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Cape Sable Seaside Sparrow report for 2004

Stuart L. Pimm

Doris Duke Chair of Conservation Ecology,

Clinton Jenkins

Research Associate

The Nicholas School of the Environment and Earth Sciences

Duke University

Durham, North Carolina 27708

and

Oron L. Bass, Jr.

Supervisory Wildlife Biologist

Everglades National Park

Homestead, Florida 33034

Introduction

This report consists of four parts.

Part 1 is the preliminary end-of-season account of the number of sparrows counted on the survey. It was written after the end of the 2004 breeding season.

Part 2 is an assessment of the costs and benefits to the sparrow of building either a short or a long bridge across the Tamiami trail to replace the road that currently blocks the natural water flows in the northeast portion of Shark Slough. It was written, by request, in December 2004.

Part 3 is a preliminary assessment of the vegetation changes in population A over the last dozen years from the sparrow's perspective. It was written in response to discussions at the annual fire meeting in December 2004, but it is quite general in significance.

Part 4 is an assessment of the long-term changes to the vegetation in the (mainly) north-eastern sparrow populations C, E, and F.

Part 1. The 2004 range-wide survey

Cape Sable sparrow numbers remain constant and have not yet recovered

Counts of Cape Sable sparrows conducted during the 2004 breeding season show an estimated total of 3584 birds, up from 3216 birds in 2003, and 2704 birds in 2002, and 3264 in 2001 birds. These estimates are 16 times the numbers of birds heard singing, a number based on knowledge of the bird's territory size and the area over which observers can hear the songs.

Serious concerns remain about this Federally-listed Endangered Species. The once largest subpopulation (A; west of Shark River Slough) has remained at below 100 birds for the last few years. Managed water flows across Tamiami trail in 1993 to 1995 dramatically reduced its numbers. Those numbers increased slowly until 2000 when an unexpected dry season storm raised water levels by nearly two feet and likely caused a catastrophic breeding season for the roughly 450 birds then present. Water levels in the 2001, 2002, and 2003 seasons have been such that most breeding pairs likely raised only one brood of young each year. Detailed studies of the birds' breeding biology and demographics predicted that with only one brood per year, the population would likely hold its own and certainly could not increase substantially. The estimated numbers in 2001 — 2003 were 128, 96, and 128 respectively. The comparable number for 2004 was 16 — that is, only one bird was detected on the regular survey. (Figure 1).

Concerns about the exact numbers of birds breeding in subpopulation A motivated a more intensive helicopter survey across the areas known to hold birds in both 2003 and 2004. In both years, additional sites were surveyed on a half-kilometer grid. In 2003, an additional 12 singing males were detected (for a total of 20). The comparable numbers in 2004 were an additional 10 birds (for a total of 11). The population estimates on this half-kilometer grid should be four times the numbers of birds detected. (Figure 2).

In addition, these areas were surveyed on the ground (from the West camp base) and an intensive effort was made to map all territories across this area. The results of this work will be distributed in the annual report. One impression, however, causes alarm. Many of the birds located appeared to be lone males, unaccompanied by females that often give alarm calls when on nests or by recently fledged young.

The largest subpopulation (B, east of Shark River Slough and south of the Main Park Road) increased from an estimate 2368 birds in 2003 to 2784 birds. The second largest subpopulation (E, east of Shark River Slough and north of the Main Park Road) was almost exactly the same (640) as the previous year. This subpopulation is down from its peak of over 1000 birds because of the damage caused by the Lopez fire of mid-May 2001. These increases may be genuine increases in population numbers. However, we feel that it is more likely that they represent populations already augmented by birds born during 2004. The 2004 counts in B and E were relatively late this year, delayed in large part, by the more extensive effort to count more sites in subpopulation A. The highest recent count in subpopulation B was a similarly late count in 2000, a count that duplicated the normal survey but which ran a couple of weeks later in the season.

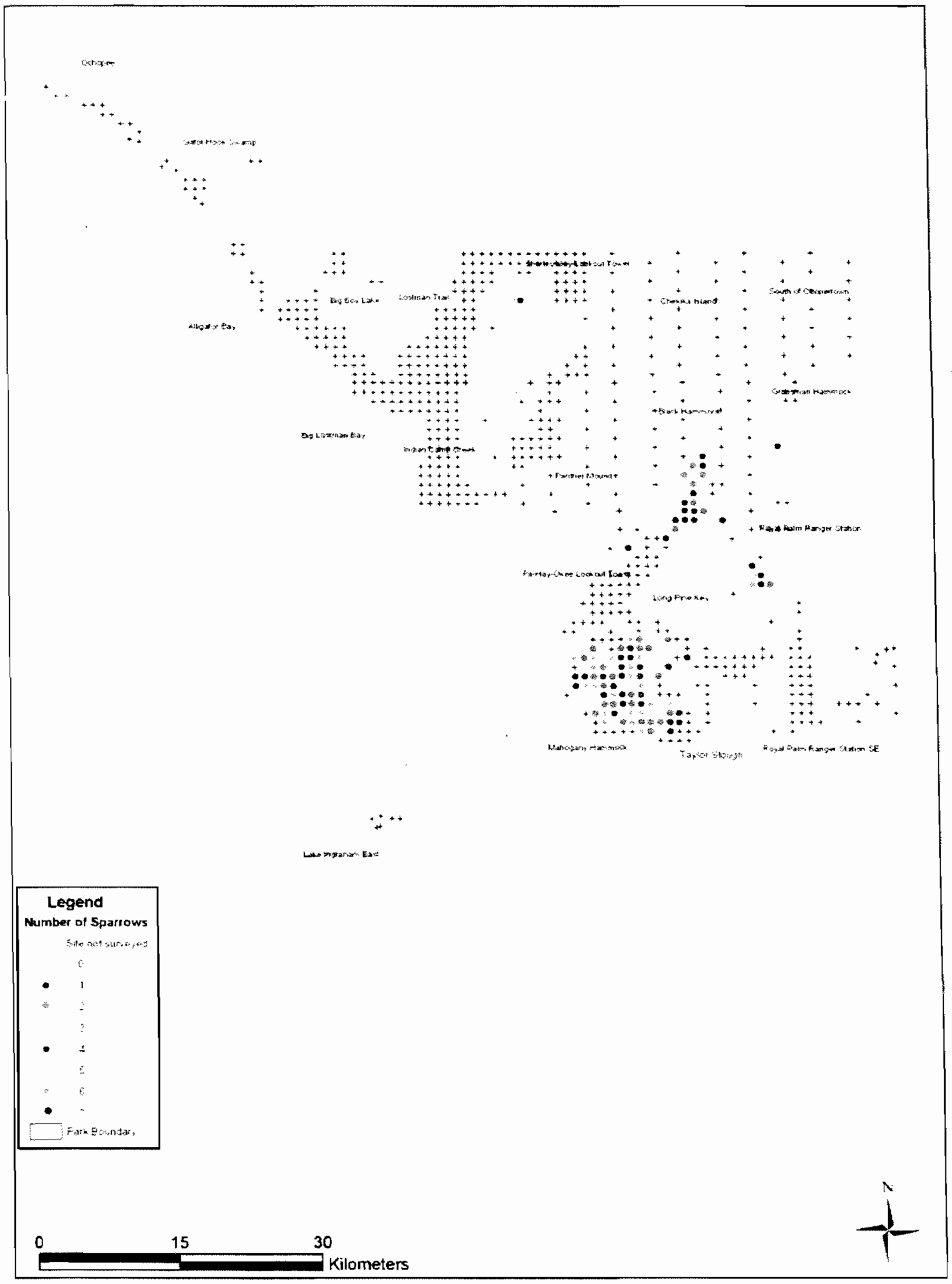
Big Lostman Bay
Royal Palm Ranger Station
Long Pine Key
Mahogany Hammock
Taylor Slough
Royal Palm Ranger Station SE
Legend
Number of Sparrows
1
4
0
15
30
Kilometers
N

Figure 1

Smaller, eastern populations continue to remain at low levels. Typically, only one bird has been counted in population F each year. On the ground surveys found several singing males — as would be expected, since the survey is expected to find only one in eight. As with some of the birds in population A, these males did not appear to have mates or young, even late in the season. (In late May, when one other populations did so.) Population C has remained at low, but relatively constant numbers.

Of greatest concern is extreme southeastern subpopulation (D). No birds were heard here in 2002, 2003, or 2004 and the estimate size of the population in 2001 was only 32 birds. The cause of the probable extermination of this subpopulation is almost certainly the managed releases of water on top of the birds during the breeding season of 2000.

The combination of deliberate flooding events (as in D), accidental fires (as in E), and the slowness of the populations to recover (as in A) confirm the conclusions that this Endangered Species is still at risk from management decisions that alter the natural hydrological patterns of the Everglades.

At the time of writing this (June 4th), there has been little rain and ENP is under a state of severe risk from fire. While the dry conditions may allow the birds to continue to nest (and so permit the second broods that might allow substantial population increases), the risks of fires could substantially harm even the most abundant subpopulations.

