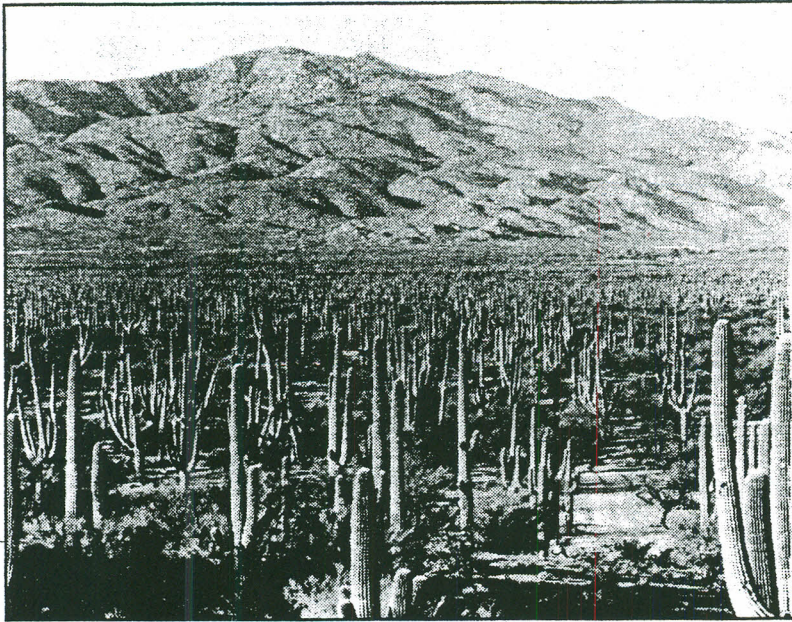
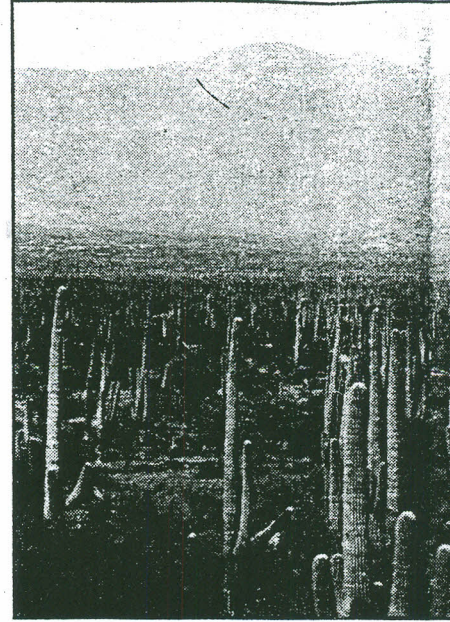


1935



1960



The National Park Service

Each of these photos was taken from the same spot on Cactus Forest Drive in the Saguaro

Scientists scrutinize decl

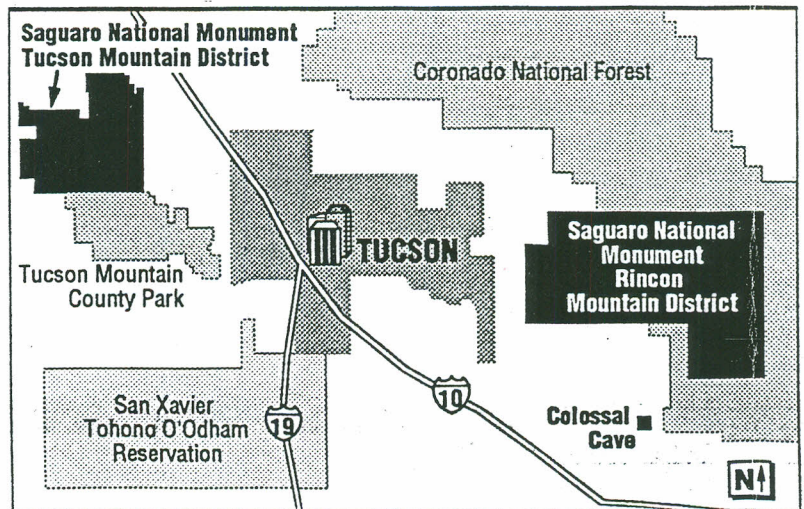
By Jim Erickson
The Arizona Daily Star

What's left of the mature saguaro forest east of Tucson will be gone by the year 2000, and new evidence suggests that erratic summer monsoons may be partly to blame, according to a botanist who's been studying the cacti for 33 years.

