

J. Bernie Beasley, Jr., P.E.
Vice President

**Southern Nuclear
Operating Company, Inc.**
40 Inverness Center Parkway
Post Office Box 1295
Birmingham, Alabama 35201

Tel 205.992.7110
Fax 205.992.0341



Energy to Serve Your World™
NL-03-2256

November 3, 2003

Docket Nos.: 50-348
50-364

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D. C. 20555-0001

Joseph M. Farley Nuclear Plant
NRC Environmental Scouting Trip Requested Additional Information
In Support of NRC TAC Nos. MC0768, MC0769

Ladies and Gentlemen:

On October 15, 2003, the NRC held a license renewal environmental scouting meeting at Joseph M. Farley Nuclear Plant (FNP). During the meeting the NRC requested additional backup information to support their environmental review of FNP's license renewal application. A CD has been sent to Jack Cushing of the NRC with the requested information. This letter provides the documents identified below (in the same format as on the CD) for docketing since they have not been previously available to the public.

- Supplemental Socioeconomic Bounding Information
- Land Management Options and Recommendations for the Farley Nuclear Plant, Houston County, Alabama, by Dr. Keith Causey
- Farley Nuclear Plant Environmental Procedure FNP-0-ENV-23 "Land and Wildlife Management Program"
- Guidelines for Performing Powerline Construction and Maintenance in Areas of Gopher Tortoise Habitat.

If you have any questions, please contact Jim Davis at (205) 992-7692.

Sincerely,

J. B. Beasley, Jr.

JBB/JTD/slb

Enclosures

A099

U. S. Nuclear Regulatory Commission
NL-03-2256
Page 2

cc: Southern Nuclear Operating Company
Mr. D. E. Grissette, General Manager – Plant Farley
Document Services RTYPE: CFA04.054; LC# 13859

U. S. Nuclear Regulatory Commission
Mr. L. A. Reyes, Regional Administrator
Mr. F. Rinaldi, NRR Project Manager – Farley
Mr. T. P. Johnson, Senior Resident Inspector – Farley
Mr. J. S. Cushing, Environmental Project Manager

ENCLOSURES

Supplemental Socioeconomic Bounding Information

Per NRC request the additional socioeconomic bounding information is provided for review. The information is organized under the application environmental report (ER) headings for ease of review. In addition, for the sake of clarification in the ER the number of SNC permanent site nuclear-related employees is approximately 900 and the typical length of an outage is 30-40 days.

The socioeconomic information attached addresses the following:

- Employment
 - Current Workforce
 - License Renewal Increment
- Housing Impacts
- Public Utilities
- Transportation
- Impact Comparison Details
- References

Supplemental Socioeconomic Bounding Information

3.4 EMPLOYMENT

Current Workforce

SNC employs a nuclear-related permanent workforce of approximately 900 employees and up to an additional 375 (during the 2001 steam generator replacement) contract and matrixed employees at FNP; this is less than the range of 600 to 800 personnel per reactor unit estimated in the GEIS (NRC 1996b, Section 2.3.8.1). Approximately 77 percent of FNP's employees live in Houston County, Alabama. The remaining 23 percent are distributed across 22 counties in Alabama, Georgia, and Florida with numbers ranging from 1 to 76 employees per county.

The FNP reactors are on an 18-month refueling cycle. During refueling outages, site employment can increase above the 900 permanent workforce by as many as 800 workers for temporary (30 to 60 days) duty. These numbers are within the GEIS range of 200 to 900 additional workers per reactor outage.

License Renewal Increment

Performing the license renewal activities could necessitate increasing FNP staff workloads by some increment. The size of this increment would be a function of the schedule within which SNC must accomplish the work and the amount of work involved. Having determined that it would not undertake refurbishment (Section 3.2), SNC focused its analysis of the license renewal employment increment on programs and activities for managing the effects of aging (Section 3.3).

The GEIS (NRC 1996b, Section 2.6.2.7) assumes that NRC would renew a nuclear power plant license for a 20-year period, plus the duration remaining on the current license, and that NRC would issue the renewal approximately 10 years prior to license expiration. In other words, the renewed license would be in effect for approximately 30 years. The GEIS further assumes that the utility would initiate SMITTR activities at the time of issuance of the new license and would conduct license renewal SMITTR activities throughout the remaining 30-year life of the plant, sometimes during full-power operation (NRC 1996b, Section B.3.1.3), but mostly during normal refueling and the 5- and 10-year in-service refueling outages (NRC 1996b, Table B.4).

SNC has determined that the GEIS scheduling assumptions are reasonably representative of FNP incremental license renewal workload scheduling. Many FNP license renewal SMITTR activities would have to be performed during outages. Although some FNP license renewal SMITTR activities would be one-time efforts, others would be recurring periodic activities that would continue for the life of the Plant.

The GEIS estimates that the most additional personnel needed to perform license renewal SMITTR activities would typically be 60 persons during the 3-month duration of a 10-year in-service refueling. Having established this upper value for what would be a single event in 20 years, the GEIS uses this number as the expected number of additional permanent workers needed per unit attributable to license renewal. GEIS Section C.3.1.2 uses this approach in order to "...provide a realistic upper bound to potential population-driven impacts...."

SNC has identified no need for significant new aging management programs or significant modifications to existing programs. SNC expects that existing "surge" capabilities for routine activities will enable SNC to perform the increased SMITTR workload with existing staff. Therefore, SNC has no plans to add non-outage employees to support FNP operations during the license renewal term. Refueling and maintenance outages typically have durations of approximately 30 to 40 days and, as described above, result in a large, temporary increase in employment at FNP. SNC believes that increased SMITTR tasks can be performed within this schedule and employment level. Therefore, SNC has no plans to add outage employees for license renewal term outages.

Supplemental Socioeconomic Bounding Information

However, in order to provide a bounding scenario for the purpose of conservatism, the impact of adding 60 employees is analyzed as follows. Adding full-time employees to the plant workforce for the license renewal operating term would have the indirect effect of creating additional jobs and related population growth in the community. SNC has used an employment multiplier appropriate to Houston and Henry Counties (2.896) (USDC 2001), to calculate the total direct and indirect jobs in service industries that would be supported by the spending of the FNP workforce. The addition of 60 license renewal employees would generate approximately 114 indirect jobs distributed in Houston and nearby counties. This number was calculated as follows: 60 (additional employees) × 2.896 (regional multiplier) = 174 (total jobs). Of these, 60 would be direct employees and 114 would be indirect jobs.

Supplemental Socioeconomic Bounding Information

4.14 HOUSING IMPACTS

NRC

The environmental report must contain "...[a]n assessment of the impact of the proposed action on housing availability..." 10 CFR 51.53(c)(3)(ii)(I)

"...Housing impacts are expected to be of small significance at plants located in a medium or high population area and not in an area where growth control measures that limit housing development are in effect. Moderate or large housing impacts of the workforce associated with refurbishment may be associated with plants located in sparsely populated areas or areas with growth control measures that limit housing development...." 10 CFR 51, Subpart A, Appendix B, Table B-1, Issue 63

"...[S]mall impacts result when no discernible change in housing availability occurs, changes in rental rates and housing values are similar to those occurring statewide, and no housing construction or conversion occurs...." (NRC 1996b, Section 4.7.1.1, pp. 4-101 to 4-102)

NRC made housing impacts a Category 2 issue, because impact magnitude depends on local conditions that the NRC could not predict for all plants at the time of GEIS publication (NRC 1996, Section 3.7.2). Local conditions that need to be ascertained are: (1) population categorization as small, medium, or high, and (2) applicability of growth control measures.

Refurbishment activities and continued operations could result in housing impacts due to increased staffing. As described in Section 3.2, SNC has no plans to increase staff because no refurbishment-related activities required for extended operations due to license renewal have been identified. SNC concludes that there would be no refurbishment-related impacts to area housing and no analysis is therefore required. Accordingly, the following discussion focuses on impacts of continued operations on local housing availability, and the assumption, for analytical purposes, that SNC would add up to 60 additional license-term employees.

As described in Section 2.6, FNP is located in a medium population area. As noted in Section 2.8, the area of interest is not subject to growth control measures that limit housing development. In 10 CFR 51, Subpart A, Appendix B, Table B-1, NRC concluded that impacts to housing are expected to be of small significance at plants located in "medium" population areas where growth control measures are not in effect. Therefore, SNC expects housing impacts to be small.

This conclusion is supported by the following site-specific housing analysis. The maximum impact to area housing is calculated using the following assumptions: (1) all direct and indirect jobs would be filled by in-migrating residents; (2) the residential distribution of new residents would be similar to current worker distribution; and (3) each new job created (direct and indirect) represents one housing unit. As described in Section 3.4, SNC's conservative estimate of 60 license renewal employees could generate the demand for 174 housing units (60 direct and 114 indirect jobs). In an area which has a population within a 50-mile radius of 393,639, and an average of 2.45 persons per household (USCB 2000) suggesting the existence of approximately 161,000 housing units, it is reasonable to conclude that this demand would not create a discernible change in housing availability, rental rates or housing values, or spur housing construction or conversion. SNC concludes that impacts to housing availability resulting from plant-related population growth would be small and would not warrant mitigation.

Supplemental Socioeconomic Bounding Information

4.15 PUBLIC UTILITIES: PUBLIC WATER SUPPLY AVAILABILITY

NRC

The environmental report must contain "...an assessment of the impact of population increases attributable to the proposed project on the public water supply." 10 CFR 51.53(c)(3)(ii)(I)

"...An increased problem with water shortages at some sites may lead to impacts of moderate significance on public water supply availability...." 10 CFR 51, Subpart A, Appendix B, Table B-1, Issue 65

"Impacts on public utility services are considered small if little or no change occurs in the ability to respond to the level of demand and thus there is no need to add capital facilities. Impacts are considered moderate if overtaxing of facilities during peak demand periods occurs. Impacts are considered large if existing service levels (such as quality of water and sewage treatment) are substantially degraded and additional capacity is needed to meet ongoing demands for services." (NRC 1996b, Section 3.7.4.5, pg. 3-19)

NRC made public utility impacts a Category 2 issue because an increased problem with water availability, resulting from pre-existing water shortages, could occur in conjunction with plant demand and plant-related population growth (NRC 1996b, Section 4.7.3.5). Local information needed would include: (1) a description of water shortages experienced in the area, and (2) an assessment of the public water supply system's available capacity.

NRC's analysis of impacts to the public water supply system considered both plant demand and plant-related population growth demands on local water resources. As Section 3.4 indicates, SNC analyzes a 60-person increase in FNP employment attributable to license renewal. Section 2.6 describes the FNP regional demography. Section 2.9.1 describes the public water supply systems in the area, their permitted capacities, and current demands. As discussed in Section 3.2, no refurbishment is planned for FNP and no refurbishment impacts are therefore expected. Accordingly, the following discussion focuses on impacts of continued operations on local public utilities, and the assumption, for analytical purposes, that SNC would add up to 60 additional license-term employees.

FNP does not use water from a municipal system and plant groundwater usage during the renewed license period of operations would be considered "indiscernible" (Section 4.5); therefore, SNC does not expect FNP operations to have an effect on local water supplies.

The impact to the local water supply systems from plant-related population growth can be determined by calculating the amount of water that would be required by these individuals. The average American uses between 50 and 80 gallons per day for personal use (Fetter 1980, pg. 2). As described in Section 3.4, SNC's conservative estimate of 60 license renewal employees could generate a total of 174 new jobs, which could result in a population increase of 426 in the area [174 jobs multiplied by 2.45, which is the average number of persons per household in the area (USCB 2000)]. Using this consumption rate, the plant-related population increase could require an additional 34,080 gallons per day (426 people multiplied by 80 gallons per day) in an area where the excess public water supply capacity is approximately 22 million gallons per day in Houston County, alone. If it is assumed that this increase is distributed across the potentially affected counties, consistent with current employee trends, the increase in water demand would not create shortages in capacity of the water supply systems in these communities. (See Section 2.9.1 for a discussion of these systems). SNC concludes that impacts resulting from plant-related population growth to public water supplies would be small, requiring no additional capacity and not warranting mitigation.

Supplemental Socioeconomic Bounding Information

4.18 TRANSPORTATION

NRC

The environmental report must "...assess the impact of highway traffic generated by the proposed project on the level of service of local highways during periods of license renewal refurbishment activities and during the term of the renewed license." 10 CFR 51.53(c)(3)(ii)(J)

"...Transportation impacts...are generally expected to be of small significance. However, the increase in traffic associated with additional workers and the local road and traffic control conditions may lead to impacts of moderate or large significance at some sites...." 10 CFR 51, Subpart A, Appendix B, Table B-1, Issue 70

Small impacts would be associated with U.S. Transportation Research Board Level of Service A, having the following condition: "...Free flow of the traffic stream; users are unaffected by the presence of others." and Level of Service B, having the following condition: "...Stable flow in which the freedom to select speed is unaffected but the freedom to maneuver is slightly diminished...." (NRC 1996b, Section 3.7.4.2, pp. 3-18 and 3-19)

NRC made impacts to transportation a Category 2 issue, because impact significance is determined primarily by road conditions existing at the time of license renewal, which NRC could not forecast for all facilities (NRC 1996b, Section 3.7.4.2). Local road conditions to be ascertained are: (1) level of service conditions, and (2) incremental increases in traffic associated with refurbishment activities and license renewal staff.

As described in Section 3.2, no major refurbishment is planned and no refurbishment impacts to local transportation are therefore anticipated. Accordingly, the following discussion focuses on impacts of continued operations on transportation, and the assumption, for analytical purposes, that SNC would add up to 60 additional license-term employees.

SNC's FNP workforce includes approximately 900 permanent and 375 contract employees. On an 18 month cycle, as many as 800 additional workers join the permanent workforce during the refueling outages. SNC's conservative projection of 60 additional employees associated with license renewal for FNP represents a 7.2 percent increase in the current number of permanent employees and an even smaller percentage of employees present onsite during the annual refueling outage. Given these employment projections and the average number of vehicles per day currently using the surrounding roads to FNP, SNC concludes that impacts to transportation would be small and mitigative measures would be unwarranted.

Supplemental Socioeconomic Bounding Information

Table 8-2. Impacts Comparison Detail.

Proposed Action (License Renewal)	Base (Decommissioning)	No Action Alternative		
		With Coal-Fired Generation	With Gas-Fired Generation	With Purchased Power
Alternative Descriptions				
FNP license renewal for 20 years, followed by decommissioning	Decommissioning following expiration of current FNP license. Adopting by reference, as bounding FNP decommissioning, GEIS description (NRC 1996b, Section 7.1)	<p>New construction at the FNP site.</p> <p>Use existing switchyard and transmission lines Two 800-MW (net) tangentially-fired, dry bottom units; capacity factor 0.85</p> <p>Existing FNP intake/discharge system Pulverized bituminous coal, 11,009 Btu/pound; 10,200 Btu/kWh; 9.4% ash; 0.98% sulfur; 9.7 lb/ton nitrogen oxides; 5,850,206 tons coal/yr Low NO_x burners, overfire air and selective catalytic reduction (95% NO_x reduction efficiency). Wet scrubber – lime/limestone desulfurization system (95% SO_x removal efficiency)</p>	<p>New construction at the FNP site.</p> <p>Construct 100 miles of gas pipeline in a 100-foot-wide corridor</p> <p>Use existing switchyard and transmission lines Two units, each with 800 MW of net power, consisting of three 184-MW combustion turbines and a 248-MW heat recovery boiler Existing FNP intake/discharge system Natural gas, 1,019 Btu/ft³; 5,940 Btu/kWh; 0.0034 lb sulfur/MMBtu; 0.0109 lb NO_x/MMBtu; 72,225,176,997 ft³ gas/yr Selective catalytic reduction with steam/water injection</p>	<p>Would involve construction of new generation capacity in the region. Adopting by reference GEIS description of alternate technologies (Section 7.2.1.2)</p> <p>Construct up to 200 miles of transmission lines</p>

Supplemental Socioeconomic Bounding Information

Table 8-2. Impacts Comparison Detail (Cont'd).

Proposed Action (License Renewal)	Base (Decommissioning)	No Action Alternative		
		With Coal-Fired Generation	With Gas-Fired Generation	With Purchased Power
900 workers		Fabric filters (baghouse - 99.9% particulate removal efficiency) 300 workers (Section 7.2.2.1)	25-40 workers (Section 7.2.2.2)	
Land Use Impacts				
SMALL – Adopting by reference Category 1 issue findings (Table 4-2, Issues 52, 53)	SMALL – Not an impact evaluated by GEIS (NRC 1996b, Section 7.3)	SMALL – The powerblock and associated facilities could be constructed on previously disturbed land at the FNP site. Approximately 213 acres would be needed for ash and scrubber waste disposal over the 20 year license renewal term.	SMALL – 500 acres would be required for a new gas pipeline. The powerblock and associated facilities could be constructed on previously disturbed land at the FNP site.	MODERATE – Transmission lines could be constructed along existing transmission corridors. Adopting by reference GEIS description of land use impacts from alternate technologies (NRC 1996b, Section 8.2)
Water Quality Impacts				
SMALL – Adopting by reference Category 1 issue findings, (Table 4-2, Issues 3, 6-11). Category 2 groundwater issues not applicable, (Section 4.7, Issue 35; and Section 4.8, Issue 39). One Category 2 surface water issue applies (Section 4.1, Issue 13) and one Category 2 groundwater issue applies (Section 4.6, Issue 34)	SMALL – Adopting by reference Category 1 issue finding (Table 4-2, Issue 89.)	SMALL – Construction impacts minimized by use of best management practices. Operational impacts minimized by use of the existing cooling water system.	SMALL – Reduced cooling water demands, inherent in combined-cycle design	SMALL to MODERATE – Adopting by reference GEIS description of water quality impacts from alternate technologies (NRC 1996b, Section 8.2)

Supplemental Socioeconomic Bounding Information

Table 8-2. Impacts Comparison Detail (Cont'd).

