

## Trail Layout and Design

### Today's Activities

- Morning Lectures
  - Design Concepts
  - Layout Principles



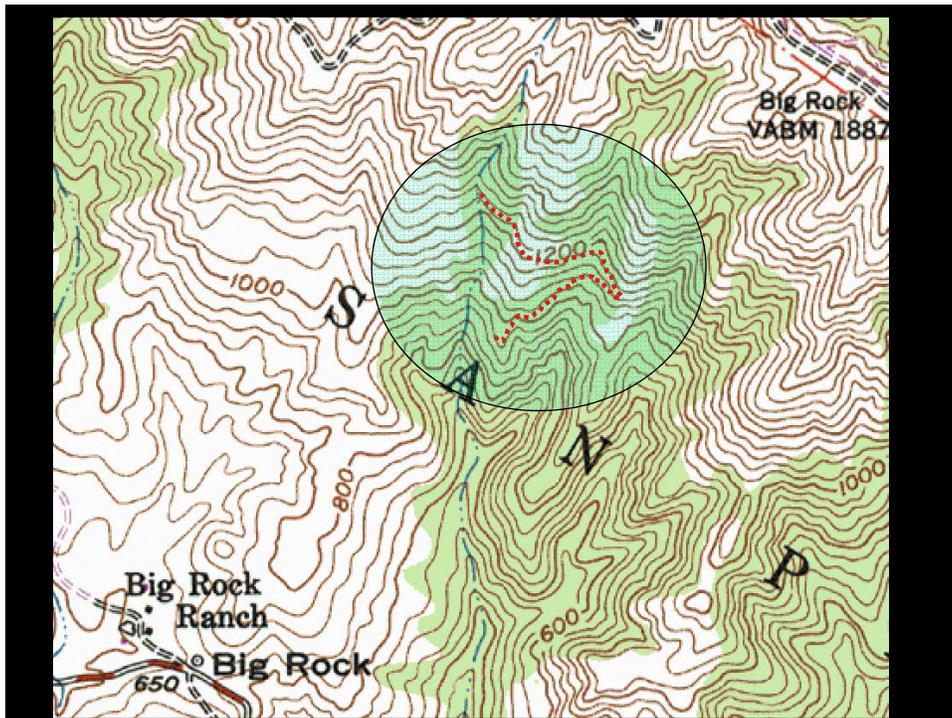
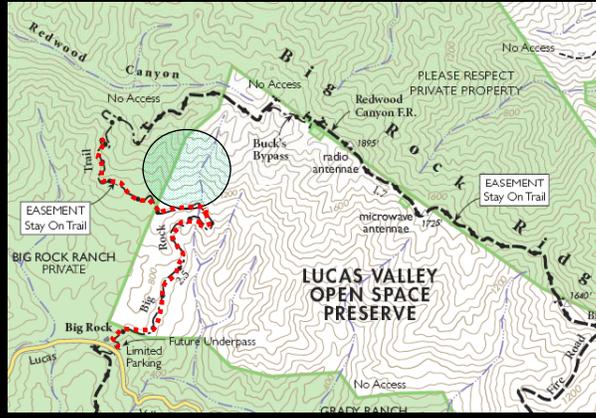
# Trail Layout and Design

## Days Activities

### Afternoon Lab

#### Activity

- Afternoon 4 Hour Lab
- Big Rock Trail
- Marin Open Space District



## Trail Layout and Design Lab Activity

- Task  
Hazard  
Analysis

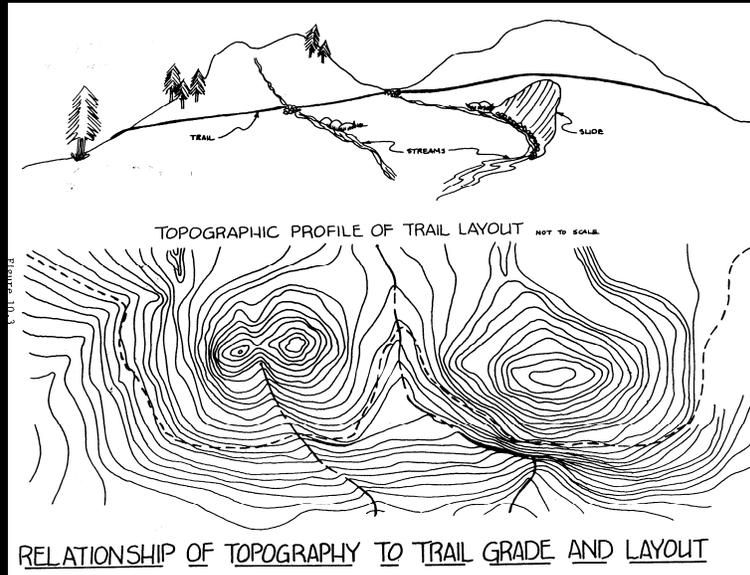


## Trail Layout and Design Days Activities Morning Lab Activity

- Abney Hand Level and Clinometer  
Orientation



# Trail Design Concepts



## Trail Design Concepts Objectives

- Learn How Types of Users, Trail Classes and Standards Effect Design
- How The Planning Process Affects Design
- Ability to Establish Major and Minor Control Points in Trail Corridors
- What is Reconnaissance?
- How to Design for Land Capability, Aesthetics, and Safety Concerns
- The Role of Resource Specialists for Review Before Laying a Flagged Alignment

# Identify the Trail User



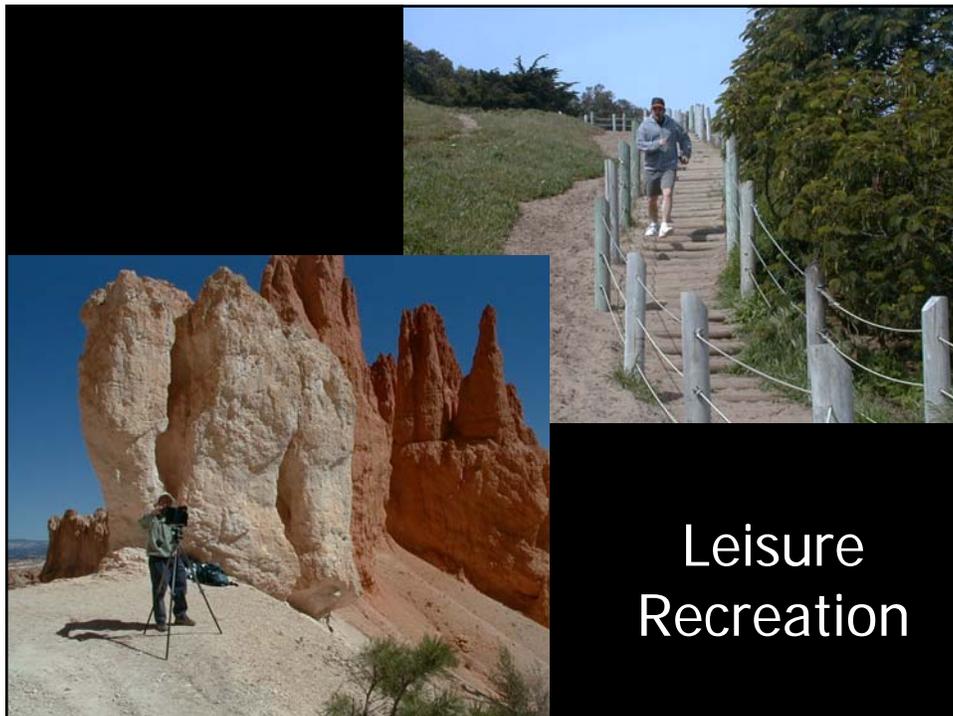
# Hikers and Backpackers

# Users with Mobility Devices



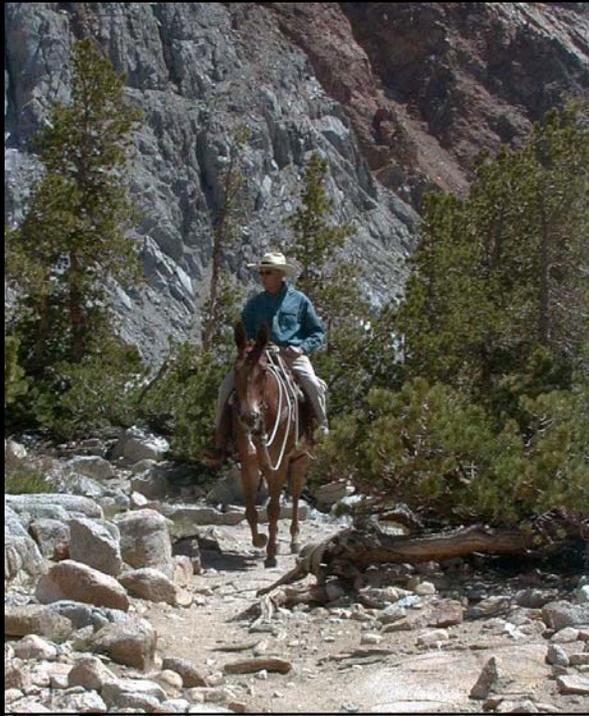


Wheeled Users



Leisure  
Recreation

# Equestrians



# Winter Users





High Use Pedestrian Settings

## New Outdoor Access Guidelines for Trails



New or Altered Trails May Need to Comply

# Identify the Trail Classification

# Trail Classification Matrix

Determines Objective Level of Use

TRAIL NAME: \_\_\_\_\_

TRAIL CLASSIFICATION MATRIX

CRITERIA	Point Values	Rating
1. Accessible	25	
2. Interpretive	15	
3. Within Visitor Use Facility	15	
4. Equestrian and Bike (Multi Use)	15	
5. Adjacent to Visitor Use Facility		
0-1/4 mile	12	
1/4 - 1 mile	8	
1-2 mile	4	
2 or more miles	0	
6. Connection of Visitor Use Facilities	5	
7. Parking Access	5	
8. Destination Oriented		
0 - 1 mile	3	
1 -3 miles	2	
3 + miles	1	
9. Connection with Other Agency Trail	+3 - +5	
10. Special Use or Access Improvements	1	
11. Dead End Trail	0 or -3	
12. Loop or Connecting Trail	+1 - +3	
13. Fragile Environment		
Protected by lessening use	-1 - -3	
Protected by upgrading	+1 - +3	
14. Safety Factors		
a. Encourage less use by not Providing Improvements	-1 - -5	
b. Provide and maintain improvements	+0 - +5	
15. Staff Determined Use Patterns		
Little or no use	-1 - -3	
Higher use	+1 - +3	
	TOTALS	
CLASSIFICATION: II		
I = 30+		
II = 19 - 29		
III = 10 - 18		
IV = 0 - 9		

