

Off Highway Motorcycle and ATV Trail Management

Guidelines Planning and Design RRT 484

(Originally developed by Monti Sorem)

Four Components of Trail Planning and Design

- Inventory
- Planning
- Construction
- Monitoring

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Inventory

- Inventory is a collection of information about the land base that will assist in trail development and management
 - information can be found on existing maps and GIS databases
 - riders are an excellent source of information

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Inventory

- Trails should be classified by type
 - which trails are more suitable for motorcycle or ATV use
- Give the trails names or numbers
- Identify sensitive areas that require special attention or avoidance
 - resorts, summer homes, archeological sites, ESA plant and animal habitat

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Inventory

- One of the most *important* tasks is to identify and locate features that will enhance the trail experience
 - waterfalls, lakes, streams, cliffs, changing timber and vegetation type, meadows, vistas, talus slopes, hot springs and sometimes large rocks



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Trail Planning

- A trail system plan will serve as a blueprint for trail construction and maintenance
- Planning requires managers to recognize not all riders are the same and have differing preferences for their recreation experience

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Trail Difficulty

- *Easiest trails* are intended to be suitable for novice riders who don't have the skill or desire to ride more difficult trails
- *More difficult* trails are intended for the majority of the user population and should challenge the average rider
- *Most difficult* are intended for expert riders and dedicated enthusiasts.

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Elements of Difficulty

- Alignment
- Grade
- Clearing
- Tread width
- Tread Surface
- Obstacles
- Sideslope
- Isolation

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Elements of Difficulty

- Alignment
 - the configuration of the trail in the horizontal plane
 - the more turns, the more difficult the trail
 - note: twists and turns are very desirable
- Grade
 - the slope of the trail
 - grades >30% provide a major contribution to difficulty

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Elements of Difficulty

- Clearing
 - the corridor from which objects are removed
 - downed material significantly increases the difficulty of the trail
- Tread Width
 - the width of the traveled portion of the trail
 - preferred trail width for trailbikes is 18-24 inches

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Elements of Difficulty

- Tread Surface
 - physical condition of trail
 - smooth trails are easier and steep, slippery trails are more difficult
- Obstacles
 - physical objects that impair travel
 - logs, large rocks, ledges or deep or swift water are obstacle that increase difficulty

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Elements of Difficulty

- Sideslope
 - the slope of the ground perpendicular to travel
 - the steeper the side slope, the more difficult the trail
- Isolation
 - relative time from help or human contact
 - isolation is a *desirable* component for many users

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Elements of Difficulty

- Remember
 - it is the combination of these elements that help determine the difficulty of a trail system
 - classification relies on experience, observation and analysis by the manager

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Two Key Concepts

- Curvilinear Trail Design
- Loop Concept

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Loop Concept

- Ideal trail systems should form multiple loops
 - trails should not change classification during route
 - more difficult trails should branch off of easier trails, but the easy trail must form a loop
 - cornerstone of sound trail planning

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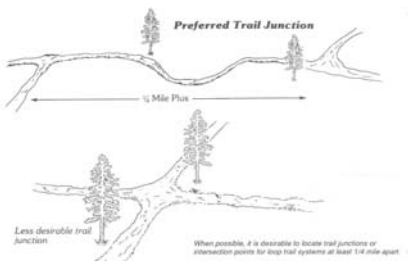
Curvilinear Trail Design

- “Nobody likes a perfectly straight trail!”
- Break long sections into gentle “S” curves
- Gentle curves hold the users’ attention
- Enable you to take advantage of landscape features like rock outcrops, openings with views, & varied habitats



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Considerations: Trail Junction



