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Vegetation succession Studies on a defoliant- equipment test, Eglin AFB Reservation Fla.,

VEGETATIVE SUCCESSION STUDIES ON A DEFOLIANT-EQUIPMENT TEST AREA, EGLIN AFB RESERVATION, FLORIDA

PYROTECHNICS BRANCH
FLAME, INCENDIARY, AND EXPLOSIVES DIVISION

Hunter, J. H. et al

TECHNICAL REPORT AFATL-TR-72-31

FEBRUARY 1972

AIR FORCE ARMAMENT LABORATORY
AIR FORCE SYSTEMS COMMAND • UNITED STATES AIR FORCE
EGLIN AIR FORCE BASE, FLORIDA

Vegetative Succession Studies on a Defoliant-Equipment Test Area, Eglin AFB Reservation, Florida

John H. Hunter, Captain, USAF
Alvin L. Young, Captain, USAF

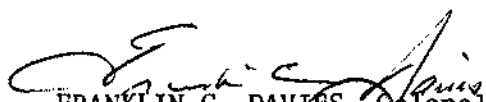
FOREWORD

The Air Force project directly related to the information in this report is Exploratory Development Project 5066, Aerial Dissemination Techniques; work unit number 00 04. This report documents specific studies performed between May and September 1971 and also general observations of the vegetation of Test Area C-52A between June 1969 and September 1971.

The assistance provided during portions of the vegetative survey by Gerald Simon and the historical information supplied by F. W. Mantey (TSGGL) are gratefully acknowledged. Appreciation is also extended to Dr. Daniel Ward and John Beckner, Department of Botany, University of Florida, for identification of ten plants collected during this study.

Information on the test grid monitoring system and types and amounts of defoliants disseminated on Test Area C-52A from July 1962 to April 1969 was obtained from Armament Development and Test Center working papers "Defoliant History of Test Area C-52A" by Helen Biever. After April 1969 this same information was obtained from Vitro Services, Vitro Corporation of America. Information on soils of Test Area C-52A was obtained from a July 1969 soil survey of Eglin Air Force Base Reservation prepared by the Soil Conservation Service of the U. S. Department of Agriculture.

This technical report has been reviewed and is approved.



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ABSTRACT

Nine months after the last defoliant-equipment test mission on the one-square-mile grid of Test Area C-52A, a vegetative coverage survey was conducted. The percent of vegetative coverage within 169 sections (each 400 by 400 feet) was ranked in one of six possible classes. The survey can serve as a basis for future studies on vegetative succession of the grid. The average number of dicotyledonous (broadleaf) plants was determined for each coverage class. Seventy-four dicotyledonous species were found on the one-square mile grid and the average number of species within vegetative coverage classes ranged from five in class 0 (0 to 5% cover) to 24 in class V (80 to 100% cover). A control area contained 28 species, all of which were also on the grid except for two species. Diodia teres, Rhynchosia galactioides, and Tithymalus spaerospermus were the most common dicotyledons and D. teres, T. spaerospermus, Stylisma villosa, and Lupinus diffusus were the first plants to invade barren or class 0 areas. The existence in class 0 or class I areas of dicotyledonous plants that are susceptible to the active ingredients of military defoliants indicates that the amount of defoliant residues in the soil is insignificant. The present vegetative coverage of sections of the grid is due to a combination of soil moisture content, prior mechanical disturbances and prior defoliant spraying. Although vegetation was removed by defoliant spraying in areas under flight paths, the low level of vegetative coverage in other areas is primarily due to prior mechanical clearing. In those areas having a relatively high soil moisture content, considerable vegetation has returned, regardless of whether the vegetation was removed mechanically or by defoliants.

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INTRODUCTION

From June 1962 to October 1970, aerial spray equipment was tested at Test Area C-52A on the Eglin Air Force Base Reservation in support of the military defoliation program. In order to realistically evaluate the spray equipment, most missions utilized military defoliants such as Purple, Orange, White, and Blue (Reference 1). The active ingredients of these defoliants are 2,4-dichlorophenoxyacetic acid (2,4-D), 2,4,5-trichlorophenoxyacetic acid (2,4,5-T), 4-amino-3,5,6-trichloropicolinic acid (picloram) and dimethylarsinic acid.

Because of the large volumes of defoliants sprayed on Test Area C-52A, a unique opportunity exists to evaluate trends in vegetative succession on an area repeatedly sprayed with military defoliants. These studies were undertaken to determine the vegetation of the test area in relation to its history and whether plant succession in such an area is different than in an area not subjected to repeated application of military defoliants.

The plant succession studies were primarily concerned with dicotyledonous (broadleaf) plants since they are typically more sensitive to phenoxy herbicides (Reference 2).

1. DESCRIPTION AND HISTORY OF TEST AREA C-52A

Test Area C-52A is an approximately three-square mile, cleared range in the southeastern section of the Eglin Air Force Base Reservation (Figure 1). Much of the center of the range was established prior to 1960, but the open range as it presently exists was developed in 1961-62. The soils of the range are predominantly well-drained, acid sands of the Lakeland Association with 0 to 5% slope. The area is about 100 feet above sea level with a mean annual rainfall of 60 inches and a mean annual temperature of 65°F. The forest surrounding the test area is dominated by turkey oak (Quercus laevis), sand pine (Pinus clausa), and longleaf pine (P. palustris).

Four sampling grids on the test area were used to monitor defoliant missions (Figure 1). Table I gives the period of application and the approximate amount of individual defoliant deposited on each grid. The pounds of active ingredients per acre were calculated from the reported total gallons delivered during each mission. Because it was impossible to determine the small percentage of material that drifted or was disseminated off target, it was assumed that all material fell within the confines of the given grid acerage. In addition to military defoliants, approximately 116 gallons per acre of number 2 fuel oil was sprayed on grid number 1 in 1962-63.

