OWL CREEK HORSE TRAIL SYSTEM

TRAIL ASSESSMENT AND MANAGEMENT PLAN

NATIONAL FORESTS OF ALABAMA
WM. B. BANKHEAD RANGER DISTRICT

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EXECUTIVE SUMMARY

The Owl Creek Horse Trail System, located in the William B. Bankhead National Forest of Alabama, has developed moderate to severe erosion issues since its formal trail adoption in the mid-1990's. A number of stream crossings have persisted as areas of concern due to the presence of federally protected mussel species in these watersheds. Sediment transport into the streams at these trail crossings has been highlighted by the US Forest Service and US Fish and Wildlife Service as a potential source of stress to these species.

Hydra Engineering & Construction, LLC entered into a contract with the US Forest Service to assess the roughly 25-mile trail system and provide a professional opinion regarding potential improvements in trail location, maintenance, and management of the Owl Creek Horse Trail System. The assessment was conducted in November, 2011 with the assistance of trail specialists, Trail Dynamics, LLC, Kay-Linn Enterprises,L LC, and Applied Trails Research, LLC. The team held meetings with USFS personnel and local/regional advocates for the horse trails, held a weekend-long sustainable trail development seminar, and assessed each mile of trail by foot during the field portion of the project. This Trail Assessment and Management Plan provides the team's professional opinion regarding the Physical, Social and Managerial Settings of the trail system, outlines recommendations regarding the location, maintenance, and management of the trail system, and develops mapping information and trail system redevelopment options for Forest Service consideration in rectifying the issues present on the Owl Creek Trails.

The trail system, while developed with specifications well within the Forest Service's national design parameters, is not currently in a sustainable state. Trail gradients are too steep relative to the high levels of equestrian use and friability of the area soils. Trail corridors generally lack a rolling gradient, which serves to break up a trail's watershed and subsequent potential for water flow down a trail. Maintenance procedures have not been successful in mitigating erosion, hardening trail treads in wet areas and near stream crossings, and other engineered structures (i.e culverts and steps) have not been properly installed and/or maintained. Together, these issues have the potential for lasting and significant resource damage.

Restoration of the existing impacts will require a substantial capital investment and a much more robust partnership with area trail advocates. Realizing a trail system that can be adequately maintained without additional resource damage will depend on a large amount of trail relocation, a dedicated annual maintenance budget, and an increased capacity for effective maintenance by both the Forest Service and its volunteer partners. Improvements will need to be planned and implemented annually over the next ten years. The Plan identifies high, moderate, and low priority areas for future actions.

The Plan provides conceptual ideas of three retrofitted trail systems, each of which addresses the challenges present. Rough estimations of capital inputs necessary to mitigate resource damage issues in each conceptual trail system are provided to facilitate USFS and partner discussions. Additional resources pertinent to the improved management of the Owl Creek Horse Trail System are included in the Appendices of the Plan.

CONTRACT ACTIVITIES

The field assessment portion of the project was undertaken between November 9th and 18th, 2011. Each mile of the designated trails within the Owl Creek Horse Trail System was hiked over its entire length at least once during that period.

Each trail was assessed related to modern principles of physical trail sustainability, including:

- Maintenance of a functional trail corridor,
- Management of water from rain and stormwater runoff as well as groundwater interception (i.e. seeps, springs, streams),
- Soil condition and susceptibility to recreation-related impacts,
- Trail grade and relationship to topographic grade.

The trails were also assessed on the basis of social sustainability, including:

- Potential for safety-related incidents,
- Potential for user-conflicts,
- Providing a positive user experience for pedestrian, equestrian, and mountain bike trail users from the standpoints of a desirable trail tread, length and/or diversity of experiences provided, attaining positive and avoiding negative control points,
- Quality and location of access facilities such as trailheads, overnight options, maps, and signage.

Finally, the trail system was assessed within the past and potential future managerial context of the Bankhead National Forest, specifically through analysis of the:

- Land and Resource Management Plan (LRMP, 2004),
- Potential Endangered and Threatened Species (PETS),
- Maintenance protocols and effectiveness to-date by USFS staff and volunteers,
- Anticipated capacity for trail management in the future by both USFS staff and volunteers.

Public interaction regarding the assessment procedure took place on November 12th and 13th, with the contracting team providing a one-day, indoor education session on the development and management of high-use equestrian trails and a one-day, outdoor education session that examined the trail system from a trail construction and maintenance perspective. A wrap-up meeting was held with Bankhead National Forest officials on November 17th where initial findings of the field-based assessment were presented. Following the field assessment, meetings with USFS officials and public interaction, this document was developed to reflect the findings of the assessment, recommend improvements related to the physical, social, and managerial sustainability of the trail system, and assist USFS and volunteers to prioritize and implement improvements.

Contractor, volunteers, and USFS personnel practicing clinometer use during education weekend

HISTORIC TRAIL DOCUMENTATION

In addition to the current Trail Management Objectives for the trail system, the Bankhead District was able to provide the following documents regarding the Owl Creek Horse Trail System:

- Environmental Assessment and Record Of Decision: Owl Creek Horse Trail System Reconstruction (USFS 1994),
- Biological Opinion (BO): Horse Trail Stream Crossings, Bankhead National Forest (USFWS, Wehrle, 1994),
- Design Narrative For Non-Motorized Trail Relocation (USFS, Malone, 1995, included as Appendix F),
- Revised Land and Resource Management Plan (RLRMP): National Forests of Alabama (USFS, 2004)
- Biological Evaluation of Federally Listed Species (BE): Owl Creek Horse Trail Addition (USFS, Counts, 2008), and
- Review Of The Owl Creek Equestrian Trail System: Alignment, Visitor Information, Reconstruction and Maintenance Needs and Costs (USFS- Trails Unlimited, Lockwood, 2008, included as Appendix G).

The formal Owl Creek Horse Trail System is relatively young, developed in the early to mid-1990's, around the time of the USFWS Biological Opinion and the Design Narrative. At the time, the existing trail system was referred to as the Black Warrior Horse Trail System and the Design Narrative states the system required relocation and reconstruction to:

- Protect threatened and endangered (T&E) aquatic species, particularly at stream crossings,
- Provide safety improvements for trail users, specifically relocating trails off of heavily used Forest system roads, and
- Improve trail location to minimize soil displacement- tread washing and gully formation where trail sections are too steep and improperly drained- and encourage trail users to remain on the trail rather than forming multiple paths around wet and boggy areas.

The stated objectives of the relocation project were to:

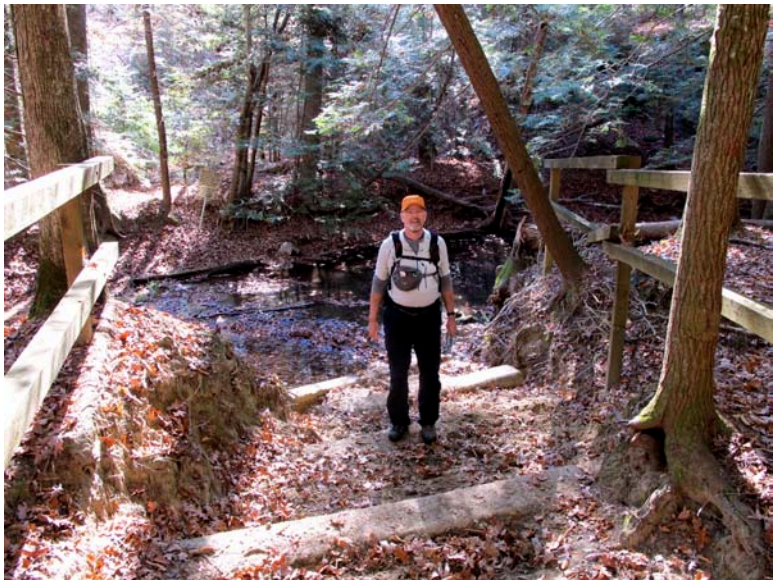
1. Reduce the number of stream crossings where T&E species were present
2. Reduce the number of trail miles located on forest roads
3. Improve the trail location and construction
4. Convert the existing trail to a non-motorized trail (primarily pack and saddle and mountain bike emphasis, with foot travel permitted)
5. Disperse use through the construction of day-use parking (Pine Torch Trailhead)

The Design Narrative and subsequent Environmental Assessment employed guidance for T&E species presence from the USFWS Biological Opinion and led to field location of stream crossings at control points where impact potential was minimized, noting that all crossings would be hardened. It was also stated that if future issues with T&E species developed at these crossings, then bridges would be considered. At the time, the Biological Opinion stated that "the direct and indirect effects of the USFS' continued operation of horse trail stream crossings located on Brown (now closed), Brushy, Owl, and Rush (also closed), together with the accumulated impacts of past and present actions and the expected cumulative effects of future actions, is not likely to jeopardize the continued existence of the dark pigtoe, fine-lined pocketbook, upland combshell, Alabama moccasinshell, Coosa moccasinshell, triangular kidneyshell, orange-nacre mucket, and ovate

clubshell, due to the limited and localized extent of the activity." The BO recommends reasonable and prudent measures to minimize any incidental take of these species, including:

1. Monitoring each stream crossing with a protocol based on the probability of T&E species presence
2. Pre- and post-event (i.e. permitted endurance ride) qualitative surveying of all crossings for T&E presence and sedimentation levels
3. Minimizing handling stress during any monitoring
4. Maintaining designated crossings to minimize or eliminate sedimentation from the trails
5. Closing all undesignated stream crossings
6. Educating the public on potential impacts on federally listed mussels and the need for minimizing the time and area horses are in the streams
7. Retaining all dead mussels and shell material for examination by USFWS
8. Maintaining annual reports regarding T&E monitoring.

Regulatory signage at upper Brushy Creek crossing



Contractor at stepped entrance to upper Brushy Creek stream crossing

In 2008, a proposed management action of "designating approximately 9.8 miles existing woods roads and bulldozed fire lines for improvement to allow for horse riding, providing additional trail riding areas and lessening the use of some existing trails" was evaluated and a subsequent Biological Evaluation was conducted. The proposed management action did not include any additional stream crossings and was compliant with prescriptions and standards for streamside management zones (SMZs). Save for one area on the north portion of the Key Mill Loop, the proposal did not cross any designated rare communities. This area was removed from consideration. The proposed action was determined not to have an effect on any of the federal T&E species present within the Bankhead National Forest.

Also in 2008, the USFS Enterprise Team, Trails Unlimited, was contracted to review the conditions of the trail system and potential additions/relocations. The Team determined that 19.8% of the existing trail mileage appeared to be in the correct location, 73.0% of the trail mileage should be considered for an adjustment in maintenance techniques, and 7.2% of the trail mileage would require minor realignment. The assessment also concluded that 80.0% of the proposed additions/relocations were satisfactory. The assessment provides a number of recommendations regarding maintenance and management improvements, an annual maintenance cost estimate for the trail system ($32,496), and a cost estimate for trail realignment ($30,390).

Commentary

A great deal of attention has been given to the potential T&E species effects of recreational use at stream crossings on the Owl Creek Horse Trail System. Recent information on the status of these potential impacts were not reviewed by the consulting team for the purposes of this trail assessment. While there are certainly sedimentation concerns at stream crossings, the need for mitigative actions relative to T&E species were not quantitatively determined.

The most recent assessment of trail conditions (Trails Unlimited report) does not include mapping or location information for any of the categories of maintenance need. Therefore, clarification on that assessment's trail classification or cost estimates cannot be made in this report. This information would be very important for the assessment of trail degradation over the last three years, cross-referenced with the current condition, especially in light of decreased maintenance budget and activity on the trail system over that time.

INVENTORY

Project Location, General Management Area, Current Trail System

Project Location

The Owl Creek Horse Trail System is located in the north-central portion of the Bankhead National Forest, approximately 15 miles north of Double Springs, AL, east of State Highway 33. The trails are located in the Brushy and Owl Creek watersheds.

Management Area

The area is currently being managed for the production of uneven age, secondary successional forest types, both coniferous loblolly and short-leaf pine and oak-hickory hardwoods. The Brushy and Owl Creek watersheds both have known concentrations of federally listed aquatic species and streamside management zones have been established around all perennial and intermittent streams to mitigate sedimentation when and where timber management activities occur. The general trail system area also has more than 85 miles of inventoried forest roads that serviced previous timber management activities and have been retained in the inventory for future forest management.

Current Trail System

The current trail system consists of three looped trails. The Key Mill Loop is primarily accessed from the Owl Creek Horse Camp in the southeastern portion of the trail system. The Pine Torch Loop is accessed from the Pine Torch Trailhead on the northwestern portion of the system. The Brushy Loop forms a central connecting loop between the two other trails.

Table 1. Owl Creek Horse Trail System Mileage Comparison

Trail Name	*USFS GIS Mileage*	*Trail Sign Mileage*	*Assessed GPS Mileage*
Key Mill Loop	9.3 Miles	11.0 Miles	8.9 Miles
Pine Torch Loop (w/spur)	10.0 Miles	11.0 Miles	10.0 Miles
Brushy Loop	5.1 Miles	2.5 Miles	5.4 Miles
Total Mileage	25.5 Miles	24.5 Miles	24.3 Miles

There is a small discrepancy in mileage figures from the various sources of information. On the Key Mill Loop, the source of the variability between the trail sign mileage and the two gps sources cannot be ascertained. On the Pine Torch Loop, the difference between the gps mileage sources and the trail sign mileage is likely due to the spur from the Pine Torch Trailhead being counted twice (assuming users leaving the trailhead are returning to the same spot), which is the standard practice. The discrepancy on the Brushy Loop is related to a portion of that trail's mileage being counted in the Pine Torch Loop's mileage. This has the potential to be confusing for trail users that may be basing a navigation decision based on time or light constraints.

PHYSICAL SETTING

Topography, Forest Cover, Soils, Hydrology, Trail Location

Topography

The topography in the vicinity of the Owl Creek Horse Trails is characterized by broad ridges with gentle surrounding slopes of 10% to 45%. The ridges are dissected by intermittent and perennial stream valleys with sandstone outcrops at the upper topographic break. The outcrop exposures range from 20 to approximately 75-feet, often with steep (60% to 80% grades) hill slopes beneath.

This terrain is ideal from a trail perspective. Trails are easy to develop on the broad ridges down to the outcrop areas. Trails near the edge of the outcrops and steep topographic break provide excellent views across the narrow valleys.

Representative bluff and forest cover for this portion of the Bankhead

Forest Cover

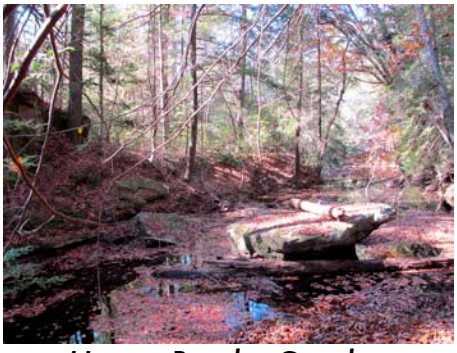
A mixed hardwood canopy covers most of the ridged forest areas where the trails are located, with small sections located in loblolly pine stands. Much of the forest surrounding the trails is in a mid-successional state, with many medium sized trees. The understory is relatively thick in some locations, and light in others where indications of forest thinning or prescribed burning (for oak regeneration and uneven-aged pine restoration) are evident. Healthy hemlock stands dominate the stream valleys and shaded, steep slopes below rock outcrops.

Indications of significant forest management operations are present throughout the forest. The trails have generally been located adjacent to or outside the boundaries of previous harvest, thinning, and other mechanical management activities. In one location, the trail crosses a managed wildlife area that is undergoing herbaceous forb cover establishment.

The forest diversity provides a high quality aesthetic experience for trail users. The consistent canopy cover and steep stream valleys moderates the heat to some extent. The thick understory and higher than normal percentage of dead trees for this forest type indicate that trail corridor management will be a primary management task in the future.

Soils

The soils of the area are mostly sandstone-based, with varying but generally low loam, silt, and clay constituents. Sandstone rock, ranging in size from four-inch chunks to small car-sized slabs, is present near the outcrops and generally at the elevation of the primary topographic break. The soils drain very well in almost all locations, which is ideal for trail management. However, the high sand content increases friability to a level where maintaining an outsloped trail tread and a firm trail tread is not likely possible. This condition of a loose, sandy trail tread does not provide a high quality experience for hikers and bikers.



Upper Brushy Creek

Hydrology

This portion of the Bankhead National Forest, upstream of Lewis Smith Lake, has a number of small, perennial streams with very high water quality. The watershed of the Upper Brushy Creek, where most of the trails are located, are relatively protected from a land disturbance and stormwater perspective. Consequently, a number of sensitive aquatic species still persist in these streams. Mostly mussel species, this area is sensitive to sediment impairments potentially caused forest management activities, including recreation. A significant amount of attention has been given to attempts at minimizing sediment deposition at stream crossings. These attempts have seen varying, but generally low levels of success in controlling sediment entrainment, bank erosion, and subsequent deposition.

Managing trails that descend the steeper slopes to the stream valleys is challenging, as the gradients that the trail must traverse is generally steeper. The bases of many of the outcrops have active springs/seeps and local groundwater interception occurs generally around the same elevation. The more prevalent hydrology, along with the friable soils, creates a condition where significant erosion/deposition is possible. The evidence of this condition is easily seen in almost every location where the trails drop below the outcrop elevation.

Groundwater dripping from rock outcrop

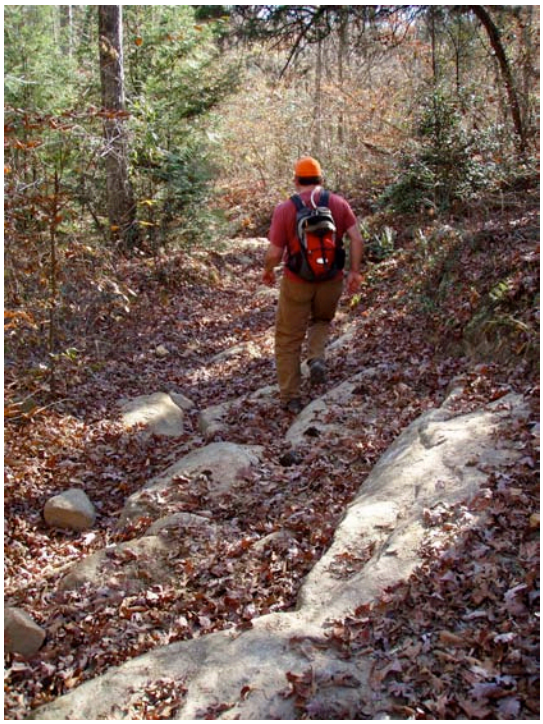
Trail Location

The trails are generally located to take advantage of the natural and scenic qualities present in this portion of the Forest. The trails were relocated during the early to mid-1990's from an earlier, socially developed layout. This relocation process placed the trails in sidehill locations with grades that corresponded to the Forest Service's trail design parameters at the time. Unfortunately, the designed trail grades exceeded the capacity for this area's soil cohesion under moderately heavy equestrian use. The result has been moderate to severe erosion in a number of repeated locations around the trail system, including:

- Trail grades steeper than 7-8%
- Trails crossing over sandstone outcrops
- Stream crossings

Historic documentation regarding the initial trail relocation and subsequent closure of historic trails to the south and west of the Owl Creek Horse Camp indicate a large number of socially created trails in the area and multiple stream crossings experiencing sedimentation. Generally, current trail segments located below the rock outcrops show indications of groundwater interception, either by directly intersecting a seasonal water table near springs/seeps or streams or by trail entrenchment that is carrying water from higher elevations. In each case, sediment entrainment, trail widening, linear mudhole formation, and social spur trail development has occurred. This degrades the recreational experience and can lead to navigation issues. In the most egregious cases, sediment to streams containing federally listed mussel species has resulted in past trail closures, intensive trail maintenance attempts, and continued conflicts between resource quality and recreation opportunity.

20% gradient trail, incised to a depth of 5'



15% gradient trail, eroded to bedrock

SOCIAL SETTING

Types of use, Volume of Use, Potential for Use Conflict

Types of Use

The Owl Creek Horse Trail System is designed and maintained for pack and saddle use. The Pine Torch Trailhead and Owl Creek Horse Camp are the two major entry points to the trail system, and those facilities cater toward truck/trailer rigs. The trail system is managed for non-motorized use. Limited mountain biking and hiking occurs on the trails. The loose and sandy trail conditions do not provide a high quality mountain bike experience, and higher quality hiking trails in the Sipsey Wilderness seem to draw the majority of regional hiking use.

Volume of Use

The National Survey of Recreation and the Environment (NSRE) Recreation and Tourism Statistics Update (Cordell, 2006) reported the following estimates of recreation participation in the US Forest Service Region 8 lands by residents 16 and older. Estimates for Alabama resident participation are calculated by multiplying the estimated participation percentage by the Alabama population of 4,708,708 (US Census Bureau, 2009) with the assumption that use participation in Alabama is proportional to that in other states in Region 8 and nationally, respectively. The most recent State of Alabama equestrian participation as 5.6%, down considerably from the survey five years earlier. For the purposes of this assessment, the 8.6% figure will be employed to conservatively account for out-of-state visitation.

