XVI. Protect natural and cultural resources of the Forest and the health and safety of visitors from damage or degradation.

Management action(s) taken to achieve this goal:

Soils:

The Soil Resource Program conducts an annual forest-wide monitoring program to address issues and concerns brought forth by external or internal persons and to satisfy the requirements of the MNF Plan, 1986. Currently, the issue of acid deposition and the effects on the terrestrial habitat has been raised. Therefore, a monitoring plan is being established to gather some baseline information in sensitive areas on the Forest. Another issue of great importance nationally to the Forest Service is the use of native seed species to revegetate any ground disturbance. The two issues are currently the focus of the Forest-wide soils monitoring program. The results of these monitoring efforts will help to direct the Soil Resource Program in providing accurate information to land managers in order to protect the long term soil productivity of the Forest and to protect the native vegetation populations on the Forest.

Heritage:

Provide information pertaining to heritage resources

Minerals:

Based on its inventory of abandoned coal mines, the Forest has requested and obtained some funding to restore lands impacted by past coal mining. The kind of work the Forest typically would accomplish in the abandoned mine lands restoration program includes barricading mine openings that may be accessible to public entry, restoring or repairing uncontrolled water discharges from mine sites or their access roads, installing acid mine drainage water treatments, and reshaping and revegetating land disturbed by mining. During 2001-2003, the Forest has taken action towards restoring land impacted by past coal mining.

Lower Williams River Coal Mine Restoration and Road Obliteration

In May of 2002, the Forest Service completed an Environmental Assessment (EA) on proposed work in the lower Williams River watershed near Dyer, West Virginia. The EA addressed closing abandoned coal mine openings to public access by installing bat-friendly gates or barricades, obliterating once-used coal mining haulroads that were no longed needed and restoring drainage that had been diverted during mining to more natural patterns.

In the summer of 2002, Gauley District Ranger issued a decision to implement the bat-friendly gates construction portion of the project, and deferred a decision on the remainder of the project until the Forest completed its Plan Amendment on threatened and endangered species.

The Forest awarded a contract and the work was completed in 2003 on the construction of the bat friendly barricades. The contractor, an expert in bat gate design and construction, proposed some design modifications based on circumstances that became apparent during construction. These proposed changes were reviewed by Forest engineers or a wildlife biologist, as appropriate, prior to approving the changes. The photograph below shows one of the bat-friendly mine closures installed in the lower Williams River coal mines.

Brushy Run Mine and Road Restoration

Monitoring the previously completed restoration work at the Brushy Run coal mine occurred in 2001-2003 (See project file in Forest Geologist's office).

The Brushy Run mine was a small abandoned coal mine on the east flank of Spruce Mountain south of Onego in Pendleton County, West Virginia. It had openings into underground workings that could be entered by the public and had a steep, eroding road that led to the mine. Rainfall during hurricane Fran in 1996 had worsened erosion on the excessively steep road. So, in 1998, the Cheat-Potomac District Ranger issued a decision to complete restoration at the mine and to obliterate the unneeded, eroding access road by outsloping, installing waterbars, and revegetating the roadway. Work was completed in the late summer and fall of 2000 on the Brushy Run coal mine and road restoration project.

Monitoring in the spring of 2001 noted that, although the waterbars constructed to divert and disperse runoff were spaced every 100 feet or closer, they were constructed during a relatively dry period when ephemeral or intermittent road bank discharges were not evident. This resulted in the placement of some waterbars at points some distance from where water emerges, allowing the water to produce some rill erosion between where it emerges and where it is dispersed from, or turned off of, the road. These results could have been avoided by walking the road to be restored during a wet period, and identifying by flagging or otherwise specifically documenting where waterbars need to be placed to minimize the distance water would flow over the restored road surface. Follow-up monitoring should be conducted to determine if noted rill erosion is worsening or if vegetation has now become established in these areas such that they are protected from further erosion.

Monitoring in 2001 also revealed that all terrain vehicle (ATV) use had eliminated vegetative cover and was beginning to rut portions of the road. The Forest wanted to take action that would eliminate the ATV use on this road to prevent further damage to the restored surface.

So, in the summer of 2001, the following work was completed:

- A partially buried or embedded rock barricade was installed near the beginning of the road to make it clear that motorized vehicle use was prohibited (See photo on next page.)

- At a location beyond the point that ATVs circumventing the first rock barricade could get onto the restored road, a second embedded rock barricade was installed, with several hundred feet of road beyond this second barricade re-shaped to the original ground which had a side slope of 40% or greater. (See photos below.)

Monitoring occurred in November 2002 primarily to determine the effectiveness of the 2001 efforts to block ATV use on this restored road. The Forest staff that examined the area found no sign of ATVs breaching the barriers, going around the barriers, or of ATV traffic using the restored road.

Another observation during the 2002 monitoring was that the grass and other herbaceous vegetative cover on the restored road was sparser than in 2001. (See photos below compared to 1st and 3rd photo above).

The concern was that the soil may erode without the protective cover of the grass and other herbs. However, the group noted that the leaf litter was providing a protective cover over the soil; the natural forest floor nearby

has a similar amount of vegetative cover; and that vegetation similar to that of the nearby woods, such as maple seedlings, were growing in the restored road. In addition, although there was some sediment that had collected in the waterbars, there was no indication that sediment had been transported and deposited at the outlets of the waterbars, or erosion at the waterbar outlets. The consensus of the group was that the vegetation that grew from the seed sowed during the restoration served the intended purpose, namely, to hold the freshly disturbed soil in place until the long term vegetative cover becomes established.