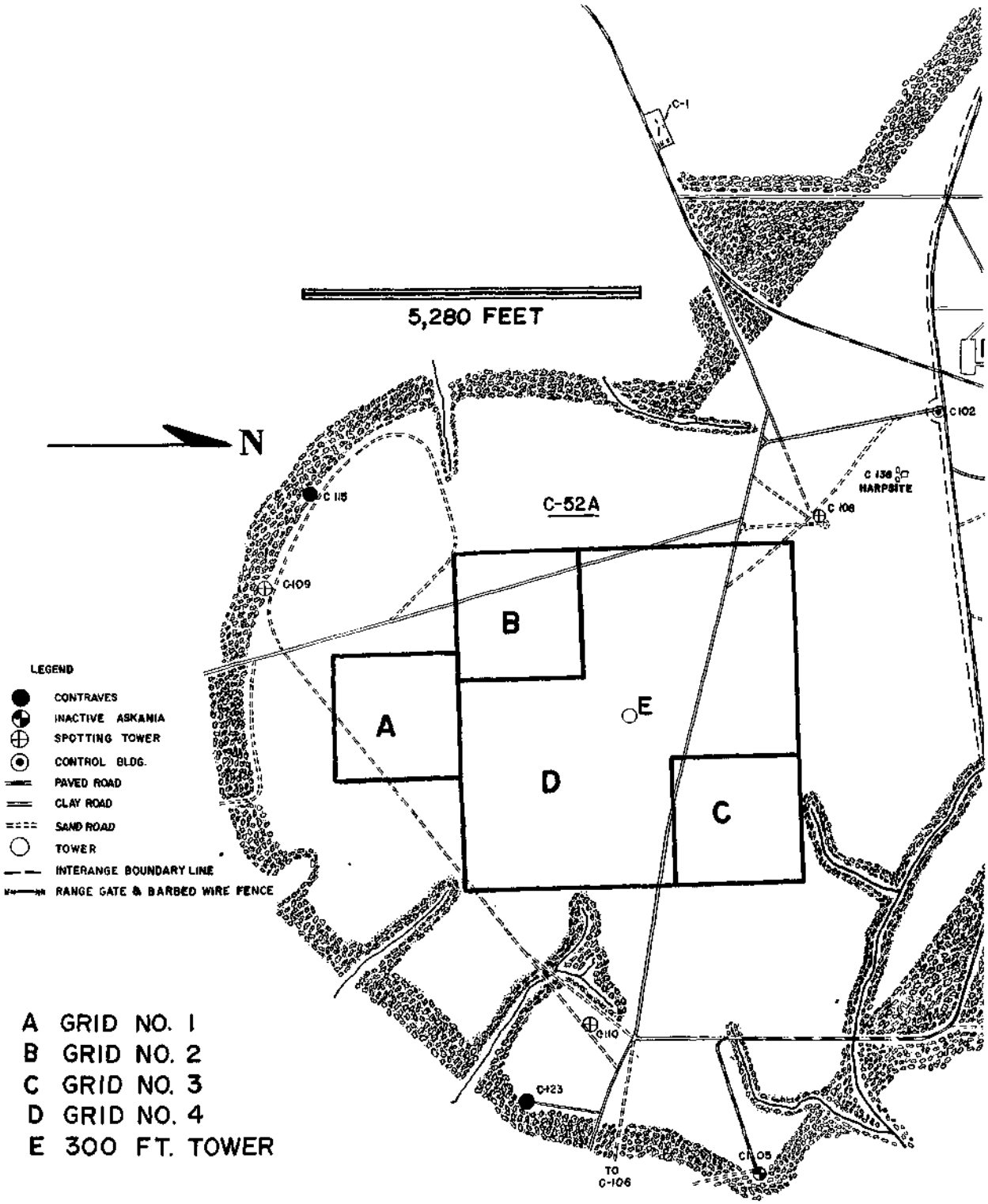

Figure 1. Location of Test Grids on Test Area C-52A, Eglin Air Force Base

TABLE I. DEFOLIANT DEPOSITION RATE ON GRIDS NUMBER 1, 2, 3, AND 4 OF TEST AREA C-52A BETWEEN JUNE 1962 AND OCTOBER 1970

GRID NUMBER	AREA OF GRID, Acres	TIME OF APPLICATION	POUNDS OF ACTIVE INGREDIENT PER ACRE FOR INDIVIDUAL HERBICIDES[a]			
			2,4-D	2,4,5-T	PICLORAM	CACODYLIC ACID
1	92	Jun 1962 - Jul 1964	947	947	0	0
2	92	May 1964 - Sep 1966	380	380	0	0
3	92	Oct 1967 - Apr 1968	30	0	8	11
4	[b]240	May 1968 - Sep 1970	183	160	6	53

[a]Disseminated in the form of military defoliants Purple, Orange, White, and Blue. Purple and Orange contain 4.21 lb ai/gal of 2,4-D and 4.41 lb ai/gal of 2,4,5-T. White contains 0.54 lb ai/gal picloram and 2.0 lb ai/gal of 2,4-D. Blue contains 2.48 lb ai/gal as a combination of cacodylic acid and sodium cacodylate.

[b]Area of grid was actually 640 acres but most of the herbicide was deposited on 240 acres.

2. LITERATURE REVIEW

Three studies have previously been concerned with the vegetation on or adjacent to Test Area C-52A. In 1967, Ward (Reference 3) studied the plants adjacent to the test area in order to determine the effects, if any, of the testing program on vegetation surrounding the test area. Turkey oaks immediately adjacent to the test area had been severely damaged by defoliant drift, but little if any damage was noticeable on longleaf or sand pines. Ward (Reference 4) observed the dominant vegetation in all directions from the test area, and in 1969, he was unable to find any damage other than that caused by the 1962-1964 period of equipment testing. Ward collected and identified several of the plants occurring on grid number 4. Hunter and Agerton (Reference 5) measured the annual growth rings of selected trees adjacent to the test area and did not find any relationship between annual defoliant dissemination and annual diameter growth. In 1970, Sturrock and Young (Reference 6) conducted a histological study on crown tissue of Yucca filamentosa samples growing in the soil of the grid that contained defoliant residue. A gross comparison of control plants and those on the grid showed differences, but a histological examination revealed no differences. Both samples followed the normal structural development described for Yucca in the scientific literature.

The work described in this technical report was primarily concerned with the vegetation occurring on the one-square mile grid (grid number 4), which includes within its boundaries the areas previously occupied by grids number 2 and 3 (Figure 1).

SECTION II

MATERIALS AND METHODS

A survey of the vegetative coverage of the one-square mile grid was initiated in May 1971. This grid has 169 permament air sampling stations as illustrated in Figure 2. These stations and their interconnecting, clay-covered access roads provided the boundaries for dividing the grid into 169 sections (each 400 by 400 feet), and within each section the percentage vegetative coverage was ranked as class 0, 0 to 5%; class I, 5 to 20%; class II, 20 to 40%; class III, 40 to 60%; class IV, 60 to 80%, and class V, 80 to 100% coverage. Sections were designated by the number of the permament sampler in the northwest corner of the section, e.g., B-8 and J-4 (Figure 2).

In June 1971, a quantitative and qualitative study of the plant populations of the one-square mile grid was initiated. Three of the 400 by 400 foot sections within each coverage class were selected at random and a diagonal transect starting 20 feet within the northwest corner of each section was walked to the southeastern boundary. All dicotyledonous (broadleaf) plants were collected along the transect. Data were tabulated for the number of dicotyledonous plants occurring in each section. Then, one of the 400 by 400 foot sections from each class was randomly selected for further study and identification of plants. A control area 0.2 mile northwest of the one-square mile grid and the center of the area formerly occupied by grid number 1 were also surveyed.

Most of the plants collected during this study were permanently mounted and added to the Eglin Reservation Herbarium. A photographic record of the vegetation coverage of grid number 4 was initiated to serve as a base line for future observations.