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Trail Capacity

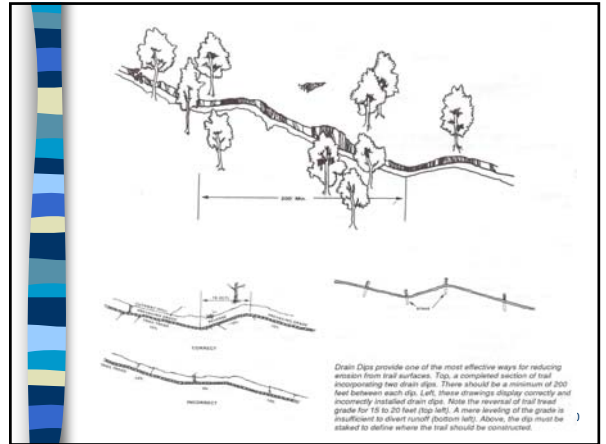
- Trail capacity is the physical ability of the trail to withstand use and the number of users on one mile of trail per day
 - trail capacity for users enjoyment is determined by the user themselves
 - trailhead/campsite facilities should follow four users per mile of trail (10 miles= 40 users)
 - trails should withstand 6-8 machines per mile of trail (10 miles= 80 machines)

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Drain dips: remove the water

- A drain dip is the reversal of the trail grade to remove water
 - is effective at removing water
 - inexpensive
 - should be designed before construction of trail
 - should be no closer than 200 feet apart, to prevent a “roller coaster” effect

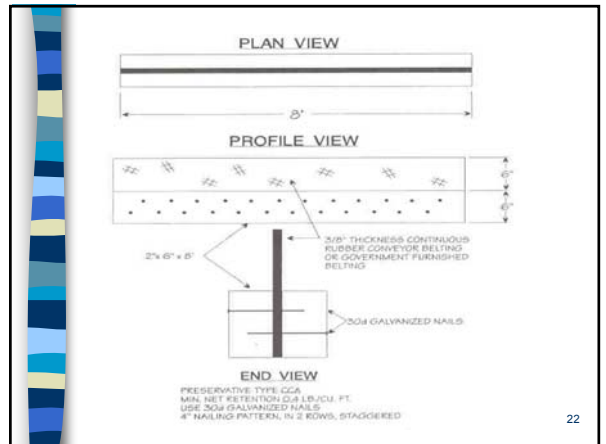
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Flexible Water Bars

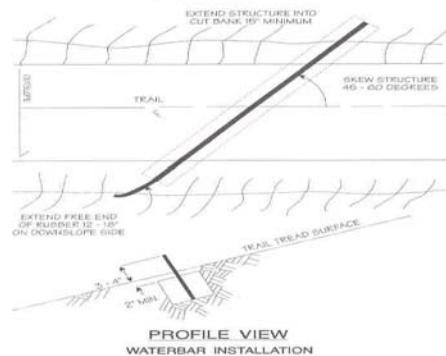
- A flexible water bar is a strip of conveyor belting between two 2 X 6 boards
 - installed with a skew of 45 to 60 degrees from centerline of trail
 - effective, if installed properly

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RUBBER BELTING WATERBAR



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Additional Considerations

- Locate campsites far from trails
- Accommodate young riders by placing a mini-loop near the campsite
- Make 2/3 of the trails “more difficult”
- Roads are very undesirable by most riders
- Use a single “easiest” trail to access other trails from campsite

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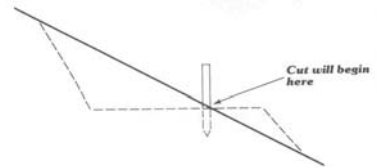
Trail Construction

- Constructed trails should remain rustic in appearance
- Hand or Machine?
 - “easier” and ATV trails may require heavy equipment
- Who will perform the work?
 - Agency crew, Contracted crew or Volunteers

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Trail Construction: setting up

- Flagging the trail
 - use survey stakes in critical locations
 - place stakes 4 to 6 feet apart

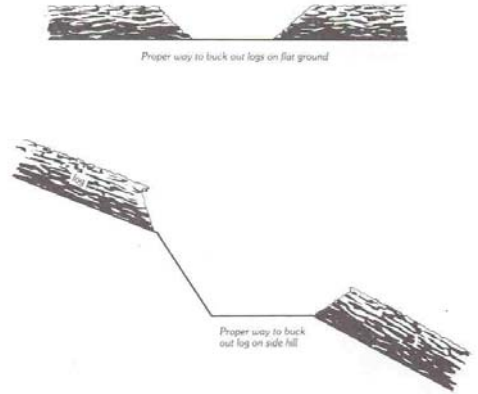


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Clearing

- Prominent in forested terrain
- Less clearing will make the trail more primitive
 - trail will also become more difficult
- Clearing must be properly done
 - short stumps and logs can cause serious injury to rider