A recommendation for lengthening the time the seeded vegetation lives in the restored disturbed area is to use more shade-tolerant species in the seed mix when the area to be restored is heavily shaded or under a closed forest canopy.

During monitoring of threatened, endangered or sensitive plant populations in 2003, the Forest learned that the Brushy Run road restoration eliminated two subpopulations of running buffalo clover; the third subpopulation in the area was not affected. This situation occurred because of differences in information contained in the data bases used to track threatened and endangered species between agencies. The Forest Service followed the protocol for identifying the presence of these species in the project area, but was not made aware that additional subpopulations were subsequently documented by another agency in the project area.

In sum, Brushy Run Coal Mine and Road Restoration monitoring revealed the following:

1. When designing road restoration or obliteration,
    a. Specifically locate needed cross drainage on site during wet conditions or rainy periods;
    b. Pay particular attention to the terrain and the potential for illegal motor vehicle use. Employ techniques such as placing one or more partially buried or embedded large rock barriers at locations that cannot be circumvented, returning the road to the original contour of the natural ground for a several hundred foot length at locations where the restored side slope would be 40% or steeper and cannot be circumvented;
    c. Tailor the seed mix used in restoration to accomplish immediate and long term soil protection under the light and soil conditions expected in the project area.
2. There is a need to have current threatened, endangered and other special species information that is consistent between and accessible to the appropriate agencies. To this end, the Forest is working on an agreement with WVDNR that will allow information to be more easily shared. In addition, the Forest Service is working with WVDNR and the US Fish and Wildlife Service (USFWS) on a process that will help ensure that new information is considered prior to implementing a project.
3. The area will continue to be monitored:
    a. to assess the status of running buffalo clover populations, and
    b. to check to see if rill erosion noted in 2001 has ceased and the area revegetated, or if action is warranted to repair any eroding areas.

Plants:

NNIS added to botany contract in 2003. Data are presence/absence of NNIS from random meander survey methods.

Monitoring conducted in 2001, 2002, and 2003, and results:

Soils:

Listed below are the projects conducted in 2002 and 2003 to accomplish the goals discussed above. Details of each project will follow.

- Native seeding monitoring project FY2002

- Soil sampling for three to four season road upgrades in Desert Branch OA for a proposed timber sale
- Soil chemistry sampling – Soils on the Pottsville Geology (Desert Branch OA); Soil on the Hampshire Formation in Tucker and Northern Randolph Counties, Fernow area, McGowan Mountain, and Glady Watershed
- Foliar chemistry sampling – Focused on total elemental analysis of poplar, black cherry, and sugar maple. Sampling occurred on the same sites that were sampled for soil chemistry on the Pottsville Geology. Sampling of vegetation on the Hampshire sites will occur in FY2004
- Foliar biochemistry sampling – poplar, black cherry, and sugar maple

Native seed monitoring on Allegheny 55 Knapp Creek OA 46.108 (Mp 6.1 Mixed Remote Habitats)

This project was an attempt to identify a specific soil type (Weikert soil series) on a close out of a timber sale and make a site-specific seeding recommendation using native grass seed to stabilize the soils in the disturbed areas on this timber sale (i.e. log landings and skid trails). The site was chosen to monitor the success of native seeding on the Weikert soil type due to timing of seeding, accessibility, and ease of implementation of a small scale-monitoring project. The seed mixture chosen was based on soil type and site condition. Soil in the area is the Weikert Series on northerly facing aspects. The native seed mixture recommended for this site by Ernst Conservation Seed Company was formulated for shallow silty clay loam or clay loam soils (low nutrients, low pH), which is appropriately matched to the Weikert soil type. In following with Forest Plan Standards and Guides, the site was also limed, fertilized, and ripped. Sites were physically prepped the week of March 25th, 2002. Planting occurred on April 9, 2002 with site conditions of overcast skies, 60 degrees F, and then mid morning showers (light rain). The sites seeded are five landing sites (.25 acres in size) and .5 miles of haul road 12ft wide (displayed in the following map). Approximately two acres were seeded. Slopes were all less than eight percent. Less sloping landscape positions were chosen for the planting of the native seed in order to lessen the risk of soil erosion from any failure or slow response to seed generation. Native seed is often slow to establish and not often vigorous in creating adequate soil surface protection.

Seed mixture is as follows:

