



United States
Department of
Agriculture

Forest
Service

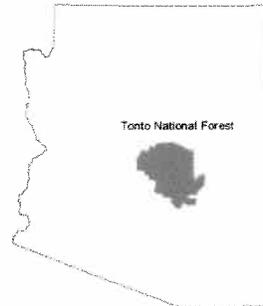
Southwestern
Region



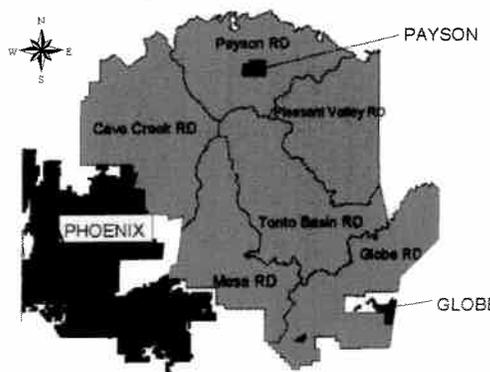
2008 Forest Plan Monitoring and Evaluation Report

Tonto National Forest

The State of Arizona



TONTO National Forest



(2.9 million acres, est.)

FOREST SUPERVISOR'S CERTIFICATION

I certify the Tonto National Forest Plan (Forest Plan) as amended is sufficient to guide management of the Forest over the next year.

A handwritten signature in cursive script, reading "Gene Blankenbaker", written over a horizontal line.

Gene Blankenbaker
Forest Supervisor

Tonto National Forest Monitoring and Evaluation Report, FY08

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, gender, religion, age, disability, political beliefs, sexual orientation, or marital or family status. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD).

To file a complaint of discrimination, write USDA, Director, Office of Civil Rights, Room 326-W, Whitten Building, 14th and Independence Avenue SW, Washington, DC 20250-9410 or call (202) 720-5964 (voice and TDD). USDA is an equal opportunity provider and employer.

Table of Contents

<i>FOREST SUPERVISOR'S CERTIFICATION</i>	2
<i>INTRODUCTION</i>	1
<i>MONITORING PLAN REQUIREMENTS</i>	2
Watersheds	2
Protection (Insect/Disease and Visibility Condition).....	8
Grazing Capacity and Range Condition.....	10
Wild Burro Population	11
Riparian Condition	11
Wildlife.....	14
Cultural Resources	15
Visual Quality	17
Timber	17
Standards and Guidelines	19
Costs	20
Outputs	20
<i>ADDITIONAL MONITORING</i>	20
Soil and Water Quality	20
Protection (Fire Management and Wildland Fire)	21
Transportation Management	22
Outdoor Recreation	23
Caves	24
Wilderness and Wild and Scenic Rivers	24
Lands	25
Minerals.....	25
Law Enforcement	26
<i>REFERENCES CITED</i>	27
<i>APPENDIX A: AMENDMENTS TO THE FOREST PLAN</i>	28

INTRODUCTION

This report emphasizes findings and conclusions compiled from monitoring activities conducted in Fiscal Year 2008 (FY08) on the Tonto National Forest (TNF) under the *1985 Tonto National Forest Plan* ("Forest Plan," as amended). An electronic version of the present Forest Plan for the TNF is available at <http://www.fs.fed.us/r3/tonto/projects>.

The Forest Plan specifies the monitoring activity or practice, the effect to be monitored, one or more measurement techniques, and the expected future condition to be met. In this report, expected future conditions are directly taken from the Forest Plan. Forest Plan monitoring is an ongoing process that assesses the response of the Forest environment to management activities undertaken to move the Forest from an existing condition to an expected future condition as described in the Forest Plan. By evaluating the results of the monitoring plan, the Forest is able to better identify future research needs and to shift monitoring activities to more effectively measure overall Forest health. Monitoring also allows for opportunities to modify the Plan.

It is important to note that this is not a monitoring report on individual projects, although some individual projects have been considered in the preparation of this report. Forest Service managers, resource specialists, and scientists in cooperation with State and other Federal agency staff and scientists, provided the information and followed established protocols for collecting and reporting data to address the questions included in the monitoring plan.

MONITORING PLAN REQUIREMENTS

Watersheds

Background Summary

When the Forest Plan was completed in 1985, there were 2.2 million acres of land classified in unsatisfactory condition. Unsatisfactory watershed conditions were attributed to overgrazing and off-road vehicle use that resulted in inadequate vegetative cover to prevent accelerated erosion.

Renewable water supplies were not adequate for meeting human consumption demands. To satisfy demand, ground water pumping was occurring in some areas, resulting in declining water tables. As a result, there was substantial interest in the State to increase available water supplies. The Rocky Mountain Forest and Range Experiment Station was a leader in water yield research at the time. They found that significant increases in runoff could be expected by vegetation treatments including prescribed fire, mechanical fuel treatments, and timber harvest in chaparral, ponderosa pine, and mixed conifer vegetation types in the Lower Colorado River Basin (Hibbert, 1979). To respond to opportunities for increasing water yield through vegetation treatments to meet the demand for increased water yield in the State, the TNF, as well as other national forests within Arizona, included a water yield increase goal in its plan.

The Plan identifies opportunities for increasing water yield through vegetation management, primarily in the ponderosa pine and chaparral vegetation types when compatible with institutional constraints, and objectives for management of other resources. Research and modeling conducted since completion of the Forest Plan suggest that greatest increases in water yields occur during wet years (Brown and Fogel, 1987). Modeling of stream flow and institutional conditions on the Verde River suggest that in an average year about 38 – 42 percent of the increased yield would be available to water users (Brown and Fogel, 1987). While it is not possible to isolate the increased yield available from only TNF lands within the Verde River watershed, total increase in water yield from treatments on suitable sites on all National Forest Service lands within the Verde Watershed in an average year is 32,630 acre feet per year.

Since completion of the Plan, water supply conditions within the State have changed. The most significant change was completion of the Central Arizona Project (CAP) in 1994. The CAP supplies an average of 1.4 million acre feet of water per year into Central and Southern Arizona from the Colorado River. The substantial increase in renewable water supplies provided by the CAP has reduced the interest in increasing water yields through vegetation treatments on the national forests in the State.

Watershed Condition

Expected Future Condition: There will be 2.8 million acres in satisfactory or better condition by the end of Period 5.

Monitoring Summary

Watershed condition assessment has been conducted on a project area basis. Assessments have focused on specific elements of watershed condition such as soil quality, stream channel stability, upland vegetative conditions, and riparian condition.

Watershed condition includes factors such as vegetative cover, soil condition, stream channel condition, water quality, aquatic biota, riparian condition, watershed disturbances, etc. TNF is currently conducting a Terrestrial Ecosystem Survey of the Forest. Information provided in this survey will be valuable for assessing watershed condition. This survey is expected to be completed in about five years. The Forest Service is also developing a national protocol for assessing watershed condition known as the Watershed Program Assessment Rating Tool (PART) that is expected to be issued in FY10. This tool may also assist with the watershed condition assessment process and may be a required element of watershed condition assessment that is reported to the Office of Management and Budget.

Stream channel condition and soil quality data are collected on a project level basis. Macro invertebrate data is collected as part of the Forest Plan monitoring requirements. The Forest is also currently conducting an inventory of the Forest's developed water sources. The project level data is collected primarily for input to *National Environmental Policy Act* (NEPA) documents prepared for various project level activities (primarily grazing and wildland-urban interface projects) and to comply with the monitoring requirements include in these documents. The water resource inventory is being conducted to prepare for a general water rights adjudication.

Soil condition monitoring occurred on approximately 85,000 acres of Forest Land. Soil condition monitoring utilized the Region 3 protocol. Approximately ten miles of riparian stream course monitoring was conducted in 2008. Stream channel and riparian conditions were analyzed using the Tonto Stream Assessment method (Mason and Grove, 1999) and proper function condition assessment. Stream condition assessments completed since the Forest Plan was issued in 1985 identify that of the reaches assessed about 19 percent are in stable condition, 49 percent are impaired, and 32 percent are unstable.

Estimated Water Yield

Expected Future Condition: Projected average annual water yield will be 375 million acre feet.¹

¹ The Forest Plan projected that average annual water yield would be 375 thousand acre feet per year in Period 2 under the proposed action, an increase of 26,000 acre feet per year above the water yield from the Forest in 1980.

Monitoring Summary

Thirteen stream flow gages operated by the U.S. Geological Survey monitor stream flow in watersheds that are primarily located within the TNF boundaries. Six of these have periods of record that would permit computation of ten-year average water yield beginning with the completion of the Forest Plan. Stream flow at one gauge, East Verde River near Childs, was affected by imports from Blue Ridge Reservoir and would not reflect water yield conditions on the Forest. The five remaining gauges were selected to assess change in water yield since the completion of the Forest Plan (Table 1).