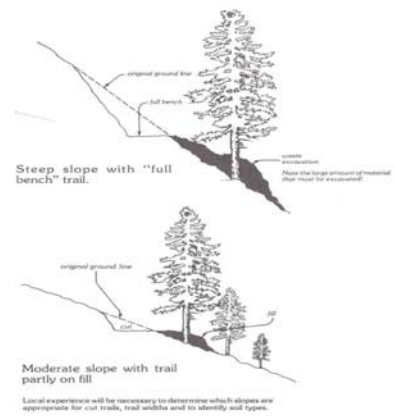
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Excavation

- Most time consuming operation in trail construction
 - “easier” trails will be wider and will require more work than more difficult trails
 - steep side slopes require a “full bench” trail, where moderate slopes can use fill for the trail tread
 - outside corners should be bermed to prevent trail erosion

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Full Bench Construction

Hillside before trail existed. Water sheets down hillside, and is kept moving slowly by vegetation.

Full bench cut. Proper cut slope on bread. Back slope not finished. Water flowing over sharp edge causes back slope to undercut, and erode.

Same full bench cut with back slope blended in land revegetated. Note how water will continue to sheet and move slowly allowing the trail to exist without adversely affecting the landscape.

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Crossing Talus Rubble

- Only traverse stable rubble
- Location
 - keep grade under 15%
 - avoid large rocks that cannot be moved by hand
- Construction
 - width: 3.5 feet for motorcycles and 4-6 feet for ATVs
 - may require blasting by trained individuals

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Collector Ditches

- Wet trails require extra maintenance and repair
- Collector ditches have four parts
 - shallow, upslope channels to catch water
 - lead-in ditch
 - recessed culvert inlet
 - metal or PVC culvert pipe

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COLLECTOR DITCHES

CATCH BASIN

TRAIL TREAD

In wet areas, it is often desirable to surface the trail with native rock or crushed stone. Construction may be done by hand, with high explosives or, if the ground is sufficiently stable, by machine. Dig out the catchbasins and culvert lays.

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Puncheon: To cross wet soil

- Puncheon is an artificial tread to cross wet or swampy soil
- Similar to a bridge, but rests on soil
- Four components
 - sill logs that rest on ground
 - log stringers that rest on sills
 - decking spiked to the stringers
 - wheel guards spiked to decking

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TOP VIEW

DECKING

WHEEL GUARD

NOTE OVERLAP

STRINGER

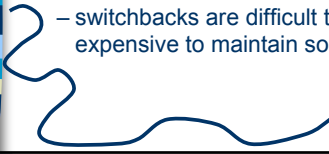
SILL LOG

Puncheon is an effective method for elevating trail surfaces in locations where it is necessary for the trail to cross wet soils.

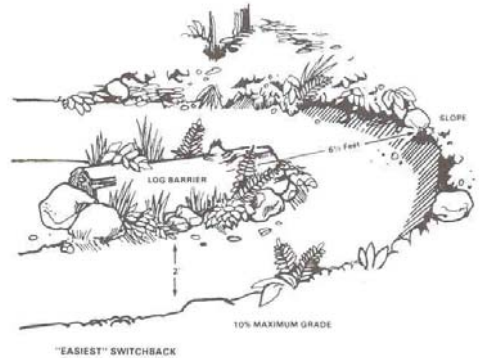
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Switchbacks

- A switchback is a steep turn of 180 degrees to lessen the grade of a trail on a steep slope
 - properly constructed switchbacks can contribute to a quality riding experience
 - switchbacks are difficult to ride and expensive to maintain so location is critical