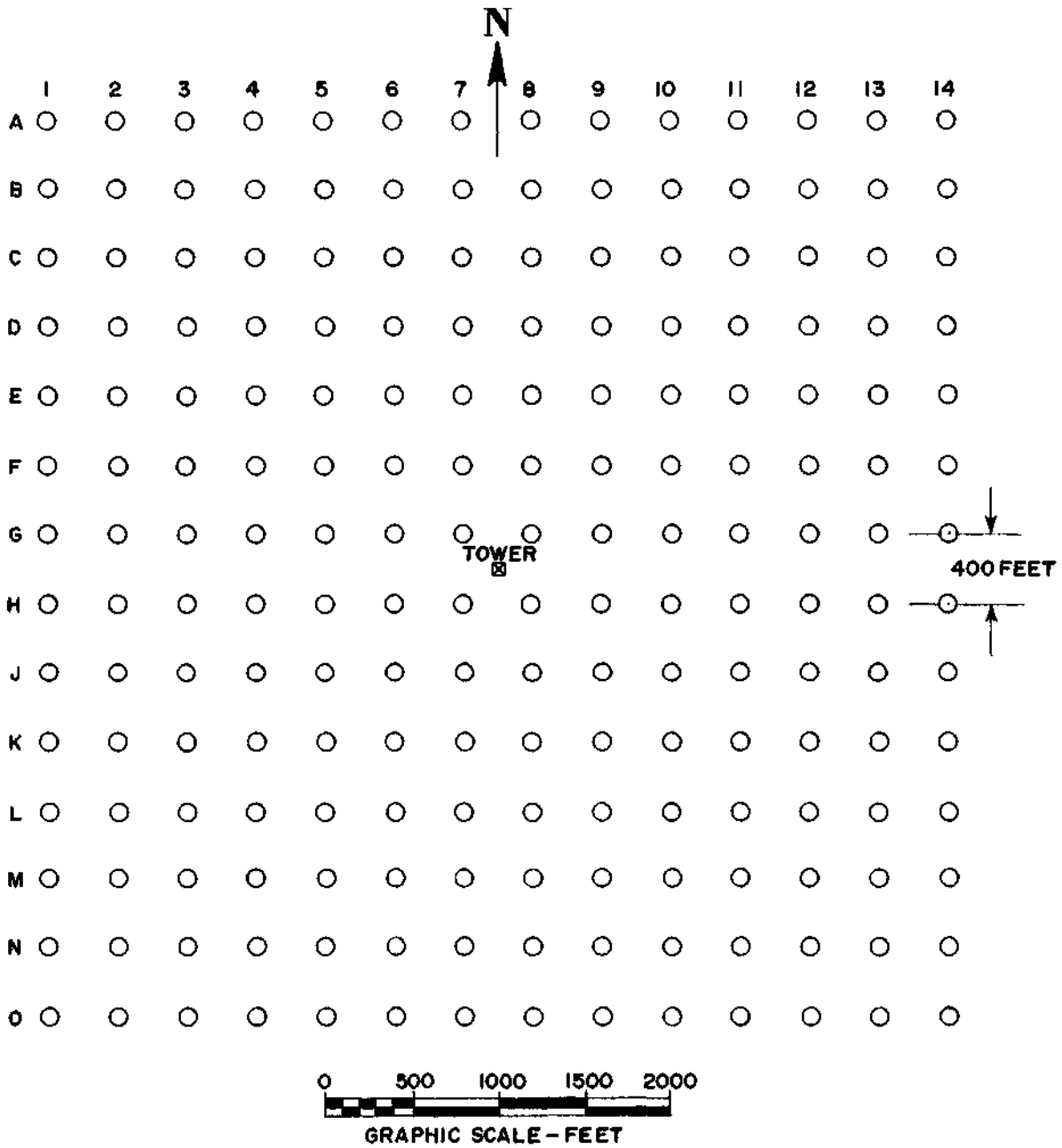

Figure 2. Location of the Permanent Sampling Stations on the One-square Mile Grid

SECTION III

RESULTS AND DISCUSSION

The results of the May 1971 vegetative coverage survey are shown in Figure 3. This survey can serve as a basis for future surveys of grid number 4. The survey was made 8 months after the last defoliant mission. However, most of the defoliant sprayed in 1970 was Blue which has an effect (dessication) on vegetation that is less permanent than Orange or White (systemic herbicides). The last mission with a systemic herbicide was in May 1970 (264 gallons of White). Comparison of the May 1971 survey with a preliminary survey made in March 1970 indicated a 68% reduction in the number of class 0 areas during a 13 month period.

Figure 4 is a photograph that shows the vegetative coverage of the grid in March 1971 (6 months after testing stopped). The class 0 and I coverage areas predominantly occurred on or adjacent to the three aircraft flight paths that were most frequently used. A reduction of vegetation along portions of these flight paths can be seen in Figure 4. The flight path of most frequent use followed a north-south line formed by the number 9 permanent samplers. Figure 5 is a ground view of this flight path. The other flight paths, in order of usage, were an east-west line along row J and a southwest to northeast line along sampling stations 0-2, L-6, and H-9 to C-14. A fourth flight path on grid number 4 was occasionally used and ran along a southeast to northwest line perpendicular to the southwest to northeast flight path. The area in Figure 4 that resembles a flight path running from E-14 northwestward between A-7 and A-2 and then off of the grid is the remnant of a former bomblet test area that was built prior to 1958. Testing activity on this area stopped in 1963. So far as is known, this area was mechanically cleared and received no surface treatment such as surfacing with clay. Therefore, this area is a very good example of how slowly vegetation returns to some soils of the test area after mechanical clearing.

The areas of very dense vegetation (class IV and V) across the middle portion of the grid are primarily due to soil types. These areas contain moderately to poorly drained sands (compare Figures 4 and 6). The Lakeland Sand that covers most of the one-square-mile grid forms excessively drained thick deposits that extend to a depth of about 7 feet. This sand is characteristically very dry even with 60 inches of annual rainfall. The Chipley Sand is moderately well-drained, and the water table in this soil may rise to within 20 to 40 inches of the surface for 3 months during the year. The Rutledge Sand is a poorly drained, strongly acid (pH 4.5 to 5.0) soil. The water table in this sand is within 10 inches of the surface for several months during the year. The two small permanent ponds in areas F-7 and F-13 are underlaid with Rutledge Sand. Even though areas of Chipley and Rutledge Sands were repeatedly sprayed with herbicides, the vegetative cover was affected very little or it rapidly returned; as is shown on the flight path areas between rows E and K of Figure 4.