Table 2. NSRE Estimates of Recreation Participation

Activity	*Percentage of Population*	*Total Number of Participants*	*Approx. AL Participation*
Freshwater Fishing	31.6	23,656,285	1,487,951
Day Hiking	28.8	21,569,639	1,356,107
Mountain Biking	17	12,744,658	800,480
Hunting	13	9,720,342	612,132
Horseback Riding (on trails)	8.6	6,440,979	404,949
Backpacking	8.2	6,128,472	386,114
Rock Climbing	4.1	3,069,574	193,057

These statistics provide larger participation estimates than are presented in other sources. The Outdoor Industry Association's latest National Outdoor Recreation Participation Study (OIA, 2008) provides the following estimates for Americans 6 years old and older.

Table 3. OIA Estimates of Recreation Participation

Activity	*Percentage of Population*	*Total Number of Participants*	*Approx. AL Participation*
Freshwater Fishing	14.5	40,961,000	682,763
Day Hiking	11.6	32,572,000	546,210
Mountain Biking	2.5	7,142,000	117,717
Hunting	5.4	15,273,000	254,270
Horseback Riding (on trails)	3.5	9,755,000	164,805
Backpacking	2.7	7,647,000	127,135
Rock Climbing	0.7	1,835,000	32,961

The American Horse Council (from Caffin, 2007, SETC: Trails Planning, Stewardship, and Equestrian Trails on Forest Service Lands) estimates 2,970,000 horses are used in America for recreational purposes, including but not limited to trail riding. The AHC estimates that roughly 50% (1,485,000) of the horses in America are used for showing and recreational riding and 4.3 million participants take part in recreational riding, which equates to approximately 1.5% of the American population. Extrapolating this data to Alabama participation provides an estimate of 70,630 horseback riders.

Summarizing the participation data, horseback riding participation falls somewhere between 70,000 and 400,000, and that participation is decreasing.

Recreation Supply and Demand

Recreational trail supply, specifically for equestrian use, has decreased in the last decade. The Owl Creek Horse Trail system has decreased in mileage in the last fifteen years due to water quality-related issues with trail crossings and sensitive species in Owl Creek.

Generally, equestrian trails in Region 8 National Forests have experienced a dramatic increase in use over the last 30 years. In this region in particular, the acreage of rural and agricultural lands where horseback riding traditionally took place has decreased, with much of this area undergoing suburban development. In recent years, many Forests in the Region have undergone a management change requiring riding to take place on designated trails rather than allowing cross country travel, which is the situation on the Bankhead National Forest. The combination of these factors has effectively decreased the supply of equestrian opportunities across the landscape and focused that use on specific trail systems. So, while the number of horseback riding participants may be relatively small and/or decreasing, the opportunities for meeting that recreational demand have experienced a much more acute decline. The result, which is manifest in many Region 8 forests, is large pressure and subsequent degradation of equestrian trail system conditions over the last two decades.

While recreational demand for horse trails on the Bankhead National Forest cannot be accurately characterized without a lengthy study, the field assessment did indicate the forest parking facilities were fully utilized on a fall weekend of good weather. The Pine Torch Trailhead was at capacity with twelve trailers and there were 30

trailers in the Owl Creek Horse Camp at that time. A number of trailers were parked alongside FSR 254 near trail crossings and the assessors witnessed a more than a dozen "visitor" trailers at private residences in the surrounding area (roughly assessed by the presence of more than one connected truck/trailer combination in a private yard or driveway.

The recreation market has two segments:
(1) Local users are in close proximity to the Forest. Most of these users are from a predominantly rural areas of the surrounding or exurban, potentially part-time residents, in relatively new developments around Lewis Smith Lake.
(2) Users from surrounding, more highly populated, areas such as the greater Birmingham area and Huntsville, for whom the Owl Creek Horse Trail System provides the closest recreational opportunity that provides a long day or weekend's worth of riding.

The Southern Appalachian Assessment defines Recreation Supply as: "the opportunity to participate in a desired recreation activity in a preferred setting to realize desired and expected experiences. Three components of supply are settings, activities, and facilities. These three components are linked in the following manner:

1. Landscapes are available for people to use in recreational pursuits. Landscapes are characterized by settings, which provide the physical and social environments needed to produce experiences.

2. Recreationists choose a setting and activity to create a desired experience.

3. Facilities, such as campgrounds and trails, are supplied to assist uses of the setting and to support activities.

Settings, activities, and support facilities are managed to maintain the condition necessary to produce the expected experience. There are limits to the use of settings. When use is too intensive for recreators to achieve desired experiences, the carrying capacity has been exceeded. Providing additional support facilities may increase the capacity of settings."

In total, the parking capacity on Forest Service property for horse trailers is approximately 50 (including the Owl Creek Horse Camp). Assuming a maximum of four riders and horses per trailer, this equates to a current daily carrying capacity of approximately 200 horses on the Owl Creek Horse Trail System. This conservative estimate is likely sufficient in accounting for additional recreational use that accesses the trail system from nearby private properties.

Assuming full occupancy of all parking and overnight sights, all visitors on a 25-mile trail system and an average outing of a half day/12-mile ride this would place approximately four trail users on each mile of trail at any one time. Assuming an individual sitting at a fixed point for four hours and trail users traveling an average of four miles per hour, this visitor could potentially encounter approximately 16 or fewer trail users in a half day, depending on the location's proximity to the major access point, in this case the Owl Creek Horse Camp. This density of use is within the scope of the Roaded Natural ROS class.

Potential for Use Conflict

The Owl Creek Horse Trails have a relatively low probability for use conflict. Potential conflicts between use groups are minimal. The predominant use on the system is pack and saddle, including wagons on FS roads. Trail conditions are substandard for a positive mountain bike experience, and although regional riders do make use of the trails, it is generally in small numbers and by individuals who seem to understand safety and etiquette practices. The proximity of the Sipsey Wilderness, which provides high quality hiking opportunities, limits hiking use of the Owl Creek trails.

Conflicts within the equestrian use group are traditionally low, a situation reflected on the Owl Creek trails. Some equestrians commented that they were bothered by refuse along the trail. There did not seem to be any parking conflicts. Horse tethering layout in the Owl Creek Horse Camp is likely adequate in terms of quantity and quality, though some frequent visitors had opinions for positioning of facilities for increased use and ingress/egress. It is not known whether noise violations or other law enforcement-focused social issues are present at the Horse Camp.

Use conflict can take a variety of forms, ranging in severity from general intolerance (i.e. disliking clear cut-type timber operations, insects, or another type of trail user) to a genuine safety incident (physical altercation). The perception of conflict changes from person to person and potentially within any singular individual from day to day. There is no hard and fast equation for determining whether a situation has the potential for conflict. That stated, most conflict originates from goal interference. Very few visitors to the Forest arrive with the idea to be disrespectful or abuse the natural resources, though these types of stories persist for a lengthy period of time and help to create stereotypes. Much more often, a visitor is not pleased by some aspect of their experience and subconsciously seeks to place the blame for the situation on someone else (i.e. horse manure, mountain bike speeds, the Forest Service trail maintenance).

A land manager intending to prohibit or degrade someone's lawful recreational experience is also very unlikely. The public communication and decision-making process, regulations, or reasons for decisions are not entirely clear to most recreationists. Conflicts related to trail conditions management are most often the caused by 1) insufficient design, 2) construction/maintenance practices that alter the trail experience, and 3) lack of sufficient education and outreach materials (maps, kiosk signage, public outreach, and peer-to-peer education).

MANAGERIAL SETTING

Recreational Opportunity Spectrum, Quality of trail Construction/Maintenance, Stewardship, and Facilities, Forest Plan (RLRMP) direction, Compatibility of Resource Management with Intended Recreational Use

Recreational Opportunity Spectrum

The portion of the Bankhead National Forest containing the Owl Creek Horse Trails falls into the Roaded Natural class of the Recreation Opportunity Spectrum (ROS). This management prescription intends to provide moderate to high recreation use and is managed to provide the public with a variety of recreation opportunities in a setting that provides quality scenery, numerous trails, and limited facilities. The management emphasis is to improve the settings for non-formal outdoor recreation in a manner that protects and restores the health, diversity, and productivity of the ecological resources. Typical user interactions along the trail in the Roaded Natural ROS Class is estimated to be around 15.

Quality of Trail Construction/Maintenance, Stewardship, and Facilities

Trail Construction/Maintenance

The majority of the Owl Creek Trail System was constructed, rather than adopted from linear forest management routes. The trails were constructed in a mechanized manner at a width of four to eight feet. The trails were generally constructed on sidehill locations rather than at the valley or ridge of the landscape. Trail gradients rarely exceed 20% with average grades of approximately 8%. The trails seem to have been constructed with some cross slope to facilitate proper sheet flow drainage and there are very few switchbacks in the system. The initial design and construction of the trails was quite progressive relative to many other regional trail systems developed in the same era. However, a combination of soils that lack cohesive qualities and large amounts of horse use has demonstrated flaws in the design.

Trail gradients are too steep to resist the shearing stress of heavy horse use, creating loosened soil material in the middle two feet of the trail tread. In precipitation events, the fines wash away first, further decreasing soil particle cohesion. Secondarily, the larger soil particles are entrained and deposited downslope. This action has left behind incised trails that carry water, causing further erosion, and creating the need for significant maintenance.

Mechanized maintenance has been sporadically attempted, but has not rectified the problems. The maintenance activities were mostly attempted with mechanized equipment, at some points with a 48”-wide machine and at others by a 96”-wide machine. The latter machine is more commonly used for road maintenance and other grading operations. The wider trail makes natural sheet flow difficult unless under-trail drainage (i.e. typical road construction-style insloped ditch and culvert) or significant outslope (greater than 10%) is maintained. The 48”-wide machine is a more appropriate width for the intended Trail Class and desired recreational experience.

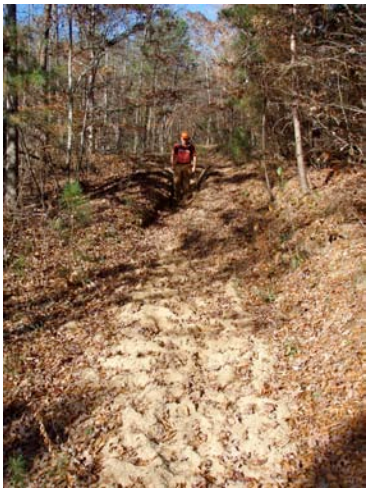
Trail Operations And Maintenance Considerations
(Excerpted from FSH 2309.18, Exhibit 1)

Trail Attributes	*Trail Class 3- Developed*	*Trail Class 4- Highly Developed*
Trail Management	Typically managed to accommodate: • Moderate to heavy use • Users with intermediate skill level and experience • Users with minimal orienteering skills • Moderately easy travel by Managed Uses	Typically managed to accommodate: • Very heavy use • Users with minimal skills and experience • Users with minimal or no orienteering skills • Easy travel by Managed Uses
Maintenance Indicators	• Resource Protection • User Convenience • Safety commensurate with targeted recreation experience	• User comfort and ease • Resource Protection • Safety commensurate with targeted recreation experience
Routine Maintenance Frequency and Intensity	• Trail cleared for availability early in its season of use and for preservation of its integrity • Typically, maintenance conducted every 1-3 years or in response to reports of trail or resource damage or significant obstacles to Managed Use and experience level	• Trail cleared at earliest opportunity to make it available for season of use • Typically, maintenance conducted at least annually

The vast majority of drainage additions are not properly located. While many drainage additions have been attempted, few work with the natural dynamics of water flow. Most attempt to turn water off the trail rather than utilizing locations where the trail turns away from the water flow. Some drainage features are located on cross slope gradients that are less steep than the trail tread gradient. In this case water moving down the trail has increasing hydraulic energy by remaining on the trail tread.

The construction quality of the drainage features is insufficient. Rolling grade dips are generally constructed with tread crests that are too steep on the face and the tail. These features do not persist under the shearing and compaction forces of equestrian trail use, particularly with highly friable, sandy soils. The loosened tread crests become broken down with much of the soil material washing back toward and blocking the drain. Reestablished

drains, whether constructed in concert with a tread crest (i.e. rolling grade dip) or without a tread crest (i.e. knick or broad-based dip), are not wide enough and blockage of water flow has happened quickly.



Sand deposition

There are a number of locations where maintenance on wet area crossings has been attempted with culverts, turf stone blocks or large timber steps. One culvert is properly sized and placed at the proper grade and location below the stream substrate. The remaining culverts are either not sized/constructed properly, leading to some level of scouring of the streambed. It does not seem that culverts had been cleared of debris recently, potentially worsening the scouring situation.

Turf stone block tread hardening is present in a handful of locations around the trail system. One location, the north side entrance to the creek at the "Dinner

Functioning culvert

Scour, downstream of partially blocked culvert

Installed above substrate

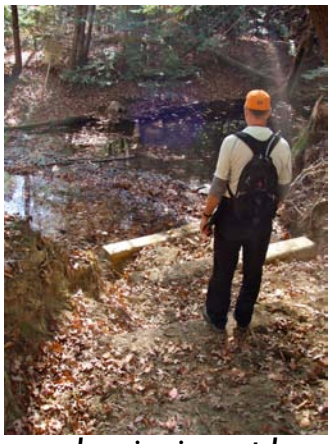
Broken turfstone

Bell", was adequately constructed and is functioning to minimize sedimentation. Other locations of turf stone armoring are not functioning due to insufficient construction techniques. This can be a valuable and effective maintenance prescription in friable soils and should not be abandoned because of past lack of success. Additionally, there are a number of unused block caches spread around the Forest in relatively close proximity to needed wet area maintenance needs.

The large timber steps and corral fencing at the north entrance to the Brushy Creek crossing has likely reduced the amount of sediment entering the stream. However, the crossing does not align well with line-of-sight of the trail, apparently leading to confusion and the need for the "Whoa" signs, which are directly along the line of sight of trail users entering the crossing area. The bottom steps are experiencing scour from larger flow events, threatening the integrity of the entire structure. Additionally, the crossing is not aligned well with the south entrance to the stream, where

there is no formal structure entering the stream, leading trail users to guess where the intended exit might be and resulting in unnecessary, additional time spent by trail users in the streambed itself. Furthermore, the steps are quite intimidating to many trail users due to the steepness of the entire structure, the large rise in each step, and the somewhat loose and/or changing consistency of the streambed off the last step. A number of riders questioned during the assessment period stated that they avoid the crossing altogether because horse and/or rider were not prepared to handle the challenge. The presence of spur crossings in the immediate area indicate that other riders cross the stream, but not at the steps, further exacerbating the sedimentation issues. Since this step feature is an engineered facility, it represents a much higher duty of care than is currently present and the high level of mandatory challenge is not in keeping with the remainder of the trail system. Altogether, this situation represents a risk management challenge that needs to be addressed in some manner.

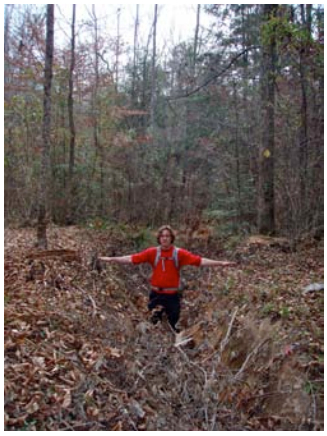




Upper Brushy Creek crossing structure- very steep stream entrance, scour beginning at base

It is apparent that annual heavy maintenance has not been undertaken in a number of years, reportedly due to insufficient budgets. This is particularly problematic with high-use equestrian trails, especially in the highly friable soils present on this portion of the Bankhead National Forest. The deferred maintenance has led to a degradation of trail conditions, particularly on steeper trail gradients, that has resulted in one to four foot incision, spur trail development, and in some instances potential impacts to sensitive aquatic species.



Trail incision to bedrock. No trail grade in these photos is greater than 20%

Volunteer Stewardship

At this time, there is some evidence of volunteer trail stewardship on the Owl Creek trail system. Trailside trash levels are relatively low and vegetation encroachment and downfall has, in most cases, been cleared. It does not seem that regular volunteer-led trail tread maintenance is occurring. Forest-directed, volunteer-accomplished manual cleaning of blocked drains and small relocations within the trail corridor to facilitate better rolling contour and hydrologic management will be a necessary part of future trail management.

Uncleared deadfall results in spur trail

Compliance improves with docent outreach

There does not seem to be any type of Docent Patrol or other peer-to-peer public outreach program in place that would demonstrate management collaboration to the public-at-large. With fee program compliance estimated at 50%, there are valuable maintenance resources that are not being captured.

Trail-Related Facilities

Engineered facilities attendant to the trails include the Owl Creek Horse Camp and the Pine Torch Trailhead. Both have been developed in the last twenty years, with the Pine Torch Trailhead constructed most recently. The facilities do not show immediate signs of disrepair. Surfacing of travel paths is in good condition. The capacity of both trailhead facilities may become a future issue, especially if an increase in day use is experienced. The assessment took place during a fall weekend with good weather and both trailheads were at maximum capacity.

Well-maintained sanitary facilities

The mapping resources at the trailheads kiosks showed the entire forest and included all recreational trails. The scale of the maps made interpretation of the horse trail system difficult. Maps of the trail system were available at the District Ranger Station in Double Springs. Trail intersection signage within the Forest is varied in quality and repair. Many trail and road signs have been stolen, cut off for scrap metal. This fact makes navigation difficult for new visitors to the Forest, especially when paper maps are not readily available. Carsonite post-based signage is employed irregularly throughout the trail system and does not include level of challenge information. These signs were most often employed to signal "no travel" areas, such as roads closed to recreational use, roadside parking areas being restored, etc. The trails are blazed with metal diamonds, with different colored blazes representing the different trails/loops in the system. This is generally functional, except near the southern intersection of the Pine Torch and Brushy Creek loops, where white blazes are present. The lack of an intersection sign at this location makes navigation more difficult.

Full Forest map at Pine Torch TH

Relict concrete trail marker with newer signage

Confusing white blaze

Sign at intersection with mgt route

Horse Camp Fee Area Sign

Pertinent RLRMP Information

(From Revised Land and Resource Management Plan, National Forests in Alabama, January, 2004)

Goals and Objectives: Develop management strategies for overused areas, especially trails and wilderness areas.

Standards: Develop water quality standards for trail maintenance and construction

Issues:

Threatened, Endangered, and Sensitive/Locally Rare Species- What levels of management are needed to protect and recover the populations of federally listed threatened, endangered, and proposed species? What level of management is needed for Forest Service sensitive and locally rare species?

Riparian Area Management- What are the desired riparian ecosystem conditions within national forests, and how will they be identified, maintained, and/or restored? What management direction is needed to help ensure that the hydrologic conditions needed for the beneficial uses of water yielded by and flowing through national forest system lands are attained? What management is needed for the maintenance, enhancement, or restoration of aquatic habitats?

Recreation Opportunities/Experiences- How should the increasing demand for recreational opportunities and experiences be addressed on the national forests while protecting forest resources? This includes considering a full range of opportunities for developed and dispersed recreation activities (such as nature study, hunting and fishing activities, and trail uses).

Bankhead Forest as a National Recreation Area- Should the Bankhead National Forest be recommended as a National Recreation Area to showcase and provide for outdoor recreation opportunities?

Goals and Objectives

Hydrologic Unit Codes- Black Warrior, Tennessee, and Upper Tombigbee. Appalachian Plateaus aquifer system. Upper Brushy watershed condition is good and vulnerability is low, with increasing vulnerability with added recreational pressure. Sedimentation is the leading contributor to water quality degradation within the watersheds with Forest Service ownership. Forestry and agricultural practices are the leading causes of erosion and thereby sedimentation.

Threatened, Endangered, and Sensitive Species

Goal 11: Substantially contribute to the recovery of federally listed threatened and endangered species, and provide for the conservation of sensitive species so as to minimize the need for additional federal listings under the Endangered Species Act.

Recreation- Developed, Dispersed, and Backcountry

Goal 22: Provide a spectrum of high quality, nature-based recreation settings and opportunities that reflect the unique or exceptional resources of the Forest and interests of the recreating public on an environmentally sound

and financially sustainable basis. Adapt management of recreation facilities and opportunities as needed to shift limited resources to those opportunities.

- Obj. 22.1- Evaluate recreation quality using health, cleanliness, setting, safety, security, and the condition of facilities as rating categories.

- Obj. 22.2- Strive to be responsive to deficiencies.

Goal 23: Provide a wide variety of dispersed and developed recreation opportunities

- Obj 23.1- Annually evaluate existing opportunities to determine if they meet carrying capacity, demand, and financial ability to maintain in the future for maintenance, expansion, or closure.