Proposed Action (License Renewal)	Base (Decommissioning)	No Action Alternative		
		With Coal-Fired Generation	With Gas-Fired Generation	With Purchased Power
Air Quality Impacts				
SMALL – Adopting by reference Category 1 issue finding, (Table 4-2, Issue 51). Category 2 issue not applicable, (Section 4.11, Issue 50).	SMALL – Adopting by reference Category 1 issue findings (Table 4-2, Issue 88)	MODERATE – 5,447 tons SO ₂ /yr 1,419 tons NO _x /yr 1,463 tons CO/yr 275 tons TSP/yr 63 tons PM ₁₀ /yr	MODERATE – 125 tons SO ₂ /yr 401 tons NO _x /yr 83 tons CO/yr 70 tons PM ₁₀ /yr ^a	SMALL to MODERATE – Adopting by reference GEIS description of air quality impacts from alternate technologies (NRC 1996b, Section 8.2)
Ecological Resource Impacts				
SMALL – Adopting by reference Category 1 issue findings, (Table 4-2, Issues 15-24, 28-30, 41-43, 45-48). Four Category 2 issues not applicable, (Section 4.9, Issue 40; Section 4.2, Issue 25; Section 4.3, Issue 26; and Section 4.4, Issue 27).	SMALL – Adopting by reference Category 1 issue finding (Table 4-2, Issue 90)	SMALL – 213 acres of forested land could be required for ash/sludge disposal over 20-year license renewal term.	SMALL – Construction of the pipeline could alter habitat.	SMALL to MODERATE – Adopting by reference GEIS description of ecological resource impacts from alternate technologies (NRC 1996b, Section 8.2)
Threatened or Endangered Species Impacts				
SMALL – No federally threatened or endangered species are known at the site or along the transmission corridors. (Section 2.6, Issue 49)	SMALL – Not an impact evaluated by GEIS (NRC 1996b, Section 7.3)	SMALL – Federal and state laws prohibit destroying or adversely affecting protected species and their habitats	SMALL – Federal and state laws prohibit destroying or adversely affecting protected species and their habitats	SMALL – Federal and state laws prohibit destroying or adversely affecting protected species and their habitats

Supplemental Socioeconomic Bounding Information

Table 8-2. Impacts Comparison Detail (Cont'd).

Proposed Action (License Renewal)	Base (Decommissioning)	No Action Alternative		
		With Coal-Fired Generation	With Gas-Fired Generation	With Purchased Power
Human Health Impacts				
SMALL – Adopting by reference, Category 1 issues, (Table 4-2, Issues 56, 58, 60, 61, 62). Risk due to transmission-line induced currents minimal due to conformance with consensus code, (Section 4.13, Issue 59) Small risk due to microbiological organisms (Section 4.12, Issue 57)	SMALL – Adopting by reference Category 1 issue finding, (Table 4-2, Issue 86)	MODERATE – Adopting by reference GEIS conclusion that risks such as cancer and emphysema from emissions are likely (NRC 1996b, Section 8.3.9)	SMALL – Adopting by reference GEIS conclusion that some risk of cancer and emphysema exists from emissions (NRC 1996b, Table 8.2)	SMALL to MODERATE – Adopting by reference GEIS description of human health impacts from alternate technologies (NRC 1996b, Section 8.2)
Socioeconomic Impacts				
SMALL – Adopting by reference Category 1 issue findings, (Table 4-2, Issues 64, 67). Two Category 2 issues are not applicable, (Section 4.16, Issue 66 and Section 4.17.1, Issue 68). Location in a medium population area with limited growth controls minimizes potential for housing impacts (Section 4.14 Issue 63); Capacity of public water supply and transportation infrastructure minimizes potential for related impacts (Section 4.15, Issue 65 and Section 4.18, Issue 70). Plant contribution to county tax base is large, and continued plant operation would benefit county (Section 4.17.2, Issue 69).	SMALL – Adopting by reference Category 1 issue finding, (Table 4-2, Issue 91)	MODERATE – Reduction in permanent work force at FNP could adversely affect Houston and surrounding counties (Section 7.2.2.1).	MODERATE – Reduction in permanent work force at FNP could adversely affect Houston and surrounding counties (Section 7.2.2.2).	SMALL to MODERATE – Adopting by reference GEIS description of socioeconomic impacts from alternate technologies (NRC 1996b, Section 8.2)

Supplemental Socioeconomic Bounding Information

Table 8-2. Impacts Comparison Detail (Cont'd).

Proposed Action (License Renewal)	Base (Decommissioning)	No Action Alternative		
		With Coal-Fired Generation	With Gas-Fired Generation	With Purchased Power
Capacity of public water supply and transportation infrastructure minimizes potential for related impacts (Section 4.15, Issue 65 and Section 4.18, Issue 70)				
Waste Management Impacts				
SMALL – Adopting by reference Category 1 issue findings (Table 4-2, Issues 77-85)	SMALL – Adopting by reference Category 1 issue finding (Table 4-2, Issue 87)	MODERATE – 549,369 tons of coal ash and 212,765 tons of scrubber sludge per year would require 213 acres over 20-year term. (Section 7.2.2.1)	SMALL – Almost no waste generation (Section 7.2.2.2)	SMALL to MODERATE – Adopting by reference GEIS description of waste management impacts from alternate technologies (NRC 1996b, Section 8.2)
Aesthetic Impacts				
SMALL – Adopting by reference Category 1 issue findings (Table 4-2, Issues 73, 74)	SMALL – Not an impact evaluated by GEIS (NRC 1996b, Section 7.3)	MODERATE – The coal-fired power block and the exhaust stack would be visible from Hwy 95 and from a moderate offsite distance (Section 7.2.2.1)	SMALL – Steam turbines and stacks would create visual impacts comparable to those from existing FNP facilities (Section 7.2.2.2)	SMALL to MODERATE – Adopting by reference GEIS description of aesthetic impacts from alternate technologies (NRC 1996b, Section 8.2)
Cultural Resource Impacts				
SMALL – SHPO consultation minimizes potential for impact (Section 4.19, Issue 71)	SMALL – Not an impact evaluated by GEIS (NRC 1996b, Section 7.3)	SMALL – Impacts to cultural resources would be unlikely due to developed nature of the site (Section 7.2.2.1)	SMALL – 100 miles of pipeline construction could affect some cultural resources (Section 7.2.2.2)	SMALL – Adopting by reference GEIS description of cultural resource impacts from alternate technologies (NRC 1996b, Section 8.2)

SMALL - Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource.

MODERATE - Environmental effects are sufficient to alter noticeably, but not to destabilize, any important attribute of the resource. 10 CFR 51, Subpart A, Appendix B, Table B-1, Footnote 3.

Btu = British thermal unit

ft³ = cubic foot

gal = gallon

GEIS = Generic Environmental Impact Statement (NRC 1996)

kWh = kilowatt hour

lb = pound

MM = million yr = year

MW = megawatt

NO_x = nitrogen oxide

PM₁₀ = particulates having diameter less than 10 microns

SHPO = State Historic Preservation Officer

SO₂ = sulfur dioxide

TSP = total suspended particulates

Supplemental Socioeconomic Bounding Information

New References for 60 Additional Employees Bounding Analysis

Fetter, C. W., Jr. 1980. Applied Hydrogeology. Charles E. Merrill Publ. Co. Columbus, OH.

USDC (U.S. Department of Commerce). 2001. Letter from H. Boston (Regional Economist) to E. N. Hill (TtNUS) containing RIMS II multipliers. May 17.

USCB (U.S. Census Bureau). 2000. "State and County Quickfacts. Houston County, Alabama and Henry County, Alabama." Available online at <http://factfinder.census.gov/>. Accessed October 20, 2003.

LAND MANAGEMENT OPTIONS AND RECOMMENDATIONS
FOR THE FARLEY NUCLEAR PLANT, HOUSTON COUNTY, ALABAMA

Submitted by: Dr. Keith Causey

Feb. 4, 1993

INTRODUCTION

This report was prepared by Dr. Keith Causey, Professor of Wildlife Science at Auburn University. Dr. Causey prepared the initial wildlife and land management guidelines for the Farley Nuclear Plant several years ago. This report was developed following discussions held January 19, 1993 with company representatives as part of ongoing efforts to evaluate and improve the existing land management program.

WILDLIFE CENSUS, INCLUDING BIRD POPULATIONS

Recommendations - True population censuses are not practical or necessary. Annual counts and long-term trend data are more practical and appropriate for the Farley Site.

Options - A system involving interested members of the security force who constantly patrol the area could be developed to record and enumerate the various common mammals occurring on the site. This system would require those counts to be recorded over precise distances travelled across or around the site during specific times and dates on an monthly, quarterly, semi-annual or annual basis.

Bird counts usually require trained professionals or very competent amateurs because of the variety and difficulty of identification of various sex and age classes of resident and migratory species. Useful and appropriate data could be gathered by employing private consultants, university graduate students or enlisting the volunteer services of local Audubon clubs for annual or seasonal bird counts. The time and frequency of these counts should be coordinated to factor in seasonality of population changes occurring from migratory nature of many of the bird species using the plant site. Private consultants would require capital outlay but minimal logistical problems while utilizing Audubon clubs

would be free but maybe require more coordination and planning. Either option would produce adequate data sets.

DEER POPULATION ISSUE

Density: My personal observation and counts of white-tailed deer on the plant site indicate a minimum of 150 animals using the area in winter of 1992-93. Many individuals appear undernourished, scruffy-coated and small-bodied. In my opinion there are more deer on the site than adequately can be fed by the natural and supplemental forage base. Distinct browse lines are readily observable across the entire site and many native forages are suffering damage from excessive use by deer. These conditions contribute to poor physical fitness among individuals in the deer herd and increases their susceptibility to parasites and diseases. Without effective predators to limit population growth (cougars, red wolves and black bears once preyed heavily on white-tailed deer in southern habitats) and no human predators (hunting) the population stabilizes at a density determined by the annual production of digestible forage produced on the site. Few fawns survive to reproductive age and most deer are stunted and appear unthrifty. By this time all edible vegetation below 5 feet in height is severely browsed and some shrubs, vines and forbes even eliminated from the area. This situation negatively impacts many other bird and mammal populations.

Left to nature these protected deer herds may linger in poor, nutritionally stressed condition for many years but are prime for a "die-off". The Farley deer herd would be a likely candidate for a die-off from EHD, a hemorrhagic disease transmitted by small biting gnats. Historically these die-offs have occurred in late summer which is a particularly stressful period for many southern deer herds.

Winter Food Crop Needs: Adequate acreage currently is devoted to winter deer food production. The only change I recommend would be the inclusion of Redland II clover to the fall planting. About 12 pounds per acre of clover seed can be broadcast on top of the small grain crop (after it has been harrowed in) then rolled with a cultipacker. This should insure a good clover stand under the small grain canopy during fall and winter and the clover will begin good production after the small grains mature and die.

Overpopulation Problem: Protected deer herds in the southern U.S. rapidly become overcrowded and suffer reduced vigor. This has now occurred on the Farley site. Significant crop damage is being endured by property owners on the southern boundary of the site.

Recommendations: At least 35 antlerless deer should be removed from the site.

Options: 1. Population reduction could be achieved by initiation of archery deer hunting from 15 October through 31 January each year. The number of antlerless deer taken should be tallied and should the total kill not equal 35, the remainder should be removed by skilled marksmen within the security division personnel. The removal should occur as quickly as possible in February. Disposal of the carcasses might be facilitated by cooperating with the Buckmasters, Inc. "Hunters for the Hungry" program whereby the meat would be processed and distributed to the needy. This reduction would not "solve" the crop damage problem off the site but should help reduce the severity. Removal of deer by security personnel outside the regular hunting season will require careful coordination with and approval from the Alabama Department of Conservation and Natural Resources, specifically Mr. Charles Kelley and Capt. Tim Cosby.

2. Another option to consider is switching wildlife food plantings to spring and summer foods and reducing or eliminating the winter grain crops. This would encourage deer to move off the site to winter food planted by adjoining land landowners where they could be harvested during the regular hunting season.
3. Deer may be removed in sufficient numbers by live-trapping and re-location. This option also would require careful coordination with Alabama Department of Conservation, Game and Fish Division. Initial considerations must include identification of relocation site(s). Should this problem be solved, decisions concerning capital outlay, man-power and logistics must be made.

Construction of up to 10 Michigan-style box traps should enable personnel to capture 30-40 antlerless deer in a relatively short time (3-4 trapping sessions). Fewer traps would increase duration of effort, more would decrease it. Plans for construction of these traps can be obtained from Paul Maddox (Ph. 242-2469) with Division of Game and Fish in Montgomery. Depending on materials used, cost per trap would run about \$300 each. Hauling crates for transporting deer to re-location sites might be borrowed from Alabama Game and Fish. Otherwise more cost will be incurred. Crates would cost about \$100 each. Live-traps, after assembly, should be placed adjacent to or in existing agricultural wildlife plantings. Other trap sites might be used also i.e. wooded sites away from planted openings. Deer must be given adequate time to adjust to the presence of the traps and each trap should have both drop doors locked in their open position. Adjustment to presence of traps may require 3 to 4 weeks possibly less.

After deer are observed to move freely around and near the traps, whole kernel corn should be scattered on the ground around each trap daily. The equivalent of about 15 to 20 cups full around each trap should be sufficient.

As deer become habituated to eating corn in close proximity to the traps, corn should be placed inside each open trap. Increasing the amount of corn inside each trap while decreasing the amount scattered outside the trap will soon "train" the deer to go inside traps to eat corn. Once this is achieved successful trapping may begin. The pre-baiting period usually is approximately 10 days. When all is ready each trap is "set", usually in afternoon, and checked early the following morning. Deer captured in traps may be sedated with Rompun® and loaded into crates for removal to the release site.

A minimum of 4 people would be needed the day deer are trapped and moved. Vehicles for transporting deer to the release site also must be available. Someone with considerable experience in trapping and handling deer must be available to coordinate and supervise the operation. I would be willing to serve in this capacity.

Cost per deer removed can be quite high using live-trapping techniques. Cost varies with time and man-power involved and the trapability of the deer. Trapping success would be best from December through February. This option should not be selected without careful consideration of costs and logistical problems. If desirable I could make a detailed presentation on deer trapping and removal procedures and "pit falls" followed by a question and answer session with interested nuclear operations personnel.

PLANTING OF TREES

Any area not mowed for specific purpose on the plant site may be planted to tree cover. The soil types and moisture regimes of the unforested areas of the plant site lend themselves to establishment of pine forests. These soils also are suited for establishing stands of sawtooth oak (Quercus acutissima). All tree plantings should be enclosed by firebreaks 12-15 feet wide that

regularly are mowed or harrowed. Any sawtooth oak plantings should be on a 15 x 15 foot spacing and for the first 2-3 growing seasons should have grass and weed competition suppressed around the seedlings by regular mowing or light harrowing. Plantings not treated in this manner often fail to produce desired results. If plantings of pine [recommend loblolly (Pinus taeda)] and oaks are undertaken, I recommend equal acreage devoted to each type. It also is important to maintain the firebreaks around these plantings on a continuing basis.

WILDFLOWER AREA - Malcolm Pierson with Environmental Affairs of Alabama Power Company has experience with wildflower plantings. Wildflower mixtures suitable for use on the site are available. The Alabama Wildflower Association makes recommendations for plantings and Malcolm Pierson has worked with this group. In consultation with Jim Lochamy it is recommended that development of the wildflower areas be handled through Environmental Affairs.

WOOD DUCK/SONGBIRD BOX INSPECTION/CLEANING

All wood duck and songbird nest boxes should be checked for previous use and cleaned annually. This activity should be completed sometime during fall and winter but prior to 15 January. Percent previous or current occupancy and attempted identification of user species should be recorded.

RAPTOR NEST SITES

Barred owls and screech owls are common to the Farley site and both are cavity nesters. Attached are diagrams for nest box construction.

Barred owls defend rather large territories and boxes should not be located closer than 5-700 meters apart. No more than 10 boxes would be needed to saturate the hardwood and mature mixed forest types on the Farley site. Boxes should be about 10 meters high in a mature hardwood or conifer tree. The

entrance hole should not be obscured by branches or leaves but a nearby perch is desirable for young to use when leaving the nest box. The box should be no closer than 50 meters to the forest edge or clearings. An open flight path to the entrance is preferred. Squirrels often use owl boxes. If this becomes a problem, removing the tops from the boxes often discourages use by squirrels but owls continue to use them. Boxes should be installed by January and cleaned each January thereafter.

Screech owl nest boxes should be placed at least 3 meters high in hardwood or mixed forest. Edges adjacent to fields or wetlands seem to be preferred. About 2-3 inches of wood chips should be placed in the bottom of the boxes and 10-15 boxes should be placed initially and evaluated to determine future needs or desires. Boxes should be installed by January and cleaned each year in January.

Osprey Platform: A diagram for constructing an osprey nesting platform is attached. I recommend placing the pole and attached platform in the shallow wetland east of the Service Water Pond. An optional site would be the shallow end of the Service Water Pond. The pole supporting the platform should be 25-30 feet in height.

BEAVER DAMAGE

Damage to trees by gnawing activity of beavers in upper end of Service Water Pond can be managed.

