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Item ID Number:	00093
Author	Bartleson, Fred D.
Corporate Author	U.S. Air Force, Air Force Systems Command, Air Force Armament Laboratory, Environics Office, Eglin AFB
Report/Article Title	A Survey of Trees on a Herbicide Treated Test Area, Eglin AFB, Florida: Final Report: June to August 1974
Journal/Book Title	
Year	1974
Month/Day	November
Color	
Number of Images	42
Description Notes	Project 50660101

TECHNICAL REPORT AFATL-TR-74-190

A SURVEY OF TREES ON A HERBICIDE TREATED TEST AREA, EGLIN AFB, FLORIDA

Bartleson, F.D.

ENVIRONICS OFFICE

NOVEMBER 1974

FINAL REPORT: June to August 1974

Approved for Public Release by DASD/PA 21 March 75

AIR FORCE ARMAMENT LABORATORY

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REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER: AFATL-TR-74-190	2. GOVT ACCESSION NO.
3. RECIPIENT'S CATALOG NUMBER	
4. TITLE *(and Subtitle)*: A SURVEY OF TREES ON A HERBICIDE TREATED TEST AREA, EGLIN AFB, FLORIDA	5. TYPE OF REPORT & PERIOD COVERED: Final Report June - August 1974
6. PERFORMING ORG. REPORT NUMBER	
7. AUTHOR(s): Fred D. Bartleson, Jr, Lt Col, USAF; Don D. Harrison; Charles I. Miller	8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS: Environics Office (DLV), Air Force Armament Laboratory, Eglin Air Force Base, Florida 32542	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS: Project 50660101
11. CONTROLLING OFFICE NAME AND ADDRESS: Air Force Armament Laboratory, Air Force Systems Command, Eglin Air Force Base, Florida 32542	12. REPORT DATE: November 1974 13. NUMBER OF PAGES: 43
14. MONITORING AGENCY NAME & ADDRESS *(if different from Controlling Office)*	15. SECURITY CLASS. *(of this report)*: UNCLASSIFIED 15A. DECLASSIFICATION DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT *(of this Report)*

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18. SUPPLEMENTARY NOTES

Available in DDC.

19. KEY WORDS *(Continue on reverse side if necessary and identify by block number)*

Herbicide Treated Areas
Tree Survey
Ecological Recovery

20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

A survey was made of trees growing on the 1 square mile instrumented test grid of Test Area C-52A, Eglin Air Force Base Reservation, Florida. This area had previously been subjected to land clearing operations and heavy herbicide deposition. The active herbicide ingredients have disappeared, but there were still many large areas devoid of young trees. The absence of trees in these areas was apparently due to heavy herbicide deposition which prevented regeneration from roots of previous trees and the lack of soil moisture, which has retarded the germination of seeds. The lack of soil moisture was principally attributed

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to the previous removal of ground cover and consequent drying effects of the wind. The areas with the most trees were generally outside of the herbicide spray aircraft primary flightpaths and were in more moist soil. Young oak trees, sprouting from roots, were predominant on the test area and were in contrast to the surrounding pine forest. Additional studies were recommended to evaluate future vegetative succession.

PREFACE

This technical report is the result of research conducted by the Air Force Armament Laboratory from June 1974 to August 1974 under Air Force Exploratory Development Project 50660101.

Information on the physical characteristics and past history of Test Area C-52A was obtained from AFATL-TR-74-12, Ecological Studies on a Herbicide-Equipment Test Area (TA C-52A), Eglin AFB Reservation, Florida, by Captain Alvin L. Young (January 1974).

This technical report has been reviewed and is approved.

JOE A. FARMER
Chief, Environics Office

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TABLE OF CONTENTS

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SECTION I

INTRODUCTION

Between June and August 1974, a survey was made of the trees growing on a 1 square mile instrumented test grid in the center of Test Area C-52A (TA C-52A), Eglin Air Force Base Reservation, Florida. This test area received massive quantities of military herbicides during the period 1962 to 1970 while aerial dissemination equipment was being tested. Prior to this period, the area had been bulldozed and cleared of vegetation in order to make it a useful test range. It has also been burned several times by controlled burning and by wild fire.

The objective of the survey was to provide baseline data for studying the ecological recovery and reforestation of an area subjected to land clearing operations, mowing, and extensive herbicide applications.

SECTION II

DESCRIPTION OF TA C-52A

TA C-52A is a man-made, grassy plain that covers approximately 3 square miles (Figure 1). It is surrounded by a dense forest stand that is dominated by sand pine (Pinus clausa (Engelm) Vasey) but that also includes longleaf pine (Pinus palustris Mill), turkey oak (Quercus laevis Walt), and live oak (Quercus virginiana Mill). The instrumented grid used for herbicide equipment testing is subdivided into 400-by 400-foot sections by permanent markers (Figure 2). This grid is occupied mainly by broomsedge (Andropogon virginicus L.), switchgrass (Panicum virgatum L.), and low growing grasses and herbs.

The soils of the test grid are predominantly well drained, acid sands of the Lakeland association and include Lakeland, Chipley, and Rutledge sand series (Figure 3). A small shallow pond is located just south of marker F-7 and an intermittent pond is located northeast of marker G-13. The average annual rainfall on the area is approximately 60 inches, and the average temperature is approximately 65°F.

Herbicide spray, aircraft flightpaths, and herbicide quantities are shown in Figure 4. There was no way to determine the exact quantity of herbicide deposited on each of the sample plots. Deposition levels would vary considerably, depending on existing meteorological and flight conditions, as well as on herbicide discharge rate. Figure 4 shows the quantity of herbicide delivered on the instrumented grid and the quantity deposited on a non-instrumented grid (Grid 1) immediately south of the surveyed area. Grid 1 received nearly 1,000 pounds of herbicide per acre between 1962 and 1964, and undoubtedly, some fallout occurred on the test plots of the 1 square mile grid.

Young (Reference 1) has provided a thorough description of the area including vegetation, animal life, climatology and soils, as well as the history of the use of the test area and herbicide deposition levels.

Reference

1. A. L. Young: Ecological Studies on a Herbicide Equipment Test Area (TA C-52A) Eglin AFB Reservation, Florida. AFATL-TR-74-12, Air Force Armament Laboratory, Eglin AFB, Florida. January 1974 (Unclassified).

