

Design

Planning

- Objectives: Style, Audience, Skill Level, Connections
- Bike-Specific vs. Bike-Friendly Multi-Use
- Resources, Funding, Volunteers
- Permission, Permitting, contracts

Design

- Scouting, control points, flagging
- Trail Alignment
- Detailed Maps
- Grades, Half-rule, Specs, Flow, Features, Sightlines, Drainage
- Documentation++
- Schedule & budget

Construction

- Trail Corridor, Dirt, Full Bench, Outslope, Half Bench, SBs, Grade Reversals
- Dealing with Running Water (seeps & streams)
- Crossing Flat/Wet Areas
- Tools & Work Safety

Maintenance

- Brushing, clearing
- Re-benching
- Trail Widening
- Drainage, nicks, grade reversals
- Choke points
- Re-routes



Bike-Friendly Techniques



PNW Techniques

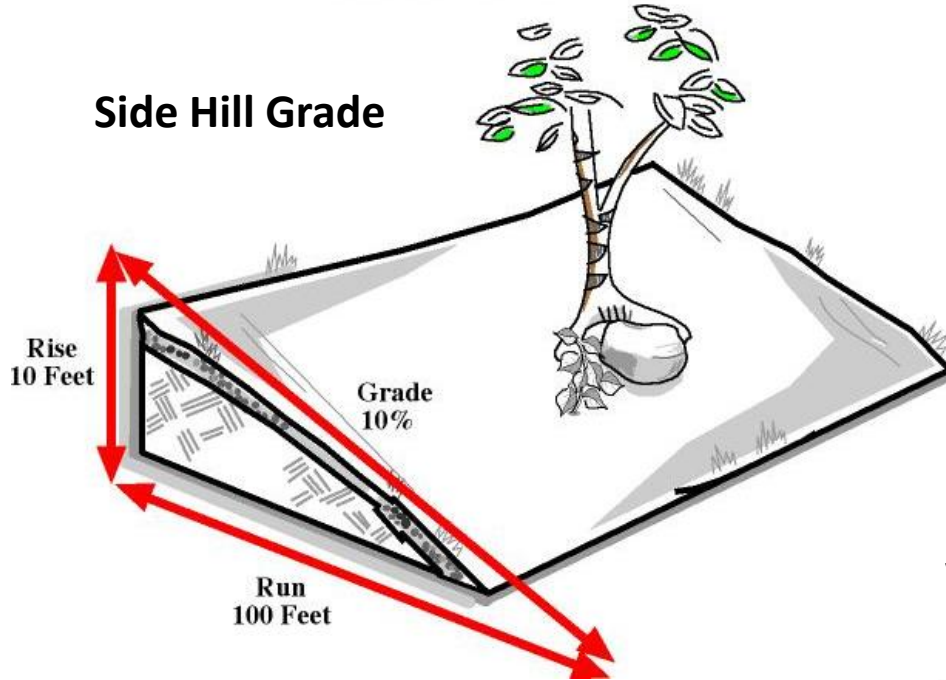


Tools, Special Considerations

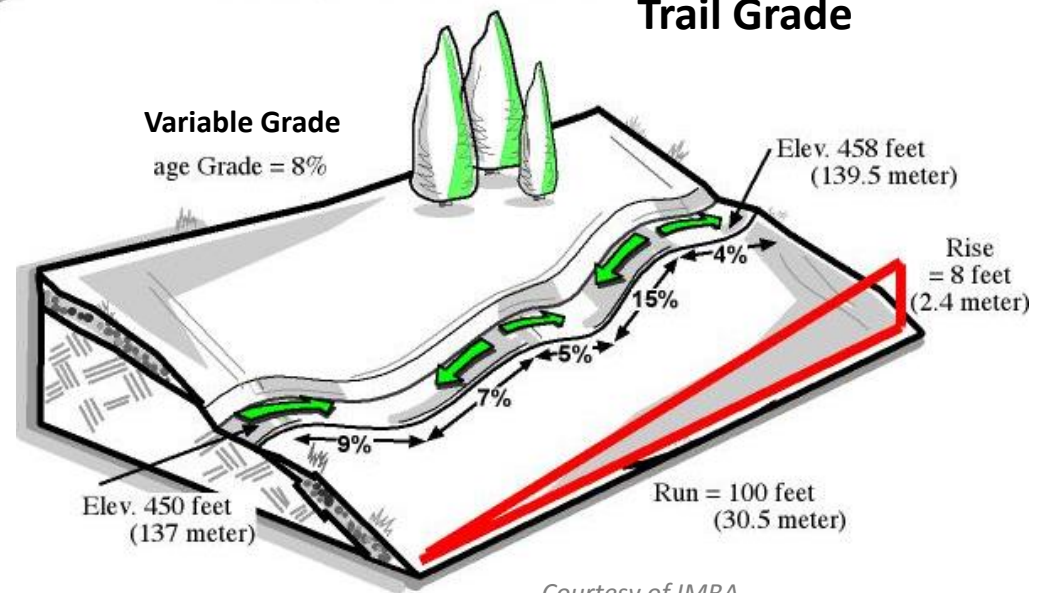
Grade

$$\text{Grade} = \text{Rise} \div \text{Run}$$

Side Hill Grade

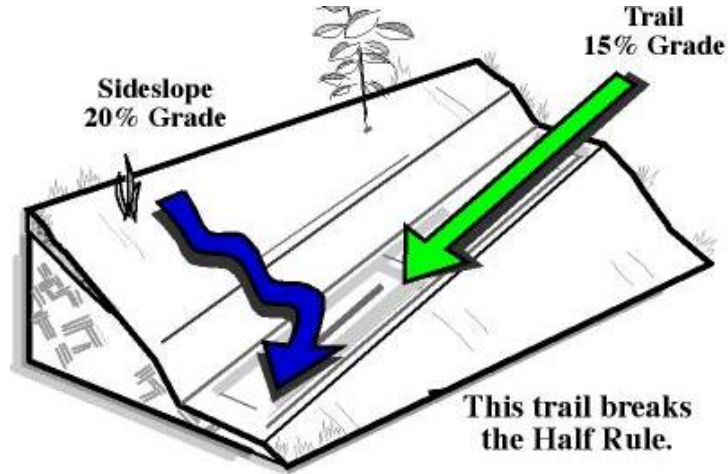


Trail Grade

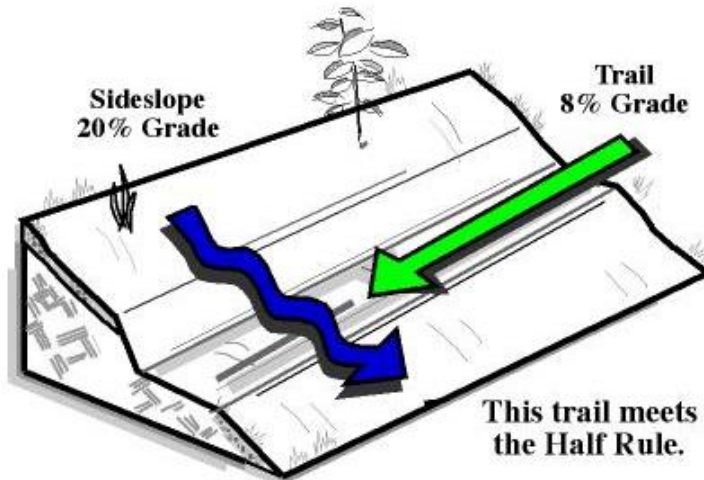


Courtesy of IMBA

The Half Rule

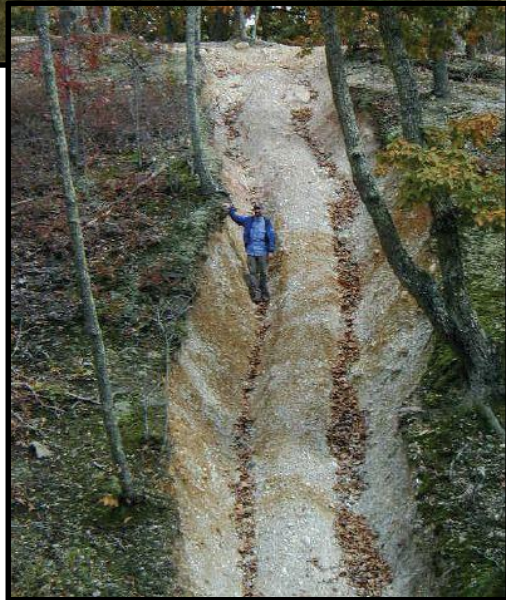


Courtesy of IMBA



Trail grade must be
less than $\frac{1}{2}$ of the
side hill grade.