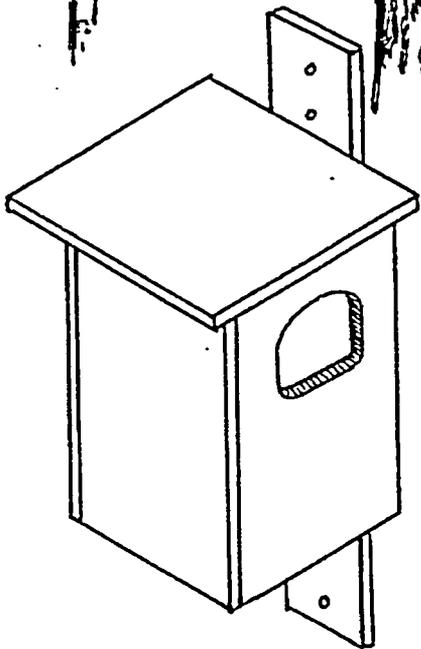
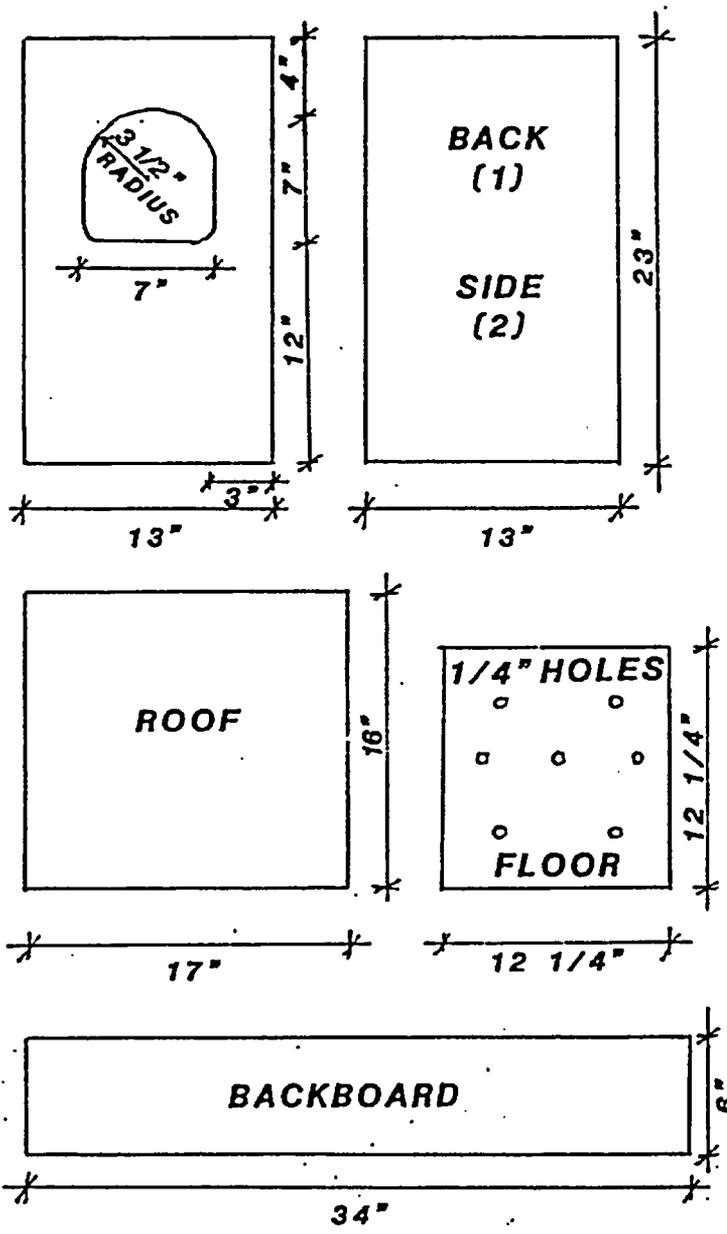
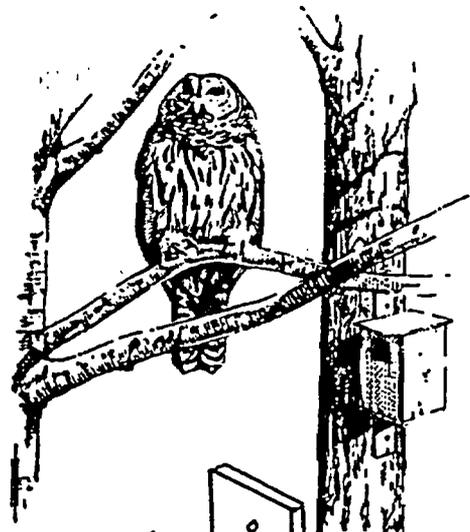
1. Trees may be protected by placing 2 x 4 inch wire mesh cages around bases of trees near the pond edge. Cages should be 36 inches tall and staked along bottom edge.

2. The alligator currently inhabiting the pond will likely deter increased beaver activity.

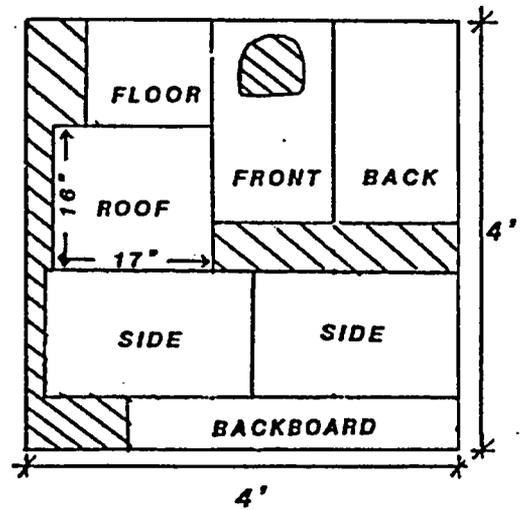
3. Beavers may be removed from the Service Water Pond by trapping with No. 330 Conibear® traps set along feeding trails of beavers in the area of feeding activity.

Note: Beaver problems in the pond likely will be a continuing problem requiring continuous monitoring.

BARRED OWL NEST BOX

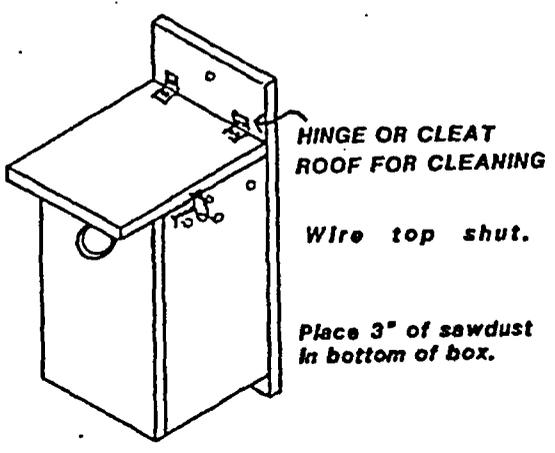
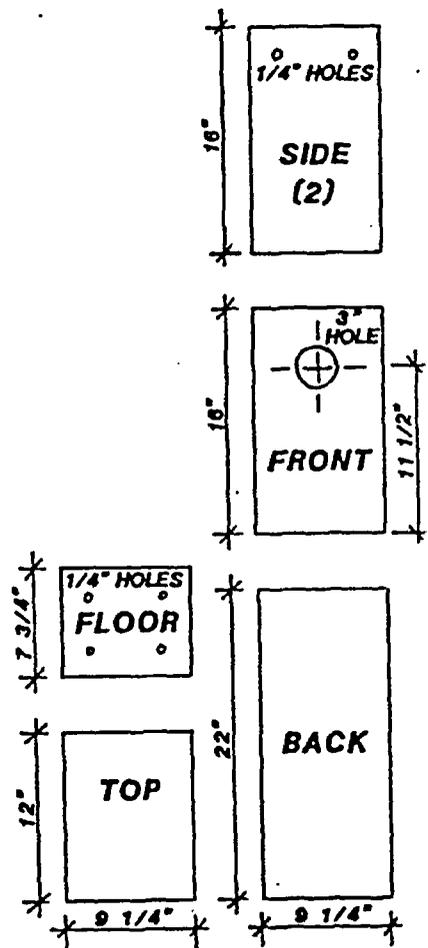


NOTE: No hinged door needed.
Clean through entrance hole.

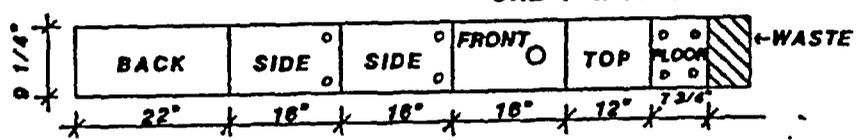


LUMBER: One 4'x4'x3/4" sheet exterior plywood,

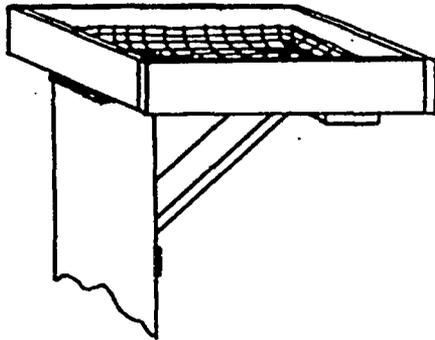
AMERICAN KESTREL
 NORTHERN SCREECH-OWL
 NORTHERN SAW-WHET OWL
 BOREAL OWL (?)
 NEST BOX



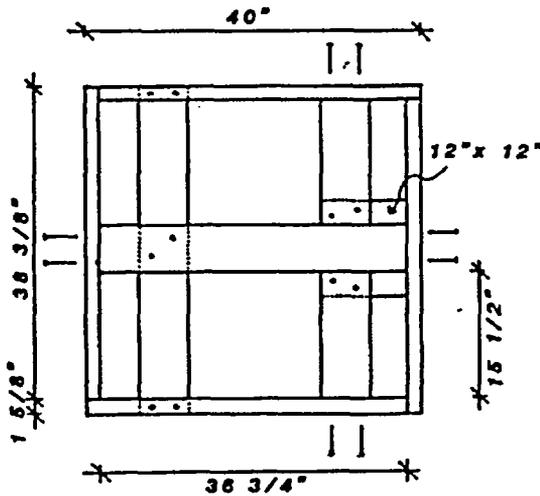
LUMBER:
 ONE 1" x 10" x 8' 0"



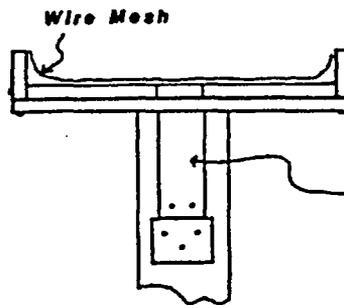
OSPREY NEST PLATFORM



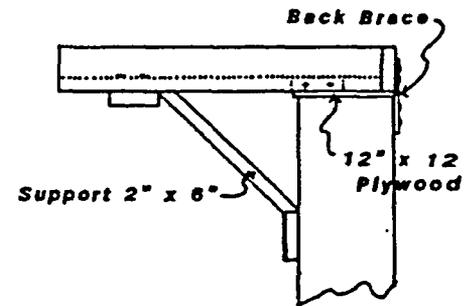
TOP VIEW



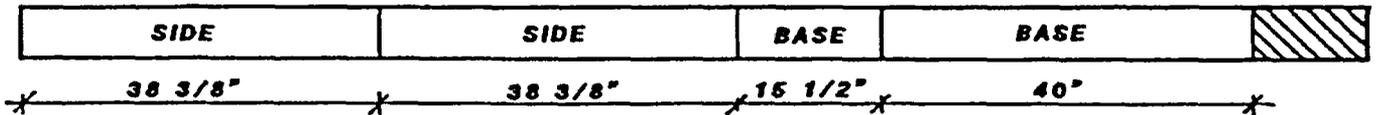
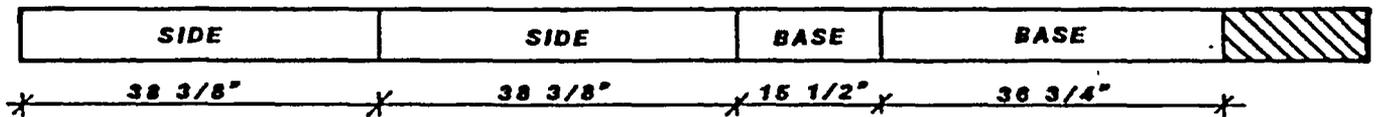
FRONT VIEW



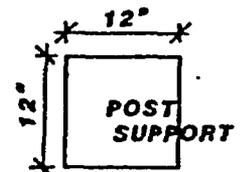
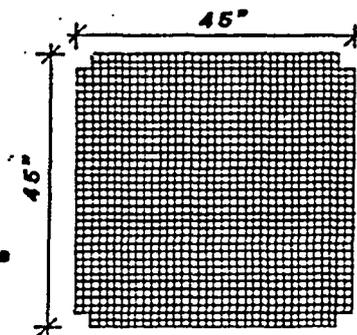
SIDE VIEW



LUMBER: Two 2" x 6" x 12' cedar board
 One 2" x 6" x 4' cedar board
 One 12" x 12" x 1/2" exterior plywood
 One 20' or 30' cedar support post



Galvanized welded wire



SHARED

10/21/03 10:47:34

FNP-0-ENV-23
August 9, 2000
Revision 6

FARLEY NUCLEAR PLANT
ENVIRONMENTAL PROCEDURE

FNP-0-ENV-23

LAND AND WILDLIFE MANAGEMENT PROGRAM

PROCEDURE USAGE REQUIREMENTS PER FNP-0-AP-6	SECTIONS
Continuous Use	
Reference Use	ALL
Information Use	

Approved:

ROBERT A. LIVINGSTON
CHM & ENV Superintendent

Date Issued 8-24-00

LAND AND WILDLIFE MANAGEMENT PROGRAM

1.0 Purpose

To provide guidance for activities conducted to implement the Joseph M. Farley Nuclear Plant Land Management Plan.

2.0 References

- 2.1 Environmental Protection Plan, Appendix B of FNP Technical Specifications Units 1 and 2
- 2.2 NT-87-0486, Letter from K. W. McCracken to W. L. Bowers, November 16, 1987; Subject: Land Management Program
- 2.3 Letter from K. W. McCracken to D. N. Morey, November 9, 1988; Subject: Land Management Program
- 2.4 FNP-88-0968, Letter from D. N. Morey to K. W. McCracken, December 20, 1988; Subject: Land Management Program
- 2.5 ENV-89-214, Letter from K. W. McCracken to B. D. McKinney, Jr., October 4, 1989; Subject: Land Management Plan-Planting of Winter Food Plots
- 2.6 ENV-90-039, Letter from K. W. McCracken to J. E. Garlington, February 12, 1990; Subject: FNP Land Management Plan
- 2.7 Joseph M. Farley Nuclear Plant Land Management Plan

3.0 General

- 3.1 The Farley Nuclear Plant Site has been certified by the Wildlife Habitat Enhancement Council (WHEC) as a Corporate Wildlife Habitat under two categories:
 - 3.1.1 Restoration and Creation of Wildlife Habitat: Reforestation
 - 3.1.2 Maintenance, Protection and Enhancement of Existing Wildlife Habitats: Wildlife Food, Cover and Nesting Cavity Management and Wetlands Management Programs
- 3.2 The land and wildlife management program requires management support, employee involvement and close cooperation and coordination between the Visitors' Center, Environmental Group, and Facilities Group to be visible and successful.

- 3.3 Technical assistance may be obtained from Alabama Power Company Environmental Field Services and from Environmental Services, as needed.
- 3.4 Nest box monitoring is essential to determine the number of boxes being used, the types of birds using them, and to identify and correct problems such as predation, parasites or undesirable bird species. With management approval, non-FNP organizations such as the Wiregrass Audobon Club may perform nest box monitoring. Such organizations use data sheets and procedural guidance provided by the FNP Environmental group. A copy of the results of their monitoring activities will be retained by the FNP Environmental group to track the progress of this portion of the Land and Wildlife Management Program. A site coordinator appointed by the Chemistry and Environmental Superintendent will act as point of contact and ensure that non-FNP personnel are briefed on safety, emergency procedures, and security concerns, that permits to drive privately owned vehicles on the plant site are obtained and that camera passes, if needed, are obtained (See Attachment 2 for a listing of items which must be covered.).
- 3.5 The Wildlife Program depends on assistance from volunteer employees as well as occasional offsite personnel. Instructions for wildlife management program and monitoring are provided based upon periodic review and consideration of implementation of recommendations from an individual with expertise in the area of land and wildlife management. The instructions of this procedures will be updated as this is done.

4.0 Procedure

NOTE: Planting of food plots and placement of mineral blocks may be discontinued during times of overpopulation (As of the date of this procedure, an overpopulation situation is deemed to exist.).

4.1 Wildlife Management

- 4.1.1 Coordinate placement of salt and mineral blocks in selected wooded areas semi-annually at the approximate locations shown on an uncontrolled map maintained by the Environmental Group unless an overpopulation condition exists.
- 4.1.2 Coordinate planting of winter food crops between the approximate dates of September 15 and October 15 as weather permits at the approximate locations shown on an uncontrolled map maintained by the Environmental Group unless an overpopulation condition exists.
- 4.1.2.1 Obtain soil samples prior to planting a new plot to determine what seed and fertilizer to use for yielding the best growth.

NOTE: ENV Technician will coordinate with Facilities (FAC) for the preparation of the ground for planting.

- 4.1.2.2 Prepare the ground for planting by turning the soil with a disk harrow or equivalent.
- 4.1.2.3 Spread lime (if needed) to adjust pH. (A rate of ≈ 2 tons per acre may be used as the "normal" distribution rate unless another rate is deemed necessary per discussions with consultant personnel).
- 4.1.2.4 Spread fertilizer (if needed) over each plot. (A rate of ≈ 700 pounds per acre may be used as the "normal" distribution rate unless another rate is deemed necessary per discussions with consultant personnel).

NOTE: The clover seeds will need to be replanted approximately every 4 - 5 years.

- 4.1.2.5 Broadcast seed mixture at the following approximate rate as needed (with consideration for the results determined in step 4.1.2.1):

Wheat	2 bushels/acre
Abruzzi rye	1/2 bushel/acre
Oats	1/2 bushel/acre
Crimson clover	10 lbs/acre
Ladino clover	10 lbs/acre
Regal clover	4 lbs/acre

- 4.1.3 Manage vegetation in open areas by mowing which creates and maintains edge effect and habitat diversity.
- 4.1.4 Post "No Hunting" signs on the north and south boundaries to prevent inadvertent trespassing by hunters, thus preserving the wildlife population.
- 4.1.5 Bow hunting by plant employees may be used to thin the deer population to prevent overgrazing and overpopulation, thus ensuring a stronger deer herd.