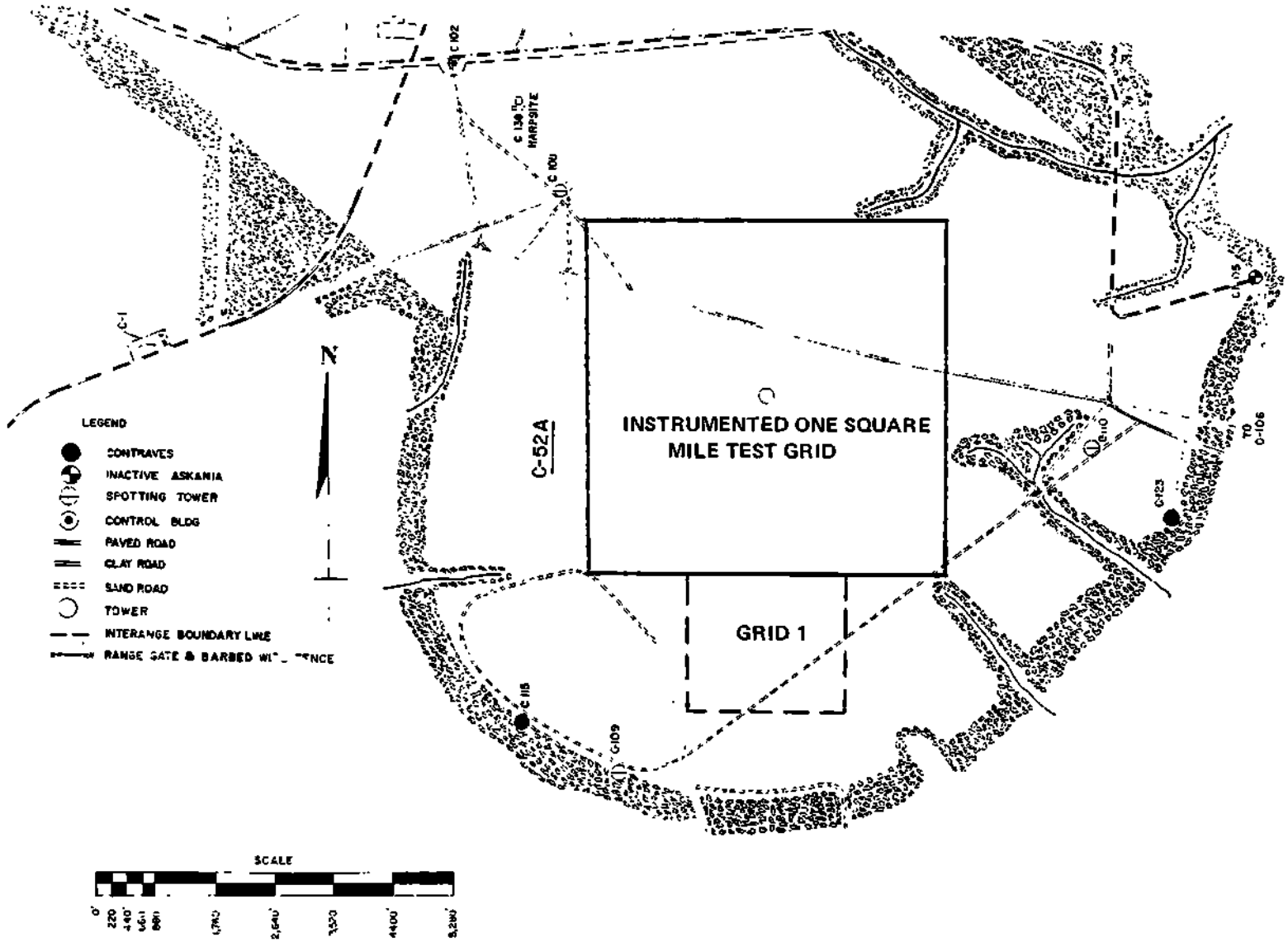

Figure 1. Map of Test Area C-52A, Eglin AFB Reservation, Florida

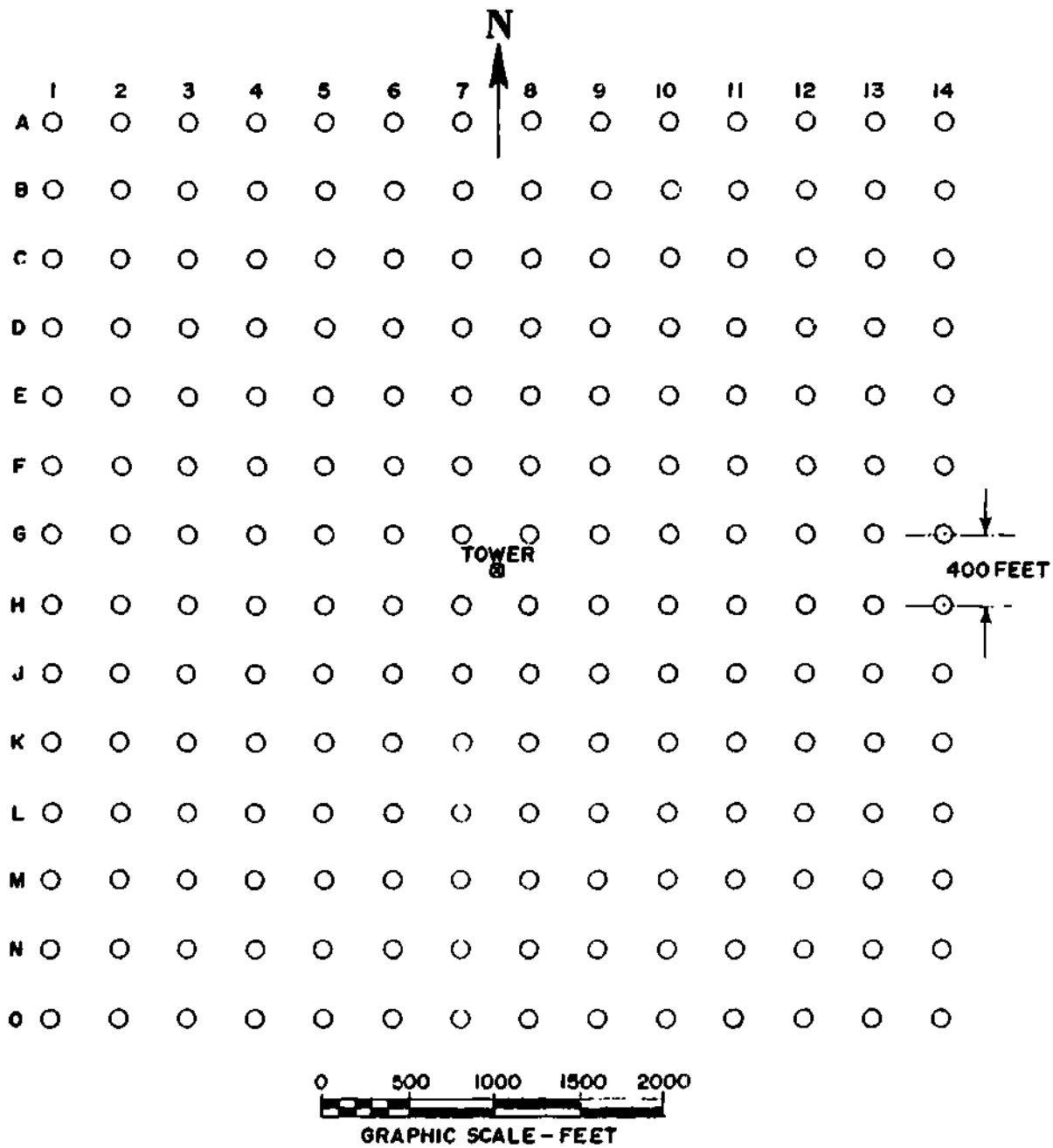

Figure 2. Location of the Permanent Sampling Stations on the One Square Mile Grid

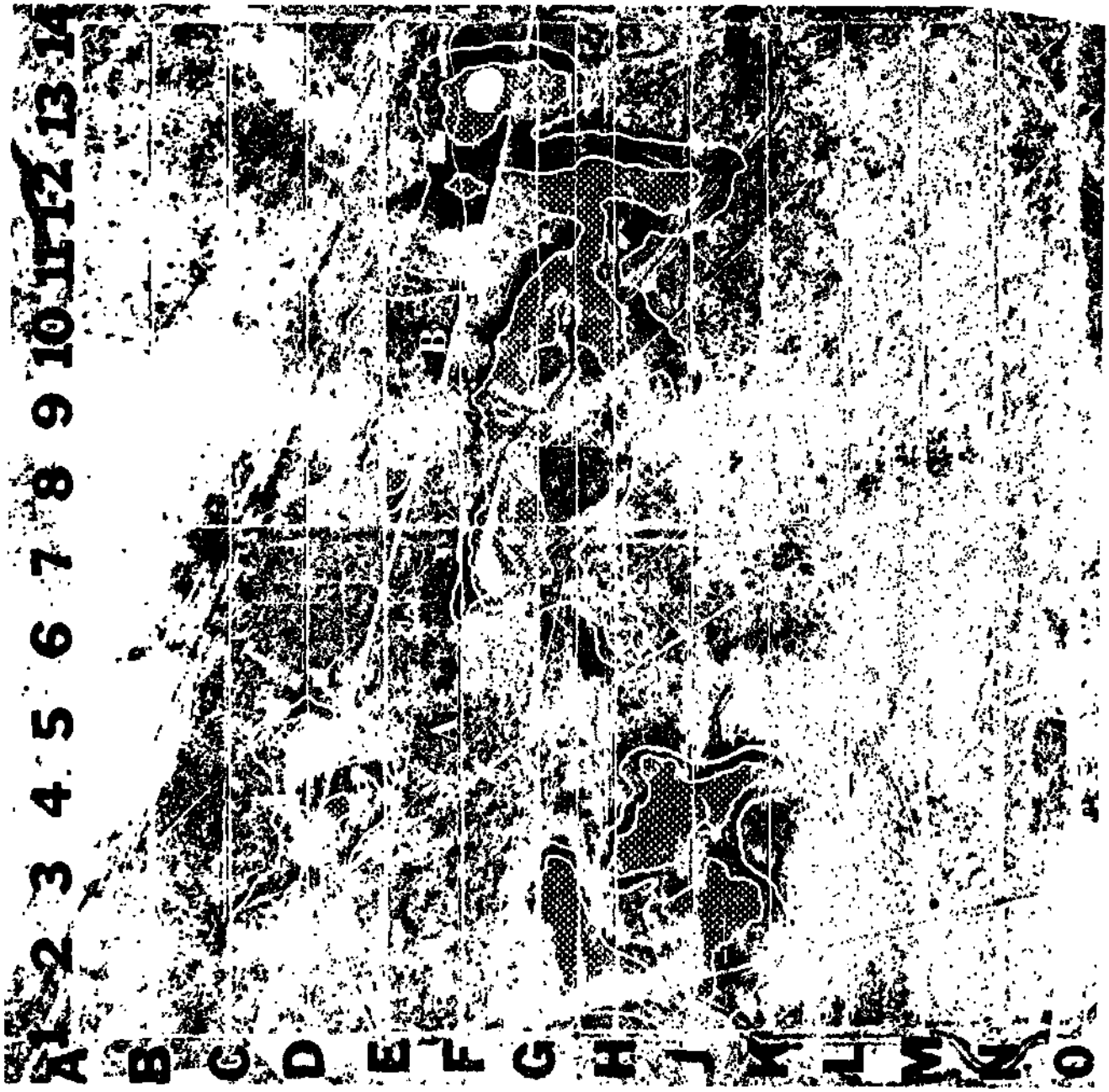

Figure 3. Soil Types and Water on the One Square Mile Grid on Test Area C-52A.

