# Comparing relative impacts of various trail user groups

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**"The goal is minimizing impacts to the natural resources through good management decisions and sustainable trail development practices."**

I am a professional trail builder based in NC and as such I see the relative impacts of all user groups on a very regular basis. I recently researched and made comments on this issue for a local state forest recreational plan and you may use these comments and review of the research in your efforts there. You will find my comments below comparing the relative impacts of horses vs. bikes, I hope this is helpful. Please let me know if I can answer any other questions for you.

Comparing relative impacts of various trail user groups: The EA document introduces the concept that different user groups have varying levels of physical impacts on trails noting that hiking and biking have similar impacts while horse use has significantly higher impacts. Unfortunately the document does not really site any specific research or studies in forming this conclusion and some reviewers of the EA may read in an opinion based on prejudice instead of reaction to hard science. As a professional trail designer/builder, perhaps I have researched this (as it is important to my job) more than the author of the EA and I can share the research I have re-viewed.

**Erosion on a hiking-only trail, the Tennessee Creek Trail in Marin County, CA**

The statements/claims in the EA are certainly well founded and number of different studies

back up the generalizations made.

A 2001 study performed by botanist Richard Reader of the University of Guelph (Canada) noted that "We've found that hikers have the same effect as bikers do, regardless of the number of trips along the path. In reality, both are equally damaging to the environment, but there is increased trail wear because twice the number of people are now using the trails." (*Impacts of Experimentally Applied Mountain Biking and Hiking on Vegetation and Soil of a Deciduous Forest* - Eden Thurston and Richard Reader).

A trail impact study from the Aldo Leopold Wilderness Research Institute comparing hiking impacts to horses and llamas noted: "Horse traffic resulted in statistically significant higher sediment yields (the primary indicator of trail deterioration) than either hiker or llama traffic. The low level (250 passes) horse treatment caused more impact than the high level (1000 passes) llama treatments, suggesting that horses can cause at least four times as much impact to trails under the conditions simulated in this experiment. In addition, under dry trail conditions horse traffic caused significant reductions in soil bulk density (a measure of how compacted the soil is) compared to llama and hiker traffic. Horse traffic also caused significant increases in soil roughness compared with the other 2 users. This suggests that the greater impacts of horses on trails is a result of soil loosening of trail surfaces that are otherwise compacted, thereby increasing the detachability of soil particles and increasing sediment yield and erosion." (*Llamas, Horses, and Hikers: Do They Cause Different Amounts of Impact?* - Thomas Deluca (University of Montana) and David Cole (USFS - Wilderness Research Institute) 1998 study)

Don Weir also addresses the differences in compaction of soils by some users and displacement of soils by others in his book *A Guide to the Impacts of Non-Motorized Trail Use* (Don Weir and Associates- Edmonton Alberta Canada). Weir noted: "Repeated passes by bicycles (and most other users) tend to compact the soils of a trail tread. Vertical compaction tends to push particles closer together, thereby increasing shear strength. An increase in shear strength of the soil will have greater ability to resist erosive forces."

Weir also notes that: "Research to date has indicated that the degree of impacts from mountain bikes, relative to those of walkers who have their own unique forms of impacts, appear to be similar."

The Weir book is a wonderful resource and a great review of the literature and research available on the subject of trail impacts. It cites from many studies from around the word on the subject matter (many of these studies I

have complete copies of the research papers). A few of these notable sources include:

Cessford (1995) asserts that: "Mountain bikers will exert a downward force through their tyres (translated to tires - Cessford is from New Zealand)which comprises the wheel load divided by the contact area, is likely to be less than that of heavier motorized vehicles, horses, and heavily laden hikers." (*Off Road Impacts of Mountain Bikes: A Review and Discussion, Science and Research* - G.R. Cessford, Department of Conservation Wellington New Zealand).