Table 1: Stream Gauging Stations Considered for Water Yield Monitoring

Name	Area (sq mi)	Period of Record	Gage Number
Wet Bottom Creek near Childs	36.4	1967 - Present	09508300
Sycamore Creek near Fort McDowell	164.0	1961 - Present	09510200
Cherry Creek near Globe	200.0	1965- Present	09497980
Tonto Creek above Gun Creek, near Roosevelt	675.0	1940 - Present	09499000
New River near Rock Springs	68.3	1965 - Present	09513780

The figures below display ten-year average discharge at the Tonto Creek above Gun Creek gauge and the remaining gauges listed above that were selected for the analysis.

Figure 1: Ten-year Average Annual Runoff and Trend, Tonto Creek above Gun Creek

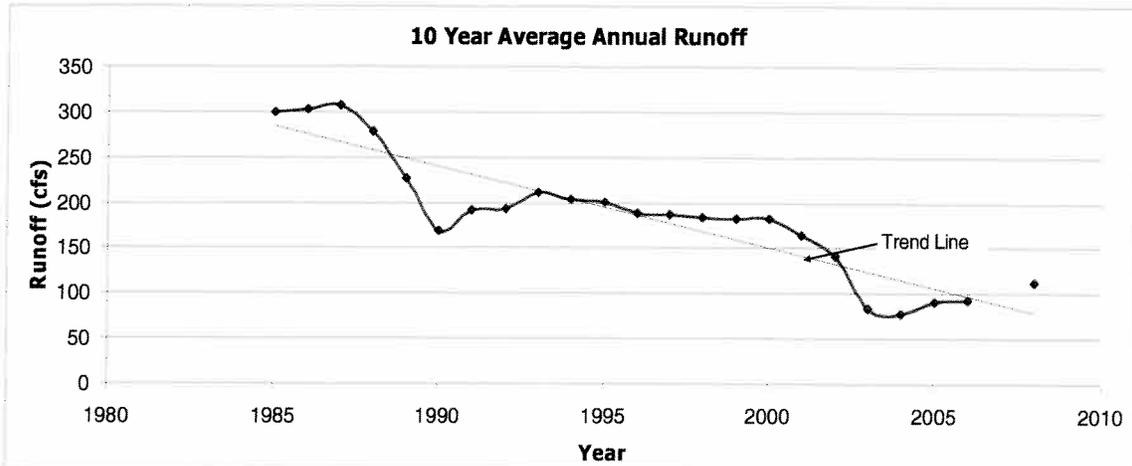
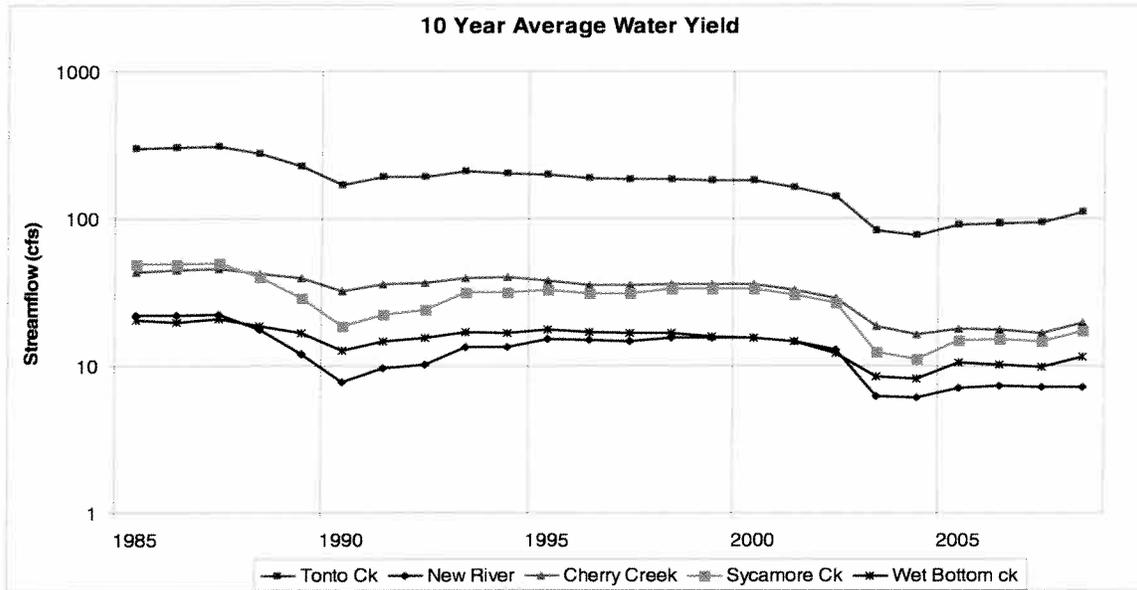
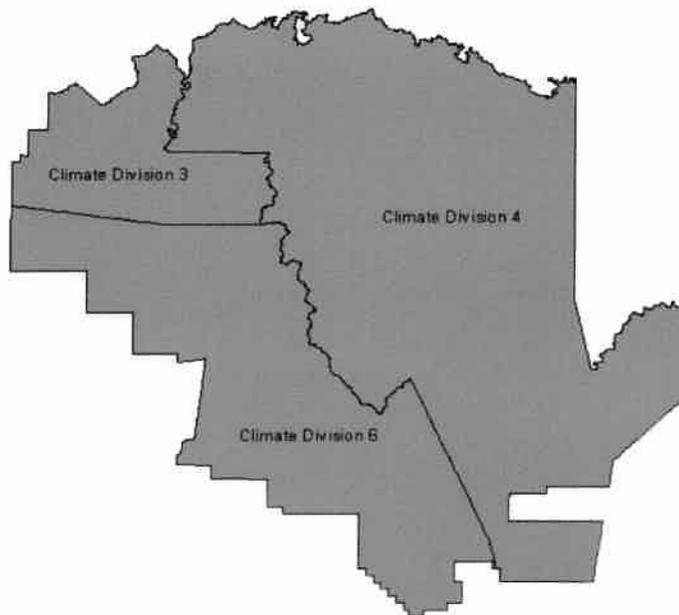


Figure 2: Ten-year Average Water Yield at Selected Gauging Stations



The data for each of the selected gauges shows that water yield has declined since the completion of the Forest Plan. Since water yield is clearly tied to precipitation, changes in precipitation amounts should have a substantial effect on water yield. Looking at Arizona Climate Divisions (Figure 3) provides average precipitation totals for the TNF. The Forest is comprised of Climate Divisions 3, 4, and 6.

Figure 3: Tonto National Forest Climate Divisions



Ten-year average precipitation totals for the period since completion of the Forest Plan are displayed in Figure 4. Figure 4 shows that rainfall and water yield have followed a downward trend since completion of the Forest Plan.