A LAKELAND SAND

B CHIPLEY SAND

C RUTLEDGE SAND

■ WATER

TOTAL NUMBER OF POUNDS OF HERBICIDE

Years	2, 4-D	2, 4, 5-T	Picloram	Cacodylic Acid	Arsenic
1968-1970	44,010	38,150	1,501	12,595	1,889
1966-1970	2,784	------	752	1,029	154
1961-1966	35,026	35,026	--------	----------	-------
1962-1964*	87,186	87,186	--------	----------	-------

*Center of flightpaths during this period was located approximately 1,000 feet south of marker X-7.

Solid Lines - Major Flightpaths

Dashed Lines - Minor Flightpaths

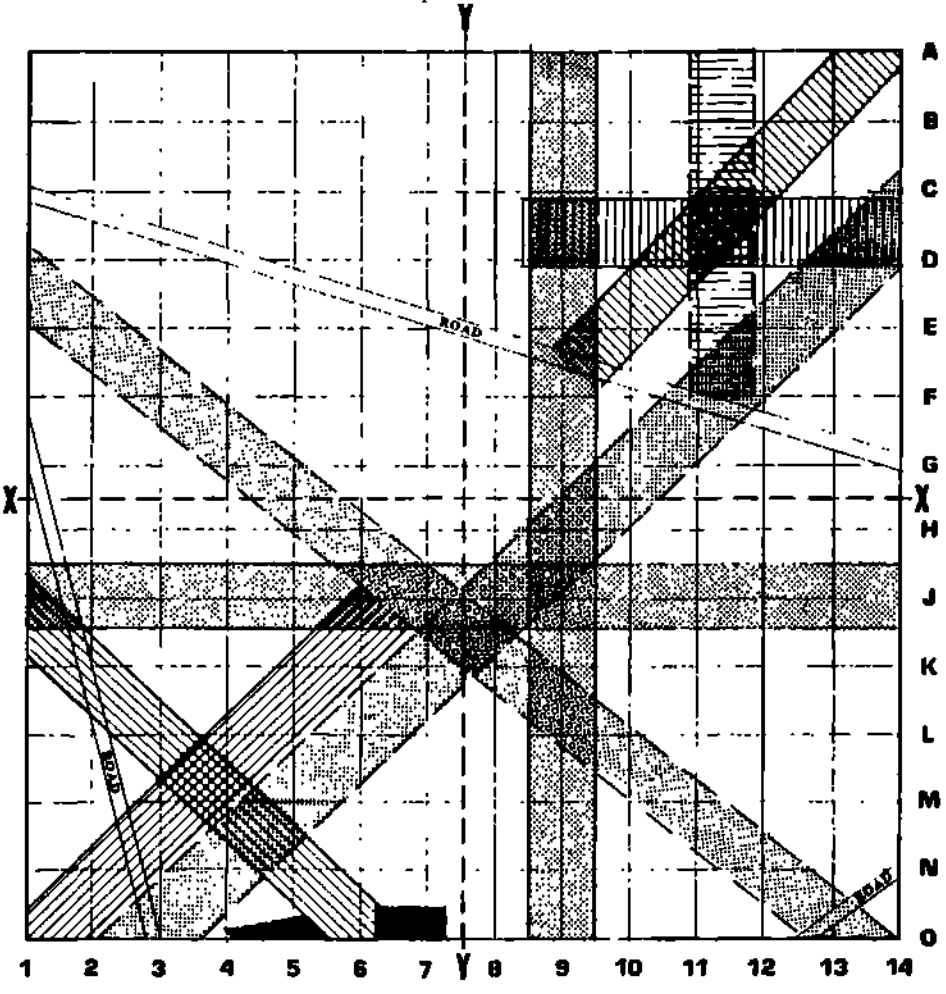

Figure 4. Flightpaths of Herbicide Spray Aircraft. (Major flightpaths used are shown with solid lines and minor by broken lines.)

SECTION III

SURVEY METHODS

The tree survey was made by sampling each of the 169 sections (400 by 400 feet) of the test grid. Five sample plots were taken at predetermined locations in each of the sections. These plots (50 by 50 feet) were located 50 feet diagonally from the permanent markers at each corner of the section and at the center of the section. When the intended sample area was interrupted by a road, the plots were shifted 50 feet in the direction shown by the arrows in Figure 5. Within each plot, the species and height (to the nearest foot) of each tree were recorded (Appendix A). Oaks (*Quercus* spp) were frequently found growing in dense clusters. In such cases, all shoots emerging from the ground that were over 6 inches in height were counted as separate trees.

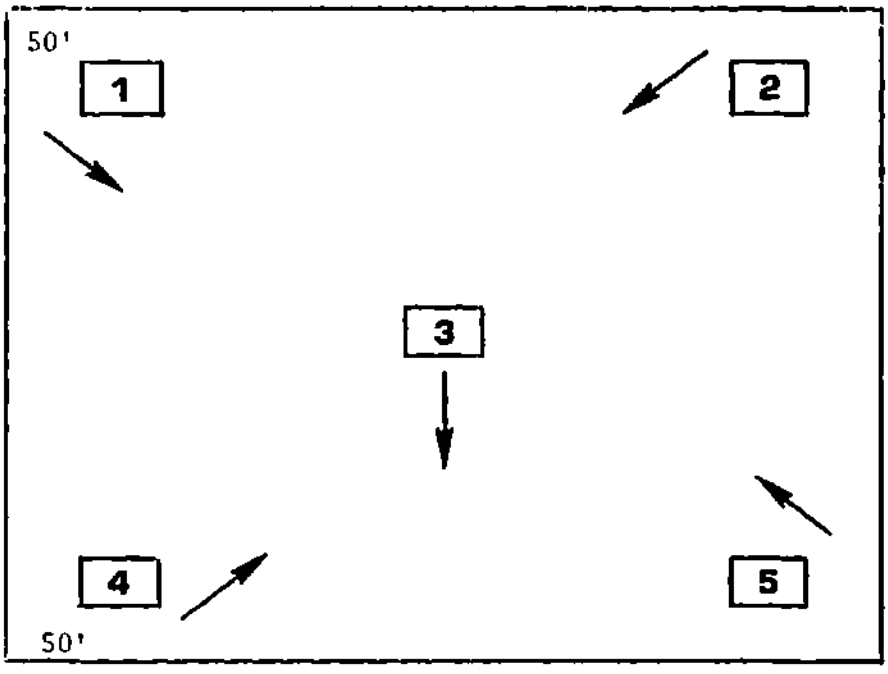

Figure 5. Location of the Five Sample Plots within each of the Grid Sections. (Arrows indicate direction plots were moved if roads interfered.)

SECTION IV

RESULTS AND DISCUSSION

A total of 5,155 trees was counted in the 845 sample plots on the 1 square mile grid of TA C-52A, representing an average of 126.9 trees per acre. The average could be misleading, however, because 66 per cent of the sample plots contained no trees. Figure 8 shows the distribution of trees.

The species present were dispersed in patterns over the grid due to largely unknown reasons, and the dominant species in one area might be scarce in another area. However, over the entire grid, the dominant species were live oak (Quercus virginiana Mill) and turkey oak (Quercus laevis Walt). Five other species of oaks (Quercus spp), three species of pines (Pinus spp), and the common persimmon (Diospyros virginiana L.) were also found in the sample plots. The number and heights of these trees are shown in Table 1. Although not observed in any of the plots, one cedar (Juniperus silicicola (Small) Bailey) was observed on the grid.

The combined effects of land clearing, fire, and herbicide application on the survey area were quite pronounced. The denudation of the area resulted in sequelai, such as loss of soil moisture and blowing sand, that continued to retard ecological recovery (Figure 6). A large part of the area had not recovered sufficiently to permit natural reforestation, particularly in the southern one-third and in parts of the northeast corner of the 1 square mile grid. These areas were quite arid and sandy but did contain a few widely scattered small trees even in sections where no trees were observed in the sample plots.

The mean height for the 5,155 trees counted was less than 2 feet. Only 41 of these had a height over 6 feet (Figure 7), the tallest being 11 feet. Most of the trees were oaks found in small but dense clusters originating from the roots of previous trees. Trees starting from seeds, such as pines, persimmons, and single oaks, were relatively sparse, but their presence indicated the area was recovering.