4.2 Timber Management

NOTE: The objective of any tree thinning program is to leave well-formed pine trees in addition to the residual hardwood component that are free of disease and defect and have good genetic characteristics. This will insure good seed stock for resulting natural regeneration.

- 4.2.1 Leave hardwood and pine sites in natural state unless thinning of the pine sites is determined to be necessary to enhance the overall health of the trees in the area per discussions with consultant personnel and with the approval of plant management.

NOTE 1: These plantings create more edge in this open area and provide cover and food for the wildlife when the pine canopy is closed and the oaks begin acorn production.

NOTE 2: Seedlings should be planted by March 1 if possible.

- 4.2.2 Coordinate planting of loblolly pines and sawtoothed oaks as needed with the Facilities Group for re-forestation as determined necessary per discussions with consultant personnel and with the approval of plant management.

- 4.2.2.1 Note the approximate location of any planting on an uncontrolled plant site map (to be maintained by the Environmental Group).

- 4.2.2.2 Use no fertilizer on the seedlings during the first year of growth.

4.3 Songbird Management

4.3.1 Installation of Nest Boxes

NOTE: These boxes entice birds to nest thus increasing the existing songbird population.

- 4.3.1.1 Ensure boxes are numbered or otherwise identifiable such that trending of box activity can be performed if deemed necessary and practical.

- 4.3.1.2 Place boxes in the edges of open areas with entrance facing open area.

- 4.3.1.3 Attach boxes at a height of 4 1/2 - 5 feet above the ground on fence or light posts using wire, nails or other hardware as appropriate.
- 4.3.1.4 Space boxes so that the approximate minimum distance between them is in the range of 100 yards.
- 4.3.1.5 Note the approximate location of each box on an uncontrolled copy of a map of the plant site or in a ledger indicating the approximate box location (and a listing of the global positioning system coordinates if being used).

4.3.2 Inspection and Cleaning of Nest Boxes

NOTE: The Environmental Technician should coordinate with Facilities (FAC) and/or the Wildlife Team for the cleaning of the nest boxes.

CAUTION: Exercise caution when opening nest boxes as they are often occupied by wasps.

Inventory, inspection and cleaning the nest boxes is most appropriately done during the winter months but it may be done at other times, if necessary. Record findings on a data sheet such as Attachment 3.

- 4.3.2.1 Ensure that each box is numbered or otherwise identified.
- 4.3.2.2 Confirm the location of the box on an uncontrolled map of the plant site maintained by the Environmental Group or in a ledger indicating the approximate box location (and a listing of the global positioning system coordinates if being used). The map or ledger of the nest box locations will be maintained by the Environmental Group and/or the Wildlife Team; additions to or deletions from the map or ledger may be made as necessary.
- 4.3.2.3 Inspect the box for damage.
 - a. Perform any needed repairs at the site if possible.
 - b. Return the box to the environmental lab for repairs if necessary.
 - c. Replace boxes that are removed for repair or too badly damaged to repair.
- 4.3.2.4 Clean debris and old nesting material from the boxes.

4.3.2.5 Use nesting material, feathers, eggs or egg shells to identify, if possible, the species that nested in the box.

4.3.2.6 Place the nest in a plastic bag or other suitable container, label it and take it to the environmental lab for later identification if unable to identify the species from the material in the box and if thought necessary.

4.3.3 Nest Box Monitoring

4.3.3.1 Check nest boxes periodically (normally weekly) during the nesting season (usually starting in March).

4.3.3.2 Initially make a soft noise when approaching the box to give the female a chance to fly away.

CAUTION: Exercise caution when opening nest boxes as they are often occupied by wasps.

4.3.3.3 Tap gently on the box before opening.

4.3.3.4 Open the box slightly before opening completely.

4.3.3.5 Make final egg count only after the female has begun to incubate.

4.3.3.6 Remove the old nest from the box shortly after the young have left to allow the adults to use the box for another brood.

4.3.3.7 Inspect and clean the nest boxes each year per section 4.3.2.

4.3.3.8 Record information and observations on a data sheet and retain (Attachment 3 or a similar form may be used.).

4.4 Wood Duck Management

4.4.1 Installation of Wood Duck Nest Boxes

4.4.1.1 Ensure boxes are numbered or otherwise identifiable such that trending of box activity can be performed if deemed necessary and practical.

4.4.1.2 Place wood chips (oak or any hardwood) inside boxes.

4.4.1.3 Place boxes 30 to 50 yards apart.

- 4.4.1.4 Place all boxes at the bank of or near the vicinity of a pool of water.
- 4.4.1.5 Clear the area of brush six to ten feet around the location of the box.
- 4.4.1.6 Drive a ten foot length pole into the ground about 3 to 4 feet.
- 4.4.1.7 Place one or two (if practical) wood duck boxes back-to-back (preferably facing north and south) at the top of the pole and the predator shield under the box(es).
- 4.4.1.8 Note the approximate location of each box on an uncontrolled copy of a map of the plant site or in a ledger indicating the approximate box location (and a listing of the global positioning system coordinates if being used).

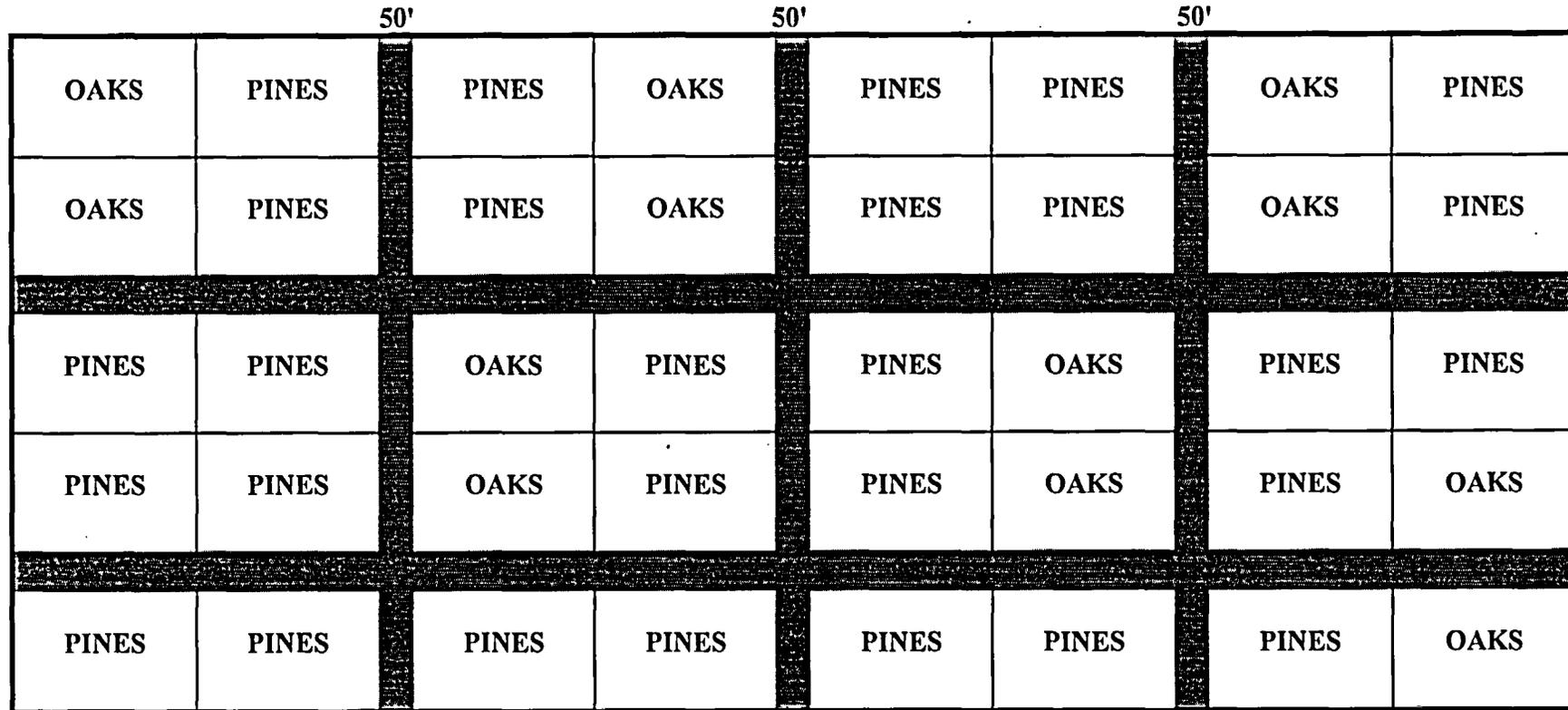
4.4.2 Maintenance of Wood Duck Nest Boxes

NOTE: The ENV Technician should coordinate with Facilities (FAC) and/or the Wildlife Team for the cleaning of the nest boxes.

CAUTION: Exercise caution when opening nest boxes as they are often occupied by wasps.

- 4.4.2.1 Nest boxes should be checked for old nest material sometime from late November through end of January of each year.
- 4.4.2.2 Remove old nest material.
- 4.4.2.3 Remove old wood chips if necessary.
- 4.4.2.4 Repair/replace or eliminate any damaged boxes.

**ATTACHMENT ONE
FNP LAND MANAGEMENT PLAN
Recommended Pattern for Tree Planting**



One Acre
(Approx.)

375'

- NOTES:**
1. Shaded areas represent unplanted openings.
 2. Oaks planted on 15' X 15' spacing.
 3. Pines planted on 6' X 10' spacing.
 4. Rows of trees should not be staggered (to allow mowing).

ATTACHMENT ONE

FOREST MANAGEMENT PLAN FOR PLANT FARLEY LANDS

DATE: Feb/2000

I. GENERAL INFORMATION

The Farley Plant Lands are located on the Chattahoochee River in Houston County, Alabama and in Early County, Georgia. They consist of 1806 acres in Alabama, which are immediately around Southern Nuclear's Farley Nuclear Electric Generating Plant. The portion of land in Georgia lies in the Chattahoochee River and therefore there is no practical use of the Georgia property for forestry activities. The Farley Plant land is fee ownership property held by Alabama Power Company.

II. FACTORS AFFECTING FOREST PRODUCTIVITY

The Farley tract is located in the Coastal Plain Region. The topography is generally flat to gently rolling. However, along the streams some slopes approach 12 percent. Much of the flats along the Chattahoochee River are subjected to flooding. The soils associated with this tract range from the silt and fine sandy loam of the Bibb, Bladen, and Cowarts soil series to the loamy sand Alaga series. The Alaga series lying along the stream and river terraces are good sites for mixed pine hardwood stands. The Bibb and Bladen series lie along the banks of the river and major streams. These are primarily excellent sites for hardwood stands. The Cowarts series lie along undulating ridgetops and side-slopes. These sites support average to good stands of pines such as those along Highway 95 near the contractor entrance to the Plant. Most of the old field areas consist of the sandy loam Dothan series, which is well suited to pine growth. Some of the most productive pine sites occur in the stream flats north and east of the firing range where the Flint series predominates. The other dominant series are the Red Bay series and the Maxton series. The Red Bay series occurs mostly north of the Plant on the uplands and gentle side slopes. These are generally good pine-hardwood sites. The Maxton series produce good stands of pine timber and this series is found in the second and third terraces of the river.

III. TIMBER TYPE

Most of the pine stands of the Farley tract are stocked primarily with loblolly pine. There is some occurrence of shortleaf and spruce pine within these areas. The hardwood bottoms in the vicinity of the river are respectably stocked with water oak, cherrybark oak, white oak, poplar, and miscellaneous species. The hardwood areas and mixed pine-hardwood areas along the streams and in the upland areas consist of miscellaneous oaks, sweetgum, and poplar. Very little regeneration is present due to crown closure in the overstory. However, in the recently harvested areas, natural pine regeneration is flourishing where sunlight can reach the forest floor.

ATTACHMENT ONE

IV. COMPARTMENTAL BREAKDOWN

NOTE: Please refer to the accompanying set of Farley Plant Lands Maps for visual reference of the areas described herein. The Farley Plant Lands are divided into two forest compartments to facilitate timber management objectives. The two compartments are generally divided on the ground by the main Plant entrance road and the secondary Plant road leading to the fresh-water intake at the river's edge. The Plant acres in Georgia are river acres and are not included in the timber management plan.

A. Plant Area - 860 acres. The Plant area in the context of this plan is made up of buildings, facilities, and maintained open areas. This is represented as facility and open land types on the accompanying *Land Type and Use Planning Map*. This area also includes all transmission rights of way and the cooling tower emergency reservoir. The Plant area has very little timber volume associated with it and is not considered manageable for timber. The acreage of this area remains fairly stable over time with some occasional change when selected open areas are planted in trees or when areas are cleared and included for Plant construction or maintenance needs. Approximately 428 acres of the Plant area are located within Compartment P01 and the remaining 432 acres are located in Compartment P02.

B. Compartment P01 - 535 acres. In general, the natural timber stands in the western half of this compartment are pine type. The pine-hardwood areas and the hardwood areas are found more consistently in the eastern half of the compartment. Other than the re-clearing of the roadside of the contractor entrance, no harvesting has occurred in this compartment. However, five harvest areas have been identified for cutting over the next four years. These areas are depicted on the accompanying *Harvest Priority Schedule Map*. These sites are in areas of natural timber stands and will consist of single tree selective cutting from the pine component. No hardwood is scheduled for harvest initially other than a small amount of pulpwood to facilitate the pine harvest. There may, however, be a need to harvest some hardwood sawtimber 15 - 20 years from now to promote hardwood regeneration. As shown on the accompanying *Tree Plantations Map*, approximately 52 acres of previously open land have been planted to pine and some hardwood over the years. Ten acres of the plantations are ready for first thinning and this should occur in the next few years. Some additional areas have been identified for planting in the next several years.

Compartment P02 - 411 acres. The natural timber stands of this compartment are productive sites composed of mostly pine and pine-hardwood areas. The true hardwood areas are in the very southeast corner of the compartment and along the first terrace of the river. Two harvests of selectively cut pine have occurred in recent years. In 1998 a sale was conducted in the general vicinity of the target range. Pine sawtimber totaling 335,126 board feet (Scribner scale) was selectively harvested from this 97-acre area. In addition, 143.59 cords of pine pulpwood and 24.87 cords of hardwood pulpwood were selectively harvested to produce total revenue from the sale of \$100,608.14 or \$1,037 per acre. The harvest in 1999 was conducted on 72 acres in the eastern one third of the compartment in an area between the 1998-harvest area and the river. This sale produced a selectively cut pine sawtimber

ATTACHMENT ONE

volume of 271,735 board feet (Scribner scale) and selectively cut volume of 355.55 cords of pine pulpwood and 42.02 cords of hardwood pulpwood. The revenue from this harvest totaled \$105,766.88 or \$1469 per acre. The residual stand of pine and hardwood in both of these harvest areas is such that similar harvests will again be possible at the next 20-year cutting cycle. As shown on the accompanying *Tree Plantations Map*, approximately 94 acres of previously open land have been planted to pine and some hardwood over the years. Thirty-eight acres of the plantations are ready for first thinning and this should also occur in the next few years. In addition, there are few areas of pine sawtimber that will come of age in the next 10-15 years. Areas for additional planting may come available from time to time in this compartment as well.

V. SUMMARY AND RECOMMENDATIONS

The active management of the timber on the Plant Farley property represents responsible stewardship of the land and the wise discretion of Plant Farley's management team. Timber management will insure the long-term health of this forest. The management of the timber can not only work in concert with, but also can enhance primary Plant objectives of sound wildlife management and Plant aesthetics.

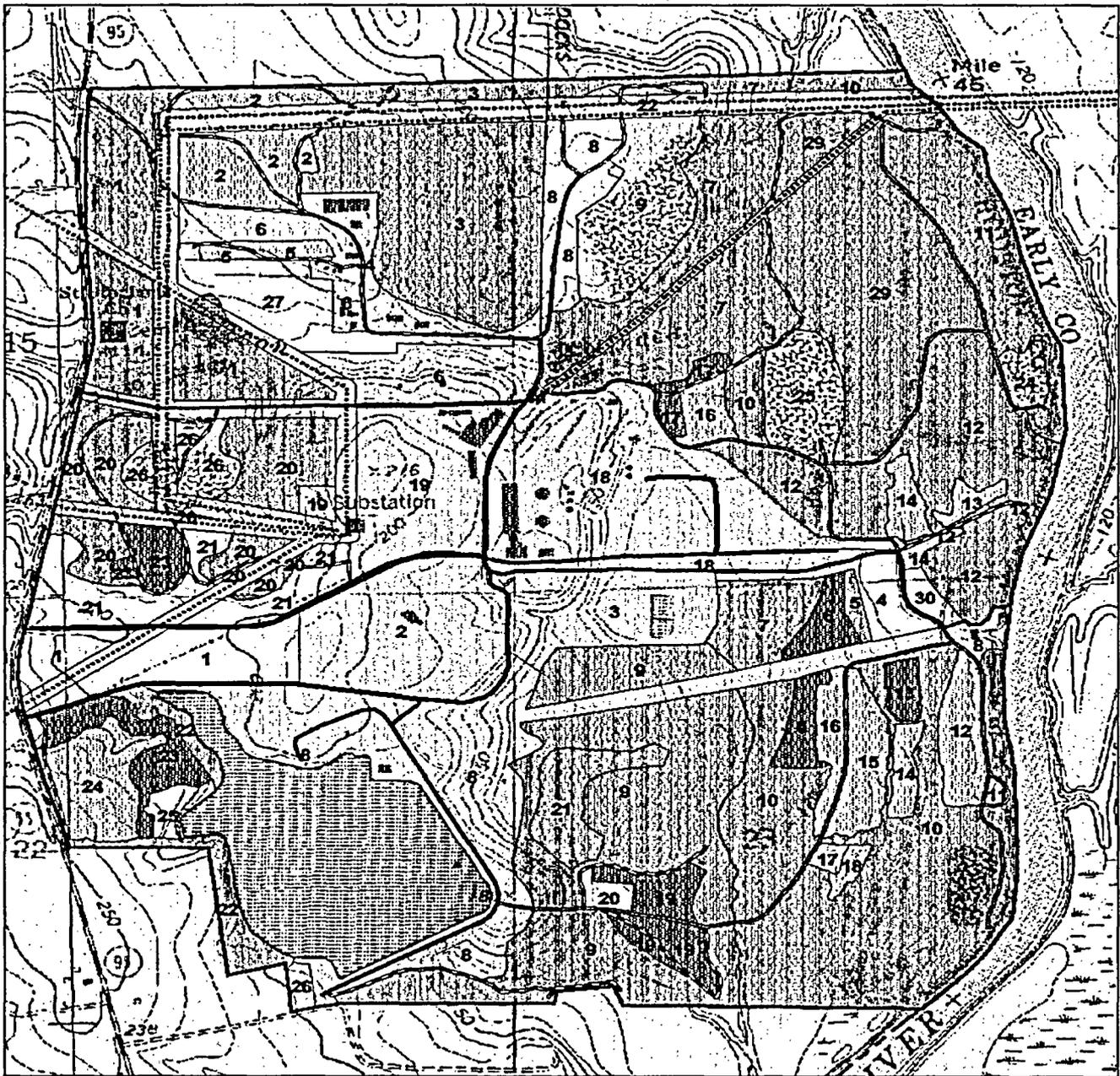
Current needs of the tract include the thinning of the merchantable pulpwood size pine stands as well as the selective harvest of mature pine and pine-hardwood stands. This is to be accomplished following the noted harvest priority schedule. Variance from this schedule may be dictated by changing timber market conditions or unforeseen silvicultural needs. Property boundary lines are marked at present with large property signs placed at varying distances along the boundary. These lines could be enhanced in the future using standard Alabama Power Co. red boundary paint on trees inline between these existing signs. Road access is generally not a problem as an adequate road system is well maintained by plant personnel.