- Obj. 23.2- Conduct annual assessments of existing OHV roads and trail crossings in relation to aquatic ecosystem condition and species of concern. Prioritize road and trail maintenance and reconstruction projects in accordance with threatened, endangered, and sensitive species recovery and conservation efforts. If new impacts to threatened and endangered species are discovered, consult with USFWS to develop a plan to avoid and/or mitigate future impacts.

Goal 24: The National Forests will manage areas to provide for "backcountry" recreation experiences.

Standards:
FW-128- Recreation-induced impacts to highly sensitive components of the ecosystem, such as cultural or biological sites, watershed, and vegetation will be analyzed and mitigated as needed.

FW-130- Recreational uses that are shown to be negatively affecting federally listed or Regional Foresters Sensitive Species will be modified to reduce or eliminate negative effects.

FW-131- Horseback riding, mountain biking, OHV use, and camping are prohibited on all permanent wildlife openings, including linear openings to protect established vegetation.

Horse Trails:
FW-143- Equestrian use is permitted on designated horse trails and open public roads. Equestrian use on closed Forest Service Roads is permitted if the closed road is designated a horse trail by the district ranger.
FW-144- Cross country equestrian use is not allowed except by Special Use permit.

Management Prescription- 7.E.2 Dispersed Recreation Areas With Vegetation Management

Desired Condition: These areas will be characterized by easy access and will be capable of sustaining a relatively high number of recreationists in a manner that protects the surrounding water, soil, vegetation, and wildlife. Visitors to these natural appearing settings will be able to choose from a wide variety of well-maintained nature-based recreation opportunities. Forest roads and well-marked trails through these areas provide convenient access for visitors. Management is designed to meet the growing demands of dispersed

recreation and to showcase high quality scenery maintained through low intensity, planned vegetation management activities.

Bankhead Ranger District- sightseeing and trails opportunities will have emphasis where appropriate. Hunting and wildlife viewing are expected to be major recreation activities with wildlife viewing being an important part of sightseeing (Black Warrior Wildlife Management Area).

Non-motorized trails will be maintained or improved as needed for visitor experience and resource protection. Trails may be expanded to meet local demands provided watershed and ecosystem health are not negatively affected. Limitations of use will occur if any dispersed activity results in, or is expected to result in, negative affects to watershed or ecosystem health. Management and protection of rare communities and species associates will be provided, along with management and protection measures of population occurrences of TES and locally rare species. High quality watershed conditions are provided resulting in secure aquatic ecosystems/habitats on NFS lands.

Riparian Corridors
Recreation-Trails
11.07- New non-motorized trail construction is allowed to improve existing trail configuration and improve access to streams, lakes, and the riparian corridor.

11.09- Motorized and non-motorized trail reconstruction and relocation within the riparian corridor are allowed to reduce impacts to riparian and aquatic resources. Reconstruct and/or relocate motorized and non-motorized trails as needed to mitigate impacts to threatened and endangered aquatic species.

Recreation-Dispersed
11.14- Tethering or corralling of horses or other livestock is not allowed within 50’ of stream courses or lakes. Existing corral sites will be maintained to limit impacts to water quality and riparian corridors.

Compatibility of Resource Management with Intended Recreational Use

From a historic perspective, the potential for natural resource impacts from forest activities has been substantially reduced. Streamside management zones have been established for vegetation management activities, excess forest road mileage is planned for decomissioning, cross country travel has been regulated, and recreational crossings of streams that were potentially damaging threatened or endangered species/habitats have largely been eliminated. In sum, these actions should provide for increased confidence that the management of activities in the forest will not deteriorate the resource functions or values.

There are a number of locations where improvements are possible. Most notably, 1) potential sedimentation to mussel-bearing streams at trail crossings, 2) soil compaction, tree mortality, and potential manure impacts at these same crossings, and 3) general erosion issues related to the lack of regular or effective maintenance practices. None of these issues are permanent and compatibility with resource goals is possible, given changes in recreation management practices.

TRAIL CLASSIFICATION

Current & Recommended Classification for Trail Type, Class, Managed Use, Designed Use, Design Parameters, Desired Experience/Challenge Level

Trail Type

Current Trail Type: Standard Terra Trail, Non-Motorized
Recommended Trail Type: Standard Terra Trail, Non-Motorized

Trail Class

Current Trail Class: Class 3 (Developed)
Recommended Trail Class: Class 3 (Developed), Class 4 (Highly Developed) in proximity to high use areas, such as the Pine Torch Trailhead and Owl Creek Horse Camp

Managed Uses

Current Managed Uses: Non-motorized, with emphasis on pack and saddle and mountain bike
Recommended Managed Uses: Non-motorized, removing the emphasis on mountain bike

Designed Use

Current Designed Use: Pack and Saddle
Recommended Design Use: Pack and Saddle

Design Parameters

The current national trail design parameters for equestrian (pack and saddle) use are not likely to succeed in the prevailing soil, hydrologic, and topographic conditions in the Owl Creek Horse Trail System. The highly friable, low nutrient capacity, sandstone-based soils do not have sufficient binding capabilities to withstand moderate to heavy equestrian use in much of the trail system's current incarnation without very high maintenance levels and recurrence intervals. This is especially pertinent in trail locations below the rock outcrop elevation where additional hydrologic interception exacerbates issues.

The current grades are too steep in many locations. These soils become displaced by hooves and a subsequent precipitation event entrains the fine clays, leaving the soil structure with even less cohesion. The results are trail incision and widening, sediment deposition, extensive mudhole formation, and subsequent potential resource impacts.

The national Trail Design Parameters do not relate to physical conditions necessary for sustainable trails. These parameters do not require mechanical compaction of soils during the construction or maintenance process. This facet will be necessary on all trails that are relocated and/or managed for reduced hydrologic impacts. The parameters do not take into account the need for a rolling contour to aid in trail-based water management. Rolling contour of all trails within the system should be retrofitted into the trail corridor with rolling grade dips, knicks, and short relocations that take advantage of nearby slopes. The parameters do not account for trail grade in relation to landscape grade.

The following refinements to the Pack and Saddle Trail Design Parameters are intended as an initial estimation for creating and maintaining a trail tread with heavy horse use in this physiographic condition.

Table 4. Recommended Alterations to Pack and Saddle Trail Design Parameters (Owl Creek Trails)

Trail Attribute	*Nat'l. Trail Class 3*	*Owl Creek Class 3*	*Nat'l. Trail Class 4*	*Owl Creek Class 4*
Width				
Tread	18-48"	36-48" (48" tread necessary as trails will be relocated on side slopes steeper than 40%)	24-96"	48-60" (Never on steeper hill slopes for safety)
Structures	60" (bridge w/o rails), 84" (with rails) 36" (non-bridge structures)	60" (no need for rails) 36" (structures such as turnpiking)	Same as Nat'l. Trail Class 3	Same as OC Trail Class 3
Surface				
Type	Native, some borrow, intermittent rough	Native, some borrow such as native rock at drainage xings, intermittent rough	Native, improved, minor rough	Native, improved wherever necessary for a solid tread, minor rough
Protrusions	Less than 3"	Less than 3"	Less than 3"	Less than 3"
Obstacles	Less than 6"	Less than 6"	Less than 3"	Less than 3"
Grade				
Target	3-12%	3-7%	2-10%	2-5%
Maximum	20%	10%	15%	7%
Percent Max.	5-15%	5%	5-10%	5%
Cross Slope*				
Target	3-5%	5%	0-5%	5%
Maximum	8%	10-15% (at all rolling grade dips, knicks)	5%	10-15% (at all rolling grade dips, knicks)
Clearing				
Height	10'	10'	10-12'	12'
Width	72-96"	72-84"	96"	72-96"
Shoulder	12-18"	12-18"	12-18"	12-18"
Turn Radius	5-8'	8-10'	6-10'	8-10'

* It is not likely that an outsloped trail tread will be a maintainable condition in most instances, but reconstructed tread should be developed with an outslope and mechanically compacted as it will aid in moving water toward the outside edge of the tread and to natural or developed outflow locations.

Desired Experience/Challenge Level

Equestrian Easiest (Trail Class 4)
The trail experience provided at this level should appeal to newer riders, "greener" horses, or mixed groups with one or more of the latter. Generally, these trails will be shorter loops and may contain significant portions of closed administrative road mileage. For safety, trail portions of these experiences should be located on reasonable side slopes (less than 40%), have corridors cleared wider than the trail tread, and minimize tread surface inconsistencies, as practicable, that may cause concern to the horse or rider.

Ideally these trails should take riders past points of interest- clifflines, caves, arches, lake views, or the moving water of streams- to engage visitors in the landscape. In some instances, it may not be possible to bring horses and riders directly to the point of interest due to hill slope grades or resource concerns. The ideal solution is to design a rest/tie up area as close as practical to the interest point and developed for the needs of inexperienced riders/horses.

Trails that are co-located on administrative roads would allow for side-by-side riding and wagon use, which can be a desirable situation for portions of a longer ride. Roadside resting areas can be developed in a manner that is much less damaging to the surrounding natural resources and much easier to maintain over time due to ease of access. A necessity for this type of use is a large, pull-through trailhead that is clearly demarcated for trailers, has tie-up and watering facilities, human sanitary facilities, and quick access to the trails which disperses riders onto the trail system.

In high use areas such as the Owl Creek Horse Camp and the Pine Torch Trailhead, interpretive information on safety, etiquette, horsemanship skills, and responsible use should be combined with waymarked route signage to passively educate users. These are also the areas where docent patrols should focus their stewardship efforts, as maintenance issues need to be quickly addressed, responsible use is most necessary, and the collaboration is demonstrable to forest visitors.

Casual riders riding to Brushy Creek steps, then backtracking to Owl Creek Horse Camp

Equestrian More Difficult (Trail Class 3)

Trails in this class will be less formally developed (i.e. less surfacing and narrower) and traverse to locales that are a greater distance from access points. They will generally provide longer distance options and more varied and challenging opportunities, linking other loops, administrative roads, and areas of the Forest. For sustainability, these trails should be located above the rock outcrop zone, traversing mid and upper slopes, sometimes attaining and crossing over a ridgeline for scenic differentiation. Due to the soil cohesion and subsequent maintenance issues present, width of these trails should be maintained between 36" and 48". This will allow for passing and improve maintenance effectiveness while preserving a generally natural trail experience.

More experienced riders seek out this narrower and less developed natural experience that traverses a significant distance and rarely backtracks on trails that have already been ridden during a particular ride. These riders are often prepared for a half-to full-day experience with supplies for horse and rider alike. Riders with this level of experience and inclination typically read topographic and trail maps and have at least moderate orienteering skills. Like less experienced riders, it is important to relate the trail design to interesting features along its course, but generally the opportunity of riding for a significant portion of the day holds just as much interest.

These enthusiast riders often have equipment that allows them to camp overnight in close proximity to their horses. More recently, the trend in full-service horse trailers with bunk, electric and sanitary facilities allows for very comfortable front-country horse camping. While these riders and horses often have a higher level of trail experience, the development of way marked loops (with approximate ride times and most direct "escape" routes for weather changes or injuries), mapping information with rest areas and watering spots delineated, interpretive information on responsible trail use, etiquette, and forest rules will greatly assist in self-regulation around the trail system. It is also important to have at least weekly docent patrol coverage of these more backcountry trails in order to report maintenance issues and provide outreach to other potential members of the organized equestrian community.

Skilled riders that had just crossed Brushy Creek

GENERAL RECOMMENDATIONS

Sustainability, Manageability, Recreational Quality and Diversity

Sustainability

Major Relocations

Across the system, trail entrances to and exits from valleys were not developed in a manner that handles the high level of equestrian use. The gradients are too steep, often 10-20%, and the trails were developed without any rolling contour. These areas are deeply incised and carrying sediment toward the bottom of the drainages. These areas are outlined on the Trail System Priorities map in orange where drainages have physical characteristics (scoured channel, presence of at least intermittent rock streambed, presence of wetland vegetation) that indicate intermittent or less flow. Areas on the Trail System Priorities Map outlined in red, where drainages are crossed, typically indicate a higher level of erosion and deposition in close proximity to or directly draining into perennial streams.

The western half of the Key Mill Loop has a high-density of trail incision, erosion, spur trail development, private property, and potential aquatic impact issues. Earlier proposals have focused on moving large segments of this trail onto inventoried Forest Service Roads. While that action may reduce the aquatic impact issue, as the roads are near the ridges, it would not adequately deal with the other issues. Employing these particular roads for recreational use would necessitate extensive drainage improvements and consistent heavy maintenance, essentially trading one maintenance issue for another. Additionally, the roads provide a lower quality recreational experience.



Steep, severely eroded trail sections where maintenance has a very low probability of success. Relocation necessary.

Minor Relocations

Much of the trail system was not developed with a rolling contour trail tread. As a berm developed that prohibited cross slope drainage and water subsequently was contained within and further eroded the trail tread, heavy maintenance became necessary. In locations where the existing trail is not steep (less than 7%), rolling contour could be retrofitted into the trail design, providing high spots in the trail tread that prohibit water from continuing to move down the trail, gain hydraulic force, and entrain additional sediment. Where applicable, this practice will decrease the amount of annual heavy maintenance that is required. The Trail Priorities Map indicates these areas in highest need as orange (where drainages are not crossed), but the majority of the trail system would benefit from this protocol.

Rider's view: Trail "disappears", then intimidating rock step presents itself, spur route to avoid challenging rocks develops

Lack of rolling contour design results in lengthy erosion sections. Rolling grade designed into relict forest management route and relocations will better control the flow of water and sediment.

Environmental Restoration

Relocations alone are not likely to mitigate the areas outlined in red on the Trail Priorities Map or other damaged areas such as:

- "Dinner Bell",
- The north side of the northern Brushy Creek Crossing,
- The water access on the north side of the southern Brushy Creek Crossing,
- The erosion channel on the southeast side of the Horse Camp, and
- Various mid-trail tie-up areas.

These areas will require active environmental restoration were erosion is heavy. Where vegetation trampling, cribbing, tree damage, and heavy compaction has occurred, reseeding and improved visitor management (designated tie-ups, seating areas, and potentially fencing) should occur.

Old forest road (proposed for trail sysem at one time)with failed water management

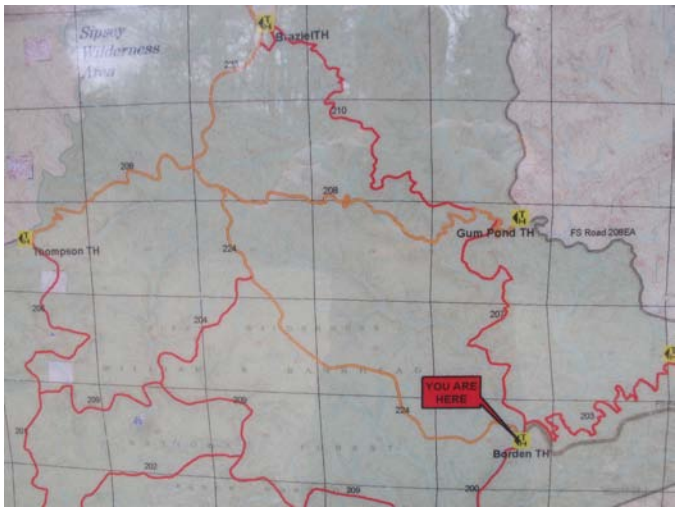
Eroded trail stream crossing just downslope of old road

Rest area adjacent to stream with lower density of vegetation and significant compaction

More cribbing and loss of vegetation at rest area/stream crossing

Manageability

Signage and Mapping
Attempts at better and more accessible navigation aids need to be made. Installation of fiberglass-based signage (in upright panels and on posts) will decrease vandalism incidents and are not attractive to horse cribbing. Maps should be available at the Ranger Station and at each trailhead that indicate blaze color code, trail length by segment between intersections, and difficulty level. A waymarking system should be considered, in partnership with the equestrian community, that provides routes to follow for specific experiences, ride duration, etc., based on the most important factors to the riding community.



Better mapping resources at Sipsey Wilderness Trailhead

Formalized Maintenance Program
High-use equestrian trail systems, especially in challenging soil or climatic situations, require consistent heavy maintenance. It is apparent that budget decreases or time/staff constraints have limited maintenance in recent years. Additional training to improve the quality of maintenance (location choice, technique, machine operation) is necessary. Finally, proper mechanized equipment needs to be employed. A 48”-wide or narrower machine with rubber tracks is vital in this trail system’s soil conditions to minimize impacts within the maintenance corridor.

Volunteer Agreements/Partnerships
The Owl Creek Trail System cannot be efficiently managed by the Bankhead District staff alone. Outreach regarding regulations, best practices, responsible riding, etc. needs to be undertaken on a very active basis by the organized riding community. This assistance should include assessing emerging issues, alerting the District to problems, regular corridor clearing, consistent trash removal, mechanized maintenance, and funding. A formal volunteer agreement should direct the activities of both the partner and USFS in managing the trails, and when successful should be parlayed into a challenge cost-share agreement.

Recreational Quality and Diversity

Experience Optimization

The Owl Creek Horse Trail System was developed as a shared-use trail system to provide an "easy" trail experience for equestrian users and a "more difficult" experience for mountain bikers and hikers. The sandy, unconsolidated trail conditions, with some long muddy areas, have effectively removed the latter two managed uses. While the challenge level for equestrians is generally appropriate, the steep gradients and subsequent erosion near rock outcrops and perennial stream crossings, has created an increased level of challenge that is not universally desired, as noted by spur trails at every location where this situation is present. Additionally, the design of three large loops is apparently restrictive, as a much higher percentage of riders, whether camping or not, base out of the Horse Camp and ride primarily the Key Mill Loop. As part of the relocation process, shorter and multiple loop options of different levels of challenge should be considered to disperse use better throughout the system.

Spur development at location of old deadfall

Access/Outreach Improvements

In high-use areas, such as the trailheads and trails nearby (within one mile), trail durability improvements (aggregate addition), resource and management interpretation, and skill training locations would be welcome additions. Without the presence of staff or partner docents, it is difficult to provide the necessary education and trail conditions at the beginning of a ride to communicate management desires. Regularly updated information at the trailheads regarding volunteer maintenance, social events, etc. would also demonstrate a broader community at work in managing the trail system.

Severely eroded watering access near Brushy Creek bridge

Two of many regulatory signs at upper Brushy Creek crossing

SPECIFIC RECOMMENDATIONS

Trail Closure/Relocation, Trail Maintenance, Trail-Related Facilities, Trail Management

Trail Closure/Relocation

Recommendation 1.1: Hydrology-Related Resource Impacts
The stream crossings of Brushy Creek and at the "Dinner Bell" area, being sensitive mussel habitat, have unnecessary potential sedimentation impacts. The upper Brushy Creek crossing, where the large timber steps are currently located, also poses a safety hazard due to the design and condition of the steps. These areas have not been suitably hardened (as was indicated in the original design narrative for the trail system), nor was an alignment created that minimizes time within the stream for equestrian users. Approaches to the creeks are confusing for users as they don't align with the crossings. Either much more robust and durable hardening of the approaches or bridging the creeks is necessary if these sections of trail are to remain open to use. In either case, streambank restoration is needed to arrest the potential ongoing sedimentation issues.

Recommendation 1.2: Unmaintainable Alignment
All trail lengths marked in red on the Trail Priorities Map exceed the maximum sustainable grade of the area soils, when combined with heavy equestrian use. These areas generally drop from the rock outcrop elevation toward the streams and have undergone severe erosion, multiple route formation, and general resource damage. Check dams and other erosion control measures should be employed to arrest the degradation and these trail sections should be relocated. Relocations should generally be above but near the rock outcrops, should not exceed a grade of 7% and retain an average grade below 5%.

Recommendation 1.3: Unsuitability for Particular Use
Currently, one portion of the Brushy Creek Trail traverses through a wildlife management area. While this trail is not significantly eroding, the RLRMP states that recreational trails should not pass through these areas. A relocation to the east of the road through the center of the area will not be difficult.

Recommendation 1.4: Minor Relocations
Without a rolling contour alignment, water must be engineered/managed off the trail rather than the trail alignment itself providing much of that hydrologic management. Areas coded in orange on the Trail Priorities Map are the most crucial relocation needs, suffering the greatest level of erosion and/or are related to drainage crossings where stormwater to seasonal flow is present. It is likely that relocation in these areas will not be possible within close proximity (within 150') of the existing trail. Relocations should contain a rolling contour design with particular attention to grade reversals near the bottom of the drainages. Grades should not exceed a maximum of 7% and retain an average grade less than 5%.

Much of the trail coded in green on the Trail Priorities Map would also greatly benefit from minor relocation. This protocol, where current trail grades are below 10%, will minimize future heavy maintenance related to rolling grade dips or other drainage structures. In many cases, the relocations will be possible within close proximity (150') of the existing trail tread.