Although the data were not statistically analyzed due to lack of precise information on actual herbicide deposition, there does appear to be some correlation between previous spray aircraft flightpaths and plots with no trees. There also appears to be some correlation between the presence of trees and the more moist Chipley and Rutledge sands, as well as the proximity to the two major clay roads which cross the grid.

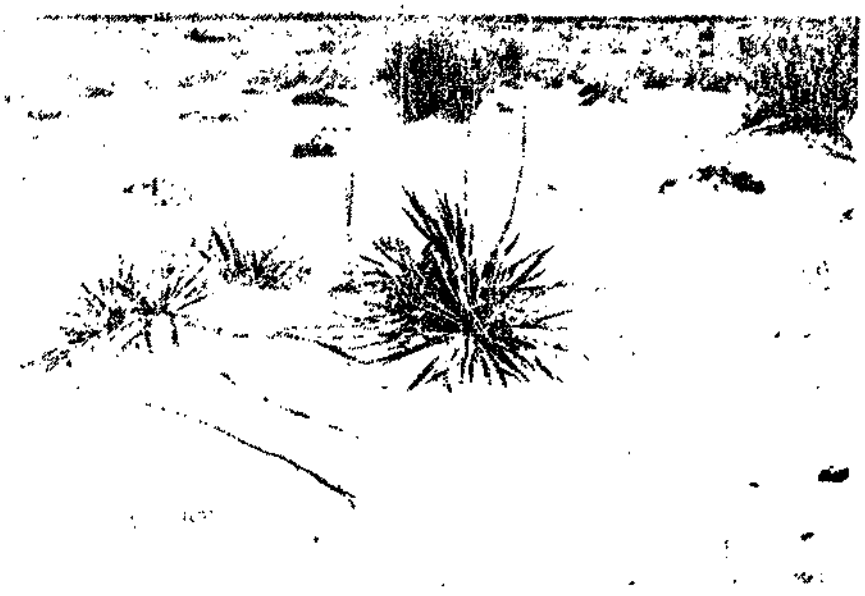

Figure 6. Barren Area Showing Effects of Blowing Sand.

TABLE 1. FREQUENCY AND HEIGHT OF TREES IN SAMPLE PLOTS ON TA C-52A

TREES	TOTAL NO.	HEIGHTS IN FEET									MEAN HEIGHT	STANDARD DEVIATION	TALLEST TREE, FT
		1	2	3	4	5	6	7	8 . . . 11				
Live Oak Quercus virginiana (Mill)	3682	1886	1048	485	187	56	16	1	3		1.79	1.03	8
Turkey Oak Quercus laevis (Walt)	1064	370	357	181	104	36	10	2	4		2.18	1.23	8
Sand Post Oak Quercus margaretta (Ash)	188	126	38	18	5	1					1.49	.82	5
Persimmon Diospyros virginiana (L.)	117	54	40	17	4	2					1.80	.93	5
Blue Jack Oak Quercus incana Bartr.	53	13	24	7	4	2	3				2.38	1.35	6
Sand Pine Pinus clausa (Engelm.) Vasey	21	5	12	3	1						2.00	.77	4
Water Oak Quercus nigra L.	20	10	6	4							1.70	.80	3
Longleaf Pine Pinus palustris (Mill)	4	3								1	3.50	5.00	11
Laurel Oak Quercus laurifolia (Michx.)	3		2	1							2.33	.58	3
Chapman Oak Quercus chapmanii (Sarg.)	2			2							3.00	-	3
Slash Pine Pinus eliottii (Engelm.)	1		1								2.00	-	2
TOTALS	5155	2467	1528	718	305	97	29	3	7	1	1.87	1.09	11

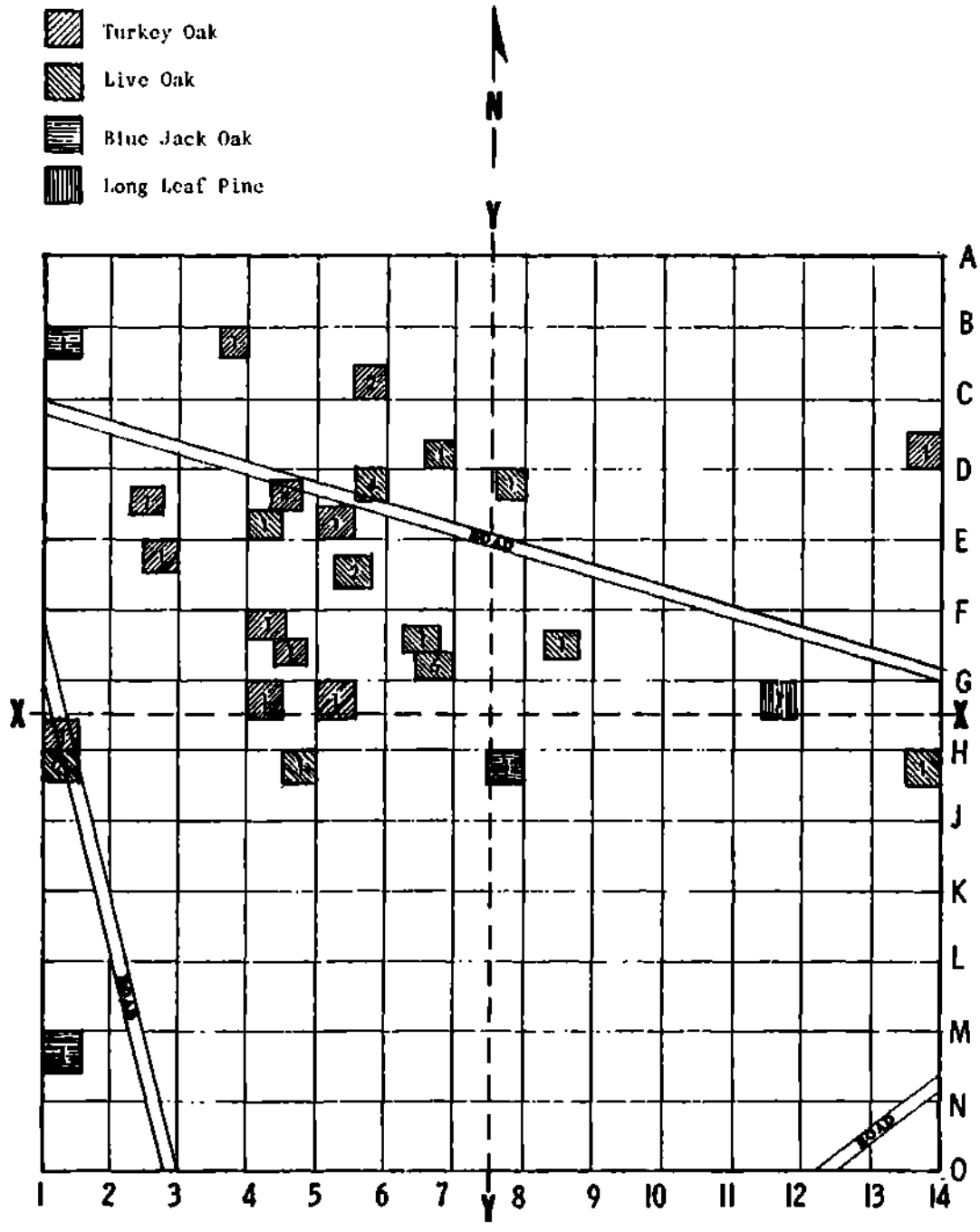

Figure 7. Distribution of Observed Trees at Least 6 Feet High on TA C-52A.

