Guide to Sustainable Mountain Trails

Foundations of Mountain Trail Sustainability

One Trail at a Time / One Mile at a Time

Webinar Series 1 of 3

June 26, 2014

FINAL

Trail Assessment, Planning
& Design Sketchbook
2007 Edition

Intrinsic Values of Our Precious Public Lands …

… help establish why lands have been set aside …



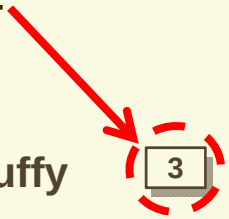


… and they must be preserved and if necessary – restored ...

Webinar 1 of 3 – Foundations – Learning Objectives

1. Overview of the "***Sketchbook***" process
2. Professional landscape architectural policies & ethics and land management agency missions that inform modern mountain trail sustainability by minimizing impacts to natural resources
3. A few key documents that have inspired and influenced mountain trail sustainability
4. The paramount and subordinate landscape architectural criteria which influence mountain trail sustainability
5. Successful Tools & Techniques of the application of mountain trail sustainability on the ground
6. Introduce the *Sketchbook / Workbook Training* process
7. Adherence to the *Sketchbook* process through inspiration.

Questions? Please note the slide #



Let me start with a hypothetical question:

What is the most important issue affecting environmental sustainability?

- **Fossil fuel consumption?**
- **Renewable energy?**
- **Global warming?**
- **Species extinction?**
- **Fracking?**
- **Recycling?**
- _____

… and, the most important question:

What are you doing about it?

Let me highlight one basic environmental issue that is important to me:

- **Aluminum can (beverage containers) recycling**
- **Did you know what beverage containers are 99.99% recyclable?**

… this translates into 10,000 recycled beverage containers being able to produce …

… 9,999 new beverage containers.

Let me introduce to you another important issue facing the environment:

Sustainability of Mountain Trails …

The concept of sustainable mountain trails was first proposed in 1990, and I have been continuing to articulate that philosophy since. (January 1991 Colorado State Trails Newsletter Article)

I have put together … the *Sketchbook* … to help you improve stewardship of your mountain trails …

… "One Trail at a Time / One Mile at a Time."

Background … Sustainable Mountain Trails 1 of 4

- 1965 – Exposed to the Appalachian Trail
  @ Bear Mountain State Park, New York
  - Bear Mountain Trailside Museum
  - Bear Mountain Perkins Fire Tower
- 1970 – (first) Earth Day – Carman's Creek
- 1976 – Hiked Bear Mountain
- 1980 – Bachelor's of Landscape Architecture
  Syracuse University
- 1980–1983 USFS
  - Recreation Planning
- 1983–1985 Buffalo National River, Arkansas
  - Park Landscape Architect
- 1985–2014 Various NPS Projects

Hugh Duffy
PLA, PMP, ASLA, LEED® GA
Hugh_duffy@nps.gov; duffyfamily7@comcast.net
NPS: (303) 969-2452; Cell: (303) 981-5120

1985–1990 Volunteers for Outdoor Colorado (VOC.org)

- 12 Projects “Soups to Nuts”
- Many Roles & Responsibilities
  - Technical Advisor
  - Projects Committee Chair
  - Project Selection Committee
  - Board of Directors 1988–1990

Many Consultant Projects

- 1997–2002, 2010 & 2011
- Colorado State Parks
  - Park-wide Trail Plans, Trail Designs, Trail Training
- City of Lakewood Regional Parks
  - Park-wide Trail Plans, Trail Designs

Landscape Architecture

- Writing / publishing documents
- Solving problems through design
- Being creative with solutions

Presentations

- Graphics / line drawings
- Natural & cultural resource protection

Outdoor / Environmental Education

- Volunteerism
- Trail planner training
- *Sketchbook / Workbook* training

One-on-One Mentor – Bob Steinholtz, 1983 ~ 1990

National Trails Symposium Presentations

- **1984 – *"Importance of Design Drawings for Mountain Trail Projects"***
- **2001 – *"Successes Along Colorado's Front Range"***
- **2006 – *"Art & Science of Sustainable Mountain Trails"***

1989–1992 NPS Rivers, Trails & Conservation Assistance Program

- **Various Program Trainings**
- **Many Consultations, Several Projects**

Colorado Trails Symposium

- **1986–2004 (Many)**

+ my "Interdisciplinary Team" … Danny / Greg / John / Don

Origins of the *Sketchbook*

2004 – Master Instructor

- **Colorado Outdoor Training Initiative (COTI)**

2005 – Draft *Sketchbook* Inspiration

- **Steamboat Lake State Park Outfitters Cabin**
  "Labor Day – Family Retreat"

2006 – Kim Frederick, JEFFCO Open Space, Lunch

- ***"We* need *you to … write a book!"***
- ***Oivay!***

2006 – *Sketchbook* for COTI

2007 – *Sketchbook* for the National Park Service

"The Sketchbook is a synthesis of key principles that influence sustainability of mountain trails."

What is the *Sketchbook* process?

It is Art … Science & Inspiration …

Get the trails community on *Common Ground* to stand on ...

1. **Project Management Tools & Techniques**
2. **Uniformity of Terminology**
3. **Background**
4. **How's & Why's**
5. **Purpose**
6. **Target Audiences**
7. **Tools & Techniques**
8. **Examples / Case Studies / Samples**
9. **Sketches …**

… *Sketchbook* …

What Is …
&
What Can Be.

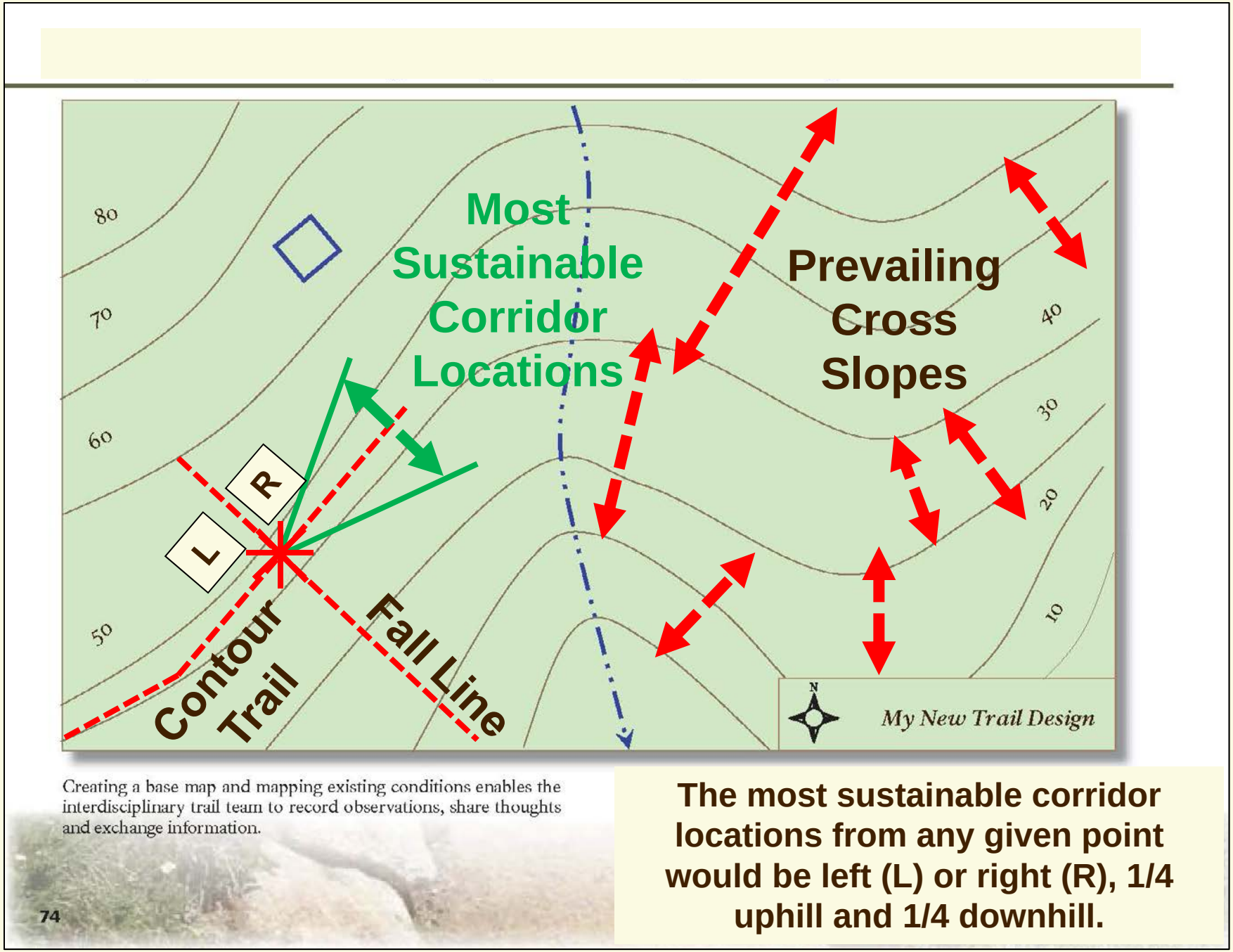
It is a vignette only!

Mountain Trail Sustainability *Common Ground* Definitions

1. Fall Line
2. Fall Line Trail
3. Contour Trail
4. Rolling Contour Trail
5. Side-hill Trail
6. Topographic Prevailing Cross Slope
7. Trail Profile
8. Trail Centerline
9. Trail Profile Gradient
10. Average Profile Gradient / Maximum Profile Gradient
11. 1/4 Prevailing Cross Slope / Profile Grade
12. Trail Slope Alignment Angle
13. Optimum Trail Corridors

***– Sustainability of National Park Service Backcountry Trails, Minimizing Resource Impacts*, May 2012**

Mountain Trail Sustainability *Common Ground* Graphics



"Optimum trail corridors will connect trailheads with destinations and consider linkages within the trail system.

Once corridors are established, incremental improvements can be made over time to achieve trail sustainability.

Multiple corridors can be studied together, adjustments made, and assembled into an area-wide plan.

The most sustainable corridor is the corridor implemented to sustainable criteria, incrementally improved and with minimal or no re-routing."

***– Sustainability of National Park Service Backcountry Trails, Minimizing Resource Impacts*, May 2012**

"The optimum [trail] corridor starts at appropriate origins, utilizes appropriate corridor functional and aesthetic control points, and terminates at appropriate destinations.

The optimum corridor also considers boundary constraints, adjacent corridor locations, easements and off-site connections.

When the optimum corridor is compared to existing trails, the percentage of the existing corridor that is sustainable, as well as degree of impact in that corridor, will assist the interdisciplinary trail team in determining appropriate actions such as New Trail Design, Maintenance, Rehabilitation, Armor or Ecological Restoration."

***– Sketchbook, 2007 edition*, page 49.**

Goal: Do it right the first time!

- **Establish trail corridor.**
- **Establish Major (corridor) control points in planning.**
- **Establish Minor control points in design.**

Maintenance / Rehabilitation / Armor

- **Incremental spot improvements or armor over time.**
- **Maintenance program up to 4x per year.**
- **Annual review, additional incremental spot improvements … combined with *"Patience!"***

Purpose … realizing the intrinsic values of land … and … through a combination of art, science & inspiration … to promote excellence when implementing sustainable mountain trails.

The purpose of the *Sketchbook* is

Not … to overwhelm you … but rather … to create a framework whereby you can start taking actions that will improve the long-term sustainability of your trail system …

So say, for instance … that you are the manager of a small park or open space unit with 25 miles of trails …

Why not embark on a journey based upon a tried-and-true framework … and start improving …

"One Trail at a Time / One Mile at a Time?"

~ The journey of a thousand miles begins with but a single step …

Trail Project Management Tools & Techniques

Inputs

- Typical Inputs
- Foundations

Tools & Techniques

- Typical Tools & Techniques
- Lessons Learned Technique
- Trail Project Cycle Tool

Outputs

- Typical Summary Package Outputs
- Draft for Review; Final

Typical Inputs

- Foundations
- Stakeholder Analysis & Summary
- Popular Literature
- Aerial Photos, Annotated Aerial Photos
- Maps, Annotated Maps
- Data Bases

Foundations

- Inspirational Literature / Organic Act / Enabling Legislation
- Agency Management Policies & Guidelines
- Interpretive Plans
- Environmental Compliance Regulations

Typical Tools & Techniques

- Assemble Interdisciplinary Trail Team
- Popular Literature Review – Internet & More Tools
- Research / Science
- Field Work, i.e.: Field Notes, Design Notes, Thumbnail Sketches
- Drawings, Examples, Photo Collages, Photomontages
- GPS, GIS, Analytical Techniques
- Choosing by Advantages
- Estimating Tools
- Stakeholder Analysis
- Charette Techniques
- Management Team Review
- Compliance Review

Typical Summary Package Outputs

- Written Summary
- Plans Set
- Thumbnail Sketches / Drawings
- Stakeholder Summary
- Photographs
- *Lessons Learned* Summary
- Trail Management Techniques
- Actions Sequences
- Checklists

Customizing ***Tools & Techniques*** that apply to *"most projects, most of the time"* will increase achievement of sustainability on mountain trail projects.

Sketchbook Basis – 7 Realities & Considerations

"7 Realities"

1. **Funding is scarce!**
2. **Day labor is scarce!**
3. **Volunteer labor is scarce!**
4. **Time is scarce!**
5. **Materials are scarce!**
6. **Lessons Learned – Others have gone before you.**
7. **Pitfalls to Avoid – Ditto, others have gone before you.**

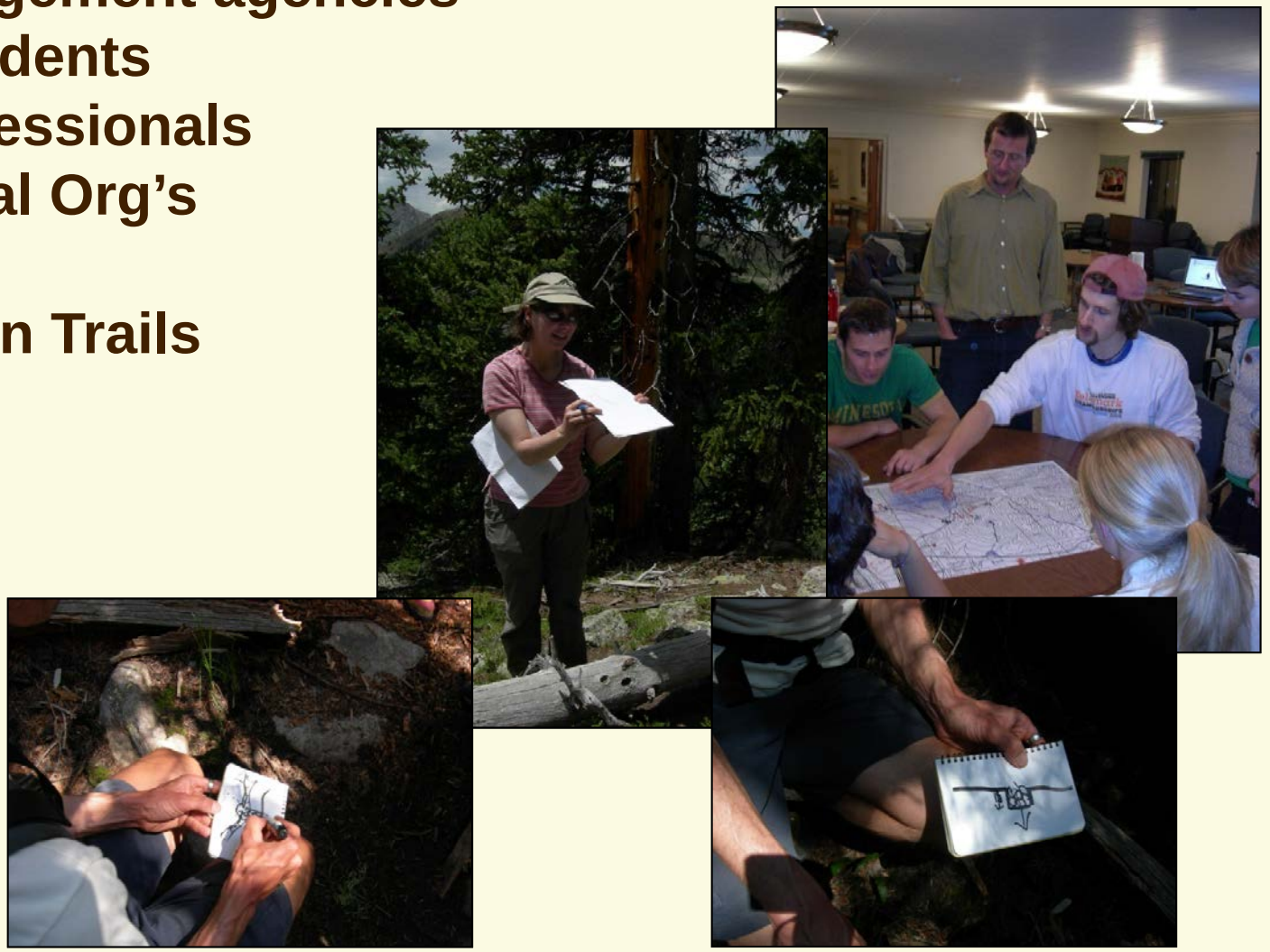
Considerations

1. **Maintenance will be required**
2. **Rehabilitation will be required**
3. **Armoring of some segments …**
4. **100-year rains will come**
5. **500-year rains will come**

See American Trails eNewsletter for June 2014 for maintenance needs on federal lands!

Target Audiences

- Outdoor Stewardship Institute (OSI), formerly COTI
- Nonprofit / volunteer conservation community
- National Park Service community
- Land management agencies
- College students
- Young professionals
- Professional Org's
  - ASLA
  - American Trails
- Etc.



Stewardship …

- Wise management … like a woodlot … improve … leave in a better condition than you receive it.

Land Management Agency Role

- See Mission Statements
- Laws / Policies / Agency Directives

Conservation Nonprofit Agency Role

- See Mission Statements
- Education / Interpretation / Research / Training
- Fund Raising

Partnerships

- The Appalachian Trail is the hallmark private nonprofit / public land stewardship partnership.

American Society of Landscape Architects (ASLA)

Policies & Ethics

- Research
- Environmental Sustainability
- Open Space
- Wildlife Habitat
- Wetlands
- National Parks
- Public Lands & Forests
- Visual Resources
- Water Quality & Conservation
- Invasive Species

^ All of these topics will come up on mountain trail projects.

Landscape Architectural Influences 2 of 4

Preserving, enhancing, restoring … the intrinsic values of land …

… are the hallmarks of sustainable mountain trails…

Frederick Law Olmsted, Sr. is credited with the founding of the profession of Landscape Architecture with his proposed "Greensward Plan" for New York City's Central Park in 1858.

For almost 150 years the profession of landscape architecture has commonly combined the application of artistic, scientific and design principles to land development or land stewardship projects with effective written and graphic communication.

"Foundational to the practice of landscape architecture is the professional ethic to protect, respect, enhance or restore the intrinsic values of land, and to not degrade the intrinsic values of land. In one word, the profession of landscape architecture emphasizes land 'stewardship.'"

– *Sketchbook, 2007 edition*, page 10.

Tools & Techniques

- Interdisciplinary Team
- Planning Processes
  - Rational / Defensible / Repeatable
- Environmental Compliance Processes
- Stakeholder Analysis
- Site Analysis
- Alternatives / Options Framework
- Comparison of Alternatives & Options
- Choosing by Advantages Decision-Making Process
- Agency / Public Review
- Incremental Implementation
  - *"One Trail at a Time / One Mile at a Time."*
- Lessons Learned / Pitfalls to Avoid

The *Sketchbook* is a niche document – intended to complement other popular trail documents:

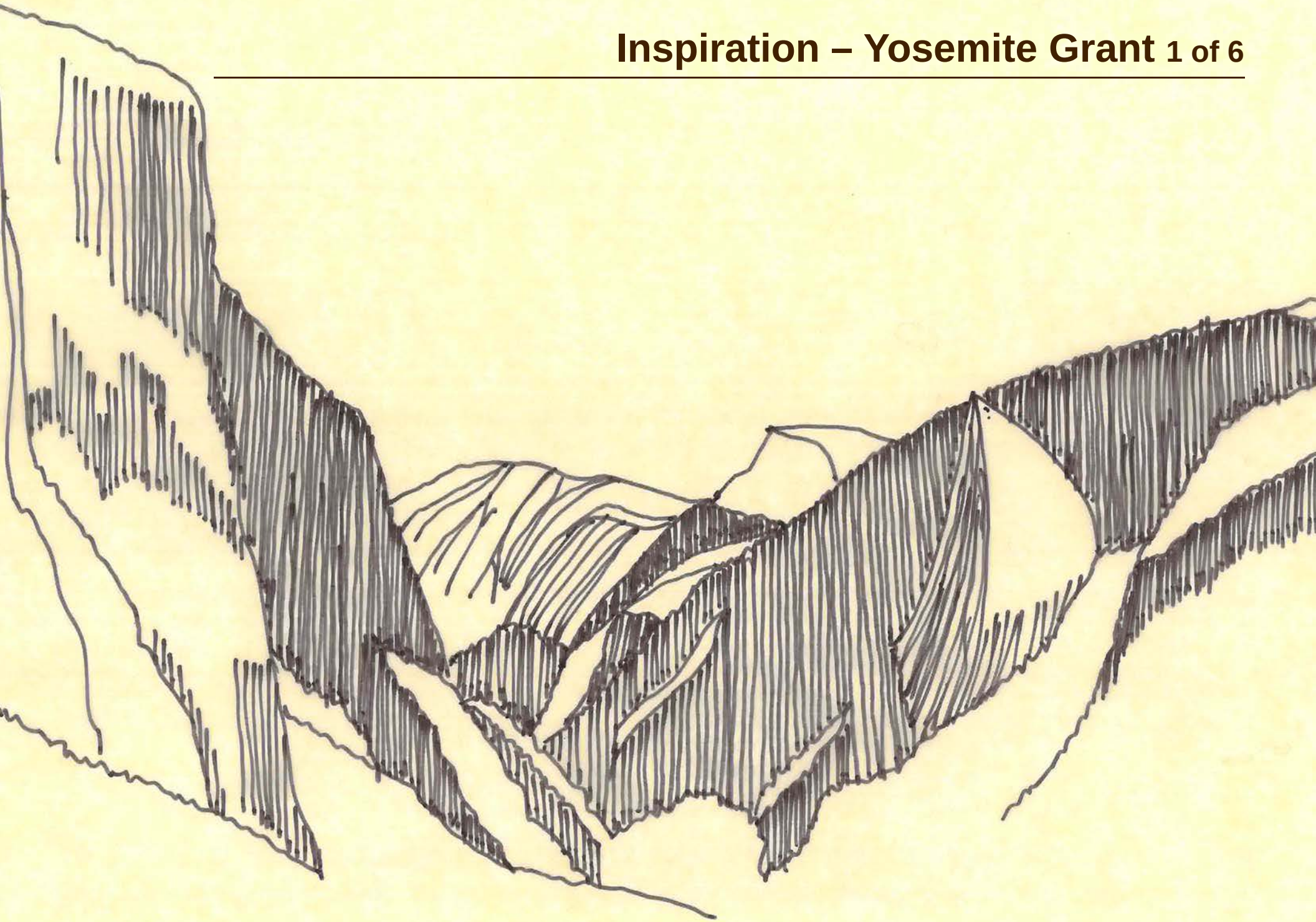
- **Sustainability criteria a.k.a. "narrow limits"**
- **The "Why's?" and "How's?" of successful projects.**
  - **If you teach "Why?" first …**
  - **Then go on to "How? …**
- **It is a National Park Service Guidebook**

Generally accepted criteria … will work in most cases most of the time – can be customized without risk …

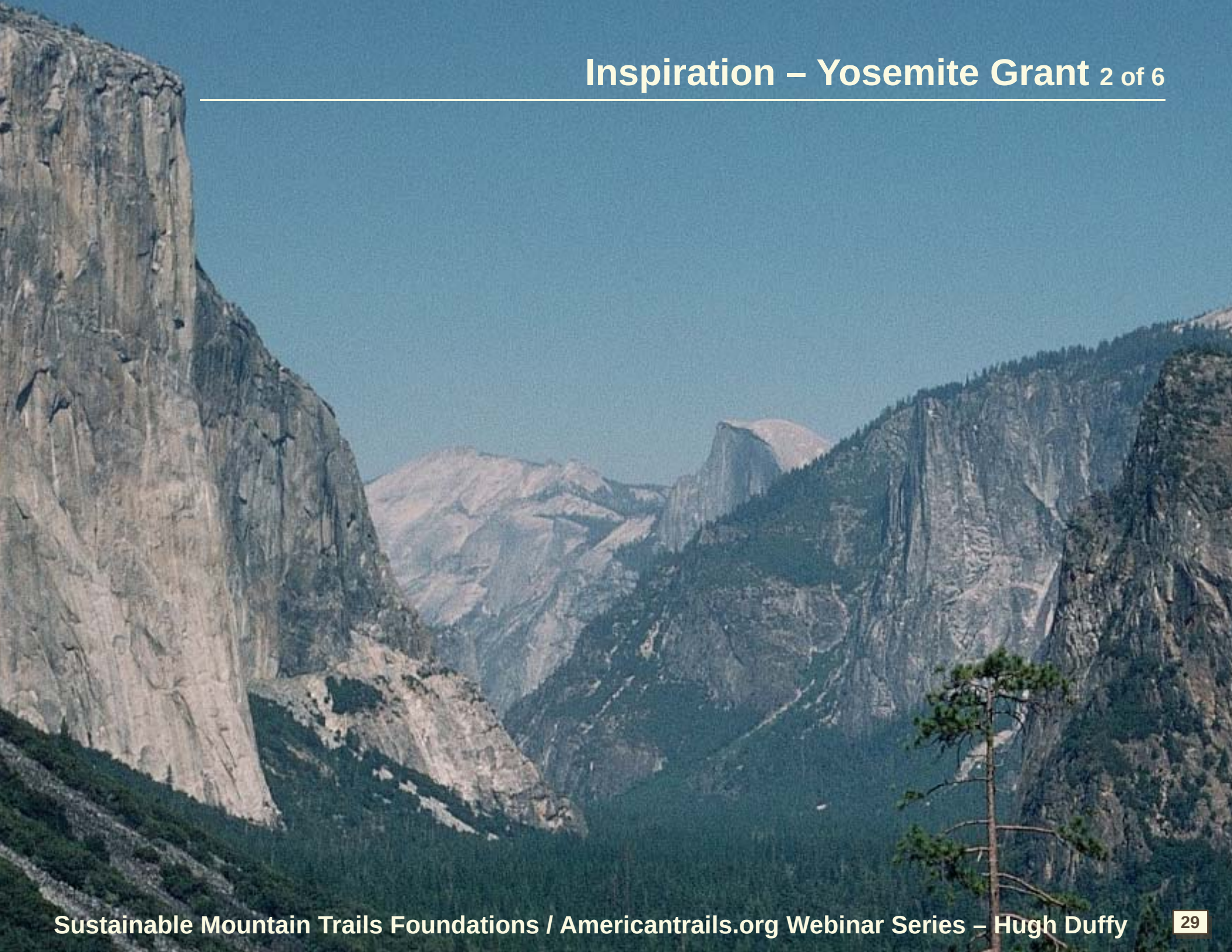
"Fix process = fix product!"