But recent studies also show that a new generation of saguaro has gained a foothold in the Rincon Mountain district of Saguaro National Monument and someday will rise up to replace those dying giants, said Raymond Turner of the U.S. Geological Survey in Tucson.

"It was predicted several decades ago that the population of big individuals in the rolling flats at the base of the Rincons would be gone by 2000, and what was predicted is indeed happening," Turner said.

"What we didn't know until now was whether they would come back, but now we can say that they



Judy Margolis, The Arizona Daily Star

are indeed coming back in droves," Turner said.

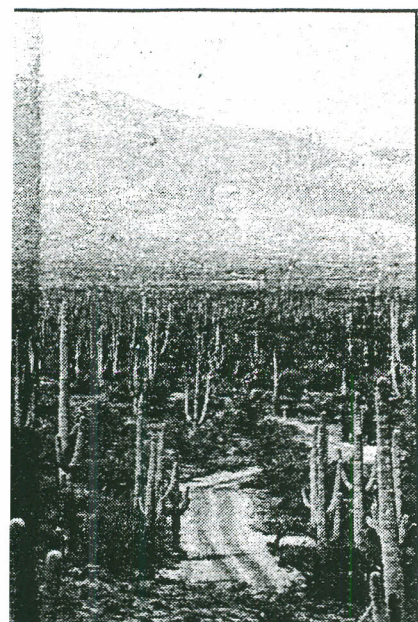
Saguaro National Monument was established in 1933, primarily to preserve the impressive saguaro stands there. The two monument districts — the Rincon Mountain district and the Tucson

Mountain district — are some 30 miles apart, separated by the city of Tucson.

About 700,000 people visit the 83,574-acre monument each year.

In the late 1930s, researchers first noticed that the Rincon saguaros weren't producing enough

1985



University of Arizona



U.S. Geological Survey

aro National Monument Rincon Mountain District, looking north toward the Catalinas

cline of giant saguaros

seedlings to maintain a steady population, and they've been struggling to understand the decline ever since.

In the early 1960s, Turner and his colleagues set up 20 saguaro monitoring plots throughout Southern Arizona and Northern Sonora. This month they began re-checking those plots for the first time in more than a decade, and the first site they visited was in the monument's Rincon district.

In 1961, that plot contained 18 saguaros. Today only three of those plants remain, survivors from a generation of Rincon saguaros established between 1870 and 1900, Turner said.

But Turner also counted 36 new plants, up to 2 feet in height, that have sprung up in the Rincons since 1960, he said. The new plants apparently represent a resurgent population in the Rincons after a 60-year hiatus, he said.

It takes a saguaro about 50 years to grow 6 feet, so there will be several decades, beginning around the turn of the century,

when the Rincon district will be without large saguaros, he said.

"These are preliminary results, and I really shouldn't be talking about this before publication (in a scientific journal), but there's been so much erroneous information fed to the public recently, and it's important to set them straight," Turner said last week.

Last month, Newsweek magazine, in a story headlined "The Vanishing Cacti," suggested that the saguaro is in danger of becoming extinct. In a letter to the editors of Newsweek, Turner explained that there is no scientific basis for such a claim.

The species "is doing fine," though individual populations rise and fall fitfully, as in the Rincons, Turner said in an interview.

"In most places we look, they don't get an even addition to the population each year," he said. "There is a series of good years, then a series of bad years — the populations recruit (new plants) in pulses."

While it now appears that the

Rincon saguaros are making a comeback, scientists still can't explain the 60-year gap in seedling establishment. The gap is found in saguaro stands all over Southern Arizona and Northern Sonora, though it is more pronounced in the monument's Rincon district, Turner said.

Through the years, the leading hypothesis has been that increasingly frequent winter freezes killed off the seedlings and the older saguaros.

