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Enclosed is a copy of the Allegheny National Forest Monitoring and Evaluation Report for FY 1999. This annual report, compiled since the Allegheny National Forest Land and Resource Management Plan (Forest Plan) was approved in April 1986, provides you with the status of the Forest's progress toward meeting the goals and objectives outlined in the Forest Plan.

This Monitoring and Evaluation Report can also be found on our website at http://www.fs.fed.us/r9/allegheny.

If you have any questions or comments on the Monitoring and Evaluation Report, please contact report editor Linda Houston at 814/723-5150. Your comments will be appreciated.

Sincerely,

/s/ Kevin B. Elliott

KEVIN B. ELLIOTT
Forest Supervisor

Enclosure

ALLEGHENY NATIONAL FOREST
MONITORING AND EVALUATION REPORT
FOR
FISCAL YEAR 1999

ABSTRACT

This report evaluates the results of monitoring the implementation of the Allegheny National Forest Land and Resource Management Plan for Fiscal Year (FY) 1999. It is the thirteenth Monitoring and Evaluation Report since the Forest Plan was approved in 1986.

The objectives of monitoring and evaluating Forest Plan implementation are to determine how well management standards and guidelines have been applied, and to evaluate the effectiveness of management direction. This report displays monitored items by resource program. It also discusses the effects and effectiveness of Forest Plan management direction by resource program.

APPROVAL

I have reviewed and approve the Forest Plan Monitoring and Evaluation Report for FY 1999, which was prepared by the Allegheny National Forest Interdisciplinary Monitoring Team. I am satisfied that monitoring and evaluation efforts meet the intent of both the Forest Plan (Chapter 5 and Appendix B) and the National Forest Management Act planning regulations (36 CFR 219).

/s/ Kevin B. Elliott

KEVIN B. ELLIOTT
Forest Supervisor

Date: __16 APR 01_____

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FOREST PLAN PROGRESS

1999 ACTIVITIES, BY MANAGEMENT OBJECTIVE

During the Forest planning process, issues raised by the public were grouped to form the management objectives. Forest Plan direction for the future was developed to resolve the management objectives. A summary of the actions that were taken in Fiscal Year 99 (October 1, 1999 - September 30, 2000) to address each objective follows.

Providing Developed Recreation

- Construction continued at Willow Bay during 1999 with the completion of the Hemlock camping loop. Thirty-five new walk-to sites in the new Deer Grove camping area were also partially completed.

- Renovation of the Rimrock Overlook area continued with the restoration of the stone work.

- The picnic shelter at Hearts Content day use area was renovated with a new roof and supports.

- All of these projects improved the accessibility of these recreation areas.

- The Forest Recreation Team operated and maintained a developed site capacity of 3,627,545 PAOT Days ("persons at one time" on the site times the number of days open) in 1999. All sites were open for the normal managed season.

- The FY 99 recreation concessionaire permits for the ANF were re-bid due to a change issued by the Department of Labor requiring concessionaires to pay volunteers and also to pay higher wages under the Service Contract Act. This resulted in a new special use permit being issued to the Cradle of Forestry in America Interpretative Association (CFAIA) for continued operation of 15 sites instead of the 26 sites that they previously operated. Mainstreet Car Wash, Inc. was the successful bidder for the operation of 5 sites including Willow Bay and Tracy Ridge campgrounds. The net result was that the Forest Service took over the operation of 6 sites previously under concessionaire operation due to the lack of bids. Both concessionaires funded and carried out numerous improvements to the respective permit areas.

- Developed recreation use in 1999 was approximately at the same high level as the 1998 season due to the long periods of sunny warm days throughout the summer and into the fall season. One exception to this was an approximate 10% drop in occupancy at Beaver Meadows Campground due to the small impoundment at this area being drained for maintenance (aquatic weed control) purposes.

Providing Dispersed Recreation

- The ANF was again able to fund two summer trail crews and continue the much needed trail maintenance and rehabilitation on our pedestrian trail system. Of note was the rehabilitation of 5.5 miles of the Buzzard Swamp and Minister Creek Trails and the addition of 12.5 new trail miles in the Tracy Ridge NRA (11.4) and the Timberdoodle Flats (1.1). Timberdoodle Flats is a new interpretive trail along PA Route 59 east of the Bradford District office. Two foot bridges were replaced along the North Country National Scenic Trail within the Tionesta Scenic Area with the assistance of volunteers during National Public Lands Day.

- As a result of the continuing summer motorized trail condition inventory, improvements were made to the Marienville Bike Trail, which included three miles of reconstruction.

- Snowmobile trail improvements were carried out with the construction of the Kellettville reroute (2.2 miles) and the reconstruction of trail (2.8 miles) along connectors #12 and #23.

- As in the past, much of this facility maintenance and improvement work was possible thru the funding assistance from partners and work done by volunteers. The PA DCNR has been an active partner funding pedestrian and motorized trails thru state grants and registration monies.

- Dispersed recreation, which increased in 1998, continued at a similar level in 1999 due again to a warm, dry summer and good camping and hiking weather. Mild temperatures continuing through October providing several weeks of peak fall foliage colors. Summer motorized trail use continues to have the most significant annual increase of all recreational activities on the forest. Again, winter recreation was down due to the lack of snow and record warm temperatures

Timber Management

The Forest Plan set the long-term sustained yield and the allowable sale quantity for each decade at 94.5 million board feet (MMBF) per year. The Forest sold (awarded) 2.9 MMBF of timber in 1999, with a value of $1.0 million. A total of 808.7 MMBF have been sold (awarded) since 1986, a 57.8 MMBF annual average.

The Forest Plan identified management practices that directly help establish tree seedlings: site preparation for natural regeneration; planting or seeding; herbicide control of competing understory vegetation; fencing; and aerial fertilization. Table 1 displays the activity amounts estimated in the Forest Plan for Decades 1 and 2 (beginning in 1986) and the amounts accomplished since 1986.

TABLE 1. ACRES OF REFORESTATION ACTIVITIES

Type of Activity	Forest Plan 20-year Estimate	1999 Amount	Ave. Annual Amount since 1986	Total Accomplishments 86-99	% of Forest Plan Estimate
Site Prep	36,000	1,743	1,223	17,118	48
Fertilization	39,000	1,060	895	12,534	32
Fencing	8,000	929	869	12,171	152
Herbicide	38,000	858[1]	1,151	16,111[2]	42
Planting/Seeding	4,000	429	146	2,048	51

1 - Includes re-spray Acres
2 - Excludes re-spray Acres

Since 1986, the following harvesting activities have been completed. They are designed to move the Forest toward the desired future vegetative condition as specified in the Forest Plan.

TABLE 2. ACRES OF HARVESTING ACTIVITIES IN AWARDED TIMBER SALES

Type of Activity	Forest Plan 20-year Estimate	1999 Amount	Ave. Annual Amount since 1986	Total Accomplishments 86-99	% of Forest Plan Estimate
Final Harvest*	67,000	187	1,719	24,061	36
Thinning	172,000	15	3,239	45,351	26
Selection	6,000	0	443	6,206	103
Shelterwood Seed/Prep	60,300	0	1,142	15,984	27

**** includes clearcutting and shelterwood removal***

Wildlife and Fish Management

- Hunting use was about the same as FY 98 and fishing use decreased slightly due to continued drought conditions.

- Deer population densities increased in 1998-99 in all four counties.

- Black bear harvest levels decreased in 1998. A total of 247 bears were harvested in the four-county area in which the ANF is located. It appears that this area can sustain a harvest of approximately 250 to 300 bears annually.

- Surveys for the Federally-listed endangered Indiana bat were conducted on 32 sites during 1999. No Indiana bats were caught in mist nets. Indiana bats were detected at 4 of the 32 sites.

- Adult walleye and smallmouth bass populations were surveyed in the Allegheny Reservoir in the spring. Walleye numbers decreased slightly from 1998, but had a high percentage of legal size fish. The smallmouth bass population decreased from its high in 1998

- Yearly monitoring for brook trout on four streams continued in 1999. Brook trout populations increased in two streams and decreased in the other two streams. Biomass estimates decreased in three of the streams, indicating a larger percentage of younger fish. Water quality results meet the State's high quality cold-water standards.

- A survey of the effectiveness of fish habitat improvement structures in the Allegheny Reservoir indicates that the structures are being utilized for cover, and that target species (e.g. panfish) prefer these sites to control areas where no habitat improvement has been placed.

Soil and Water

- Sediment monitoring was conducted on one stream as part of a road construction/reconstruction project. Two other streams are also being monitored, but because of the drought conditions, these could not be done. The site downstream of the project did show a higher increase in sediments than the control site. Further monitoring will be conducted over the next several years.

- Water quality was measured on six additional streams in conjunction with Pennsylvania Fish and Boat Commission fisheries surveys. All streams have good water quality and meet state standards.

- Two streams were monitored for the presence of herbicides sprayed on two nearby power line right-of-ways. An analysis of the water samples collected showed that no herbicide were within detectable limits.

Private Oil and Gas

- There were 275 new wells drilled on Federal lands in 1999.

- No USA-ownership wells were plugged in 1999.

- Overall, total samples (for 34 criteria) averaged 8.74, above the handbook standard of 8.0. Better documentation of project activities is necessary. An emphasis on Spill Plan development is also needed.

DESIRED FUTURE CONDITION

The Forest's definition of Desired Future Condition (DFC) relates to the type, condition, location, and amount of various facilities, vegetative conditions, and other aspects of the ecosystem that will be created long term (150 years or at "steady state") by implementing specific Management Area Direction. Projects that are implemented should be integrated with other existing resource opportunities in the area to move us toward the DFC.

The following information measures the Allegheny's overall progress toward meeting the DFC across all management areas. The assumption is that there is a relationship between movement toward the DFC and the production of various goods and services estimated in the Forest Plan.

The Allegheny National Forest is now in the second decade of Forest Plan implementation. Progress towards reaching the DFC at the end of this decade is measured as the sum of all goods, services, and habitat treatments estimated for both Decades 1 and 2. The amounts given in the Forest Plan for Decade 2 were predicated based on accomplishing 100 percent of the Decade 1 goals. We know from previous monitoring that this is not the case. Therefore, in the Table 3, amounts for Decade 2 have been recalculated to reflect Decade 1 accomplishments.

The amounts shown in the "Balance Decade 2 Forest Plan" column would need to be accomplished in the second decade to fully implement the Forest Plan for Decades 1 and 2. Negative numbers indicate that we have already over-accomplished the Forest Plan estimate for both decades. The information in Table 3 will be used for various comparisons in this Monitoring Report and in the Forest's 20-year Implementation Spreadsheet (Appendix A).

TABLE 3. REVISED DECADE 2 FOREST PLAN PROJECTIONS

Output/Activity	Unit of Measure	Decade 1 Forest Plan	Decade 2 Forest Plan	Sum of Decades 1 & 2 Forest Plan	Decade 1 (FY 86-95) Accomp-lishments	Balance Decade 2 Forest Plan
DEVELOPED RECREATION						
...Semi-primitive Motorized	MRVD	370	380	750	583.1	166.9
...Roaded Natural	MRVD	4,300	4,710	9,010	4,553.2	4,456.8
...Rural	MRVD	4,190	4,320	8,510	4,966.9	3,543.1
DISPERSED RECREATION						
...Semi-primitive/Non-motorized	MRVD	300	420	720	335.8	384.2
...Semi-primitive/Motorized	MRVD	3,680	3,720	7,400	5,175.7	2,224.3
...Roaded Natural	MRVD	4,990	5,250	10,240	8,194.1	2,045.9
WILDERNESS						
...Semi-primitive/Non-motorized	MRVD	10	16	26	23.0	1.0
TRAIL CONSTRUCTION						
...Pedestrian	Miles	48	41	89	39.3	49.7
...Motorized-Winter	Miles	11	11	22	50.5	-28.5
...Motorized-Summer	Miles	145	145	290	70.0	220.0
TIMBER MANAGEMENT						
...Hardwood sawtimber	MMBF	383	460	843	350.1	492.9
...Hardwood Pulpwood	MMBF	562	480	1,042	333.1	708.9
...Hardwood Firewood	MMBF	0	0	0	17.1	-17.1
...Total Sell	MMBF	945	940	1,885	700.3	1,184.7
...Clearcut	Acres	3,300	3,400	6,700	6,925.0	-225
...Shelterwood Seed/prep	Acres	29,700	30,600	60,300	12,930.0	47,370
...Shelterwood removal	Acres	29,700	30,600	60,300	12,971.0	47,329
...Thinning	Acres	94,000	78,000	172,000	40,653.0	131,347
...Selection Cut	Acres	6,000	0	6,000	5,573.0	427
...Timber Stand Improvement	Acres	8,000	6,000	14,000	855.0	13,145
...Herbicide	Acres	20,000	18,000	38,000	11,240.0	26,760
...Fertilization	Acres	25,000	14,000	39,000	9,571.0	29,429
...Fencing	Acres	4,000	4,000	8,000	9,451.0	-1,451
...Planting	Acres	2,000	2,000	4,000	1,096.0	2,904
...Site Prep	Acres	18,000	18,000	36,000	11,887.0	24,113
...Release	Acres	0	0	0	169.0	-169
ROADS						
...Construction	Miles	239	134	373	157.3	215.7
...Reconstruction - Betterment	Miles	97	55	152	116.9	35.1
...Reconstruction - Restoration	Miles	0	0	0	426.1	-426.1
...Temporary	Miles	17	17	34	12.7	21.3
WILDLIFE						
...Hunting Use	MWUF	1,970	2,200	4,170	2,302.2	1,867.8
...Fishing Use	MWUF	1,510	1,720	3,230	1,663.1	1,566.9
...Fish Habitat Impr.	Acres	N/A	N/A	1	149.0	-148
...Wildlife Habitat Impr.	Acres	23,720	27,580	51,300	22,273	29,027
...Wildlife Habitat Impr.	Structs	60	110	170	2,256.0	-2,086
SOIL/WATER/AIR						
...Water/Soil Improvement	Acres	N/A	N/A	0	7,765.5	-7,765.5

The Forest's 20-year Implementation Spreadsheet (Appendix A) compares the total number of goods, services, and habitat treatments estimated in the Forest Plan for Decades 1 and 2 with the actual accomplishments to date. If the sum of projections for Decades 1 and 2 were spread equally over the 20-year period, the fourteenth year (1999) would show 70 percent accomplished. The following data on percent actually accomplished indicates resources or activities that have been over or under emphasized at this point in the 20-year planning period. These figures are used as a relative indicator of how integrated our program has been and the rate at which we are moving toward the Forest's overall DFC.

CUMULATIVE FOREST PLAN ACCOMPLISHMENTS
THROUGH FY 99 (PERCENT OF 1986 - 2005 ESTIMATES)

Developed Recreation (RVD)	Semi-primitive Motorized Use	114.4%
	Roaded Natural Use	82.9%
	Rural Use	95.0%
Dispersed Recreation (RVD)	Semi-primitive Non-motorized Use	66.0%
	Semi-primitive Motorized Use	117.1%
	Roaded Natural Use	123.7%
Wilderness (RVD)	Semi-primitive Non-motorized Use	150.8%
Trail Construction	Pedestrian Trail (miles)	63.1%
	Motorized Winter Trail (miles)	339.5%
	Motorized Summer Trail (miles)	25.7%
Timber Management	Sell Volume (MBF)	42.9%
	(Sawtimber)	48.7%
	(Pulpwood)	36.2%
	Final Harvest cuts (acres)	35.9%
	(Clearcuts)	115.5%
	(Shelterwood Removals)	27.1%
	Shelterwood Seed/prep (acres)	26.5%
	Thinning (acres)	26.4%
	Selection Cut (acres)	103.4%
	Herbicide Use (acres)	42.4%
	Fencing for animal control (acres)	152.1%
	Aerial Fertilization (acres)	32.1%
	Site Prep (acres)	47.6%
Roads	Construction (miles)	44.0%
	Reconstruction - betterment (miles)	79.9%
Wildlife/Fish	Wildlife Habitat Improvement (acres)	58.0%
	Wildlife Habitat Improvement (structures)	1,491.2%

EMERGING ISSUES AND PUBLIC CONCERNS

BIOLOGICAL ISSUES

Deer Herd Management: During the development of the Forest Plan, the overpopulation of deer on the Forest was well recognized by both the Forest Service and the Pennsylvania Game Commission. The Game Commission was increasing antlerless license allocations at a steady rate. Research had revealed that 87 percent of all clearcuts that had failed to regenerate into a new forest stand could be directly attributed to excessive deer browsing (Marquis and Brenneman 1981). Game Commission biologists and other researchers had documented the impacts of high deer populations on turkeys and other wildlife species (Wunz and Hassinger personal communications, Dorio and Marquis 1986, Harrison 1984).

The Pennsylvania Game Commission has set deer density goals, but antlerless licenses have not been allocated to move the population toward the goal. Consequently, the sustainability of many forest resources is at an increased risk.

This led to an agreement between the Game Commission and the Forest Service. The Commission agreed to continue to bring the deer herd population down, striving to reach a goal of about 20 deer per square mile, Forest-wide. The Forest Service agreed to provide more early succession vegetation, mainly through timber harvest. By increasing the food supply through the creation of early successional vegetation, and by reducing the population through increased antlerless allocations, a balance should be reached where deer are in equilibrium with their habitat.

The intent of managing habitat on the National Forest is to provide habitat to "maintain viable populations of native and desirable non-native species" (from National Forest Management Act regulations). This requires managing for a variety of habitats, managing for unique habitats and managing for specific features that may be needed by a species. Habitat for forest interior species as well as forest edge species must be provided in a balance that maintains ecological integrity. We believe that the Forest Plan provides sound guidance for managing all native wildlife species on the Forest, including deer.

Endangered Species: During FY 99, the partnership with Dr. Mike Gannon from Pennsylvania State University to survey the ANF for bats continued. An additional 32 new sites were sampled. Indiana bats were detected at 4 new sites in 1999 bringing the total number of sites where Indiana bats were detected to eleven.

During FY 1999, the ANF entered into formal consultation with the Fish and Wildlife Service for five federally listed threatened and endangered species (Indiana bat, small whorled pogonia, bald eagle, clubshell mussel, and northern riffleshell mussel). The Fish and Wildlife Service issued a Biological Opinion (BO) in June 1999. The ANF Appeal Deciding Officer (Regional Forester) amended the Forest Plan to incorporate the terms and conditions from the BO.

Forest Health: A variety of insects, diseases, droughts, and local site limitations are affecting tree health locally. Pear thrips, forest tent caterpillars, gypsy moth, cherry scallop shell moth, fall cankerworm, elm spanworm, linden looper, beech bark disease complex, maple decline, and ash dieback are of particular concern. Damage from most of these was observed between 1993 and 1995, and an increasing number of trees are showing symptoms of decline from repeated impacts by these species. Severe droughts occurred in 1988, 1991, and 1995. Substantial tree mortality developed suddenly in the summer of 1994 (primarily sugar maple, but white ash, beech, birch and red maple also suffered in lesser amounts). Some tree decline has continued to develop since then, trees with less heavily affected crowns have demonstrated some recovery. Rainfall was abundant during the 1996 growing season, but below normal in 1997, 1998, and 1999. In Warren County, rainfall showed a deficit of almost 4.7 inches between April 1, 1997, and November 9, 1997; a deficit of 2.51 inches for the April 1 to November 1, 1998 period; and a deficit of 7.7 inches between April 1 and November 1, 1999. Additional recovery may occur if drought and defoliation are minimal over the next few years.

In 1993, close to 261,000 acres of National Forest land were moderately to severely defoliated by elm spanworm. This marked the third year of such defoliation on 7,500 acres, and the second year on 51,800 acres. Very little elm spanworm defoliation occurred in 1994, but close to 18,000 acres were defoliated by forest tent caterpillar, cherry scallop shell moth defoliated approximately 54,000 acres, and slightly more than 1,500 acres were affected by pine budworm. In 1995, cherry scallop shell moth defoliated over 205,000 acres, with close to 124,000 acres classified as severe. Since 1992, close to 700 acres have been defoliated three times by this insect, 36,600 acres have been defoliated twice, and 238,000 acres have been defoliated once. Most of the same areas have also been defoliated at least once since 1991 by either elm spanworm or Forest tent caterpillar. In 1996, cherry scallop shell moths defoliated close to 11,800 acres, with 70 percent of that defoliation classified as moderate to severe. Most of those areas had already been defoliated at least once since 1993 by cherry scallop shell moth. In 1997 the only detectable ANF defoliation was 1,350 acres in the oak type from oak leaf tier. In 1998, there was no detectable defoliation on the ANF, and in 1999 only a small area of light gypsy moth defoliation was detected.

Noticeable tree mortality developed in 1994 on about 89,600 acres from the combined effects of a variety of factors, including repeated defoliation and two recent (1988 and 1991) droughts. Spray treatment (with Bacillus thuringiensis or B.t.) completed in 1995 limited additional defoliation stress on the surviving trees, but another drought that year did place trees under additional stress. Decline and mortality continued to develop in many areas, but some areas demonstrated slight recovery. The total impact these multiple stresses have had, and will have in years to come, remains largely unknown. It depends on environmental conditions and additional stresses that may develop. If natural events over the next few years place additional stress on the trees, permanent effects on wildlife habitat, vegetation diversity, recreation, and timber harvest volumes could be severe.

Forest personnel are working on additional analyses to determine management alternatives for many areas having the heaviest mortality. Since mid-1995, they have completed eight environmental assessments, which have looked at site-specific tree mortality and ecosystem sustainability on about 81,232 acres, resulting in over 13,500 acres of treatment. Reforestation of affected sites has been a key issue addressed. The Mortality II Project (one of the eight EAs mentioned above) included over 5,350 acres of treatment. In October 1997, the Federal District Court in Pittsburgh (PA) enjoined the ANF from implementing the Mortality II Project. The Court ordered ANF personnel to prepare an environmental impact statement (EIS) and to revisit certain parts of the analysis. In 1998 and 1999, ANF personnel continued to work on the East Side EIS, a project designed in part, to analyze some of the activities originally included in the Mortality II EA. Analysis efforts slowed down for part of FY99 pending the outcome of consultation with the U.S. Fish and Wildlife Service regarding threatened and endangered species management. Work continues on developing a long-term strategy to address these forest health questions. In 1998 and 1999, ANF personnel, cooperating with USDA Forest Service Forest Health Monitoring and Forest Health Protection personnel initiated data collection on a network of permanent plots to evaluate a number of indicators of Forest Health. It will take 4 years to complete the first round of data collection on the ANF.

Tree Seedling Development in Upland Hardwood and Northern Hardwood Forest Types: Data collected in 1992 in Management Area 3 indicates that tree seedlings of a variety of species are not becoming established beneath the overstory tree canopy of these forest types. Selective deer browsing, dense interfering plants, and erratic seed production all play a role in limiting seedling development. If this situation continues, forest structure and tree species composition will be affected. Over the long term, it raises serious questions about tree composition and sustainability in Management Areas where the Forest Plan direction permits little human intervention to control forest and ground vegetation structure, composition, and development. Trees that die will not be replaced by similar species or, in many cases, by any species of vigorously growing tree seedlings that are capable of growing up to replace them. In 1996, Forest personnel initiated an adaptive management approach designed to help answer questions about how to reforest these kinds of areas. The study may take up to 10 years to complete. Work continued in 1999, though progress slowed due to an expansion of work related to threatened and endangered species management (see further discussion in the research, administrative studies, and adaptive management subsection of this document).

IMPLEMENTATION ISSUE

Degree of Ground Disturbance in Timber Harvest Areas: Monitoring of ground disturbance within harvest units was initiated in 1990. The degree of area disturbed has ranged from a low of 8.1% in 1992 (3 units sampled) to a high of 24.5% in 1996 (2 units sampled). The average disturbance from 1990 through 1998 is 14.2%. Between one and five harvest units per year have been examined to determine the extent of ground disturbance. Results have been reported in the Annual Monitoring and Evaluation Report that display the average condition found across the units examined within a particular year. The emerging concern is: Do harvest activities on the ANF exceed the Forest Plan standard and guideline ("Surface area disturbed by logging operations should be less than 15 percent of the sale area")?

The data as reported is difficult to interpret because the degree of disturbance within individual stands is not displayed. There may be common conditions found within the stands where disturbance exceeds 15%, which would enable the development of additional standards or guidelines to reduce disturbance to 15% or less.

In order to determine what additional measures might be added to the Forest Plan, additional analysis of existing data is needed. Forest personnel will take a more detailed look at existing monitoring data to determine:

- What factors occur in areas where disturbance exceeds 15% (i.e. -- method of cut, degree of slope, terrain position, soil type, season of harvest)?
- Is an additional standard or guideline needed under certain conditions in order to reduce disturbance to 15% or less?
- Should a more extensive monitoring effort be initiated?
- Has ground disturbance led to site damage (lower productivity, erosion, etc.)?

SOCIAL ISSUES

Wild and Scenic River Management: Since approval of the Final Environmental Impact Statement (EIS) and River Management Plan (RMP) for the Allegheny Wild and Scenic River in 1997, a partnership agreement has been executed with the Venango Museum of Art, Science and Industry in Oil City to assist the Forest Service with public involvement in river management. The director of the Museum has formed the Allegheny River Support Group (ARSG) to assist with implementation of recommendations in the RMP as well as other projects of interest to the group that are consistent with the "spirit" of the RMP. The ARSG is open to any interested party and meets quarterly. To date, their accomplishments include construction of the viewing platform and interpretative signing at the Indian God Rock and construction and placement of several osprey nesting platforms along the Allegheny River. The ARSG also sponsored fund raisers for future projects, and several river cleanups along the Allegheny River in Venango County.

The Planning and Oversight Committee of the Clarion River Basin Commission (CRBC) was inactive during 1999. The CRBC did initiate water quality monitoring to determine if there are additional water quality problems (to those already known) and determine what action is needed to mitigate any identified problems. The ANF continues to work with the Elk County Commissioners and their consulting engineering firm regarding the replacement of the Arroyo and Maxwell Run bridges over the Clarion River. These bridges are the last remaining turn-of-the- century thru-truss bridges on the Clarion River and both bridges are eligible for the National Register. The Arroyo Bridge is located in a segment of the designated river with a scenic classification. There is a concern that alternatives to replacing the two historic bridges are given due consideration for preserving vestiges of their historic character if feasible. Because the bridges are 80% funded by the Federal Highway Administration, the ANF is required to do a Section 7 assessment under the Wild and Scenic Rivers Act to determine if direct and adverse impact will occur to either the free flow of the river or the outstanding values which caused the river to be designated.

The ANF continues participating in the process for relicensing of the Piney Dam Hydroelectric Project due to the proximity of the designated river immediately upstream of the Piney Reservoir and dam. The Piney Project is privately owned and operated by Reliant Energy. The license to operate this facility is granted by the Federal Energy Regulatory Commission and is due to expire on October 12, 2002.

The continuing public inquiries about the Allegheny and Clarion Wild and Scenic Rivers concerning recreational opportunities, possible restrictions and permit requirements, unpermitted activities, proposed water resource projects such as bank rip-rapping and riparian land uses such as timber harvesting, indicates a continuing need for better public information and education. A final corridor boundary and management plan for the Clarion W&SR have yet to be completed. The trend for the past six years of flat budgets (actually declining budgets with inflation factored in) and increasing workloads from expanded programs with greater complexity has not allowed the ANF to meet these minimum needs. There is a concern that support for river issues gained during initial efforts before and after designation will be lost as public frustration increases with the perceived lack of Forest Service action.

Deterioration of Developed Recreation Facilities: Although good progress has been made, there are still significant needs to rehabilitate recreation facilities developed in the early to mid 1960s around the Allegheny Reservoir and other facilities around the Forest due to age. A comprehensive list of recreation capital investment needs was developed and prioritized to address this concern. Since the early 1990s, twelve recreation sites have been partially or completely upgraded with an investment of over five million dollars. Capital funds are limited and allocated to National Forests on a competitive basis. Although the ANF was very successful in obtaining substantial amounts of funding, this need will continue and will be addressed through the capital investment process. A business approach to managing facilities will be used to develop more functional, low-maintenance facilities and to assess which facilities should be decommissioned with the goal of increasing the quality of public service. In addition, few of these facilities and sites fully meet the needs of people with disabilities. Such needs are being addressed during rehabilitation at little additional cost.

Allegheny Snowmobile Loop and Trail System Connectors: There continues to be great interest by snowmobile riders on the Allegheny to add to and improve the Allegheny Snowmobile Loop (ASL) and connectors. As time permits, we continue to work on accomplishing a priority list of trail projects developed at a public meeting in 1996. Rerouting the 2.2 mile segment of trail into Kellettville from state highway to public land in 1999 is a good example of this. Over 300% of Forest Plan goals for snowmobile trails for the first two decades has been accomplished. There is a need to focus on problems with the existing trails before attempts are made to add new connectors. New connectors will be limited to address the need for access to necessary services. Cooperators will be responsible for obtaining private rights of ways before the Forest Service takes action on national forest lands. The PA DCNR Bureau of Forestry continues to cooperate with the ANF in the maintenance and grooming of this trail system by providing partial funding through the PA snowmobile registration program. Several snowmobile clubs also contribute substantial amounts of time and resources to maintain this 300+ mile system. Due to continuing poor winter weather, use of this system has been relatively low, with a higher cost per visitor day. Demand for additional connectors continues despite relatively low use, and the fact that we have already exceeded planned trail miles.

Horse Use: Horse riding is a very traditional, but generally minor, recreation activity on the ANF; however, during the last 10 years, it has grown to a dominant use in some locations on the Forest. Most of the guided trail rides are now under special use permit. Designated horse trails are not provided as part of the Forest trail system.

In recent years, some areas (stream bottoms, crossings, steep slopes, etc.) have been identified with resource damage associated with horse use. Most of the guided trail riding is now under special use permit and resource problems are being dealt with through the permits. A Forest-wide inventory and analysis has been conducted and an alternative selected which will keep the existing policy of allowing horse use Forest-wide except for hiking trails and developed campgrounds. In addition, efforts continue to involve users in improving trails through user

education, self policing, trail relocation and volunteer efforts. Formal bridal trails will not be designated, however to avoid concentrating use and creating greater maintenance needs than is presently occurring.

ATV Trail Management: Forest Plan goals are to provide 350 miles of ATV trails by the end of the second planning decade (2005). Currently, there are approximately 106 miles (30% of goal) available for use on the Forest. Demand has met or exceeded Forest Plan projections, with ATV use increasing faster than other recreational uses. Expansion of the trail system has been delayed because of the lack of funds to do the up-front planning and design work, and the decision to focus on completing backlog maintenance before building new trails. Heavy use of existing trails has resulted in resource damage, safety concerns, and some continuing illegal use. The PA DCNR has made significant funds available to the ANF from state ATV registration monies and trail grants. However, these funds can not be spent for federal salaries.

Forest personnel are continuing to implement a strategy and have made significant progress addressing these issues. The need for additional ATV trail miles will be addressed after existing trails are brought to an acceptable and maintainable standard.

Development of Private Outstanding/Reserved OGM Rights: The United States Government owns only seven percent of the mineral rights under the surface of the Allegheny National Forest. The remainder is in private ownership. These subsurface owners have the right to develop their mineral estate. The public has expressed concerns for oil and gas development on the Forest, but is not generally aware of the limitations on Forest Service authority with regard to these privately-owned minerals.

The Forest Service, the private mineral developer, and the Commonwealth of Pennsylvania are jointly responsible for protection of the surface resources. The Forest's management objective, as defined by the courts, is to negotiate to the greatest extent possible with individual developers to manage and protect the surface resources while allowing full development of their mineral rights.

FOREST PLAN AMENDMENTS

One amendment to the Allegheny National Forest Land and Resource Management Plan was processed in FY 99. This amendment (ANF Forest Plan Amendment #10) assigns a Management Area 6.1 designation for the 97.13-acre tract of land added to the ANF in FY 1998 (See FY 98 Monitoring and Evaluation Report, p. 76).

MONITORING RESULTS, EVALUATION, AND RECOMMENDATIONS

IMPLEMENTATION AND MONITORING REVIEWS

Conduct Interdisciplinary Field Reviews of Projects in Several Management Areas to Determine Application and Effectiveness of Standards and Guidelines

Method of Measure: Interdisciplinary field review of projects in different Management Areas by the Forest's Leadership Team, the Ecosystems Management Team and others.

Monitoring Results: The two-fold purpose of these reviews is to determine: 1) if projects are being implemented as planned in their environmental documents; and 2) if those projects, as implemented, are moving the Management Areas towards their Desired Future Condition (DFC), as outlined in the Forest Plan. No fewer than four project reviews will be conducted during the year.

In FY 99, Forest Plan Monitoring and Implementation Reviews were conducted on projects approved in four environmental documents. Prior to each review, NEPA documents were thoroughly reviewed by resource specialists, and a list of site-specific and general Forest planning questions were developed for use during each review. Resource specialists, Forest Leadership Team, and Ranger District personnel then field reviewed each project area and gathered technical resource data on the application of existing standards and guidelines and actual environmental effects. This project-specific data was carried into discussions held during each review.

As part of the review process, follow-up actions may be recommended. Ranger District personnel are establishing plans of action to address them.

Rocky Gap Trail Rehabilitation/Relocation (MA 3.0) – The Rocky Gap ATV/Bike Trail is heavily used. The objectives of this project were to correct drainage and erosion problems on portions of the trail. Activities approved in the EA included relocating segments of the trail and decommissioning "old" portions; installation of new culverts; limestone surfacing; reshaping all existing trail to 6 feet wide with a drowned surface; installation of broad-based dips; and removal of a few trees to improve safety.

All activities proposed for the three sites reviewed have been implemented. Overall, this project moves the ANF toward the DFC of MA 3.0. The project meets the roaded/natural ROS class.

The serpentine trail design has significantly improved drainage of the trail surface. The use of limestone surfacing on bridge approaches has reduced sediment in the stream. Forest Plan mitigation measures were applied and, appear to have been effective. There are still places along the trail (not a part of this project), particularly on some curved sections, where soil is still moving. Some of the crowning has been lost after one use season, reinforcing a need for regularly scheduled trail maintenance.

The ANF is well below the number of motorized-summer trail miles approved by the Forest Plan. However, in light of environmental concerns on the existing trial system, a decision has been made to delay expansion until existing problem areas are addressed.

Recommended follow-up actions include:

1. Removing any trail signs remaining on old portions of the trial that have been relocated.
2. Establishing an annual trail maintenance schedule
3. Adding riprap or a splash rock at the outlet end of the culvert a one site.

