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NATIONAL WILDLIFE REFUGE

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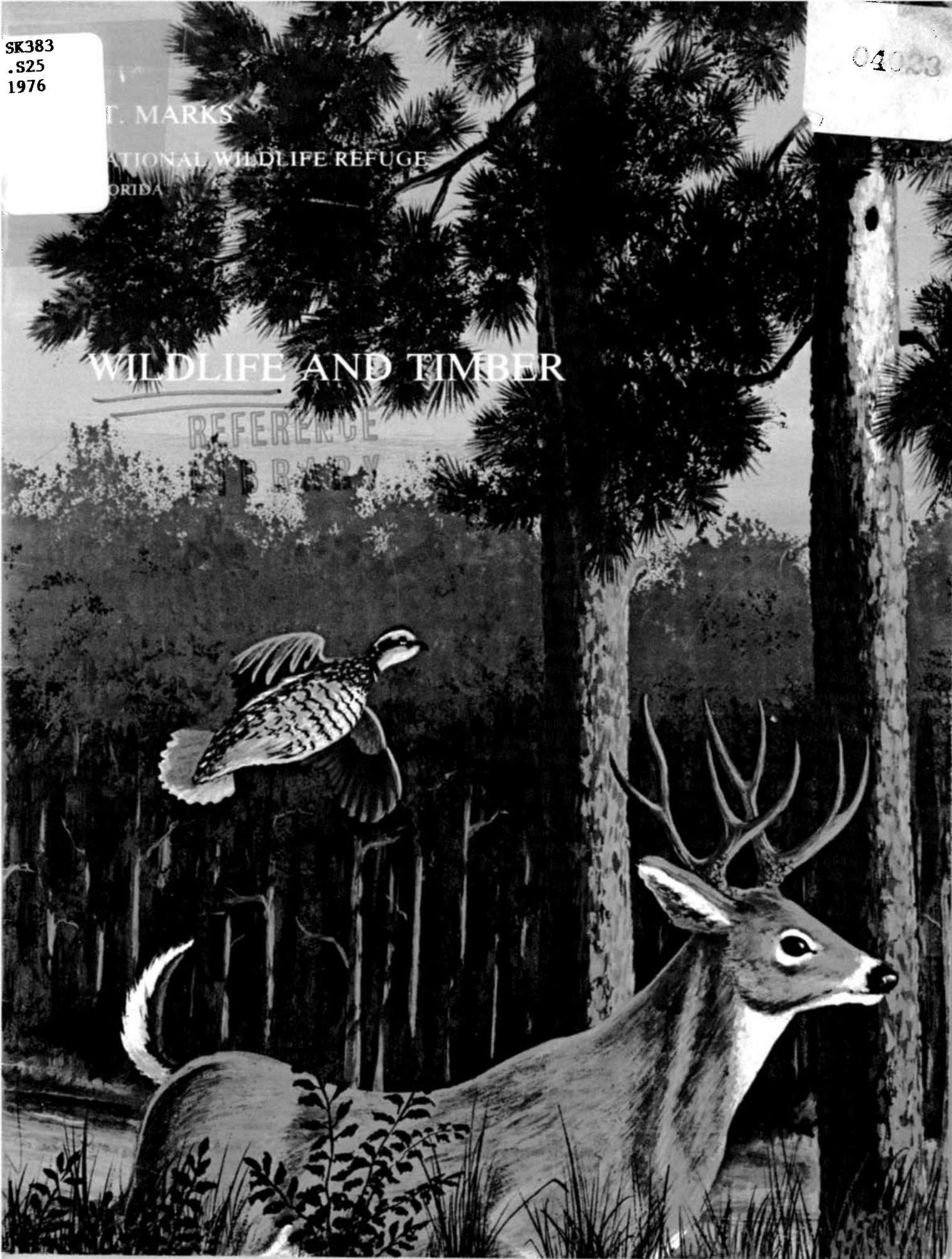
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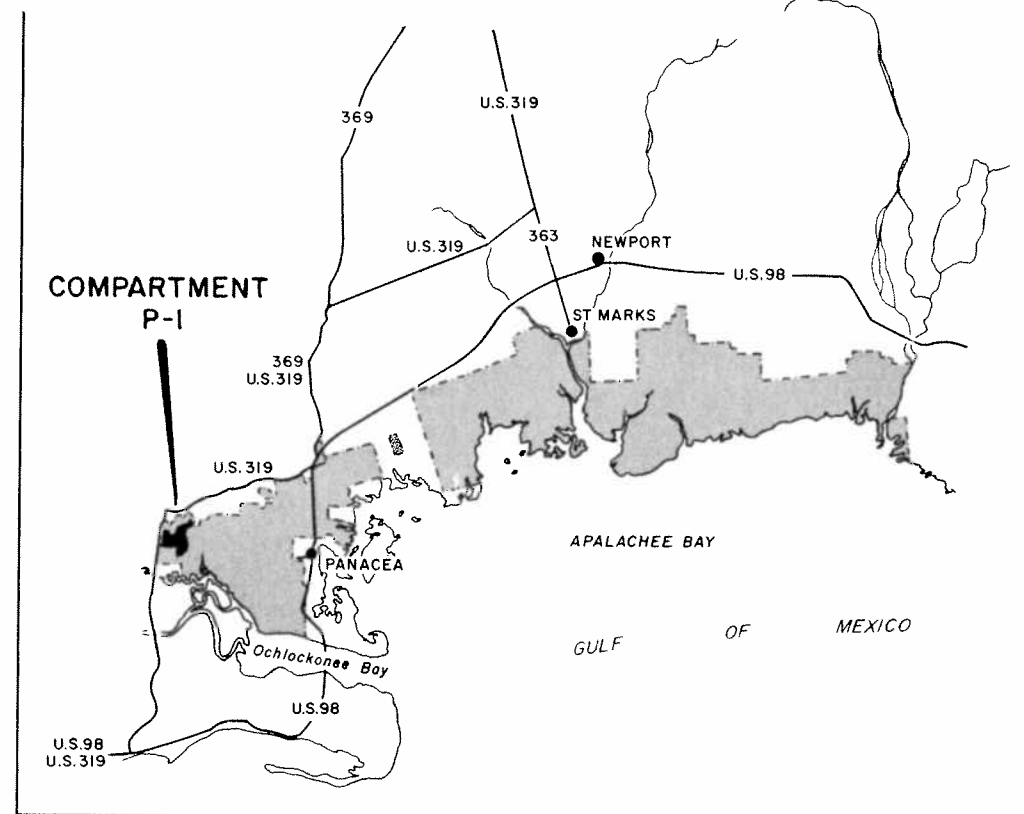
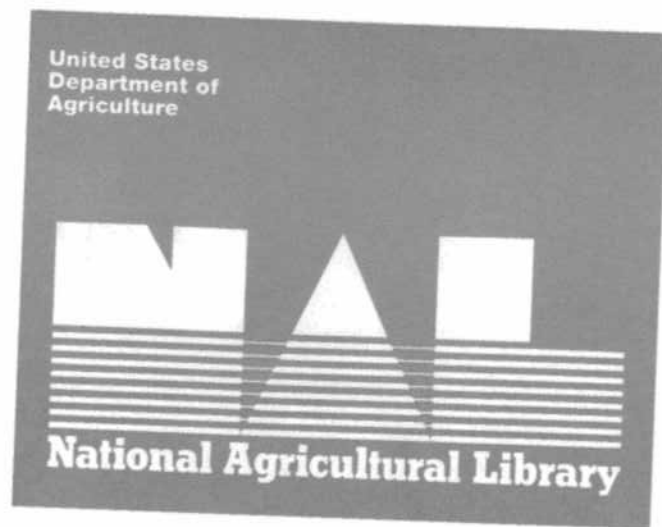
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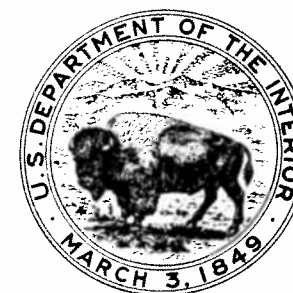
As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States—now and in the future.