Figure 4: Ten-year Average Rainfall for Climate Divisions

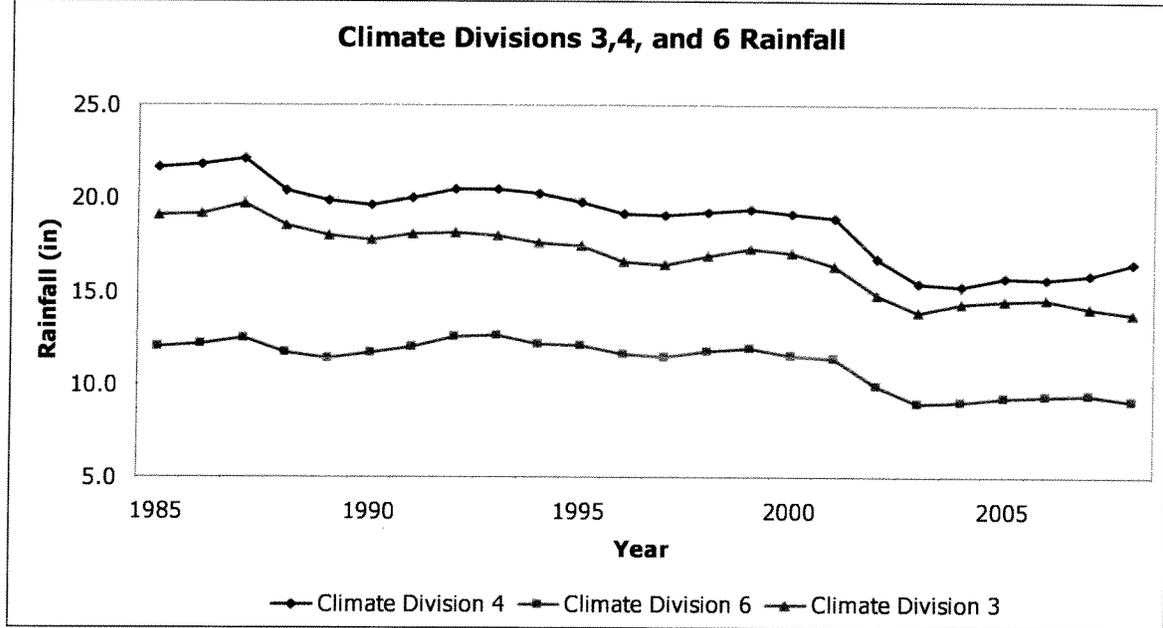
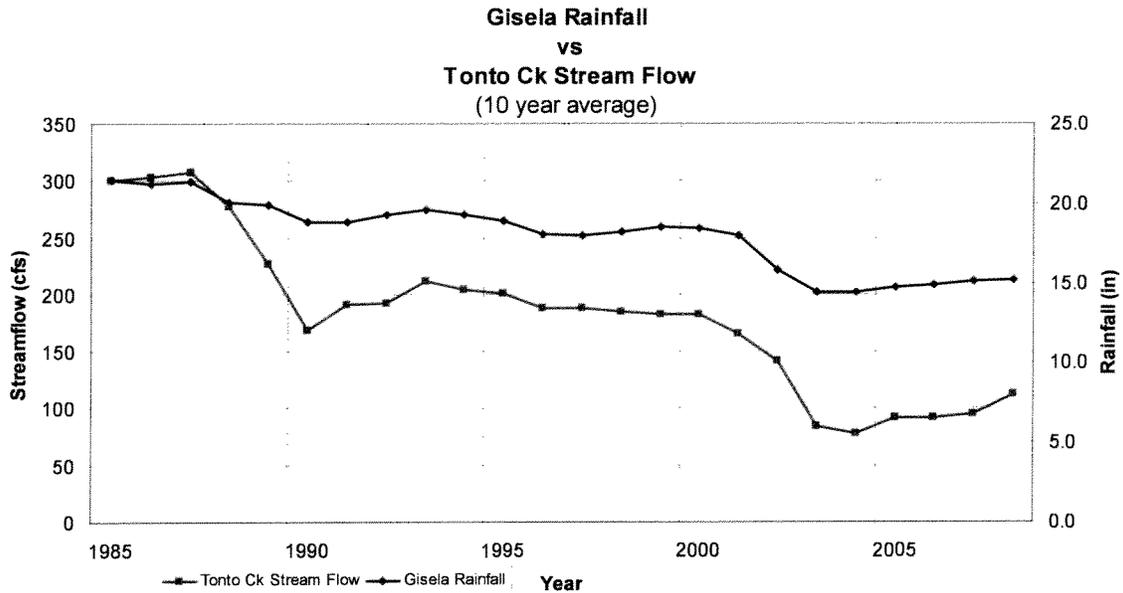


Figure 5 displays the correlation between ten-year average runoff at the Tonto Creek stream flow gauge and 10-year average rainfall at Gisela, which is located several miles upstream of the stream flow gauge. The 0.93 correlation coefficient between these two gauges is very high, confirming the relationship between average rainfall and water yield. Similar correlations exist with other rainfall gauges and the selected stream gauges on the TNF, although with lower correlation coefficients.

Figure 5: Gisela Rainfall Compared to Tonto Creek Stream Flow



Rainfall and runoff data displayed in the previous figures clearly identify that water yield has been declining with declining precipitation and that precipitation is the major factor affecting runoff. Climate change predictions for the Southwest are that conditions will become warmer and drier and that water yield will continue to be reduced.

Little increase in water yield can be expected from vegetation management in piñon-juniper, semi desert grassland, or desert ecosystems. Watershed treatments in the chaparral and ponderosa pine vegetation types result in the greatest increases in water yield. But duration of water yield increases in the chaparral type is short-lived (3-5 years) due to rapid resprouting of species unless chaparral is permanently converted to a grassland vegetation type. Proposals for converting chaparral to grass with the use of herbicides do not currently exist due to public concerns about herbicide use and multiple use constraints in the Forest Plan. The most efficient method for converting chaparral to grassland is with the use of herbicides. Duration of water yield increases in Ponderosa pine is greater than chaparral and may last for up to ten years (Baker, 1986). Treatments such as timber sales that reduce the basal area of harvested species, prescribed burns and other fuels treatments that reduce vegetation density and even wildfires can reduce evapotranspiration in these vegetation types and result in increased water yield.

Because the 26,000 acre foot per year potential increase in water yield from vegetation treatments on the TNF is less than two percent of the supply available via the Central Arizona Project, the impetus for increasing water yields by treatment of chaparral and ponderosa pine vegetation communities on the Forest has diminished. Multiple use management mandates (e.g., wilderness, wildlife habitat, scenery) limit the number of treatable acres and prohibitions on the use of herbicides limit the duration of increased water yields in the chaparral vegetation type (the community with the greatest potential for increased yields).

Protection (Insect/Disease and Visibility Condition)

Background Summary

The Forest monitors insect and disease conditions in order to better predict future impacts. Insect and disease problems should not have serious adverse effects on TNF due to an appropriate mix of silvicultural activities, treatment of slash, and various other control methods.

Insect and Disease

Expected Future Condition: Insects and disease are not expected to have serious adverse effects on the Forest.

Monitoring Summary

Annual aerial detection surveys are made by the Forest Health Protection staff, located in the Rocky Mountain Research Station office in Flagstaff, AZ. Bark beetle activity continues to occur on the TNF, but at levels that are creating less mortality and less area infected than observed in the 2003 surveys.

Visibility Condition (Protection)

Expected Future Condition: Class 1 areas will retain good visibility to meet Class 1 standards. Visibility will be retained in form, line, feature, and color of characteristic landscapes.

Monitoring Summary

Monitoring for visibility in Class 1 areas is ongoing. The Forest monitors visibility through the Interagency Monitoring of Protected Environments (IMPROVE) network using monitors located in or adjacent to forest lands. The IMPROVE network is operated by University of California at Davis Crocker Nuclear Laboratory. The monitors detect aerosol particles in the air, which scatter light and cause a “hazy” effect in the air.

Goals for regional visibility are to meet or exceed baseline conditions by 2054. Baseline conditions are based on visibility data collected between 2000 and 2004. Although data is currently unavailable for FY08, the most currently available data are reported in the Figures 6 and 7. The graphs show the best 20 percent, mid 20 percent and worst 20 percent of days in a year for total light extinction by aerosol particles in inverse megameters (Mm^{-1})². A higher Mm^{-1} value means the air is hazier. The best 20 percent is the percentage of days in a single year that had the best visibility conditions, while the worst 20 percent is the percentage of days within the same year that had the worst visibility conditions. To meet the goal of achieving baseline visibility conditions by 2054, the best 20-percent trend line should remain flat or show a slight increase. The trend line for the worst 20 percent should decline and the trend line for mid 20-percent days should be an average of the best and worst trend lines. The graphs show that aerosol

² Inverse megameter: The amount of light lost as it travels over one million meters. This unit is most useful for relating visibility directly to particle concentrations in the air.

particles in the Sierra Ancha Wilderness and the Superstition Wilderness are decreasing and therefore, visibility is improving.

