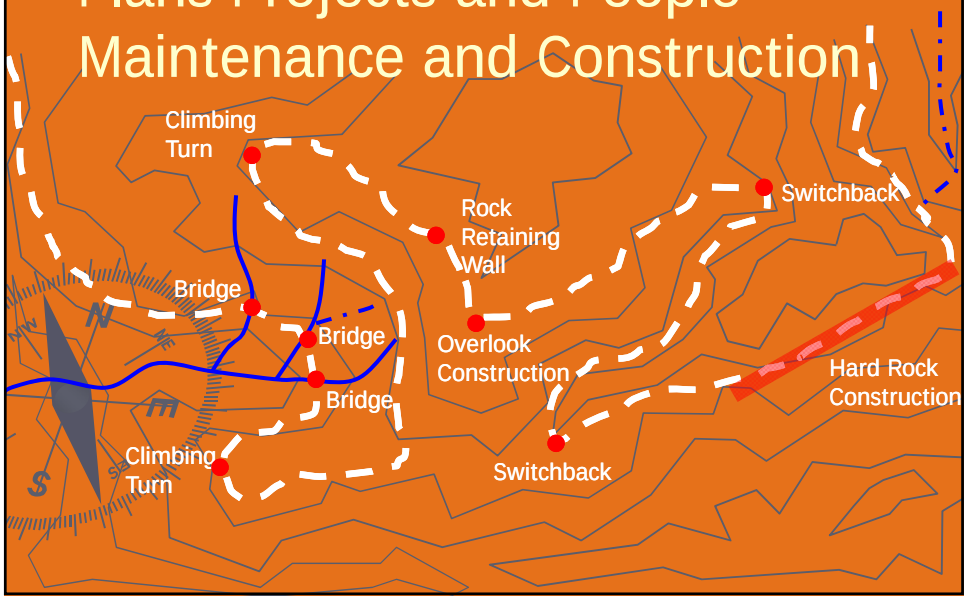
Trail Management
Plans Projects and People
Maintenance and Construction



Construction and Maintenance

Session Objectives:

- Principles of New Trail Construction
- Brushing and Clearing Maintenance
- Drainage Maintenance and Structures
- Tread Maintenance and Structures
- Trail Step Installation
- Retaining Walls

Construction and Maintenance

- Handrails
- Puncheons and Boardwalks
- Bridges
- Rehabilitation
- Development of Trail Projects
- Field Exercise

New Construction

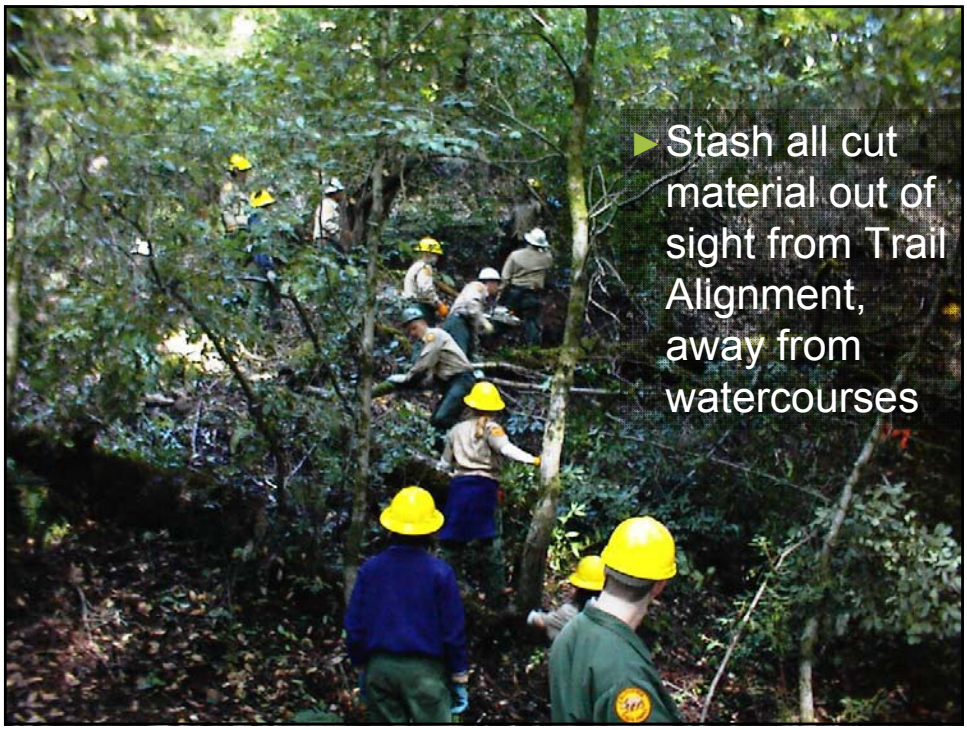
- Most New Construction is a Reroute of an Existing Trail
- Existing Route does not Meet Design Requirements
- In Fortunate Cases there is New Construction for a Newly Created Trail

Principles of New Trail Construction

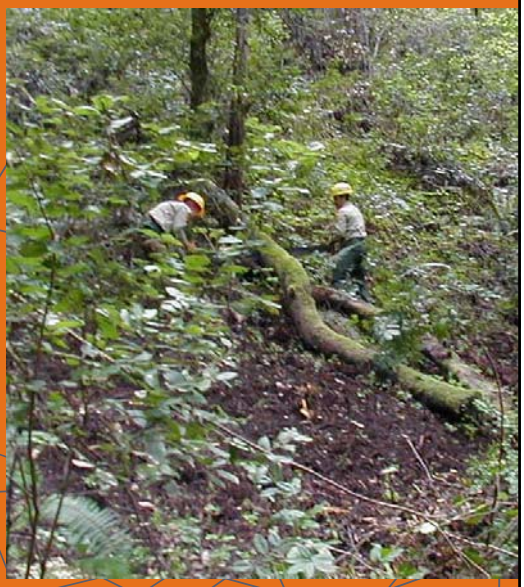
- First Phase of Work
- Orientate and Follow Flag Line Established During Layout and Design Phase

- Brush alignment from top of cut bank to bottom of fill slope


Corridor Width of Brushing will Vary with Steepness of Sideslope

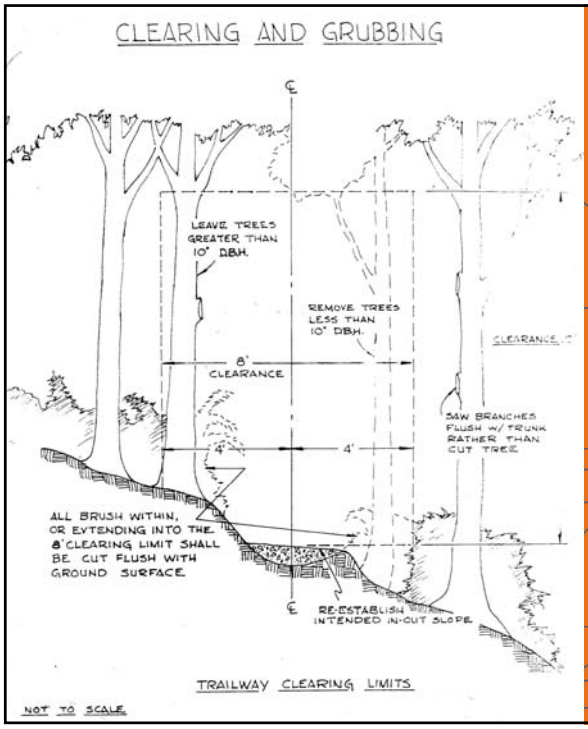

Stash all cut material out of sight from Trail Alignment, away from watercourses

- Remove Fallen Logs
- Cut to Design Standard Clearing Limits
- Remove Logs in Maximum Possible Lengths for Potential Use in Structures During Trail Construction



- Remove small trees, including stumps, up to approx. 10” dbh, or Agency Standard

- Remove Organics from Corridor
- Retain "duff" Removed for Covering New Constructed Tread



Maintenance Clearing and Brushing

Maintenance Clearing

Clearing

- Log and Rock Removal
- Clear to Original Constructed Standards
- Performed Annually

Maintenance Brushing

- Cyclic Removal of Dead and Living Vegetation from the Travel Way
- Remove Brush to Standards Based on User Type

Trail Construction and Maintenance

Drainage Maintenance and Erosion Control Structures

Drainage Maintenance and Erosion Control Structures

- What is the Most Damaging Influence on Native and Gravel Trails?

Water

- How Does Water Damage the Trail?

Transport of Trail Bed Material

Loss of Fill Slope

Sedimentation of Water Courses

What Do You Do When Water is Eroding the Trail?

- Find the Source
- Why is Water Getting On the Trail?
  - Trail Bed Cut through Seep/Spring
  - Diverted Ephemeral or Seasonal Drainage
  - Outslope or Crown Eroded or Entrenched
  - Poorly Designed Trail Alignment
  - Poorly Constructed Drainage Swale

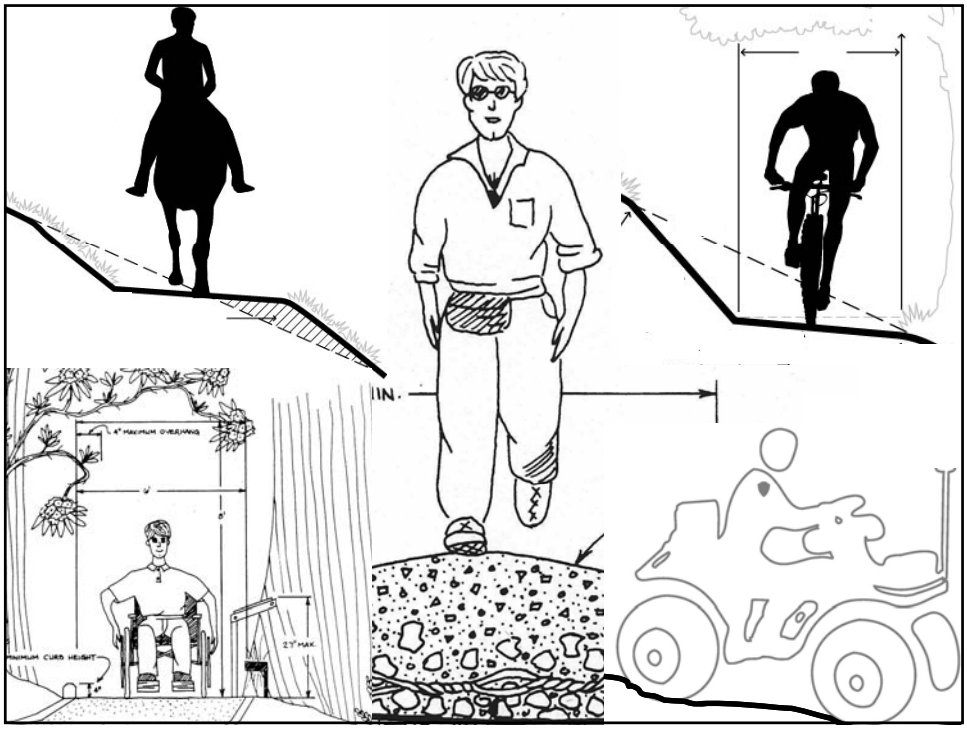
Drainage Structures and Maintenance

- Many Trails Managed by Public Agencies and Volunteers are Existing on Bad Trail Alignments
- Options for Reroutes May be Limited
- Proper Installation and Maintenance of Erosion Control Structures May be the Best Option

Drainage Structures and Maintenance

Session Objectives:

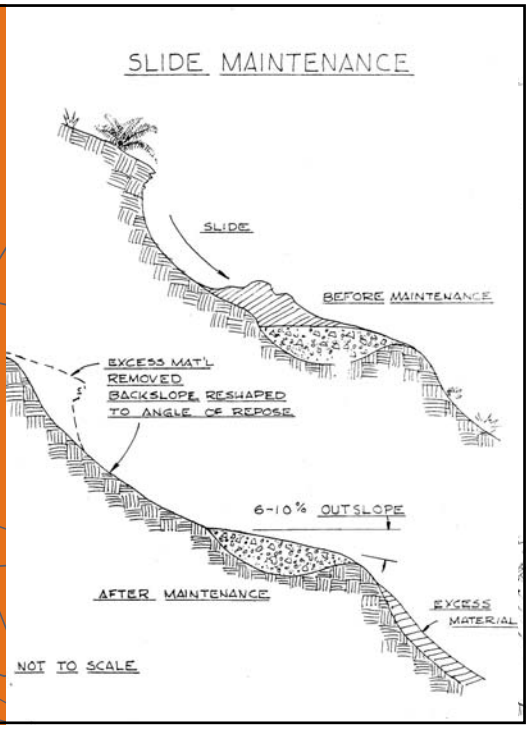
- Outslope/Crown Maintenance
- Drain Dips
- Water Bars
- Check Dams
- Drainage Lenses
- Culverts
- Step Stone Crossings
- Fords



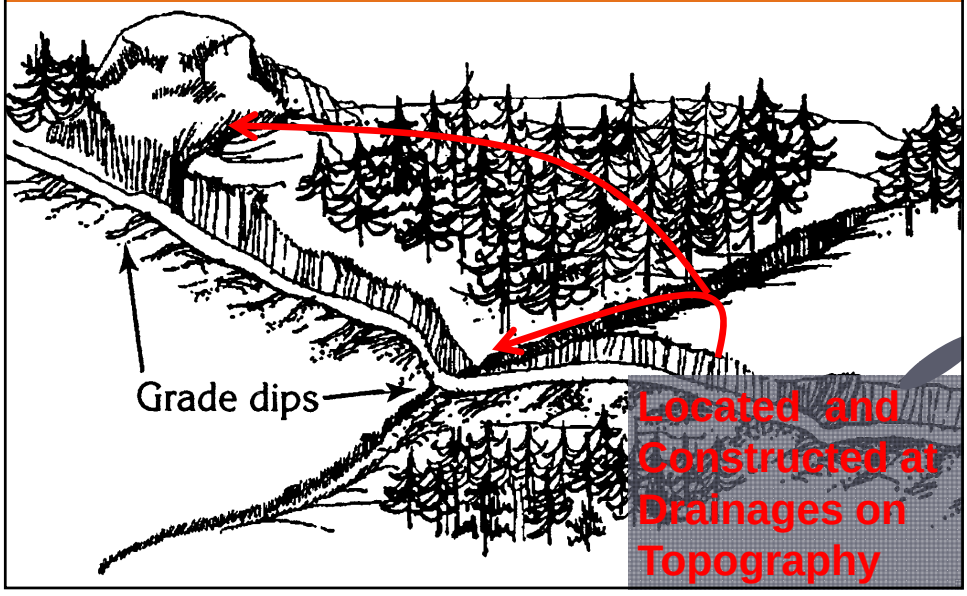

Mechanical
Wear will
Happen from
Trail Use
Loosened
Material will
Migrate from
the Trail Tread

Outslope and Crown Maintenance

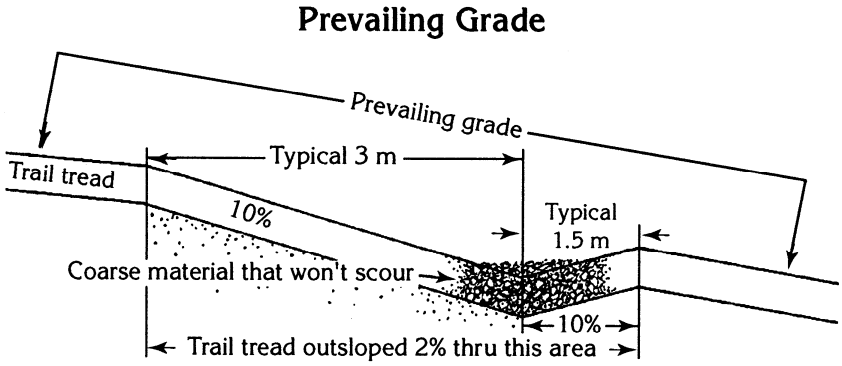
- Slough and Berm Removal
- Maintain Crown on Turnpikes and Causeways
- Reconstruct Entrenched Trail
- Remove Slides



