TABLE III

COST COMPARISON PER ACRE OF THE FOUR HERBICIDES USED ON THE BROAD RIVER PROJECT

	Ammate	*2, 4, 5-T*	*Fenuron**	*Monuron†*	*Bulldozing*
Labor	$17.70	$17.10	$ 11.50	$....	$....
Chemical	22.50	9.66	95.00	....	....
Oil	....	9.78	....	....	....
Dozer and Operator	....	....	....	....	90.00‡
TOTALS	$40.20	$36.54	$106.50	$....	$90.00

* Based on 5-10 active per stem.
† Cost not available.
‡ Does not include time spent by resident game manager on hand clean-up work necessary to condition areas for tilling.

SUMMARY

It is apparent that fenuron and monuron are the most effective herbicides for killing a greater proportion of the tree species; fenuron being more desirable because quicker results are obtained. Both of these herbicides can be easily transported into inaccessible areas in knap sacks and no other equipment is necessary. Areas treated with these chemicals could be left until the stems have partially decayed then remove them or leave undisturbed for their value as an open area. A considerable number of annual and perennial plants invaded these areas during the first growing season after treatment. Oak and sassafras seedlings were present in limited numbers.

Due to the great number of sprouts produced by the use of Ammate, this method of treatment might be used to produce browse in areas where it is desired, but because the original stems must be frilled and treated or cut and stump treated (not carried out in this experiment) and equipment necessary, Ammate would probably be used on a limited scale.

The use of 2, 4, 5-T in spaced ax-cut frills is not a satisfactory method of creating an opening such as might be used for a wildlife clearing or removing undesirable tree species. Perhaps a frill consisting of overlapping axe cuts would be more effective.

Herbicides as a wildlife management tool shows great promise for creating wildlife clearings and controlling undesirable tree and shrub species. It is improbable that they will replace bulldozing as a method of creating clearings; what is to be accomplished and accessibility of areas will be the determining factors.

WILDLIFE HABITAT MANAGEMENT IN FLORIDA NATIONAL FORESTS

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INTRODUCTION

The signing of a cooperative wildlife agreement on 20 December 1937 between the U. S. Forest Service and the Florida Game and Fresh Water Fish Commission paved the way for a united effort to properly manage the wildlife on Florida National Forests. This agreement has been revised and brought up-to-date on several occasions in order to meet changing wildlife needs in our forest lands. The cooperative agreement spells out in detail the responsibilities of each agency toward a united wildilfe program.

Throughout the State of Florida the Game and Fresh Water Fish Commission operates 31 wildlife management areas, four of which are located on National Forest lands. A special $5.00 fee entitles hunters to participate in 27 of these managed hunts. The cooperative agreement, previously mentioned, provides that

a certain percentage of the monies collected on the wildlife management areas will be turned over to the U. S. Forest Service. This money will be spent by the Service in carrying out its wildlife obligations under the cooperative wildlife agreement.

During the first 10 to 15 years of the cooperative agreement, the majority of the money collected from the managed hunts was spent in providing check stations, law enforcement, and other activities directly connected with the operation of the managed hunts. For the past five or six years, a large percentage of the U. S. Forest Service's portion of the management area receipts has gone into wildlife habitat improvement work. The Game and Fresh Water Fish Commission's portion of the money has gone toward hunt operation expenses, law enforcement, and the hiring of temporary labor to carry out the increased work load necessitated by the managed hunts.

It is the responsibility of both agencies to prepare and formulate wildlife habitat improvement work plans. As the Game and Fresh Water Fish Commission has trained wildlife biologists working in the National Forests, the U. S. Forest Service relies heavily on these trained men to help formulate good sound programs. After the plans have been approved by both agencies, the U. S. Forest Service provides the men and machinery to see that the recommended program is carried out. Wildlife biologists of the Game and Fresh Water Fish Commission follow up the habitat improvement work with periodic inspections to determine the degree of vegetational changes, the wildlife usage, and the over-all success of the program.

Although the wildlife habitat improvement program is relatively new in the Florida National Forests, and a limited amount of money is available for this work, the authors feel a very sound habitat improvement program is underway and the future holds a great opportunity for continued wildlife habitat improvement. Progress made to date is especially gratifying, as it is due to the combined efforts of the U. S. Forest Service and the Florida Game and Fresh Water Fish Commission.

STUDY METHODS

In order to evaluate the various wildlife habitat improvement programs, as well as to determine the degree of wildlife utilization, a vegetational study was conducted in those areas receiving wildlife habitat improvement.

The system used in these studies was the 100 percent clipping method originated by Campbell and Cassady (1951) termed the "Forage Weight Method of Range Inventory." As this system was originally used for grasses only, it was adapted to all forms of vegetation available to wildlife, particularly deer.