Future needs include thinning of unmerchantable plantations as they reach merchantability. Also, future selective group cuttings of mature hardwood may be necessary to promote the natural regeneration of some hardwood areas.

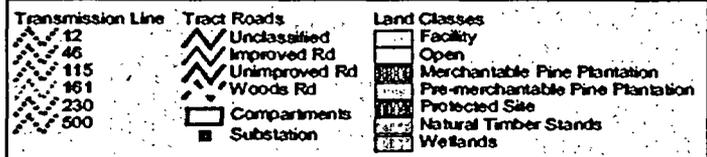
Farley Plant Lands

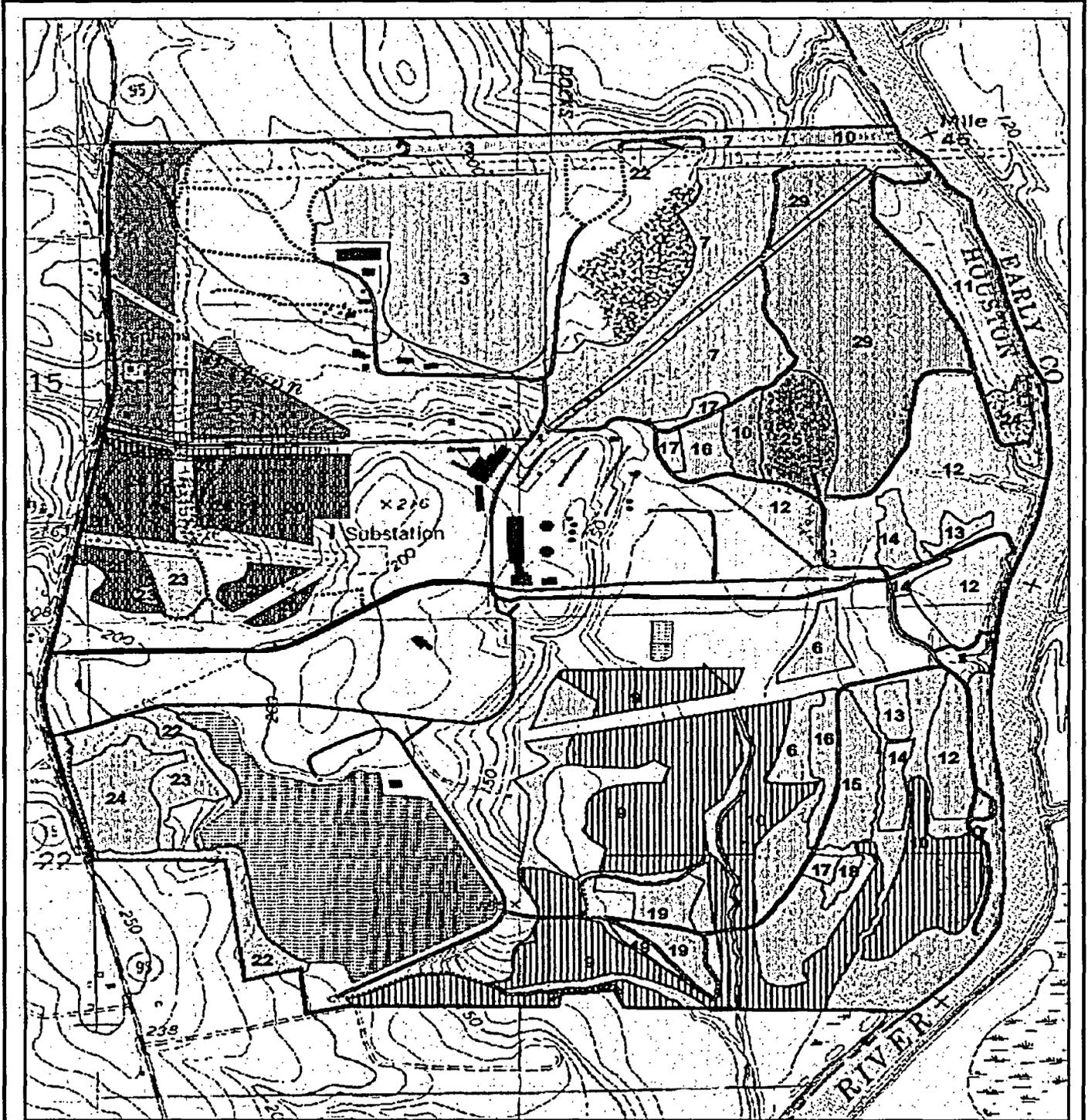
Land Type and Use Planning

ALABAMA
POWER
Corporate Real Estate - Forestry Section



Land Type	Number of Stands	Total Acres	Average Acres
Facility	15	431.6	28.7
Open	11	95.2	8.6
Merchantable Plantation	9	48.0	5.3
Unmerchantable Plantation	17	97.9	5.7
Protected Sites	1	1.0	1.0
Natural Timber Stands	29	810.3	27.9
Wetlands	3	32.0	10.6





Farley Plant Lands

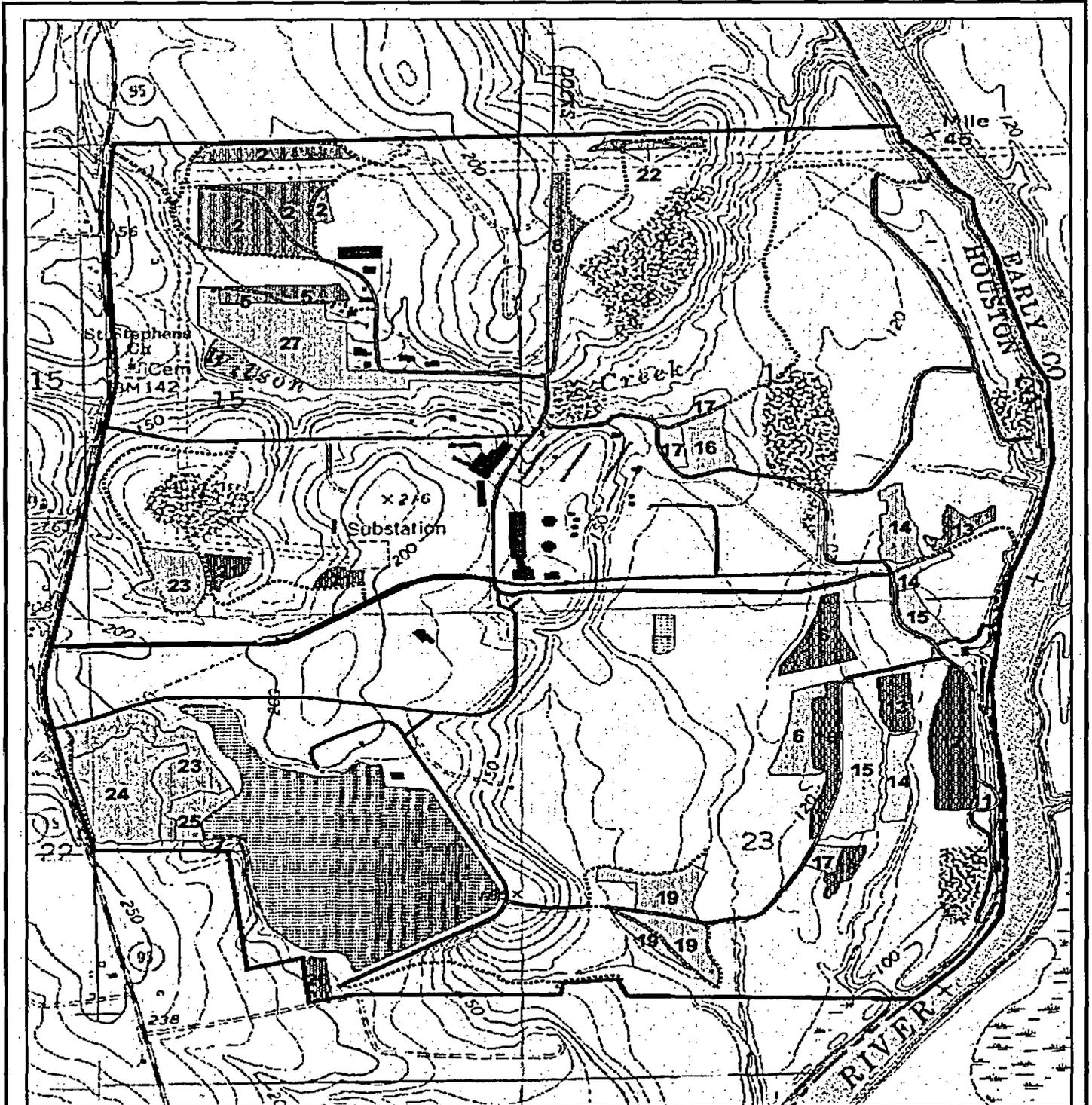
Harvest Priority Schedule

	Tract Roads		Priorities
	Unclassified		2000
	Improved Rd		2001
	Unimproved Rd		2001-2002
	Woods Rd		2002
	Compartments		2003
			2004
			Future Harvest
			Past Timber Sales



Corporate Real Estate - Forestry Section

24 January 2004 - D.H.H.



Farley Plant Lands

Tree Plantations



Corporate Plant Estate - Forestry Section

Tract Roads		Date Planted	
	Unclassified		1981
	Improved Rd		1982
	Unimproved Rd		1983
	Woods Rd		1984
	Compartments		1989
			1990
			1994
			1995
			1996
			2000
			2001

2 February 2004 - 01.01

**ATTACHMENT TWO
SONGBIRD NESTBOX MONITORING BY NON-FNP ORGANIZATIONS**

1. Security Concerns:

- **Do not enter fenced areas (RWIS, MPBPA, SW).**
- **Remain at least 20 feet from fenced areas.**
- **Report to security in event plant emergency alarm sounds.**
- **Do not cross plant boundary fences.**
- **NO alcohol or firearms allowed on site.**
- **No camera use allowed on site without camera pass.**

2. Safety Concerns:

- **Work in pairs at all times.**
- **Check out with security prior to leaving site.**
- **Report any accident or injury.**
- **Contact security if first aid is needed.**
- **Review site map of areas to be visited.**

3. Site Coordinator Responsibilities:

- **Inform security of visit in advance.**
- **Arrange for use of private vehicles on plant site.**
- **Arrange for camera passes if needed.**
- **Ensure each member of group understands safety and security concerns.**
- **Inform shift supervisor and security of arrival and departure of group.**
- **Render any assistance needed.**

**GUIDELINES FOR PERFORMING POWERLINE
CONSTRUCTION AND MAINTENANCE
IN AREAS OF
GOPHER TORTOISE HABITAT**



TABLE OF CONTENTS

- I. LIST OF FIGURES
 - II. GENERAL INFORMATION REGARDING THE GOPHER TORTOISE
 - III. RECOMMENDATIONS FOR POWERLINE CONSTRUCTION AND MAINTENANCE IN AREAS
OF GOPHER TORTOISE HABITAT
 - IV. EXHIBIT A
 - V. EXHIBIT B
- LITERATURE CITED

List of Figures

- Figure 1. Adult Gopher Tortoise
- Figure 2. Active Gopher Tortoise Burrow
- Figure 3. Active Juvenile Tortoise Burrow
- Figure 4. Entrance of Active Burrow
- Figure 5. Active Armadillo Burrows
- Figure 6. Gopher Tortoise Burrow - Burrow and Apron Sides

GENERAL INFORMATION REGARDING THE GOPHER TORTOISE
(Gopherus polyphemus)

The gopher tortoise is listed by the U. S. Fish and Wildlife Service as a federally "threatened" species west of the Tombigbee and Mobile Rivers in Alabama. The protected western population extends from Alabama across southern Mississippi to extreme southeastern Louisiana. The tortoise is listed as a threatened species in three Alabama counties: Mobile, Choctaw, and Washington.

The adult gopher tortoise has a large shell (carapace), 6-14.5 inches long. It is a dark-brown to grayish-black terrestrial turtle with elephantine hind feet and shovel-like forefeet (Figure 1). The yellowish, hingeless plastron (undershell) is characterized by a prominent gular projection beneath the head (Ernst and Barbour 1972). The front limbs are flattened for digging and they have large, thick scales and prominent toenails. Gopher tortoise hatchlings are yellowish-orange, have a soft shell, and are 1.5 to 2 inches long at hatching. Gopher tortoises are shy, harmless turtles that escape humans when possible. They cannot be provoked to bite, but will usually retract the head and appendages when disturbed or handled.

The species is found on elevated, well-drained, deep sandy ridges which are frequently characterized by longleaf pine and patches of scrub oak along the coastal plains of the southeastern United States. Controlled burning of these areas encourages herbaceous growth and increases the carrying capacity of the habitat for the tortoise. In Alabama, tortoise habitat is generally characterized by rolling hills capped with dry, sandy, terrace soils and dominated by longleaf pine, turkey oak, saw palmetto, reindeer moss, prickly pear, slender yucca, and wiregrass. Other habitat features that are conducive to the tortoises are an abundance of herbaceous ground cover and a generally-open canopy which allows sunlight to reach the forest floor. Grasses and legumes are reported to be the tortoise's most important food plants (Garner and Landers 1981). Tortoises are also found in ruderal habitats such as fence rows, pastures, field edges, and utility right-of-ways (U. S. Fish and Wildlife Service 1990).

Since the secretive tortoises escape into their burrows when disturbed, they are not frequently encountered in the field. Therefore, the conspicuous tortoise burrow is the main recognizable feature that confirms the presence of tortoises in the field. Most burrows have a single entrance and adult burrows average about 15 feet in length, with a depth of approximately 6 feet (Hansen 1963). Burrow tunnels slope downward from the surface and then usually level off underground (Conant and Collins 1991). Burrows are wide enough for the tortoise to turn around at some point along its length. Some burrows have been noted to extend to more than 20 feet horizontally. The burrow provides shelter from extreme heat and cold. Jackson and Milstrey (1989) have reported more than 60 vertebrate and 302 invertebrate species using gopher tortoise burrows. Some of the more commonly known burrow associates include the Eastern diamondback rattlesnake, the dusky gopher frog, and the Eastern indigo snake.



Figure 1. Adult Gopher Tortoise

Research in Georgia has indicated that males reach sexual maturity at 16-18 years of age and females mature slightly later when they are 19-21 years old. Females lay an average of four to six eggs per clutch. Breeding periods may begin as early as February and extend into September, depending on location. The period of maximum reproductive activity is from May through July. In some populations it is estimated that over 90 percent of the clutches are destroyed by predators prior to hatching (Mississippi Department of Wildlife, Fisheries & Parks 1992).

Biologists have discovered that the activity of the tortoises is greatly restricted during winter months. In warm weather, the tortoises usually emerge daily from their burrows in the morning before the heat is too great. They forage on grasses, leaves, and such wild fruits or berries as they can find (Conant and Collins 1991). Activity is very rare during extremely hot periods in the summer months.

Additional information regarding the gopher tortoise can be found in the Gopher Tortoise Recovery Plan (Exhibit A) prepared by the U. S. Fish and Wildlife Service in 1990. Additional natural history information on the gopher tortoise (Mount 1975) is also provided in Exhibit B. This latter publication includes a map that shows the range of the gopher tortoise in Alabama.

GUIDELINES FOR PERFORMING POWERLINE CONSTRUCTION AND MAINTENANCE
IN AREAS OF GOPHER TORTOISE HABITAT

- 1) A survey should be performed prior to Company crews entering rights-of-ways (ROW) with heavy equipment in areas of suspected gopher tortoise colonies to determine if active gopher tortoise burrows are present. An active burrow will have a mound of sand or soil thrown in front of the burrow with an absence of vegetation near the mouth of the burrow (See Figures 2 and 3). In the Fall of the year, leaves may cover an active burrow entrance, thereby giving it an appearance of being uninhabited (Figure 4). Also, gopher tortoise burrows have a characteristic oval or "half-moon" shape at the burrow entrance as shown in Figures 2 and 3. Armadillo burrows typically have a characteristic rounded opening (See photos in Figure 5) and should not be confused with gopher tortoise burrows. Armadillo burrows may occur in low, wet areas near dense vegetation. They do not typically manifest a conspicuous sandy mound near the entrance. However, armadillos may occasionally occupy abandoned tortoise burrows. Active gopher tortoise burrows should be identified with conspicuous flagging tape or brightly-painted wooden stakes near (but not obstructing) the burrow entrance.

