

A non-motorized  
multi-use trail  
network proposal  
for a city park:  
A case study of  
Phillips Farm Park  
in Moscow, ID

---

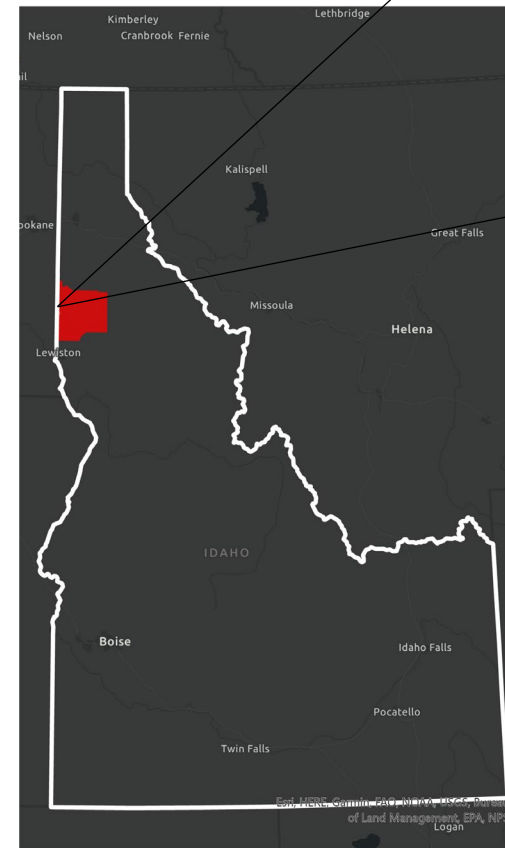
Jenine Estlick

*Masters of Landscape Architecture  
Candidate 2023*



# The Site – Phillips Farm Park

- 5 miles north of Moscow Idaho
- Owned by the City of Moscow and maintained by Latah County
- 160 acres
- Open prairie & Forested land
- Current Uses:
  - Nature trails
  - Orchard for apple picking
  - Dog Walking
  - Multi-use trail (.67 miles)
- Lack of beginner to intermediate trails



# Project Goals

## Welcome

*an array of users by designing trails to suit the needs of diverse user groups*

## Embraces

*the fact that activity zones are to be established for specific user groups (i.e., multi-use vs. hiker or biker only)*

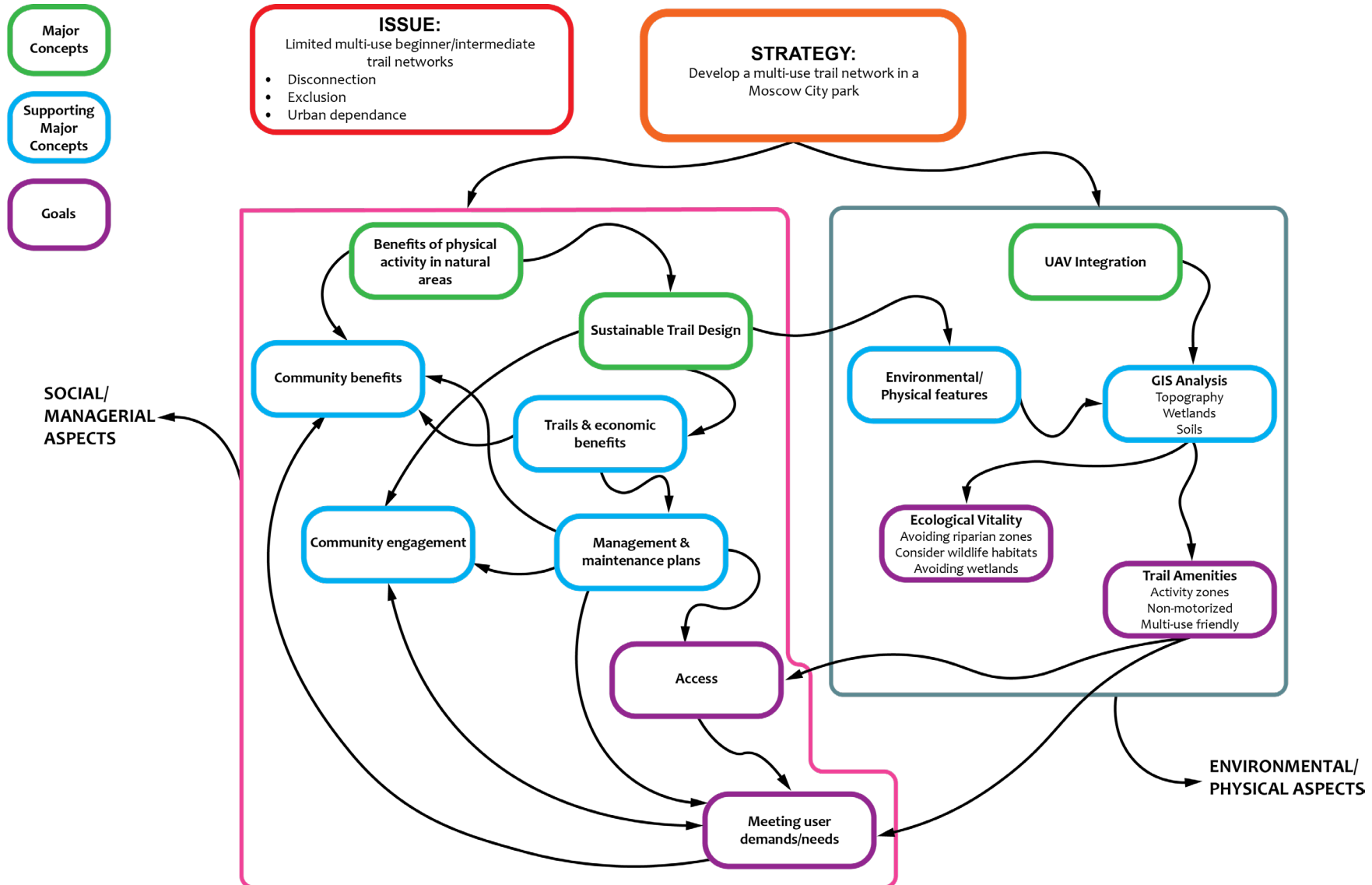
## Accessible

*trail network close to home and accommodates individuals who identify themselves at a beginner or intermediate fitness level*