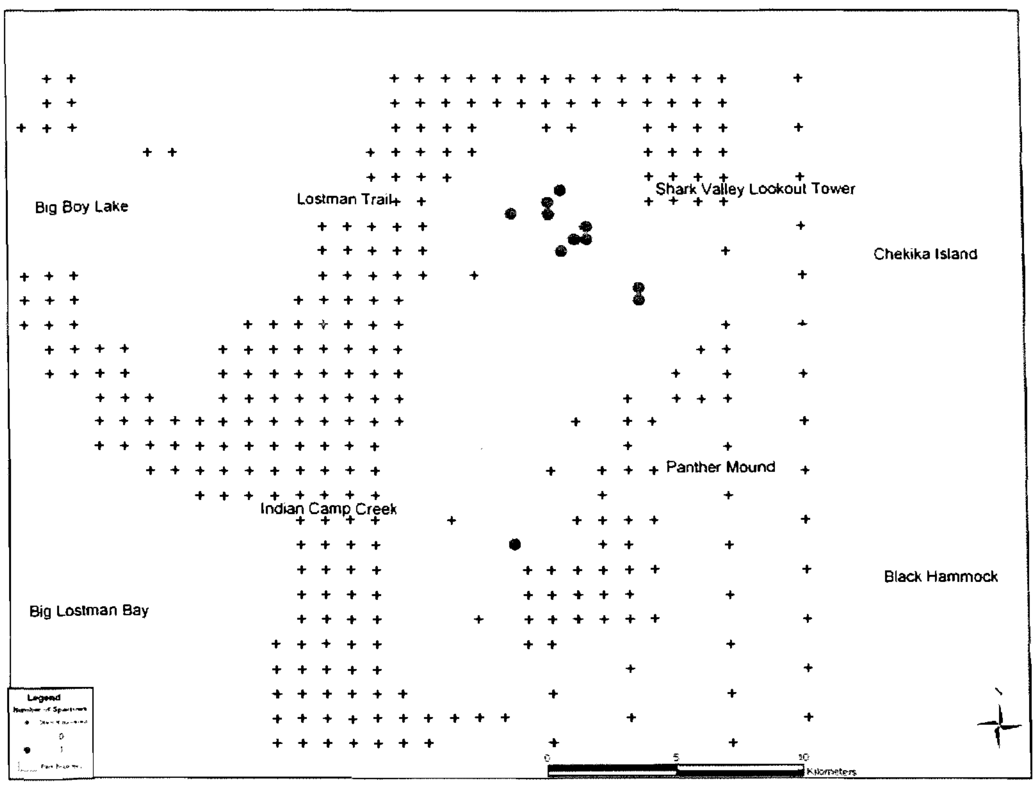

Figure 2

Part 2: Four miles or 3000 feet?

Two plans are proposed to remove the barrier to the sheet flow of water between Water Conservation Area 3B (WCA3B) and the area to the south of it in Everglades National Park, henceforth called "Northeast Shark Slough." The barrier — Tamiami Trail and its associated dykes and levees — runs east to west across the Everglades preventing that sheet flow. Water can flow north to south, but only through the S12 structures that lie to the west along Tamiami trail, west of another barrier, that runs northeast to southwest. These structures connect WCA 3A to the western portion of Shark River Slough.

The approximate location of the barrier (and its planned modification) is shown in the figure.

At the landscape level, the ecological reasons for both removing the barrier to flow and for choosing the largest possible opening are unassailable. (Thus, 4 miles would be much better than 3000 feet and even larger openings would be better still.) The reasons are self-evident in the figure. The natural flow path of Shark River Slough is illuminated by the lineup of tree islands within the slough. (In this false colour image, blue is water, red areas of plant growth.) In the north of the image, the natural flow has an easterly component, and then at the barrier it turns southwest. Man-made structures massively alter the pattern of actual flow, moving it to the west, blocking flow along the natural pattern.

These comments, however, address an endangered species issue — how the proposed reconnection of the ecosystem (smaller or larger) would affect the Federally-listed Cape Sable Seaside-sparrow. On logical grounds, it is hard to understand why a restoration of the natural system — the maximum possible removal of the barrier — should not provide the best chance to restore this species' numbers. Simply, like other endangered species, it has become that way because of human interventions. One should always expect that if one removes those interventions, then the species would benefit.

Closer inspection of the details confirms this. In the 1990s, sparrow numbers were halved by massive, dry-season releases of water across the S12 structures (Pimm et al. 2002). The sparrow's subpopulation A (see figure 3) was almost eliminated, until a Biological Opinion led to modifications in the water deliveries. Not only do the present barriers to flow alter the natural flow path, they have altered the *timing* of the water deliveries to the areas south of the barrier. Water has been released across the S12s during the dry season, when natural flows would be low. Not only does unnatural dry season flooding across the S12s harm the Endangered sparrow, but such events also explain the failure of large wading birds (herons, egrets, storks etc) to attain high numbers in the breeding season (Russell et al. 2002). (Such managed floods greatly reduce the areas suitable for the birds to feed.) The first conclusion is that restoration of the most natural flow — the four mile option — is by far the better choice to prevent such catastrophes in the future.

An obvious question is whether the restoration of the natural flow path would jeopardize the sparrow subpopulation, E, immediately south of northeast Shark Slough. Indeed, might it harm the largest remaining subpopulation, B, to its south? Both are rebutted by satellite images such as the figure and others like it taken during periods of high water levels. Population B is on relatively high ground and was not flooded during the catastrophic years of 1993 and 1995 when managed floods drowned out most of population A. Population E, likewise, was not seriously impacted. Moreover, there is a likely benefit to restoring natural hydroperiods in population E and other smaller populations to the east of it. Sparrows in these areas are at particular risk from fires. Fires reduce sparrow numbers for at least two years, post-fire. Restoration of natural flow patterns would help reduce these risks.

In summary, restoration of natural flow patterns, better achieved by a 4 mile removal of the barrier to flow than a 3000 foot one, offers considerable benefit to the ecosystem and the Cape Sable seaside-sparrow that depends on it.

Pimm, S. L., J.L. Lockwood, C. N. Jenkins, J. L. Curnutt, M. P. Nott, R. D. Powell and O. L. Bass, Jr. 2002. *Sparrow in the grass*. Printed privately, 182.pp.

Russell, G. J, O. L. Bass, Jr., and S. L. Pimm. 2002. The effect of hydrological patterns and breeding-season flooding on the numbers and distribution of wading birds in Everglades National Park. Animal Conservation 5: 185-199.

Figure 3

Part 3: Medium-term vegetation changes in Population A.

The 2003 Annual Report was simultaneously a report on the comparison of hydrology and sparrow numbers in the years since the implementation of IOP. (S.L. Pimm and O. L. Bass Jr., 2004, *The Cape Sable Sparrow under IOP*). It summarized the state of population A as follows.

1. Water levels at NP205 from 1975 to 2003 show long-term trends, with dry years in the late 70s to early 80s, when breeding season water levels were often under 6 feet (the approximate height of NP205), followed by wetter years in the middle 80s. The late 80s to 1992 were usually dry, while the years from 1993 to 1995 were exceptionally wet, a condition exacerbated by unprecedented breeding season water-releases across the S12s. High water levels in 1993---1995 caused a precipitous decline in the number of sparrows.

2. The period of interest compares 1996 to 1999 (inclusive) to 2000 to 2003 (inclusive) and involves the 90 days following March 15th each year. Water levels at NP205 remained **above** 6 feet for all but about 20 days of 1996, all of 1997, and about 30 days in 1998 (ending with a 2 day rainfall total of 2.72in in late May). In contrast, in 1999, water levels were below 6 feet from March 15th, until mid-May,

3. In contrast, water levels in 2000 to 2003 were nearly always **below** 6 feet during these 90 days. Generally, water levels dropped at about one foot per 20 days. However, in most years, large rainfall events raised water levels dramatically during the breeding season. E.g. a mid-April rain (3.76in in two days) in 2002 raised water levels by over two ft, a late April rain (2.66in in two days) in 2003 raised water levels by one ft.

4. To translate these levels at NP205, we employ a map of how much of this area is at a given elevation. Approximately, 275 km^2 of this area is >5 ft, 175 km^2 > 6 ft, 75 km^2 >6.5 ft and none >7 ft. These areas are total areas; not all afford suitable habitat. Using a well-calibrated satellite-image based model of sparrow habitat that excludes areas that are too bushy for sparrows or too small to support sparrow territories, we estimate how much habitat is available. Approximately, 125 km^2 of this area is potential sparrow habitat >5 ft, 90 km^2 >6 ft, and 40 km^2 >6.5 ft. Only a fraction of these areas can be occupied in any year, but these numbers provide a relative basis for comparison.