20% Shawnee Switchgrass

20% Deertongue, Tioga

10% Red Top

2.5% Black-eyed Susan

2.5% Partridge Pea

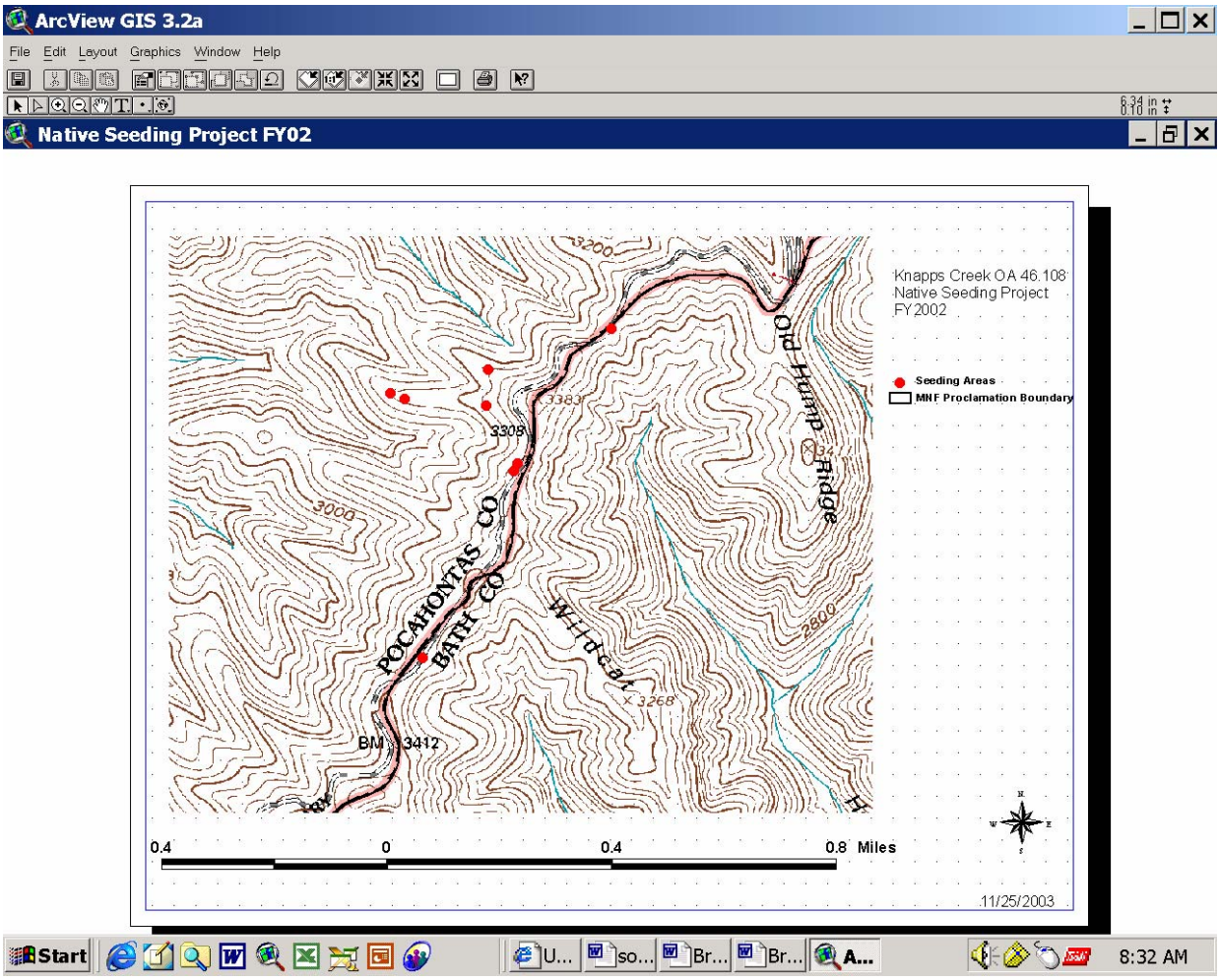
10% Fowl Bluegrass

25% Creeping Red Fescue

10% Virginia Wild Rye

20lbs/acre of Annual Ryegrass as a nurse crop

All species identified above are perennials and are natives to West Virginia except the Annual Ryegrass, which is an annual that does not persist beyond one or two years. Estimated cost is $4.78/lb @ 100lbs = $478.00. Shipping is $90.00 UPS equaling a total cost of $568.00 for seed. This value does not include the cost of liming and fertilizing the site. In a cost comparison, the price of a traditional seed mixture used on the Forest, which may include non-natives and possibly invasive species for revegetation, ranges from less than $1.00 to $2.50/lb depending upon the seed mixture composition.


ArcView GIS 3.2a
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Native Seeding Project FY02
Knapps Creek OA 46.108
Native Seeding Project
FY2002
Seeding Areas
MNF Proclamation Boundary
Old Hump Ridge
POCAHONTAS CO
BATH CO
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3383
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3200
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11/25/2003
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The site was monitored in the fall of 2002 (FY 2003). Below are pictures of the sites. The criteria to measure the success of site revegetation were established grown cover and presence of native seeds. Some of the species listed are slow to establish and may take two to three years before the species are present at the site and mature. Therefore, some of the species planted may not be identifiable in this early cover.

Skid trails:

The monitoring was done using ocular survey methods. This is a visual method. The picture to the left shows one section of skid road where native seed species were used. Ground cover is estimated at 25 percent. This is not considered to be effective in protecting the soil resource. Failure may be due to lack of soil moisture, shallow to bedrock, or not enough time for seed to establish because some native seed types take up to two to three years to establish a viable ground cover.

Landings:

Pictures of three of the five landings are showing the varying degree of success for seed establishment. The two landings on the left side of the page have moderate to good (greater than 75 percent) ground cover. The annual ryegrass is doing its job as a nurse crop by providing good soil protection from erosion in the short-term and decaying organic for emerging native seedlings and other seeds dormant in the soil in the next growing season. Once the annual rye grass dies back in the fall, it will provide good mulch for the 2003-growing season.

Above is a picture of the landing to the furthest north on the map. This site did best of the five in having a successful ground cover established. Soil moisture was good as well as the soil was deeper here than at the other landing sites.

Below are several pictures pointing out some of the observations made during the monitoring trip.

1) In the picture above, seed has established itself in rows. This is attributed to the benefits of ripping a site to decrease compaction and increase water infiltration. The seed found a niche area that had increased soil moisture and took advantage of the site conditions in the small furrows.

2) The pictures on the left side of the page were taken at a log landing, and there is a skid trail that takes off down slope from this landing. There was very little soil on this site and as much as 70 percent rock fragments on the soil surface. Also from the picture in the lower corner, it is evident that bedrock is at the soil surface in some place and any soil that did cover the bedrock was removed for the skid trail construction. This area will be very difficult to establish vegetation in that soil moisture is low and there is very little to no soil material to act as a prepared seedbed.