- 2) The direction of an active burrow should be determined prior to traversing the ROW with heavy vehicles or equipment. Heavy equipment can cause the burrows to collapse. These vehicles and equipment may approach a gopher tortoise burrow entrance by remaining at least 25 feet from the entrance on the burrow side and at least 15 feet from the entrance on the apron side (See Figure 6). However, heavy equipment may travel along ROWs on well established vehicular routes. Jack Fuqua of Environmental Affairs should be contacted in the following instances:
 - 1) where there are problems with performing maintenance or construction activities along the ROW due to the location(s) of gopher tortoise burrows,
 - 2) where digging or excavation will occur within 25 feet of an active burrow, and
 - 3) where new guy anchors will be installed within 25 feet of an active burrow.

- 3) No heavy equipment should be used within 25 feet of an active burrow entrance while performing ROW clearing or bush hogging. Brush within the 25-foot radius should be hand cut or otherwise removed without the use of heavy equipment. Tortoise burrows must not be covered with debris.

- 4) No danger tree that is outside of a 25-foot radius of an active burrow entrance should be cut so that it falls within the 25-foot radius of the entrance. All danger trees that are cut within the 25-foot radius should be felled away from the entrance. Fallen trees and brush should not impede movement of the tortoise's exit and entry to the burrow. Topping or trimming the tree should be

performed in those cases where cutting the tree would adversely impact an active burrow.

NOTE 1: During emergency conditions it may be impractical to follow the recommendations described above. Any adverse impacts to tortoises or tortoise burrows following emergencies should be reported to Jack Fuqua.

NOTE 2: Questions regarding these guidelines should be addressed to either Jack Fuqua (205-250-4175), Malcolm Pierson (205-664-6177) or Johnny Dyess (334-285-2416 or 334-412-0050).

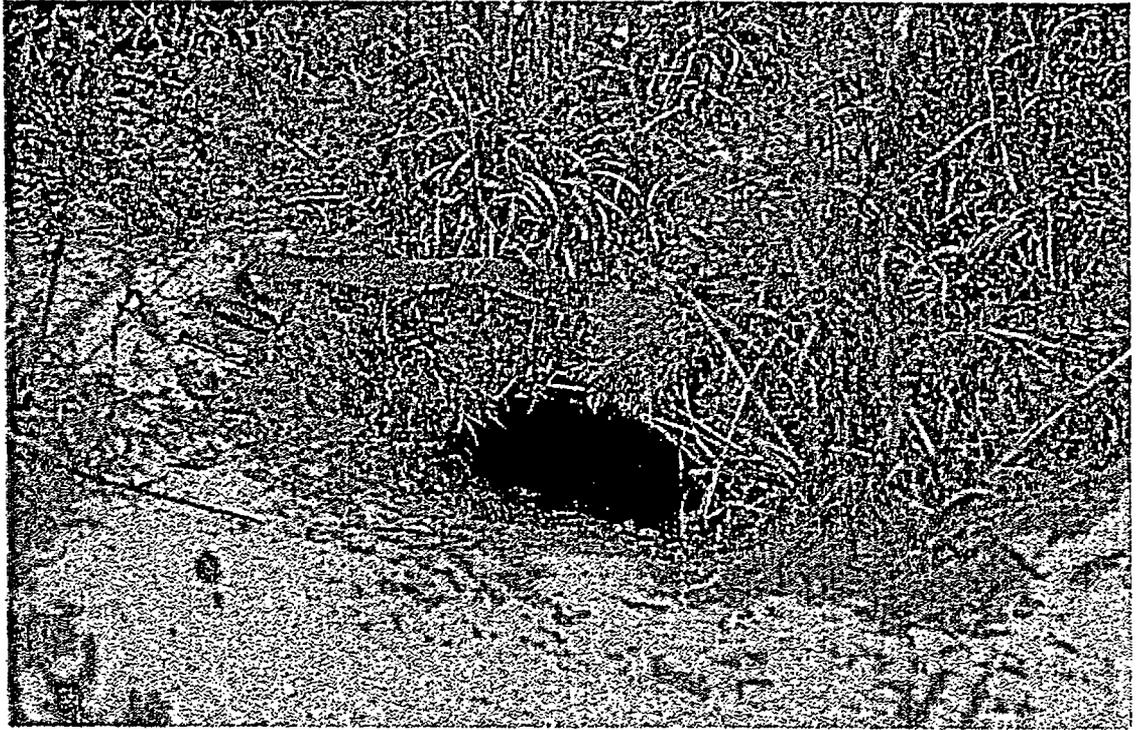


Figure 2. Active tortoise burrow

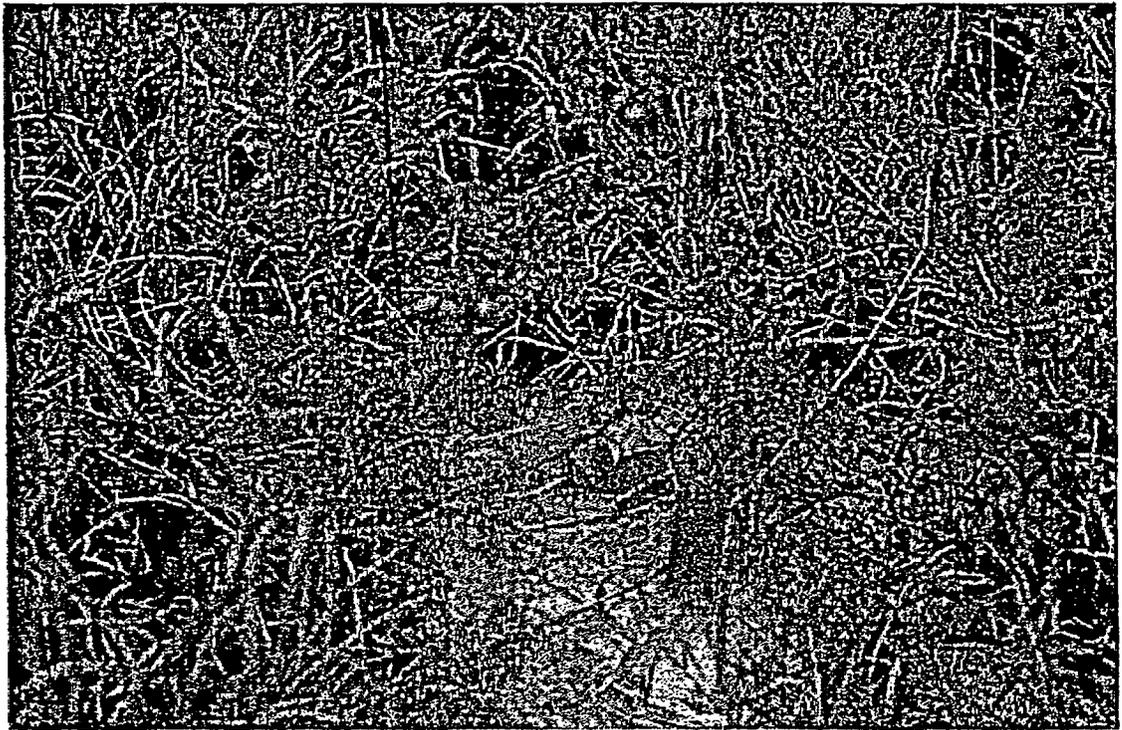


Figure 3. Active juvenile tortoise burrow



Figure 4. Entrance of active burrow covered in leaves.
Fresh soil appears under leaves.

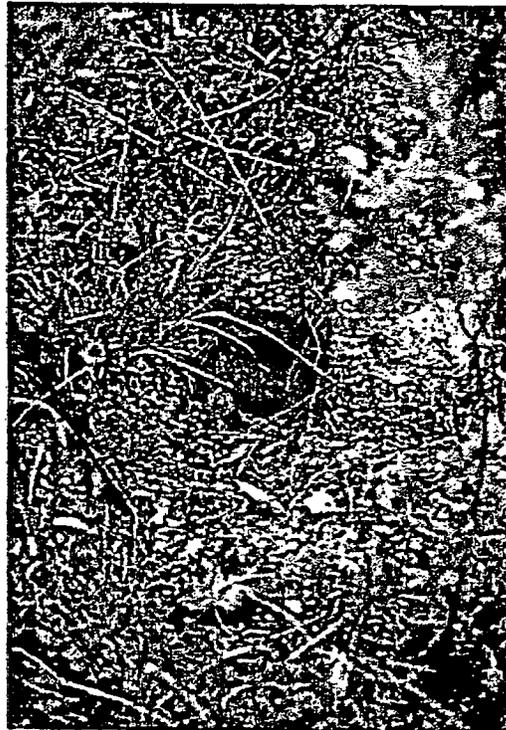


Figure 5. Active Armadillo burrows

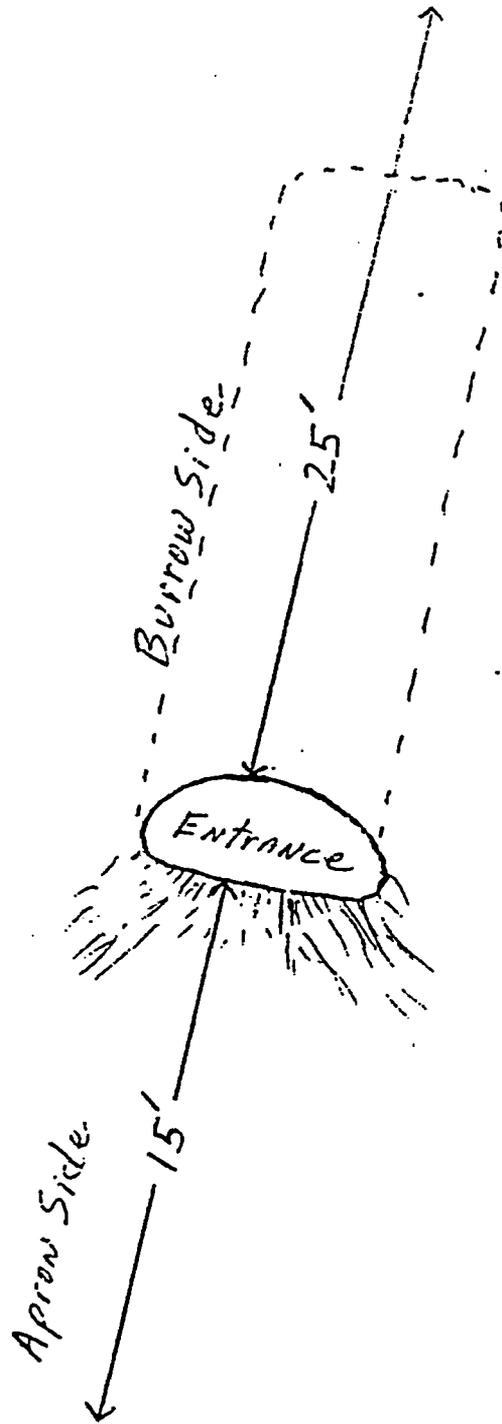


FIGURE 6

1214 Stevens Lane
Mobile, Alabama 36618

7 April 1995

Glenn G. Waddell
Balch & Bingham
Attorneys and Counselors
P.O. Box 306
Birmingham, Alabama 35201

Attorney Work Product - - Prepared in Anticipation of Litigation

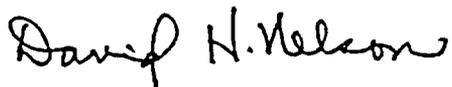
Dr. Mr. Waddell:

I have gone through the Gopher Tortoise Guidelines for the Alabama Power Company for a third time. I have made a few minor changes in the text. The document appears to be relevant, succinct and scientifically accurate. If this policy is followed, it should reduce the adverse impacts on tortoises in the field. I am encouraged to see a document formulated to promote sound ecological practices.

Powerline and gasline rights-of-way generally provide favorable habitats for tortoises. If the guidelines are followed, then the tortoise populations in the field should benefit.

I am pleased to participate in an attempt to responsibly manage a natural resource as extraordinary as the beleaguered gopher tortoise.

Sincerely,



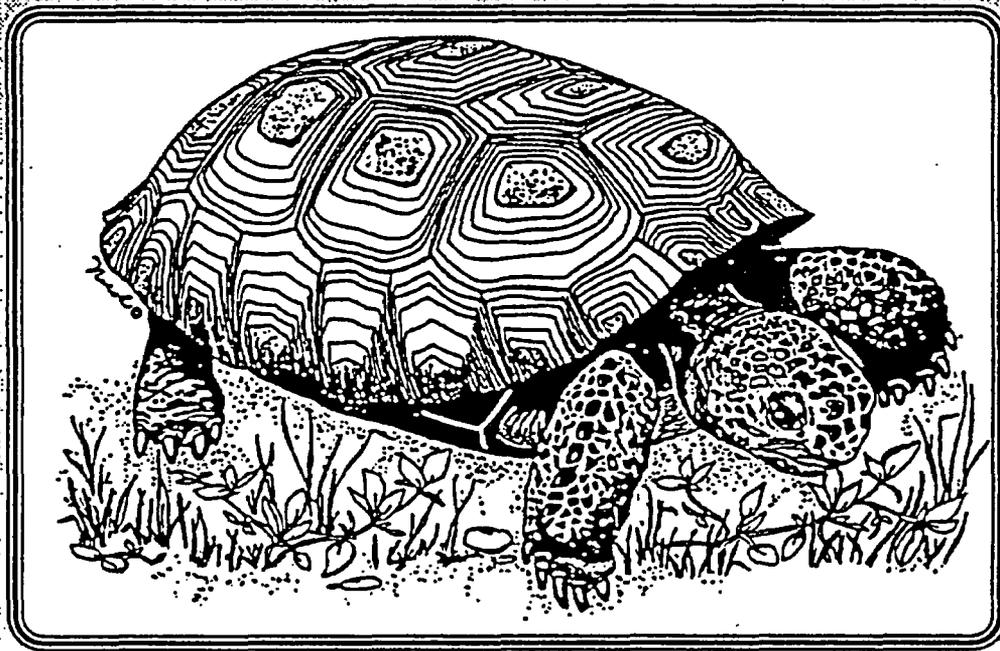
David H. Nelson, Ph.D.
Vertebrate Ecologist
Associate Professor of Biology

EXHIBIT A

Gopher Tortoise

(Gopherus polyphemus)

Recovery Plan



U.S. FISH AND WILDLIFE SERVICE
Southeast Region, Atlanta, Georgia

GOPHER TORTOISE
Gopherus polyphemus
RECOVERY PLAN

Prepared by
Wendell A. Neal
U.S. Fish and Wildlife Service

for

Southeast Region
U.S. Fish and Wildlife Service
Atlanta, Georgia

Approved:


Regional Director, U.S. Fish and Wildlife Service

Date:

December 26, 1990

Recovery plans delineate reasonable actions which are believed to be required to recover and/or protect the listed species. Plans are prepared by the U.S. Fish and Wildlife Service, sometimes with the assistance of recovery teams, contractors, State agencies, and others. Objectives will only be attained and funds expended contingent upon appropriations, priorities, and other budgetary constraints. Recovery plans do not necessarily represent the views nor the official positions or approvals of any individuals or agencies, other than the U.S. Fish and Wildlife Service, involved in the plan formulation. They represent the official position of the U.S. Fish and Wildlife Service only after they have been signed by the Regional Director or Director as approved. Approved recovery plans are subject to modification as dictated by new findings, changes in species' status, and the completion of recovery tasks.

Literature Citations should read as follows:

U.S. Fish and Wildlife Service. 1990. Gopher Tortoise Recovery Plan. U.S. Fish and Wildlife Service, Jackson, Mississippi. 28 pp.

ADDITIONAL COPIES MAY BE PURCHASED FROM:

Fish and Wildlife Reference Service:
5430 Grosvenor Lane, Suite 110
Bethesda, Maryland 20814

301/492-6403 or
1/800/582-3421

The fee for the plan varies depending on the number of pages.

ACKNOWLEDGEMENTS

Ed Wester of Auburn University circulated this plan among knowledgeable persons on the Gopher Tortoise Council for review. Robert H. Mount, Professor Emeritus, Auburn University; Joan Diemer of the Florida Game and Fresh Water Fish Commission and Ren Lohofener of the U.S. Fish and Wildlife Service are gratefully acknowledged for making significant contributions to the development of this plan.

The U.S. Fish and Wildlife Service thanks Ellen Nicol, an artist, writer, and reptile breeder from Anthony, Florida, for the cover sketch.

EXECUTIVE SUMMARY

Current Status: The western population of the gopher tortoise is listed as threatened. This population lies west of the Tombigbee and Mobile Rivers in Alabama, across south Mississippi and including extreme southeastern Louisiana. Threats include habitat alterations and illegal taking.

Habitat Requirements and Limiting Factors: The species is found on droughty, deep sand ridges which originally supported longleaf pine and patches of scrub oak. The most significant threats to the species are adverse habitat alteration, taking, and development of occupied habitats.

Recovery Objective: The two objectives of this plan consist of an immediate objective which is prevention of the listed population from becoming endangered and a long-term objective which is delisting.

Recovery Criteria: The necessary criteria for the above objectives are:

- (1) Successful prevention of endangered status would be considered by evidence of an average of 5 gopher tortoise burrows per hectare (ha) on deep sandy soils (1.52 meters(+)) for a period of 30 years on the DeSoto National Forest. This would equate to an estimated population of 22,400 gopher tortoises on 7,343 ha of suitable habitat.
- (2) For delisting, evidence is required of an average of 3 gopher tortoise burrows per ha on deep sandy soils (1.52 meters(+)) on private lands. This would equate to an estimated population of 34,000 gopher tortoises on 18,594 ha on privately-owned lands.