Trail Maintenance

Recommendation 2.1: Corridor Management
The ***entire trail system requires annual corridor clearing to buck downed trees and remove spring poles and hazard trees***. In every situation where a tree is down or has been down along the trail, a spur trail has developed.

While risk management-related incidents should always be dealt with by an experienced Forest Service sawyer, basic brushing and bucking can be accomplished by volunteers with USFS certification and proper protective protocols. The Forest should sponsor training for volunteers every two years, insert this task into volunteer agreements, and develop a maintenance logging protocol that is cooperatively managed by volunteer groups for real-time knowledge of issue development and resolution.

Recommendation 2.2: Effective Hydrologic Management
The ***entire trail system requires retrofitting for effective water management***. None of the trails within the system were designed with rolling contour that provides periodic low areas where water can flow off of the trail tread. Very few of the trails currently have outslope that facilitates sheet flow across the trail. Without these design facets, maintenance activities must be adopted that regularly facilitate the movement of water off of trails. Rolling grade dips with tread crests have not persisted due to the sandy, friable nature of the local soils. Rather than creating tread crests in the future, the maintenance task should be focused on creating much wider drains (10-15' wide) and maintaining an outsloped condition through regular drainage clearance maintenance. Broad-based rolling grade dips on sections of trail with a gradient and knicks where trail gradient is negligible should be the protocols of choice.

Where rolling grade design with consistent undulation is not possible, broad-based dips should:

- Begin near the top of the hill and be constructed at approximately 100' intervals.
- Be located where trails turn and hill slopes are substantially greater than the trail grade.
- Be constructed with a broad drain (at least 10') that is maintained with an outslope of at least 10%, preferably 15%, to accelerate water off the trail but maintain a sheet flow pattern.

The broad-based dips will have to be maintained on a consistent basis, as high-use equestrian trails lose outslope over time due to accumulating sediment or compaction/displacement during wet weather use. A protocol should be developed that initiates this water management on all system trails in the next 2-3 years and then provide ongoing maintenance to each structure on a two-year cycle.

Recommendation 2.3: Trail Tread Hardening

High use, Class 4 equestrian trails in sand-based soils require extra rock material for durability. The addition of rock material will improve the binding capacity of clays to the larger particles and provided better resistance to compaction. There are a number of methods to accomplish this soil amendment, depending on the volume of use, hydrologic condition of the soil, and natural rock composition percentage in a given location.

Where soil wetness is minimal, rock composition is moderate and use is high, 3/8”-minus aggregate material can be disked into the existing trail tread during drainage maintenance work and mechanically compacted to create a firmer tread that experiences less displacement and compaction. Crushed limestone is the best material for tread hardening as it contains natural binders and thus produces the hardest finished product trail tread.

Where soil wetness is higher and rock composition is relatively low, use volumes will not be a factor. These areas will compact and/or displace even with relatively low levels of use during wet weather. In this situation, trails will have to be trenched and 2”-minus used to fill the trench. 3/8”-minus material is then added, wetted, compacted, and allowed to dry. This process is repeated until the pre-trenching grade is reached.

Trail hardening application near stream crossing to prevent sedimentation

Minor excavation, then fill-to-grade in sandy soil to harden tread

Crushed limestone surfacing application at Biltmore Estate horse trail system

Where soil wetness is highest, rock is negligible, and drainage is an issue (i.e. stream valley location), the highest level of construction is necessary. In this case the resulting trail tread will not be at-grade, but raised above grade in a turnpike fashion. Depending on the organic content of the substrate and water flow patterns, filter fabric may be required at the base of the tread to prevent extensive stone loss into native soils. Successive layers of filter fabric is not however suggested separating layers of different crushed stone materials. To the contrary, the idea is for smaller stone to fill the cracks and crevices of lager stone and the layers to blend together. The first rock layer should be a 6-12" course of railroad ballast (2-4" surge or #67 stone), followed by similar procedures as described above.

Raised tread hardening application with railroad ballast (and intermittent lateral rock migration additions) topped by crushed and compacted limestone

Recommendation 2.4: Hardened Stream Crossings

All stream courses that carry intermittent or greater flow, as well as consistently muddy stormwater drainage crossings should be hardened to minimize sedimentation impacts and reduce long-term maintenance needs. Natural hardened fords are the ideal location for equestrian crossings and are prevalent within these stream systems.

When a naturally hardened crossing is not available, rock from within the forest is the ideal source material for compatibility with the desired and intended recreation experience. It also minimizes the potential for water chemistry alterations during natural weathering and recreational wear. Where rock sources are far away, turfstone blocks or broken and flipped concrete can be utilized, so long as the pore spaces within the blocks are filled with smaller aggregate materials. With natural rock, blocks, or concrete a great deal of care should be given to the installation process. Armoring should be done at stream substrate elevation and stream gradient so as not to obstruct flow in any way. Hardening should continue at least 20' up each approach to minimize muddiness and entrenchment adjacent to the stream. Termini of the hardened sections should be fully boxed in to resist heaving and migration, while further interlocking the hardening materials.

Full box turfstone armoring, beginning from stream gradient and continuing upslope

Finished project with rip rap flow protection and 7 years/1,000's of horse passes later

Broken concrete full box armoring in process and just prior to final joint fill

Trail-Related Facilities

Recommendation 3.1: Trailhead Facilities
The Owl Creek Horse Camp has a significant stormwater problem. Compaction of the area without a break in the slope or any catchment areas has resulted in significant erosion to the south of the campground, both on the trails and in the direction of nearby water sources. This has contributed to the current, fall-line access to the trail system becoming deeply incised with multiple braids. The trail access to the campground should be altered to a more sustainable location and gradient that is also more easily accessible by all campers and day-users. Some amount of stormwater management retrofit should be installed to mitigate further sedimentation.

The Pine Torch Trailhead is functional at the current use levels, but the unstructured parking situation can compromise the capacity with just a few trailers placed in inopportune locations. Minor grading and surfacing to widen the access by 3-5' would also alleviate rutting and muddiness issues created during wet, busy periods.

Recommendation 3.2: Signage and Maps
Signage and maps, when USFS personnel or stewardship partners are not present, become the primary means of visitor management and a quality recreational experience. The kiosk-based map resource for the trail system is adequate, but inclusion of the entire Bankhead National Forest obscures more pertinent information regarding the immediate environs. The current map depicts all the trails on the system but does not provide any information, pictorially or in writing, on trail difficulty, mileage, estimated time, scenic resources, or wayfinding cues.

The paper map available at the Ranger Station is not adequate and is not available at the trailheads. This map's trail location information is not correct, has a confusing color scheme, and is rather blurry and difficult to interpret. Paper maps should use black line color for all the trails, better depict intersections and scenic features on the map with insets, and include difficulty levels and mileage and/or time estimations in the legend. When that information is coordinated with signage on the trail system, navigation, recreational choices, and risk management are improved.

Very good trailhead kiosk signage and visitor information from United Kingdom Forestry recreation areas

Trail Management Recommendations

Recommendation 4.1: Regulated Use

Large group rides or endurance events are not recommended for the Owl Creek Horse Trail System. The soil conditions are not durable enough to withstand these types of extremely high use over a short time duration, especially if it coincides with a precipitation event. Likewise, large social rides (over 5-6 horses) also have more potential for trail tread impacts as horses follow in a line, creating a focused impact in a 12-18" wide area of tread. Outreach through the organized trail community to voluntarily ride in smaller groups, consider EZ-On boots over traditional horse shoes, carry individual high lines for rest area stops, etc. could further reduce impacts and maintenance needs.

Unshod hoof, traditionally shod horse shoes, and EZ-On horse boots

Recommendation 4.2: Use Volume Monitoring

The gross and seasonal use of the Owl Creek Horse Trail System cannot be accurately defined at this time. This confounds the USFS' ability to develop fee compliance rates, as well as monitor visitation levels and trends. If this data were collected, it could then be qualitatively related to management and maintenance protocols in an effort to determine effectiveness and appropriateness of different actions. The best manner for accomplishing this is through trail counters: Simple trail counters can count total user passes. This counter information, coupled with recurring weekday and weekend-long trailhead observation and counting activities on a monthly basis, would provide enough information to make confident estimates of use. More refined systems can be linked to box-protected cameras that would provide a breakdown by type of user and fee compliance. Ideally, information garnered from either type of visitor use data collection would also be linked to some form of visitor outreach such as web- or paper-based survey about use patterns, desired experience, and visitor satisfaction.

Recommendation 4.3: Use Impact Monitoring

With data collection protocols in place and maintained, it becomes much easier to create an adaptive management environment where USFS and volunteer stewardship actions can be used to create performance measures to monitor incremental progress, develop results-oriented goals, strategies to achieve those goals, and time frames for implementing strategies. Working together, USFS and the organized equestrian community can determine acceptable levels of change in physical resources, necessary maintenance activities to maintain a level of resource management, and suitable facilities to service use levels. This data collection and outreach would also help to bridge a communication gap between the Forest Service and the recreating public and subsequent regulatory compliance.

Recommendation 4.4: Staff Capacity

The Owl Creek trails have many needs to bring the entire system into a manageable state that serves the needs of the users while doing a better job of protecting the natural resources. Better water management on trails to remain in the system, re-grading tread surfaces in many places where outslope has been lost, needed trail relocations of bad alignments, trail restoration of trails to be closed, surface hardening of trails in certain places to create all weather tread surfaces collectively combine to make a large task for trail managers and partner organizations moving forward.

It will be difficult to make real headway on improving trail conditions at Owl Creek without proper equipment, proper tools and adequate training for USFS staff and volunteers. Funding a trail machine to assist the USFS and volunteers will be crucial. Building relocations and new trails without the proper trail machine will be slow or create additional, unnecessary impacts.

Large metal tracked bulldozers that have been employed in the past create far too large a construction footprint for the intended recreational experience. Furthermore, the width of these machines creates additional maintenance complications related to moving water off the trail tread. While a smaller machine, such as a SWECO or Sutter 500 Trail Dozer, would lessen the construction impact footprint and help create a more easily maintainable trail width, the heavy weight and metal tracks on these machines cause undo impacts to sandy soils during the construction and maintenance process. In these soil conditions, the machine tends to "bog down" under the torque and grip of the tracks, leaving behind a trench rather than an outsloped trail. Finally, tracked excavators are far too slow moving to be an efficient maintenance choice in the future.

Powerful Sweco 480 Trail Dozer moving large rock and soil. The machine's power, combined with the sandy soils in Bankhead, hold the potential for causing as much trail damage as maintenance

The ideal machines for lowest impact and highest effectiveness maintenance/relocation on the Owl Creek trails will be rubber-tracked, small, and relatively fast. Machines fitting this description and effectively employed for trail construction and maintenance include the ASV RC30, Ditch Witch 650, or Vermeer S600TX/S800TX. Each machine can be outfitted with many different attachments for increased versatility. Base cost for one of these skid steers is $20-40K and another $10-15K will be needed for the various attachments (4-way blade for new trail construction and trail maintenance, large bucket for surfacing material, ripper tines for scarifying old trail as part of an obliteration and restoration process).

Various 36-48"-wide, rubber tracked skid steer machines with a multitude of attachments

There is much material that needs to be moved for the construction of causeways/turnpikes and surfaced hardened tread, and a tracked carrier would greatly increase the efficiency of this work. These machines can be described as micro dump trucks, on tracks instead of wheels. Suggested machines would include the CanyCom SC75, CanyCom S100 or a Yanmar C12-RB. A 36-48" rubber tracked hauler would be an ideal machine to accelerate surfacing and armoring projects. Such a machine would not need to be purchased by the Forest, but a long-term rental to mobilize materials to different locations would be much more efficient than employing a skid steer bucket.



Rubber tracked haulers employed to move materials on trailbuilding projects

Training and additional education to move the trails program forward will certainly be needed. Knowledge is the most important tool of any trails program and investing in education is some of the best money spent. Internal budget is one source for such training, but the RTP program has specific money and grants available for education.

Pertinent workshops for USFS personnel include 1)Basic trail design and maintenance- rolling contour trails and good water management structures, 2) Trail Hardening- proper surfacing and rock/turfstone armoring, and 3) Mechanized trail construction and maintenance. Volunteers will need additional training on 1) Trail problem assessment, 2) Chainsaw safety and certification, and 3) Volunteer docent outreach and education. Incorporating these educational courses with demonstration projects has been proven to be the most effective technique for raising the capacity level of staff and volunteers while leaving a model project on the ground for replication in future trail improvement endeavors.


Volunteers and land managers taking trailbuilding machine operation by PTBA members

POTENTIAL FUTURE TRAIL SYSTEM

Existing, Improved Trail System, Low Resource Impact Trail System, Idealized Trail System

The following alternatives for trail system redevelopment are based on the existing trail system conditions and the capacity demonstrated by both the Forest Service and Volunteer Partners to realize a manageable trail system. Improvements to the trail system outlined below can be realized if the accompanying criteria can be met. For the improved management of the trails, in any case, the following criteria should be met, including:

- Historic use of trails by any group does not provide any sort of precedent for future use
- Volunteer agreements will be developed between official, organized, legal groups representing the equestrian community and the Bankhead District of the USFS. These agreements will be stringently adhered to for a 10-year period. Failure to comply with the agreements would likely require additional trail closures, as the Forest Service's management capacity would be reduced
- The Forest Service will continue to retain at least the current budgeted amounts for trail management for the next ten years, will allocate these funds directly to maintenance activities and/or the management of maintenance activities by contractors, service corps, or additional volunteer assistance
- Significant improvements will be made to the quality of Forest Service- and volunteer-led trail maintenance protocols, timeliness, efficiency, and quality. Without this increased level of capacity, it is likely that future trail maintenance will be as ineffectual as past activities and render a situation where natural resource impacts require additional trail closure
- The Forest Service will coordinate volunteer training (sustainable maintenance, sawyer certification, docent patrol, Adopt-A-Trail, etc.) at least every other year to account for the development of additional volunteers and natural turnover.

The following trail system redevelopment options aim to provide general guidance regarding goals, capital improvements, annual maintenance costs, and necessary public support. Short descriptions of the component projects within each option are included with priority level and approximate costs. The priority levels range from:

- Low- accomplished over five years with significant responsibility for the improvements on the recreating public
- Medium- immediately placed into heavy maintenance protocols and incrementally implemented over five years and after higher priority projects have been completed
- High- planning and design initiated immediately, funds raised, and projects implemented over the next two years.

Costs are approximations, as detailed design and specifications will require additional time in the field.

Existing, Improved Trail System

Goals: Provide non-motorized recreation to 1) the widest range of users and 2) highlight the natural resources of the Bankhead National Forest

Capital Needs: ~$355,000

Maintenance Budget: $45,000/year, including annual stream monitoring

Volunteer Assistance: 750 hours/Year (Value: $13,275 based on a rate of $17.70/hour. Source: Financial Accounting Standards Board, 2010 value for State of Alabama)

This redevelopment option aims to retain the essential character of the existing trail system, while rectifying problems related to:

- Potential sediment impacts to sensitive mussel habitat
- Steep and/or rocky slope priority erosion areas
- Private property and wildlife management area incursions

Major Actions

Stream Crossing Projects
Prioritization Level: High
Costs: ~$150,000

This option maintains trail system connectivity across the mussel-bearing Brushy Creek at the two existing locations and the smaller stream crossing to the "Dinner Bell" rest/meeting area. The southern stream crossing on the Pine Torch Loop that utilizes a forest road bridge requires relocations of both approaches, restoration of natural stormwater flow characteristics along the reclaimed trail, and streambank stabilization on the north side of the creek. The northern crossing requires much more costly work, with a significant change in the approach to better align the crossing and reduce safety issues. The crossing can be accomplished either by a much more fortified tread and stream crossing armoring or by a large bridge. In either case, mitigative measures in this location will likely exceed $60,000 to implement. Additional time/expense will be required on relocating the descending trail on each side of the stream and stabilizing streambanks where alternate routes have developed. The "Dinner Bell" crossing will also require more fortified armoring to harden the crossing as well as streambank stabilization where alternate routes into the stream have developed. In each of these locations, maintenance assessment will need to be conducted each successive year and additional tread hardening and sedimentation mitigation measures applied as necessary.

Major Trail Relocations
Prioritization Level: Medium
Costs: ~$75,000

Trail relocations on the Key Mill Loop have a relatively high priority for reducing grades on steep, rocky sections of trail to mitigate severe erosion issues, provide the intended level of challenge, and alleviate private property concerns.

The relocation on the southern portion of the Key Mill Loop should begin at the FSR 262 intersection, determine a much better location to descend to the stream crossing at a lower gradient, and harden the approaches to the stream. The rest area location on the south side of the stream crossing, existing trail and FSR 262 are all contributing factors to general resource degradation and all will require mitigative restoration. FSR 262 should not be utilized for this route as it is already in a degraded condition near the stream crossing and descends to that point at a very steep grade. It is also very flat further to the east. Utilization of this route would require annual heavy maintenance similar to what the existing route would require.

The relocation on the northwestern side of the Key Mill Loop will alleviate steep, eroding sections of trail currently descending below the rock outcrop level where long, muddy trail conditions have developed. The relocation will also remove the trail from private property boundaries, where spur trails have currently formed as trail incision and rockiness has increased. This relocation will also require a more formalized connection to the "Dinner Bell" area at a location where a gentle trail gradient can traverse the steep sideslope. Restoration of a natural surface hydrology will be a necessary part of this relocation, as will general restoration of the "Dinner Bell" area to reduce the area of impact, especially compaction and tree damage.

Smaller relocations included in this option are indicated where severe erosion has developed, but are not in close proximity to active streams. Also included is the relocation around the wildlife management area. It may be prudent in design and implement these shorter relocations on a more immediate timeframe and/or as part of equipment training for USFS (and potentially volunteers) as the terrain is generally less steep and consequences for imperfection are much less.

Other Actions

Small Relocations
Priority Level: Medium
Approximate Cost: $50,000

Map and Signage Improvements
Priority Level: High
Approximate Cost: $5,000

Volunteer Patrol/Maintenance Training
Priority Level: High
Approximate Cost: $5,000

USFS Equipment Purchase/Training
Priority Level: High
Approximate Cost: $70,000

Low Natural Resource Impact Trail System

Goals: Provide non-motorized recreation to 1) the widest range of users and 2) highlight the natural resources of the area, 3) reduce potential impacts to aquatic resources of concern

Capital Need: $425,000

Maintenance Budget: $15,000/year, with stream monitoring no longer necessary after banks are stabilized

Volunteer Assistance: 750 hours/Year ($13,275 value based on $17.70/hour. Source: Financial Accounting Standards Board, 2010 value for State of Alabama)

The aim of this redevelopment option is to fundamentally change the structure and function of the trail system in order to:

- Remove the potential for sedimentation impacts to sensitive mussel-bearing streams
- Diversify the trail experiences offered
- Disperse trail use better across the area to decrease maintenance and user interaction frequency
- Remove steep and/or rocky slope priority erosion areas
- Avoid private property and wildlife management area incursions

If this option was fully implemented, it would also require an expansion of the Pine Torch day-use trailhead to formally and comfortably accommodate at least 30 truck/trailer rigs. Area to the northwest of the existing trailhead is relatively flat and a road with parking pull-outs, tie-ups, and day use facilities could feasibly be developed.

Major Actions

Stream Crossing Projects
Priority Level: High
Costs: ~$30,000
In this redevelopment option, only the southern Brushy Creek crossing at the FSR 254 bridge would remain as part of the trail system. Trail relocation and streambank restoration work would be identical to the Level 1 description. The northern Brushy Creek and "Dinner Bell" crossings would be abandoned, with trail approaches obliterated and streambanks stabilized.

Major Trail Relocations
Priority Level: High
Costs: $125,000
Trail relocations in this option are increased in both number and length to address the high and medium priority options. The relocations focus on keeping trail segments at a higher elevation, above the rock outcrops, and adding scenic mileage to the system adjacent to these steep drops. Five to six miles of trail would be relocated, with the majority of that work happening on the more heavily damaged Key Mill Loop. Significant amounts of trail (~ 10 miles total) would also require obliteration, an ideal task for USFS personnel to provide the machine-based ripping with volunteer assistance on erosion control and revegetation by partner groups, including the organized equestrian groups, youth/job corps, university groups, and/or Wild South.

Major Trail Additions
Priority Level: Medium
Costs: ~$150,000
With relocations complete and erosion issues mitigated, the ensuing phase of the trail system redevelopment would focus on new trail additions to add diversity to the potential experiences for visitors to the Owl Creek Trail System. By the completion of this phase, the total trail system mileage could increase by more than ten miles to a total of around 36 miles. The ten additional miles of trail would include a mixture of new trails designed high on the landscape at the edge of the rock outcrops and cross-ridge connectors to provide a variety of ride options.

The Key Mill-area additions would include a cross-ridge trail originating near FSR 260 in the north and traversing in a southern orientation to create a main "campground loop". An additional trail connecting the relocated Key Mill Loop on the north side of the stream to the new traverse would result in a three loop system accessible from the Owl Creek Horse Camp.