4. Removing old erosion control devices.

5. As funds are available, expand annual maintenance contract to include reshaping, spot surfacing, and maintenance of drainage structures.

Morrison Boat-to Campground Rehabilitation (MA 6.1) - Activities approved in this project include installation of new "sweet smelling" toilets (SST) and removal of old vault toilets; installation of a 4" plastic sewer line; selective tree felling at SST locations to improve south sun exposure and promote natural ventilation processes.

Proposed activities were implemented, with the exception of the selective tree felling. To better fit site conditions and operational needs, the engineer, landscape architect and outdoor recreation planner adjusted the location of the SSTs in the field. This adjustment made it unnecessary to remove the trees.

The additional minor action of rehabilitating campsites (leveling a small area for tent pads) was not documented; if done today, this action would be documented. However the sites were in need of leveling to make them more useful and since the necessary equipment was on site, it was the most efficient time to complete the work.

The environmental document did not anticipate the need and associated effects of bringing heavy equipment (excavator) into the site. The original plan was to use a barge, which turned out to be too expensive and logistically unrealistic. The concrete vaults were floated in (a creative and quite novel approach) during high water, and the excavation equipment was driven in on old roads. The act of driving the excavator to the site resulted in some unanticipated soil disturbance and sedimentation along Morrison Run. High water and local flash floods in spring contributed to the unanticipated effects.

After reviewing the situation and an analysis of what was done, review participants agreed the actions taken were appropriate; however, actions like this in the future should be documented in a supplement to the environmental document or a note in the file.

Mitigation measures for Heritage, T&E Species, Recreation Facilities, Visual, and Water and Soils listed for this project were implemented as proposed. The review team examined disturbed areas and found them to be fully vegetated and in many cases difficult to recognize as once being disturbed. The toilet designs were not as rustic as originally intended however the review team agreed with the changes that lowered material cost and resulted in higher durability (less expensive to maintain over time).

Actual costs were lower than the planned costs by about 10%. The team suggested additional site furniture and/or signs could be purchased with remaining funds. In future boat-to rehab projects, research on potential use of mulching toilets should be completed.

The review team found that this project moves the ANF toward meeting Forest Plan goals and objectives and the desired future condition for MA 6.1. The ROS Class for semi-primitive motorized was met. With the exception of modernizing the toilets, site conditions remain semi-primitive.

Some minor rehabilitation of a few of the existing campsites was also done while this project was being implemented. This action was not documented in the environmental analysis.

Hammer Timber Sale (MA 3.0) – Activities approved in this Environmental Assessment include timber harvest, reforestation treatments, wildlife improvement work, recreation resource improvements, erosion control measures, road management opportunities (daylighting, road closures, decommissioning, road construction and reconstruction).

At the time of the review, 81% of timber harvest activity and all road construction/reconstruction had been completed. Herbicide treatment had also been completed.

Forest Plan and project site-specific management requirements and constraints were implemented and appear to have been successful, with the following exceptions: the requirement to retain five snags per acre greater than 10"DBH was not met in one payment unit (estimated that 2-3 were left); some road construction was done during the turkey nesting season (April 15 to June 15); in one stand, some white oak were marked when all white oak over 10" DBH should have been reserved; and a reserved grape vine patch in one stand was partially destroyed. Successful implementation of management requirements and constraints include: maintaining visual quality along North Country Trail and along FR 449 by modifying the cutting unit boundary during layout; reserve trees were protected during harvest.

Implementation of this project moves the ANF toward meeting the goals and objectives and desired future condition of MA 3.0.

Sockeye Timber Sale (MA 3.0) - Activities approved in this project include timber harvest, reforestation activities, wildlife habitat improvement work, construction of a parking lot, and road betterment/reconstruction.

At the time of the review, all specified road work, herbicide treatment, and harvesting had been completed. Some minor erosion control work had yet to be done. The five-car parking lot was not constructed.

Forest Plan and project site-specific management requirements and constraints were implemented and appear to have been successful, with the following exceptions: the requirement to retain five snag per acre greater than 10" DBH was not met in one payment unit (estimated that 2-3 were left); some road construction was done during the turkey nesting season (April 15 to June 15); in several stands, specific trees (identified by species and dbh) stipulated to be retained could not be found after harvest; limestone surfacing for approaches before a stream crossing was applied to only 43 feet rather than the 100 feet specified. Successful implementation of management requirements and constraints include the retention of snag trees where available (in all but one unit); the retention of hemlock clumps; the application of appropriate buffer strips along Farnsworth Branch; the revegetation of skid trails and landings and proper placement of water bars; the appropriate protection of a cultural resource site that was discovered during project implementation; and proper disposal of slash in visually sensitive areas.

Implementation of this project moves the ANF toward meeting the goals and objectives and desired future condition of MA 3.0.

HERITAGE RESOURCES

Verify that Heritage Resources are being protected [36 CFR 219.24]

Method of Measure: Field observations.

Monitoring Results: Earlier attempts at monitoring, such as those conducted in 1990, revealed that "many" of the past cultural resource surveys on the ANF may have been inadequate and that "damage had occurred inadvertently to archaeological sites." One of the 1990 recommendations states, "All surveys conducted under earlier contracts should be revisited by in-house personnel to check site locations and correct oversights."
In 1999, a number of previously recorded cultural resources and selected areas that had been covered by earlier surveys were re-examined. This was to test the validity of the previous investigators' methodologies and results, as well as to determine the adequacy of mitigation measures.

The results of our review showed that, although the majority of the areas that were re-examined appeared to have

been adequately surveyed, some of the previous investigations did indeed miss or overlook potentially significant cultural resources. These results suggest that, whenever possible, selected areas of high probability pre-1990 surveyed acres located within newly proposed project areas be re-examined to test the adequacy of the previous investigators' methodologies, results, and mitigation measures.

Throughout the year, a select number of previously recorded cultural resources were checked during the course of our cultural resource investigations. Monitoring revealed that implemented projects were generally designed to avoid impacts to the cultural resources. One exception to this was noted in 1999. Our monitoring efforts identified modifications to portions of an historic logging railroad grade system to prevent off road vehicles from using the grade. Although integration of heritage resource information is an important element in the ecosystems management approach on the Forest, apparently such input was overlooked in this particular well-meaning approach to address an immediate problem. With this in mind, even greater integration in forest management practices is recommended to prevent such problems from occurring in the future. Likewise, such examples as this illustrate the value of monitoring.

In 1999, as in all previous years since 1978, heritage resource specialists on the Forest continued to have problems relocating cultural resources recorded before 1979. The reasons for this are many but include the following: the sites were recorded simply on the basis of historical documentation, informant interviews, or folklore; and the site records contain little or no location or descriptive data and rarely contain a map of their location (or suspected location). Compounding all of this is the fact that none of the sites recorded before 1979 were ever field verified before being recorded as a cultural resource site. Field verification of these sites is being accomplished with limited success on a case-by-case basis within watershed analysis areas.

Throughout the year, monitoring efforts were also conducted at the most significant cultural resources on record on the Forest including the Buckaloons sites, the Elk County earthwork sites, a number of prehistoric rock shelter sites, and a number of historic petroleum central power systems. This was done to assess the nature and degree of damage to these cultural resources caused by vandalism, visitor use, and natural deterioration, and to identify and implement appropriate protective measures.

Our monitoring of the earthwork sites resulted in no human caused degradation of the sites.

At Buckaloons, monitoring also revealed no evidence of human impacts to the cultural resources; however, uncontrolled/unmanaged vegetation on the Irvine Flats (known as the "Beanfields") continues to adversely affect the subsurface archaeological features in the now overgrown fields. The first steps to reverse this process began in 1997, and have continued yearly. Portions of the field were plowed, disked, and replanted with a mixture of cool season grasses to provide a soft vegetation cover to protect the sites from natural and human causes, and also to provide cover and an excellent food source for wildlife. Prior to planting, a systematic controlled archaeological surface collection was conducted. The archaeological work was accomplished through a partnership with the Pennsylvania Historical and Museum Commission, the Brokenstraw Valley Area Authority, and Mercyhurst Archaeological Institute's archaeological field school, which, in turn, was assisted by Forest Service Passport in Time volunteers.

Elsewhere at Buckaloons, additional impacts continue to be noted along Brokenstraw Creek, where bank erosion first observed in 1997 continues to erode the south bank, beginning approximately at the midpoint of the mouth of the creek. In 1999, the rate of bank erosion was less than that of the preceding year, but nonetheless continues at an alarming pace. The erosion threatens to destroy an historic sunken road, which also may represent one of the few, if any, intact portions of the Brokenstraw Indian Trail. Stabilization of the bank is recommended.

As has been the case in previous years, our monitoring efforts have identified impacts to prehistoric rock shelter sites caused by dispersed recreational users on the Forest. These results suggest that monitoring efforts should continue to focus on the most threatened rock shelter sites on the Forest.

Also, as has been the case in previous years, our monitoring efforts have identified impacts occurring to historic oil and gas related sites. The impacts include human caused damage as a result of vandalism, as well as the removal of equipment. Naturally caused damage, such as trees falling onto powerhouses and damage caused by porcupines, was also noted. A variety of steps are being taken to address this issue, including documenting and recording several potentially historically significant central power systems.

TIMBER

Application of Silvicultural Guides for Intermediate or Selection Cuts [36 CFR 219.12(k)(2)]

Method of Measure: Timber sale marking checks are normally conducted by gathering new silvicultural examination plot data for a number of thinnings and shelterwood seed cuts on active timber sales on both Ranger Districts. This information is then used to produce a new SILVAH summary of the stand characteristics and to determine whether the marking followed the silvicultural prescription and any interdisciplinary modifications approved for the stand. SILVAH is the computer program developed by the Forest Sciences Laboratory in Irvine to evaluate vegetative data and develop silvicultural prescriptions.

Monitoring Results: Since the only timber sales awarded in 1999 were firewood cutting or oil and gas development rights of way, no timber sale marking checks were conducted in 1999.

Summarize Results of Regeneration/Final Harvest Cuts [CFR 219.12(k)(5i)]

Method of Measure: By conducting stocking surveys once the final harvest cut is complete.

Monitoring Results:

TABLE 4. REGENERATION SUCCESS FOR AREAS HARVESTED 1976 TO 1994 IN MA 1.0, 3.0 AND 6.1

Type of Regeneration	Established [1]	Probable Success [2]	Probable Failure [3]
Regular Timber Sales	95%	2%	3%
Final Harvest in 1985 Tornado Swath	96%	2%	2%
Regeneration with No Salvage Cutting in Tornado Swath [4]	86%	12%	2%
Oak Mortality Salvage	94%	3%	3%
Selection Cutting [5]	53%	22%	25%

1 70% or more of the stocking survey plots have adequate numbers of seedlings present.
2 50% to 69% of the plots have adequate seedling numbers.
3 Less than 50% of the plots have adequate seedling numbers.
4 No surveys have been done in wilderness, Tionesta Scenic Area, savannas, or very steep areas (1,660 acres).
5 Stocking levels for Selection cutting units are based on new stocking survey evaluation guidelines established by the ANF and NERS in March 1996. Percentages shown here include beech and birch (see discussion below).

Evaluation of Results: The Regular Timber Sale and Final Harvest in 1985 Tornado Swath categories show high levels of success in establishing regeneration in areas where more than five years have elapsed since the cutting occurred. We anticipate that additional seedling development will occur in the probable success and probable

failure categories as time passes and as additional reforestation treatments (area fencing, fill-in planting, etc.) are employed. The least well-stocked areas will be evaluated for potential use as permanent openings. Approximately 10 percent of the probable failures reported in the Regular Timber Sale category are old tornado salvage areas.

There is moderate success in establishing seedlings on areas blown down by the 1985 tornado where salvage did not occur, although seedling development has been slower than in final harvest areas, and there is a higher percentage of birch and pin cherry. No additional reforestation efforts are planned in areas included in the probable failure category. Approximately 1,660 acres blown down by the tornado and not salvaged were not surveyed. Many of these stands were originally savannah stands that had low overstory tree stocking and understories composed of thick interference. Limited regeneration response was predictable. Other stands are those located on extremely steep side slopes, which had higher levels of overstory tree stocking and understories composed of thick interference, which also had an expected limited regeneration response. Reforestation treatments could be attempted in these areas, however it is highly unlikely that full stocking would ever be achieved. Leaving these areas as they are does provide important habitat (savannas, openings) that is otherwise lacking on these portions of the ANF. No monitoring was done of the tornado swath in the Hickory Creek Wilderness Area and Tionesta Scenic Area.

Reforestation success in the oak mortality category has improved (+8%) since last year. Areas will continue to be evaluated for additional reforestation needs as appropriate.

In 1996, ANF and Northeastern Research Station (NERS) personnel developed revised guidelines for prescribing and evaluating uneven-aged management (UEAM) treatments. On the ANF, there is limited success in establishing seedlings following selection cutting. Where seedlings have become successfully established, they are predominately beech and birch. Both of these species are significantly impacted locally by specific insects and/or diseases which threaten the potential for affected stems to develop into larger, quality trees. Additional reforestation treatments (herbicide application, area fencing, etc.) will be considered for stands in the probable success and probable failure categories. ANF personnel will continue to examine the effectiveness of UEAM prescriptions and standards for evaluating tree seedling stocking as part of the ongoing adaptive management study.

Table 5 summarizes data that has been reported annually since 1990 in this section of the Monitoring Report. It shows the trends for each harvest category during the ten year period 1990-1999.

TABLE 5. TRENDS IN REGENERATION SUCCESS (AREAS ESTABLISHED) FOR AREAS HARVESTED SINCE 1976 IN MA 1.0, 2.0, 3.0 AND 6.1

Type of Regeneration	FY '90	FY '91	FY '92	FY '93	FY '94	FY '95	FY '96	FY '97	FY '98	FY '99
Regular Timber Sales	88%	91%	89%	91%	90%	92%	94%	94%	95%	95%
Final Harvest in 1985 Tornado Swath	37%	61%	62%	81%	87%	91%	93%	95%	95%	96%
Oak Mortality Salvage	0%	0%	0%	10%	57%	76%	76%	84%	92%	94%
Selection Cutting *1*	-	-	-	-	-	41%*2*	22%*2*	31%	46%*3*	53%*3*

1 Cutting practice not evaluated FY 90 to FY 94.

2 For 1995, 69 acres (41%) out of the 167 acres cut from 1988 to 1990 had adequate tree seedlings, whereas for 1996, 113 acres (22%) out of 500 acres cut from 1988 to 1991 had developed adequate tree seedlings; for 1997, 217 acres (31%) out of the 693 acres cut from 1988 to 1992 had developed adequate tree seedlings

3 American beech and sweet birch (for which insect/disease concerns exist) dominate tree seedlings that have developed

The Regular Timber Sale harvest areas have shown a relatively constant (but slightly improving) level of regeneration success or seedling development during the past eight years. The tornado swath and oak mortality salvage categories have shown a dramatic increase in establishment during the same time period. It will take several more years to determine trends for selection cutting. The seven percent increase from 1998 to 1999

results primarily from including 1994 harvest in this year's report, not from improved stocking on areas evaluated in the FY98 report.

Report the Percentage of Successfully Stocked Regeneration Units in the Following Categories: Oak Regeneration Cuts; Shelterwood Seed Cuts; Units Treated with Herbicide; and Units Fenced [36 CFR 219.12(k)(1)]

Method of Measure: Most of the data came from the vegetation database. The discussion for Final Harvest Cuts (see preceding section) describes the overall reforestation success in regeneration units. Historical reforestation activity success rates are difficult to extract from the vegetation database at this time. Readily available information is summarized below by acres rather than percentages.

Monitoring Results: In 1999, 1,356 acres were certified as "established" in regeneration cutting areas. In order for a regeneration unit to qualify for certification, at least 70 percent of the area must be stocked with tree seedlings taller than 4.5 feet. Tables 6 and 7 show the acres certified *by forest type* and *by Management Area*.

TABLE 6. ACRES CERTIFIED AS REGENERATED IN FY 99 BY FOREST TYPE

Timber Type	Acres
Red Maple	41
Upland Hardwood	230
Northern Hardwood	54
Allegheny Hardwood	1,014
Quaking Aspen	17
Total	1,356

TABLE 7. ACRES CERTIFIED AS REGENERATED IN FY 99 BY MANAGEMENT AREA

Management Area	Acres
1.0	55
3.0	1,266
6.2	35
Total	1,356

On the Allegheny National Forest, more than one reforestation activity may be required in an area in order to establish tree seedlings. For the 1,356 acres certified as reforested in FY 99, Table 8 shows the combination of reforestation activities that had occurred on them. This is the fourth year that any significant acreage that had been treated with herbicide was certified. It has only been a few years since we began to carry out shelterwood removal cuts on some of them, and it generally takes a minimum of three years following the removal cut before the seedlings exceed 4.5 feet tall, the height required for certification.

TABLE 8. ACRES CERTIFIED AS REGENERATED IN FY 99 BY REFORESTATION ACTIVITY

Reforestation Activity	Acres
Fertilization and site prep	206
Fertilization	215
Fertilization, striped maple cutting	40
Fencing, fertilization	15
Herbicide and fencing	31
Shelterwood seed cut[1]	1,001
Fencing and site prep	91
Herbicide, site prep, striped maple cutting	39
No reforestation activity required	323
Site prep only	122
Striped maple cutting, fertilization, site prep	37
Herbicide, fencing, site prep, striped maple cutting	31
Herbicide, fertilization, striped maple cutting	19
Herbicide, fencing, site prep	24
Planting, fencing, fertilization	9
Site prep, fencing, planting	6
Fertilization, site prep, planting, fencing	14
Herbicide, fertilization, fencing, site prep	91
Herbicide, site prep	24
Fencing, fertilization, site prep	11
Planting, fencing	8
Total	**1,356**

1 ***Shelterwood seed cuts - These acres are spread throughout the rest of the reforestation activity categories listed here. Therefore, they should not be included when adding to get the total acres shown below.***

Units Treated with Herbicide

The ANF began to implement an herbicide application program on an operational level in 1987. Herbicides are used to remove understory woody and herbaceous vegetation that interferes with the establishment and growth of tree seedlings. They are used primarily in forested areas to help establish tree seedlings as part of even-aged management systems (the final harvest would not occur until adequate tree seedlings become established). They have also been included in stands being managed under uneven-aged systems. The herbicide glyphosate (RoundUp^R) was the only herbicide used until 1989. In that year, one district made a test application of the herbicide sulfometuron methyl (Oust^R). In March 1991, the Forest Plan was amended to allow the use of sulfometuron methyl, alone or in combination with the herbicide glyphosate. In recent years, due to changes in the RoundUp^R label, ANF personnel have used Accord^R.

Stocking surveys (surveys which measure the kinds and quantities of understory vegetation present) are used to monitor the understory development of stands following herbicide application. Generally, surveys are taken annually or bi-annually in stands where treatment has taken place at least two years earlier. We can evaluate the effectiveness of treatments by looking at the amount of seedling development that has occurred since treatment.

The survey data includes only seedlings that are more than one year old, taller than two inches and have two or more normal sized leaves. Prior to spraying, almost all of these areas had virtually no seedlings present. Table 9 displays survey results through 1999 for stands treated with herbicides.

TABLE 9. ACRES OF SPRAY AREAS HAVING TREE SEEDLINGS[1]

Year Sprayed	0-30[2]	31-50[2]	51-70[2]	70+[2]	Final Harvest Completed	No Survey	Re-spray Defer & Unknown[3]	Total	% Acres >50% Stocked
1987	12	0	13	14	224	0	104	351	70%
1988	0	13	93	67	396	15	238	844	67%
1989	26	12	102	258	853	41	321	1665	74%
1990	16	29	81	216	798	0	175	1351	82%
1991	54	41	25	109	282	28	255	784	53%
1992	215	196	50	295	716	35	145	1666	64%
1993	319	216	196	296	447	34	251	1669	55%
1994	303	146	275	298	399	35	39	1459	66%
1995	211	127	293	523	185	9	101	1485	68%
1996	282	72	62	469	358	10	56	1315	68%
1997	204	301	367	614	80	59	1	1638	65%
Subtotal	**1,642**	**1,153**	**1,557**	**3,159**	**4,738**	**266**	**1,686**	**14,227**	**66%**
1998	48	24	80	132	232	937	0	1453	na[4]
1999	269	49	47	97	60	336	0	858	na[4]
Total	**1,959**	**1,226**	**1,684**	**3,388**	**5,030**	**1,520**	**1,686**	**16,538**	

1 Figure represents the most recent stocking survey taken for a stand.
2 Percent of plots with adequate number of tree seedlings.
3 This category includes areas we were unable to categorize into a stocking category due to data base errors.
4 na = not available. Survey data has not yet been summarized.

Evaluation of Herbicide Results:

Through the end of FY 99, stocking surveys are available on 13,332 acres of the 16,538 acres treated with an herbicide application between 1987 and 1999. Of the 3,206 acres where surveys are not available:

- 1,273 acres were treated in either 1998 or 1999 and insufficient time has elapsed to make surveys in these areas worthwhile,
- 266 acres were treated prior to 1998, however treatments occurred in portions of stands and separate stocking surveys to measure success of herbicide treatments have not been made.
- 1686 acres treated between 1987 and 1995 have either been resprayed (908 acres), and are being tracked in the year when follow-up treatment occurred – OR – (on 778 acres) are no longer being tracked due to change in management objective for the stand, or treatment failure. Outdated survey data that has been collected in the past is not presented here for these acres.

The discussion of survey results will focus on areas where it has been at least two years since treatment (14,227 acres) because we know that it takes at least three to five years for good seedling development to occur. Final harvest cuts were sold on 4,738 acres (33%) of the 14,227 acres that were treated between 1987 and 1997. The stocking level was above 70 percent on these acres at the time of the sell. There are 3,159 acres (22%) that have more than 70 percent stocked plots. In addition, the 1,557 acres in the 51-70 percent stocked plot category (or 11 percent of the total 14,227 acres treated) are well on their way to becoming adequately stocked. This means that a total of 66 percent of the acres treated between 1987 and 1997 have become or are making good progress towards

becoming adequately stocked with tree seedlings.

A number of environmental conditions can affect the establishment, survival and development of tree seedlings within the first few years after spraying. Drought can take a heavy toll on seedlings whose roots are shallow. The Forest experienced several droughts during the 1988, 1991 and 1995 growing seasons. Rainfall was below normal during April – October in 1997 (-4.7 inches), 1998 (-2.5 inches), and 1999 (-7.7 inches). Insect defoliation (cherry scallop shell moth) occurred on 205,000 acres across the Forest in 1995. This defoliator removed the leaves from overstory trees as well as the understory seedlings. In areas where seedlings did not develop quickly after herbicide application, the potential for re-invasion by fern and grass was high. Only the 1996 growing season was favorable for seedling development.

Overall program success can also be looked at by examining the survey results that have been reported in our annual monitoring report for the last five years. Table 10 displays the trends in seedling development over time by looking at the acres reported in Table 9 in this and prior years' monitoring reports. Each line displays the total number of acres for that monitoring year where it had been at least two years since treatment, and the number of acres which were more than 50 percent stocked with seedlings.

TABLE 10. TRENDS IN SUCCESSFUL SEEDLING DEVELOPMENT IN STANDS WHERE AT LEAST TWO YEARS HAVE ELAPSED SINCE TREATMENT

Survey Year	Acres Treated	>50% Stocked
1991	2,890	891 (31%)
1992	4,221	1,824 (44%)
1993	4,995	3,684 (74%)
1994	6,661	3,964 (60%)
1995	8,360	5,300 (64%)
1996	9,819	5,873 (60%)
1997	not calculated	not calculated
1998	not calculated	not calculated
1999	14,227	9,454 (66%)

The data shows that seedling development success where it has been at least two years since treatment is variable. Data reported in 1991 and 1992 reflects a period where program development occurred, where we gained a better understanding of site selection criteria and treatment protocols. From 1993 through 1996, seedling stocking has equaled or exceeded 60%, although variability in seedling establishment is evident. We know that drought and defoliation can impact seed production and seedling development. We believe that droughts that occurred in 1991 and 1995 and the rainfall deficits during the 1997 – 1999 growing seasons, as well as defoliations from elm spanworm and cherry scallop shell moth that occurred from 1991 through 1996 are reflected in seedling response rates reported here. The improvement in seedling development from 1996 (60%) to 1999 (66%) is quite encouraging, especially when considering the stress factors on seedling development from 1995 through 1999.

The ultimate goal of the herbicide program is to bring seedling counts to a high enough level so that a final harvest cut can occur. In some cases, it is necessary to include a shelterwood seed cut in this process. From 1991 through 1999, shelterwood seed cuts occurred on 5,994 acres that had been treated with an herbicide application. These areas had very dense overstory tree canopy that was inhibiting seedling development. The shelterwood seed cut was designed to remove enough trees so adequate light will reach the forest floor to stimulate tree seedling development and growth. Within the next few years, adequate seedlings should begin to develop in most of these areas since lighting and conditions for seedling establishment and growth will be improved.

Table 11 on the following page summarizes the acreage treated with herbicides in past years where seedlings have become successfully established and where a final harvest cut was sold since 1991.

The herbicide program plays an important role in the timber harvest program on the Forest. In 1999, 699 acres (91%) of the 771 acres prepared to sell as final harvest on the Forest had been treated with an herbicide. This serves as another indicator of the importance of removing interfering plants in order to provide growing conditions for tree seedling development needed to sustain forest cover.

Final harvest cuts have been sold in 5,030 acres where herbicides have been applied. This represents 30 percent of the total number of acres treated with herbicides through the end of FY 99 (16,538 acres). A total of 958 acres of selection cutting have also been sold. Stocking survey data indicates that there are another 3,159 acres that have seedling densities high enough to qualify for regeneration cutting (see Table 9). The 1,557 acres in the 51-70 percent stocked category should soon qualify for a final harvest cut if favorable seedling growth and development continues to occur.

TABLE 11. ACRES OF FINAL HARVEST CUTS SOLD IN FY 91 THROUGH 99 IN AREAS TREATED WITH HERBICIDE SINCE 1986

Year of Herbicide Treatment	Year Final Harvest Sold									Total Acres Sold	Total Acres Treated w/ Herbicide
	FY 91	FY 92	FY 93	FY 94	FY 95	FY 96	FY 97	FY 98	FY 99*		
1987	66	0	112	0	0	46	0	0	0	224	351
1988	66	91	87	0	61	85	6	0	0	396	844
1989	24	157	202	201	145	64	60	0	0	853	1,665
1990	9	58	120	40	204	266	101	0	0	798	1,351
1991	32	39	4	19	99	37	45	0	7	282	784
1992	78	31	0	0	120	39	273	44	131	716	1,666
1993	10	0	86	40	0	28	146	59	78	447	1,669
1994	44	5	0	54	0	48	69	104	75	399	1,459
1995	0	5	6	7	0	9	22	51	85	185	1,485
1996	6	0	21	39	0	23	0	0	269	358	1,315
1997	10	0	7	0	13	25	0	0	25	80	1,638
1998	24	0	0	41	24	78	36	0	29	232	1,453
1999	19	0	0	0	0	5	36	0	0	60	858
Total	**388**	**386**	**645**	**441**	**666**	**753**	**794**	**258**	**699**	**5,030**	**16,538**

**** Acres shown here were prepared for sale in FY 99, however actual award of sale did not occur until FY 2000.***

Summarize Size of Final Harvest Blocks by Management Area [36 CFR 219.12(k)(5iii)]

Method of Measure: Summarize data from timber sale prospectus and appraisal report for each sale.

Monitoring Results: No final harvest units were sold in FY 1999. The only sales awarded were for firewood cutting or oil and gas development rights of way.

Volume of Hardwood Sawtimber, Pulpwood, and Firewood in Timber Sales Awarded

Method of Measure: Automated Timber Sale Accounting System (TSA) and Timber Activity Control System (TRACS)

Monitoring Results:

TABLE 12. VOLUMES AWARDED TO TIMBER SALE PURCHASERS

	FY 99 Volume of Sale (MMBF) [1]	FY 99 $ Return of Sale [2]	Total MMBF since 1986
Sawtimber	1.166	985,540	410.5
Pulpwood	.811	4,827	377.3
Fuelwood	.945	9,835	21.0
Total	**2.922**	**1,000,202**	**808.8**

[1] From TRACS. Includes 0.388 MMBF of additional volume marked in FY 99 in existing sales.

[2] From TSA. Does not include value of 0.388 MMBF additional volume marked in FY 99 in existing sales. CORRECTION: These same dollar values were incorrectly reported as the values for 1998 in last years Monitoring Report. The correct 1998 values are: sawtimber $5,752,909; pulpwood $57,765; fuelwood $9,835; total $5,820,509.

Evaluation of Results: The total budgeted FY 99 target for timber offered for sale was 15.0 million board feet. The actual volume offered for sale was 15.3 million board feet, or 102 percent of the target. The volumes shown in Table 12 are based on "award," which includes those sales for which a valid contract had been awarded by the end of the fiscal year.

The total volume awarded in FY 99 (2.9 MMBF) was well below historical averages for four reasons: 1) The "Mortality II Project" ruling by the U.S. District Court for Western Pennsylvania; 2) Delays, harvest volume losses, and complexity associated with the East Side EIS; 3) Consultation with U.S. Fish and Wildlife Service regarding new threatened and endangered species information; and 4) The need to complete a Forest Plan Amendment addressing threatened and endangered species management.

Units of Accomplishment by MA for the Following Activities

Method of Measure: Commercial cutting activities are from sales awarded in FY 99. Oil and gas right-of-way clearing and firewood cutting were the only commercial sales awarded. The information source is the Combined Data System (CDS) and Timber Activity Control System (TRACS) reports.

TABLE 13. 1999 ACCOMPLISHMENTS, BY MANAGEMENT AREA

Activity	MA 1.0	MA 2.0	MA 3.0	MA 6.1	MA 6.2	MA 6.3	MA 6.4	MA 8.0	MA 9.1	Totals
Hardwood Sawtimber (MMBF)			1.0	0.2						1.2
Hardwood Pulpwood (MMBF)			0.6	0.2						0.8
Hardwood Fuel (MMBF)			0.9							0.9
Final Harvest with Residuals (Acres)			159	28						187
Shelterwood Seed (Acres)										0
Thinning (Acres)			15							15
Selection Cut (Acres)										0
Acres Certified without Site Prep	33		268		22					323
Timber Stand Improvement (Acres)										0
Herbicide (Acres) *			713		145					858
Fertilization (Acres)	13		1023	24						1,060
Fencing (Acres)	17		852	48			12			929
Planting/Seeding (Acres)	47		348	22			12			429
Site Prep (Acres)	17		1,146	130						1,293
Release (Acres)	10		600	54						664
Striped Maple Cutting (Acres)			457							457

**** Includes Re-spray Acres***

Evaluation of Results: Final harvest acreage is less than the Forest Plan average because less than the expected amount of advanced regeneration is being found during site-specific analysis. Timber harvests cannot take place until there is adequate advanced regeneration on the site.

Timber stand improvement, as specified in the Forest Plan, is implemented to complete the silvicultural prescription only where the optional pulpwood is not removed in the commercial timber sale. In FY 99, all pulpwood was removed in sales, so none of this kind of timber stand improvement was necessary.

The Forest's herbicide program is lower than planned. We began this program in 1987 by treating a relatively small acreage and monitoring those areas closely to ensure the equipment and technology used were appropriate for the various sites. We soon found we needed to make some adjustments to ensure effective and efficient control of the target vegetation. New technology now provides for better control of a wider range of species. With the 1991 addition of sulfometuron methyl as a valid treatment technique and a new and better sprayer in 1992, effective control of competing understory vegetation can now be considered on many more sites.

Fertilization stimulates rapid tree seedling growth so seedlings quickly grow beyond the deer browsing height. Fertilization is a function of past final harvest cuts. It is completed only in stands that have a high component of black cherry, significant deer pressure and dense enough black cherry regeneration. It is used to stimulate trees to rapidly grow above the deer browsing height.

Pre-fencing combined with shelterwood cut or herbicide is used to establish advance regeneration quickly and with a greater diversity of tree species. To accomplish these objectives, personnel have fenced more acres than were anticipated in the Forest Plan. Fencing has also been used in mortality areas.

Site preparation is necessary when a significant amount of damaged or small diameter, poor-quality stems remain following a final harvest cut. To prevent interference with new seedling development, they must be cut with a chainsaw.

In 1995, Forest personnel initiated a tree release program in regenerating stands. Desired tree seedlings or saplings sometimes grow more slowly than other competing vegetation in young, developing forest stands. In order to assure the desired seedling/saplings survive, we release them by cutting down the taller, competing vegetation.

Striped maple cutting occurs where tall, dense striped maple is interfering with tree seedling establishment and growth. If tree seedlings are abundant beneath the taller striped maple, hand cutting the striped maple concurrent with the overstory removal may adequately stimulate seedling development. If tree seedlings are not already present, the striped maple that sprouts from the cut stems will most likely require herbicide treatment to prevent it from quickly recapturing the site. In the latter case, the striped maple, before cutting, would be taller than our spray equipment can effectively treat. Following cutting, the stem generally sprouts prolifically and is well within the sprayer's effective treatment range (12 to 15 feet).

Suitable And Unsuitable Lands

There is a requirement in 36 CFR 219.12(k)(5ii) that every 10 years land not suited for timber production shall be evaluated to determine whether it has become suited. If it is found to be suitable, this land is to be returned to timber production. This category of monitoring will assure that information is gathered which can be used to determine this suitability.

Method of Measurement: Determine suitability on a stand-by-stand basis during vegetation examination data collection.

Monitoring Results: Lands designated as not suited for timber production in the Forest Plan (Table C-3) have not become suited during the last 10 years.

In 1992, Forest personnel initiated and completed an intensive data collection effort designed to provide a better description of vegetation and site characteristics (including suitable and unsuitable lands) on 300,000 acres of Management Area 3. Data was collected on 6,000 plots located 1/4-mile apart.

Analysis of the data indicates additional acres are temporarily not suited for final harvesting until we learn more about reforestation response on them or develop appropriate reforestation practices. Because the sample was designed to provide us with a large-scale estimate, we do not have an accurate inventory of the specific sites. Reliable, site-specific data will not be available for several years. Additional details regarding the analysis we have completed thus far are included in Appendix L of the November 1995 "Analysis of Timber Harvest Program Capability 1995 through 2005" for the Allegheny National Forest.