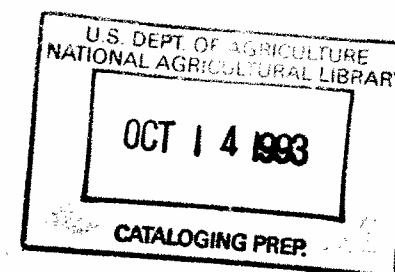
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ST. MARKS
WILDLIFE AND TIMBER
MANAGEMENT



UNITED STATES DEPARTMENT OF THE INTERIOR



U. S. FISH AND WILDLIFE SERVICE



FOREWORD

The refuge lands are about equally divided between marsh and forest vegetative types. The management of each cover type is integrated to provide the greatest combination of wildlife benefits. However, this brochure deals primarily with the management of 31,000 acres of refuge woodlands.

Service experience gained in managing St. Marks and other refuge forests shows that wildlife habitat development and timber production can be highly compatible. Neither should be neglected where multiple opportunities for management and wise resource utilization exist.

The primary purpose of this brochure is to explain the refuge's forest management approach and to provide some insight into modern forest management technology and how it may be applied to benefit wildlife.

Refuge woodlands, like those privately owned, offer multiple opportunities and can be managed wisely with considerable flexibility. The refuge's forest management program is one example of how basic silviculture can be utilized to develop productive habitat for wildlife, and maintain a favorable environment without neglecting the timber production potential.

The refuge vegetative cover types are typical of those which cover several million acres of the coastal plain. These public forests, being representative of the tremendous acreage of the coastal plain and managed to benefit wildlife, can demonstrate to other landowners the practical aspects of including wildlife in their forest management programs.

PREFACE

The U. S. Fish and Wildlife Service, Department of the Interior, administers over 380 units and 30 million acres within the National Wildlife Refuge System. The St. Marks National Wildlife Refuge is one of these units.

This refuge, located about 20 miles south of Tallahassee, Florida, in Jefferson, Taylor and Wakulla Counties, was established in 1931 under the authority of Executive Order 5740. Management of this 64,000-acre refuge is part of the special mission of the National Wildlife Refuge System to provide, manage, and safeguard a national network of land and water, sufficient in size, diversity, and location to help meet people's need for management areas, where the entire spectrum of human benefits associated with wildlife and wildlands are enhanced and made available. St. Marks, like most other refuges, places primary emphasis on the enhancement of rare and endangered wildlife species, migratory waterfowl, and other wildlife.