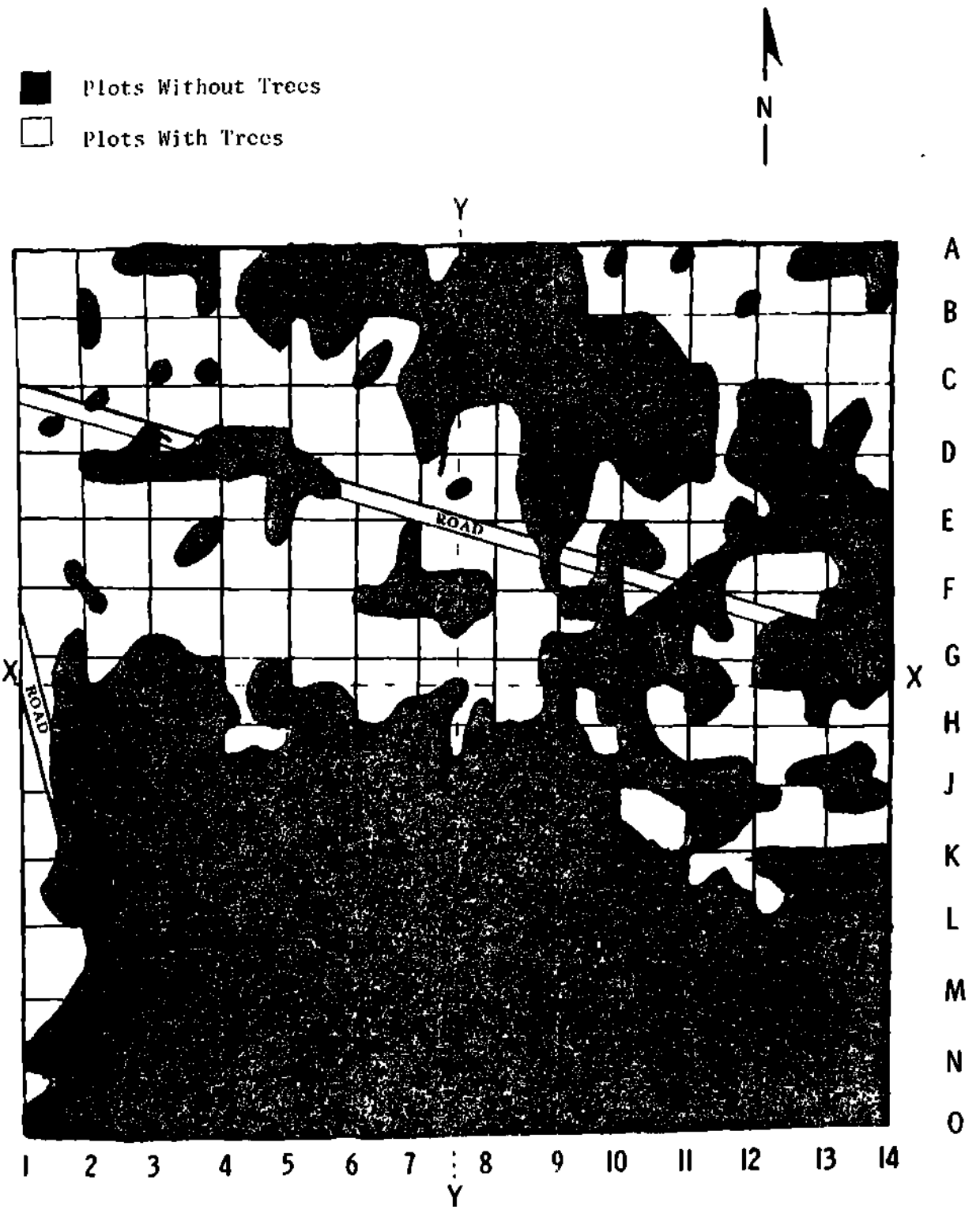

Figure 8. Map Showing Areas in Which Trees Were Found.

Photographs of typical areas on the grid are shown in Figures 9 to 12 and of the surrounding cleared areas are shown in Figures 13 to 16. As can be seen, young trees were well developed in the adjacent clearing on all sides except to the south where massive herbicide applications were made between 1962 and 1964. This area, called Grid 1, consisted of a 2,000-by 2,000-foot test area centered approximately 1,000 feet south of marker N-7. Although not a part of the current study, Grid 1 was surveyed on foot and only 6 trees were observed. Four of the trees were sand pines and the other two were longleaf pines.

The dominance of small oaks on the 1 square mile grid contrasted markedly with the clear dominance of sand pine around the border of the clearing. Oaks also predominated in most of the cleared area surrounding the 1 square mile grid, except to the south (on and around Grid 1), where there were only a few small pines. This lack of trees on Grid 1 appeared to be more related to the previous heavy herbicide deposition than to lack of soil moisture, except for the area adjacent to the 1 square mile grid, which was extremely arid and sandy.

Agerton and Crews (Reference 2) have shown that the residual herbicide has, for all practical purposes, disappeared. They were able to grow sensitive agronomic crops in the most arid section 300 feet south of marker 0-7. These crops required considerable extra water and were not as healthy as controls, but showed no herbicide damage.

In general, it appears that land clearing and herbicide application killed the trees in the clearing and also some of the oaks along the tree line. With the disappearance of the active ingredients of the herbicides and cessation of land clearing operations, trees are reappearing, but mainly from the roots of previous trees. Natural reseeding has been slow due to the distances from other mature trees and the lack of soil moisture necessary for seed germination. Strong winds in this large open area contribute to the drying of the soil and probably keep most small seeds from settling in the barren areas.

Reference

2. Agerton, B. M. and R. C. Crews: A Study of Agronomic Plants Grown on Herbicide Contaminated Soils. AFATL-TR-75-8, Air Force Armament Laboratory, January 1975 (Unclassified).