The Pine Torch-area additions would include two new trails that flank the steep slopes above the east and west side of Brushy Creek, wrapping upstream through the intermittent side drainages. This would result in a more scenic main Pine Torch Loop and a smaller, scenic loop on the east side of the FSR 254 bridge (which could also be separately accessed with a three rig-sized pull-out developed at the staging area for the upcoming vegetation management operations). Ridgeline road-to-trail conversions of FSR 246 would provide connectivity through the middle of the main loop to provide a three loop system west of Brushy Creek. Road-to-trail conversion would focus on narrowing the travel corridor to provide a more intimate experience than is present on a forest road at the same time as it shrinks the maintenance corridor. These trail conversions function best when the resulting trail does not remain on the strict alignment of the road, but rather meanders where drainage or scenic qualities can be enhanced.

Other Actions

Small Relocations
Priority Level: Medium
Approximate Cost: $50,000

Map and Signage Improvements
Priority Level: High
Approximate Cost: $5,000

Volunteer Patrol/Maintenance Training
Priority Level: High
Approximate Cost: $5,000

USFS Equipment Purchase/Training
Priority Level: High
Approximate Cost: $70,000

Ideal Trail System (Level 3)

Goals: Create an ideal trail system that 1) provides regional destination quality to equestrians, 2) helps drive tourism-related spending in the area, and 3) serves as a model equestrian trail system for the National Forests of Alabama

Capital Needs: ~$1,000,000

Maintenance Budget: $75,000/year

Volunteer Assistance: 2,000 hours/Year (Value of $35,400 at $17.70/hour. Source: Financial Accounting Standards Board, 2010 value for State of Alabama)

This redevelopment option would combine all the project implementation recommendations for Level 1 and Level 2 options. This would result in an interconnected 40-+ mile trail system. It is likely that visitation levels would require a large expansion of the Pine Torch Trailhead to include at least 25 day-use parking spaces and the addition of a campground of similar size to the existing Owl Creek Horse Camp. The day-use expansion would be necessary as soon as the new trail additions were completed and the campground development could occur when fee proceeds allow.

A number of benchmarks would have to be met to facilitate this recommendation, including:

- Approximately $500,000 in capital funds are almost immediately available for improvements, new trail construction machinery, additional staff to manage trail-based recreation, etc. Much of this funding for trail construction and improvements would have to be developed by the recreating public and local governments.
- Volunteer agreements developed between official, organized, legal groups representing the equestrian community and the Bankhead District of the USFS are successful and can be expanded into Challenge Cost Share or other mechanisms that provide for the inputs of external funding with the confidence that the trail system will be cooperatively well managed into the future.
- Forest Service budget for maintenance would be funded fully at this planned levels into the future.
- Use fees would be increased to two to three times the current amount and fee compliance would be managed on a daily basis by Forest law enforcement staff

APPENDIX A

PROJECT MAPS

APPENDIX B

TRAIL IMPACTS RESEARCH

Introduction

Much research has been conducted to analyze recreational impacts to public lands; some of this research has focused on understanding impacts of different types of recreational use on trails, trail systems and the natural settings in which trails exist. Here we summarize the key findings of this body of research which apply to specific trail and trail system problems we encountered on the Owl Creek Horse Trail System.

Trails are generally regarded as essential facilities in parks and forests. They provide access to remote areas, accommodate a diverse array of recreational activities, and protect resources by concentrating visitor trampling on narrow and resistant tread surfaces. Formal or designated trails are generally designed and constructed, which involves vegetation removal and soil excavation. These changes may be considered "unavoidable," in contrast to "avoidable" post-construction degradation from their subsequent use (e.g., trail widening, erosion, muddiness), or from the development and degradation of informal visitor-created trails.

Common environmental impacts associated with recreational use of trails include:

- Vegetation loss and compositional changes
- Soil compaction
- Erosion
- Muddiness
- Degraded water quality
- Disruption of wildlife

This review is organized into four broad categories: impacts to vegetation, soil, water, and wildlife.

Impacts to Vegetation: General Research

On formal trails, most vegetation is typically removed by construction, maintenance, and visitor use. This impact is necessary and "unavoidable" in order to provide a clear route for trail users. One goal of trail construction and maintenance is to provide a trail only wide enough to accommodate the intended use. Trails made wider than this through visitor use or erosion represent a form of "avoidable" impact. For example, a doubling of trail width represents a doubling of the area of intensive trampling disturbance. Wider trails also expose substantially greater amounts of soil to erosion by wind or water.

The creation and maintenance of trail corridors also removes shrubs and trees, allowing greater sunlight exposure that favors a different set of groundcover plants within trail corridors. Occasional trailside trampling within trail corridors also favors the replacement of fragile plants with those more resistant to trampling traffic. For example, shade-tolerant but fragile broadleaved herbs are frequently replaced by grasses and sedges that are trampling-resistant and require more sunlight to survive. Trail construction, use, and maintenance can also be harmful when trails divide sensitive or rare plant communities.

Trampling - the action of crushing or treading upon vegetation, either by foot, hoof, or tire - contributes to a wide range of vegetation impacts, including damage to plant leaves, stems, and roots, reduction in vegetation height, change in the composition of species, and loss of plants and vegetative cover (Leung & Marion, 1996; Thurston & Reader, 2001). Trampling associated with "avoidable" off-trail traffic can quickly break down vegetation cover and create a visible route that attracts additional use. Complete loss of vegetation cover occurs quickly in shady forested areas, less quickly in open areas with resistant grassy vegetation. Regardless, studies

have consistently revealed that most impact occurs with initial or low use, with a diminishing increase in impact associated with increasing levels of traffic (Hammit & Cole, 1998; Leung & Marion, 1996). Furthermore, once trampling occurs, vegetative recovery is a very slow process.

Compositional changes in the vegetation along trail corridors* can have both beneficial and adverse effects. Trampling-resistant plants provide a durable groundcover that reduces soil loss by wind and water runoff, and root systems that stabilize soils against displacement by heavy traffic. The ecological impacts of such compositional changes are not fully known, except when non-native vegetation is introduced to and spreads along trail corridors. Many of these species are disturbance-associated and are naturally limited to areas where the vegetation is routinely trampled or cut back. However, a few non-native species, once introduced to trail corridors, are able to out-compete native plants and spread away from the trail corridor in undisturbed habitats. Some of these species form dense cover that crowd out or displace native plants. These "invasive" species are particularly undesirable and land managers actively seek to prevent their introduction and spread. Unfortunately their removal is difficult and expensive.

See Wells and Lauenroth 2007 for a case study examining horse and pack stock as dispersal mechanism for plants along recreational trails.

Impacts to Vegetation: Management Implications

Trail managers can either avoid or minimize impacts to vegetation through careful trail design, construction, maintenance, and management of visitor use. Here are some recommendations to reduce vegetation impacts:

- Design trails that provide the experience that trail users seek to reduce their desire to venture off-trail.
- Locate trails away from rare plants and animals and from sensitive or critical habitats of other species. Involve resource professionals in designing and approving new trail alignments.
- Keep trails narrow to reduce the total area of intensive tread disturbance, slow trail users, and minimize vegetation and soil impacts.
- Limit vegetation disturbance outside the corridor when constructing trails. Hand construction is least disruptive; mechanized construction with small equipment is less disruptive than full-sized equipment; skilled operators do less damage than those with limited experience.
- Locate trails on side-hills where possible. Constructing a side-hill trail requires greater initial vegetation and soil disturbance but sloping topography above and below the trail bench will clearly define the tread and concentrate traffic on it. Trails in flatter terrain or along the fall line may involve less initial disturbance but allow excessive future tread widening and off-tread trampling, which favor non-native plants.
- Construct and formalize meet-up and “tie-up” areas in a fashion that contains and concentrates visitor use to durable surfaces
- Use construction techniques that save and redistribute topsoil and excavated plants.

There are also important considerations for maintaining and managing trails to avoid unnecessary ongoing impacts to vegetation:

- While it is necessary to keep the trail corridor free of obstructing vegetation, such work should seek to avoid "day-lighting" the trail corridor when possible. Excessive opening of the overstory allows

greater sunlight penetration that permits greater vegetation compositional change and colonization by non-native plants.

- An active maintenance program that removes tree falls and maintains a stable and predictable tread also encourages visitors to remain on the intended narrow tread. A variety of maintenance actions can discourage trail widening, such as only cutting a narrow section out of trees that fall across the trail, limiting the width of vegetation trimming, and defining trail borders with logs, rocks, or other objects that won't impede drainage.
- Use education to discourage off-trail travel, which can quickly lead to the establishment of informal visitor-created trails that unnecessarily remove vegetation cover and spread non-native plants. Such routes often degrade rapidly and are abandoned in favor of adjacent new routes, which unnecessarily magnify the extent and severity of trampling damage.
- Educate visitors to be aware of their ability to carry non-native plant seeds on their bikes or clothing, and encourage them to remove seeds by washing mud from bikes, tires, shoes, and clothing. Preventing the introduction of non-natives is key, as their subsequent removal is difficult and costly.
- Educate visitors about low impact riding practices, such as those contained in the IMBA-approved Leave No Trace Skills & Ethics: Mountain Biking booklet (www.LNT.org).

For further reading see: Pickering et al 2010, Cessford 1995; Gruttz and Hollingshead 1995; Thurston and Reader 200l.

Impacts to Soils: General Research

The creation and use of trails also results in soil disturbance. Some loss of soil may be considered an acceptable and unavoidable form of impact on trails. As with vegetation loss, much soil disturbance occurs in the initial construction and use of the trail. During trail construction, surface organic materials (e.g., twigs, leaves, and needles) and organic soils are removed from treads; trails built on sidehill locations require even more extensive excavation. In addition, the underlying mineral soils are compacted during construction and initial use to form a durable tread substrate that supports trail traffic.

In contrast, post-construction soil displacement, erosion, and muddiness represent core forms of avoidable trail impact that require sustained management attention to avoid long-lasting resource degradation. This degradation can reduce the utility of trails as recreation facilities and diminish the quality of visitor experiences. For example, soil erosion exposes rocks and plant roots, creating a rutted and uneven tread surface. Erosion can also be self-perpetuating when treads erode below the surrounding soil level, hindering efforts to divert water from the trail and causing accelerated erosion and muddiness. Similarly, excessive muddiness renders trails less usable and aggravates tread widening and associated vegetation loss as visitors seek to circumvent mud holes and wet soils (Marion, 2006).

Research has shown that visitors notice obvious forms of trail impact, such as excessive muddiness and eroded ruts and tree roots, and that such impacts can degrade the quality of visitor experiences (Roggenbuck and others., 1993; Vaske and others., 1993). Such conditions also increase the difficulty of travel and may threaten visitor safety. Remedying these soil impacts can also require substantial rehabilitation costs. Clearly, one primary trail management objective should be the prevention of excessive soil impacts.

The Four Common Forms of Soil Degradation on Trails:

- Compaction
- Muddiness
- Displacement
- Erosion

Compaction

Soil compaction is caused by the weight of trail users and their equipment, which passes through feet, hooves, or tires to the tread surface. Compacted soils are denser and less permeable to water, which increases water runoff. However, compacted soils also resist erosion and soil displacement and provide durable treads that support traffic. From this perspective, soil compaction is considered beneficial, and it is an unavoidable form of trail impact. Furthermore, a primary resource protection goal is to limit trailside impacts by concentrating traffic on a narrow tread. Success in achieving this objective will necessarily result in higher levels of soil compaction.

The process of compacting the soil can present a difficult challenge, especially on new trails. Unless soils are mechanically compacted during tread construction, initial use compacts the portions of the tread that receive the greatest traffic, generally the center. The associated lowering of the tread surface creates a cupped cross-section that intercepts and collects surface water. In flat terrain this water can pool or form muddy sections; in sloping terrain the water is channeled down the trail, gaining in volume, speed, and erosive potential.

Displacement

Trail users can also push soil laterally, causing displacement and development of ruts, berms, or cupped treads. Soil displacement is particularly evident when soils are damp or loose and when users are moving at higher rates of speed, turning, braking, or other movements that create more lateral force. Soil can also be caught in hooves, footwear, or tire treads, flicked to the side or carried some distance and dropped. Regardless of the mechanism, soil is generally displaced from the tread center to the sides, elevating inslopes or berms, and compounding drainage problems.

Muddiness

When trails are located in areas of poor drainage or across highly organic soils that hold moisture, tread muddiness can become a persistent problem. Muddiness is most commonly associated with locations where water flows across or becomes trapped within flat or low-lying areas. Soil compaction, displacement, and erosion can exacerbate or create problems with muddiness by causing cupped treads that collect water during rainfall or snowmelt. Thus, muddiness can occur even along trails where there is sufficient natural drainage. Subsequent traffic skirts these problem spots, compacting soils along the edges, widening mud holes and tread width, and sometimes creating braided trails that circumvent muddy sections.

Erosion

Soil erosion is an indirect and largely avoidable impact of trails and trail use. Soil can be eroded by wind, but generally, erosion is caused by flowing water. To avoid erosion, sustainable trails are generally constructed with a slightly crowned (flat terrain) or outsloped (sloping terrain) tread. However, subsequent use compacts and/or displaces soils over time to create a cupped or insloped tread surface that intercepts and carries water. The concentrated run-off picks up and carries soil particles downhill, eroding the tread surface.

Loose, uncompacted soil particles are most prone to soil erosion, so trail uses that loosen or detach soils contribute to higher erosion rates. Erosion potential is closely related to trail grade because water becomes substantially more erosive with increasing slope. The size of the watershed draining to a section of trail is also influential - larger volumes of water are substantially more erosive.

Water and the sediment it carries will continue down the trail until a natural or constructed feature diverts it off the tread. Such features include a natural or constructed reversal in grade, an outsloped tread, rocks or tree roots, or a constructed drainage dip or water bar. Once the water slows, it drops its sediment load, filling in tread drainage features and causing them to fail if not periodically maintained. Sediment can also be carried directly into watercourses, creating secondary impacts to aquatic systems. Properly designed drainage features are designed to divert water from the trail at a speed sufficient to carry the sediment load well below the tread, where vegetation and organic litter can filter out sediments. A well-designed trail should have little to no cumulative soil loss, for example, less than an average of one-quarter inch (6.3 mm) per year.

Several key studies comparing the impacts to soils by user-type are reviewed below:

Wilson and Seney (1994) evaluated tread erosion from horses, hikers, mountain bikes, and motorcycles on two trails in the Gallatin National Forest, Montana. They applied one hundred passes of each use-type on four sets of 12 trail segments, followed by simulated rainfalls and collection of water runoff to assess sediment yield at the base of each segment. Control sites that received no passes were also assessed for comparison. Results indicated that horses made significantly more sediment available for erosion than the other uses, which did not significantly vary from the control sites. Traffic on pre-wetted soils generated significantly greater amounts of soil runoff than on dry soils for all uses.

Marion (2006) studied 78 miles (125 km) of trail (47 segments) in the Big South Fork National River and Recreation Area, Tennessee and Kentucky, measuring soil loss along transects across the trail to evaluate the influence of use-related, environmental, and management factors.

Sidehill-aligned trails were significantly less eroded than trails in valley bottom positions, in part due to the influence of periodic floods. Trail grade and trail alignment angle were also significant predictors of tread erosion. Erosion rates on trails with 0-6 percent and 7-15 percent grades were similar, while erosion on trails with grades greater than 16 percent were significantly higher. And there was significantly greater erosion on fall line trails (alignment angles of 0-22 degrees) than those with alignments closer to the contour.

This study also provided an opportunity to examine the relative contribution of different use types, including horse, hiking, mountain biking, and ATV. Trails predominantly used for mountain biking had the least erosion of the use types investigated. Trails receiving equestrian use had significantly less erosion when rock content was high and grades were minimized.

Cessford (1995) provides a comprehensive, though dated, summary of trail impacts with a focus on mountain biking. Of particular interest is his summary of the two types of forces exerted by bike tires on soil surfaces: The downward compaction force from the weight of the rider and bike, and the rotational shearing force from the turning rear wheel. Mountain bikers generate the greatest torque, with potential tread abrasion due to slippage, during uphill travel. However, the torque possible from muscle power is far less than that from a motorcycle, so wheel slippage and abrasion occur only on wet or loose surfaces. Tread impact associated with

downhill travel is generally minimal due to the lack of torque and lower ground pressures. Exceptions include when riders brake hard enough to cause skidding, which displaces soil downslope, or bank at higher speeds around turns, which displaces soil to the outside of the turn. Impacts in flatter terrain are also generally minimal, except when soils are wet or uncompacted and rutting occurs.

Impacts to Soils: Management Implications

Soil loss is among the most enduring forms of trail impact, and minimizing erosion and muddiness are the most important objectives for achieving a sustainable trail. Soil cannot easily be replaced on trails, and where soil disappears, it leaves ruts that make travel and water drainage more difficult, prompting further impacts, such as trail widening.

Existing studies indicate that motorized and equestrian use have far greater impacts to soils than human powered recreation. Other factors, particularly trail grade, trail/slope alignment angle, soil type/wetness, and trail maintenance, are more influential determinants of tread erosion or wetness.

There are a number of tactics for avoiding the worst soil-related impacts to trails:

- Discourage or prohibit off-trail travel. Informal trails created by off-trail travel frequently have steep grades and fall-line alignments that quickly erode, particularly in the absence of tread maintenance. Exceptions include areas of solid rock or non-vegetated cobble.
- Design trails with sustainable grades and avoid fall-line alignments. Where equestrian or motorized use is allowed, minimize trail grades and import rock material to form a durable substrate should the native soils not have substaintial rock content.
- When possible, build trails in dry, cohesive soils that easily compact and contain a larger percentage of coarse material or rocks. These soils better resist erosion by wind and water or displacement by feet, hooves and tires.
- Minimize tread muddiness by avoiding flat terrain, wet soils, and drainage-bottom locations.
- Use grade reversals to remove water from trail treads. Grade reversals are permanent and sustainable - when designed into a trail's alignment they remain 100 percent effective and rarely require maintenance.

Other strategies are more temporary in nature and will require periodic maintenance to keep them effective:

- While the use of a substantial outslope (e.g., 5 percent) helps remove water from treads, it is rarely a long-term solution. Tread cupping and berm development will generally occur within a few years after tread construction. If it is not possible to install additional grade reversals, reshape the tread to reestablish an outsloped tread surface periodically, and install wheel-friendly drainage dips or other drainage structures to help water flow off the trail.
- If it is not possible to install proper drainage on a trail, consider rerouting trail sections that are most problematic, or possibly hardening the tread with the addition of local or imported material (rocks).
- In flatter areas, elevate and crown treads to prevent muddiness, or add a gravel/soil mixture in low spots.
- Finally, it is important to realize that visitor use of any type on trails when soils are wet contributes substantially greater soil impact than the same activities when soils are dry. Thus, discouraging or prohibiting the use of trails that are prone to muddiness during rainy seasons or snowmelt is another

effective measure. Generally such use can be redirected to trails that have design or environmental attributes that allow them to better sustain wet season uses.

For further reading see: Pickering et al 2010, Cessford 1995, Thurston and Reader 2001, Newsome et al 2004.

Impacts to Water Resources: General Research

Trails and their use can also affect water quality. Trail-related impacts to water resources can include the introduction of soils, nutrients, and pathogenic organisms (e.g., Giardia), and alter the patterns of surface water drainage. However, in practice, these impacts are avoidable, and properly designed and maintained trails should not degrade water quality. Unfortunately there is very little research to draw from on these topics, and none that is specific to different modes of trail use.

Poorly sited and/or maintained trails can be eroded by water, with tread sediments carried off by runoff. Generally, if water control features such as grade reversals and outsloped treads are used to divert runoff from trails, the water drops its sediment close to trails, where it is trapped and held by organic litter and vegetation. Soils eroded from trails rarely enter water bodies, unless trails cross streams or run close to stream or lake shorelines and lack adequate tread drainage features. Since many recreational activities, such as fishing, swimming, boating, and viewing scenery (e.g., waterfalls) draw visitors and trails to the vicinity of water resources, it is often necessary to route trails to water resources or visitors will simply create their own informal trails.

Trails that are close to water resources require special consideration in their design and management to prevent the introduction of suspended sediments into bodies of water. Eroded soil that enters water bodies increase water turbidity and cause sedimentation that can affect aquatic organisms (Fritz and others 1993). Trout and other fish lay their eggs in gravels on the bottom of streams and lakes, and sediments can smother those eggs, reducing reproductive success. Sedimentation can also hurt invertebrate organisms, which serve as food for fish and other creatures. In addition, some sediment may contain nutrients that can contribute to algal blooms that deplete the dissolved oxygen in water bodies when they die off.