The fertile, shallow Apalachee Bay, the productive salt marshes, and the valuable forest areas are all part of the diversified environment of St. Marks Refuge. Approximately 28,000 acres of salt marsh, 33,000 acres of forest land, 2,000 acres of man-made impoundments, and 1,000 acres of lakes and ponds are within the boundaries of the Federally owned refuge.

FOREST MANAGEMENT ON THE ST. MARKS NATIONAL WILDLIFE REFUGE

THE PAST

Prior to refuge status, both the wildlife and timber resources were ravaged by wildfire and indiscriminate land use practices. Excessive timber cutting was done without regard to either wildlife or reforestation. Even today some of the understocked and inferior refuge timber stands still reflect the mismanagement scars of the exploitation era. However, forest restoration, although slow at first, is responding favorably to refuge protection and intensive management.



Regeneration following clearcutting was not obtained due to the indiscriminate burning of the woodlands by cattlemen.

Approximately 19,000 acres of the refuge marsh and woodlands have been designated for wilderness. This wilderness along with other research natural areas are excluded from management. The remaining 31,000 acres of forest, containing the greatest potential for habitat development and timber growth, are available for intensive management.

The increasing wildlife populations are of major interest to the refuge's 200,000 annual visitors. These visitors also show a sincere interest in refuge management that support these populations. Most landowners and resource managers who visit this area are interested in the technical and practical phases of wildlife and timber management coordination.



Forest-Wildlife Management techniques being presented to a group of local high school students.

Some refuge visitors are often amazed to learn that the same factors that destroy wildlife habitat—the plow, axe, fire, and gun—when used wisely, can restore environmental integrity and perpetuate a high, sustained yield of this renewable resource. Visitors also learn about forest management as it relates to habitat development and economics. A high standard of living, which like wildlife, clean air, pure water, and a pleasing atmosphere, are significant aspects of a quality environment.

MANAGING THE REFUGE FOREST

Under the Service's stewardship a staff of foresters, wildlife biologists, and other professionally trained land managers developed and initiated plans for protecting and managing the renewable forest resources on the St. Marks Refuge. Although the forest resources have not fully recovered from mismanagement of the past, they are greatly improved. The management trend of developing a healthy, productive, and attractive forest with maximum alternatives for wildlife will continue until complete recovery is obtained.

St. Marks' 31,000 acres of woodlands may be further classified as pine, 20,000 acres; bottomland hardwoods, 8,000 acres; and upland hardwoods, 3,000 acres. The various cover types are widely dispersed and are closely associated with topography features and soil capabilities.



Forest access roads seeded with bahia grass provide bugging areas for a wide variety of birdlife and a grazing area for deer during the critical food (early spring) period.

MANAGEMENT TERMINOLOGY

In managing the refuge forest for wildlife, the writing of management plans and related discussions usually involve many technical terms. *Silvics* is a term used to describe the life history and general characteristics of forest trees and stands, with particular reference to environmental factors; and *Silviculture* is a term meaning the art of producing and tending a forest, the application of the knowledge of silvics in the treatment of a forest, and the theory and practice of controlling forest establishment, composition and growth.

All-aged Management and *Even-aged Management* are two basic silviculture terms often used to describe management being applied within a forest. *All-aged Management* is a term applied to a stand in which, theoretically, trees of all ages up to and including those of felling age are found growing together; and *Even-aged Management* is a term applied to a stand in which relatively small age difference exists between individual trees.

Rotation or Regeneration Age represents a period of years required to establish and grow timber crops to a specified condition of maturity. The term *Cutting Cycle* is the planned interval between major thinning operations in the same stand.

Mast is another descriptive term used to describe nuts, fruits, and berries utilized by wildlife.