Collection of plot data in the field consisted of the following steps:

1. Sample plots were spaced close together (10 paces) in areas of small acreage, while in larger and more uniform types plots were spaced farther apart (50 paces). Spacings between plots were equal and in straight lines approximately perpendicular to the type boundary.
2. Plot numbers were determined by the following method:
   a. Twenty plots, each 19.22 square feet in size, were taken.
   b. An important plant species was selected which had a frequency of occurrence of approximately 50 percent.
   c. The standard deviation of the mean value was derived for this species.
   d. The following formula (Hanson and Graybill, 1956) was applied to obtain the allowable gram error.

$$N = \frac{4\ 0^2}{e^2}$$

Where N = number of samples.
0 = standard deviation of the mean value.
e = allowable error—5 percent.
4 = approximately value squared for 95 percent probability for any species which occurred 55 percent of the time in the 20 plots.

From this figure the number of plots necessary to reduce the allowable gram error to the degree desired may be determined. A five percent gram error was considered in most cases to be allowable; however, in one or two instances a ten gram error was allowed.

3. The quantity of browse available on each plot was determined by first clipping and weighing in grams all portions of each individual species of plant that were considered edible by either deer or cattle. Only those portions of plants within reach of deer (*i. e.,* within four and one-half feet of the ground) were weighed. The total available browse on a plot was then obtained by adding the weights of each plant species present.

4. Samples weighing at least 100 grams of each species of vegetation that was clipped were saved separately in paper bags labeled with the date, plant species, type of vegetation, and green weight in grams. These samples were then air dried for at least 30 days and weighed again to obtain the moisture loss for each species. The amount of air dry forage available in pounds per acre was then calculated.

5. Data for each plot were placed on separate 3" x 5" file cards. Each card contained the following information: area, date, green weight in grams, air dry weight in grams, percent utilization, and vegetation type.

A two or three man survey team is desirable; one or two to clip plants and one to record data. For convenience in carrying, scales were fastened in a close fitting plywood box open in front and on top.

Utilization of grasses and herbaceous material was determined by the following descriptive scale taken from Campbell and Cassady (1951).

Description	*Utilization (%)*
Leaf tips bitten off on occasional grass tufts, or herbs	10
Leaf tips bitten off ¼ to ½ of grass tufts present	20
Leaf tips bitten off ½ to ¾ of grass tufts and herbs	30
Leaf tips bitten more than ¾ of grass tufts and herbs present, occasional patches left ungrazed	40
Leaf tips bitten off nearly all grass tufts and herbs; average height remaining vegetation about 4-5 inches; evidence of light trampling	50
Nearly all grasses and herbaceous material closely grazed, especially on burned range, average stubble only 1–3 inches in height; evidence of heavy trampling	60–90

Utilization of small trees and shrubs was determined by counting the number of browsed and unbrowsed twigs on each plant. The ratio of browsed twigs to the total (*i. e.,* browsed and unbrowsed) twigs expressed as a percentage was used to indicate the degree of utilization. Average utilization on a plant species was determined by adding the percentage figures indicating utilization for that species and dividing by the number of plots on which the species occurred. Total average utilization figures for each species and dividing by the number of species which indicated utilization.

Plant names are taken from Robinson and Fernald (1808), Small (1933), and Thorne (1954).

All of the vegetational work and analysis was done by personnel of the Florida Game and Fresh Water Fish Commission.

WILDLIFE HABITAT IMPROVEMENT

Power Line Rights-of-Way

Within the past several years several power line rights-of-way have been established in the Florida National Forests. In many instances these areas provide excellent areas for wildlife habitat improvement work.

At the present time the majority of this type of improvement work is being conducted in the Ocala National Forest and primarily in those areas lying within a sand pine habitat. The sand pine habitat is characterized by extremely dense stands of sand pine (*Pinus clausa*), palmetto (*Sabal etonia*), myrtle oak (*Quercus myrtifolia*), Chapman's oak (*Quercus Chapmanii*), and scrub live oak (*Quercus geminata*). The soil is of sand origin and is considered very sterile.

Deer is the only major wildlife species found in abundance in these areas and habitat improvement work in the power line rights-of-way was aimed toward improving the deer habitat.

Studies carried on by Strode (1954) showed that when vegetation in the sand pine areas was subjected to a single cutting by a tandem drum brush cutter not only was the amount of available forage increased but also a substantial increase in the number of preferred browse species was noted.

Armed with this information two methods of habitat improvement were formulated. Where a wide right-of-way existed a strip approximately one-half the width of the right-of-way was brush-cut, leaving the uncut strip to be cut in two or three years. At the present time, 60 acres or 15 miles of power line rights-of-way have been treated in this manner in the Seminole District of the Ocala National Forest.

Where a narrow right-of-way exists the entire width will be brush cut periodically in order to keep the native vegetation in a succulent preferred stage of development. At the time of this writing no treatment following this pattern has been done; however, if present plans are followed several miles of power line rights-of-way will be treated in this prescribed manner in the near future.

In other habitat areas a small amount of work has been done in establishing quail and turkey food plots in power line rights-of-way.

It is certain that in the future the power line rights-of-way in the Florida National Forests will receive greater attention in the wildlife habitat improvement program. Vegetational studies were not conducted in the power line rights-of-way as the vegetational situation was identical to the road rights-of-way, and this program is discussed later in this report.

