APPENDIX "G": MONITORING SUMMARY TABLE (continued)

MONITORING TASK NO.	MONITORING QUESTIONS	MONITORING ITEM	METHOD OF COLLECTION	DURATION/ FREQUENCY	PRECISION/ RELIABILITY	COSTS/NEW Y OR N?	RESPONSIBILITY
	Are FDRs operated and maintained to the standards planned in the annual planning process?	*Roads*	*Inspection*	*Annually*	*Medium/Medium*	*$5,000/N*	*Engineering*
	Are frequency, magnitude of safety problems, and risks at a low level?	Incidents	Safety reports	Monthly	High		
	Are administrative facilities replaced as needed for health and safety of employees?	*Administrative facilities*	*Inspection*	*Annually*	*High/High*	*$500/?*	*Engineering*
2g	Are equal opportunity regulations and opportunities being met?	EEO	Review of regulations and EEO reports	Annually	High		
2h	Are public lands properly identified and access provided for use and enjoyment?	Boundary identification	Inspection and evaluation.	Annually	High/High	Negligible/?	
	Do resource project plans identify needed access for management and users?	Resource plans narrative	Comparison/results with management/ project description.	Continuing	Medium/Medium	Negligible/?	
3a	Are ecosystems being maintained or enhanced to help meet social and economic benefits?	Sample Ecosystem	Benefits analysis	Annually	Low		
	Are trends in ecosystems' elements stable or increasing?	Ecosystem elements	Sample surveys	5 years			
	Are the landtypes showing positive characteristics of sustainability?	Ecosystem elements	Sample surveys				
3b	*Are resource programs being managed* in the most cost-efficient manner?	*Per unit costs*					
	Are efforts to reduce per unit costs effective?	Per unit costs					

APPENDIX "G": MONITORING SUMMARY TABLE (continued)

MONITORING TASK NO.	MONITORING QUESTIONS	MONITORING ITEM	METHOD OF COLLECTION	DURATION/ FREQUENCY	PRECISION/ RELIABILITY	COSTS/NEW Y OR N?	RESPONSIBILITY
	Are cost efficiency measures achieving the desired results?	Measure costs					
3c	Are landownership adjustments improving management and consolidation?	Exchange and purchase tracts					
	Do acquisitions, exchanges, and disposals result in a net boundary reduction?	Boundary length	Review of results	Annually	High/High	Negligible/?	
3d	How well are landline boundaries being established, maintained, and protected from obliteration?	Landline boundaries	Field investigation	Annually	High/High	Negligible/?	
3e	Are acquired rights-of-ways achieving better Forest management?	Acquired rights-of-ways					
	Do acquired rights-of-ways provide more efficient management of public lands?						
3f	Is the transportation system cost-effectiveness being increased?						
	Are FDRs constructed/reconstructed and operated in accordance with compartment project plan?	Road system	Field review of projects	Project	High/?	$6-8,000/?	Engineering
	Are FDRs constructed/reconstructed and operated in accordance with the Recreation Area Design Narrative?	Recreation roads	Inspect completed projects	Project	High/High	$1,000/Y	Engineering/ Recreation
	Are roads planned and constructed as temporary being obliterated and revegetated as per requirements?	Temporary roads	Review of projects	Annually	Medium/Medium	$5,000/Y	Engineering/ District/ Timber

APPENDIX "G": MONITORING SUMMARY TABLE (continued)

MONITORING TASK NO.	MONITORING QUESTIONS	MONITORING ITEM	METHOD OF COLLECTION	DURATION/ FREQUENCY	PRECISION/ RELIABILITY	COSTS/NEW Y OR N?	RESPONSIBILITY
3g	Is fire protection to public and private property and human life being performed in a cost-effective manner?	Fire protection costs					
3h	Are partnerships, cooperative agreements and volunteer programs being encouraged?						
	Are requests to volunteer and support programs being processed? How are the districts and the SO soliciting people and groups to assist the Forest Service?	Districts/SO understand how to process/solicit volunteers.	All Districts/SO know how to respond to requests to help and how to encourage volunteers and support	Annually	High/?		
3i	Are programs for recreation based markets and rural development being developed?						
	Are recreation based markets and rural development programs improving rural economies and social conditions?	Economic Recovery projects	Review results of projects	3-5 year intervals	Low		
	How many new jobs result from programs?	*Jobs*	*Economic analysis*	*Annually*	Low		
3j	Are districts/SO providing HRP *employment opportunities to the* public? How many employment *opportunities were created?*	Member of HRP *position*	District/SO files em*ployment opportunities* announced. List of *groups, universities,* county employment *offices, etc.*	Annually	High/High	N/A	
3k	*Are land use authorizations being* issued only after all opportunities are explored to provide goods and services?	Land use authorizations	Project alternatives review	Annually	High		

APPENDIX "G": MONITORING SUMMARY TABLE (continued)

MONITORING TASK NO.	MONITORING QUESTIONS	MONITORING ITEM	METHOD OF COLLECTION	DURATION/ FREQUENCY	PRECISION/ RELIABILITY	COSTS/NEW Y OR N?	RESPONSIBILITY
	Are the results of applying the application decision guidelines fair and equitable considering the needs of the public?	Decision guidelines	Review of results	Annually	High/High	None	
4a	Are renewable resources being managed to prevent long-term loss of future productivity of the land?	Productivity	Soil Analysis	Annual samples	Moderate		
	Are National Forest streams consistent with state antidegradation policies and meeting water quality standards?	Water quality	Grab samples, non-parametric tests	Quarterly	Medium/Medium	$6,000-$10,000/N	Resources
	Are any public lands defined with declining productivity?						
4b	Are huntable wildlife populations being provided without any detriment to viable populations of the many non-game species?	Game and non-game populations	Population counts	5 years	Low		
	Is hunting successful and are non-game populations viable?	Hunter success rate	Hunter surveys/ population surveys	Annually/ On-going	Medium/Medium	Hunter - No cost to agency / N	Resources staff, State Parks & Wildlife, Districts
4c	Are age class distributions and species diversity being achieved in even-aged stands forest wide?	Acres by 10-year age classes	CISC data analysis	Annually	High		
	Is the desired ecosystem diversity being achieved?	Species analysis	Site surveys	Annually	Medium		
	What age classes exist and in what acreage amounts?	10-year age classes	CISC data analysis	Annually	High		

APPENDIX "G": MONITORING SUMMARY TABLE (continued)

MONITORING TASK NO.	MONITORING QUESTIONS	MONITORING ITEM	METHOD OF COLLECTION	DURATION/ FREQUENCY	PRECISION/ RELIABILITY	COSTS/NEW Y OR N?	RESPONSIBILITY
4c-1	Are age classes and species diversity being achieved on uneven-aged acres?						
	Are age classes within stands achieving the desired reverse "J" curve configuration?						
4d	Is there a continual flow of high quality pine and hardwood being produced?	Volume and wood quality	TISPRS reports	Annually			
	How do timber outputs compared to plan estimates?	Volume harvested	Compare volume harvested to estimates in selected alternative runs.	Annually	High/High		Timber
4e	Are grazing opportunities being provided at demand levels on the grasslands, while de-emphasizing grazing on the forest?	AUMs levels	Grazing permits	Annually	High		
	Is the Range Program achieving the expected forage utilization?	Forage utilization	Transect surveys	Annually	High		
	Are AUMs at the appropriate range carrying capacity level?	Forage capacity	Transect surveys	Annually	High		
4f	Has management resulted in a decrease of susceptibility to SPB and other pests?	SPB hazard rating as listed in CISC records.	CISC query of SPB hazard rating, insect and decision key	Annually	High/High		Timber
	Are pest incidents decreasing with applied IPM programs?	Pest incidents	Survey counts	Annually	High		
4g	Is the prescribed burning program improving forest and grassland resource production?	Production capability	Investigation surveys	5 year intervals	Medium		

APPENDIX "G": MONITORING SUMMARY TABLE (continued)

MONITORING TASK NO.	MONITORING QUESTIONS	MONITORING ITEM	METHOD OF COLLECTION	DURATION/ FREQUENCY	PRECISION/ RELIABILITY	COSTS/NEW Y OR N?	RESPONSIBILITY
	Are ecosystems showing improvement or being sustained by burning practices?	Burning practices	Sample analysis	5 year intervals	Low		
4h	Are projects implemented according to project design, Forest Plan S&Gs, and associated NEPA documents?	Project plans	Site investigations	Annually	Medium/Medium	$2,000/?	
	Are the standard and special requirements providing the protection needed and anticipated?	Mitigation measures	Field visits and reports.	Annually	High/High	$75,000/?	Affected Resource Specialists and Ranger District personnel
	Are any detrimental conditions being documented (i e spills, water contamination)?	Reported incidents.	Special reports	Annually	High		
5a	Are state water quality standards of antidegradation being met per Forest Plan through implementation of standards and guidelines?	Water quality	Water samples	3 months	High		
	Are National Forest streams consistent with state antidegradation policies and water quality standards?	Water quality	Grab samples, non-parametric tests	Quarterly	Medium/Medium	$6,000-$10,000/N	Resources & Districts
	Are turbidity and chemical analysis appropriate to evaluate and show that water quality is maintained in compliance with Staet standards?	Water quality	Water samples	Annually	Medium		
5b	Are management practices protecting municipal and other potable water supplies?	Municipal and potable water supplies	Water samples	Semi-annually	Medium		
	Do activity mitigation measures assure consistency with state antidegradation policies and water quality standards?	Water quality	Water samples	Annually	Medium		