Figure X

The image contains several technical diagrams for trail construction:

- Rock Steps:** A diagram showing "ROCK STEPS" and "OVERLAPPING ROCK STEPS" with a "FIBER" layer at the base.
- Tread Details:** A cross-section of a tread showing "TREAD", "SPINDERS", and "BRACE" components. Dimensions include a 42" height and a 36" width.
- Typical Cross Sections:** Three diagrams showing trail profiles on slopes of 50%, 40%, and 30%. Each shows a "TREAD" and "BRACE" structure. Slope labels include "1:1 BANK SLOPE" and "1/2:1 BANK SLOPE".
- Cross Section:** A diagram showing a person standing on a tread. Dimensions include a 36" width and a 4" gap. Text below reads: "CONSTRUCTION AND TREAD DETAIL DETERMINED BY SITE" and "SLOPE BANK 1:1 SLOPE".
- Station 437 Cross Section:** A diagram titled "Cross Section B-B @ Station 437" with a scale of 1"=10' @ full size. It shows an "Existing Road", "Edge of Pavement and Flag Line", "48" 0' 0" dimension, "Existing Road", "Proposed Stone Drainage Grade", and "Height of walk surface according to the location".

Figure 9.10

Exhibit "A"

Determine Specifications & Standards – Based on User Group, Classification and Season of Use

## Identify Points of Connection

- These are the Points of Beginning and End of Your New Trail Alignment
- They Exist on All New Trail Layout
  - A Reroute Fix of Poor Trail
  - A New Trail Proposal

## Trail Heads

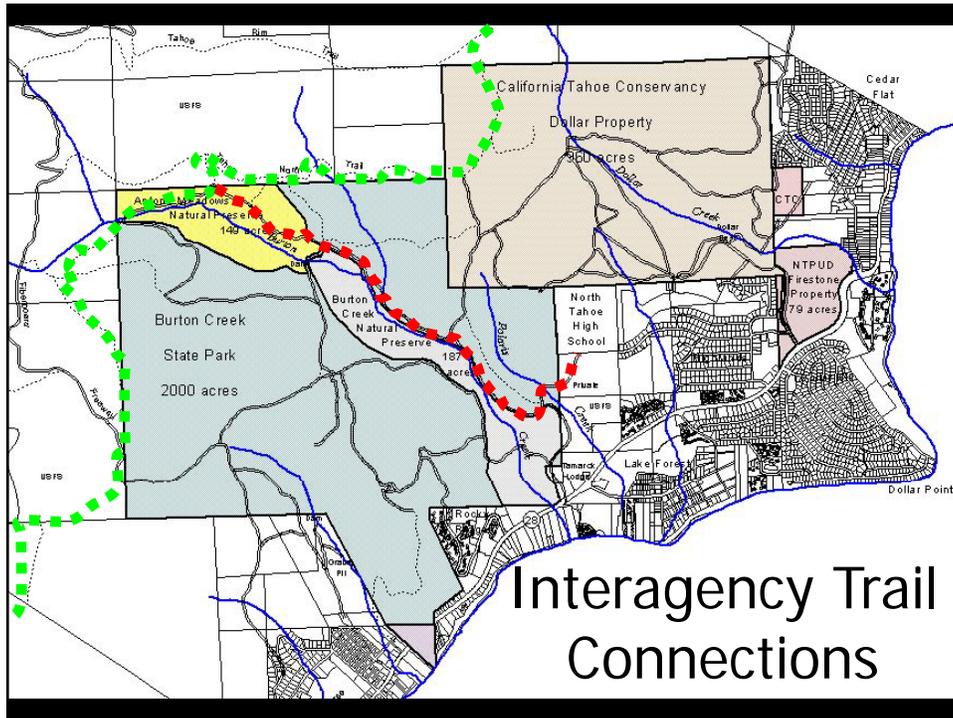


## Visitor Use Areas



## Visitor Destinations





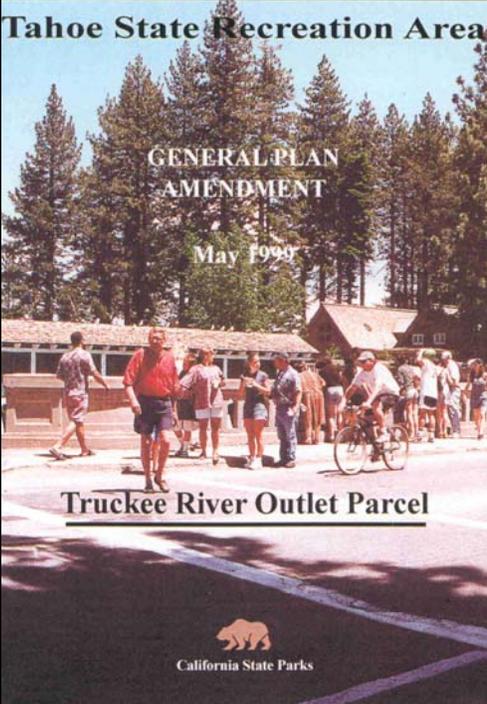
Use and Beginning and Ending Identification is Done During the Planning Process

Other Planning Information is a Literature Search

**Tahoe State Recreation Area**

**GENERAL PLAN AMENDMENT**

May 1999



**Truckee River Outlet Parcel**



California State Parks



**STATE REDWOODS PARKS**

Jedediah Smith Redwoods State Park  
 Del Norte Coast Redwoods State Park  
 Prairie Creek Redwoods State Park

**GENERAL PLAN**

State of California — The Resources Agency  
 DEPARTMENT OF PARKS AND RECREATION



**Managing Land Unit Trail Plan**



**BACKCOUNTRY TRAIL PLAN**

Redwood and Skunk Cabbage Creeks

Redwood National Park March 1984



Natural Resources Inventorizing and  
Monitoring Program

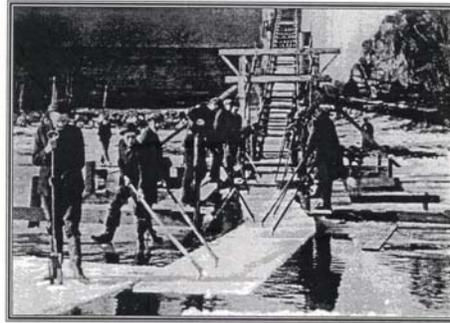


Plumas-Eureka State Park

Managing  
Land Unit  
Natural  
Resources  
Inventory and  
Management  
Plans

Cultural  
Resources  
Inventories,  
Evaluations  
and  
Management  
Plans

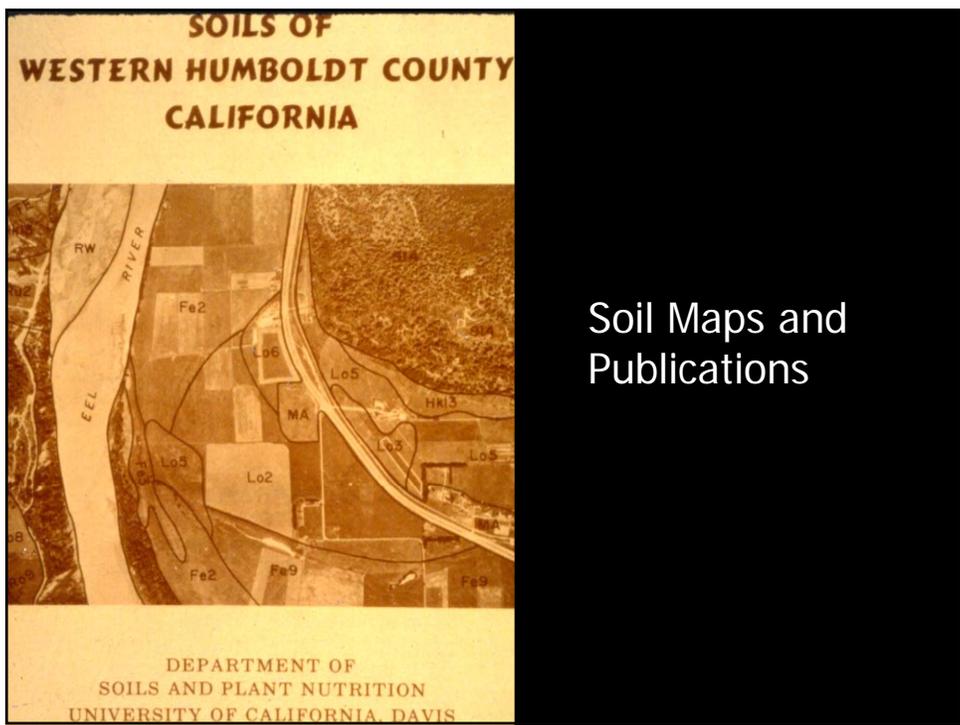
CENTRAL DISTRICT  
DEPARTMENT OF WATER RESOURCES