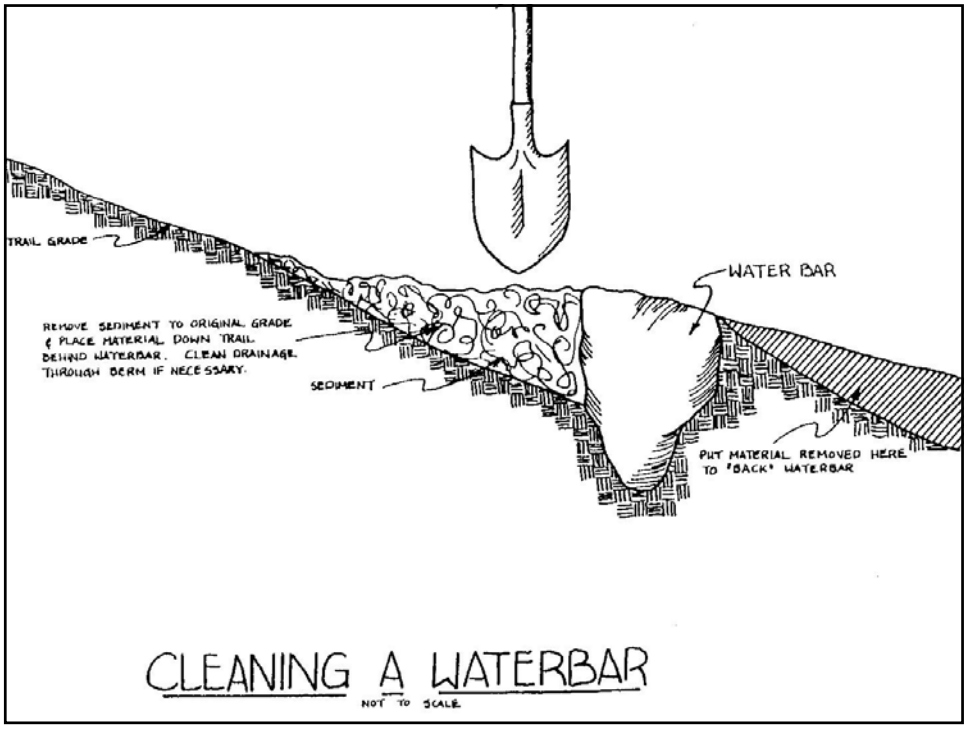
Grade Dips

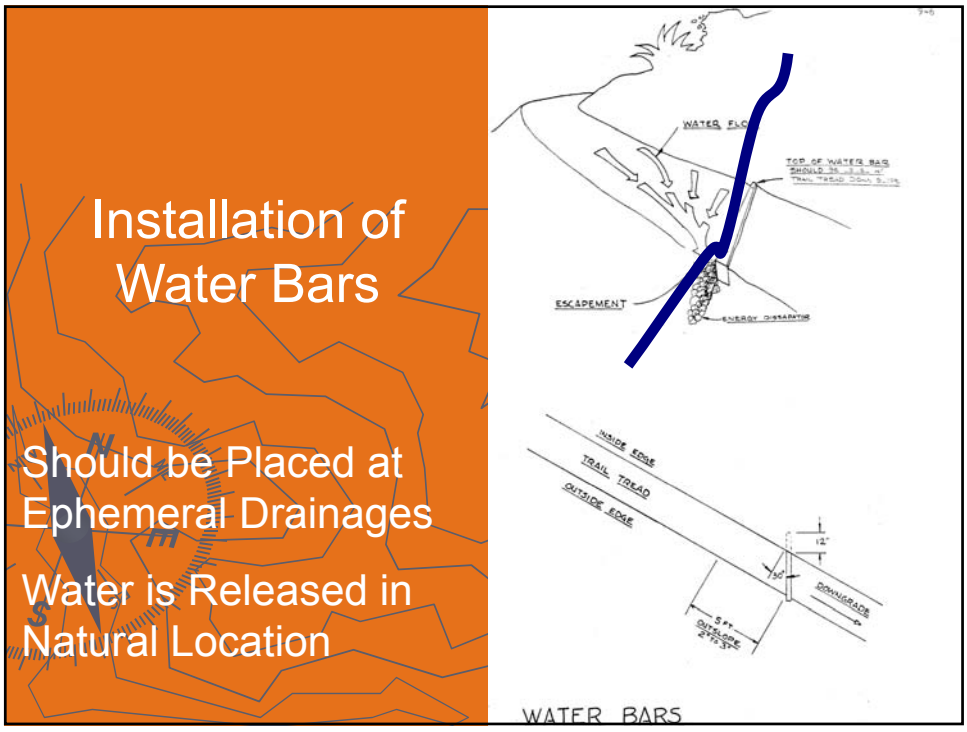


Profile of a Grade Dip



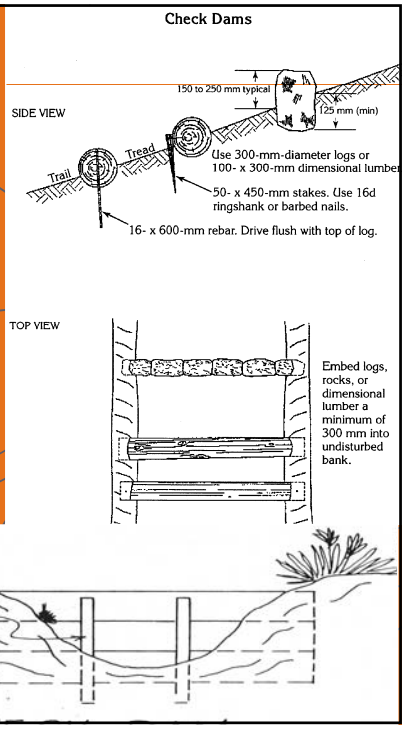
Grade Dip at Ephemeral Drainage

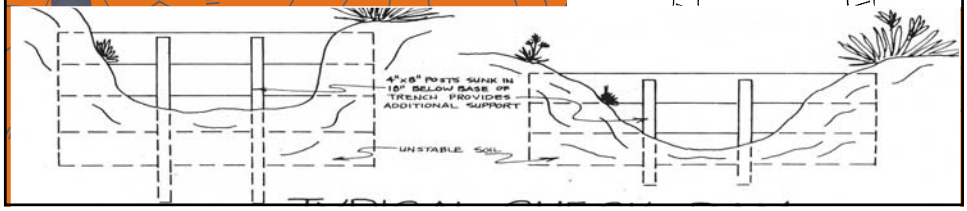

TRAIL GRADE
WATER BAR
REMOVE SEDIMENT TO ORIGINAL GRADE & PLACE MATERIAL DOWN TRAIL BEHIND WATERBAR. CLEAN DRAINAGE THROUGH BERM IF NECESSARY.
SEDIMENT
PUT MATERIAL REMOVED HERE TO "BACK" WATERBAR
CLEANING A WATERBAR
NOT TO SCALE


Installation of Water Bars
Should be Placed at Ephemeral Drainages
Water is Released in Natural Location
WATER FLO
TOP OF WATER BAR
ESCARPMENT
ENERGY DISSIPATOR
INSIDE EDGE
TRAIL TREAD
OUTSIDE EDGE
12"
30°
DOWNGRADE
5 FT
OUTSLOPE
WATER BARS

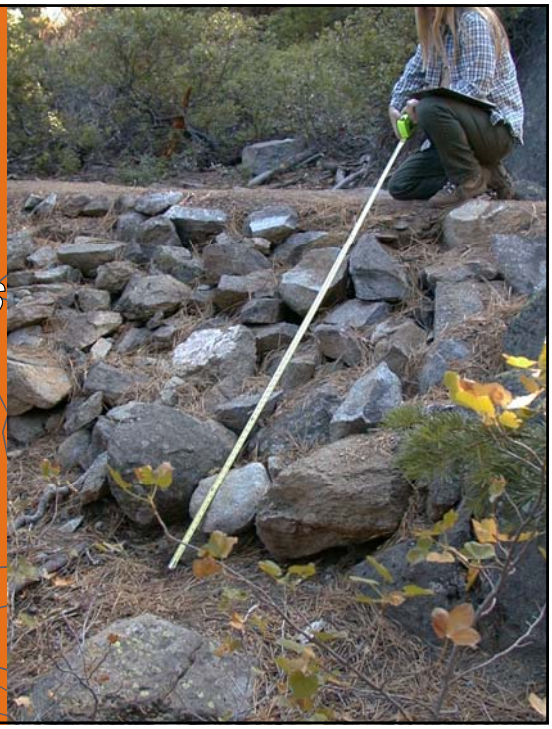
Check Dams

- Used in Severely Eroded Trail Beds
- Stop Gap Measure to Slow Erosion
- Typically in Fall Line Trails



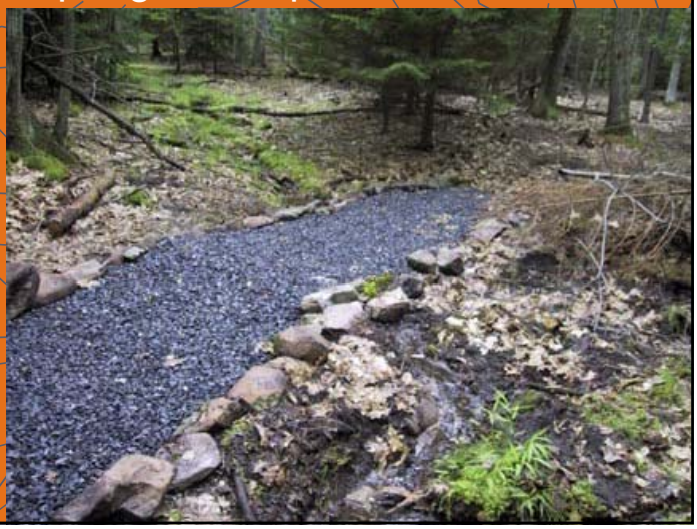


Drain Lenses or Horizontal French Drains



Drainage Lenses

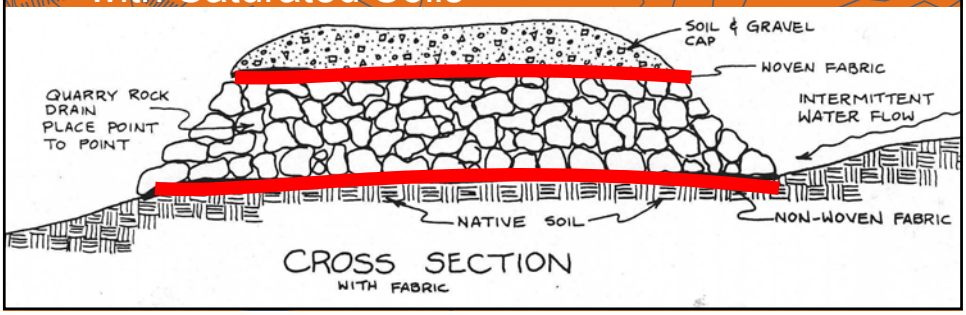
- Used on Saturated Trails Bisected by an Ephemeral Spring or Seep.



- Used Where Saturated Soils Create Muddy Unstable Tread

Drainage Lenses

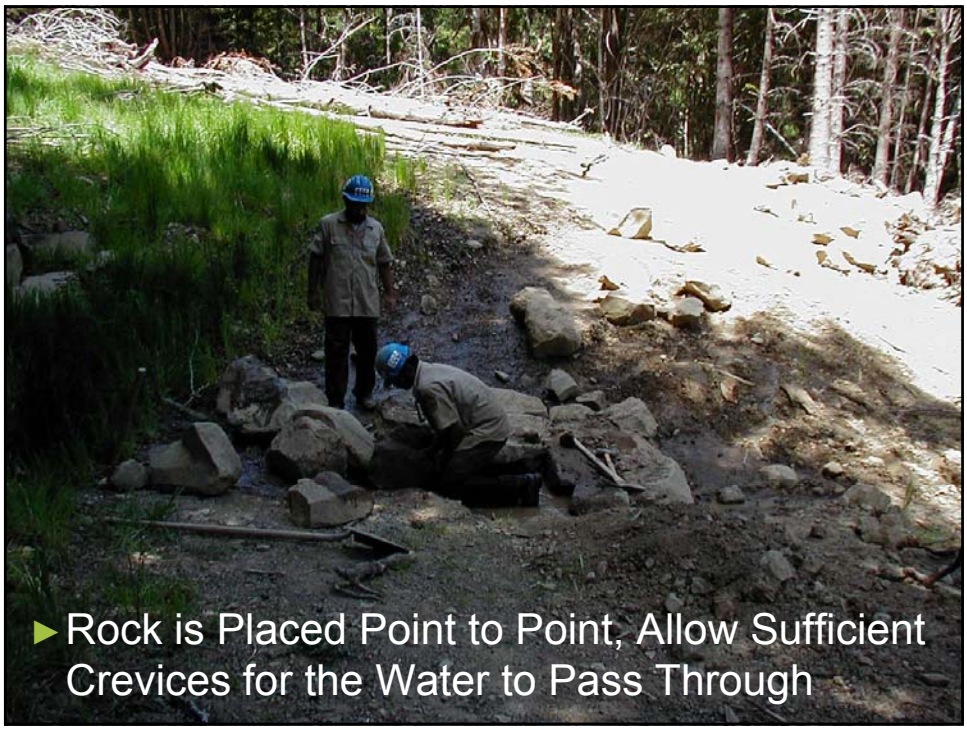
- Use of Geotextiles is Recommended
- Sandwich the Rock Lens Between Two Layers of Geotextile Fabric
- Stable Base is Established, the Rock is Protected from Contamination or Plugging with Saturated Soils

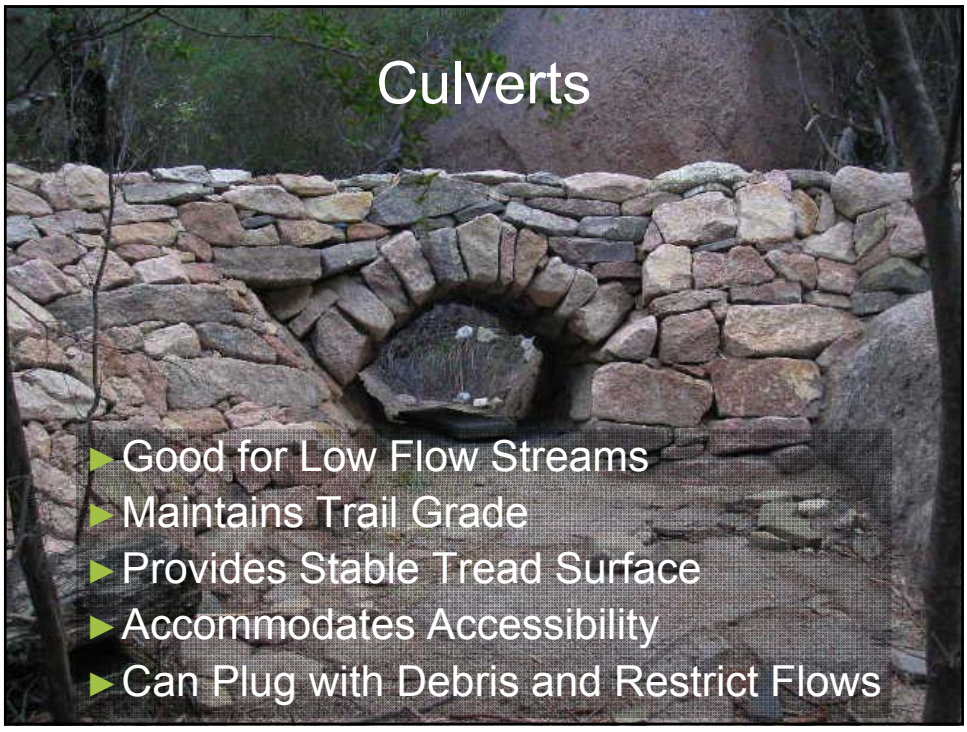


Construction of a Drainage Lens

Saturated Trail Bed is Fully Excavated


Void is filled with Large Angular Quarry Rock
The Bottom Course is the Largest Quarry Rock


Rock is Placed Point to Point, Allow Sufficient Crevices for the Water to Pass Through


Culverts
Good for Low Flow Streams
Maintains Trail Grade
Provides Stable Tread Surface
Accommodates Accessibility
Can Plug with Debris and Restrict Flows


Squash CMP Culvert

Good for Low to Moderate Flows

Fair Crossing for Experienced Hikers

Can Obstruct the Stream Channel and is Not Accessible

Step Stone Crossing

Drainage Structures Review

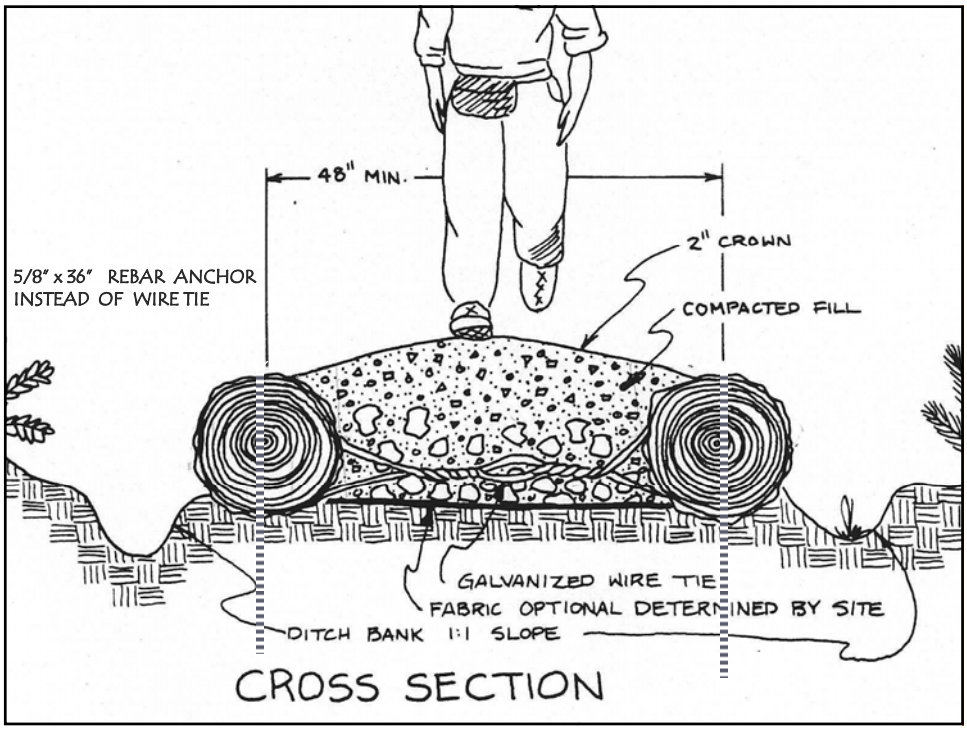
- Do Not Fall into the Trap of Placing Water Bars as Catch All Solution
- Tread and Drainage Maintenance is Crucial to Keep Water in Natural Drainages
- Find the Source
- Trail Use will Erode Trail Tread
- Cyclic Slough, Bern and Crown Maintenance Keeps Original Drainage Design
- Drainage Structures Need to be Placed in Natural Drainage Features

Trail Tread Structures

- Turnpikes and Causeways
- Corduroy
- Gravel Surfacing or Stoning
- Super Elevated Curves for ATVs
- Hardened Tread - Rip Rap, Pavers; Synthetic and Masonry
- Trail Steps

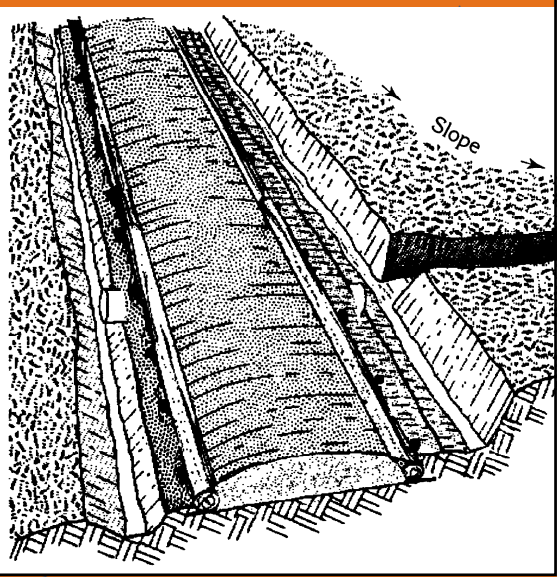
Turnpikes

- Turnpiking is the Process of Hardening the Trail by Raising the Tread Surface Above the Ground through Boggy, Wet or Muddy Areas
- A more Permanent Structure
  - Preferred over Puncheon when Material and Work Force are Available
- It Consists of Two Curb Logs, Placed Parallel to the Trail, filled with Rock, Gravel or Soil, then Crowned



Turnpikes

- Water can be Collected and Channeled by Parallel Ditches
- Drain Lenses or Culverts Carry the Flow Under the Turnpike and Drain Down slope

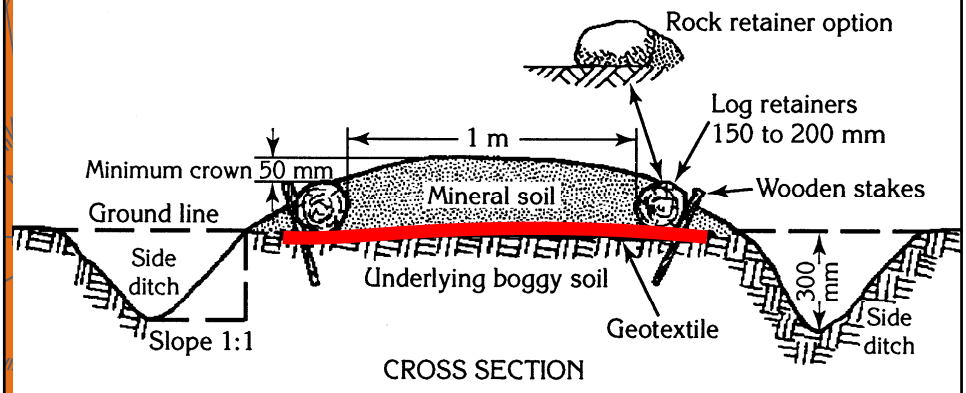


Turnpikes

- A Common use of Geotextiles in Trail Maintenance is in the Construction of Turnpikes
- Prior to Building up the Trail Bed with Soil or Gravel, a Course of Non-woven Fabric Cloth is Laid Down
- This Semi-Impervious Material Helps Provide a Stable Base for the Application of Soil or Gravel and Reduces the Contamination of Fill Material by the Saturated Base Soils.