APPENDIX "G": MONITORING SUMMARY TABLE (continued)

MONITORING TASK NO.	MONITORING QUESTIONS	MONITORING ITEM	METHOD OF COLLECTION	DURATION/ FREQUENCY	PRECISION/ RELIABILITY	COSTS/NEW Y OR N?	RESPONSIBILITY
	Are soils being restored to the level that meets the intent of the 319 section of the Clean Water Act?	Acres of restored lands	Field surveys and observations	All year long	High/High	$10,000-$12,000/N	Resources
5c	Is soil productivity and water quality being maintained or improved?	Soil productivity	Soil and water samples	2-5 years	Medium		
	Are any sites loosing productivity or is any stream water quality being degraded?	Project sites	Soil and water samples	Annually	Medium		
5d	Does the Forest Service prescribed fire and smoke management program meet NAAQS/Texas FS smoke management objectives?	PM-10 and/or visibility	Sample PM-10 concentrations and/or measure visibility changes down wind of prescribed fire	5 burns each FY		$400 per sample-equipment $5,000 (on hand)/?	Resources
	Does the air meet NAAQS and state standards?	NO, SO, CO, PR, 03 and PM-10	State-wide ambient Air Quality Monitoring Network and Federal EPA	Continuous	High/High		Resources
	Is the vegetation in the Forest being impacted by ambient ozone concentration?	Visual symptoms of ozone damage on sensitive species	Field surveys on plots in Class II wilderness areas Plot established in July, 1991 in Little Lake Creek Wilderness Area.	Annually/ Growing Season.	Medium/Low-Med.	$900/?	Resources

Appendix H

Budget

The budget described in this section was developed for the selected Alternative 8 of the Final Environmental Impact Statement All Forest Service costs in this budget were developed by resource specialists on the National Forests and Grasslands in Texas (NFGT) Interdisciplinary Team for different management activities prescribed within the alternative All costs are based on historic data and professional judgement. These costs display the approximate minimum funds needed to achieve the goals, objectives, standards, and guidelines shown in Plan Chapter IV.

The Forest Supervisor shall develop annual budget proposals based on this Appendix H, and shall strive for the efficient and effective use of the available funds to implement this Plan

ACTIVITY CODE LIST

CODE	ACTIVITY	UNIT OF MEASURE
	SOIL, WATER, & AIR	
FA1	AIR RESOURCE ADMINISTRATION	DOLLARS
FW1	SOIL & WATER ADMINISTRATION	DOLLARS
FW111-1	SOIL RESOURCE INVENTORY	ACRES
FW111-2	WATER RESOURCE INVENTORY	ACRES
FW22	WATER RESOURCE IMPROVEMENT CONSTRUCTION	ACRES
FW23	WATER RESOURCE IMPROVEMENT MAINTENANCE	ACRES
	MINERALS	
NFML	MINERALS & GEOLOGY - LEASES	LEASES
NFCA	MINERALS & GEOLOGY - CASES	CASES
NFMC	MINERALS & GEOLOGY - COMMON VARIETY	CASES
NFGE	MINERALS & GEOLOGY - GEOLOGY	DOLLARS
	LANDS	
JL122	SPECIAL USE ADMINISTRATION NON-RECREATION	CASES
JL123	LAND OWNERSHIP ADMINISTRATION	CASES
JL23	LANDLINE MAINTENANCE	MILES
JL24	LANDLINE LOCATION	MILES
JL261	LAND OWNERSHIP ADJUSTMENT	ACRES
JL263	LAND EXCHANGE	ACRES
	ROADS & FACILITIES	
LF125	DAMS ADMINISTRATION	DAMS
LF22	FACILITY CONSTRUCTION	STRUCT
LF23	FACILITY MAINTENANCE	DOLLARS
LF231	UTILITY SYSTEM MAINTENANCE	DOLLARS
LF233	COMMUNICATION SYSTEM MAINTENANCE	DOLLARS
LF234	DAM MAINTENANCE	DAMS
LT214	ROAD & BRIDGE PRECONSTRUCTION	MILES
LT221	ROAD & BRIDGE CONSTRUCTION ADMINISTRATION	MILES
LT223	ROAD PRECONSTRUCTION	MILES
LT23-1	ROAD MAINTENANCE LEVEL 1	MILES
LT23-2	ROAD MAINTENANCE LEVEL 2	MILES
LT23-3	ROAD MAINTENANCE LEVEL 3	MILES
	PLANNING	
ML16	FOREST LAND MANAGEMENT PLANNING	DOLLARS
	FIRE & PROTECTION	
PF11	FIRE MANAGEMENT OPERATION	DOLLARS
PF112	FIRE PRESUPPRESSION PLANNING	DOLLARS
PF114	FIRE PROTECTION PREPARATION	DOLLARS
PF114-1	FIRE PREVENTION	DOLLARS
FFPO	FIRE OTHER PROTECTION	DOLLARS
PL	LAW ENFORCEMENT ACTIVITIES	ACRES
PP2	FUEL REDUCTION	DOLLARS
	GA & HUMAN RESOURCES	
HS	SENIOR CITIZENS ACTIVITY	DOLLARS
TG3	LINE MANAGEMENT	DOLLARS
TG4	PROGRAM SUPPORT	DOLLARS

ACTIVITY CODE LIST

CODE	ACTIVITY	UNIT OF MEASURE
	CULTURAL RESOURCES	
AC111	CULTURAL RESOURCE INVENTORY	ACRE
AC112	CULTURAL RESOURCE EVALUATION	PROPERTIES
AC122	CULTURAL RESOURCE NOMINATION	PROPERTIES
AC124	CULTURAL RESOURCE ENHANCEMENT	PROPERTIES
	RECREATION	
AN1	RECREATION RESOURCE OPERATIONS	PLANS
AN12	RECREATION RESOURCE ADMINISTRATION	PAOT DAYS
AN22	RECREATION RESOURCE IMPROVEMENT CONSTRUCTION	PAOT
AN23	RECREATION RESOURCE IMPROVEMENT MAINTENANCE	PAOT
AT22	TRAIL CONSTRUCTION	MILE
AT23	TRAIL MAINTENANCE	MILE
	WILDERNESS	
AW	WILDERNESS ADMINISTRATION	ACRE
AW112	WILDERNESS RESOURCE PLANNING	PLANS
	WILDLIFE	
CF	FISH ADMINISTRATION/SURVEY/PLANS	EACH
CF2	FISH HABITAT IMPROVEMENT STOCKING	EACH
CT	T&E ADMINISTRATION/PLAN/SURVEY	EACH
CT2	T&E MONUMENTATION	ACRES
CTSI	CT221-T&E STRUCTURAL IMPROVEMENT	STRUCTURES
CTB	T&E HABITAT IMPROVEMENT FIRE	ACRES
CW	WILDLIFE ADMINISTRATION/PLANS/SURVEY	EACH
CW1	WILDLIFE INVENTORY	ACRES
CW2	WILDLIFE HABITAT IMPROVEMENTS	ACRES
CW22	WILDLIFE HABITAT IMPROVEMENT CONSTRUCTION	ACRES
CWSI	CW221 - WILDLIFE STRUCTURE IMPROVEMENT	STRUCT
CWPC	CW2212 - WILDLIFE POND CONSTRUCTION	ACRES
CW23	WILDLIFE HABITAT IMPROVEMENT MAINTENANCE	ACRES
CWTI	CW231 - WILDLIFE TIMBER STAND IMPROVEMENT	ACRES
CWPM	CW2312 - WILDLIFE POND MAINTENANCE	ACRES
CWB	WILDLIFE PRESCRIPTION BURN	ACRES
	RANGE	
DN	RANGE RESOURCE ACTIVITY	EACH
DN2	RANGE RESOURCE IMPROVEMENT FIRE	ACRES
DN22	RANGE RESOURCE IMPROVEMENT CONSTRUCTION	ACRES
DNFC	DN2211 - RANGE FENCE CONSTRUCTION/RECONSTRUCTION	MILES
DNPC	DN2212 - RANGE POND CONSTRUCTION/RECONSTRUCTION	PONDS
DN23	RANGE RESOURCE IMPROVEMENT MAINTENANCE	ACRES
DNFM	DN2311 - RANGE FENCE MAINTENANCE	MILES
DNPM	DN2312 - RANGE POND MAINTENANCE	PONDS
	TIMBER	
ET111	TIMBER INVENTORY	ACRES
ET112	TIMBER PLANNING	ACRES
ET113	TIMBER RESOURCE COORDINATION	ACRES
ET114	TIMBER SALE PREPARATION	$/MCF
ET12	TIMBER HARVEST ADMINISTRATION	$/MCF
ET24S	SITE PREPARATION	ACRES
ET24P	PLANTING	ACRES
ET25	RELEASE/TIMBER STAND IMPROVEMENT	ACRES
ET25B	SPECIES MANAGEMENT FIRE	ACRES
ET27	GENETIC TREE ACTIVITY	ACRES

ANNUAL BUDGET TOTALS IN M$.

