

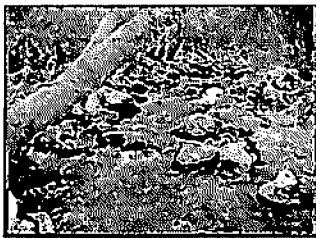


Stream Crossings

Trails...from a River's Point of View

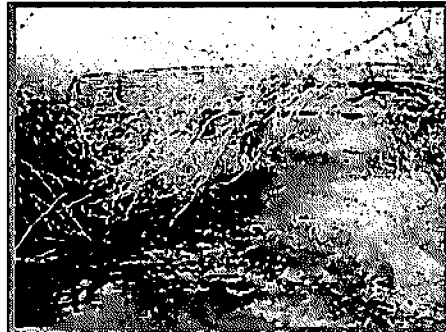
There's more to me than you might know

- I am a river.
- I am dynamic, ever-changing.
- I am pleasing to the eye and to the ear.
- I cut through the earth.
- I meander across the landscape.
- I carry water, sediment, and debris.
- I adjust my shape to maintain balance among runoff, sediment, and slope.
- I provide critical habitat for unique and diverse communities of aquatic and terrestrial organisms.
- I am home to many species of fish, mollusks, insects, amphibians, mammals, reptiles, and birds.
- I provide transport routes to their areas of food, shelter, reproduction, and colonization.
- I change and evolve over time in predictable patterns.
- I tend toward stability unless disturbed.



Trails can harm me or be my welcome companions; poorly designed, constructed, or maintained trail crossings can:

- Deliver polluted runoff and sediment to my channel.
- Divert, capture, or block my flow.
- Cause my channel to become unstable and disrupt transport of water, sediment, and debris.
- Impede or bar passage of fish, macroinvertebrates, and other aquatic organisms.
- Fragment habitat by creating impassable water depths, flow velocities, or jump heights.
- Impair or prevent access to food resources, refuge from unfavorable conditions, reproductive success, and new areas for colonization.
- Diminish biological diversity and species abundance.



I prefer solitude

- It's best to keep your distance - avoid interacting with me ; trails can be too close for comfort.
- Travel parallel to my course, rather than perpendicular to it.
- Select a path that's higher, flatter, and drier.
- Leave a healthy fringe of vegetation -- riparian buffer -- between me and a trail.



But, if you must come near or cross me...

- Minimize the number of crossings.
- Cross where my channel is most stable - at a riffle or where my banks are solid rock.
- Use a bridge instead of a ford or culvert.
- Span as much of my active floodplain as possible, preferably at least twice my bankfull width.
- Use an armored ford instead of a culvert.

- If you must use a ford or culvert - minimize the width of the ford or length of the culvert.
- Mimic nature; don't change width, depth, or gradient.
- For culverts, use a natural bottom; don't change the substrate.
- For fords, armor the crossing if the natural substrate consists of clay, silt, sand, or gravel; use stones large enough to withstand scour during flood events.



- Size culverts to handle the largest expected flows and to allow a flood fringe to develop inside.
- Design the approach, to descend into and climb out of the crossing, at an 8% grade maximum.
- Provide grade reversals on both approaches to prevent water and sediment from entering the stream.
- Get runoff from the trail into the soil - use outslopes, dips, and waterbars. Avoid outside berms.
- Plan and design for possible failure of the crossing.
- Integrate other restoration activities into the design and construction of new or rebuilt crossings.

If you can do all this, we can peacefully coexist...but, there will be times when I will flood you...it's natural!

For more information:

www.nps.gov/ncrc/programs/rtca/whatwedo/wwd_innovations.html

For more stream crossing resources:

www.nps.gov/ncrc/portals/rivers/projjpg/stream.htm