FOREST HEALTH

Summarize Significant Changes in Health and Vigor of Stand Conditions [36 CFR 219.12(k)(5iv)]

Method of Measure: Annually from vegetation examination, vegetation data, aerial observation, and ground observation.

Monitoring Results: Overall tree health and vigor in the oak forest type has improved from that observed in 1988/89 when tree mortality from the combined effects of several gypsy moth defoliations and drought was at its peak. Little tree mortality has been identified in the oak type since then.

Such is not the case for the northern hardwood type. Substantial tree mortality developed in 1994, and tree decline continued between 1995 and 1999. Since a large portion of the Allegheny hardwood type was defoliated for a second time in 1995 and suffered a severe late-summer drought, ANF personnel became quite concerned about the health and vigor of the Allegheny hardwood forest type. Fortunately, the 1996 growing season was marked by abundant and regular precipitation, ideal conditions to permit some trees to begin to recover, though rainfall was again less than normal during the 1997 through 1999 growing seasons. There are, however, a number of forest health concerns, which the adequate rainfall cannot ameliorate, including sugar maple decline and beech bark disease impacts. Investigations are underway to determine some of the factors contributing to sugar maple decline.

Recent (since 1994) Tree Mortality/Decline

Background: Recent insect and disease impacts on the Allegheny hardwood and northern hardwood forest types have created substantial stress on trees there. Severe 1988, 1991 and August/September 1995 droughts and rainfall deficits during the 1997 through 1999 growing seasons are also a factor. Over half (260,000 acres) of the Allegheny National Forest was moderately to severely defoliated in 1993 by several species of forest insects, primarily the elm spanworm. In 1994, over 72,000 acres were defoliated by forest tent caterpillar and cherry scallop shell moth, and in 1995, the cherry scallop shell moth defoliated cherry on over 205,000 acres. Fortunately in 1996, populations of defoliating insects returned to their normal, non-outbreak levels. The only defoliation, which occurred, was 11,800 acres from cherry scallop shell moths. No measurable defoliation occurred in these forest types between 1997 and 1999.

Prior to 1994, we reported finding increasing amounts of sugar maple dieback, sparse foliage, and tree mortality. In 1994, the new tree mortality we detected far exceeded that which had occurred in recent years. A substantial part of it appeared to have developed suddenly that year. We believe a series of environmental stresses caused the mortality, including repeated defoliation and several droughts, though site characteristics may also play a role. Evaluation of color infrared photos taken in mid-August 1994 showed that 89,565 acres of Management Area 3 had higher levels of tree mortality (29% of MA 3). Over half of it appeared to be moderate to severe.

Additional mortality occurred between 1995 and 1999, though it expanded to include black cherry (which has suffered repeated cherry scallop shell moth defoliations). Both the size of the area affected by tree mortality and the intensity of tree mortality will no doubt increase over the next few years as trees respond to the multiple stresses that have already occurred. It usually takes several years for the full impact to develop. Adequate soil moisture is important when trees are recovering from stress. Though rainfall was excellent during the 1996 growing season, rainfall reported for Warren County between April 1, 1997 and November 9, 1997 showed a deficit of almost 4.7 inches. For the April 1, 1998, to November 1, 1998, period, the deficit was 2.51 inches, and for April 1, 1999 through November 1, 1999 the deficit exceeded 7.7 inches.

Analysis: Northeast Forest Experiment Station (NEFES) Research Note NE-360, "Characteristics of Declining Forest Stands on the Allegheny National Forest," published in June 1996, provides an additional summary of the species impacted by the 1994 decline. A summary of those findings was published in the FY 95 Monitoring and Evaluation Report.

In 1999 McWilliams and others updated this analysis to include an additional 529 stands (10,533 acres), primarily located within what is now called the Eastside project area, which showed substantial symptoms of tree decline.

Stand data was collected in this second group of stands in 1995 and 1996. This second group of stands inventoried was believed to contain lesser amounts of dead and dying trees.

When analyzed together, the 1994, 1995, and 1996 data collected included 869 stands (18,876 acres) and represents a fairly large, site-specific inventory and independent analysis of conditions within the project area on sites where tree mortality and decline is most evident. Figures 1 and 2 below display the results of this larger area analysis by tree status and species group. Dead trees and trees at risk of dying account for 18.7% of the total basal area in this larger sample while they accounted for 28% of the total basal area in the smaller sample which was known to include areas where tree decline was more severe.

FIGURE 1. PERCENT OF BASAL AREA BY TREE STATUS FOR STANDS WITH NO SIGNIFICANT FOREST DECLINE SYMPTOMS

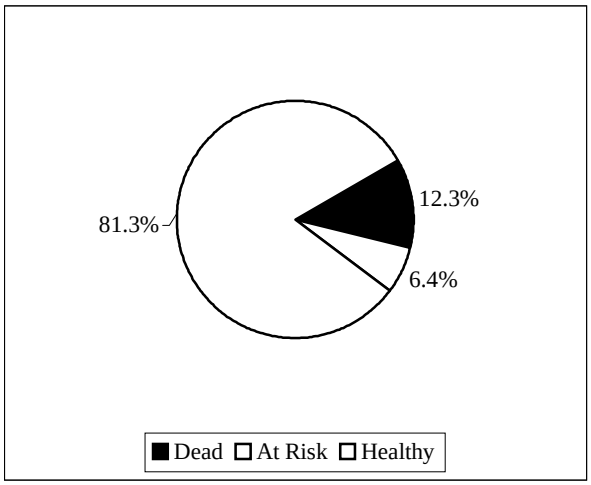
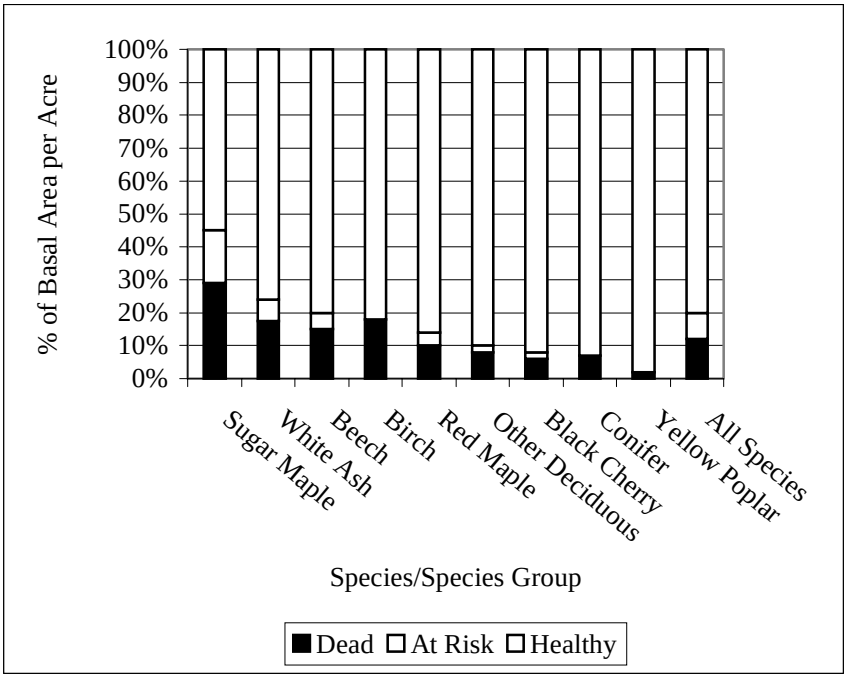


FIGURE 2. PERCENT OF BASAL AREA PER ACRE BY TREE STATUS/SPECIES GROUP FOR STANDS WITH SIGNIFICANT FOREST DECLINE SYMPTOMS



This expanded analysis also served to confirm the understory vegetation conditions described in the 1996 analysis. Adequate numbers of tree seedlings are present in only 8 percent of sampled stands. Vegetation that interferes with tree seedling development and growth is present in sufficient quantities to require treatment in 93 percent of the stands examined. Sparse regeneration and the abundance of interfering vegetation continue to raise serious concerns about tree seedling development and survival as well as the long-term maintenance of forest cover on sites where tree mortality and decline are or may become most severe.

Since mid 1995, we have completed eight environmental assessments, which have looked at site-specific tree mortality and ecosystem sustainability on the ANF. Reforestation of affected sites has been a key issue addressed. Those analyses have covered 81,232 acres (through there is some overlap of the areas examined, and it includes more than just Management Area 3) and have prescribed the following kinds of treatment:

Type of Treatment	Acres
Thinning harvests	5,873
Sanitation harvests	12
Clear cuts	606
Shelterwood seed cuts	3,538
Two-aged harvests	635
Selection harvests	356
Shelterwood removal cuts	1,072
Reforestation treatment with no final harvest	1,420
TOTAL	**13,512**

We continue to work cooperatively with NERS personnel, Forest Health Protection, the Pennsylvania Bureau of Forestry and Pennsylvania State University on several projects designed to determine some of the causal factors or environmental conditions, which have set the stage for tree mortality.

Mortality II EA: In October 1997, the Federal Court for the Western District of Pennsylvania, located in Pittsburgh, ordered ANF personnel to revisit specific facets of the Mortality II analysis (one of the eight environmental assessments mentioned above) and to prepare an Environmental Impact Statement. The Court enjoined ANF personnel from implementing the Mortality II Project. This work is time-sensitive due to the urgency of completing the harvest before the dead/declining timber loses its value, and due to the need to complete reforestation treatments before field conditions deteriorate further. The following treatments were included in the Mortality II Project.

Type of Treatment	Acres
Thinning	2,440
Two-aged	49
Shelterwood seed cuts	1,891
Overstory removal cuts	395
Selection harvest	356
TOTAL	**5,131**
***** Reforestation treatments	4,363
***** Reforestation with no harvest	988
TOTAL	**5,351**

**** Reforestation treatments include herbicide, fencing, planting, and site preparation. More than one treatment may occur on a site.***

East Side Project EIS:

In response to the October 1997, order from the Federal Court in Pittsburgh for the Western District of Pennsylvania, ANF personnel have initiated the East Side Project EIS. This project is designed to analyze many of the areas originally included in the Mortality II EA (see above). It also includes areas formerly identified as part of several other projects.

The East Side Project EIS considers treatment activities within a 141,000 acre zone of mortality, which is closely linked to a series of defoliation and drought events (described in previous sections of this report). The following treatments are part of the proposed action for this project as identified during initial project development.

TABLE 14. SILVICULTURAL ACTIVITIES IN THE PROPOSED ACTION FOR THE EAST SIDE PROJECT

Type of Treatment	Acres
Salvage Final Harvest	3,020
Green Final Harvest	456
Salvage Thinning	2,513
Green Thinning	1,752
Salvage Selection	113
Green Selection	229
Improvement cuts	123
TOTAL	**8,206**

Initial project scoping and comment analysis have been completed. During FY 1999, the Interdisciplinary Team began evaluating alternatives and environmental consequences. Limited project work occurred during a portion of the year while ANF personnel consulted with the U.S. Fish and Wildlife Service regarding new threatened and

endangered species information. Following receipt of the U.S. Fish and Wildlife Service Biological Opinion, ANF personnel reviewed East Side project stand prescriptions to ensure they complied with the terms and conditions of the opinion. Acres shown in the table above may change as the site-specific analysis progresses.

September 1994 Tornado

In early September 1994, a tornado touched down at a few locations on the Marienville and former Sheffield Ranger Districts. Damage occurred intermittently along a path that extended for 9.8 miles on the Marienville District and 3.5 miles on the former Sheffield District. The amount of damage ranged from minor patches of partial blowdown to patches of complete blowdown in a swath that is 800-900 feet wide. Three environmental documents were prepared to address salvage and reforestation needs. A total of 545 acres of salvage thinning and 220 acres of salvage clear-cut were sold in FY 95. By the end of FY 96, 231 acres of the salvage thinning and 146 acres of the salvage clear-cut had been harvested. The remaining 314 acres of salvage thinning and 74 acres of salvage clear cuts were completed in FY 97. Reforestation work and stocking surveys are either in progress or scheduled to be completed at the appropriate time in the regeneration areas. The latest stocking surveys indicate 40% of the salvage clear-cut acreage has adequate tree seedlings, 6% are probable successes, and 54% may fail to become established without additional reforestation work.

May 1995 Tornado

In May 1995, a tornado touched down on the former Sheffield Ranger District. Approximately 391 acres of partial to severe blowdown occurred. In FY 96, 262 acres of salvage thinning and 16 acres of salvage seed tree cutting were sold. Treatment options for the remaining 113 acres of blowdown were analyzed in FY 96; 13 acres were included in a shelterwood seed cut that was part of the FY 97 sale program, and 100 acres of light blowdown in areas managed to provide old-growth values were excluded from salvage harvest since it provides dead and down material, an important old-growth component. Harvests were completed in these areas in FY 97. Appropriate reforestation work has been prescribed, and tree seedling development will be monitored through stocking surveys. The latest stocking surveys show the seed tree harvest area is 96% stocked with tree seedlings, and the shelterwood seed cut area is 60% stocked with tree seedlings. No additional harvest is planned at this time for these areas.

May 25, 1995 Hail Storm Damage

A severe hail storm on May 25, 1995, defoliated 4,880 acres of forest land on the Sheffield unit. Light defoliation occurred on 1,920 acres and moderate to severe defoliation on 2,960 acres. Almost all of this area was subsequently defoliated again by cherry scallop shell moth in July/August 1995, and all of it suffered from the 1995 late summer drought. In 1996 and 1997, many of the tree crowns were thin and poorly developed in the most severely damaged portion of this area. In 1997, about one-third of the Black cherry on a monitoring plot had crowns with a low vigor class rating. Crown development will be assessed again in FY 2000. We are concerned that substantial tree mortality or decline may begin to develop. Management options for this area are being analyzed as part of the Farnsworth and Duck Eddy-Sheriff Run Projects.

1998 Blowdown

In early June 1998, a major windstorm blew down a substantial number of scattered large trees on the Marienville Ranger District. It was characterized by 2 to 3 strips of strong, straight-line winds, which touched down sporadically along a path beginning west of Guitonville in the Devil's Hollow Area, tracking ENE through Byromtown, then turning ESE through the Parrish and Steck Run Areas. The system then headed east through

State Gamelands, caused damage in the Bear Creek Valley Area, and then moved off the ANF onto private land near the Ridgway Reservoir.

In mid August 1998, a series of severe thunderstorms blew down trees in the North Central part of the Marienville Ranger District. Scattered blowdown occurred beginning in the Rocky Run Area (SW of Lynch) and followed a path that ended north of Russell City.

On the Bradford Ranger District, these windstorms blew down scattered large trees in 12 areas, ranging from 2 acres to 10 acres in size, located on the southern portion of the District.

Approximately 725 acres of partial and 7 acres of complete blow down from these two events occurred in areas where there were already active timber sales. Appropriate salvage activity occurred through these existing sales. Another 1490 acres of partial blow down and 7 acres of complete blow down are being reviewed to determine management options. In FY 99, evaluation of these areas was on hold pending completion of consultation with the U.S. Fish and Wildlife Service regarding new threatened and endangered species information.

1999 Blowdown

In June 1999, a major windstorm blew down a substantial number of large trees scattered across the Bradford and Marienville Ranger Districts. Most of the areas where damage occurred are characterized by partial blowdown; however, field reconnaissance is underway to more accurately characterize the affected areas. Over 400 acres were affected on the Bradford District plus an undetermined acreage in the Allegheny Front National Recreation Area. Field personnel continue to assess damage elsewhere on the ANF. Management options will be evaluated, taking into account new information regarding threatened and endangered species management.

Summarize the Effectiveness of Insect and Disease Control Efforts and Status, as Determined by Forest Health Protection personnel [36 CFR 219.12(k)(5iv)]. Summary will include a Measure of Mortality Occurring, Especially from Major Outbreaks.

Methods of Measurement:

- Aerial survey by Forest Health Protection Staff
- High altitude aerial photography
- Low altitude aerial photography
- Field observations

Gypsy Moth

No gypsy moth spraying or detectable defoliation occurred in FY 97 or FY 98, and only a small area of light defoliation was detected in FY 99. Forest Health Protection (FHP) personnel have conducted egg mass surveys and have prepared an entomological evaluation to assess the defoliation potential for FY 2000. After increasing for two years, gypsy moth populations have again collapsed, Forest wide. The egg masses that were found were very small, indicating a very stressed population. A combination of the effects of the fungus Entomophaga maimaiga and the virus NPV probably caused this collapse.

It is not yet clear how these two potential control factors will impact gypsy moth populations in the future. No gypsy moth spraying is planned or expected in FY 2000.

Evaluation of Results: Following a gypsy moth population crash, egg mass and caterpillar densities usually remain low for two to five years before they begin to build again to higher levels. With the exception of the small amount of light defoliation in 1999, the last observed gypsy moth defoliation on the ANF was reported in the

spring of 1993. FHP personnel will continue to monitor egg mass densities, the indicator used to help assess defoliation potential and possible treatment needs for the coming spring.

Beech Bark Disease Complex

Beech bark disease complex is killing American beech trees on the Allegheny National Forest. The disease begins when beech scale insects infest the trunk of an American beech tree. The wounds they create are then invaded by fungi (primarily Nectria sp.). Nectria infections result in lower tree quality, or the resulting cankers may coalesce to girdle and kill the tree.

Two waves of tree infestation or colonization actually occur. The first is the wave of colonization by the scale insect, known as the "Advancing Front". The second, known as the "Killing Front", occurs as the fungus colonizes the feeding wounds left behind by the advancing scale insects.

Monitoring Results: In 1996, personnel (P. Gundrum, A. Iskra, and M. MacKenzie) from the USDA Forest Service, Forest Health Protection Staff, Morgantown, WV, completed a field evaluation of the status of the beech bark disease on the Allegheny National Forest. A report was written to document the location of the leading edge of both of these fronts.

Results from a previous survey (1990) showed the "Advancing Front" of the beech scale complex on the ANF was located north of a line drawn between Warren PA, and the Kane Experimental Forest, covering about 30 percent of the area within the proclamation boundary. Generally beech scale populations were scattered within the southern portion of this area where about 16 to 18 percent of the beech was dead or affected by the disease complex. Populations of the disease complex increased as one moved further north and east. The "Killing Front" was located in the northeastern section of the Bradford Ranger District, affecting about five percent of the ANF. Within the "Killing Front", about 88 percent of the beech was dead or affected by the complex. The disease was spreading in a SW direction at about 2.5 miles per year. It was also present at one outlying location (ahead of the advancing front) in the Heart's Content Scenic Area.

The 1996 resurvey of the ANF revealed that the percentage of the ANF infested with the scale insect ("Advancing Front") had more than doubled from 30 percent to 70 percent of the ANF. The uninfected area is on the southern border of the ANF. Within the same time frame, the "Killing Front" had also doubled in size, now covering 10 percent of the ANF. The area occupied by the "Killing Front" encompasses only 14 percent of the area occupied by the scale insect.

Three fungi are involved in killing the trees, two native and one exotic. On the ANF, the scale insect is spreading much faster than the Nectria fungus, unlike other areas within the Northeastern US. For example, a survey completed in 1996 on the Monongahela National Forest in West Virginia revealed that the "Killing Front" encompasses 70 percent of the area occupied by the scale.

Three permanent beech bark disease monitoring plots (containing 400 trees) on the ANF have been examined annually since 1986. Two plots are located within the northeast section of the ANF and one more southerly, near Westline.

1996 Survey Results: Combined plot data reveals that 5 percent of the trees on the plots had died by 1991. By 1996, 14 percent were dead. Presently scale insects are found on 71 percent of the beech trees, down from the 87 percent observed in 1991. While the total number of scale infested trees may not be substantially different between 1991 and 1996, the number of trees classified as moderately to heavily infested differs substantially, dropping from 41 percent in 1991 to 13 percent in 1996. Nectria was initially found on 3 percent of the trees and in 1996 was found on only 1.5 percent of them.

1997 Survey Results: Despite the above-mentioned advance of the beech bark disease scale Cryptococcus fagisuga on the Forest, an increase in the amount of scale on individual trees has not occurred. Very light to light scale populations observed in past years still occur within the permanent plots. However, the percent of beech with any incident of scale increased from 71 percent in 1996 to 75 percent in 1997.

Scale density trends may continue to be low due to the very smooth scale resistant bark found on many beech within the survey plots. Additionally, the northerly climate conditions within this area might attenuate large scale buildup.

Tarry spots, the beech response to the presence of the developing beech bark disease fungus, Nectria coccinea var. faginata, were found on only 27 trees or 7 percent of the total trees in all 3 plots. Nectria sp. fruiting bodies were observed on only two trees at 0.6% percent of the total trees in all three plots. Asexual fungal fruiting associated with Nectria sp., the fungal hyperparasite, Nematogonum sp., and the secondary scale Xylococculus betulae was not observed.

Common trends in disease development on the permanent plots should be compared to other areas of the ANF within the scale advancing zone. This would determine the validity of predicting disease incidence trend based solely on the permanent plot data.

1998/1999 Survey Results: No additional surveys or data collection occurred in 1998 or 1999. Data collection is planned for FY 2000.

Evaluation of Results: The beech scale insect continues to advance across the ANF, now covering 2.3 times as much of the proclamation area as it did in 1990. However, the scale insect within the entire advancing front is much less abundant on affected trees than it was in 1990. In recent years the authors have encountered the Twice-stabbed ladybug feeding on the scales. The authors have also noted after recent hard winters that scale populations on the ANF appeared to decline to a greater extent than had populations on the Monongahela National Forest in West Virginia. Perhaps biological control agents and abiotic influences are having a greater impact on disease development in the more northerly Allegheny National Forest.

Management recommendations provided in the 1992 ANF Monitoring and Evaluation Report still apply.

Dogwood Anthracnose

Dogwood Anthracnose, a fungal disease of flowering dogwood, occurs in 23 eastern states (including Pennsylvania), and has spread to the northern limit of flowering dogwood's native range. It was first reported in New York in the mid-1970's, and it is most likely not native to North America. It attacks trees of all ages and sizes. Since it prefers cool moist conditions, trees are more susceptible at higher elevations and along waterways.

Dogwood Anthracnose first attacks the leaves and twigs in the tree's lower crown. During spring and early summer, the injured leaves have tan spots with purple rims. Twig dieback occurs next, along with the development of cankers on the twigs, branches, or trunk of the tree. Dogwood trees often die two to five years after being attacked by the fungus. Mortality has been very extensive in some southern states, where more than 80% of dogwood stems have died of this disease.

Through the end of 1996, this anthracnose had been detected in Warren and McKean Counties. In 1998, a Forest Health Protection staff pathologist from Morgantown, West Virginia, established Dogwood Anthracnose monitoring plots west of Tionesta in the Jamieson Run area of Forest County. Spring 1999 evaluation detected no evidence of anthracnose on the plots.

Pine Budworm

In 1994, about 1,500 acres of red pine plantation on the Marienville Ranger District became infested with pine budworm. Defoliation was heavy there. In 1995, these trees improved in appearance, developing more green needles in their crowns. They also suffered much less defoliation.

No defoliation occurred between 1996 and 1999. Tree crowns in previously-defoliated areas continued to improve. Though the older foliage remained abnormally thin, as expected, the new growth appeared to be normal. Forest Health Protection personnel believe one good way to help maintain healthy red pine is to closely regulate stand density. Thrifty, vigorously growing trees demonstrate better recovery than do trees growing poorly in dense, over-stocked conditions.

Pear Thrips and Maple Decline

History in Pennsylvania: The pear thrip is a tiny insect that feeds on the expanding buds of many trees, but of particular importance are sugar maple and black cherry. It was first observed in Pennsylvania in 1912, feeding in fruit orchards in Erie County. It was not identified as a forest pest until 1979 when, following heavy defoliation in 1978, it was found to have caused severe leaf damage on an estimated 73,000 acres in Pennsylvania. Recent literature reports the pear thrips insect serves as a vector for a fungus that enters the thrips-created wound on the leaf and causes necrosis, deformity, and discoloration of the leaf tissue. There have been two cycles of recent Pear Thrips damage. In the first cycle, the acreage affected statewide increased from 11,000 acres in 1985 to a high of 1.3 million acres in 1988, followed by a reduction to about 500,000 acres in 1989, 186,600 acres in 1990, and to no mapable acres in 1991 or 1992. In 1993, PA DEP estimated over 335,000 acres in Pennsylvania had moderate to severe pear thrips damage, though the damage was difficult to assess since it was obscured by widespread elm spanworm defoliation. From 1994 through 1998, pear thrips damage has been minimal.

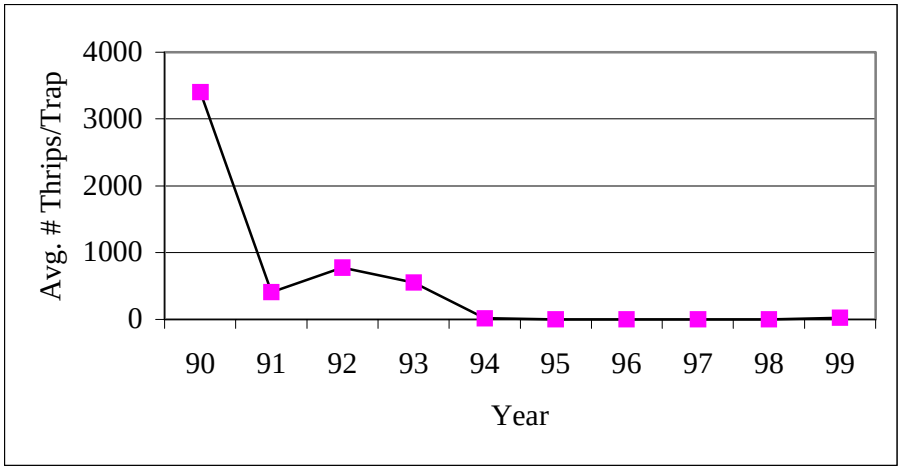
Monitoring Results: Extensive damage to sugar maple from pear thrips occurred on the Forest during FY 1989. Approximately 9,600 acres suffered heavy leaf damage, the highest level of pear thrips damage recorded on the Forest to date. Though some damage was observed in McKean County in 1990, little mapable damage occurred in 1991, 1992, and 1994 through 1999. In 1993, moderate damage was observed during random ground observations. The damage was impossible to map due to the widespread elm spanworm defoliation that occurred.

Pear thrips have been implicated in the decline of sugar maple, but there is no practical control for them at present. Even with the estimates of defoliation, it is difficult to evaluate the potential short-term and long-term effects due to our poor understanding of how thrips defoliation affects host species. Pesticides have been used effectively to control pear thrips in orchards, but more information is needed to develop valid control strategies in forested areas.

In FY 90, Forest Health Protection personnel from Morgantown, WV, established 30 permanent plot clusters on all Ranger Districts to monitor pear thrips and maple decline. Plots were established within three different types of forested areas, based on the area's management history: no recent harvesting, thinned, and final harvest with residuals.

From 1990 through 1998, Pear thrips trapping has taken place on at least 12 of these sites each year to determine population densities and the threat to sugar maple on the sites. In 1999, the number of trap sites was reduced to six. FIGURE shows the average number of pear thrips caught per trap from 1990 through 1999. Since 1994, the catch has been very low.

FIGURE 3. PEAR THRIPS POPULATIONS ON THE ANF SUGAR MAPLE MONITORING PLOTS



In August 1991 and every year thereafter, each tree on the 30 permanent maple decline plots was evaluated to determine amounts of crown dieback, foliage transparency, and foliage discoloration. These data have been re-examined by Dr. Robert P. Long, Research Plant Pathologist, NERS, Delaware, Ohio. New analyses report results with data broken into smaller discrete classes. The extent of tree decline symptoms was estimated and placed into classes ranging from 5 (0-5%) to 10 (6-15%), and continuing by 10% intervals to 90 (86-95%) and 99 (96-100%)based on the percent of the tree crown affected. Results are summarized in the following table for trees with more than 15% dieback.

TABLE 15. PERCENT OF SUGAR MAPLE (ON 30 SAMPLE PLOTS) WITH MORE THAN 15 PERCENT DIEBACK

	FY 91	FY 92	FY 93	FY 94	FY 95	FY 96	FY 97	FY 98	FY 99
Final Harvest	66	77	74	69	81	81	75	76	71
Unthinned	24	28	31	32	37	42	43	36	24
Thinned	30	32	41	39	39	43	46	43	38

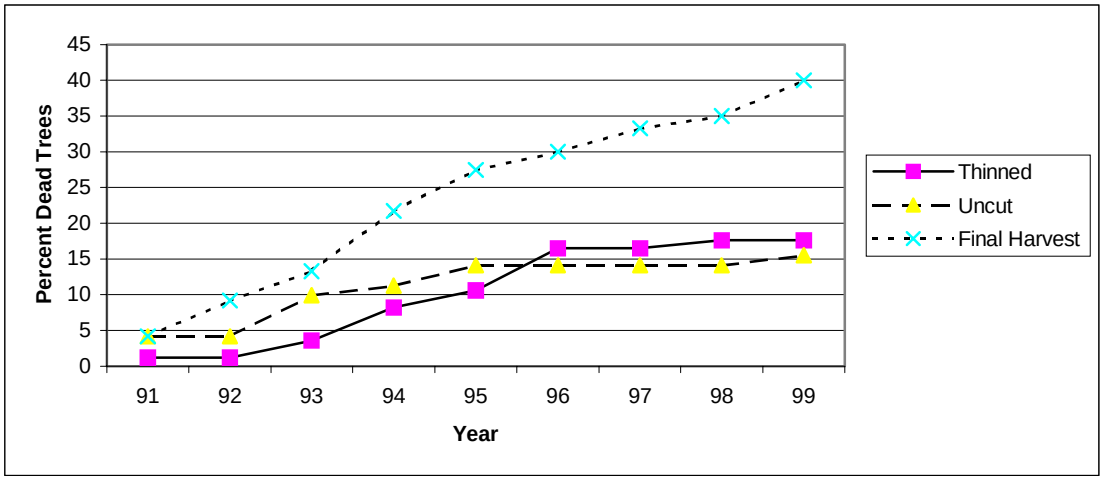
Sugar maple dieback has increased in all management types since 1991. The majority of the sugar maples in the thinned and unthinned categories have less than or equal to 15 percent dieback. The percent of the trees in these two categories has been similar since 1995, and both categories reflected an improvement in 1999. The majority of the sugar maples in the final harvest cut category have more than 15 percent dieback, and this number (71%) remains lower than the 81 percent reported in FY 96.

The sugar maple mortality levels observed on the ANF from 1990 through 1995 were much higher than the average sugar maple mortality observed from 1989 through 1994 in similar plots located throughout the northeastern U.S. and southeastern Canada. In fact, the ANF rate was three to four times higher.

When the ANF plots were established in 1990, initial mortality ranged from 1.7 percent to 2.5 percent for all sugar maple trees greater than or equal to 10 cm dbh, for all three management types. By 1995, sugar maple mortality for dominant and codominant trees exceeded 10 percent for all management types (Figure 4). By 1996, sugar maple mortality reached at least 14 percent. Mortality of dominant and codominant sugar maple has been

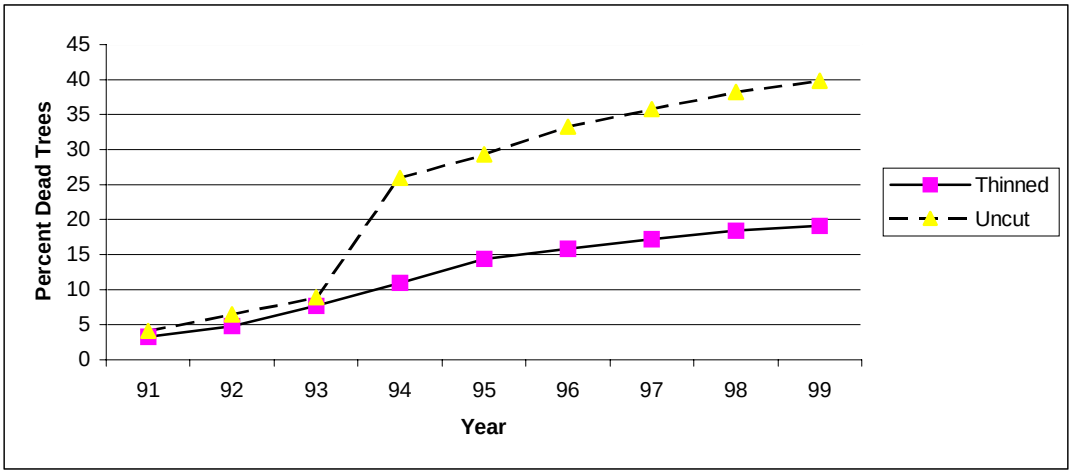
similar in the thinned and unthinned plots since the beginning of this project. Mortality in the final harvest plots is more than double the mortality in the uncut or thinned plots.

FIGURE 4. CUMULATIVE ANNUAL SUGAR MAPLE MORTALITY OF DOMINANT AND CODOMINANT TREES ON THE ANF SUGAR MAPLE MONITORING PLOTS



In 1995, mortality within the intermediate and suppressed crown class was more than 14 percent in thinned stands and more than 28 percent in uncut stands (Figure 5). Between 1995 and 1998, mortality in thinned stands has increased only 5%, but in uncut stands, mortality has increased by about 10%. (Final harvest with residuals stands had no intermediate or suppressed class.)

FIGURE 5. CUMULATIVE ANNUAL SUGAR MAPLE MORTALITY OF INTERMEDIATE AND SUPPRESSED TREES ON THE ANF SUGAR MAPLE MONITORING PLOTS



We are continuing to monitor these plots and to evaluate the data collected to hopefully determine the cause or causes of this mortality and the differences observed between management types.

Oak Mortality

Monitoring Results: As was reported in 1988 and 1989, significant amounts of oak mortality (10 to 80 percent) were confirmed in the fall of 1988 on about 18,000 acres of the Forest. This oak mortality resulted from the combined effects of two major natural events: repeated and extensive moderate or severe gypsy moth defoliation from 1986 to 1988, and a severe drought that occurred in the summer of 1988. These events weakened the oak trees and made them more susceptible to attack by two secondary pathogens, the two-lined chestnut borer and the shoestring root rot fungus, which ultimately kill the trees. No significant additional mortality developed from 1989 through 1999.

Reforestation activities, including fencing (area and individual tree), herbicide treatment, and tree planting (seedlings and acorns) have been completed or are in progress on most of the heavily salvaged areas. Close to 94% of the acres have adequate seedling stocking, 3% are likely to become adequately stocked in several years, and 3% are failures needing additional reforestation treatment.