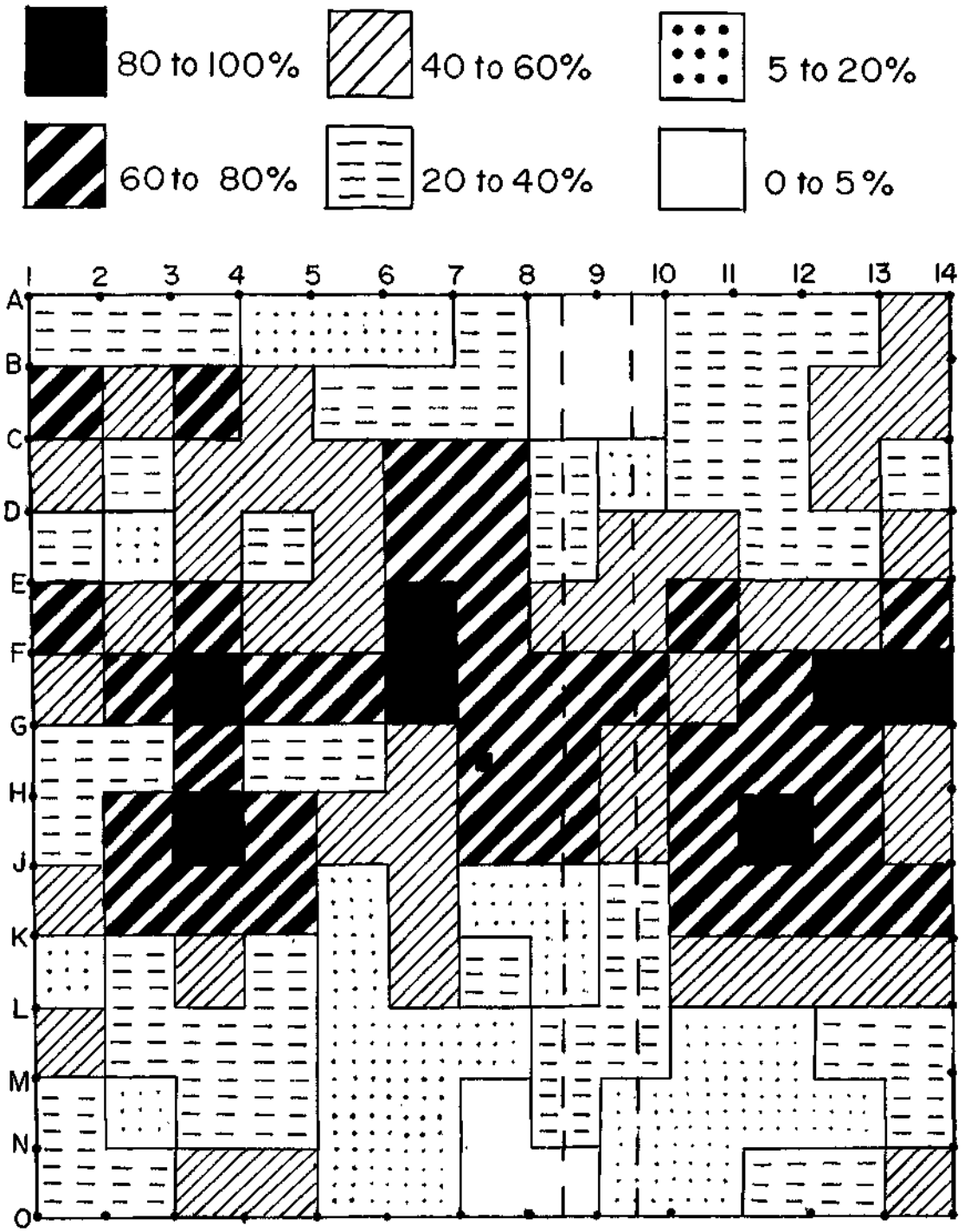

Figure 3. Vegetative Coverage of the One-Square Mile Grid on Test Area C-52A, May 1971

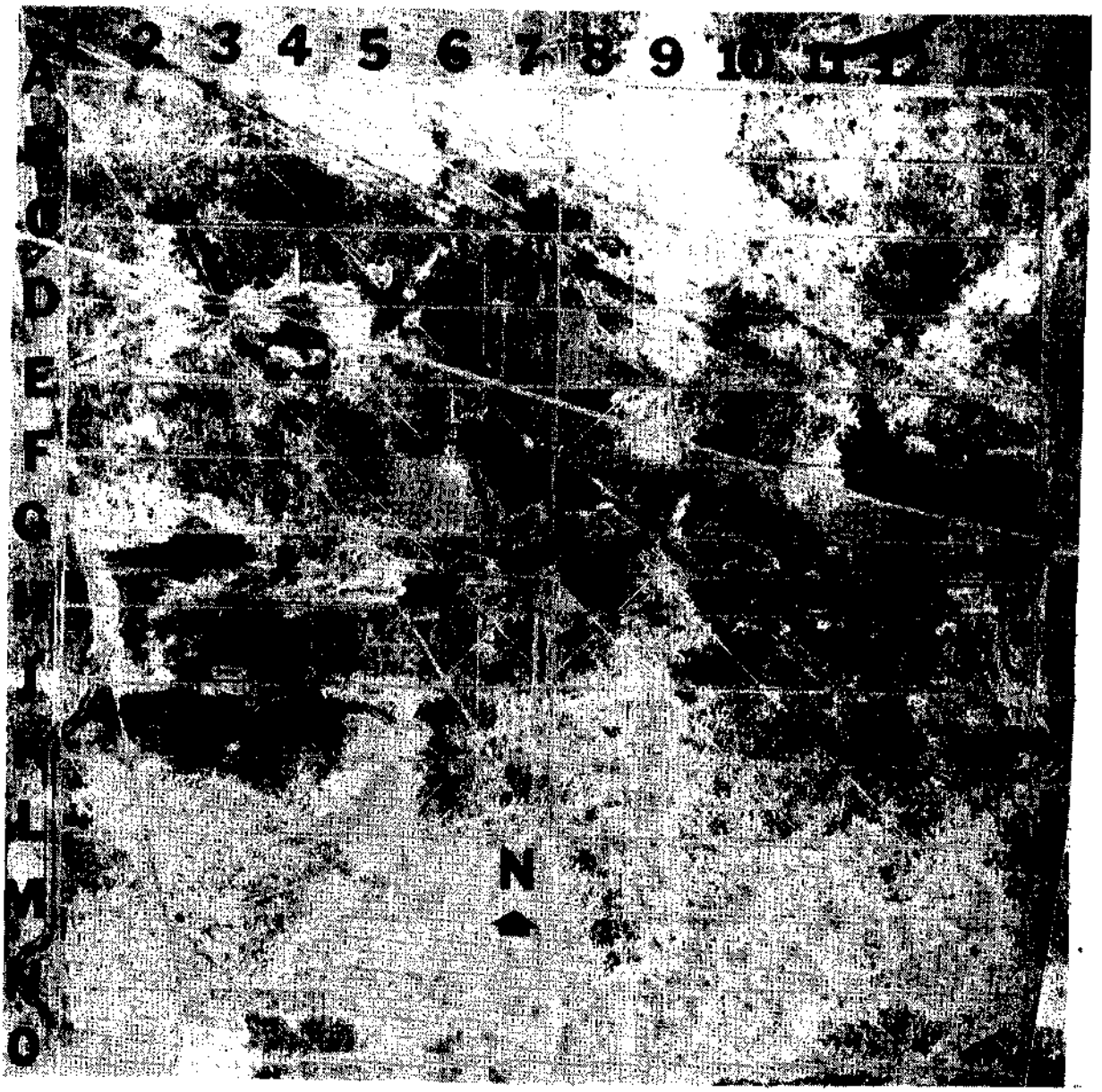

Figure 4. Photograph of the One-Square Mile Grid (Grid Number 4) Taken at 5,000 Feet Above Ground Level on 16 March 1971

Figure 5. Photograph Looking North Along North-South Flight Path from Permanent Sampler Station L-9 on Grid Number 4, August 1971

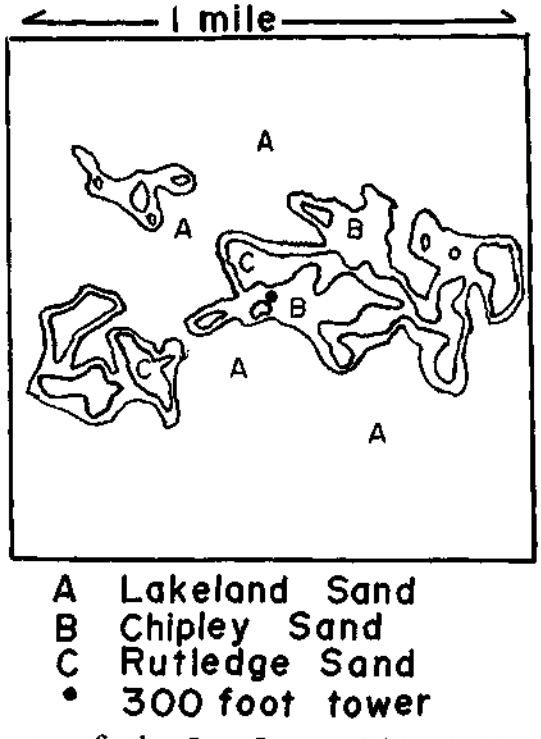

Figure 6. Soil Types of the One-Square-Mile Grid on Test Area C-52A

Switchgrass (Panicum virgatum L.) is the most prominent plant, in terms of coverage, on the grids. It seems to be well adapted to the xeric Lakeland Sand and is quite resistant to damage by the military defoliants. Other monocotyledonous plants that remained along flight paths or grew in soils with relatively high defoliant residues were broomsedge bluestem (Andropogon virginicus L.), yucca (Yucca filamentosa L.), beakseed (Bulbostylis warei Torr.), lovegrass (Eragrostis sp.), and a woolly panicum (probably Panicum lanuginosum Ell.). Between March 1970 and June 1971, the woolly panicum colonized several barren or class 0 areas. Other grasses that occur on the grids have been listed by Ward in Reference 7.