Figure 6: Visibility in Sierra Ancha Wilderness

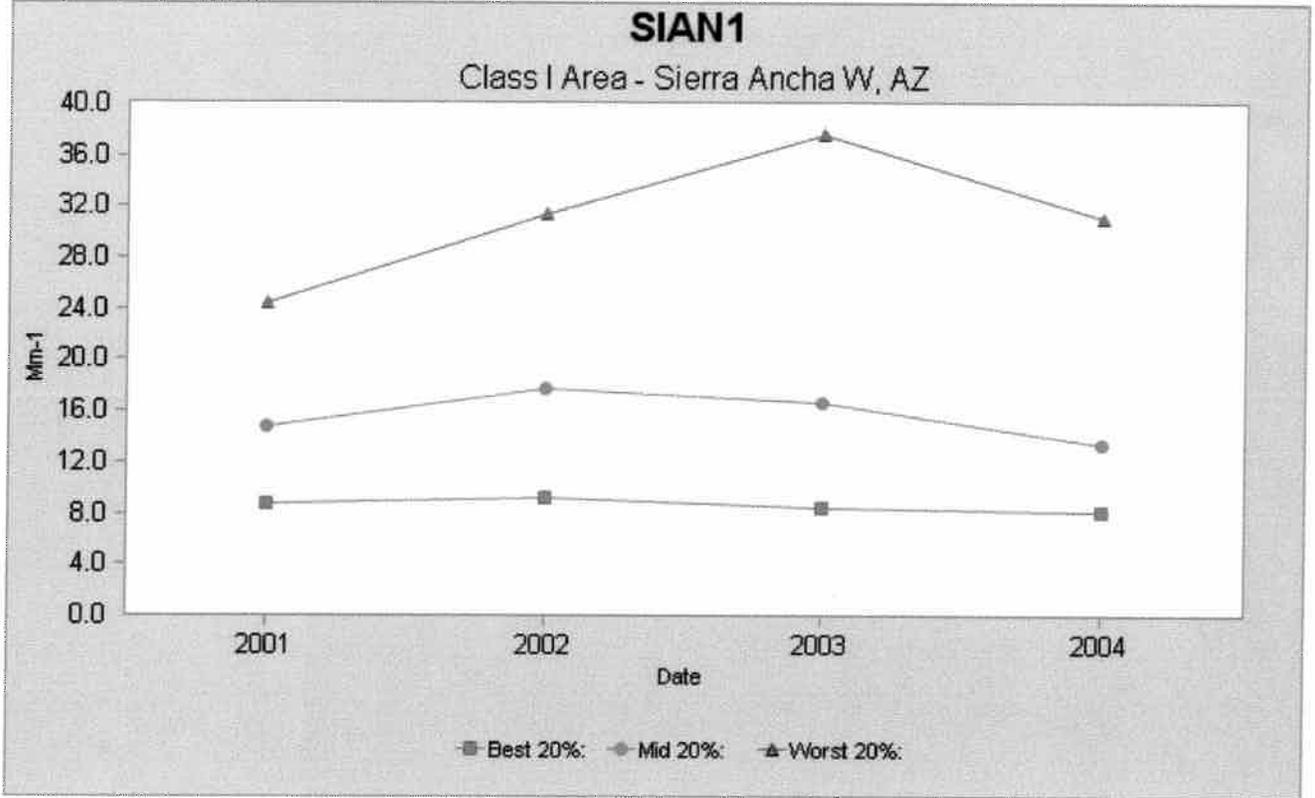
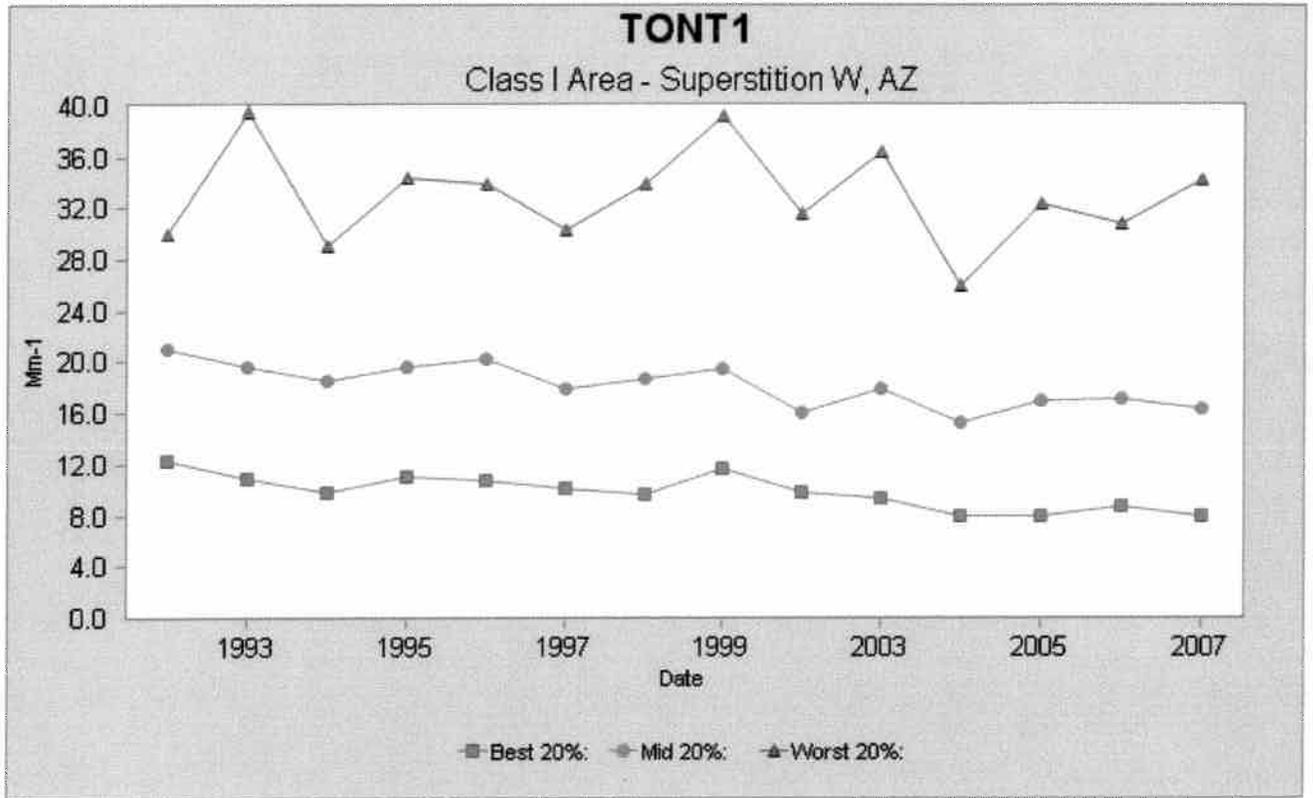


Figure 7: Visibility in Superstition Wilderness



Grazing Capacity and Range Condition

Expected Future Condition: Grazing capacity of 278,000 animal use months (AUM's) and permitted use at the same level.

Background Summary

In 1980, the grazing capacity was 259,425 AUM's and permitted use was 428,189 AUM's. Livestock grazing is monitored through inspections to determine short-term needs for adjustment in stocking numbers and through use of data collected for analysis of grazing projects as required by NEPA. Short-term adjustments in stocking levels are based on forage plant vigor and production and livestock water availability.

Rangeland conditions are difficult to measure directly on an annual basis because of climatic conditions, which affect plant species diversity, herbaceous growth, and litter production. Therefore, indicators of changes in condition, such as type and quantity of plant species present, are used to compare plot data from the Forest's ecological inventory and current rangeland health field inspection information with Terrestrial Ecosystem Survey information to estimate site potential and changes in plant and soil condition. This combination of management tools has generally resulted in favorable condition assessments, with possible exceptions near watering locations where livestock,

wildlife, and recreational activity typically concentrate. Administrative actions are taken, where needed, to ensure that rangeland conditions in not in a declining trend.

Monitoring Summary

In FY08 an estimated 2,182,841 acres of rangeland were evaluated and administered to standard across the Forest. All range allotments with Threatened and/or Endangered species were monitored for compliance with *Endangered Species Act Section 7* consultation agreements and were found to be in compliance.

Livestock numbers increased slightly with authorized use stocking level to 27,825 head of livestock, less than a one-percent increase over the previous year. This increase is attributed to the outstanding summer growing season on Pleasant Valley Ranger District. In response to the ongoing drought, however, authorized numbers for 2008 were still well below permitted numbers.

Inspections were done on all authorized pastures. Inspections were completed by District personnel, Arizona Cattle Growers’ contractor, Drs. Sprinkle and Crew, and permittees. Results of inspections and other Forest projects are listed in Table 2.

Table 2: Range Monitoring

Improved Range Vegetation	85,132 acres
Grazing Allotment Administration to Standard	2,182,841 acres
NEPA Documents for Grazing Decisions	6 each

Wild Burro Population

Expected Future Condition: A maximum population of 25 animals.

Monitoring Summary

The burro population in 1980 was 31 animals. Currently, there are no local issues or concerns surrounding wild burro management. One visual observation was completed in FY08 by the Mesa Ranger District biologist and wild burros were observed.

Riparian Condition

Expected Future Condition: Riparian areas will be managed to achieve:

- Annual growth by volume in woody species will not be browsed more than 20 percent per year.
- Crown cover of overstory species will be enhanced to 80 percent of potential for each vegetative type.
- Fifty percent of cottonwood-willow and mix broadleaf acreage will be in structural Type I in 50 years, with 25 percent in structural Type IV in 10 years, and 50 percent in structural Type IV in 20 years.

Achievement of the conditions will be indicated by the increased occurrence and density of management indicator species: bald eagle, Bell's vireo, summer tanager, hooded oriole, hairy woodpecker, Arizona gray squirrel, warbling vireo, western wood pewee, black hawk, and macro-invertebrates.