Fall Line Trails

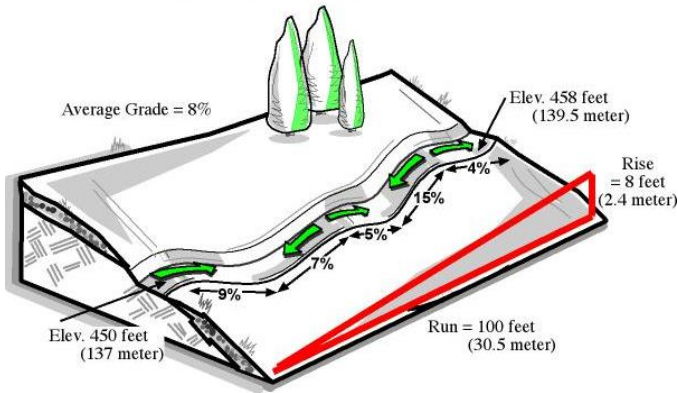


Rolling Contour Trails:



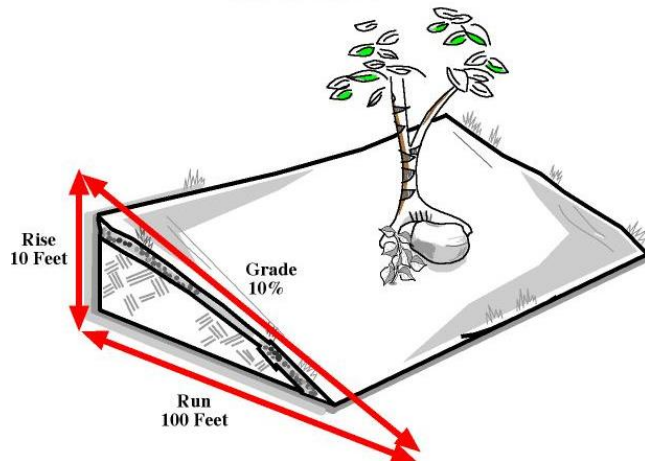
Courtesy of IMBA

More on Grade



Max Trail Grade

- *IMBA & USFS:*
Max Sustained Ave Grade = 10%



Side Hill Grade

0-5% Keep Out

5-10% Avoid

Look for 10-60%
Ideal: 30-50%

60-80% OK *Difficult for machine build*

80-100% Avoid

>100% Keep Out

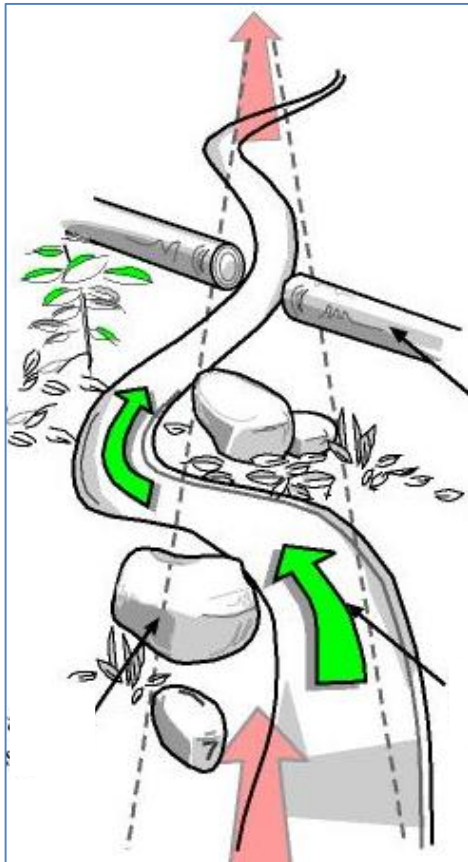
Depends also on user experience and soil type

Sight Lines



- Route steeper grades / faster speeds in higher visibility areas
- Clear vegetation around turns
- Bring trails close together before a switchback or an intersection
- Bring trails uphill before a blind turn or intersection
- Consider 1-way trails

Speed Control



- Route trails uphill into and out of blind corners or before a merge
- Use chicanes and corraling where needed to reduce speed