5. In sum, conditions were improved considerably for the sparrow in 2000 onwards, though the population was almost certainly harmed by the mid-April 2000 rain event. However, the area that remains dry during the breeding season is still very small compared with the extent of the sparrow's distribution in 1981 and 1992, when this population held almost half of the total sparrow population.

Given the small numbers of sparrows in population A, discussions at the two-day sparrow meeting in Homestead in December 2004 concentrated on whether some remedial actions might be possible. We discussed two strategies in particular.

(a) *Attempt to rescue the population through translocations of birds from populations E or B.* We prepared a report on the feasibility of translocations for the Fish and

Wildlife Service (*Cape Sable seaside-sparrow translocation protocols* Pimm and Jenkins 1998). *Inter alia,* we emphasized that such actions would be foolish in the absence of suitable, but unoccupied habitat into which one might move the bird. Continued discussions of this prompt a more detailed analysis of where such habitats might be (should they exist at all.)

(b) *Attempt to restore presently unsuitable habitat by setting deliberate fires.* We have abundant evidence that prolonged flooding converts prairies dominated by muhly grass, black-top sedge, and other species the sparrow favors with sawgrass dominated communities that they do not. Evidence for the reversal of this change is not so compelling. Speculation centres on whether fires within sawgrass might encourage the re-growth of the grasses that generally grow in drier conditions.

Responding to strong interest in a burn from the Fish and Wildlife Service, Bob Panko suggested a controlled burn that, superficially, was placed in an area between the two remaining concentrations of sparrows in population A.

Figure 4 suggests to us that this proposed burn would achieve little in habitat restoration from the bird's point of view, though the changes to the vegetation might provide some important clues for future work. Another location might improve our understanding of the vegetation dynamics.

The figure shows all the locations where birds have been encountered on surveys since 1981 (coloured in various ways), and, an orange-red line, the proposed burn. The blue centres of the dots are where birds have been recorded in the last 4 years. The dots are the same size (or near enough) because only 1 or 2 birds are seen at each location.

The red to green dots represent a change in index of habitat suitability from 1981 and 1992 (combined) to 2001-2004 (combined). A point is scored as "suitable" if it contained the codes for "mixed prairie," "muhly" or "black-top sedge" (in any order) in a given year. If for both 1981 and 1992, these terms occurred, then the habitat suitability would be 1, likewise in all four years 2001 to 2004. If these terms occurred in only 1981 and not 1992, the score would be 0.5. The change is the second number subtracted from the first. Red locations indicate a loss of habitat; dark green indicate an improvement of habitat, yellow points indicate no change. There are several key features:

(1) The proposed burn would have covered mostly areas where the birds have *not* been found. These areas are either out in Shark Slough and have never held birds, or in the west are too bushy or too close to hammocks.

(2) The proposed burn comes close a recent bird site.

(3) Particularly in the west and northwest of the burn, there is only limited potential to burn "red" and "orange" sites -- those that have held birds but are now deemed unsuitable.

(4) There is, however, the potential to burn habitats elsewhere – particularly in the west of the former range —which once held birds and have not done so since 1992. These sites, however, are at low elevation and may often be flooded even in the breeding season.

In addition to these burn issues are general issues about the habitat. As predicted in the 2003 Report, based on hydrological considerations there should be much less habitat for the sparrow in the last 4 years than in the past. The figure confirms this. Areas "coloured" dark yellow to red are less suitable in 2000 to 2004 than they were in 1981 and 1992. The floods of 1993, 1994, and 1995 have destroyed substantial areas of habitat.

The areas in light yellow are essentially unchanged. Two such sites held sparrows in the last four years, but most did not. Many of these areas presently unoccupied are in the far South and the far West of this population. Sparrows may not have re-colonized these habitats because of their remoteness from remnant populations.

Birds now live in habitats where the habitat has improved since 1992. Nonetheless, this simple analysis finds substantial numbers of places with apparently suitable habitat and no sparrows. Work in the 2005 field season will explore these sites in more detail to seek an explanation for the birds' absence.

Birds have been lost from sites that are low and still likely to be flooded and offer less of an opportunity for intervention.

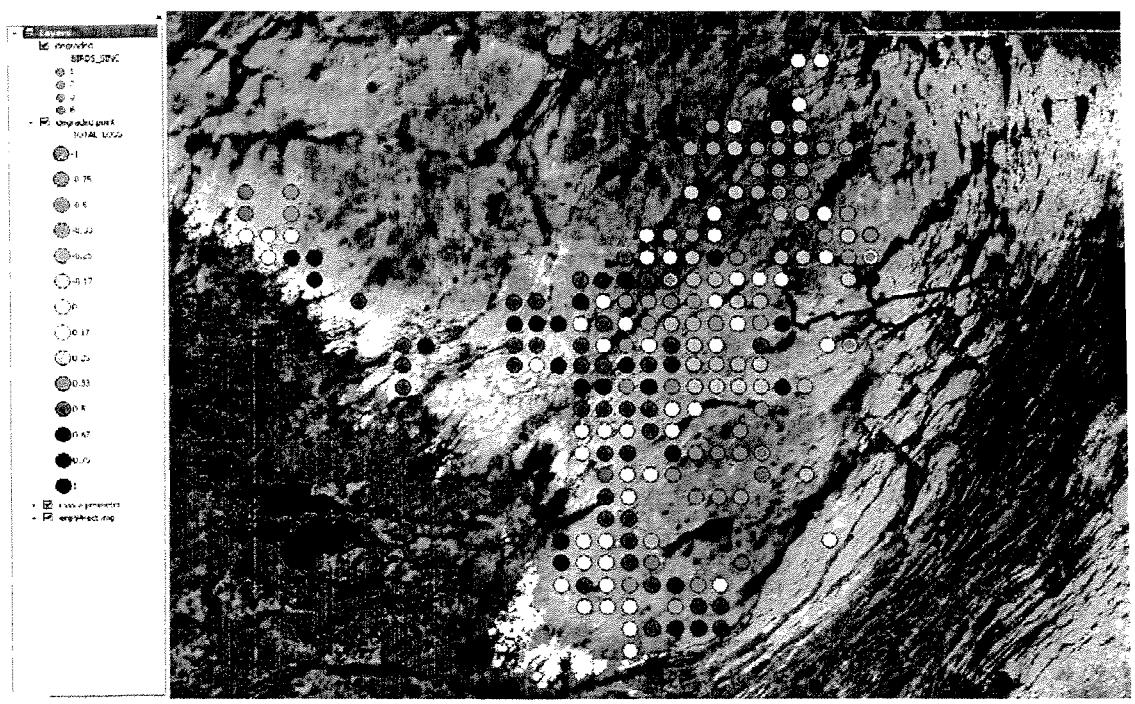

Figure 4

Part 4: Long-term vegetation changes in populations C, E, and F.

Professor Lockwood and her team have been exploring the short-term consequences of fire on the sparrow's survival. A recurrent theme is whether fires, though harmful in the short term, might have a beneficial effect over long periods. The proposed mechanism is that frequent fires might prevent the spread of bushes and hammocks or remove the latter vegetation if it were established.

We obtained digital versions of aerial photographs taken in 1940 —prior to the major damage done to the Everglades ecosystem by the dykes and levees the Army Corps of Engineers built over the following decades. We compared these images to those from 1999. The former are black and white, often scratched, and show large changes in brightness due to the sun's position when taken. The 1999 images are very much better, of course. Some images were particularly difficult to compare.

The large differences in quality make the application of standard measures of change detection impractical. Consequently, we counted the number of bushes in each image and estimated the area of each one. This proved to be an extremely time-consuming task. To simplify it, we selected 15 samples across the prairies east of Shark River Slough of size 0.5 x 0.5 km (= 25 ha). We chose these areas according to their recent fire frequencies. Only since 1986 are compelling digital fire outlines available. Figure 5 shows the distribution of fire frequencies in the period since then and the location of the 15 sites. We chose 3 sites each from fire frequencies of 0, 1, 2, 3, and 5 attempting as best we could to sample from as wide a region as possible within each fire frequency.