## Analyze

*the topography to propose multi-use trail expansions that support and adhere to sustainable trail design guidelines*

# Conceptual Framework



# A Literature Review- Supporting topics to inform the project design

- Physical Activity in Nature
- Sustainable Trail Design Elements
- UAV, Photogrammetry, and GIS Analysis

# Physical Activity in Nature

*The links to overall human well-being*

- Staying physically active contributes to longevity
- The environment plays a key role
- Access to green infrastructure is important
- Positive experiences on human health justify the need




# Sustainable Trail Design Elements



*The three main pillars*

A trail is considered sustainable if it meets the needs of the users and provides the necessary environmental protection while minimizing maintenance needs *(Marion, 1)*

- Environmental Sustainability
  - Social Sustainability
  - Economic Sustainability
- 

# Environmental Sustainability

## TRAIL GRADE & HALF-RULE



(Adapted by Carsten, 28)

## TRAIL ALIGNMENT

Trail Slope Alignment (TSA)	Degradation Potential	Trail Profile
<b><i>Fall-aligned Trails</i></b>		
0-22°	Very High— tread drainage rarely possible; erosion, widening, & muddiness probable	
23-45°	High— tread drainage is often difficult; erosion, widening, & muddiness are likely	
<b><i>Side-hill Trails</i></b>		
46-68°	Low— tread drainage is possible; low potential for problems	
69-90°	Very Low— tread drainage is easy; very low potential for problems	

(USGS, 2017)



# Environmental Sustainability

## GRADE REVERSAL



*(Adapted by Carsten, 29)*

## OUT SLOPE



*(Adapted by Carsten, 29)*

# Social Sustainability

## *Recreation Opportunity Spectrum*

Understanding the behavioral aspects of why people recreate

(Kliskey, 22)

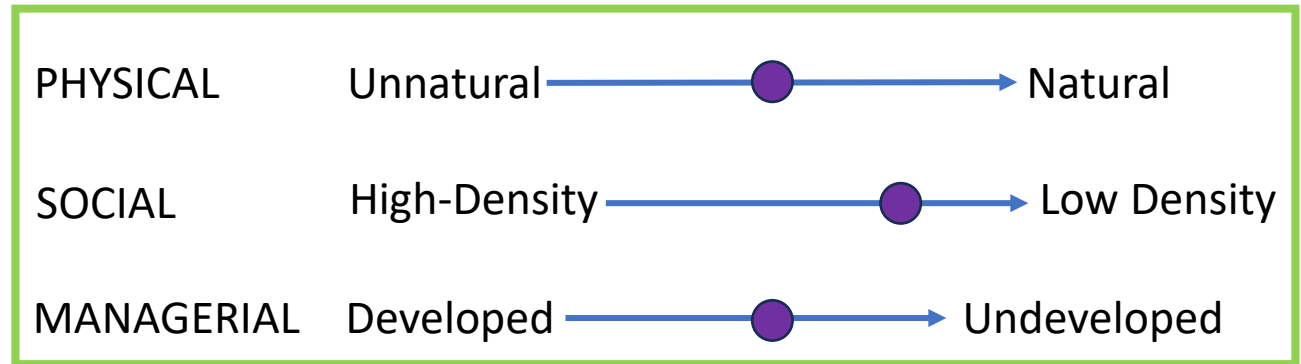
### **Stages of the Recreation Opportunity Spectrum**

Engagement in the activity

Recreating in a specific setting (physical, social, and managerial)