Above are pictures showing a comparison of vegetation establishment at two different landing sites. The difference in vegetation cover and species diversity is attributed to several items. One, the soil on the left has more rock fragments on the surface. Rock fragments act to protect the soil from surface erosion and help to promote increased soil moisture; however, a nice stand of grass does a much better job in accomplishing soil erosion protection and storing soil moisture for the long term. Also, the soil depth at the two sites is different. The gravel surface of the picture on the left exists on shallow soils to bedrock (less than 20 inches). The site on the right has soils that range in a depth of 20 to 36 inches (from field observation and measurement).

This site will be monitored again in 2004. At that time, species will be identified. An assessment will be made to determine if using this seed mixture is successful. In the short term, for controlling erosion, the success was variable. With a regional emphasis continuing on using native seed for revegetation projects, other means of erosion control will need to be utilized during the establishment of the vegetation on Weikert soils and similar soil types. This may include straw or coconut fiber mats, mulching, scatter slash, and UV degradable plastics as an example. The cost of using native seed is also quite high compared to general non-native seed mixtures. Therefore, success of establishing the seed is important. Additional projects and monitoring should occur on various soils types across the Forest.

Three to Four Season Road Upgrade for Winter Time Hauling Operations:

With the recent use of helicopter logging methods in the Forest, it has become necessary to review road standards for winter operations and road use. Helicopter logging occurs primarily in the winter season due to the availability of companies operating in the area. Forest haul roads are constructed primarily to three season road standards meaning that these roads are designed for use in all seasons except winter. These standards are not high enough to prevent soils from failing in the road during the winter conditions of continual freezing and thawing. Shear strength in many of the Forest soils is low and cannot adequately support continual use and heavy loads when saturated. Therefore, to address this concern, soil samples are taken from the roadbed or adjacent cut bank to determine the engineering properties of the soil. The road then is upgraded to the requirements of a four-season road. Desert Branch Timber Sale is the first sale that will have pre-designed roads for four- season hauling of logs. Samples were taken in the summer of 2002. The samples were sent to a lab and tested for soil engineering properties. The soil engineering properties of interest are a UNIFIED or

AASHTO classification. This classification of soil material is used for the construction and design of roads. The soils in Desert Branch had AASHTO values of A-2 and A-4.

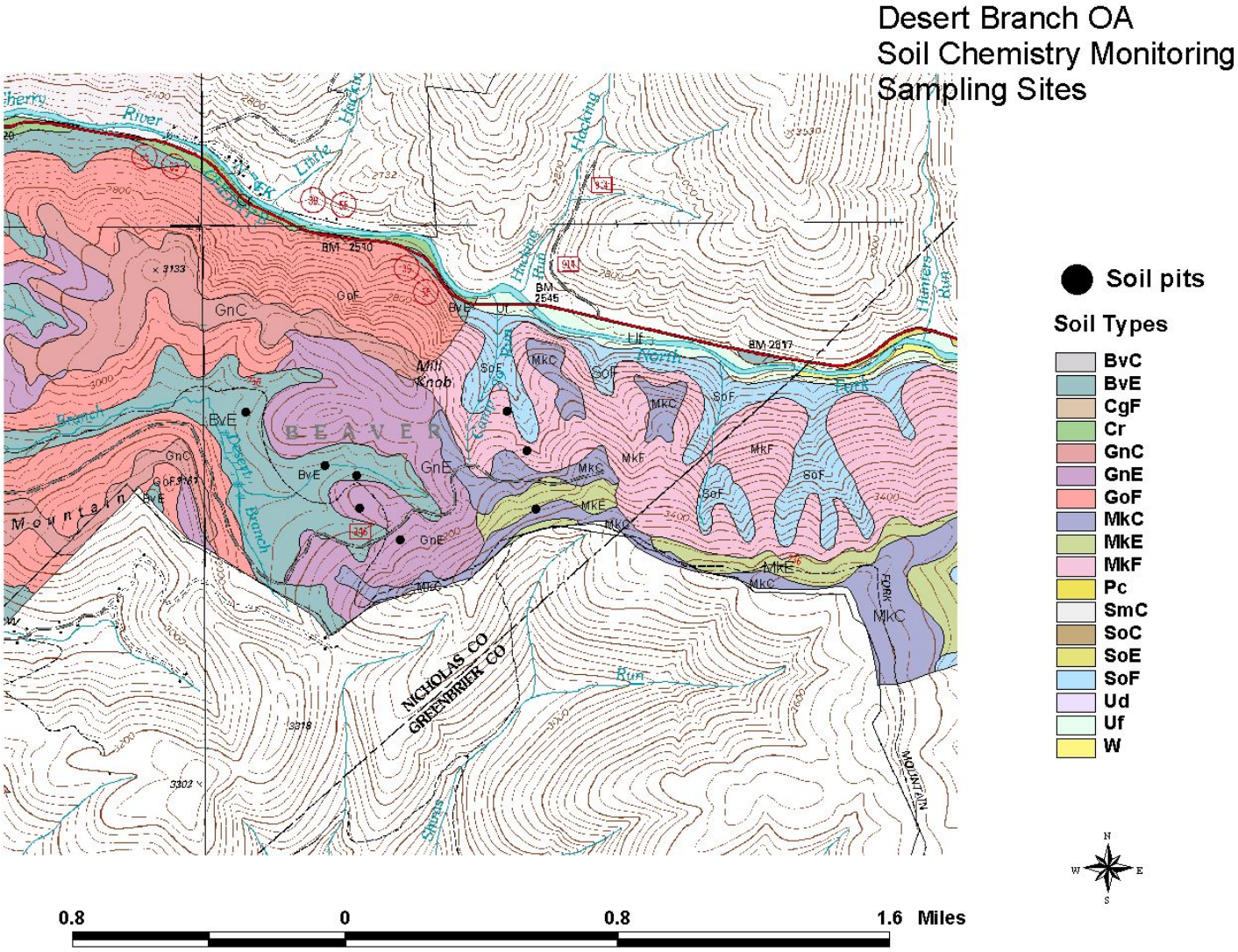
Effects will be monitored during use and also after the timber sale is closed out to evaluate the effectiveness of upgrading the road.