The *Sketchbook* is a training product, but it is also a process document.

Inspiration – Yosemite Grant 1 of 6



Inspiration – Yosemite Grant 2 of 6



The Olmsted Report

Having been declared a national trust by Abraham Lincoln in 1864, Yosemite was the first conservation area land in the United States set aside for its visual resource values. The publication of "The Olmsted Report" in 1865, which provided recommendations for the preservation of the naturally occurring scenery as well as visitor management strategies for Yosemite Valley and Mariposa Grove of Giant Sequoia trees, was a watershed event in the preservation community. The report no doubt influenced preservation and conservation initiatives of the late 19th and early 20th centuries. From the report:

> *The first point to be kept in mind then is the preservation and maintenance as exactly as is possible of the natural scenery; the restriction, that is to say, within the narrowest limits consistent with the necessary accommodation of visitors, of all constructions and the prevention of all constructions markedly inharmonious with the scenery or which would unnecessarily obscure, distort or detract from the dignity of the scenery.*
>
> *Second; it is important that it should be remembered that in permitting the sacrifice of anything that would be of the slightest value to future visitors to the convenience, bad taste, playfulness, carelessness, or wanton destructiveness of present visitors, we probably yield in each case the interest of uncounted millions to the selfishness of a few individuals* (Yosemite Association, 1995).

Preservation and conservation of public lands is a complex endeavor, and many times significant effort goes into actually drawing lines on a map establishing conservation area boundaries. Interdisciplinary trail teams of today are wise to be mindful of this fact and take specific care to develop strategies that protect the very resources that public lands are set aside to protect. Recreationists of all types are relying on public land managers to develop projects that provide for safe and enjoyable access, while protecting sensitive natural and cultural resources and their intrinsic resource values.

Foundational principles of landscape architecture, the preservation of naturally occurring scenery and the restriction of development within narrow limits, still apply today. Too often, haste or improper planning and design lead to projects that are out of scale with their environment, or diminish the visual resource quality of naturally occurring landscape features. Every effort should be made to preserve landform and soil resources as these are the most foundational of natural and visual resources, lest impacts occur which detract from the natural setting of the area.

8

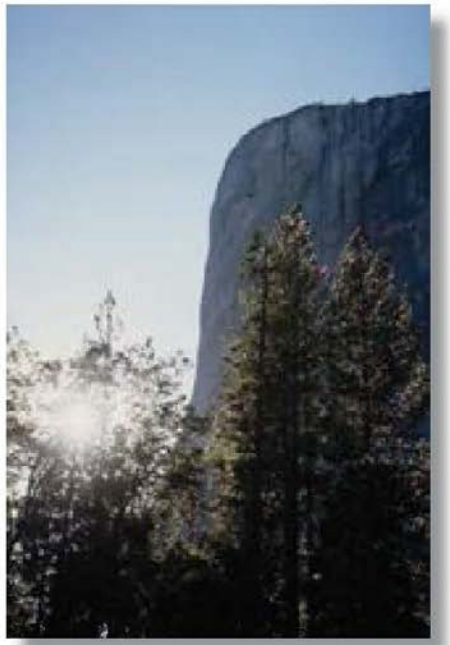
After designing New York's Central Park, Frederick Law Olmsted, Sr., was commissioned to make recommendations for management of the Mariposa Grove of Giant Sequoias & Yosemite Valley.

"The first point to be kept in mind then is the preservation and maintenance as exactly as is possible of the natural scenery; the restriction, that is to say, within the narrowest limits consistent with the necessary accommodation of visitors, of all constructions and the prevention of all constructions markedly inharmonious with the scenery or which would unnecessarily obscure, distort or detract from the dignity of the scenery."

– *Olmsted Report, 1865* (Yosemite Association, 1995).

Inspiration – Yosemite Grant 5 of 6

Opposite page. Yosemite Valley in Yosemite National Park has been the source of inspiration to the preservation, conservation and recreation communities for many years. Left, Frederick Law Olmsted.



As much as our natural and cultural resources inspire us, so too, should our trailside improvements, so as to not detract from their settings or the reasons why land was set aside for enjoyment.

No less important to citizens of our country today, are all open space lands possessing unique visual resource values, wetlands, habitat for native or rare plants and wildlife, and opportunities for passive recreation and solitude.

Not all Americans are able to visit the crown jewels of our National Park system. State governments, cities, counties, local governments and special districts all across the country provide conservation area lands for their citizens to enjoy. A mature understanding of the intrinsic resource values of a landscape, the reasons people visit and recreate upon public lands, as well as a mature mountain trails' sustainability ethic are required to ensure that wise decisions are made regarding the safe access to-, enjoyment of-, and stewardship of- our nation's public lands.

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Origins

- Frederick Law Olmsted Sr. & Calvert Vaux, Central Park

Literature References

- NPS CCC Training Document
- Parks Canada
- USFS

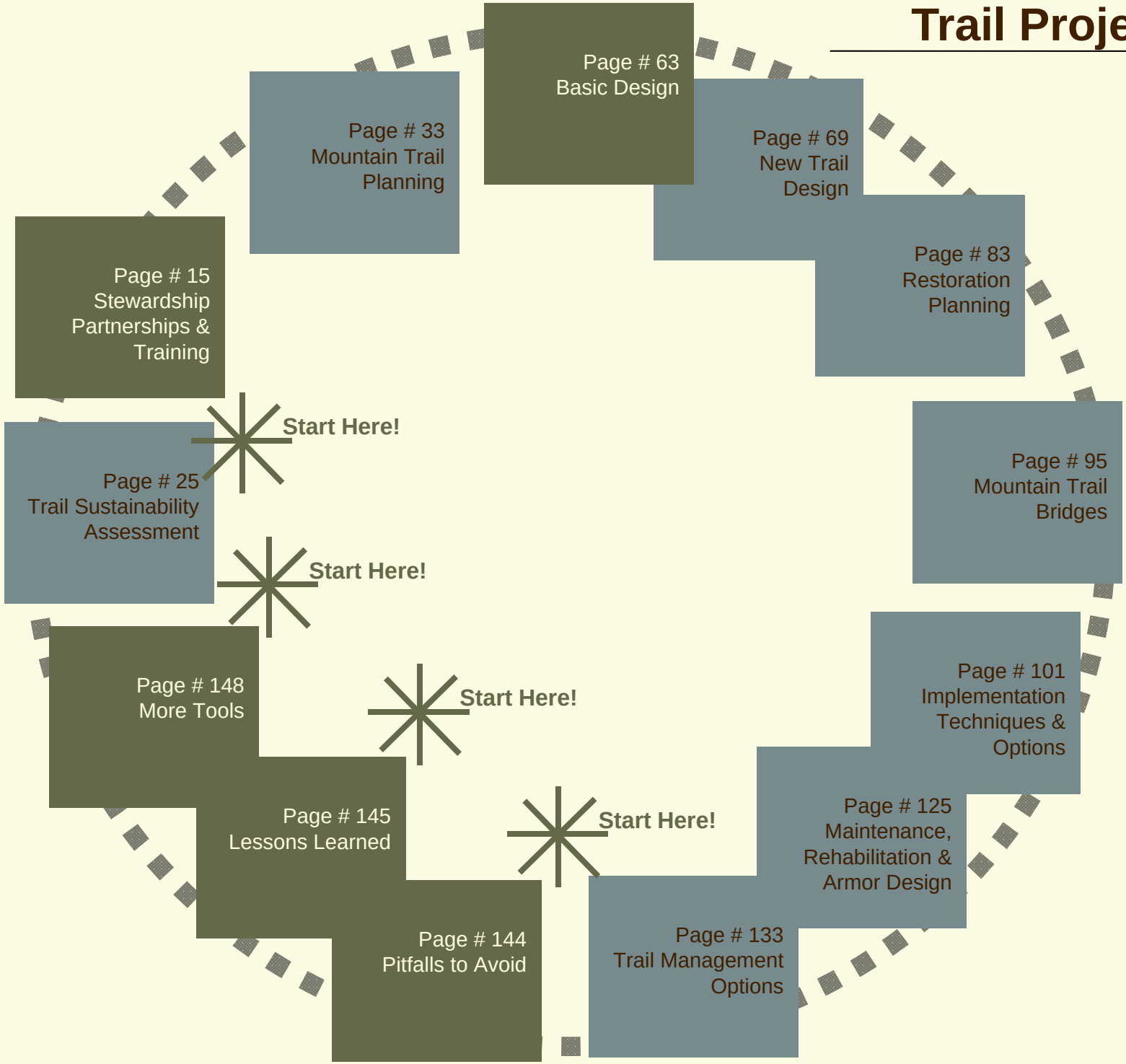
Various Legislations

Sustainable Mountain Trails Experience

- Landscape Architect
- Civil Engineer
- Geologist
- Forester
- Restoration Ecologist
- Non-profit Agency Manager

With … modern realization and understanding … through interdisciplinary team collaboration … the team is greater than the sum of the individual team members.

Trail Project Cycle Tool



Partnerships with conservation nonprofit agencies are required, now more than ever, to ensure continued success of recreational trails on public lands.

All cogs of the trail project cycle would benefit from such support!

Pitfalls to Avoid

1. Not forming an interdisciplinary team
2. Not including management / compliance reviews
3. Using inappropriate sustainability criteria
4. Not conducting a sustainability assessment before planning
5. Not considering the planning context before designing
6. Not planning ecological restoration activities from the outset
7. Not entering into a partnership with a conservation nonprofit agency
8. Et al.

Lessons Learned

1. Having patience and not undertaking too-ambitious of a project (one mile per trail per year may be sufficient)
2. Not exceeding recommended profile grades minimizes erosion
3. Not exceeding recommended cross slope grades minimizes erosion
4. Complete documentation of plans and designs assures project success
5. Training activities strengthen the overall trails' program
6. Post-project lessons-learned summaries at the conclusion of each project or project season
7. Et al.

What is Appropriate? Sustainable trails …

… provide the appropriate settings to contemplate nature …




…learn about our natural and cultural resource heritage and be renewed, inspired and refreshed …

Trail Project Management

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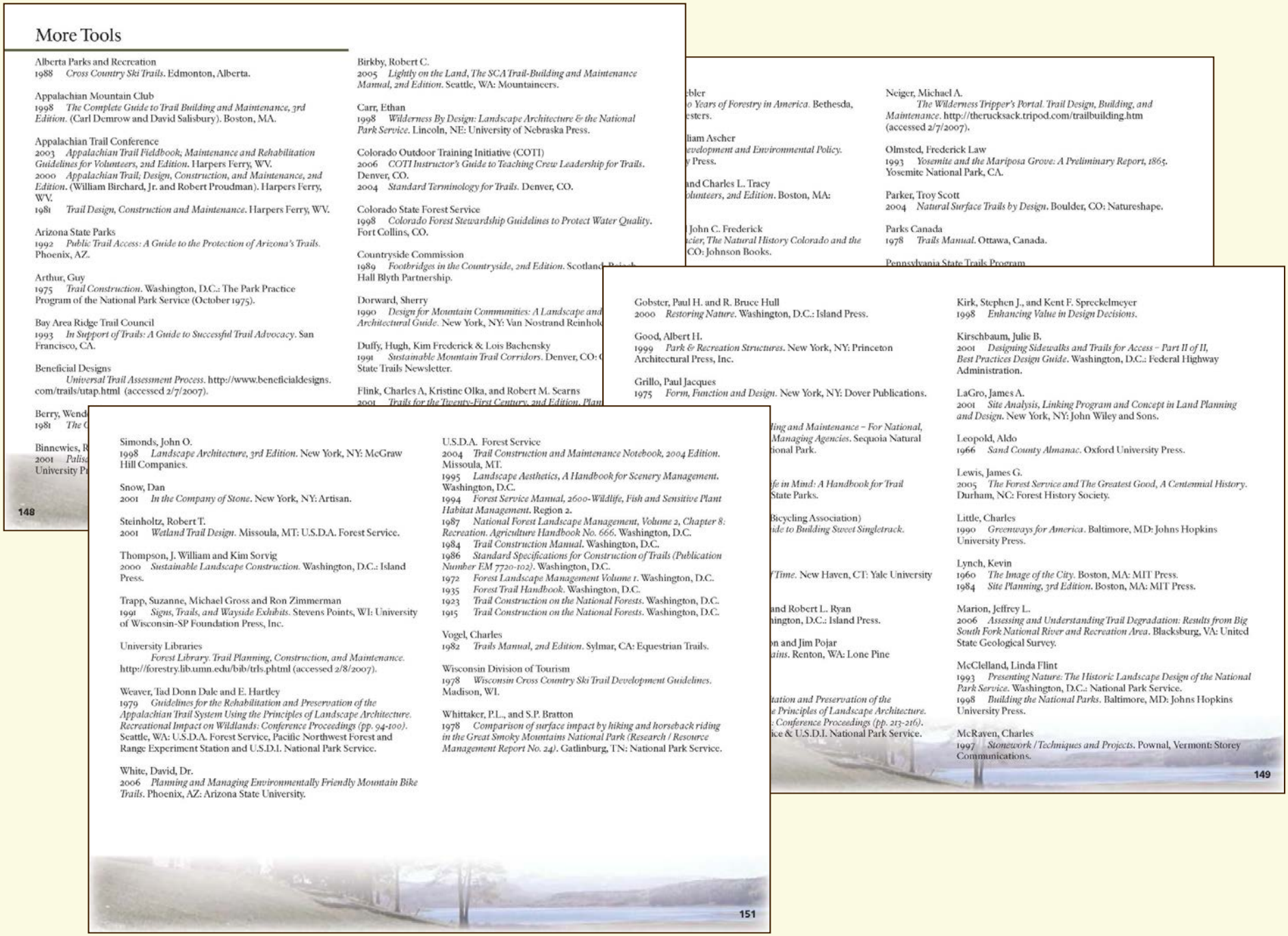
More Tools



More Tools

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2004 *Trail Construction and Maintenance Notebook, 2004 Edition*. Missoula, MT.
1995 *Landscape Aesthetics, A Handbook for Scenery Management*. Washington, D.C.
1994 *Forest Service Manual, 2600-Wildlife, Fish and Sensitive Plant Habitat Management*. Region 2.
1987 *National Forest Landscape Management, Volume 2, Chapter 8: Recreation. Agriculture Handbook No. 666*. Washington, D.C.
1984 *Trail Construction Manual*. Washington, D.C.
1986 *Standard Specifications for Construction of Trails (Publication Number EM 7720-102)*. Washington, D.C.
1972 *Forest Landscape Management Volume 1*. Washington, D.C.
1935 *Forest Trail Handbook*. Washington, D.C.
1923 *Trail Construction on the National Forests*. Washington, D.C.
1915 *Trail Construction on the National Forests*. Washington, D.C.

Vogel, Charles
1982 *Trails Manual, 2nd Edition*. Sylmar, CA: Equestrian Trails.

Wisconsin Division of Tourism
1978 *Wisconsin Cross Country Ski Trail Development Guidelines*. Madison, WI.

Whittaker, P.L., and S.P. Bratton
1978 *Comparison of surface impact by hiking and horseback riding in the Great Smoky Mountains National Park (Research / Resource Management Report No. 24)*. Gatlinburg, TN: National Park Service.

Jump to …

NPS Sustainable Trails website

- http://www.nps.gov/dsc/trails.htm

American Trails / Resources website

- http://www.americantrails.org/resources/index.html

University of Minnesota Forestry Libraries

- http://www.lib.umn.edu/cgi-bin/forestry/index.cgi

Google.com

Inspirational National Park Service Literature

1934 NPS Trail Standards Sheet (San Francisco Office)

1937 NPS CCC Construction of Trails (Great Smoky Mountains NP)

1975 NPS Trail Construction (Guy Arthur) Park Practice Program

1983 Trails Management Handbook (NPS D2023)

1983 NPS Parks Trail Article (Based Upon 1975 Guy Arthur Article)

1991 NPS – 77 Trail Management Issues and Strategies

1991 Developing Sustainable Mountain Trail Corridors – An Overview (Colorado State Trails Newsletter)

1996 NPS Sequoia Kings Canyon National Parks Trails (Stephen S. Griswold)

2006 NPS DO – 77 Natural Resource Management

2007 Guide To Sustainable Mountain Trails Sketchbook – 2007 edition

2012 Sustainability of NPS Backcountry Trails – Minimizing Resource Impacts

Sustainability of Mountain Trails – Classic Definition

"Sustainability of backcountry trail corridors is defined … as the ability of the travel surface to support current and anticipated appropriate uses with minimal impact to the adjoining natural systems and cultural resources.

Sustainable trails have negligible soil loss or movement and allow the naturally occurring plant systems to inhabit the area, while allowing for the occasional pruning and removal of plants necessary to build and maintain the trail.

If well-designed, built, and maintained, a sustainable trail minimizes braiding, seasonal muddiness and erosion. It should not normally affect natural fauna adversely nor require re-routing and major maintenance over long periods of time."

– NPS Reference Manual # 77, 2006.

"As soil is the substrate for most terrestrial plant and animal life, protection of soil resources from human-caused erosion is the most foundational ethic of mountain trail sustainability.

Areas where soil unnecessarily or excessively erodes, as well as areas where eroded soils are deposited, too often testify to poorly established trails, influencing additional impacts, less than optimum recreational experiences and increased life cycle costs.

***– Sketchbook, 2007 edition,* page 22.**

"Introduction or spreading of non-native plant species along improperly implemented mountain trail corridors are common impacts and can usually be prevented or avoided.

Careful attention to sustainability criteria and customization of landscape architectural tools and techniques across the trail project cycle will prevent or avoid unnecessary soil resource impacts."

***– Sketchbook, 2007 edition,* page 22.**

Erosion is a naturally occurring process accelerated by ecological manipulation. It is a slow, insidious cycle.

1. **Removal of protective vegetation**
2. **Changing of surface drainage patterns**
3. **Changing of subsurface drainage patterns**
4. **Channelization of runoff**
5. **Widening / cutting of new channels**
6. **Additional erosion within the channel (trail tread)**
7. **Neighboring plants' roots dry out**
8. **Neighboring plants die**
9. **Lack of root stability causes loss of more soil … wider channels … etc. …**
10. **See #1 above and start over.**

Also consider:

1. **Wind erosion**
2. **Surface compaction from recreation use**

Time Effect of the Natural Erosional Processes

Effects of erosion are seemingly never ending.

Considering the local frequency / intensity of precipitation on a mountain trail …

… rain / runoff … snow / snowmelt / runoff

New Hypothesis: the effects of erosion on mountain trails are due *more* to natural erosional processes … than they are to simple recreation use!

Duration of natural erosional processes …

60 Minutes	=	1 Hour
60 x 24 hours	=	1,400 Minutes / 1 Day
1,400 x 365 days	=	525,600 Minutes / 1 Year
525,600 x 50 years	=	26,280,000 Minutes / 50 Years

Optimum Prevailing Cross Slope Ranges & Profile Grades

"There is a limited prevailing cross slope range and optimum trail profile grade combination which yield the most sustainable mountain trail corridor.

Multiple project's experience along Colorado's front range indicates that sustainable mountain trails not only have good maintenance programs in place, but they also have trail gentle to moderate profile grades (elevation change along the trail center line) and that are less than 1/4 of the prevailing cross slope in the immediate section of trail."

***– Sketchbook, 2007 edition,* page 23.**

Inspirational USFS & BLM Literature

1915 USFS “A” Trail Construction on the National Forests

1915 USFS “B” Trail Construction on the National Forests

1923 USFS Trail Construction On The National Forests

1935 USFS Forest Trail (Roads) Handbook

1972 USFS Landscape Management

1977 USFS R6 Plans & Methods for Maintenance of Trails

1990 USFS Guide for Mountain Trail Development

2004 USFS Trail Construction and Maintenance Notebook

2007 USFS Equestrian Guide

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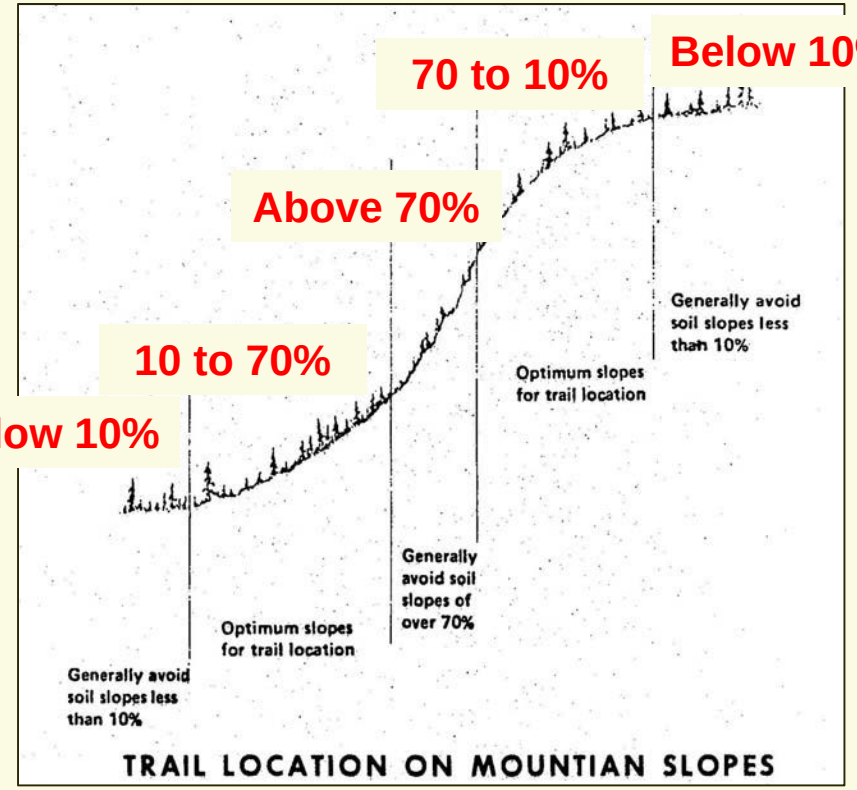


BLM Handbook 9114-1 (Trails [Manual]), 1984.

National Park Service Mission – “Organic Act”

The purpose of the National Park Service is …

“... to promote and regulate the use of the Federal areas known as national parks ... which purpose is to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations.” – 1916

^ This legislation was strongly influenced by Frederick Law Olmsted, Jr.

Other land management agencies have similar documents guiding their respective missions.

What is your land management agency mission?

USFS

The mission of the USDA Forest Service is to sustain the health, diversity, and productivity of the Nation's forests and grasslands to meet the needs of present and future generations.

BLM

It is the mission of the Bureau of Land Management to sustain the health, diversity, and productivity of the public lands for the use and enjoyment of present and future generations.

Colorado State Parks Mission Statement

To be leaders in providing outdoor recreation through the stewardship of Colorado's natural resources for the enjoyment, education and inspiration of present and future generations.

Colorado State Parks Vision Statement

Colorado State Parks offer exceptional settings for renewal of the human spirit. Residents and visitors enjoy healthy, fun-filled interaction with the natural world, creating rich traditions with family and friends that promote stewardship of our natural resources. Parks employees and their partners work together to provide ongoing and outstanding customer service through recreational programs, amenities and services.