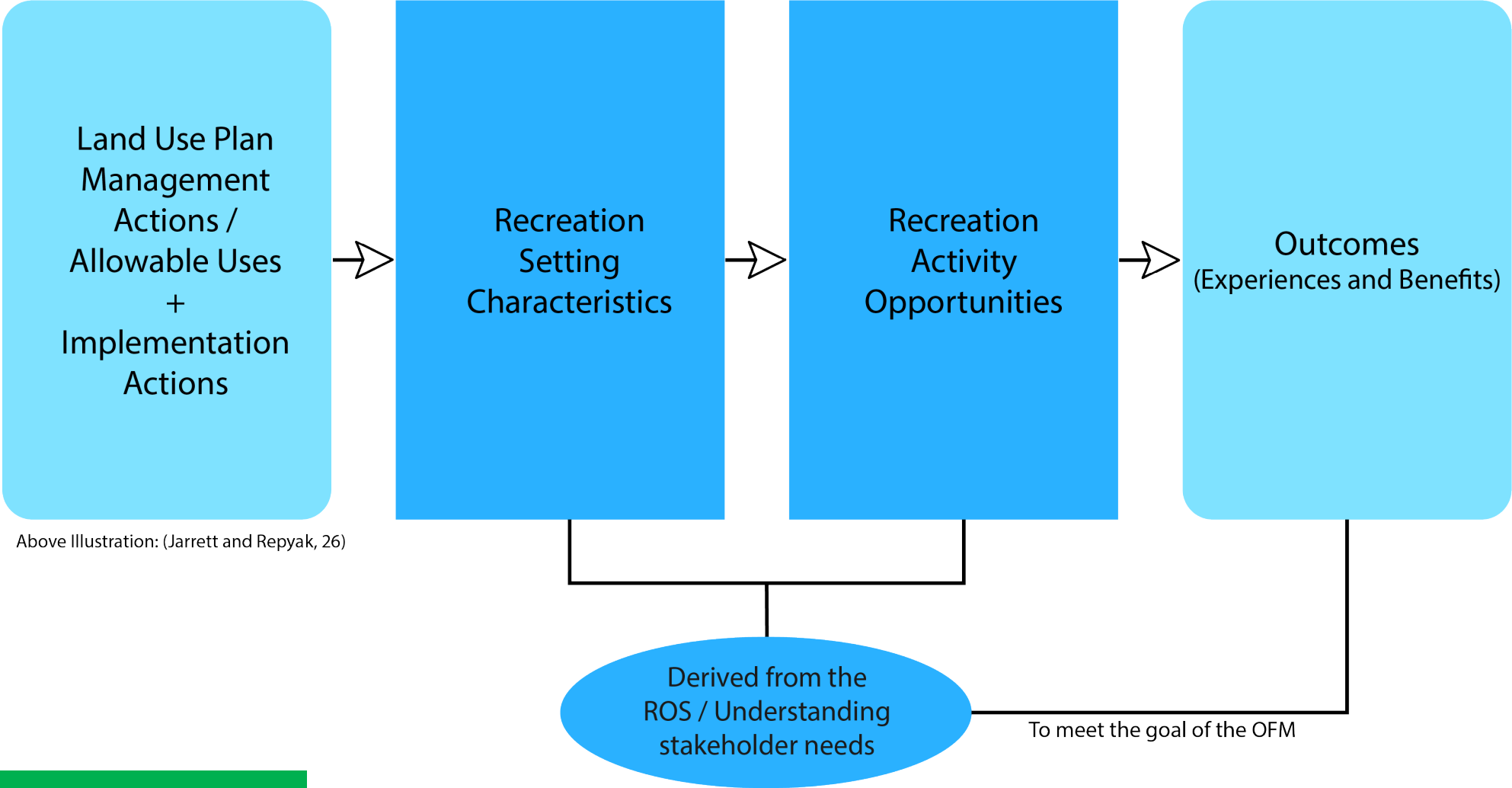
Realizing the psychological outcomes, and experiences (specific to the individual)