Control Burning

Two specific types of wildlife burning are being conducted on the Florida National Forests. During the past year 1,265 acres in the Ocala National Forest and 14,767 acres in the Apalachicola National Forest were control burned for wildlife in a routine prescribed manner. Along with the wildlife control burning, 70,543 acres were control burned as part of the forestry management program. The great majority of this control burning was beneficial to the wildlife habitat.

In addition to the above wildlife burning, 527 acres were control burned in the Ocala National Forest in a strip pattern. This area, located in the Lake George Ranger District, consisted entirely of a longleaf pine habitat type. The pattern of the strip burning was as follows: a one-fourth mile strip was control burned across the area, a one-fourth mile strip was left unburned, to be followed by another one-fourth mile strip of burning.

The strip burned area has a good population of deer and a poor population of quail. Prior to the strip burning program, this area had not been control burned for several years and the ground cover was very heavy.

It should be pointed out that in Table I the plots for the strip-burned area were taken approximately 10 months following burning, while the control had not been burned for three to four years. It should also be pointed out that livestock is not present in this area and all plant utilization can be attributed to deer.

The most apparent and significant fact shown in Table I is that although a greater pondage per acre of all vegetation was found in the control, plant species in the strip burned areas received considerable deer utilization, while no utilization was recorded in the control.

TABLE I

STRIP CONTROL BURNED IN OCALA NATIONAL FOREST. TWENTY PLOTS TAKEN

	Strip Burn			*Control*		
Species	*Lbs./ Acre*	*% Occur.*	*% Util.*	*Lbs./ Acre*	*% Occur.*	*% Util.*
WOODY PLANTS:						
Quercus geminata	38.5	38.0	33.0	35.0	5.0	0
Quercus laevis	0.10	4.7	0	. .	. .	–
Quercus cineria	0.45	4.7	10.0	1.7	10.0	0
Geobalnus oblongifolius	15.0	61.8	0.8	7.3	45.0	0
Smilax sp.	0.5	4.7	50.0	. .	. .	–

TABLE I—*Continued*

STRIP CONTROL BURNED IN OCALA NATIONAL FOREST. TWENTY PLOTS TAKEN

	Strip Burn			*Control*		
Species	*Lbs./ Acre*	*% Occur.*	*% Util.*	*Lbs./ Acre*	*% Occur.*	*% Util.*
Ceanothus microphyllus	4.0	4.7	10.0	1.8	10.0	0
Diospyros virginiana	. .	. .	. .	14.6	30.0	0
Muscadinia minsoniana	. .	. .	. .	1.3	20.0	0
Vaccinium Myrsinites	. .	. .	. .	0.2	5.0	0
SUB-TOTAL	58.5			62.8		
FORBES:						
Eupatorium sp.	3.5	4.7	0	3.1	55.0	0
Legume spp.	24.0	100.0	5.2	4.6	65.0	0
Legume spp.	1.0	4.7	0	. .	. .	–
Stillingia sp.	4.0	28.5	1.6	0.05	5.0	0
Chrysopsis gramnifolia	4.5	9.5	0	0.4	5.0	0
Berlandiera subacaulis	2.0	9.5	0	1.2	20.0	0
Pterocaulon undulatum	2.0	14.2	3.3	0.1	5.0	0
Chamaecrista sp.	1.0	9.5	25.0	. .	. .	0
Cirsium horridulum	. .	. .	. .	1.4	10.0	0
Elephantopus elatus	. .	. .	. .	2.7	40.0	0
Jatropha stimulosus	. .	. .	. .	0.3	5.0	0
Stylosanthus biflora	. .	. .	. .	0.2	10.0	0
Pteris latisculata	. .	. .	. .	1.2	15.0	0
Viola c. f. septemloba	. .	. .	. .	0.6	25.0	0
SUB-TOTAL	42.0			15.8		
GRASSES AND SEDGES:						
Andropogon sp.	3.0	19.0	0	. .	. .	–
Panicum sp.	1.5	33.0	1.4	5.6	35.0	0
Aristida spp.	104.0	100.0	0	240.1	95.0	0
Grass (unidentified)	. .	. .	. .	0.7	15.0	0
SUB-TOTAL	108.5			246.4		
TOTAL	209.0			325.0		

Double Burn

On occasions a unique situation, referred to as a "double burn," occurs in the sand pine areas of the Ocala National Forest. This situation occurs when an area of sand pine burns, and before the progeny can reach a seed producing age another fire burns through the area. This leaves a habitat that for many years is practically devoid of sand pine; however, the area does develop a very dense and heavy stand of scrub vegetation. This creates a situation that is not beneficial from a timber production standpoint, and at the same time it is too thick in most instances to be desirable deer habitat.

In order to open up these areas and to reduce the scrub vegetation to a sprouting succulent stage of development, preferred by deer, the following treatment was administered: a strip 35 feet wide was cut across the "double burn" area, a strip seven feet wide was left uncut.

This alternate pattern of strip cutting was continued across the area. The majority of the brush cutting operations in this and other wildlife habitat work was done with a drum type of tandem chopper. These areas received a single chopping as further chopping would be detrimental to the existing vegetation. The purpose in leaving the strips of uncut vegetation was to maintain a supply of mast producing scrub oaks to help meet the needs of wildlife.