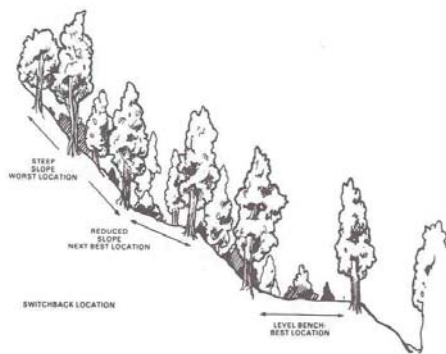


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"EASIEST" SWITCHBACK

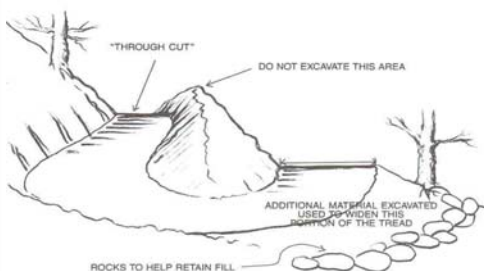
10% MAXIMUM GRADE



Switchback Design Minimums

- Grade should always be compatible with soil type
- Use a barrier to prevent "cutting"
- It is critical to keep the grade of the trail through the switchback as low as possible
- Using a "through cut" improves quality
 - reduces grade of trail
 - makes switchback easier and safer

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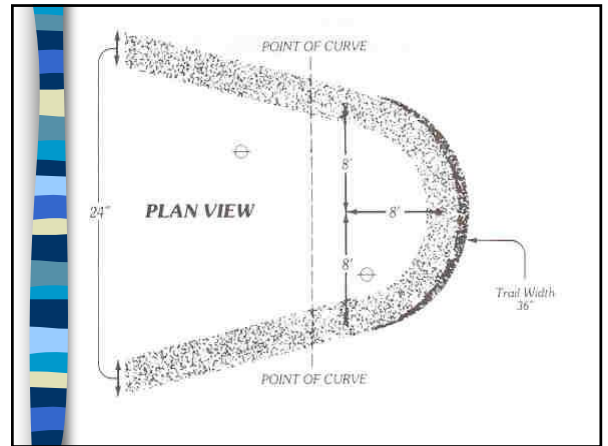
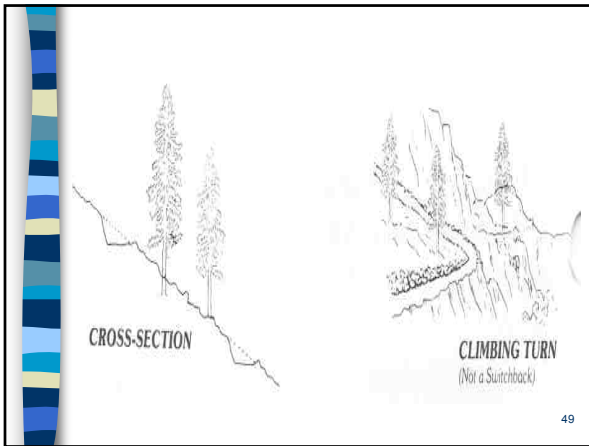
Two views of a switchback using a "through cut." The cross section above shows the unexcavated area, resulting in the through cut. Widen the lower portion with additional fill. Use rocks to help retain the fill. Below, the arrows point out where the trail should be widened with additional fill.

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Climbing Turns

- Alternative for switchbacks for ATV classified trails
 - also used in "easiest" trail construction
- Design considerations same as switchbacks
 - mechanical compacting will be necessary to compensate for the extra weight of spinning ATV tires

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Signing

- Necessary element of any trail system
- Provides users with information regarding trail identification, difficulty and regulations
 - signing should include identification and information signs at all trail heads, intersections and periodically on trails
 - signs can include interpretative information, trail distances, public facilities, access points and encouragement

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Monitoring

- Data gathering for evaluation of trail system and facilities
 - help determine if OHV plan is successful and if management is meeting desired objectives
 - if system is inadequate, improve it
- Ask your users!
 - The users are probably the best information source

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Resources

- **American Motorcyclist Association**
 - (614) 891-2425
- **Blue Ribbon Coalition**
 - (208) 237-1557
- **National Off-highway Vehicle Conservation Council**
 - PO Box 2225 Torrance, CA 90509--2225
- **Tread Lightly! Inc.**
 - (801) 627-0077

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References

- Wernex, Joseph. 1993. *Off-highway motorcycle and atv trails: guidelines for design, construction, maintenance and user satisfaction*. 2nd ed. American Motorcyclist Association. Waterville, OH. 56 pp.

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