

# A Call for Expanding Trails Research

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## Types of Trails Research<sup>1</sup>

- Trail use measurement – developing reliable and efficient methods to measure trail use.
- Information management – evaluating/improving the communication of information to trail users and evaluating the efficacy of *Leave No Trace* trail use practices.
- Visitor surveys – acquire information about trail use, users, management preferences, and demographic changes – who are our trail users and how will they change over time? Do trail systems meet the users' desires?
- Economics – what is the positive economic impact of trails? How does the price of gasoline affect trail use? How can we justify expenditures on trails (e.g. health benefits, environmental learning/appreciation)?
- Trail sustainability – improve our understanding of trail degradation and the relative importance of influential use-related, environmental, and managerial factors. Apply this knowledge to create trails that cause minimal resource impacts, require limited maintenance, and are enjoyable for a variety of trail users.
- Trail surveys – to monitor trail conditions over time, assess prescriptive maintenance needs, and quantitatively assess trail sustainability.

1 – Derived from workshop sessions at the 2008 National Trails Symposium on Trail Research run by Steve Elkinton, National Trails System Program Leader, National Park Service.

## Need for Trails Research

Trails research can help support trail management decision-making and funding by providing objective, quantitative information describing trail users, their numbers and demographics, preferences, and economic expenditures. Sometimes knowledge of trail-related use, demand, and expenditures can make or break decisions regarding the funding of new trails and related facilities. While not common, these types of studies are occasionally conducted and used for these purposes. Less common are studies oriented to examining or improving trail sustainability, including various types of trail resource surveys. This handout focuses on these last two issues, though the conclusions point to a need for all types of trails research.

By way of introduction, I am a Recreation Ecologist who studies the environmental impacts of visitation and recreation in protected natural areas. This work includes trail sustainability research, which seeks to improve our understanding of the trail degradation process and the relative contributions of a multitude of factors:

- Use-related – type and amount of use, and user behavior
- Environmental – soil and vegetation type, topography
- Managerial – trail design, construction, maintenance, visitor use regulation and education

Through an improved understanding of the relative influence of these interrelated factors we can provide better guidance to trail managers and advocates to improve the sustainability of trail systems for all types of users, including hikers, equestrians, mountain bikers, and motorized users. While such studies have evaluated the relative impacts of these different use types, trail sustainability research is much broader and focused on understanding trail degradation to improve sustainability, not on apportioning blame for degraded conditions. For example, improving our knowledge of what trail grades or alignment angles are most sustainable, which soil textures most erodible, and the efficacy of alternative low impact education practices.

## Failure to Use Existing Research

Examine any trail maintenance book on your shelf and I'll bet you will not be able to find a trail management design, construction, or maintenance practice that is based on actual data or that cites a scientific study. I recently spent two hours examining a dozen of our most current leading trail design/construction/maintenance books and was unable to find such an instance. This could mean one of three things: 1) the trail science literature was reviewed but not cited, 2) the trail science literature is not being consulted, or 3) the trail science literature was evaluated and found not to be useful. I suspect it is a combination of these.

They say that trail design is “part science and part art” but I would characterize it today as mostly art and field experience. As an example, consider that the “Half Rule” is becoming a widely applied trail design principle but I’ve seen no evidence that it’s based on empirical data or research. Why 50%, and not 30% or 25%, which are cited in two other leading publications? If hundreds of trails will be designed based on such guidance over the next several decades shouldn’t we invest on research to evaluate these differing percentages?

I respect and have learned from the collective judgment of the trail professionals who have authored our existing trail management literature but I’m surprised that they all appear to ignore existing trails science literature. Part of the reason is that our trail sustainability science is poorly-developed but that also begs the question: why has it been neglected in funding decisions by agency land managers? Can you think of any other natural resource management program area that has not been professionalized through scientific research in the last 50 years (e.g., vegetation or wildlife management, road engineering, timber management)? WHY is there such an enormous disconnect with the trail management literature? I agree that it is poorly developed, mostly due to the lack of funding and the small cadre of scientists interested in this research. One task would be to summarize the existing literature for trail practitioners, but we also need to begin collaborating to prioritize the research we need and to develop funding mechanisms. We could also collaborate on developing various types of trail surveys, including the incorporation of GPS/GIS applications that will help to streamline assessments and evaluation of data and the planning of trails or trail networks. To stimulate thinking and provide examples, I’ve outlined some potentially beneficial trail sustainability research topics in the following section.