New Trail Design

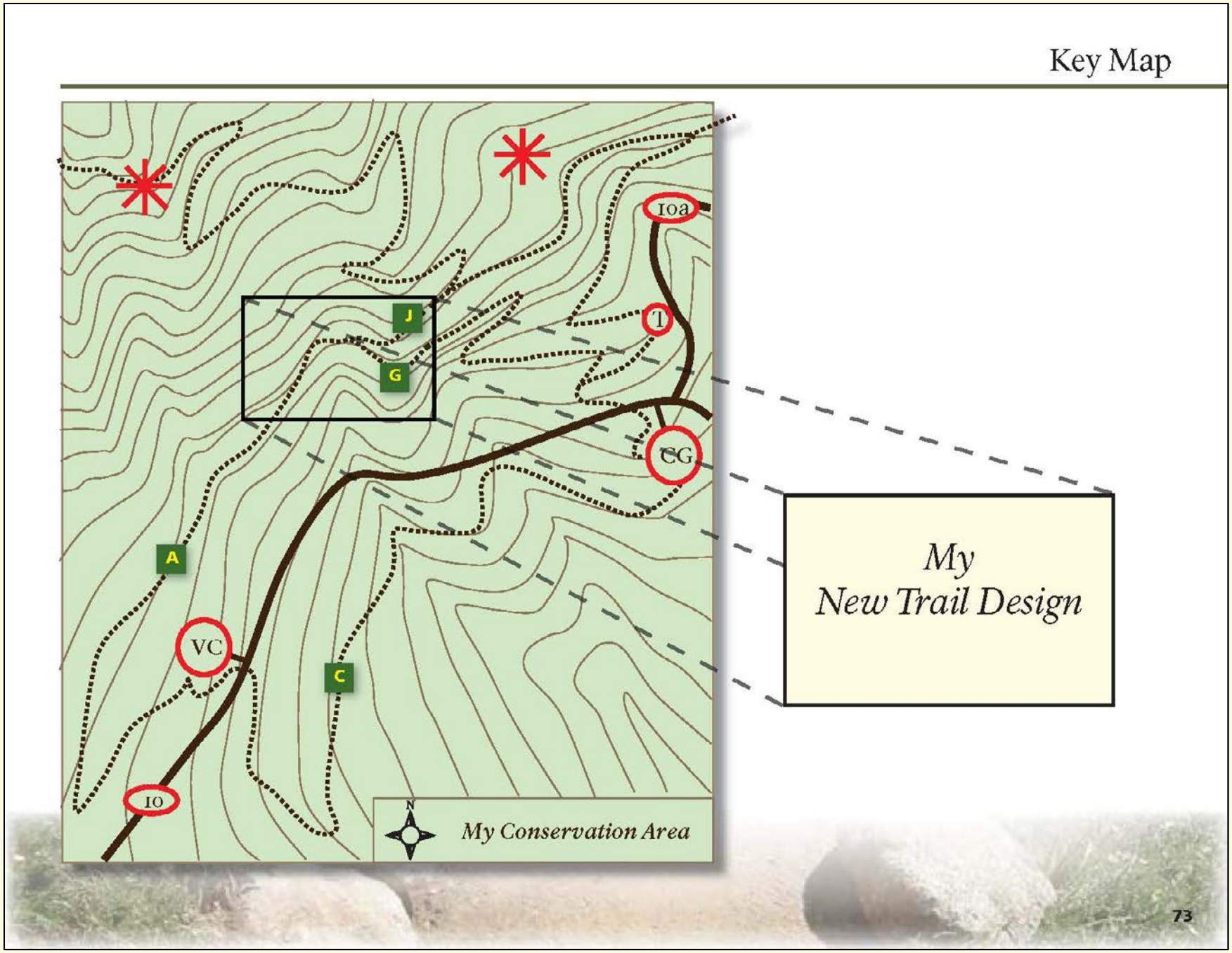
From hiking to wildlife viewing, to mountain biking …



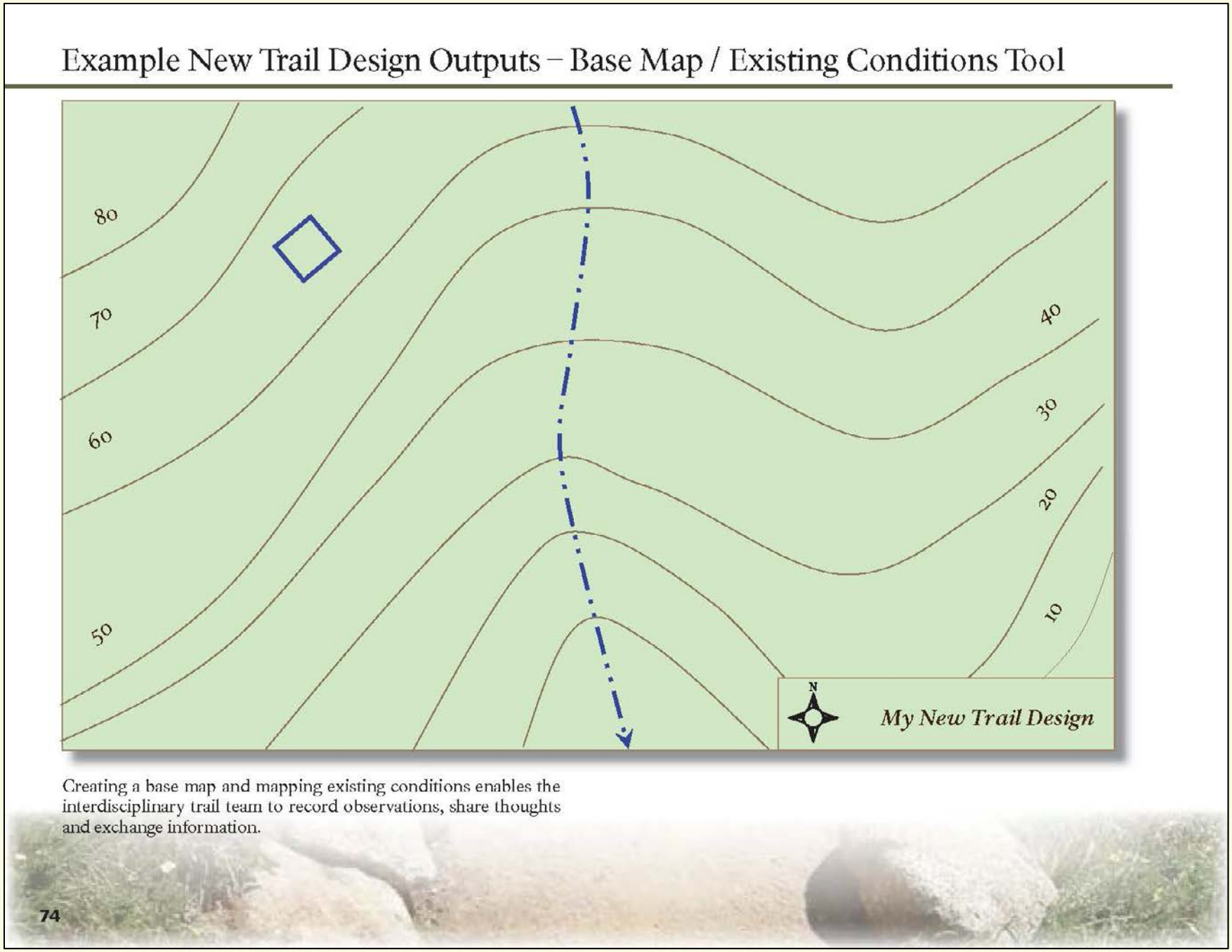



and a wedding ... all benefit from properly implemented sustainable mountain trails …

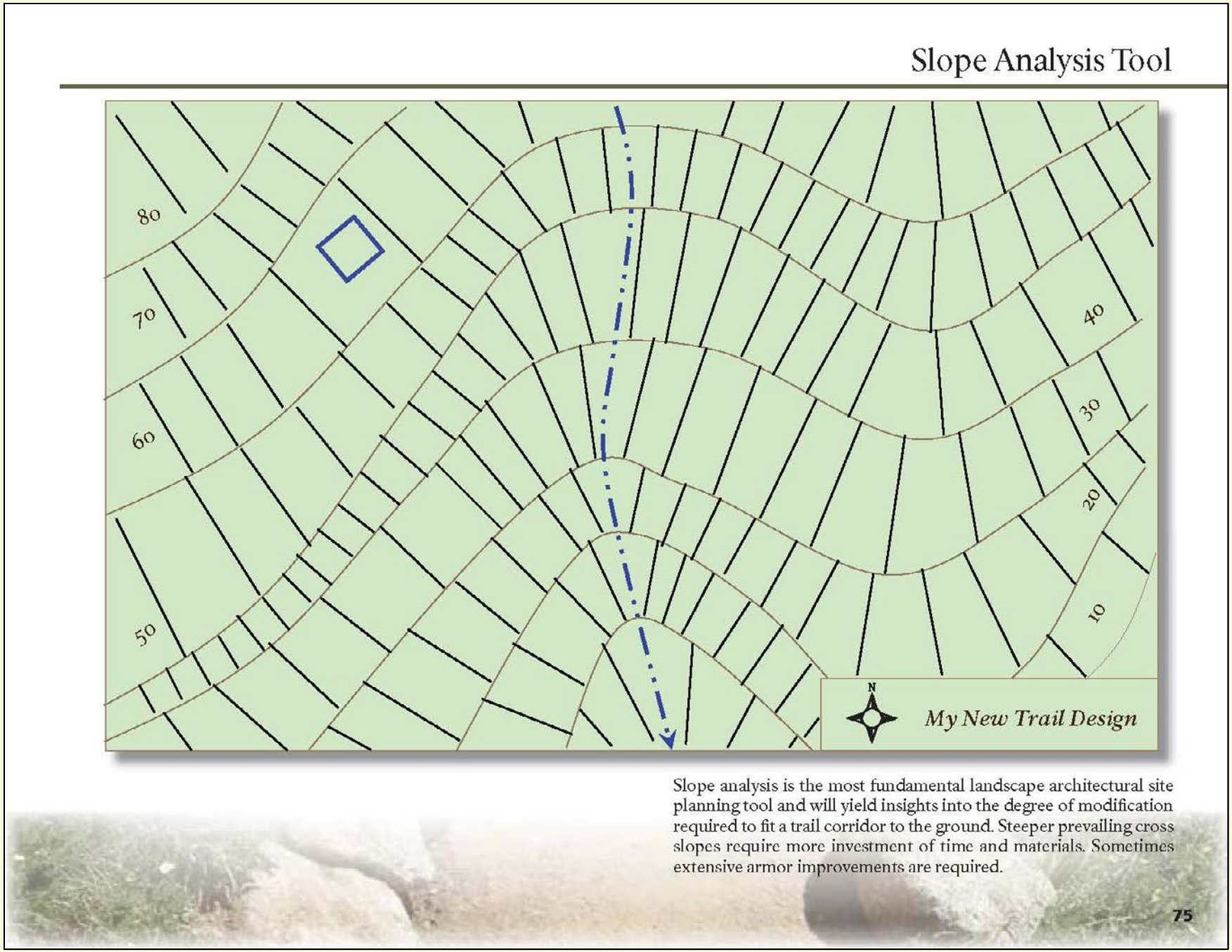
Example 1 – My New Trail Design



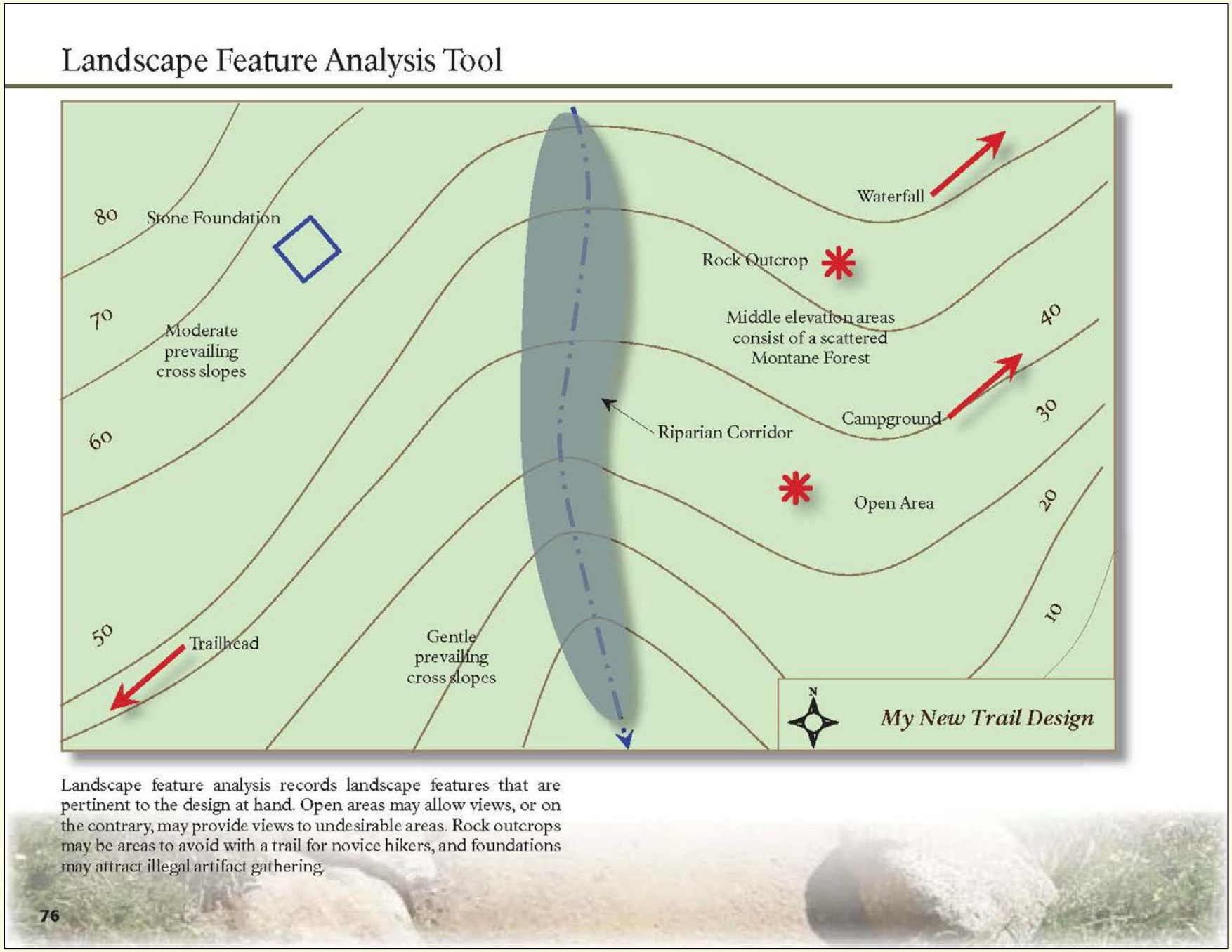
Example 1 – Base Map / Existing Conditions Tool



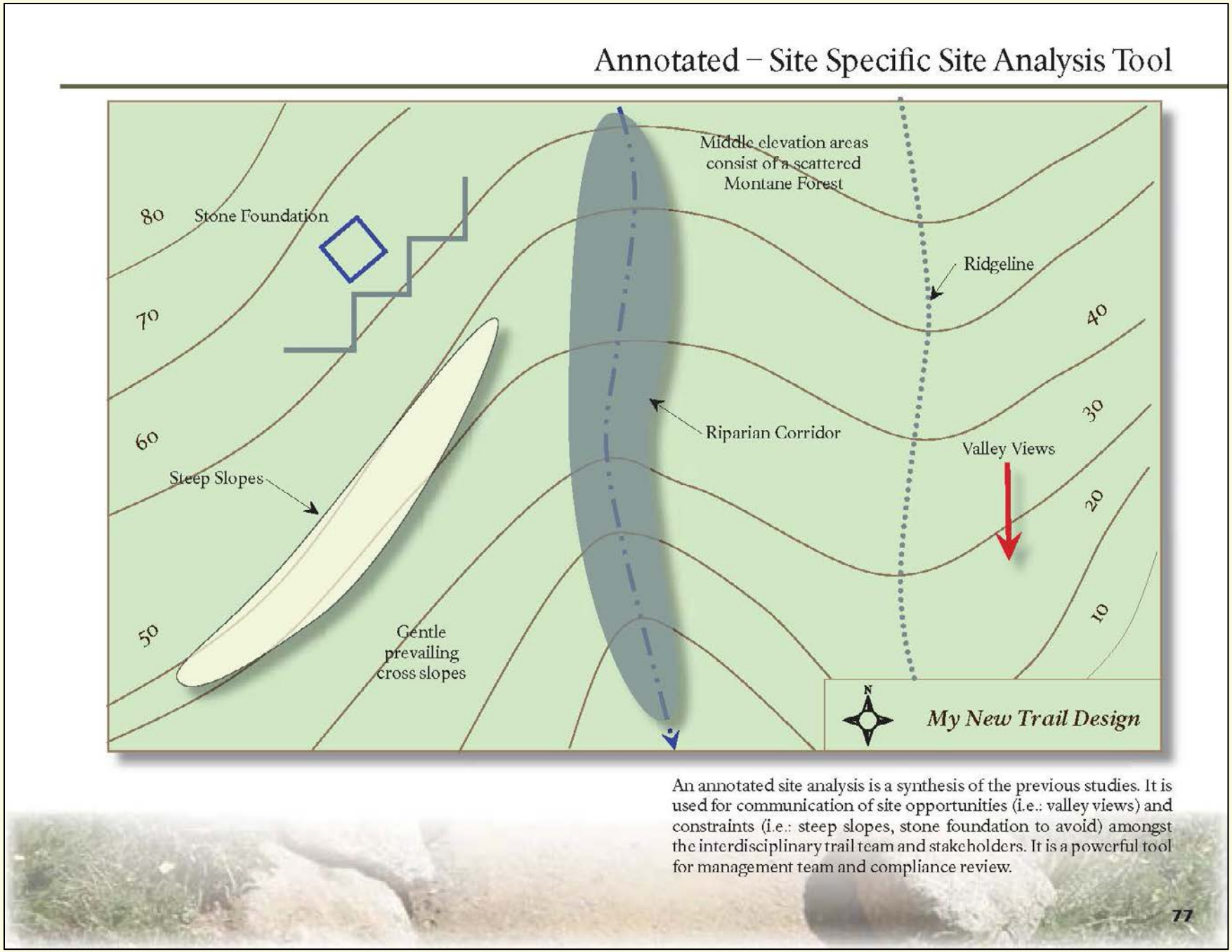
Example 1 – Slope Analysis Tool



Example 1 – Landscape Feature Analysis Tool

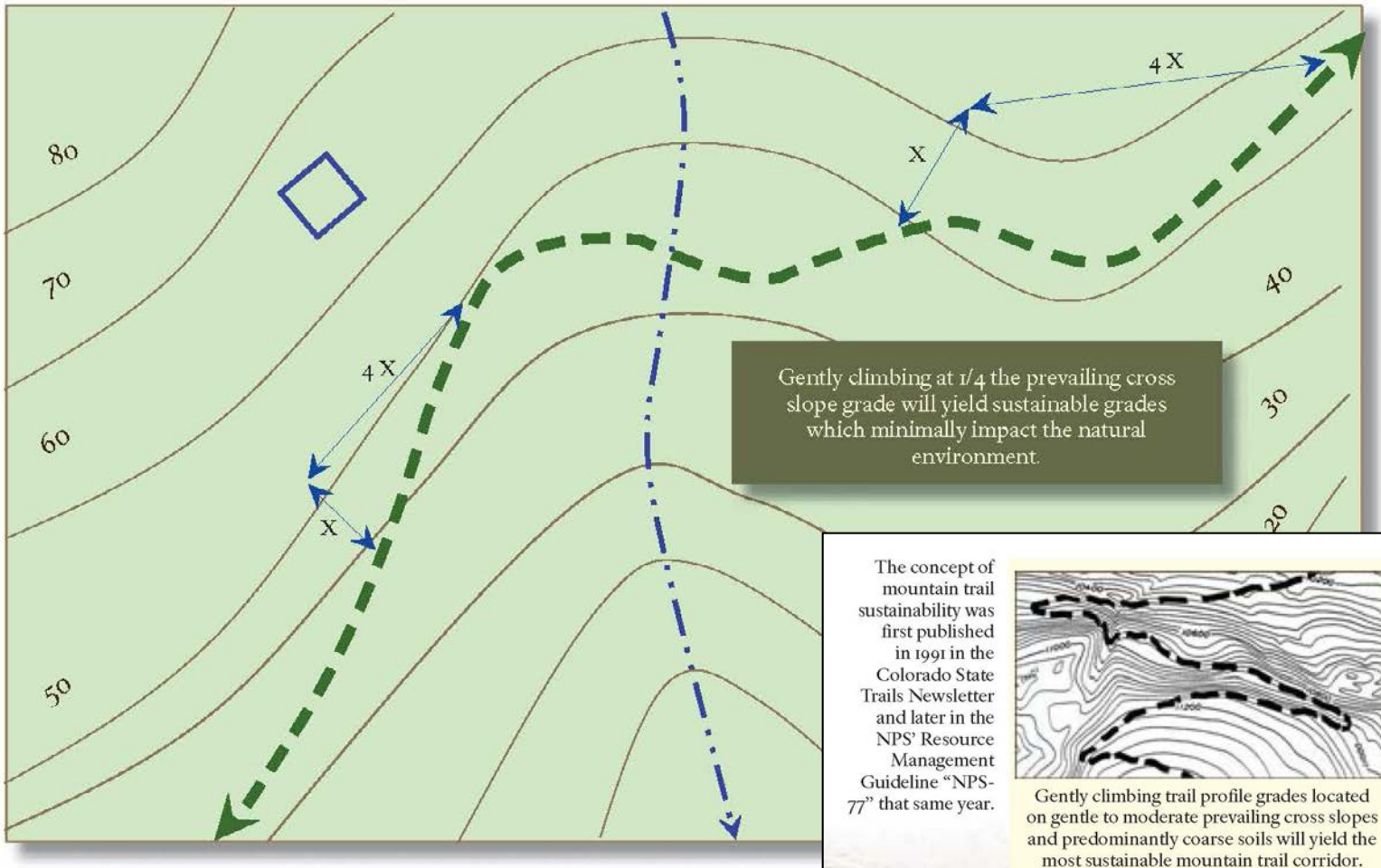


Example 1 – Annotated – Site Specific Site Analysis Tool



Example 1 – Paramount Criteria Influencing Sustainability

1/4 Prevailing Cross Slope Criteria Tool



Gently climbing at 1/4 the prevailing cross slope grade will yield sustainable grades which minimally impact the natural environment.

Using a pair of engineering dividers or a map tool from topographic map software, the interdisciplinary trail team can layout trail alignments on the base map by first measuring the prevailing cross slope (X) and extending out four times (4 X) parallel to the contour.

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The concept of mountain trail sustainability was first published in 1991 in the Colorado State Trails Newsletter and later in the NPS' Resource Management Guideline "NPS-77" that same year.

Gently climbing trail profile grades located on gentle to moderate prevailing cross slopes and predominantly coarse soils will yield the most sustainable mountain trail corridor.

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The New Trail Design – Notes Tool …

… is based upon Engineering Stationing Notation, per the following:

Start	**=**	**0 + 00**
100 feet	**=**	**1 + 00**
125 feet	**=**	**1 + 25**
200 feet	**=**	**2 + 00**
Etc.		

Using the Sustainable Design Notes Tools & Techniques … for any computational studies, including … Sustainability Assessments, Planning, Ecological Restoration as well as Maintenance, Rehabilitation & Armor activities … strengthens and professionalizes your trail program.

Example 1 – Design Notes Tool 2 of 2

New Trail Design – Design Notes Example

Station	Cross Slope % (Left)	Cross Slope % (Right)	Trail Profile Grade (%)	Azimuth	Soils	New Trail Design Notes
0+00	0%	0%		108d	Good	Begin Clearing D, Begin Tread Cut 1, Width = 36 inches.
			3%			
1+00	0%	10%		120d	Good	Install Trail Drains A on downhill side at 1+40, 1175 at low points.
			8%			Note: Good source of stone in this area, uphill from the trail.
2100	35%	40%		125d	Good	Begin Tread Cut 2 at 3175.
			12%			
3+00	30%	35%		120d	Good	3+50 Begin Retaining Stone Wall (2' H X 10' L).
			7%			
4100	45%	55%		120d	Good	Begin Tread Cut 3 at 4100.
			6%			
5+00	45%	50%		125d	Good	Install barriers 1 and educational signage 2 for the restoration area.
			7%			

Tread Cut Options	Prevailing Cross Slope (%)
1	0 – 20%
2	20 – 40%
3	40 – 60%
4	60 – 70%
5	> 70%
6	Crowned Trail
7	Tread Cut with Ditch

On-Trail Management Options - see p. 133.	
1	Barriers
2	Educational Signage
3	Directional Signage
4	One-Way Routes
5	Clockwise / Counterclockwise Routing

Corridor Clearing Options	Height (H)	Width (W)
A	8 Feet	6 Feet
B	8 Feet	8 Feet
C	10 Feet	6 Feet
D	10 Feet	8 Feet
E	10 Feet	10 Feet

	Trail Drainage Options
A	Trail Drain
B	Swale Crossing
C	Paved Dip / Stone Paving
D	Stepping Stones
E	Stone Waterbar
F	Stone Drains

	Mountain Trail Bridge Options - see p. 99.
1	Simple Foot Log
2	Log with Handrail
3	Foot Traffic Only
4	Multiple Use
5	Boardwalk

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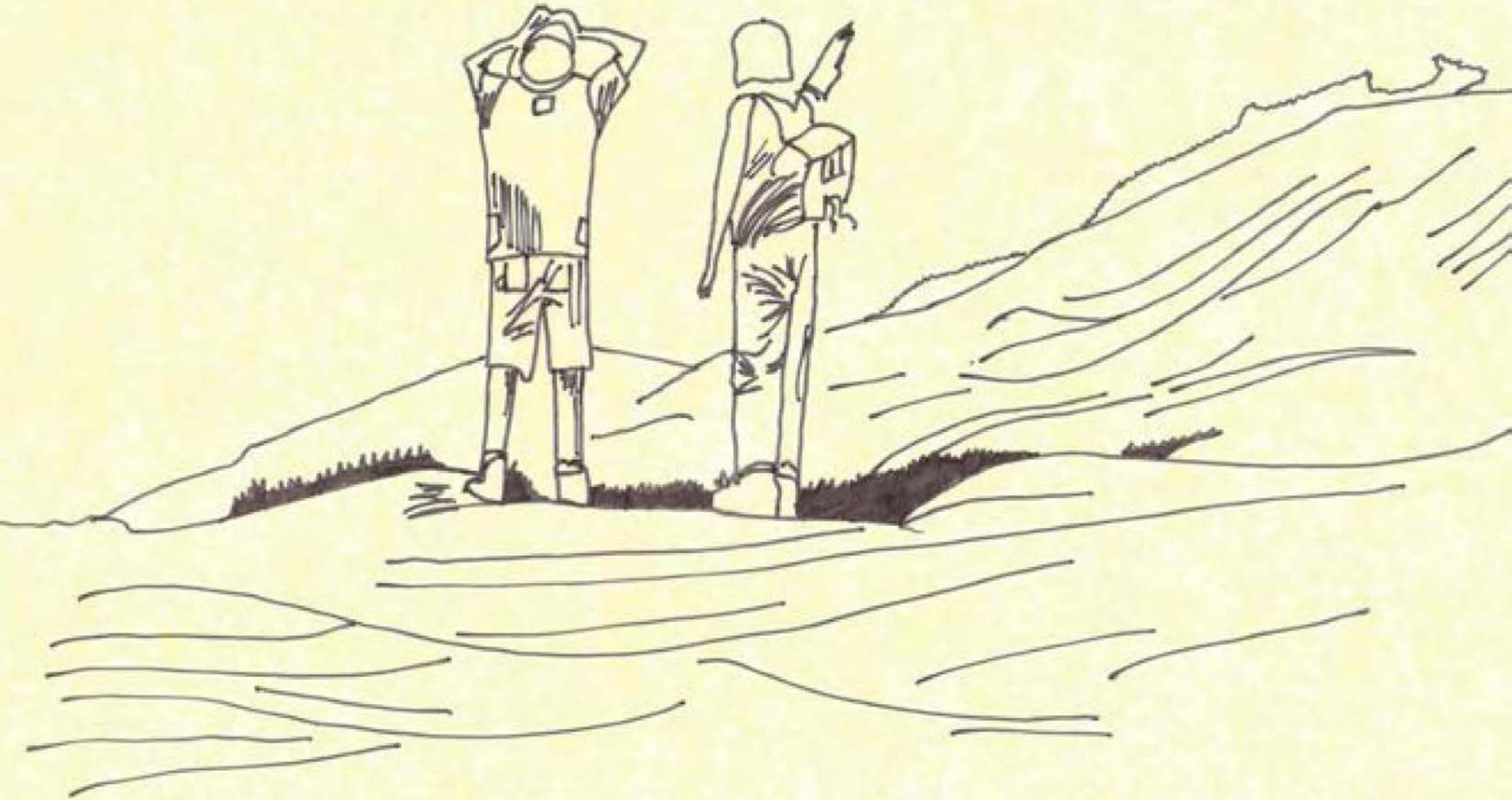
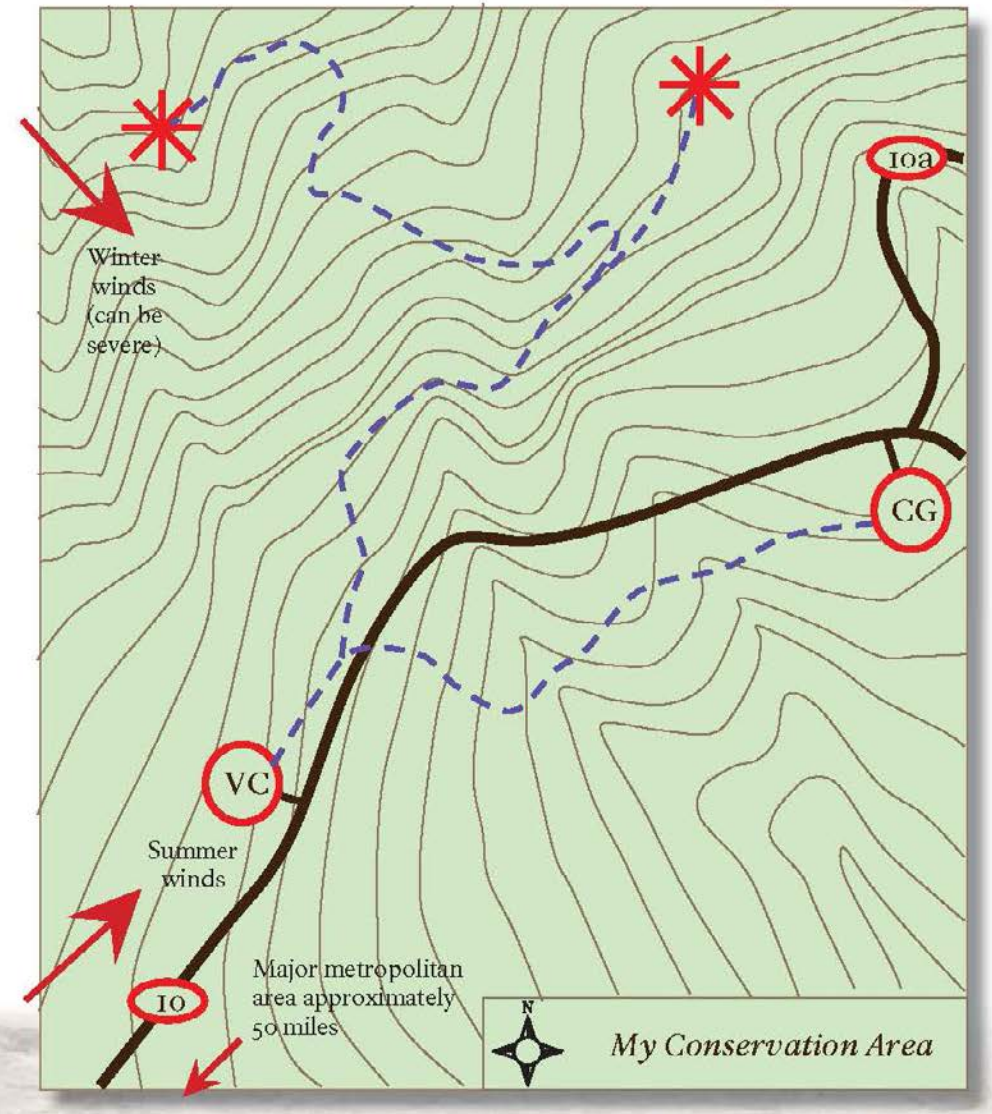


Example 2 – Area-Wide Base Map Tool

Area-wide Base Map / Existing Conditions



Summary

This conservation area was acquired by a conservation nonprofit agency and transferred to a land management agency. It originally was a homestead and cows were run on this property, as there are many grassy openings. When the land was acquired, game and cattle trails were converted to trails. Currently a trail dead-ends at the waterfall, coming in from the side, offering an uninspiring view.