At the time of this writing, 260 acres of "double burn" areas have been treated in the Ocala National Forest. Additional wildlife habitat improvement work will be done in these areas at a later date.

TABLE II

"DOUBLE BURN" WILDLIFE HABITAT IMPROVEMENT IN THE OCALA NATIONAL FOREST

Species	Brush Cut (60 Plots) Lbs./ Acre	% Occur.	% Util.	Uncut (30 Plots) Lbs./ Acre	% Occur.	% Util.
WOODY PLANTS:						
Quercus myrtifolia	616.5	90.0	2.2	462.5	93.3	0
Quercus geminata	49.5	46.6	3.0	42.0	16.6	6.0
Quercus Chapmanii	171.0	53.3	2.5	135.5	50.0	0
Xolisma ferruginea	196.0	40.0	0	42.5	43.3	0
Pinus clausa	0.025	1.6	0	. .	. .	–
Serenoa repens	82.0	25.0	0	43.0	16.6	0
Smilax auriculata	0.020	1.6	50.0	. .	. .	–
Zamia integrifolia	15.0	5.0	0	. .	. .	–
Polycodium floridanum	0.20	1.6	0	. .	. .	–
*Sabal Etonia**	266.0	51.6	0	176.0	46.6	0
Vaccinium Myrsinites	21.0	25.0	4.6	43.5	30.0	4.4
Tamala humilis	1.9	1.6	0	. .	. .	–
Hypericum sp.	.4	.15	0	. .	. .	–
Ceratiola ericoides	15.0	3.3	0	. .	. .	–
Ceanothus microphyllus	3.5	1.6	0	. .	. .	–
Garberia fruiticosa	4.0	6.6	0	. .	. .	–
SUB-TOTAL	1,442.0			945.0		
FORBES:						
Miscellaneous	.8	6.6	2.5	. .	. .	–
Cnidoscolus sp.	.1	1.6	0	. .	. .	–
Legume sp.	3.1	25.0	6.0	1.0	3.3	0
Legume spp.	.1	3.3	5.0	. .	. .	–
Petalostemon sp.	.6	1.6	0	. .	. .	–
SUB-TOTAL	4.75			1.0		
GRASSES AND SEDGES:						
Andropogon sp.	.4	10.0	0	.05	3.3	0
Rynchospora sp.	.1	6.6	0	.05	3.3	0
SUB-TOTAL	.5			.10		
TOTAL	1,447.25			946.1		

* *Sabal Etonia* bore fruit in 42 percent of the 31 plots in which it occurred in the brush-cut areas and bore fruit in 21 percent of the 14 plots in which it occurred in the uncut areas.

Examination of Table II shows a greater number of plant species and pounds of available vegetation as well as a greater wildlife utilization in the brush cut areas compared to those areas that were uncut. Also of importance is the higher percentage of palmetto berry production in the brush cut areas. Palmetto berries are highly preferred by deer and are also utilized by bear and other wildlife species.

Road Rights-of-Way

Wildlife habitat improvement work has been conducted on three miles of road rights-of-way in the Ocala National Forest. This work was accomplished within the sand pine habitat in an even age stand of pine. Such stands of even age sand pine in themselves are not very productive for deer, but if these areas are interspersed with different age stands, occasional openings, and vegetative breaks, they provide good deer habitat.

The habitat improvement program for road rights-of-way is similar to the improvement program already discussed under power line rights-of-way. The major portion of the road rights-of-way were cut with a tandem brush cutter

leaving a narrow strip of scrub oak vegetation along both sides of the road in order to provide needed oak mast. This work was done on little used woods roads.

As the sand pine habitat consists of extremely dense vegetation, it is virtually impossible to control burn in these areas. The greatest need in the majority of the areas of the sand pine region is to create small openings and reduce the present vegetation to a succulent stage of development. At the present time, the only practical way to do this is by mechanical means. In mature stands of sand pine, pulpwood cutting operations are creating a very suitable habitat for deer (Strode, 1954).

Table III shows the brush cut areas produced a greater amount of available vegetation as well as a larger number of plant species. Considerable wildlife utilization was present in both area; however, the brush cut area did provide the greatest amount of utilization. The same vegetative picture occurred in this program as experienced in other sand pine areas.

Brush cutting operations, such as described above, have the advantage not only of improving the wildlife habitat but also of providing a fire break in a potentially dangerous fire situation.