Realization of the benefits following the activity



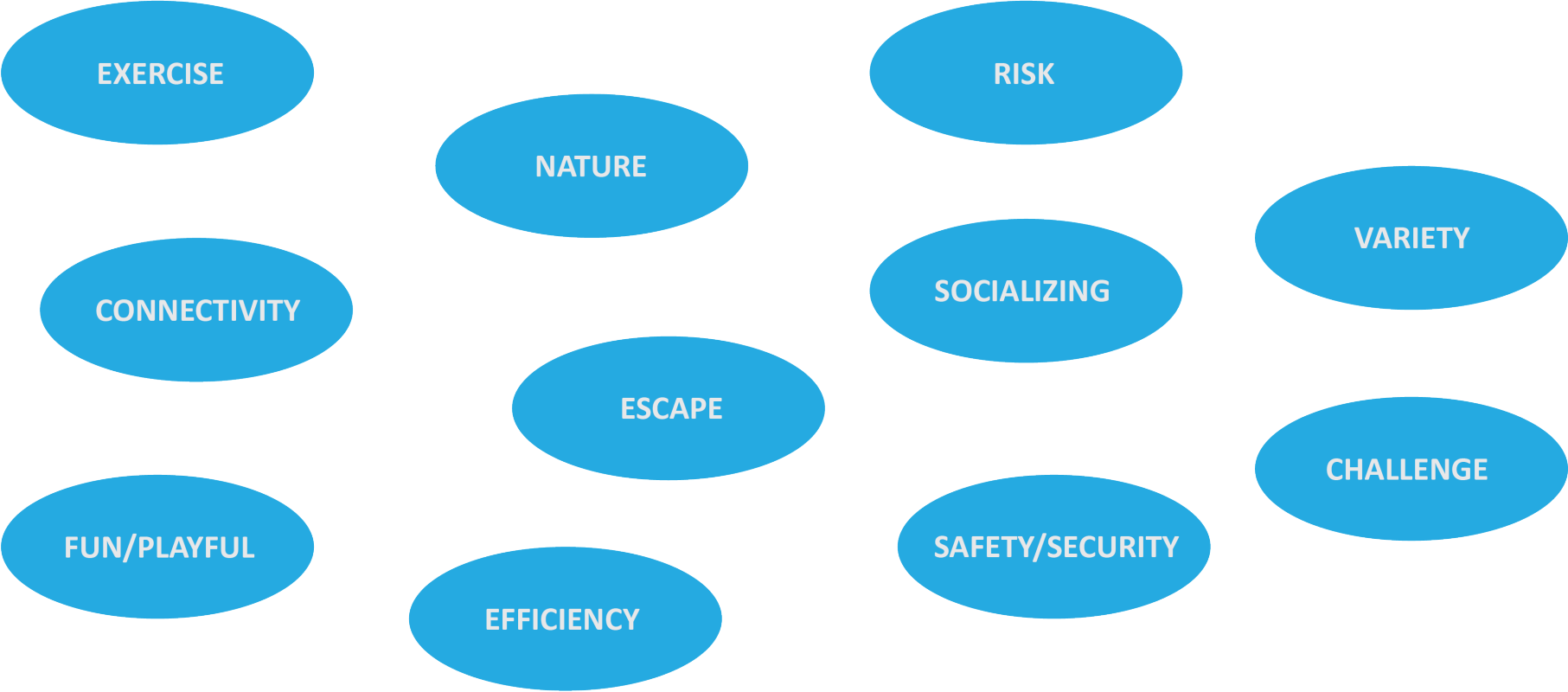
# Social Sustainability –

*Outcomes Focused Management*



# Social Sustainability

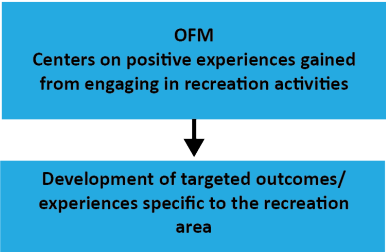
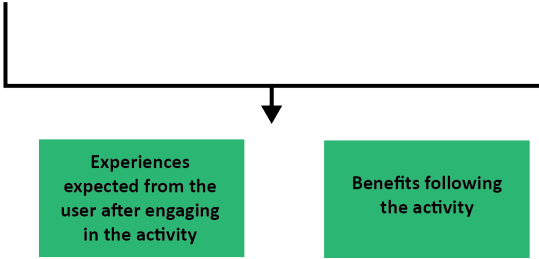
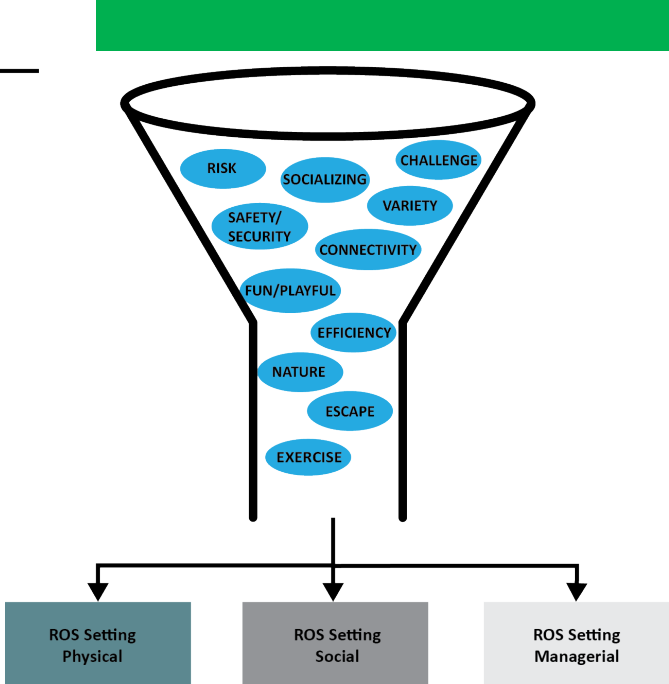
## Trail User Objectives



# Social Sustainability

Tying it all together

Recreation Opportunity Spectrum stages  
(based on individual stakeholder/user input)



Outcomes-Focused  
(based on management response to the ROS stages identified by users)



# Economic Sustainability

- A positive correlation between trail systems and economic health.
- Relies on ongoing management and maintenance plans.
- Maintenance plans for trail vitality

## Draft Trails Management Plan for Phillips Farm County Park

January 2022

Trails Committee: Jodi McClory, Lee Anne Eareckson, Tim Steury

The trails system at Phillips Farm County Park is likely the aspect of the park most used and enjoyed by members of the public. Trails bring visitors into direct contact with the natural resources of the park and are used not only for recreation but to access interpretive messaging, student research projects, vegetation management tasks and biological monitoring efforts.

### Friends of Phillips Farm mission statement:

- To enhance opportunities for recreation and education at Virgil Phillips Farm County Park
- To educate children and adults about natural and managed ecosystems, with an emphasis on exploring and learning from nature
- To restore and enhance habitat that is characteristic of the Palouse Bioregion

### Who do we serve?

Trail users are primarily casual walkers and beginning and intermediate hikers and mountain bikers. They include families with children, dog owners, and occasional snowshoers and cross-country skiers in the winter. Trails should provide educational and recreational opportunities for children and adults of the Palouse area.

Our committee will consider goals for each of the following aspects of trails management:

- 1 **Parking and access to trails**
- 2 **Existing trails maintenance and management**
- 3 **Signage and mapping**
- 4 **New trail construction**

### Parking and access to trails

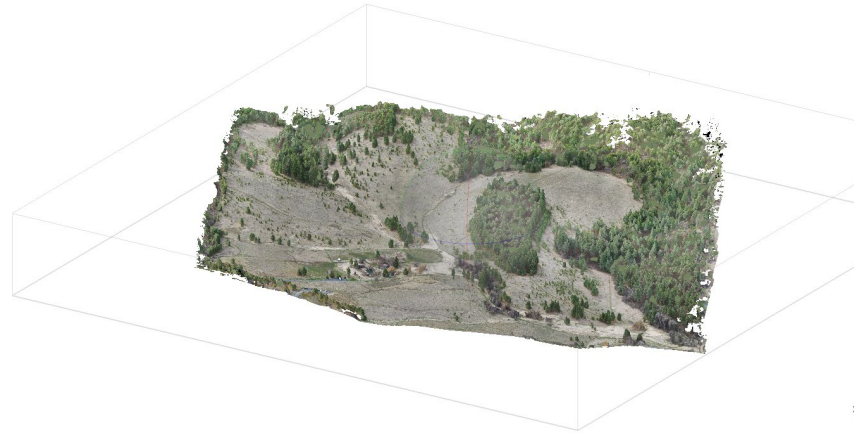
Trail accessibility is impacted by parking access and connecting trails, and so is important in planning for management of the trails system at the Phillips Farm County Park. Parking areas should be maintained by the Latah County Parks and Recreation Department in safe and stable condition.