ACTIVITY	PERIOD 1	2	3	4	5
SOIL, WATER, & AIR					
FW1 & FA1	168.2	176 8	185 8	195 3	205 3
FW111	72 5	54.7	92 3	97 1	102 0
FW22	193.4	203 3	213 7	212 4	223 3
FW23	125 1	131.4	138 2	145 2	152.6
TOTAL	559 2	566 2	630 0	650 0	683 2
MINERALS					
NFML	109 2	137 4	155 9	172 2	190 2
NFCA	331 5	336 6	372 3	411.2	454 2
NFMC	7 5	7 7	8 5	9 4	10 3
NFGE	22.2	25 4	28 1	31.1	34 3
TOTAL	470 5	507 1	564 7	623 9	689 1
LANDS					
JL 122	218 5	260 1	315 0	348.0	418 1
JL 123	49 6	45 5	40 4	44 6	49 2
JL 23	178 8	184 3	189.1	201 7	214.7
JL 24	108 0	71 2	78 6	86 9	96 0
JL 263	141 9	73 2	48 5	29 8	32 9
TOTAL	696 9	634 4	671 6	710 9	810 9
ROADS & FACILITIES					
LF 125	3 8	4 0	4 2	4.4	4 6
LF 22	141 9	99 4	58 1	97 7	102 7
LF 23	77 8	81 8	85 9	90 3	95.0
LF 231	11 4	11 7	12 0	12 3	12 6
LF 233 (GRASS)	1 6	1 7	1 7	1 6	1 9
LF 234	20 0	21 0	22 1	23 2	24 4
LF 234-1	89 3	88.4	11 6	48 8	12 8
LT 23-1	26 3	27.6	29 0	30.5	32 1
LT 23-2	851 4	895 0	940 7	988 8	1039 4
LT 23-3	1059 5	1113 7	1170.7	1230 6	1293 5
LT23 (GRASS)	53 0	55 7	58 5	61 5	64 7
LT214 [LFPR]	348 2	136 2	9 4	75 0	10 3
LT221 [LFAD]	345 3	134.0	9 4	75 0	10 3
LT223 [LTRR]					
TOTAL	3029.4	2670 1	2413 4	2739 7	2704.1
PLANNING					
ML16	565.6	594 5	624 9	656 9	690 5
TOTAL	565.6	594 5	624 9	656 9	690.5
FIRE & PROTECTION					
PF11	80 7	84 8	89 2	93 7	98 5
PF114	372 6	391 7	411.7	432 8	454 9
PF114-1	25 7	27 0	28 4	29 8	31 4
PP2	76 6	80 5	84 7	89 0	93 5
FFP-OTH	95 2	100 1	105 2	110 6	116 3
TOTAL	650.9	684 2	719 2	756 0	794 6
GA & HUMAN RESOURCES					
TG3	530.6	557 7	586 3	616 2	647 7
TG4	1075 0	1130 1	1187 9	1248 6	1312 4
TOTAL	1605 7	1687 8	1774 1	1864 9	1960 2
TOTAL BUDGET	**25394.2**	**23551.5**	**23496 3**	**25572.2**	**27169 4**
NON-BUDGET ITEMS					
JL 261	59 2	65 4	72 3	79 8	88 2
LT223 [LTRR]	1009 5	375 2	0 4	195 7	0 0
HS	194 4	204 3	214 8	225.8	237 3
PL	359 7	377 9	397 2	417 4	438 9
NON-BUDGET TOTAL	**1263.1**	**644.9**	**287.5**	**501.3**	**325.5**
TOTAL COST	**26657.3**	**24196.4**	**23783 8**	**26073.5**	**27494.9**

ANNUAL BUDGET TOTALS IN M$.

ACTIVITY		PERIOD 1	2	3	4	5
CULTURAL RESOURCES						
AC111		231 6	118 2	33 7	7 8	8 1
AC112		120 6	125 9	131 2	137 0	119 3
AC122		70 9	74 6	78 4	82 4	77 0
AC124		81 5	30 4	31 9	33 6	35 3
	TOTAL	504 6	349 1	275 2	260 7	239 7
RECREATION						
AN1		59 9	59 9	66 2	69 6	73 1
AN12 (+DSPR)		1684 6	1936 6	2122 7	2254 1	2393 4
AN22		2028 4	907 4	344 2	150 0	150 0
AN23		1818 9	209 9	160 5	161 0	161 5
AT22		138 4	40 0	20 0	20 0	20 0
AT23		133 4	197 4	207 5	218 1	229 2
	TOTAL	5863 6	3351 2	2921 0	2872 8	3027 3
WILDERNESS						
AW		170 0	175 0	180 0	185 0	190 0
	TOTAL	170 0	175 0	180 0	185 0	190 0
WILDLIFE						
CF FISH A/P/S		41 5	43 6	45 9	48 2	50 7
CT T&E A/P/S		367 9	359 6	349 6	337 6	323 4
CT2		1039 9	1093 1	1149 0	1207 8	1269 5
CW WLF A/P/S		29 4	54 1	89 2	119 6	161 3
CF2		35 5	37 4	39 3	41 3	43 4
CTB		198 7	208 8	219 5	230 7	242 5
CTSI		66 2	59 9	54 9	47 0	40 4
CW2 (GRASS)		15 7	16 5	17 3	18 2	19 2
CW22		11 4	11 9	12 6	13 2	13 9
CWB		2831 5	3037 9	3193 7	3510 1	3689 5
CWSI		42 0	37 6	30 2	24 4	18 0
CWTI		184 3	193 8	203 7	214 1	225 0
CW23		49 2	51 4	53 9	56 3	59 0
CWPC		33 1	28 2	22 6	18 3	13 5
CWPM		7 9	8 3	8 7	9 2	9 6
	TOTAL	4954 3	5242 3	5490 1	5896 0	6178 8
RANGE						
DN		33 1	61 9	93 5	128 2	166 2
DN2		87 5	92 0	96 7	101 6	106 8
DN22		9 4	9 9	10 4	10 9	11 5
DNFC		40 5	38 7	36 6	34 2	31 4
DNPC		3 2	3 3	3 5	3 7	3 8
DN23-DISK (GR)		3 4	3 5	3 7	3 9	4 1
DN23-FERT (GR)		33 6	35 3	37 1	39 0	41 0
DN23-MOW (GR)		31 8	33 4	35 2	37 0	38 8
DN23-SEED (GR)		3 8	4 0	4 2	4 4	4 6
DN23 -SPRAY (GR)		10 1	10 6	11 1	11 7	12 3
DNFM		11 0	12 4	13 9	15 6	17 3
DNPM		6 3	6 6	7 0	7 3	7 7
	TOTAL	273 5	311 6	352 8	397 4	445 6
TIMBER						
ET111		809 8	851 2	894 8	940 5	988 6
ET112		261 2	274 6	288 6	303 4	318 9
ET113		116 1	122 0	128 3	134 8	141 7
ET114		1474 6	1558 6	1567 0	1638 4	1769 6
ET12		819 2	856 2	876 7	909 8	982 2
ET24S		1906 0	2239 6	2325 8	2917 6	3249 4
ET24P		193 6	238 0	237 5	234 4	317 4
ET25 (FORP)		0 1	0 2	0 2	0 3	0 3
ET25B		47 8	54 3	57 3	65 9	64 7
ET27		35 5	37 3	39 2	41 2	43 3
	TOTAL	5663 8	6232 1	6415 4	7186 3	7876 1

Appendix I

Old Growth

Introduction

National and Regional Direction

The public and the Forest Service have identified "old growth" as an important issue. A national old-growth task group was assembled in 1989 and developed a national policy statement and a generic definition of old-growth:

> Old growth forests are ecosystems distinguished by old trees and related structural attributes. Old growth encompasses the later stages of stand development that typically differ from earlier stages in a variety of characteristics that may include tree size, accumulation of large dead woody material, number of canopy layers, species composition, and ecosystem function.
>
> The age at which old growth develops and the specific structural attributes that characterize old growth will vary widely according to forest type with climate, site conditions, and disturbance regime. For example, old growth in fire-dependent forest types may not differ greatly from younger forests in the number of canopy layers or accumulation of downed woody material

Old growth is typically distinguished from younger growth by the following structural attributes and characteristics

1. Large trees for that species and site.
2. Uneven age structure with tree species in several size classes resulting in multiple canopy layers.
3 Accumulations of large-size dead standing and fallen trees that are high relative to earlier stages and in all stages of decay
4 Broken or deformed tops or bole and root decay primarily resulting from weather phenomena such as ice or wind storms.
5 Single or multiple tree-fall gaps similar to windthrow and resulting in understory patchiness and increased micro-topography relief

Factors used to define old growth forest type groups are those that most strongly influence the structural and functional characteristics of old growth forests. These include site factors that directly or indirectly affect productivity and spacing of trees, disturbance regimes, physiognomy, dominant tree species, and geography (in that geography is related to climate, which controls productivity, in part).