TABLE III

ROAD RIGHTS-OF-WAY HABITAT IMPROVEMENT IN THE OCALA NATIONAL FOREST

	Brush Cut (60 Plots)			*Control—20 Year Sand Pine (22 Plots)*		
Species	*Lbs./ Acre*	*% Occur.*	*% Util.*	*Lbs./ Acre*	*% Occur.*	*% Util.*
WOODY PLANTS:						
Xolisma ferruginea	80.0	15.0	0	. .	. .	–
*Sabal Etonia**	783.5	76.6	1.0	322.5	45.4	0
Quercus myrtifolia	383.5	78.3	4.9	302.5	95.4	3.3
Quercus geminata	78.0	45.0	7.4	35.5	59.0	6.1
Garberia fruiticosa	1.5	3.3	0	. .	. .	–
Quercus Chapmanii	66.0	28.3	4.7	27.5	22.7	6.0
Geobalanus oblongifolius	2.5	11.6	10.0	25.0	77.2	2.9
Quercus laevis	71.0	25.0	5.3	4.5	22.7	0
Pinus clausa	.40	3.3	0	. .	. .	–
Tamala humilis	3.0	1.6	0	. .	. .	–
Smilax auriculata	1.4	3.3	50.0	.40	13.6	26.0
Serenoa repens	2.8	3.3	0	51.0	18.1	0
Vaccinium Myrsinites	2.6	5.0	0	.2	4.0	20.0
Hypericum sp.	0.2	1.6	0	. .	. .	–
Ceratiola ericoides	. .	. .	. .	9.5	31.7	0
Ilex sp.	. .	. .	. .	0.1	4.0	0
SUB-TOTAL	1,476.22			778.7		
FORBES:						
Miscellaneous	3.0	45.0	0	.25	13.6	0
Legume sp.	38.5	73.3	1.8	10.0	54.5	0
Eupatorium sp.	.01	1.6	0	. .	. .	–
Crotolaris sp.	.10	1.6	0	. .	. .	–
Petalostemon sp.	9.5	16.6	1.0	. .	. .	–
Asclepias sp.	.15	1.6	0	. .	. .	–
Stillingia sp.	6.0	10.0	1.6	. .	. .	–
Rynchosia sp.	.7	5.0	0	.20	9.0	0
Chyrsopsis sp.	7.5	26.6	12.5	. .	. .	–
Cridoseolus sp.	.20	8.3	0	. .	. .	–
Liatrus sp.	.75	10.0	1.6	. .	. .	–
Rynchospora dodecandra	.02	1.6	0	. .	. .	–
Legume spp.	. .	. .	. .	1.15	22.7	18.0
SUB-TOTAL	66.43			11.6		

* *Sabal Etonia* bore fruit in 44 percent of the 46 plots in which it occurred in the brush-cut areas and bore fruit in 30 percent of the 10 plots in which it occurred in the control.

TABLE III—*Continued*

ROAD RIGHTS-OF-WAY HABITAT IMPROVEMENT IN THE OCALA NATIONAL FOREST

Species	*Brush Cut (60 Plots)* Lbs./ Acre	% Occur.	% Util.	*Control—20 Year Sand Pine (22 Plots)* Lbs./ Acre	% Occur.	% Util.
GRASSES AND SEDGES:						
Cyperus sp.	10.5	36.6	0.4	. .	. .	–
Andropogon sp.	2.0	56.6	0	1.3	36.3	0
Panicum sp.	.35	8.3	0	. .	. .	–
SUB-TOTAL	12.85			1.3		
TOTAL	1,555.50			791.6		

Titi

Within the Apalachicola National Forest are found large areas of almost impenetrable titi. These areas are commonly referred to as "titi swamps" or "titi thickets". They are located in very wet sites and in most instances the vegetation is very dense. Both white titi (*Cyrilla racemiflora*) and black titi (*Cliftonia monophylla*) are present.

The examination of deer stomach samples taken from the Apalachicola National Forest showed that titi was a highly preferred deer browse species especially in those areas where a fire had penetrated into the edge of a "titi swamp".

Based upon this information, two types of vegetational habitat improvement work have been tried in these areas. Control burning was attempted but due to the very wet site it was difficult to burn even into the edge of the titi unless a head fire was run into the thicket. This was also tried and proved successful where the timber situation was such that a head fire could be used. In other instances a bulldozer was used around the perimeter of these areas. Mechanical penetration into the titi is also difficult due to the wet site in which titi grows.

During the past year, 60 acres of titi were treated for wildlife habitat improvement. Results from both methods of treatment indicated that control burning would probably be the best and cheapest method to use in future operations. At present the authors feel that routine control burning operations in these areas will burn enough of the edges of the "titi swamps" for desired results to be obtained without spending additional wildlife money on this project.

Wildlife utilization was not recorded in the vegetational studies in the "titi swamps". Examination of Table IV shows the habitat improvement work in the titi increased the available pounds of vegetation per acre from 228.6 pounds to 896.1 pounds. Some of the preferred deer browse plants showing an increase were *Ilex glabra, Ilex coriacea, Cliftonia monophylla,* and *Smilax laurifolia.* A marked increase in herbaceous species was also noted in the treated areas.