There is a scenic viewpoint which is taken advantage of.

Climate

Climate is semi-arid, with most moisture falling as snow from December through April totals 150 inches per year. Frequent summer thunderstorms occur, and can drop 1" of rain in just one hour. Frost depth is 40". Winds are from the northwest in winter and can be severe. Summer winds are predominantly from the southwest.

Geographic Context

This parcel is about 50 miles from major population areas, which invites year-round users. Local destination resorts publicize the area as a great place for weekend getaways and recreational activities. Now that the park has been open for several years, neighboring conservation land managers are also encouraging trail connections and increased trail use.

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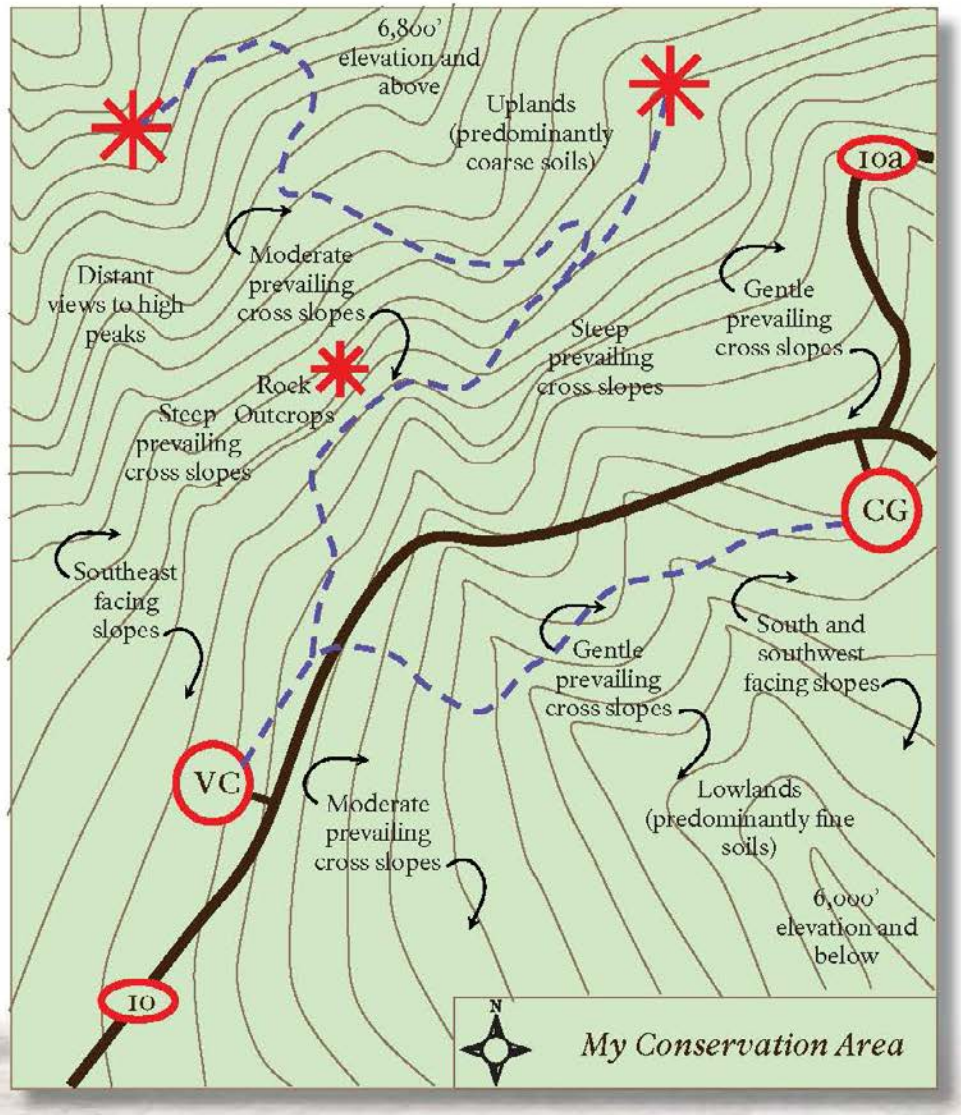
Example 2 – Physical Criteria Planning Tool

Example Planning Outputs – Physical Planning Criteria Summary



Existing cross slope ranges are generally moderate. Approximately 55% of the property has cross slopes of 20 – 60%; approximately 15% over 60%; and approximately 40% of the parcel is in the less than 20% range.

There are several rock outcrops on the property, a hazard, as they are fragile rocks and erode easily. Elevations are moderate, between 6,000 and 7,000 feet.

Approximately 60% of the parcel has an aspect of south, approximately 25% of the parcel has an aspect of east, and approximately 15% has an aspect of west. No land on this parcel has a north aspect.

Some of the open lands have substantial topsoil. The more upland slopes are have predominantly coarse soils. There are several intermittent streams on the parcel.

The eastern plains of Colorado extend as far as the eye can see east of the foothills of Colorado's front range. The prevailing cross slopes in the foreground are favorable for trail corridor locations.

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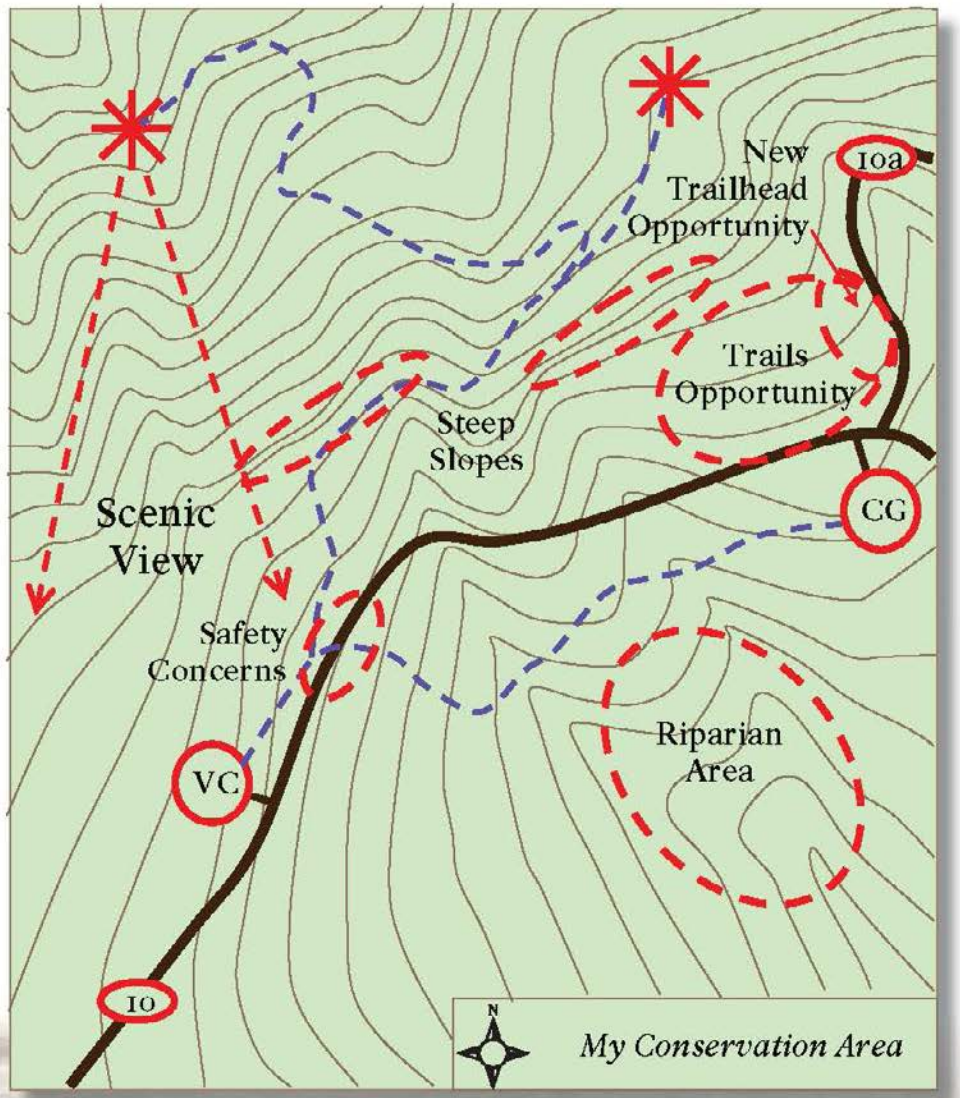
Example 2 – Site Analysis Tool

Annotated Area-wide Site Analysis



Summary

- Scenic views to the valleys and ranch lands below are to be capitalized upon.
- Steep slopes are to be avoided.
- County Road 10 is crossed in an unsafe location and the trail should be re-routed to a safer location.
- Neighboring land offers the opportunity for network linkages and there is a gentle slope where a new trailhead can be established.
- An opportunity exists to approach the waterfall from below, a more desirable observer location.
- Constraints, such as property boundaries, are not a concern in this project.

Nearly flat (< 20% prevailing cross slope) two-track ranch roads usually become muddy when converted to trails. They are inherently unsustainable.

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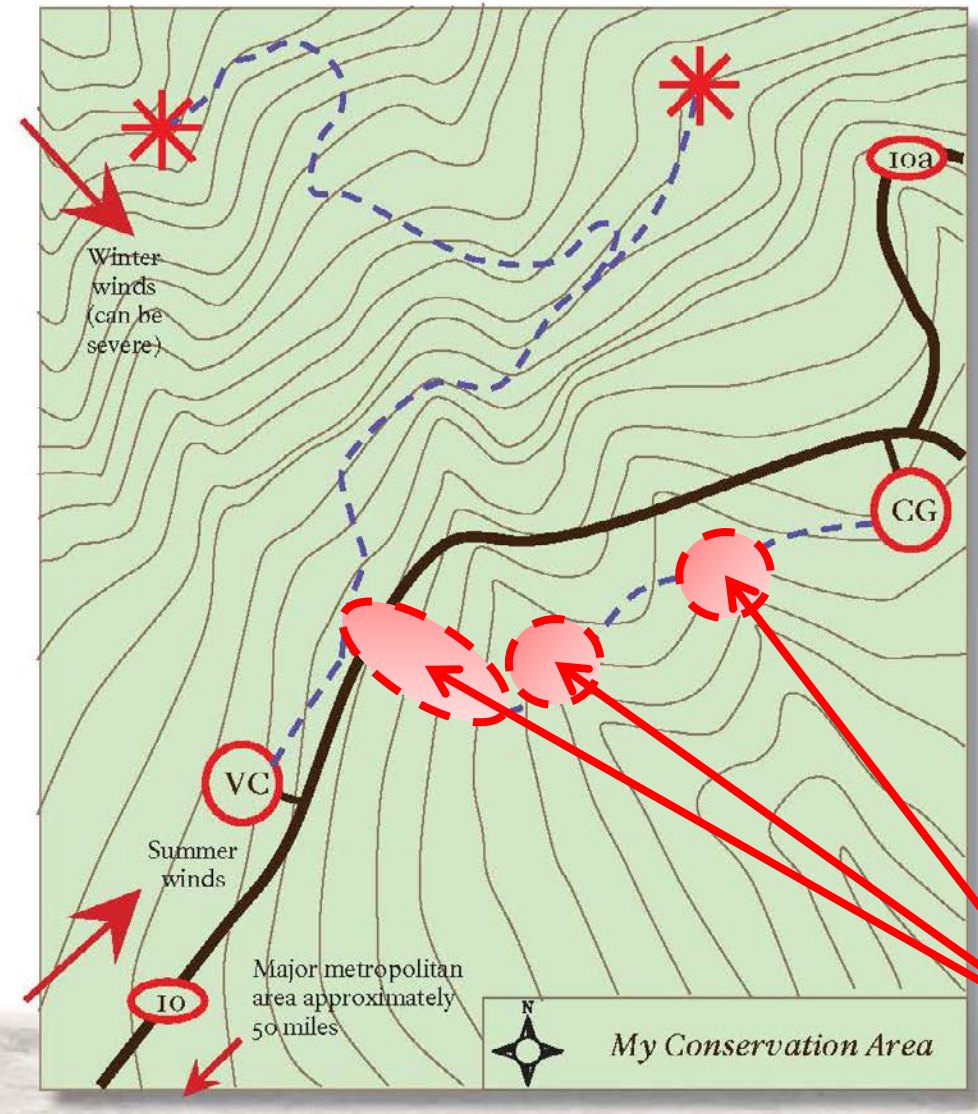
Example 2 – Corridor C Sustainability Issues

Area-wide Base Map / Existing Conditions



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Geographic Context

This parcel is about 50 miles from major population areas, which invites year-round users. Local destination resorts publicize the area as a great place for weekend getaways and recreational activities. Now that the park has been open for several years, neighboring conservation land managers are also encouraging trail connections and increased trail use.

Sustainability Issues

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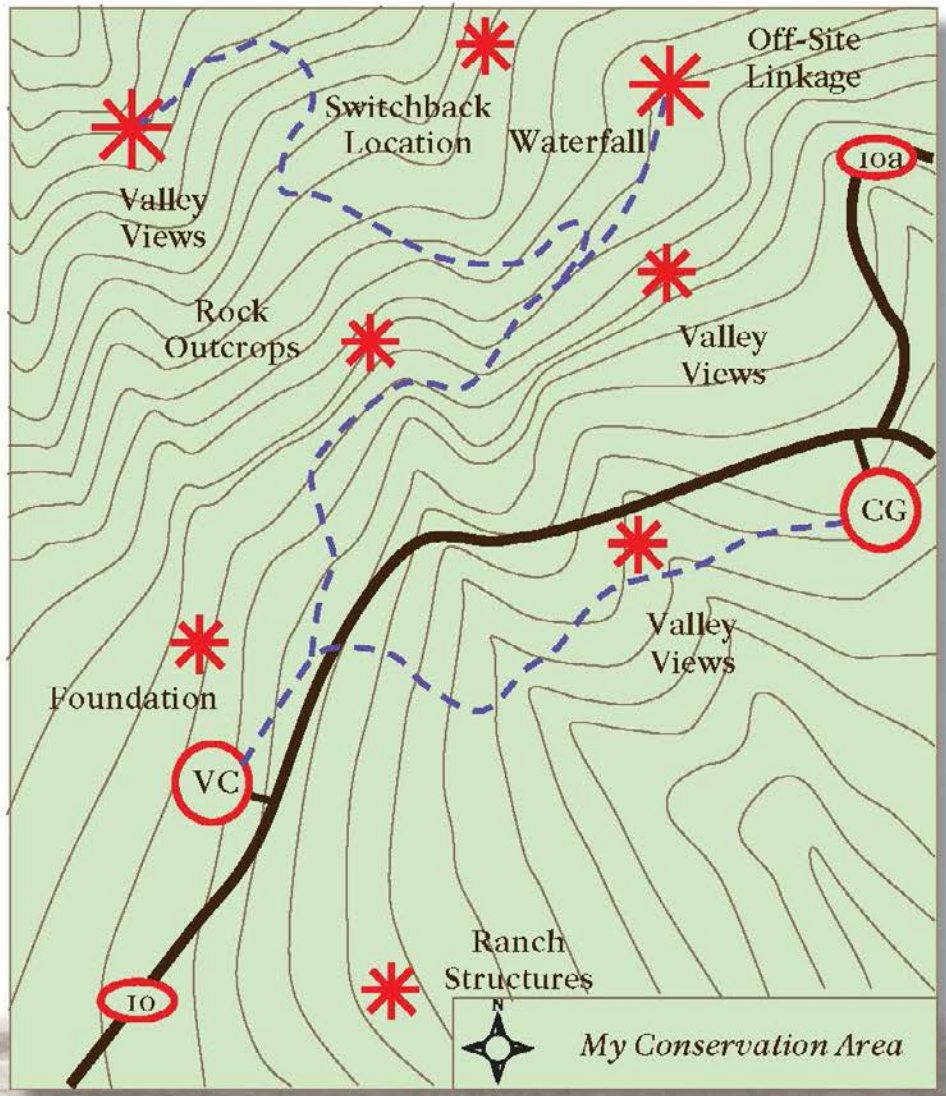
Example 2 – Corridor Control Points Tool

Corridor Control Points



Woodpecker snags or elk rubs may be desirable places to bring a trail. Scenic viewpoints have long been identified as desirable trail features to include along a trail. Cultural resource remnants, such as ranch structures and foundations may be desirable places to bring trail users. Rock outcrops, in this case, are corridor constraints, places to avoid. Off-site connections are key to successful network connections and increasing trails-related benefits.

Discovery of natural and cultural resource values strengthens the overall recreation experience, as is the case with this child and a woodpecker snag.

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Patience!

"Knowing when trail corridors are unsustainable and must be relocated to sustainable sites, and having the patience to do so is the foundational [mountain trails] sustainability ethic.

Establishing a sustainable corridor and implementing it according to sustainable ethics is just the start of a long process.

Spot improvements, maintenance, rehabilitation and some armoring are understood to be required in most corridors over long periods of time."

***– Sketchbook, 2007 edition,* page 61.**

New Trail?

- New Trail Design Tools & Techniques

Existing Trail?

- Sustainability Assessment Tool
- Area-wide Plan Confirmation
- Origins / Destinations / Corridor Control Points (CPs)
- Sustainable? > *In-Corridor MRA*
- *Partially Sustainable?* > *In-Corridor MRA*
- *Minor In-Corridor Reroutes?* > *In-Corridor MRA*
- *Re-Establish Corridor CPs* > *In-Corridor MRA*
- *Unsustainable?*
  - *Determine Optimum Corridor*
  - *Implementation Actions Sequence / High Priorities*
  - *Ecological Restoration of Abandoned Corridor*
  - *Implement 1-Year – 5-Year MRA*

MRA = Maintenance, Rehabilitation / Armor Strategies

Constraints?

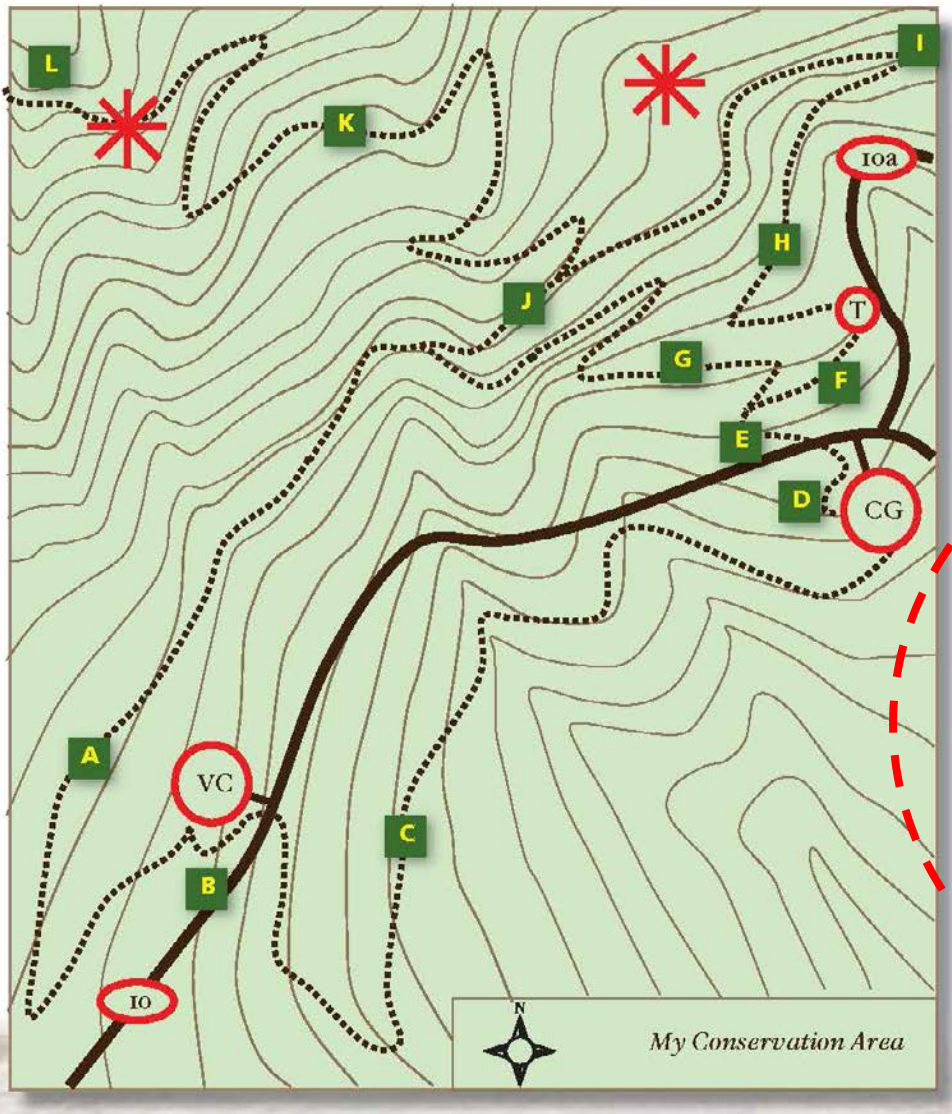
Topographic	> In-Corridor MRA
Natural Resources	> In-Corridor MRA
Cultural Resources	> In-Corridor MRA
Management Directive	> In-Corridor MRA
Management Policy	> In-Corridor MRA

Provide environmental documentation for the project files.

MRA = Maintenance, Rehabilitation / Armor Strategies

Example 2 – Corridor C Summary

Mountain Trails Plan – Corridor C Summary



Trails that link appropriate origins and destinations with appropriate intermediary linkages form the basis of a mountain trail plan. Most of the identified corridor control points are accommodated in this plan.

Establishing this plan allows resource professionals to have input into corridor locations, allowable uses, and potential resource impact determination.

Tabulating origins, destinations and linkages for each trail corridor, combined with describing the trail purpose, elevation gain, anticipated trail length, appropriate users types, and interpretive story opportunities yields the framework for the trail plan.

Corridor C (Example)

- Corridor C's origin is at County Road 10, traverses southeast to an appropriate switchback location, then heads north and northeast to its destination, the campground.
- The purpose of Corridor C is to provide multiple use access to the lower elevations of the park and to connect the visitor center and Corridor B with the campground.
- Natural characteristics of the predominant Ponderosa Pine forest as well as riparian features are to be preserved.
- The estimated length is 1.2 miles, with a vertical change of approximately 120 feet for an average profile grade of about 2%.
- Prevailing cross slopes are moderate.
- Appropriate uses are hiker and mountain bicyclist.
- Interpretive stories include cultural resource history, riparian values and forest ecology.