Tree Planting and Survival

Tree planting is an expensive reforestation practice, especially since almost all planted seedlings require individual tree protection from deer browsing. ANF personnel began planting in 1990, and through 1995, the planted stock was almost exclusively red oak. Much of this planting was in salvage areas. Beginning in 1996, ANF personnel began to expand the program to include other species (aspen, hemlock, and white pine). Four additional species (red maple, black cherry, hickory, yellow poplar) were planted on a trial basis in 1997. Three more species (red pine, white ash, and sugar maple) were planted as a trial in 1999. Much of the tree planting has occurred in salvage areas.

Table 17 shows acres planted and seedling survival for tree species each year.

Evaluation of Results: ANF personnel formally check tree seedling survival one and three years after planting. For oak planting, drought most likely caused trees to die between 1992 and 1994 on several of the areas planted in 1991, resulting in the low survival rate (75%). The low survival rate for areas planted in 1993 (65%) resulted primarily from competition from unexpected natural seedlings that developed in two of the areas. The severe drought that occurred in late summer 1995, no doubt contributed to the lower survival rate (73%) for the areas planted in 1995. Low survival (67%) for 67 acres planted in 1996 was primarily due to too much shade (a shelterwood seed cut area which was underplanted), which limited seedling survival. Survival rates average better than 87 percent for the rest of the areas.

Natural seedlings are beginning to overtop planted seedlings in some of the areas. Where needed, we hand cut saplings and brush that are competing with the planted oak or with naturally occurring oak seedlings/saplings. This hand cutting is termed a “release” treatment.

Hemlock, aspen, and white pine have been planted for three years, and survival rates are the poorest of all species planted to date. It seems prudent to limit the number of acres planted with these species until we learn more about techniques needed to ensure better survival.

Red maple and yellow poplar survival for 1997 planting is close to, but less than desirable (objective is 80% survival after three years). Yellow poplar survival for 3 acres planted in 1998 is exceptionally low (13%) due to poor quality of the planting stock and competition from other species. Black cherry and hickory survival rates are excellent after one year. Additional trial planting and monitoring is necessary before reaching any final conclusions about the appropriateness of planting these hardwood species.

TABLE 16. ACRES PLANTED AND TREE SEEDLING SURVIVAL (%)*

Survey Year	Year Planted								
	1990	1991	1992	1993	1994	1995	1996	1997	1998

PLANTED WITH OAK									
1991	76 (98%)								
1992		312 (92%)							
1993	76 (87%)		251 (96%)						
1994		312 (75%)		142 (78%)					
1995			251 (87%)		164 (91%)				
1996				142 (65%)		145 (80%)			
1997					164 (89%)		67 (87%)		
1998						145 (73%)		87 (93%)	
1999							67 (67%)		97 (89%)
PLANTED WITH ASPEN									
1997							41 (66%)		
1998								14 (77%)	
1999							41 (23%)		4 (85%)
PLANTED WITH HEMLOCK									
1997							10 (76%)		
1998								19 (52%)	
1999							10 (72%)		26 (61%)
PLANTED WITH WHITE PINE									
1997							25 (78%)		
1998								31 (46%)	
1999							25 (55%)		57 (79%)
PLANTED WITH RED MAPLE									
1998								7 (75%)	
PLANTED WITH BLACK CHERRY									
1998								8 (100%)	
1999									2 (100%)
PLANTED WITH HICKORY									
1998								3 (100%)	
PLANTED WITH YELLOW POPLAR									
1998								22 (77%)	
1999									3 (13%)

**** First number is the planted acreage surveyed and the second number (in parentheses) is the average percent survival.***

Oak Leaf Tier Defoliation

Approximately 1,354 acres of moderate to severe oak leaf tier defoliation of the lower crowns of red and black oaks were detected in August 1997 on the ANF. In contrast, the upper crowns were mostly unaffected. Defoliation was also observed in 1997 on non-federal land east of the ANF. While there was no oak leaf tier defoliation on the ANF in 1998, defoliation was observed east of the ANF and on Seneca Nation land just north of the New York border. Throughout Pennsylvania, 1666 acres of oak leaf tier defoliation were mapped in 1998. In 1999, there again was no oak leaf defoliation observed on the ANF. East of the ANF in Potter and Tioga Counties, 3,786 acres were defoliated, a twofold increase from that observed in 1998.

The oak leaf tier is a small moth whose larvae feed early in the growing season on various tree species in the red oak group. This insect was very abundant in the Northeastern United States between 1959 and 1962, when abundant populations caused severe defoliation of host trees throughout Pennsylvania, New York, New Jersey, Connecticut and Massachusetts. The oak leaf tier can cause severe damage to foliage of host trees in the spring, when newly hatched larvae enter unopened buds and feed on newly formed leaves. At the highest population densities, the young larvae can destroy nearly all the buds on a tree. At lower densities, these larvae produce holes in expanding leaves.

Older larvae feed more openly within the protection of webbed and folded leaves, which are "tied" together by silk. Damaged leaves appear tattered, with only their major veins remaining. Mature larvae drop to the ground on silken threads to pupate in leaf litter by mid June. In late June, adult moths emerge. Females lay eggs singly on twigs where the bark is rough. These eggs over-winter and hatch in early April of the following year.

Survey procedures exist for detecting oak leaf tier insect densities that may be used to predict future host tree damage, by using maple moth trapping. In 1998 these procedures were evaluated on the Elk State Forest using pheromone traps. FHP personnel had planed to use the results of this evaluation in 1999 to monitor oak leaf tier densities throughout the ANF's red oak stands. Due to technical problems with the pheromone, this project was postponed to FY 2000.

Elm Spanworm

Monitoring Results: The FY 94 Monitoring and Evaluation Report provided a detailed account of the elm spanworm life cycle, development and defoliation history on the ANF. Between 1991 and 1993, close to 333,000 acres were defoliated by elm spanworm (about 21,000 acres of that also included frost and linden looper defoliation).

There has been little additional defoliation caused by elm spanworm since the 260,000 acres of moderate to severe defoliation that occurred in 1993. Populations crashed in 1994, and no egg masses were found during surveys conducted in the fall of 1995. The elm spanworm has returned to its normal status as a minor component of the total forest insect population. No defoliation has occurred between 1995 and 1999.

Forest Tent Caterpillar

One of the more significant types of insect damage observed in 1994 during aerial detection survey was 18,080 acres of moderate to severe forest tent caterpillar defoliation. This was a substantial increase from the 4,230 acres observed in 1993.

In 1995, 55,444 acres were treated with B.t. where forest tent caterpillar defoliation was expected to be heavy, unless natural parasites or predators intervened.

No detectable forest tent caterpillar defoliation occurred between 1995 and 1999.

Cherry Scallop Shell Moth

Statewide, this insect defoliated close to 229,750 acres in 1994 and over 858,600 acres in 1995. It produced the most significant type of defoliation observed statewide in either year. In 1996, the area defoliated in Pennsylvania decreased 99 percent from that observed in 1995. From 1997 through 1999, this insect defoliated no acres in Pennsylvania.

On the ANF, this insect produced the most significant type of defoliation observed in 1995. Defoliation of National Forest land reached 205,400 acres, a significant increase from the 3,840 acres observed in 1993 and the 54,200 acres observed in 1994. Close to 123,600 acres of the 1995 defoliation was severe. From 1992 to 1995, 666 acres have been defoliated three times by this insect, 35,562 acres twice, and 238,057 acres at least once. Most of the same acres have also been defoliated at least once since 1991 by elm spanworm or forest tent caterpillar.

In 1996, cherry scallop shell moth defoliation decreased to 11,800 acres, with over 8,200 acres classified as moderate to severe. Most of these areas had already been defoliated at least once since 1993 by cherry scallop shell moth. No acres were defoliated from 1997 through 1999.

This insect defoliates only black cherry trees by webbing leaves into nests and feeding on the upper surfaces. Defoliated black cherry trees may lose vigor and become susceptible to the peach bark beetle, especially when outbreaks persist for several years and when soils are poorly drained.

Extensive black cherry dieback and mortality have not been documented from local outbreaks that occurred in the 1970s and 80s. FHP and ANF personnel evaluated the need for and feasibility of spraying selected areas in 1996,

including determining whether there are suitable survey techniques, spray methods and pesticides. Since no insecticide is registered for use against cherry scallop shell moth, FHP and ANF personnel worked together with Pennsylvania Bureau of Forestry, Kane Hardwoods and Abbott Laboratory personnel to conduct a trial B.t. treatment on Kane Hardwood property in July 1995. This trial was partially successful, though timing of the spraying (with respect to larval feeding behavior) and adverse weather may have affected the results.

Cherry scallop shell moths over winter in the pupal stage in the top few inches of the soil. In 1996, FHP personnel developed survey techniques and found high pupal counts in several areas. They evaluated the potential for natural controls (primarily parasitism by minute wasps) to reduce the 1996 population. Though parasitism is difficult to assess ahead of time, preliminary estimates were that populations would collapse in 1996. No spraying occurred in 1996, and populations did collapse, with the exception of 11,800 acres scattered throughout the western half of the ANF.

FHP personnel will continue to monitor cherry scallop shell moth populations through observations of adult densities and egg parasitism.

We are concerned that substantial tree mortality may develop over the next several years on many of these areas. Severe droughts have occurred during the summers of 1988, 91 and 95, and rainfall was below normal during the 1997 – 1999 growing seasons. Since 1991, black cherry trees have also suffered some defoliation by other insects. By the end of August 1995, most new leaves were less than one-half normal size, and tree crown foliage density was substantially less than normal. Some trees did not refoliate at all and have died. With the additional moisture stress that has occurred between 1997 and 1999, the full effect may not be seen for several more years, or it may increase substantially if additional stresses occur within the next three to five years (for more information, see the following discussion regarding black cherry health).

Black Cherry Health Assessment

An assessment, BLACK CHERRY HEALTH ASSESSMENT - ALLEGHENY NATIONAL FOREST - 1997, was completed by Robert E. Acciavatti, Entomologist, Forest Health Protection, USDA Forest Service, Morgantown, WV and, Timothy P. Virden, Forest Technician, Ecosystem Management, Allegheny National Forest, Warren, PA.

The following summarizes crown vigor and dieback data collected in 1995, 1996 and 1997 from 864 black cherry trees at seven locations on the ANF.

Recent natural disturbances on the Allegheny National Forest, especially from several annual defoliations by the cherry scallop moth from 1993 through 1995, were considered a threat to the health of black cherry trees. The severe droughts in 1988, 1991, and late summer 1995, are additional, severe stresses the trees have suffered.

Field sampling was performed in 1995, 1996 and 1997 to assess the status and trends in health of the black cherry resource of the ANF. The health assessment was based on black cherry crown vigor and dieback as indicators of tree decline and crown mortality. Forest stands were sampled where black cherry trees had experienced the highest frequencies of defoliation since 1993. Initially, the assessment included about 600 black cherry trees in five stands on the Marienville Ranger District that had either two or three defoliations. In 1996, another 83 black cherry trees on the Bradford Ranger District were added to the assessment. This latter area had been severely defoliated by a hailstorm in May 1995, and again by cherry scallop shell moth in July/August 1995. In 1997, a seventh location containing 174 trees on the Bradford Ranger District was added.

Crown vigor: Results based on an assessment of black cherry crown vigor at the end of 1995 growing season indicated that a large majority (85%) of the black cherry resource on the Allegheny NF was healthy or showed only light decline (vigor classes 1 and 2) despite the recent defoliations and drought. The remainder of the black cherry resource had worse crown vigor (13% with moderate or severe decline, 2% dead). Furthermore, this health situation remained virtually unchanged after the 1996 growing season (even though defoliation was absent and precipitation was above normal) and the 1997 growing season. However, from 1995 through 1997, there has been a gradual improvement (38% to 62%) in trees classified as healthy (vigor class 1), as trees showing light decline (vigor class 2) in crown vigor recovered.

The proportion of black cherry trees in the healthiest two crown vigor classes were about the same (84% to 88%) at the end of each growing season regardless of whether two or three defoliations had occurred.

While these findings represent average conditions, there is variation in the health of the Black cherry resource. Some stands sampled showed little decline. By contrast, the residual black cherry trees in the most disturbed stand (defoliated, hail damaged) had the lowest proportion (66%) in the healthiest crown vigor classes at the end of 1996 and 1997 (71%).

Crown Dieback: Results based on crown dieback at the end of the 1996 growing season indicated that the proportion of black cherry trees with 30 percent or greater dieback, was higher after three defoliations (11%) than after two defoliations (7%). Trees with mostly dead crowns doubled in occurrence (2% to 5%) between the 1995 and 1996 growing seasons. However, nearly all (88%) were pole timber or small sawlog sized black cherry trees.

Recommendations are to continue the assessment in FY 2000 for only the most disturbed areas, to determine if the health of the ANF black cherry resource there exhibit's a major improvement after several growing seasons which presumably will be free from defoliation. Trees in the other areas seem to be demonstrating reasonably good recovery already, however FY 2000 survey results will be used to help determine when to remeasure them.

Forest Health Monitoring Program

In FY 98, ANF personnel initiated a cooperative project with USDA-FS Forest Health protection personnel in Radnor, PA, and Morgantown, WV, and with the USDA-FS National FHM program staff. Officially called the "Forest Health Monitoring (FHM) program" at the national level, the program is designed to collect data regarding a number of indicators of Forest Health and to use this data to help assess conditions and trends in the health of our nation's Forest Ecosystems. Data is collected from a network of permanent plots regularly visited to evaluate forest health indicators, including tree vigor, crown condition, signs of tree damage, and other site/ecosystem indicators. In the "detection monitoring phase" of the program, data from these plots and other forest sources is used to determine if changes and trends are within normal bounds and whether there is cause for concern that warrants additional evaluation.

Because changes and trends observed on the ANF are at a level that appears to be outside normal bounds, in 1998, the ANF began the "evaluation monitoring phase" of the program. Evaluation monitoring examines the extent, severity, and probable causes of undesirable changes in Forest Health. Reports and analysis identify management consequences and follow up research needs.

In 1998, ANF personnel, specially trained in FHM data collection protocol, established and collected data on 25% of a 168 plot network on the ANF. In 1999, ANF personnel collected data on another 25% of the 168 plots. On some of the plots measured in 1999, ANF personnel participated in a nationwide pilot effort to collect data regarding down woody debris, soils, lichens, herbaceous/woody plants on the forest floor or in the understory, and fire fuel loading. Initial data collection will be completed by FY 2001.

In 1999, a pathologist and an entomologist from the Forest Health Protection staff in Morgantown, West Virginia, audited a sample of these 1998 FHM plots. They concluded the 1998 field crew had done a good job assessing the condition of the trees on the plots they had audited.

WATER QUALITY

Land Disturbing Activities

Method of Monitoring: One stream on the Forest was monitored for any possible effects from nearby land management activities within their respective watersheds. There are actually three streams we are monitoring, but because of the drought condition, we could not do the others. The stream that was monitored was Arnot Run. To determine if best management practices are effective, the level of sediment in the streams was measured.

For Arnot Run, the objective was to determine if new road construction/reconstruction would cause an increase in sedimentation to the stream. The road was about 700' from the stream, much further than we have seen sediment move off other roads and into a stream course. Nonetheless, a control and downstream site were selected in 1995 to begin pre-treatment monitoring. Road work was completed in 1998 two weeks prior to the survey. Rain of unknown amount occurred after the road work was completed and before the survey. 1999 was a drought year, and water levels were low.

A method called the interstitial space index (ISI) was used to actually measure how much free space cobble size particles (2.5-10") had on the streambed in Arnot Run. This is similar to streambed roughness and is an indicator of the area protected from the current. These are areas important to smaller sized fish and aquatic insects. Basically, the ISI is used to evaluate changes in the deposition of fine sediments, and the higher the index value, the more free space is available to aquatic species.

Monitoring Results:

The results for 1999 showed the largest change to date between the 2 sites being monitored. While both readings decreased, the site downstream of the road activity decreased considerably more, implying a larger increase in sediment amounts when compared to the control site. What the exact cause of this is unknown, but monitoring will continue for a few more years.

	Interstitial Space Index	
	Arnot Run	**Arnot Run (control)**
1995	0.71	0.54
1996	0.70	0.56
1997	0.53	0.47
1998	0.86	0.67
1999	0.67	0.63

Management Indicator Species

Annual monitoring of brook trout populations also includes the analysis of water quality in the same four streams. One grab sample was taken from each of the streams and taken to a local lab for general chemical analysis. Also, stream temperature was measured on a daily basis from May to September using an automatic recording thermograph.

Results: Based on the analysis, the water quality of the four streams meet Pennsylvania Department of Environmental Protection (DEP) water quality standards. Based on the results of the thermographs, stream temperatures are adequate to support cold-water aquatic communities.

It is recommended to continue annual monitoring of these four streams on the Forest.

Routine Surveys

Water quality was assessed in six streams in conjunction with Pennsylvania Fish and Boat Commission stream surveys. Grab sample(s) were taken from the streams and analyzed at a local lab.

Results: Results of the analysis indicate that the streams meet DEP water quality standards.

It is recommended to continue routine surveys of water quality, primarily in conjunction with Pennsylvania Fish and Boat Commission fisheries surveys, and also for use with proposed land-use activities on the Forest.

Herbicide/Electric Utility Right-of-Way

In 1998, Allegheny Power Company and GPU Energy (private utility companies) treated 257 acres of electric right-of-ways with herbicides to control tall-growing vegetation. In 1999, GPU Energy treated 332 acres of their rights-of-way to achieve the same objectives. Treatment alternatives for these right-of-ways on the ANF were analyzed in an Environmental Impact Statement (EIS) that was completed in 1997. One of the resource management concerns covered in the EIS was the protection of water resources located near rights-of-way. As a result, the EIS outlined mitigation measures to protect water quality and monitoring procedures to determine their effectiveness.

The monitoring sites for 1999 were located on Irvine Run, a tributary to Brokenstraw Creek, and Pine Run, a tributary to Kinzua Creek.

At Irvine Run, a low volume foliar treatment was completed on 1.02 acres, with a buffer strip width of 75 feet. The mixture used was 0.5 gallons of 5% Accord®/0.5% Arsenal®/1% cleancut/0.5% Nalco-Trol/93% water. A second type of treatment used at this site was cut-surface on 0.31 acres, with a 13 foot wide buffer strip. One quart of 50% Accord®/50% water mixture was used for the cut-surface method.

At Pine Run, a low volume foliar treatment was completed on 0.045 acres, with a one quart mixture of 5% Accord®/0.5% Arsenal®/1% cleancut/0.5% Nalco-Trol/93% water. A buffer strip width of 54 feet was used. A cut-surface treatment was also completed on 0.17 acres, using one quart of 50% Accord®/50% water mixture. A buffer strip width of 54 feet was used.

Due to site and vegetation conditions, and crew leader discretion, buffer strip widths exceeded the 10 foot minimum specified in the EIS for these treatments.

The monitoring program included a direct measure of water quality based on the collection and analysis of water samples for the presence of glyphosate (the active ingredient in Accord®) and imazapyr (the active ingredient in Arsenal®). The water samples were collected using an ISCO® automatic water sampler that collected water every six hours for 9 days. A private lab, Centre Analytical Laboratories, Inc. in State College, PA, performed the chemical analysis. The results were then compared to the established water quality protection criterion, which are

levels of herbicide in water that will not harm human health or the health of other animals that consume water, and will not harm populations of common aquatic organisms living in or near the water.

Results: No herbicide was present in any samples at levels that are within the range that could be quantified. Water quality protection criteria outlined in the EIS was not exceeded in any case, verifying that protection goals were achieved at the sites monitored. The methods of analysis are quite sensitive, providing levels of quantification that are far below the water quality protection criteria. In other words, the limit of quantitative detection for glyphosate is 140 times below the water quality protection criterion for the herbicide, thus providing an additional margin of safety of 140 over that already incorporated into the water quality protection criterion. For imazapyr, the margin is even greater at 1667 times below the water quality protection criterion.

Preliminary visual surveys revealed that many seedlings went untreated immediately outside the buffer along Irvine Run. As a result, this site will be retreated and water quality monitored in 2000.

OIL, GAS, AND MINERALS (OGM)

Evaluation of OGM Activities to Verify the Effectiveness of Negotiations in Obtaining Industry Compliance with Standards

Method of Measure: The Allegheny National Forest OGM evaluation form was used. The Ecosystems Management Team and representatives from the Ranger Districts conducted monitoring by numerically scoring each of the 34 criteria for the entire case for 3 cases. Scores ranged from 1 to 10 (1 = poor; 5 = minimum acceptable; 8 = OGM Handbook standard; and 10 = excellent).

Monitoring Results:

TABLE 17. THIRTY-FOUR MONITORED OGM CRITERIA BY MANAGEMENT AREA

	Criteria	Average Rating FY 99
1 -	Right to Operate	8.5
2 -	Maps	9.5
3 -	Operating Plan	8.0
4 -	Erosion Plan	8.0
5 -	Spill Plan	3.25
6 -	Environmental Analysis	8.25
7 -	Designated Representative	10.0
8 -	Forest Service Inspection	7.5
9 -	Documentation	6.5
10 -	Road Location	9.0
11 -	Stream Crossing	NA
12 -	% Road Mile-Grade	9.0
13 -	% Road/Cross-drains	9.0
14 -	Road Clearing Width	8.5
15 -	Road Stabilization	8.5

TABLE 17. THIRTY-FOUR MONITORED OGM CRITERIA BY MANAGEMENT AREA

	Criteria	Average Rating FY 99
16 -	Road Management Permit	9.0
17 -	Road Management - % Drains	9.0
18 -	Road Management - Surface	9.0
19 -	Road/ROW Restorations	NA
20 -	Timber Output	9.5
21 -	Recreation	9.0
22 -	Fish	NA
23 -	Wildlife	9.5
24 -	Visual	9.0
25 -	Stream Condition	8.67
26 -	Tank/Battery	9.33
27 -	Pipeline/Electric	9.33
28 -	Signs/Gates	9.33
29 -	Timber Utilization	9.5
30 -	Well Sites	9.5
31 -	Litter/Trash	9.5
32 -	Safety	9.5
33 -	Old Wells	NA
34 -	Used Equipment	10.0
	Average of 34 Criteria	**8.74**

Evaluation of Results: Overall, total samples (for 34 criteria) averaged 8.74, above the handbook standard of 8.0. Better documentation of project activities is necessary. An emphasis on Spill Plan development is also necessary.

Estimate the Amount of OGM Activity on the Forest From the Number of Producing Wells, the Number of Wells Drilled, or Other Measure.

Method of Measure: From Ranger Districts EAs for 1999.

Monitoring Results: There were 275 new wells drilled on Federal lands in 1999. No USA-ownership wells were plugged in FY 99.

TABLE 18. WELLS DRILLED IN 1999 BY MANAGEMENT AREA

Management Area	# of Wells Drilled
3.0	227
6.1	48
Total	**275**

Evaluation of Results: The Forest Plan estimates that for the low oil/gas scenario, 86 wells would be developed per year, and for the high scenario, 860 wells.

Status of Lands Available for Exploration and Development of USA-Owned Minerals

Method of Measure: By deed search, and maintenance of this list.

Monitoring Results:

TABLE 19. MINERAL OWNERSHIP AND STATUS

Status	Acres	Ownership/ Acres
USA-OWNED MINERALS		34,973
- Withdrawn (Hickory Creek/River Islands Wilderness and National Recreation Areas	13,960.57	
- Mineral ownership only	4,297.00	
- Leased	1,451.97	
- Available for lease	15,263.42	
OUTSTANDING AND RESERVED OWNERSHIP		478,283
TOTAL ACRES (rounded to nearest whole acre)		**513,256**

Forty percent (13,961 acres) of the total USA-owned mineral acreage is not available for exploration and/or development and 60 percent (21,012 acres) is available. The "available" acreage represents only four percent of the Forest's total land base of 513,256 acres. The subsurface oil/gas rights on the remaining 478,283 acres are reserved or outstanding.

Cubic Yards of Rock Surfacing Used for Contracts, Permits, and Free Use

Method of Measure: Actual amount included in permits, contracts, and visual observations of pit use.

Monitoring Results:

TABLE 20. USAGE OF ROCK MATERIALS IN 1999

Use	Cubic Yards	Forest Plan
Oil, Gas Minerals (free use)	48,685	41,000
Forest Service Roads	7,429	103,000
Trails	0	N/A
Permits/Contracts	0	N/A
Total Cubic Yards used in 1999	56,114	144,000

Evaluation of Results: Usage in FY 99 is 39 percent of estimated Forest Plan use. Of the total amount used this year, 87 percent was for oil, gas, and mineral development (the Forest Plan estimate was 29%). This can be attributed to an increase in mineral activity due to rising gas prices. A lack of timber sales and public works contracts caused the unusually low rock use in all other categories.

Mineral Material Pit Management

Monitoring Criteria: (See Table 21)

Monitoring Results:

TABLE 21. 1999 MINERAL PIT MANAGEMENT

Monitoring Criterion	1999
Pit plan development	5
Pit addressed in EA	8.5
Development follows plan	8
Restored, and to landform	8
Present management of stone	8.5
Wildlife management	NA
Visual quality	8
Litter/trash	10
Unused equipment	9.5
AVERAGE Criteria	**8.2**

Note: A rating of "8" is the Forest standard (1 is low; 10 is high).

TABLE 22. NUMBER OF MINERAL PITS DEVELOPED (by MA)

MA	Total Closed	Total Open	Total Pits
1.0	1	1	2
2.0	1	2	3
3.0	160	253	413
5.0	0	0	0
6.1	26	35	61
6.2	7	10	17
6.3	0	0	0

6.4	0	2	2
7.0	0	0	0
8.0	0	1	1
9.1	1	1	2
Totals	**196**	**305**	**501**

Evaluation of Results: This monitoring expresses project planning and long-term planning and implementation efforts in managing the results of mineral materials extraction. Pit management meets or exceeds the Forest Plan standard for all criteria except Pit Plan development. Efforts should focus on improvement in this area.

HABITAT

Summarize the Following Components of the Desired Future Condition by MA: % Opening, % Old-growth, % Conifer Cover, Acres of Aspen Type, Age Class Distribution, and Acres of Oak Type

Method of Measure: The following chart lists five variables for determining the diversity of habitat and progress towards the Desired Future Condition on the Forest.

Habitat Variable	Acres	Existing % Forest Habitat	Forest Plan DFC[1]
Conifer	27,265	5.4	5-10%
Oak	77,102	15.1	18%
Aspen	3,280	0.6	2%
Openings	22,069	4.3	6%
Late Successional [2]	8,852	1.7	16%

1 Desired Future Condition based on vegetation conditions after 15 decades of Forest Plan implementation (Forest Plan FEIS, p. 4-94)
2 Stands older than 110 years (for this analysis)

Evaluation of Results: This information is based on 512,927 acres of National Forest Land that have been inventoried over the past 20 years. Some discrepancies exist in the data, and further refinements are continuing. Except for late successional habitats, we are approaching the desired future condition for the habitat variables. About 102,200 acres are between 90 and 109 years old, so additional acres will be moving into the late successional habitat in the next 20 years. We should continue to plant conifer and enhance/maintain the existing conifer component throughout the Forest.

TABLE 23. HABITAT ACRES BY AGE CLASS

Habitat	0-20	21-60	61-90	91-110	111+	No Age[1]	Total
Conifer	159	4,753	9,258	12,052	917	99	27,265
Oak	1,854	1,706	47,849	22,162	2,990	541	77,102
Hardwoods*	33,636	29,984	227,458	74,030	4,945	6,448	376,501
Aspen	790	1,020	1,287	161	0	22	3,280
Openings**	73	104	144	0	0	21,748	22,069
Unknown	17	0	404	115	0	1,144	1,680
Total	**36,529**	**37,567**	**286,427**	**108,520**	**8,852**	**30,002**	**507,897**

1 No Age Class indicates an uneven-aged stand.
** Hardwoods include Northern Hardwoods, Allegheny Hardwoods, and Forest Survey Types 72, 76, 79, 81, 83, 84, 85, 86, 87, 88, and 89.*
*** Openings include low stocked savannahs as described in the Forest Plan.*

WILDLIFE

Measure Habitat and Population Trends for Management Indicator, Game, and Threatened and Endangered Species Based on a Specific Wildlife and Fish Monitoring Guide

and

Obtain Population Trend Data for Several Game Species from Pennsylvania Game and Pennsylvania Fish and Boat Commissions [36 CFR 219.99]

Appendix B of the Forest Plan identifies the wildlife species to be monitored. These species can be grouped into three categories:

Game Species	White-tailed Deer	Black Bear
	Ruffed Grouse	Woodcock
	Beaver	
Management Indicator Species	White-tailed Deer	Ruffed Grouse
	Woodcock	Red-Shouldered Hawk
	Magnolia Warbler	Yellow-bellied Sapsucker
	Beaver	Pileated Woodpecker
	Black-throated Green Warbler	Barred Owl
	Hermit Thrush	Timber Rattlesnake
	Great Blue Heron	
Federally-Listed Threatened or Endangered Species	Bald Eagle	Small Whorled Pogonia
	Clubshell Mussel	Northern Riffleshell Mussel

During the development of the Forest Plan, wildlife species were selected as management indicator species to monitor trends in habitat capability for them and other associated species with similar habitat requirements.

TABLE 24. MANAGEMENT INDICATOR SPECIES

Species	Habitat Indicator
White-tailed Deer	Regenerating Deciduous
American Woodcock	Permanent Openings Regenerating Deciduous
Magnolia Warbler	Regenerating Hemlock
Beaver	Regenerating Deciduous (aspen)
Black Throated Green Warbler	Mature Mixed Hemlock - Deciduous
Hermit Thrush	Mature Mixed Hemlock - Deciduous with dense understory

Barred Owl	Old-growth Mixed Hemlock - Deciduous
Great Blue Heron	Old-growth Mixed Hemlock - Deciduous
Ruffed Grouse	Regenerating Deciduous
Red-shouldered Hawk	Mature Deciduous
Yellow-bellied Sapsucker	Mature Deciduous
Pileated Woodpecker	Old-growth Deciduous
Timber Rattlesnake	Regenerating Deciduous

White-tailed Deer

Table 25 is a summary of winter deer densities over the past 13 years. These densities are calculated by the Pennsylvania Game Commission (PGC) based on deer harvest data and hunter report cards. In conjunction with the Forestry Sciences Laboratory, pellet group transects were completed on 20 sites in 1999. These pellet group transects are summarized in Table 26.

TABLE 25. WINTER DEER POPULATION PER SQUARE MILE OF FORESTED LAND

		YEAR (Winter Density)												
County	**Density Goal**	**86-87**	**87-88**	**88-89**	**89-90**	**90-91**	**91-92**	**92-93**	**93-94**	**94-95**	**95-96**	**96-97**	**97-98**	**98-99**
Elk	21	31	33	29	30	25	21	22	26	30	29	23	21	24
Forest	23	33	36	32	35	31	24	28	29	32	33	29	32	39
McKean	20	29	28	26	26	23	22	25	28	26	26	25	25	30
Warren	21	30	31	32	32	30	30	31	27	29	27	30	30	31

TABLE 26. OVERWINTER ESTIMATES OF DEER DENSITY ON STUDY SITES WITHIN THE ALLEGHENY NATIONAL FOREST. ESTIMATES ARE IN DEER PER SQUARE MILE. A DASH (-) INDICATES NO DATA COLLECTED ON THAT SITE IN THAT YEAR.

Study Site	1992	1994	1995	1996	1997	1998	1999
Bradford 653	31.9	16.4	17.3	16.8	13.0	18.2	10.8
Bradford 654	41.3	24.6	31.6	41.7	24.2	33.5	14.5
Bradford 656	28.9	21.8	28.1	25.9	26.4	78.8	15.3
Bradford 657	50.4	21.2	54.6	19.1	29.5	57	21.8
Marienville 659	25.2	23.5	23.4	23.8	11.1	33.7	41.5
Marienville 660	27.0	17.3	54.5	37.8	21.4	76.1	32.9

Study Site	1992	1994	1995	1996	1997	1998	1999
Marienville 661	17.4	23.4	25.6	23.6	18.3	32.8	36.1
Ridgway 663	28.0	31.5	20.5	25.2	31.9	18.5	15.9
Ridgway 664	36.1	32.5	52.9	29.1	26.3	83.8	34.7
Ridgway 665	29.7	31.8	33.0	28.1	43.3	50.7	17.6
Porter-E	-	-	-	47.0	32.5	29.6	28.5
Porter-W	-	-	-	29.8	14.1	32.8	10.8
Heart-C	-	-	-	12.7	5.2	21.7	5.6
KEF-E	-	-	-	17.7	15.2	17.6	-
KEF-W	-	-	-	15.9	15.8	22.1	10.2
HOF-E	-	-	-	31.2	11.7	34.7	9.6
HOF-W	-	-	-	34	4.1	39.1	9.3
OAK-MS	-	-	-	36.6	10.6	22.1	16.4
Root	-	-	-	24.3	-	18.6	8.8
Robbie	-	-	-	25.9	-	18.6	-
Area-A-T	-	42	43	39.9	-	14.2	23.6
Area-B-T	-	36	-	-	-	-	-
Area-C-T	-	48	-	33.6	-	-	-
Area-D-T	-	29	46	40	-	32	18.8
Hickory North	-	-	-	-	8.3	-	-
Hickory South	-	-	-	-	7.5	-	-
Millstone West	-	-	-	-	38.9	21.8	-
Millstone East	-	-	-	-	10.7	25.5	-
Grouseland	-	-	-	-	15.9	31.7	-
Pine Run	-	-	-	-	3.8	17.9	-
Bear Creek	-	-	-	-	3.9	19.2	-
Otter Run	-	-	-	-	51.8	-	-
Hammer	-	-	-	-	6.6	-	-
Minister	-	-	-	-	18.7	-	-
Tracey Ridge	-	-	-	-	9.4	-	-
Tracey Ridge-E	-	-	-	-	16.6	-	-
Brush Creek N.	-	-	-	-	-	21.9	-
Brush Creek S.	-	-	-	-	-	3-7	-
Big Run	-	-	-	-	-	13.8	
Average	**31.6**	**27.1**	**35.9**	**27.5**	**18.2**	**31.4**	**19.1**

Evaluation of Results: The pellet group transects demonstrate the variability of the deer density across the Forest. This transect data supports the density figures calculated by the PGC but shows that densities can be much higher and much lower than the average county density.