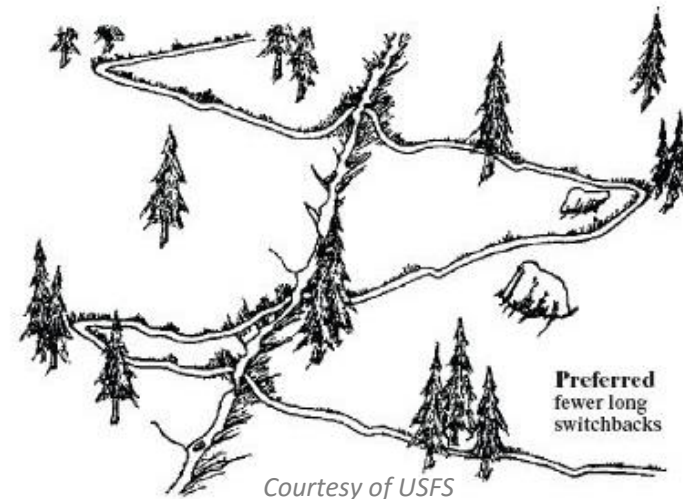
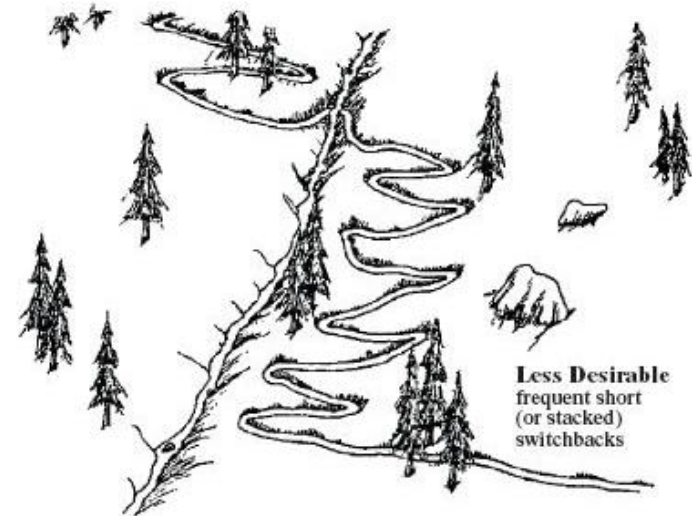
Courtesy of IMBA

Routing and Switchbacks

Minimize Switchbacks

- **Extensive work**
- **Interrupt flow for bikers**
- **Can be difficult for bikers**
- **Can be erosion prone**
- **Can promote trail braiding**

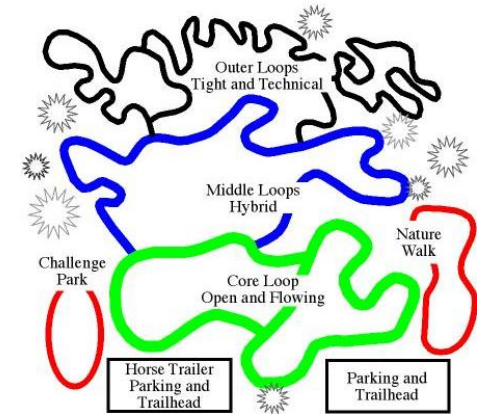
Use fewer longer/wider in-sloped turns wherever possible



Control Points – 1) From the Planning Process

(+)ve Control Points

- Trailhead, parking, facilities
- Connections: other trails, residential neighborhoods, towns and transportation centers
- Other users' trails
- Very rough trail routing
- Construction access
- Emergency access



(-)ve Control Points

- Other Users' Trails
- Neighbors & private property
- Identified sensitive or unsuitable areas (wetlands, stream buffers, unstable slopes)
- Imminent timber harvest
- Other users' trails



Control Points – 2) From the Landscape

(+)ve Control Points:

- Cool features to look at: views, boulders and big trees
- Cool features to ride: smooth rocks, gnarly rocks, gnarly roots, root drops, natural terrain variations
- Good grades & soils
- Flat locations for switchbacks
- Best locations for water crossings