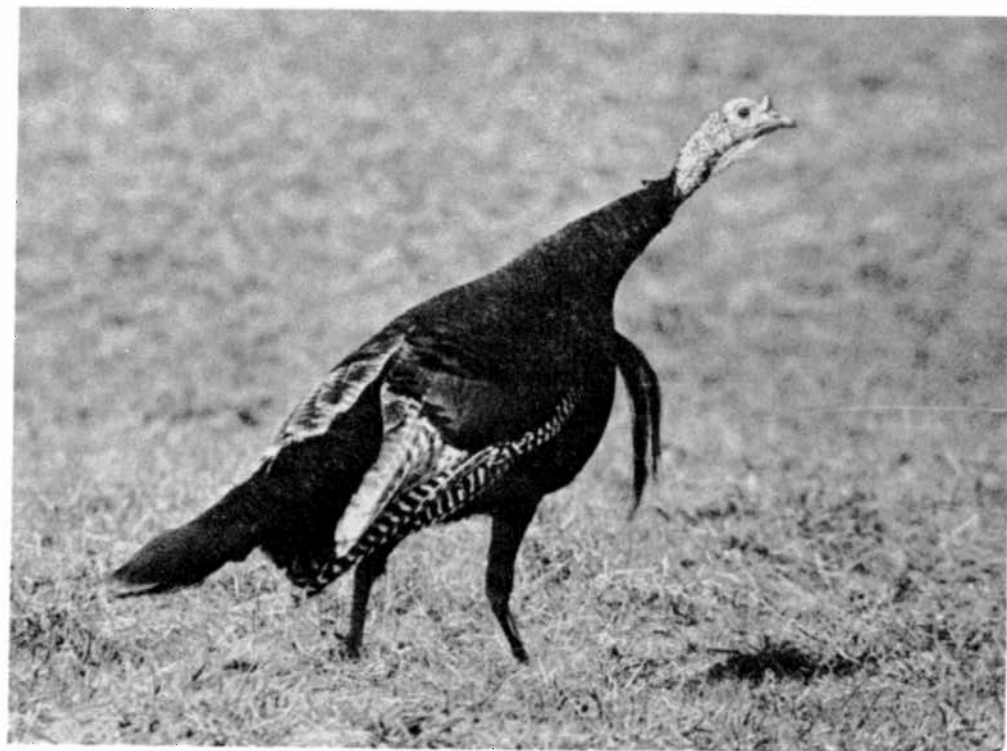


Upland hardwood areas supply winter food for a variety of wildlife species.

EVEN-AGED SILVICULTURE

Research and experience have shown that most tree species, of the greatest importance, are intolerant or moderately intolerant to shade; therefore, professional foresters usually recommend and rely on the Even-aged concept of silviculture for growing and perpetuating the current and future timber requirements in the United States and throughout other parts of the world. Since this concept will be basic to managing most of the Nation's woodlands, it is reasonable to assume that the future opportunities for managing forest wildlife will depend on some version of Even-aged silviculture.

How best to develop a quality environment for wildlife and people by using approved silviculture principles has long been a challenge for the National Wildlife Refuge System. Experience gained in managing forest resources on St. Marks and other refuge woodlands clearly shows that it is technically sound as well as practical to produce high yields of wildlife and timber without any major conflict. St. Marks' program, not only features approved principles of Even-aged silviculture, but also demonstrates how the size of Even-aged units can be controlled and arranged to create habitat variety.



"Ole Tom" is one of many forest creatures that thrive in an even-aged timber environment.

Because of the restrictions which the refuge places on the maximum size of individual Even-aged units and their wide distribution pattern to benefit wildlife, this modified system is often referred to as "All-aged Management in Even-aged Units."

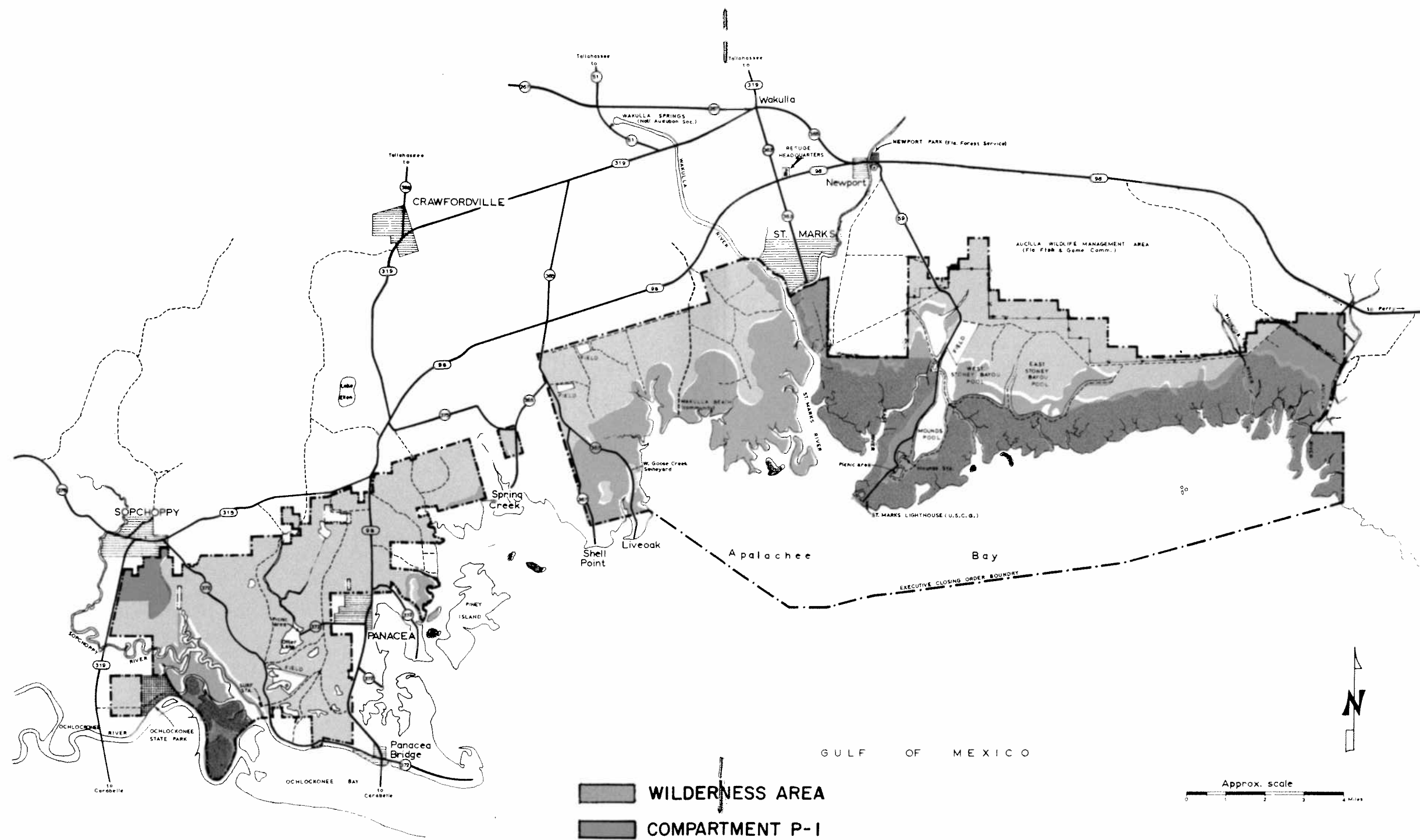
BIOLOGICAL AND PHYSICAL FLEXIBILITY

Aside from the biological advantages of growing and reproducing the forest under full sunlight which occurs in Even-aged stands, this concept also provides great flexibility to fully utilize the basic management techniques of timber harvest and prescribed burning.