The results of the 1971 survey for the number of dicotyledonous plants on grid number 4 are given in Table II.

TABLE II. NUMBER OF DICOTYLEDONOUS PLANT SPECIES OCCURRING IN 400 BY 400 FOOT SECTIONS HAVING VEGETATION COVER OF CLASS 0 TO V

VEGETATION CLASS	PERCENTAGE COVER	NUMBER OF DICOTYLEDONS[a]	NUMBER OF SHRUBS[a]
0	0 to 5	5	0
I	5 to 20	6	0
II	20 to 40	13	1
III	40 to 60	17	2
IV	60 to 80	19	5
V	80 to 100	24	4
V	(Control)	28	5

[a]All figures except control are averages obtained from survey of three 400 by 400 foot sections.

The 400 by 400 foot sections surveyed on grid number 4 were A-11, B-8, C-6, C-11, D-9, D-7, D-12, E-3, E-6, F-12, H-11, J-1, K-13, L-10, M-2, M-7, N-5, and N-8. Figures 7, 8, 9, 10, 11, 12, 13, and 14 are examples of the various vegetation classes on the grid and a control area.

Seventy-four dicotyledonous species were collected on grid number 4 from June to September 1971 (Table III). Diodia teres, Rhynchosia galactioides, and Tithymalus spaerospermus were the most common. Those species that tended to be the first dicotyledons to invade barren or class 0 areas were D. teres, T. spaerospermus, Stylisma villosa, and Lupinus diffusus. All of the plants