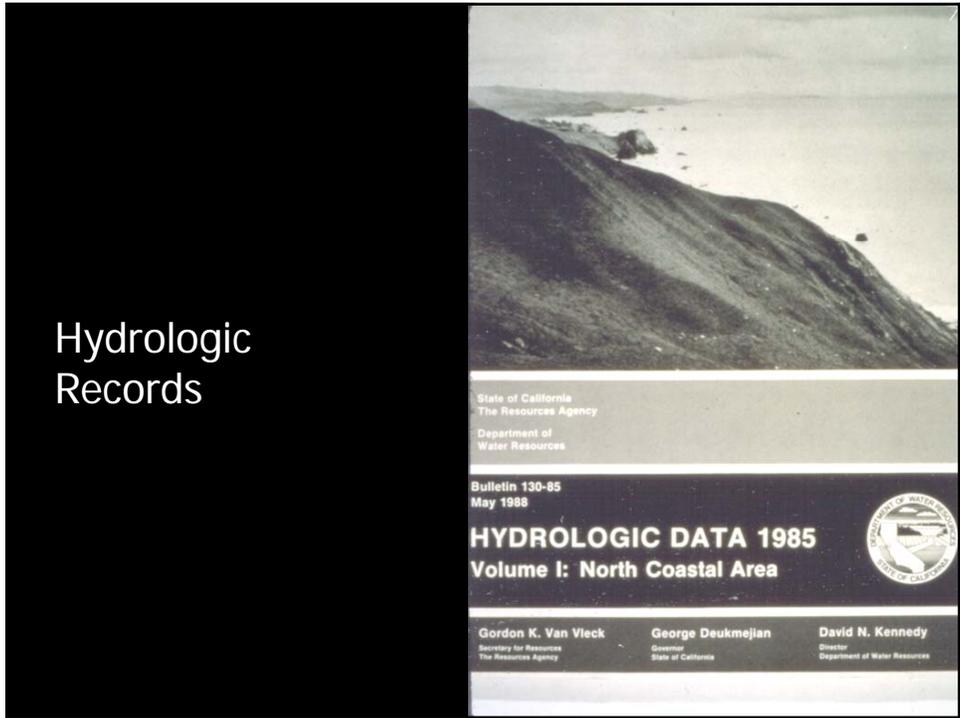
TRUCKEE RIVER DRAINAGE  
CULTURAL RESOURCE EVALUATION  
[VOLUME 1]

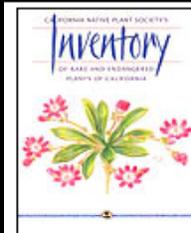
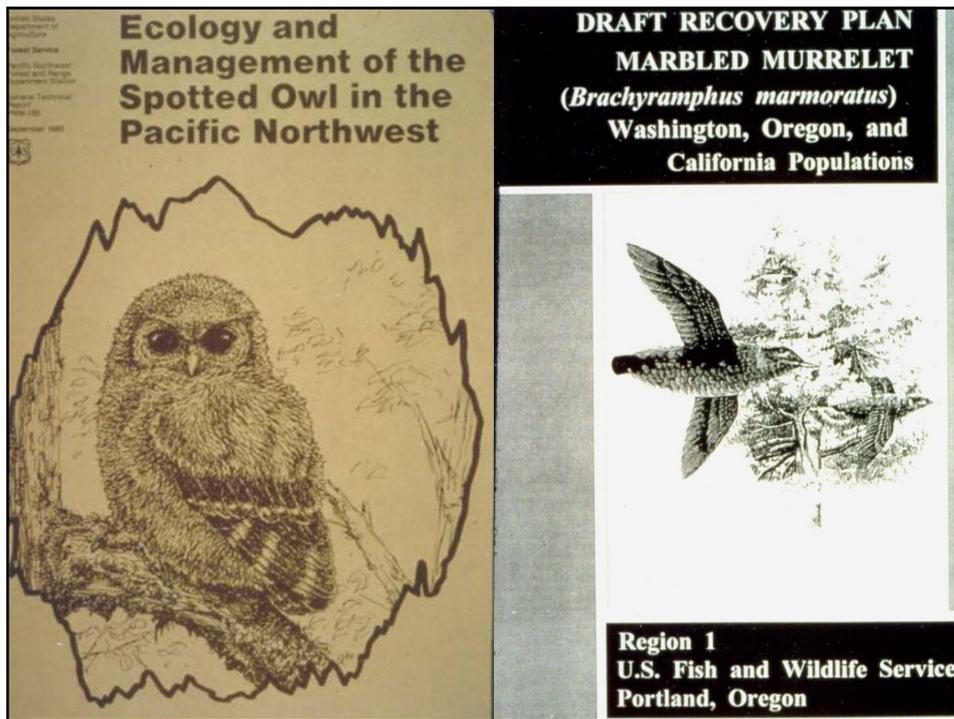
PREPARED BY  
CULTURAL HERITAGE PLANNING UNIT  
RESOURCE PROTECTION DIVISION  
STATE DEPARTMENT OF PARKS AND RECREATION





Soil Maps and  
Publications





**CNPS Inventory of Rare and Endangered Vascular Plants of California - 6th Edition**

Rare Plant Scientific Advisory Committee

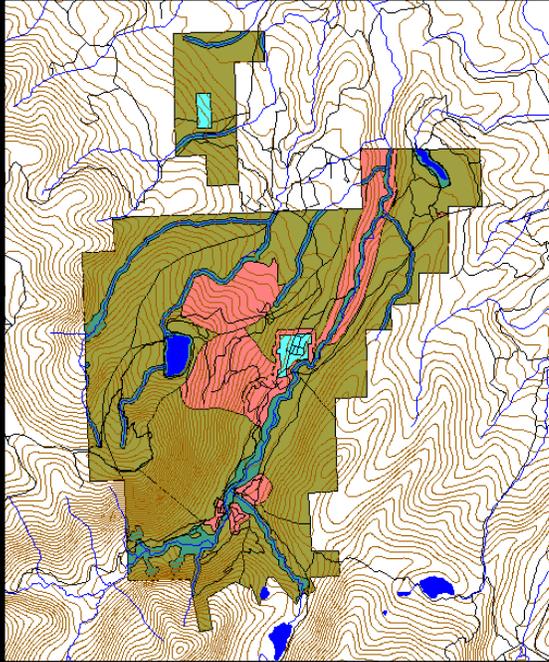
The definitive book on rare and endangered plants in California.

2001 CNPS Press. 386 pages, 8½"x11", includes line drawings, 7 appendices including plants by county, plants by common name, plants by family, and new to this edition. ISBN 0-943460-40-9 \$29.95 softcover

 **CNPS Electronic Inventory - Electronic Format**

The Electronic Inventory now contains data from the 6th Edition of the CNPS *Inventory*. Users can now view the most current version of the CNPS Inventory of Rare and Endangered Vascular Plants, and search for plants based on hundreds of specific criteria. This applications is available for MS-DOS compatible systems only and requires 11 megabytes of hard disk space. Includes 3½" diskettes and manual.

# Geographic Information Systems Maps

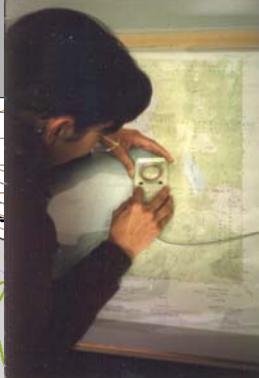


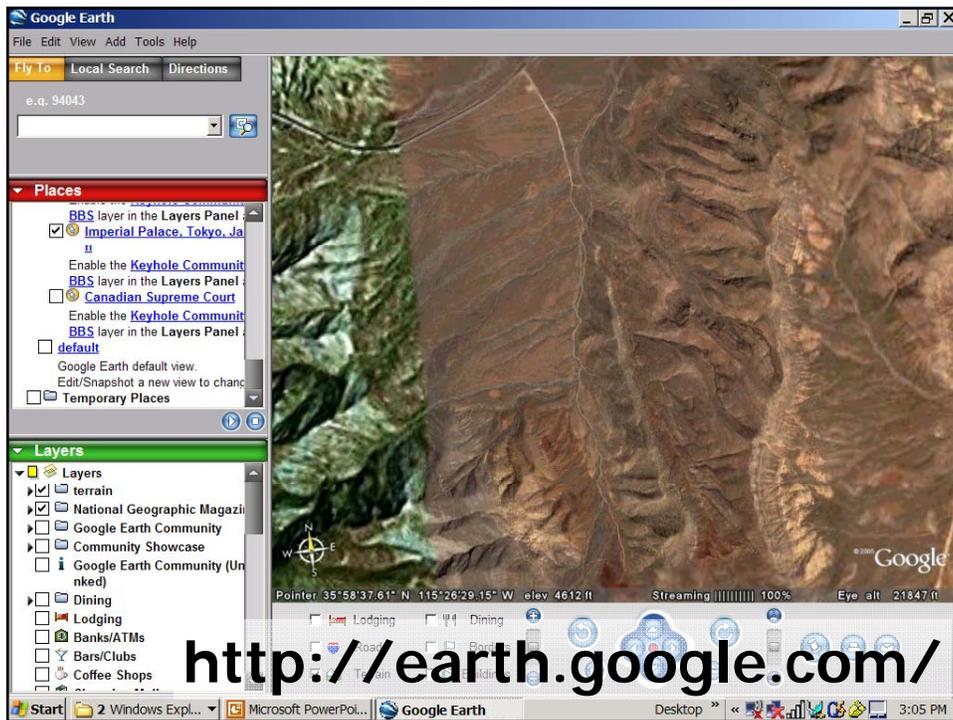
## Research Cooperating Agencies GIS Data Bases