Actions Needed:

- (1) Survey, monitor and assess status of populations as baseline for recovery actions.
- (2) Protect and manage habitat on Federal lands.
- (3) Encourage management of populations on private lands.
- (4) Develop law enforcement strategy to curb illegal taking.
- (5) Conduct population viability studies.
- (6) Conduct telemetry studies to determine extent of reproductive isolation as a threat.
- (7) Conduct genetic studies.
- (8) Relocate threatened isolated individuals/colonies to protected and managed lands.

TABLE OF CONTENTS

	PAGE
I. INTRODUCTION	1
A. Background	1
B. Description and Taxonomy	1
C. Life History and Ecology	2
Distribution	2
Habitat	2
Longevity and Reproduction	5
Food	6
Activity/Movement	7
Adult Movements	7
Behavior	7
D. Threats and Causes for Decline	8
Habitat Alteration	8
Predation	10
Other Mortality	11
Population Viability	12
II. RECOVERY	13
A. Biological Perspective	13
B. Objectives	14
C. Narrative Outline	15
D. Literature Cited	20
III. IMPLEMENTATION SCHEDULE	24
IV. APPENDIX	27
List of Reviewers	27

I. INTRODUCTION

A. Background

The gopher tortoise (Gopherus polyphemus) is the only tortoise indigenous to the southeastern United States. It is found in varying numbers in xeric sandy habitats from South Carolina through Florida and west to extreme southeastern Louisiana. Within xeric sandy habitats, the range of G. polyphemus nearly coincides with the original range of the longleaf pine (Pinus palustris).

On July 18, 1984, Drs. Ren Lohofener and Lynn Lohmeier petitioned the U.S. Fish and Wildlife Service to list the population of G. polyphemus west of the Tombigbee and Mobile Rivers under provisions of the Endangered Species Act. The petition and accompanying report (Lohofener and Lohmeier 1984) presented substantial information on numbers and distribution of the western population. The Fish and Wildlife Service reviewed the petitioned action and on July 7, 1987, listed the western population as threatened under the Endangered Species Act (52 FR 25376-25380).

The basic biology of the tortoise has been reasonably well documented, although many specific details remain unknown. Many biological parameters for this species vary considerably, including: age (or size) at sexual maturity, clutch size, growth rates, phenological characteristics, burrow depths, specific food habits, and others (Diemer 1986). Biological information on G. polyphemus mostly originates from Georgia and Florida. This plan draws primarily from the research in Georgia by Landers and Buckner (1981) since their study sites are more similar to the western population (by latitude) than to populations in Florida. This recovery plan is aimed specifically at the western population, but of necessity relies greatly upon data sources and expertise developed elsewhere.

B. Description and Taxonomy

Gopherus polyphemus (Testudines, Testudinidae), described in 1802 by F.M. Daudin, is the only Gopherus in the southeastern United States. The gopher tortoise has a large shell, 15-37 centimeters (cm) (5.9-14.6 inches) long. It is a dark-brown to grayish-black terrestrial turtle with elephantine hind feet, shovel-like forefeet, and a gular projection beneath the head on the yellowish, hingeless plastron or undershell (Ernst and Barbour 1972). Gopher tortoise hatchlings are yellowish-orange, have a soft shell, and are 4-5 cm (1.5-2.0 inches) long at hatching.

has been significantly altered. Gopher tortoises may also be found in ruderal habitats such as fence rows, pastures, and field edges and power lines.

Soil conditions are responsible for the xerophytic nature of gopher tortoise habitats. Auffenberg and Iverson (1979) report a positive correlation between the amount of herbaceous ground cover and tortoise density, with grasses, grass-like plants and legumes being the most important food plants (Garner and Landers 1981). The amount and kind of low growing (within reach of a gopher tortoise) herbaceous plants may be a function of many variables, including timber age, density and species composition, burning history, nature and timing of past soil disturbance, and inherent soil fertility.

A relatively open canopy is necessary not only for herbaceous food plants but also for egg incubation. The female gopher tortoise selects a bare spot for nest excavation, normally in the mound of excavated sand at the burrow entrance. Landers and Buckner (1981) noted that when overstory overshadowed the burrow entrance, nests were selected in openings such as firelanes or roadsides.

The burrow is the focal point of many above ground activities and a major portion of the gopher tortoise's life is spent in the burrow. Most burrows have a single entrance, and adult burrows average about 4.5 meters (m) (15 feet) in length with a depth of 1.8 m (6 feet) (Hansen 1963). Small juveniles use similarly small burrows, often as shallow as a few inches. Single tortoises often excavate more than one burrow. Lohofener and Lohmeier (1984) reported a correction factor of 0.625 in Mississippi for converting burrows counted to burrows occupied. The burrow provides protection from fire, predators, and climatic extremes, and habitat for a host of unique species. Jackson and Milstrey (1989) reported more than 60 vertebrate and 302 invertebrates species using gopher tortoise burrows. Some of the more commonly known burrow associates include the eastern diamondback rattlesnake (Crotalus adamanteus), the gopher frog (Rana areolata), and the eastern indigo snake (Drymarchon corais couperi).

Longevity and Reproduction

Longevity is estimated at 40-60 years (Landers 1980) and may extend to 80-100 years (Landers et al. 1982). Growth annuli on scutes become worn at 20-40 years, making age determination imprecise. Age at sexual maturity in the Georgia study (Landers et al. 1982) ranged from 19-21 years for females. These animals had a plastral length of 25-26.5 cm (9.8-10.4 inches). Males normally reach reproductive maturity at a smaller size and younger age than females. Growth rates vary with environmental and genetic factors among gopher tortoise populations.

Activity/Movement

McRae et al. (1981) found activity to be very restricted during winter months. In fact, from late November through February, feeding activity was observed only five times. On unusually warm winter days when maximum temperature exceeded 26° Celsius (C) or 79° Fahrenheit (F), tortoises were occasionally observed at the burrow entrance (McRae et al. 1981). No crepuscular or nocturnal activity is reported. As temperatures rose during the spring (March and April), outside burrow activity was most often observed in the Georgia study during the warmest part of the day, 1600-1800h (hours). During July and August, McRae et al. (1981) found a bimodal movement pattern, the feeding forays peaking at mid-morning (1000-1200h) and mid-afternoon (1600-1800h), with much reduced activity during the hottest part of the day, 1300-1500h. They concluded that "activity throughout the year was correlated with ambient temperature; movement from the burrow was rare at coolest temperatures (<22° C or 72° F), was greatest at 28 to 31° C (82 to 88° F), and was curtailed at >32° C (90° F)."

Adult Movements

McRae et al. (1981) studied movement related to feeding separately from movements related to other behavior and determined 95 percent of all feeding activity took place within 30 m (33 yards) of the burrow being used. Auffenberg and Iverson (1979) reported increasing foraging radii from the burrow in areas with reduced ground cover. This suggests that food availability can increase or decrease foraging distances. McRae et al. (1981) trailed 13 adults and determined their movements to be in a nearly circular or elliptical pattern around the burrow. Depletion of preferred foods near burrows by late summer is thought to contribute to larger movements later in the year. In the Georgia study, the home ranges of males were much larger than females; males had a home range of 0.06-1.44 ha (0.14-3.56 A) with a mean of 0.47 ha (1.16 A), while females had a home range of 0.04-0.14 ha (0.10-0.35 A) with a mean of 0.08 ha (0.20 A) (McRae et al. 1981). The sexual differences are attributed to breeding forays by the males. Landers and Speake (1980) found the average colony typically used an area less than 4 ha (9.88 A).

Behavior

Gopher tortoises have a well-developed social structure, courtship, and territorial combat (Auffenberg 1966, Douglass 1976, McRae et al. 1981). Males bob their heads to attract females during the breeding season. The speed and amplitude

regenerated naturally through a shelterwood system of cutting combined with burning just in advance of an adequate seed fall. The U.S. Forest Service recently has adopted a practice of regenerating only longleaf pines on longleaf sites in the DeSoto National Forest. However, the agency's preferred method is by planting. Most private landowners continue to regenerate longleaf pine sites to off-site species.

The original longleaf pine community burned and reseeded naturally. It contained trees of many ages and a diverse ground cover with much edge, which would be of particular importance to the gopher tortoise. Landers and Speake (1980) found better gopher tortoise densities in longleaf pine - scrub oak stands that were thinned and burned every 2-4 years. Slash pine plantations, with a similar system of thinning and burning, had sparser population densities. While it is apparent that gopher tortoises can be maintained under a modified (heavily thinned, frequently burned) plantation system of management, Landers and Buckner (1981) showed that gopher tortoise densities are significantly greater (32 percent) in more naturally managed stands of longleaf.

The natural longleaf pine community and its associated biological diversity represent optimal forest habitat for the gopher tortoise. This community occurred in pure stands, constantly trending toward small even-aged groups of a few hundred square feet (Chapman 1909). Larger even-aged patches and strips were found following blowdowns from severe weather. These were often interspersed with patches or single survivors, creating open glades and a patchiness which favored the gopher tortoise. Management practices which alter this system include: clearcuts of large blocks (including the crowded planting of off-site species), diversity-diminishing soil churning activities that often accompany even-aged timber management, and prolonged burning intervals. Timber practices that most nearly mirror the natural system, such as a shelterwood regeneration system with frequent burning and natural regeneration, improve the soil and herbaceous cover condition to optimally support the gopher tortoise.

Longleaf pine trees, as well as fire-dependent annuals and perennials, originally existed in a summer burning cycle which has long since been interrupted. The change in fire frequency and timing may be the single most important factor influencing other alterations which have changed the original xeric communities. For example, it has been a common practice to remove most of the longleaf pines from these dry ridges and then to exclude fire (or at least fail

and populations are often fragmented, the adverse effects of even limited taking may be exacerbated. Lohoefener and Lohmeier (1984) report a significant number of Mississippi gopher tortoises being taken for pets.

Gopher tortoise predators, other than human beings, are many. The most important egg and hatchling predator appears to be the raccoon (Procyon lotor) (Landers and Speake 1980); however, a variety of mammals are reported predators of G. polyphemus, including gray foxes (Urocyon cinereoargenteus), striped skunks (Mephitis mephitis), opossums (Didelphis virginiana), armadillos (Dasyus novemcinctus) (Landers et al. 1980), and dogs (Canis domesticus) (Causey and Cude 1978). Imported fire ants (Solenopsis saevissima and/or S. victa) are reported as hatchling predators (Landers et al. 1980, Lohoefener and Lohmeier 1984). Snakes and raptors have also been reported as preying on G. polyphemus. Reported clutch and hatchling losses often approach 90 percent (Landers et al. 1980).

Other Mortality

Road mortality is reported by Landers and Buckner (1981) and Lohoefener and Lohmeier (1984) as a significant mortality factor. Lohoefener and Lohmeier (1984) believe nests and juveniles are often destroyed by intensive site preparation (heavy equipment). Tanner and Terry (1981) report a major reduction in burrow density in Florida which was believed attributable to roller chopping or web plowing. Diemer and Moler (1982) demonstrated that tortoises are able to dig out following chopping treatment on deep sandy soils, but concluded that additional data were needed regarding tortoise response to various site preparation techniques in different soil types.

Lohoefener and Lohmeier (1981) believed that a serious problem for the Mississippi gopher tortoise was isolation of sexually mature animals because of habitat fragmentation aggravated by forest management practices. Only 14 percent of the tortoises encountered in density survey transects by Lohoefener and Lohmeier (1981) in Mississippi were considered so situated that interactions with other sizeable (sexually mature) tortoises might occur. As further support for this hypothesis, the discontinuous nature and small size of Mississippi sand ridges, which are often separated by streams or wet boggy areas, may serve as impediments to courtship travels of adult males (Lohoefener and Lohmeier 1984).

II: RECOVERY

A. Biological Perspective

The listed population of G. polyphemus could be considered relatively abundant. Lohoefener and Lohmeier (1984) estimated 10,923 tortoises of >23 cm (9.1 inches) carapace length (CL) in 102,084 ha (252,246 A) of Mississippi habitat; and 12,900 tortoises >23cm (9.1 inches) CL were estimated to occur in 40,370 ha (99,753 A) of Alabama habitat west of the Tombigbee and Mobile Rivers. However, the species is nearing extinction in an estimated 4,815 ha (11,898 A) of Louisiana habitat. About 80 percent (121,000 ha) of the available habitat occurs on corporately-owned lands.

Despite the relatively large number of extant individuals estimated, the long-term prospects for survival of the western population are dimming. In view of past, current, and predicted forest management practices, continued illegal taking, development on dry uplands, and private ownership of much of the gopher tortoise's habitat, this species is truly threatened in the western portion of its range. According to Donner and Hines (1987), timberland ownership in south Mississippi is mostly private (85 percent belonging to individuals, the forest industry and corporations, 11 percent belonging to the Federal government, with the remainder in State or county ownership).

Section 7 of the Endangered Species Act requires Federal agencies to insure that their actions do not jeopardize the continued existence of listed species. Beyond the jeopardy prohibition, Section 7 requires Federal agencies to use their authorities to further the purpose of the Act. The essential purpose of the Act is conservation of listed species. Section 7 is limited in scope to Federal actions. Thus, the role of Section 7 in recovery of this species will be limited because the majority of habitat is in non-Federal ownership. However, any advice given by Federal foresters or soil scientists to manage forests on state, local, and private lands is also subject to Section 7. Outside of Section 7, the Act may serve in protection, and therefore, possibly contribute to recovery, through exposure of certain activities under Section 9 (prohibition of take).

Through consultations with Federal landowners, it is expected that forest management practices will be designed to contribute significantly to recovery on these lands. However, because Federal ownership is comparatively small, rangewide recovery for this population requires significant success on privately-owned lands as well. Examples of such activities can be found in Mount et al. (1988).

distribution, this recovery objective assumes that once the stated density is maintained for 30 years that the recruitment rate is adequate for short-term stability.

A long-term objective, that of recovery to the point of no longer requiring protection of the Act, requires significant successes on the privately-owned lands having these deep sand ridges. Within the range of the western population, on private land, there are approximately 18,594 ha (45,945 A) of what originally constituted sandhill communities. Attaining the lower range of the recovery density for deep sands based on Lohoefener et al. (in review) would mean three burrows per ha ($18,594 \times 3 \times 0.61$) = (approximately 34,000 gopher tortoises on privately owned forested deep sands. To measure these goals, some form of survey is necessary and must be comparable to the original statistically derived estimate (Lohoefener and Lohmeier 1984).

C. Narrative Outline

1. Survey, monitor, and assess the status of populations.
The original survey work by Lohoefener and Lohmeier (1984) needs to be updated to monitor status. There remains controversy about the abundance of the gopher tortoise. A survey will clarify the tortoise's status; moreover, it will provide an essential baseline for measuring the effectiveness of recovery activities. Surveys should also attempt to determine recruitment rates and age-class distribution, if possible.
 - 1.1 Survey gopher tortoise populations on Federal and other public lands not previously surveyed.
Baseline surveys will be necessary to track the effectiveness of habitat management.
 - 1.1.1 Conduct status surveys on Camp Shelby.
This requirement is incorporated into Section 7 compliance.
 - 1.1.2 Conduct status surveys on DeSoto National Forest. This requirement is incorporated into Section 7 compliance.
 - 1.1.3 Conduct surveys on State-owned Parklands, Wildlife Management Areas and 16th Section School lands. Colonies on public lands offer possibilities for conservation unavailable on private lands.

- 2.2 Manage habitat for present and future expansion. In order to reverse declines in gopher tortoise populations, it will be necessary to manage for optimum habitat conditions on some part of Federal ownerships. The Camp Shelby Section 7 consultation has resulted in the establishment of a 2,200-acre gopher refuge where military use is restricted and forest management is aimed at achieving and maintaining optimal habitat conditions.
- 2.3 Assess adequacy of established and proposed management plans. This is a continuous task accomplished largely through Section 7 of the Endangered Species Act. All Federal agencies must review their established and proposed programs, and for those that may affect the species, initiate consultation with the Fish and Wildlife Service. The Service will then review the action and prepare a biological opinion which addresses the likelihood of jeopardy to the continued existence of the species if the action is carried out. If jeopardy is likely, alternatives to remove jeopardy are presented in the opinion. All management programs for the species represent a "may affect" situation requiring consultation.
3. Encourage protection and management on private lands. Private lands contain the vast majority of forest possibly containing gopher tortoises. Accordingly, maintenance of the population is not possible without some significant successes on privately-owned timberlands. Promotion of protection and management of habitat on private lands is difficult because of the few legal responsibilities and the perceived economic interests of landowners. Therefore, special efforts are needed on private lands.
- 3.1 Provide information on management and legal requirements to private landowners and managers.
- 3.1.1 Develop informational articles and management guidelines oriented to private lands. Informational articles and management guidelines oriented to private lands should be developed. These articles and guidelines should include information and visual aids which identify the habitat of the species, and give detailed options by which the species' welfare can be

4. Develop law enforcement strategy to curb illegal taking of gopher tortoises. Gopher tortoise depredation by humans remains a practice in the rural areas where the listed population occurs. Habitat protection may be for naught if "taking" pressures continue to impact populations. Law enforcement must be a cooperative effort among the Fish and Wildlife Service, U.S. Forest Service, and the States. This effort may or may not involve the use of publicity.
5. Conduct research on population viability. This is needed to determine what densities and distributions are necessary to achieve minimum viable populations necessary for recovery goals. These factors are still unknown; yet they may eventually control the results of any scheduled recovery activity. Three areas, critical to understanding population viability, requiring baseline data, are (1) recruitment rates, (2) present age-class distribution, and (3) what constitutes contiguous habitat for the species.
6. Conduct telemetry studies. This is needed to determine whether or not seemingly isolated tortoises (particularly males) are in fact interacting with other tortoises. Data from telemetry studies will also yield information on what constitutes contiguous habitat for gopher tortoises.
7. Conduct genetic studies. This is needed to answer questions on the effects of augmentation and relocation efforts.
8. Relocate reproductively isolated individuals to existing protected and managed colonies. Animals that are determined to be in this category add nothing to maintenance or recovery. If introduced into an existing small colony which is protected and managed, they may contribute to the recovery goal. Such relocation should be done in accordance with the procedures outlined in Mount et al. (1988).