Turnpikes

Geotextile Placement



CROSS SECTION

Causeways

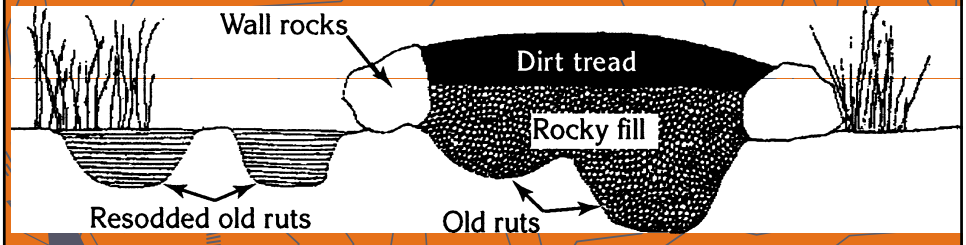
Rock Causeway

- Elevated Section of Trail
- Trail Tread Contained by Rock
- Bridges Permanent or Seasonally Wet Areas.

Hoover Wilderness
Inyo National Forest

Causeways

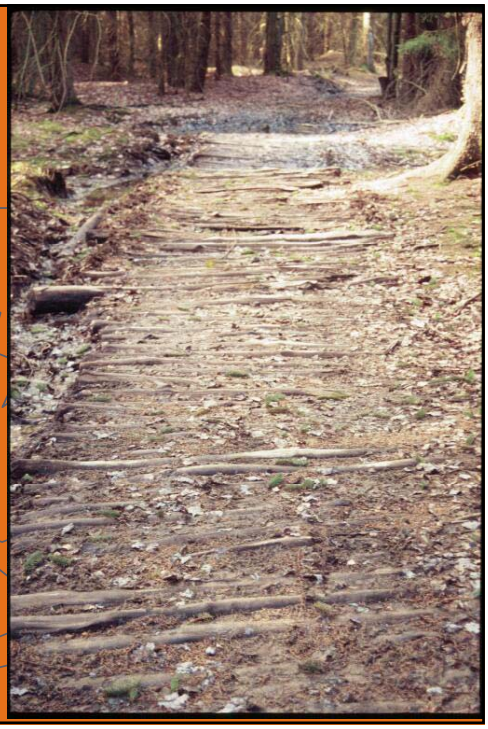
- Causeways can be Used to Consolidate Areas of Multiple Trail Ruts into One Trail and Allow Re-vegetation



- A Causeway is Built to be as Inconspicuous as Possible. Do not Over Build, Design Close to the Minimum Height and Length Needed to Cross the Problem Area.

Corduroy

- Laying of Horizontal Small Logs in Boggy Areas
- High Resource Impacts
- Temporary fix
- Will Only Last if Logs are Saturated Year Round



Stoning or Gravel Surfacing

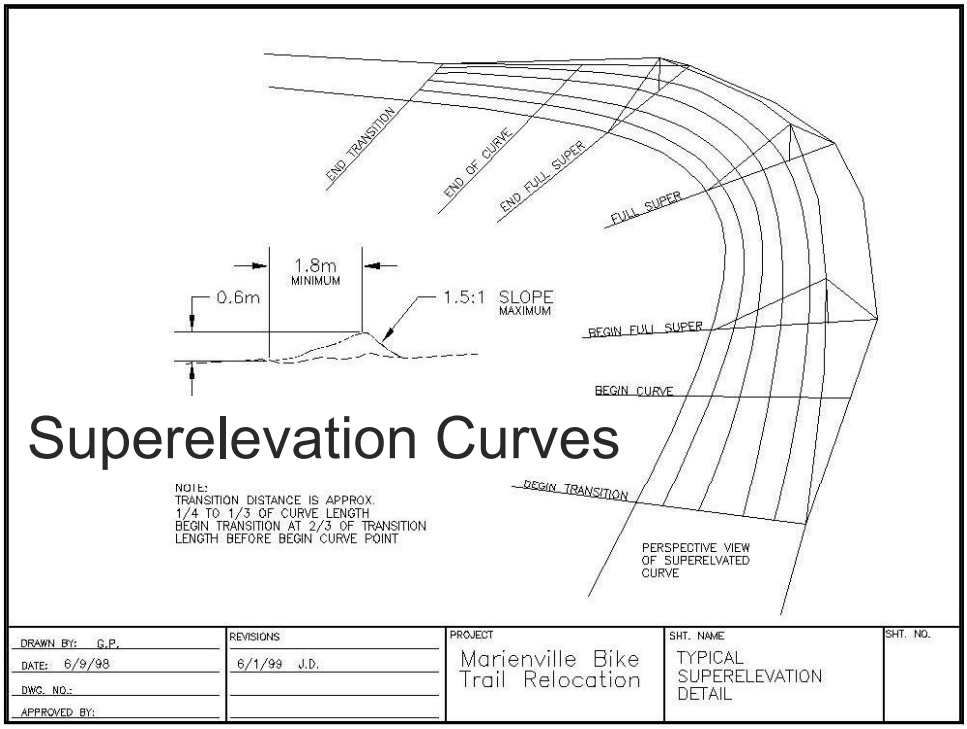
- Stoning Provides a Hardened Maintainable Tread for Horse, OHV, Mountain Bike or Accessible Users
- The Trail Tread shall be Crowned Where Cross Slope is at or Near 0%. Outsloped on Sidehill Construction
- Trail Tread Subsurface Grades shall be Prepared to Appropriate Drainage Design before Surfacing Placement
- Stoning is Labor and Equipment Intensive


Use with Geotextile if Ground is Saturated
Be Cautious Not to Over Use Fabric


Compaction is Critical
Proper Moisture Content is Required
Grand Canyon National Park

ATV Trail with Fall Line Alignment Captured Water, Before Surfacing

ATV Trail with Fall Line Alignment After Surfacing



Superelevation Curves

- Used to Provide Riding Experience For OHV Trails
- Need Routine Maintenance

Trail Hardening with Pavers

- Hardening to Protect Low Capability Soils and Tread from Aggressive User Types
- Labor Intensive
- Must Be Placed Appropriately for Aesthetics
- Tread Specifications Are User Type Dependent

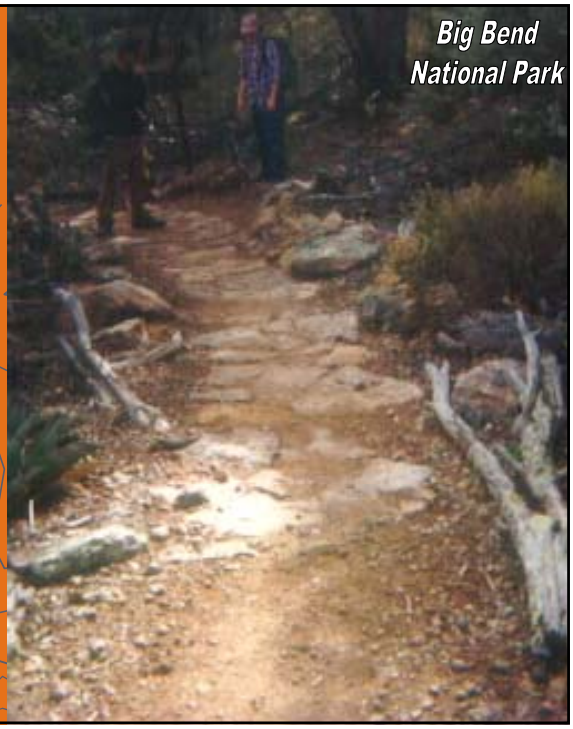

"Grout" or Fill Blocks

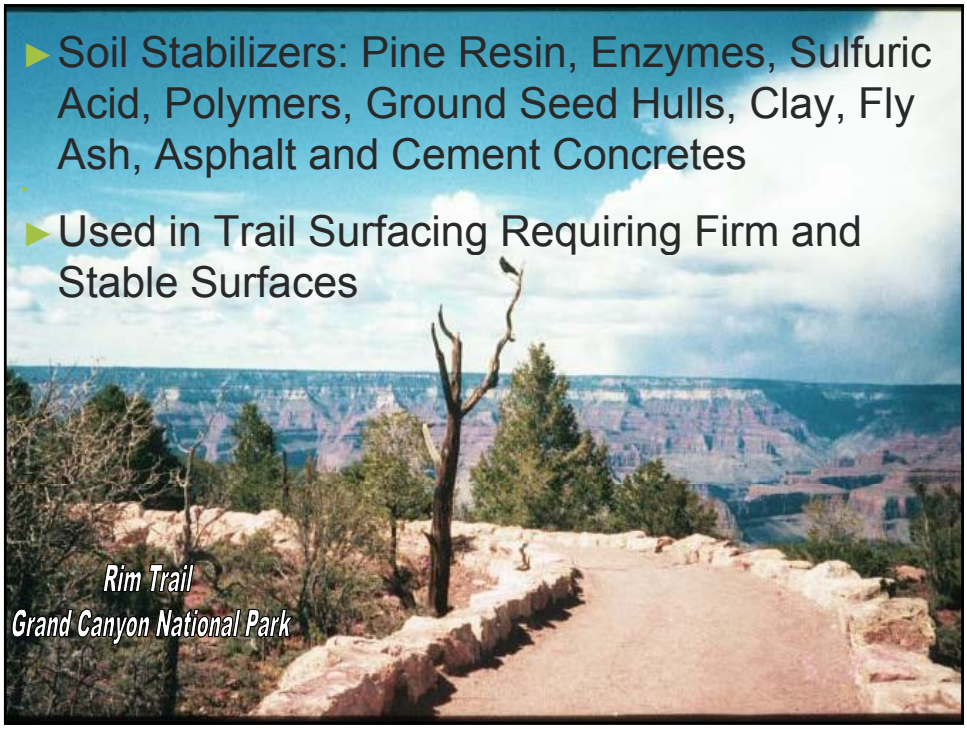

Can be Used to Harden
Superelevate Curves for Tread Protection

Geosynthetics Tread Stabilization

Trail RipRap

- Stone Placed Tread Surfacing
- Like Cobblestone Pavement
- Used Primarily on Primitive Earth Mountain Trails
- High Skill Level Needed



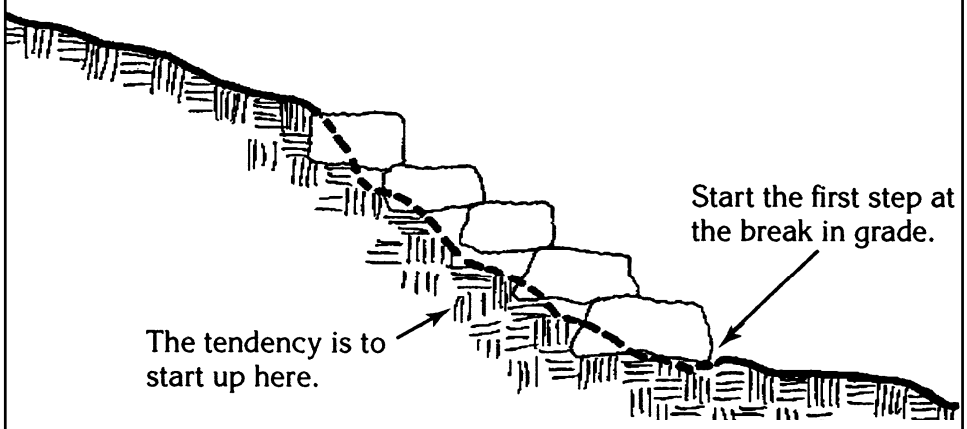

Soil Stabilizers: Pine Resin, Enzymes, Sulfuric Acid, Polymers, Ground Seed Hulls, Clay, Fly Ash, Asphalt and Cement Concretes
Used in Trail Surfacing Requiring Firm and Stable Surfaces
Rim Trail
Grand Canyon National Park


Accessible
High Use
Equestrian/Mountain Bikes and poor soil treads
"Cold Patch Asphalt"

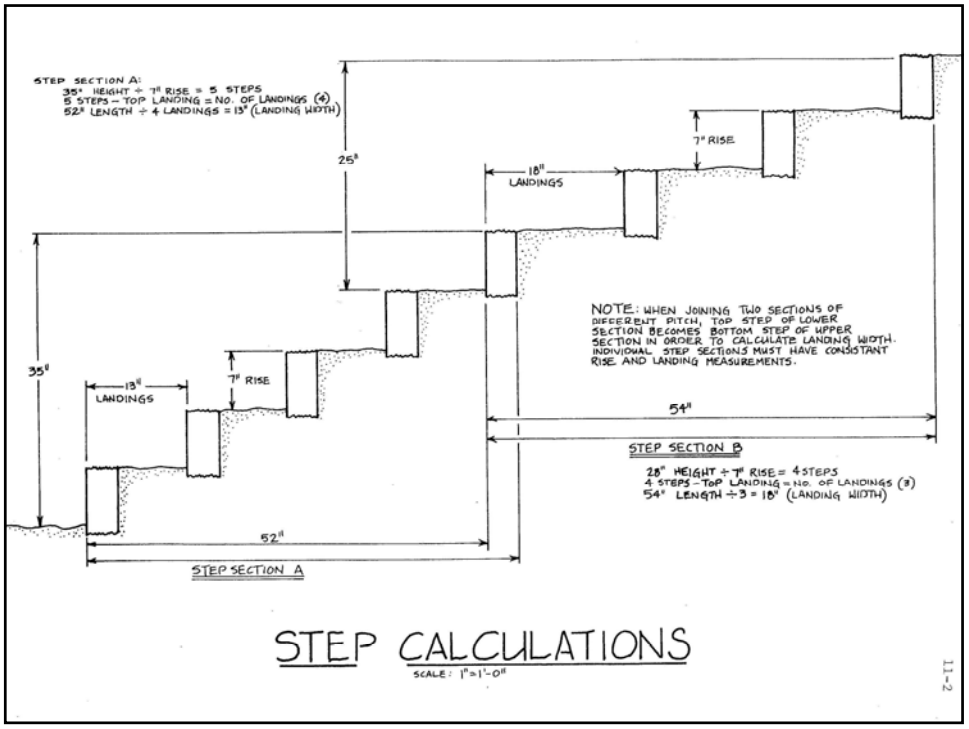
Trail Steps

- Trail Steps are Used for Rapid Elevation Gain in Steep and/or Low Soil Capability Trail Tread
- Steps are Designed and Placed at Proper Locations
- Steps should be Thoughtfully Placed on the Trail to Ensure that Hikers will Use them
  - They have to have Evenly Spaced Rise and Run, otherwise they will be avoided by hikers
- Do Not Install "Fanned" Steps

Step Construction



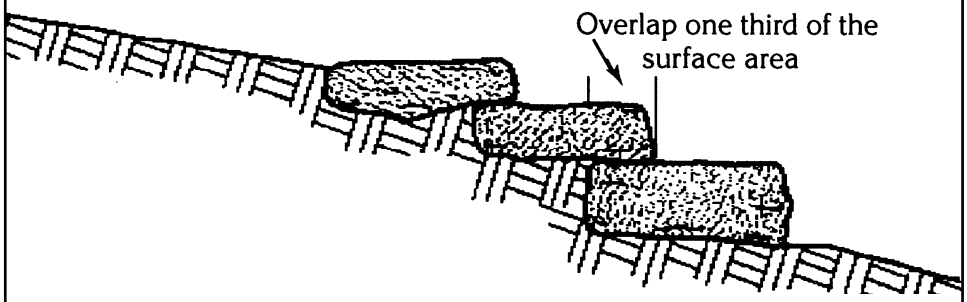
- Work up from the Bottom of a Slope.
- Makes it Easier to Determine Best Placement and the Optimum Mix of Stabilization Techniques