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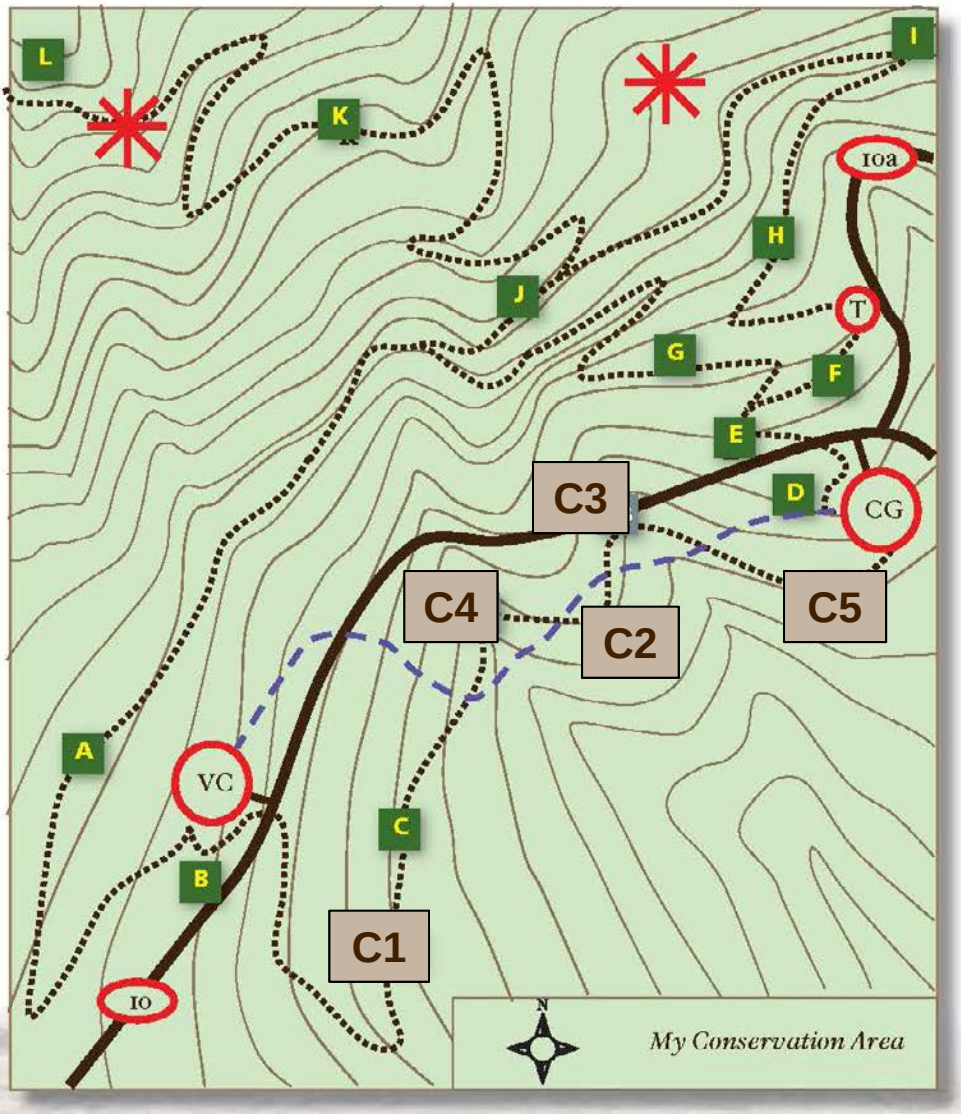
Example 2 – Corridor C Implementation Actions Sequence

Corridor C Implementation Actions Sequence



Patience is a virtue! Looking over a trails plan for trail needs, and prioritizing corridors and actions (C1, C2, C3, C4, C5) within sustainable corridors is a foundational ethic of sustainable mountain trails.

Outlining the needs of the priorities will yield insight into the appropriate crew skill level to carry out the task. Many times it makes sense to develop trails in a linear fashion, sometimes resources impacts or seasonal wildlife concerns may indicate the need to leap-frog some actions ahead of other segments.

Patience?

Knowing when trail corridors are unsustainable and must be relocated to sustainable sites, and having the patience to do so is the foundational sustainability ethic. Establishing a sustainable corridor and implementing it according to sustainable ethics is just the start of a long process. Spot improvements, maintenance, rehabilitation and some armoring are understood to be required in most corridors over long periods of time.

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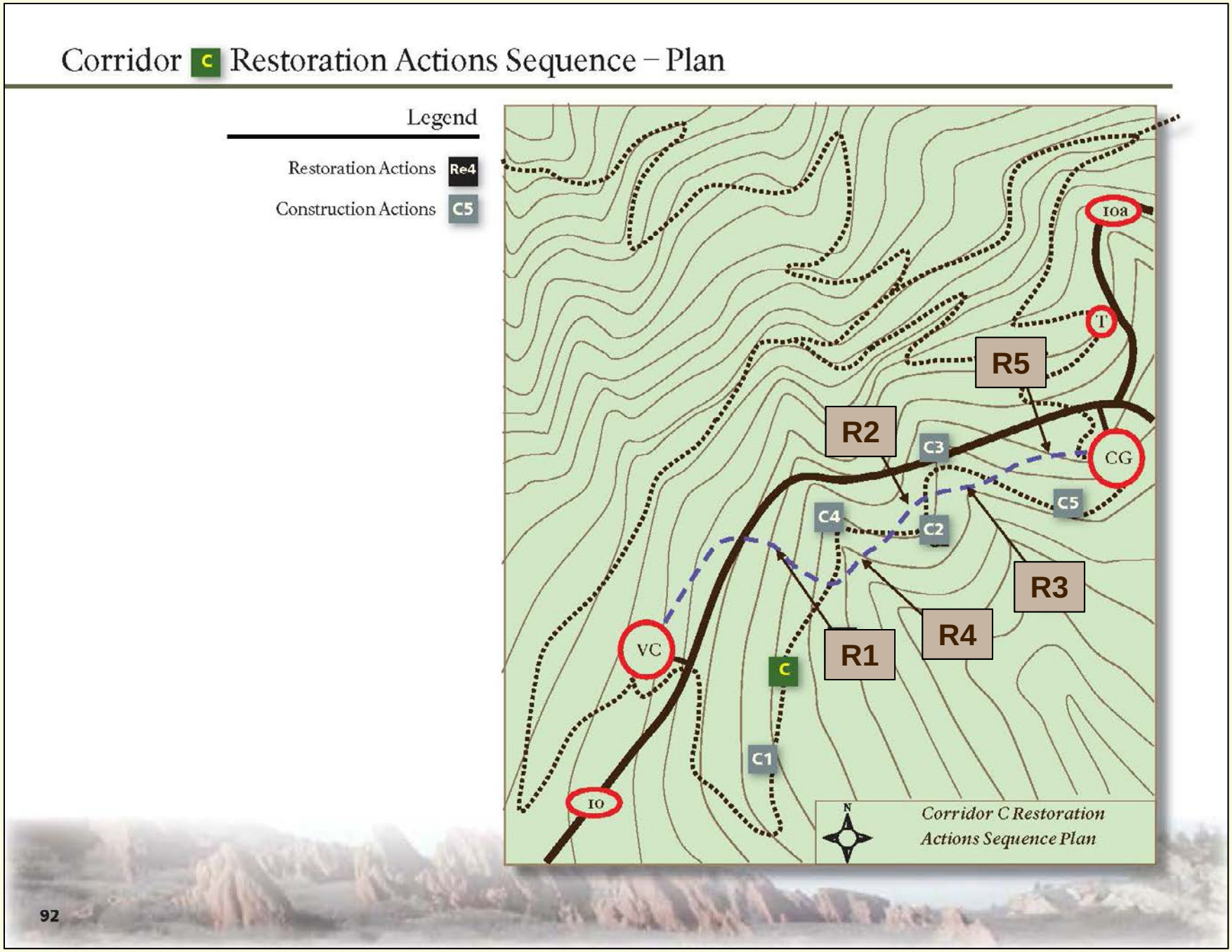
Subordinate Criteria Influencing Sustainability

The *Sketchbook* suggests that the subordinate criteria influencing mountain trail sustainability may include:

- **Soils**
- **Aspect**
- **Elevation**
- **Season of Use**
- **Type of Use**
- **Vegetation / Ecosystem Type**
- **Design / Maintenance Standards**
- **Major Control Points**
- **Minor Control Points**
- **Etc.**

^ Your project may vary in terms of what might be the order of importance of subordinate sustainability criteria.

Example 2 – Restoration / Implementation Actions Sequence



Example 2 – Maintenance / Rehabilitation / Armor Options

Maintenance Strategies	Rehabilitation Strategies	Armor Strategies
Each season - up to 4X / year frequency	Up to 5 - 20 year frequency	Once in up to 50 year frequency
Low investment to bring corridor to sustainable status (< 10% of original $ annually)	Moderate to high investment to bring corridor to sustainable status (10% < X > 50% of original $ / rehabilitation cycle)	High to very high cost to bring corridor to sustainable status (> 50% of original to 5X original $)
Sustainable prevailing cross slopes	Sustainable prevailing cross slopes	Unsustainable prevailing cross slopes
Sustainable Soils	Sustainable Soils	Unsustainable soils
Existing cross section generally in good condition	Restore cross section	Existing cross section is unsustainable
Minor management activities (i.e.: install barriers, plantings, educational signage)	Some management activities	Management activities proven unsuccessful
Minor earthwork activities	Moderate earthwork activities	Significant earthwork activities required
Little or no off-site materials required	Off-site materials make up a small % of required improvements	Off-site materials make up a large % of required improvements
Routine trail maintenance activities will upgrade the corridor to sustainable status	Limited segments of the overall corridor, may be less than 25%	Over 50% of the corridor is unsustainable / management concerns prohibit trail relocation or new trail design
Typical sections and typical details apply	Rebuild - or - add new structures	Build new cross section on unsustainable soils or prevailing cross slopes
Outline design notes only	Competent design drawings / design notes required	Complex to very complex solutions required
No problem solving by trail crew required	Problem solving required by trail crew	Expert construction skills required
High production per person or trail crew	Moderate production per person or trail crew	Low production per person or trail crew
Minimum design time required	Some design time required	Expert design skills required / extensive time and substantial cost may be required
Simple tools required	Simple to difficult tools required	Difficult to complex tools required
Some supervision required	More supervision required	Extensive supervision required
Some training required	More training required	Extensive training required
Loads of time to still go hiking or fishing!	Some time left to go hiking or fishing!	Little time left to go hiking or fishing!

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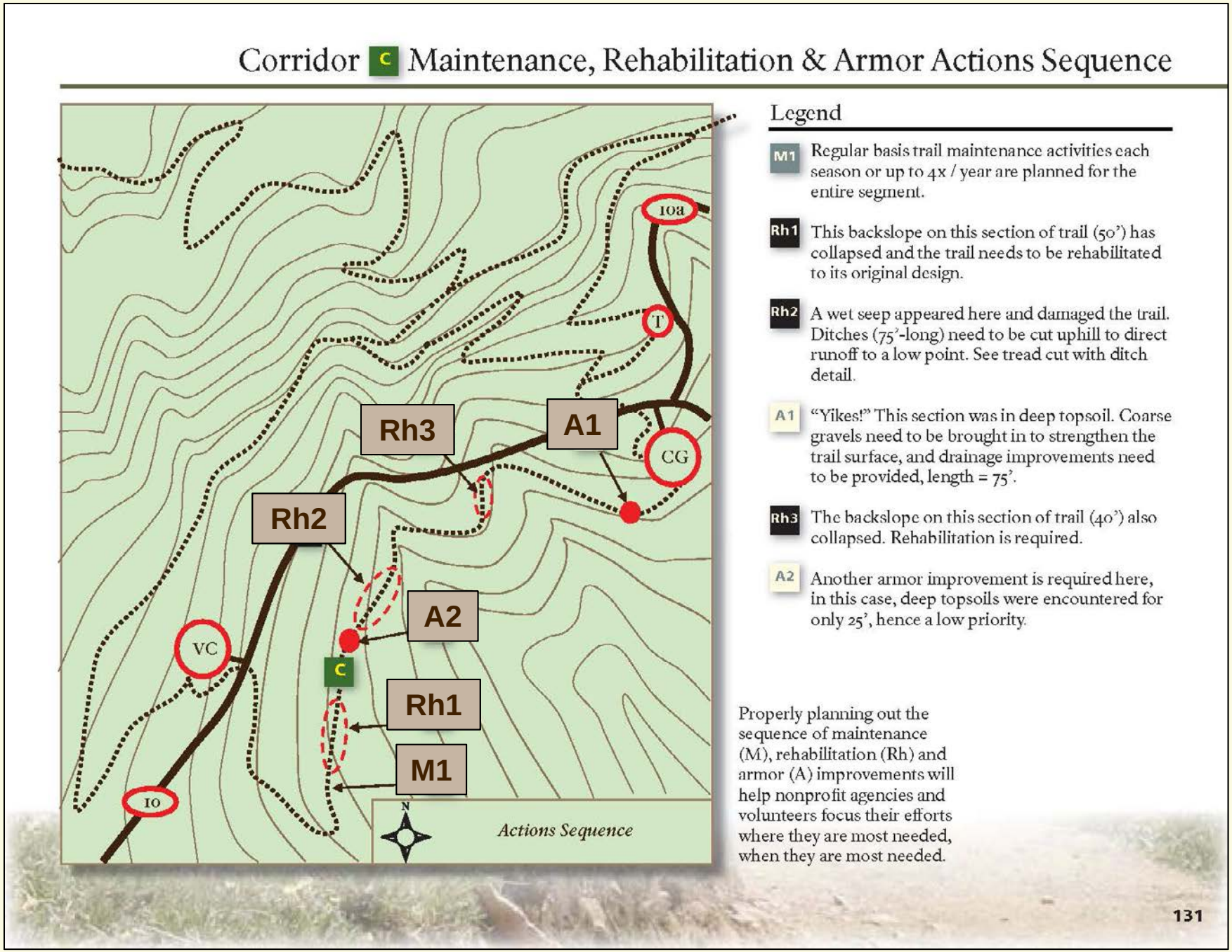
Example 2 – Optimum Corridor "MRA" Actions Sequence



Case Study 1 – Eagle Cliff Mountain *Sketchbook* Training

Case Study 1 – Eagle Cliff Mountain

Tools & Techniques

- Classroom / Field Work
- Walk & Talk
- Lecture & Discussion
- Group Activities
- Individual Activities
- Reading Assignments
- Research / More Tools

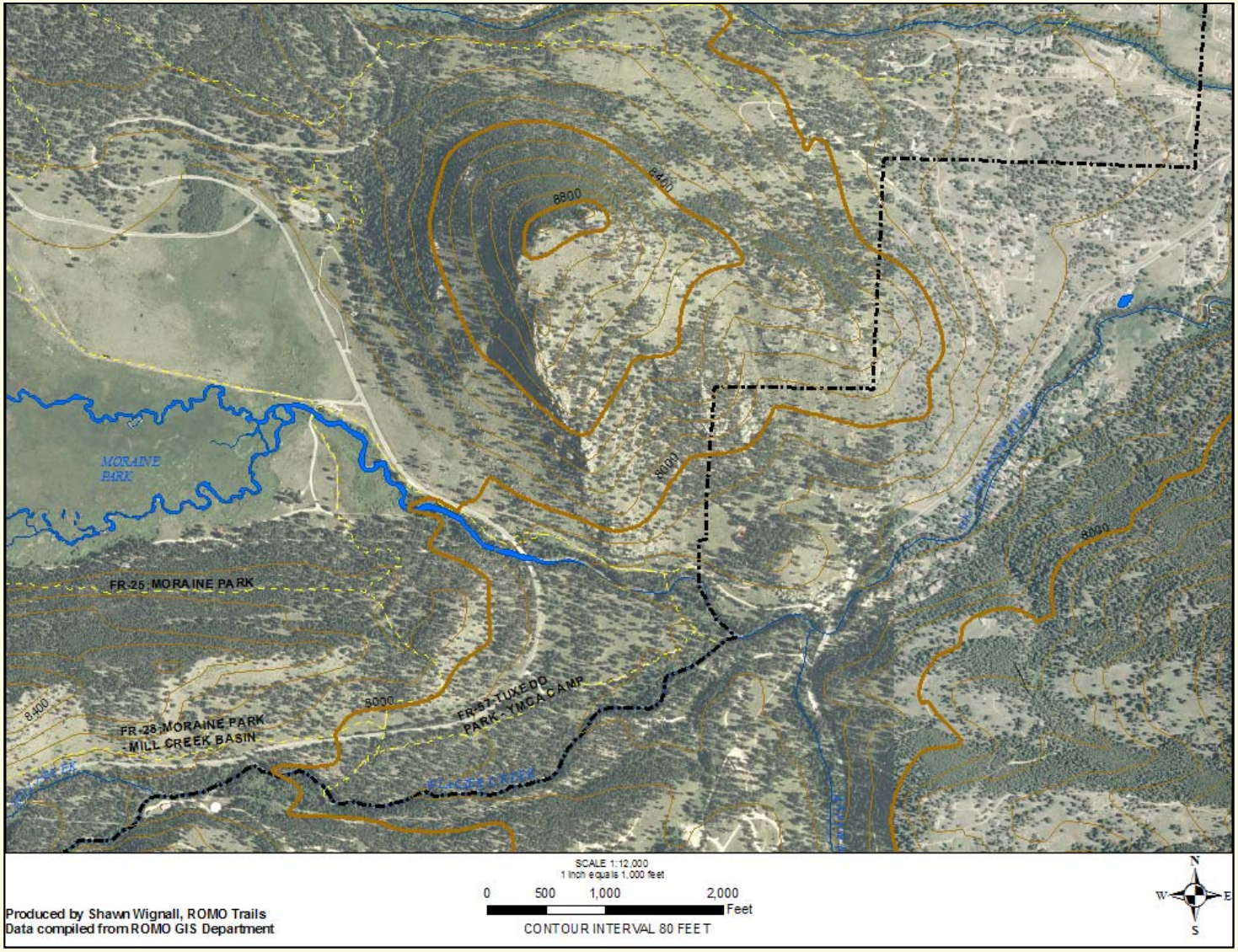
Case Study 1 – Aerial Base Map

Eagle Cliff Mountain is on the eastside of Rocky Mountain National Park, near Estes Park in Colorado.

The Beaver Meadows Entrance Station is immediately north of Eagle Cliff Mountain.

The Big Thompson River drains Moraine Park immediately west of Eagle Cliff Mountain and towards the south.

Glacier Creek flows into the Big Thompson River just south of Eagle Cliff Mountain.



Case Study 1 – Natural Resource Impacts

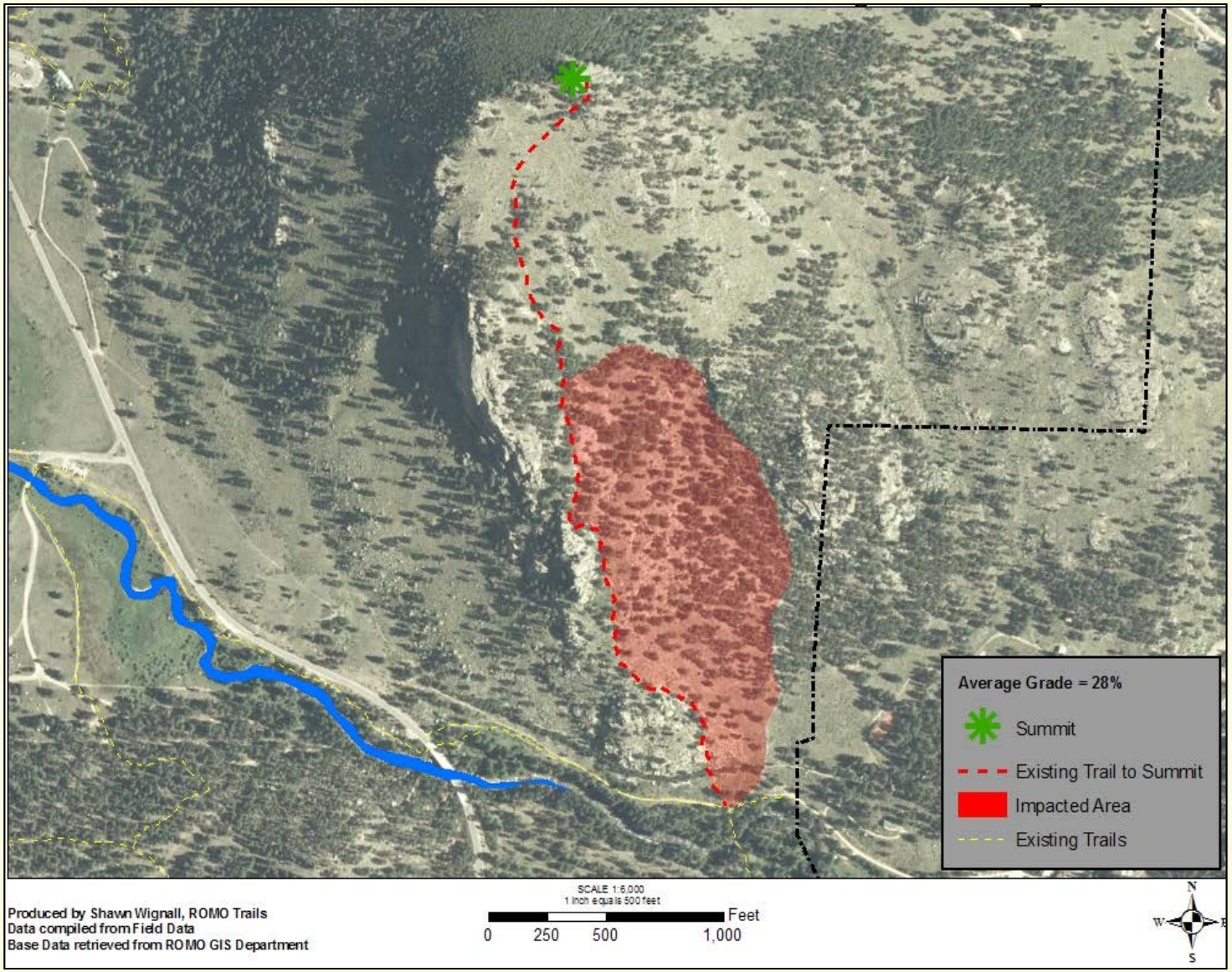
A large series of social trails has developed on the southern flank of Eagle Cliff Mountain.

In some locations there are almost 10 parallel tracks going straight up a valley confined by two ridges with stone outcrops.

Damage to the Mountain have caused the National Park Service to start this Case Study.

It will take many years to assess the Mountain, plan for new trails, design new trails and to develop a parallel restoration plan as new trail routes are established.

The NPS is prudent to start this planning effort now before impacts get even more severe.



Case Study 1 – Natural Resource Impacts

Social trails have developed on Eagle Cliff Mountain to the point that the National Park Service has decided to undertake a plan for trail implementation with a parallel restoration effort.

It is estimated that there is approximately 10,000 linear feet of impacted corridors, sometimes upwards of 15-feet wide and covering several acres.

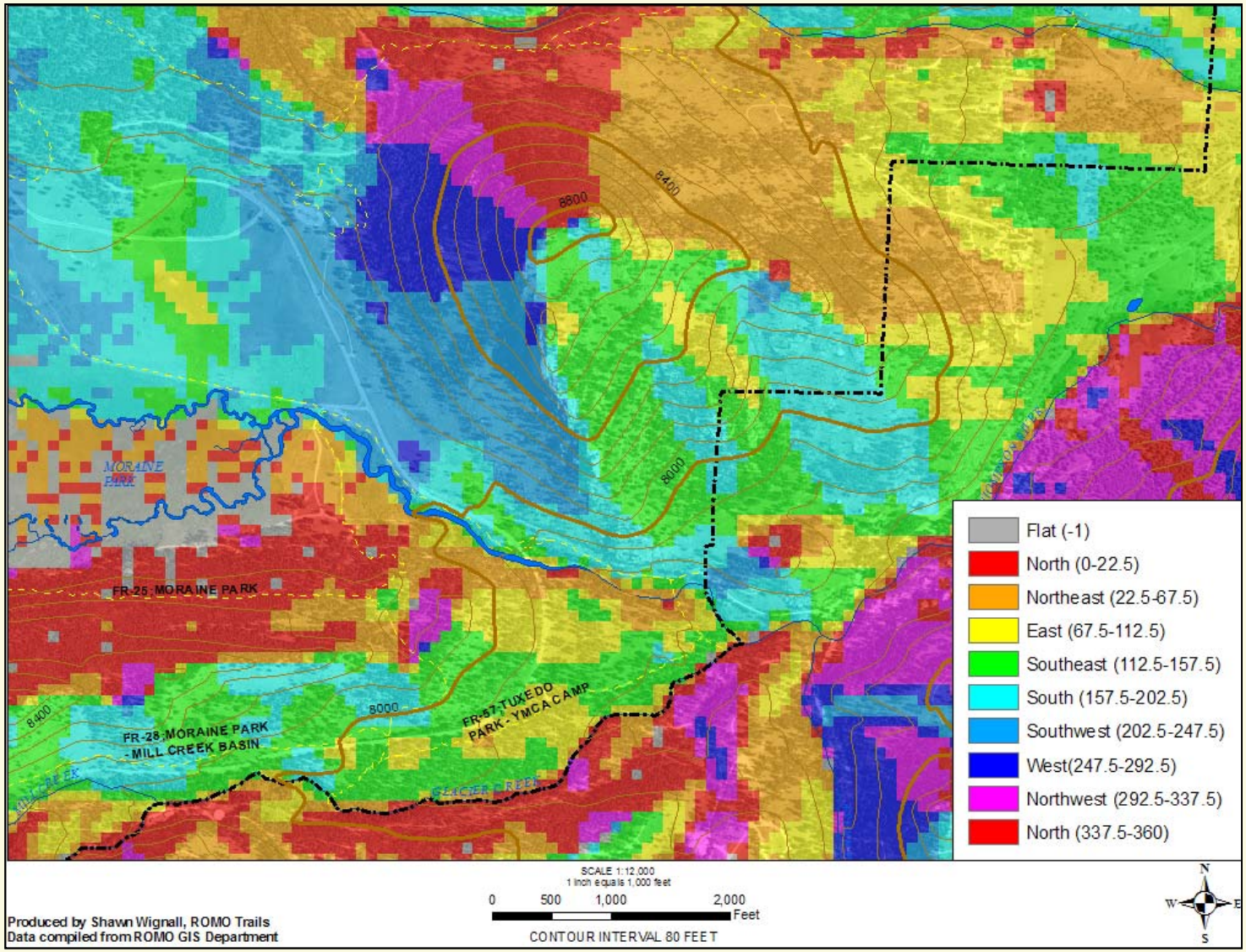
Case Study 1 – Aspect Analysis

Aspect is a predominant factor in determining mountain trail sustainability.

Eagle Cliff Mountain faces predominantly southeast, a good aspect for sustainability.

Social trails have developed on Eagle Cliff Mountain on the southeast aspects and caused impacts.

Paradoxically, natural resource impacts are harder to restore on southeast, south and southwest slopes at high elevations in Colorado.