Weaver and Dale (1978) found that: "During down slope travel, downhill stepping (by foot and horse) was more erosive than downhill motor biking." It should be noted that the modern mountain bike did not exist at the time of this study, but later studies show that mountain bikes have far less impacts (equal to hiking) as compared with motor bikes. (*Trampling Effects of Hikers, Motorcycles, and Horses in Meadows and Forests*) - T. Weaver and D. Dale - Journal of Applied Ecology 1978)

In the Executive Summary of Weir's book, he notes that: "Common belief holds that wheeled vehicles cause new trails to form more readily than the actions of feet or hooves, thus justifying the allowance of off trail travel by hikers and equestrians. Yet, erosion studies cited above, practically Weaver and Dale (1978, Quinn et al (1981), Soanne et al (1981) and Cole (1987) , suggest that in many places, "feet and hooves will trample more than bicycle tires. The instantaneous sheer forces exerted on a plant by a foot or hoof will have much more of a tearing effect than the rolling over and crushing force of a bicycle wheel."

Don Weir also explores the effects/impacts of what he refers to as biological loading" in his book. He notes: "The amount of excreta produced by user groups is a function of user type and the residence time the user is in the area. We can hypothesize that equestrians produce the most amount by mass; then hikers, who have a longer residence time; and finally the mountain bikers who have the shortest residence time and therefore are less likely to need to void".

Perhaps the most widely accepted research on trail impacts of different users is the Seney/Wilson Study as it compared all the user groups together in one study (hikers, motorcycles, mountain bikes, and horses). Some of the findings from the Seney/Wilson Study include:

"The sediment yields reported in part B of Table 4 indicates that horse plots produced significantly more sediment yield than the bicycle, control, or hiker

plots." "Hiker and bicycle plots were not significantly different from each other or the control plots." " Indeed, hikers produced the second largest increase in sediment yield following the horse treatments, and overall the horse and hiker plots suggest that hooves and feet make more sediment available for removal than wheels on pre-wetted soils. The results in Part D of Table 4 indicate horse traffic produced significantly more sediment than other users on dry plots as well". (Erosional Impact of Hikers, Horses, Motorcycles, and Off Road Bicycles on Mountain Trails in Montana- John Wilson and Joseph Seney - Mountain Research and Development 1994)

There are numerous other research reports that compare relative impacts of different user types on soils, vegetation, and trail tread surfaces. Most of the readers of my comments are likely to be bored by now as few are as interested in this subject matter as I am. I will therefore to cease to cite from these various reports and move on. Suffice it to say however that Dr. Gary Blank was well founded in his assertion that horses do indeed have a greater impact on trails than do hikers or mountain bikes.

Observations in the field by a trained eye will report similar results to the hard science and note that horse damage to trails is easier to record. This also follows common sense logic; horses will have greater impacts due to a much higher combined weight (horse with rider) concentrated into a smaller surface area (four hooves of which not all four can be on the ground as the horse moves forward, as compared to a bicycle tire which has a large contact surface area), and horse are the only trail user with metal (most trail horses are shoed) to trail tread contact (tires of mountain bikes and shoes on hikers are rubber).

Despite numerous reports (coming from science and research), observations and common sense that horses do indeed have much higher impacts than the other two user groups (hikers and mtn bikes), I am in no way suggesting that horses be removed from the DuPont State Forest trail system. To the contrary, I see DSF as being a wonderful and important resource for equestrian trail users. We do however need to recognize the greater impacts and make good decisions about which trails are appropriate for horse use and which ones are not. Trails identified as not suitable for horses (so as to protect the trail resources) always have the option of re-location to better alignments for sustainability and these options should be exercised in DSF when at all possible.

There are, however, a number of limiting factors on how quickly these changes can be made: availability of funding resources for professional trail construction, volunteer efforts on behalf of the equestrian community, cooperation with other users on volunteer projects to improve trail

conditions for all users to name a few. Perhaps a long-term goal for the trail system at DSF could be to maximize the trail mileage for each user group (to provide for abundant recreational opportunities and have a very positive effect on the local economy) while minimizing impacts to the natural resources through good management decisions and sustainable trail development practices.