Background Summary

Riparian areas provide essential habitat requirements for a variety of wildlife. However, local concerns collected during Forest Plan development noted that riparian areas on the Forest were heavily impacted by livestock grazing and recreational users. As a result, the *Forest Plan Environmental Impact Statement* (EIS) states that riparian vegetation is an important element of the land base, especially on the TNF, where it is limited to less than one percent of total Forest area (25,900 acres) and riparian areas are probably the most critical ecosystem for multiple use management. Deteriorated areas are characterized by unstable streambanks and the absence of shrub and tree species. Stream temperatures are elevated, aquatic community diversity is reduced, fish habitat is depleted, and terrestrial habitat is extremely limited (U.S.D.A. Forest Service, 1985a, 94-95).

The Forest Plan is clear in its intent regarding the importance and management for riparian areas, including:

1. Maintaining and improving wildlife and/or aquatic species habitat (U.S.D.A. Forest Service, 1985b, 20, 33), and
2. Enhancing riparian ecosystems by improved management (U.S.D.A. Forest Service, 1985b, 19).

Monitoring Summary

Benthic organism sampling (reported below) was conducted by TNF staff in FY08. Water quality conditions at two sites, Cherry Creek above Devil's Chasm and Tangle Creek at the Forest Service Administrative Site, were inconclusive based on the macroinvertebrate communities. One site, Cherry Creek below Turkey Creek, was rated as impaired and one site, Seven Springs Wash, was rated as attaining water quality conditions.

Figure 8: Water Quality Conditions and Dominant Taxa

Location: Cherry Creek above Devils Chasm

Sample Date: May 15, 2008

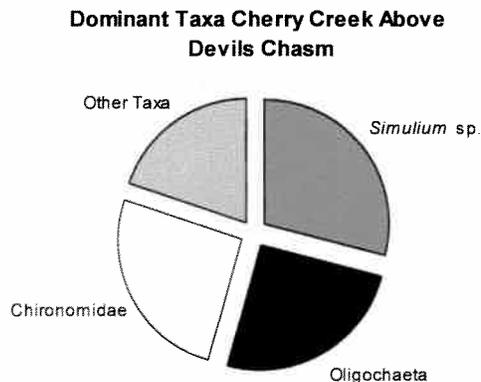
Elevation: 3,243 ft.

AZDEQ Warm Water IBI

Score: 46.30

Assessment Based on IBI

Score: *Inconclusive*



Location: Cherry Creek below Turkey Creek

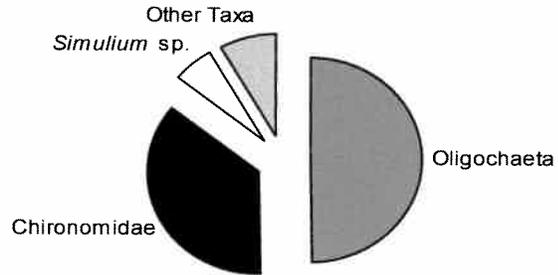
Sample Date: May 1, 2008

Elevation: 4,547 ft.

AZDEQ Warm Water IBI Score: 31.00

Assessment Based on IBI Score: *Impaired*

Dominant Taxa Cherry Creek Below Turkey Creek



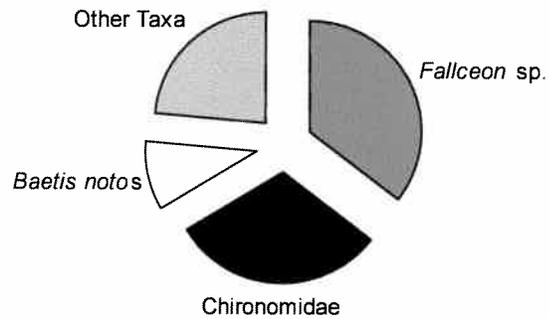
Location: Seven Springs Wash

Sample Date: May 13, 2008

Elevation: 3,473 ft AZDEQ Warm Water IBI Score: 55.39

Assessment Based on IBI Score: *Attaining*

Dominant Taxa Seven Springs Wash



Location: Tangle Creek at Admin Cabin

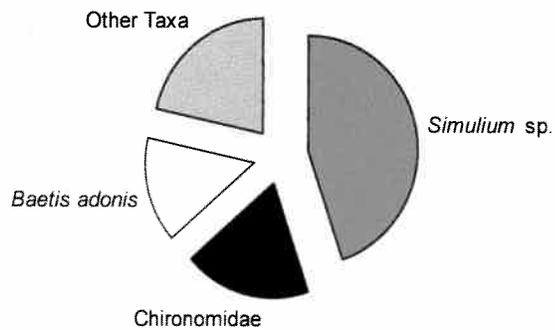
Sample Date: 30 April 2008

Elevation: 2849 ft.

AZDEQ Warm Water IBI Score: 44.20

Assessment Based on IBI Score: *Inconclusive*

Dominant Taxa Tangle Creek at Admin Cabin



The six TNF Ranger Districts conduct, to varying degrees, rangeland implementation monitoring of riparian utilization guidelines as described in “Riparian Area Management Utilization Guidelines, Tonto National Forest” (McBride and Grove 2002). This document recommends utilization guidelines and monitoring protocols for riparian areas grazed by ungulates. These guidelines, or modifications of these guidelines, are included in District Range Allotment Annual Operating Instructions, Allotment Management Plans, Environmental Assessments, or Biological Opinions as mitigation measures.

As part of project level analysis in 2008, 18 stream reaches were assessed for condition and function. A stream channel cross section, pebble count and slope measurements were re-measured on one stream reach for effectiveness monitoring.

A three-year effectiveness monitoring project was completed at Canyon Creek on the Pleasant Valley Ranger District in a partnership with Arizona Game and Fish Department. Using protocols developed by Marc Coles-Ritchie from Forest Service Research, riparian vegetation and stream channel trends were measured to evaluate the effectiveness of an elk exclosure.

Kathy Nelson’s riparian area photo point program remains the primary effectiveness monitoring occurring on the Forest. About 220 permanent photo points were re-photographed or established in 2008.

In 2004, the Tonto Riparian Monitoring Team and Riparian Ecologist initiated the development of an effectiveness monitoring protocol for riparian vegetation. Due to changes in personnel and lack of funds, this effort was never finalized. Currently, the Forest Service lacks any corporate effectiveness monitoring protocols.

Generally, riparian area management has improved since 1995, and there is an increased awareness of riparian area management needs.

Wildlife

Expected Future Condition for wildlife management indicator species in piñon-juniper, chaparral, and grassland/desert areas: Decreased occurrence and density of grey vireo, Townsend’s solitaire, and plain titmouse in piñon-juniper. Increased occurrence and density of ash-throated flycatcher, common flicker, and rufous-sided towhee in piñon-juniper. Increased occurrence and density of rufous-sided towhee and black-chinned sparrow in chaparral. Increased occurrence and density of black-throated sparrow and brown towhee in the desert scrub type.

Expected Future Condition for wildlife management indicator species: Indicator species will show trend of increase in population. Habitat conditions should be improved and age-class distributions of trees in the forested ecosystems should be improved.

Background Summary

Local concerns about wildlife habitat were collected when the Forest Plan was developed. These included concerns about the inadequacy of existing wildlife habitats to supply basic food and cover requirements, as well as the failure of wildlife habitat management prescriptions to provide the basic needs, where conflicts with other resource needs were amplified.

Wildlife and fish habitat elements are recognized in all resource planning and management activities to ensure coordination that provides for species diversity and greater wildlife and fish populations through improvement of habitat. Additionally, fish and wildlife habitats are managed to maintain viable populations of existing native vertebrate species and to improve habitat for selected species through cooperation with appropriate State fish and wildlife agencies. Threatened and Endangered Species are managed for a goal of increasing population levels that will remove them from the lists by preventing destruction or adverse modification of critical habitats on Forest land.

The summary of population and habitat trends for the Management Indicator Species identified in the Forest Plan provides biologists with a Forest-wide evaluation of MIS habitat to use when analyzing a project's site-specific effects.

Standards and Guidelines in the Forest Plan require monitoring of threatened, endangered and sensitive species. Threatened and endangered (T&E) species are surveyed for project and program monitoring requirements, as well as to provide planning information during project analysis. Monitoring is ongoing for T&E species on the Forest for known nesting locations. The primary species monitored on TNF are southwestern willow flycatcher and Mexican spotted owl.

Monitoring Summary

TNF uses data for monitoring from external sources such as the Breeding Bird Survey, Christmas Bird Count, NatureServe, Arizona Game and Fish Department, as well as project-related data (e.g., Range NEPA). However, data for FY08 has yet to be compiled by the external sources.