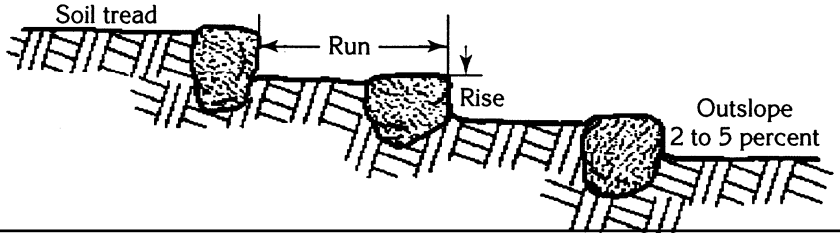
Rock Steps

- If the Setting is Appropriate, Rock Steps are Aesthetically Pleasing and will Last Longer than Wood Steps
- Suitable Rock may not be Readily Available in Some Locations. Additional Effort Required to Transport Rock may be Justified.
- Rocks should be 50 to 100 pounds and Span as much of the Tread Surface as Possible
- High Skill Level for Quality Rock Steps

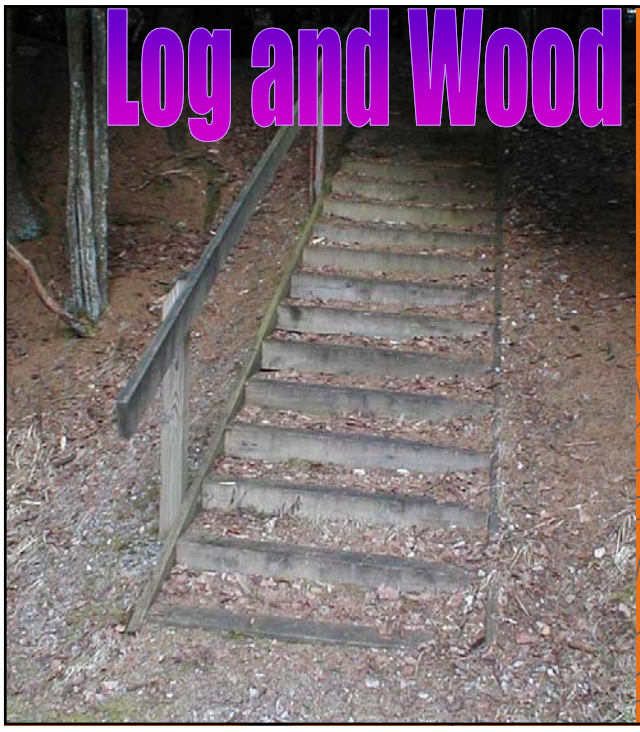
Overlapping Rock Stairway



Rock Riser Stairway

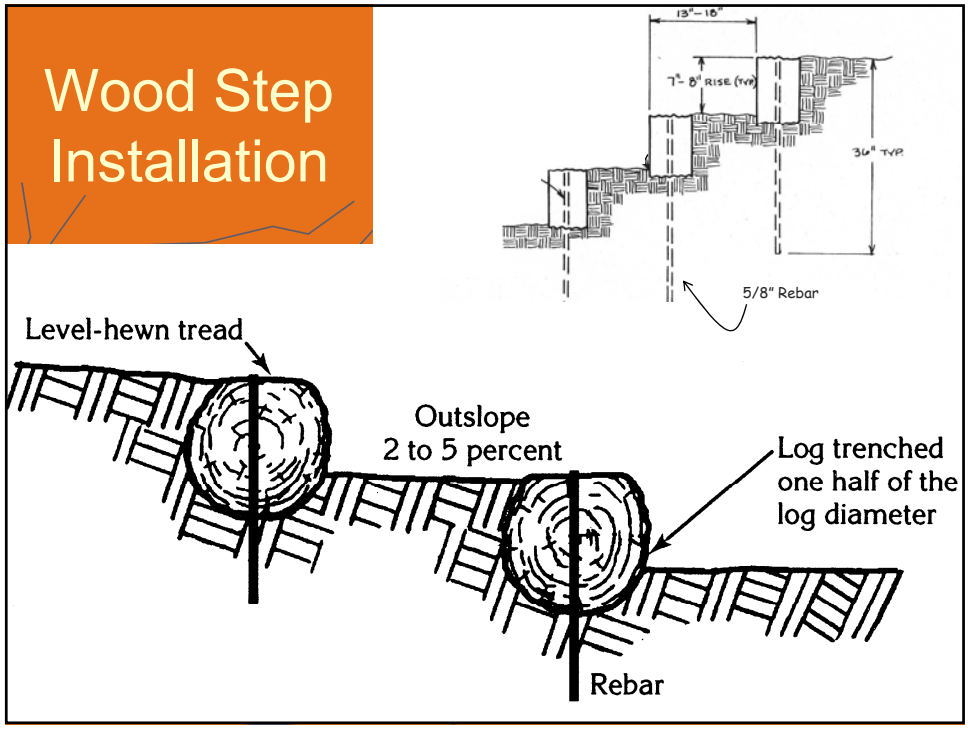


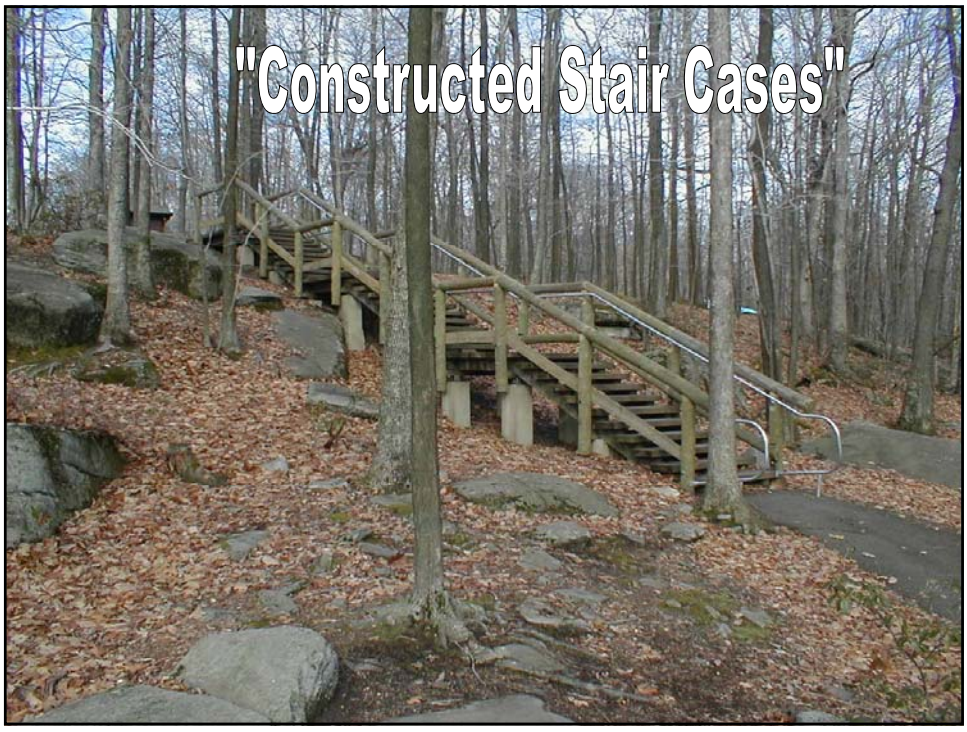
Log and Wood Steps



- Skill Level to Install is Lower
- Designed The Same as any Step Carriage

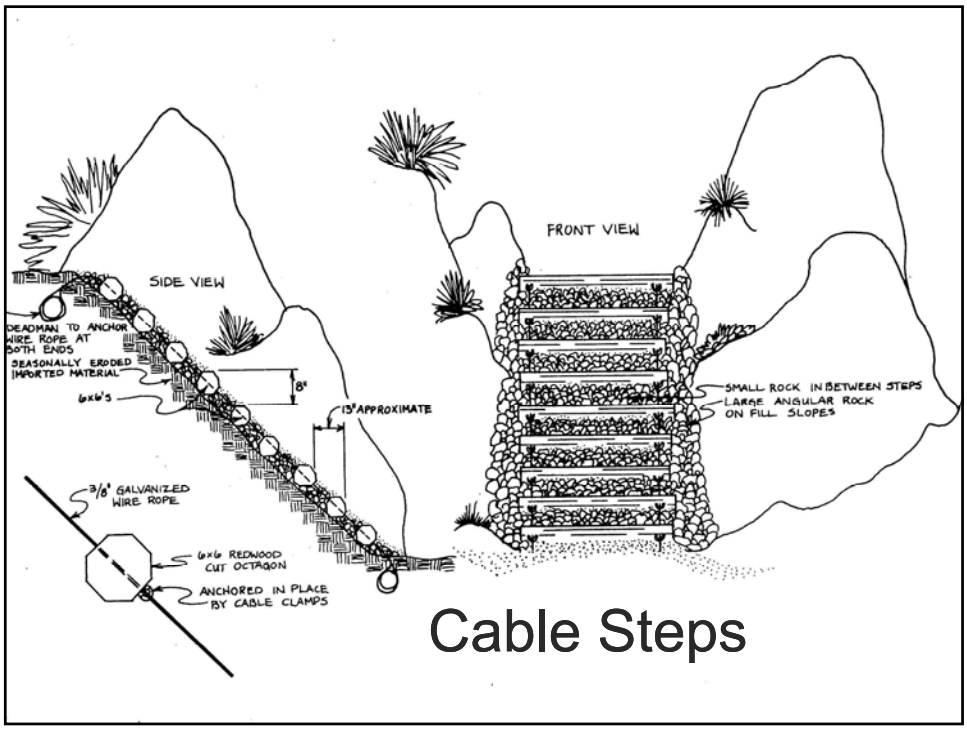
Wood Step Installation



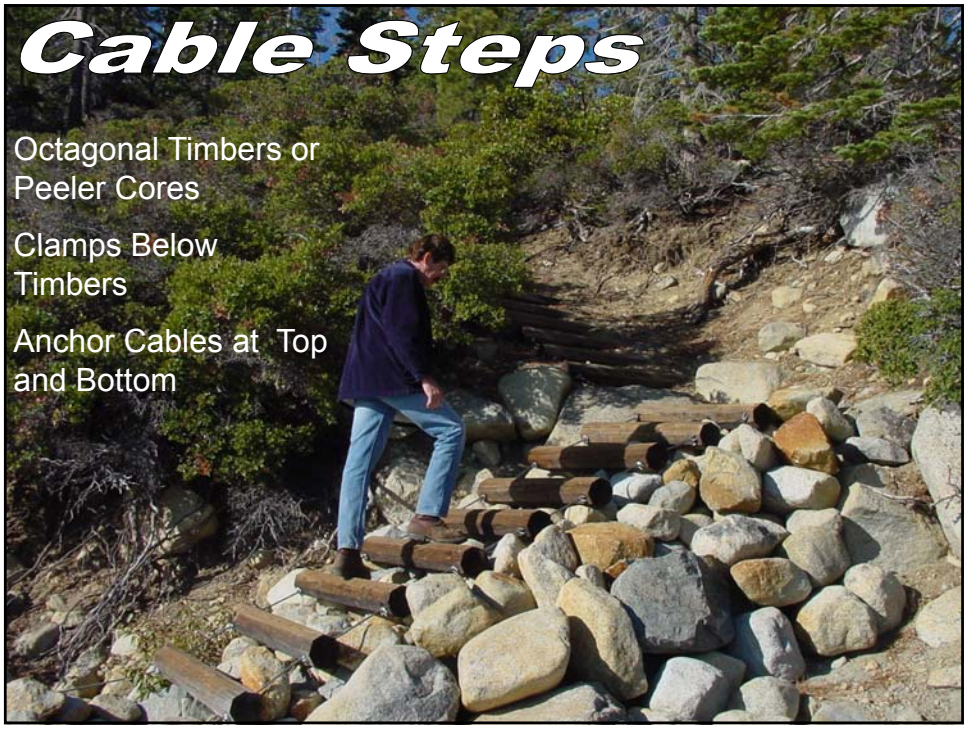


Cable Steps

- Steps that are Draped over a Surface of Highly Erodible Material such as Sand or Seasonally Flooded Areas -- Ocean Bluffs or River Access
- Rise and Run of the Step Section Determined by the Slope of the Hillside
- Some Locations may Require Importing Suitable Material Beneath the Step Section so a Reasonable Rise and Run is Obtained



Cable Steps



Retaining Walls

- When do You Need Retaining Walls?

To Stabilize Cut Banks

To Stabilize Fill Slopes

To Repair Stream Bank Erosion

7/9/2008

To Go Around Minor Control Points

7/9/2008

To Provide Foundations for Trail Structures

7/9/2008

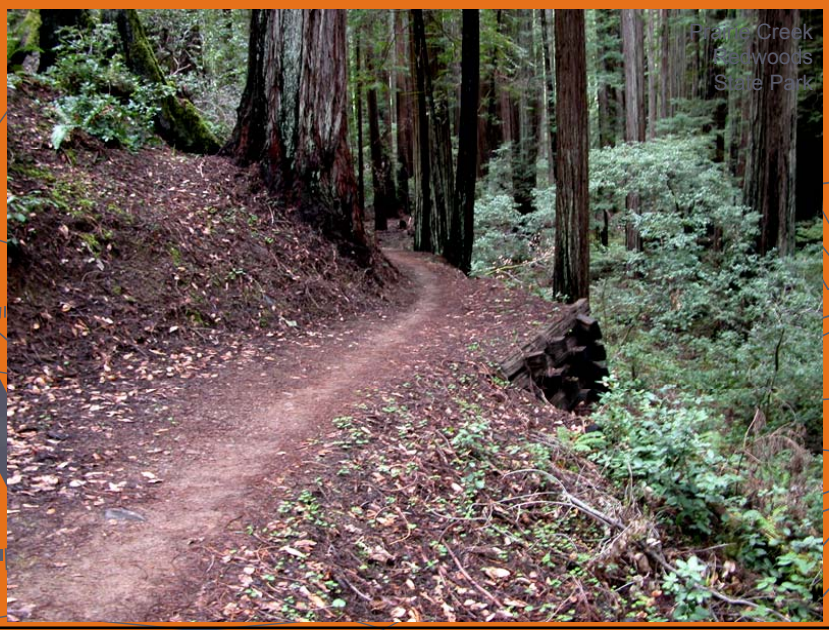
Retaining Walls

- What Advantages are there to Building a Retaining Wall?

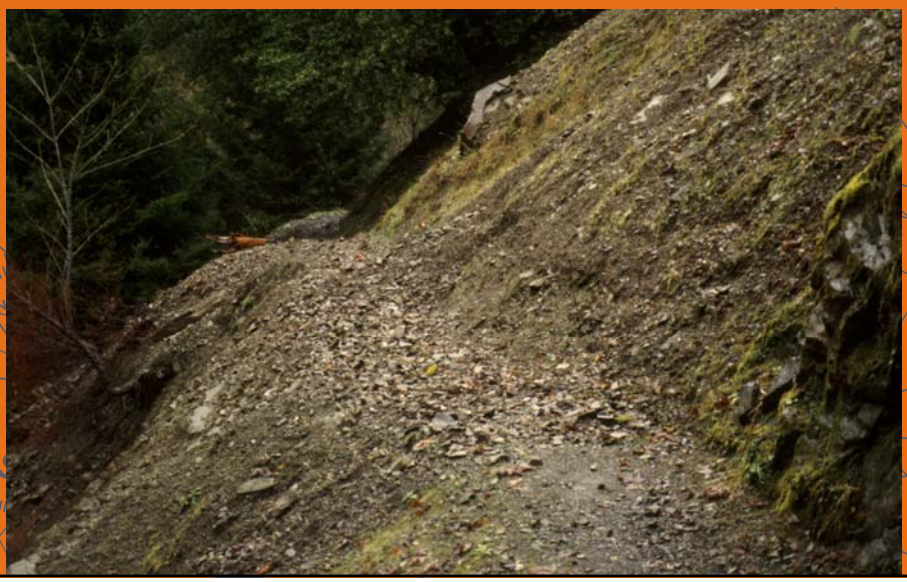
Allows You to Keep Your Trail Alignment

Allows You to Maintain Your Trail Grade

Protects Resources



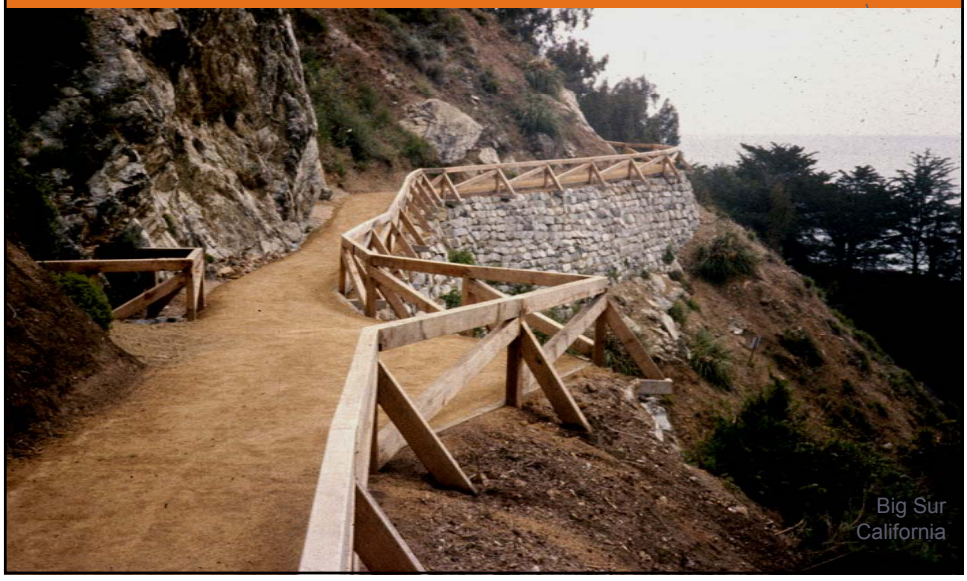
Reduces Debris Falling Onto Trail



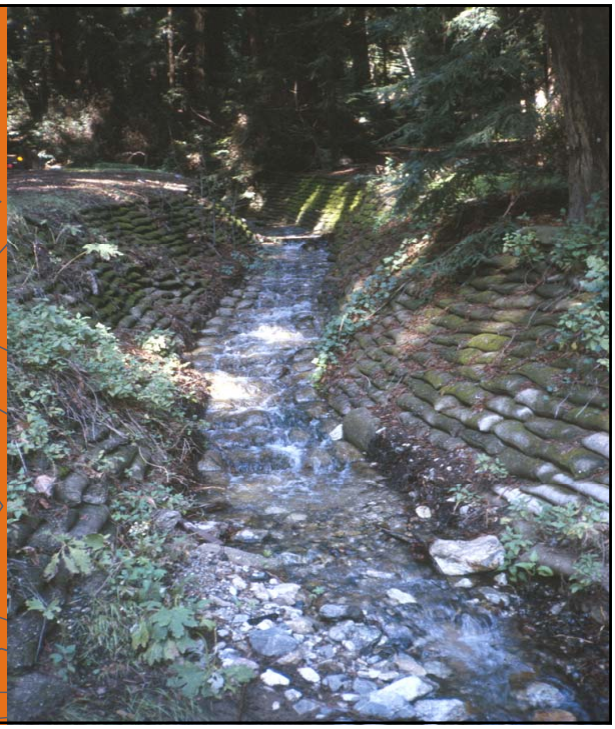
Retaining Walls

- What Disadvantages are there to Building a Retaining Wall?