In July, 1990, the R-8 old growth steering committee was organized. The committee, in cooperation with R-9, started the process for defining eastern old growth type groups. The eastern experiment stations worked with The Nature Conservancy to being developing specific definitions for each forest type The Final Project Report "The Development of Old-Growth Definitions for Eastern United States Forests Phase II" was competed by Gregory J Nowacki of the Nature Conservancy in February 1993. This report also developed a crosswalk between SAF Cover Types, USFS R-8 Forest Type Codes and the Representative Old-Growth Forest Type Number(s) The crosswalk for forest types occurring on NFGT is shown in exhibit 1 of this appendix.

Regional direction has stressed the importance of identifying and providing existing and potential old growth on the National Forests. The Region has called for an inventory of all stands 100 years and older. Each Forest has been asked to assess the demand for old growth resources, and to look at land areas larger than compartments when determining the extent and distribution of old growth.

Old Growth on the NFGT

The NFGT, through the plan revision, has worked to acertain the needs for old growth, with a goal of providing suitable blocks of old growth in each of the major forest types found on the NFGT. Old growth was identified as a sub-issue of biodiversity in the NFGT Five Year Review/Analysis of the Management Situation (1992) The AMS used the following accepted USFS terminology that can be applied to all successional stages (seral to climax) of old growth regardless of the specific forest type or definition. This terminology is used to describe how old growth will be managed for in the various management areas

Old Growth - Areas having all or most of the attributes of old growth; existing old growth. Existing old growth may be allocated as designated old growth or for some other purpose, including harvest.

Potential Old Growth - Areas under consideration to be designated as old growth, future old growth, or restored old growth. These areas may be allocated to other purposes requiring vegetative manipulation for wildlife habitat or timber management, if not designated as some form of old growth

Designated Old Growth - Areas which have been designated to be maintained in perpetuity as old growth subject only to natural forces. No active management practices such as thinning will be applied to these areas to enhance or maintain old growth attributes.

Restored Old Growth - Areas which have been designated to eventually become old growth. Active management practices may be applied

to enhance or restore some old growth attributes These areas may eventually be harvested.

Future Old Growth - Areas which have been designated to eventually become old growth. Areas will be subject only to natural forces No active management practices such as thinning will be applied to these areas to develop or enhance old growth attributes.

An old growth discussion and workshop was held July 17, 1992 with representatives from Universities, agencies, partner cooperators and USFS personnel. Written comments were received from Universities, agencies and other interested publics. An old growth sub-committee was organized by the ID Team in August 1993 is presently working to identify stands of trees greater than 95 years old. Through planning and public scoping, the following social and biological demands for old growth have been identified.

Social Needs

The social aspect of old growth involves its intrinsic value, which has no market value and invokes deep human emotions. The aesthetics/visual quality of old growth are most often associated with big trees and possibly a park-like setting which can develop into a special "sense of place". The public perceives old growth as one part of the overall ecosystem, providing habitat for certain animals and plants, bringing about proper biological balance and harmony.

There are approximately 2.5 million recreational users in Texas, and many have indicated they wish to visit and experience areas of old growth. It is therefore important that old growth be found in sections of the forest accessible and often visited by the public, including socially valued areas such as historic and scenic sites, as well as other special management areas Distribution of old growth needs to be evaluated at both the individual stand level and at the landscape level

It is imperative that public involvement continue in the evaluation of social values of old growth. This involvement will help determine the range of physical access needed, where the important old growth images now occur and where did they occur, how do old growth areas relate to other areas in the forest, what size does an area of old growth really need to be to achieve the desired benefits, and how does the old growth area relate to the location of users. It will also be necessary to consider areas that do not presently meet the old growth criteria for future old growth locations.

Wildlife Considerations

Old growth, along with other mature forest areas, provides habitat and other benefits to a variety of wildlife species While wildlife needs specific for old growth in Texas are not fully understood, it is recognized that old growth can provide linkages between HMAs and other older forests, reducing fragmentation, plus help maintain diversity Wildlife benefits of older forests, including old growth, are discussed in the EIS, Chapter III, Part I(b), and in the Forest Plan, Management Area II

As the Forest Plan is implemented, monitoring will track how management practices in old growth areas, special management areas, and habitat management areas are impacting and benefitting wildlife This information, along with new research and data on wildlife old growth requirements, will be used in refining old growth policy on the NFGT as needed

Old Growth Inventories

Table 1 lists the current allocation of National Forest land by classification as unsuitable and suitable for timber production All unsuitable land would have the potential to develop into old growth over time

To further address old growth potential in this Forest Plan, all major resource management areas have been classified by the type and potential for old growth Classification was made according to the Forest Service old growth definitions listed above Under the preferred alternative, estimated acreage in each old growth category is potential old growth, 51,090, designated, 605, restored, 11,555, and future, 37,216 No old growth allocations were made in MA-1, general forest area, or MA-2, habitat management area, though some stands in these two management areas probably could be classified as "old growth" The management emphases in these areas is not directed toward old growth, so it would be somewhat misleading to classify stands in an old growth category Old growth attributes may develop in these areas, particularly in the HMAs, due to the extended rotations, but management activities to meet area objectives may alter old growth character As further assessment continues, areas within SMZs, scenic areas, botanical areas, and other SMAs categorized as potential old growth may be selected as restored old growth and managed for old growth attributes

To help meet the old growth needs on the NFGT, an inventory of 95 year and older stands was initiated 1991 CISC data was used, and these older stands were mapped and coded by forest type Tables 2 and 3 give the preliminary results of this inventory, with the data broken down by forest type and suitability for timber production The Forests are in the process of evaluating these stands for old growth characteristics and to verify the accuracy of the classification in CISC To protect possible old growth, a forest wide standard will be implemented which mandates an ID team evaluation of all older stands before entry These areas will be evaluated for old growth character, and based on location, forest type, or other old growth needs, the stand may be managed for old growth If old growth management is incompatible with management area emphases, the stand will be considered for reclassification as a special management area

The NFGT plans to continue inventorying and evaluating stands for old growth characteristics, and to monitor SMAs to assess how potential, designated, and future old growth is developing Our objective is to determine how the current SMAs meet the needs for old growth on the NFGT, and to decide if special old growth management areas are required to achieve an appropriate balance between managed and unmanaged areas of old growth

Old Growth Forest Types

The draft narrative descriptions for the 35 old-growth forest type groups known to occur on the National Forest in Texas are taken from the Nowacki (1993) Final Project Report referenced above Following each old growth group narrative description is a description of the old growth desired future condition and disturbance regime

Coastal Plain Upland Mesic Hardwood Forests

FOREST TYPES REPRESENTED: *White Oak-Northern Red Oak-Hickory and Beech-Magnolia*

These forests occur frequently on favorably moist upland sites in the Coastal Plain Physiographic Province. This forest type group develops best on fertile, well-drained, fine-textured soils. Due to the diverse environmental conditions of the region (e.g. topography, soils, land-use history, fire regimes), these forests are scattered over much of the Coastal Plain.

These type forests consist primarily of hardwood species, conifers are occasionally represented in the canopy by pines (*Pinus* L.) Overstory composition is quite variable, and may be largely restricted to a single species or encompass a number of species. Principal species include white oak (*Quercus alba* L), laurel oak (*Q. hemisphaerica* Bartram.), pignut hickory (*Carya glabra* [Mill] Sweet), southern magnolia (*Magnolia grandiflora* L.), yellow poplar (*Liriodendron tulipifera* L), red maple (*Acer rubrum* L.), sweetgum (*Liquidambar styraciflua* L), beech (*Fagus grandifolia* Ehrh), American holly (*Ilex opaca* Ait.), live oak (*Q. virginiana* Mill), and flowering dogwood (*Cornus florida* L.) Stands located on calcareous substrates are most diverse floristically, though fewer conifers are normally present.