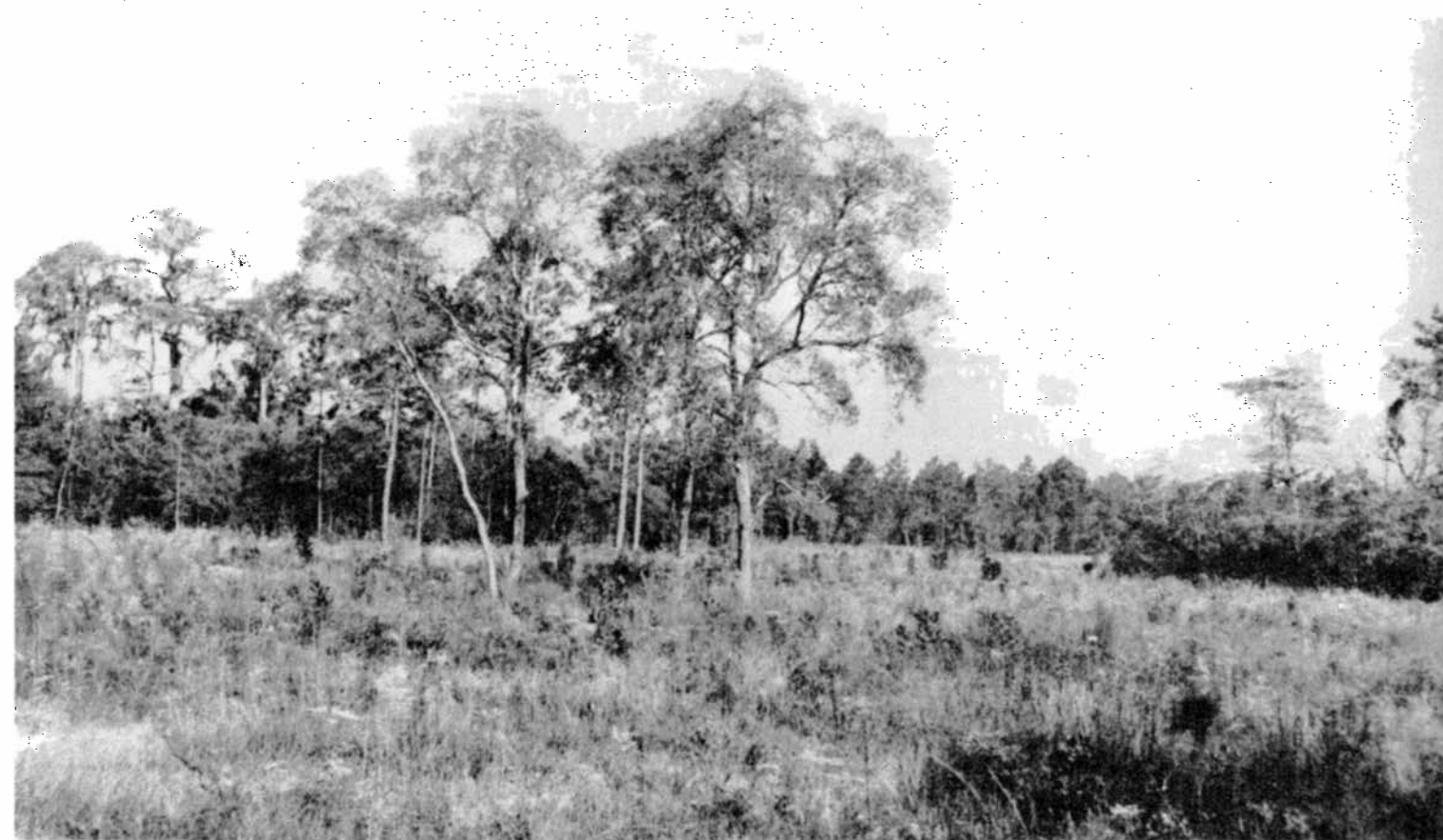


A young "Button Buck" photographed while browsing through this stand of even-aged longleaf pine.

Selective thinning made at scheduled cutting cycle intervals and regeneration harvest of mature stands are used very effectively in refuge management. Thinning not only provides proper spacing for tree crown expansion and root development, but also allows sunlight to pass through these canopy openings in sufficient quantity for growing preferred wildlife food and cover plants on the forest floor.



Regeneration cuttings are made to perpetuate the sound biological principles of reforestation and the size and pattern of distribution are regulated to assure that quality habitat is maintained for both wildlife and man. Under the refuge version of "All-aged management in even-aged units" less than two percent of the forest is scheduled for regeneration each year. The average size of each regeneration area is 30 acres.