Specific projects and areas of concern include:

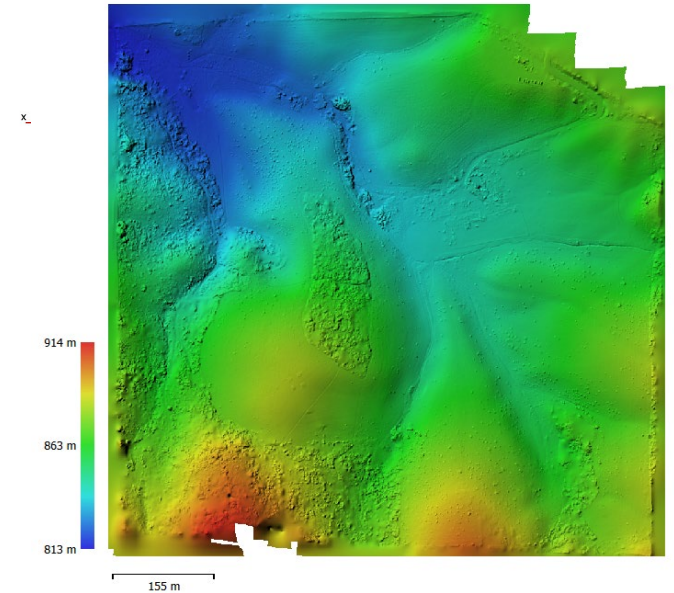
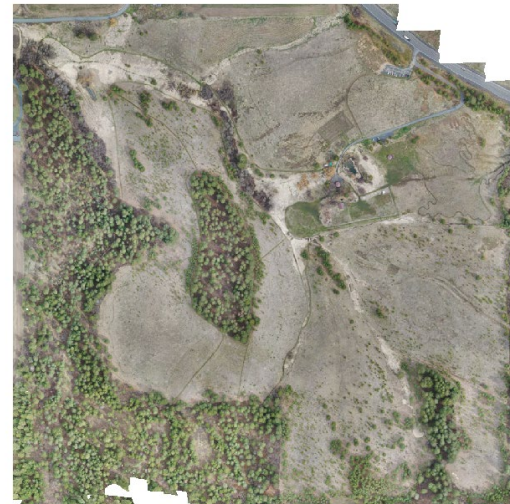
- periodic grading of all parking areas
- adequate fencing and signage to discourage driving outside of the parking areas and direct users onto trails
- adequate parking spaces for the number of users on a regular basis, as well as space for occasional larger events (for example, use of the northeast hillside during the Fall Festival)
- winter snow plowing of upper parking lot

# UAV, photogrammetry, and GIS Analysis

*Tools to support the development of sustainable trail networks*

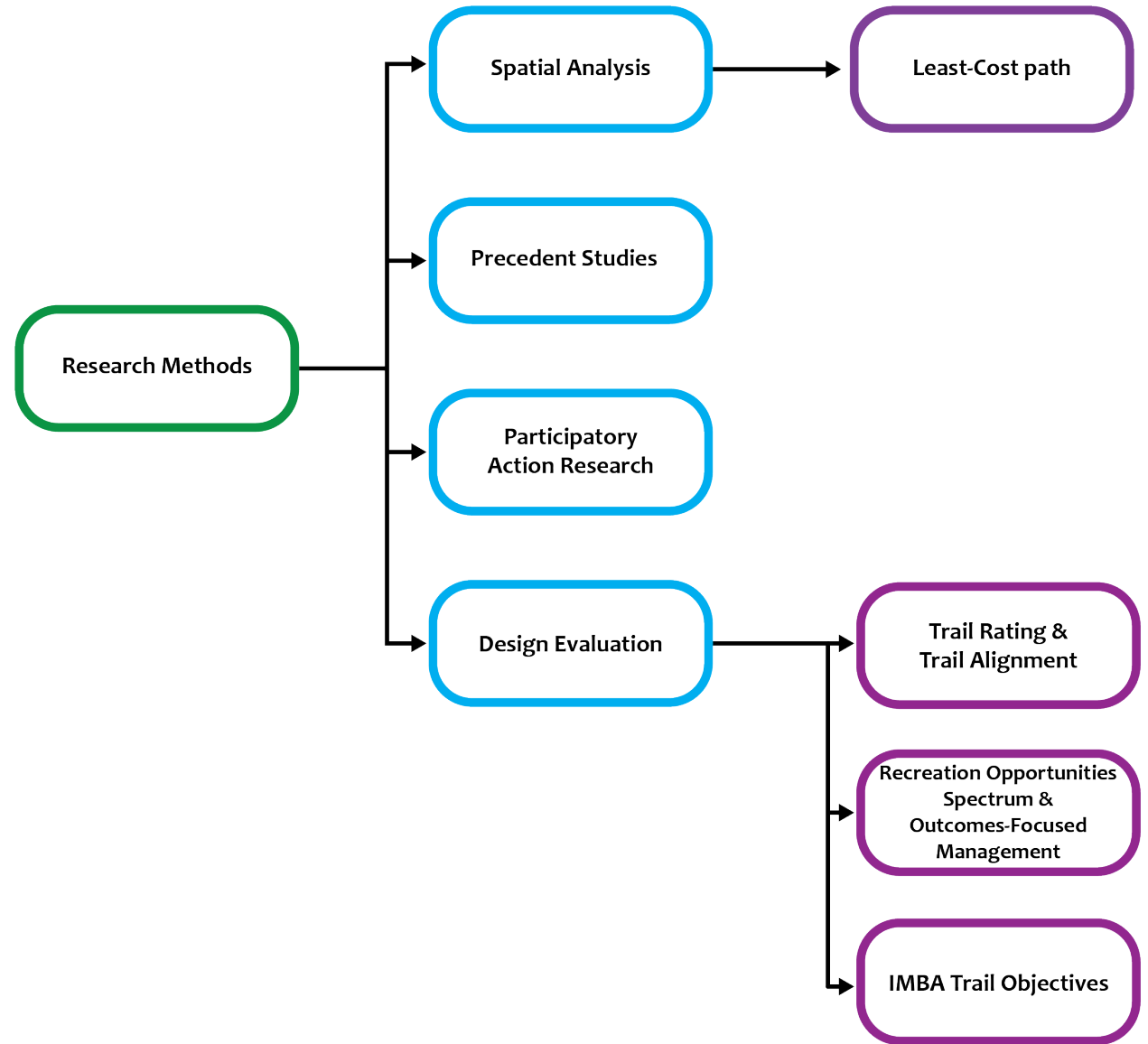


faces: 89,943,869 vertices: 45,018,062



# METHODS

- Participatory Action Research
- Precedent Studies
- Spatial Analysis
- Qualitative and Quantitative evaluation