The disturbance regime of this forest type group is characterized by small-scale, low intensity (single tree gaps) perturbations However, large-scale disturbances do occur periodically, and are essential for the maintenance of oak (*Quercus* L) and pine in these forests. These earlier-successional species are quite abundant in forests that have originated after large-scale disturbances (e.g. fires and/or hurricanes) Reductions in fire frequency and intensity this century have caused many pine forests on mesic sites to succeed to hardwood forests. Coastal Plain Upland Mesic hardwoods are most representative of mesic slope and hammocks along or within river floodplains and swamps.

FOREST TYPE GROUPS: White Oak-Northern Red Oak-Hickory, and Beech-Magnolia

1. *Desired Future Condition.* These closed canopy forests exhibit a wide variety of hardwood species, including several oak species. Large hardwoods are common Some large, old hardwood trees will develop heartrot with visible cavities and buttrot present Trees with large broken branches or tops will be present. Pine may be a minor component after disturbance, but gradually decreases as the stand matures A few very large pines may be present in the overstory. Vertical structure is provided by tolerant species in the understory and by more intolerant species in single or multiple tree fall gaps The dominant overstory canopy will appear closed except in recent tree fall gaps which quickly fill in from the sides and from below

   a Overstory: Large hardwood species dominate the overstory with diameters exceeding 26 inches diameter breast height (DBH). Pine may be present in small numbers and may exceed 36 inches DBH. The canopy is closed except for recent mortality or tree falls. Due to differing ages, growth rates, and light tolerances, tree size is variable

   b Midstory/understory: Midstory and understory hardwoods are represented in all size classes Intolerant species may occupy intermediate crown positions with more tolerant species in suppressed and understory positions. Beech, American holly, red maple, and dogwood are common understory species. Midstories are not dense, except under recent crown openings, due to the limited light reaching the forest floor and may appear parklike. A deep, actively decaying leaf litter layer is present

   Standing snags/down trees. Standing snags are present in moderate numbers, more so than in pine old growth due to the greater decay resistance of some of the hardwood species. Downed timber in all stages of decay is common. There is no buildup of undecayed down material. The high temperature and humidity in east Texas prevent large build-ups of snags or down timber over large areas

2 *Disturbance regime.* The disturbance regimes of these forests are a combination of small-scale, single-tree fall gaps and infrequent large scale disturbances such as hurricane, tornado, and fire. The interval between major disturbances may be several hundred years The small scale disturbances favor development of the more tolerant species such as beech and magnolia, although the long lived oaks and hickories remain an important component. The

larger scale disturbances result in a greater percentage of intolerant species such as the oaks. Some loblolly or shortleaf pine is usually established after large scale disturbance

River Floodplain Hardwood Forests

FOREST TYPES REPRESENTED: ***Bottomland Hardwood-Yellow Pine, Swamp Chestnut Oak-Cherrybark Oak, Sweet Gum-Nuttall Oak-Willow, Sugarberry-American Elm-Green Ash, and Laurel Oak-Willow Oak***

The majority of these forests are found in broad river valleys from Virginia to Florida, west to Texas, and north along the Mississippi River and its main tributaries to southern Illinois and Indiana River floodplain hardwood forests are distinguished by an abundance of water and rich alluvial soils Forests occur on first bottom ridges, terrace flats, flat bottomlands and in shallow sloughs. Alluvial bottomland soils may vary in composition from sand to clay; however, on higher locations (e.g first bottom ridges) forests are restricted to heavier soils. Depending on landform and proximity to the river, soils can be saturated either continually, seasonally, or rarely

The flooding regime, rather than soil type, seems to be the primary determinant of vegetational composition within these forests Canopy dominance differs greatly among forests, and may be shared by many species or restricted to just a few. The most important species are sweetgum (Liquidambar styraciflua L.), willow oak (Quercus phellos L.), pin oak (*Q. palustris* Muenchh.), water oak (*Q. nigra* L.), swamp chestnut oak (*Q michauxii* Nutt.), cherrybark oak (*Q. pagoda* Raf.), overcup oak (*Q lyrata* Walt), diamondleaf oak (*Q. laurifolia* Michx.), Nuttall oak (*Q. nuttallii* Palmer), water hickory (*Carya aquatica* [Michx f.], red maple (*Acer rubrum* L.), sugarberry (*Celtis laevigata* Willd.), hackberry (*C. occidentalis* L), green ash (*Fraxinus pennsylvanica* Marsh.), American elm (*Ulmus americana* L), yellow poplar (*Liriodendron tulipifera* L.), sycamore (*Platanus occidentalis* L.), black tupelo (*Nyssa sylvatica* Marsh.), possum-haw (*Ilex decidua* Walt) and musclewood (*Carpinus caroliniana* Walt.). Flooding is a natural component of these forests and aids in the perpetuation of primary tree species by keeping in check invading shade-tolerant species which are flood-sensitive. Flooding is considered to be a disturbance only where hydrological processes have been disrupted by humans (e.g. water control structures). Alterations in flooding duration and frequency by artificial measures can lead to changes in forest composition and structure Wind-throw occurs routinely in these forests, especially in areas where high water tables limit the downward extension of root systems Fire is a rare phenomenon, and occurs only during prolonged droughts Other than fluctuating water levels, site conditions are usually quite stable. In areas where dynamic conditions exist due to river migration, scouring and/or sediment deposition, this forest type is replaced by Eastern Riverfront Forests.

FOREST TYPE GROUP: Bottomland Hardwood Group

1 *Desired Future Condition·* These closed canopy forests exhibit a wide variety of hardwood species, including several oak species Large hardwoods are common Some large, old hardwood trees will develop heartrot with visible cavities and buttrot present. Trees with large broken branches or tops will be present. Loblolly pine may be a minor component with a few very large pine present in the overstory Vertical structure is present in tolerant species in the understory and by more intolerant species in single or multiple tree fall gaps. The dominant overstory will appear closed except in recent tree fall gaps which quickly fill in from the sides and from below

a. Overstory. Large hardwood species dominate the overstory with diameters exceeding 26 inches DBH. Pine may be present in small numbers and may exceed 36 inches DBH The canopy is closed except for recent mortality or tree falls. Due to differing ages, growth rates, and light tolerances, tree size varies.

b. Midstory/understory: Midstory hardwoods are present in intermediate and suppressed trees, but are not particularly abundant due to the relative intolerance of many species Periodic flooding may prevent the development of shade-tolerant trees and shrubs

c Standing snags/down trees· Standing snags are present in small numbers since windfall is a common disturbance. Down timber in all stages of decay is present, but not abundant. There is no buildup of undecayed down material The high temperature and humidity in east Texas prevents large build-ups of snags or down timber over large areas.

2 *Disturbance regime.* Single and multiple stem windfalls are the common disturbance regimes for these forests The soil types and depth to the water table contribute to the frequent windfalls. These disturbances perpetuate the more common intolerant species

Xeric Pine and Pine-Oak Forests and Woodlands

FOREST TYPE REPRESENTED: ***Shortleaf Pine***

Xeric pine and pine-oak forests and woodlands are found throughout most of the eastern United States; from southern Missouri to northeast Texas, eastward to the Atlantic coastline from southern Maine to South Carolina. These communities normally exist on sites with extreme moisture and nutrient deficiencies Xeric site conditions may exist due to any number of reasons: (1) Low precipitation, (2) limited moisture absorption/retention (exposed bedrock, steep slopes, coarse-textured soils, shallow soils); and/or (3) elevated rates (southern exposures).

Most pine and pine-oak forests and woodlands occur on ridgetops and south-facing, upper slopes in mountains or excessively-drained, sandy uplands on gentler terrain (e.g. Piedmont). Soils are normally quite acidic

Principal species of these xerophytic communities include pitch pine (*Pinus rigida* Mill), Virginia pine (*P virginiana* Mill), shortleaf pine (*P. echinata* Mill), table mountain pine (*P. pungens* Lamb), eastern white pine (*P. strobus* L.), and chestnut oak (*Quercus prinus* L). Associate species are scarlet oak (*Q coccinea* Muenchh), black oak (*Q. velutina* Lam.), blackjack oak (*Q marilandica* Muenchh), post oak (*Q. stellata* Wang), northern red oak (*Q rubra* L), southern red oak (*Q. falcata* Michx), white oak (*Q alba* L), and pignut hickory (*Carya glabra* [Mill.] Sweet). Understories predominantly consist of ericaceous shrubs, and within its range bear oak (*Q. ilicifolia* Wang)

Due to the prevailing xeric conditions, these forests and woodlands have historically experienced frequent fires During the presettlement era, most fires were probably low intensity, surface burns, although occasional catastrophic canopy fires undoubtedly occurred in some stands Periodic burns are more-or-less required by these early-successional forests for maintenance purposes, especially the pines (*Pinus* L). Without fire, the pine component quickly becomes decadent, and over extended periods, increases in dead biomass can predispose these forests to catastrophic fire However, even in the absence of fire, successional changes are normally quite restricted (possibly ending with oak domination) since most sites are very nutrient and moisture limiting.