But Turner notes that the same 60-year gap can be found in saguaro stands in the Pinacate Mountains of Northern Sonora, where subfreezing temperatures are infrequent.

Turner now suspects that the primary cause of the saguaro decline may be fluctuations in summer rainfall levels, not killer freezes.

Over the last year, Turner and his colleagues have reviewed precipitation records to 1868. They've

Giants

Continued from Page 1B

found that between 1870 and 1900, when the Rincon saguaros were established, the Tucson area regularly received more than 7 inches of rain in July and August.

But from the turn of the century through the 1960s, summer rain levels exceeded that threshold only once every 10 or 11 years, he said. Summer rains are critical to saguaro establishment because the cactus seeds become available for germination in July and August and remain viable for only a few weeks, Turner said.

Reliable summer rains returned in the 1960s and '70s, and the 36 young saguaros on Turner's Rincon plot appear to date to that period.

A paper on the topic is being considered for publication in the journal "Ecology," he said.

Even if rainfall is the key to the 60-year gap, capricious monsoons don't explain why the saguaros in the Rincon district appear so much worse than cacti in other stands.

"I have a problem believing this is all part of a natural cycle," National Park Service botanist Ken Stolte said last week as he looked out over the moribund Rincon saguaros, which have been reduced by up to 75 percent since the late 1930s.

Stolte, who works for the agency's air-quality division in Denver, was in Tucson last week to oversee the establishment of the first of 40 Park Service saguaro monitoring plots. The health of 1,200 saguaros will be tracked on the plots for the next 50 years.

Twenty-five of the 40,000-square-foot plots will be set up in the monument's Rincon district, with 15 more in the Tucson Mountain district west of the city.

The monitoring program is part of a Park Service "biological effects" study that has been under way for about a year. The goal is to determine whether airborne pollutants — from copper smelters, acid rain, auto emissions, pesticides, herbicides, or lime kilns that once operated in the area — contributed to the decline of the Rincon saguaros.

As part of the study, researchers in New Mexico, California and New York are analyzing the elemental composition of saguaro tissue and soil samples from the monument, and exposing young saguaros to varying levels of acid rain in the laboratory.

Stolte's hypothesis is that some airborne pollutant, or a combination of pollutants, degrades the saguaro's waxy, protective outer coating. Stolte suspects that damage to that waxy layer, called cuticle, speeds the spread of "brown decline," a darkening of the tissue common in old saguaros.

Brown decline reduces the plant's vigor and makes it more vulnerable to frost damage, according to Stolte's hypothesis.

"I do think that freeze is the Grim Reaper, but it appears that air pollution has first lowered their winter heartiness, setting them up and predisposing them to that fate," said Stolte.

Grazing, wood-cutting and a decline in the number of pollinators may also have contributed to the decline of the Rincon saguaros, some researchers say.

Cattle grazing was allowed in the monument until 1979, according to a 1987 environmental assessment of Saguaro National Monument. Cattle eat and trample grasses that shelter tiny saguaros from temperature extremes.

Palo verde and mesquite also shelter the young cacti and are therefore referred to as "nurse plants." Palo verde and mesquite were cut to fire 13 lime kilns that operated until 1920 on land that later became part of the monument, according to Robert Hall, director of resource management for Saguaro National Monument.

Recently some researchers have suggested that the decline of the Rincon saguaros is linked to the disappearance of a large population of saguaro-pollinating bat that used to roost in nearby Colossal Cave.

But Stanley Alcorn, a University of Arizona plant pathologist who's been studying saguaros for 33 years, doubts that the endangered Sanborn's long-nosed bat is a significant factor. He said other saguaro pollinators — birds, insects and a different species of bat — probably have filled the void left by Sanborn's.



Benjie Sanders, The Arizona Daily Star

Cactus clinic — Plant physiologist Mike Lolk tracks a saguaro's photosynthetic rate. The research is part of the National Park Service's effort to monitor and understand the dramatic decline since the 1930s of the cactus population in the Saguaro National Monument. The Park Service is rechecking monitoring plots at the monument for the first time in a decade. Story, Page 1B.