TABLE IV

TITI WILDLIFE HABITAT IMPROVEMENT IN THE APALACHICOLA NATIONAL FOREST

Species	*Bulldozed (20 Plots)* Lbs./Acre	% Occur.	*Control (20 Plots)* Lbs./Acre	% Occur.
WOODY PLANTS:				
Pieris nitida	145.0	88.0	18.5	45.0
Ilex coriacea	457.0	100.0	92.5	80.0
Serenoa repens	9.0	17.0	. . .	. . .
Ilex glabra	1.6	5.9	19.5	5.0
Cliftonia monophylla	106.0	94.1	51.5	55.0
Rubus sp.	26.0	29.0	. . .	. . .
Gaylussacia hirtella	12.0	53.0	1.1	15.0
Vaccinium Myrsinites	0.4	5.9	. .	. . .
Polycodium floridanum	4.0	23.0	. .	. . .
Aronia arbutifolia	14.0	35.0	. .	. . .
Persea borlonia	36.0	35.0	6.1	15.0

TABLE IV—*Continued*

TITI WILDLIFE HABITAT IMPROVEMENT IN THE APALACHICOLA NATIONAL FOREST

Species	*Bulldozed (20 Plots)* Lbs./Acre	% Occur.	*Control (20 Plots)* Lbs./Acre	% Occur.
Smilax laurifolia	28.0	47.0	2.2	45.0
Ilex sp.	34.0	17.0	0.1	5.0
Magnolia virginiana	8.0	5.9	5.5	10.0
Myrica inodora	. .	. .	0.6	5.0
Ilicium floridanium	. .	. .	28.2	55.0
Vitis sp.	. .	. .	0.1	5.0
Pinckneya pubens	. .	. .	1.6	10.0
SUB-TOTAL	881.0		227.1	
HERBACEOUS MATERIAL:				
Carex sp.	6.0	29.0	. .	. . .
Osmunda regalis	2.4	23.0	1.5	10.0
Fern (Unidentified)	0.1	5.9	. .	. . .
Xyris sp.	0.3	5.9	. .	. . .
Rynchospora sp.	2.4	12.0	. .	. . .
Eriocaulon sp.	2.4	17.0	. .	. . .
Rhexia sp.	0.3	5.9	. .	. . .
Iris sp.	1.1	5.9	. .	. . .
SUB-TOTAL	15.1		1.5	
TOTAL	896.1		228.6	

A very important consideration, not only in the titi work but all of the wildlife habitat improvement work previously discussed, is the fact that research has shown on numerous occasions that young succulent sprouting vegetation is higher in nutritive value than older mature vegetation. This consideration is probably of more importance in this type of habitat work than increasing the quantity of vegetation. This is especially important in some areas of Florida where very poor soil exists and nutritive wildlife foods are at a minimum.

Pine Site Preparation

Pine site preparation, as practiced in the deep sand scrub ridge areas of Florida, cannot in itself be considered an improvement to the wildlife habitat. The general practice followed by private wood-using industries in preparing a scrub ridge for planting is to double chop the whole area with a large tandem brush cutter or to drag a large anchor chain between two bulldozers and windrow the downed vegetation. Both of these operations removes all the vegetation from the treated area. As these practices have been modified in the Florida National Forests in order to meet the needs of wildlife, this program will be considered in this paper as wildlife habitat improvement.

A very extensive area of deep sand consisting primarily of a dense stand of turkey oak (*Quercus laevis*) is found in the northern part of the Leon Ranger District of the Apalachicola National Forest. In a few instances a good stand of longleaf pine is present but in most of the area little, if any, pine is present and virtually cannot regenerate due to severe competition from dense stands of scrub oaks. For the past several years this area has produced very little in the way of timber products and furthermore wildlife populations have been extremely low. It is not known at this time whether the low wildlife populations are due to an adverse habitat condition or other unknown factors.

In order to convert this fairly extensive area of deep sand into timber productivity and also to maintain a habitat suitable for wildlife, several meetings and field trips were held with personnel of the Game and Fresh Water Fish Commission and the U. S. Forest Service attending.

Keeping in mind the need of producing timber as well as wildlife in this area, the following program was inaugurated and at the present time 1,100 acres have been developed in the following prescribed manner. Where the pine

plantation was less than 100 acres in size, no special wildlife considerations were given; however, if the pine plantation was over 100 acres in size, for every ten chains of plantation a strip five chains wide was left in its present condition, alternating with the cleared strips. A one-half chain strip on each perimeter of the five chain strip was treated to one application of the tandem brush cutter. Where the pine plantation was located adjacent to a swamp or different habitat type, the five chain strip was run at right angles to the different habitat type and a five chain buffer strip was left unplanted between the plantation and the new habitat. In addition to the above, an occasional live oak (*Quercus virginiana*) hammock was found in these areas and was left untreated. In those situations where a small scrub ridge was present in a continuous titi and flatwoods habitat, every effort was made to maintain this ridge in its present condition.

It should be pointed out that scrub oaks provide a good source of oak mast which is available to wildlife during the critical months of January, February and March. Oak species found in the bottom lands produce their mast earlier than the scrub ridge oaks. By preserving a supply of both bottomland and scrub oaks, it is possible to have oak mast available for a six months' period.

Following the completion of the pine site preparation, as prescribed above, a wildlife habitat improvement program was conducted in the five chain strips of vegetation left in the plantation areas.