Regeneration sites are small, irregular, and follow the existing landscape.

Prescribed burning in pine forests, when applied in a skillful manner, improves wildlife habitat and reduces wildfire hazards. The refuge version of Even-aged management provides greater flexibility for using prescribed fire as a management tool than previously experienced with the system of All-aged Silviculture. For example, hardwood and young pine being highly important but susceptible to fire damage can be adequately provided for and protected within the system of Even-aged units.



Prescribed burning converts rank herbaceous growth to young succulent browse and releases legumes and other plants that had been suppressed by the dense undergrowth.

Prescribed burning in a pine forest provides the greatest combination of wildlife and conservation benefits when utilized in conjunction with timber harvesting operations.

Refuge forest openings consist of agriculture fields, mowed dikes, seeded roadsides, etc., which provide additional habitat variety for both game and non-game species. Wildlife requirements for forest openings appear to be directly related to the quality of the forest habitat adjacent to these openings. Approximately five percent of St. Marks' timber lands are classified as some type of wildlife opening.

REFUGE FOREST COMPOSITION AND DISTRIBUTION OF AGE CLASSES

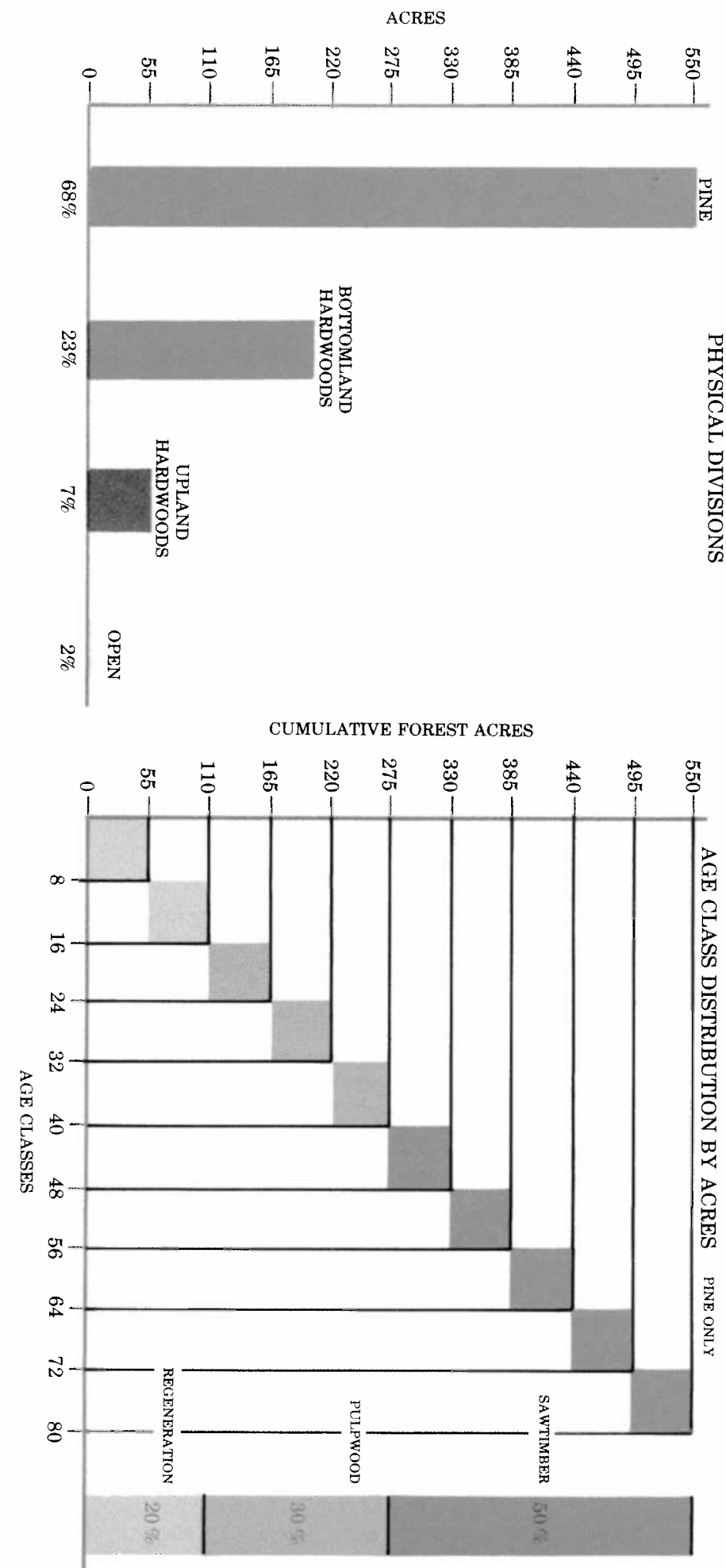
Forest variety is exemplified in the mechanics of the "All-aged management in Even-aged units" system used on St. Marks Refuge. The pine and hardwood cover types, which comprise 65 percent and 35 percent respectively, are interspersed and distributed into a pattern of many different aged stands to yield year-round habitat requirements within the home range of wildlife species.

Regenerating 1/80th of the forest annually throughout the 80-year rotation will create a balance of young, intermediate, and mature timber stands. Restricting the size of each regeneration unit is an important aspect in developing a healthy, productive, and attractive forest environment with maximum alternatives for wildlife management.