Soil Chemistry Monitoring Project FY2003:

The MNF is described as having some of the highest levels of acid deposition in the United States. One of the concerns with the effects of acid deposition is the loss of soil productivity due to base cation depletion. Although the Forest has an almost complete digital database of a soil resource inventory, the Forest has limited amounts of detailed data about soil chemistry. In order to better understand the status of soil productivity in certain susceptible watersheds across the Forest, a soil chemistry-monitoring program is being developed. These efforts began in 1996 with the detailed mapping of the Otter Creek Wilderness Area, a Class 1 Wilderness Area.

It was recognized that a risk assessment of the Forest for sensitivity to acid deposition should be done for soils. This was accomplished in August of 2003 for Forest Plan Revision. The risk assessment is primarily based on the geochemistry of the sedimentary geologies across the Forest. In the fall of 2002, it was already recognized that one of the most at risk geologies was the Pennsylvanian Age Pottsville geology (Jenkins, 2002). In the spring of 2003, a soil chemistry-monitoring project was designed for the Desert Branch Opportunity Area, which is entirely underlain by the Pottsville geology. The Pottsville geology does vary in its make up from north to south and east to west across the Forest. Desert Branch OA was selected for several reasons. One, an intensive study had already been completed in Otter Creek Wilderness where acid deposition effects have been documented and are perceived to be the worst across the Forest. Two, county geologic reports indicate that the Pottsville geology in this area of the Gauley Ranger District does contain some very thin layers of shales that do contain weatherable minerals that have calcium in them. Three, the question was posed as to the status of soil productivity in the sub watershed in public scooping of an EA for activities proposed in the sub watershed. Four, currently a small-scale timber sale is being proposed in this watershed; therefore, an opportunity existed to design a monitoring project that could look at soil chemistry prior to a timber sale and post timbering in an area with questionable sustainable soil, water, and vegetation productivity. Ultimately the question of effect stems not only to soils but also to stream chemistry, vegetation growth, and aquatic habitat because all of these systems are linked.

Desert Branch is located in the Gauley Ranger District and the OA straddles Nicholas and Greenbrier Counties. According to the Nicholas County and Greenbrier County soil surveys there are four major different soil series in the area. The Buchanan, Gilpin, Mandy and Snowdog soil series were sampled by opening nine soil pits. Each soil series contained two pits. The pits were further divided up into harvest and non-harvest timber units. This means that each soil series will have at least one pit in and one pit out of a harvest area. The one exception to these constrictions is that the final pit will be located in the riparian area of Desert Branch.



The Buchanan series is a very deep, moderately well drained soil that was formed by acid colluvial material. The O, A1, A2, Bt, Btx, and C horizons were sampled. The second soil series sampled is the Gilpin series. The Gilpin series is characterized by its moderately deep, well-drained, acidic soils that formed from siltstone, shale, and sandstone residual material. The third soil to be sampled will be the Mandy series. The Mandy series is very similar to the Gilpin except it is frigid. This means that the soil is on the average colder. This causes soil reactions to take place slower, which in return affects things like soil structure and organic matter decomposition. These soils formed in residuum weathered form interbedded siltstone, shale, and sandstone. The O, A, BE, BW, and C were sampled. The fourth soil is the Snowdog series. The Snowdog series is similar to Buchanan, except it is also frigid. It is different for the same reasons that Mandy is different than Gilpin. It consists of very deep; moderately well drained soils that formed in colluvial material derived from shale, siltstone, or sandstone. The O, A BA, Bw, Bx, Bc, and C were sampled. As expected, there were a few discrepancies in the soil survey. As a result, the sampling plans had to be amended so that a good representation of the landscape could be obtained. Several of the areas that were identified as residuals soil types on the map are, in reality, colluvial soil types. There is more acreage of Buchanan and Snowdog series (colluvial soil types) on the landscape than originally mapped. In fact, we did not observe a Mandy (a high altitude frigid residual soil type). All of the pits sites were marked with pink and black striped tape so that they were easily visible and marked for safety purposes. With these changes, there are now six pits inside proposed harvest units and three pits outside proposed harvest units. Seven of these pits are colluvial soil types, one is alluvial, and one is a residual soil type. Results from this monitoring project are expected back in the winter of 2004.

Interpretation of the data will occur in the spring and summer of 2004. This data will be used to assess the current status of soil productivity on these sites and like sites across the Forest.

Foliar Chemistry and Foliar Biochemistry Sampling

Also in this monitoring project, foliar chemistry samples were taken from sugar maple, black cherry and tulip poplar trees in the over story, which all were the same age class. Sampling occurred around the pit area along the same topographic landscape position. Total elemental analysis will be analyzed and results will be obtained in 2004. This monitoring is being done to look for possible relationships between foliar nutrition and soil chemistry. As a side project, foliar biochemistry analyses are also being run on the same samples selected for foliar sampling. This work is being done in association with Dr. Rakesh Minocha at the Northeast Forest Experiment Station in Durham, NH. The analyses being run are for exchangeable ions and putriscene, (amino acids, chlorophyll and proteins) in the foliar sample. Results from this data may be used to determine if a relationship exists between poor soil productivity and biochemical stress levels in the trees on site.