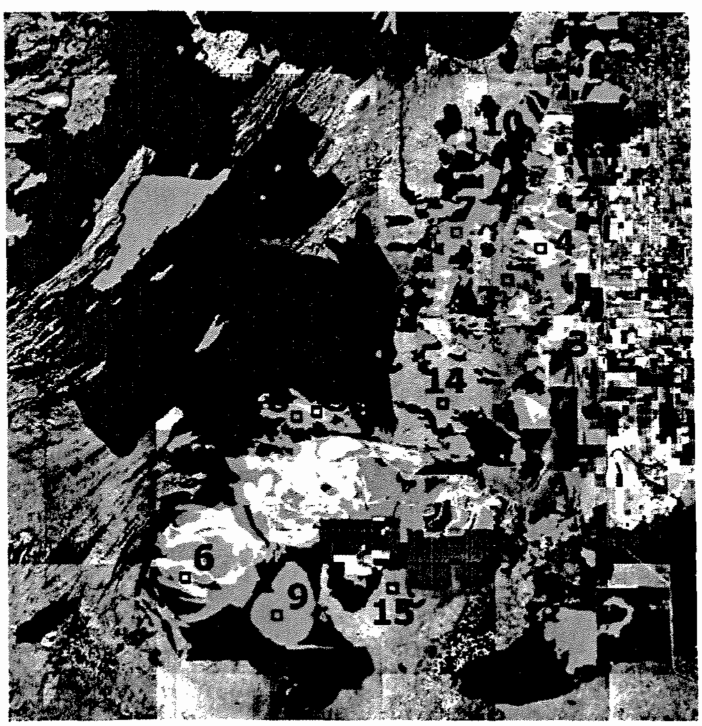

Figure 5

Figures 6 through 20 provide the raw imagery of our analyses. Table 1 shows that, with some exceptions, the striking feature of these comparisons is how little the vegetation has changed in >50 years. Only two sites have changed >1 ha in the area of their bush cover, only three more by > 0.5 ha, which may be within the error of our methods for detecting change.

Figure 15 (site 10) is not exceptional in showing an image where not only are the bushes in the same places, but odd-shaped bushes are readily seen to not have changed shape over the time interval.

The largest loss (site 1) appears to be due to the loss of a single large willow island, though inspection of this image motivates further examples to see if such changes are more widespread. (In other words, this is one of the largest changes and it is based on only one bushy area.) We are more confident about the increases in bushes in sites 5 and 8. Both are on the edge of Shark River Slough and show consistent and obvious increases in the area of bushes.

Apart from the ambiguous site 1, the other three most easterly sites (2, 3, 4) do not show consistent losses of bushes, despite being in the most fire-prone areas.

				1940s		1990s		
ID	# Fires since 1986	Most Recent Fire	Years burned	# of bushes	Area of bushes (in m^2)	# of bushes	Area of bushes (in m^2)	change (in ha)
1	5	1998	1998, 1994, 1991, 1988, 1986	7	18096	1	3431	-1.5
2	5	1998	1998, 1996, 1994, 1989, 1987	3	471	0	0	0.0
3	5	1999	1999, 1994, 1989, 1987, 1986	20	14209	51	16617	0.2
4	3	1996	1996, 1990, 1988	15	7517	15	3077	-0.4
5	3	1995	1995, 1989, 1986	14	5749	100	40108	3.4
6*	3	1998	1998, 1989, 1986	0	0	19	3696	0.4
7	2	1989	1989, 1986	11	3149	9	2997	0.0
8	2	1989	1989, 1986	7	2155	53	8267	0.6
9	2	1999	1999, 1989	23	9234	20	3527	-0.6
10	1	1986	1986	35	26851	66	20653	-0.6
11	1	1995	1995	3	289	1	74	0.0
12*	1	1989	1989	1	253	8	895	0.1
13	0			5	5609	9	2500	-0.3
14	0			13	10602	31	15488	0.5
15*	0			0	0	10	2476	0.2

* indicates that the 1940s image is particularly difficult to interpret.

We find these changes puzzling and will continue to investigate them.