Poorly designed trails can also alter hydrologic functions - for instance, trails can intercept and divert water from seeps or springs, which serve important ecological functions. In those situations, water can flow along the tread, leading to muddiness or erosion and, in the case of cupped and eroded treads, the water may flow some distance before it is diverted off the trail, changing the ecology of small wetland or riparian areas.

Trail users may also pollute water with pathogenic organisms, particularly those related to improperly disposed human waste. Potential pathogenic organisms found through surveys of backcountry water sources include Cryptosporidium spp., Giardia spp., and Campylobacter jejuni (LeChevallier and others, 1999; Suk and others, 1987; Taylor and others, 1983). This is rarely a significant concern where trail use is predominantly day-oriented, and waste issues can be avoided by installing toilet facilities or following Leave No Trace practices (i.e., digging cat-holes for waste away from water resources).

Impacts to Water Resources: Management Implications
The same trail design, construction, and maintenance measures that help minimize vegetation and soil impacts also apply to water. But there are also some additional efforts needed to protect water resources:

- Trails should avoid close proximity to water resources. For example, it is better to build a trail on a sidehill along a lower valley wall than to align it through flat terrain along a stream edge, where trail runoff will drain directly into the stream.
- It is best to minimize the number of stream crossings. Where crossings are necessary, scout the stream carefully to select the most resistant location for the crossing. Look for rocky banks and soils that provide durable surfaces.
- Design water crossings so the trail descends into and climbs out of the steam crossing, preventing stream water from flowing down the trail.
- Armor trails at stream crossings with rock, gravel or concrete to prevent erosion.
- Include grade reversals, regularly maintained outsloped treads, and/or drainage features to divert water off the trail near stream crossings. This prevents water and sediment from flowing down the trail into the stream, and allows trailside organic litter, vegetation, and soils to slow and filter water.
- On some heavily used trails, a bridge may be needed to provide a sustainable crossing.
- Where permanent or intermittent stream channels cross trails, use armoring, open rock culverts or properly sized buried drainage culverts to allow water to cross properly, without flowing down the trail.

Impacts to Wildlife: General Research
Trails and trail users can also affect wildlife. Trails may degrade or fragment wildlife habitat, and can also alter the activities of nearby animals, causing avoidance behavior in some and food-related attraction behavior in others (Hellmund, 1998; Knight & Cole, 1991). While most forms of trail impact are limited to a narrow trail corridor, disturbance of wildlife can extend considerably further into natural landscapes (Kasworm & Monley, 1990; Tyser & Worley, 1992). Even very localized disturbance can harm rare or endangered species.

Different animals respond differently to the presence of trail users. Most wildlife species readily adapt or become "habituated" to consistent and non-threatening recreational activities. For example, animals may notice but not move away from humans on a frequently used trail. This is fortunate, as it can allow high quality wildlife viewing experiences for visitors and cause little or no impact to wildlife.

Other forms of habituation, however, are less desirable. Visitors who feed wildlife, intentionally or from dropped food, can contribute to the development of food-related attraction behavior that can turn wild animals and birds into beggars. In places where visitors stop to eat snacks or lunches, wildlife quickly learn to associate people with food, losing their innate fear of humans and returning frequently to beg, search for food scraps, or even raid unprotected packs containing food. Feeding wild creatures also endangers their health and well-being. For instance, after food-attracted deer in Grand Canyon National Park became sickly and dangerously aggressive, researchers found up to six pounds of plastic and foil wrappers obstructing intestinal passages of some individuals.

The opposite conduct in wildlife - avoidance behavior - can be equally problematic. Avoidance behavior is generally an innate response that is magnified by visitor behaviors perceived as threatening, such as loud sounds, off-trail travel, travel in the direction of wildlife, and sudden movements. When animals flee from

disturbance by trail users, they often expend precious energy, which is particularly dangerous for them in winter months when food is scarce. When animals move away from a disturbance, they leave preferred or prime habitat and move, either permanently or temporarily, to secondary habitat that may not meet their needs for food, water, or cover. Visitors and land managers, however, are often unaware of such impacts, because animals often flee before humans are aware of the presence of wildlife.

Impacts to wildlife are often the most difficult to understand and study, results from one study can contradict another study. Much of the research is site and species specific; general recommendations are to design a trail system to minimize potential wildlife disruption through location.

Two studies of possible interest are summarized below:

A study of the Boise River in Idaho examined flushing distances of bald eagles when exposed to actual and simulated walkers, joggers, fishermen, bicyclists, and vehicles (Spahr 1990). The highest frequency of eagle flushing was associated with walkers (46 percent), followed by fishermen (34 percent), bicyclists (15 percent), joggers (13 percent), and vehicles (6 percent). However, bicyclists caused eagles to flush at the greatest distances (mean = 148 meters), followed by vehicles (107m), walkers (87m), fishermen (64m), and joggers (50m). Eagles were most likely to flush when recreationists approached slowly or stopped to observe them, and were less alarmed when bicyclists or vehicles passed quickly at constant speeds. Similar findings have been reported by other authors, who attribute the difference in flushing frequency between walkers and bikers/ vehicles either to the shorter time of disturbance and/or the additional time an eagle has to "decide" to fly (Van der Zande and others. 1984).

Impacts to Wildlife: Management Implications

- Many potential impacts to wildlife can be avoided by ensuring that trails avoid the most sensitive or critical wildlife habitats, including those of rare and non-rare species. There are a number of tactics for doing this:
- Route trails to avoid riparian or wetland areas, particularly in environments where they are uncommon. Consult with fish and wildlife specialists early in the trail planning phase.
- For existing trails, consider discouraging or restricting access during sensitive times/seasons (e.g., mating or birthing seasons) to protect wildlife from undue stress.
- The education of trail users is also an important and potentially highly effective management option for protecting wildlife. Organizations should encourage Leave No Trace practices and teach appropriate behaviors in areas where wildlife are found:
- Store food safely and leave no crumbs behind - fed animals too often become dead animals.
- It's OK for wildlife to notice you but you are "too close" or "too loud" if an animal stops what it’s doing and/or moves away from you.
- It's best to view wildlife through binoculars, spotting scopes, and telephoto lenses.
- All wildlife can be dangerous - be aware of the possible presence of animals and keep your distance to ensure your safety and theirs.

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APPENDIX C

Thoughts on Horses, Horsemen, Trails, and Conservation

Thoughts on Horses, Horsemen, Trails, and Conservation

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Trail Equestrians as Conservationists

Three conditions must be addressed in the identification of a "conservationist:" 1) how the individual thinks about land (ecosystems), 2) how the individual views human-land interactions – appropriate versus inappropriate, and 3) how the individual plays out his/her own personal relationship with land. Aldo Leopold (1887-1948) believed that the third element included the summation of the first two.

In his words: “A conservationist is one who is humbly aware that with each stroke [action] he is writing his signature on the face of his land.”

For the trail equestrian, perhaps these points might be framed in the following questions:

1) In the process of thinking about trails, at what point do we begin to think about land, i.e., the ecosystem with us playing an active role in shaping it?
2) How do we define the equestrian trail experience?
3) How do we harmonize our trail designs, construction and usage with the rest of the ecosystem components and processes?

The first aspect of a landscape that catches our attention is its physical qualities. As people whose dreams revolve around our activities with saddle and packstock on trails, we want to ride across many landscapes. We want to experience the land from the back of a horse or mule. Some lands even seem to beckon us to come and immerse ourselves in them. But some of these perceptions of invitation may be the calls of the sirens of fanciful desire. In some places, our presence is inappropriate. The equestrian trail rider that is a conservationist will be attracted to the aesthetics of the landscape, but he/she quickly will be mindful of concerns for the ecological implications of taking horses into these systems. Does the land have the capacity to accommodate us and our horses without significant disruption of its aesthetic qualities or its ecological processes? To what extent, in whole or in part, is it fragile, and to what extent is it robust? What are its capacities for self-renewal? Will our entry there be in a mind-set of conqueror’s conquest, or admirer’s pursuit? Do we love this land enough to want to be one with it, or do we merely seek to subdue it for some transient pleasure?

How the equestrian trail rider reacts to the land during the ride is a highly visible clue as to his/her personal objectives for the rider-land interaction, i.e., the trail experience. To the mere rider, steep slopes, canyon walls, rocks, streams, bogs, and thick or spiny vegetation are obstacles to be overcome in the most expedient manner. To the rider-conservationist, these are the assets and the liabilities of the system of which he/she has chosen to be a part. For the conservationist, the trail experience is not one of over-coming and defeating an adversary, but a matter of dealing with a friend. For the mere rider, the best way to get from Point A to Point B is the quickest way. For the conservationist, while expediency is a concern, aesthetic and ecological degradation are matters of greater importance.

How many trail riders go on rides and rarely see more than the rear end of the horse in front of them? How much of the trail ride conversation is about tack, breed lines, the bad habits of someone else’s horse, and who won what show? How much of the conversation is about the land on which we ride? How much time do we worry about the riding manners of other riders versus how much time do we worry about manners designed to avoid land abuse? How much time do we think about the

feet of our horses versus how much time do we think of the soils and stream beds where we direct those feet to be placed? How much time do we spend wondering about the historical cultural and ecological aspects of the land on which we ride, and how much time do we spend wondering how much longer the ride will last? These questions will separate mere riders from the rider-conservationists.

The third element that defines a rider-conservationist is how he/she plays out his/her role in designing to create, manage and use a trail. Land managers are frequently confronted with a request (sometimes a demand) for an equestrian trail across the lands that they manage. The "I want" approach to the land manager is hardly the approach of the conservationist. The conservationist's approach will be framed first in wanting to know if there are ecological or historical site protection reasons why an equestrian trail should not cross a certain landscape. Presumably the officials of the managing agency will be forthright and honest in their response to such a question. However, even the conservationist must keep in mind that there are sociological and financial constraints that may still preclude the installation of a new equestrian trail.

The same sequence of thinking should be followed in questioning trail closures. Are there ecological or cultural site protection reasons for closing this trail? Are there possibilities for avoiding, minimizing or mitigating these adverse impacts through trail realignment or other management processes? However, even if the answers are affirmative, sociological or financial forces may still prevail.

In my travels to equestrian trail conferences and other activities around the nation, I have never met anyone who unabashedly declared that he/she was not a conservationist. On the contrary, most people profess their strong beliefs in conservation or environmentalism. But what comes easily to ones' tongue, may or may not be deeply embedded in the heart. And even those things embedded in our hearts may seem unreasonable to adhere to in the real world. For instance, I have heard numerous complaints about my recommendation that when the soils are too wet, events such as endurance or competitive rides should be canceled. Some event organizers complain bitterly that they have a lot of money at stake if the event can not go on as scheduled. I would no more allow the land to be challenged in this way than, if I were a coach, I would send a debilitated athlete into the storm of athletic competition. There is a lot more than today's game at stake!

I am also aware of a situation in which a group of riders and a political representative demanded that 900 horses be allowed on a state forest trail that was only 15 miles in length in one weekend. The political leader stated in a local newspaper that if they destroyed any resources, they would pay to have them replaced. I found this to be an interesting concept that nature could work overtime in rebuilding soils, streams, and root systems if given enough money.

Recently, I read through a copy of one of my favorite horse magazines to find three

well-written articles that focused directly on trail riding and one which dealt with a health issue that a trail horse might face. Not one mentioned any natural resource conservation concerns. In fact, one pictured four trail horses using a streambed for a trail. It was not a shock when the author revealed that one of the local residents was trying to get the area closed to trail horse use.

All of the problems are not caused by insensitive riders. I recently camped and rode at a public area known for its equestrian activities. Both the managers and the users were cooperating in maintaining immaculate camping areas, restroom and shower facilities, stables, and roadsides. The trails were impressively almost litter free. Yet trails were so poorly designed that they were largely incurable mudholes. As far as I could see, riders were in general staying on designated trails as they should, but the trails that they had to stay on were atrocious by almost any standard.

Finally, some riders will offer the rationalization: “What’s a few chewed trees and eroded trails compared to the impacts of logging and livestock grazing?” The comparison is that of “apples and oranges.” There are no adequate excuses for inappropriate logging or grazing. Appropriate forest and rangeland management practices are backed by a foundation of science accumulated over a century of effort. Timber can be harvested and livestock can be grazed in a manner that does not degrade ecosystems and that supports the needs of the nation to be fed, clothed and sheltered.

We can not justify our own poor behavior on the basis that someone else behaved in a worse manner. For example, poor driving practices on the part of one group of motorists does not alleviate in any way the requirement for each of the rest of us to drive responsibly. The reasons should be obvious, although they are frequently ignored.

For trail equestrians to be practicing conservationists they must recognize and adhere to a code of ethics that will guide decisions that separate appropriate from inappropriate trail design, construction, management and usage. Such a code has been offered by Back Country Horsemen of America and the National Outdoor Leadership School. Perhaps the Seventh of the Back Country Horsemen Commandments offers the summation of all of the conservation points of these codes: “The horseman shall recognize the fragility of the back country environment and practice minimum impact techniques at all times.”

But no code of conduct, no matter how eloquently written, has value without a conscience present in each person professing that code. In matters of conservation, the force that will cause adherence is the ecological conscience. For the trail equestrian, that conscience struggles to separate appropriate from inappropriate trail behaviors in an attempt to harmonize the horse and rider with the rest of the elements of the landscape on which they travel.

Land Ethics for Equestrian Trail Users

Among the most fundamental images of Euro-Americans pioneering the lands of the New World is the mounted horseman on a wild landscape. The horse and its rider are quintessential Americans.

While that image may carry with it more fantasy than reality, it is, nevertheless, what we dream of as a romantic past, and what we try to capture in order to bring forward an old flavor to our present. In short, whether we know it or not, in the equestrian trail experience, we attempt to preserve a cultural heritage by reenacting it in a natural heritage setting.

That the horseman and horse are increasingly unwelcome on the nation's public land trails seems to be paradoxical to the fundamental reasons for having public lands that serve to preserve cultural and natural heritages. Yet on closer examination, we find conflicts between the objectives of natural heritage conservation and the preservation of opportunities for the equestrian trail experience.

It would be a rare horseman who did not consider himself/herself to be a conservationist. However, when asked what they consciously do to harmoniously integrate equestrian trail use with numerous other values that Americans have for their public lands, the answer usually is to help build and repair horse trails on those lands.

Equestrians are steadily being constrained to less and less land because, in general, they have an insufficient awareness of broad-based natural resource conservation, and what role they should be playing in this process. It is inadequate and even callous to simply demand a place to ride a horse. However, it is entirely appropriate to argue for the experiential values of riding a horse on wild lands. Credibility is gained when one argues for these values and how they can be appropriately integrated with other values for these lands.

A land ethic must guide those arguments. The most basic statement guiding contemporary natural resource conservation is Aldo Leopold's 1949 articulation of the land ethic: "A thing is right when it tends to preserve the integrity, stability and beauty of the biotic community. It is wrong when it tends otherwise." Leopold's writings and those of his biographers make it clear that he believed strongly that, even in the wilderness, humans should be there interacting with the land. In fact, biographer Dr. Susan Flader wrote: "Most people who would quote Leopold's statement of the land ethic would not understand it as he had intended."

Leopold sought a harmonious integration of humans as ecosystem8 component and human activity as ecological process. In his writings, he often defined conservation as "man and land in harmony." He did not seek to take humans away from wild landscapes; instead, he sought appropriate human behaviors on those landscapes.

Appropriate behaviors enhance ecosystem "integrity, stability, and beauty." Inappropriate behaviors degrade them.

Trail equestrians must address fundamentally how their activities affect these basic ecosystem characteristics. In attempting to do so, the first thing do is to understand these terms.

Ecosystem integrity is descriptive of the array of ecosystem biotic (living organisms) and abiotic (physical aspects such as soils and water) components and processes natural to the particular system. The sizes of these arrays are refereed to as natural diversity. Some systems naturally have low diversity and are always fragile. That is they will not tolerate a great deal of human activity before they undergo drastic change. Others may have high diversity and be "robust", i.e., they can tolerate a great deal of human activity without major adverse effects on the natural ecosystem processes.

To the extent that equestrian use of trails adversely affects sensitive species, erodes soils, and lowers water quality, the ecosystem integrity is being degraded. The question that must immediately surface for equestrians is: "How do we design, use and manage the use of trails in order to avoid or minimize and mitigate these effects?" Every set of circumstances of intensity of trail use and ecosystem capacity to withstand that level of use will require novel management approaches.

Writing in the 1940s, Leopold accepted the ideas of the early ecologists about stability. The thinking was that in the absence of human influence, ecosystems tended to move to a general steady state condition. That is, they would simply change to some ultimate condition and remain there in a state of dynamic equilibrium. That theory is no longer accepted by ecologists. What is accepted is that ecosystems are always changing, and that there is an array of forces causing these changes. Human influences effect and affect change. That we do so is a natural thing as we must live on this planet and by the very nature of our life processes we affect the rest of the system. It is not that humans cause change that is unethical, but rather the kinds and degrees of change that we cause that becomes questionable. For instance, it is O.K. to ride your horse from Point A to Point B. It is how you drove or rode that is at issue. Did you drive or ride in a manner that threatened or destroyed life or property? If so, you behaved in a destabilizing manner. Things changed in an adverse and unacceptable way, i.e., the system was destabilized. However, if your activity left the rest of the system intact, then you did not significantly affect the natural rate of change. The system will continue to change, but the rate of change will not be destabilized by your activity.

It seems intuitively obvious that the most destabilizing influence that equestrians have on ecosystems is the acceleration of soil erosion. The question: "How do I design and use trails and stream crossings incorporated in those trails in manners

that are appropriate to slope, soil and stream conditions?"

Finally, Leopold's use of the term beauty incorporated two aspects of what is beautiful. The first is the obvious aesthetic beauty. Littered and eroded trails and stream banks are the antithesis of natural beauty. Only the most insensitive or totally unaware riders will fail to be adversely affected, even angered, by such visual stimuli. There is no harmony in a relationship characterized by such disrespect and abuse.

The second aspect of beauty is a deep sense of the full ecological dynamic. One who appreciates this beauty is struck by the questions: Where am I and who am I in all of this? What is the nature of this land, and how do I behave in order to achieve a harmony with it? As I feel my horse moving rhythmically under me, I also feel the rhythm of the symphony of the ecosystem dynamic; what part do I play in that symphony, and how well do I play it?

In summary, people are a part of the land. When we ride out on it we reenact rolls from our past. The reenactment can help us reflect on who we are and where we came from, but to do so requires an open and inquiring mind that searches for a differentiation between right and wrong ways to ride the land.

Best Management Practices

The recommended equestrian trail Best Management Practices (BMP) guidelines are an expression of the current state of our knowledge. It should be noted that these are based on reasonable and practical theory and experiential knowledge of practicability. However, they have not undergone rigorous scientific testing. Therefore, as our scientific knowledge increases these recommendations may be modified and new ones added. As you attempt to use these recommendations, treat them as guidelines that need to be customized to the sites on which you are working.

1. To the extent practicable, avoid use of closed or abandoned logging roads and skid paths for horse trails.

2. To the extent practicable, avoid the use of utility rights-of-way for trails as appropriate trail design and maintenance are almost impossible, particularly in hilly or mountainous terrain.

3. Do not use fire lines as trails where grades exceed 5 percent.

4. To the extent practicable, do not place trails on ridgelines or ridge points.

5. Position trails on side slopes where water flow will be away from the trail.

6. To the extent practicable, avoid trail grades that exceed 10 percent.

7. To the extent practicable, where the topographic slope is less than 20 percent, do not allow the trail grade to exceed 50 percent of the topographic slope.

8. Create a trail tread that is approximately 5 feet wide, and that:
   a. is out-sloped to facilitate water flow away from the trail;
   b. has a clean outside berm to allow flow of water away from the trail;
   c. has sloped inside banks that are unlikely to undergo "bank caving," and
   d. avoid the use of water bars in favor of the use of "rolling dips" to move water away from the trail.

9. To the extent practicable, do not allow a trail to parallel a stream at a distance of less than 50 feet from the stream bank.

10. To the extent practicable, bridge all permanent streams.

11. Place trail culverts or French drains in all gullies and intermittent streams.

12. Use soil hardeners as they are appropriate to bog crossings.

13. To the extent practicable, avoid having horses cross streams by direct entry into the stream in order to minimize stream bank degradation.

14. Where it is necessary to provide drinking water directly from the stream for the health of the horse:
   a. use access points that have low sloping banks and, where available, exposed bedrock;
   b. use soil hardeners on the banks, shorelines, and streambed;
   c. place blockades at the upper and lower ends of the watering point to prevent horse movement on the unprotected portions of the stream;
d. place a blockade on the opposite bank to prevent horse access.

15. Where practicable, provide a watering device that is acceptable to the horse and has a low maintenance requirement at a location at least 50 feet from the stream bank.

16. Where water devices are provided, properly cover the site surface with a soil hardener. Geoweb with pea-gravel or sand would be desirable options.