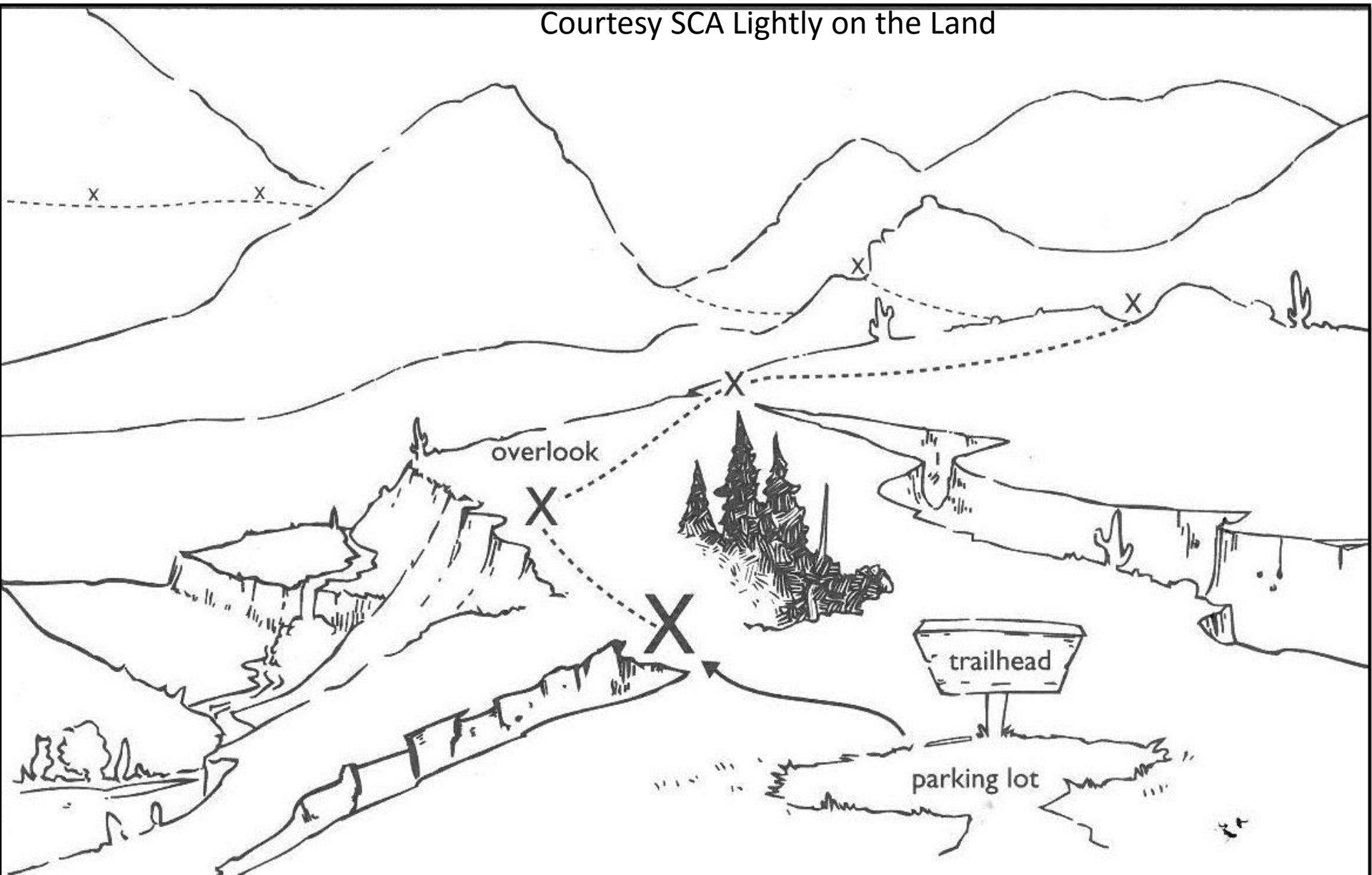


(-)ve Control Points :

- Wet & flat areas, seeps, streams
- Unbuildable steep terrain or poor soil
- Nasty vegetation: Devil's Club, blackberries
- Difficult build conditions – e.g. 10-15 year old clearcuts!!



Courtesy SCA Lightly on the Land



Positive & Negative Control Points

1) From the Planning Process

- + Trailhead, parking, facilities
- + Connections: trails, green spaces, neighborhoods, town centers, transportation
- + Very rough trail routing
- + Construction access
- + Emergency access

