successor, Reubin O'D. Askew, noting that "it is apparent that we are entering into a major drought in the south Florida area," confirmed the request.

April and May are the earliest suitable months for stimulating rainfall by cloud seeding, and NOAA Administrator Robert M. White directed the Experimental Meteorological Laboratory in Coral Gables to begin a massive rain enhancement project on April 1.

Under the direction of Drs. Joanne Simpson and William L. Woodley, the laboratory is trying to increase rainfall by seeding clouds over a 4,800-square-mile target area. The seed area will take in Kissimmee Basin and part of St. John's Basin just north of Lake Okeechobee. Kissimmee Basin water drains into the lake.

In experiments conducted in 1968 and 1970, Drs. Simpson and Woodley had shown that on relatively fair days



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Target area for NOAA cloud seeders.

(when cumulus clouds cover less than 12.7 percent of the area) seeding of single clouds by a technique called dynamic seeding can produce seven times the rainfall of unseeded clouds (SN: 12/26/70, p. 479). They also found evidence to suggest that seeding may promote the growth of a single cloud and mergers between separate clouds. This also increases rainfall, since large clouds rain more than small ones, and two merged clouds produce more rain than they would produce separately. The present project is concentrating on inducing cloud mergers, since this technique is most productive and since even very successful single-cloud seeding will produce only a small part of the needed water.

But, Dr. Simpson cautions, drought conditions are the worst possible conditions for cloud seeding. "I've been saying for years that the only way this method can work is to seed when clouds are suitable and to conserve the water in reservoirs until it is needed." The technique just isn't suited to relief of a drought that has already begun, she says.

By Wednesday this week, the EML researchers had conducted one day of experimental seeding. Conditions for seeding have been poor, and Dr. Simpson said the outlook was not good for the next several days.

On seeding days, Drs. Simpson and Woodley hope to inject silver iodide into as many as 16 clustered clouds. Through National Weather Service radar facilities at Tampa and Daytona Beach, the researchers will attempt to trace the movement of the seeded areas within the general mass of clouds. A network of 141 rain gauges, monitored by the FCD, will record rainfall data in the target area. These tools will help the EML scientists to evaluate the success of the project.

In order to be responsive to the cloud-seeding technique used by the EML scientists, a cloud top must con-

tain supercooled liquid water at about minus 10 degrees C., a temperature usually found at an altitude of about 20,000 feet over Florida. Cloud tops must grow naturally to between 20,000 and 26,000 feet to be eligible for seeding.

Dr. Simpson and another NOAA scientist, Victor Wiggert, have worked out a computerized numerical model for predicting the behavior of cumulus clouds. On a typical experimental day, Wiggert will feed data on morning cloud conditions into a University of Miami computer, which will use the model to predict how the clouds will grow if seeded or left unseeded. The larger the difference between the seed and no-seed growth predictions, the greater the rainmaking potential of the cloud. Suitable clouds will then be seeded according to a random scheme to eliminate any bias.

Dr. Woodley emphasizes that there are several significant unknowns in this project. Dynamic seeding can increase rainfall only under the proper atmospheric conditions. One uncertainty, therefore, is how many days in April and May, the timespan of the project, will qualify for seeding. Another uncertainty is the amount of additional rain that will fall as a result of the seeding.

"Under the most ideal weather conditions," Dr. Woodley cautions, "we will be able to help alleviate the water shortage. It is unlikely, however, that our efforts alone will break the drought. A good naturally rainy period will be required to fill the reservoirs." □

### MAMMALS AFFECTED

## DDT and reproduction

It has been known for some time that DDT and other chlorinated hydrocarbons interfere with the reproductive systems of birds, causing eggshell thinning and the near extinction of some birds.

Dr. William L. Heinrichs of the University of Washington told science writers at an American Cancer Society seminar this week that rat studies he has done indicate DDT can interfere with mammalian reproduction, and that the increased incidence of ovarian cysts among young women may be a result of DDT exposure.

According to Dr. Heinrichs, DDT induces in rats a syndrome which includes multiple ovarian cysts and failure of reproduction. In recent years, there has been evidence of increase of a similar condition among young women, he says. He theorizes that DDT acted on the pituitary gland of the young women—perhaps prenatally—thus altering the hormonal "programming." □