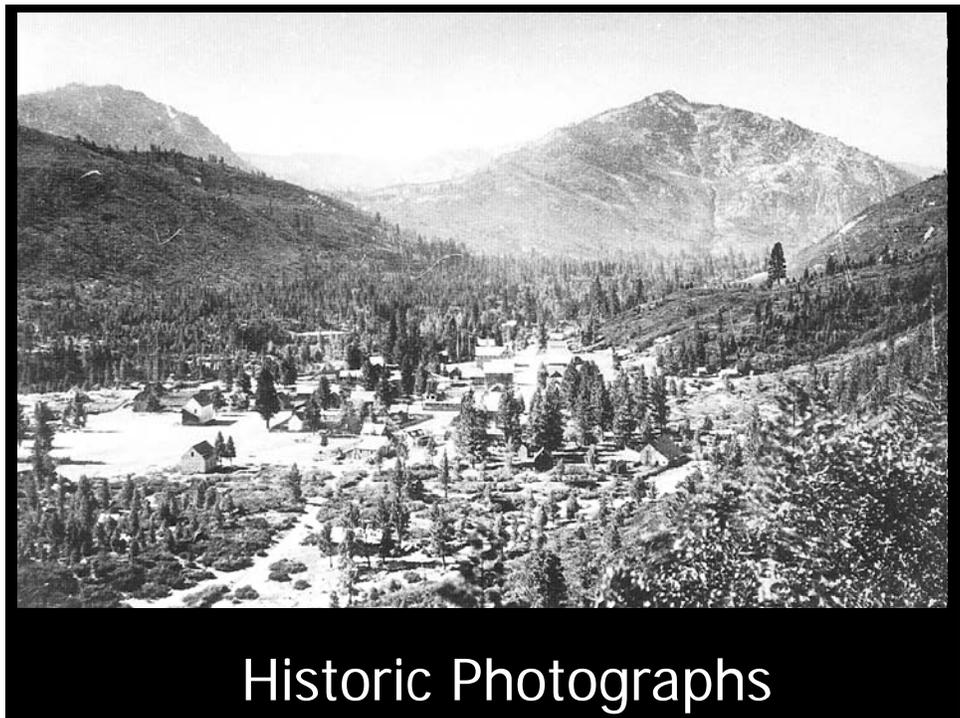
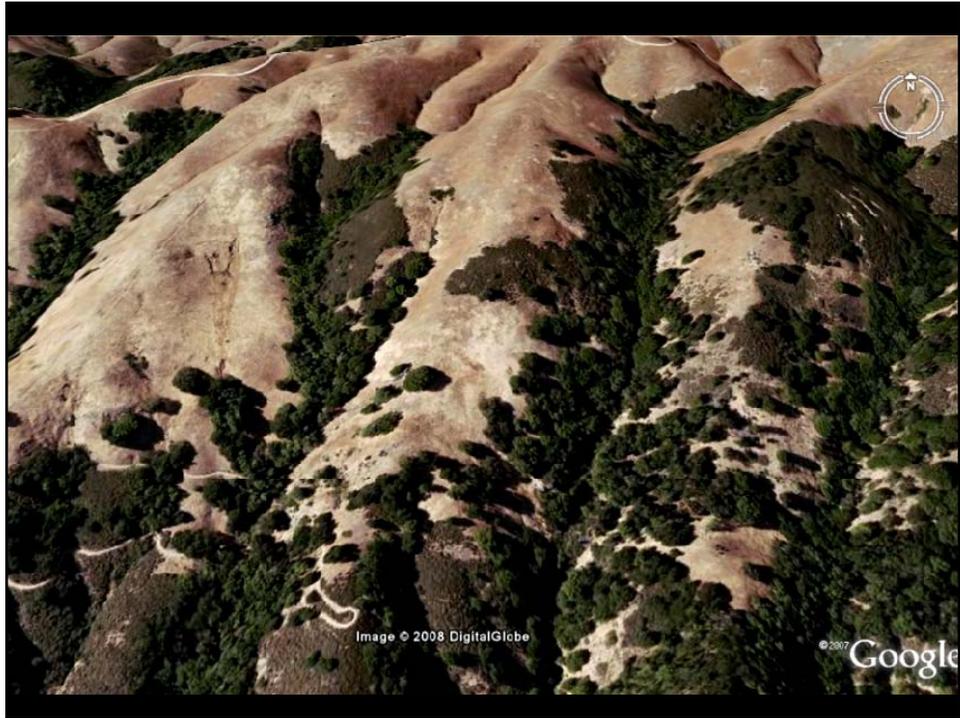
The figure displays a screenshot of a GIS software interface. On the left is a legend with the following items:

- Rdtrips
- Facilities
  - MUSEUM
  - KIOSK
  - BLDG COMBINATION
  - BLDG COMF
  - CAMPFIRE CENTER
  - DISABLED COMF
- ROUTE: Trails
- ROUTE: Roads
- Highway 80
- Linear Features
- Railroad
- Topography, 40ft Contour
- Streams
- Lakes
- Ownership
  - California State Parks

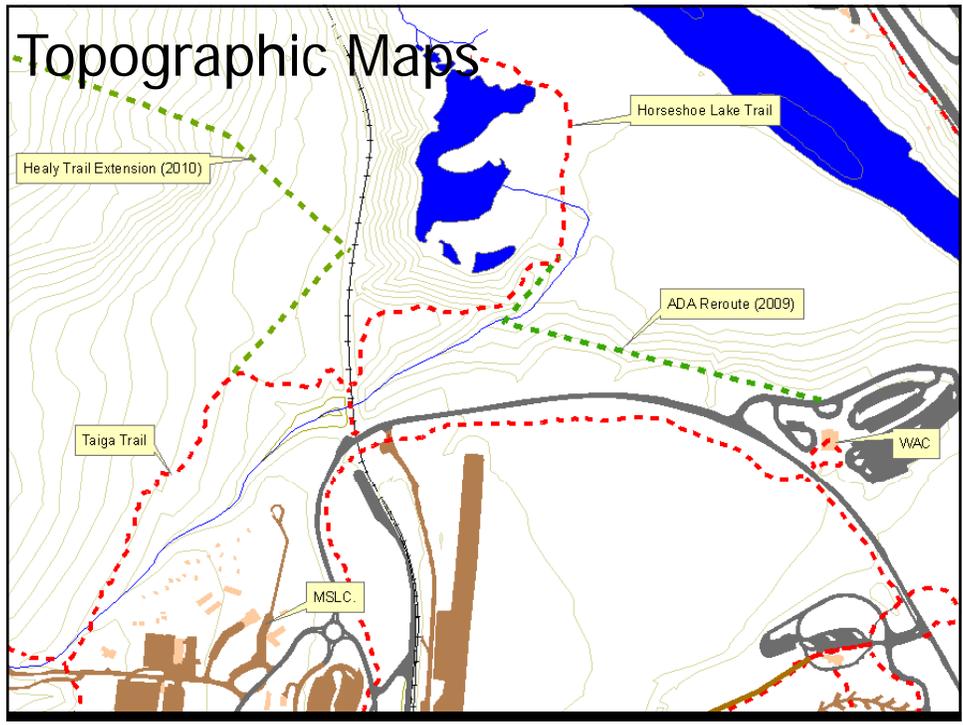
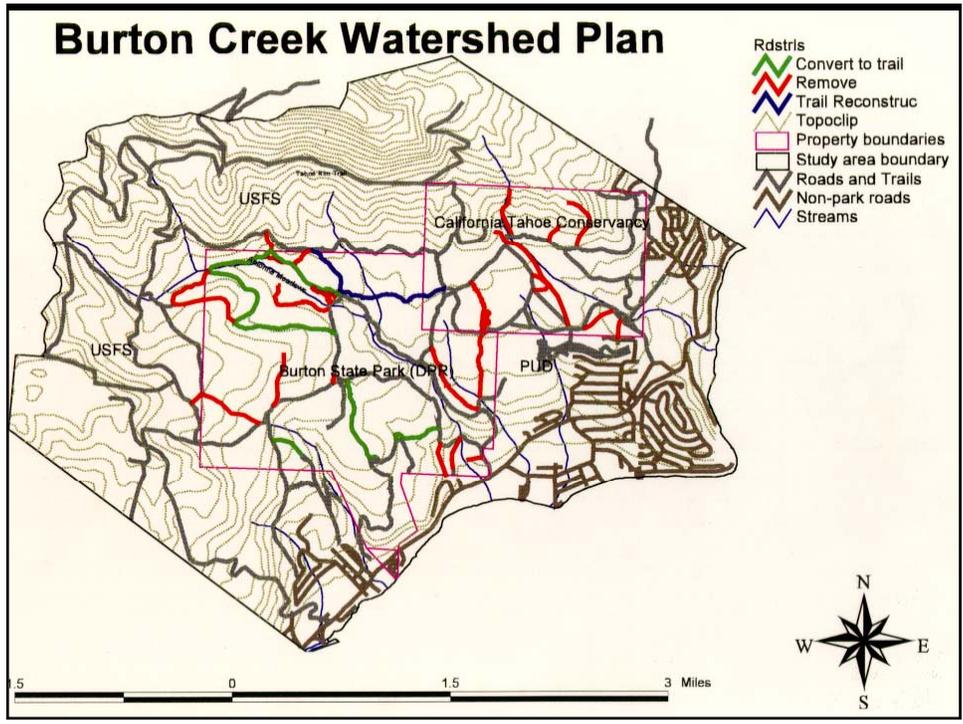
The main map area shows a topographic map of a region with a large blue lake labeled "Donner Lake". A road labeled "Highway 80" is visible. Various facility icons are placed on the map. The status bar at the bottom shows: "Origin: (738,243.38, 4,355,603.50) m Extent: (856.55, 756.56) m Area: 648,035.05 sq m". The taskbar at the very bottom includes icons for Start, Microsoft PowerPoint, ArcView GIS Vers..., Microsoft Excel - Mus..., and a system clock showing 4:12 PM.

An inset photograph in the top right corner shows a person from the side, looking at a handheld GPS device. The person is wearing a dark jacket and is standing in front of a large map on a wall.