Heritage:

Table 28 – Heritage Monitoring Activities (2001-2003)

	2001	2002	2003
Acres inventoried for heritage resources	3138	2306	755
Heritage resource sites identified as a result of surveys	62	12	22
Heritage resource sites evaluated	5	8	3
Heritage resource sites preserved	18	17	24
Heritage resource sites interpreted	3	3	3

Also, see Goals IX and XII.

We attempt to monitor the current condition of archaeological sites as part of our larger field schedules. Unfortunately, no systematic monitoring plan is in place, and site visits tend to be ad hoc and opportunistic.

Aquatics

1. Annually monitor individual comments to determine if –
   - Problems exist with too much or too little access;
   - Projects are being used to provide opportunities for physically challenged persons; and
   - There is a wide enough range of experiences for fishing.
2. Annually monitor individual comments and habitat needs assessments to determine if enough warm water fisheries opportunities are available;
3. Review research to determine feasible technology to improve water chemistry for fish production; and
4. Annually monitor individual comments and stream surveys to determine if trout stocking is causing problems with Native or Wild trout, user conflicts, or dispersion of users.

Plants:

NNIS

A requirement to note NNIS was added to botany contract in 2003. In Cherry River and Lower Clover areas, about 6,363 acres were surveyed for TES species and NNIS. No major populations of NNIS were noted in any of the surveyed stands; however NNIS were noted on roads and some edges.

NNIS and other, non-invasive exotic species were noted in other botany surveys as well. See the table below for known NNIS and other exotics on the Forest. The Forest has a draft list of NNIS species to be included in

future botany contracts, and other surveys. Included in the table is the risk ranking for the species known on the Forest.

Table 29 – Draft NNIS species – MNF

Species common name	MNF Invasive ranking	Species common name	MNF Invasive ranking
common or lesser burdock	2	Thyme-leaved speedwell	-
Ozark tickseed sunflower	-	Sweet vernal grass	2
crown vetch	1	Bittersweet	-
ground ivy	3	Barnyard grass	-
Japanese stiltgrass	1	Kentucky bluegrass	2
Japanese knotweed	1	Canada bluegrass	-
Japanese spirea	2	Common thistle, Canada thistle	3, 2
yellow sweet clover	2	Bouncing bet	-
Asiatic water pepper	2	Tall buttercup	-
great mullein	3	velvet grass	3
common St. John's wort	3	Queen Anne's lace	3
mutiflora rose	1	Yarrow	-
redtop	-	Smooth galinsoga	-
winter cress	3	Black medic	-
orchard grass	-	Sheep fescue	-
meadow fescue	2	Heal-all	-
Smooth bromegrass	2	Morrow's honeysuckle	1
Autumn olive	1	White campion	-
Mouse-eared hawkweed, field hawkweed	2	Ox-eye daisy	3
Broadleaf dock	3	Quack grass	2
Sheep sorrel	3	Viper's bugloss	3
Fiddle dock	3	Hemp nettle	-
annual bluegrass	2	White bedstraw	-
bluegrass	2	Lesser stitchwort	-
Rough bluegrass	2	Sticky chickweed	2
Great plantain	3	cow parsnip	-
English plantain	3	Alsike clover	-
Timothy grass	3	Red clover	-
Common dandelion	-	Yellow hop clover	-
White clover	2	Coltsfoot	3
		Common speedwell	-

Gypsy Moth

Aerial sketch map surveys have been conducted annually, normally in July, by FHP (FHP). In 2001 these surveys were accomplished by contract with the state of West Virginia. In 2002 contracted surveys were accomplished, with an additional flight in cooperation with MNF employees. In 2003, three Mon employees received formal training in aerial sketch mapping, and four MNF employees completed on line safety training for this activity. FHP in cooperation with MNF employees, conducted a complete flight of the National Forest using new GIS technology to map observations. These surveys identified signs of defoliation and mortality, and were followed by on the ground visits to identify the causes of visible effects, and to do gypsy moth egg mass surveys, as needed. Egg mass surveys for gypsy moth were done in 2001, 2002, and 2003 by FHP employees, with complete reports transmitted to the National Forest for each year. Shape files of defoliation have been placed in the Forest's computerized GIS files.

Table 30 - Gypsy Moth Defoliation on National Forest System lands within the proclamation boundary

Year	Acres
2000	21,568
2001	46,037
2002	21,934
2003	8,801

Table 31 - Gypsy Moth Treatment accomplished

	2001	2002	2003
Aerial treatment with BtK to reduce gypsy moth populations and prevent defoliation	14,381 acres	0 acres	4,350 acres

Treatments for damaging populations of gypsy moths were done as shown above in 2001 and in 2003, after the National Forest completed Environmental Analyses. No Environmental Analysis and no treatment for gypsy moths were done in 2002.

Monitoring of gypsy moth treatments indicates that treatments were successful in reducing defoliation. In 2001, 97% of treatment areas had no defoliation. Control blocks (no treatment to suppress gypsy moths) were 97% defoliated, and the Forest had an overall increase in gypsy moth defoliation that year. The 2001 season was the peak year for gypsy moth defoliation in the state of West Virginia, when the acreage defoliated in the state doubled from 2000. Following treatment in 2003, no acreage within the treatment area was defoliated. There was an overall decrease in the amount of defoliation on the Forest that year.

Monitoring results indicated that treatments were not as successful in reducing gypsy moth populations as they were in reducing defoliation, in 2001. Sixty one percent of the treated acreage had population reductions below the treatment threshold of 750 egg masses per acre and 250 egg masses per acre. Defoliated control areas that were untreated showed some reductions in gypsy moth populations, based on egg mass surveys. Monitoring of gypsy moth populations in 2002 indicated that populations in three of seven areas surveyed had populations over a spray threshold of 1000 egg masses per acre.