### **Potential Trail Sustainability Research Topics**

**Trail Design** – investigating the relative importance of trail design guidance, including trail grade and landform grade (average and maximum sustainable grades, the half- and quarter-rule, trail slope alignment). How should trail design guidance vary by intended type and amount of use (e.g., hiking, horse, mtn. bike, ATV/motorcycle, OHV), region of the country, and soil type?

**Trail Construction** – investigating the efficacy of alternative trail construction practices. Examples include a comparison of machine-built trails to hand-built trails, use of specialized equipment (e.g., a plate compactor to pre-compact tread soils following construction to resist displacement and cupping from initial use or erosion from rainfall), and use of native soils, native soils with soil binders, gravel, gravel/soil mixes, and geotextiles of various types.

**Trail Maintenance** – investigating the efficacy of alternative trail maintenance practices. Examples include the alternative efficacy of tread drainage through grade reversals, tread outsloping (how long after construction does it remain effective?), water bars, drainage dips, etc. Develop data-based guidance on tread drainage feature spacing by soil type/texture position in the watershed, and expected rainfall patterns. Manipulating vegetation management and the surface roughness of treads and trailside areas to limit trail widening. The efficacy of alternative methods of armoring treads. Evaluating the most sustainable and least impacting methods for crossing streams without bridges.

**Trails Surveys** – developing improved survey methods for:

- objective numerical evaluations of trail sustainability,
- monitoring trail conditions to document change over time, evaluate the efficacy of trail management actions, and to support carrying capacity (LAC, VERP) decision-making,
- evaluating and modeling trail degradation to improve understanding of the relative influence of use-related (type & amount of use, user behavior), environmental (soil and vegetation type), and managerial (trail design, construction, maintenance, visitor regulation/education) factors,
- prescriptive maintenance needs assessments to guide trail rehabilitation

**Trail Restoration** – investigating the efficacy of alternative trail restoration practices and the ecological and monetary costs of relocation and restoration vs. tread rehabilitation.

**Social Science** – investigating visitor support for alternative trail design, construction, and maintenance actions. Model user interactions on a trail or trail network, to gain an understanding of how to design and modify trails or trail systems to minimize user conflicts when needed.

**GPS & GIS Technology** – Develop state-of-the-knowledge GPS/GIS tools and techniques to streamline trail surveys and the design and assessment of trails and trail networks:

- Digitally assess potential or existing trail alignments
- Develop design tools with input from trail professionals to digitally rough in or plan trail alignments, evaluate and visualize trails, streamline trail corridor scouting and planning, and provide estimations of materials and costs.

U.S. Dept of Transportation, Federal Highway Administration (FHWA), Recreation Trails Program (RTP)

The **Recreational Trails Program** (RTP) provides funds to the States to develop and maintain recreational trails and trail-related facilities for both non-motorized and motorized recreational trail uses. The RTP is an assistance program of the Department of Transportation's Federal Highway Administration (FHWA). [Federal transportation funds benefit recreation](#) including hiking, bicycling, in-line skating, equestrian use, cross-country skiing, snowmobiling, off-road motorcycling, all-terrain vehicle riding, four-wheel driving, or using other off-road motorized vehicles.

The RTP funds come from the Federal Highway Trust Fund, and represent a portion of the motor fuel excise tax collected from non-highway recreational fuel use: fuel used for off-highway recreation by snowmobiles, all-terrain vehicles, off-highway motorcycles, and off-highway light trucks. The RTP funds are distributed to the States by legislative formula: half of the funds are distributed equally among all States, and half are distributed in proportion to the estimated amount of non-highway recreational fuel use in each State. See the [Funding Levels by State](#). Each State administers its own program. [Contact your State RTP Administrator](#) for guidance on State policies and project eligibility requirements.

The Congress authorized the RTP for \$60 million in 2005, \$70 million in 2006, \$75 million in 2007, \$80 million in 2008, and \$85 million in 2009. FHWA may use up to \$840,000 annually for program administration and [trail related research](#), technical assistance, and training. The remaining funds are distributed to the States. Half of the funds are distributed equally among all States, and half are distributed in proportion to the estimated amount of non-highway recreational fuel use in each State: fuel used for off-road recreation by snowmobiles, all-terrain vehicles, off-road motorcycles, and off-road light trucks.

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