Black Bear

TABLE 27. BLACK BEAR HARVEST SINCE 1986, BY COUNTY

County	86	87	88	89	90	91	92	93	94	95	96	97	98	Total	Average
Elk	58	72	74	93	32	131	55	65	37	63	54	66	58	792	**61**
Forest	21	23	50	85	59	29	33	52	16	51	41	72	65	525	**40**
McKean	63	58	134	147	55	90	98	75	36	102	96	114	91	1045	**80**

Warren	30	34	42	62	39	46	37	33	28	62	59	30	33	505	**39**
Total	**172**	**187**	**300**	**387**	**185**	**296**	**223**	**225**	**117**	**278**	**250**	**282**	**247**	**2867**	**220**

Evaluation of Results: Bear populations appear to be stable to slightly increasing. After a below-average harvest in 1994, a large harvest occurred in 1995, and a slightly above average harvest in 1996, followed by a large harvest in 1997. Harvests are usually better when there is snow on the ground and winds are calm. It appears that a harvest of about 250-300 bears annually can be sustained in the four-county area.

Ruffed Grouse

Results: The results of ruffed grouse surveys completed between 1991 and 1999 are presented in Table 28. Data indicate that populations were lowest in 1997 and highest in 1991 and 1993.

Evaluation: Ruffed grouse populations appear to be stable on the ANF. Grouse populations are known to be cyclic, undergoing highs and lows every five to ten years (Fergus, unpublished). These fluctuations vary with locality but have been attributed to changes in cover, food, and weather conditions (Ibid.).

On the ANF, ruffed grouse are an indicator of regenerating deciduous habitat. In Missouri, Wiggers et al. (1992) recommend that 14% of the forest be maintained in 7 to 15 year old hardwood regeneration to enhance grouse habitat. Currently, about seven percent of the ANF is in the early successional stage (0-20 years old) (USDA-FS, 1997).

Pennsylvania Game Commission data indicate that 304,162 grouse were harvested in 1994 and 315,197 in 1995 in Pennsylvania, despite a reduction of 20,000 grouse hunters in 1995 (Diefenbach, 1996). Grouse harvest per square mile and number of grouse hunters per square mile for Pennsylvania and the ANF are believed to be similar.

These data suggest that habitat is of sufficient quality, distribution, and abundance to allow the species population to stabilize and to be well distributed across the ANF, resulting in a high likelihood of persistence.

TABLE 28. INDEX OF RUFFED GROUSE ABUNDANCE

Year	Grouse/stop
1991	.53
1992	.42
1993	.53
1994	.47
1995	.44
1996	.47
1997	.38
1998	*

1999	.40

**** No surveys were conducted in 1998. Starting in 1997, Ruffed Grouse surveys will be conducted every other year.***

Woodcock

Results: Woodcock surveys were completed annually between 1990 and 1997. In 1997, the ANF decided to alter the monitoring schedule to every other year. Results have varied from a low of 0.05 woodcocks per survey point to a high of 1.20 woodcocks per survey point. The average number of woodcocks per year is 0.36.

TABLE 29. WOODCOCK SINGING GROUND SURVEY

Year	Total Miles	Survey Points	Woodcock Heard	Woodcock/ Survey Point
1990	11.1	20	1	.05
1991	29.1	75	18	.24
1992	8.6	20	7	.35
1993	20.6	35	8	.22
1994	16.2	35	8	.22
1995	17.6	40	15	.38
1996	6.3	10	12	1.20
1997	3.2	5	1	.20
1998	*			
1999	5.4	10	4	.40

**** No surveys were conducted in 1998. Starting in 1997, American Woodcock surveys will be conducted every other year.***

Evaluation: With the exception of 1996, woodcock populations do not appear to be widely fluctuating on the ANF. Data suggest a sparse but stable population. Woodcock were selected as an indicator of permanent openings and regenerating deciduous habitat. However, biologists now recognize that wet soils, often in lowlands and bottoms, are specific components of the woodcock's niche. These low wet areas with small openings and saplings contain earthworms, an important food source for woodcock. Small openings near early successional stands, and also near wet soils comprise a small portion of the ANF. In 1997, permanent openings comprised about 24,393 acres (5%) of the ANF, while 36,179 acres (7%) were considered regenerating deciduous habitat. Consequently, woodcock populations are expected to be sparse.

Since woodcock are a migratory game bird, the Pennsylvania Game Commission and the USDI Fish and Wildlife Service conduct monitoring. The PGC reported that the number of woodcock hunters dropped from 19,401 to 15,702 between 1994 and 1995, while the number of woodcock harvested dropped from 29,654 in 1994 to 28,624 in 1995 (Diefenbach, 1996). These data represent an increase from 1.53 woodcock harvested per hunter in 1994 to 1.82 woodcock harvested per hunter in 1995. Woodcock hunter densities for Pennsylvania are believed to be similar to woodcock hunter densities on the ANF.

USDI Fish and Wildlife Service data show long-term declines in woodcock populations in the Eastern Region (Amman, 1997). The woodcock index for Pennsylvania based on singing ground surveys dropped from 2.40 in 1968 to 0.85 in 1992 (Straw, 1992). Reasons for this decline are unknown.

These data, plus incidental observations of both young and adults in suitable habitat, indicate that habitat is of sufficient quality, distribution, and abundance to allow the species population to stabilize and to be well distributed across the ANF, resulting in a high likelihood of persistence.

Barred Owls

Results: Barred owl data have been collected along seven standard routes across the ANF for seven years. In 1997 the ANF decided to monitor barred owls every other year, hence no surveys were done in 1999. Responses have remained fairly constant over this time period. New timber sales, oil and gas development, and other new activities have changed the habitat along some sections of these barred owl routes over the past nine years. No analysis or correlations with habitat changes have been completed with these data, but plans are to complete a habitat analysis in the future.

TABLE 30. BARRED OWL SURVEY
AVERAGE RESPONSES/TRANSECT

Year	Brad. 1	Brad. 2	Shef.	Ridg. 1	Ridg. 2	Marn. 1	Marn. 2	Average
1991	7.3	11.3	2.3	12.0	12.0	7.7	4.0	**8.1**
1992	7.3	8.3	12.0	14.0	18.0	3.7	5.0	**9.8**
1993	8.7	8.0	5.5	10.7	19.0	6.7	3.7	**8.9**
1994	7.7	12.3	7.0	15.7	29.0	11.0	2.7	**12.2**
1995	7.3	5.3	11.3	8.7	16.0	5.0	3.0	**8.1**
1996	4.7	6.3	7.0	8.7	14.7	5.0	2.3	**7.0**
1998	10.3	12.7	10.7	9.7	17.3	10.0	10.0	**11.5**

Evaluation: The total average Barred owl responses per year have remained relatively stable since 1991 suggesting a fluctuating but stable population. These owls are an indicator of old-growth-mixed hemlock/deciduous habitat, but are found throughout the ANF in second growth (mature) forests. A hemlock component appears to be preferred, and cavity trees used for nesting must be a minimum of nine inches in diameter at breast height (Devereux and Mosher, 1984). Suitable Barred owl habitat is abundant on the ANF. An analysis that correlates habitat with Barred owl responses is planned. Based on these data, habitat is of sufficient quality, distribution, and abundance to allow the species population to stabilize and to be well distributed across the ANF, resulting in a high likelihood of persistence.

Beaver

Results: By 1991, all beaver habitat on the ANF had been mapped using aerial photography and ground surveys. Results indicate about 20% of all drainages surveyed contained beaver activity. Leaf-off aerial photography was flown on the ANF in 1998 and 1999. New mapping of beaver activity is in progress.

Pennsylvania Game Commission beaver tag records are displayed in Table 31. Although beaver harvest is influenced by pelt prices, these data suggest two plateaus in the population. Between 1986 and 1993 the harvest was steady to slightly decreasing. In 1994, the harvest increased dramatically, and then leveled off.

Evaluation: Beavers have shown a steady increase on the ANF since 1986. Harvest data in Table 31 is supported by on-the-ground observations of beaver activity throughout the ANF. It appears that beavers may have been increasing between 1986 and 1993, but low fur prices and unfavorable trapping conditions may have kept the harvest down. In 1994, a combination of pelt prices and favorable weather may have contributed to the dramatic increase in harvest that has been sustained for five years. Beavers are an indicator of regenerating aspen, but observations have shown that they will readily adapt to many other hardwood species. About 4,000 acres (1%) of the ANF is aspen (USDA FS, 1997). Although managers believe the amount of aspen has remained fairly constant since 1986, the Forest Plan estimated about 10,000 acres (2%) are aspen. These differences may be a result of better data rather than actual changes on-the-ground. Ruffed grouse and woodcock are other MIS known to utilize regenerating aspen habitat.

Beavers often enhance habitat for other species such as waterfowl, river otters, and sometimes brook trout. However, they may also cause problems by flooding roads and other facilities. Maintaining viable populations of beavers on the ANF is not currently a problem. The challenge is to achieve a sustainable beaver population, provide habitat for other wildlife, and provide recreation opportunities for wildlife viewers and trappers in balance with other forest uses.

These data suggest that habitat is of sufficient quality, distribution, and abundance to allow the species population to stabilize and to be well distributed across the ANF resulting in a high likelihood of persistence.

TABLE 31. BEAVER TRAPPING HARVEST REPORTED TO PENNSYLVANIA GAME COMMISSION

County	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Elk	150	160	114	88	60	62	134	66	184	244	257	378	245	292
Forest	89	109	58	62	53	125	86	58	139	78	181	222	205	180
McKean	433	432	310	269	184	285	269	225	650	529	445	710	636	585
Warren	256	246	183	182	119	172	184	162	554	351	473	538	392	277
TOTAL	**928**	**947**	**665**	**601**	**416**	**644**	**673**	**511**	**1525**	**1202**	**1356**	**1848**	**1478**	**1334**
Estimated ANF Harvest	399	407	286	258	179	277	289	220	657	517	583	795	636	592

Note: During 1997 and 1998, 43% of the beavers trapped in the four-county area were taken in townships included within the ANF boundaries. This proportion (43%) of the beaver harvest within the ANF was used to estimate harvest totals during previous years.

Red-Shouldered Hawk

Results: Monitoring data for red-shouldered hawk nests on the Marienville and Bradford districts is displayed in Tables 32 and 33. Active nests monitored range from a low of 0 in 1991 to a high of 9 in 1996**.** Total nests found or monitored range from a low of 1 to a high of 32.

Evaluation: Fluctuations in the total number of nests monitored is most likely the result of variation in search effort. Search effort was not tracked each year. Red-shouldered hawks are an indicator of mature deciduous habitat. About 78% of the ANF currently provides this habitat condition (USDA FS, 1998). Their nests are difficult to find and the monitoring protocol is labor intensive resulting in some nesting going undetected. Breeding and reproduction are occurring but more monitoring needs to occur to determine population trends on the ANF. However, based on the above data, red-shouldered hawk populations are believed to be viable on the ANF.

Within Pennsylvania and the Northeast, red-shouldered hawk populations appear to remain relatively stable. Pennsylvania lists this species as vulnerable although the Pennsylvania Breeding Bird Atlas recorded this raptor in a total of 745 blocks and confirmed breeding in 134 blocks (Brauning, 1992). Titus and Fuller (1990) found no discernable populations trends when evaluating counts of red-shouldered hawks migrating past six Eastern hawk lookouts between 1972 and 1987.

These data suggest that habitat is of sufficient quality, distribution, and abundance to allow the species population to stabilize and to be well distributed across the ANF resulting in a high likelihood of persistence.

TABLE 32. RED-SHOULDERED HAWK NESTING ACTIVITY ON THE MARIENVILLE RANGER DISTRICT

Year	Active	Inactive	Unknown	Total # found/monitored
1988	6	0	0	6
1989	4	0	2	6
1990	1	1	5	7
1991	0	0	1	1
1992	1	1	3	5
1993	2	1	4	7
1994	3	8	2	13
1995	8	17	7	32
1996	5	5	2	12
1997	1	0	0	1
1998	1	1	0	2
1999	3	4	3	10

TABLE 33. RED-SHOULDERED HAWK NESTING ACTIVITY ON THE BRADFORD RANGER DISTRICT

Year	Active	Inactive	Unknown	Total # found/monitored
1995	8	17	7	32
1996	5	5	2	12
1997	1	0	0	1
1998	1	1	0	2
1999	4	0	2	6

Great Blue Heron

Results: Tables 34 and 35 reflect monitoring results on the Marienville and Bradford Ranger Districts. A total of seventeen sites (colonies) have been monitored on the ANF. Not all nests are monitored every year and some nesting colonies move locations. No data have been collected to determine what causes these herons to move.

In general, great blue heron colonies on the Allegheny National Forest are small ranging in size from 1 nest to 33 nests per colony.

TABLE 34. GREAT BLUE HERON NESTING ACTIVITY ON THE MARIENVILLE RANGER DISTRICT

Great Blue Heron Nest Activity – Marienville RD Number of Nests/Site/Year																
Site	**84**	**85**	**86**	**87**	**88**	**89**	**90**	**91**	**92**	**93**	**94**	**95**	**96**	**97**	**98**	**99**
1*						2U									2A4U	
2												1A		1G	2A	
3											5A		3/5A			
4														1A		
5	Pre 1998 - possible nest w/unknown activity; 1998 - no nests found; this site is near site 6.															
6															3U	
7										2A	2A	2G				
Key: Activity Status A=Active I=Inactive U=Unknown G=Nests Gone or Not located																

**** Site 1 is on private land adjacent to the Allegheny National Forest. One of the nests found in 1989 was on the ANF. The six nests found in 1998 are on private land.***

TABLE 35. GREAT BLUE HERON NESTING ACTIVITY ON THE BRADFORD RANGER DISTRICT

Great Blue Heron Nest Activity – Bradford RD Number of Nests/Site/Year																
Site	**84**	**85**	**86**	**87**	**88**	**89**	**90**	**91**	**92**	**93**	**94**	**95**	**96**	**97**	**98**	**99**
1												33A	3A	13A		5A
2							1I									
3							1I									
4												5U		5A		5I
5	23 nests in 1980; inactive since 1986										1I					
6*							1U									
7			16A												16G	
8	2A			2I								1I				
9		6A/6U														
10						5-9A						5-9G				
Key: Activity Status A=Active I=Inactive U=Unknown G=Nests Gone or Not located																

**** Site 6 is in New York State, near the Allegheny National Forest.***

Evaluation: Great blue herons are an indicator of old-growth-mixed hemlock deciduous habitat on the ANF. Currently about 1.5% of the ANF is older than 111 years and provides this habitat (USDA FS, 1997). However, on the ANF, great blue herons are known to nest in stands that are 60 years old or older, a habitat condition found on about 78% of the forest. No wildlife species on the ANF have been found to depend solely on old-growth, so great blue herons remain a valid MIS.

Reproduction is occurring and great blue herons are frequently spotted foraging along many streams and impoundments on the ANF indicating that the location of all colonies is not known. These data indicate a viable population on the ANF. During the Pennsylvania Breeding Bird Atlas project, great blue herons were found in 46 percent of all survey blocks but reliable confirmation of breeding was found in only five percent of the survey blocks (Brauning 1992). Additional monitoring data needs to be collected on the ANF to determine population trends.

These preliminary data suggest that habitat is of sufficient quality, distribution, and abundance to allow the species population to stabilize and to be well distributed across the ANF resulting in a high likelihood of persistence.

Forest Songbirds

Magnolia Warbler; Black-throated Green Warbler; Hermit Thrush; Yellow-Bellied Sapsucker; and Pileated Woodpecker

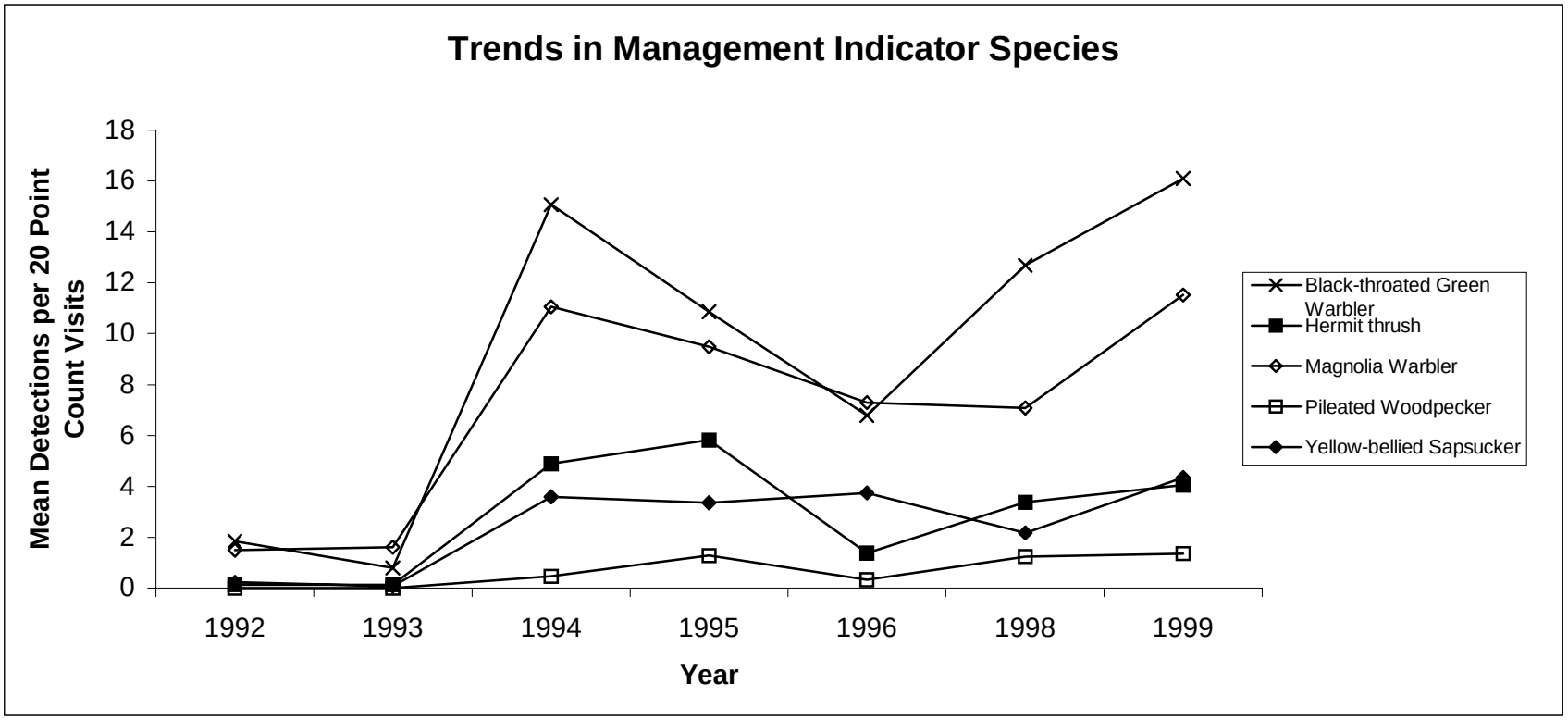
Methods: From 1992 through 1999, personnel at the Northeast Research Station, Warren PA, conducted annual counts of singing songbirds as part of several research projects. Sites utilized in these studies (75) included a full range of successional stages, representing the four stages of stand development identified by Oliver and Larsen (1990) (stand establishment/early succession; stem exclusion/sapling-pole; understory re-initiation/second growth maturing; and old-growth). Research projects included: 1) evaluation of impact of herbicide application on wildlife communities/wildlife habitat; 2) characterization of wildlife communities and habitat within old-growth and over mature second-growth; 3) characterization of wildlife communities and habitat within early succession and sapling-pole stands; 4) response of wildlife communities and habitat to silvicultural prescriptions designed to hasten development of old-growth characteristics in second-growth stands; 5) response of wildlife communities and habitat to uneven-aged management; 6) monitoring of songbird communities and habitats within a broad variety of successional stages/management applications; and 7) naturally-induced succession created by tornado events.

Singing songbird censuses were conducted three times annually during the breeding season (May-July) for the eight-year period. Wildlife habitat characteristics were also recorded, resulting in comprehensive habitat descriptions. Classification Tree Analysis was conducted for each songbird species, resulting in identification of habitat components associated with sustainable populations of individual species, at the stand level. This analysis can be used to identify habitat(s) selected by individual songbird species, and to characterize habitats associated with “management indicator species”. The analysis may also be used to identify candidate indicator species, once desired “indicator habitats” are identified. Furthermore, sites identified as sustaining populations of individual songbird species can be used in protracted monitoring programs to track status of songbirds through time and across landscapes (trends).

Results: Trend data for the five songbird species for the 1992-1999 period is provided in Figure 6. None of the songbird species identified as indicator species in Allegheny National Forest Plan are early succession songbirds. Accordingly, point count data for the five indicator species obtained from early succession sites are not included in the trend analysis. Also, for each of the five management indicator species, sites were eliminated from the sample if the bird was never recorded on the site. Thus, maximum number of sites utilized in developing trend data was 45. Songbird census data were obtained from fixed points within each of the sites: numbers of singing birds were recorded at each point. Number of points varied among sites because sites varied in size: actual number of points approximated one per three acres. Counts for all sites were adjusted to represent number of birds observed per 10-point counts (e.g. on a site with 4 rather than 10 points, number of singing birds was multiplied by a factor of 2.5). Also, because earlier counts (those conducted in May and June) tend to better reflect the peak of breeding/singing activity, counts obtained during May-June for each songbird were utilized.

Thus, numbers reported are numbers of singing birds observed per 10 point count locations per 2 visits (20 point count visits). In 1997, a much smaller and less representative number of sites were sampled: these data are not reported. Trend data reported are numbers of songbirds observed per 20 point count visits averaged across all sites per year.

FIGURE 6. TRENDS IN COUNTS OF SINGING BIRDS 1992-1999



Data reported in 1992-1993 were collected by less-experienced observers who reported fewer birds per point count than during 1994-1999, when data were collected by much more experienced observers. The difference in observer experience probably accounts for the large gap in numbers of singing birds reported between 1992-1993 and 1994-1999. During 1991-1993 there was a major eruption of the elm spanworm, resulting in a huge increase in available food for nestling songbirds. The increased food supply should have resulted in more young produced and surviving to return in subsequent years. The peak in bird numbers reported for 1994 is thought to reflect this peak in food supply: there should have been more birds recruited into the population and available to sing in the year following the height of the spanworm outbreak. The spanworm population crashed in early 1994, resulting in far less food available for feeding young in 1994. The expected result, far fewer birds recruited into the population and returning the following year to sing is reflected in the reduced number of birds reported in 1995-1998. It appears that over the 1992-1999 period, population trends of the five identified Management Indicator Species have remained relatively stable, increasing temporarily in response to a massive increase in food supply, declining to more traditional levels since then. There is no evidence of persistently increasing or declining trends in abundance for the five Management Indicator Species during the 1992-1999 period.

Management Indicator Species (MIS)

Classification Tree Analysis (CTA) was conducted to identify habitat components associated with songbird classes representing optimal and minimal sustainable conditions for each species. A rule-based decision tree was developed that assigns four sustainability classes of songbird: optimal, minimal, non-minimal but present, and not present. Birds are assigned to one of the four categories for each census site based on number of singing birds and on consistency of observations of singing birds within and among years. The sites must be classified as optimal or minimal for the purpose of identifying habitats, and habitat components for which each songbird is an "indicator".

The four stages of stand development were subdivided into nine so that the "indicator habitats" could be addressed as suggested by Allegheny National Forest personnel. Stand establishment, stage 1, was subdivided into clearcut stands 7-12 years post cutting, and failed clearcuts that reverted to permanent grasslands or savannas. Stem exclusion, stage 2, was comprised of northern hardwood sapling/pole stands 12-25 years post cutting. Understory reinitiation, stage 3, was comprised of stands ~ 70+ years post harvest and was subdivided into five classes: 1) shelterwood seed cut, northern hardwood stands thinned to ~ 60% relative density to foster development of seedlings; 2) shelterwood seed cut plus herbicide application, northern hardwood stands thinned to ~ 60% relative density and with herbicide application to eliminate undesired vegetation (ferns, grasses, undesirable hardwood seedlings) to foster development of desired seedling species; 3) hemlock-riparian, maturing second growth northern hardwood stands with hemlock overstory concentrations along riparian ravines; 4) maturing second growth, a variety of ~70 year old second growth northern hardwood stands with some hemlock in the midstory and overstory; and 5) chronosequence, mature northern hardwood second growth stands 125-190 years post cutting which contained mixes of hemlock and deciduous trees. Old-growth, stage 4, was retained as old-growth and was comprised of mixed hemlock - deciduous stands that had never been harvested and were > 300 years post disturbance. Accordingly, when CTA was run for each species, the nine habitat types were first used to see if sites rated as optimal or minimal for each songbird species represented "indicator habitats". CTA was then run to see if habitat characteristics could be identified to separate optimal and minimal sites from non-minimal but present and not present.

Evaluation:

Black-throated Green Warbler – This species is identified as an indicator for mature mixed hemlock/deciduous forest. CTA analysis draws "trees" that demonstrate how sites are separated. The first tree drawn demonstrates how the 57 sites were assigned to the 9 subdivisions: class 1 = clearcuts, 6 sites; class 2 = sapling poles, 8 sites; class 3 = savannas, 2 sites; class 4 = shelterwood second growth, 10 sites; class 5 = shelterwood/herbicide second growth, 10 sites; class 6 = hemlock riparian, 5 sites; class 7 maturing second growth, 9 sites; class 8 =

chronosequence, 4 sites; and class 9 = old-growth, 3 sites. The first separation (terminal node 1) identified as optimal for black-throated green warblers: 0 clearcuts; one sapling pole; 0 savannas; 7 shelterwood, 0 shelterwood and herbicide; 4 hemlock riparian; 7 maturing second growth; all 4 chronosequence; and 1 of the 3 old-growth sites. Terminal node 2 identifies sites ranked as minimal for the black-throated green warbler and included: 0 clearcuts, 5 sapling poles; both savanna sites; 3 of the shelterwood sites; 9 of the shelterwood herbicide sites, the remaining hemlock riparian site; the two remaining maturing second growth sites; and the two remaining old-growth sites. Terminal node 3 contains only sites identified as non-minimal or not present (CTA couldn't separate these two classes of site) and contained few sites; only the clearcuts (all of them), two of the sapling pole sites, and one of the shelterwood herbicide sites. The only class of site where the black-throated green warbler was not rated optimal or minimal was clearcuts. At least one or more representatives of all the other classes were rated as optimal or minimal for the black-throated green warbler, suggesting that this bird is not an indicator of mature forests but rather of all forest successional stages excepting early succession (clearcuts) where the bird was never observed singing. Lab researchers contend that this bird occurs on all forest stands representing the last 3 stages suggested by Oliver and Larsen (1990), which makes it an indicator of stem exclusion through old-growth sites: a general forest bird that occurs widely within the Allegheny National Forest on all but early succession stands.

Based on these data, habitat is of sufficient quality, distribution, and abundance to allow the species population to stabilize and to be well distributed across the ANF resulting in a high likelihood of persistence.

Hermit Thrush – This species is identified as an indicator for mature mixed hemlock-deciduous forest with dense understory**.** CTA analysis draws the same first tree, which simply exhibits the breakdown of sites prior to separation based on individual bird species classifications for each site. The "tree" drawn by CTA for the hermit thrush is different from that drawn for the black-throated green warbler. Terminal node 3 identifies all class 4 sites, where the bird was never observed. The hermit thrush was not observed on 5 of the 6 clearcuts, and never observed on one sapling pole and one shelterwood herbicide site. Terminal node 1 identifies optimal sites for the hermit thrush, and includes representatives from all classes of sites except clearcuts, shelterwood herbicide, and old-growth sites. Terminal node 2 contains sites identified either as minimal or non-minimal for the hermit thrush; CTA was unable to separate them completely. Clearly, this bird, like the black-throated green warbler, is a bird of maturing forests representing the last 3 stages of Oliver and Larsen. But identification of younger stands (sapling pole and savanna) as optimal sites, and lack of old-growth sites identified as optimal belies the description of the bird as an indicator of mature forests. A CTA analysis was run for this bird on those habitat components that represented hemlock in the overstory and dense understory (heavy shrub and ground cover) as a test of this bird as an indicator of sites with mature mixed hemlock-deciduous with dense understory. The resulting "tree" drawn by CTA was unable to cleanly separate optimal from minimal from non minimal from non sites based on hemlock in the overstory and a dense understory. When utilizing the full range of habitat components to identify characteristics associated with optimal and minimal sites, separations were got on pole relative density, volume of down and dead vegetation (logs) and shrub density (beech) in the 2-5' height above ground interval but not on hemlock as a component of the mid or overstory. Based on the analysis, lab researchers would characterize the hermit thrush as indicating maturing stands with a midstory of pole-sized trees, minimal volume of down wood in the larger diameter classes (>12" diameter), and moderate low shrub density – basically a bird of maturing forested stands with a midstory and shrub layer, large logs, and widely distributed across the Allegheny National Forest.

Based on these data, habitat is of sufficient quality, distribution, and abundance to allow the species population to stabilize and to be well distributed across the ANF resulting in a high likelihood of persistence.

Magnolia Warbler – This species is identified as an indicator for regenerating hemlock. The "tree" drawn by CTA for the magnolia warbler suggests that it is a bird of maturing forests. Terminal node 1 contains sites identified as optimal for the magnolia warbler. It includes all old-growth and chronosequence (older maturing) sites, all the riparian conifer sites, and a smattering of second growth maturing sites. Terminal node 2 contains

sites identified as minimal, including sapling pole, savanna, and a smattering of second growth maturing sites. Terminal nodes 3 and 4 represent non-minimal to not present sites and include all the early succession sites, most of the sapling sites and a few maturing second growth sites. Like the hermit thrush and black-throated green warbler, the magnolia warbler is a bird of maturing forests, not occurring on early succession sites. Its presence on savannas as minimal sites, and absence on most of the sapling pole sites suggests that the bird is associated with open midstories with at least a minimal of overstory maturing trees such as found on savannas. Because old-growth and chronosequence sites all were identified as optimal, the bird seems to favor older maturing stands more than the black-throated green warbler and hermit thrush. When the full range of habitat components were utilized to identify characteristics associated with optimal sites, separations were got on relative density of hemlock (all size classes combined and not much, the threshold level was 7.5 square feet of basal area/acre) for some but not all optimal sites and basal area of large snags – both characteristics of the old-growth and chronosequence sites. When the full range of habitat components were utilized to identify characteristics associated with minimal sites, separations were got on relative density of upper canopy vegetation (> 10.9% trees pole-sized and larger) and shrub density. Based on the analysis, lab researchers would characterize the magnolia warbler as indicating maturing sites above the sapling pole class, with some hemlock in the overstory, and at least some (> 4%) shrub density, adding that such sites could include savannas with an overstory relative density >11% with or without a hemlock component.

Based on these data, habitat is of sufficient quality, distribution, and abundance to allow the species population to stabilize and to be well distributed across the ANF resulting in a high likelihood of persistence.

Pileated Woodpecker – This species is identified as an indicator for old-growth. This is a landscape level, rather than a stand level bird, and our rule system did not classify sites according to the 4 classes of this species. The rule system requires that only birds heard singing within 150 feet of census points are recorded: pileated woodpeckers were visually observed, and heard within old-growth sites, but not within the 150 foot distance from census points. Thus, even though the bird was present on old-growth sites, it was unable to be recorded on these sites. The bird was recorded on a number of maturing timber sites. The description of this bird is limited to a landscape level forest bird, which requires a number of sites to meet its feeding and breeding requirements. The bird is not characterized as an old-growth indicator, and there is no data that supports such an identity. The bird's presence is indicative of a forest exhibiting a number of structural and species composition (for arborescent vegetation) combinations, including most stages.

Based on these data, habitat is of sufficient quality, distribution, and abundance to allow the species population to stabilize and to be well distributed across the ANF resulting in a high likelihood of persistence.

Yellow-bellied Sapsucker - This species is identified as an indicator for mature deciduous forest. The "tree" drawn by CTA for the yellow-bellied sapsucker suggests that it is a bird of all forest types: the optimal and minimal sites identified in terminal nodes 1 and 2 include representatives of all types. Clearcuts and sapling pole sites had only one site each identified as minimal, suggesting that although sapsuckers use the sites, clearcuts and sapling pole sites do not generally represent sites for which the bird is an "indicator". The yellow-bellied sapsucker utilizes areas larger than single stands to meet its foraging and breeding requirements.

Based on these data, habitat is of sufficient quality, distribution, and abundance to allow the species population to stabilize and to be well distributed across the ANF resulting in a high likelihood of persistence.

Rattlesnake

Results:

TABLE 36. TIMBER RATTLESNAKE SIGHTINGS ON THE ALLEGHENY NATIONAL FOREST

Year	Bradford RD	Marienville RD
1982	-	1
1983	-	-
1984	-	-
1985	1	-
1986	-	-
1987	-	1
1988	-	-
1989	3	1
1990	5	2
1991	2	1
1992	2	1
1993	-	-
1994		4
1995	2	3
1996	1	3
1997	-	4
1998	-	6
1999	-	25

Evaluation: Timber rattlesnakes are a difficult species to monitor. Their secretive nature and ability to hide beneath logs, rocks and vegetation make them difficult to detect. Protective measures have focused on maintaining the integrity of known and potential den sites and placing seasonal restrictions on logging operations near known den sites when the snakes may be traveling and foraging in the area. Timber rattlesnakes were identified as an indicator of regenerating deciduous habitat in the Forest Plan probably because they like to bask in the sun (warming of the body is necessary to ensure proper functioning of several organs and to rid the body of disease and parasites). However, second growth forests on hillsides with a southern exposure and rock outcrops is preferred habitat (Shaffer, 1991). These habitat conditions occur on about 20 to 30 percent of the ANF.

The primary cause of mortality in this species is most likely persecution by humans and not forest management activities. Many people are afraid of snakes and will kill any that they may come in contact with. Some people collect rattlesnakes and use them in rattlesnake roundups or rodeos. The Pennsylvania Fish and Boat Commission is the state agency responsible for managing reptiles and has placed more stringent regulations on the collecting of rattlesnakes.

More data is needed to determine population trends for this species although current data suggests that habitat is of sufficient quality, distribution, and abundance to allow the species population to stabilize but with gaps in the historic species distribution on the ANF. These gaps cause some limitations in interaction among local populations resulting in a moderate likelihood of persistence.

FISHERIES

Management Indicator Species

Brook trout are an indicator of good water quality and habitat conditions in cold-water streams on the forest. This species occurs in most headwater streams on the forest, with the exception of a few streams where pH is too low or water temperatures are too warm. Populations are monitored annually in September on four different streams across the forest.