17. Where practicable, install water faucets at trailheads for horse watering.

18. Install restrooms at all trailheads.

Other Conservation Practices
Trail Construction and Maintenance

1. To the extent practicable, design trails to avoid planted wildlife food plots and other openings managed for wildlife food and cover.

2. Do not design for trailheads, campsites, or rest sites adjacent to wildlife openings.

3. Design trails to avoid sites that are ecologically sensitive, e.g. those with rare species of plants or animals that are likely to react adversely to trail traffic, and where soil-plant associations are easily damaged.

4. During trail construction and maintenance, leave dead and dying trees that are either leaning away from the trail or that are on the downwind side of the trail as they are valuable wildlife habitat components.

5. To the extent practicable, avoid removal of bushy evergreen trees such as cedars, spruce, fir and holly as these provide important songbird food and cover, particularly in winter.
6. To the extent practicable, do not remove American beech trees as these retain their golden leaves in winter and aesthetically enhance the winter landscape.

Riding Practices
1. Do not tie horses directly to trees. This practice results in trees being chewed and root systems being damaged. Use high lines or picket lines.

2. To the extent practicable avoid riding through wildlife food plots or openings managed for wildlife food and cover.

3. Do not camp in or beside openings managed for wildlife food and cover.

4. When encountering wild animals on or near the trail, if the animals are moving, stop in place and observe the animals at your pleasure. Once the animals have moved on, begin moving your horse again, but stay on the trail.

5. When encountering turkey, quail, grouse, or pheasant hens with broods, do not stop, but keep moving. Typically, but depending on the age of the brood, young birds will hide in place while the hen moves away. Never seek a closer look at the hiding, young birds. The more quickly that you move on, the more quickly the hen will return and attempt to collect her brood.

6. When encountering a bird performing the “crippled wing” act, move on as if

you had not seen it. This minimizes the disruption to the nesting or brooding activity in which that bird is engaged.

7. Never pursue wild animals through the woods on horseback. This results in major disruption of normal behavior patterns, and is likely to substantially raise the mortality rates among young and parent-dependent animals.

8. Stay on designated trails.

9. Do not ride horses at a pace greater than a walk on muddy trails.

10. Follow "Back Country Horsemen Commandments"

a. The horseman shall not keep horses longer than it takes to unpack or pack them in any campsite normally used by hikers [or other trail users]. (We suggest horsemen stay away from such sites if possible.)
b. The horseman shall not tie his stock, for more than a short period of time [minimal time], directly to a tree.
c. The horseman shall not cut switchbacks.
d. The horseman shall not leave a campfire unattended.
e. The horseman shall properly dispose of all manure, bailing twine, wire and waste hay in camp areas, trailheads, or loading areas.
f. The horseman shall abide by administrative rules and regulations affecting the area he/she is in.
g. The horseman shall recognize the fragility of the back country environment and practice minimum impact techniques at all times.

11. "Leave No Trace" Principles for Recreational Stock Use on Trails

a. Plan ahead and prepare.
b. Travel and camp on durable surfaces.
c. Properly dispose of waste.
d. Leave what you find.
e. Minimize campfire impacts.
f. Respect wildlife.
g. Be considerate of other visitors (users of the landscape).

Finally, the guidelines offered in this presentation are about conservation. Equestrian trail conservation is about "preserving a cultural heritage in a natural heritage setting." Harmonizing equestrian activity with natural resource protection is how that goal can be accomplished.

APPENDIX D

RECOMMENDED TRAIL DEVELOPMENT RESOURCES

Conflicts on Multiple-Use Trails. Roger Moore. U.S. Federal Highway Administration, 1994. www.fs.fed.us/cdt/carrying_capacity/conflicts_trails_synthesis_1994.pdf
This resource offers a comprehensive review of the research literature related to recreation conflict, and has served as an invaluable resource for trail managers, volunteers, and advocates for more than a decade. The information summarized in Section 2.5 is built upon the foundation of knowledge presented in this free publication.

Fromme Mountain Sustainable Trail Use and Classification Plan. District of North Vancouver, 2008 (http://www.dnv.org/article.asp?c=988)
This document is a good example of system-wide trail master plan. It was created through a 5-year process, and formalizes a shared-vision for the trails on Fromme Mountain. The document includes assessment of each system trail to provide an overall vision, best practices for environmental sustainability, and provides trail guidelines for future trail projects.

Lightly on the Land: The Student Conservation Association Trail-Building and Maintenance Manual. Robert Birkby, SCA, 2005 (www.americantrailsstore.org/books.html)
Lightly on the Land focuses on crew leadership and the nuts and bolts of trail construction and maintenance. It contains detailed instructions on many technical skills such as building with rock, felling and buckling, building with timber, bridge construction, transplanting, and environmental restoration. It gets down and dirty with tools, tool repair, knots, and rigging. Instead of photos, it uses hundreds of fine illustrations to depict specialized techniques such as surveying, rigging, stonework, chainsaw skills, timber joinery, and bridge building.

Recreational Horse Trails in Rural and Wildland Areas: Design, Construction, and Maintenance
by Dr. Gene W. Wood, Clemson University, 2007 (www.americantrailsstore.org/books.html)
Designed as a textbook as opposed to a “how to do it” manual, the book guides readers in how to fit design, construction, and maintenance of equestrian trails to the environments in which they work, as well as the kinds and intensities of use that their trails will receive. Readers are frequently reminded that the trail must fit ecosystem capacities to accommodate sustainable equestrian use.

*Equestrian Design Guidebook for Trails, Trailheads, and Campgrounds: Tech Rep. 0723–2816–MTDC. (*http://www.fhwa.dot.gov/environment/fspubs/07232816/index.htm)
For equestrian trail advocates, this book is essential in covering all the many specialized aspects of stock use and riding horses on trails. For other trail managers and planners, the book provides a compendium of the whole range of trail types and facilities.

Managing Mountain Biking: IMBA's Guide to Providing Great Riding. IMBA, 2007 (*www.imba.com*)
Managing Mountain Biking offers a collection of best practices for planning, designing, and managing successful trail networks and bike parks. More than 50 experts—including land managers, recreation ecologists, professional trailbuilders, and experienced advocates—contributed to Managing Mountain Biking, creating a complete reference. Managing Mountain Biking details overcoming user conflict, minimizing environmental impact, managing risk, and providing technically challenging riding. While Trail Solutions covers trail construction, Managing Mountain Biking focuses on solving mountain biking issues through innovative trail design, effective partnerships, and visitor management strategies.

Natural Surface Trails by Design: Physical and Human Design Essentials of Sustainable, Enjoyable Trails. Troy Scott Parker, 2007 (www.americantrailsstore.org/books.html)
This groundbreaking book explores trail design from a theoretical perspective, covering the physical and human forces and relationships that govern trails—how we perceive nature, how trails make us feel, how trail use changes trails, and how soils, trail materials, water, drainage, and erosion behave.

Recreational Trail Study for British Columbia: Phase 1 – Background Report. Ministry of Tourism, Sports and the Arts, Ministry of Environment, and Province of British Columbia, 2007 www.tsa.gov.bc.ca/sites_trails/docs/Provincial_Trails_Strategy/Trail_Strategy_Appendix1_May23.pdf
The first phase of this multi-phased project is the creation of this background report. This document is a great reference for information on Canadian laws and rules related to trails, best trail management practices from across North America, and discussion on the overall benefits of trails. It also includes a comprehensive survey, and the results, to help create a vision for the provincial trail planning, potential funding sources, and a province-wide trail inventory.

Region 5 Mountain Bike Management Strategy: Situational Assessment and Implementation Toolbox. Garrett Villanueva. U.S. Forest Service, 2007.
http://www.fs.fed.us/r5/mountainbikes/
This management strategy and situational assessment characterizes existing mountain bike trail conditions and provides methods for management. This document is written specifically for Region 5 in California, but its format, as a toolbox provides trail management advice that can be applied in any trail system. It is also a good example of a system-wide master plan.

Sea to Sky Corridor Recreation Trail Strategy. British Columbia, Ministry of Tourism, Sport and the Arts, 2007 (http://www.tsa.gov.bc.ca/sites_trails/Initiatives/SeatoSky-Strategy/sea_to_sky_strategy.htm)
The Ministry of Tourism, Culture and the Arts (MTCA) developed this comprehensive strategy to provide guidance on the management of this regional trail system. The strategy provides a framework for legal authorization and establishment of the vast majority of previously unauthorized trails on Crown land, recommends a process and organizational structure for ensuring a Corridor-wide coordinated approach to management of the extensive trail network, identifies opportunities and actions required to ensure a sustainable and economically beneficial network, and outlines and recommends trail construction, maintenance and sign standards and guidelines. This document is a useful example of a regional trail masterplan.

Trail Construction and Maintenance Notebook. Woody Hesselbarth, Brian Vachowski, and Mary Ann Davies. U.S. Forest Service, 2007 (www.fhwa.dot.gov/environment/rectrails/trailpub.htm)
This pocket-sized notebook is oriented to the needs of a trailworker. It pulls together basic trail construction and maintenance information in an easy-to-understand format. It includes a lot of the information detailed in Trail Solutions, plus a few additional strategies for trails in wet areas. It is concise with lots of illustrations – a perfect book to keep in a backpack out on the trail.

Trail Planning, Design, and Development Guidelines. Minnesota Department of Natural Resources, Trails and Waterways Division, 2007 (www.americantrailsstore.org/books.html)
This comprehensive guide to shared-use paved trails, natural surface trails, winter use trails and bikeways is an excellent reference, well organized with tabs and an easy to follow lay-out. The book features dozens of useful reference illustrations and pictures for each specific topic (i.e. 6 pictures of different types of water caused erosion). Some information is Minnesota specific, but most is relevant to all climates and situations.

Trail Solutions: IMBA's Guide to Building Sweet Singletrack. IMBA, 2004 (*www.imba.com*)
This comprehensive trailbuilding resource combines cutting-edge trailbuilding techniques with proven fundamentals in an easy-to-read format. The book is divided into eight sections that follow the trailbuilding process from beginning to end. Readers will be guided through the essential steps of trail planning, design, tool selection, construction, and maintenance. Additionally, Trail Solutions provides detailed advice on banked turns, rock armouring, mechanized tools, freeriding, downhilling, risk management, and other pioneering techniques. Trail Solutions is an essential tool for land managers and volunteer trailbuilders aspiring to raise their shared-use trail systems to the next level.

Wetland Trail Design and Construction. U.S. Forest Service, 2007. www.fhwa.dot.gov/environment/fspubs.
This manual describes common techniques for building a wetland trail. Starting with identifying the type of wetlands, this manual outlines how to build a dozen different types of wetland crossing structures (with and without foundations), what tools and materials to use, and instruction on maintaining drainage to minimize environmental impacts. This book is written for wetland trails, the techniques described can also be used for correcting other poorly drained low areas in existing trails.

APPENDIX E

MEMORANDUM OF UNDERSTANDING BACKCOUNTRY HORSEMEN OF AMERICA AND US FOREST SERVICE

SERVICE-WIDE MEMORANDUM OF UNDERSTANDING
07-SU-11132424-002
between
THE UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE
and
THE BACK COUNTRY HORSEMEN OF AMERICA

This memorandum of understanding (MOU) is entered into by the United States Department of Agriculture, Forest Service (FS) and the Back Country Horsemen of America (BCHA).

A. PURPOSE
The purpose of this MOU is to continue to develop and expand a framework for the FS and BCHA to plan and implement mutually beneficial programs, projects, training, and other equestrian opportunities at the national, regional and local levels.

B. AUTHORITY
The authority of this MOU is the Organic Act of 1897, 16 U.S.C. § 551.

C. STATEMENT OF MUTUAL BENEFIT AND INTERESTS
The FS manages National Forest System (NFS) lands for a variety of users and activities, including outdoor recreation. The FS is interested in providing a variety of equestrian opportunities that are environmentally sensitive and educational and that support local and regional economies and quality of life.

BCHA is a national organization of private recreational saddle and pack stock users and is a recognized leader in establishing equestrian and saddle and pack stock ethics, providing education on responsible backcountry use, encouraging volunteerism, and fostering appropriate management of federal and non-federal lands. BCHA members desire to use the National Forests for recreational purposes and to accomplish mutually beneficial equestrian and recreational saddle and stock projects or activities.
The parties want to encourage responsible use of NFS lands by visitors participating in equestrian and recreational stock travel and activities. Both the FS and BCHA disseminate information to the public regarding conversation, recreation, and natural resource activities as they relate to equestrian and recreational stock use.

D. THE FS AGREES TO:
1. Work with BCHA to facilitate improved understanding and communication among equestrian and recreational stock users, federal agencies, and the public.

2. Work with BCHA and its affiliates to identify appropriate cooperative opportunities, such as trail projects, administrative studies, and educational programs, and, contingent upon availability of funds and personnel, pursue these projects and activities jointly with the equestrian and recreational stock community.
3. Encourage local FS officials to collaborate with BCHA national office staff, representatives, affiliates, and members in the development of mutually beneficial projects and educational activities.
4. Where appropriate and feasible, make available to the public information form BCHA regarding development and presentation of training materials related to responsible equestrian and recreational stock use on NFS lands.
5. Consistent with applicable laws, regulations, land management plans, other management direction, and the FS's multiple-use mission, facilitate the continued access and use of NFS lands for equestrian and recreational stock use and related activities.
6. Consistent with applicable laws, regulations, and FS policies, consider BCHA's goals and concerns in trail system analysis and planning, and in particular, in developing and managing FS programs relating to equestrian and recreational stock use.
7. Provide information on completing job hazard analyses and conducting safety training for BCHA project sand activities conducted on NFS lands pursuant to this MOU.

E. BCHA AGREES TO:

1. Work with the FS to facilitate improved understanding and communication among equestrian and recreational stock users, federal agencies, and the public.
2. Work with the FS to identify appropriate cooperative opportunities, such as trail projects, administrative studies, and educational programs, and to pursue these projects jointly.
3. Develop and maintain a communication network for contacting equestrian and recreational stock users through a system of local and state BCHA facilities.
4. Subject to applicable federal laws, regulations, land management plans, and other management direction, provide input on trail system analysis and planning and assistance to land managers and communities involved in equestrian and recreational stock projects, educational activities, and management.
5. Maintain a public database and library of publications related to BCHA activities.
6. Provide training and instruction to its members and, when appropriate, the public regarding Leave No Trace and other this programs relating to backcountry equestrian and recreational stock use, and encourage the incorporation of these programs in that use.
7. Obtain FS approval prior to publication of any materials regarding equestrian and recreational stock use on NFS lands that are developed cooperatively by the FS and BCHA and that are intended for public distribution.
8. Complete job hazard analyses for BCHA projects and activities conducted on NFS lands pursuant to this MOU, and conduct safety training prior to engaging in these projects and activities. Address anticipated hazards and steps that should be taken to reduce the hazards in these training sessions.

F. IT IS MUTUALLY AGREED BY THE FS AND BCHA THAT:

1. This MOU shall take effect when it is fully executed and shall expire five years from its effective date.
2. Modifications to this MOU shall be made in writing and shall be signed and dated by the FS and BCHA.
3. Either the FS or BCHA may withdraw from this MOU after 60 days written notice.
4. The principle contacts for this MOU are:

Jonathan Stephens
Congressionally Designated Areas and Trails Program Manager
USDA Forest Service
Recreation and Heritage Resources Staff
201 14th Street, S.W.
Washington, D.C. 20250-1125
Telephone: (202) 205-1701
Facsimile: (202) 205-1145
Email: jstephens02@fs.fed.us

Alan Hill
Public Liaison
Back Country Horsemen of America
P.O. Box 1367
Graham, Washington 98338-1367
Telephone: (888) 893-5161
Facsimile: (360) 832-2471
Email: athill01@Charter.net

The FS and BCHA certify that the individuals listed as principal contacts are authorized to act in their respective areas of responsibility on matters related to this MOU. The local contacts for the FS are District Rangers, who may enter in subsequent agreements as needed to implement this MOU.

5. The FS and BCHA will handle their own activities and utilize their own resources, including expenditure of their own funds, in pursuing the objectives enumerated in this MOU.
6. In implementing this MOU, the FS will be operating under applicable laws, regulations, and policies, subject to the availability of appropriated funds.
7. Nothing in this MOU authorizes the FS to obligate or transfer funds. Specific projects or activities that involve the transfer of funds, or property between the FS and BCHA require executive of separate agreements and are contingent upon the availability of appropriated funds. These activities must be independently authorized by statute. This MOU does not provide that authority. Negotiation, executive, and administration of these agreements must comply with all applicable law.
Nothing in this MOU is intended to alter, limit, or expand the FS's statutory and regulatory authority.

Nothing in this MOU restrict the FS or BCHA from participating in similar activities with other public or private agencies, organizations, and individuals.

This MOU does not create any substantive or procedural rights that are enforceable at law or equity against the United States or its officers, agents, or employees.

Any information furnished to the FS under this MOU is subject to the Freedom of Information Act (5 U.S.C. § 552).

No member of or delegate to Congress may benefit from this MOU either directly or indirectly.

(Signature)_____ Date: 11/29/06
Merlyn Huso, Chairman
BACK COUNTRY HORSEMEN OF AMERICA

(Signature)_____ Date: 12/13/06
Dale N. Bosworth
Chief
USDA, FOREST SERVICE

APPENDIX F

TRAIL SYSTEM DESIGN NARRATIVE (MALONE, USFS,1995)

DESIGN NARRATIVE

for

NON-MOTORIZED TRAIL RELOCATION

BANKHEAD NATIONAL FOREST

PREPARED BY: Joy Malone
JOY MALONE - Dispersed Recreation Manager

REVIEWED BY: Harold D Bradford
HAROLD D. BRADFORD - Ecosystem Technical Support Team Leader

REVIEWED BY: James W. Ramey
JAMES W. RAMEY - Bankhead District Ranger

APPROVED BY: John H. Yancy Sept. 22, 1995
JOHN H. YANCY - Forest Supervisor

I. INTRODUCTION

This project involves the relocation and reconstruction of the Black Warrior Horse Trail System. The Black Warrior Horse Trail System needs to be relocated and reconstructed for several reasons. First, for protection of threatened and endangered (T&E) aquatic species, particularly at existing stream crossings. Second, the trail needs to be relocated for safety of trail users. Some stretches of the existing trail are located on heavily used Forest system roads. These trail sections need to be relocated to reduce conflicts between trail users and automobile and truck traffic. Third, some sections of the trail are improperly located. Soil displacement from tread washing and gully formation are occurring in sections that are too steep and improperly drained. In other sections, multiple tread paths are forming as riders go around wet and boggy areas.

The objectives of this trail relocation project are as follows:

1. Reduction of the number of stream crossings which involve T&E species habitat.

2. Reduction of trail miles located on forest roads.

3. Improvement of trail location and construction.

4. Conversion of trail to non-motorized trail.

5. Dispersion of use through construction of day-use parking area.

This system will be for non-motorized trail users. It will be open to horse, pack stock, bicycle and foot traffic. Motorized use will be prohibited on the system. The trail will provide an easy hiking and horse back riding experience and a more difficult mountain bike riding experience. Stream crossings may add a degree of difficulty to the overall hiking and bicycle riding experience during the wet season months and following periods of heavy rainfall.

The grade, trail length, and unfinished tread surface will make this trail extremely difficult for people with ambulatory disabilities. However, the trail will be open to horse and pack stock and therefore may be enjoyed by disabled horse back riders. All signs and posted trail information will be printed to enhance readability by individuals with sight disabilities.

II. GENERAL PROJECT LOCATION

This trail system is a pattern of three stacked loops beginning at the Owl Creek Horse Camp and radiating generally north and west of the Camp. The western most loop passes between Pine Torch Road and Brushy Creek Road and crosses the Brushy Creek drainage twice. The day use parking area will be located off of this loop. The central loop is a short loop that connects both loops and shares a section with the western most loop. The central loop is connected to the eastern most loop but does not share a section. See Map A for trail pattern and approximate location.

The trail crosses two major creeks, Brushy and Owl Creek, and two named branches, Coal and Key Mill Branch. The lower crossing of Brushy Creek will utilize an existing road bridge for crossing. All other stream crossings will be hardened and crossed by fording. However, if T&E concerns arise at any of the crossings, bridges may be considered.

III. PHYSICAL ENVIRONMENT

This trail system is located east of State Highway 33 in Lawrence County, Alabama. The terrain in the project area is rough, broken topography with narrow gorges, steep bluffs and numerous stream courses throughout. Ridges are generally gently sloping until they approach stream channels. At stream channels topography tends to be steep and rocky, making location of trail crossings difficult. In other areas the approaches to stream crossings go through moist soil bases. Turnpike or other special drainage structures may be needed in these areas to prevent boggy trail surfaces and discourage widening of the trail tread. See Appendix for a description of soils in the project area.