Historic Photographs



## Literature Search Allows for a Detail Corridor Alignment

- Knowledge of the Land Increases
- Establish Connectivity with Adjoining Land Managers
- Identify Sensitive Areas to Stay Away From
- Knowledge of Land Capabilities Limitations
- Broad Expanse of Land Narrowed to a Trail Corridor



## Work Completed in Your Office Not the Field

- User Type
- Classification Identification
- Points of Destination
- Literature Research
- Trail Corridor Alignment (on paper)

## Further Corridor Work Before Going Into Field

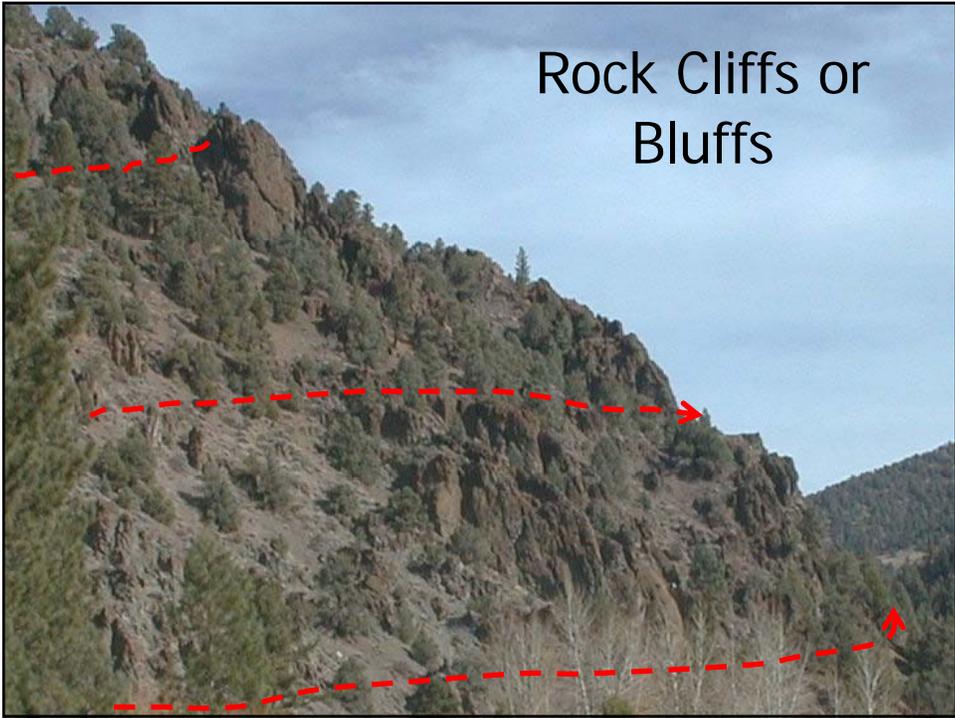
- Identify Major Control Points
  - These are areas that the Trail Corridor NEEDS to Go To or Miss
- Break The Trail Corridor into Smaller Units
  - Major Control Point to Major Control Point

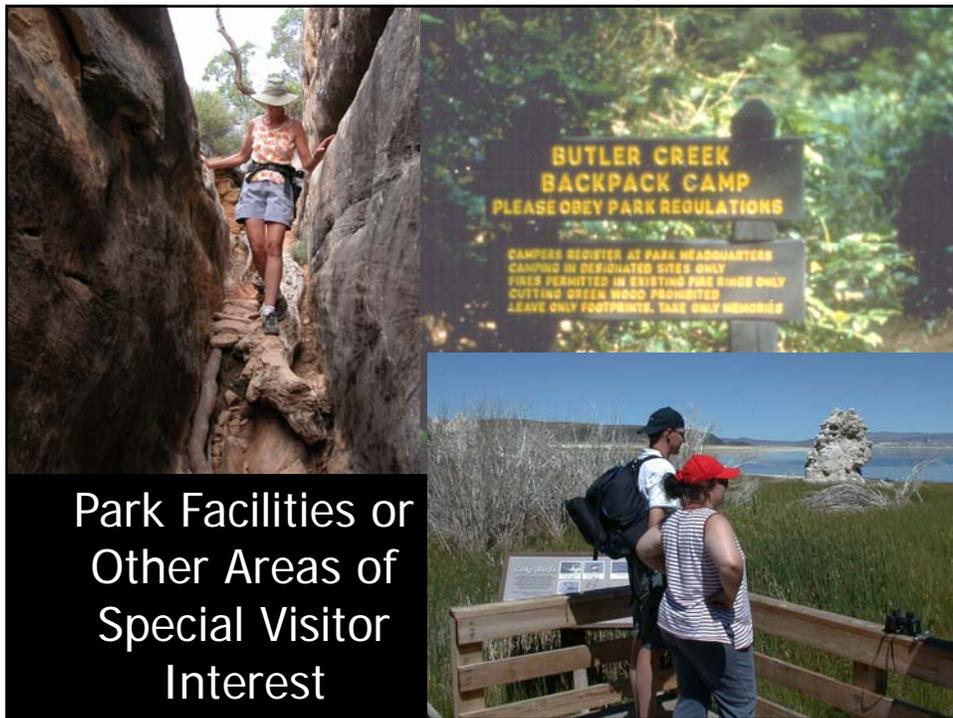
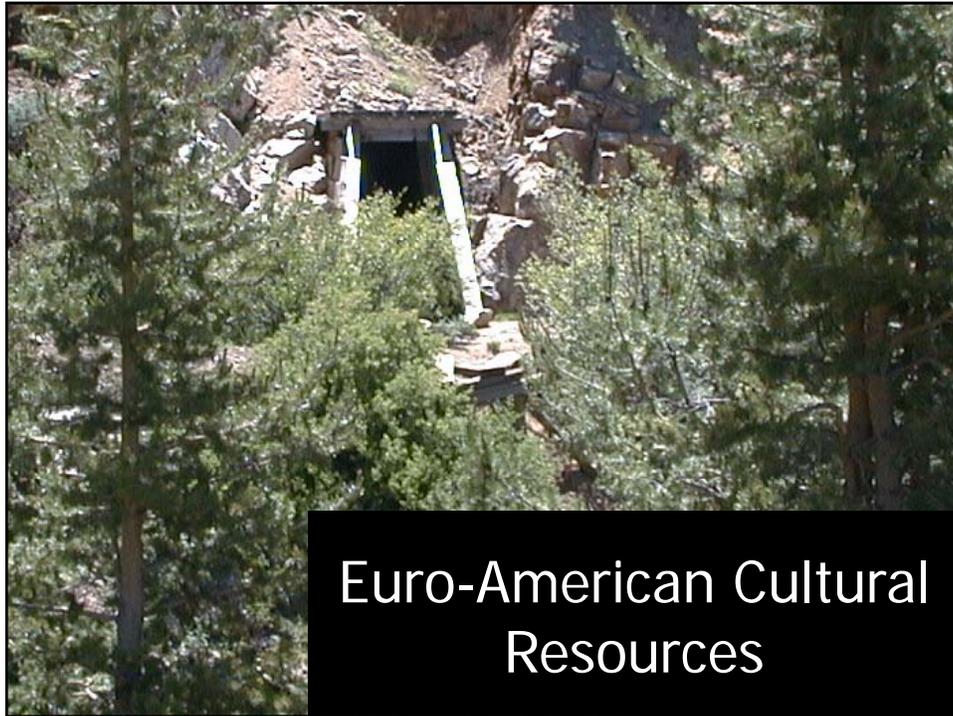
## Rivers or Bodies of Water