Maintaining this Even-aged System, in accordance with the specified regeneration-maturity ratio, requires that the percentage of area needed to support stands of young, intermediate, and old growth timber be in proportion to the rotation time consumed in growing these various stands through these respective stages. By the end of the assigned rotation 20 percent of the total area will contain young stands, another 30 percent will support intermediate aged stands, and the remaining 50 percent of the area will contain the more mature stands.



A lush stand of partridge-pea and the accelerated growth of live oak sprouts following site preparation.



The application of this concept of "All-aged management in Even-aged units" for one rotation will produce ten basic age groups, one for each time the cutting cycle (eight years) is applied within the assigned rotation. Prior to this management approach, it was not unusual for one or two age classes to dominate an entire compartment. However, under advanced management all of the ten age groups will occur in each of the refuge's thirty-eight 800-acre management compartments.

The young pre-commercial age group contains two of the ten age classes, 0 to 8 years and 9 to 16 years; intermediate group contains three of the ten age classes, 17 to 24 years, 25 to 32 years, and 33 to 40 years; and the remaining five age classes, 41 to 48 years, 49 to 56 years, 57 to 64 years, 65 to 72 years, and 73 to 80 years will make up the older age group.

The flexibility of this 20-30-50 percent ratio of young, intermediate and older aged timber provides ample opportunity for developing and maintaining quality habitat for wildlife and a favorable environment for conservation-oriented recreation. This "All-aged management in Even-aged units" approach also generates sound silviculture practices. Once ideal patterns of forest composition and age class distribution has been established within the home range of preferred wildlife species they will remain unchanged in subsequent rotations. The physical location of the various aged stands will shift within the pattern as the young stands grow older and the mature stands are regenerated.

REGENERATION AND PRE-COMMERCIAL STAGE

Small even-aged stands of young forest trees, often referred to as pre-commercial, are essential as the intermediate and older stands in perpetuating the forest resources on a sound basis.

These pre-commercial stands occupy 20 percent of the forest area. Interspersion of these areas with older stands provide a variety of feeding and resting sites for most wildlife species. During the early stages of regeneration, soil disturbance and full sunlight releases a wide variety of grasses, sedges and herbaceous growth that add greatly to habitat diversity for forest wildlife. For example, wild turkey, quail, white-tailed deer, bear and many other important game species utilize these young forest areas.

Song birds such as the cardinals, blue birds, thrashers and numerous other species feed on the seed, fruits, berries and insects produced in these reforested areas. They also serve as hunting areas for hawks and owls.

Other wildlife that show a preference for the older adjacent stands also find part of their seasonal food requirements in these young stands. As these young trees grow older and approach the intermediate classification they provide excellent cover for a great variety of game and non-game wildlife.

INTERMEDIATE STAGE

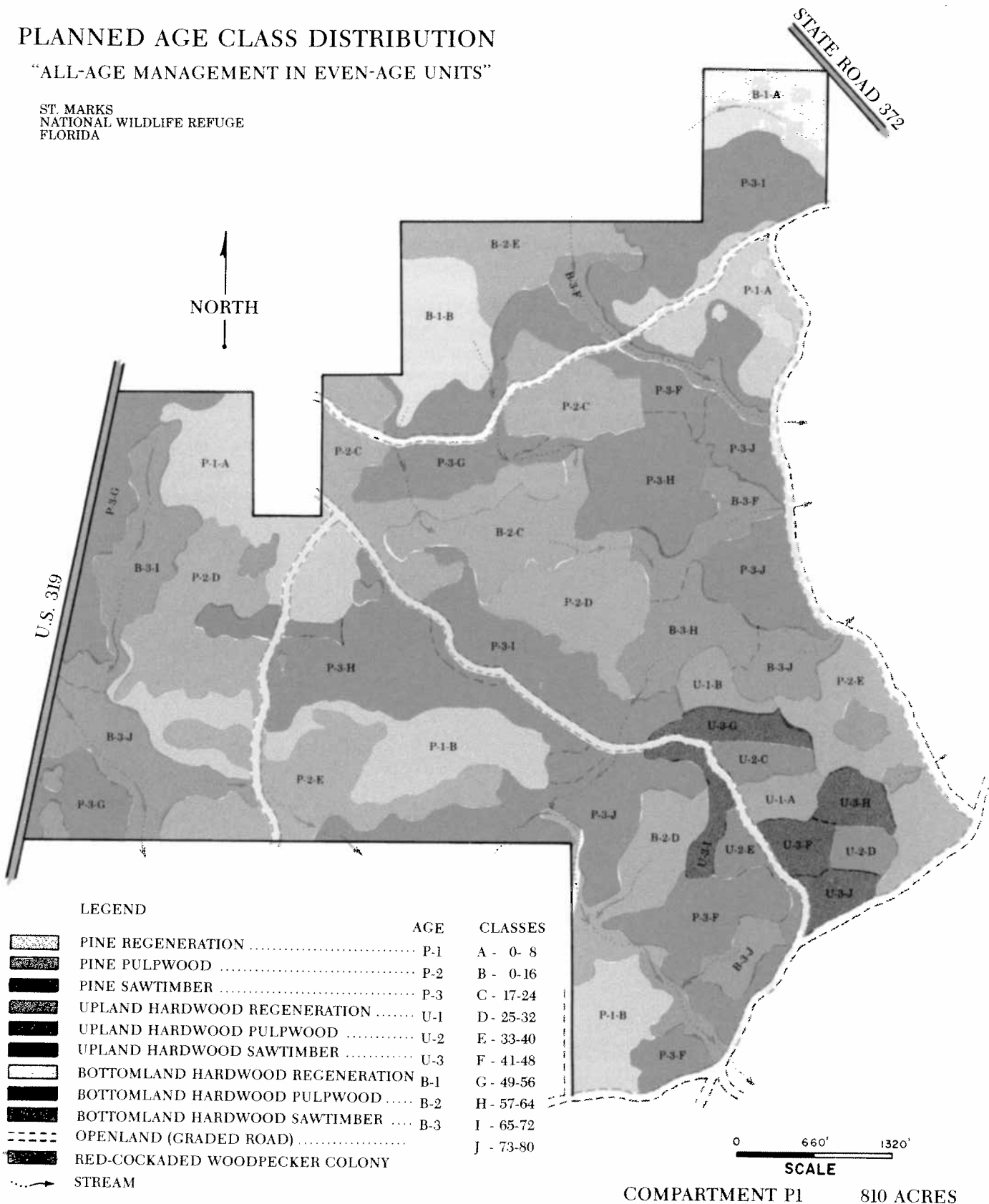
The intermediate aged stands will occupy 30 percent of the forest area and will represent that part of the rotation required to grow a stand from the young classification of 16 years to approximately 40 years of maturity. Upon reaching the intermediate stage these stands are suitable for commercial type thinnings. Also prescribed burning within the pine type, which may have been initiated in the advanced regeneration stage, can be continued throughout the remaining life of the stand.