Case Study 1 – Slope Analysis

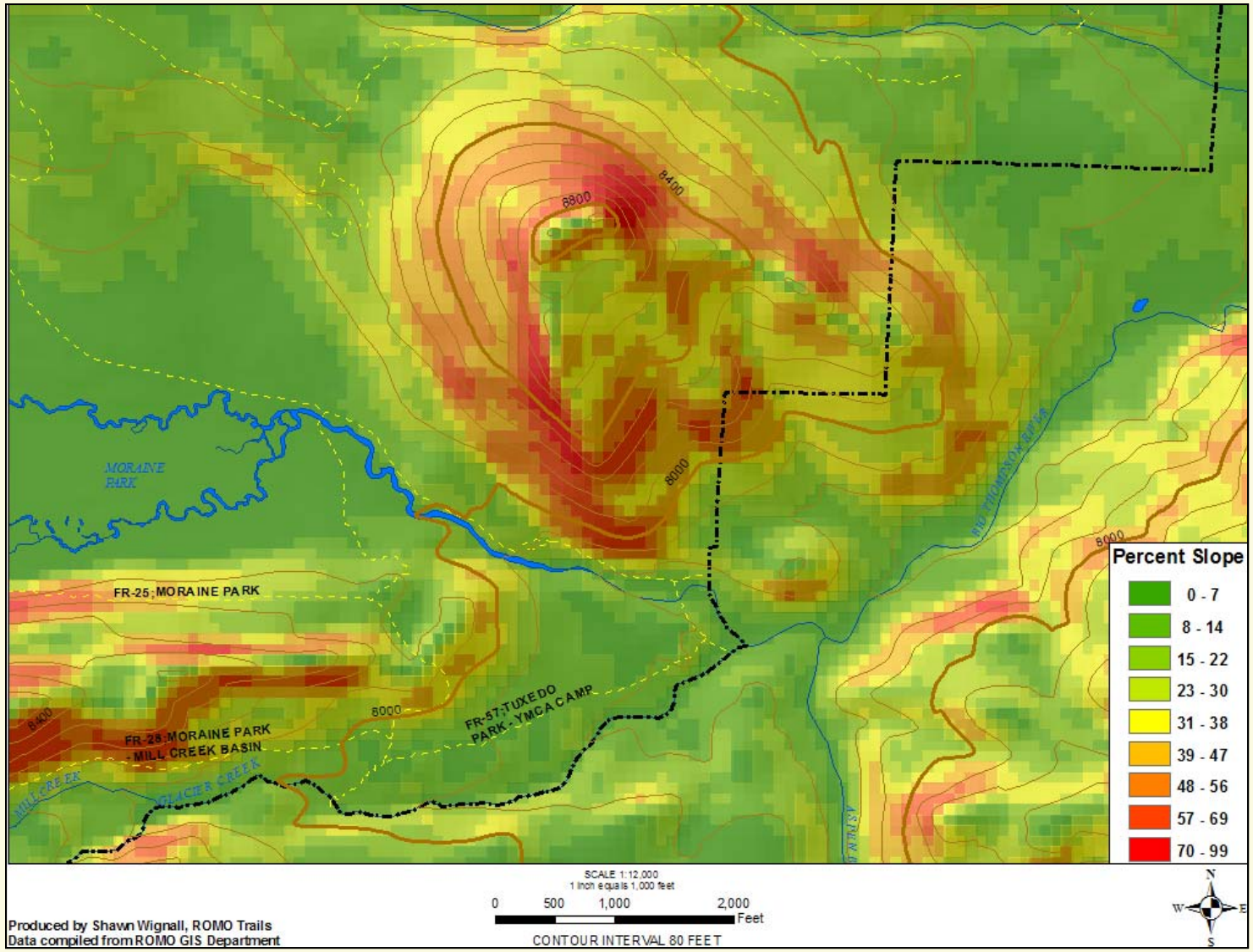
Rock outcrops are common on Eagle Cliff Mountain.

Prevailing cross slopes are a predominant factor in determining mountain trail sustainability.

Eagle Cliff Mountain displays a wide range of prevailing cross slopes.

Cross slopes are steep on the western flank of Eagle Cliff Mountain, and on some southeast aspect slopes.

Middle elevation cross slopes are moderate indicating very good to excellent opportunity to achieve sustainable mountain trails.



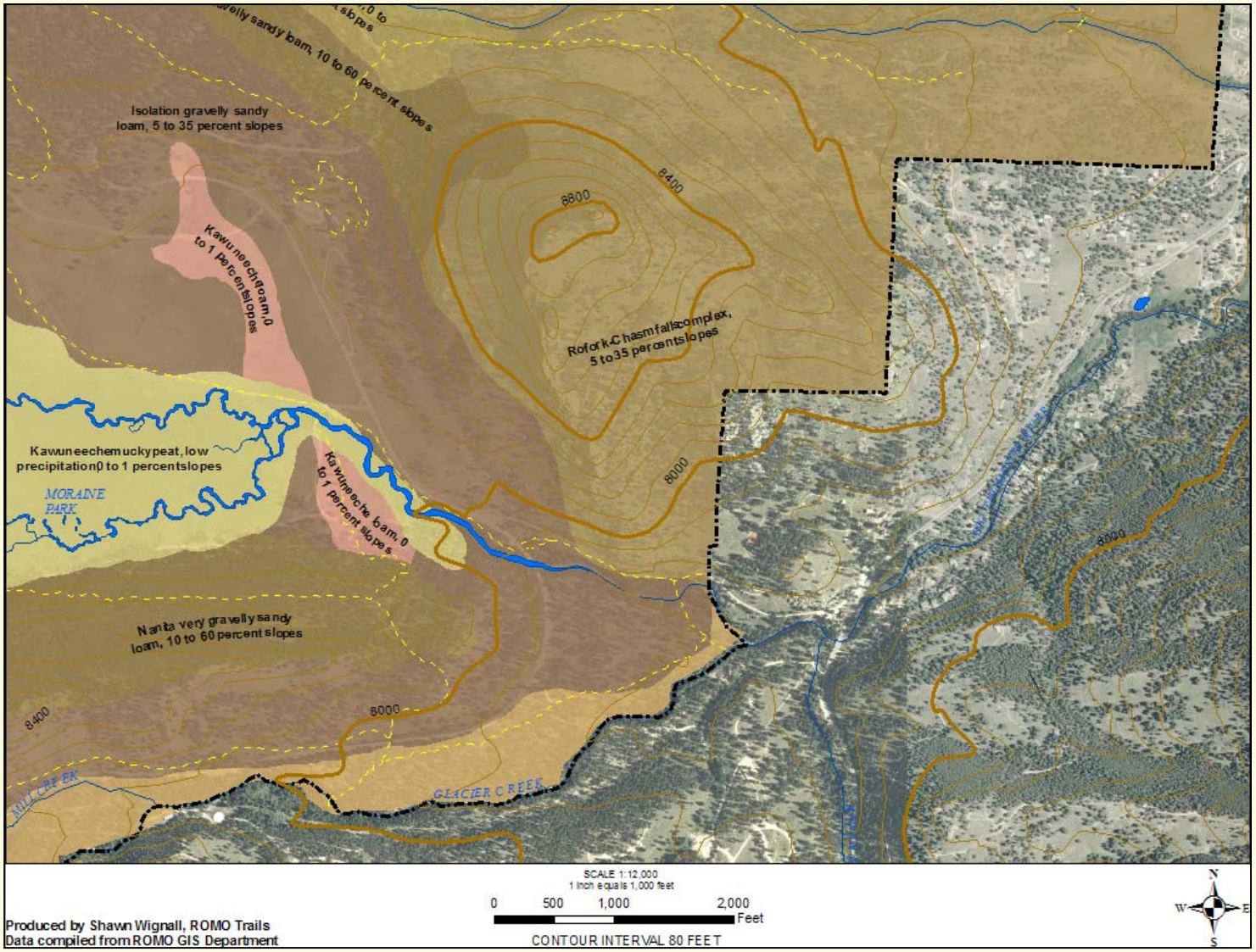
Case Study 1 – Soils Analysis

Soils are less of predominant factor in determining mountain trail sustainability than aspect or prevailing cross slopes on Eagle Cliff Mountain.

Trail corridors are many times a function of origins and destinations.

On Eagle Cliff Mountain, the predominant soil type is "Rofork Chasm Complex." Soils are shallow, uniform, and well draining.

Corridor selection will not be dependent upon soil type on Eagle Cliff Mountain.



Case Study 1 – Vegetation Analysis

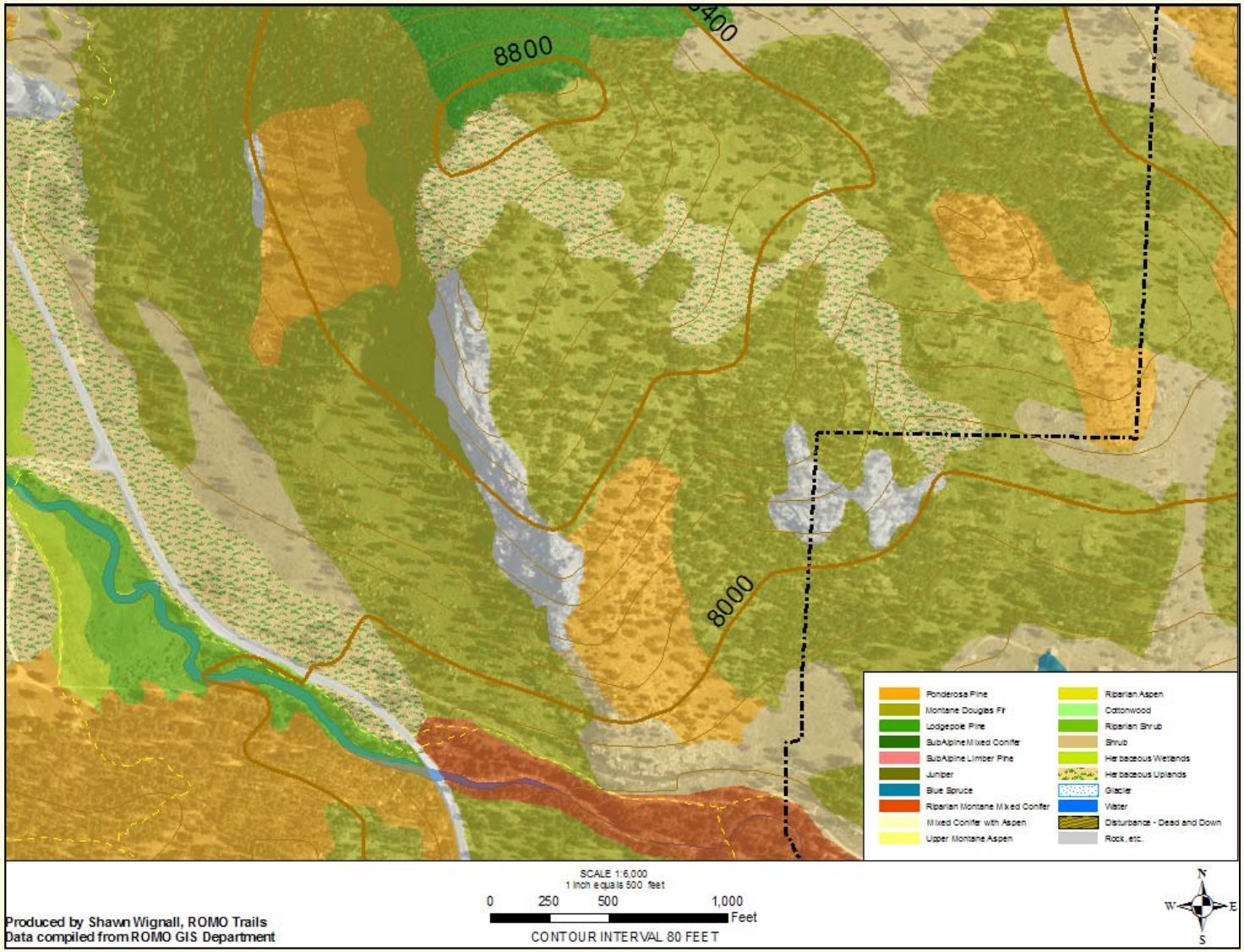
Naturally occurring vegetation is dependent upon climate, soils, aspect, elevation.

Several vegetation types on found on Eagle Cliff Mountain.

Southeast slopes are dominated by Ponderosa Pine with pockets of either Juniper or Blue Spruce.

Higher elevations are dominated by herbaceous shrubs with scattered Ponderosa Pine.

Northern slopes are dominated by Lodgepole Pine.

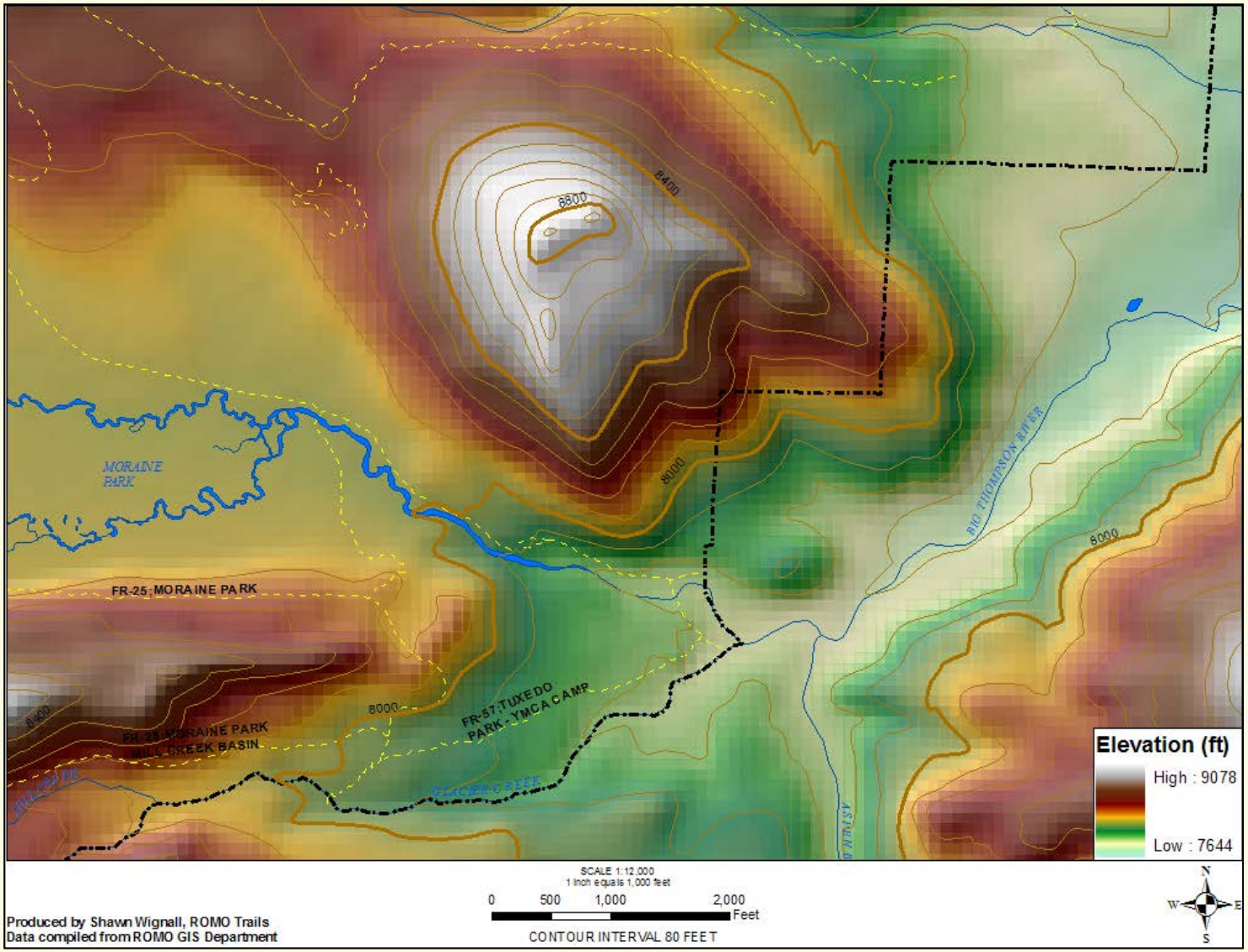


Case Study 1 – Elevation Analysis

Elevation will affect vegetation and temperatures in the mountains of Colorado.

Elevations in the vicinity of Eagle Cliff Mountain vary from approximately 7,700 feet to over 9,000 feet a difference of approximately 1,300 feet.

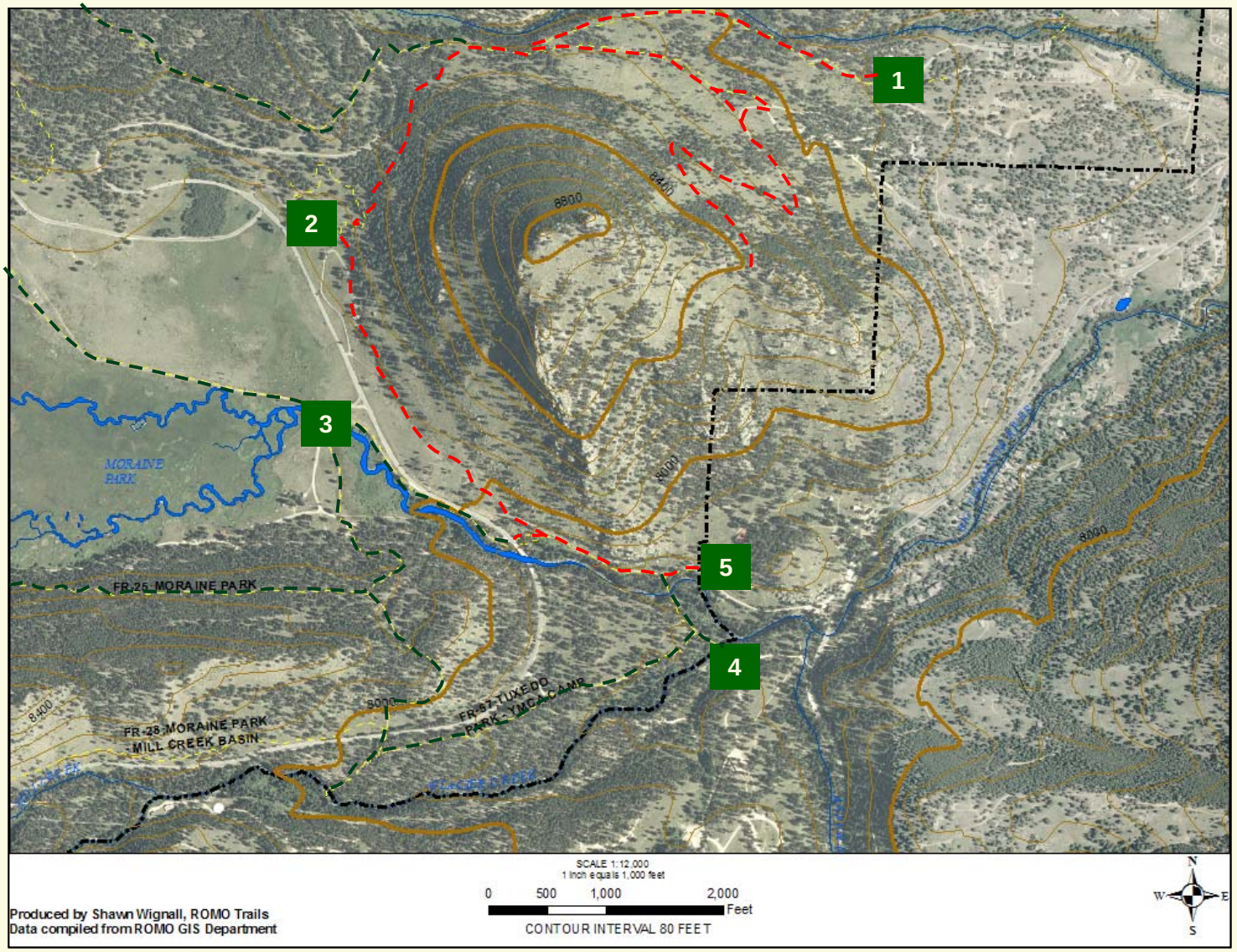
Lower elevations generally exhibit more moderate prevailing cross slopes, with higher elevations exhibiting steeper prevailing cross slopes.



Case Study 1 – Origins

Origins

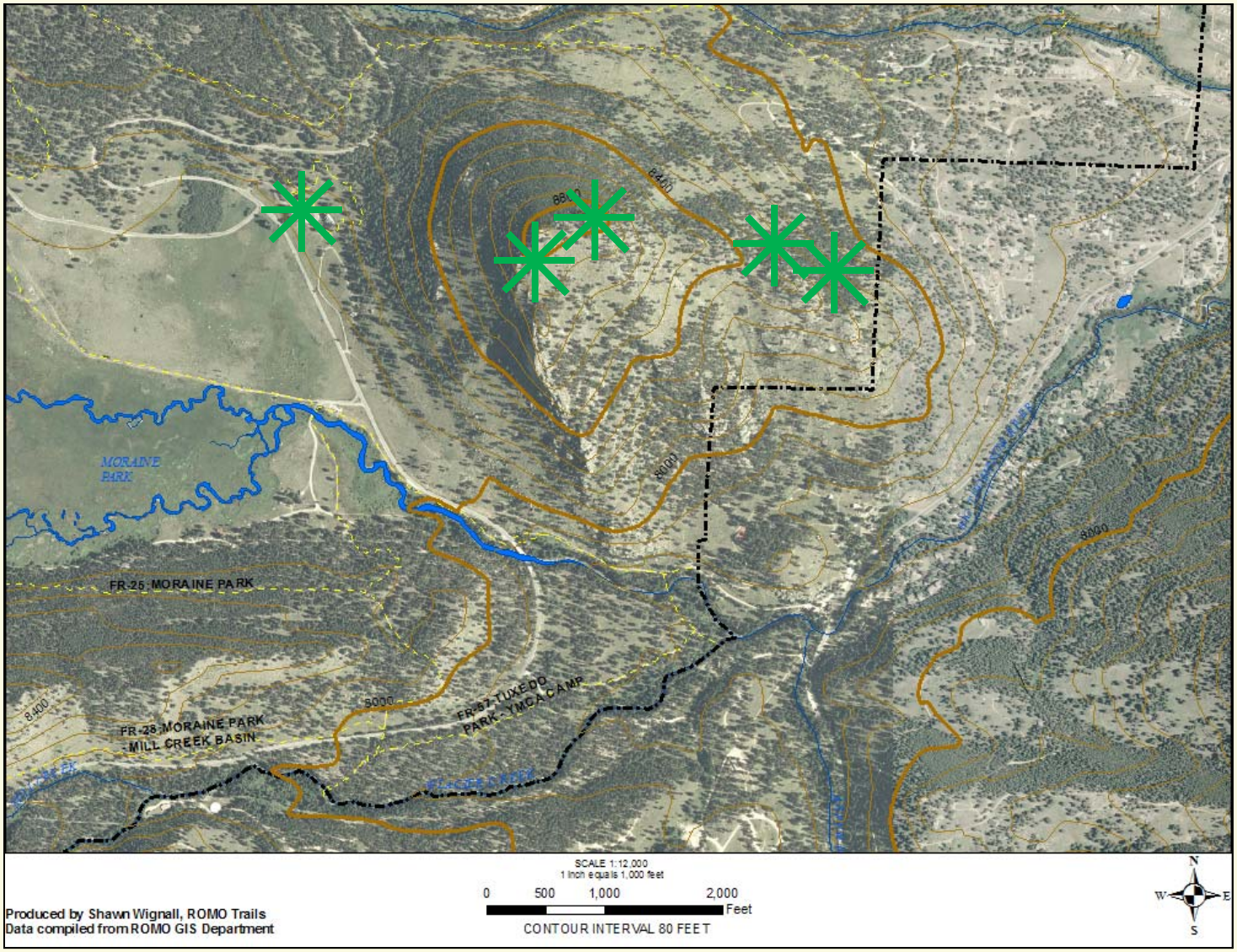
1. Park Maintenance
2. Moraine Park Visitor Center
3. Moraine Park Parking Area
4. YMCA of the Rockies
5. Historic Park Entrance



Case Study 1 – Destinations

Destinations for visitors to Eagle Cliff Mountain are most often the summit of Eagle Cliff, the Moraine Park viewpoint or the auxiliary summit east of Eagle Cliff.

Some visitors will visit the Moraine Park Museum, or continue up into Moraine Park.



Case Study 1 – Planning Context – Site Analysis

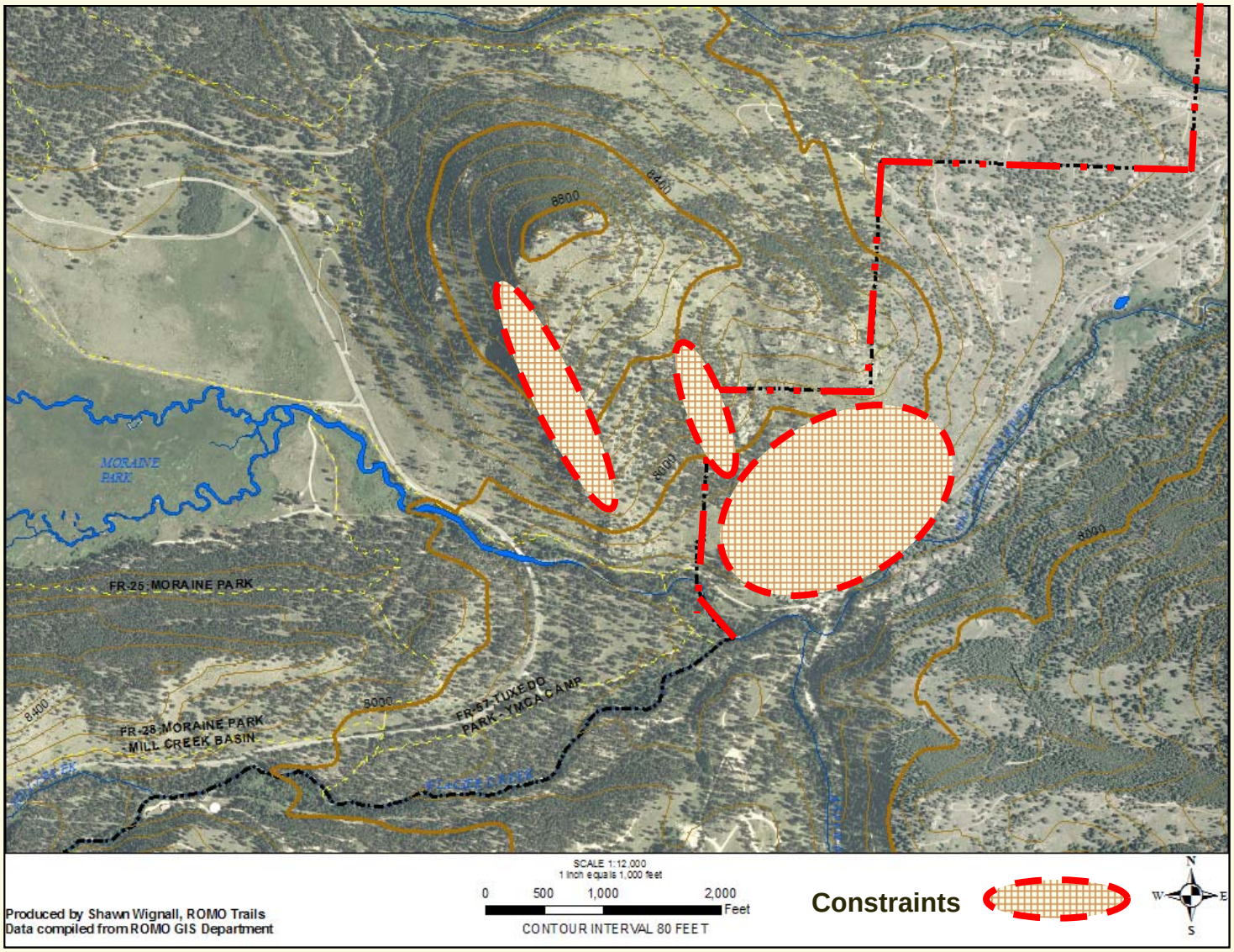
An escarpment dominates the western flank of Eagle Cliff Mountain.