Cultural Resources

Expected Future Condition: All national register-eligible resources will be protected from project-derived, ground-disturbing activities and from willful or negligent damage, including vandalism and recreation.

Background Summary

TNF manages 34 properties that include 100 individual sites or structures that are listed as National Register Properties. Since a number of these sites are actively being used, many are visited throughout the year by heritage resource management personnel. Those National Register properties that are not used on a daily basis are visited less regularly. These less-visited sites are customarily checked by Forest personnel as the opportunity

arises, usually every few years. Monitoring has identified two primary sources related to site integrity. Properties tend to experience little overall change from year to year, although pre-historic sites can be affected by natural processes as well as vandalism. Natural processes typically relate to weather events. For example, heavy rain can cause sheet and rill erosion, causing artifacts to be displaced and archaeological features to be compromised. Site integrity can also be impacted by vandalism and recreational activity such as camping and OHV use.

Monitoring Summary

Listed National Register Properties remain in fairly stable condition with no major impacts having altered their historic integrity.

There were 103 heritage resource projects completed in FY08 on the TNF, resulting in the discovery of 144 archaeological properties. In addition to discovering new archaeological properties, 227 previously recorded sites were monitored in relation to project activities. Of the projects that were surveyed, 34 (33 percent) resulted in direction to manage for the presence of historic and prehistoric resources. This is about 10 percent more than the previous year. Pre-project monitoring of implemented projects where sites are present consisted of ensuring that sites were properly identified and marked for avoidance, checking the sites, and removing identification boundary markers once the project was completed. It is not uncommon that sites are visited more than once during the life of a project to ensure that they are protected.

TNF conducted inspections at various levels on approximately 12 percent of all in-service projects, 90 percent of all out-service projects and 100 percent of all projects over 100 acres.

Monitoring also consisted of inspecting 12 pre-historic and historic non-project related sites for signs of natural deterioration and vandalism primarily sites listed as Priority Heritage Assets. This was well below target for the year. During FY08, all of these sites showed varying degrees of natural deterioration, although no sites were significantly damaged by natural occurrences. There were also three reports of vandalism that were inspected, but no individuals were identified. This number is slightly decreased from the previous year. No areas were identified with high probability for vandalism.

In addition to monitoring National Register Properties, monitoring efforts included checking a number of archaeological sites that fell within prescribed burns and other large scale vegetation treatments. Monitoring also occurred on smaller projects of all types.

Identifying recreation impacts by establishing test sites and inspection schedules was not done because there is insufficient funding and personnel to design and implement this type of program.

Visual Quality

Expected Future Condition: All analysis areas will be at specified visual quality or better.

Background Summary

Visual resources and impacts to them are regularly considered during environmental analyses, as this resource is impacted by management activities and decisions. Visual quality is also sometimes impacted by influences beyond the control of the Forest. Visual quality concerns will continue to grow in significance as the rural and urban populations surrounding the TNF continue to increase.

Monitoring Summary

Projects involving vegetative treatment or manipulation, road or trail construction and major development have been evaluated through the NEPA process to maintain visual quality objectives and ensure mitigation. Over most of the TNF, visual quality has been maintained.

Timber

Background Summary

Acreage of intermediate harvest, regeneration harvest, and removal harvest monitoring is done to measure treatment prescriptions and effects in order to achieve the expected future condition. At the time the Plan was approved, local issues acknowledged that demand for fuelwood exceeded accessible supply and was not located in areas preferred by the public. The timber harvest levels may have been exceeding the productive capability of the timber resource and allocations to other resources emphasizes could reduce the amount of available timber. In addition, the Forest lacked a comprehensive fuelwood inventory.

Timber Prescription Compliance

Expected Future Condition: Achieve a more balanced age-class distribution, appropriate growing stock levels, appropriate rotations, and provide wildlife habitat needs.

Monitoring Summary

Monitoring was done through the TMIS reporting system. There has been a lack of harvest activity on the Forest, as a result of poor market conditions and drastic reduction in purchaser availability. Poor timber market conditions have resulted in purchasers receiving extensions on their contracts and not harvesting, making ground review by staff minimal.

TNF has taken advantage of other opportunities to help achieve expected future conditions. The Healthy Forest Initiative provides funding to reduce fuel hazards, especially within the Wildland Urban Interface (WUI). This has allowed treatment of fuels, both in the piñon-juniper woodland type and the Ponderosa pine type, on slopes

that are not suitable for timber harvest, as well as treatment of commercially suitable lands.

Sawtimber Offered

Expected Future Condition: Annual sale offerings will be made on a sustained yield basis.

Monitoring Summary

TNF sold approximately 1,929 CCF³ of sawtimber. These sales were green sales that involved clearing for highway right-of-way (ROW) construction. Reduction of the density of the stands to improve Forest health occurred on 12 acres of powerline ROW. This volume was a permanent change to the landscape and vegetation deemed necessary to meet the requirements of the ROW. Three thousand (3,000) cords of firewood from various personal use and commercial sale areas were also sold.

The TIM program and MAR programs report annual sale offerings. In FY08, the sawtimber program harvested 247 acres of intermediate cut and 0 acres of regeneration cuts. Table 3 shows the number of acres of harvest treatment from 2005 through 2008 in pine and piñon-juniper types.

Table 3: Harvest Treatment

Pine Type (acres)			
Year	Regeneration Harvest	Intermediate Harvest	Removal Harvest
2005	0	1640	0
2008	0	189	0
Piñon-Juniper Type (acres)			
Year	Regeneration Harvest	Intermediate Harvest	Removal Harvest
2007	0	37	0
2008	0	58	0

In FY08, there were fewer sawmills in operation than in previous years, meaning that there are fewer purchasers to buy timber sales. Further, due to poor market conditions, even purchased timber sales were not being harvested because purchasers were waiting for market conditions to improve before beginning operations. New highway construction has provided an opportunity to meet volume sold targets; however, this is not part of a sustained yield volume noted in the Forest Plan. There is potential to manage for sustained yield from a resource standpoint in the future, but low industry numbers are still creating potential problems with selling sales.

Timber Harvest Area Size

Expected Future Condition: Wildlife habitat will be improved through timber harvest by manipulation of stand sizes, methods of cut, and juxtaposition of stands.

³ CCF = 100 cubic feet

Monitoring Summary

Monitoring for wildlife habitat improvement has occurred as part of overall wildlife management. The initial Forest Plan was designed around even-aged management using the integrated management concept where a few stands in a given area would be treated by a sale, and then a few years later additional stands would be treated. This concept has changed drastically over the past few years. Uneven-aged management is now required by the 1995 plan revision for northern goshawk and Mexican spotted owl. Further, because of the ever increasing size and intensity of wildfires, there is a strong move to treat landscape scale areas to reduce fire risk and improve Forest health over a broader scale. Therefore, stand size is no longer a concern (except for possibly being too small), when trying to improve wildlife habitat.

Timber Restocking of Lands

Expected Future Condition: All lands harvested for timber production as part of the allowable sale quantity are adequately restocked within five years after final harvest. Meaning that 80 percent of the timber sale area has at least a minimum of trees commensurate with site quality by forest type and management objectives.

Monitoring Summary

The Forest has not needed to use “regeneration prescriptions” that would trigger restocking requirements, which only come into play with specific regeneration prescriptions.

Unsuitable for Sustained Yield Timber Lands

Expected Future Condition: Better define those areas that may be unsuitable for sustained yield timber production.

Monitoring Summary

When the 1985 Forest Plan was initiated, it was recognized the much of the land identified as suitable timber land had been based upon aerial photo interpretation. Since that time, the silviculturist has been able to verify and recommend stands as suitable or not by stand exam and field reconnaissance.

Standards and Guidelines

Expected Future Condition: Application of standards and guidelines will ensure achievement of planned management direction.

Monitoring Summary

Program reviews are conducted by each district through overviews of work plans and individual programs. Both goals and accomplishments are tracked yearly. Public comments on various projects are routinely collected and responses are prepared and sent.

Costs

TNF monitors planned and actual costs via Work Plan and the Federal Financial System throughout each fiscal year to ensure the Forest stays within funding allocations received in Final Program Direction from the Regional Office.

Outputs

Monitoring of outputs has occurred annually as required by the Forest Plan. TNF has achieved FY08 output targets for planning and monitoring.

ADDITIONAL MONITORING

Soil and Water Quality

Public concern during Forest Plan development noted that land uses created some areas on the Forest with unacceptable soil erosion and watershed condition, threatening soil productivity. Additionally, it was noted that Forest management activities have the potential to significantly alter water quality and that the physical, chemical, and biological quality of water can limit its uses. When the Plan was developed, isolated pollution problems both on and off the Forest produced conflicts with water uses.

