"Trails have multiple values and their benefits reach far beyond recreation. Trails can enrich the quality of life for individuals, make communities more livable, and protect, nurture and showcase America's grandeur by traversing areas of natural beauty, distinctive geography, historic significance, and ecological diversity. Trails are important for the nation's health, economy, resource protection and education."

- *Trails for All Americans report, 1990*
Trails for the Future...

Sustainable Trails

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Welcome

- My Background
- Who is here?
- Your trail concerns
- Your responsibility
"Sustainability on natural surface trail corridors is defined as the characteristic of a travel surface to support currently planned and future uses with minimal impact to the natural systems of the area. Sustainable trails have negligible soil loss or movement while allowing the naturally occurring plant systems to inhabit the area, recognizing required pruning and eventual removal of certain plants over time. Sustainable trails will not adversely affect the naturally occurring fauna. Sustainable trail design will accommodate existing and future uses while only allowing appropriate uses. The sustainable trail will require little rerouting and minimal maintenance over extended periods of time."

- January 1991, National Park Service; Rocky Mountain Region
Benefits of sustainable trail…

- Supports current and planned uses with minimal impact to natural systems
- Results in negligible soil loss or movement
- Requires little rerouting and minimal maintenance
- Uses construction techniques and materials designed for long term self-sustaining use
- Uses on-site materials
Why sustainable trail?

Sustainable trail =

- time
- money
- user enjoyment
- resource protection
Characteristics of sustainable trail

- Gets water off the trail
- Connects control points
- Can offer different user experiences
- Keeps users on the trail
- Follows natural contours
Gets water off the trail

Rule #1: The laws of gravity and physics overrule all else

Sustainable trail has water management:
- *V’s are bad*
  - Volume & Velocity = Violent Erosion
- *S’s are good*
  - Shallow, Slow & Sheeting = Sustainable
Why is it important to get water off the trail?

Rule #2: If you don’t plan to manage water flow, it will destroy your trails

Poor water management = erosion

- Effects of erosion include:
  - Visual intrusion
  - Damaged ecosystems
  - Closed trails
  - Increased cost (labor and materials)
More about water management…

- A poor trail does not allow the water to sheet off. Water which remains on the trail removes surface material causing ruts, and undercuts, which in turn are difficult to navigate.

- When not planned for, water will always win!
Characteristics of sustainable trail

- Gets water off the trail
- Connects control points
- Can offer different user experiences
- Keeps users on the trail
- Follows natural contours
Connects control points

**Positive control points**
- scenic overlooks
- waterfalls
- rock outcroppings
- historical sites
- lakes and rivers
- support facilities

**Negative control points**
- low-lying wet areas
- steep sideslopes
- environmentally sensitive areas
- private property
- fall lines
- areas identified for other uses/management
Characteristics of sustainable trail

- Gets water off the trail
- Connects control points
- Can offer different user experiences
- Keeps users on the trail
- Follows natural contours
What kind of trail flow?

- Open and flowing
- Tight and technical
- Poor design - abrupt transitions
Characteristics of sustainable trail

- Gets water off the trail
- Connects control points
- Can offer different user experiences
- Keeps users on the trail
- Follows natural contours
Keeps users on the trail

- User needs
  - Safety
  - High quality experience
  - Must provide users with opportunity to protect resources
  - Information

- Trail design is first key
- User education, then
- Management response

Know your users!
Characteristics of sustainable trail

- Gets water off the trail
- Connects control points
- Can offer different user experiences
- Keeps users on the trail
- Follows natural contours
Follows natural contours

- There are three types of trail:
  - Contour trail
  - Fall-line trail
  - Flat ground trail

- Only ONE of these is sustainable!
Contour trail = sustainable trail

- Erosion resistant and low maintenance
- Keeps users on the trail
- Keeps water off the trail
- Achieves balance between recreation and resource protection
Follows natural contours

- There are three types of trail:
  - Contour trail
  - Fall-line trail
  - Flat ground trail

- Only contour trail is sustainable!
Water removes surface material causing ruts and undercuts.