Results: Population estimates increased for two of the four streams. While population estimates increased in two of the streams, the biomass estimates decreased in three. This implies that a majority of the fish surveyed were in the smaller size classes, indicating successful natural reproduction. Overall, the streams maintain reproducing populations of brook trout.

Smallmouth bass is the cool-water management indicator species. The smallmouth bass is primarily an inhabitant of the Allegheny Reservoir and the larger rivers, such as the Allegheny River, Tionesta Creek, and the Clarion River. Populations also reside in the Ridgway Reservoir and Tionesta Lake. The ANF has been an active participant in the surveys of the Allegheny Reservoir, and results are reported for this location only. A consistent monitoring method has been applied on an annual basis since 1991 at the Allegheny Reservoir.

Results: The smallmouth bass population slipped below the high recorded in 1998, to 6.6 fish/100 net hours in 1999. Although the numbers are down, the population is still doing well, and providing quality size fish to the angler.

The **walleye** is also a cool-water management indicator, but a demand species. The population is annually monitored in the Allegheny Reservoir. It is not listed as an ecological indicator like the smallmouth bass or brook trout since its numbers are artificially influenced by the stocking of three million fry annually. This results in less than a natural population. The population is monitored annually in the Allegheny Reservoir because of its importance to the recreational fishery.

Results: walleye numbers dropped for the second year in a row, to 32 fish/100 net hours. However, the percentage of legal sized fish increased from 1998 to a high level of 72%, increasing the publics' chance at catching a legal size walleye.

Fish Habitat Improvement Projects

Allegheny Reservoir

A variety of fish habitat improvement structures have been placed in various locations around the reservoir. To evaluate the effectiveness of structures that have been used to provide fish cover, one day in August was spent conducting a fisheries survey using an electrofishing boat. The chart below summarizes the Christmas tree structures that were surveyed. In addition, a control site where no habitat improvement structures were placed was surveyed to use as a comparison. The pool elevation at the time of survey was 1320.5 feet, or 7.5 feet below summer pool elevation.

Results: The following chart summarizes the data collected at four different sites, and the total time spent surveying each site. All game and non-game fishes were collected during the survey. The chart documents target species, which include panfish (yellow perch, bluegill, pumpkinseed, bullheads, crappie), largemouth bass, and one year old northern pike, walleye, and muskellunge.

	Kinzua Point	Kinzua Beach (south shore)	Kinzua Beach (near SR59)	Kinzua Beach (control)
CPUE/all fish	200	117	480	216
CPUE/target species	49	107	297	0
# Species	7	6	8	5
# Target species	3	4	3	0
Dominant species	rock bass	yellow perch	yellow perch	logperch/sm. bass
Effort (minutes)	13.5	18	18	15

CPUE = catch per unit effort, summarized as # fish/hour

As the results show, Christmas trees are providing habitat for the target species, as compared to the control site where no target species were collected. The reason is that the trees provide a thick vegetation type habitat that young fish can hide in. While not depicted in the table, yellow perch account for approximately 90% of the fish collected on the trees, and it appears that adult yellow perch are using these as spawning areas because of the dominance of yearling perch. The trees are providing a critical habitat component in the reservoir that is lacking since the creation of the reservoir in 1965.

WILDERNESS

Monitor "Limits of Acceptable Change" in the Allegheny Islands and Hickory Creek Wildernesses

Method of Measure: A variety of methods will eventually be used to monitor wilderness; from trail logs and vehicle counts for recreation use to sampling surveys measuring physical conditions. The Wilderness Implementation Schedule indicates trails, campsites, island shorelines, recreation use, biological species, vegetative/exotic species, heritage resources and soil erosion categories will be monitored. Before monitoring can begin for island shorelines, vegetative/exotic species and heritage resources, a baseline resource condition (present condition) must be established. These inventory efforts will largely be done through partnerships over several years.

A trail log is the basis for monitoring recreation use and has been in place since 1985. Since the early 1990's a part-time Wilderness Ranger and other seasonal employees have been patrolling the Wilderness area observing use, trail and campsite conditions, and making personal contracts. In addition to the trail log, a trail counter and personal observation records are used to improve baseline data on wilderness use. A greater emphasis has been placed on monitoring the Allegheny Islands Wilderness to begin completing and finalizing the initial condition inventory.

An intensive inventory of campsites in the Hickory Creek Wilderness was completed in 1999 to refine inventory data. Permanent photo points were established for campsites identified in the Hickory Creek Wilderness and campsite locations were recorded using Global Positioning technology. Conditions were measured and recorded at each campsite, in addition to photographic records. No unacceptable resource damage from use was noted.

A cultural resource survey of the Allegheny Islands Wilderness was initiated in Partnership with Clarion University to complete a baseline condition inventory of pre-historic and historic resources. The first phase of this inventory process was initiated in 1999, with non-intrusive island surveys completed for the development of a Geomorphologic Model of the Upper Allegheny River. The Geomorphologic Model will help in determining how the islands were formed, and how they have changed over the years. This information will help focus efforts

to complete a baseline inventory of cultural resources present on the islands, so their condition may be monitored in the future.

Preliminary botanical surveys were initiated in partnership with Clarion University to complete baseline inventories for exotic, or non-native plants in the Allegheny Islands Wilderness. These surveys are expected to continue for several years, with a report and management recommendations resulting.

Monitoring Results: Currently the only category being monitored is recreation use. Based solely on the number of users signing the trail log, use increased about six percent from 1995 to 1996, eight percent from 1996 to 1997, twelve percent from 1997 to 1998, and use decreased in 1999 twenty-eight percent. There is no apparent reason for this anomaly however as the weather was similar in 1999 as in 1998 and interest in the wilderness areas has not diminished, based on the public inquiries. Based on field observations, the large decrease in registrations is more likely due to fewer visitors actually signing in, or vandalized register pages. We will assume that use in the Hickory Creek Wilderness dropped by (1/2 of 28%) or 14% for 1999. The bulk of the use occurred during June, September and October due to the record hot temperatures during July and August.

The Hickory Creek Wilderness is accommodating a wide variety of users, from backpackers to day hikers, and individuals to groups. Over half of the use appears to be by overnight backpackers. Group size remains small, averaging two or three persons. A few larger groups of 6 to 10 occasionally use the area. Encounters are very low during the week and moderate on weekends, with the maximum usually being around three or four encounters along the trail. These numbers are well within standards set up for limited of acceptable change. Larger groups are primarily scout troops and outdoor clubs.

Many people are first-time visitors, and are unaware that Hickory Creek and the Allegheny Islands are Federally designated "wilderness," or of the legal implications that go along with that designation. However, the percentage of first-time visitors has been declining since 1996. To address the high percentage of first-time visitors in 1996 (75 percent), a survey of wilderness users was initiated in 1997 in cooperation with the Pennsylvania State University and was completed in 1998. The data from this survey and report will help in the development of a wilderness education action plan; work on this action plan was started in 1997 with a desire to finish and implement this plan as soon as possible.

RECREATION

Report the Number of Wildlife/Fish User Days Associated with Hunting and Fishing Use

Method of Measure: Annual Recreation Use Report, trends estimated from car counts and field observations.

Evaluation of Results: A Recreation Visitor Day (RVD) is 12 hours of recreation use on the Forest. Hunting use was 163,900 RVDs, remaining the same as 1998. Fishing use is estimated to have decreased slightly from 1998 (200,100 RVDs) due primarily to the record high temperatures and drought conditions that occurred through out the summer.

National trends indicate the number of persons who participate in hunting and fishing has declined by 12.3 percent and 3.8 percent, respectively, over the previous decade (National Survey on Recreation and The Environment, USDA-FS, 1990). Trends for hunting in Pennsylvania however, have shown an overall lower decline and numbers have somewhat stabilized in recent years (Brad Nelson). Fishing license sales for Pennsylvania have shown a 16.5% decline over the past decade, which is somewhat greater than national trends (PA F&BC).

Visual Quality Objectives, Existing vs. Planned, in at Least These MAs: 3.0, 5.0 and 6.1

The Forest Plan requires monitoring of Visual Quality Objectives (VQO) to determine if Forest Plan Management Direction [36 CFR 219,12(k)(2)] within the Management Areas across the forest is adequate for managing visual quality. This monitoring and summary shall be accomplished at five year intervals, and shall be included in the Forest Plan Monitoring Report published by the Ecosystems Management Team.

Visual Monitoring was conducted in FY 92 and 97; the next monitoring will take place in FY 2002. The FY 97 Monitoring and Evaluation Report summarized areas where existing visual conditions fell below the standards adopted in the Forest Plan. It also builds on the findings of the 1992 report with an updated chart comparing the existing and proposed visual condition. Additional information includes a comparison of the percentage of acres of the MAs in the sample areas to the percentage of acres of those MAs on the entire Forest.

Method of Measure: The sample areas for this analysis consist of nine 10,000-foot square quadrants used in the 1992 monitoring report. These areas, representing three percent of the Forest land base, were randomly selected using the Pennsylvania State Coordinate System that covers the ANF. Management Areas 3, 5, and 6.1 are the most actively managed and are found in at least five of the sample areas. The remaining Management Areas, 2.0, 6.3, 7.0, 8.0, and 9.1, are small or unique with little resource activity. Table 37 depicts the Management Area Distribution and demonstrates the similarity between the percent of Forest management types represented in the sample and the percentage in the total Forest land base.

TABLE 37. MANAGEMENT AREA DISTRIBUTION

Mgmt Areas in Sample	% of Forest in MA *	Acres of Sample	% of Sample in MAs
1.0	2%	417	3%
3.0	61%	6,908	49%
5.0	2%	60	<1%
6.1	25%	3,865	27%
6.2	4%	843	6%
6.4	4%	2,106	15%
Acres	98%	14,199	100%

**** Percentages are based on the most recent MA acreage calculations using GIS.***

Evaluation of Results: The existing visual condition was first evaluated from the vegetative records that are part of the Combined Data System (CDS) Data Base. This data base has the most complete records of management since 1990. The activities were placed on the compartment maps to summarize the vegetative changes of each of the nine sample areas during the last five years. Changes were recorded and a site visit was made, when necessary, to verify changes in visual quality. Since the Proposed Visual Quality had been mapped for the 1992 Report, the focus of this monitoring is the change in Existing Visual Quality since the last report.

Table 38 compares the Existing Visual Quality to the desired or Proposed Visual Quality as targeted in the Forest Plan. The acres that are above the double line fall below the standard and guides in the Forest Plan.

TABLE 38. EXISTING VS. PROPOSED VQO

Proposed Acres of VQO in Sample Sites (Based on Forest Plan)	Existing Acres of VQO in Sample Sites (Based on field Survey/Data Base)			
	R	PR	M	MM
Retention (R)	3,271	2,979	192	
Partial Retention (PR)	3,846	2,773	1,173	
Modification (M)	3,283	2,790	493	
Maximum Modification (MM)	3,799	3,020	182	597
Total Acres	14,199	11562	2,040	597

Evaluation of Results: The existing visual quality in some of the acreages changed since the 1992 monitoring report, however, there was no loss of the minimum visual quality standards established in the Forest Plan. The two areas that fell below the Forest standard five years ago represent 1% of the sample and remain below visual quality. The findings in this analysis as in the 1992 report conclude that the standards and guides in the Forest Plan, the visual analysis process, and the current mitigation measures are adequate to manage the visual resource.

The 1992 report recommended that areas not meeting Proposed Visual Quality Objectives (VQOs) be identified as rehabilitation projects and submitted for funding in the Forest's capital investment process. The two areas in the sample were submitted, but they were not given the highest priority. Several other projects, however, were identified for visual mitigation or improvements and were accomplished during the past five years. Rehabilitation of this type is ongoing and projects needing mitigation or visual improvements are routinely brought forward at forest project reviews, recreation and district program of work meetings, and in ID team meetings for timber projects.

Future Five-year Monitoring

The Visual Management System (VMS) was developed in 1976, and the use of VQOs has been the standard for both Forest Planning and Project Implementation as well as for the monitoring visual conditions. In the last five years, a new system that builds on the VMS has been introduced. It is called the Scenery Management System (SMS), and it primarily addresses issues that develop at the Forest Plan scale versus the project scale. Other features of the SMS include the consideration of the human dimension through a constituent analysis and identification of special places when evaluating the intrinsic scenic values in a landscape. This new SMS, with its changes in terminology, will most likely be incorporated in the next Forest Plan and in future monitoring reports. In addition, CDS is being integrated with GIS, which is becoming the best tool for handling vast amounts of spatial information. As layers of information create a more complete data base, and people become proficient at querying it, GIS will be the best source for the data needed in future monitoring.

Recreation Opportunity Spectrum, Existing vs. Planned

The FY 95 monitoring concluded that, with the exception of some inconsistencies that existed prior to Forest Plan implementation, the Recreation Opportunity Spectrum class objectives are being met or exceeded.

Formal monitoring for ROS is planned for every five years. It will next be done in FY 2000.

Recreation Visitor Days by Activity and Recreation Opportunity Spectrum Class by MA

Method of Measure: Annual Recreation Use Report and Management Attainment Report

Monitoring Results:

TABLE 39. DEVELOPED AND DISPERSED RECREATION USE BY RECREATION OPPORTUNITY CLASS

Thousand Recreation Visitors Days (RVDs)

Recreation Opportunity Class	Forest Plan Decades 1 & 2	1999	1986-99	% of Forest Plan
Developed Recreation				
... Semi-primitive Motorized (SPM)	750	75	858	114%
... Roaded natural (RN)	9,010	792	7,469	83%
... Rural (R)	8,510	846	8,082	95%
Developed Recreation Total	18,270	1712	16,408	90%
Dispersed Recreation				
... Semi-primitive Non-motorized (SPNM)	720	38	476	66%
... Semi-primitive Motorized (SPM)	7,400	947	8,663	117%
... Roaded natural (RN)	10,240	1,213	12,662	124%
Dispersed Recreation Total	18,360	2,199	21,801	119%
Forest-wide Total	**36,630**	**3,911**	**38,209**	**104%**

TABLE 40. 1999 RECREATION USE BY MANAGEMENT AREA

MA	1.0	2.0	3.0	5.0	6.1	6.2	6.3	6.4	7.0	8.0	9.0	All MAs
MRVDs	24.2	25.4	1,455	4.0	914.9	34.4	24.1	549	845.8	32	2.4	3,911

Evaluation of Results: Overall, the FY 99 season showed a recreation use level very similar to that in 1998. The most notable exception was the continued steady increase in the summer motorized use which continues to be the fastest growing recreation use on the forest and a 10% decrease in occupancy at Beaver Meadows due to the impoundment being drained.

The major factor resulting in the stable level of camping and dispersed use was the weather. Late spring, summer and fall had record long warm periods with clear sunny weather. Conditions were favorable for hiking and other day-use activities, as well as camping throughout the summer. Swimming and boating use remained high do to the ideal weather conditions also. Fall tree color was good with an extended color season to the end of October. Winter weather was erratic, with early snow followed by record high temperatures (60's) then light snow cover. This allowed for only two weeks of snowmobile use. ATV use continued to show the greatest and most significant increase in use on the Forest. State registration continued at record levels with an estimated 37% increase between 1998 and 1999 (from PA DCNR).

To assess customer services satisfaction, Forest Service comment cards were continued similar to 1998. The concessionaires operating campgrounds on the ANF did not circulate separate survey forms as was done in the past however, due to decreased staffing as a result of having to pay volunteers and higher wages required by a Department of Labor ruling. The printed Forest Service comment cards were self addressed to the Chief of the Forest Service in Washington D.C. with postage paid. In addition, several written comments were sent to local

Forest Service offices. The number of cards received by the Washington office and written comments received on the forest totaled eighty eight. Of those, three were dissatisfied with their recreation experience and the remainder, or 96.6% of respondents, voiced satisfaction. In addition, 66% of the responses were complimentary.

The Marienville Ranger District also distributed a separate survey form at Loleta and Beaver Meadows Campgrounds, which are operated by Forest Service personnel. The questionnaire asked campers to rate their camping experience, treatment by campground host and staff, and the condition/cleanliness of facilities, as well as additional questions to determine camper preferences as well as satisfaction. Campers were given a choice of five ratings for each question, A (highest) through E (failing), to indicate their feelings. A total of 71 responses were received with a 100% rating of C or better for the overall quality of the services provided and a 76% rating of B or better. The largest dissatisfaction voiced was the fact that Beaver Meadows impoundment, which is a favorite feature at that campground, was drained for maintenance work.

Combining the results of the Washington Office and Marienville District surveys gave a satisfactory rate of 98% with 72% of respondents voicing compliments. These results are very consistent with past surveys. Most of the complaints or suggestions, other than those at Beaver Meadows, dealt with areas having identified deferred maintenance needs, which are a priority for capital improvement when funds become available. Dissatisfied customer comments were followed up with the concessionaire or with a contact from the forest to assure appropriate corrective measures were taken where feasible.

An analysis of relationships between ROS classes does not show any trends or significant shifts from the data collected. A possible exception is that of increasing river use. Most of the changes discussed in the previous paragraphs are spread evenly across ROS classes. There also appear to be no significant changes in use across Management Areas, again with the possible exception of river areas (MA 6.1) and a slight increase in wilderness use (MA 5.)

In reviewing the Forest Plan outputs through the 14th year of Plan implementation, we can see that use continues to exceed Forest Plan projections for Decades 1 and 2 by 34 percent; i.e. we are in the 14^{th} year of a 20 year period at which time one could expect 70% accomplishment of the 20 year projection instead of the 104% actual accomplishment. Analysis of the data indicates most of the increase continues to be in dispersed use. The activities that are growing faster than projected include motorized trail use, mountain bike use, foot trail use, horseback riding, driving for pleasure, camping outside of developed areas, and canoeing. With the addition of the Clarion River in October 1996 as a National Wild and Scenic River and the 86.5 miles in the Allegheny National Wild and Scenic River, the total of designated river on and adjacent to the ANF is approximately 140 miles. Increased dispersed use along these waterways is expected to continue due to increased marketing by local tourist promotion agencies, increased public awareness, and interest brought about by the designations. No facilities or areas are receiving use beyond capacity with a possible exception of ATV trails. Progress was made during 1999 to bring trail conditions up to maintainable standards so that future efforts can be focused towards trail expansion to better meet demand and Forest Plan objectives. The additional use, which is above Forest Plan projections, does not produce any discernable additional environmental effects beyond those described in the Forest Plan EIS.

Miles of Trail Constructed, by Type and MA

Method of Measure: Recreation Information Management Summary and Management Attainment Report

Monitoring Results:

TABLE 41. MILES OF TRAIL CONSTRUCTION (New Trail Miles)

Type of Trail	MA	Forest Plan Amount (Decades 1 & 2)	1999	Total to Date (86-99)	% Of Forest Plan
Pedestrian	1.0	0	1.1		
	3.0	26	0		
	5.0	3	0		
	6.1	38	0		
	6.2	8	0		
	6.4	9	11.4		
	8.0	5	0		
(All MAs)		**89**	**12.5**	**56.2**	**63.1%**
Motorized/Winter	3.0	22	1.7		
	6.1		.5		
(All MAs)		**22**	**2.2**	**74.7**	**339.5%**
Motorized/Summer	1.0	6	0		
	3.0	240	0		
	6.1	44	0		
(All MAs)		**290**	**0**	**74.4**	**25.7%**

TABLE 42. MILES OF TRAIL RECONSTRUCTION IN FY 99
(Reconditioning Existing Trails)

Type of Trail	Pedestrian	Motor/Winter	Motor/Summer	Total
# Miles	5.5	2.8	3.0	11.35

Evaluation of Results: Pedestrian trail miles changed significantly in FY 99 with the addition of 1.1 miles of interpretive trail (Timberdoodle Flats) and 11.4 miles of new trail added to the Tracy Ridge NRA Trail System. Also the reconstruction of a segment of the Allegheny Snowmobile Loop at Kellettville resulted in the construction of 2.2 miles of new trail. Both pedestrian and summer motorized trail miles are still short of the amount projected in the Forest Plan.

Work done in FY 99 toward major reconditioning of existing trails included miles accomplished on segments of the Buzzard Swamp and Minister Creek Trails, Marienville Bike Trail and on connectors 12 and 23 of the snowmobile trail.

The backlog of reconstruction, which existed prior to FY 98, has been significantly reduced through the accomplishments of the two trail crews, as well as other trail accomplishments listed above for this year. In FY 99, the ANF, its partners and volunteers again performed both heavy and routine maintenance work on over 600 miles of trails.

Total Recreation Receipts and management Capacity Figures for Developed Recreation Sites

Method of Measure: Recreation Information management Summary and Management Attainment Report

Monitoring Results:

	Forest Service	Concessionaire	Total
PAOT* Days	255,455	3,372,090	3,627,545
Receipts	$80,794	$350,325	$431,119

**** Persons at One Time; a measure of capacity***

Evaluation of Results: The PAOT-Day figure is a measure of the total amount of developed recreation site capacity the Forest operates and maintains during the year. This figure is not associated with use; it measures the amount of recreation available for use each year. In other words, even if no one chose to use a campground, trailhead, etc., this figure would not change because the Forest would still have to operate and maintain the areas open for use.

The PAOT-Day figure is derived by determining the capacity of a site in terms of how many people it is designed to accommodate multiplied by the number of days it is expected to be open and available for use. Take, for example, a campsite designed to handle five people at one time (PAOT). If it was operated and maintained for 100 days, then the PAOT-Day figure would be 500 (5 PAOT x 100 days). The average total figure for the Forest is approximately 3,600,000 PAOT Days. Occasionally there is a need to close sites for reconstruction or reduce the length of time they are open.

In FY 99, we managed for 3,627,545 PAOT Days. This is a slight increase in PAOT Days from FY 98, brought about by the expanded seasons of concessionaire operated areas. The new concessionaire offerings also resulted in an increase of Forest Service managed PAOT Days and corresponding decrease in concessionaire managed days.

Total receipts for FY 99 decreased slightly from 1998, which is partially related to the decrease in occupancy at Beaver Meadow. Recreation receipts have increased over 70 percent since concessionaire operations began in 1994. Fee collections after major renovations at Twin Lakes (1991), Loleta (1995), and Willow Bay have increased significantly.

Status of Recreation Site Construction and Maintenance

Monitoring Results: The following projects were initiated or continued during FY 99.

- Willow Bay: Construction continued with the completion of the renovation of the Hemlock Loop. Thirty-five new walk-to sites in the new Deer Grove camping area were also partially completed.
- Hearts Content Day Use Area: the pavilion was renovated with new supports and a new roof.
- Rimrock: The stonework was completed on the steps and overlook.
- Accessibility: All of these projects improved accessibility in these areas.

ECONOMICS

The National Forest Management Act (NFMA) planning regulations requirement for monitoring this category of information is very specific [36 CFR 219.12(k)(3)] and states that we will monitor "costs associated with carrying out the planned management prescriptions as compared with costs estimated in the Forest Plan." Carrying out this section of the monitoring program will involve the continued use of management codes for keeping track of costs by activity.

Cost per Unit for the Following Activities

Method of Measure: Management codes, Program Accounting Management Attainment Reporting System (PAMARS), Cumulative Accomplishment Target System (CATS) data, contract records, and engineering reports.

Monitoring Results: (See Table 43)

Evaluation of Results: Overall, unit costs are in line with previous years, assuming a general inflation rate of two to three percent annually.

With regard to Pedestrian Trail Construction/Reconstruction, the FY 99 unit cost is much higher than previous years due to the type of trail involved. One of the trail projects, Timberdoodle Flats, was a wildlife interpretive project, which is much more expensive than typical pedestrian trail.

Summer Motorized Trail unit costs are slightly higher than in the past, as the remaining rehabilitation projects are generally the more expensive ones. Motorized Winter Trail unit costs are higher than FY 98 because the 5.0 miles of accomplishment includes bridges. Overall, unit costs for trail rehabilitation projects for Summer and Winter Motorized Trails will probably rise, as most of the easy, less expensive backlog work has been completed. Once the system is brought up to standard, reconstruction work should drop dramatically, and unit costs can be expected to stabilize.

The unit costs for Wildlife, Fish, and T&E Habitat Structural Improvement rose dramatically in FY 99 due to a change in definition for reporting fish habitat work. Previously, inexpensive fish habitat work completed on the Allegheny Reservoir was reported as “# of structures.” The new definitions convert these structures to “# of acres of habitat enhanced.” This caused a drop in number of structures, and a posted rise in structural habitat unit costs.

Timber Sale Preparation costs continue to rise as the level and scope of NEPA project analysis increases in response to litigation issues.

Herbicide unit costs rose because the number of acres treated dropped, so our overhead costs were spread over fewer acres of treatment.

Fencing costs dropped due to better than normal contract bids, and larger acreages of work, which spreads our sunk overhead costs.

TABLE 43. 1999 COST OF IMPLEMENTATION, PER UNIT

Activity	Unit of Meas.	FY 99 Units Accomp.	FY 99 Total Cost	FY 99 Unit Cost	Forest Plan Estimate	FY 98 Unit Cost	FY 97 Unit Cost	FY 96 Unit Cost	FY 95 Unit Cost	FY 94 Unit Cost	FY 93 Unit Cost
Trail Construction/Reconstruction											
... Pedestrian Trails	Mile	18	$172,660	$9,592		$3,433.89	$3,338	N/A	$54,369	$11,734	$13,970
... Bridges	Bridge	3	$0	$0		$10,927.33					
... Motorized/Summer	Mile	3	$32,780	$10,927	$2,782	$8,834.95	$29,705	$116,688	$6,245	N/A	$15,931
... Motorized/Winter	Mile	5.0	$123,945	$24,789		$2,522.50	$28,129	$97,158	$16,614	N/A	$7,935
Sale prep to offer	MBF	15,349	$1,620,992	$105.60	$10.90	$286.82	$56.86	$51.11	$49.64	$34.56	$36.58
	MCF	25,144	$1,620,992	$64.46		$1,763.58	$348.53	$763.87			
Wildlife, Fish, T&E Species Habitat Improvement	Acre	2,079	$626,505	$301.35		$313.42	$302.26	$295.27	$197.20	$188.21	$159.19
Wildlife, Fish, T&E Species Habitat Improvement	Struct.	36	$37,822	$1,051		$115.38	$56.82	$57.00	$69.86	$66.91	$34.53
Site Prep for Natural Regeneration	Acre	1,743	$228,263	$130.95	$40	$98.94	$103.80	$87.50	$63.06	$93.43	$57.18
Herbicide	Acre	858	$169,077	$197.05	$57	$153.12	$161.62	$152.89	$134.85	$155.70	$218.38
Aerial Fertilization	Acre	1,060	$234,274	$221.01	$244	N/A	$216.10	$196.59	$197.31	$207.80	$138.31
Timber Stand Improvement (Release)	Acre	664	$101,189	$150.89	$60	$208.99	$154.25	$172.57	$0	$0	$0
Fencing	Acre	929	$285,764	$307.60		$445.62	$608.16	$395.79	$344.96	$301.13	$368.86
Road Construction	Mile	0	$0	$0	$46,337	$46,795.33	$39,569.29	$46,207	$29,765	$36,099	$50,225
Road Reconstruction	Mile	43.9	$1,408,707	$32,089	$26,659	$28,348.39	$18,240.03	$21,070	$14,229	$13,420	$9,249

ROADS

Road Status Summary showing the Following Categories:

a. Total system road miles and density by Management Area (MA).

b. Miles of new construction by MA - no prior existing corridor.

c. Miles of temporary road construction (Forest-wide).

d. Miles of new system road constructed by MA on existing, unimproved locations (this is identified as "reconstruction" in the Forest Plan).

e. Resurface road miles and cumulative resurface road miles.

Method of Measure: By Transportation Planner from completed work.

Evaluation of Results: Road densities are well within or below the Forest Plan's mile/square mile guidelines (see Table 44). As in past Monitoring Reports, we have included a column titled road restoration miles (roads that have had minor work completed on them). This work would include culvert replacement, grading, and replacement of surfacing material. During the development of the Forest Plan, this type of work was included within road maintenance. However, shortly after the Forest Plan was approved, the national definitions and funding philosophies were changed to include this type of work within the general category of road reconstruction. To better understand what has occurred on the ground and its relationship to the Forest Plan projections, we will discuss and display all categories of reconstruction.

The National definition for road reconstruction is found in Forest Service Manual (FSM) 7705.

Road Reconstruction - The investment in construction activity that results in betterment, restoration, or in the realignment of a road as defined in the following:

Realignment - Investment in construction activity that results in the new location of an existing road or portions thereof.

Betterment - Investment in construction activity that raises the traffic service level of a road or improves its safety or operating efficiency.

Restoration - Investment in construction activity required to rebuild a road to its approved traffic service level.

Road Maintenance - Expenditures in the minor restoration and upkeep of a road necessary to retain the road's approved traffic service level.

The differences in these definitions are one of intention or purpose of the work to be performed, not necessarily the work activities themselves (i.e., applying pit run surfacing could be a work activity under realignment, betterment or restoration or even road maintenance). If we are replacing worn out surfacing or culverts that are corroded through, then the project intent is restoration. If the intention is to improve the road from a Traffic Service Level (TSL) "D" to a TSL "C", then it is classified as betterment.

In an effort to improve understanding of what is actually happening on the ground, a decision was made to not use the general term *road reconstruction* itself but to explain the subcategories. The subcategories of reconstruction called realignment, betterment, and restoration will be tracked and described in all NEPA and monitoring documents.

TABLE 44. ROAD STATUS BY MANAGEMENT AREA

					Road Construction			Temporary Road Construction			Road Reconstruction				
											Betterment			Restoration	
Mgmt Area	Total Miles	Density (mi/sq mi)	Forest Plan Density (mi/sq mi)	Existing Roads	1999 (miles)	Cum. Total (mi)	% of Forest Plan Miles	1999 (miles)	Cum. Total (mi)	% of Forest Plan Miles	1999 (miles)	Cum. Total (mi)	% of Forest Plan Miles	1999 (miles)	Cum. Total (mi)
1.0	8.9	0.8	1 to 3	0.0	0.0	2.3	~	0.0	0.0	~	0.0	3.1	~	0.0	5.3
2.0	13.8	1.5	2 to 4	0.0	0.0	1.0	14.3	0.0	0.0	~	0.0	3.4	113.0	0.0	5.5
3.0	877.2	1.7	2 to 4	0.0	0.0	144.0	57.0	0.0	10.3	~	0.0	103.1	99.7	12.2	534.7
6.1	175.9	1.1	1 to 3	0.0	0.0	8.4	40.0	0.0	1.0	~	0.0	5.5	65.5	26.4	69.3
6.2	31.7	1.0	1.5 to 4	0.0	0.0	7.8	80.0	0.0	1.8	~	0.0	3.8	90.5	0.0	8.9
6.3	5.7	3.6	~	0.0	0.0	0.0	0.0	0.0	0.0	~	0.0	1.7	~	2.7	2.7
6.4	5.3	0.1	~	0.0	0.0	0.0	0.0	0.0	0.0	~	0.0	0.0	~	1.1	1.1
7.0	11.5	7.2	~	0.0	0.0	0.6	~	0.0	0.0	~	0.0	0.8	~	1.5	13.6
8.0	5.0	0.0	~	0.0	0.0	0.0	0.0	0.0	0.0	~	0.0	0.0	~	0.0	4.7
9. 1	1.4	0.9	~	0.0	0.0	0.0	0.0	0.0	0.0	~	0.0	0.0	~	0.0	0.0
Total	**1136.4**	**1.8**	**~**	**0.0**	**0.0**	**164.1**	**56.5**	**0.0**	**13.1**		**0.0**	**121.4**	**102.0**	**43.9**	**645.8**

***Density** - Total miles divided by square miles assigned to that Management Area (Forest Plan, p. 4-55).*
***Existing Roads** - Existing non-system roads added to system minus roads taken off of the system (obliterated) and adjustments for changes due to improved data.*
***Cumulative Totals** are for FY 86 to present.*

We have slightly exceeded our Forest Plan estimate for betterment and realignment. We consider this a positive environmental impact, because by doing so, we have been able to keep the amount of new road construction (which has more impacts to the landforms) at a level significantly less than estimated in the Forest Plan.

We have also been attempting to minimize new road construction. In some instances, we have been able to perform betterment or realignment, and thereby eliminate the need for new construction. This is evidenced in the fact that we have constructed less than 60 percent of the amount the Forest Plan estimated projection for new roads.

Other factors have also contributed to increased road reconstruction - betterment mileages. We have reconstructed several roads primarily to reduce the potential for erosion and sedimentation from those roads. For example, we have improved 5.9 miles of Township Roads, some within 100 feet of perennial streams. These types of projects were not included in the Forest Plan reconstruction estimates.

A review of our records indicated that all of our road reconstruction projects fell within the definitions of either betterment or restoration. Therefore, there is no column titled realignment in Table 46.

The current status of road management is: 38% open, 25% restricted, and 37% closed. The Forest Plan calls for 20% of the roads to be open, 20% restricted, and 60% closed. As stated in the plan, this is a long term objective, to be attained within 50 years. At the present rate, it is projected that the forest will meet this objective in the 50 year time frame. Table 45 compares our progression toward meeting this objective since 1987.

TABLE 45. ROAD MANAGEMENT BY YEAR

	OPEN		RESTRICTED		CLOSED		TOTAL
Year	%	Miles	%	Miles	%	Miles	Miles
1987	63	573.5	24	216.2	14	123.5	913.2
1988	na	na	na	na	na	na	na
1989	58	564.1	22	214.0	20	194.4	972.5
1990	55	550.8	21	210.3	24	240.3	1,001.4
1991	52	542.8	21	219.2	27	281.8	1,043.8
1992	na	na	na	na	na	na	1,055.7
1993	41	449.8	19	211.5	40	445.5	1,106.8
1994	39	438.4	24	269.3	37	416.3	1,124.0
1995	38	430.6	25	385.2	37	419.6	1,135.4
1996	38	430.6	25	284.6	37	422.1	1,137.3
1997	38	430.6	25	284.6	37	426.3	1,141.5
1998	38	430.6	25	284.6	37	426.6	1141.8
1999	38	428.9	25	284.6	37	422.9	1136.4
w/ OGM Roads on System	36	432.4	24	288.2	40	480.4	1,201.0

na - data not available

The Forest Plan emphasizes road management. Our NEPA documents are discussing road management to a greater extent than they have in the past. This chart demonstrates the significant progress the ANF has made towards the road management guidelines in the Forest Plan.