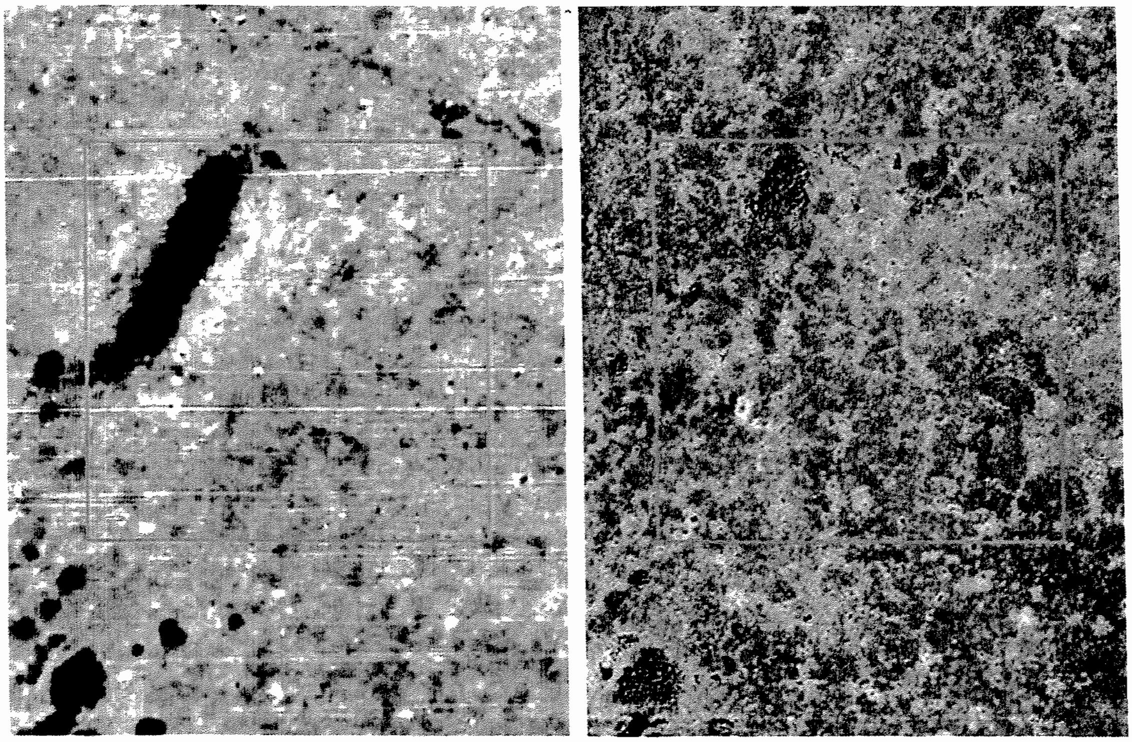

Figure 6 Site 1

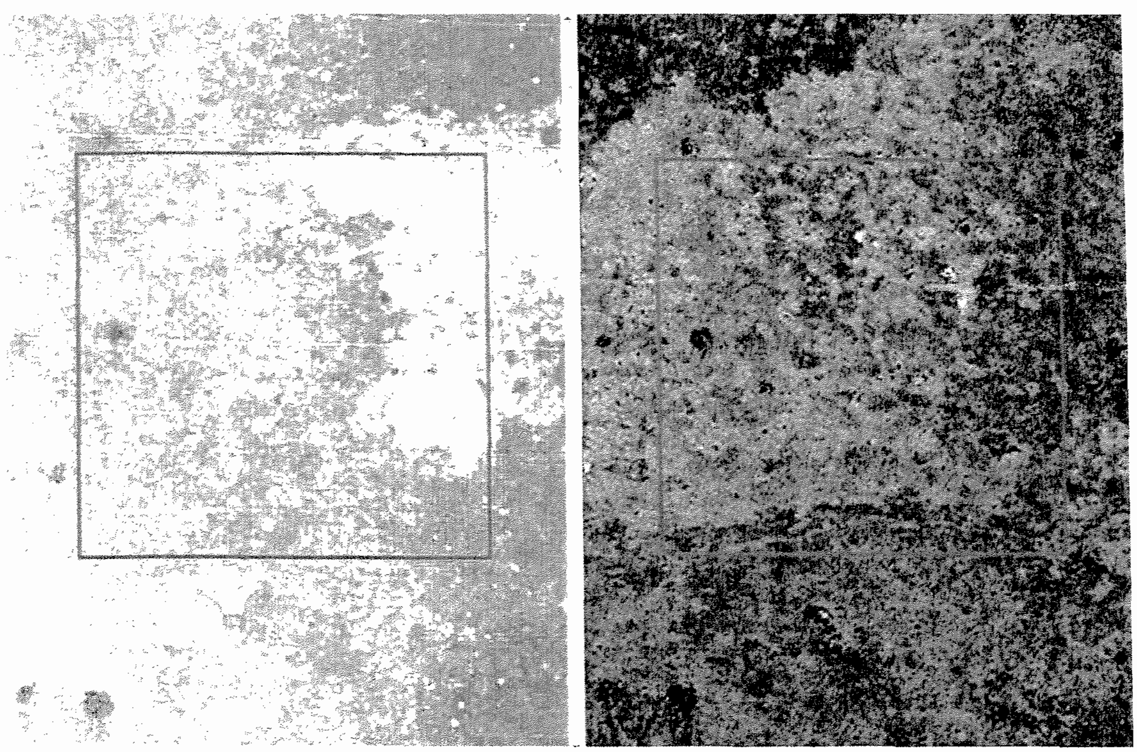

Figure 7 Site 2

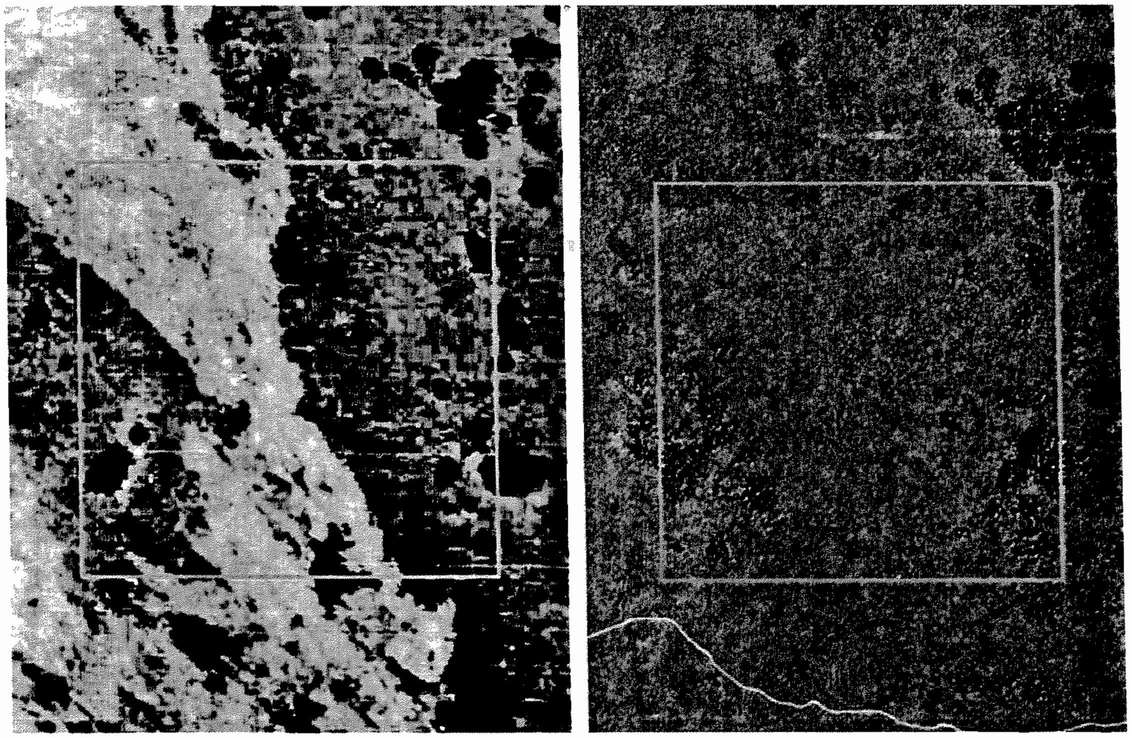

Figure 8 Site 3

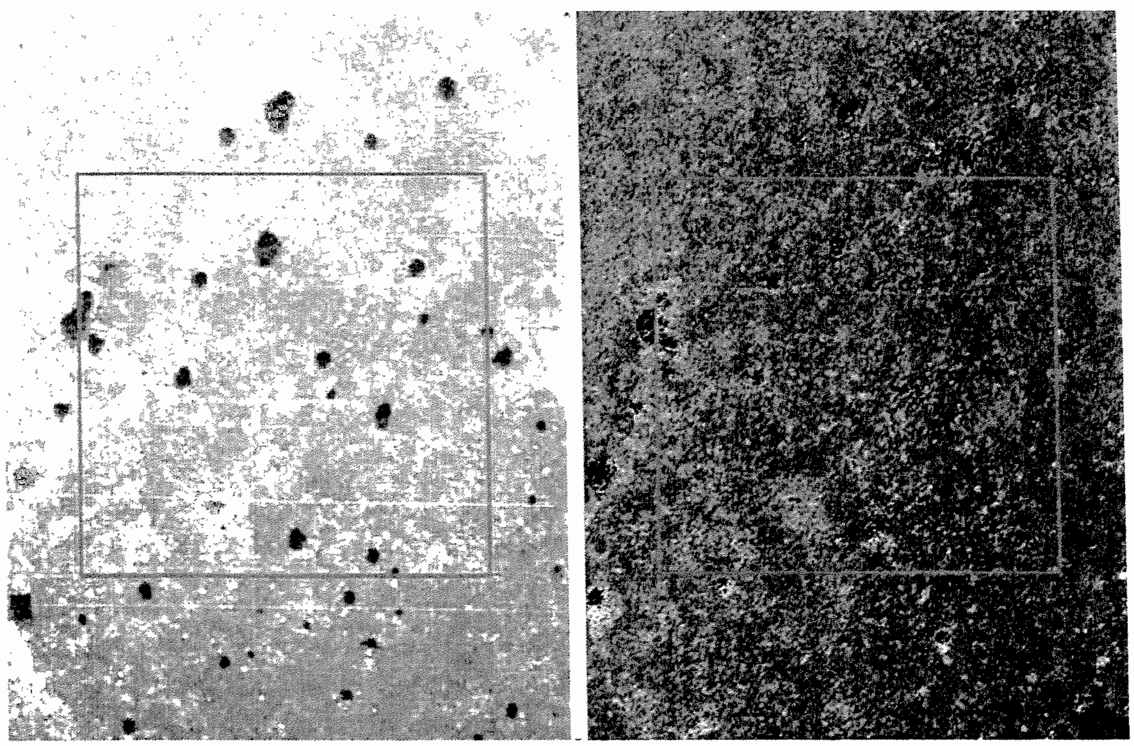