Monitoring for the presence of the fungus *Entomophaga maimaiga* at the treatment locations indicated that this natural enemy of the gypsy moth was present in gypsy moth cadavers in 2001 within the treatment areas. In 2003, additional monitoring of this ecosystem component was done. Field collected larvae showed infection rates up to 83%. Soil samples resulted in 6-41% infection in laboratory bioassays. Monitoring results from soil samples are not yet completed.

Populations of gypsy moths appear to be very low. Defoliation levels are expected to remain low for three to six years, based on historical averages. Forest health effects, including tree mortality, from the outbreak of 2000-2003 are expected to continue for five years after defoliation occurred.

The results of a long term research project funded primarily by the Forest Service are expected to be received this year. This study focused on the effects of gypsy moth defoliation and spraying with Bt on non-target species. Some of the results of this study have been published in scientific publications, and were used during the preparation of environmental assessments for gypsy moth treatments.

Future actions to protect forest resources from future damaging levels of defoliation are expected to include silvicultural treatments to decrease forest susceptibility to such damage. In some areas where mortality effects are high, near forest facilities or communities, future fuels reduction work may be needed.

Hemlock Wooly Adelgid Hemlock Wooly Adelgid has been detected in many places throughout the National Forest. This serious pest of hemlock trees has caused death of all hemlocks along stream corridors in parts of

the Monongahela in Grant County. Scattered isolated hemlocks are also heavily infested. Grant County has been infested for about 10 years.

In 2002, a release of *Pseudoscymnus tsugae* was accomplished as a research project in the Fanny Bennett area. Establishment of this natural enemy of the hemlock wooly adelgid has occurred and monitoring is on-going. Environmental analyses are being accomplished for other releases, which may help to reduce the expected damage to hemlock.

Beech Bark Scale Widespread mortality and discoloration of American beech were mapped, in 2003, on 68,146 acres. The mapped mortality occurred over the past five or so years. The late spring freeze of 2002 may have affected the mortality from this complex.

Ice storm damage An aerial survey was done in March of 2003 to determine the extent of ice damage present on the Gauley Ranger District due to the region-wide ice storm of February, 2003. Much of the most obvious damage occurred due to blocked roads and downed utility lines; however, large areas of broken tree tops were also present. Combined aerial and ground surveys identified about 9,500 acres of forests with many broken tree tops.

Anthracnose damage During 2003, anthracnose was noticed on many species of trees, and especially on oaks, during the midsummer. This type of native fungi causes discoloring and defoliation of tree leaves and can be especially noticed during wet years. The aerial survey identified 18,118 acres of this damage during July. Anthracnose disease was also very noticeable on sycamore trees earlier in the growing season, and this year (2003) it resulted in complete defoliation, and refoliation of many of these trees throughout the Forest.

Future trends and direction:

Soils:

The future trends for acid deposition across the Forest are summarized in the August 2002 Southern Appalachian Mountains Initiative Report (http://www.saminet.org/). Monitoring of the potential effects on soil and water in sensitive areas across the Forest will continue at a minimum through 2004 and 2005. Forest Plan Revision is addressing this issue, and direction for managing under these effects is currently being discussed. There are many uncertainties in this issue, and a quick easy solution does not exist. Research does not give a clear definitive recommendation to land managers for dealing with the effects in time or in management. The Forest will be looking at the resources potentially affected and making recommendations as new knowledge is uncovered and can be implemented.

Heritage:

A continuation of the current program of survey, evaluation, and monitoring in support of the Heritage Resources goals and in support of other FS programs.

Plants:

Future trends for FHP involve increased cooperation with FHP staff, on issues related to native and non-native insects and diseases on the Forest, as well as invasive plant species. The age class distribution on the majority of the Forest is weighted towards trees between 70 and 100 years old. The ecosystems are approaching the end of the aggradation phase of ecosystem development, when the death and decay of trees in the Forest is expected to become more noticeable.

Monitoring done to determine the extent and severity of insect occurrence and ensure destructive insects does not increase to potentially damaging levels (Forest Plan, p. 251):

Annual monitoring was completed by Forest Health and Protection, USDA State and Private. Reports from 2001, 2002, and 2003 are summarized in letters on file and on web site.

On July 8 and 15, 2002, Rick Turcotte, Martin Mackenzie and Bill Jones of FHP, Morgantown along with Morris Ruddle, and Jane Bard conducted an aerial sketch mapping survey of the Monongahela National Forest. Maps showing the general locations and types of damage observed during these flights and those conducted by the State of West Virginia, Department of Agriculture are available at the Supervisors Office in Elkins, WV.

In 2002, gypsy moth defoliation, frost/freeze damage, scattered mortality pockets, and unknown discoloration and damage were observed within the proclamation boundaries of the Forest. The following table shows the number of acres sketch mapped for each District.

Table 32 - 2002 Sketch mapped Damage in Acres

District	Gypsy moth defoliation	Beech bark disease complex	Frost/Freeze Damage	Pine Decline	Unknown Damage	Total
Cheat	0	0	0	0	201	201
Gauley	0	0	13,849	0	46	13,895
Greenbrier	0	2,794	0	0	590	3,384
Marlinton	2,291	6,053	0	106	340	8,790
Potomac	20,940	2,013	0	0	0	22,953
White Sulphur Springs	4,635	0	0	0	48	4,683
Total	27,866	10,860	13,849	106	1,225	53,906

Gypsy moth: Approximately 27,866 acres of oak forest were defoliated by the gypsy moth this year. This is a large decrease from the 46,039 and 42,515 acres sketch mapped in 2001 and 2000, respectively. Many of the areas sketch mapped this year have suffered repeated defoliation over the last three years. This defoliation, in combination with the dry conditions occurring this summer may result in tree mortality in those areas. Ground surveys to support a potential suppression project for this insect are ongoing.