The project area is drained by Brushy and Owl Creeks. These creeks are known habitat for threatened or endangered freshwater mussel species. To reduce possible impacts to these species caused by trail construction and use, locations for crossing these streams were identified and used as control points for field location of the trail route.

Following field location of the non-motorized trail, it was surveyed for cultural and threatened and endangered species resources. Some sections of the proposed trail route were relocated to alleviate possible impacts on these resources prior to the Environmental Assessment.

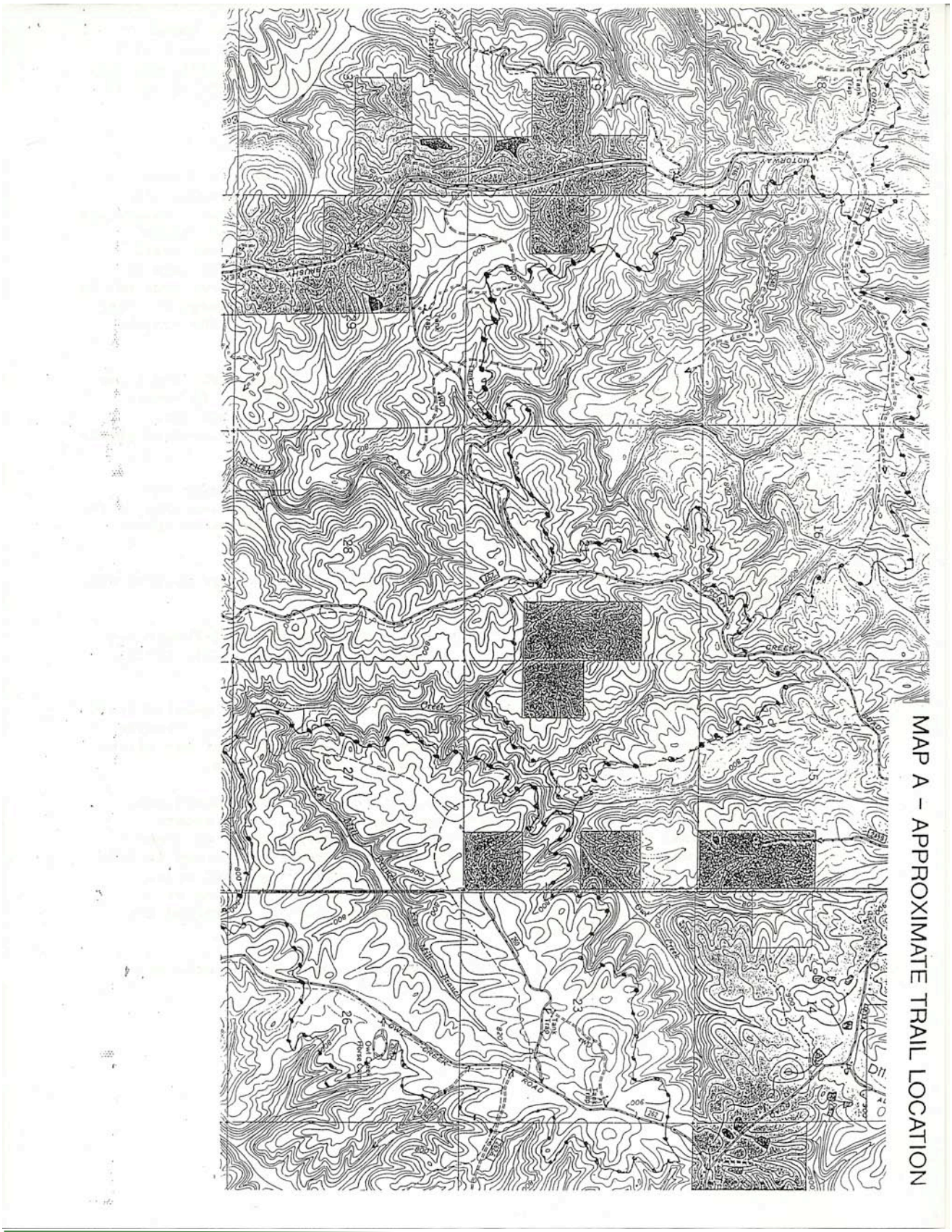
In addition to these modifications, the following standards and guidelines will be practiced:

Manage developed recreational trails on the Bankhead National Forest for the specific uses as determined appropriate by the site-specific trail environmental analysis and design narrative.

Provide public information for recreational trails including general trail locations, difficulty levels, and trail rules and regulations. Provide information and education where necessary to prevent uses that may affect threatened, endangered, or sensitive plant and animal species.

Monitor trail use for noise, safety, quality of recreation experience, sensitive, threatened or endangered species, wildlife, soil, water, archeological and wilderness resources. Where damage to any of these resources warrants, use may be restricted. Such restrictions may include but are not limited to restricted use seasons, revolving trail uses, required user permits, restrictions on party size, and limiting or prohibiting organized events. Trail closure may also be warranted for limited or extended periods.

Education of trail users will include low impact messages as well as emphasize ways to reduce user conflicts.



MAP A – APPROXIMATE TRAIL LOCATION

Organized events that use designated trails will be subject to special use requirements and administration. An environmental analysis will be conducted prior to issuing special use permits for organized events on trails.

IV. ANTICIPATED SEASONAL USE

This non-motorized trail will be open for use year round. Most use is expected from mid-September to early June. Hot, dry summers discourage most trail use during late June, July, August, and early September but some use may be expected year round. The trail will often be used while it is wet so proper design and construction for drainage is essential.

V. DESIGN GUIDELINES

1. Experience Level - Roaded Natural

2. Maintenance Level - Level 3. This means the trail is maintained for an intermediate experience level. Tread is maintained for public safety and user convenience. Small slides may remain except for erosion potential. Trailsides are brushed out to a prescribed standard. Structures maintained to original design standards. Signing is at a minimum level commensurate with the level of trail use or complexity.

3. Primary Management Objective - This trail will be primarily for horse and mountain bikes. Foot traffic will also be allowed.

4. Difficulty Level - This trail will be in the Easy category for horse and foot traffic and the more difficult category for mountain bikes.

5. Accessibility Level - Mechanized equipment will be allowed throughout this trail system. However, due to rough tread surfaces, stream fords, and steep sustained grades and steep pitches, this trail will generally not be an accessible trail.

6. Expected Traffic Volume - The expected use on this trail will be in the high use category (50 to 100 users on a weekend day or holiday).

VI. DESIGN CRITERIA

1. Grade:
   Maximum Pitch: 15% for 100 feet
   Maximum Sustained Grade: 10 percent

2. Clearing:
   Width: 8 feet
   Height: 10 feet

3. Tread:
   Width: 42 inches
   Width of trail from Pine Torch Parking to Loop: 48 inches
   Cross Slope: 3/4" per 12" or 6.25%
   Surface: Unsurfaced, some roots, rocks and small logs may be present.

4. Tread Structures:

To drain the trail, drain dips will be constructed at the intervals prescribed below. Waterbars may also be used on any reconstructed sections with grades above 8 percent.

Intervals:

slope = 2% - 200 feet	slope = 3% - 150 feet
slope = 4% - 100 feet	slope = 5% - 88 feet
slope = 6% - 75 feet	slope = 7% - 63 feet
slope = 8% - 50 feet	slope = 9% - 46 feet
slope =10% - 41 feet	slope =11% - 37 feet
slope =12% - 33 feet	

5. Bridge Needs:

Most major creek crossings and crossings of other stream courses will be serviced by rock fords. The lower crossing of Brushy Creek located in Section 20, T8S, R7W will be located on the bridge that services Forest Service Road 254.

Bridge crossings may be required if monitoring of threatened or endangered aquatic species indicates such structures are needed to protect habitat or individual animals.

6. Signs:

Approach signs - This trail crosses forest roads in five locations. There are two crossings of FSR 262, two crossings of FSR 254 and the bridge crossing on FSR 254. Traffic control warning signs indicating trail crossings will be needed at each of these locations. Signs should be placed according to guidelines in the Manual on Uniform Traffic Control Devices. In addition, signs indicating horses on the FSR 254 bridge will be needed on each side of the bridge. Trail signs will be needed to warn trail users of upcoming road crossings. See Map B on the following page for approximate sign locations.

Directional signs - Directional signs to the parking area on FSR 246 should be placed on State Highway 33 and on FSR 246. Directional signs to the Owl Creek Camp should be placed from State Highway 33 and U.S. Highway 157.

Regulatory signs - Travel management posters will be placed at the trail heads leading out of Owl Creek Camp and out of the parking area off FSR 246. Carsonite prohibition signs will be placed at all trailheads and intersections with Forest Service Roads. Decals on these signs will be permitting hiking, horses, and bicycles and prohibiting ATV's and motorcycles. See Map C for approximate sign locations.

4. User Education:

User education will include low impact use messages, safety messages, trail yielding messages and rules and regulations. These messages will be presented to the public through published Leave No Trace information, Tread Lightly information, group contacts from agency personnel, information signing on kiosk, volunteer patrols and law enforcement. Education is preferred over law enforcement to gain user compliance.

5. Marketing:

This trail system will be marketed to attract users. It should be included in any known private publications listing trails in Alabama. It should also be included in any National Forest Recreation Opportunity Guides for the National Forests in Alabama. The trail will be shown on district maps. Once Phase I of the Bankhead Trails Project is completed, a brochure showing District trail opportunities should be published.

6. Volunteer Opportunities:

This trail system can draw volunteers from a variety of trail users. Opportunities with bicycle and equestrian groups should be pursued for trail maintenance. The Adopt-a-Trail program will be initiated with volunteer groups. A partnership with the Bankhead Trail Riders Association should be continued to the extent desirable by both the Forest Service and the group. Other partnerships should be actively pursued. Interpretive type messages and presentations may also be presented by interested individuals. This may add validity to some trail users of the Forest Service's message.

7. Time and Cost Estimates:

Item	Dollars	Completion Date
A. Planning	$ 2,000	Done 8/94
B. Field Layout	$ 7,000	Done 12/94
C. Supervision/Overhead	$ 8,000	
D. Design	$ 1,000	October, 1995
E. Bridge Design	$ 0	
F. Final Layout/Staking	$ 5,000	End September, 1995
G. Contract Preparation	$ 1,000	Mid October, 1995
H. Construction	$175,000	September, 1996
I. Bridge Construction	$ 0	
J. Administration	$ 22,000	September, 1996
K. Signs/Registration Stations	$ 6,000	October, 1996
L. Sign Installation	$ 2,000	October, 1996
M. Post Construction Review	$ 1,000	October, 1996
TOTAL	$230,000	

The trail depicted in Map A is estimated to be about 25 miles long.

APPENDIX G

OWL CREEK TRAIL SYSTEM ASSESSMENT (LOCKWOOD, TRAILS UNLIMITED, 2008)

File Code: # U30-Trails Unlimited

Date: January 11, 2008

To: Glen Gaines, District Ranger
Joe Nicholson, Forest Recreation Program Manager
Enid Erickson, Other Resource Area
Shirley Watts, Recreation Forester

From: Merdith C. Lockwood, **Trails Unlimited**

Ref: Review of the Owl Creek Equestrian Trail System on the Bankhead National Forest for alignment, visitor information, reconstruction and maintenance with their associated costs. Review took place January 12, 2008.

The overall purpose of the review was to:

1. Assess the trail alignment of the trail complex (approximately 30 miles).
2. Determine (from a publics prospective) visitor information (publications, maps and signing).
3. Document trail conditions and recommend appropriate changes in trail location and maintenance needs.
4. Provide cost data for realignment and maintenance of the Trail System (e.g., maintenance techniques, design and annual maintenance costs.

Owl Creek Trail System Review:

On January 11th and 12th, four members of the Trails Unlimited team rode the entire (29 miles) trail system and visited two trailheads which is considered to be a representative sampling of the entire system.

Findings:

Based on the trails that were reviewed, the estimates of trail conditions were made in the following categories:

I – Trails that need no change
II- Trails that need minor modification (maintenance techniques)
III – Trails that need minor realignment (re-alignment for drainage)
IV - Trails that need to be added

1. **19.8 % of the trail mileage appears to be in the correct location.** Would require no change to keep at an acceptable standard.

2. **73.0 % of the trail mileage should be considered for maintenance techniques adjustment.** Example, change in tractor maintenance techniques.

3. **7.2 % of the trail mileage would require minor realignment.** To bring a trail into

4. **80.0 % of the (Proposed roads to trails) trail mileage should be added.** To improve the manageability of the system. Example – adding additional mileage to connect various loop trails together to provide a more varied, manageable and sustainable overall trail system.

1 In general, the trail has excellent alignment, grades and, location. The original Recreation Opportunity Spectrum classification (ROS) is correct and should be kept the same. Semi primitive non motorized is correct for this system, narrow, winding, varied grades.

2 Visitor information is lacking.
   - Maps and brochures make it difficult to locate trailheads and trails.
   - Maps were inadequate to meet needs of riders such as lack of topography, access roads, vicinity map. Forest service office locations are not identified.
   - Trail and road signs are difficult to follow maps and trails did not indicate difficulty ratings. Trail signing is inadequate as well as reassurance markers. Trail blazes had improper locations and inadequate maintenance. Trailhead signing not marked. Difficult to know where trails start. Road crossing signing and design inadequate and for safety. No signing for interpretation ie. (geology, muscles, birds, cultural, recreational, vegetation, horses).

3 Improper maintenance techniques. Material is being pushed off the trail. Improper use of water bars, no rolling dips, no catch basins, use of wing ditches is wrong concept, location of dips are wrong, too many water diversion, depth is too deep and causing a clay soil horizon to be expose, too much out slope on trail and outlets. Not recycling eroded and displaced soil material. Improper use of turf block, should not be used for horses. Improper installation techniques with GEO Web.

4 Limited use of types of equipment. Equipment not being utilized: Mini-Excavator, SWECO, RC 30 ASV, Tracked Carriers, no authority to use pull behind implements w/ ATV's.

5 Lack of hitching posts and high lines in needed areas.

6 Lack of training for operators and maintenance staff.

Recommendations:

1. Develop a sign/ operations plan that includes Trail Management Objectives, (TMO's). Plan should include a phased approach for maintenance (by loop) maintenance practices, maintenance techniques, types of equipments, operations, enforcement, signing and public information, volunteer.
2. Update public information to better inform the user of opportunities and what to expect.
3. Provide a wet weather management procedure with 800 number and develop a campaign for **"Dial before you Ride" or "Call before you Haul".**
4. Trail signing and maps for the area should be planned and updated. Carsonite should be used sparingly as confidence markers, closures and restricted areas. Develop a "theme" name and

graphic to highlight the area.

5. Maps should be consistent with trail system on the ground. Provide maps and information presented on forest web sites, information kiosks, trail junctions, brochures/ maps should use topographical features. Update information on a regular basis.
6. All trails need to have drainage reconstruction using current designs for rolling dips, breaks in grade, sediment basins and arch culverts (need to recover spoiled material).

    a. Change waterbars to rolling dips
    b. Reduce outslopes to 5% or less
    c. Reduce the number of waterbars/ wing ditches and convert the remaining to rolling dips with catch basins at proper locations.
    d. Keep trail narrow utilizing correct equipment (mini excavator & ASV RC-30).
    e. Utilize trail drags and/ rock rake to groom trail on scheduled basis

7. Some minor trail realignment is needed to provided for proper trail sustainability and the family orientated recreationist.
8. Where fall line trails exist, these sections should be relocated on the contour for sustainable trail management.
9. Forest Service Information about the Owl Creek Trail Complex should be available on the Forest Service internet site and private web sites including maps with the trail alignment, roads and major water courses (internet map should be readable and printable). The overall (FS) internet map of the area should be large enough for trail use (trailheads & campgrounds).
10. There should be information bulletin boards at each trailhead/ campground area. They should consist of maps, interpretative, resource and trail information.
11. The maps should display roads, trails, access points, trail safety, topography (contours) and trail difficulty ratings.
12. There should be entry signs at all of the Highways and Forest roads leading to the Trail System to indicate the trailheads.
13. All trailheads and trail egresses should have size limiters to restrict motorcycle and ATV use.
14. There needs to be trail realignments (turns) prior to the stop or yield signs at all of the trail/ road junctions to slow riders.
15. Three water crossings may need bridges (estimate $450 per ft. bridge materials does not include abutment or installation costs) or other hardened crossing designs (do not use block)
16. Much of the proposed additional trail mileage would be usable with minor realignments for sustainability. Convert using road to trail techniques
17. Relocate many of the wet/ stream crossing egress/ ingress (lessen grades).
18. Expose existing operators and trail managers to training (BMP's, techniques, equipment certification).

Costs Estimate:

1 **Maintaining trails for maintainability & sustainability (73.0%)**

2 Trail maintenance to be completed on a bi-annual basis for 1/4 to 1/3 of the system (volunteer and force account).

2 Specific heavily impacted segments may require more periodic maintenance. Heavy use on the sand-clay soils will require frequent maintenance.

- Work will consist of: Soil recovery from catch basins
  Reconstruct & compact rolling dips
  Fill ruts
  Clear lead off ditches
  Clear trees and brush
  Add additional drainage structures if needed
  Clear or add drainage dissipaters
  Repair hardening block
  Repair bridge ingress/ egress
  Inspect & repair arched culverts

3 Use of mechanized trail maintenance equipment will be necessary.
4 Utilize Trail Techs. for visitor services, monitoring & maintenance.
5 Use drags and trail rakes for bi-annual maintenance.
6 Utilize mini excavators and trail tractor only for areas that requires heavy (3 yrs.) maintenance.

Cost of **Annual Maintenance** is based on the following criteria:

- Quarterly maintenance for drainage and log-out will be at the rate of 2 to 3 miles per day.
- Utilize Two Trail technicians or volunteers on motorcycles and ATV's with trail rakes and drags for quarterly or more maintenance to maintain integrity of trail tread on trails that have soil that can be maintained with such equipment.
- Work would consist of clearing drainage structures and sediment basins, repair of hardened areas (erosion pavers – heavy stone) sign repair, bridge maintenance, removal of vegetation (trees) only from treadway.
- Areas requiring additional drainage or reconstruction will require heavy equipment (excavators).
- Utilize small ASV (RC-30) type rubber tracked tractor only for repairs and maintenance (less then 48" width).

7 Utilize volunteers to help with quarterly maintenance and special projects.

Annual maintenance for the Owl Creek Trail Complex

1. Based on maintaining only ¼ to 1/3 of the 30 mile system on a bi-annual basis

	Quantity	Description	Rate	Days	Cost
Labor Expenses					
•	2	Operator(s)	$240.00	15	$7,200.00
•	2	Trail Tech's GS-4/5/6	$144.00	32	$9,216.00
Equipment					
•	1	SWECO/ASV	$310.00	0	$0.00
•	1	ASV RC-30	$175.00	15	$2,625.00
•	0	Medium Excavator	$425.00	0	$0.00
•	2	ATV w/ rock rake, drag	$43.00	30	$2,580.00
•	1	Mini Excavator	$175.00	15	$2,625.00
•	0	Tdtr w/ Dump Trailer	$300.00	0	$0.00
•	2	FS vehicle(s)			
	3000	Miles + FOR	$1.23		$7,380.00
Supplies					
•	1	Blocks, Arch Culverts, Signs, Base rock, Bridge Mat	$3,000.00		$3,000.00
Total Cost/Funding =					**$34,626.00**

Annual maintenance **TOTAL = $32,496.00**

Cost of Relocating Trails for maintainability & sustainability (07.2 %)

Based on the following criteria:

- Most of the location can be made with tweaking the layout to design in break in grade for water control.
- Relocations can be made within proposed trail corridors (within 150' cl).
- Some additional water control will need to be designed where relocation intersect wet areas.
- Costs do not reflect environmental review.

	Quantity	Description	Rate	Days	Cost
Labor Expenses					
•	0	Operator(s)	$240.00	0	$0.00
	1	Trail Locator	$1,100.00	15	$16,500.00
•	2	Trail Tech's GS-4/5/6	$144.00	30	$8,640.00
Equipment					
•	1	SWECO/ASV	$310.00	0	$0.00
•	1	ASV RC-30	$310.00	0	$0.00
•	0	D-5 Bulldozer	$425.00	0	$0.00
•	2	ATV w/ rock rake, drag	$43.00	0	$0.00
•	1	Mni Excavator	$175.00	0	$0.00
•	0	Totter w/ Dump Trailer	$300.00	0	$0.00
•	2	FS vehicle(s)			
	3000	Miles + FOR	$1.23		$7,380.00
Supplies					
•	1	Blocks, Arch Culverts, Signs, Base rock, Bridge Mat	$2,000.00		$0.00
Total Cost/Funding =					**$32,520.00**

Relocation of proposed trails for sustainability TOTAL = $30,390.00

If you would like to discuss this estimate please don't hesitate to call me @ 626-233-4309
Respectfully Submitted,

MERDITH C. LOCKWOOD, Trails Unlimited
USDA Forest Service, WO Enterprise Program