Figure 9 Site 4

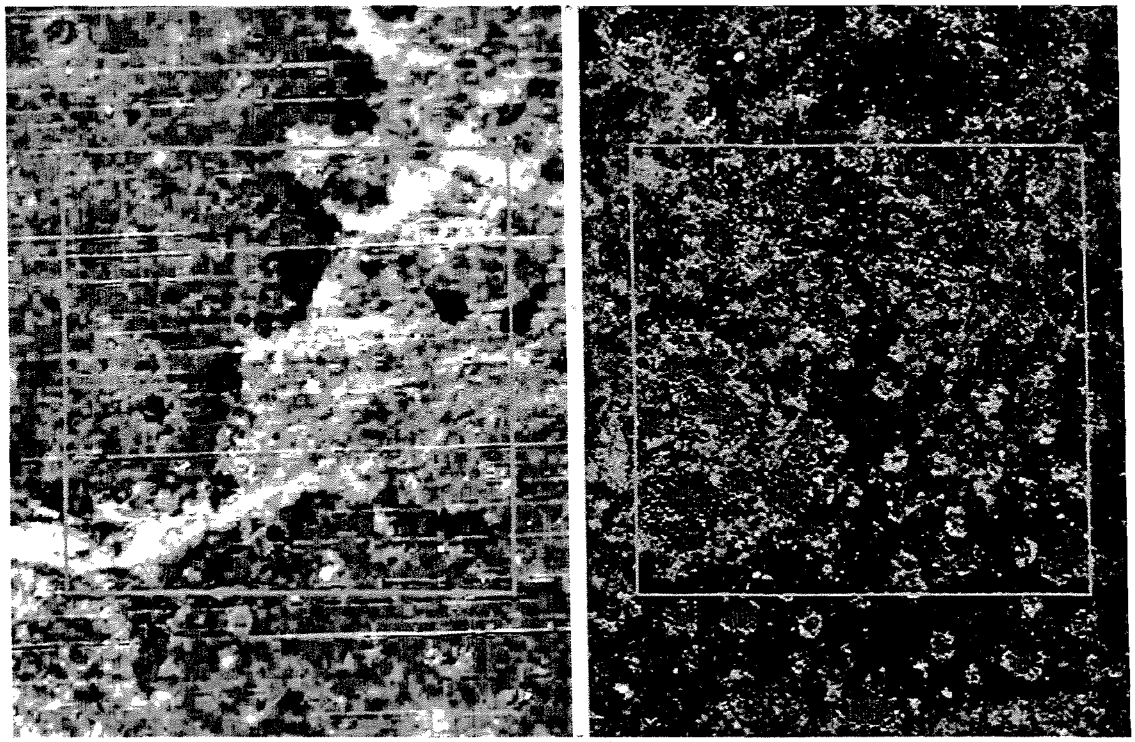

Figure 10 Site 5

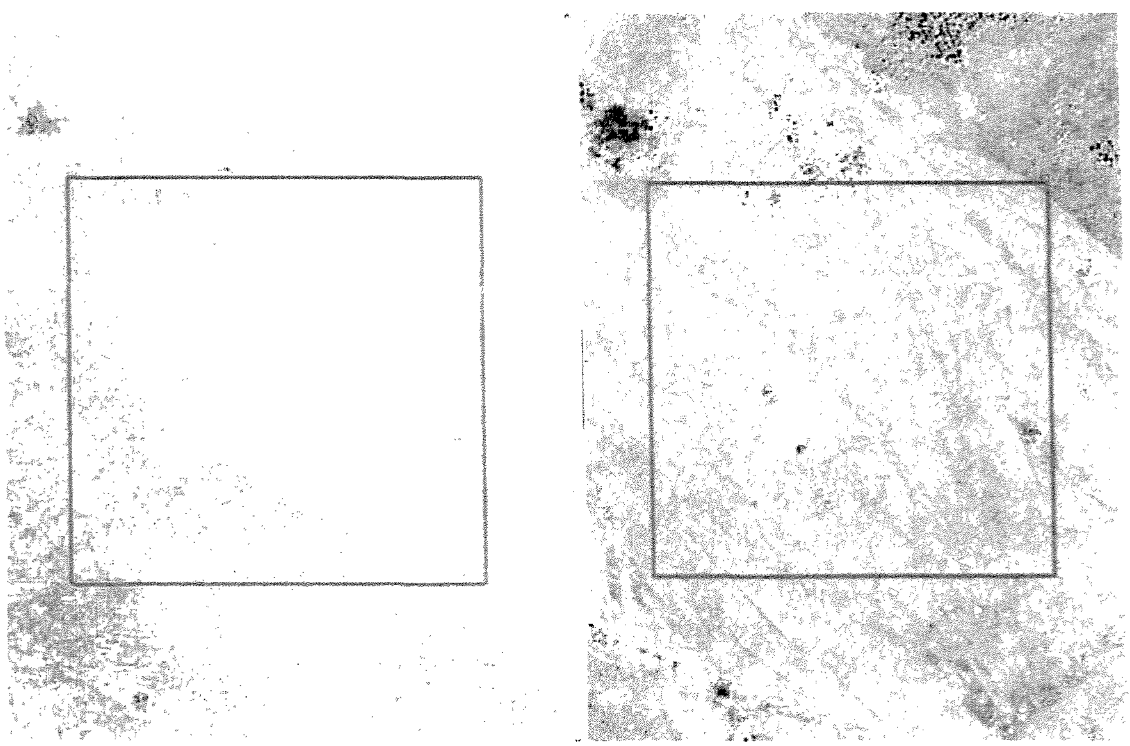

Figure 11 Site 6

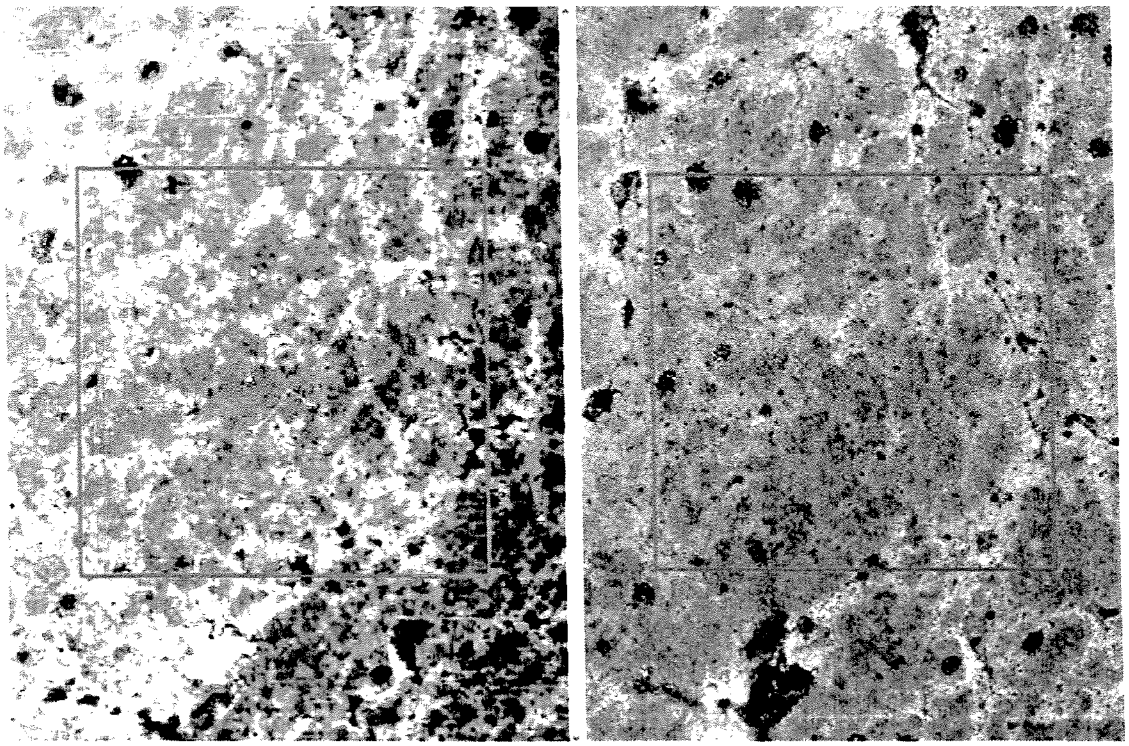

Figure 12 Site 7

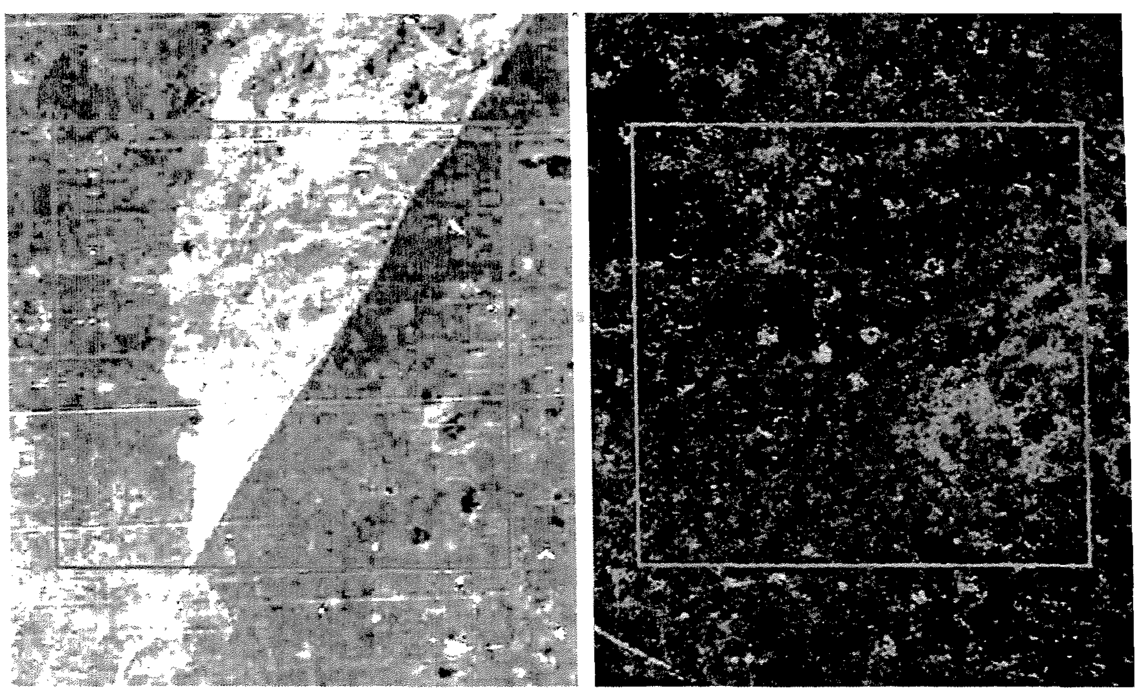