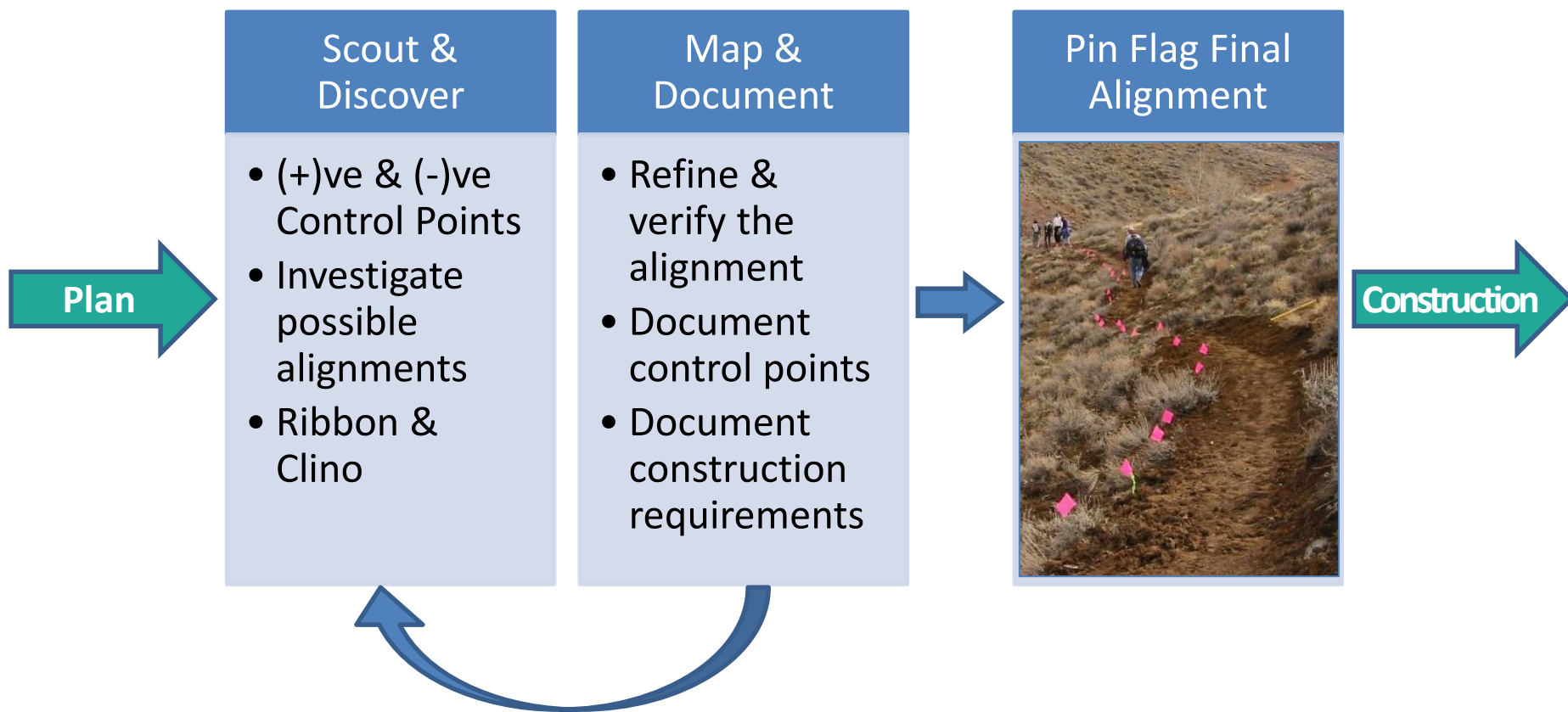
- Neighbors & private property
- Identified sensitive or unsuitable areas (wetlands, stream buffers, unstable slopes)
- Imminent timber harvest
- Other users' trails
- Erosion prone soils or terrain

2) From Scouting the Landscape

- + Beautiful features to look at: views, boulders, big trees
 - + Fun features to ride: smooth rocks, gnarly rocks, gnarly roots, root drops, natural terrain variations
 - + Good grades & soils
 - + Flat locations for switchbacks
 - + Best locations for water crossings

 - Wet & flat areas, seeps, streams
 - Unbuildable steep terrain or poor soil
 - Nasty vegetation: Devil's Club, blackberries
 - Difficult build conditions – e.g. 10-15 year old clear cuts!!
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Design Process



Design Tools

- Topo Maps
- GPS
- GPS Mapping Software
 - Free: Gmap4, Google, Google Earth, Strava
 - \$: GPS-Kit, Avenza PDF Maps
 - \$\$: ExpertGPS, TopoFusion
- Clinometer
 - \$: iPhone app
 - \$\$: Suunto, Brunton
- Ribbons, Pin flags
- <http://websoilsurvey.sc.egov.usda.gov>