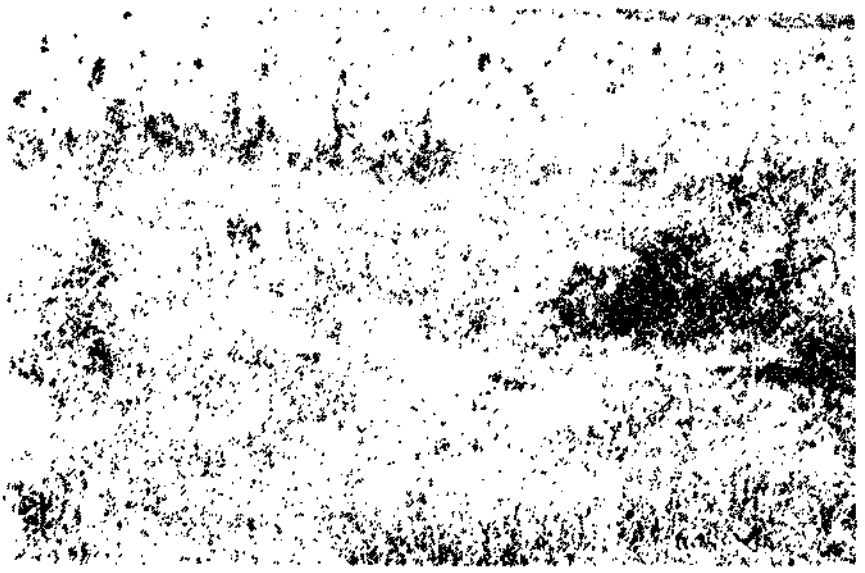

Figure 9. Northern Section

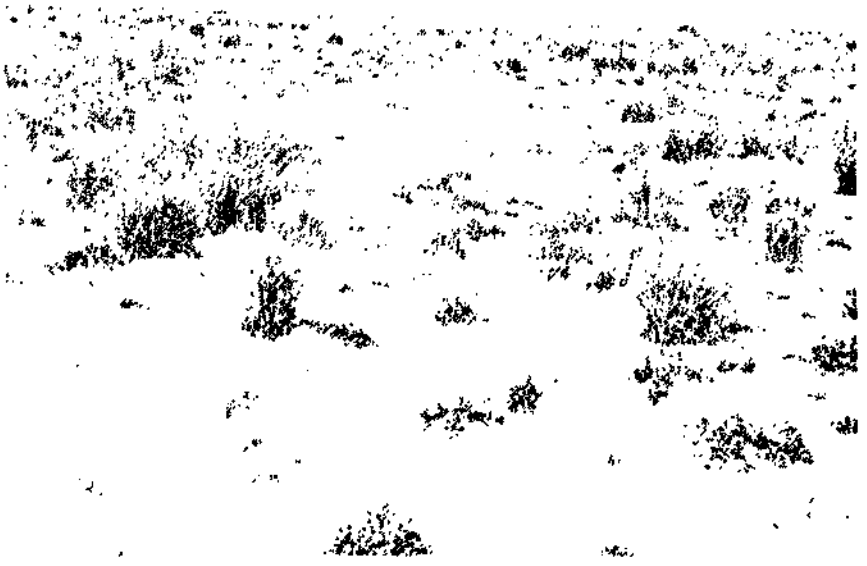

Figure 10. Southwestern Section

Figure 11. Western Section

Figure 12. Southeastern Section

Figure 13. North of Instrumented Grid

Figure 14. East of Instrumented Grid

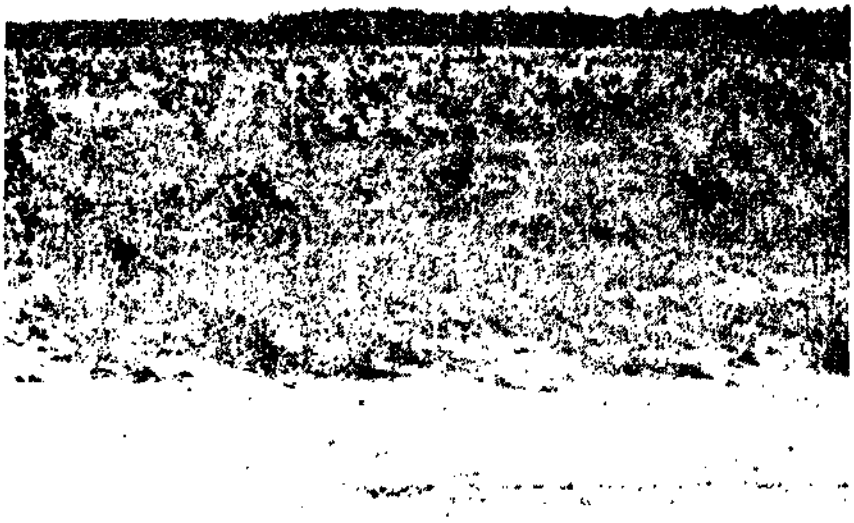

Figure 15. West of Instrumented Grid

Figure 16. South of Instrumented Grid, Overlooking Grid 1

SECTION V

CONCLUSIONS AND RECOMMENDATIONS

The 1 square mile instrumented test grid of Test Area C-52A has previously received massive and repeated applications of military herbicide and has been subjected to land clearing operations. These operations resulted in the destruction of trees and much of the other vegetation on the instrumented grid and parts of the adjacent areas. There have been no recent requirements for land clearing operations, and chemical analyses and bioassays have revealed that the active herbicide ingredients have disappeared.

The area appeared to be in a normal stage of vegetative succession. The ecological recovery was obviously being retarded by a lack of soil moisture and by the constant movement of soil by the wind. Both of these factors were probably induced by the previous repeated destruction of vegetative ground cover and trees.

Grasses had started to infiltrate even the most arid sections of the test grid. This, together with the reappearance of small trees in certain parts of the area, should accelerate the recovery.

In contrast to the surrounding pine forest, the trees of the cleared area were principally oaks. The vast majority of these probably sprouted from roots that survived the various stresses rather than from seeds brought into the area. In the southern sections, which received the most herbicide, it appeared that even the roots of the trees were destroyed. Trees in these sections were sparse even in the more moist areas and apparently originated from seeds.

The results of this study indicate that the lack of trees on parts of the test grid is directly related to previous herbicide applications and that succession is generally more rapid in the more moist areas.

Additional surveys should be made in future years to study the pattern of succession in this unique test area. Appendix A contains data collected in this survey, which can be used for comparison in future studies on the vegetative succession of TA C-52A.

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APPENDIX A

A SURVEY OF TREES ON A HERBICIDE TREATED TEST AREA OF EGLIN AFB, FLORIDA - TEST AREA C-52A (JUNE-AUGUST 1974)

Height to the nearest foot and frequency of trees are recorded for each species of tree observed in the sample plots. Plots are numbered 1 through 5 (see Figure 3). Sections were identified using the letters and numbers on the instrumented grid beginning with Section A-1 in the northeast corner (see Figure 2). Plots not listed had no trees over 6 inches in height. Abbreviations used for species are as follows:

BJO - Blue Jack Oak - Quercus incana Bartr.

TKO - Turkey Oak - Quercus laevis (Walt)

LVO - Live Oak - Quercus virginiana (Mill)

CHO - Chapman Oak - Quercus chapmanii (Sarg.)

SPO - Sand Post Oak - Quercus margaretta (Ash)

WRO - Water Oak - Quercus nigra L.

LRO - Laurel Oak - Quercus laurifolia (Michx.)

SNP - Sand Pine - Pinus clausia (Engelm.) Vasey

LLP - Longleaf Pine - Pinus palustris (Mill)

SHP - Slash Pine - Pinus elliottii (Engelm.)

PSM - Persimmon - Diospyros virginiana (L.)

SECTION	PLOT	SPECIES	HEIGHT AND FREQUENCY								TOTAL
			1'	2'	3'	4'	5'	6'	7'	8'	
A-1	-1	TKO	2	0	1						3
		LVO	71	32	13	0	1				117
A-1	-2	LVO	0	0	1						1
A-1	-3	TKO	0	0	1	2					3
		LVO	23	12	8						43
		SPO	5	0	1						6
A-1	-4	TKO	4	2	5	3	1				15
		LVO	0	2	2	2					6
A-1	-5	TKO	1	3	0	2	1				7
A-2	-1	TKO	10	7	5	1	1				24
A-2	-3	TKO	9	3	4	1					17
		LVO	8	3	1						12
A-2	-5	TKO	1	2	3						6
		LVO	0	0	1						1
A-3	-3	LVO	0	2	0	1					3
A-3	-4	TKO	0	1	1						2
		BJO	0	0	0	1					1
		LVO	5								5
A-4	-1	SNP	1								1
A-4	-4	TKO	1								1
A-7	-1	LLP	1								1
A-9	-3	TKO	2								2
A-9	-5	TKO	0	0	1						1
A-10	-1	PSM	1								1
A-10	-3	TKO	1	0	1	4					6
A-10	-4	TKO	1	3							4
A-10	-5	TKO	6	1							7

SECTION	PLOT	SPECIES	HEIGHT AND FREQUENCY								TOTAL
			1'	2'	3'	4'	5'	6'	7'	8'	
A-11	-1	TKO	3								3
A-11	-2	TKO	4	0	1						5
		SPO	6	1							7
A-11	-3	TKO	1	2	1						4
A-11	-4	TKO	4	1							5
		SPO	2								2
A-12	-1	TKO	1								1
A-12	-3	PSM	6	1							7
		SNP	1								1
A-12	-4	WRO	0	1							1
A-12	-5	SPO	1								1
A-13	-3	TKO	0	1							1
A-13	-4	TKO	1								1
		PSM	1	1							2
B-1	-1	TKO	5	4	3	2	1				15
		BJO	0	0	0	0	0	1			1
		LVO	1	0	1						2
B-1	-2	TKO	0	2							2
		LVO	3	0	1						4
B-1	-3	TKO	4	2							6
		LVO	8	5	4						17
B-1	-4	LVO	19	17	14	16					66
		TKO	3	2	3	3					11
B-1	-5	LVO	0	0	1						1
		TKO	0	1	0	1	1				3
		WRO	0	1							1
B-2	-2	TKO	7	2							9
		LVO	9	8	3	2					22

SECTION	PLOT	SPECIES	HEIGHT AND FREQUENCY								TOTAL
			1'	2'	3'	4'	5'	6'	7'	8'	
B-2	-3	TKO	3	4	4	2	2				15
		LVO	1	4	1	1					7
B-2	-4	LVO	3	3	6						12
		WRO	0	1	1						2
B-2	-5	TKO	0	2	1	1	1	1	1		7
		LVO	0	0	0	0	1				1
B-3	-1	LVO	17	3							20
		TKO	4	2	2						8
B-3	-2	LVO	1								1
		TKO	1	4	0	2	0	1			8
B-3	-3	LVO	0	1							1
		SPO	8								8
		TKO	0	3	0	1	1				5
B-4	-1	TKO	1	2	5	1					9
		LVO	2	0	1	1					4
B-4	-3	BJO	0	1	1						2
		TKO	1	0	2						3
		SPO	7	5	2						14
B-4	-4	LVO	6	6	3	1					16
		PSM	2	1							3
B-4	-5	TKO	3	0	1						4
B-5	-1	LRO	0	0	1						1
B-5	-4	LVO	1	0	2	1					4
B-5	-5	PSM	1	1							2
B-6	-1	SNP	0	0	0	1					1
		PSM	8	8							16
B-10	-2	PSM	0	1							1
B-11	-1	TKO	0	3							3

SECTION	PLOT	SPECIES	HEIGHT AND FREQUENCY								TOTAL
			1'	2'	3'	4'	5'	6'	7'	8'	
B-11	-2	SNP	0	1	1						2
		TKO	4	1							5
		SPO	0	2							2
B-11	-3	SPO	1								1
B-11	-5	TKO	0	2							2
B-12	-1	TKO	4	1							5
B-12	-2	TKO	0	2	3						5
		SPO	0	2	0	1					3
		SNP	0	1							1
B-12	-3	TKO	5	5							10
		SPO	4	3							7
B-12	-4	SPO	1								1
		PSM	0	1							1
B-12	-5	TKO	1	1							2
B-13	-1	TKO	1	6	3	1	1				12
B-13	-2	PSM	0	1							1
B-13	-3	TKO	2	5							7
		PSM	0	1							1
B-13	-4	TKO	2	0	1						3
		PSM	3								3
		SPO	3	1	0	1					5
B-13	-5	TKO	1								1
C-1	-1	TKO	0	1	0	1					2
		WRO	6	1							7
		LVO	10	4	3	1	1				19
C-1	-2	TKO	0	0	0	1					1
		WRO	1								1
		LVO	6	1	2	1					10
C-1	-4	LVO	0	0	1						1
		TKO	0	1	1	1					3