LAND ADJUSTMENTS

Summary of National Forest Land Adjustments by MA

Method of Measure: Continuous tabulation of land adjustments.

Monitoring Results:

TABLE 46. SUMMARY OF NATIONAL FOREST LAND ADJUSTMENTS

Mgmt. Area	Acres Acquired in FY 99	Acres Disposed of in FY 99	Net Change since 1986
1.0	0	0	0
2.0	0	0	0
3.0	0	0	+716
6.1	0	0	0
6.2	0	0	+1,580
6.3	0	0	0
6.4	0	0	0
7.0	0	0	0
8.0	0	0	+300
9.1	0	0	0
Total	**0**	**0**	**+2,596**

Evaluation of Results: No adjustments were made to the total land base of the Allegheny National Forest in FY 99.

RESEARCH, ADMINISTRATIVE STUDIES, AND ADAPTIVE MANAGEMENT

Research needs were identified in the Forest Plan [36 CFR 219.7(e)]. Since 1986, when implementation of the Forest Plan began, ANF personnel have followed three paths to accomplish needed research. First, we have worked with scientists to develop formal research studies that will answer our research needs. ***Research studies*** are conducted to advance the frontiers of scientific knowledge and to test hypotheses of broad forest management interest. Second, we can use ***administrative studies*** to test solutions proposed by Research that we believe will work within our boundaries and our administrative and management framework. Third, when we believe that information already available suggests a probable solution for problems that we face, but these solutions are accompanied by uncertainty, we can use an ***adaptive management*** approach. To us, adaptive management means defining expected outcomes and designing methods to measure responses to the implementation of proposed solutions, monitoring results with planned measurements and analyses, learning from the comparisons between expected and actual outcomes, and changing actions and plans according to what we learn. In the sections that follow, we describe ongoing applications of all three approaches to meeting research needs. For additional information, refer to summaries presented in previous ANF Monitoring and Evaluation Reports.

ECOLOGICAL CLASSIFICATION AND INVENTORY (EC&I)

This is a cooperative and partnership project between Clarion University Department of Biology (Dr. Charles E. Williams), Penn State University Office for Remote Sensing of Earth Resources (George Baumer), and the Allegheny National Forest (ANF). The objective is to produce ecological land type maps, associated resource interpretations, and soil/site - vegetation relationship information for project planning, long-term planning, and long-term monitoring.

Status: Field assessment of vegetation - site relationships on ecological mapping units continued this past summer through an agreement with Clarion University (Dr. Charles Williams) and the ANF. Forest overstory, herbaceous layer, soils, ecological site data, and large woody debris were quantified in $500m^2$ plots. A total of 30 random plots were sampled during summer 1999. Some data has been translated into GIS format by Penn State (George Baumer). Analysis of vegetation and soils data is on-going.

MONITORING AND EVALUATION OF DEER BROWSING ON RIPARIAN PLANT COMMUNITIES

Past field work conducted by Clarion University (Dr. Charles Williams and students) and the ANF has demonstrated that riparian zones on the ANF support species-rich plant communities that are compositionally distinct from those of adjacent uplands. Little is known about the impact of deer browsing on the structure and composition of ANF's rich riparian plant communities.

Through a partnership with Clarion University (Dr. Charles Williams), a pilot study on deer browse impacts to riparian plant communities that was initiated the summer of 1997 is being continued into 1999. A permanent plot system was established at each of three riparian sites in the ANF to inventory and assess vegetation for deer browse damage. In addition, work is continuing on assessing the indicator potential of an herbaceous riparian plant, turtlehead *(Chelone glabra)*, for monitoring the impact of deer browse on riparian plant communities.

Analysis of browsing data is on-going, and browse monitoring and indicator assessment of turtlehead will continue into year 2001.

Eric Mosbacher (Masters Degree, Clarion University) continued his camera study to determine the use that deer make of riparian areas. This will be completed in year 2000.

INVENTORY OF ALIEN PLANTS ALONG KINZUA CREEK

An inventory of non-native or alien plants occurring in the riparian zone of Kinzua Creek of the ANF was conducted this past summer by Clarion University (Dr. Charles Williams). The goal of this project was to assess the threat of non-native invasive plant species to the structure and function of riparian zones, identify what non-native invasive plants are present, and to develop a management strategy to deal with these threats.

Sample points were stratified along the public lands in the Kinzua Creek riparian corridor and inventoried using a time-constrained search method. Thirty sample points were completed. Both native and non-native plants were inventoried at each sample point to provide more information on the composition of the riparian flora of Kinzua Creek.

In 2000, Dr. Williams will be conducting a time-constrained inventory of non-native invasive and native plants on the Allegheny River Wilderness Islands and also in old and new oil and gas development sites.

EFFECTS OF GYPSY MOTH EGG MASS DENSITIES ON SHELTERWOOD AND SEED TREE CUTS ON THE ALLEGHENY NATIONAL FOREST

This research study is being conducted by Dr. Rose-Marie Muzika, Research Ecologist, Dr. Kurt Gottschalk, Project Leader, and David Feicht, Forester, Northeast Forest Experiment Station, Morgantown, WV. It is scheduled for completion in FY 2000.

Problem Statement: As a result of repeated gypsy moth defoliation, drought, and the action of secondary organisms, significant acreages on the ANF have developed substantial tree mortality. Increasing acreages have very low (overstory) stocking with valuable trees that are highly susceptible to defoliation. Are these stands with low residual stocking at higher risk of defoliation with lower densities of gypsy moth egg masses than are currently used as spray thresholds?

Objectives:

1. To evaluate the susceptibility of shelterwood seed cut areas to defoliation where egg mass densities are low.

2. To evaluate the effects of expected defoliation on vulnerability to mortality of residual trees in regeneration cuts.

3. To evaluate tree regeneration response under various residual stocking levels as well as the effects of gypsy moth defoliation of tree seedlings.

Status: Study areas were established in 1991 on the ANF and State Game Lands 29. Egg mass density data was collected through 1993.

Evaluation of susceptibility (Objective 1) and vulnerability of residual trees (Objective 2) was discontinued in 1994 due to the treatment of all study plots on the ANF with B.t. The B.t. treatments were necessary to minimize potential mortality of planted oak seedlings from expected gypsy moth defoliation. Replanting costs would be high. This B.t. treatment compromised the several years of gypsy moth population data that were being monitored in these shelterwoods. No further overstory data collection is planned at this time.

Tree regeneration (seedling) response (Objective 3) was re-measured annually between 1991 and 1995. The next scheduled re-measurement will be in the year 2000. Tree seedling development data is still important due to the timely bumper acorn crop in 1990. Through the end of 1995, the number of oak seedlings greater than one foot tall has gradually increased inside the fenced shelterwoods to around 1,200/acre, while the number has declined in the unfenced shelterwoods, and no oak larger than one foot tall was recorded in 1995 in the control (fully stocked) stands. This same pattern holds true for black cherry and other commercial hardwoods (birch, red maple, etc.) in these stands.

EXAMINING THE EFFECTIVENESS OF CLEANINGS TO ENHANCE THE SURVIVAL AND DEVELOPMENT OF OAK SPECIES IN YOUNG MIXED-SPECIES STANDS

Principal Investigators: Dr. Kurt Gottschalk, Research Forester and Project Leader, and Dr. Gary Miller, NERS, Morgantown, WV; Dr. Tom Schuler, Research Forester, NERS, Parsons, WV; Dave Lombardo and Steve Wingate, Silviculturists, Allegheny National Forest, Marienville Ranger District, Marienville, PA; and Bob White, Silviculturist, ANF, Warren, PA. This study is scheduled for completion in FY 2010.

Problem Statement: Previous research in the Eastern United States has shown that various pre-commercial thinnings, cleanings, and weedings can improve growth and survival of the species released. Treatments can help regulate tree species composition in developing stands. The tree age or stage of development is critical to the success of the treatment. Most of the ANF stands treated are between 8 and 25 years of age. Without treatment, local observations indicate numerous young stands (including harvested areas as well as areas where no harvest has occurred) may lose some of the desired tree species diversity present initially when the stand is at the seedling stage of development.

Objectives: Initial objectives of this study are two-fold: 1) to test the appropriateness of cleaning/release/pre-commercial thinning standards for the ANF, and 2) to assess the efficiency (biological effectiveness and economic feasibility) of cleaning/release/pre-commercial thinning treatments to enhance the survival probabilities of oak crop trees in young stands established after a variety of natural disturbances and cutting.

Status: ANF and research personnel selected proposed study sites in FY 1999. ANF personnel have begun appropriate NEPA analysis.

REGENERATING NORTHERN RED OAK ON THE ALLEGHENY NATIONAL FOREST USING TREE SHELTERS

Principal Investigators: Thomas M. Schuler, Research Forester, Northeastern Research Station, Parsons, WV, with cooperation from Bob White, Silviculturist, Allegheny National Forest, Warren, PA and Andrea Hille, Forester, Bradford Ranger District, Bradford, PA. This research study is scheduled for completion in 2010.

Problem Statement: Regeneration of northern red oak on good to excellent growing sites is a common problem throughout the eastern and central United States. Natural regeneration methods are still being tested and depend on existing natural seedlings of sufficient size and quantity to be successful. Adequate natural stocking of this advanced regeneration is an uncommon situation in many of today's forests. A possible alternative to natural regeneration is the use of plastic tree shelters in conjunction with a planted seedling. This is a method that has been widely adopted on the Allegheny, Monongahela and other eastern National Forests. However, detailed silvicultural prescriptions regarding the use of tree shelters have not been tested, and information about the long-term results does not exist.

Objectives: Many environmental variables could influence the success or failure of regenerating a stand with the use of tree shelters. Some of those discussed which are relevant to the conditions on the ANF include the use of herbicides to control competing vegetation, tube height and color, stake material, the use of nets on top of the shelter, competing species and height of competing vegetation, the use of fencing to prevent or reduce deer browsing of the natural regeneration, site quality or land type association, age of planting stock, quality of planting stock, planting technique, month planted, species planted, and density of residual overstory. Initially, given the restrictions of time and money, it was clear that the study would have to focus on one or two explanatory variables of greatest interest.

After evaluation, it was decided to initially investigate only the role of residual overstory density and competing understory density on the height growth and survival of northern red oak seedlings planted in white shelters. Study sites would incorporate existing operational efforts by the ANF staff and not establish any new experimental sites.

Status: Study sites were established in May 1995, and initial measurements were taken on 400 trees from different stands. Residual basal area of the overstory trees ranged from an average of 14.5 to 62.8 square feet per acre.

Height of the sheltered seedlings and height and species composition of the competing vegetation were measured again in May 1996, May 1997, April 1998, and April 1999. In July 1996, 14 trees were minimally released to prevent overtopping by competing vegetation. In 1997, 12 trees were released in the same manner, and 8 were released for the second year. In April 1998, 22 trees were released, of which 12 had been released at least once before in the spring of 1996 or 1997. In April 1999, 26 trees were released, of which 19 had been previously released. The release procedure was experimental and only removed the branches that were overtopping the sheltered tree, leaving the majority of the competing vegetation. In 1997 and 1998, some plots were difficult to re-measure because brass tags and flagging were missing. For this reason, one plot with very low survival and growth has been dropped.

First year observations suggested that growth rates declined as overstory basal area increased. Following the second, third, fourth, and fifth years of measurements, it was possible to measure the growth, and the results correspond with initial observations (see table on next page). The two stands with the highest residual overstory basal area (i.e., about 60 square feet per acre) exhibited a sheltered seedling growth rate of about 0.5 feet in the 1995 growing season, 0.35 feet in the 1996 growing season, .1 foot in 1997 growing season, and .2 feet in the 1998 growing season. The two stands with lower levels of basal area (i.e., about 15 and 31 square feet, respectively) had an average growth rate of just over 1.0 foot during 1995, 0.65 foot in 1996, 1.05 foot in 1997, and 1.1 feet (based on one remaining stand) in 1998.

In the two stands with lower basal area, by 1996, about half of the surviving seedlings have emerged from the top of the shelter. Many of the seedlings reached the top of the shelter with the nets still intact. The nets are used to prevent birds from entering the shelter and becoming entrapped. This almost always caused a serious deformity in the stem of the sheltered seedling. Many of these were clipped back below the deformity to prevent future problems associated with poor form. Our observations clearly indicate the need for net removal before the stem grows tall enough to contact the net. Nets with larger openings in the fabric reduced the chances of deformity, but some still occurred.

While growth rates are significantly related to the residual overstory density, much of the variation in growth rates cannot be explained by this variable alone. Among the multitude of other potentially significant explanatory variables, it appears that the competing vegetation is going to play an increasingly important role in determining sheltered seedling survival and growth. The stand with the lowest level of residual overstory density is dominated by red maple regeneration that has been heavily browsed but has grown above browse height in some areas of the stand. Competing vegetation in the other stand with relatively open conditions is characterized by a much more diverse array of species, including grasses, ferns, shrubs, and some tree species. The height growth of this suite of

species should be much less of a threat to the continued survival of the sheltered oaks than in the stand dominated by red maple. However, shade from the much expanded crowns of the residual overstory trees now appears to be affecting survival and growth of some of the planted seedlings. Browsing has undoubtedly had a major effect on the natural regeneration in both stands and has actually benefited the sheltered oaks by slowing the growth of the competing vegetation.

The interaction between sheltered seedling growth, residual overstory density, and competing understory vegetation is an important aspect of this study. Past efforts have shown that sheltered seedlings demonstrate the greatest growth rates in full sunlight. The drawback to this is that so does the competing vegetation. Our objective is to establish the desired species in the newly created stand following overstory removal. It is our desire to find a level of stocking that favors sheltered seedling development while minimizing the competition from natural regeneration of undesirable species. Continued monitoring and analysis of these stands may provide some important insights into this complex problem.

STAND LEVEL CHARACTERISTICS OF ANF STUDY SITES AND SHELTERED SEEDLINGS USING MEASUREMENTS TAKEN IN APRIL 1998

ID	Basal Area[1] (ft^2/ac)	Date of Origin[2]	Survival April[3] 1999	Height May 1995 (feet)	Height May 1996 (feet)	Height May 1997 (feet)	Height April 1998 (feet)	Height April 1999 (feet)	Sample Size	Remarks
411-1	62.8	1991	51%	3.1	3.6	3.9	4.1	4.3	100	by aspen
411-2	14.5	1992	91%	4.3	5.3	6.0	7.2	8.2	100	behind gate
424-3	31.8	1991	67%	3.9	5.0	5.6	6.5	6.9	100	spring
424-4	59.4	1993	N/A	1.5	2.1	2.5	2.5	N/A	100	oil tank[4]

1 - Stand average residual overstory basal areas as measured in May 1995.
2 - Planted prior to the onset of the growing season in the year specified.
3 – CORRECTION: correct 1998 values in this column are 64%, 92%, 67%, and 11% (top to bottom).
4 – Dropped from study due to vandalism.

USING AN ADAPTIVE MANAGEMENT APPROACH TO ANSWER QUESTIONS RELATED TO TREE SEEDLING DEVELOPMENT IN OAK, UPLAND HARDWOOD, AND NORTHERN HARDWOOD FOREST TYPES

Development of an adaptive management strategy to regenerate stands having a low black cherry seed source has been a cooperative venture between the Ecosystem Management Team of the Allegheny National Forest and scientists at the Northeastern Research Station (NERS) in Irvine, PA. Primary responsibility lies with Lois DeMarco and Bob White on the ANF and with Dr. Susan Stout and Dr. Stephen Horsley at NERS. District silviculturists Stan Kobielski and Steve Wingate are responsible for recommending specific sites to include in the study and ensuring that prescribed treatments occur.

Problem Statement: As reported in the 1995 Monitoring and Evaluation Report, ANF personnel are concerned about the mix of tree species and the low number of seedlings of species other than black cherry and black birch, which are developing in these forest types. Selective browsing by white-tailed deer, dense interfering plants, and erratic seed production all play a role in limiting seedling development. Strategies are needed to regenerate other species. In response to this situation, the ANF has initiated an adaptive management approach to find answers to management questions related to seedling development and composition in regenerating stands.

Adaptive management is a process, which allows existing and evolving research findings to be blended with applied management actions. Carefully monitoring preliminary results and being flexible in applying subsequent

actions can attain successful management objectives, while furthering overall knowledge. By placing a strong emphasis on understanding the starting conditions, the series of management actions or environmental events which take place, and the response to actions and events, we will be able to generate an increased understanding of patterns and levels of seedling development.

Objectives: Our objectives for this adaptive management strategy are the following: 1) to develop full stocking of advance regeneration of a variety of species appropriate to each forest type, and 2) to make final harvests in stands of each forest type which have good advance regeneration and achieve full stocking and establishment of a variety of appropriate species.

Status: Three work plans were developed in 1996 to address the needs of the different forest types. Progress on each is described in the following paragraphs.

The Oak Type

The first step in developing an adaptive management approach for the oak type was to determine under what conditions, if any, had successful oak regeneration become established during the last 25 years. Field visits were made to stands, which had been regenerated since the early 1970's. While we do not have data that describes the conditions that existed at the time of treatment, and in some cases we do not have a complete picture of stand treatment history, we did find that oak seedlings have been successfully established in some stands. The following is a summary of what we have observed.

- Oak seedlings were established on some sites through natural regeneration processes. Most of the cases followed some kind of catastrophic event such as tornado, wildfire, or tree mortality associated with severe drought and insect defoliation.

- Some of these stands are in areas where low levels of deer impact exist (i.e., adjacent to farmland, high levels of 0-20 year age class, etc.).

- Planting and protecting stems with tree shelters have successfully establish oak seedlings.

- It was evident in some of the older (10-25 year old) stands that oak had been established early on in the life of the stand, however it had become or was becoming over-topped by faster growing species such as red maple, black birch and black cherry. Tree mortality was occurring, thereby removing some of the oak component from these stands. This is occurring in stands regenerated both through natural and artificial regeneration methods.

Based on these observations, we intend to implement a series of regeneration treatments in oak stands focusing on the following:

- Overstory tree stocking needs to be lowered sufficiently to allow adequate light to reach the forest floor for seedling establishment to occur.

- Seedbed preparation could include herbicide application or prescribed burning to remove vegetation, which competes with developing oak seedlings.

- Continued monitoring following the removal cut will be needed to ensure the retention of oak as the stand develops. Release treatments (mechanical, manual or prescribed burn) will be applied to see what works best under a variety of conditions.

Stand selection has taken place in the Wolf/Pigeon project area. Implementation of one ten-acre prescribed burn in the Wolf/Pigeon sale area took place in 1999. Pre- and post- burn surveys were taken. Oak seedlings

resprouted following the burn. Some aspen was also found after the burn. Follow-up surveys are scheduled for FY 2001. The remaining prescribed burns in the Wolf/Pigeon project will occur after timber harvests have been completed, most likely by FY 2002.

In FY 1999, we began a cooperative administrative study with NERS, Morgantown, WV, which examines the effectiveness of cleaning/release/pre-commercial thinning to enhance the survival and development of oak species in young mixed-species stands. Appropriate sites have been selected and NEPA analysis is in progress.

The Upland Hardwood Type

Working with scientists at the NERS, Irvine, PA, ANF personnel developed an action plan which outlines a series of regeneration prescriptions which will be applied in upland hardwood stands which have low stocking of black cherry. It is believed that deer impact, light quality and the length of time needed for seedlings to develop are the three most critical factors which must be considered in regeneration prescriptions for upland hardwood stands. The purpose of this phase of adaptive management will be to determine the ranges and combinations of tree harvest and/or reforestation treatments, which will encourage the development of red maple seedlings.

In 1999, plot data were collected in a select group of 10-30 year old stands to monitor seedling/sapling development and species composition of regenerated stands. Based on preliminary assessment of survey data, this data collection will be expanded in FY 2000 to provide more information on this age class.

The Northern Hardwood Type

The action plan for the northern hardwood type included revising regeneration standards for uneven-aged management treatments and the completion of a formal analysis of regeneration success in selected stands where uneven-aged prescriptions have been implemented.

Forest managers on the Allegheny plateau have questioned the viability of uneven-age silvicultural systems (UEA) for many years because of the regeneration challenges associated with these systems: long periods of exposure to deer browsing and widespread difficulty in regenerating eastern hemlock and sugar maple. Since 1986, the Allegheny National Forest has been applying UEA prescriptions in areas where multiple resource objectives precluded the use of even-age silvicultural systems and to comply with the 1986 Allegheny National Forest Land and Resource Management Plan. In 1996, Forest personnel undertook a project to assess these areas to determine if modifications in prescription application are needed, and to complement emerging results from the Hoffman Farm administrative study.

During the summer of 1996, field data were collected in 35 stands totaling 749 of the 2,027 acres that received UEA silvicultural treatments between 1988 and 1994. In the 1996 Monitoring and Evaluation Report, we reported the survey results, indicating that uneven-aged treatment success has been limited. We continue to review regeneration standards and local site-specific results, paying particular attention to standards used elsewhere in the Northeast. Another report should be available in 2001.

Implementation and monitoring has continued to occur in both the Hoffman Farm and Porter's Prize Administrative Study areas. Both of these studies are expected to contribute to developing strategies for treating northern hardwood stands. In 2001, we will use a similar process as was used in the oak type to determine under what conditions successful northern hardwood regeneration has occurred. We then plan to develop a treatment strategy for this forest type.

IMPACTS OF GLYPHOSATE AND SULFOMETURON METHYL ON DIVERSITY OF PLANTS AND WILDLIFE IN ALLEGHENY HARDWOODS

This is a cooperative research project between the Allegheny National Forest and the Northeastern Research Station in Irvine, PA. It is scheduled for completion in FY 2005. The principal investigators are Dr. Stephen B. Horsley and Dr. David S. deCalesta.

Problem Statement: The effects of the operational herbicide applications in use on the Allegheny National Forest on wildlife habitat and non-target organisms need to be better understood. This study will examine the impacts of the herbicides glyphosate and sulfometuron methyl on songbirds, tree seedling development, non-arborescent vascular plants, small mammals, amphibians, and wildlife habitat components.

Status: After completing herbicide treatments on half of each study site in late summer 1994, a full round of plant and animal measurements was collected during the spring and summer of 1995. During the '95-'96 winter season, shelterwood seed cuts were conducted in the six study areas with high relative density to stimulate regeneration development. Small mammal, songbird, and amphibian censuses were performed during the spring and summer of 1996 and 1998, as were surveys of tree seedlings, non-arborescent vascular plants, and wildlife habitat components.

Last years Monitoring and Evaluation Report summarized results of preliminary analyses of data collected through 1998. No new data were collected in this study in 1999.

IMPACTS OF WHITE-TAILED DEER BROWSING ON FOREST ECOSYSTEMS

This study is being conducted cooperatively by the Northeastern Research Station, Irvine, PA; Allegheny National Forest; State University of New York, Environmental Science and Forestry (SUNY-ESF); and the National Biological Service (NBS).

Principal investigators are Dr. Susan Stout and Dr. David S. deCalesta, NERS; Dr. William Porter, SUNY-ESF; and Dr. Brian Underwood, NBS.

Problem Statement: Herbivory by white-tailed deer has been shown to influence the diversity and sustainability of forest ecosystems.

Status: The cooperative research with the State University of New York concluded in 1999. This research used a modeling environment in which deer move across a simulated landscape containing habitats of different quality. In this modeling environment, we tested the creation of different sized patches of relatively high-quality habitat, such as that created by clearcutting, on deer impact, measured as the time deer spent in different patches. These simulations showed that 30 acres was the minimum size at which deer impact became consistent—that is, the deer impact on smaller patches was more influenced by factors such as original distribution of deer than by their relative quality. This project was completed in 1999.

Deer pellet group counts were conducted within about 20 different 600-acre areas as part of an overall program of monitoring deer densities on stands within landscapes and relating advance regeneration to landscape deer density.

Publications in 1999:

Pauley, Thomas K.; Mitchell, Byron J. 1999. Potential effects of silvicultural practices and deer densities on forest salamanders in northwestern Pennsylvania. ASB Bulletin. 46(2): 139. Abstract.

SNAG AND LOG MANAGEMENT IN MIXED SPECIES HARDWOOD FORESTS ON THE ALLEGHENY PLATEAU

Dr. David S. deCalesta, Research Wildlife Biologist, Northeastern Research Station, Warren, PA, and Scott Reitz, Wildlife Biologist, and Stan Kobielski, Silviculturist, Bradford Ranger District, Allegheny National Forest, Bradford, PA are conducting this administrative study. It is scheduled for completion in FY 2006.

Problem statement: Most managed second-growth forests have relatively low amounts of both snags and logs compared to unmanaged second-growth or true old-growth forests. Research already completed has documented the amounts of snags and logs found in true old growth in the Allegheny National Forest region, and research completed elsewhere has shown that cultural creation of those elements where they are missing can enhance habitat. This may enhance the functions and values of a stand by providing habitat for many wildlife communities. This study will test the local applicability of these existing research results and ensure optional local use of them. Few guidelines currently exist to direct snag and log management in Allegheny Plateau forests.

Objectives: 1) to determine which snag creation method is locally most effective, 2) to determine when cultured snags and logs become useful, by what wildlife, for how long, and 3) determine if the pattern of snag and log creation elicits different responses in wildlife communities. The study is being conducted in two stands, each with two 10 acre areas of scattered, cultured snags and logs and 10 acres of untreated area. Snags were created by girdling.

Status: Data on snags, logs, other habitat features, and songbird, small mammal, and amphibian communities were collected in 1996 and 1998.

No data were collected in this study in 1999.

DEFINING CHARACTERISTICS OF OLD-GROWTH ON THE ALLEGHENY PLATEAU

Dr. David S. deCalesta, Research Wildlife Biologist, Northeastern Research Station, Irvine, PA, and Dr. Christopher A. Nowak, State University of New York College of Environmental Sciences and Forestry are conducting this research study.

Problem Statement: General definitions for old-growth forest exist for the Eastern U.S., but preservation, restoration, and maintenance activities for old-growth requires forest cover type and locale-specific definitions.

Objectives: 1) to characterize forest structure and wildlife communities in the true old-growth hemlock-beech forests in the Tionesta Scenic and Research Natural Areas and 2) compare the forest attributes and functions of true old-growth with unmanaged and managed second-growth. The study is being conducted in 41 stands, of which 7 are in Tionesta Scenic and Research Natural Areas and the rest scattered throughout the ANF.

Status: Data on habitat components and songbird communities were collected in 1997 and 1999.

Publications in 1999:

deCalesta, D.S.; Ordiway, L.D. 1999. Contribution of RNA's to forest wildlife management. In: Eckhoff, Janet D., Ed. 2nd North American Forest Ecology Workshop: forest ecology into the next millennium: putting the long view into practice; 1999 June 27-30; Orono, ME: University of Maine: 86. Abstract.

ECOSYSTEM RESPONSE TO INTENSIFIED CUTTING WITHIN A FOREST COMPARTMENT

Pam Valentine, Wildlife Biologist, Lois DeMarco, Silviculturist, Allegheny National Forest, Dr. Susan Stout, Research Forester, and Jim Redding, Forester, Northeastern Research Station, Warren, PA are conducting this administrative study. It is scheduled for completion in 2003.

Problem Statement: Understanding deer-forest interactions is critical to sustaining Allegheny Plateau forests. Research has shown that the population of deer has an effect on the understory vegetation that develops following different management treatments. The scale at which deer population dynamics respond to plant communities is of the order of square kilometers or square miles, while plant communities respond at a much smaller scale to local disturbances and deer impact. One of the critical elements of ecosystem management is understanding interactions that cross scales.

Objectives: 1) to test the effect of additional cutting on development of advance regeneration (tree seedlings) stocking in final removal cuts and in stands left uncut; 2) to test the impact of this sequence of cutting on species composition and diversity of the tree regeneration (research work linked with this study will look at effects on herbaceous plant and songbird communities.)

Status: The second round of cutting within the Porter's Prize Project Area was completed in 1997. Two pellet group surveys of this area during the spring of 1999 suggested a mean over wintering deer density in the area of 19.7 deer per square mile, down from the 1997 estimate of 23.3 and the 1998 estimate of 31.2 deer per square mile. Regeneration surveys were conducted in seventeen stands within the area during 1999. In the ten uncut stands that were examined during 1999, mean advance regeneration stocking at deer impact 4 was 8%, and at deer impact 3 was 12%. This represented little net change from the 11% stocking of advance regeneration at deer impact 4 estimated in these stands prior to the start of the study. Also, in these uncut stands, mean stocking of hay-scented and New York fern was 40%, little changed from 37% prior to the start of the study. A mean of 10 woody species was detected in these stands.

The other seven stands sampled in 1999 were young stands. Three received a shelterwood seed cut in 1989, one in 1990, and three in 1991, and all received removal cuts during the second round of cutting within the compartment. In these stands, a mean of 64% of the sample plots were stocked with at least 25 black cherry seedlings or 100 northern hardwood seedlings at deer impact 3, or 59% at deer impact 4, although height development has been slow, and the mean proportion of plots stocked with 2 stems over 5 feet tall is only 12%. A mean of 11 woody species was detected in these stands

These preliminary results affirm last year's suggestion that silvicultural strategies to overwhelm overabundant deer are effective for only a short period of time unless accompanied by effective measures to reduce deer density.

OPERATIONAL TESTS OF UNEVEN-AGE SILVICULTURE IN MANAGEMENT AREA 2.0

This administrative study is being conducted by the Ridgway Ranger District, Allegheny National Forest, and Dr. Susan Stout, Research Forester, Northeastern Research Station, Irvine, PA, and is scheduled for completion in 2002.

Problem Statement: Implementation of uneven-age silviculture on the Allegheny National Forest faces many challenges. These are the impact of deer browsing on development of new age classes of trees, insect and disease problems in sugar maple, limited establishment and survival of eastern hemlock seedlings, the competitive influence of dense understories of fern, grass, American beech root suckers, and striped maple, and the advancing front of the beech bark disease complex. Yet the Forest Plan calls for practicing uneven-age silviculture throughout Management Area 2.0. Previous research has shown that uneven-age treatments in Allegheny

hardwoods lead to the establishment of sparse and unsatisfactory regeneration where interfering plants are present. Other research has led to the development of techniques that effectively remove this interfering vegetation. The Allegheny National Forest needs to make a formal test of the results of uneven-age silvicultural treatments and reforestation practices on an operational basis.

Objectives: To test the conditions that result from using reforestation activities to help initiate the transition to uneven-aged management on the Hoffman Farm project area, Ridgway Ranger District, ANF.

Status: We completed pretreatment measurements on all study areas in the spring and summer of 1995. Treatments on two of the five study stands--those with a high percentage of overstory basal area in hemlock--were completed during the winter of 1995-1996, and we collected data during the summer of 1997 to characterize regeneration, herbaceous plant communities, songbirds, and amphibians. Harvesting in the other study stands was completed in 1996-1997. We collected a full suite of data in 1998 on all study stands. Last years report provides a summary. In 1999, we collected data in the stands with a high proportion of hemlock overstory basal area.

In 1999, in the hemlock hardwood stands, regeneration stocking across all treatments was 3%. Control plots averaged 6% stocking with 0% fern stocking, while stands that had been treated with group selection averaged 2% regeneration stocking with 6% fern stocking. Fifteen percent of the plots had at least one hemlock seedling.

A 1999 pellet group survey resulted in an estimate of the local overwintering deer density as 10 deer per square mile. When compared with the 8 deer per square mile estimated in 1997, and the 37 deer per square mile estimated in 1998, we see a pattern of high variability in winter deer use of the study area.

During 1999, measurements of herbaceous plant community diversity, regeneration, songbirds, and amphibians were also collected in the two hemlock-hardwood stands.

PIN CHERRY EFFECTS ON ALLEGHENY HARDWOOD STAND DEVELOPMENT

Dr. Stephen B. Horsley and Todd Ristau, Northeastern Research Station, Irvine, PA are conducting this study. It has been completed and a manuscript has been published (*see below).*

Problem statement: Pin cherry is an important pioneer species found throughout the northern hardwood forest region. Its seed can persist in forest floors for fifty or more years, and germinates in response to disturbance, such as during stand regeneration. When such disturbances occur in areas of low deer impact, like inside fences or where deer densities are locally low, pin cherry can interfere with the survival of longer-lived species, especially those intolerant of shade. This study is intended to determine the effects of different levels of pin cherry density on stand development patterns and processes.

Objectives: The objectives of this study are to 1) describe the similarities and differences among stand development patterns in stands that originate with high vs. low densities of pin cherry; and 2) identify levels of pin cherry density that interfere with the survival of longer-lived species.

Status: *This study was completed in 1999 with the publication of the article describing the results of the study.* Pin cherry develops an early height advantage over associated species. Data from three long-term studies, extending up to 70 years after complete overstory removal, were used to evaluate the effects of pin cherry density on associates. Survival of seedling-origin stems of black cherry, red maple, and sugar maple at age 15 decreased as the density of pin cherry > 1.5 m. tall at age 3 increased. The regression of pin cherry with black cherry was particularly strong (R^2 = 0.632). Height of the tallest black cherry and white ash at age 15 also decreased. If the density of pin cherry at age 3 was > 1 stem > 1.5 m. tall per 0.0004 ha (high density), the number of black cherry fell below full stocking at age 15. When pin cherry occurred in high density, it lived longer than when it occurred at low density (< 1 stem > 1.5 m. per 0.0004 ha). High pin cherry density early in stand development delayed the

time when shade-tolerant and shade-intermediate species reached a stable proportion of the total basal area. In the long term, pin cherry reduced stand diameter and volume growth, particularly of black cherry.

Publications in 1999:

Ristau, Todd E.; Horsley, Stephen B. 1999. Pin cherry effects on Allegheny hardwood stand development. Can. J. For. Res. 29: 73-84.

SUGAR MAPLE HEALTH

Two research thrusts are being made in this problem area. One focuses on the role of soil nutrition on health, growth and vigor of sugar maple trees and regeneration and has two parts.

Part 1 investigates the impact of forest liming on sugar maple vigor and regeneration (Lime study). This is a joint study of the Pennsylvania Department of Conservation and Natural Resources, *Bureau of Forestry and the Northeastern Research Station. Principal investigators include Paul Lilja, Dr. Tom Hall, and Dr. Barry Towers for the Bureau of Forestry, and Dr. Stephen Horsley (Warren, PA) and Dr. Robert Long (Delaware, OH) for the Northeastern Research Station. Additional research collaborators include: Dr. Phil Wargo (NERS, Hamden CT), Dr. Dave DeWalle (Penn State), Dr. Carolyn McQuattie (NERS, Delaware OH), and Dr. Tom Pauley (Marshal Univ.).