Beech bark disease (BBD): Beech bark disease is a disease complex caused by a combination of native fungi and an introduced insect. BBD results from the interaction between the introduced beech scale insect *Cryptococcus fagisuga* Lind. and the fungus *Nectria coccinea var. faginata* Lohman or *N. galligena* Bres. This complex can cause significant bole cankering and mortality in American beech, *Fagus grandifola* (Ehrh.). David Houston (NES, Hamden, retired) estimates that resistant beech trees (those that remain scale and defect free) are usually less than one percent of the population of this species, but because they occur in groups, relatively large numbers of them may occur locally within some forests.

Control: Once the fungus is established in a tree, no known control is currently possible. At this time, FHP is not recommending treatment of this complex, but we will continue to monitor these areas through next year's aerial and ground surveys.

Frost/Freeze damage: The Monongahela and a large percentage of West Virginia and the surrounding states experienced a significant freeze/frost damage event during the week of May 18, 2000. Damage to trees ranged from scattered leaf burn to a complete loss of leaves. Ground truthing of sights on the Gauley Ranger District showed that American beech and yellow birch were the tree species hardest hit by the freeze.

Pine Decline: Several small pockets of scattered pine mortality and discoloration were observed in the Marlinton Ranger District. FHP is planning on visiting these sites in the near future to determine the extent and cause of this decline.

Unknown Damage: Several small-scattered pockets of discoloration, defoliation and mortality were also mapped through the Forest. FHP is planning on visiting these sites in the near future to determine the cause of this damage.

Ice Damage

On March 24, 2003, Richard Turcotte and Martin MacKenzie of FHP, Morgantown along with Jane Bard conducted an aerial ice storm damage sketch mapping survey of the Gauley Ranger District and portions of the Marlinton and White Sulphur Springs Ranger Districts. Maps showing the location of this damage are available at the Supervisor's Office in Elkins, WV.

Meteorological Details of the Ice Storm

The National Weather Service in Charlestown West Virginia labeled this the Valentine's/President's Day Storm of February 15-17, 2003 and reported that this was one of the more unique weather systems to affect the area in many years. The weekend storm featured two main weather systems. The first was a low-pressure system that rode northeastward from the Gulf of Mexico Saturday the 15th and Sunday the 16th. Precipitation rode northeastward across the area from this low…beginning as snow for much of southeast Ohio and northern West Virginia, and as rain to the south. An artic high pressure to the north dug a thin layer of cold air southward…turning rain across central West Virginia and southeastern Ohio to freezing rain and sleet by Sunday morning. Precipitation remained all rain across the coalfields of West Virginia as well as in southeast Ohio, northeast Kentucky, and southwest Virginia.

This precipitation pattern maintained itself for much of the day on Sunday, causing various weather problems. To the south, precipitation fell mostly as rain, with 2 to 5 inches total over the course of the storm. Many counties in this area had small stream flooding problems. To the north, across central West Virginia and southeastern Ohio, major ice accumulations were realized. This was mainly in the form of sleet in the Charleston-Huntington corridor, with a few inches of sleet accumulating. Just to the north, freezing rain was the main mode across Gallia, Mason, and Jackson Counties, with tree damage and power outages from the ice accumulation. Finally, one to two feet of combined snow and ice accumulation was experienced in southeast Ohio and West Virginia north of US-50, with some totals even higher in the mountains.

Complicating matters, Sunday evening the second low-pressure system developed along the Atlantic coast and moved northward. The warm layer became better established Sunday evening, changing over to rain in the central and southern counties of West Virginia and southeast Ohio and adding sleet and freezing rain to the mix in the north. This northern mix helped to compact the snow on the ground and suppress the final accumulation totals. Precipitation tapered off by Monday morning, and during Monday afternoon a final swath of snow moved across on the backside of the coastal low. Overall, this storm will be remembered for its length (three days) and for the wide variety of weather problems that it produced.

Classification of Damage

Visual estimates for damage polygons were classified using a four-class system (Table 33). No distinction was made for the type of damage only the amount of damage present in a polygon (e.g. trees uprooted, downed, bent, or broken).

Table 33 - Damage classes used for classification of storm damage 15-17 February 2003 storm, Gauley Ranger District of the Monongahela National Forest and intermingled state and private lands

Undamaged	0-9%*
Light	10-33%
Moderate	34-67%
Heavy	≥ 68%

* Estimated percentage of downed and uprooted trees and trees showing branch or bole breakage

Results

Aerial survey identified 3,946 acres of ice storm related damage on the Gauley Ranger District of the MNF. Areas of ice damage were scattered throughout the District. The majority of damage was concentrated on ridge tops with top, branch, and bole breakage, uprooted and downed trees. Downed and uprooted trees appeared to be concentrated on slopes along roads, and in riparian areas.

Table 34 - Estimates of forest damage caused by 15-17 February 2003 storm, Gauley Ranger District of the Monongahela National Forest, based on aerial survey results

Damage Class	Area affect (acres)	Percent of Area
Undamaged	155,117	98
Light damage (10-33%)*	3,946	2
Total Area	159,063^	100

*Estimated percentage of downed and uprooted trees and trees showing branch or bole breakage

^Area flown including lakes, roads, un-forested areas, etc