Water caught in the ruts accelerates and carries sediment away.

Roots rocks and other items are uncovered when the surface material is washed away causing the surface of the trail to become unstable, and difficult to use.
The user then goes outside the original trail tread and creates a secondary trail or braid. Since the secondary trail follows the line of the original trail, it does not correct the problem and falls prey to the forces of water as well. Result is a larger impact zone, user safety issues (speed).
Follows natural contours

- There are three types of trail:
  - Contour trail
  - Fall-line trail
  - Flat ground trail

  - Only contour trail is sustainable!
Flat ground trail

- Begins as a narrow, defined trail
- Tread compacts
- Water collects in the depressions
- Depressions deepen and become a series of mud holes
- Users create re-routes to avoid deep mud
- Mud-hole cycle begins...
Doesn’t have to be a completely new trail...
Can be built by hand.
Sustainable trail basics:

- Follow natural contours, connects control points
- Ensure that water exits the tread often
  - Rolling dips/grade reversals, **not waterbars** should be the standard water drainage feature.
The failure of waterbars...
Sometimes trail doesn’t need to follow all principles of sustainable trail design & construction

- Low volume use, pedestrian only
- Wisconsin Administrative Code NR 44.07 (3)
  - Primitive or lightly developed trail
- Wisconsin Administrative Code NR 44.07 (4)
  - Type 1 or 2 Recreational Use Setting
- Recreation Opportunity Spectrum (ROS)
- Others for your properties?
Sustainable trail

- Lots of pre-work!
  - Planning
    - Vision
    - Design
    - Layout

(Before moving dirt to construct the trail!)
Overview of sustainable trail design

- Determine who will use the trail and what they will want to do.
- Familiarize yourself with the area.
- Make loops.
- Use a contour route.
- Determine trail flow.
- Walk the trail corridor and flag it.
- Develop a construction plan.
Sustainable Trail – The How

- Need to know many factors before moving dirt
- Vary by location – soil type, uses, level of development and accessibility, type of trail (difficult, easy), average rainfall
- For example, generally, Wisconsin soil is one of five types:
  - Sandy loam
  - Silty loam
  - Loam
  - Clay loam
  - Clay
Three Key Elements of Sustainable Trail Construction

- Grade
- Outslope
- Grade reversals
GRADE

- Grade = rise/run

- Elevation gain between two points (always %)

- Depends very much on soil type

- Grade should NEVER exceed half of the sideslope of what it is traversing, should be closer to 1/3 on average

- In Wisconsin 8% is a good rule of thumb (eight vertical feet for every 100 horizontal feet)
Traversing the Slope

Figure 2

Trail A 10%
Trail B 5%
OUTSLOPE

- Outslope of 2-4%
GRADE REVERSALS

aka “rolling grade dip”

backslope

tread

Critical edge
Sustainable Trail

- Means less work and money for you in the long run
- Happier users (stay on the trail)
- Layout, design, construction, and management must all look towards sustainability
- Use design elements (grade, slope) specific to location, use
Sustainable trail design includes:

- Trails aligned using the natural topography of the land.
- Trails aligned to ensure that water exits the tread often.
- Rolling dips, **not waterbars** should be the standard water drainage feature.
- Average grade of the trail should not exceed 10% (8% is better). Maximum grades up to 20% only for short sections, less than 50 linear feet.
- Outslope of the tread should be 2-4%.
- Full bench construction.
- Lots of pre-work!
Closing Activity

- Sustainable trail – hands on

Keys:
- where will water go?
- grade reversals
- outslope
- degree of incline/decline
Questions
Why consider sustainable trail?

Sustainable trail =

- time
- money
- user enjoyment
- resource protection
Closing Comments

Resources:


National Trails Symposium, Quad Cities, October 19-22, 2006