It is recognized that oaks are extremely valuable to many species of wildlife; however, it should also be recognized that it is possible to have such a dense stand of oaks in a given area they crowd out the majority of the ground cover, either by moisture competition or shading. They also compete with each other to such an extent that little oak mast is produced. In the five chain strips under consideration, a situation generally existed of too many oaks in a given area of land. The majority of the oaks was small and scrubby, was producing very little mast and was seriously affecting the ground cover. In order to provide as many vegetational changes as possible in a limited area, increase the ground cover species, and lessen the competition between oaks to grow better mast producing trees, further improvement work was done. For every three chains of the vegetation strip, two chains were treated in the manner described in Figure 1.

Table V shows the one-half chain single chop areas are producing a greater amount of vegetation than either the pine plantations or the natural vegetation strips. However, a large percentage of this increase is due to a dense stand of sprouting turkey oak. This vegetational study was conducted approximately eight months after the original site preparation was started. Wildlife utilization was not recorded in this survey as wildlife populations are too low to accurately record these data.

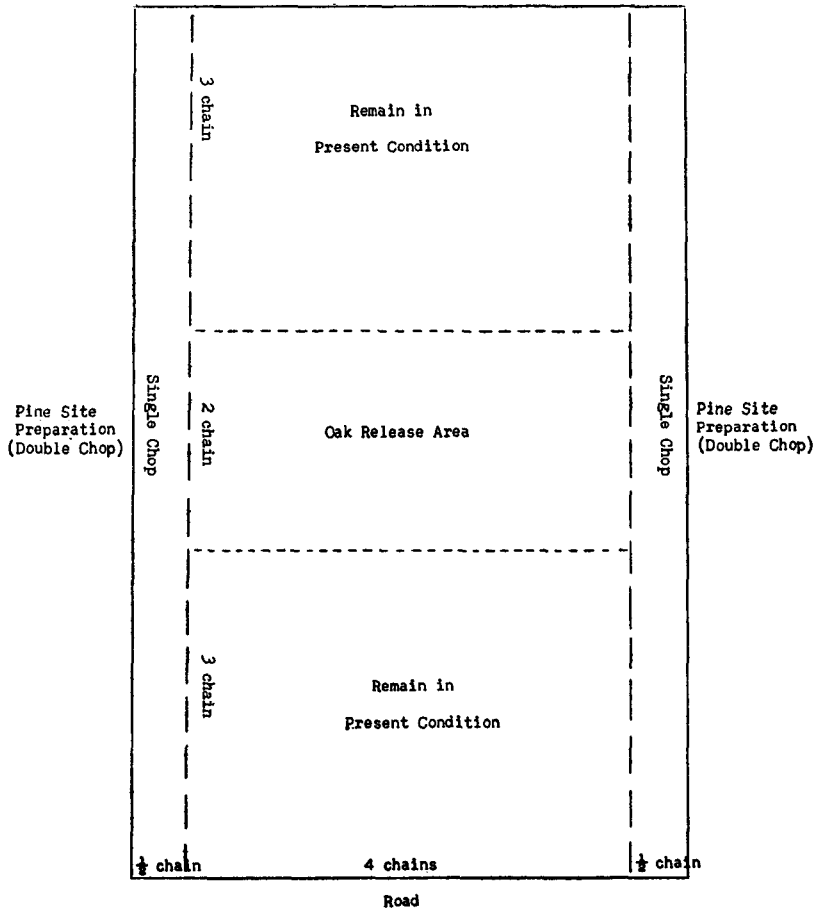
The authors feel that the above described program will convert the greater portion of the deep sand scrub regions of the Apalachicola National Forest into timber productivity as well as provide a suitable habitat for wildlife.

Wildlife Food Plots

The majority of the wildlife habitat improvement work for the last several years has been aimed toward managing and improving the native vegetation; however, a small program of wildlife food plantings has been carried out. The majority of the wildlife food plot work was conducted in the Apalachicola National Forest. Recently, however, ten acres of land have been prepared for quail food plots in the Ocala National Forest. Special emphasis has been placed on quail and turkey food plots, although six plots have been established for deer.

Details on the food plot development will not be given in this report as they were established and planted in compliance with accepted procedures for wildlife food plantings for the State of Florida.

Figure 1. Wildlife Habitat Improvement in Five Chain Vegetational Strip (Pine Site Preparation Area).



1. All oaks were removed from the two chain strip except ten well-formed turkey oaks distributed throughout the area. In addition to these ten oaks, all post oaks (*Quercus stellata*) and live oaks were left uncut. In selecting the ten turkey oaks, care was taken to select the trees with the largest d. b. h., providing they were sound, had a good crown, and were scattered throughout the area.
2. No other species, including pine trees or shrubs, were removed from the two chain treated areas.