## Large Land Slides



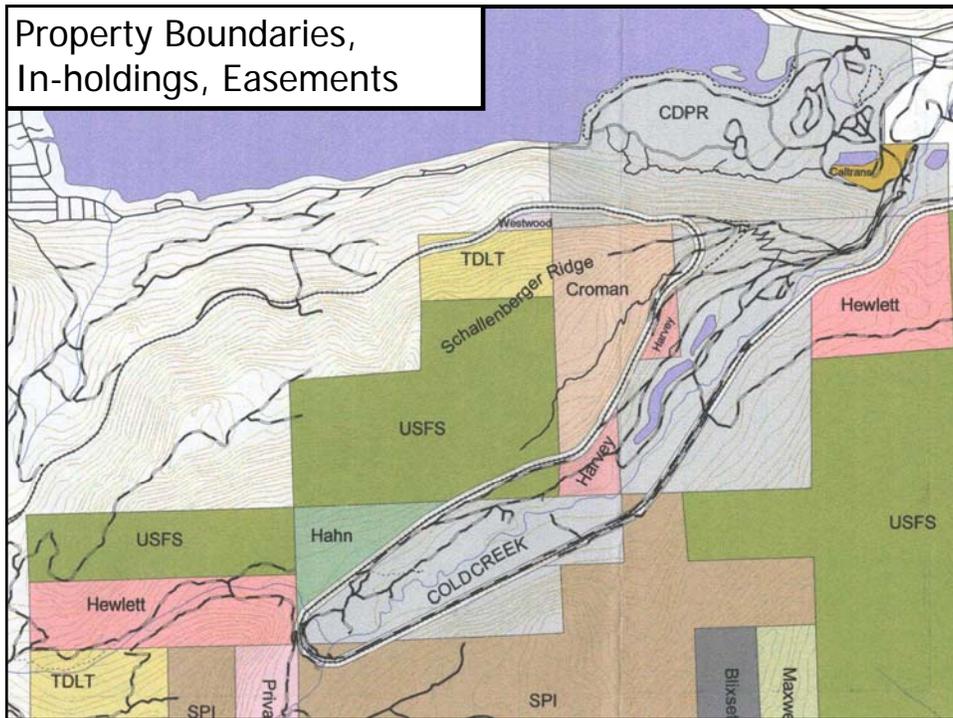




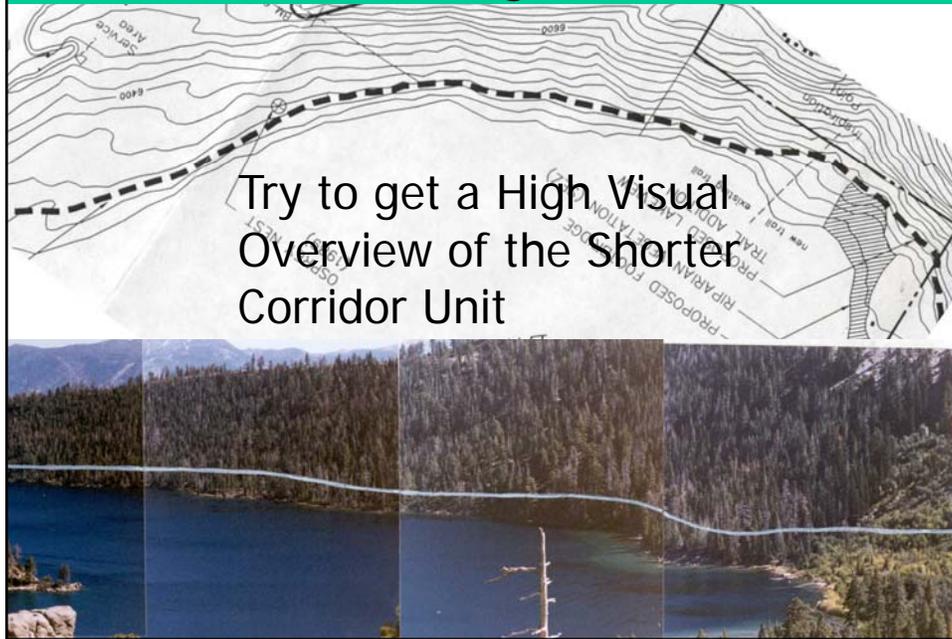
# Major Road or Highway Crossings



# Property Boundaries, In-holdings, Easements



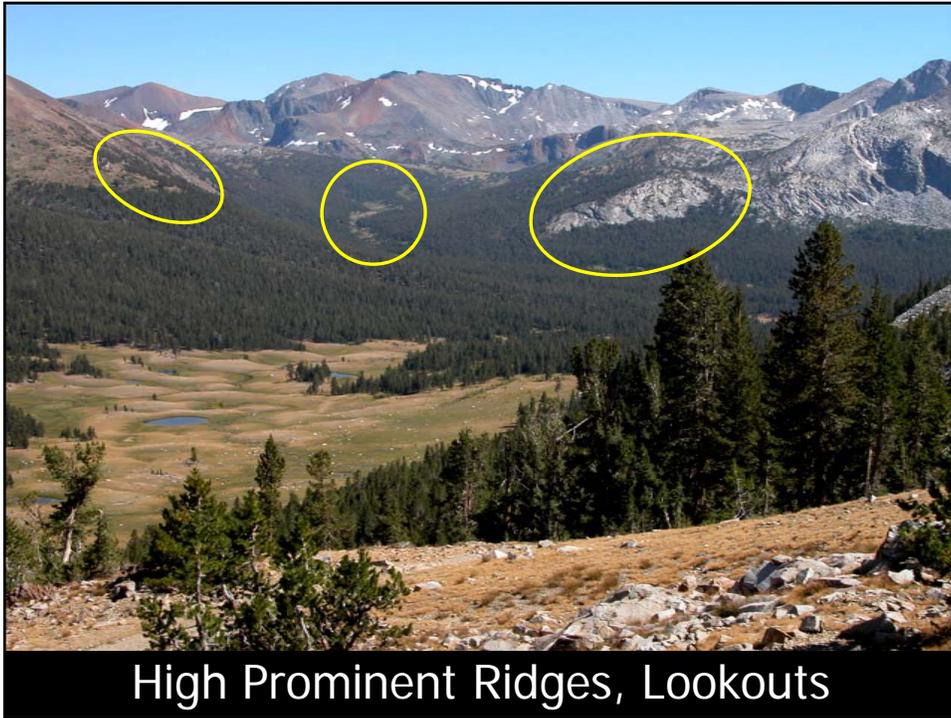
## Get the Big Picture



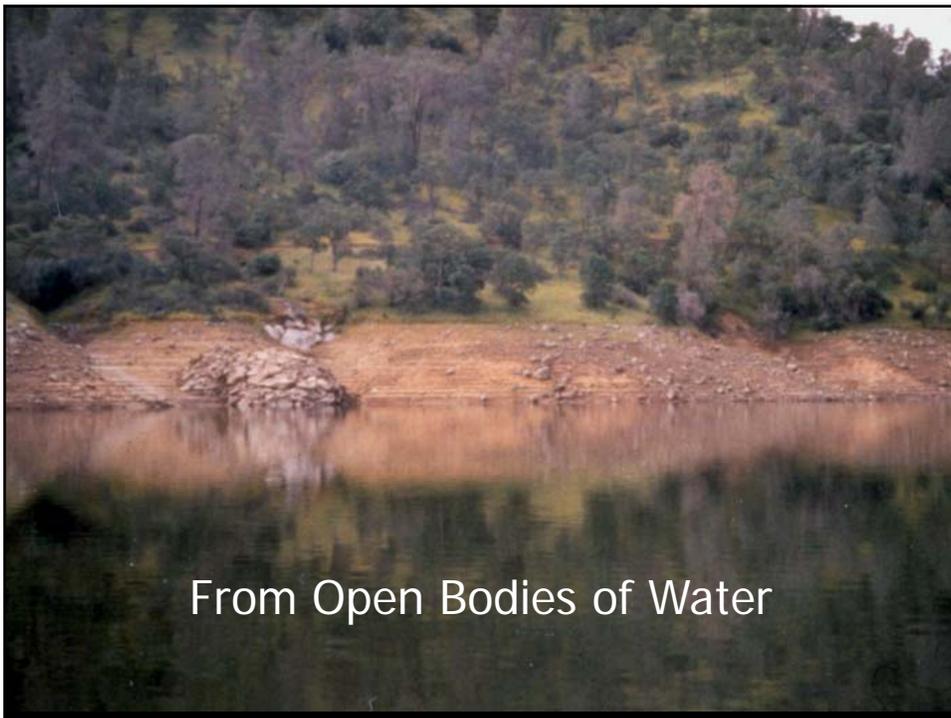
## Helicopter

- Fire Agency
- Coast Guard





High Prominent Ridges, Lookouts



From Open Bodies of Water

Get a Good Visual Survey of the Land  
Before You Jump into the Brush



## Reconnaissance

Ground Checking the  
Trail Corridor Identified

Identification of Minor  
Control Points

Reconnaissance Process  
Occurs Between Major Control Points



## Reconnaissance

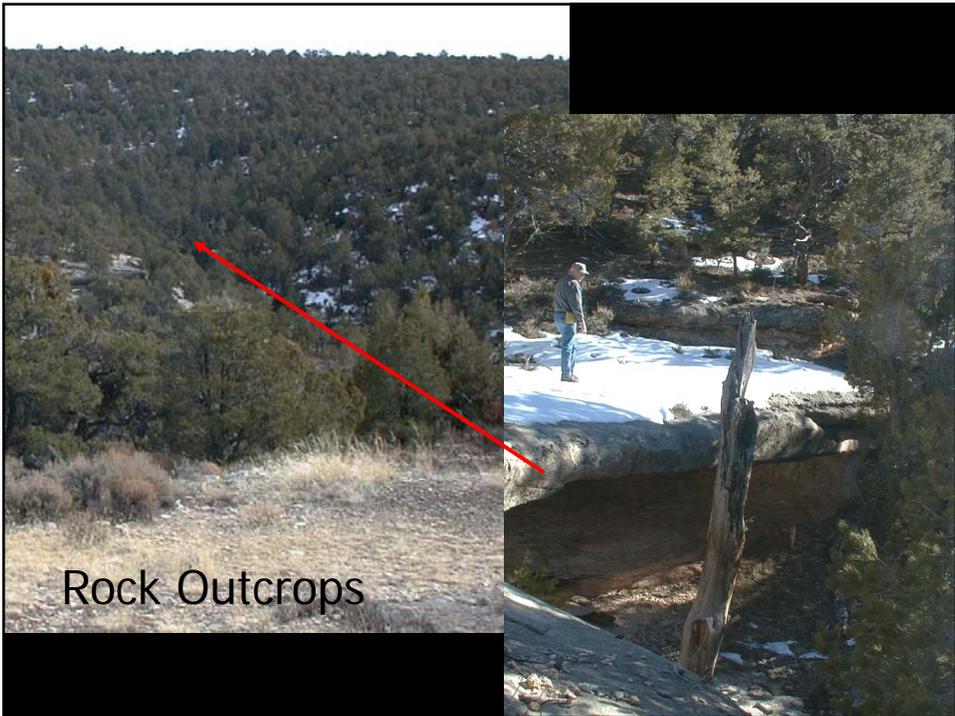
It Can Be Much  
Easier to Perform  
Reconnaissance in  
Winter Months



## Minor Control Points

- Identified During the Reconnaissance Process
- Features in the Trail Corridor that will Dictate the Alignment of the Trail
- Discovered and Worked Around During On-the-Ground Reconnaissance