- Garner, J.H. and J.L. Landers. 1981. Foods and habitat of the gopher tortoise in Southwestern Georgia. Proc. Ann. Conf. S. E. Assoc. Fish and Wildl. Agencies 35:120-133.
- Hansen, K.L. 1963. The burrow of the gopher tortoise. J. Florida Acad. Sci. 26:353-360.
- Hedrick, L. and J. Zimmermann. 1988. Unpublished data from the Conecuh National Forest, Alabama.
- Hutt, A. 1967. The gopher tortoise, a versatile vegetarian. FL Wildl. 21(7):20-24.
- Iverson, J.B. 1980. The reproductive biology of Gopherus polyphemus. Am. Midl. Nat. 103:353-359.
- Jackson, D.R. and E.G. Milstrey. 1989. The fauna of gopher tortoise burrows. Pp. 86-98. In J.E. Diemer, D.R. Jackson, J.L. Landers, J.N. Layne and D.A. Wood (eds.). Gopher Tortoise Relocation Symp. Proc. Florida Game and Fresh Water Fish Comm. Nongame Wildl. Prog. Tech. Rep. # 5.
- Landers, J.L. 1980. Recent research on the gopher tortoise and its implications. Pp. 8-14. In R. Franz and R.J. Bryant (eds.). The dilemma of the gopher tortoise-is there a solution? Proc. 1st Ann. Mtg., Gopher Tortoise Council. Florida State Museum, Gainesville, Fl.
- Landers, L. and J.L. Buckner. 1981. The gopher tortoise: effects of forest management and critical aspects of its ecology. Southlands Exp. For. Tech. Note 56. 7 p.
- Landers, J., and D. Speake. 1980. Management needs of sandhill reptiles in southern Georgia. Proc. Ann. Conf. S.E. Assoc. Game and Fish Wildl. Agencies 34:515-529.
- _____, J.A. Garner and W. A. McRae. 1980. Reproduction of the gopher tortoise (Gopherus polyphemus) in southwestern Georgia. Bull. Florida State Mus. Biol. Sci. 36:353-361.
- _____, W.A. McRae and J.A. Garner. 1982. Growth and maturity of the gopher tortoise in southwestern Georgia. Bull. Florida State Mus. Biol. Sci. 27:81-110.

Wright, S. 1982. The distribution and population biology of the gopher tortoise (Gopherus polyphemus) in South Carolina. M.S. Thesis, Clemson University, Clemson, South Carolina.

IMPLEMENTATION SCHEDULE										
PRIORITY #	TASK #	TASK DESCRIPTION	TASK DURATION	RESPONSIBLE PARTY			COST ESTIMATES (\$K)			COMMENTS/NOTES *
				USFWS		Other	FY 1991	FY 1992	FY 1993	
				Region	Program					
1	2	Protection and management of publicly-owned habitat	continuous	4	FWE	MDUFP/USFS	25			*Other agencies' responsibilities will be a cooperative nature, possibly on projects funded
2	1.1.1	Camp Shelby survey	<1 year	4	FWE	MDUFP/USFS	3			under a Service contract. In some cases contracts may be let to
2	1.1.2	DeSoto National Forest survey	<1 year	4	FWE	MDUFP/USFS	25			private individuals. The Army National Guard and USFS are
2	1.1.3	State/School lands survey	< year	4	FWE	MDUFP/USFS	20			obligated to certain actions through Section 7 of the Act. .
2	1.2	Population survey/entire population	2 years	4	FWE	MDUFP/USFS	35			Repeat every 5 years.
2	1.2.1	Assess range-wide status	2 years	4	FWE	MDUFP/USFS	5			Repeat every 5 years.
3	3	Protection and management of private lands	Continuous	4	FWE	MDUFP/USFS	10			
3	3.2	Cooperative agreements	<1 year	4	FWE	MDUFP/USFS	5	5	5	Costs to be determined.
3	3.3	Easements/donations	<1 year	4	FWE	MDUFP/USFS	5	5	5	Costs to be determined.

IV: APPENDIX

List of Reviewers

C. Kenneth Dodd
U.S. Fish and Wildlife Service
412 NE 16th Ave., Room 250
Gainesville, FL 32601

Ren Lohofener
1900 Martin Bluff Road
Gautier, MS 39553

Mr. Jack Stout
University of Central Florida
Department of Biological
Sciences
Orlando, FL 32816-0368

Bob Jones
MS Museum of Natural Science
111 N. Jefferson Street
Jackson, MS 39212

Ed Wester
Cary Hall
Auburn University, AL 36849-5508

Nora Murdock
U.S. Fish and Wildlife Service
100 Otis Street, Room 224
Asheville, NC 28801

James H. Baker
ENSR Consulting & Engineering
3000 Richmond Avenue
Houston, TX 77098

Samuel K. McLellan
Lieutenant Colonel
Corps of Engineers, MSARNG
Post Office Box 5027
Jackson, MS 39296-5027

Ms. Virginia Van Sickle
Department of Wildlife and
Fisheries
Post Office Box 98000
Baton Rouge, LA 70898

Joan E. Diemer
FL Game. & Freshwater Fish Comm.
Wildlife Research Laboratory
4005 South Main Street
Gainesville, FL 32601

Dr. Robert H. Mount
Cary Hall
Auburn University, AL 36849-5508

Joe Duckworth
District Ranger
U.S. Forest Service
Post Office Box 248
Wiggins, MS 39577

Larry D. Hedrick, Staff Officer
U.S. Forest Service
Fisheries, Wildlife & Range
Post Office Box 1270
Hot Springs, AR 71902

Gopher Tortoise Council
FL Museum of Natural History
University of FL
Gainesville, FL 32611

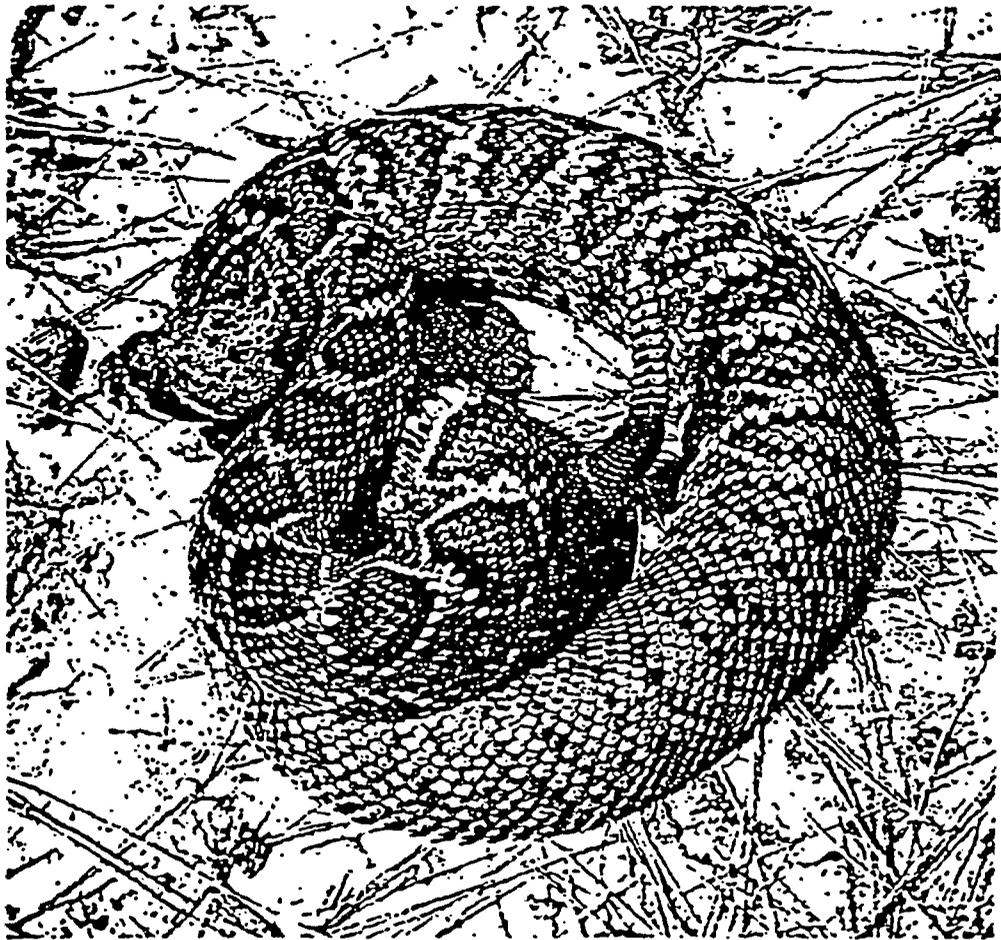
Lisa A. Lofdahl
Tenneco Gas Company
Post Office Box 2511
1010 Milam Street
Houston, TX 77252-2511

John E. Alcock
Regional Forester
U.S. Forest Service
1720 Peachtree Road, NW
Atlanta, GA 30367

Dave Flemming
U.S. Fish and Wildlife Service
75 Spring Street, S.W., Room 1276
Atlanta, GA 30303

EXHIBIT B

The Reptiles & Amphibians of Alabama



THE
REPTILES AND AMPHIBIANS
OF
ALABAMA

ROBERT H. MOUNT, PROFESSOR
Department of Zoology-Entomology

AUBURN UNIVERSITY
Agricultural Experiment Station
R. Dennis Rouse, Director/Auburn, Alabama

FAMILY TESTUDINIDAE -
TORTOISES

Tortoises occur in North and South America, Africa, Europe, and Asia. Approximately 40 species are recognized. Authorities disagree on the number of genera, with opinions ranging from 7 to 10. One genus occurs in the United States.

GENUS *GOPHERUS* Rafinesque

This genus is found only in the United States and Mexico. Four species are currently recognized, 1 of which occurs in Alabama.

ALABAMA AGRICULTURAL EXPERIMENT STATION

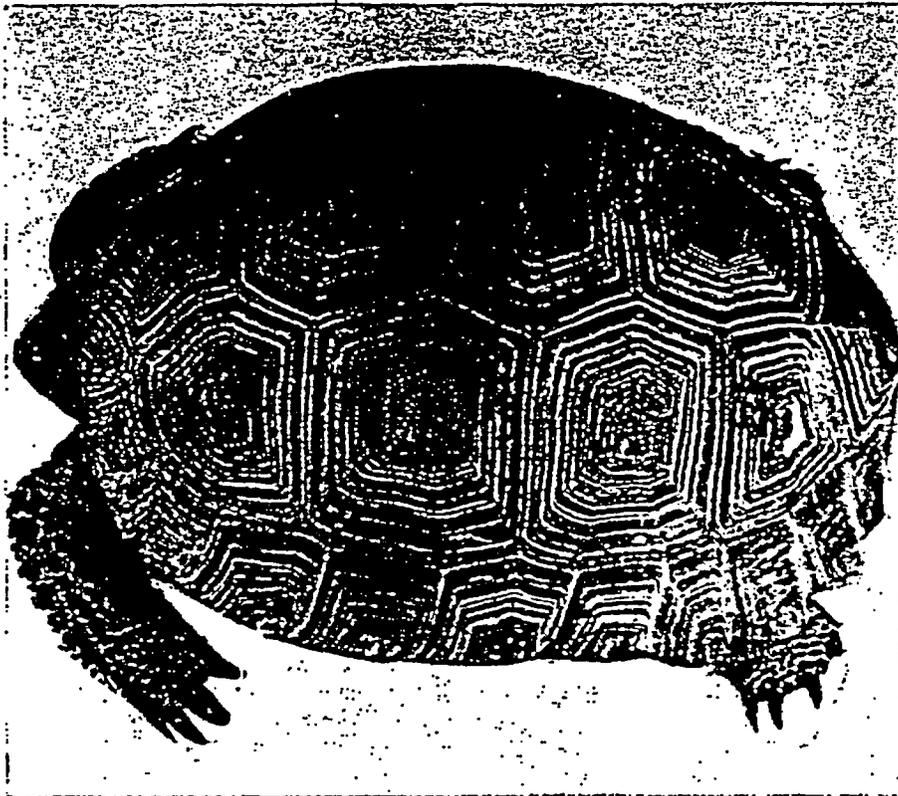


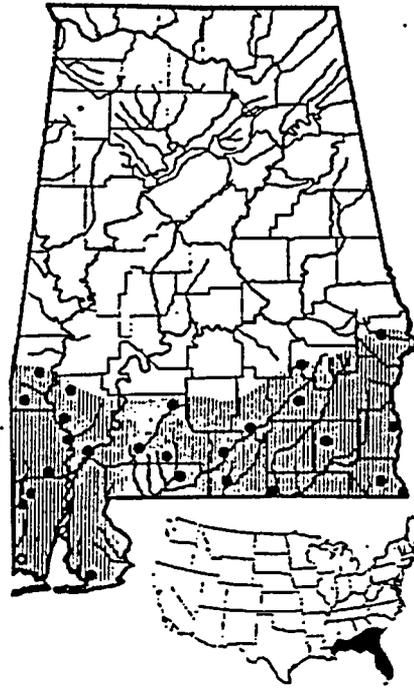
FIG. 338. *Gopherus polyphemus*, the gopher tortoise (Geneva County). This large, harmless turtle lives in dry, sandy areas of the Coastal Plain.

FIG. 339. Distribution of *Gopherus polyphemus*, the gopher tortoise. The presumed range in Alabama is indicated by hatching. Solid symbols indicate localities from which the author examined specimens. The circle is a literature record believed to be valid. The small map depicts approximately the known range in the United States.

Gopherus polyphemus (Daudin)
Gopher Tortoise

Description: (Fig. 338) A large terrestrial turtle attaining a maximum carapace length of about 355 mm. Top of head conspicuously scaled; front toenails large and flattened; hind feet elephantine; gulars of plastron protruding well forward. Carapace brown, the scutes yellow-centered in young; soft parts yellowish brown in young, darkening to brown or almost black in adults. Plastron of adult males somewhat concave.

Alabama distribution: (Fig. 339) Restricted to the Coastal Plain. Fairly common in the Lower Coastal Plain, local elsewhere in the range. Absent from the Black Belt. Only 1 native population, this a small one in Russell County, is known to occur in the Fall Line Hills, a region with several areas of seemingly suitable habitat. Harper (1943) reported seeing abandoned tortoise burrows in the Fall Line Hills in an area north of Selma,



Dallas County, and Dan W. Speake informed me that he has seen abandoned burrows in that region in southern Lee County. These reports suggest that the gopher was widely distributed in the Fall



FIG. 340. The mouth of a burrow of *Gopherus polyphemus*, the gopher tortoise (Mobile County). The burrows of this tortoise provide valuable retreats not only for the gopher but for numerous other animals, including some of our threatened and endangered species.

Line Hills in relatively recent times. At least 1 population occurs in the transitional zone between the Black Belt and Red Hills, a small one occupying portions of Pike and Bullock counties.

Habits: Gopher tortoises live in dry, sandy places, where they construct sloping burrows up to 30 feet or more in length (Fig. 340). Habitats in Alabama capable of supporting gopher populations are usually dominated by turkey oak (*Quercus laevis*) and longleaf pine (*Pinus palustris*) and are referred to as high pine-turkey oak or sandhill habitats (see Fig. 4).

The gopher burrows, described in detail by Hansen (1963), provide shelter not only for the gophers but for an assortment of other animals as well. These include invertebrates as well as vertebrates. Among the latter are mammals of several species, gopher frogs, pine snakes, indigo snakes, coachwhips, and eastern diamondback rattlesnakes. (See Preface.)

The gopher tortoise is herbivorous, feeding on a variety of herbs and berries. A staple food at many localities is wiregrass (*Aristida stricta* and *Sporobolus junceus*). The gopher is inoffensive and cannot be induced to bite.

Courtship in the gopher tortoise involves nipping and head-bobbing (Aufenberg, 1966). Nesting occurs from May to July. Between 4 and 7 round, hard-shelled eggs are laid in a cavity approximately 6 inches beneath the surface (Carr, 1952; Arata, 1958). The nest-hole is usually dug within a few feet of the burrow entrance.

Literature Cited

- Conant, R. and Collins, J. T. 1991 A Field Guide to Reptiles and Amphibians. 450 pp.
- Ernst, C. H. and R. W. Barbour. 1972. Turtles of the United States The University Press of Kentucky, Lexington. 347 pp.
- Garner, J. H. and J. L. Landers. 1981. Foods and habitat of the gopher tortoise in Southwestern Georgia. Proc. Ann. Conf. S. E. Assoc. Fish and Wildl. Agencies 35:120-133.
- Hansen, K. L. 1963. The burrow of the gopher tortoise. J. Florida Acad. Sci. 26:353-360.
- Jackson, D. R. and E. G. Milstrey. 1989. The fauna of gopher tortoise burrows. Pp. 86-88. In J. E. Diemer, D.R. Jackson, J. L. Landers, J. N. Layne and D. A. Wood (eds.). Gopher Tortoise Relocation Symp. Proc. Florida Game and Fresh Water Fish Comm. Nongame Wildl. Prog. Tech. Rep. # 5.
- Mississippi Department of Wildlife, Fisheries & Parks, Museum of Natural Science. 1992. Endangered Species of Mississippi, Gopher Tortoise.
- Mount, R. H. 1975. The Reptiles and Amphibians of Alabama. Alabama Agricultural Experiment Station, Auburn. 347 pp.
- U. S. Fish and Wildlife Service. 1990. Gopher Tortoise Recovery Plan. U. S. Fish and Wildlife Service, Atlanta 28 pp.