Pulpwood size timber in need of a thinning. This picture was taken approximately six months after a prescribed burn.

PLANNED AGE CLASS DISTRIBUTION
"ALL-AGE MANAGEMENT IN EVEN-AGE UNITS"

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Intermediate age classes widely dispersed and intensively managed are highly productive for wildlife. These intermediate aged stands produce mast and when properly thinned create favorable light conditions for growing a great variety of fruits, berries, seeds, and browse on the forest floor.

Most of the wildlife species which use the adjacent young and mature stands also show a preference for the intermediate group of age classes.

During this intermediate growth stage, the mast producing trees are favored on respective sites and are distributed in a pattern with other available food to assure that year-round wildlife requirements will be provided within their normal cruising range.

Trees within the intermediate age class, being of sufficient size and of commercial importance, are often referred to as pulpwood type timber.

OLDER GROWTH STANDS

By the end of the first rotation fifty percent of the woodland area will support Even-aged stands 40 years or older. One-half of the 80-year rotation will be required to grow a stand through the five age classes from 41 years to final maturity.

These older stands are intensively managed and continue to provide high quality habitat for wildlife, a favorable environment of conservation-oriented recreation, and valuable products for the region's wood using industries.

Most of the game and non-game species that utilize the young and intermediate stands are also present in the older aged timber. Some wildlife species show a seasonal preference for one specific cover type or aged stand for nesting, denning, feeding, or loafing. For example, the red-cockaded woodpecker, a threatened species, requires live, old growth pine for nesting but also feeds in younger stands located within its normal feeding range. Wild turkey and quail often nest in regeneration areas or in the transition zones between the intermediate or older stands. Both game and non-game species may nest or den in one aged stand but feed or loaf in an adjacent stand. The greatest combination of wildlife benefits results when the forest resource is managed in responsible manner and the annual seasonal food and cover requirements are provided within the normal cruising range of the wildlife species.

There are many justifications for maintaining one-half of the refuge forest in timber stands 40 years or older. First, the long rotation is necessary to provide habitat for the broad spectrum of wildlife. Second, this approach to age class balance represents sound silviculture and permits the use of basic management techniques for maintaining this system of long rotation management. Third, mature forest stands provide an environment better suited to conservation-oriented recreation than the younger stands.



Mature stand of longleaf pine approaching biological maturity or rotation age.

These justifications and factors for old growth stands tend to overshadow the equal importance of the young and intermediate aged forest. The success of developing and maintaining older forests is directly dependent on how well the young and intermediate forest are developed and managed.

SUMMARY

Even-aged silviculture is technically sound and is widely recognized by professional foresters as an unsurpassed method for growing, harvesting, and renewing timber resources. The opportunities for managing wildlife in Even-aged stands are great, but are somewhat less refined than those developed for timber production.

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Even-aged Forest Management, modified to improve wildlife habitat and still maintain a quality environment, is used to manage the forest resources on the St. Marks National Wildlife Refuge. This program is based on Service policy of managing refuges for optimum wildlife habitat for maximum wildlife populations and educational benefits.

St. Marks forest management program of "All-aged Management in Even-aged Units" features sound silviculture principles and demonstrates how prescribed fire and timber cutting (both selective and regeneration) can be successfully applied to develop multiple purpose benefits. Under this modified system, it is possible to develop and maintain high quality habitat for wildlife, and a favorable environment for public use, in harmony with high sustained yields of timber.



The habitat for red-cockaded woodpeckers can only be preserved by managing a forest on a long rotation.

These forest management techniques as explained and illustrated in this brochure represent one successful approach to multiple use management, and may be of significant demonstrational values to other landowners and resource managers who are charged with similar responsibilities.



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