FOREST TYPE GROUP: Shortleaf pine

1. *Desired Future Condition:* Old-growth xeric shortleaf pine forests are characterized by medium to large pine trees occupying a dominant overstory position with sparse to light density of midstory hardwoods Many pine trees appear flat topped Vertical structure is limited in the pine component, but some vertical structure may be provided by the hardwood component. The dominant overstory will appear somewhat open or even sparse on some sites Denser stocking and main canopy closure may exist in patches due to the natural seeding pattern and random seedling escapes from fire mortality. A grass and forb understory, maintained by frequent fires, will be present in the open stands

    a. Overstory. Shortleaf pine is the dominant overstory species, often exceeding 24 inches DBH. A few hardwood trees may occupy main crown positions, but not in abundance. Common overstory hardwoods are oak, blackgum, and hickory. The main canopy appears even-aged, but may actually represent two or more age classes. Hardwoods occupying main crown positions are older than the pines

b. Midstory/understory· There will be few pine trees in the midstory except in gaps created by overstory mortality. Oaks, hickory, and blackgum are common midstory hardwood species with all size classes represented. Midstory density is variable, depending primarily on the fire regime, but will not be dense Understory conditions are also variable and may range from grass and forbs to moderate amounts of brush and hardwood, depending on the fire regime and the amount of light reaching the forest floor (a function of the overstory and midstory density). In the absence of fire a midstory/understory will develop while frequent fires lead to a more open, grassy understory.

c Standing snags/down trees. Standing snags are common but are abundant only in patches of recent pine mortality Down timber in all stages of decay is present with moderate buildup of dead biomass where fire has been excluded for extended periods. The high temperature and humidity in east Texas and recurrent fires prevent large build-ups of snags or down timber.

2. *Disturbance regime:* Xeric shortleaf pine forests are maintained by large scale disturbances such as wind, insect attack, and fire. The interval between major disturbances may be 150 years or more. Fire is a recurrent agent during intervals between major disturbances. The ability of shortleaf pine seedlings to resprout after fire topkill aids in surviving repeated fires. This ability allows enough shortleaf seedlings, over time, to become establish under frequent fire return intervals. Shortleaf seedlings and saplings compete favorably with hardwoods due to the very nutrient and moisture deficient sites

Dry and Dry-Mesic Oak-Pine Forests

FOREST TYPES REPRESENTED: *Loblolly pine, Shortleaf Pine, Shortleaf Pine-Oak, Loblolly Pine-Hardwood, Southern Red Oak-Yellow Pine, and White Oak-Black Oak-Yellow Pine*

Dry and dry-mesic oak-pine forests constitute a large part of the Eastern Deciduous Forest, extending from southern Missouri to east Texas in the west across to the Atlantic Coast from New Jersey to north Florida. Most of these forests occur on excessively well-drained, coarse-textured soils on ridges and south-facing slopes in the mountains and droughty uplands on the Piedmont and Coastal Plain. Soils are often shallow, rocky and infertile, and most are derived from sandstone or shale. The inherent dryness of these sites makes them particularly prone to fire.

Principal associates vary widely based on latitude, topography, geography, and disturbance regime. On dry sites, forests consist of shortleaf pine (*Pinus echinta* Mill.), virginia pine (*P. virginiana* Mill), table mountain pine (*P pungens* Lamb.), pitch pine (*P. rigida* Mill.), post oak (*Quercus stellata* Wang), chestnut oak (*Q. prinus* L), scarlet oak (Q *coccinea* Muenchh) and blackjack oak (Q. *marilandica* Muenchh).

Loblolly pine (*P. taeda* L), longleaf pine (*P. palustris* Mill), white oak (*Q. alba* L.), southern red oak (*Q.falcata* Michx.), black oak (*Q. velutina* Lam), mockernut hickory (*Carya tomentosa* [Poir.] Nutt.), pignut hickory (*C. glabra* [Mill.] Sweet), black tupelo (*Nyssa sylvatica* Marsh) and sweetgum (*Liquidambar styraciflua* L) are more prominent on dry-mesic sites Since most of the above species have ranges restricted to certain physiographic provinces, not all of them do occur Both pines and oaks usually initiate soon after disturbances; however, pine usually dominates immediately following disturbances, and tends to yield to the oaks over time.

These forests were historically maintained by fire, and probably responded favorably to the large-scale disturbances (logging and subsequent fires) initiated by early European settlers However, fire suppression during this century has allowed more shade tolerant species, such as red maple (*Acer rubrum* L.), to increase in understory frequency. In the absence of fire over extended periods, future shifts in composition seem inevitable However, the actual direction of succession is obscure at this time since the rate of change of these forests is gradual due to the long life spans of the principal species. Indeed, fire is an integral part of these forests and is needed for their perpetuation.

FOREST TYPE GROUP: Loblolly Pine

1 *Desired Future Condition.* Old-growth loblolly pine forests are characterized by very large pine trees occupying a dominant overstory position with various densities of midstory hardwoods. Vertical structure is limited in the pine component, but is often provided by the hardwood component The dominant overstory will appear somewhat open, but not to the extent of appearing sparse. Dense stocking and main canopy closure exists in patches due to the natural seeding pattern and random seedling escapes from fire mortality

a Overstory Large loblolly pine is the dominant overstory species, often exceeding 30 inches DBH Some shortleaf pine may also be present. Hardwood species occupying main crown positions may be present but will not exceed three per acre. Common overstory hardwoods are oak, blackgum, and sweetgum The main canopy appears even-aged, but may actually represent two or more age classes Hardwoods occupying main crown positions are usually older than the pines

b. Midstory/understory The structure of these forests exhibit two distinct features, the large, pine dominated overstory and a midstory of hardwoods of all size classes There will be few pine trees in the midstory except in gaps created by overstory mortality. Oaks, hickory, and blackgum are common midstory species with all size classes represented. Midstory density is variable,

depending on soil moisture and the fire regime. Understory conditions are also variable and may range from grass and forbs to dense brush and hardwood, depending on soil moisture, fire regime, and the amount of light reaching the forest floor (a function of midstory density) In the absence of fire, a dense midstory/understory will develop.

c. Standing snags/down trees Standing snags are present, but are not abundant except in patches of pine recently killed by insect attack. Down timber in all stages of decay is present, but again not abundant except in patches The high temperature and humidity in east Texas and the recurrent fires prevent large build-ups of snags or down timber over large areas.

2. *Disturbance regime.* Loblolly pine forests are maintained by large scale disturbances such as wind, insect attack, and fire. The interval between major disturbances may be 150 years or more. Fire is a recurrent agent during intervals between major disturbances. Loblolly pine produce abundant seed nearly every year and seedling growth is rapid The overwhelming number of seedlings assures that enough seedlings survive period fires and competition to restock the stand. Under favorable light conditions, the loblolly seedlings develop and outgrow competing hardwoods and assume a dominant crown position.

FOREST TYPE GROUP: Shortleaf pine

1. *Desired Future Condition:* Old-growth dry and dry-mesic shortleaf pine forests are characterized by large pine trees occupying a dominant overstory position with light to medium density of midstory hardwoods. Many pine trees appear flat topped. Vertical structure is limited in the pine component, but is often provided by the hardwood component. The dominant overstory may appear somewhat open on some sites. Dense stocking and main canopy closure exists in patches due to the natural seeding pattern and random seedling escapes from fire mortality A grass understory, maintained by frequent fires, will be present on the drier sites.

a Overstory: Large shortleaf pine is the dominant overstory species, often exceeding 28 inches DBH Some loblolly pine may also be present. Hardwood species occupying main crown positions may be present, but will not exceed three per acre Common overstory hardwoods are oak, blackgum, hickory, and sweetgum. The main canopy appears even-aged, but may actually represent two or more age classes Hardwoods occupying main crown positions are usually older than the pines

b. Midstory/understory. There will be few pine trees in the midstory except in gaps created by overstory mortality Oaks, hickory, and blackgum are common midstory hardwood species with all size classes represented Midstory density is variable, depending primarily on the fire regime Understory conditions are also variable and may range from grass and forbs to abundant brush and hardwood, depending on the fire regime and the amount of light reaching the forest floor (a function of the overstory and midstory density) In the absence of fire a midstory/understory will develop while frequent fires lead to a more open, grassy understory

c. Standing snags/down trees Standing snag are present, but are not abundant except in patches of pine recently killed by insect attack Down timber in all stages of decay is present, but again not abundant except in patches. The high temperature and humidity in east Texas and the recurrent fires prevent large build-ups of snags or down timber over large areas.