Figure 7. Area N-8, Vegetative Cover Class 0 on Grid Number 4

Figure 8. Area N-5, Vegetative Cover Class I on Grid Number 4

Figure 9. Area L-10, Vegetative Cover Class I on Grid Number 4

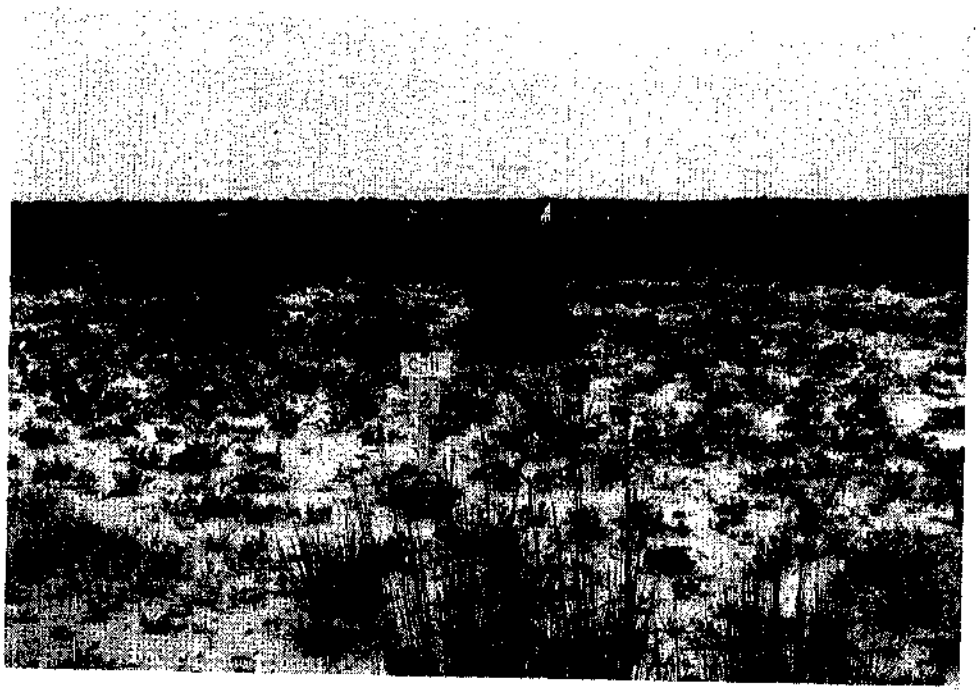

Figure 10. Area C-11, Vegetative Cover Class II on Grid Number 4

Figure 11. Area J-1, Vegetative Cover Class III on Grid Number 4

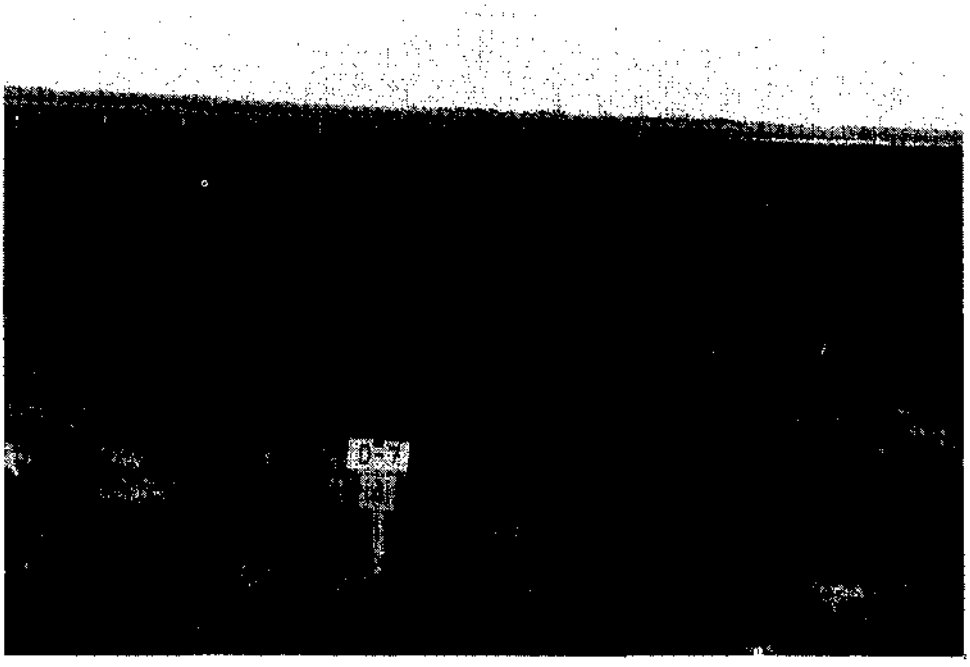

Figure 12. Area D-7, A Vegetative Cover Class IV on Grid Number 4

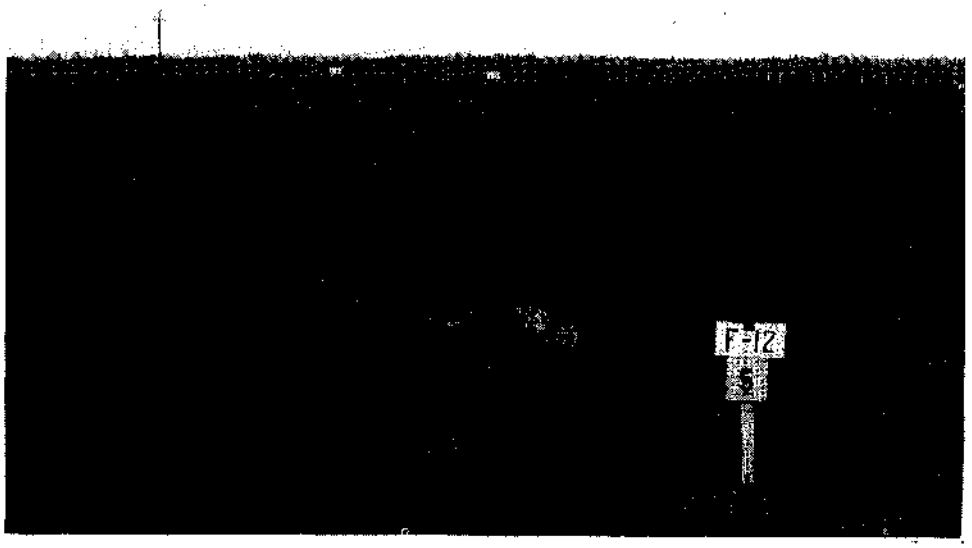

Figure 13. Area F-12, A Vegetative Cover Class V on Grid Number 4

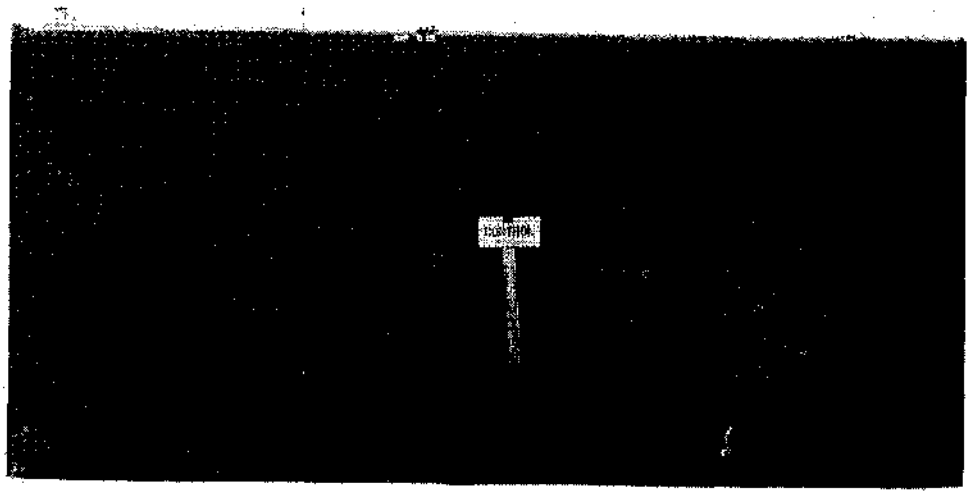

Figure 14. Control Area Located 0.2 Mile Northwest of Grid Number 4

TABLE III. DICOTYLEDONOUS PLANTS COLLECTED ON THE ONE-SQUARE MILE GRID OF TEST AREA C-52-A

SPECIES	COMMON NAME [From Reference 9]	VEGETATIVE CLASS AND FREQUENCY OF OCCURRENCE
Shrubs:		
Callicarpa americana L.	american beautyberry	IV;rare
Diospyros virginiana L.	common persimmon	IV; infrequent
Ilex glabra (L.) Gray	gallberry	V; infrequent
Ilex opaca Ait.	american holly	IV; infrequent
Lespedeza sp.		III; rare
Pinus clausa (Chapm.) Vasey	sand pine	IV; rare
Pinus palustris Mill.	longleaf pine	IV; rare
Quercus laevis Walt.	turkey oak	III,IV,V; frequent
Quercus sp.		V; infrequent
Quercus sp.		IV; infrequent
Quercus sp.		III,IV; infrequent
Quercus sp.		IV,V; infrequent
Herbs:		
Acanthospermum australe (L.) Kuntze	paraquay bur	III ; frequent
Achillea millefolium L.	common yarrow	III; infrequent
Agaloma discoidalis (Chapm.) Nieuwl.		II,III; frequent
Ambrosia artemisiifolia L.	common ragweed	II,III,V; frequent
Asclepias humistrata Walt.	common milkweed	IV; rare
Bigelowia nudata (Michx.) DC		V; infrequent
Cassia fasciculata Michx.	partridgepea senna	O,I,II,III ; frequent
Centella asiatica (L.) Urban		V; rare
Chrysobalanus oblongifolius Michx.	gopher apple	III,V; frequent
Chrysopsis graminifolia (Michx.) Ell.	grassleaf goldenaster	II; infrequent
Chrysopsis mixta Dress.	goldenaster	II; infrequent
Cnidoscolus stimulosus (Michx.) Gray	risky treadsoftly	III,IV; infrequent
Crotalaria maritima Chapm.	rattlebox	III,IV,V; infrequent
Crotalaria sagittalis L.	arrow crotalaria	V; rare
Croton glandulosus L.	tropic croton	III; rare
Diodia teres Walt.	rough buttonweed	all classes; common
Erechtites hieracifolia (L.) Raf.	fireweed	V; infrequent
Eriogonum tomentosum Michx.	wildbuckwheat	II,IV; infrequent
Eupatorium capilifolium (Lam.) Small	dogfennel	II,III,IV; frequent

TABLE III. (Continued)

SPECIES	COMMON NAME [From Reference 9]	VEGETATIVE CLASS AND FREQUENCY OF OCCURRENCE
Euphorbia supina Raf. ex Boiss.	prostrate spurge	I; infrequent
Froelichia floridana (Nutt.) Moq.	florida snakecotton	I; infrequent
Galactia microphylla (Chapm.) Rogers	milkpea	II,III; infrequent
Gnaphalium falcatum Lam.	cudweed	IV; infrequent
Gnaphalium obtusifolium L.	fragrant cudweed	IV,V; frequent
Gnaphalium purpurem L.	purple cudweed	III,IV; infrequent
Hedyotis procumbens (J.F. G. Mel) Fosberg		V; rare
Hedyotis uniflora (L.) Lam.		V; rare
Hypericum gentianoides (L.) BSP	poverty weed	II,III,IV; frequent
Lechea patula Legg.	pinweed	III,IV; frequent
Listris secunda Ell.	gayfeather	V; infrequent
Lithospermum caroliniense (Walt.) MacM.	carolina gromwell	I,III; infrequent
Lobelia brevifolia Nutt.	lobelia	V; frequent
Ludwigia virgata Michx.	false loosestrife	V; rare
Lupinus diffusus Nutt.		O,I,III; infrequent
Lupinus Nuttallii S. Wats.	sandhills lupine	I; rare
Mollugo verticillata L.	carpetweed	I; rare
Oxalis stricta L.	yellow woodsorrel	III; rare
Paronychia patula Shinners	nailwort	I,II,III; frequent
Petalostemon caroliniense (Lam.) Sprague	prairieclover	I; infrequent
Phlox floridana Benth.	florida phlox	II; infrequent
Pluchea rosea Godfrey		V; rare
Polygala nana (Michx.) Raf.	bachelor button	IV,V; infrequent
Polygala polygama Walt.	bitter polygala	II,III,IV,V; frequent
Polygala sp.	polygala	III; infrequent
Polypremum procumbens L.	common polypremum	IV; infrequent
Rhexia alifanus Walt.	meadowbeauty	IV; infrequent
Rhexia salicifolius Kral & Bostick	meadowbeauty	IV,V; infrequent
Rhynchosia gelactioides Endl.	pinebarrenpea	I,II,IV;;frequent
Rhynchosia reniformis (Pursh) DC.	dollarleaf rhynchosia	V; rare
Rubus sp.		III; infrequent
Rumex acetosella L.	red sorrel	II.III,IV; frequent
Schrankia microphylla (Soland ex Smith) Macbr.	littleleaf sensitive-brier	IV,V; infrequent
Sophronanthe hispida Benth.		IV,V; frequent
Stylisma villosa (Nash) House		O,I; rare
Stylosanthes biflora (L.) BSP	twin pencilflower	III; rare

TABLE III. (Concluded)

SPECIES	COMMON NAME [From Reference 9]	VEGETATIVE CLASS AND FREQUENCY OF OCCURRENCE
Tephrosia sp.		III; rare
Tithymalus spaerospermus (Shuttlew. ex Boiss. in DC.) Small	common euphorbia	all classes; common
Tragia linearifolia Ell.	noseburn	IV; rare
Tragia smallii Shinners	noseburn	V; rare
Vernonia angustifolia Michx.	ironweed	IV; infrequent
Wahlenbergia marginata (Thumb.) A. DC.	rockbell	V; infrequent
Warea sessilifolia Nash.		III,IV; infrequent

found in the control area (0.2 mile northwest of grid number 4) except false-indigo (Baptisia ellipitica Small) and prickly-pear (Opuntia sp.) were also found on the grid in areas having more than 40% coverage.