# Participatory Action Research – A Charrette

**What:** Charrette to collaborate on future expansions

**Where:** 1912 Center in Moscow Idaho on  
October 24<sup>th</sup>, 2023

**Attendees:**

- Friends of Phillips Farm Park
- Moscow Area Mountain Biking Association
- Palouse Road Runners
- City of Moscow
- Palouse Composite – Youth Mountain Biking



## The Future of Phillips Farm – Your Voice in Developing a Recreation Focused Strategic Plan

*Please take a moment to answer the following questions. Your input is much appreciated and will contribute to the creation of a recreation strategic plan for Phillips Farm. NOTE: This exercise is completely voluntary, and outputs will be sequestered, process, and delivered back to the group of participants for further project development. Thank you for your support!*

1) Please identify your role in the development of the strategic plan. For example: active user, design input, invested community member, etc. Please select more than one if applicable.

- Interested community member
- Active Trail user
- Potential Trail user
- Maintenance and Facilities
- Other (Please specify below):

2) Based on your expertise, what are the strengths of the park? What are the potential opportunities of Phillips Farm?

Strengths	Opportunities

3) What are the current constraints/issues concerning Phillips Farm?  
Potential Issues and Constraints:

- Budget
- Maintenance
- Increased Use
- Parking
- OTHER (please add to this list in the space below):

4) Regarding trail development, how should current and future trails be organized? For example, active and passive zones, difficulty levels, based off cost/maintenance, etc.

## Categories – Opportunities & Strengths


### Opportunities by Priority

1. Improved/Upgrade Trails
2. Awareness of park opportunities
3. Additional educational & conservation programming
4. More Trails
5. More events/uses


### Strengths by Priority

1. Good trail system
2. Multi-purpose (terrain, habitat, & uses)
3. Orchard
4. Natural setting
5. Proximity

# Precedent Studies



Park	Setting (Physical)	Size (acres)	Clients	Trail Amenities	Mileage (Miles)	Connections
Ada/Eagle Bike Park	Front-Country	200	City/County	Multi-use	10	Ridge to River trail network
Colers Mountain Bike Preserve	Front – Country	300	Private/Non-Profit	Multi-use	17	Ozark mountain trails & to downtown Bentonville
White Clouds Trail Network	Front-Country	~220	Private	Multi-use	5	Paved trail network to Sun Valley
Beacon Hill	Front-Country	1,024	Non-profit/City	Multi-use	53	Near Spokane's paved trail network
Phillips Farm Park	Front-country	160	City/County	Multi-use	~3.2	No connections