2. *Disturbance regime:* Shortleaf pine forests are maintained by large scale disturbances such as wind, insect attack, and fire The interval between major disturbances may be 200 years or more Fire is a recurrent agent during intervals between major disturbances. The ability of shortleaf pine seedlings to resprout after fire topkill aids in surviving repeated fires This ability allows enough shortleaf seedlings, over time, to become establish under frequent fire return intervals. Under favorable light conditions, the shortleaf seedlings develop and outgrow competing hardwoods and assume a dominant crown position.

FOREST TYPE GROUP: Mixed Forest (Pine-Hardwood and Hardwood-Pine)

1. *Desired Future Condition·* Old-growth mixed forests are characterized by large pine and hardwood trees occupying a dominant overstory position with various densities of midstory hardwoods While the main canopy dominates the site, some vertical structure is often provided by the hardwood component. The main canopy will appear closed or nearly so

   a. Overstory. Both hardwood and pine are dominant overstory species, with trees exceeding 26 inches DBH. Pine may be either loblolly or shortleaf, or both. Common overstory hardwoods are oak, blackgum, hickory, and sweetgum. The main canopy appears even-age, but may actually represent two or more age classes.

   b. Midstory/understory· Oaks, hickory, and blackgum are common midstory species with all size classes represented There

will be few pine trees in the midstory except in gaps created by overstory mortality Midstory density is variable, depending on soil moisture and the fire regime. A light to medium density understory of shrubs and hardwoods is present, depending on soil moisture and the fire regime. Periodic fires control the understory

c Standing snags/down trees: Standing snags are present in moderate numbers and include both pine and hardwoods. Down timber in all stages of decay is present in moderate amounts The high temperature and humidity in east Texas and the recurrent fires prevent large build-ups of snags or down timber over large areas.

2. *Disturbance regime:* Mixed forests are maintained by large scale disturbances such as wind, insect attack, and fire. The interval between major disturbances may be 200 years or more. Fire is a recurrent agent during intervals between major disturbances Pine occurs in greater proportions in early development, but yield to hardwoods during later stages of succession.

Upland Longleaf Pine Forests, Woodlands, and Savannas

FOREST TYPE REPRESENTED: *Longleaf Pine*

Upland longleaf pine forests, woodlands, and savannas are found from Virginia south to Florida and west to east Texas. On the Coastal Plain, these communities typically reside on sandhills, although in central and south Florida some occur on slight rises in flatwoods In the mountains, most are restricted to sites which are most apt to burn, specifically ridge tops and middle and upper slopes with south and southwest exposures In presettlement times, these forests covered a vast area, and were found on many different soil types. However, most of the better sites have been converted to agriculture and present-day forests are largely restricted to infertile, acidic and coarse-textured soils Some forests still occupy richer sites, particularly on the Coastal Plain. Soils usually are well-or excessively-drained depending on topographic location and soil texture. Along the coast, communities develop on sands of marine origin.

The composition of these forests, woodlands and savannas differ widely due to differences in topography and climate As its name indicates, the dominant species are longleaf pine (*Pinus palustris* Mill.) and South Florida slash pine (*P elliottii* var *densa* Little & Dorman). Loblolly pine (P *taeda* L.), shortleaf pine (*P. echinata* Mill), slash pine (*P. elliottii* Engelm.), sand pine (*P clausa* [Chapm. ex' Engelm] Vasey & Sar.), turkey oak (*Quercus laevis* Walt), bluejack oak (*Q. incana* Bartr.), blackjack oak (*Q. marilandica* Muenchh.), sand post oak (*Q. margaretta* Ashe), post oak (*Q. stellata* Wang.) and sand live oak (*Q geminata* Small) are common associates. Tree density is largely dictated by soil moisture, with density increasing from dry to mesic conditions. This forest type group is considered a pyroclimax. In the absence of fire,

longleaf and South Florida slash pine communities will likely convert to other forest types comprised of fire-sensitive/shade tolerant species, particularly on mesic sites.

FOREST TYPE GROUP: Longleaf Pine

1. *Desired Future Condition.* Old-growth longleaf pine forests are characterized by open stands of nearly pure longleaf pine with an open, grassy understory. Tree size will be variable but older trees dominate Longleaf trees over 100 years old will often appear flat topped. Intermingled within the predominantly older trees may be patches of younger growth which will occupy less than 25 percent of the area. Hardwoods will be largely absent, occurring as scattered individuals or clumps. Hardwoods that are present will usually be small. A grassy understory, maintained by frequent fires, will be present.

   a. Overstory Large longleaf pine is the dominant overstory species, often exceeding 28 inches DBH Occasional loblolly or shortleaf pine may be present. Hardwood species occupying main crown positions are uncommon The dominant overstory will appear open but will contain both sparsely and densely stocked patches. Diameters of trees occupying main crown positions will be highly variable.

   b Midstory/understory: The longleaf type is characterized by a very open midstory and understory. Midstory and understory hardwoods are generally absent except for scattered individuals, small patches, or along ephemeral and intermittent streams where increased moisture provides some protection from repeated fires. Blackjack and post oaks are the most common hardwood associates The fire resistance of longleaf seedlings and saplings allow them to become establish in openings in the main canopy. However, longleaf is intolerant to shade and the seedlings will grow and develop only in openings of sufficient size to meet its solar radiation requirements In these larger openings, longleaf regeneration will develop in even-age patches within the older tree component The understory, very diverse in species composition, is dominated by grasses and forbs.

   c. Standing snags/down trees: Standing snags are present, but are not overly abundant. Down timber in all stages of decay is present, but again not abundant except in patches. The high temperature and humidity in east Texas and the recurrent fires prevent large build-ups of snags or down timber over large areas.

2. *Disturbance regime:* Longleaf pine forests are maintained both by large scale disturbances, primarily wind, and by small scale disturbances. Intervals between major disturbances are variable with

a more frequent return interval in coastal areas subject to strong hurricane winds. Small scale disturbances are primarily wind and lightning caused. Fire is a frequent agent during intervals between disturbances The ability of longleaf pine seedlings to survive fire allows the species to become established under frequent fire return intervals which prevent establishment of other tree species Under favorable light conditions, the longleaf seedlings develop and grow in even-age patches or stands.

Bay (Gordonia-Magnolia-Persea) Forests

FOREST TYPE REPRESENTED: ***Sweetbay-Swamp Tupelo-Red Maple***

Bay forests occur exclusively in the Coastal Plain Physiographic Province, and range from Maryland to southeast Texas These forests are restricted to coastal depression or floodplains where saturated conditions prevail Soils usually are organic, although mineral soils do occur in floodplains Most are highly acidic and low in nutrient availability Surface flooding is common, but usually is not persistent.

In addition to loblolly bay (*Gordonia lasianthus*), sweet bay (*Magnolia virginiana*) and redbay (*Persea borbonia*), common species include swamp tupelo (*Nyssa biflora*), sweetgum (*Liquidambar styraciflua*), red maple (*Acer rubrum*), slash pine (*Pinus elliottii*), pond pine (*P. serotina*), live oak (*Q virginiana*), baldcypress (*Taxodium distichum*), pondcypress (*T. ascendens*) and atlantic white cedar (*Chamaecyparis thoides*) Hydric conditions retard the invasion by flood-sensitive species and consequent succession to other forest types. Disturbances from fire and storm events play an important role in the ecological development of these systems This forest type frequently reverts to Atlantic white cedar or pond pine forests (forest types #40 and #29, respectively) after catastrophic fires

FOREST TYPE GROUP: Sweetbay, Swamp Tupelo, and Red Maple

1. *Desired Future Condition·* Old-growth "bay galls" may be indistinguishable from younger bay galls. Overstory trees will be small to medium size and generally not dense. Broken limbs and tops are apparent in overstory trees. The midstory is dense and includes numerous shrub species.

   a Overstory· Sweetbay magnolia, swamp blackgum, and red bay are the predominate overstory species All sizes may be present

   b Midstory/understory Midstory species are variable with numerous shrub species Various ferns, forbs, and sedges are present on the understory

   c. Standing snags/down trees Standing snag are present, but are not abundant Down woody debris in all stages of decay

is present in various amounts, depending upon site conditions The high temperature and humidity in east Texas prevent large build-ups of snags or down timber over large areas.

2. *Disturbance regime.* Disturbance regimes are primarily wind and fire Bay galls are usually wet enough to escape the frequent fires from the surrounding uplands However, fires during drought conditions do enter bay galls with catastrophic results. Windthrow and breakage are other common disturbances.