Rock outcrops are scattered throughout the mountain.

There is also a ridgeline on the southeast face of Eagle Cliff Mountain.

The NPS boundary is a significant constraint.

Private residences are just over the boundary.



Case Study 1 – Viewpoints

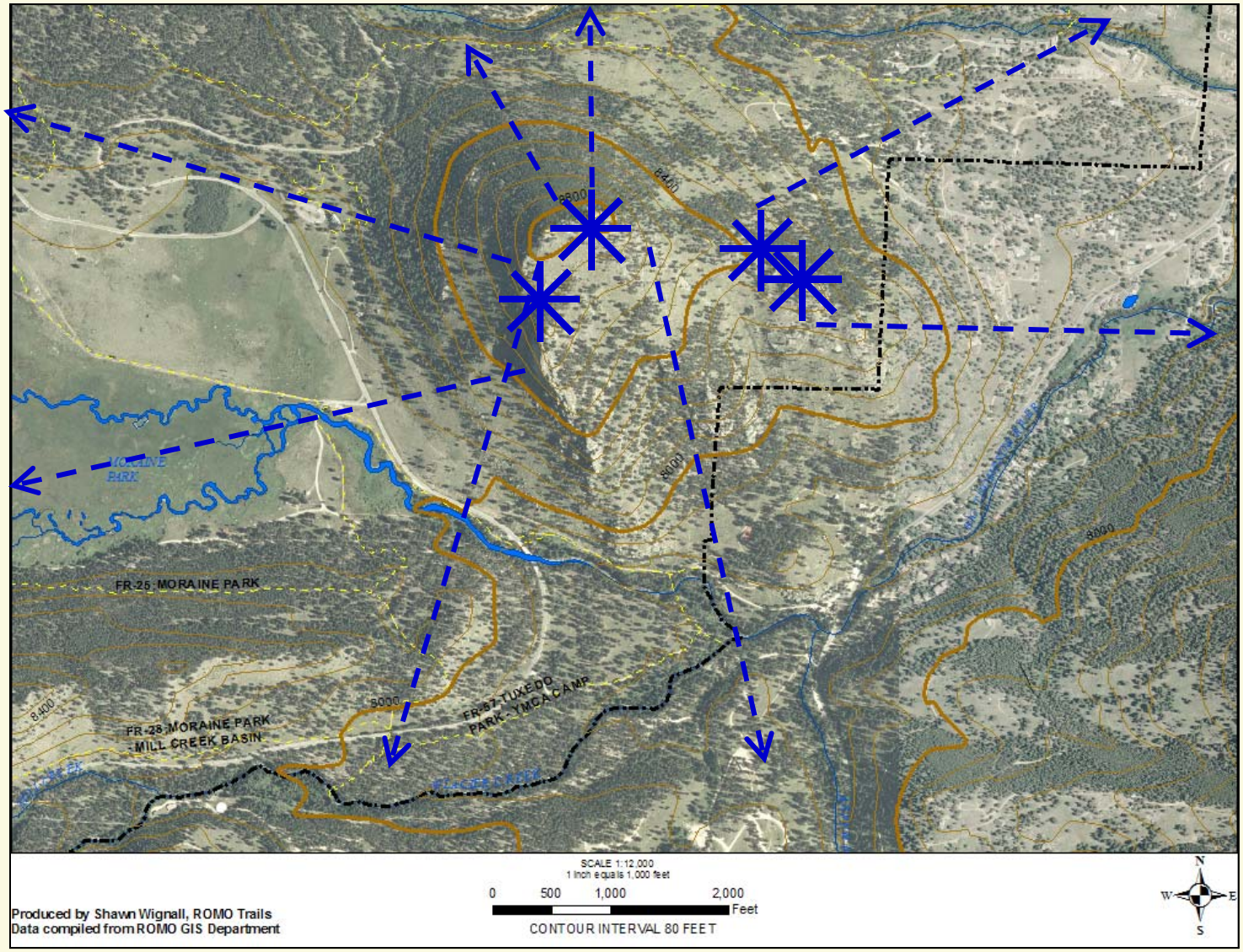
Viewpoints on Eagle Cliff Mountain are spectacular.

Views to the south include views to Longs Peak.

Views to the north are of the Beaver Meadows and the Mummy Range.

Views to the west are of Moraine Park and the Continental Divide in the distance.

Views to the east are of the Estes Park Valley.



Case Study 1 – Viewsheds

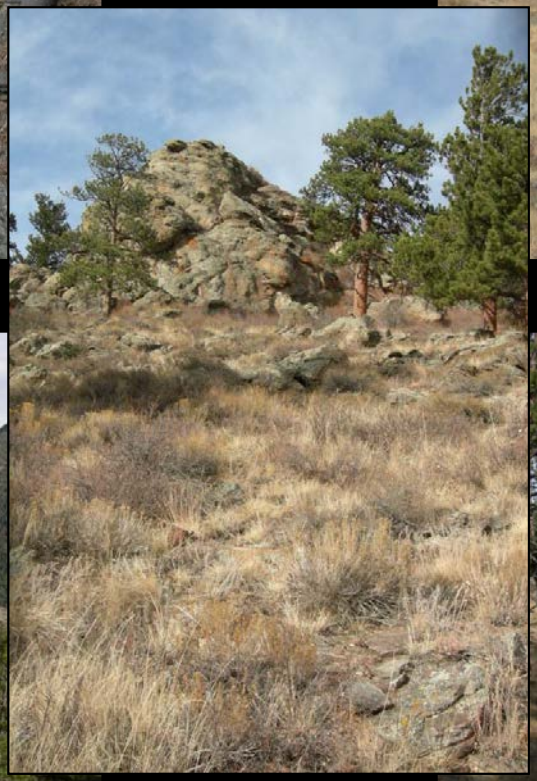
North – Beaver Meadows Entrance, Mummy Range in distance.

West – Moraine Park, Continental Divide in clouds

East – Estes Park, Lake Estes, Front Range

South – YMCA of the Rockies, Longs Peak in clouds

Case Study 1 – Landscape Character



Case Study 1 – Major Control Points

Major control points are those that must be established during the planning process.

Trail intersections

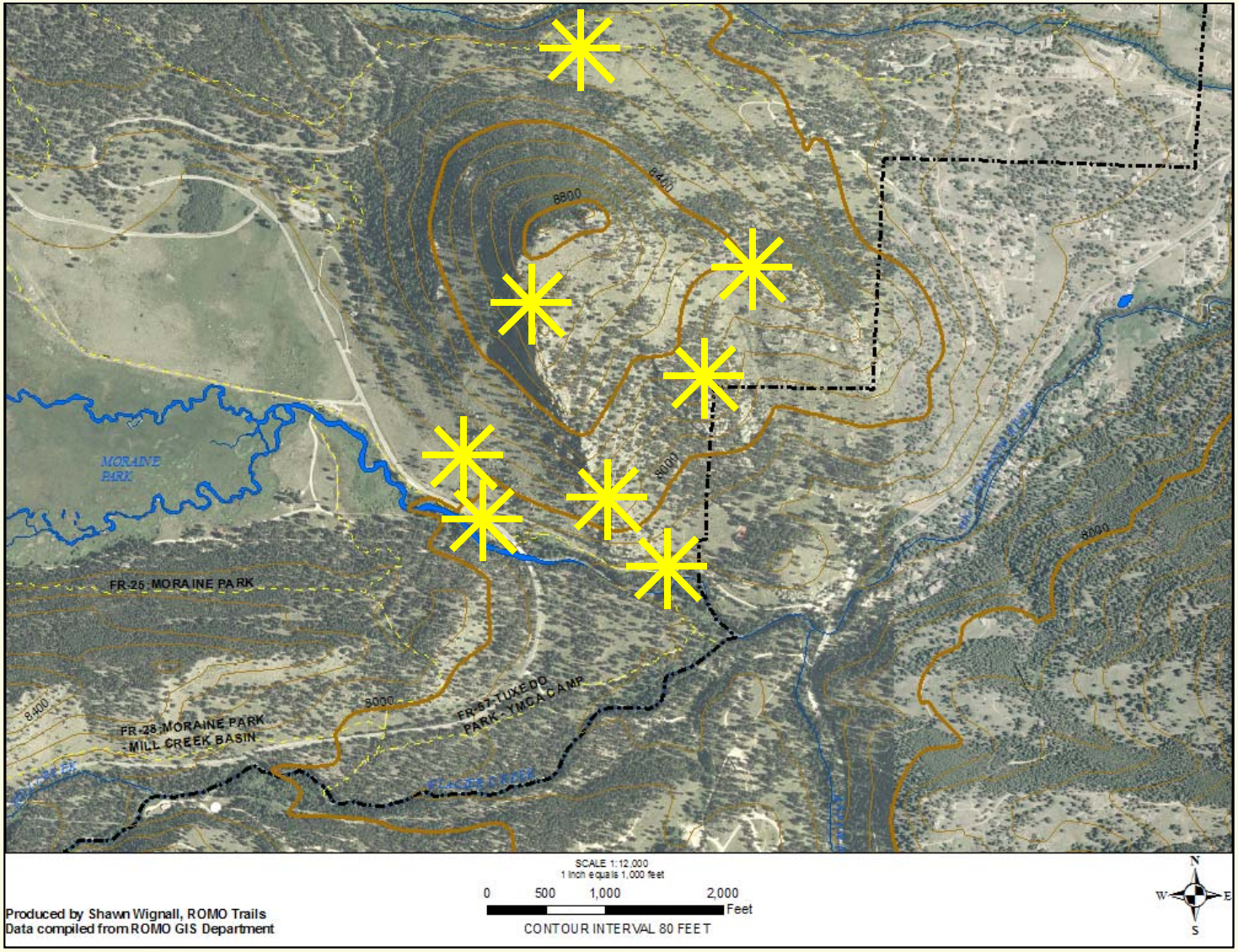
Topographic saddles

Ridgeline

Bridge (vehicular) crossing of the Big Thompson River

Existing multiple use bridge

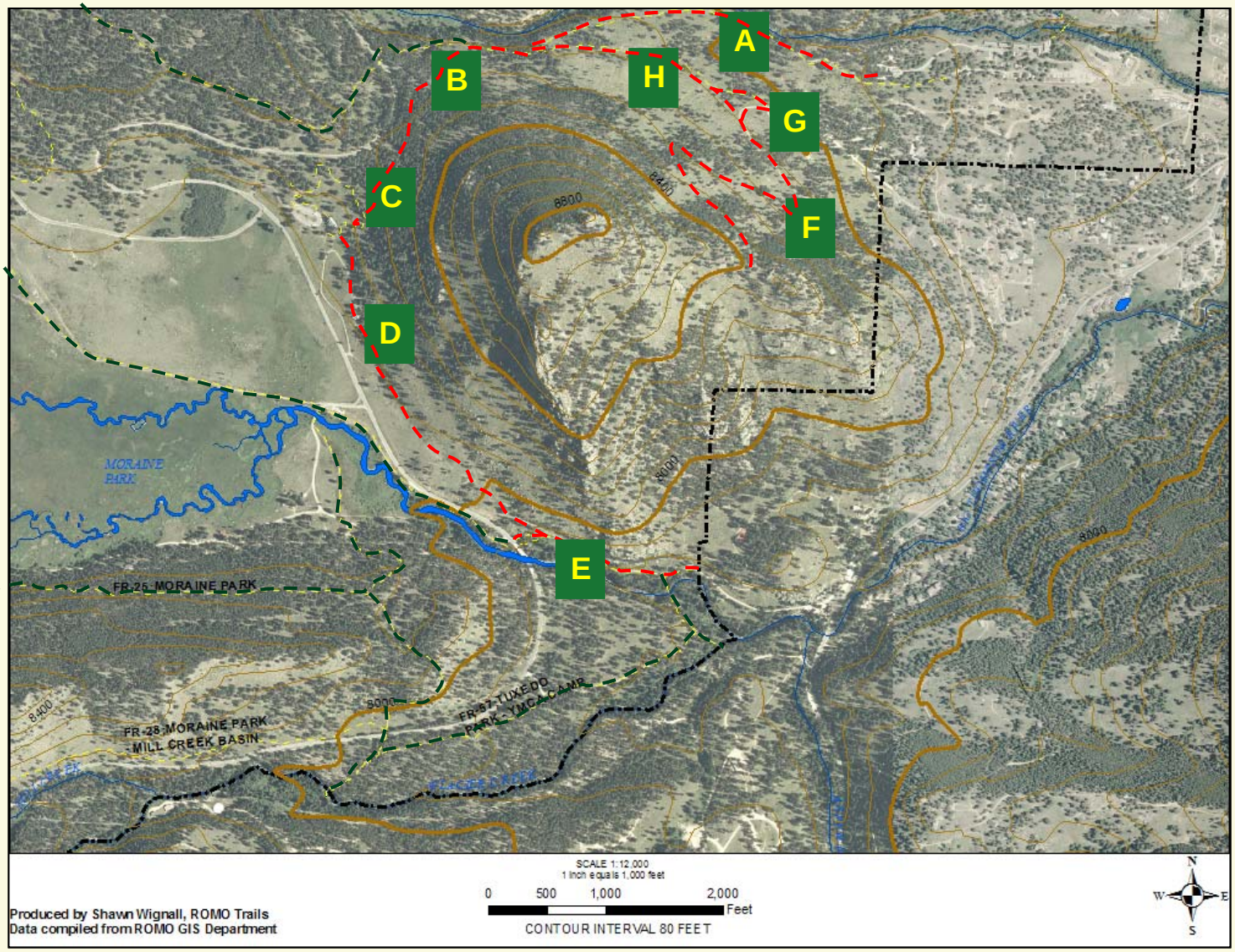
The NPS boundary corner significantly affects corridor selection opportunities.



Case Study 1 – Planning Context – Off-Site Connections

Off-Site Connection Segments

- **A** Park Maintenance to the intersection of Segment H
- **B** Segment A to the highpoint saddle
- **C** Saddle to Moraine Park Visitor Center Nature Trail
- **D** Moraine Park Visitor Center Nature Trail to the saddle intersection of Segment E
- **E** Parallel to the Big Thompson River
- **F** Saddle east of Eagle Cliff Summit to Segment G
- **G** Spur connections to existing trails in vicinity of private residences
- **H** Segment G to Segments A & B



Case Study 1 – Off-Site Connections – Summaries

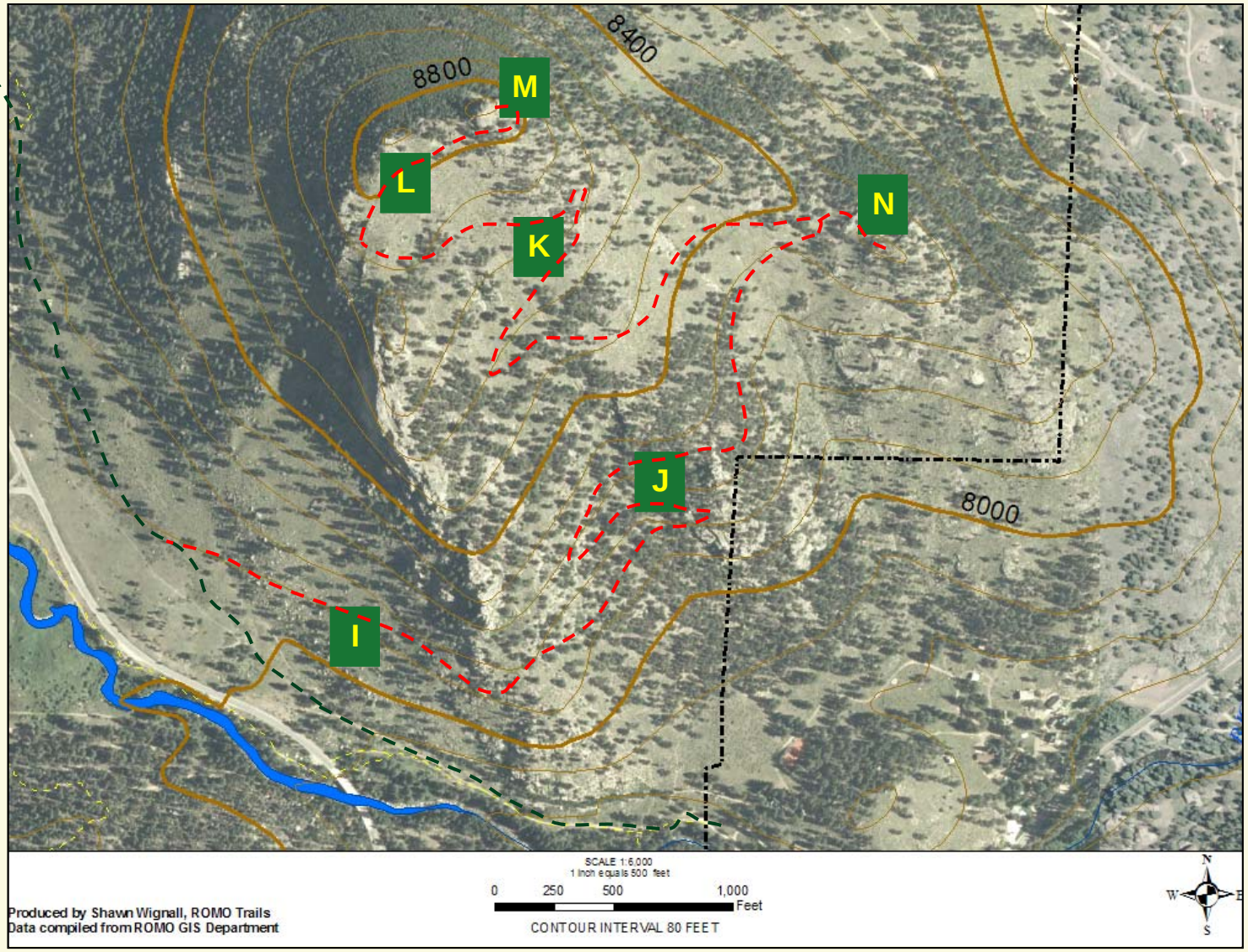
"Ballpark" Segment Data					
	Off-Site Connections	Length	Begin Elevation	End Elevation	Delta
Existing Trail	A	0.5	7875	8160	285'
Existing Trail	B	0.5	8160	8250	90'
Existing Trail	C	0.2	8250	8150	100'
Existing Trail	D	0.75	8150	7900	250'
Existing Trail	E	0.2	7900	7830	70'
New Trail Design	F	1	8400	8080	320'
New Trail Design	G	0.1	8080	8020	60'
New Trail Design	H	0.25	8080	8080	0'
	Summary	3.5 Miles			1175'

"Ballpark" Labor Estimates (Days)					
	Assessment	Planning	Design	Implementation	Maintenance Days Per Year
A	0.5	0.5	3	132	13
B	0.5	0.5	3	132	13
C	0.2	0.2	1.2	53	5
D	0.75	0.75	4.5	198	20
E	0.2	0.2	1.2	53	5
F	0	1	6	264	26
G	0	0.1	0.6	26	3
H	0	0.25	1.5	66	7
Summary	2.15	3.5	21	924	92

Case Study 1 – On-Site Linkages

On-Site Connections

- **I** Segment E to Ridgeline Control Point
- **J** Ridgeline Control Point to Saddle above Estes Valley
- **K** Saddle above Estes Valley to Saddle above Moraine Park
- **L** Saddle above Moraine Park to Base of Eagle Cliff
- **M** Eagle Cliff scramble route
- **N** Estes Valley Viewpoint scramble route



Case Study 1 – On-Site Linkages – Summaries

"Ballpark" Segment Data					
	On-Site Linkages	Length	Begin Elevation	End Elevation	Delta
New Trail Design	I	0.33	8080	8100	20
New Trail Design	J	0.67	8100	8340	240
New Trail Design	K	1	8340	8725	385
New Trail Design	L	0.33	8725	8880	155
New Trail Design	M	0.05	8880	8906	26
New Trail Design	N	0.1	8340	8425	85
	Summary	2.48 Miles			911

"Ballpark" Labor Estimates (Days)					
	Assessment	Planning	Design	Implementation	Maintenance Days Per Year
I	0	0.33	2	87	9
J	0	0.67	4	177	18
K	0	1.00	6	264	26
L	0	0.33	1.98	87	9
M	0	0.05	0.3	13	1
N	0	0.10	0.6	26	3
Summary	0	2.48	15	655	65

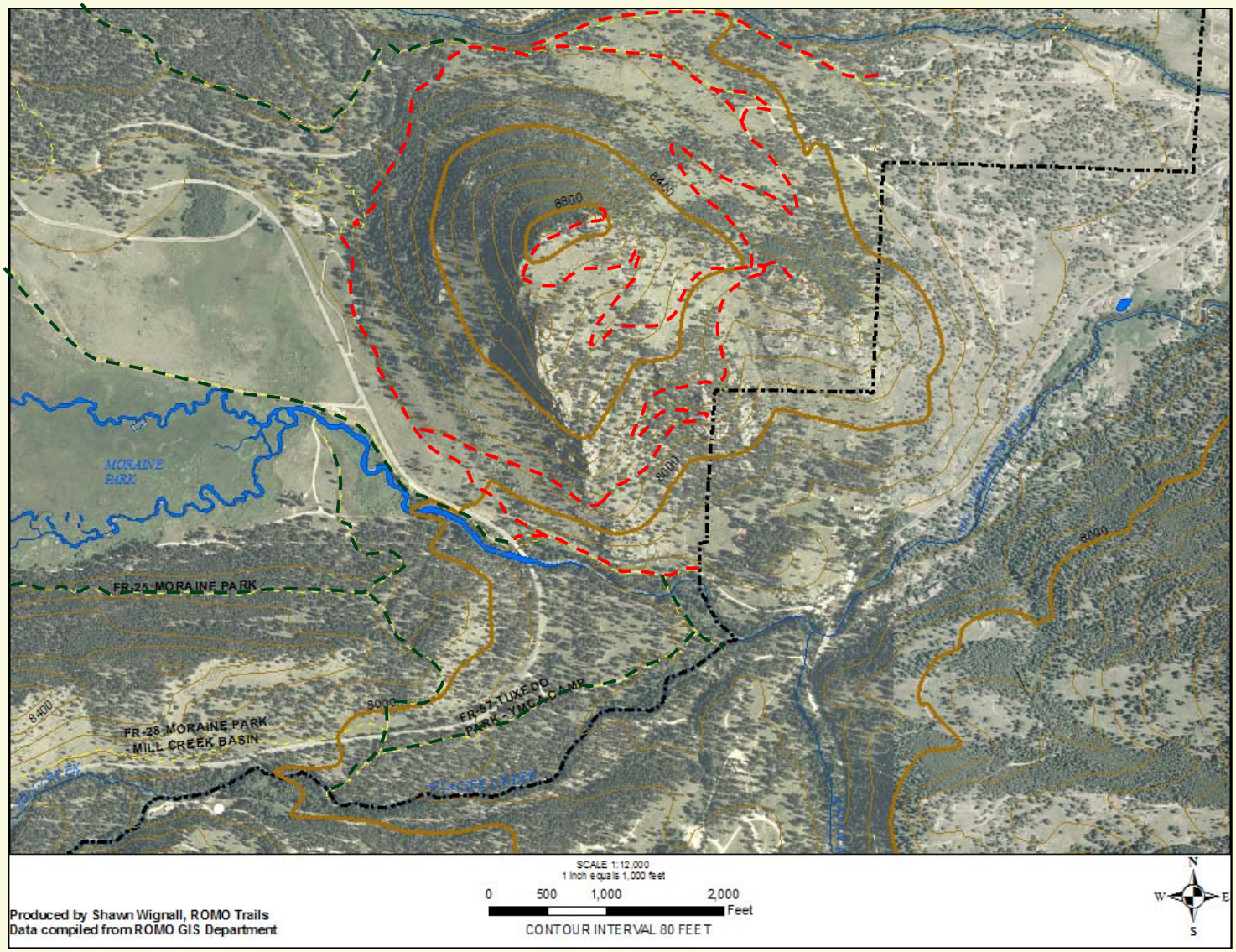
Vertical Calculations						
		Profile Grade				
	Vertical Delta	0.05	0.08	0.1	0.12	0.18
Length	750	15,000	9,375	7,500	6,250	4,167
	1000	20,000	12,500	10,000	8,333	5,556
	1250	25,000	15,625	12,500	10,417	6,944

Case Study 1 – Network

The proposed network for Eagle Cliff Mountain includes:

Off-Site Connections - Approximately 3.5 miles of existing trails to be rehabilitated

On-Site Linkages - Approximately 2.5 miles of new trail design coupled with several acres of restoration.