Rock Outcrops



Rock Outcrops

Stream  
Crossings

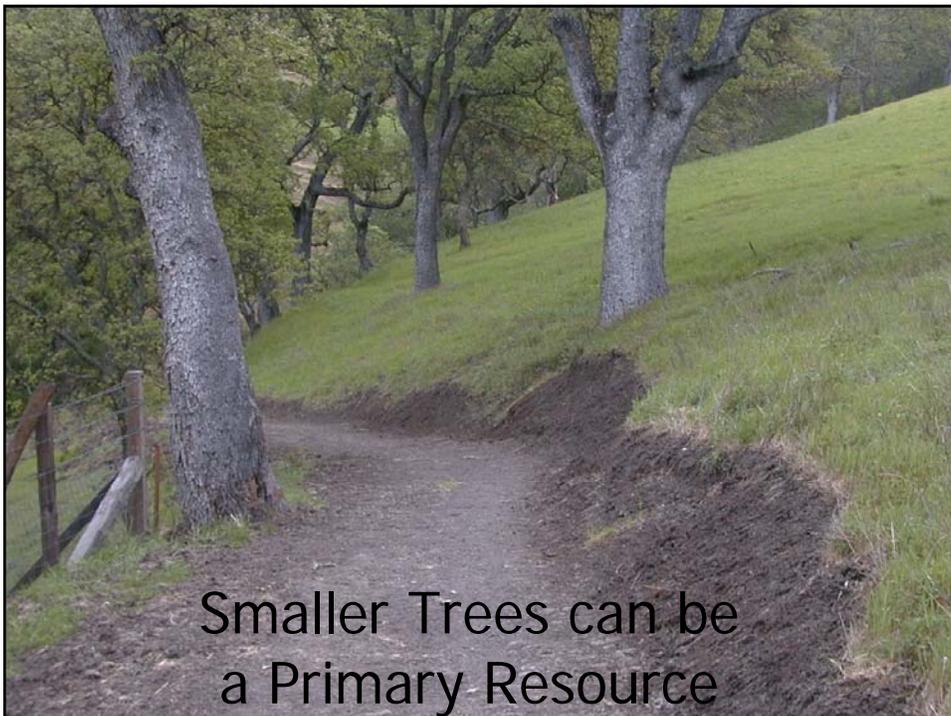
Fully  
Investigate for  
Proper Trail  
Alignment



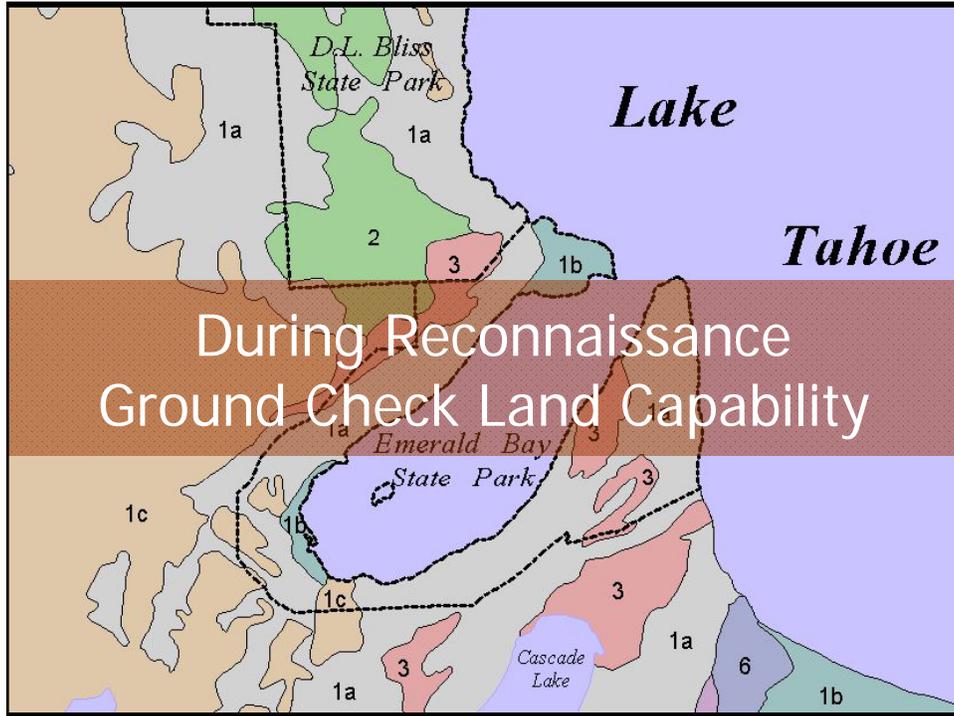
Establish High Water Flows

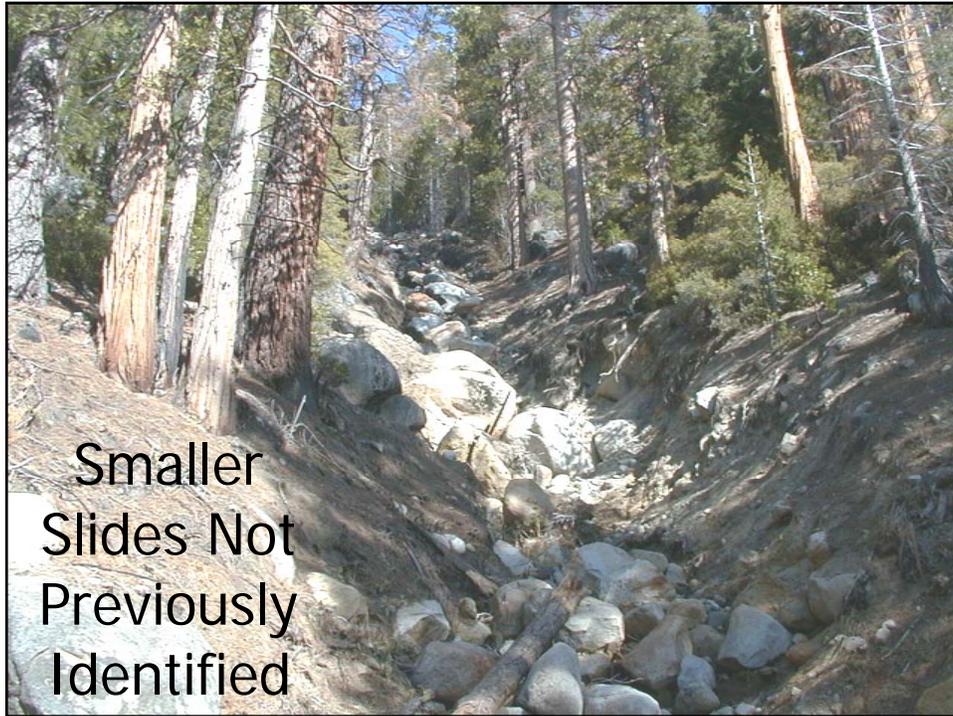


Large Trees are Minor Controls



Smaller Trees can be  
a Primary Resource



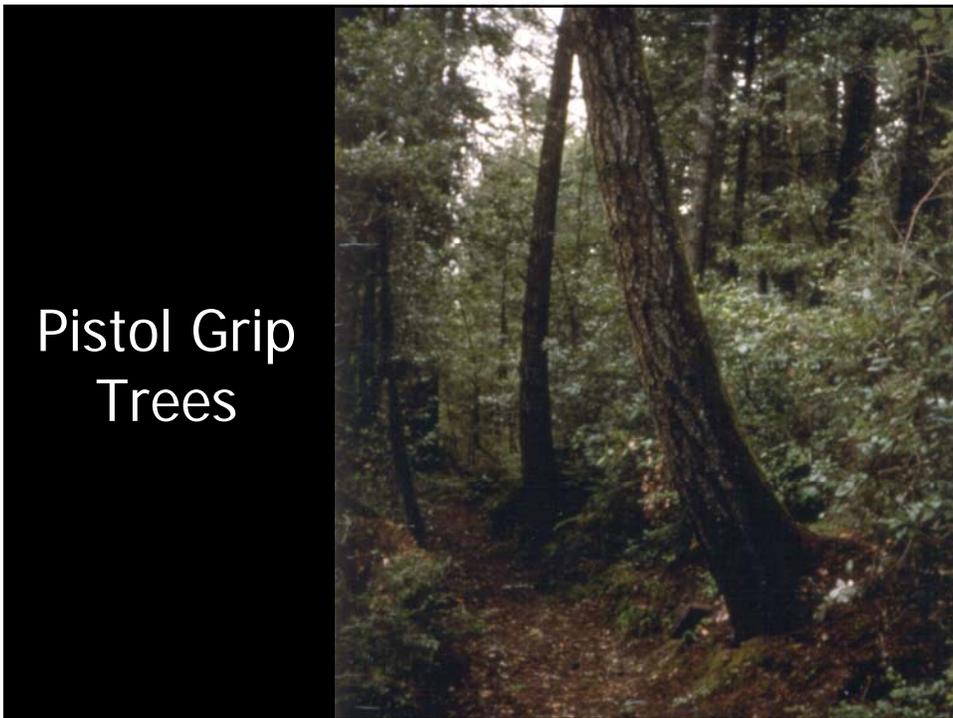


Look Hard  
Vegetation Hides Old Slides



Be Leary of Standing/Ponding  
Water







Tilted  
Trees

Open Canopy





# Land Capability Soils

Soils Range From Rock to Sand

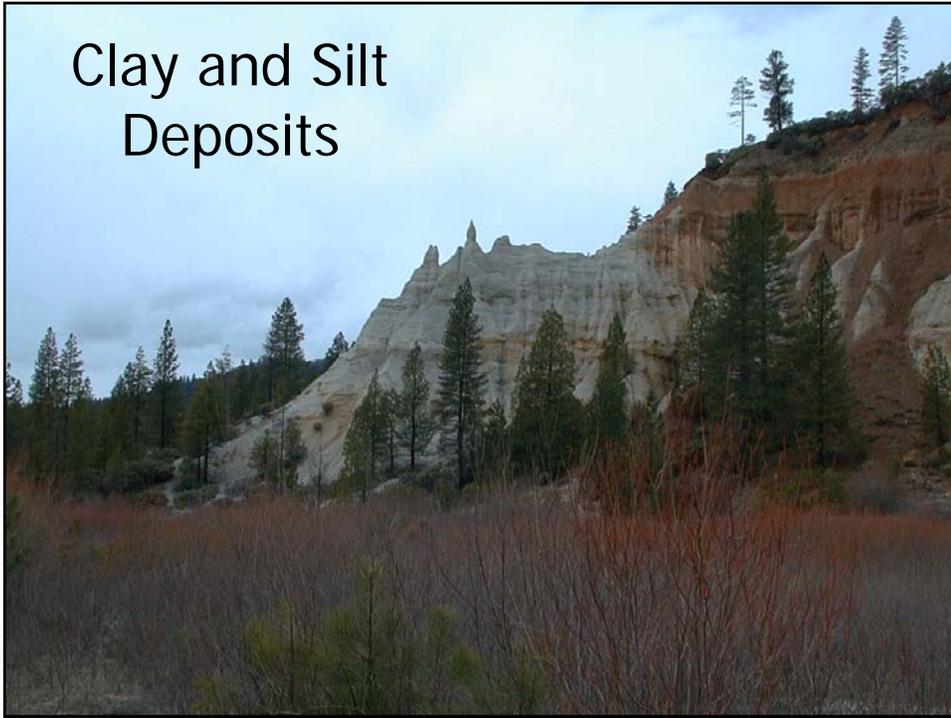
Trail Grade is Dependent on Use  
Type, Soil Type and Season of  
Use