I believe that in addition to relative impacts, there are a number of factors that should be taken into consideration in the trails management strategy and determining trail uses for each trail in DSF. Certainly the relative impacts of user types needs to be considered and impacts monitored to make resource protection decisions. Other factors include:

**1. Need and demand for trail resources.** The EA pointed out that the Southern Appalachian Assessment of 1996 concluded that recreational opportunities in natural appearing and remote settings were abundant with exceptions for mountain biking and horseback riding (and other uses not allowed in DSF). This report seems to indicate that hiking opportunities were ample and not limited in any way. Taking this into consideration, perhaps an emphasis needs to be placed on developing sustainable recreational opportunities for those trail activities being generally under served (horseback riding and mountain biking).

**2. Contributions of the various user groups giving back to the trail system (sweat equity).** Equestrians and mountain bikers have led the charge of volunteer projects much more so than hikers. In fact, hiking groups are not working in the forest as a user group except working with and under the supervision of mountain bike leaders. The typical public FODF workday profile is: Blue Ridge Bike Club members providing the leadership and knowledge as well as club owned tools, 75- 90% workers from the mountain bike community and a small fraction coming from the hiking community. The equestrian community holds its own separate workdays with the leadership coming from the Pisgah Trailblazers and this group has been fairly consistent in holding work weekends from the forest inception to present.

The focus of projects by different groups has been quite different. The hiking community has no projects located in DSF they can call their own, and have only contributed some (but limited help) to the mountain bike community based projects. Projects performed under the leadership of the mountain bike community have focused on the following trail tread improvements: providing for better drainage for trails to control water issues (adding grade dips and knicks to poorly designed trails, all over the forest on many trails), armoring steep sections of trail to protect the native soils from erosion

(Longside Trail, Cedar Rock Trail, Burnt Mountain, bottom of Jim Branch Trail), designing and building sustainable new trails and re-locations for poorly designed trails (Galax Trail, Reasonover Creek trail re-route during the IMBA Epic, Hickory Mountain Trail re-route at the old rifle range, the new addition to the Airstrip Trail, Pine Tree Extension from Staton Road to Sheep Mountain, the Switchback Trail), construction of needed trail structures (switchbacks like those found on the Galax trail) and providing for educational opportunities for all trail users though public trail schools.

Imaging what DuPont's trail system would look like without these significant contributions and improvements from the mountain bike community is daunting and needless to say there would have been a much larger impact on the resources (soil loss due to erosion) without these projects. The equestrian projects in the forest seem to focus on quite different projects: corridor clearing (brushing back of trails), work around the barn area (weed eating and cutting grass, fence work on the paddocks, fireplace ring and wood storage), signing and marking trails in the earlier stages of development, providing horse tie outs at key attractions to protect the trees, and some (but limited) drainage work on bad mud hole areas such as Turkey Knob trail. No doubt these have been important contributions to the forest and projects that forest staff would have likely not been able to accomplish without the help. However, due to the cited greater impacts to trail tread surface caused by horse use there should be a suggested shift and more energy could be directed at mitigating impacts by contributing more to trail tread related projects (perhaps working with the mountain bike community who are educated and experienced in this type of work).

**3. Numbers of users within the various user groups and predicted future use patterns as compared with needed trail mileage for average length of stay.** A number of sources have indicated that DSF averages 3000-5000 visitors per week. The EA document (and Trails Master Plan) breaks down the visitation into the most common forms of recreation: hiking (57%), mountain biking (25%), horseback riding (7%) and trail running (5%). National statistics find that there are the following numbers of trail users in America: 73.3 million hikers, 43.1 million single track mountain bikers, and 4.3 million horse back riders (sources: Outdoor Industry Association 2003 Participation Study and the American Horseman's Council).

All of these could certainly be broken down into sub categories, but perhaps the most important split would be looking at causal walkers (the typical waterfall tourist) differently from serious hikers. Hikers and walkers need the least amount of trail to make an outing experience due to the slower pace of travel and average time spent in the forest. Trail runners can range from those just catching a one-hour workout traveling an average of 4-6 miles to

long distance backcountry runners who travel distances and speeds more similar to mountain bikers. The Trails Master Plan Survey found that mountain bikers and equestrians had the longest average stay as compared with other users and also traveled more trail distance per visit. All of this information can be used in the planning process and trails management to make sure each user group has ample trail mileage to accommodate desired experiences.

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