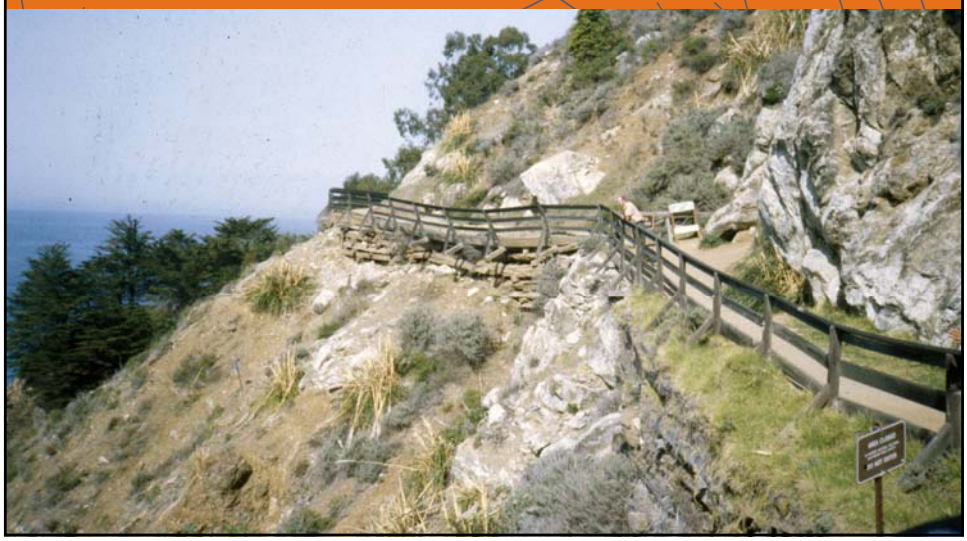
Expensive to Build Either in Labor or Materials or Both



May be Obtrusive to the Natural Setting



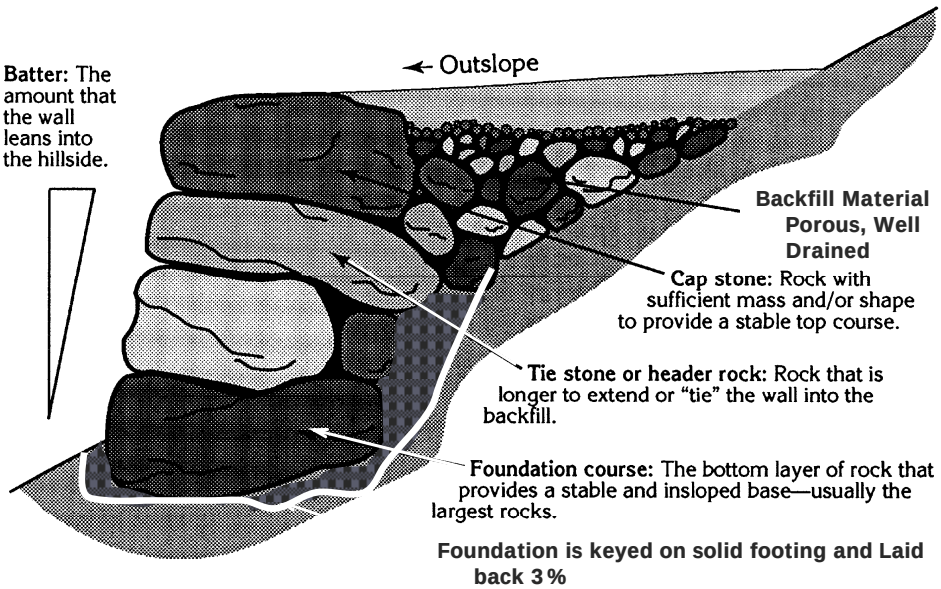
Long Term Maintenance and Replacement Cost



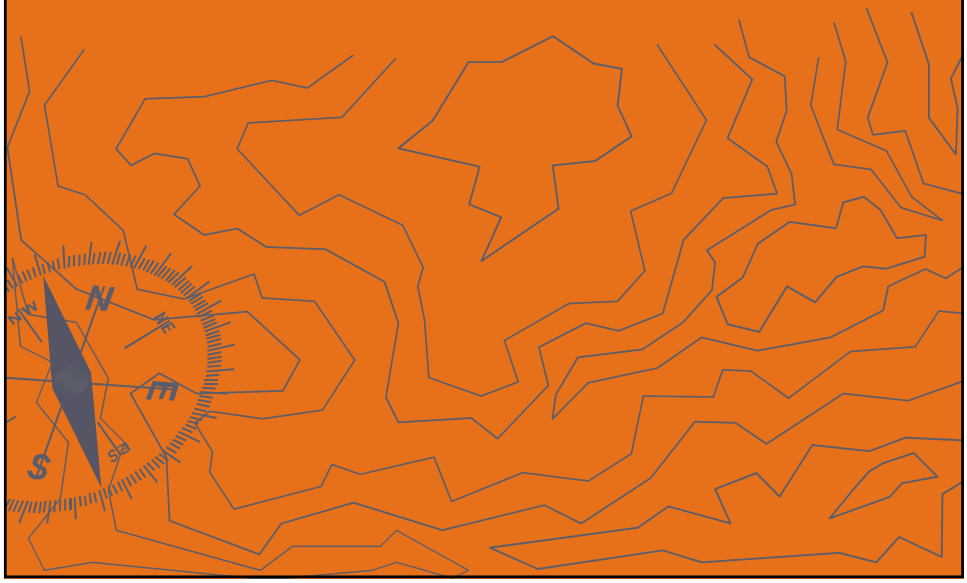
Retaining Walls

- Retaining Walls Basics

Crib Wall Terminology



Types of Retaining Walls



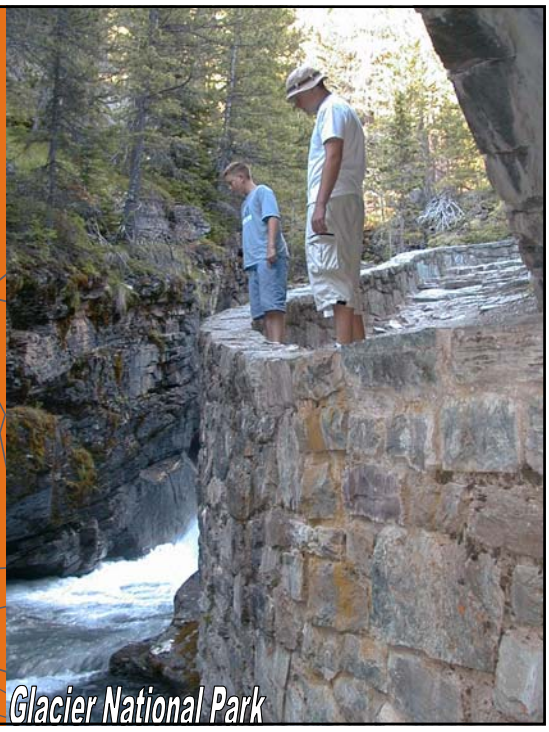
Wood Crib Wall

Patrick's Point
State Park
California

"Celluar Confinement"

Gabion Retaining Wall

Mortored Wall




Scuptured Concrete Wall


Board & I-Beam
Retaining Wall

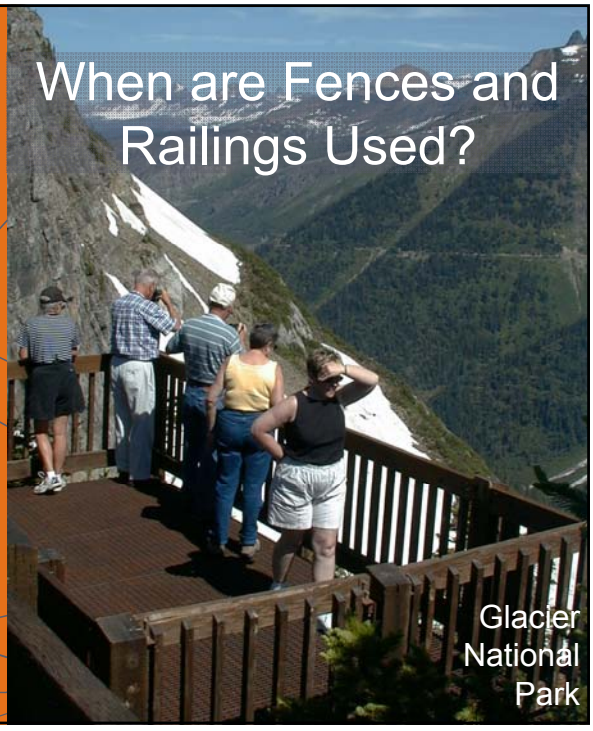
When Building a Retaining Wall Consider The Following :

- Logistics
- Aesthetics
- Cost
- Labor Source
- Design Effectiveness

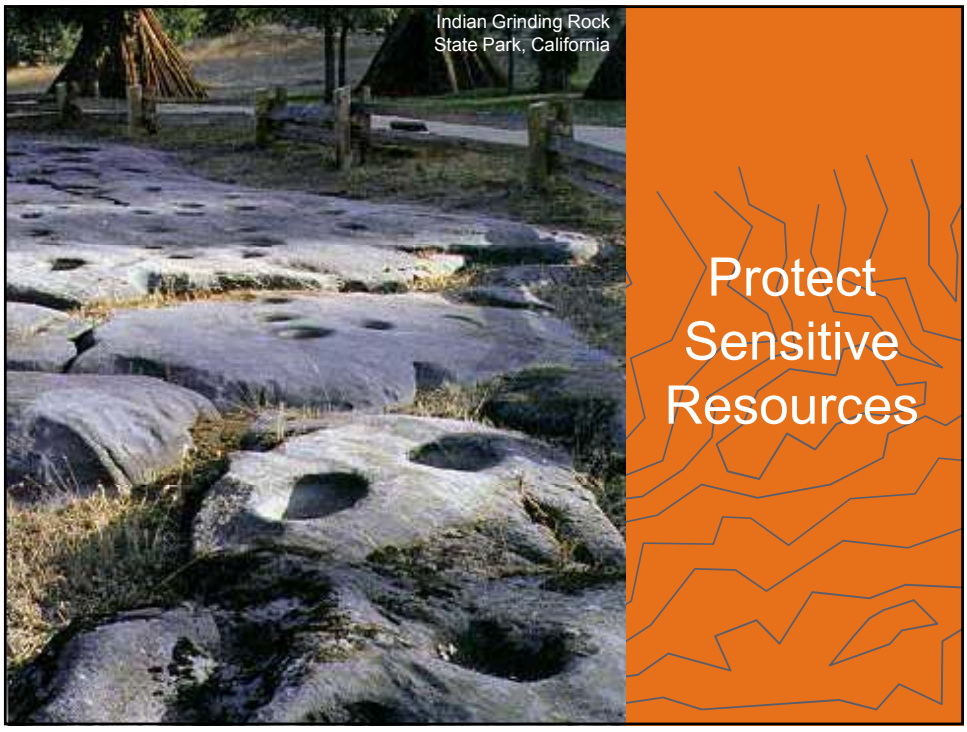
Retaining Wall Design Review

- Provide a Solid and Level Foundation with a 3% Set Back
- Higher Walls may Require a Batter
- Anchors are Needed to Transfer Weight to the Rear of the Wall
- Provide for Drainage to Reduce Pore Pressure