# Site Inventory & Analysis

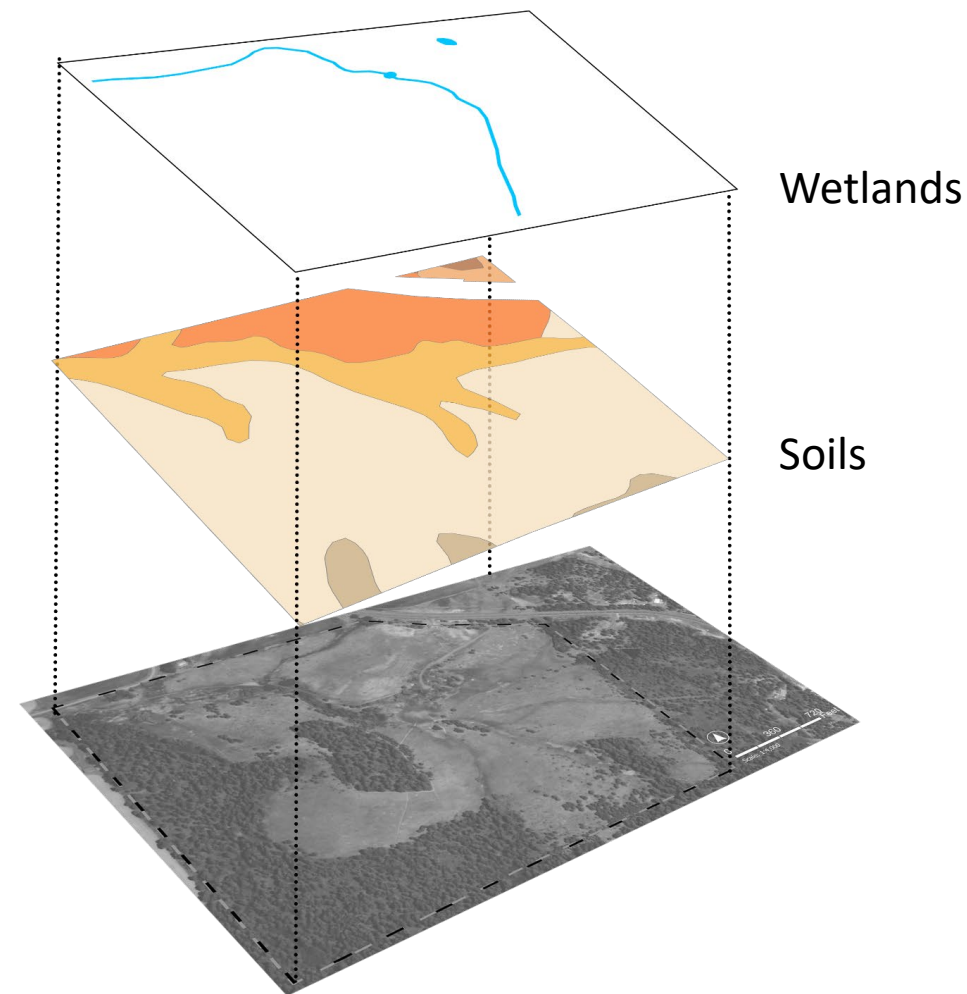
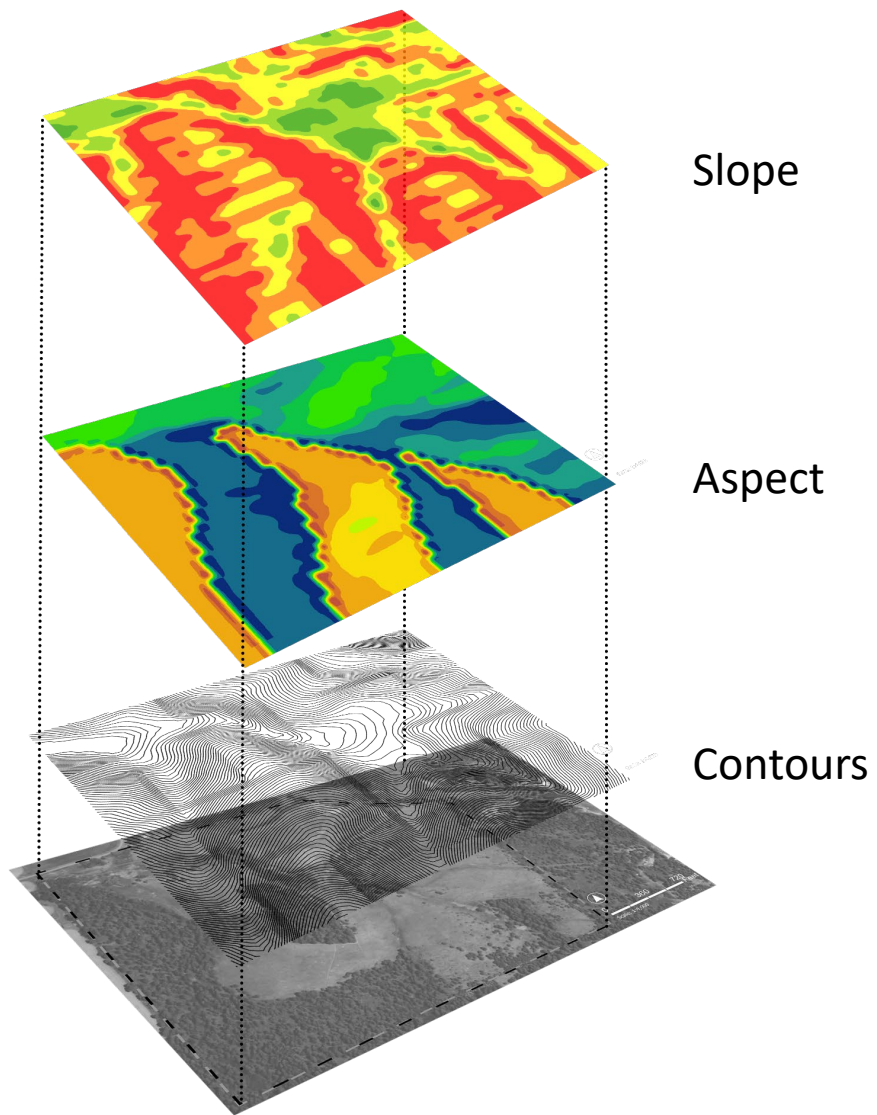
- Existing Trail Network
- Existing Conditions
- Points of Interest
- Drone mission & photogrammetry outputs