06. COASTAL PLAIN UPLAND MESIC HARDWOOD FORESTS

SAF Forest Cover Types·
- 53 - white oak
- 82 - loblolly pine-hardwood
- 89 - live oak (in part, mesic salt domes)

R-8 CISC Forest Type
- 53 - white oak-northern red oak-hickory
- 54 - white oak
- 69 - beech-magnolia
- 13 - loblolly pine-hardwood

Representative Old-Growth Stands
- Clear Branch Area, Angelina NF, TX
- Mill Creek Beech-Magnolia Forest, Sabine NF, TX

13. RIVER FLOODPLAIN HARDWOOD FORESTS

SAF Forest Cover Types.
- 65 - pin oak-sweetgum
- 82 - loblolly pine-hardwood
- 87 - sweetgum-yellow poplar
- 88 - willow oak-water oak-diamondleaf (laurel) oak
- 91 - swamp chestnut oak-cherrybark oak
- 92 - sweetgum-willow oak
- 93 - sugarberry-American elm-green ash
- 94 - sycamore-sweetgum-American elm (in part)
- 96 - overcup oak-water hickory
- 108- red maple (in part)

R-8 CISC Forest Type.
- 46- bottomland hardwood-yellow pine
- 61- swamp chestnut oak-charrybark oak
- 62- sweet gum-Nuttall oak-willow
- 63- sugarberry-American elm-green ash
- 64- laurel oak-willow oak

Representative Old-Growth Stands:
- Grassy Lake Natural National Landmark, Hempstead Co , AR
- Moro Creek Bottoms Preserve, south-central AR
- Coochie Brake, Winn Parish, LA
- Zemurray's, along Little Chappapeela River, Tangipahoa Parish, LA
- Green Ash Research Natural Area, Delta NF, MS

Morgan Brake National Wildlife Reguge, MS
Overcup Oak Research Natural Area, Delta NF, MS
Red Gum Research Natural Area, Delta NF, MS

24. XERIC PINE & PINE-OAK FORESTS & WOODLANDS

SAF Forest Cover Types.
- 43 - bear oak (in part)
- 45 - pitch pine (in part)
- 51 - white pine-chestnut oak (in part)
- 75 - shortleaf pine
- 76 - shortleaf pine-oak
- 78 - Virginia pine-oak
- 79 - Virginia pine

R-8 CISC Forest Type·
- 31 - loblolly pine
- 32 - shortleaf pine
- 12 - shortleaf pine-oak
- 44 - southern red oak-yellow pine
- 47 - white oak-black oak-yellow pine

Representative Old-Growth Stands:
- Hot Springs National Park, AR
- Lake Winona Acenic Area, Ouachita NF, AR
- Magazine Mountain, Logan Co., AR
- Roaring Branch Research Natural Area, Polk County, AR
- Torreya State Park, Liberty Co., FL
- Marshall Forest Preserve, near Rome, GA
- Ack Tract, along the Piney River, Texas Co , MO
- Meramec Upland Forest Natural Area, Meramec State Park, MO
- Mudlick Mountain Nat. Area, Sam A Baker State Park, MO

25. DRY AND DRY-MESIC OAK-PINE FORESTS

SAF Forest Cover Types:
- 51 - white pine-chestnut oak
- 75 - shortleaf pine
- 76 - shortleaf pine-oak
- 78 - Virginia pine-oak
- 79 - Virginia pine
- 80 - loblolly pine-shortleaf pine
- 81 - loblolly pine
- 82 - loblolly pine-hardwood

R-8 CISC Forest Type:
- 31 - loblolly pine
- 32 - shortleaf pine
- 12 - shortleaf pine-oak

13 - loblolly pine-hardwood
44 - southern red oak-yellow pine
47 - white oak-black oak-yellow pine

Representative Old-Growth Forests
Hot Springs National Park, AR
Lake Winona Scenic Area, Ouachita NF, AR
Magazine Mountain, Logan Co , AR
Roaring Branch Research Natural Area, Ouachita NF, AR
Lennox Woods Preserve, Red River Co , TX

26. UPLAND LONGLEAF AND SOUTH FLORIDA SLASH PINE FORESTS, WOODLANDS, AND SAVANNAS

SAF Forest Cover Types·
70 - longleaf pine
71 - longleaf pine-scrub oak
83 - longleaf pine-slash pine
111 - South Florida slash pine

R-8 CISC Forest Type
21 - longleaf pine

Representative Old-Growth Stands:
Fontainebleau State Park Site, LA
Fort Polk Military Reservation, LA
Boykin Springs Management Area, Angelina NF, TX
Longleaf Pine Roadside Park, between Hemphill and Pineland, TX

41. BAY (*Gordonia-Magnolia-Persea*) FORESTS

SAF Forest Cover Types
85 - slash pine-hardwood
104 - sweet bay-swamp tupelo-redbay

R-8 CISC Forest Type:
68 - sweetbay-swamp tupelo-red maple

Representative Old-Growth Stands:
None identified

Table 1. Number and Percentage of all Potential Old Growth Acres by Forest Type.

Group	Total Acres by Forest Type	Potential Old-Growth Acres[1]	% of Total Forest Type
25. Dry & Dry-Mesic Oak-Pine Forests			
31- loblolly pine	334,419	33,717	10
32- shortleaf pine	160,628	6,728	4
12- shortleaf pine-oak	2,798	2,070	74
13- loblolly pine-hardwood	15,989	5,494	34
44- southern red oak-yellow pine	874	398	46
47- white oak-black oak-yellow pine	1,426	185	13
26. Upland Longleaf and South Florida Slash Pine Forests, Woodlands, and Savannas			
21- longleaf pine (includes slash)	31,748	4,452	14
06. Coastal Plain Upland Mesic Hardwood Forests			
53- white oak-northern red oak-hickory	17,394	5,511	2
69- beech-magnolia	307		
13. River Floodplain Hardwood Forests			
46- bottomland hardwood-yellow pine	7,394	2,383	32
61- swamp chestnut oak-cherrybark oak	11,276	7,820	69
62- sweet gum-Nuttal oak-willow	17,148	10,732	63
63- sugarberry-American elm-green ash	1,529	256	17
64- laurel oak-willow oak	1,996	1,064	53
41. Bay (Gordonia-Magnolia-Persea) Forests			
68- sweetbay-swamp tupelo-red maple	760	207	27

[1]Acres of forest type classified in "unsuitable for timber production" land base

Table 2. Stands 95 Years and Older by Forest Type, from 1991 CISC Data

Forest Type	Acres
Dry and Dry Mesic Oak-Pine	
Loblolly pine	6,720
Shortleaf pine	12,100
Shortleaf pine - oak	32
Loblolly pine - hardwood	786
White oak - black oak - yellow pine	103
White pine - chestnut oak	62
Upland Longleaf	
Longleaf pine	165
Coastal Plain Upland Mesic Hardwood	
White oak - northern red oak - hickory	393
Beech - magnolia	123
River Floodplain Hardwood	
Bottomland hardwood - yellow pine	679
Swamp chestnut oak - cherrybark oak	1,502
Sweetgum - Nuttal oak - willow	4,421
Laurel oak - willow oak	202
Bay	
Sweetbay - swamp tupelo - red maple	37
Total	27,325

Table 3. Acres of 95 Year and Older Forest by Forest, Forest Type, and Suitability for Timber Production, from 1991 CISC Data

Forest and Forest Type	Acres		
	Suitable	Unsuitable	Total
Angelina National Forest	**3,536**	**1,707**	**5,243**
Loblolly pine	538		538
Shortleaf pine	716		716
Longleaf pine	94	71	165
Loblolly pine - hardwood	233		233
Bottomland hardwood - pine	435	48	483
White oak - northern red oak - hickory	319	25	344
Swamp chestnut oak - cherrybark oak	632	135	767
Sweetgum - Nuttal oak - willow	569	1,428	1,997
Davy Crockett National Forest	**6,346**	**2,164**	**8,510**
Loblolly pine	3,169	179	3,348
Shortleaf pine	2,597	227	2,824
Loblolly pine - hardwood	50		50
Shortleaf pine - oak		32	32
Bottomland hardwood - pine	103		103
White oak - black oak - pine	103		103
Swamp chestnut oak - cherrybark oak		404	404
Sweetgum - Nuttal oak - willow	324	1,322	1,646
Sam Houston National Forest	**2,509**	**533**	**3,062**
Loblolly pine	469	234	703
Shortleaf pine	877	65	942
Loblolly pine - hardwood	12		12
Post oak - black oak	62		62
White oak - northern red oak - hickory	23		23
Swamp chestnut oak - cherrybark oak	331		331
Sweetgum - Nuttal oak - willow	550	200	750
Laurel oak - willow oak	148	54	202
Sweetbay - swamp tupelo	37		37
Sabine National Forest	**9,310**	**1,200**	**10,510**
Loblolly pine	1,834	297	2,131
Shortleaf pine	6,948	670	7,618
Loblolly pine - hardwood	479	12	491
Bottomland hardwood - pine		93	93
White oak - northern red oak - hickory	21	5	26
Sweetgum - Nuttal oak - willow	28		28
Beech - magnolia		123	123