Figure 13 Site 8

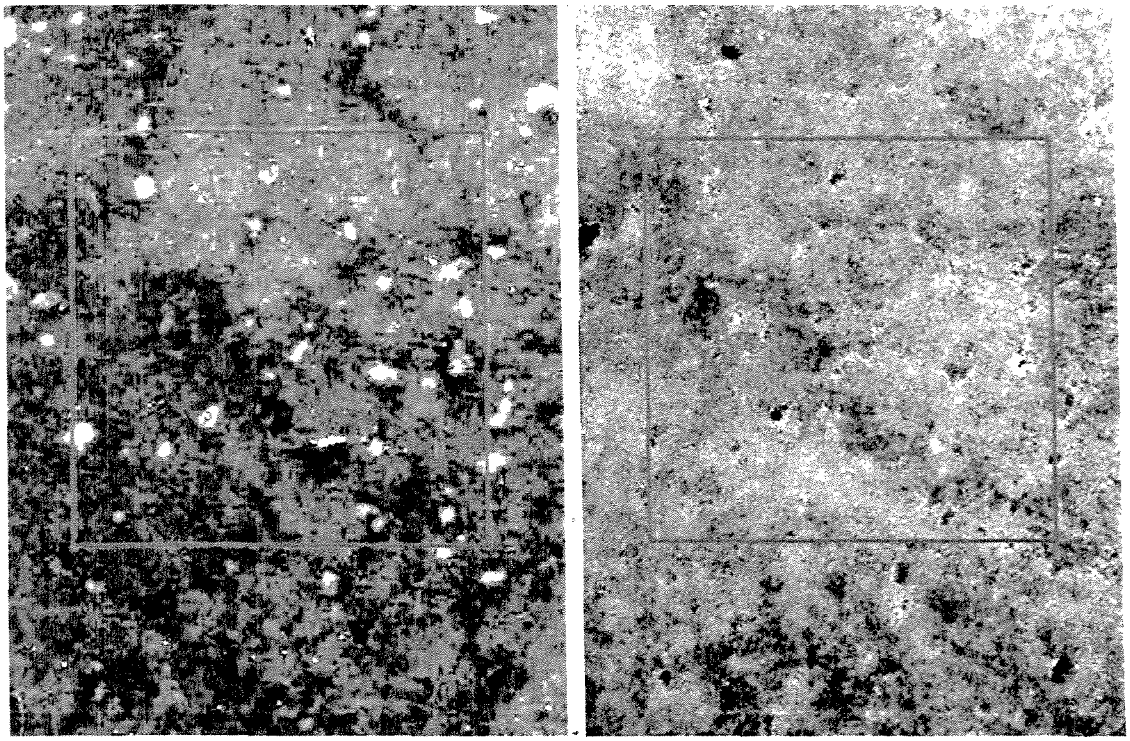

Figure 14 Site 9

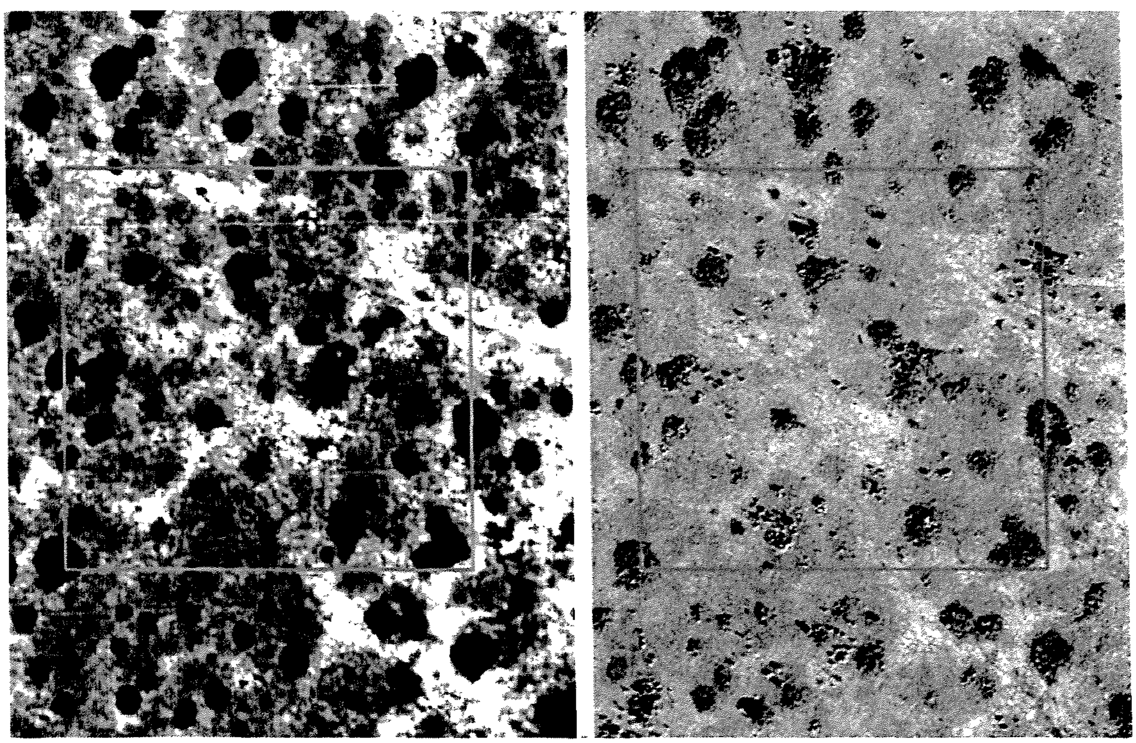

Figure 15 Site 10

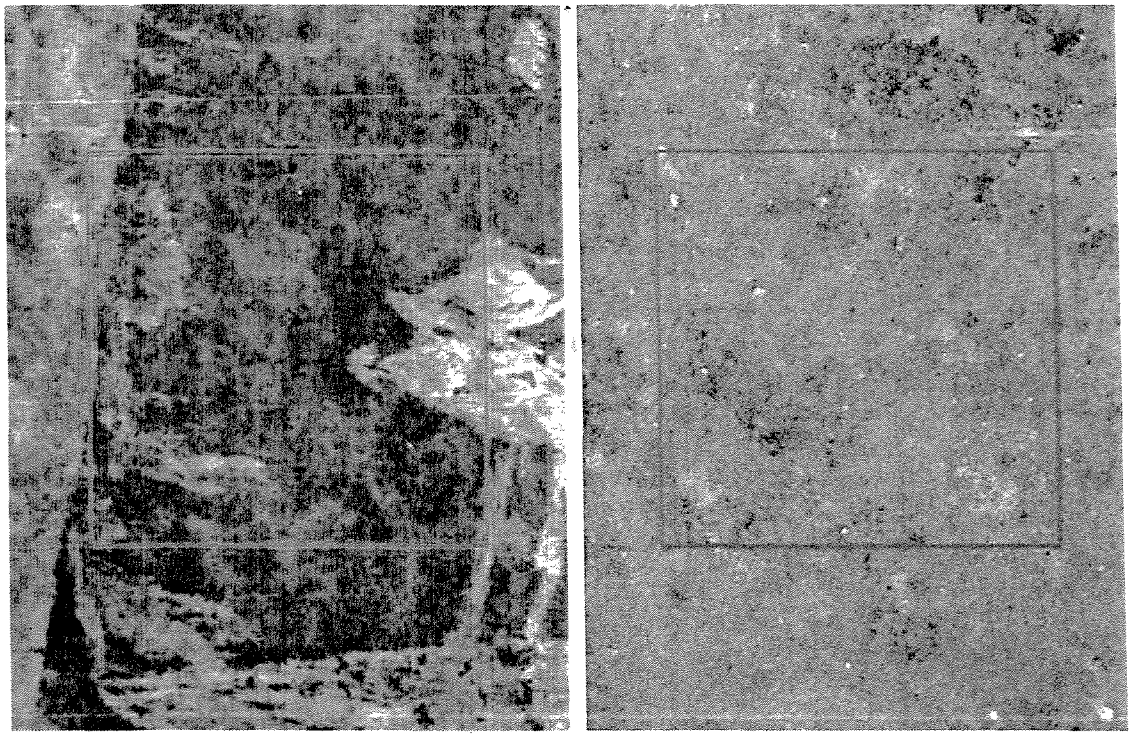

Figure 16 Site 11