Species such as D. teres, Cassia fasciculata and Mollugo verticillata which occurred in class 0 and I areas, are susceptible to moderate rates (1 to 2 lb/A) of 2,4-D or 2,4,5-T (Reference 8). Susceptibility information could not be found for the other species occurring in class 0 and I areas.

A comparison of dicotyledons on the grid during testing and non-testing years is possible via earlier work by Ward (References 3 and 7); however, his survey was not intended to be complete. Ward collected 19 dicotyledons on grid number 4 in 1966-1967. During this period, grids number 2 and 3 were in use. Fifteen of these species were also collected during the present survey, but the following were not collected: eastern coral bean (Erythrina herbacea L.), Florida purslane (Richardia scabra L.), blackeyed coneflower (Rudbeckia hirta L.), and Triodais biflora (Ruiz & Pavon) Greene. Eastern coral bean and T. biflora were probably not collected because of the time of the survey (June, July, and August). Florida purslane and blackeyed coneflower were observed in the surrounding area, and a more complete survey would probably have found them on the grid.

Ward (Reference 7) listed 41 dicotyledonous species that occurred on Test Area C-52A, and 26 of these were collected on grid number 4.

The number of dicotyledons found in this survey can be compared with a survey of a non-herbicide treated area reported by Grelen in Reference 10. Grelen studied plant succession of three plots (3 acres each) within a 2 mile area near Blountstown, Florida, after the plots were cleared and burned. This area is approximately 70 miles east of Test Area C-52A, and the soil type and rainfall are similar. Grelen collected 73 species of woody plants or herbs during a 3-year survey. Of the species collected on grid number 4, 36% were the same as those collected by Grelen. This percentage difference is not considered significant; 25% of the dicotyledons collected by Grelen were found in only one of three of his plots. Also, only 77% of the species collected by Grelen were collected by Ward on the Eglin Air Force Base Reservation (Reference 4).

In 1969, when the vegetative cover of Test Area C-52A was first examined, defoliant testing was assumed to be primarily responsible for the lack of vegetation on the grids and surrounding area. However, further examination, combined with a historical knowledge of the test grids, showed that several other factors were also involved. It is true that defoliant testing contributed directly to a loss of some vegetation and created barren areas along flight paths, but such factors as mechanical clearing and periodic burning have removed vegetation or inhibited development of vegetation. In the process of developing the test grids, much of the vegetation was removed and periodic burning of Eglin Test Areas is used to inhibit succession of shrubs and thereby maintain grasslands. Succession of vegetation after mechanical clearing tends to be relatively slow on the xeric Lakeland Sand. An example of this is the old bomblet test site that was previously discussed (Figure 4). Portions of this old test site were sprayed directly with defoliants but other portions received little, if any, spray.

Figures 15, 16, and 17 are photographs of grid number 4 taken in 1964. Before and during 1964, grids number 1 and 2 (Figure 1) were the only ones in use. In 1964, the northern half of grid number 4 appeared much as it does in 1971, except for those areas directly under flight paths. Defoliant testing undoubtedly inhibited vegetative succession after mechanical clearing, but if an undisturbed test area had been sprayed, probably an insignificant amount of vegetative cover would have been removed, unless it was directly under a flight path.

Since grid number 1 (Figure 1) received a higher concentration of defoliants than any other grid, it is also important to consider the present vegetation of this grid. The last defoliant testing on grid number 1 was in July 1964. The background of Figure 17 shows grid number 1 as it appeared in 1964. The background of Figure 18 is grid number 1 in July 1971. Presently, most of this area is in vegetative coverage class IV and contains about 17 dicotyledonous species in each 400 by 400 foot section.

Figure 15. A View of Grid Number 4 Looking from the Southeast to the Northwest, 1964

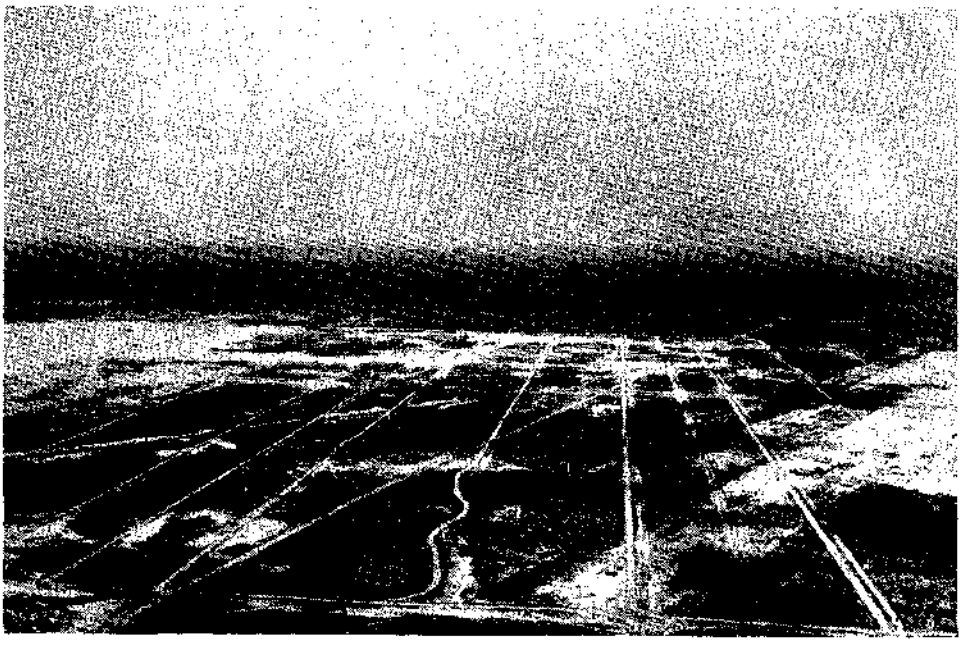

Figure 16. A View of Grid Number 4 Looking from East to West, 1964

Figure 17. A View of Grid Number 4 Looking from North to South, 1964

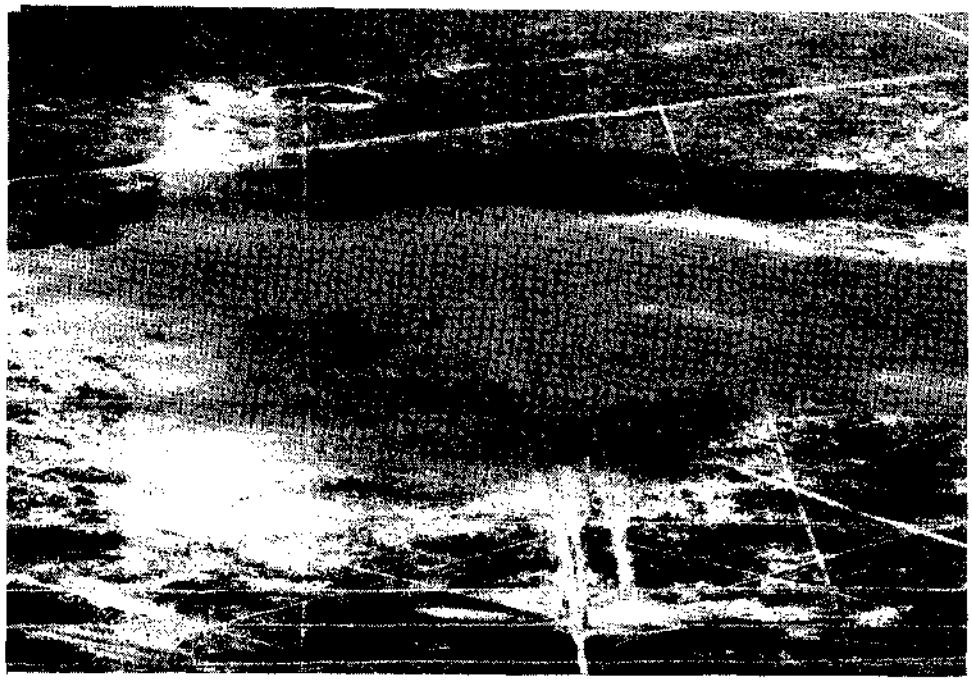

Figure 18. A View of the Southern Portion of Grid Number 4 and Area Occupied by Grid Number 1, July 1971