TABLE V

PINE SITE PREPARATION PROGRAM IN THE APALACHICOLA NATIONAL FOREST

Species	Natural Veg. Strip (20 Plots) Lbs./ Acre	% Occur.	Single Chop (30 Plots) Lbs./ Acre	% Occur.	Pine Plantation (30 Plots) Lbs./ Acre	% Occur.
WOODY PLANTS:						
Quercus laevis	107.0	55.0	417.5	83.0	108.0	53.0
Gaylussacia dumosa	11.5	35.0	6.5	13.0	3.1	20.0
Vaccinium nitidum	1.1	10.0	25.0	30.0	0.9	3.0
Geobalanus oblongifolius	19.0	40.0	11.0	36.0	1.7	20.0
Quercus cinerea	22.0	40.0	4.0	6.0	30.0	6.0
Quercus stellata	23.0	15.0	3.0	3.0	..	..
Diospyrus virginiana	2.0	5.0	..	..	0.1	3.0
Ceanothus intermedia	.4	5.0	..	..	..	..
Asclepias sp.	..	..	2.0	3.0	..	..
Smilax bona-nox	..	..	0.1	3.0	0.8	3.0
Vitis sp.	..	..	..	..	0.1	3.0
Pinus sp.	..	..	..	..	0.6	10.0
SUB-TOTAL	186.0		469.1		145.4	
HERBACEOUS MATERIAL:						
Pteris latisculata	11.5	40.0	11.0	33.0	4.0	3.0
Unidentified	1.9	60.0	19.5	76.0	4.5	33.0
Commelinaceae sp.	0.7	15.0	..	..	..	..
Cyperis sp.	0.2	5.0	..	..	0.1	3.0
Xyris sp.	0.1	5.0	2.5	56.0	..	..
Legume sp.	0.9	45.0	2.0	66.0	0.5	26.0
Euphorbia sp.	0.3	15.0	0.5	16.0	0.7	23.0
Stillingia sp.	0.6	10.0	0.9	23.0	0.4	13.0
Rynchospora sp.	..	..	1.5	13.0	..	..
Jatropha stimulosa	..	..	0.5	20.0	0.3	13.0
Chamaecrista sp.	..	..	0.2	3.0	..	..
Gnaphalium purpureum	..	..	2.0	6.0	3.5	6.0
Commelinaceae	..	..	..	..	3.0	10.0
Polygonaceae sp.	..	..	..	..	13.0	3.0
SUB-TOTAL	16.2		40.1		30.0	
GRASSES:						
Panicum sp.	6.0	75.0	48.5	83.0	8.5	53.0
Aristida sp.	6.4	100.0	25.5	93.0	3.7	16.0
Andropogon sp.	0.5	10.0	8.0	20.0	4.6	3.0
Paspalum sp.	0.6	15.0	0.7	4.0	0.3	10.0
SUB-TOTAL	13.5		82.7		17.1	
TOTAL	215.7		591.9		192.5	

SUMMARY

A cooperative wildlife agreement was signed on 20 December 1937 between the U. S. Forest Service and the Florida Game and Fresh Water Fish Commission. This agreement has been the basis of a close working relationship in wildlife management in the Florida National Forest for more than 20 years. The responsibilities of each agency are enumerated under this cooperative agreement.

For the past several years a large portion of the U. S. Forest Service's cooperative wildlife funds has been spent on a wildlife habitat improvement program. Programs described and discussed in this paper are as follows: power line rights-of-way, control burning, "double burn," road rights-of-way, titi, pine site preparation, and wildlife food plots.

With the exception of the food plots, the wildlife habitat improvement program has been aimed at improving the existing habitat. This was accomplished

by control burning and mechanical means. In most instances this work has resulted in an increased supply of preferred wildlife food species. Probably more important than the increase in the quantity of preferred foods is the increase in the quality of the foods. Increased wildlife utilization was noted in those areas receiving wildlife habitat improvement.

The authors feel the present wildlife habitat improvement program in Florida National Forests is producing good results and an expansion of this program in future years is anticipated.

ACKNOWLEDGMENT

A great deal of understanding and spirit of cooperation aimed toward a specific goal are necessary for any program to operate and function smoothly between two public agencies for a period of more than 20 years.

The authors at this time wish to acknowledge all U. S. Forest Service personnel who have been responsible for and connected with the wildlife management program on the Florida National Forests. Without their understanding and help, the wildlife program, as we know it today, would have been impossible.

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PUBLIC RECREATION ON PRIVATE LANDS IN THE SOUTHEAST

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It seems that the boom is on to the out of doors and back to nature concept. More and more pressure is being put on all lands for recreation by the increased number of individuals and families seeking the solitude and esthetics that the out of doors has to offer.

Hunters and fishermen, of course, are a part and parcel of the million of people seeking some sort of recreation on any and all lands available.

There are 358,250,000 acres of timberland in this country classified as privately owned. This acreage is shared by 4,510,000 individuals or companies—an average holding of 79 acres each.

Although my paper is entitled *"Public Recreation on Private Lands in the Southeast"*, I would like first to give a summary of recreation on Forest Industry Lands in the United States.

These figures were compiled as the result of a nationwide survey by the American Forest Products Industries, and are probably the most complete data available at this time.

As the result of a nationwide public opinion survey in 1956, AFPI made a nationwide survey of the forest industries in 1957 to find out just what was being done on company lands in the way of recreation.

The nationwide public opinion survey revealed that only 24 per cent of the general public thought forest industry lands were open to hunting, fishing and other forms of forest recreation. Thirty-seven per cent thought that all industry lands were closed, while six per cent didn't have any opinion.

The AFPI survey covered approximately 74 per cent of the 62,500,000 acres owned and managed by industry in the United States.