The Forest responds to such concerns by providing direction and support to all resource management activities to: (1) meet minimum air and water quality standards, (2) emphasize improvement of soil, (3) enhance riparian ecosystems by improved management, and (4) augment water supplies when compatible with other resources. Soil, air and water resources will be inventoried and interpreted. Further, all major riparian areas were under intensive management by 1995. Water rights are obtained as necessary to ensure orderly resource development. Resource planning and management activities within the desert zone recognize the limitations this unique ecosystem has to the impacts of man's uses and activities.

Soil Quality

The Forest monitors soil quality by proposed project activity, primarily for input to NEPA documents.

Water Quality

The Forest monitors by collecting macroinvertebrate data and by assessing stream channel conditions. The macroinvertebrate monitoring effort is conducted based on the monitoring plan contained in the Forest Plan. The stream channel condition assessments are not an element of the Forest Plan.

The Forest collects macroinvertebrate data at about 38 sites across the Forest at the rate of about five sites per year. There may be several years between repeat samplings. The Arizona Department of Environmental Quality (ADEQ) has recently incorporated

macroinvertebrate criteria into their water quality rules. The Forest has changed its sampling protocol to be consistent with the ADEQ protocols so that Forest data can be compared against the ADEQ biocriteria standards. This change occurred about three years ago. It is difficult to compare last year's data with previous data collections at the various sites due to the time interval between resampling of specific sites and the change in protocol used for sampling.

The Forest conducts stream channel assessments primarily for project level work that is incorporated into appropriate NEPA documents. Stream channel assessment data are accumulated over time in a data base maintained by water resources staff.

Protection (Fire Management and Wildland Fire)

During Forest Plan development, the public noted that revised suppression and prescribed fire polices provided more flexibility in the use of fire to benefit all resources. At the time the Forest Plan was developed, it was thought that using the Escaped Fire Situation Analysis would allow weighing the cost of wildlife suppression against values at risk to design fire control that was cost efficient. Since then, the Wildland Fire Decision Support System provides a mechanism to evaluate the impacts from the wildfire and consider the direction provided by the Forest Plan and select the best response to the wildfire.

The Forest addressed these issues by recognizing fire as a resource management tool to be included within a management prescription where it can effectively accomplish resource management objectives, including re-introducing fire back into fire dependent ecosystems and allowing it to resume its natural role. The priorities for managing wildland fire continue to be protection of public and firefighter safety, property, natural and cultural resources to minimize negative impacts. Fire management, including suppression activities, is commensurate with resource values and objectives.

The Forest monitors completion of the accomplishment acres by evaluation of every prescribed fire acre that is completed in either the WUI or Non-WUI areas. This evaluation includes recording the acres for each burn unit that is treated. The WUI/Non-WUI has been mapped and designated for the Forest.

The acres for prescribed fires have remained stable for the past few years, and the acres are reported in Table 4. The Forest anticipates that the need for additional acres in the WUI will increase as the communities expand their development.

Table 4: Acres Treated for Fuels

WUI high-priority hazardous fuels treated	5,000 acres
Non-WUI fuels treated	13,000 acres

Transportation Management

Local issues identified during Forest Plan development noted that TNF was not meeting prescribed minimum standards for road and trail maintenance and that many of the existing roads and trails were substandard. Conflict existed between providing user access to Forest resources and minimizing road density and conflicts between different user groups.

The Forest addresses these issues by confining right-of-way grants to designated corridors to the extent practicable and by providing a serviceable road and trail transportation system to meet public access, land management, and resource protection needs. Administrative facilities are provided to meet resource and activity needs, while meeting applicable pollution abatement standards.

The Forest monitors its transportation system by prioritizing road maintenance projects based on annual targets. A dedicated road crew visits each District six to eight weeks per year and responds to needed road maintenance and resource issues, as they are identified by District staff. Main public roads within the Forest are maintained annually, while other roads (such as high clearance roads) are maintained as needed to meet road standards.

In FY08, TNF met all required targets. No roads were decommissioned. Road maintenance for road levels 1-5 are described in Table 5.

Table 5: FY08 Annual Road Maintenance in Miles

Maintenance Level	Total System Operation	Roads receiving maintenance	Roads at objective maintenance level
Level 1	621.2	0.0	0.0
Level 2	3,210.7	530.0	530.0
Level 3	313.3	289.7	289.7
Level 4	84.3	37.5	67.0
Level 5	54.0	13.3	80.0
Total Miles	4,269.50	870.5	966.7
Percentage of Road receiving maintenance			20.2%
Percentage of Road Miles meeting RMO			22.6%

Maintenance levels 1-5 (operational and objective) are described below:

- Basic custodial maintenance is performed on level 1 roads to keep damage to adjacent resources to an acceptable level and to perpetuate the road. While being maintained at level 1, the roads are closed to vehicular traffic, but may be open and suitable for non-motorized uses.
- Roads assigned to maintenance levels 2-5 are either constant service roads or intermittent service roads during the time they are open to traffic.
- Level 2 roads are open for use by high clearance vehicles.
- Level 3 roads are open and maintained for travel by a prudent driver in a standard passenger car, although user comfort and convenience are not considered priorities. Roads in this maintenance level are typically low speed, single lane with turnouts and spot surfacing. Some roads may be fully surfaced with either native or processed material.
- Level 4 roads provide a moderate degree of user comfort and convenience at moderate travel speeds. Most are double lane and aggregate surfaced; however, some may be single lane and may be paved and/or dust abated.
- Level 5 roads provide a high degree of user comfort and convenience. These roads are normally double lane, paved facilities and some may be aggregate surfaced and dust abated.

TNF also maintains transportation facilities, such as bridges and major culverts. There are 27 bridges and 21 major culverts located within TNF. The bridges are inspected by the regional transportation engineer and the Forest facilities/transportation engineer every two years. Deficiencies found during condition surveys are corrected by construction contracts. In FY08, 18 bridges were repaired to current safety standards (11 more than in FY07).

Major culverts are inspected every two years by the Forest facilities/transportation engineer. The deficiencies found during culverts conditions surveys are corrected through routine road maintenance. A total of 96 facilities were maintained to standard in FY08.

Outdoor Recreation

During Forest Plan development, local concerns acknowledged that demand for developed recreation opportunities exceeded the supply and that the quality of dispersed recreation opportunities was declining. Further, the Forest Plan noted the opportunity to make recreation sites accessible to all visitors and to provide interpretation of prehistoric and historic sites as a developed recreation experience. Local issues also included the need to manage for increasing OHV use.

The Forest responds to these concerns by maintaining and enhancing visual resource values and increasing opportunities for a variety of developed and dispersed experiences. Developed sites are provided to reduce natural resource impacts from heavy dispersed recreational use. The Forest coordinates activities and planning for inventory, evaluation,

nomination, management protection, scientific study, public interpretation and enhancement of cultural resources with the State Cultural Resource Plan, the State Historic Preservation Office, and other State and Federal agencies and in accordance with management prescriptions, objectives and priorities.

Monitoring recreation allows the Forest to respond to these local concerns, as well as identify opportunities for increasing the quality and variety of developed and dispersed recreation experiences, including maintaining or enhancing visual quality and cultural resources. The Forest tracks the number of visits, buildings and sites that meet accessibility standards, special use permits, and the miles of motorized and non-motorized trails built or improved.

The Forest continues to be highly visited. Visitor use is monitored every four years and was last done for TNF in 2002. Visitor sampling was completed last year; however, results are not yet available.

Some information on OHV use can be gathered from a 2008 U.S. Government Accountability Office (GAO) report. GAO examined the (1) trends in and status of OHV use on federal lands, as well as reported environmental, social, and safety impacts; (2) agencies' strategic planning for managing OHV use; (3) actions taken by agency field units to manage OHV use; and (4) current OHV management challenges. TNF was one of the sites chosen to participate in this study. Overall, GAO found that OHV use on federal lands (both authorized and unauthorized) increased from fiscal year 2004 through fiscal year 2008. TNF noted that OHV use has increased since the state of Arizona closed lands near Phoenix to OHV use in an effort to reduce dust pollution and that the main impact associated with OHV use in the forest has been soil erosion (particularly in areas with highly erodible soils). OHVs are predominantly used for recreation and hunting.

Caves

Cave ecosystems are preserved and protected as nonrenewable resources to maintain their geological, scenic, educational, cultural, biological, hydrological, paleontological, and recreational values. The appropriateness of recreation activities are evaluated as part of a Forest-wide Cave Implementation Plan for significant or selected caves.