SECTION IV

CONCLUSIONS

Nine months after the last defoliant mission on the one-square mile grid of Test Area C-52A, 74 dicotyledonous plant species were collected on the grid. The average number of dicotyledonous species ranged from five in areas with 0 to 5% cover to 24 in areas with 80 to 100% cover. All dicotyledons found in a control area, except for two species, also occurred on the one-square mile grid. The results of this study indicate that the levels of defoliant residues in the test grid soil are insignificant and are no longer an influencing factor upon the amount or type of vegetation occurring on the grid. Furthermore, there is no indication that the types of plants occurring on the grid are different from those that would develop in a similar type area that was never sprayed with defoliants. The primary factor influencing the rate of vegetative succession on the grid is soil moisture content as determined by soil type. Although defoliant equipment testing between 1962 and 1970 removed vegetation directly under flight paths, prior mechanical disturbances are also responsible for the low level of vegetative coverage on much of the grid.

REFERENCES

1. Young, A. L. and B. C. Wolverton: Military Herbicides and Insecticides. AFATL-TR-70-1, Air Force Armament Laboratory, Eglin Air Force Base, Florida, 1970. Unclassified.

2. Klingman, G. C.: Weed Control: as a Science. John Wiley & Sons, Inc. 1961.

3. Ward, D. B.: Ecological Records on Eglin AFB Reservation--the First Year. AFATL-TR-67-157, Air Force Armament Laboratory, Eglin Air Force Base, Florida, 1967. Unclassified.

4. Ward, D. B.: Ecological Records on Eglin AFB Reservation--Conclusions. AFATL-TR-70-55, Air Force Armament Laboratory, Eglin Air Force Base, Florida, 1970. Unclassified.

5. Hunter, J. H. and B. M. Agerton: Annual Diameter Growth of Conifers Adjacent to Eglin Reservation Test Area C-52A as Related to the Testing of Defoliant Spray Equipment. AFATL-TR-71-52, Air Force Armament Laboratory, Eglin Air Force Base, Florida, 1971. Unclassified.

6. Sturrock, T. T. and A. L. Young: A Histological Study of Yucca filamentosa L. from Test Area C-52A, Eglin Reservation, Florida. AFATL-TR-70-125, Air Force Armament Laboratory, Eglin Air Force Base, Florida. 1970. Unclassified.

7. Ward, D. B.: Ecological Records on Eglin AFB Reservation--the Second Year. AFATL-TR-68-147, Air Force Armament Laboratory, Eglin Air Force Base, Florida, 1968. Unclassified.

8. Department of Defense: Herbicide Manual for Noncropland Use. Air Force Manual 91-19, Department of the Air Force, Washington, D. C. 1970. Unclassified.

9. Beetle, A. A.: Recommended Plant Names. Research Journal No. 31, University of Wyoming, Laramie. 1970. Unclassified.

10. Grelen, H. E.: Plant Succession on Cleared Sandhills in Northwest Florida. The American Midland Naturalist, 67:36-44. 1962.

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INITIAL DESCRIPTION

AFSC/DLW	2
/SDWM	1
/IGFG	1
/DPSL TECH LIB	1
TAC/LGWM	1
/DRAR	1
ASD/ENYS/MR HARTLEY	1
/XRH	2
AFML/LL	1
AFIT/ENB	1
SAC/NRI	1
/XPHN	1
DIR, DEF NUCLEAR AGENCY/APTL	1
CIA/CRS/ADD/PUBLICATIONS	2
CIA/MRS SILVIA	1
US AEC/LIBRARY BRANCH G-049	1
AIR UNIVERSITY/AUL/LSE-70-239	1
DIR, TECH INFO, ADV RSCH PROJ AGCY	1
DDR&D/ENGR TECH	1
DEF INTEL AGENCY/DI-6E1	1
SAAMA/SPQT	1
USAF ENVIR HEALTH LAB/CC	1
AF/EHL	1
US ARMY MUCOM /OPR RSCH GRP	1
EDGEWOOD/WMUEA-DE-MA	1
/SMUEA-CL-PD	1
ABERDEEN PRV GND/TECH LIB	1
USNWC/CODE 753	2
USA TEST & EVAL COMD/AMSPE-NB	1
FRANKFORD ARSENAL	1
USN WEAPONS LAB/GB & GW	2
US ARMY MSL CMD/CH, DO SEC	2
DESERET TEST CENTER/TECH LIB	1
CH, VEG CONTROL DIV	4
USA CHEMICAL SCHOOL/AJMCL-A	2
USN ORD STA/TECH LIB	2
DDC	12
OAK RIDGE NATL LAB	4
AFATL/DL	1
/DLOSL	3
/DLI	1
/DLIP	60
/DLIF	1
/DLIW	1
/DLU	1
ADTC/WE	1
USAFTAWC/DT	1
/TEYM	1
/CB	2
USAFSOF/DOR	2
/DM	2
AFATL/DLR	1
/DLX	1
/DLY	1
/DLG	1
ADTC/TSGGL	2
/DEN	2
USAFA/DFLS/CAPT YOUNG	25

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13. ABSTRACT

Nine months after the last defoliant-equipment test mission on the one-square-mile grid of Test Area C-52A, a vegetative coverage survey was conducted. The percent of vegetative coverage within 169 sections (each 400 by 400 feet) was ranked in one of six possible classes. The survey can serve as a basis for future studies on vegetative succession of the grid. The average number of dicotyledonous (broadleaf) plants was determined for each coverage class. Seventy-four dicotyledonous species were found on the one-square mile grid and the average number of species within vegetative coverage classes ranged from five in class 0 (0 to 5% cover) to 24 in class V (80 to 100% cover). A control area contained 28 species, all of which were also on the grid except for two species. Diodia teres, Rhynchosia galactioides, and Tithymalus spaerospermus were the most common dicotyledons and D. teres, T. spaerospermus, Stylisma villosa, and Lupinus diffusus were the first plants to invade barren or class 0 areas. The existence in class 0 or class 1 areas of dicotyledonous plants that are susceptible to the active ingredients of military defoliants indicates that the amount of defoliant residues in the soil is insignificant. The present vegetative coverage of sections of the grid is due to a combination of soil moisture content, prior mechanical disturbances and prior defoliant spraying. Although vegetation was removed by defoliant spraying in areas under flight paths, the low level of vegetative coverage in other areas is primarily due to prior mechanical clearing. In those areas having a relatively high soil moisture content, considerable vegetation has returned, regardless of whether the vegetation was removed mechanically or by defoliants.

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Mechanical Clearing						
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