Fences and Railings



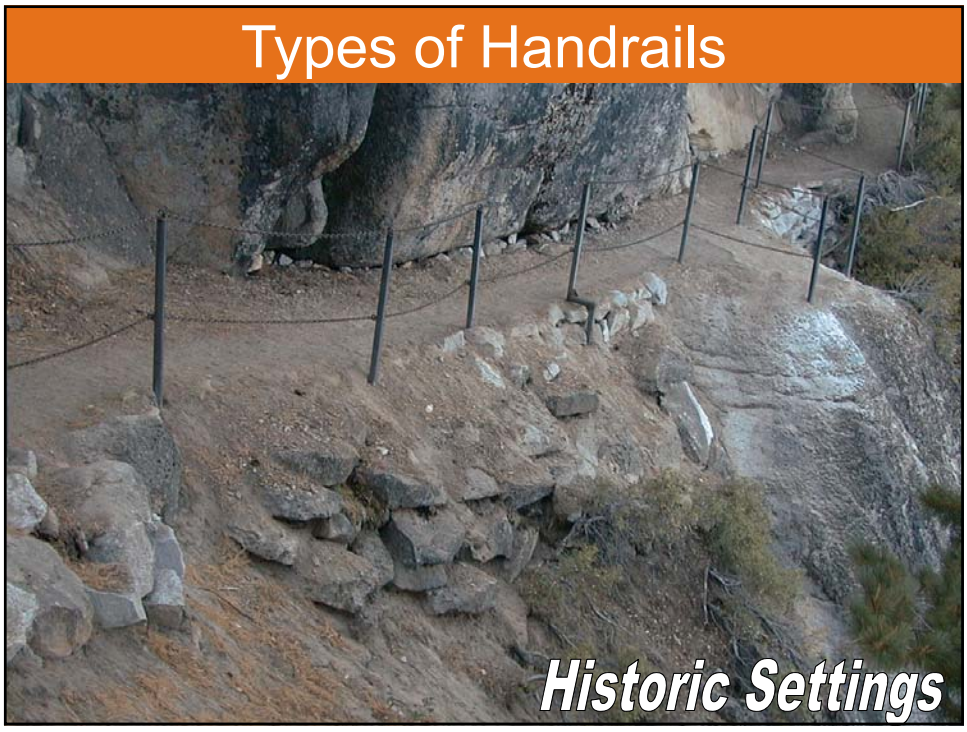

Protect Users from Harm
Grand Canyon National Park

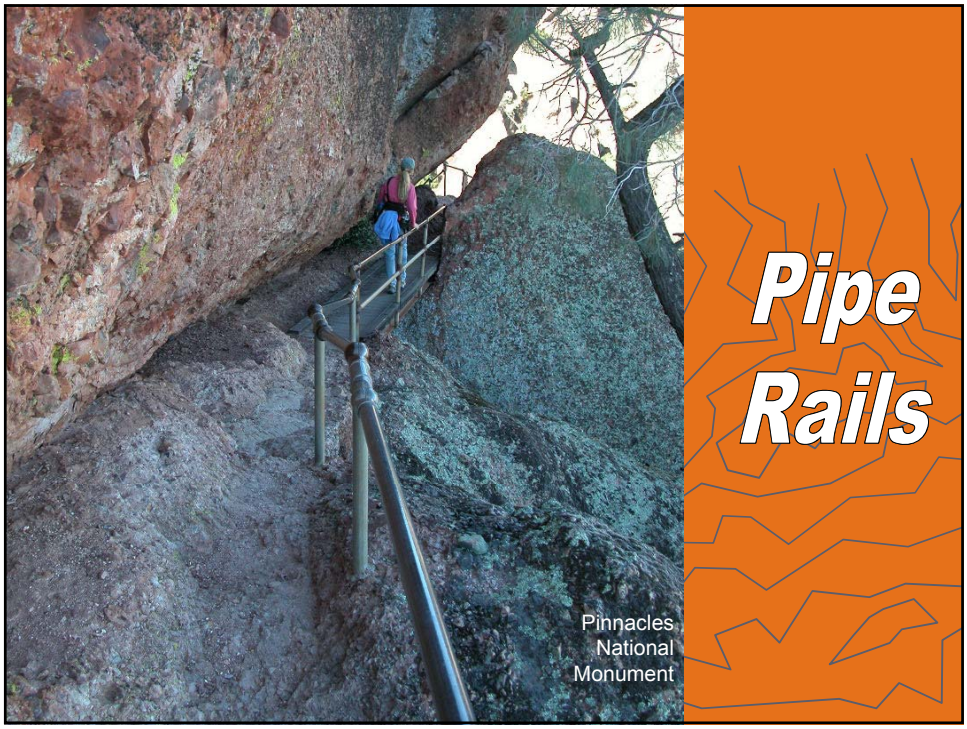

Indian Grinding Rock State Park, California
Protect Sensitive Resources


Provide Direction in High Use Areas
Zion National Park

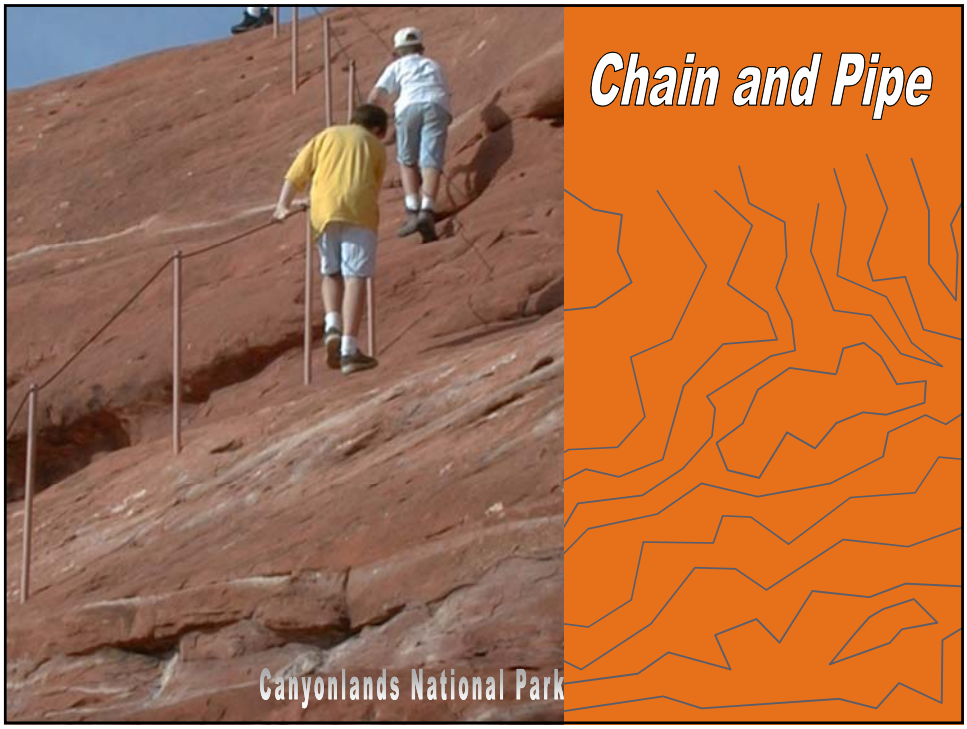

Focus Attention at Overlooks
Great Falls Virginia
C & O Canal National Park


Safe Handholds on
Steep Rock Trails
with Unsafe Tread
BLM Lands
St George
Utah


Types of Handrails
Historic Settings

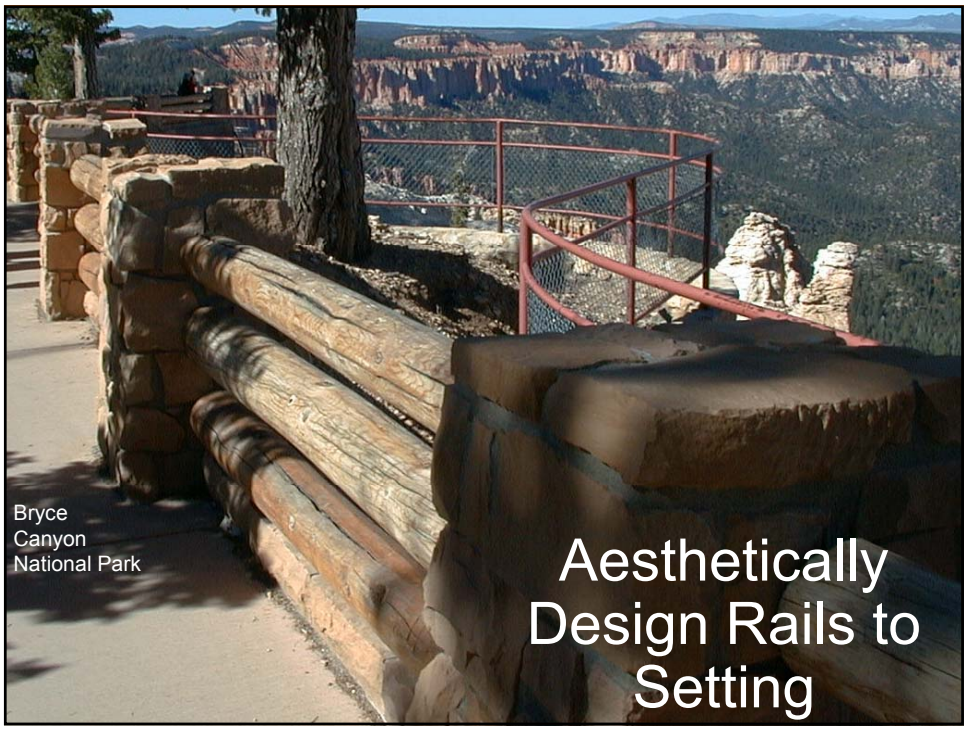

Pipe Rails
Pinnacles National Monument


Wood Railing
Plumas Eureka State Park California


Chain and Pipe
Canyonlands National Park

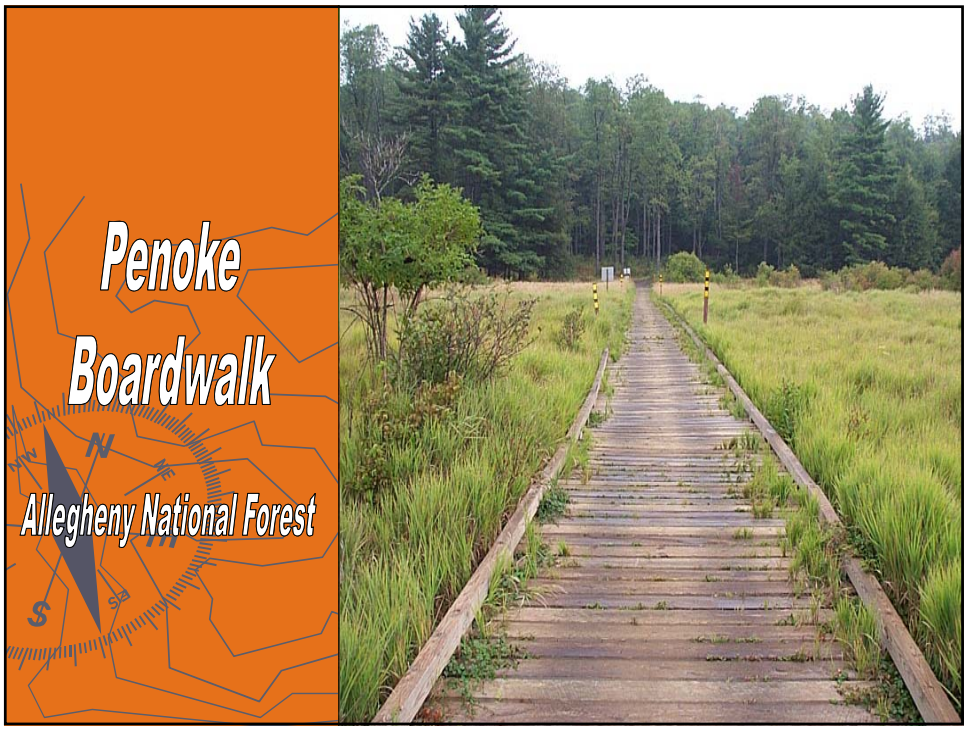

Timbers
Canyonlands National Park


Mortored Wall
Emerald Bay Lake Tahoe

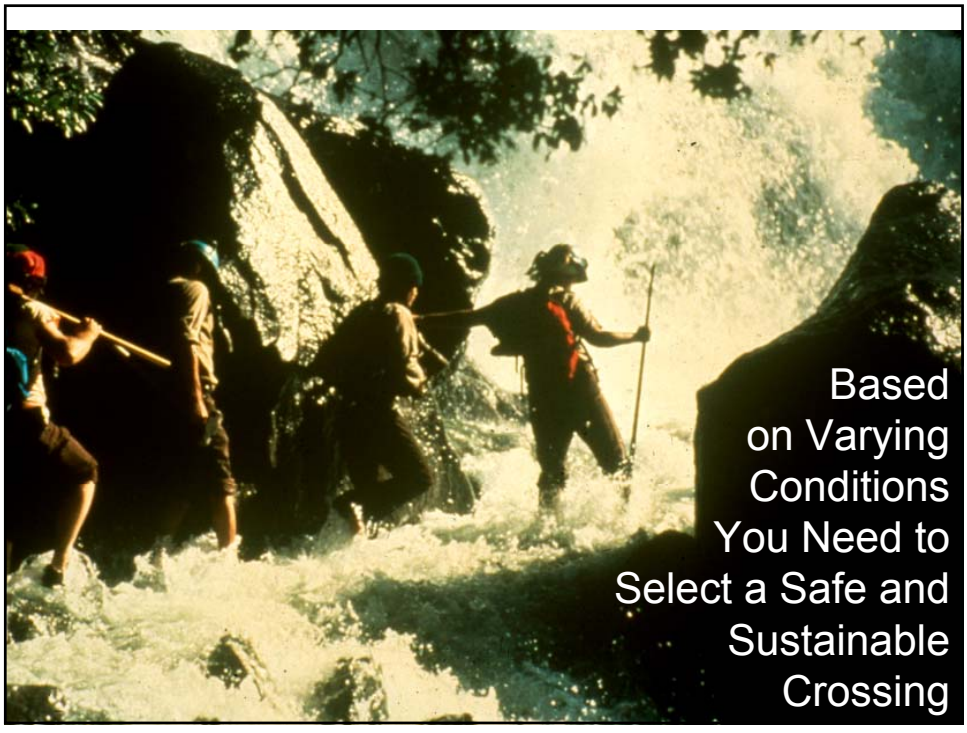

Bryce
Canyon
National Park
Aesthetically
Design Rails to
Setting

Puncheons/Boardwalks

- Good for Low Flow Streams, Marshes
- Maintains Trail Grade
- Provides Stable, Accessible Tread

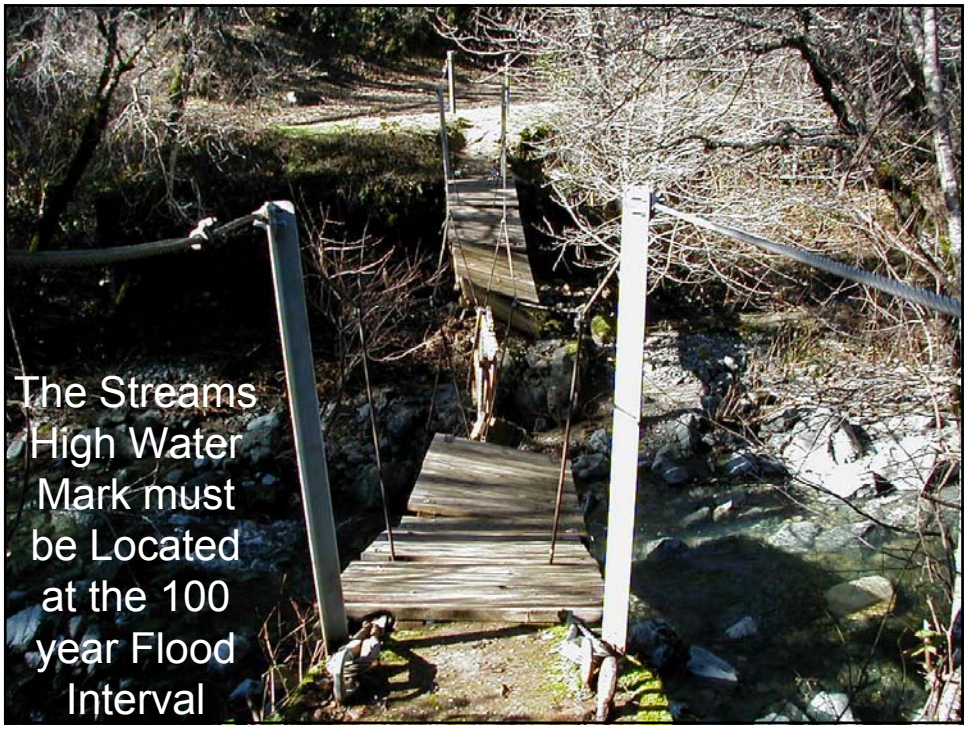


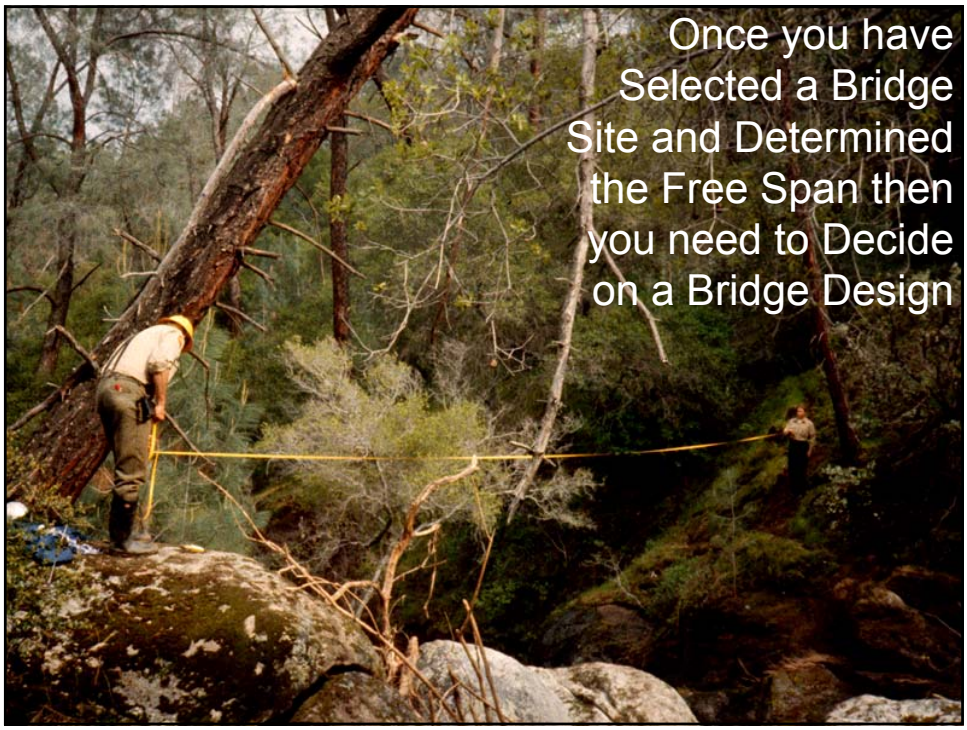
Bridge Structures



Before Deciding to Build a Bridge Consider Other Crossing Designs

- Bridges are Expensive to Build and Maintain
- Bridges can have Greater Resource and Visual Impacts


The Streams High Water Mark must be Located at the 100 year Flood Interval


Once you have Selected a Bridge Site and Determined the Free Span then you need to Decide on a Bridge Design


Log Crossing


Cable Bridge

Log Bridge

- Good Backcountry Choice
- Uses Native Materials
- Rustic
- Might Violate Resource Policies
- Hard to Verify Structural Integrity
- Assembly Labor Intensive/High Skill

Milled Stinger Bridges

Good for Short to Moderate Spans, Semi- Rustic Appearance, Easy to Assemble and Engineer Load Capacities

Drop down deck design


Steel I-Beam
Wind River
Mountains
Wyoming
Good Moderate to Long Spans
Easy to Assemble
Engineered Load Capacities
Can be Visually Obtrusive and
Longer Spans are Limited and Heavy


Prefab Steel Arch
Good for Short to Long Spans
Engineered Load Capacities
Longer Spans are Heavy and Difficult to Place
Can be Visually Obtrusive

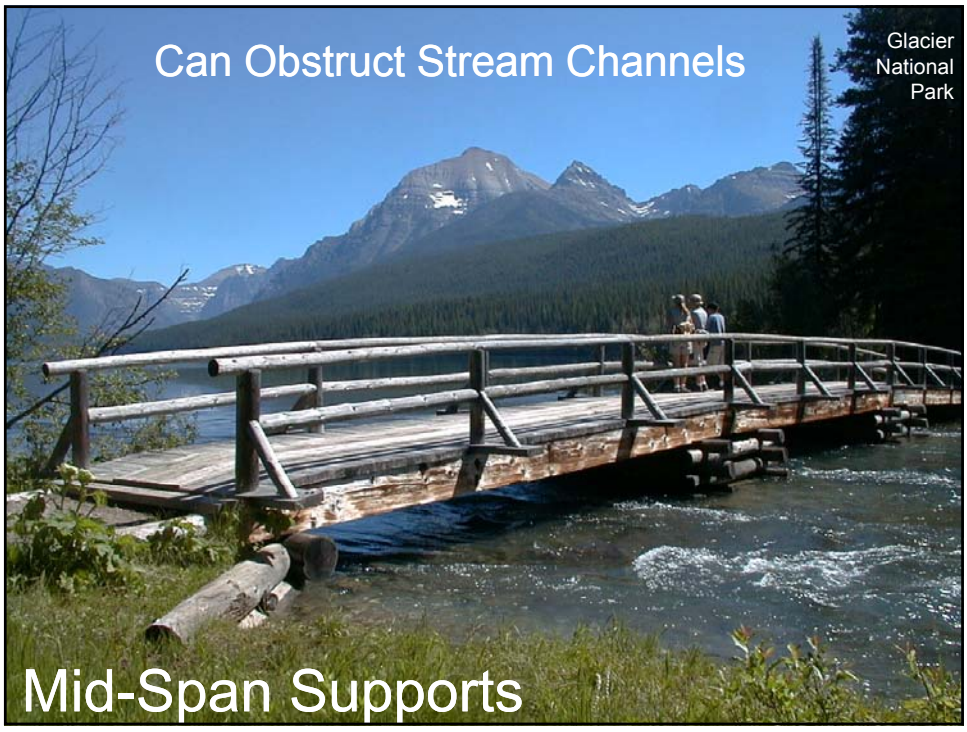

Fiberglass Truss
Good for Short to Long Spans
Light Weight
Easy to Assemble
Engineered Loads
Can be Visually Obtrusive
Longer Spans are Limited


Wood Overhead Truss Bridges
Good for Short to Long Spans
Reduce Material Weight
Engineered Load Capacities
Higher Skill Level
Can be Visually Obtrusive


Wood Truss


Suspension Bridge
Good for
Very Long Spans
Engineered Loading
Difficult to Build
Can be Visually Obtrusive


Mid-Span Supports
Good for Increasing the Span of Conventional Bridge


Can Obstruct Stream Channels
Glacier National Park
Mid-Span Supports


Mitigating Resource Impacts
Install
Silt Fences
Straw Bales
Fabric Drop Cloths
Capture Sediment
Wood Chips
Sawdust
Building Materials