SECTION	PLOT	SPECIES	HEIGHT AND FREQUENCY								TOTAL
			1'	2'	3'	4'	5'	6'	7'	8'	
C-1	-5	LVO	0	2	2	1					5
C-2	-2	LVO	3	1	1						5
		TKO	1								1
		WRO	0	0	1						1
C-2	-3	LVO	9	0	3	1					13
		TKO	0	1							1
C-2	-4	TKO	2	2	3						7
		LVO	4	5	6	1					16
		PSM	2								2
C-3	-1	TKO	3	4	0	1					8
		WRO	0	0	1						1
C-3	-2	LVO	1	1	0	6	1				9
C-3	-3	TKO	2	2							4
C-3	-4	LVO	5	10	5						20
		TKO	0	0	0	0	1				1
C-4	-1	LVO	3	4							7
C-4	-2	TKO	2	1							3
		LVO	5	3							8
C-4	-3	LVO	8	9	5						22
		TKO	1	3							4
C-5	-1	LVO	7	3							10
		TKO	2	3	1						6
		SPO	4								4
C-5	-2	LVO	0	1	1						2
C-5	-3	LVO	1	8	3	1					13
		TKO	0	1	0	1					2
C-5	-4	LLP	1								1
C-5	-5	LVO	19	15	3	3					40
		TKO	1	2	1	1					5

SECTION	PLOT	SPECIES	HEIGHT AND FREQUENCY								TOTAL
			1'	2'	3'	4'	5'	6'	7'	8'	
C-6	-1	LVO	5	1	1	1					8
		TKO	3								3
		SPO	4	1	1						6
C-6	-3	LVO	9	5							14
C-6	-4	LVO	22	19	4	10	1				56
		TKO	3	3	1	1					8
C-6	-5	LVO	44	19	9	5	1	1			79
		SPO	10	2	1						13
C-7	-3	LVO	4	0	0	1					5
C-7	-5	TKO	0	0	0	1					1
C-8	-4	TKO	0	0	1						1
		PSM	0	2	1						3
C-11	-3	TKO	2								2
		PSM	0	0	1						1
C-12	-2	TKO	9	2							11
C-12	-5	TKO	0	2							2
C-13	-1	TKO	1	2							3
		LVO	0	3							3
C-13	-2	TKO	0	1							1
		PSM	0	0	1						1
C-13	-5	TKO	0	0	0	0	0	1			1
D-1	-1	TKO	0	0	1						1
		SPO	3	1							4
D-1	-3	LVO	0	1							1
D-1	-4	TKO	0	2	2						4
D-1	-5	TKO	0	0	0	1					1
		SNP	0	1							1

SECTION	PLOT	SPECIES	HEIGHT AND FREQUENCY								TOTAL
			1'	2'	3'	4'	5'	6'	7'	8'	
D-2	-3	TKO	0	2	2	3	1	0	0	1	9
D-2	-4	SNP	0	1							1
		LVO	1	2							3
D-2	-5	TKO	8	12	3	2	1				26
D-3	-3	LVO	6	2	2	2					12
		PSM	0	1							1
D-3	-4	LVO	4	1	2	1					8
		TKO	0	1	1	1					3
D-3	-5	SNP	1								1
D-4	-3	TKO	4	4	1	2	2	1	1	2	17
		LVO	1	2							3
		SNP	0	0	1						1
D-4	-4	LVO	9	19	5	0	0	1			34
D-5	-2	LVO	45	13	3	3	4	3	1		72
		TKO	2	1	2	2					7
D-5	-4	TKO	2	3	0	0	0	1			6
D-5	-5	TKO	1	0	1	2					4
		LVO	10	2	1	2					15
D-6	-1	LVO	65	46	24	14	1				150
D-6	-2	TKO	2	2	1	2					7
		LVO	4	3	0	1					8
D-6	-3	TKO	4	5	0	3					12
		SPO	1	2	2						5
		LVO	3	1							4
D-6	-4	LVO	5	3							8
D-6	-5	TKO	2	1							3
D-7	-1	TKO	2	2							4
		LVO	6	3	1						10
		LRO	0	1							1

SECTION	PLOT	SPECIES	HEIGHT AND FREQUENCY								TOTAL
			1'	2'	3'	4'	5'	6'	7'	8'	
D-7	-2	LVO	15	13	12	11	1	1			53
		WRO	3	2	1						6
		PSM	3								3
D-7	-4	PSM	2	0	0	1					3
		TKO	2								2
D-7	-5	TKO	13	5	1		1				20
		LVO	6	1							7
D-8	-01	LVO	4	5	1						10
D-8	-04	LVO	3	0	2						5
D-9	-02	PSM	0	1	1	0	1				3
D-9	-05	LVO	23	9	5						37
D-10	-04	LVO	6	1	4						11
D-10	-05	SPO	8	2	2						12
D-11	-3	TKO	1	0	1	1					3
D-11	-4	TKO	2								2
		PSM	2	1	1						4
D-12	-4	TKO	1	2	2						5
		SHP	0	1							1
D-13	-2	LVO	1	4	0	2					7
		PSM	4	1	1	2	1				9
E-1	-1	TKO	5	13	2						20
		LVO	5	2							7
		BJO	0	4	1	0	1				6
E-1	-2	TKO	5	1							6
		LVO	6	5							11
E-1	-3	TKO	4	4	1						9
		LVO	5	0	1						6
E-1	-4	TKO	7	4	4						15

SECTION	PLOT	SPECIES	HEIGHT AND FREQUENCY								TOTAL
			1'	2'	3'	4'	5'	6'	7'	8'	
E-2	-1	LVO	2	1	1						4
		SPO	1	4							5
		TKO	1								1
E-2	-2	TKO	2	1	0	1	0	1			5
		LVO	15	20	2	1					38
E-2	-3	LVO	0	0	1						1
E-2	-4	TKO	0	1	3	2					6
		LVO	5	2	1	2	1				11
E-2	-5	TKO	5	2							7
E-3	-1	TKO	5	3	1						9
		LVO	1	3	2						6
		SPO	7	1	1						9
E-3	-4	TKO	3	1	1	3					8
E-3	-5	TKO	4	0	2	1					7
E-4	-1	LVO	6	5	2	0	1				14
E-4	-3	LVO	4	0	1						5
E-4	-4	TKO	2	2	1	1					6
E-4	-5	LVO	14	33	11	10	4				72
E-5	-1	TKO	4	4	3						11
		LVO	8	13	4						25
E-5	-2	TKO	0	1	1	1					3
E-5	-3	TKO	3	1	2	1	1				8
		LVO	10	7	6	1	1	1	0	1	27
E-5	-4	LVO	10	8	2	1	1				22
E-5	-5	LVO	0	1							1
E-6	-1	TKO	2	1	2						5

SECTION	PLOT	SPECIES	HEIGHT AND FREQUENCY								TOTAL
			1'	2'	3'	4'	5'	6'	7'	8'	
E-6	-3	LVO	9	4	2	1	1				17
E-6	-4	CHO	0	0	2						2
E-7	-1	LVO	3	2	1	1					7
		TKO	1	0	1						2
E-7	-2	LVO	54	12	17	7	3				93
		TKO	2	2	3	2					9
E-7	-3	TKO	0	0	0	1					1
E-8	-1	LVO	65	18	11	1					95
		TKO	3	4	1	0	1				9
E-9	-3	LVO	6	1	5						12
E-9	-4	SNP	0	1							1
E-10	-2	LVO	1	0	0	1	1				3
E-10	-4	LVO	0	1							1
E-10	-5	PSM	0	1	0	1					2
E-11	-1	TKO	5	0	0	0	1				6
		LVO	0	2							2
		PSM	0	1							1
E-11	-5	LVO	13	10	2						25
E-12	-3	BJO	1	2							3
		TKO	1	5							6
E-12	-4	LVO	1	2							3
		SNP	0	1							1
E-12	-5	LVO	11	6	8						25
E-13	-4	TKO	0	1							1
		SPO	1								1
F-1	-1	TKO	0	4	2	2	1				9
		LVO	0	0	0	2					2