Part 2 investigates the distribution of calcium and magnesium along topographic gradients in northwestern Pennsylvania and southwestern New York (Gradient study). This is a collaborative study between the Northeastern Research Station, the Pennsylvania Department of Conservation and Natural Resources, the Allegheny National Forest, International Paper Co., the New York Department of Conservation and Natural Resources and private landowners. Principle investigators include Dr. Stephen Horsley (Warren PA), Dr. Robert Long (Delaware OH), Dr. Scott Bailey (Hubbard Brook NH), Dr. Phil Wargo (Hamden CT) for the Northeastern Research Station, Dr. Tom Hall for the Pennsylvania Department of Conservation and Natural Resources, and Dr. Dave DeWalle for Penn State University.

The second thrust uses remote sensing and geographic information systems (GIS study) to pinpoint the amount and location of sugar maple mortality across northern Pennsylvania, including the Allegheny National Forest, and to correlate the mortality with many hypothesized causal factors. Principal investigators for this study are Dr. Susan Stout of the Northeastern Research Station, Warren, PA, and Dr. Gary Petersen of the Pennsylvania State University.

Problem Statement: Since the late 1970s, sugar maple across the northern tier of Pennsylvania has been suffering from a decline syndrome. Droughts, insect defoliations, disease organisms, forest management, atmospheric pollutants, and soils are all hypothesized contributors to this decline. A better understanding of the ecological mechanisms associated with the decline, and of its extent, is needed.

Objectives: The objectives of the two research thrusts are: 1) to understand the causes of maple decline and 2) to document the extent of sugar maple mortality across the northern tier of Pennsylvania using remote sensing and geographic information systems data. Objectives for the two parts of thrust 1 are: Lime study- to understand the impact of lime on health, growth, vigor and nutrition of sugar maple. Gradient study- to determine the distribution of calcium and magnesium with topographic position on glaciated and unglaciated sites.

Status: Work continued on both research thrusts during 1999. The Proceedings of the International Symposium on Sugar Maple Ecology and Health were published in 1999, documenting results of both the lime study and the gradient study. The publication shows that most studies of maple decline implicated deficiencies of nutrition,

especially base cation nutrition, as predisposing conditions. In most declines, a further inciting event, such as a series of defoliations or droughts, also occurred. Other data showed that sugar maple decline was detectable in the data from the 1989 USFS Forest Inventory and Analysis of Pennsylvania and that about 10% of the stands sampled across the northern tier of Pennsylvania showed symptoms of decline in that data set. Our cooperators at Penn State collected detailed data near thirty sites identified by their 1989 inventory data as having high proportions of sugar maple and either declining or non-declining overstories.

During the summer of 1999, data were collected on herbaceous plant communities at all gradient study sites in Pennsylvania, New York, and New England. These data will be analyzed to provide a system of indicator plants to help managers identify sites on which sugar maple is most vulnerable to stresses like defoliation.

Publications in 1999:

Bailey, Scott; Horsley, Stephen B.; Long, Robert P.; Hallett, Richard A. 1999. Influence of geologic and pedologic factors on health of sugar maple on the Allegheny Plateau. In: Horsley, Stephen B., Long, Robert P., Eds. Sugar maple ecology and health: proceedings of an international symposium; 1998 June 2-4; Warren, PA. Gen. Tech. Rep. NE-261. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Research Station: 63-65.

Drohan, Patrick; Stout, Susan; Petersen, Gary. 1999. Spatial relationships between sugar maple (Acer Saccharum Marsh.), sugar maple decline, slope, aspect, and atmospheric deposition in northern Pennsylvania. In: Horsley, Stephen B., Long, Robert P., Eds. Sugar maple ecology and health: proceedings of an international symposium; 1998 June 2-4; Warren, PA. Gen. Tech. Rep. NE-261. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Research Station: 46-50.

Hallett, R. A.; Bailey, S. W.; Horsley, S. B.; Long, R. P.; Hall, T. J. 1999. Foliar chemistry and sugar maple health in the northeastern United States. In: Eckhoff, Janet D., ed. 2nd North American forest ecology workshop: forest ecology into the next millennium: putting the long view into practice; 1999 June 27-30; Orono, ME. Orono, ME: University of Maine: 113. Abstract.

Hallett, Richard A.; Horsley, Stephen B.; Long, Robert P.; Bailey, Scott W.; Hall, Thomas J. 1999. Foliar chemistry of sugar maple: a regional view. In: Horsley, Stephen B., Long, Robert P., Eds. Sugar maple ecology and health: proceedings of an international symposium; 1998 June 2-4; Warren, PA. Gen. Tech. Rep. NE-261. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Research Station: 66. Abstract.

Horsley, S.; Long, R.; Bailey, S.; Hallett, R.; Hall, T. 1999. Factors contributing to decline-disease of sugar maple in Pennsylvania. In: 84th annual meeting: legacies, landscapes and limits: bridging borders: Ecological Society of America; 1999 August 8-12; Spokane, WA. Washington, DC: Ecological Society of America: 112. Abstract.

Horsley, Stephen B.; Long, Robert P., Eds. 1999. Sugar maple ecology and health, proceedings of an international symposium; 1998 June 2-4; Warren, PA. Gen. Tech. Rep. NE-261. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Research Station: 120 p.

Horsley, Stephen B.; Long, Robert P.; Bailey, Scott W.; Hallett, Richard A. 1999. Factors contributing to the decline-disease of sugar maple on Pennsylvania's Allegheny Plateau. The Dropline. 2(4): 1.

Horsley, Stephen B.; Long, Robert P.; Bailey, Scott W.; Hallett, Richard A.; Hall, Thomas J. 1999. Factors contributing to sugar maple decline along topographic gradients on the glaciated and unglaciated Allegheny Plateau. In: Horsley, Stephen B., Long, Robert P., Eds. Sugar maple ecology and health: proceedings of an international symposium; 1998 June 2-4; Warren, PA. Gen. Tech. Rep. NE-261. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Research Station: 60-62.

Long, Robert P.; Horsley, Stephen B.; Lilja, Paul R. 1999. Impact of forest liming on growth, vigor, and regeneration of sugar maple and associated hardwoods. In: Sharpe, William E., Drohan, Joy R., Eds. Proceedings of the 1998 Pennsylvania acidic deposition conference. Vol. 1. The effects of acidic deposition on Pennsylvania's forests; 1998 September 14-16; University Park, PA. University Park, PA: The Pennsylvania State University, Environmental Resources Research Institute: 263-264. Abstract.

Long, Robert P.; Horsley, Stephen B.; Lilja, Paul R. 1999. Impact of forest liming on growth, vigor, and reproduction of sugar maple and associated hardwoods. In: Horsley, Stephen B., Long, Robert P., Eds. Sugar maple ecology and health: proceedings of an international symposium; 1998 June 2-4; Warren, PA. Gen. Tech. Rep. NE-261. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Research Station: 55-58.

USE OF STAND AND LANDSCAPE HABITAT COMPONENTS TO PREDICT WILDLIFE COMMUNITY COMPOSITION: A PILOT STUDY

This is a cooperative research project between the Allegheny National Forest and the Northeastern Research Station in Irvine, PA. It is scheduled for completion in FY 1999. The principal investigator is Dr. David S. deCalesta.

Problem Statement: Managing to sustain diverse wildlife communities requires census of these populations to determine diversity status. It is too labor-intensive and expensive to census wildlife communities including over 250 species within forested landscapes. A habitat characterization procedure developed by Helene Cleveland, former forester on the Allegheny National Forest, details how to characterize wildlife habitat using vegetation data routinely collected in silvicultural descriptions within stands and use this information to predict composition of associated wildlife communities. Validation of this model by scientists at the Warren Laboratory revealed considerable errors of commission (model predicts species that do not occur on stands) and of omission (model fails to predict species that commonly occur on stands). A pilot study was undertaken in 1994 to provide empirical data for development of a data-based habitat characterization model that reliably predicts presence/absence and high abundance of individual wildlife species within stands.

Status: Wildlife communities (songbirds, small mammals, amphibians) and wildlife habitat were sampled on 22 stands including old-growth (3), managed even-aged 2nd growth (10), late-successional 2nd growth (4), and managed uneven-aged second growth (5) prior to 1997. Six early succession stands and twenty-two managed even-aged 2nd growth were included for analysis in 1997, and 6 sapling/pole stands were added in 1998. All data are being entered into a wildlife habitat component/wildlife species matrix; analysis to identify habitat components (and associated threshold values) is underway. During 1999, we continued to collect wildlife data on many of these stands and added additional information to our database.

Results: Preliminary analyses of data in the wildlife habitat/songbird data base suggest that habitat characterization can be used to classify stands by habitat quality with better than 75% accuracy for most songbird species.

Publications in 1999:

deCalesta, David S.; Ordiway, Linda D. 1999. Classification and regression trees (CART) for modeling wildlife habitat relationships. In: Eckhoff, Janet D., Ed. 2nd North American Forest Ecology Workshop: forest ecology into the next millennium: putting the long view into practice; 1999 June 27-30; Orono, ME: University of Maine: 85. Abstract.

ONGOING RESEARCH PROJECTS IN THE TIONESTA SCENIC AND RESEARCH NATURAL AREAS

The following is a listing of numerous on-going research projects currently underway in the Tionesta Scenic and Research Natural Areas and a brief description of each:

UNDERSTORY VEGETATION CHANGES IN A VIRGIN FOREST. S. Stout, USDA-Forest Service. 1942 to present. A periodic survey of 21 permanent milacres, understory vegetation.

THE ROLE OF HISTORY AND PATCH DYNAMICS IN THE REVEGETATION OF A CATASTROPHIC WINDTHROW IN AN OLD-GROWTH BEECH-HEMLOCK FOREST. C. Peterson, University of Georgia; S. Pickett, Rutgers University. 1985 to present. A periodic survey of permanent milacres for vegetation in the Scenic Area's 1985 tornado swath.

INFLUENCE OF FOREST INSECT DEFOLIATORS ON STREAM SOLUTE CHEMISTRY. G. Lewis, Cornell University. 1993 to present. A periodic survey of West Fork Run chemistry, before and after an irruption of elm spanworm.

CHARACTERIZATION OF OLD-GROWTH ON THE ALLEGHENY PLATEAU. C. Nowak and D. deCalesta, USDA-Forest Service. 1993 to present. Survey of live and dead vegetation, songbirds (three summers), small mammals (one summer), and deer density (three winters) across a chronosequence of seven stands, including three true old-growth stands.

AMPHIBIAN COMMUNITIES IN A CHRONOSEQUENCE OF FOREST STANDS ON THE TIONESTA SCENIC AND RESEARCH NATURAL AREAS. D. deCalesta, USDA-Forest Service; P. Dalby, Clarion University of Pennsylvania. 1995 to present. One summer survey of amphibians across chronosequence of seven stands, including three true old-growth stands.

DENDROCHRONOLOGY OF TIONESTA RNA ACROSS A LANDSCAPE GRADIENT. C. Ruffner and M. Abrams, Pennsylvania State University. 1996 to present. Ring analysis of trees in old-growth stands located on different topographic positions.

FOREST RECOVERY FROM CATASTROPHIC WINDTHROW. C. Peterson, University of Georgia. 1996 to present. Periodic survey of permanent plots for vegetation in the Research Natural Area's 1994 tornado swath.

FUNGI, LICHEN AND NON-ARBORESCENT PLANT COMMUNITIES IN HEMLOCK-HARDWOOD OLD-GROWTH. E. Frank, retired, Rutgers University; C. Nowak, USDA-Forest Service. 1997. One summer survey of fungi, lichen and non-arborescent plant communities in three old-growth stands in the Tionesta Areas.

MONITORING PLANT AND ANIMAL COMMUNITIES ACROSS THE TIONESTA AREAS. B. Nelson, C. Nowak and D. deCalesta, USDA-Forest Service. 1997 to 2007. A periodic survey of songbirds and vegetation, including songbird habitat, in and around the Tionesta Areas.

GLOSSARY

ANF	Allegheny National Forest
ARSG	Allegheny River Support Group
ASL	Allegheny Snowmobile Loop
ATV	All-terrain vehicle
BO	Biological Opinion
CATS	Cumulative Accomplishments Tracking System. A Forest Service reporting system.
CDS	Combined Data System. A forest Service reporting system.
CFR	Code of Federal Regulations
CRBC	Clarion River Basin Commission
DBH	Diameter at breast height. A tree measurement -- an estimated 44 inches from the ground.
DEP	Pennsylvania Department of Environmental Protection
DFC	Desired Future Condition
EA	Environmental Assessment. A document that describes the environmental analysis for a proposed project to comply with the National Environmental Protection Act.
FEIS	Final Environmental Impact Statement
FHP	Forest Health Protection
FR	Forest Service Road
FSM	Forest Service Manual
FY	Fiscal Year
MA	Management Area
MBF	Thousand Board Feet (of timber)
MMBF	Million Board Feet (of timber)
NERS	Northeastern Research Station (formerly Northeast Forest Experiment Station)
NEPA	National Environmental Policy Act passed in 1980
NFMA	National Forest Management Act passed in 1976
NRA	National Recreation Area
OGM	Oil, Gas and Minerals
PA DCNR	Pennsylvania Department of Conservation and Natural Resources
PAOT	Persons-At-One-Time. A measure of recreation capacity. The number of persons-at-one-time that a recreation facility can accommodate.
PAMARS	Program Accounting and Management Reporting System
pH	A scale for measuring acidity and alkalinity
RIM	Recreation Information Management. A Forest Service recreation use reporting system.
RMP	River Management Plan
RN	Roaded natural recreation experience
ROS	Recreation Opportunity Spectrum. A system of classifying the range of recreational experiences, opportunities and settings available on a given area of land.

ROS CLASSES	*Wilderness* - managed to preserve naturalness and solitude. Timber harvests, road construction and mining activities are generally prohibited. *Semi-primitive (motorized and non-motorized)* - largely unmodified natural environments that contain at least 2,500 non-roaded acres. These areas provide good to moderate opportunity for isolation and may be managed for either motorized or non-motorized recreation uses. Roaded Natural - managed for only moderate resource utilization and presence of people. These areas include less that 2,500 acres of non-roaded forest and allow for both social interaction and moderate isolation. *Rural* - areas characterized by a substantially modified natural environment where sights and sounds of people are evident. *Urban* - areas characterized by high social interaction and significant modification of the natural environment such as city parks. *Developed* - managed as small, distinctly defined areas where facilities are provided for concentrated public use, such as campgrounds, picnicking and swimming.
ROW	Right of Way
RVD	Recreation Visitor Day. Measures 12 hours of recreation use on the Forest.
SILVAH	Computer simulation model used for silvicultural examinations.
SMS	Scenery Management System
SPM	Semi-primitive motorized recreation experience
SPNM	Semi-primitive non-motorized recreation experience
SR	State Road
TRACS	Timber Activity Control System. A Forest Service timber use reporting system.
TSL C&D	Traffic Service Level. Describes a design standard for a road. Traffic Service Level D roads are the lowest standard Forest System roads.
UEAM	Uneven-aged management
USDA	United States Department of Agriculture
VMS	Visual Management System
VQO	Visual Quality Objective. Refers to the quality of a landscape.

APPENDIX A

FIRST AND SECOND DECADE
FOREST PLAN IMPLEMENTATION

FIRST AND SECOND DECADE FOREST PLAN IMPLEMENTATION

ACTIVITY	UNIT OF MEASURE	DECADE 1 PLAN AMT	DECADE 2 PLAN AMT	SUM OF DEC 1 & 2 PLAN AMT	FY 86-95 ACCOMPL	BALANCE DECADE 2 PLAN AMT.	1996	1997	1998	1999	2000	2001	ACCOMP. TO DATE	% COMPLETE TO DATE
DEVELOPED REC														
...Semi-primitive Motorized	MRVD	370	380	750	583.1	166.9	62.3	63	75	75			858.4	114.5%
...Roaded Natural	MRVD	4,300	4,710	9,010	4,553.2	4,456.8	661.2	671	792	792			7,469.4	82.9%
...Rural	MRVD	4,190	4,320	8,510	4,966.9	3,543.1	706.6	717	846	846			8,028.5	95.0%
DISPERSED REC														
...Semi-primitive/Non-motorized	MRVD	300	420	720	335.8	384.2	28.7	33	39	39			475.5	66.0%
...Semi-primitive/Motorized	MRVD	3,680	3,720	7,400	5,175.7	2,224.3	791.1	802	947	947			8,662.8	117.1%
...Roaded Natural	MRVD	4,990	5,250	10,240	8,194.1	2,045.9	1,013.7	1,028	1,213	1213			12,661.8	123.7%
WILDERNESS														
...Semi-primitive/Non-motorized	MRVD	10	16	26	23	1	3.6	3.9	4.7	4.0			39.2	150.8%
TRAIL CONSTRUCTION														
...Pedestrian	Miles	48	41	89	39.3	49.7	3.1	0	1.3	18.0			56.2	63.1%
...Motorized-Winter	Miles	11	11	22	50.5	0	0	0	22.0	3.3			74.7	339.5%
...Motorized-Summer	Miles	145	145	290	70	220	0	0	4.4	1.0			74.4	25.7%
TIMBER MANAGEMENT														
...Hardwood Sawtimber	MMBF	383	460	843	350.1	492.9	32.6	20.9	5.5	1.2			410.5	48.7%
...Hardwood Pulpwood	MMBF	562	480	1,042	333.1	708.9	23	16.2	4.2	0.8			377.3	36.2%
...Hardwood Firewood	MMBF	0	0	0	17.1	0	0.6	1.3	1.0	0.9			20.9	N/A
...Total Sell	MMBF	945	940	1,885	700.3	1,184.7	55.6	38.7	10.6	2.9			808.7	42.9%
...Clearcuts	Acres	3,300	3,400	6,700	6,925	0	420	177	27	187			7,736	115.5%
...Shelterwood Seed/Prep	Acres	29,700	30,600	60,300	12,930	47,370	1,196	1,641	217	0			15,984	26.5%
...Shelterwood Removal	Acres	29,700	30,600	60,300	12,971	47,329	1,864	1,119	371	0			16,325	27.1%
...Thinning	Acres	94,000	78,000	172,000	40,653	131,347	3,225	1,342	116	15			45,351	26.4%
...Selection Cuts	Acres	6,000	0	6,000	5,573	427	334	299	0	0			6,206	103.4%
...Timber Stand Improvement	Acres	8,000	6,000	14,000	855	13,145	0	0	0	0			855	6.1%
...Herbicide *	Acres	20,000	18,000	38,000	11,240	26,760	1,315	1,460	1,313	783			16,111	42.4%
...Fertilization	Acres	25,000	14,000	39,000	9,571	29,429	755	1,148	0	1,060			12,534	32.1%
...Fencing	Acres	4,000	4,000	8,000	9,451	0	650	373	768	929			12,171	152.1%
...Planting	Acres	2,000	2,000	4,000	1,096	2,904	143	191	189	429			2,048	51.2%
...Site Prep	Acres	18,000	18,000	36,000	11,887	24,113	1,230	1,108	1,150	1,743			17,118	47.6%
...Release	Acres	0	0	0	169	0	261	543	553	664			2,190	N/A
ROADS														
...Construction	Miles	239.0	134.0	373.0	158.1	214.9	2.3	4.2	0.3	0.0			164.1	44.0%
...Reconstruction - Betterment	Miles	97.0	55.0	152.0	116.9	35.1	1.0	3.5	0.0	0.0			121.4	79.9%
...Reconstruction - Restoration	Miles	0.0	0.0	0.0	424.7	0.0	61.6	75.0	39.4	43.9			645.8	N/A
...Temporary	Miles	17.0	17.0	34.0	12.7	21.3	0.0	0.4	0.0	0.0			13.1	38.5%
WILDLIFE														
...Hunting Use	MRVD	1,970	2,200	4,170	2,302.2	1,867.8	181.7	167.2	163.9	163.9			2,978.9	71.4%
...Fishing Use	MRVD	1,510	1,720	3,230	1,663.1	1,566.9	164.3	203.2	205.2	200.1			2,435.9	75.4%
...Fish Habitat Improvement	Acres	N/A	N/A	1	149	0	22	44	45	44			304	N/A
...Wildlife Habitat Improvement	Acres	23,720	27,580	51,300	22,273	29,027	2,204	2,003	1,663	1,609			29,752	58.0%
...Wildlife Habitat Improvement	Struct	60	110	170	2,256	0	119	82	42	36			2,535	1,491.2%
SOIL/WATER/AIR														
Water/Soil Improvement	Acres	N/A	N/A	0	7,765.5	0	41.7	14	10	29			7,821.2	N/A

* Excludes respray areas (Total of 457 acres from 1986 to 1999)

APPENDIX B

ALLEGHENY NATIONAL FOREST
MONITORING PLAN
FOR FY 1999

INTRODUCTION

BACKGROUND

The purpose of this Monitoring Plan is to provide a framework for observing and recording the results of implementing the Allegheny National Forest (ANF) Land and Resource Management Plan (Forest Plan). Chapter 5 of the Forest Plan includes a discussion about the basic requirements and standards for monitoring, and Appendix B translates these requirements into the details of a general monitoring plan.

To implement this Monitoring Plan, specific steps and actions must be identified, organized and assigned to Districts and/or Supervisor's Office Teams through the Annual Program of Work. This document provides the necessary detail for implementing the Monitoring Plan and identifies the individual items to be measured. This information will be used annually to evaluate progress toward meeting the direction in the Forest Plan.

This Monitoring Plan consists of two parts. The first part lists the items that will be monitored. It makes up the framework for a monitoring program for the decade.

The second part specifically explains how the monitoring tasks and responsibilities are assigned and carried out in the Annual Program of Work. This part of the monitoring program can be changed from year to year in response to variations in budgets, accomplishments or the previous year's evaluation report.

The emphasis of this plan is on monitoring Forest Plan activities. The Forest Service currently monitors a number of activities on a routine basis through timber sale administration, service contract administration, National Environmental Policy Act (NEPA) compliance reviews, supervisory reviews, and Regional Office management reviews. Such monitoring will continue to occur and will not be addressed within this document.

CATEGORIES OF INFORMATION TO BE MONITORED

Items to be monitored are organized into seven categories, which address definite monitoring requirements. These categories are:

1. Compliance with Standards and Guidelines
2. Verification of Effects
3. Quantitative Measure of Outputs and Performance
4. Costs
5. Emerging Issues
6. Suitable and Unsuitable Lands
7. Land Adjustments

All the monitoring requirements in the 1976 National Forest Management Act (NFMA) regulations and those specific to the ANF's Forest Plan are included in one of these seven categories. They are described in detail in Chapter IV.

PHILOSOPHY AND ASSUMPTIONS

Monitoring is a year-round process and is required by the Forest Plan. Monitoring is accounted for in the annual program of work. The Ecosystems Management Team has over all responsibility for monitoring and does conduct monitoring. Districts and other SO Teams also have responsibility for assigned items. All ANF associates have ownership in monitoring, because monitoring tells us how well we are implementing the Forest Plan.

Items to be monitored are based on needs identified in the Forest Plan (Appendix B, pp. B1-B5) or as identified by evaluation of previous years' monitoring results.

Monitoring the Forest Plan consists of: 1) monitoring specific items by the assigned persons/teams; 2) evaluating results by the ID Team; 3) compiling the report; and 4) acting on recommendations from past years' monitoring evaluations.

There is an expectation throughout the Forest Service's Eastern Region that management reviews will be conducted by an interdisciplinary team to ensure that integrated resource management direction is being carried out. The ANF has adopted this emphasis for Forest Plan monitoring wherever appropriate. As a result, many of the items will be monitored using Interdisciplinary Team reviews.

The ANF already has many systems for gathering and tracking information to monitor its programs; this is especially true for accomplishments and costs. However, compliance with direction and regulations and effects of management practices on resources are also monitored. Because there is not likely to be a significant increase in personnel or budgets for monitoring and because these traditional methods have worked well in the past, existing monitoring systems were included in this Monitoring Plan as much as possible to minimize costs. In this way, any additional funding for monitoring can be directed toward items in the Forest Plan that have not traditionally been measured.

Monitoring will be performed on a sample basis, which will assure that the widest possible range of projects is checked in a cost-effective manner.

OBJECTIVES OF MONITORING

Compliance With Standards And Guidelines

In this category, items to be monitored are based on Code of Federal Regulation 36 (CFR) 219.12(k). The objective of gathering this information is to provide data for evaluating how closely Forest-wide standards and guidelines and those for each Management Area (MA) in the Forest Plan have been applied. Ultimately, the evaluation of this data will provide the Forest with a measure of progress towards meeting the Desired Future Condition (DFC) of each MA.

Verification Of Effects

The emphasis in this category is to gather information that will be used to determine if the effects estimated in the Forest Plan are occurring. It will provide a measure of whether the standards and guidelines are working.

This category is based on 36 CFR 219.12(k)(2) and is closely associated with the previous "Compliance" category.

Quantitative Measure Of Outputs And Performance

This category of monitoring is based on 36 CFR 219.12(k)(1) and will be used to measure how well objectives for outputs and services are being met. Information gathered will provide quantifiable measurements of completed practices and activities, as well as a gauge of Forest progress toward the DFC described for each Management Area.

Because outputs and practices have been traditionally monitored, most of the systems for gathering and organizing this data already exist.

Costs

The CFR for this category (36 CFR 219.12(k)(3)) specifically requires monitoring "costs associated with carrying out the planned management prescriptions as compared with costs estimated in the Forest Plan." This requirement is also included as a Region 9 IRM expectation.

Carrying out this section of the monitoring plan will involve the continued use of management codes for keeping track of costs by activity.

Emerging Issues

36 CFR 219.7(f) requires a consideration of "the effects of National Forest management on land, resources, and communities adjacent to or near the National Forest being planned and the effects upon National Forest management of activities on nearby lands managed by other Federal or other government agencies or under the jurisdiction of local governments."

This means that emerging issues resulting from Forest management or from other government agencies' actions will be monitored. These are issues that apply to National Forest land or have the potential to affect National Forest management goals or objectives.

Suitable And Unsuitable Lands

As required in 36 CFR 219.12(k)(5ii), lands identified as unsuitable for timber production will be reexamined for timber production suitability every 10 years. A determination of suitability will result in a return of these lands to timber production. Annual monitoring of acreage will assure that relevant information is gathered for this determination.

Land Adjustments

Land acquisition and exchange can have direct effects on meeting Forest Plan objectives. The potential exists for a major land adjustment to add or subtract acres from certain Management Areas.

The objective of monitoring land adjustments is to provide a basis for redistributing acres to Management Areas after an adjustment. The Forest goal is to minimize the negative effect or maximize the positive effect of land adjustment on meeting Forest Plan direction.

REPORTS TO BE PUBLISHED

The Forest produces two publications, the "Annual Report to the Public" (Annual Report) and the technical "Monitoring and Evaluation Report" (M&E Report), each having different objectives and audiences.

The Annual Report is published to inform, educate and involve the public on Forest Plan implementation. It may also include:

- Offering outreach to the public on future projects.
- Highlighting areas the Leadership Team would like to emphasize.
- Involving the public and partners in the development of the Annual Report to the public.
- Developing other objectives for special or one-time projects.

The Supervisor's Office Ecosystems Management (EM) Team is responsible for determining what is to be monitored, with assistance from District Planning/Design Teams. Resource Specialists on the EM Team may do the actual monitoring. Members of the Ecosystems Management Team will author, edit and publish the Monitoring and Evaluation Report.

The Information Management Team is responsible for providing accurate numbers from the Forest databases. The Information Management Team will also write, edit and publish the Annual Report.

The Annual Report and the Monitoring and Evaluation Report will be issued separately. Items from the M&E Report mentioned in the Annual Report will be incorporated by reference only.

ACTION PLAN FOR FOREST PLAN MONITORING

INTRODUCTION

The following action items will be used to monitor the progress made in implementing the Forest Plan during FY 1998 and will remain in effect unless modified according to recommendations in future Monitoring and Evaluation Reports. This monitoring will continue to be supplemented by quality control reviews that are an on-going part of all operations on the Forest.

RESPONSIBILITIES

The Ecosystems Management Team has overall responsibility for developing measurement standards and monitoring the progress being made in implementing the Forest Plan. This Team takes the lead in developing and organizing the annual Forest Plan monitoring program for the following year.

Each of the following action items is assigned to one or more individuals who are responsible for completing the item and reporting the results to the Ecosystems Management Team.

MONITORING ACTION PLAN

Subject Area	Monitoring Criteria	Responsible Person(s)/Team *
Economics	Report Costs per Unit for the Following Activities: a. Trail construction by type b. Timber sale preparation c. Wildlife Improvement acres: Shrub and tree planting, prune and release, opening creation, seeding, and Aspen regeneration (non-commercial) d. Wildlife structures e. Site Preparation (natural) f. Herbicide understory g. Fertilization h. Timber stand improvement i. Fencing j. Road construction k. Road reconstruction	Accountant, Program Analyst, Resource Specialist (IR)
Emerging Issues	Emerging Issues and Public Concerns.	L.Team
Forest Health	Implement a Detailed Sampling Program to Monitor Soil Productivity Changes to Determine if Cumulative Impacts are Within Forest Plan Limits.	Terrestrial Scientist (EM)
Forest Health	Summarize Significant Changes in Health and Vigor of Stand Conditions.	Forest Silviculturist (EM), Resource Specialist (IR)
Forest Health	Summarize the Effectiveness of Insect and Disease Control efforts and Status as Determined by Forest Health Protection Staff. Summary Will Include a Measure of Mortality Occurring, Especially from Major Outbreaks.	Forest Silviculturist (EM), Forest Health Protection
Heritage Resources	Verify that Heritage Resources are Being Protected.	Forest Archaeologist (EM)
Impl./Mon. Reviews	Conduct Interdisciplinary Field Reviews of Projects in Several Management Areas to Determine Application and Effectiveness of Standards and Guidelines.	ID Team (EM), L.Team
Lands	Summary of National Forest Land Adjustments by MA.	Forester - Lands (OPS)
OGM	Cubic Yards of Rock Surfacing Used for Contracts, Permits, and Free Use.	Materials Engineer (OPS), Forest Geologist (EM)

**** L.Team*** ***- Forest Leadership Team***
ID Team ***- Interdisciplinary Team***
IR ***- Information Resources Team***
EM ***- Ecosystems Management Team***
OPS ***- Operations Team***
RD - ***Ranger District***

MONITORING ACTION PLAN

Subject Area	Monitoring Criteria	Responsible Person(s)/Team *
OGM	Estimate the Level of OGM Development Activity on the Forest.	Forest Geologist (EM)
OGM	Evaluation of OGM Activities to Verify the Effectiveness of Negotiations in Obtaining Industry Compliance with Standards.	Terrestrial Scientist (EM), Forest Geologist (EM)
OGM	Summarize the Status of Lands Available for Exploration and Development of USA Minerals.	Forest Geologist (EM)
Recreation	Recreation Opportunity Spectrum, Existing Vs. Planned	Recreation Program Manager (EM)
Recreation	Miles of Trail Constructed by Type and MA.	Resource Specialist (IR), Forester (OPS)
Recreation	Report the Number of WFUDs Associated with Hunting (Big Game, Small Game, and Non-Game Species) and Fishing Use.	Resource Specialist (IR), Forest Biologist (EM), District Biologists
Recreation	RVDs by Activity Type and ROS Class by Management Area (MA).	Resource Specialist (IR)
Recreation	Total Recreation Receipts ($) and Occupancy Figures (PAOTs) for Developed Recreation Sites.	Resource Specialist (IR), Accountant (IR)
Recreation	Visual Quality Objectives, Existing Vs. Planned in at least these MA's: 3.0, 5.0 and 6.1.	Landscape Architect (EM)
Recreation	Status of Recreation Site Construction	Recreation Program Mgr. (EM), Facilities Eng. (OPS)
Roads	Road Status Summary with the Following Categories: a. Total system road miles by MA b. Total road system density by MA c. Miles of new road constructed by MA. d. Miles of temporary road constructed Forest-wide by MA. e. Miles of road constructed by MA on existing, unimproved locations. (called "reconstruction in the Forest Plan). f. Roads that have been resurfaced by MA.	Civil Engineer (OPS), Transportation Planner (EM), Sale Administrators (RDs)
Timber	Application of Silvicultural Guides for Intermediate or Selection Cuts.	Forester - Timber (OPS), Forest Silviculturist (EM), District Silviculturists
Timber	Summarize Size of Final Harvest Blocks by MA.	Resource Specialist (IR)
Timber	Summarize Results of Final Harvest Cuts.	Forest Silviculturist (EM), District Silviculturists
Timber	Summarize the Following Components of the Desired Future Condition by MA: a. Percent opening Percent old-growth b. Percent Conifer Cover c. Acres of Aspen Type d. Age class distribution e. Acres of oak type	Forest Biologist (EM), Resource Specialist (IR)
Timber	Volume of Hardwood Sawtimber, Pulpwood, and Firewood Sold.	Resource Specialist (IR)
Timber	Suitable and Unsuitable Lands.	Forest Silviculturist (EM), Resource Specialist (IR)
Various	Units of Accomplishment by MA for the Following Activities (by unit of measure): a. Final harvest - clearcuts (Acres) b. Final harvest - shelterwood (Acres) c. Shelterwood prep (Acres) d. Selection (Acres) e. Thinning (Acres)	Resource Specialist (IR)

MONITORING ACTION PLAN

Subject Area	Monitoring Criteria	Responsible Person(s)/Team *
	f. Timber stand improvement (Acres) g. Herbicide treatments (Acres) h. Fertilization (Acres) i. Fencing (Acres) j. Planting (Acres) k. Site preparation (Acres) l. Wildlife habitat improvement (Acres) m. Wildlife habitat improvement (Structures) n. Cultural resource surveys (Total Acres) o. Oil/Gas wells developed (Each) p. Mineral Materials pits developed (Each)	
Wilderness	Monitor "Limits of Acceptable Change" in the Islands and Hickory Creek Wilderness Areas.	District Ranger, Bradford
Wildlife/ Fisheries	Measure Habitat and Population Trends for Management Indicator, Threatened and Endangered, and Game Species Based on a Specific Fish and Wildlife Monitoring Guide. and Obtain Population Trend Data for Several Fish and Wildlife Species from Pennsylvania Game and Pennsylvania Fish and Boat Commissions.	Forest Biologist (EM), District Biologists (RDs), Fisheries Biologist (EM)