## Sandy Soils Appear Stable



## Clay and Silt Deposits



Clay Soils Lose Structure with  
Moisture

## River Gravel Deposits

- Contain Better Matrix of Material Size, Rock, Some Silts and Less Clays
- River Gravels Have Better Sustainability
- River Run Parent Gravels are Missing Fractured Faces for Locking

Angular  
Fractured  
Rock

Shales

Good  
Material  
Matrix





A Good  
Material Matrix

Will Compact and  
Keep Soil Moisture  
Content

Sustains Grade  
and Heavy Use

While Traversing the Corridor  
Be Noting These Other  
Features



## Wetlands-Sensitive Areas

### Indicator Species

Each Area has Species  
that Indicate  
Wet/Saturated Habitat

Identify these during  
your Reconnaissance





## Slope and Aspect

South Aspect

Effects Snow Melt, Shade, Vegetation

North Aspect



Vistas and Views

# Search for Opportunity for Views the Trail User Enjoys a Vista



Aesthetics

Design in  
Visitor  
Attraction  
Areas



Flowering Native Plant Species



Specimen Trees, Etc.

## Wildlife Resources

Design Trail  
Corridor *Away* if  
Sensitive

*Design To*, if No  
Impact, for Visitor  
Experience



Historic  
Resources,  
If Not  
Sensitive

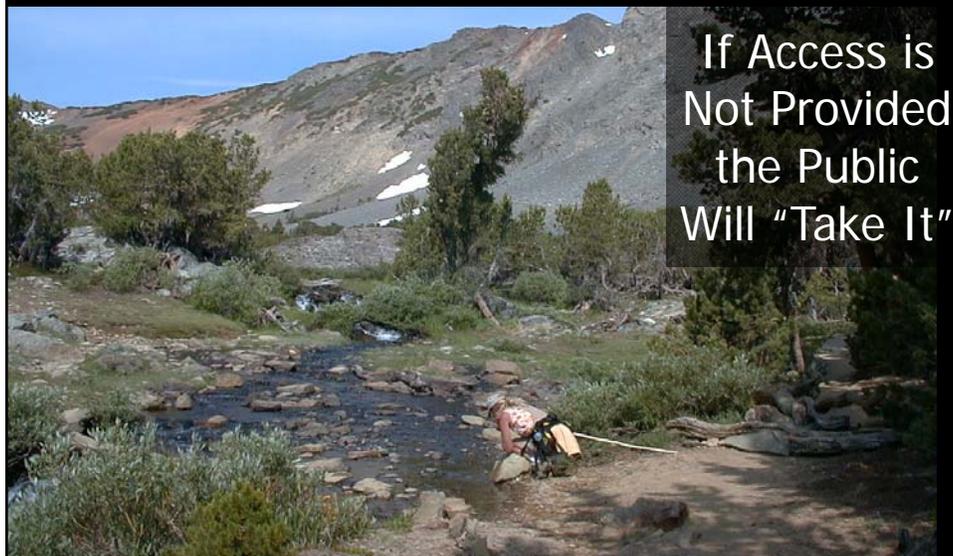
They Offer  
the Visitor  
a Sense  
of Self  
Discovery





Keep Your Eye Open  
for Sensitive Cultural  
Resources

Studies Indicate Visitor Preference  
to Feel, Hear and See Water



If Access is  
Not Provided  
the Public  
Will "Take It"

## Visitor Safety

Be Conscious of  
Talus Slopes and  
Rock Fall Areas

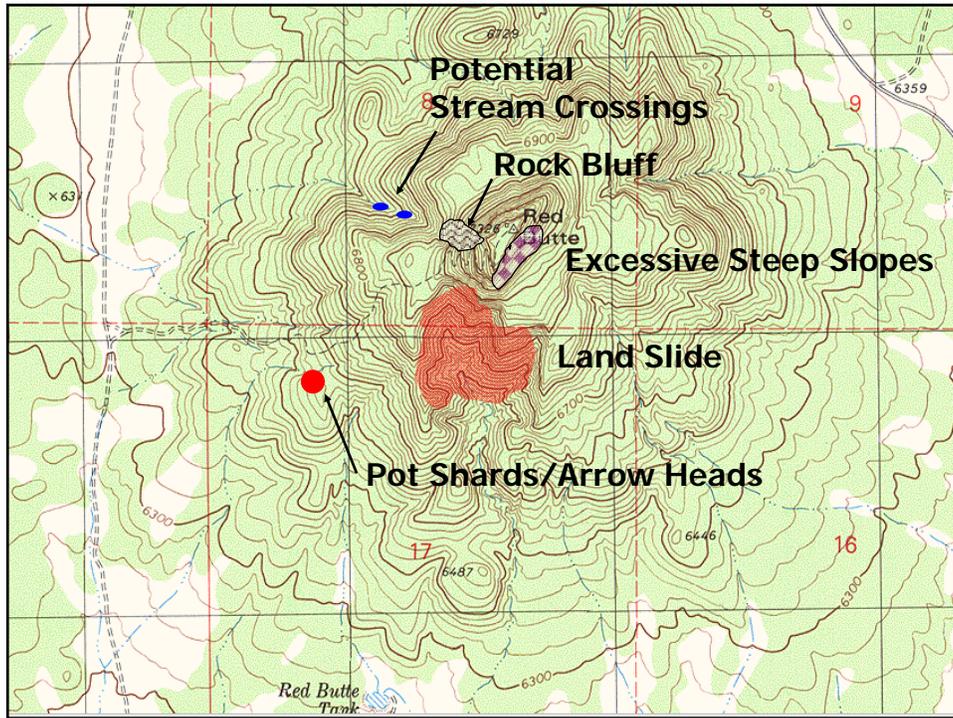


Avalanche Slide Areas

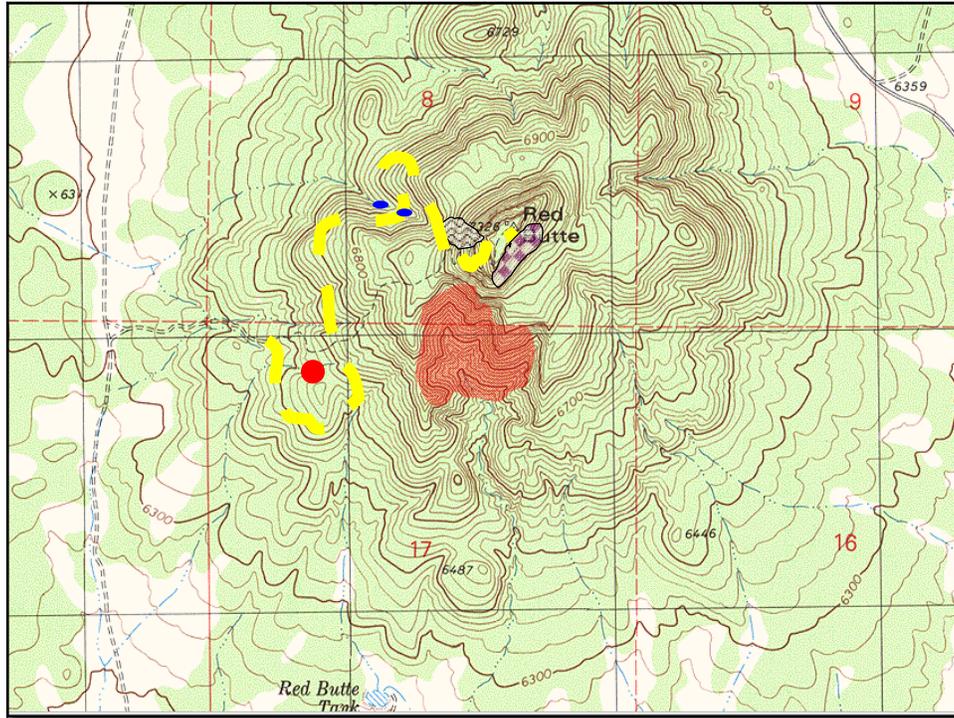
Avoid  
High Wind  
and  
Lighting  
Prone  
Areas



- When You Identify Controls and Unique Features Track Them With Altimeter and Plot on Topo Map



- Keep Track of Rough Grades With Clinometer
- Narrowing a Rough Trail Corridor



Consultation  
and Surveys  
on  
Sensitive,  
Threatened  
and  
Endangered  
Wildlife  
Habitat



Hydrologist Review of  
Stream Crossings





Archaeologist  
Cultural Survey  
of Corridor  
Alignment

## Trail Design Concepts Conclusion

- Establish User Type
- Classify and Establish Standards
- Perform Literature Search
- Establish Broad Corridor Alignment
- Identify Major Control Points
- Perform Big Picture Overview
- Field Check by Reconnaissance
- Establish Minor Control Points

## Trail Design Concepts Conclusion

- Assess Land Capabilities
- Take Advantage of Inherent Aesthetics
- Identify Safety Concerns
- Rough Map Control Points and Trail Corridor
- Bring In Resource Specialists for Review Before Laying a Flagged Alignment
- Now Final Alignment Identification Can Begin