SECTION	PLOT	SPECIES	HEIGHT AND FREQUENCY								TOTAL
			1'	2'	3'	4'	5'	6'	7'	8'	
F-1	-2	TKO	0	7	0	1	1				9
F-1	-3	TKO	0	1	1	0	1				3
F-1	-4	TKO	1								1
F-2	-2	TKO	3	5	1	1					10
		LVO	2	3	2						7
		SNP	0	1							1
F-2	-3	LVO	1	1							2
		TKO	6								6
F-2	-4	TKO	1								1
F-3	-1	TKO	1	2	2	1					6
		LVO	6	13	7	3	2				31
F-3	-2	TKO	4	3	2	1					10
F-3	-3	TKO	0	2	0	1					3
		LVO	5								5
F-3	-5	TKO	2	0	3						5
F-4	-1	TKO	1	2	1	0	0	1			5
F-4	-2	LVO	10	10	3	3					26
		TKO	5	1	5	2	1				14
F-4	-3	LVO	10	5	1	1					17
		TKO	0	1	0	0	0	1			2
F-4	-4	PSM	2	0	2						4
		TKO	2	4	1	1					8
F-4	-5	TKO	0	0	1	1					2
F-5	-1	LVO	1	3	1	1					6
		TKO	0	6	1	1					8
F-5	-2	TKO	9	18	4	1					32
		LVO	10	5	3	1					19

SECTION	PLOT	SPECIES	HEIGHT AND FREQUENCY								TOTAL
			1'	2'	3'	4'	5'	6'	7'	8'	
F-5	-3	TKO	9	4	3	0	2				18
		PSM	3								3
		LRO	0	1							1
F-5	-4	TKO	2	12	3	3					20
		LVO	53	1							54
F-5	-5	LVO	3	2							5
		TKO	4	0	1	2	1				8
		PSM	3								3
F-6	-3	LVO	6	1	4	2	3	0	0	1	17
F-6	-4	TKO	4	1	3	1					9
		LVO	30	8	6	2					46
		BJO	0	0	1	0	1				2
F-6	-5	LVO	72	24	9	8	9	5	0	1	128
F-7	-4	LVO	44	24	16	1					85
F-7	-5	LVO	53	25	9	1					88
F-8	-1	LVO	161	75	24	3					263
F-8	-2	LVO	14	11	5						30
F-8	-3	LVO	37	4	7	2	2	1			53
F-8	-4	LVO	13	5	5	3	1				27
F-9	-3	LVO	12	9	2						23
F-10	-1	SPO	3	0	1						4
F-11	-2	LVO	29	39	2						70
F-11	-4	LVO	25	6	3						34
		TKO	1	0	0	1					2
F-11	-5	LVO	85	20	7						112
		SNP	0	1							1
F-12	-1	LVO	6	6							12

SECTION	PLOT	SPECIES	HEIGHT AND FREQUENCY								TOTAL
			1'	2'	3'	4'	5'	6'	7'	8'	
F-12	-2	LVO	4	2	1	1					8
G-1	-1	TKO	3	2	1						6
G-1	-4	TKO	4	7	6	2	1	1			21
		LVO	31	18	13	3					65
G-2	-1	LVO	1	1	1	1	1				5
G-4	-1	TKO	4	19	4	2	0	1			30
		LVO	4	1	1	1					7
G-5	-1	TKO	0	2	0	0	0	0	0	1	3
G-5	-2	TKO	0	1	1	1					3
G-6	-1	TKO	3	1	1	1	2				8
		LVO	6	17	6	1					30
G-6	-2	LVO	16	16	6	5	9				52
		PSM	0	1	1						2
G-6	-3	LVO	4	0	2						6
G-6	-4	LVO	7	0	3						10
G-7	-1	LVO	15	13	5	2					35
G-7	-2	LVO	19	20	6	1					46
G-8	-1	LVO	10	6	3	1					20
		SPO	8	2							10
G-8	-3	LVO	5	5	0	1					11
		BJO	3	1							4
G-8	-4	LVO	24	8	5	4	1				42
G-9	-3	SNP	0	0	1						1
G-10	-3	LVO	0	0	3						3
		SNP	0	1							1
G-10	-5	SPO	4	1							5

SECTION	PLOT	SPECIES	HEIGHT AND FREQUENCY											TOTAL
			1'	2'	3'	4'	5'	6'	7'	8'	9'	10'	11'	
G-11	-2	LVO	71	53	14									138
		BJO	2	3	2	2								9
		LLP	0	0	0	0	0	0	0	0	0	0	1	1
G-11	-5	LVO	15	8	9	2	2							34
G-12	-3	LVO	5	2	3									10
G-12	-4	LVO	27	12	3									42
G-13	-1	PSM	0	3										3
G-13	-5	PSM	3	0	1									4
		TKO	5	2	1									8
		LVO	4	0	1	0	1							6
H-1	-1	TKO	9	8	9	3								29
		SPO	5	2	1									8
		LVO	7	3	2	0	0	2						14
H-1	-1	TKO	2	6	3									11
		SPO	7	2	1									10
		SNP	1											1
H-2	-3	TKO	2	0	3	2								7
H-4	-1	LVO	2	3	4	1								10
		TKO	0	0	2									2
H-4	-2	TKO	2											2
		LVO	8	4	3	2	0	1						18
H-7	-2	BJO	1	0	0	0	0	1						2
H-7	-3	BJO	6	3	1									10
H-9	-2	LVO	0	0	0	1								1
H-10	-2	SPO	6	2	1									9
H-11	-1	LVO	1	3										4
H-11	-2	LVO	10	2	0	0	1							13
		SNP	0	1										1

SECTION	PLOT	SPECIES	HEIGHT AND FREQUENCY								TOTAL
			1'	2'	3'	4'	5'	6'	7'	8'	
II-11	-3	LVO	8	5	1						14
		PSM	0	0	1						1
II-12	-1	SNP	0	1							1
		LLP	0	1							1
		LVO	34	17	2						53
II-12	-2	LVO	2	2							4
II-12	-3	LVO	5	2	1	2					10
II-12	-4	SPN	0	1							1
II-13	-1	TKO	1	1							2
		PSM	5	9	2						16
		LVO	5	5	3	4					17
		SPO	3	0	1	1					5
		LLP	1								1
II-13	-2	SPO	4	2	1	2	1				10
		TKO	4								4
		LVO	3	1	3	1	0	1			9
II-13	-5	TKO	2	0	1						3
J-1	-5	TKO	0	0	0	1					1
J-1	-4	TKO	0	2	3	2	1				8
J-7	-5	TKO	1	4							5
J-10	-1	LVO	1	1							2
J-10	-3	LVO	0	0	1						1
		TKO	1	0	1						2
J-10	-5	TKO	1	4	0	1					6
J-11	-5	LVO	9	3	3	0	1				16
		TKO	3	4	1						8
J-12	-2	SPO	0	0	1						1
		SNP	1								1

SECTION	PLOT	SPECIES	HEIGHT AND FREQUENCY											TOTALS
			1'	2'	3'	4'	5'	6'	7'	8'	9'	10'	11'	
J-12	-3	SPO	9	0	1									10
		LVO	0	3										3
		PSM	0	2	4									6
J-12	-4	LVO	9	1	1									11
J-12	-5	TKO	3	1										4
J-13	-3	TKO	7	4	1									12
		PSM	3	1										4
J-13	-4	TKO	3	2	1									6
J-13	-5	TKO	2											2
K-1	-1	LVO	8	5	3	2								18
K-1	-4	BJO	0	10	1									11
		TKO	0	1										1
K-11	-1	LVO	0	0	1									1
K-11	-2	LVO	2	1										3
K-12	-4	LVO	4	6	2									12
L-1	-1	TKO	3	2	0	1	1							7
L-1	-2	TKO	1	2	1	0	1							5
L-1	-3	TKO	0	1										1
L-1	-4	TKO	1	0	0	1								2
M-1	-1	BJO	0	0	0	1	0	1						2
		TKO	1											1
N-1	-1	TKO	0	0	0	1								1
		TOTAL	2466	1529	717	307	95	30	3	7			1	5155

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INITIAL DISTRIBUTION

AFSC/DLW	2
AFSC/SDWM	1
AFSC/DPSL Tech Lib	1
USAF/SAMI	2
ASD/ENYS (Mr Hartley)	1
DDC	12
AFATL/DL	1
AFATL/DLOSL	3
AFATL/DLV	50
ADTC/CSV (Maj Conrad)	2
USDA (Mr Kuhns), Forest Service	25
USAFA/DFLS	10
AFLC/DS	2
AUL (AUL/LSE-70-239)	1
4950 Test Wing/TIIM	1
Ogden ALC/MMNOP	2
AFWL/LR	2
AFSC/VN	2
Edgewood Arsenal/SAREA-TS-L	1
Edgewood Arsenal/SAREA-CL-V	1
Vegetation Control Div (SAREA-CL-V)	2
Army Material Command (AMCRD-WB/AFSC-SDWC)	1
OOAMA/MMNO	1
SAAMA/SFQT	1
USDA, Pesticide Coordinator	2
USDA, Agriculture Environmental Quality Institute	2
USAF Environmental Health Lab (AFLC)	2
USAF (PREV)	2

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