Bridge Abutments
Earth or Soil Abutment

Native Rock Abutments

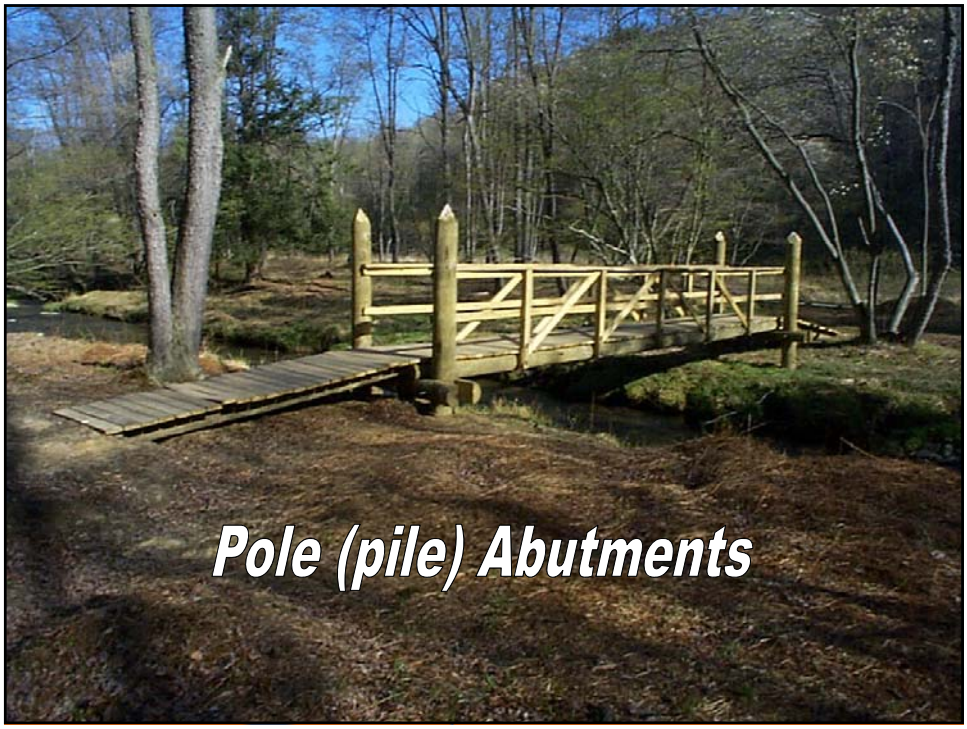
Concrete Abutments


Humboldt
Redwoods
State Park
Abutments Located in or Adjacent to the Stream Channel must Start a Minimum of Two Feet Below the Scour Line


Rock Wall Abutment
Rocky
Mountains
National
Park

Mud Sill Abutments

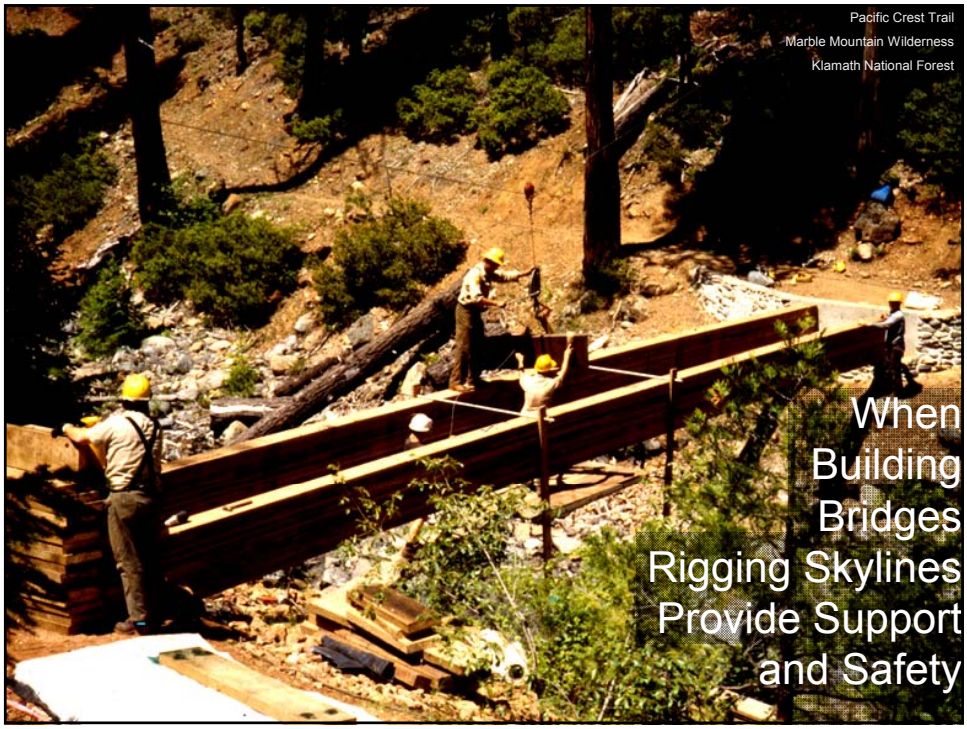
Plastic Wood or Composites are Excellent Abutment Materials


Pole (pile) Abutments


I-Beam & Plank

By:

- Hand
- Rigging
- Crane
- Helicopter


Pacific Crest Trail
Marble Mountain Wilderness
Klamath National Forest
When
Building
Bridges
Rigging Skylines
Provide Support
and Safety


Bridge
Scaffolding
is Used to
Help
Assemble
the Bridge

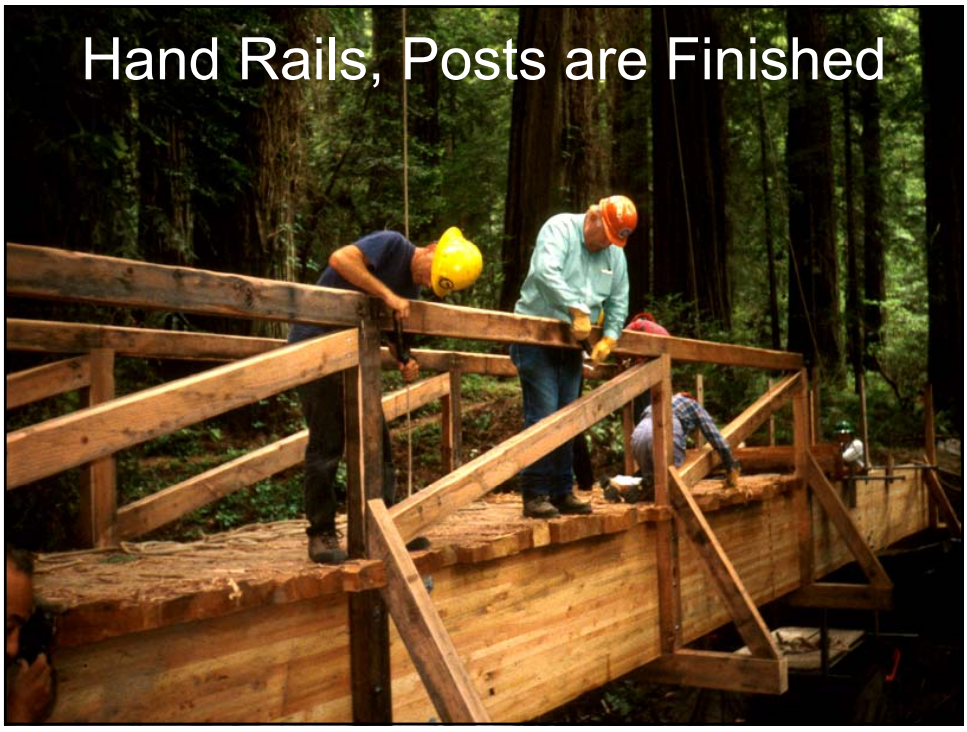

Stringers
In Place
Diaphragms
Installed


Soil Dams Protect the
Bridge Stringers, Post and Decking

Post are Installed

Next the Decking Is Laid


Hand Rails Installed Last


Hand Rails, Posts are Finished

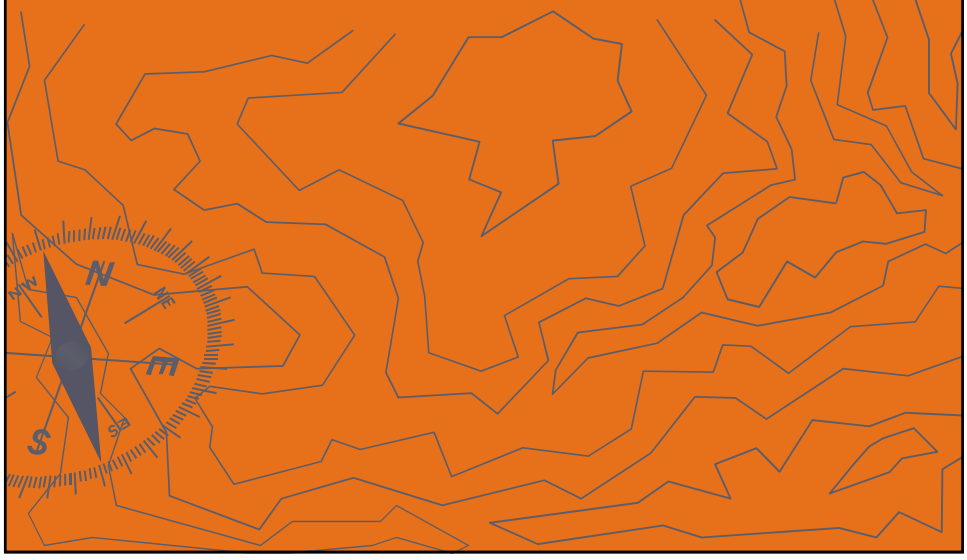
Site is Cleaned Up and Rehabilitated

Trail Obliteration and Rehabilitation

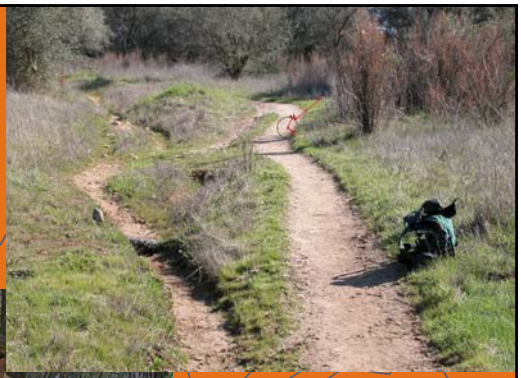
Trail Obliteration and Rehabilitation Session Objectives

- Identify Where and When to Obliterate and Rehabilitate Trails
- Identify Techniques for Trail Obliteration and Rehabilitation
- Understand the Benefits of Full Rehabilitation
- Identify Where to Obtain Vegetation for Obliteration/Rehabilitation Projects
- Review Examples of Trail Obliteration and Rehabilitation Projects

When is trail Obliteration or Rehabilitation Necessary ?



Trail Narrowing and Multiple Trails

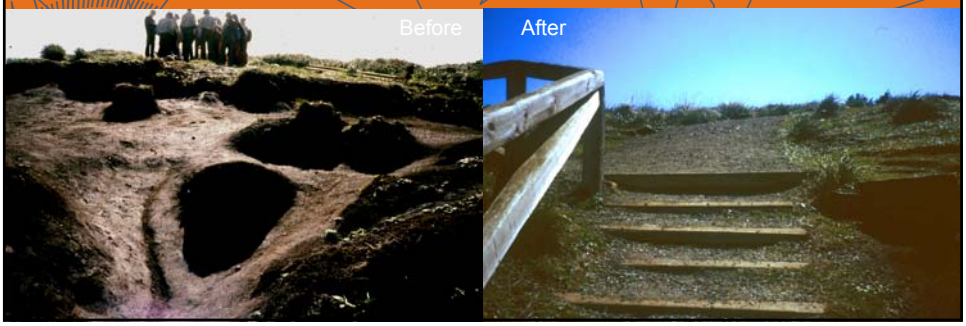


When Trails are Rerouted

Work Site Restoration

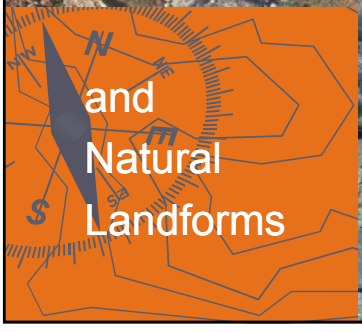
Finishing and Softening New Trail Construction

Trail Obliteration and Rehabilitation Process



Remove Organics to Prepare Soils
Aerate and De-compact Soils

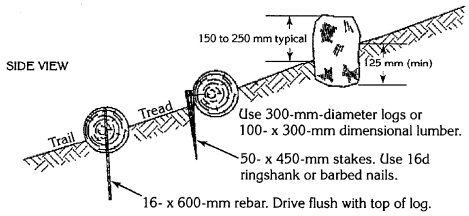
Topographically Restore Hydrology

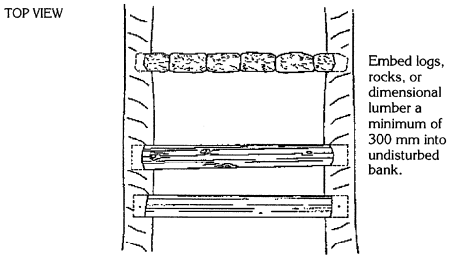


and Natural Landforms

Some Cases Check Dams Need to be Constructed to Stop Sub Surface Flow

Check Dams





This can be Done by Hand or Equipment

Harvest Vegetation from Within Watershed

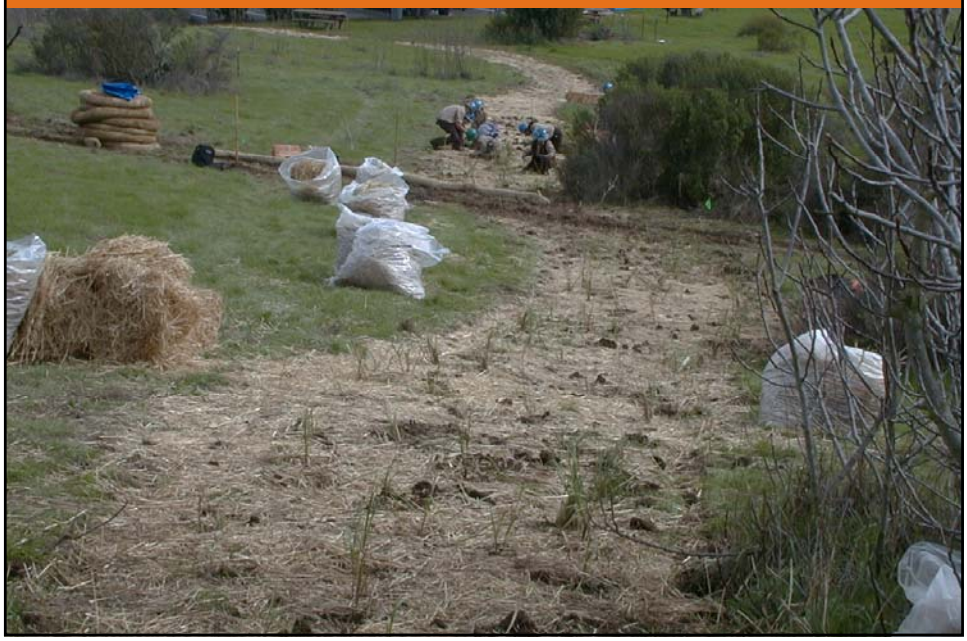
- Use New Trail Construction Areas First

- If no Harvesting is Possible, Collect Seed and Propagate at Nursery

Perform Rehab Project During Best Season for De-compaction and Re-growth to be Successful

Use Woody Debris, Rocks To Discourage Use

Mulch with Native or Weed Free Organics



Sign and Inform Public

Rehabilitation Techniques Work in All Climates

Before

After


Before
After


Before
After

Trail Obliteration and Rehabilitation

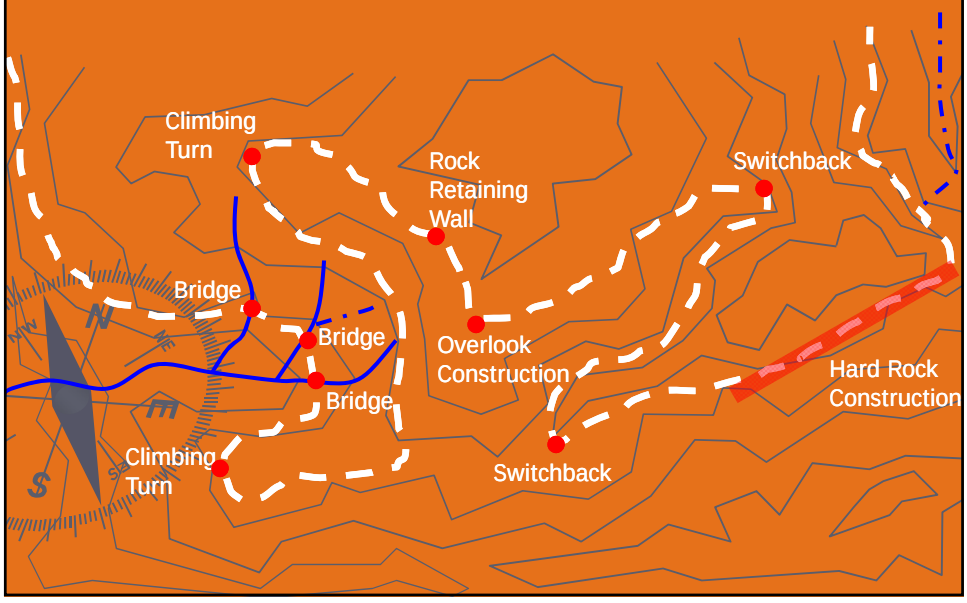
Summary:

- Good Trail Management Always Rehabilitates Abandoned Trail Alignments
- Use Obliteration and Rehabilitation Techniques to:
  - Narrow Trails
  - Remove Multiple Trails
  - Eliminate Way Trails
  - Eliminate Worksite Impacts
  - Soften New Trail Construction
- Follow Sound Rehabilitation Practices and Establish full Hydrological Restoration

Trail Obliteration and Rehabilitation

- Transplant Vegetation from within the Same Watershed and Preferably from the New Construction Sites
- Transplant Vegetation when Plants are Dormant and Conditions are Wet and Growth Season Coming
- Install Interpretive Signing to Enlist Public
- Construct New Trail Routes Prior to Obliterating and Rehabilitating the Abandoned Route

Development of Trail Projects



Development of Trail Projects

Session Objectives:

- Introduce Trail Construction Project Development
- Understand Trail Construction Work Logs and Use of Standardized Specifications
- Organize Prescriptions From Trail Construction Work Logs to Develop Labor and Materials Estimates and Project Scope
- Develop Time Line for Work Considering Appropriate Season

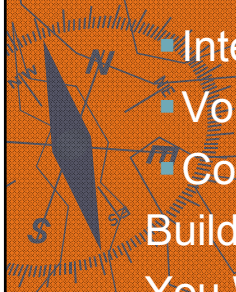
Development of Trail Projects

- Now We Have Learned the About
  - Trail Construction
  - Different Types of Trail Structures
  - Needed Rehabilitation

How Do We Develop a Project for Implementation?