Wilderness and Wild and Scenic Rivers

The Forest's wilderness management program is interdisciplinary in approach, and is directed towards achieving the intent of the *Wilderness Act of 1964* and *Forest Service Manual 2320 (FSM 2320)*. At the time the Forest Plan was developed, there were local concerns about heavy use by people, other non-compatible resource uses, and nonconforming structures are reducing wilderness values, especially in the Superstition Wilderness.

In FY08 wilderness areas on the TNF were monitored and the trails were maintained to standard. As the population in Maricopa and adjacent counties increase, the number of visits to the TNF wilderness areas is expected to increase. Impacts to natural resources within wilderness are documented and monitored.

TNF works cooperatively with the Coconino and Prescott National Forests to protect and enhance the specific outstandingly remarkable values within the designated Wild and Scenic segments of the Verde River and to protect its free-flowing condition and water quality. In FY08, 13 river trips were made on the Verde River with volunteers and other recreation managers to pick up trash, survey and eradicate invasive weeds, install signs, manage Fossil Creek, repair fences, etc.

Lands

During Forest Plan development, the public noted that land ownership adjustments within and adjacent to local communities needed continuing emphasis to significantly increase efficiency in resource management and to satisfy the needs of expanding communities.

Land ownership adjustments are used to accomplish resource management objectives. Property boundaries are identified and Forest lands are used for appropriate public or private interests consistent with Forest Service policies. The Forest has worked to resolve unauthorized occupancy and obtain needed rights-of way.

In FY08, there was a small legislative land exchange on the Payson District that traded property that no longer exhibited National Forest characteristics for parcels that exhibited unique natural resource characteristics, prehistoric artifacts, and water rights. In general in the past year, there has been increasing encroachment from the growing urban and rural population on Forest Service lands. Additionally, the workload to obtain needed rights-of-way has increased significantly.

Minerals

During Forest Plan development, the public noted that conflict existed between proponents of mineral development and other resource considerations, which were constraining both the opportunity for and the method of mineral exploration and development.

The Forest Service addresses these issues through program policy to ensure that exploration, development and production of mineral and energy resources are conducted in an environmentally-sound manner and that these activities are integrated with the

planning and management of other National Forest resources. The numbers of these activities completed in FY08 are listed in Table 6.

Table 6: FY08 Minerals Activities

Geological resource areas and hazards sites managed	15
Mineral operations administered to standard	40
Mineral proposals processed	29

Law Enforcement

During Forest Plan development, the public noted that the level of Forest Serve law enforcement was generally perceived to be inadequate to handle the problems associated with increasing unauthorized use on the TNF and that the level of enforcement did not meet public expectations. Further, officials in Gila County thought that the Forest Service cooperative law enforcement program was inadequate; and therefore, the visitors and problems on the Forest belonged to the Forest Service. The major problems identified were protection of cultural resources, OHV use, occupancy trespass, fuelwood theft, and vandalism.

The Forest places a high level of emphasis on controlling unauthorized use in areas of high recreation use and fuelwood production. In addition, the Forest cooperates with State and local law enforcement agencies in the protection of visitors and their property. The Forest continues to deal with issues associated with OHV use, protection of cultural resources, and cultivation of marijuana. The Lower Salt River recreational crowds create extensive problems with alcohol related injuries, drowning, and disorderly conduct/fighting. The proximity of TNF to a large urban population results in high visitor use of the Forest and continues to result in extreme demands on law enforcement resources.

REFERENCES CITED

- Baker, M. (1986). Effects of ponderosa pine treatments on water yield in Arizona. *Water Resources Research*, 22(1), 67-73.
- Brown, T.C, & Fogel, M.M. (1987). Use of streamflow increases from vegetation management in the Verde River Basin. *Journal of the American Water Resources Association*, 23(6).
- Hibbert, A.R. (1979). *Managing vegetation to increase flow in the Colorado River Basin* (General Technical Report RM-66). U.S.D.A. Forest Service.
- Mason, L.W. & Grove, J.L. (1999). Tonto National Forest stream assessment method. *Proceedings AWRA Conference on Wildland Hydrology* Bozeman, MT: June 30-July 2.
- McBride, K. & Grove, J. (2002). *Riparian area management utilization guidelines (revised)*. Unpublished, on file at Tonto National Forest, Phoenix, AZ.
- U.S.D.A. Forest Service. (1985a). *Environmental impact statement, Tonto National Forest plan* (Southwestern Region). Phoenix, AZ: Tonto National Forest
- U.S.D.A. Forest Service. (1985b). *Tonto National Forest plan* (Southwestern Region). Phoenix, AZ: Tonto National Forest.

APPENDIX A: AMENDMENTS TO THE FOREST PLAN

The *National Forest Management Act of 1976* requires that Forest Land and Resource Management Plans be revised after 15 years. The Tonto National Forest Plan was approved by the Regional Forester in October 1985. Since its approval, the Plan has been amended 27 times as follows:

Amendment 1: August 1988: Allows State of Arizona to install and operate transceiver on Hutton Peak.

Amendment 2: August 1988: Corrects test reference to Table 3 & 4 and provides capacity for jeep tours.

Amendment 3: August 1988: Expands Forest-wide prescriptions, Standards and Guidelines (S&G's), in accordance with the court settlement of litigation – Save the Jemez/State of New Mexico vs. Forest Service.

Amendment 4: August 1988: Corrects text reference to Table 3 & 4 and allows commercial rafting on Tonto Creek from Gisela to 76 Ranch (July 1- November 30) and 76 Ranch to Gun Creek (yearlong).

Amendment 5: August 1988: Moves construction of Haigler Creek Campground from 2nd period to 1st period.

Amendment 6: August 1988: Allows rafting on sections of the Verde River.

Amendment 7: May 1990: References Wilderness Opportunity Spectrum and Wilderness Management Plans.

Amendment 8: October 1990: Allows tour boat operations on Saguaro and Canyon lakes.

Amendment 9: November 1990: Increases river rafting allocations on the Upper Salt River.

Amendment 10: April 1991: Adds reforestation acres for rehabilitation of the Dude Fire.

Amendment 11: April 1991: Designates Crouch Mesa as an administrative electronic site and allows installation and operation of solar-powered microwave repeater.

Amendment 12: April 1991: Designates New River Mesa as an administrative electronic site and allows installation and operation of solar-powered microwave repeater.

Amendment 13: August 1991: Amends outfitter/guide allocations in Management Area (MA) 1E, including increases in rafting allocations on the lower Verde River below Horseshoe and Bartlett Reservoirs.

Amendment 14: August 1991: Amends outfitter-guide allocations in MA 3F.

Amendment 15: January 1992: Classifies recreation residences at Diamond Point, Ellison Creek, Thompson Draw, and Washington Park as base for exchange.

Amendment 16: July 1992: Modifies the number of commercial outfitter-guide permits available in MA 2A, 3B, 3C, 3D, 6B, 6D, and 6I (Superstition and Four Peaks Wildernesses).

Amendment 17: February 1993: Modifies the number of commercial outfitter-guide permits available in MA 5A, 5C, and 6H (Sierra Ancha and Salome Wildernesses).

Amendment 18: June 1993: Modifies the number of commercial outfitter-guide permits available in MA 1B, 1C, 1D, 3A, 4B (west ½ Mazatal Wilderness) and 4C and 5B (Hellsgate Wilderness).

Amendment 19: March 1994: Changes designation of Buckhorn Mountain and Hauser Wash Research National Areas from proposed to existing.

Amendment 20: May 1995: Modifies outfitter-guide permit allocations for MA 1F, 2D, 2F, 3F, 4D, 4F, 5D, 5E, 5G, 6C, and 6F, and minor housekeeping correction for recreation and residence areas located in 1F, 2D, 4D, and 6F.

Amendment 21: May 1995: Adds Standards and Guidelines pertaining to cave resource management and housekeeping consolidation of S&G's pertaining to cultural resources.

Amendment 22: June 1995: Adds Standards and Guidelines pertaining to management of Mexican spotted owl, goshawk, and old-growth habitats.

Amendment 23: June 1997: Allows installation and operation of a microwave repeater on Pinto Mesa for the telephone system serving the Rockhouse Community.

Amendment 24: June 2004: Incorporates the Verde Wild and Scenic River *Comprehensive River Management Plan* into the Forest Plan.

Amendment 25: April 2007: Updates present fire management language to be in compliance with the 2001 *National Fire Plan* and 2005 Wildland Fire implementing procedures, which allows the use of wildland fire as a management tool.

Amendment 26: January 2009: Designation of Energy Corridors in 11 Western States.

Amendment 27: July 2009: Amends plan language to make Camp Creek Recreation Residence consistent with plan direction for riparian condition, percent ground cover, and roads location.