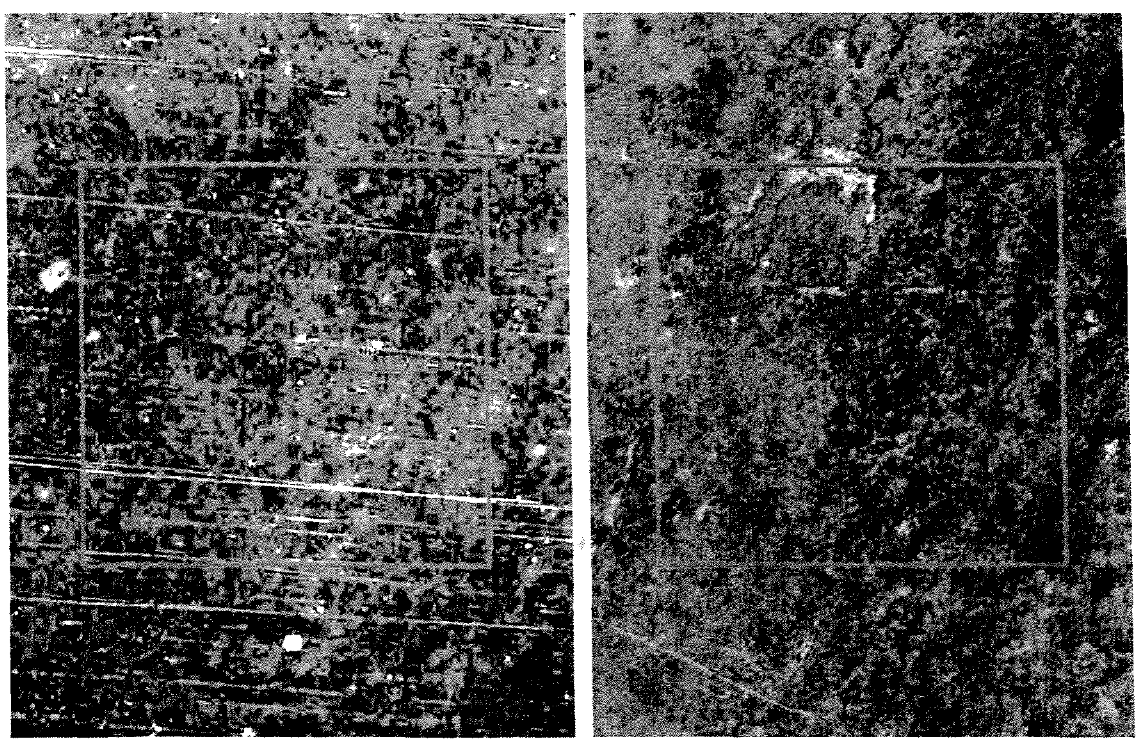

Figure 17 Site 12

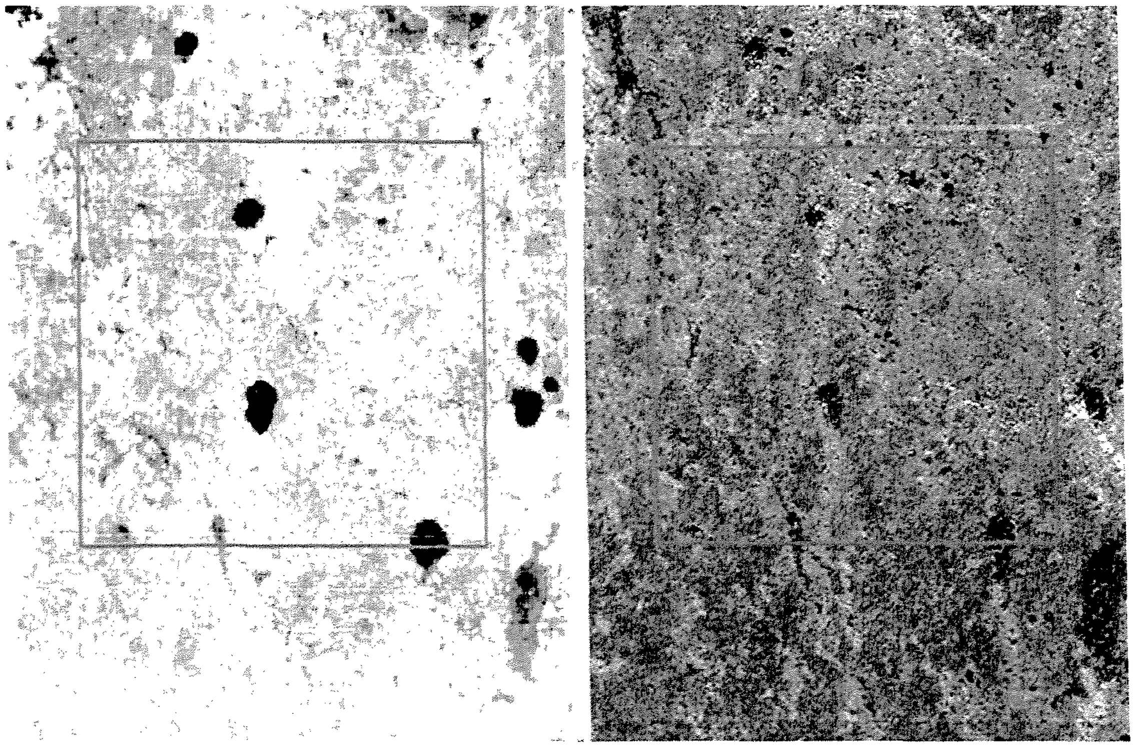

Figure 18 Site 13

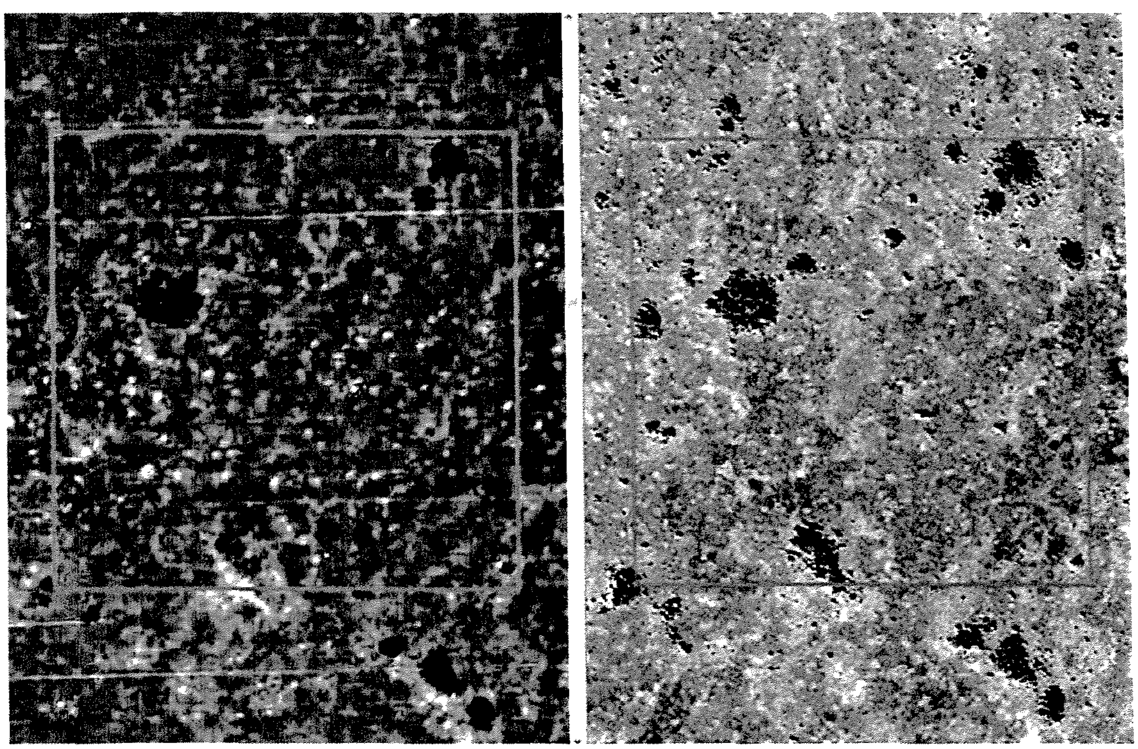

Figure 19 Site 14

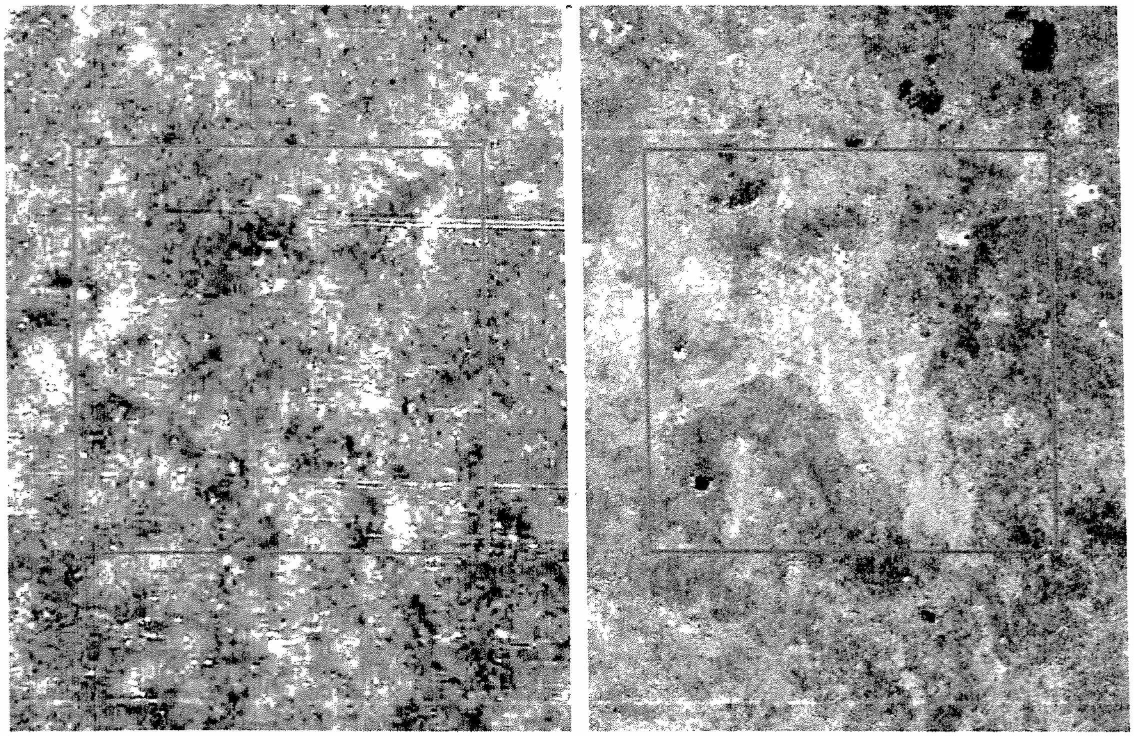

Figure 20 Site 15