How do you Estimate and Set Up a Trail Work Project?

- What Information is Needed to Document Field Designs to Ensure that Your:
  - In-house Crew
  - Interagency Crew
  - Volunteers
  - Contractor
- Builds Quality Trail and Structures Where You Want and to Agency Standards



Development of Trail Projects

Process Based Implementation

- Establish a Detail Scope of Work
- Develop Cost Allocations
  - Labor
  - Materials
  - Equipment
  - Logistics
  - Overhead
- Project Scheduling

Following the Flow of Data for Trail Cost Development

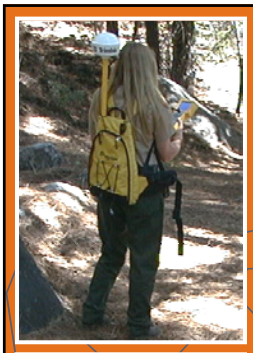
First

- Perform a Field Inventory of Work Recorded in Trail Log

How Do you Establish a Detailed Scope of Work?

A Foot by Foot Inventory of Project

Whether New Construction or Reconstruction



Trail Work Logs

- Foot by Foot Inventory of Entire Project
- Location Documentation by;
  - Rolo Tape
  - String Chain
  - GPS Unit
  - Stations

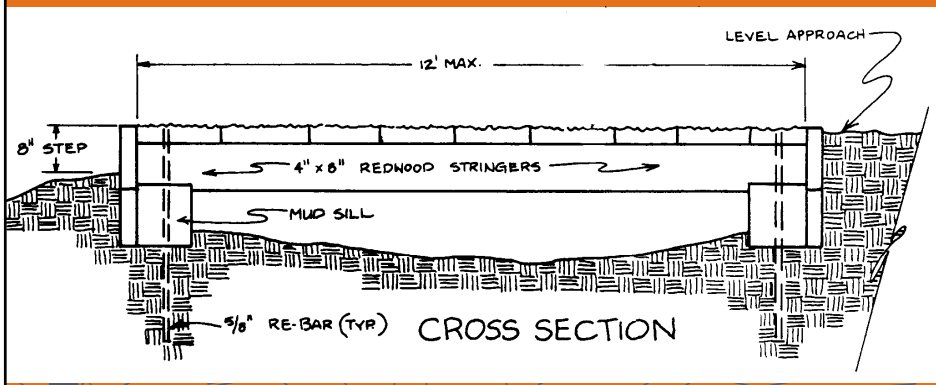
Trail Work Logs

- Trail Work Logs are Used for the Development of Work Needed for Scope Development and Budgeting
- Work is Broken Down into Like Kind Work Categories to which Production Rates, and Labor and Material Costs can be Assigned

Following the Flow of Data for Trail Cost Development

- Field Inventory of Work Needed Recorded in Trail Log
- Construction Standardization
  - Sorting of Inventory
  - Totaling of Like Kind Construction Items
  - Assign Specifications or Standards to Construction Item

Construction Standardization

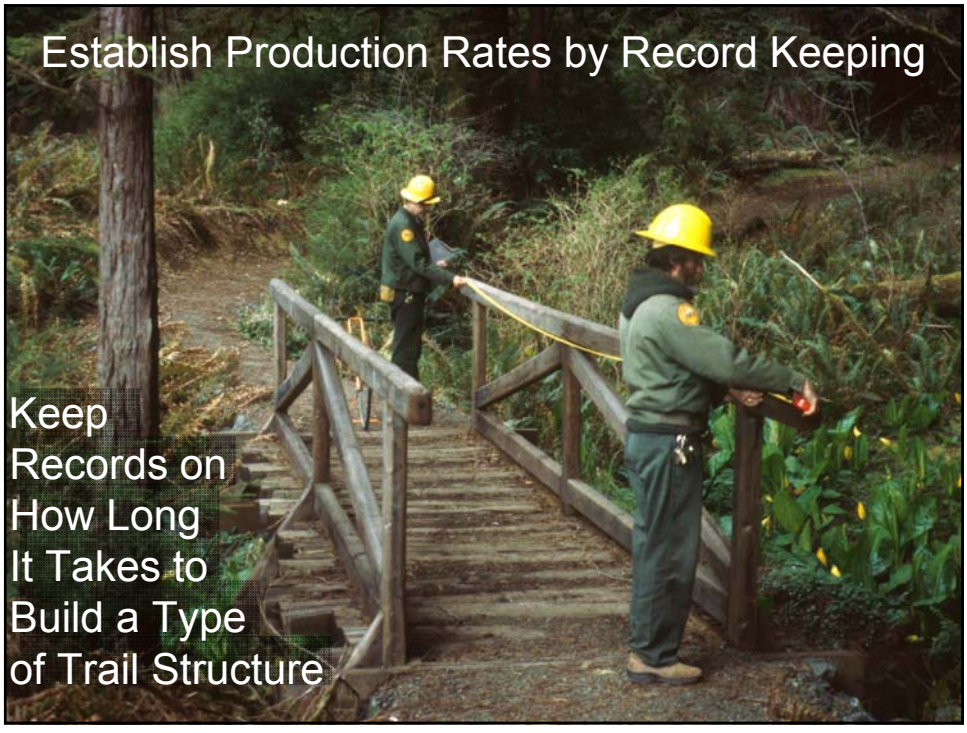


Use of Standard Specifications Develops Common Material and Methods Construction Practices

Following the Flow of Data for Trail Cost Development

- Field Inventory of Work Needed Recorded in Trail Log
- Sorting of Inventory and Totaling of Like Kind Construction Items and Assign Specifications or Standards to Construction Items
- Assign Costs to Construction Items
  - Establish Labor Production Rates
  - Estimate Materials Cost
  - Develop Equipment and Tool Needs

Establish Production Rates by Record Keeping



Keep Records on How Long It Takes to Build a Type of Trail Structure


How Fast Your Work is Completed or
Production Rate X Cost of Labor
= Labor Cost


Technology Changes
As Techniques and Materials Change, Keep Accurate Records on Time to Perform the New Technique
Update your Labor Production Rates

Cost of Materials

- Material Costs are Developed from Plan "Take Offs"
- Costs are Obtained from Hardware Stores and Lumber Yards

Equipment Costs

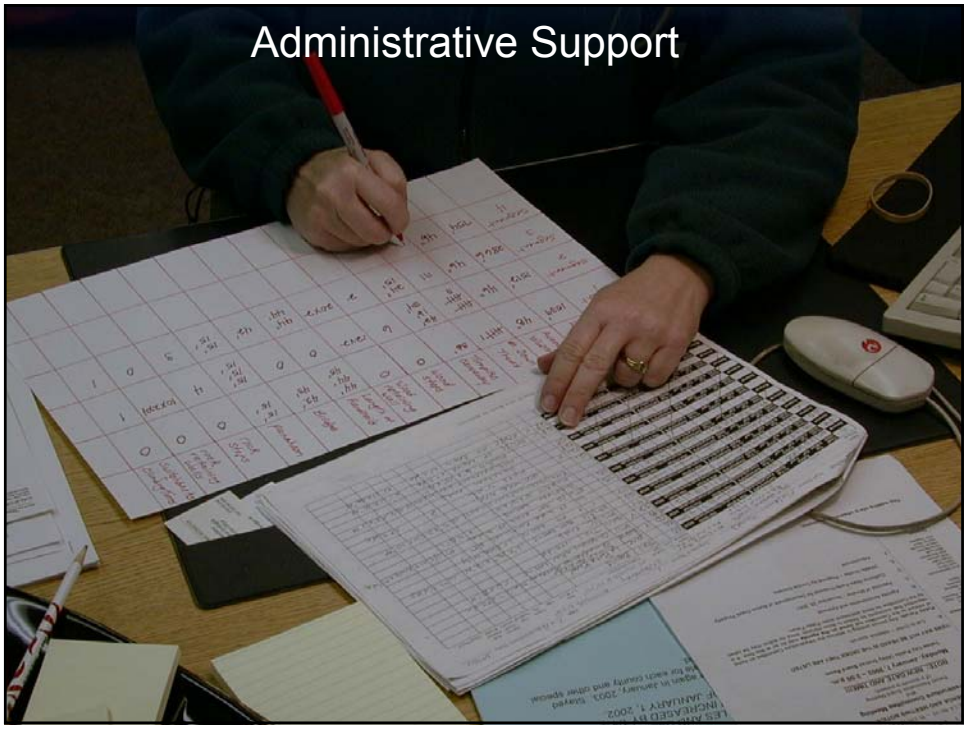
Estimate Equipment Needs and Assign Realistic Cost

Expendable Items

Following the Flow of Data for Trail Cost Development

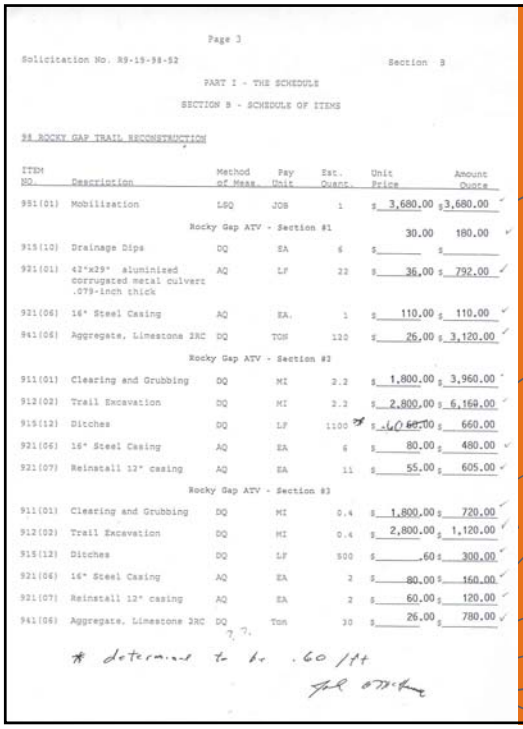
- Add Non-Accounted Costs to Get at Total Trail Cost Summary
  - Logistical Support
  - Administrative Costs

Logistical Support



Following the Flow of Data for Trail Cost Development

- Add Non-Accounted Costs to Get at Total Trail Cost Summary
  - Logistical Support
  - Administrative Costs
- Determine Labor Source
  - Develop a Schedule of Construction Items and Project Site Map



Page 3

Solicitation No. R9-19-98-52 Section B

PART I - THE SCHEDULE

SECTION B - SCHEDULE OF ITEMS

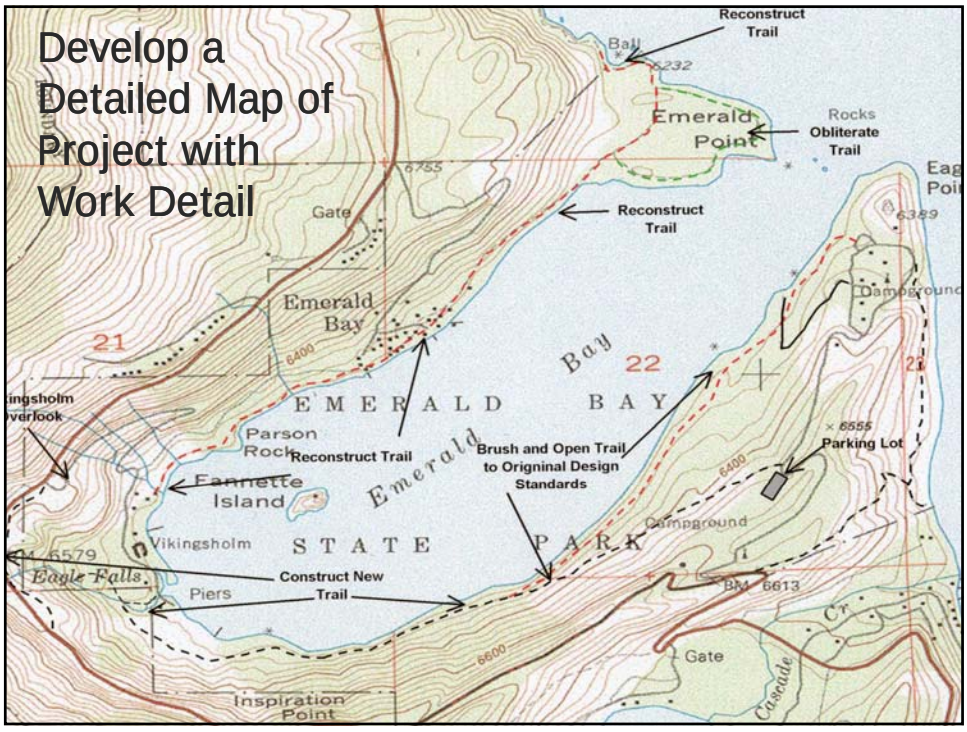
98 ROCKY GAP TRAIL RECONSTRUCTION

ITEM NO.	Description	Method of Meas.	Pay Unit	Est. Quant.	Unit Price	Amount Quote
951(01)	Mobilization	LSQ	JOB	1	$ 3,680.00	$ 3,680.00
	Rocky Gap ATV - Section #1			30.00		180.00
915(10)	Drainage Dips	DQ	EA	6	$	$
921(01)	42"x29" aluminized corrugated metal culvert .079-inch thick	AQ	LF	22	$ 36.00	$ 792.00
921(06)	16" Steel Casing	AQ	EA.	1	$ 110.00	$ 110.00
941(06)	Aggregate, Limestone 2RC	DQ	TON	120	$ 26.00	$ 3,120.00
	Rocky Gap ATV - Section #2					
911(01)	Clearing and Grubbing	DQ	MI	2.2	$ 1,800.00	$ 3,960.00
912(02)	Trail Excavation	DQ	MI	2.2	$ 2,800.00	$ 6,160.00
915(12)	Ditches	DQ	LF	1100	$ .60 60.00	$ 660.00
921(06)	16" Steel Casing	AQ	EA	6	$ 80.00	$ 480.00
921(07)	Reinstall 12" casing	AQ	EA	11	$ 55.00	$ 605.00
	Rocky Gap ATV - Section #3					
911(01)	Clearing and Grubbing	DQ	MI	0.4	$ 1,800.00	$ 720.00
912(02)	Trail Excavation	DQ	MI	0.4	$ 2,800.00	$ 1,120.00
915(12)	Ditches	DQ	LF	500	$ .60	$ 300.00
921(06)	16" Steel Casing	AQ	EA	2	$ 80.00	$ 160.00
921(07)	Reinstall 12" casing	AQ	EA	2	$ 60.00	$ 120.00
941(06)	Aggregate, Limestone 2RC	DQ	Ton	30	$ 26.00	$ 780.00

* determined to be .60 /ft

Scope of Work

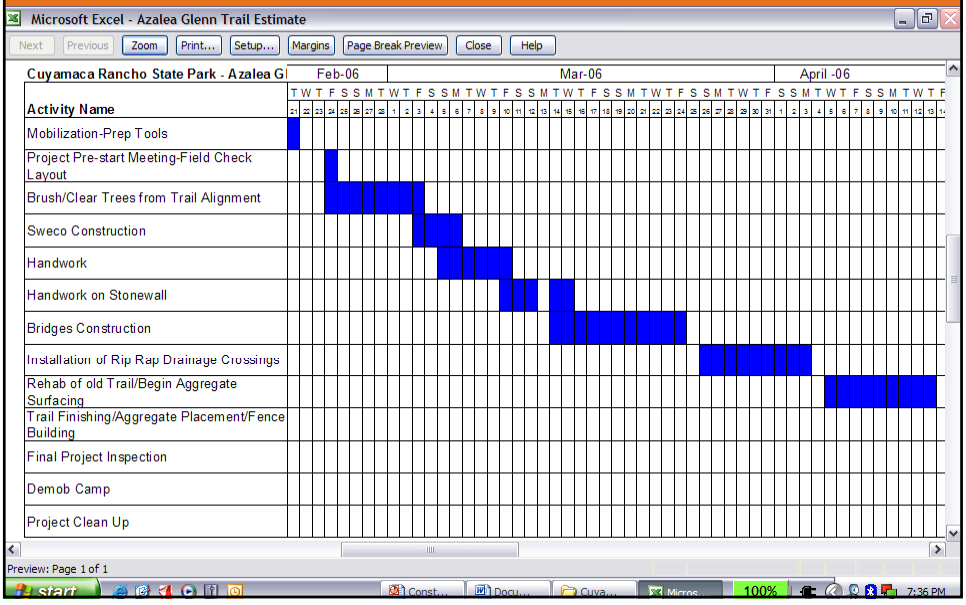
- Labor Force
  - Labor Type Dictates Level of Detail for Work Schedule
- Data from Trail Logs Would be Quantified in a Work Schedule of Items



Following the Flow of Data for Trail Cost Development

- Add Non-Accounted Costs to Get at Total Trail Cost Summary
  - Logistical Support
  - Administrative Costs
- Determine Labor Source
  - Develop a Schedule of Construction Items
- Take Trail Construction Estimate, Scope and Organize a Work Plan
  - Pick an Appropriate Time for Construction
  - Create Project Time Line

Project Time Line



Development of Trail Projects

Session Review:

- Trail Construction Work Logs
- Develop Prescriptions From Trail Work Logs
- Use of Standardized Specifications
- Develop Labor Production Rates and Cost
- Estimate Materials, Tools, Equipment
- Add in Un-Accounted Costs
- Develop Project Scope & Schedule of Work
- Develop Project Time Line

Construction and Maintenance

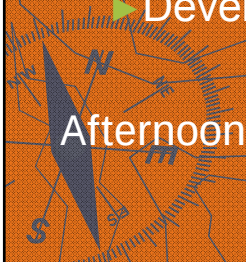
Review of Morning Lectures

- Principles of New Trail Construction
- Brushing and Clearing Maintenance
- Drainage Maintenance and Structures
- Tread Maintenance and Structures
- Trail Step Installation
- Retaining Walls
- Handrails

Construction and Maintenance

- Puncheons and Boardwalks
- Bridges
- Rehabilitation
- Development of Trail Projects

Afternoon Field Exercise



Construction and Maintenance

Afternoon Field Exercise