Case Study 1 – Eagle Cliff Mountain – Alternative No. 1

Alternative No. 1

10% Avg. profile grade

Hits major control points

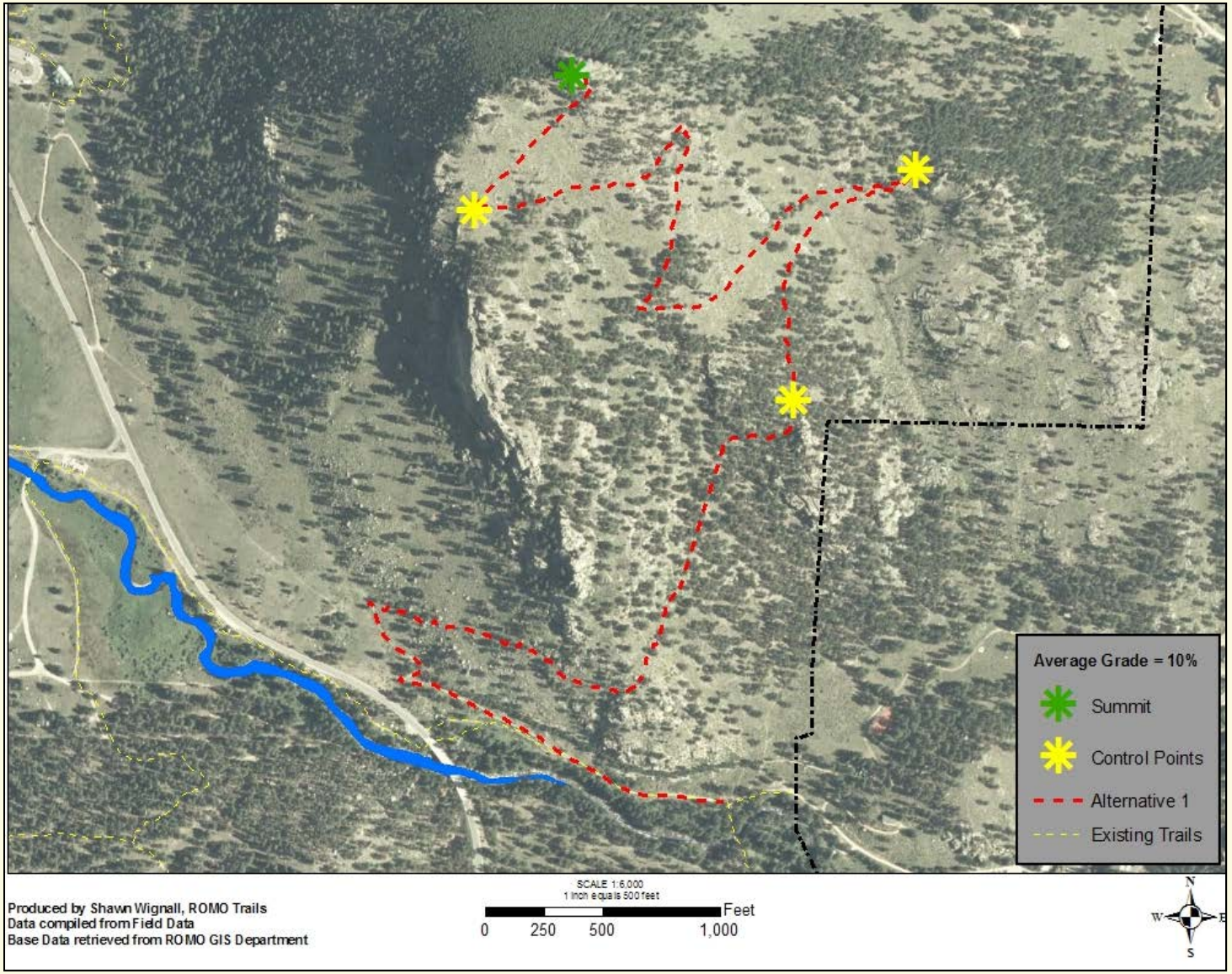
Utilizes lower break in western ridgeline

NPS boundary corner buffered by 100 feet

Takes advantage of both saddles

Ends at scramble routes to Eagle Cliff Mountain as well as the auxiliary summit.

Allows better expansion opportunities to Off-Site Connections (through auxiliary saddle).



Case Study 1 – Eagle Cliff Mountain – Alternative No. 2

Alternative No. 2

18% Avg. profile grade

Utilizes lower break in western ridgeline

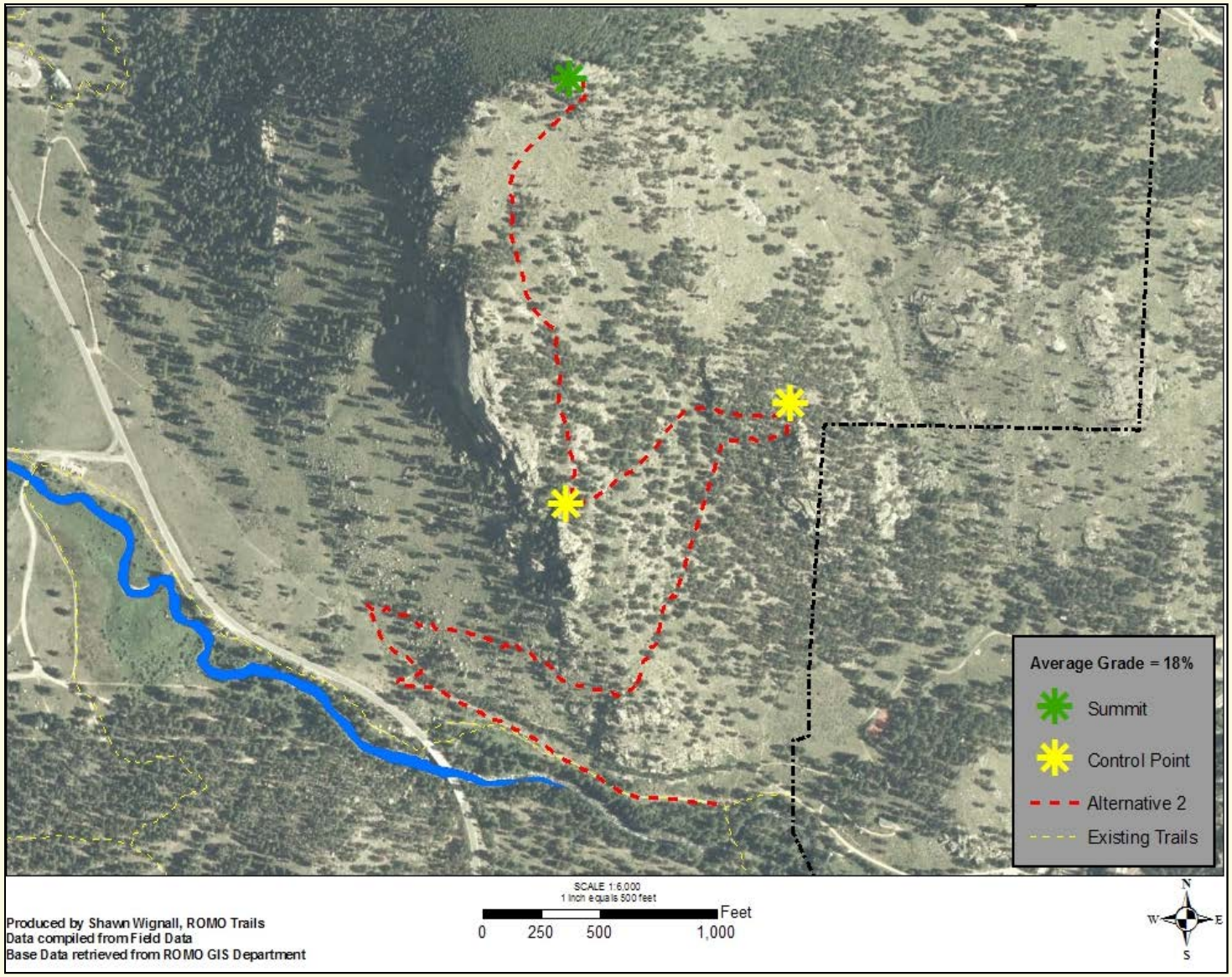
NPS boundary corner buffered by 100 feet.

Does not take advantage of auxiliary saddle.

Utilizes impact zone.

Ends at scramble route to top of Eagle Cliff Mountain.

Does not allow for efficient expansion to Off-Site Connections.



Case Study 1 – Eagle Cliff Mountain – Alternative No. 3

Alternative No. 3

18% Avg. profile grade.

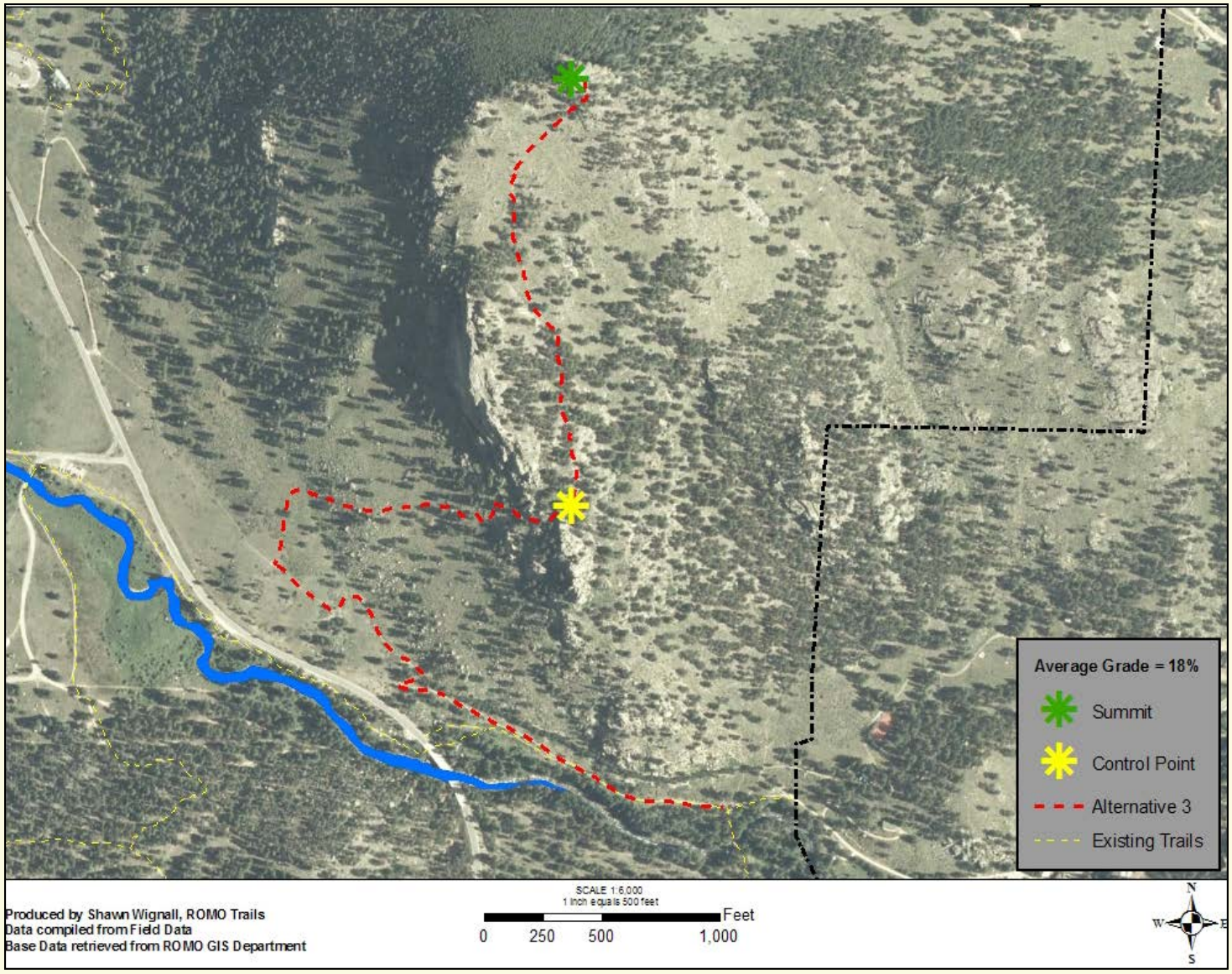
Utilizes higher break in western ridgeline.

Offers best buffer opportunity from private property and NPS boundary.

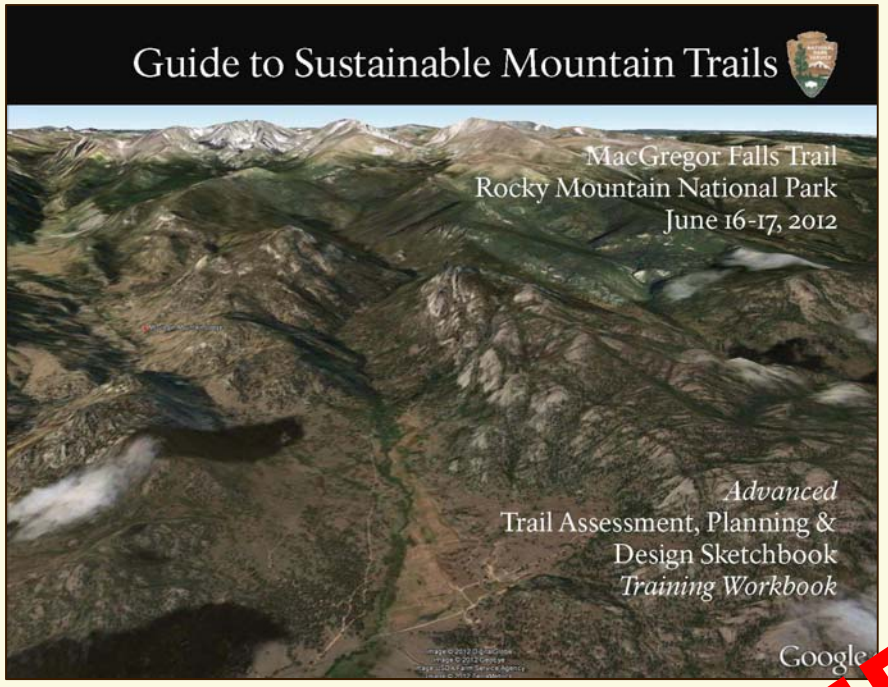
Utilizes upper portions of impact zone.

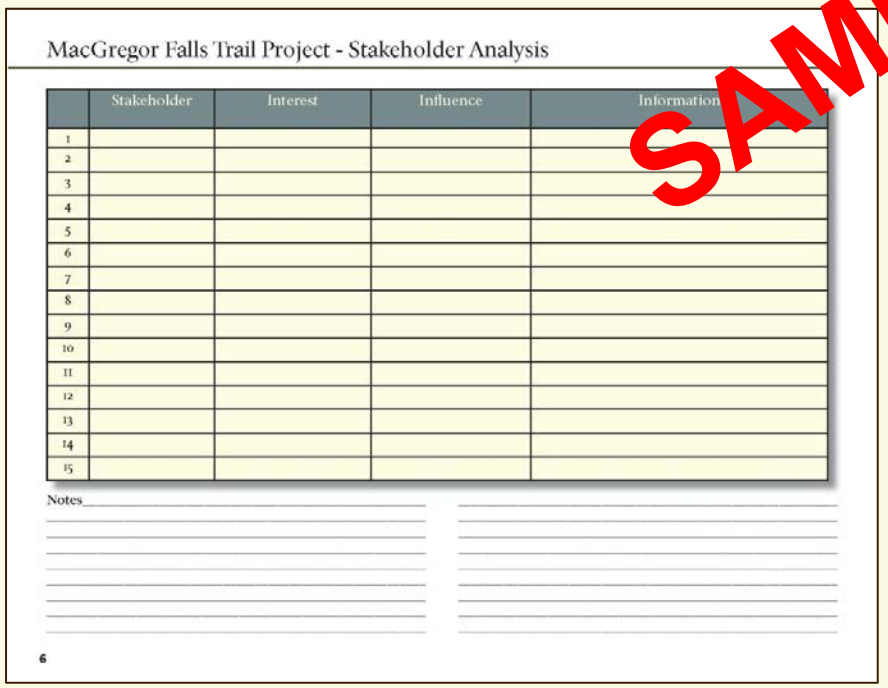
Ends at scramble route to the top of Eagle Cliff Mountain.

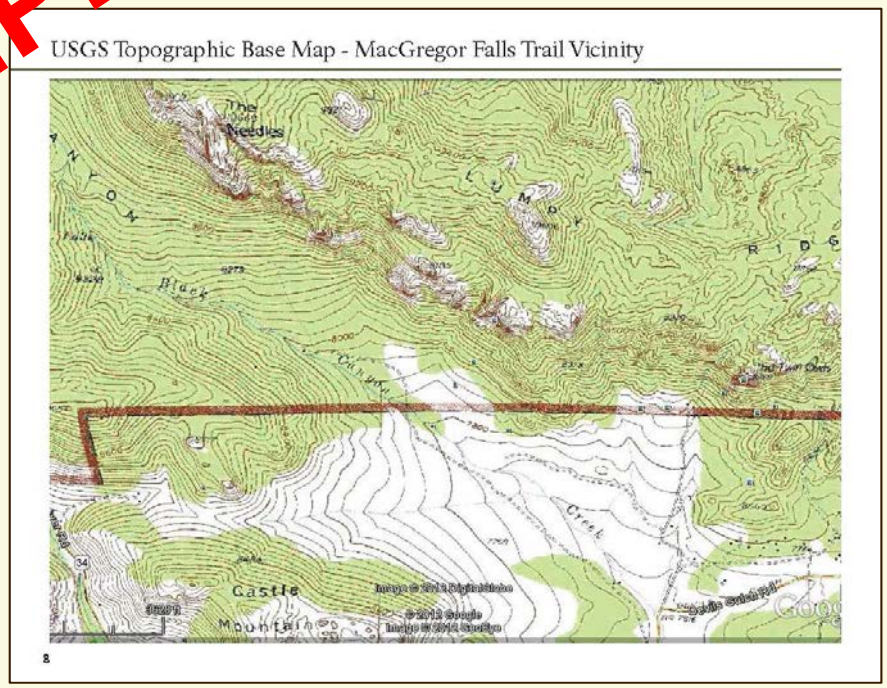
Does not allow for efficient expansion to Off-Site Connections.



Sketchbook / Workbook Training Process 1 of 2

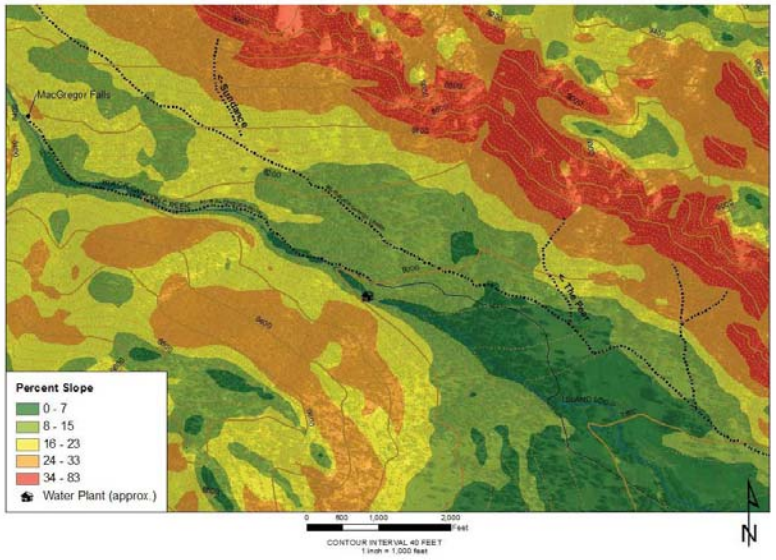






Sketchbook / Workbook Training Process 2 of 2

GIS Exports - Prevailing Cross Slope Map



18

Notes / Sketches

23

New Trail Design Summary / Est

Estimates

Station	Cross Slope Left (%)	Cross Slope Right (%)	Profile Grade (%)	Azimuth	Soils	New Trail Design Notes / Mgt. Options

39

Google Earth Oblique Exports - 1

40

I am absolutely convinced … if you have a … <u>sincere</u> <u>interest in protecting and improving the condition of the outdoor environment (combined with your background & influences)</u> …

… you can excel at implementing sustainable mountain trails … <u>hard work is all it takes</u>!

Satisfaction … knowing you did something to improve the environment … is your reward.

What is your most pressing mountain trail sustainability issue?

What are you going to do about it?

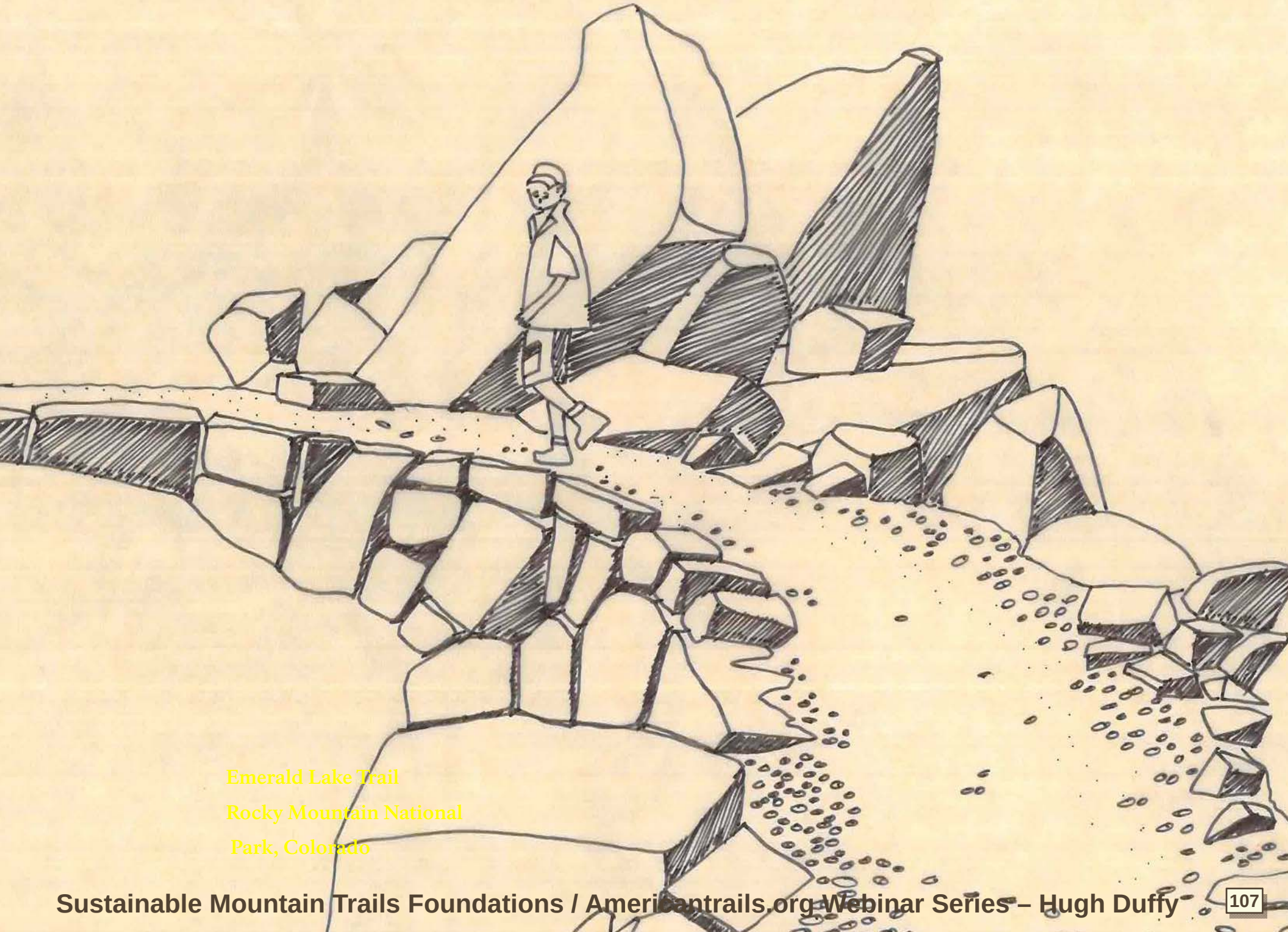
Towards a Mountain Trail Sustainability Ethic …

1. ***Inspiration …***
2. ***Optimum Investment***
3. ***Stewardship of a Woodlot***
4. ***Intrinsic Values of Land***
5. ***Fundamentals of Outdoor Recreation***
6. ***Landscape Architectural Tools & Techniques***
7. ***Nonprofit Agency Partnerships***
8. ***Training***
9. ***Art & Science***
10. ***It takes … hard work.***

"Not only are land managers, nonprofit agency partners and future generations depending upon you, but our nation's precious public lands – their natural and cultural resources with their associated intrinsic resource values – are also depending upon you.

What role will you play in helping shape the mountain trail sustainability ethic in the 21st century?"

***– Sketchbook, 2007 edition*, page 156.**



Emerald Lake Trail
Rocky Mountain National
Park, Colorado

Emerald Lake Trail
Rocky Mountain National
Park, Colorado

Fundamentals of Sustainable Mountain Trails (August 2014)

1. Students will learn Basic Design techniques which will assist them apply sustainability criteria and guidelines for New Trail Design on the ground.
2. Students will be able to understand the relationship between New Trail Design methods and Guidelines for Sustainability Assessment / Planning / Design / Implementation / Ecological Restoration / Maintenance, Rehabilitation & Armor Spectrum.
3. Students will learn to develop recommendations for the Optimum Mountain Trail Corridor and compare that to the Existing Mountain Trail Corridor and to prioritize segments for Implementation.
4. Et al.

Towards a Mountain Trail Sustainability Ethic … (Dec. 2014)

1. Students will learn the importance of understanding the Trail Project Cycle, giving full consideration to all cogs of the cycle including Lessons Learned & Pitfalls to Avoid.
2. Students will learn New Tools & Techniques and how these apply to Sustainable Mountain Trail project formulation.
3. Students will learn the Sustainable Mountain Trails Sketchbook / Workbook Training process and how this might apply to their Trail Networks.
4. Students will see an overview of Case Studies and Examples which demonstrate adherence to Mountain Trail Sustainability Guidelines.
5. “What Role Will You Play?” Students will be challenged to consider the need for their hard work, as well as continued education / enhanced training / New Partnerships, and New Tools & Techniques to enhance the Sustainable Mountain Trails community.
6. Et al.


Thank You!

End!

Danny Basch

National Park Service
Rocky Mountain National Park

Facilities Management

Eastside Trails Supervisor

Danny's responsibilities include maintenance, construction and rehabilitation of approximately 250 miles of trail, 900 trail signs and 200 bridges.

Master Instructor – Colorado Outdoor Training Initiative (COTI)

Greg Seabloom

Boulder Open Space & Mountain Parks

1998 – Present

Colorado State Parks / Americorps
Pacific Northwest Trails Association
Colorado Fourteeners Initiative

Various trail planning, design, implementation and management roles and responsibilities throughout the western United States.

2001 Bachelor's of Science in Natural Resource Management, Colorado State University

John Giordanengo

Projects Director
Wildlands Restoration Volunteers

Board of Directors, Colorado Native Plant Society

Master Instructor – Colorado Outdoor Training Initiative (COTI)

Co-author of COTI Restoration Curriculum

2000 – Present

Various restoration ecologist specialist consultation roles and responsibilities throughout Colorado.

Don Sharlow

National Park Service, Northern Arizona Parks, Flagstaff Arizona

~ 1985 – Present

Various trail planning, design, implementation and management roles and responsibilities in various NPS units in the western United States.


Thank You!