# Existing Trail Network



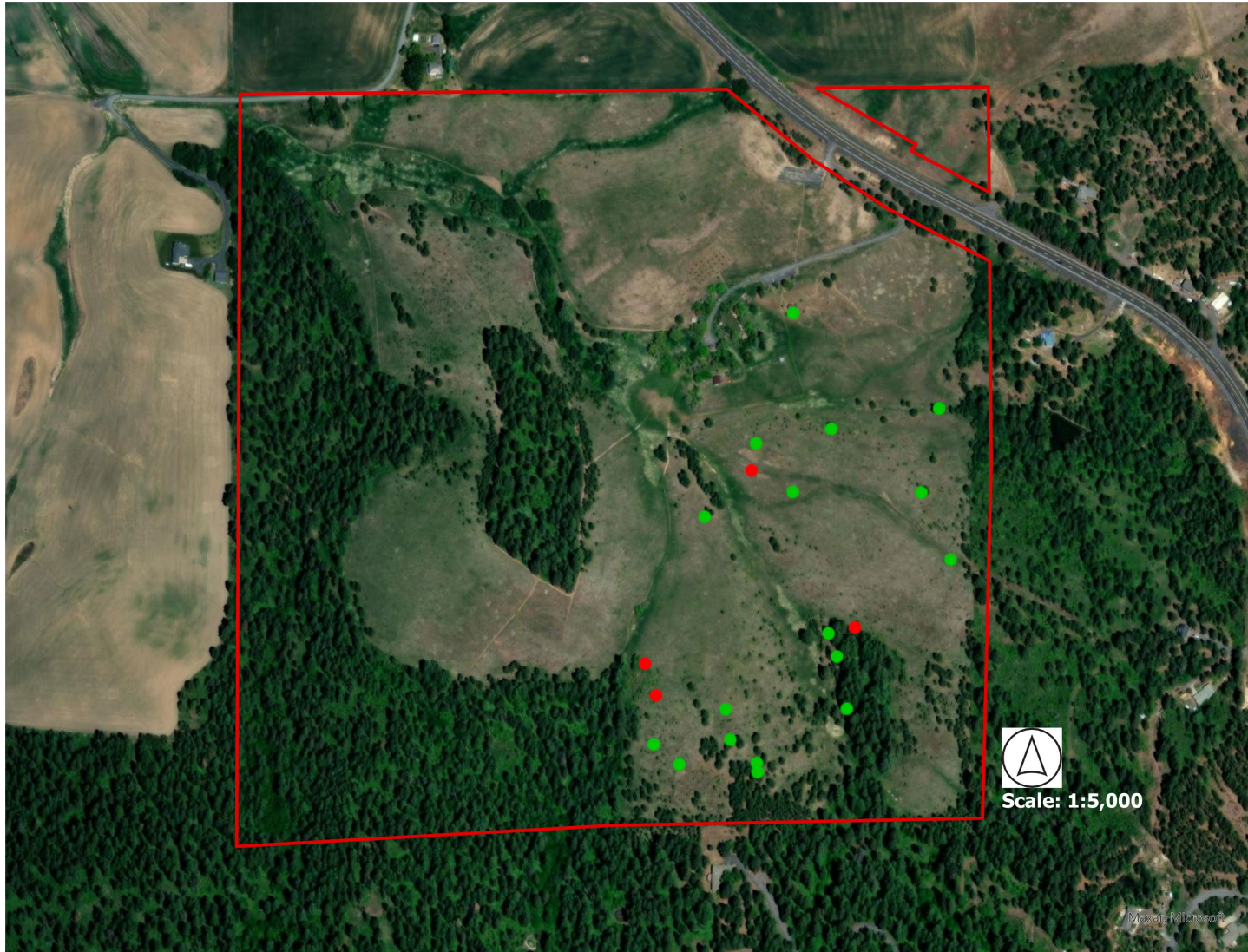
Trails Map designed by  
Chelsea Feeney

# Existing Conditions



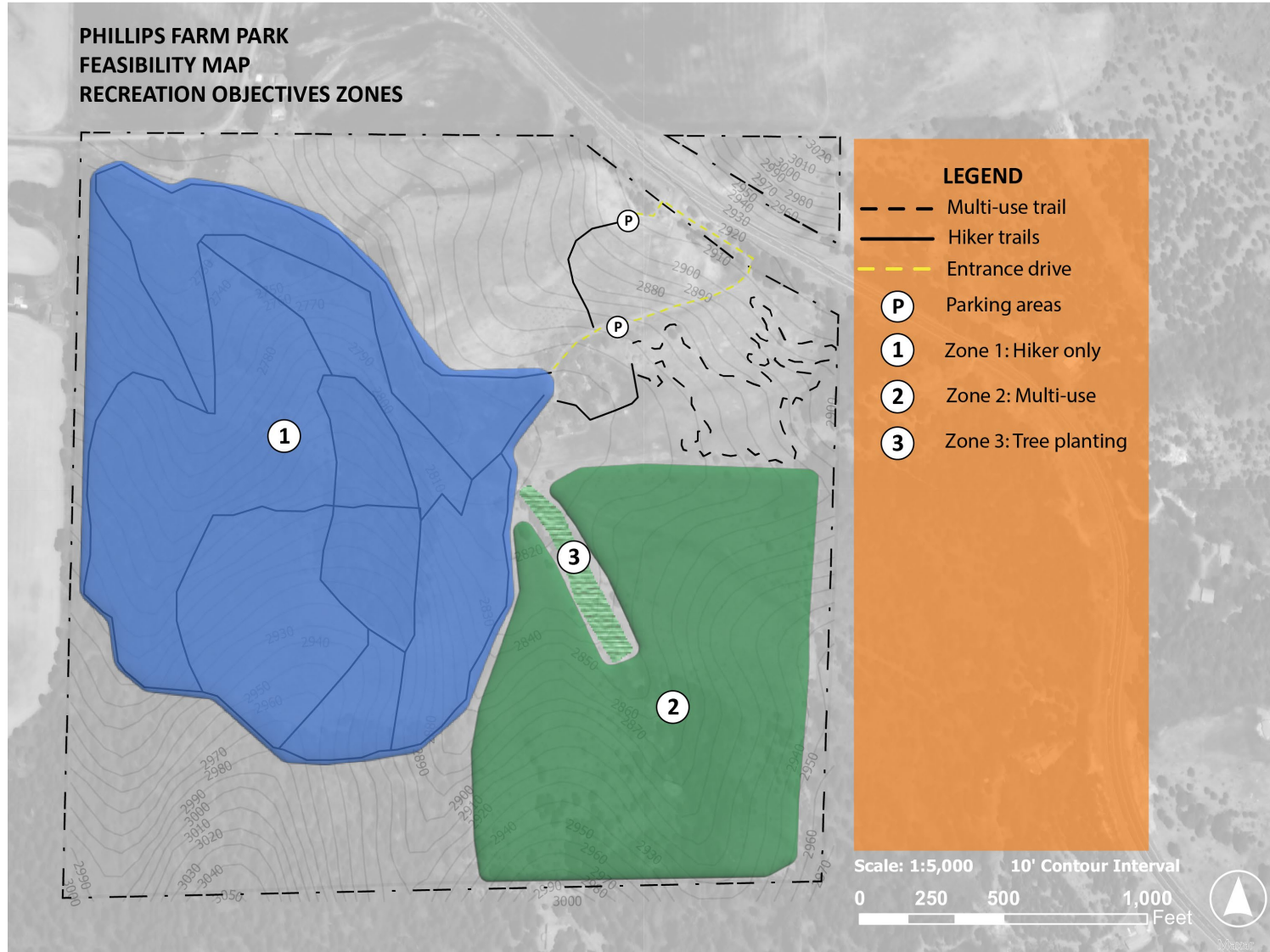


# Points of Interest Map



- August 26<sup>th</sup> site visit
- CalTopo – GPS markers
- Green dots
  - Ideal for a node, a viewpoint, or connection to other trails
- Red dots
  - Areas to avoid based on observation

# Feasibility Map



The feasibility map proposes activity zones based on inventory elements and observation.

**Zone 1:** Hiker-only (Passive zone)

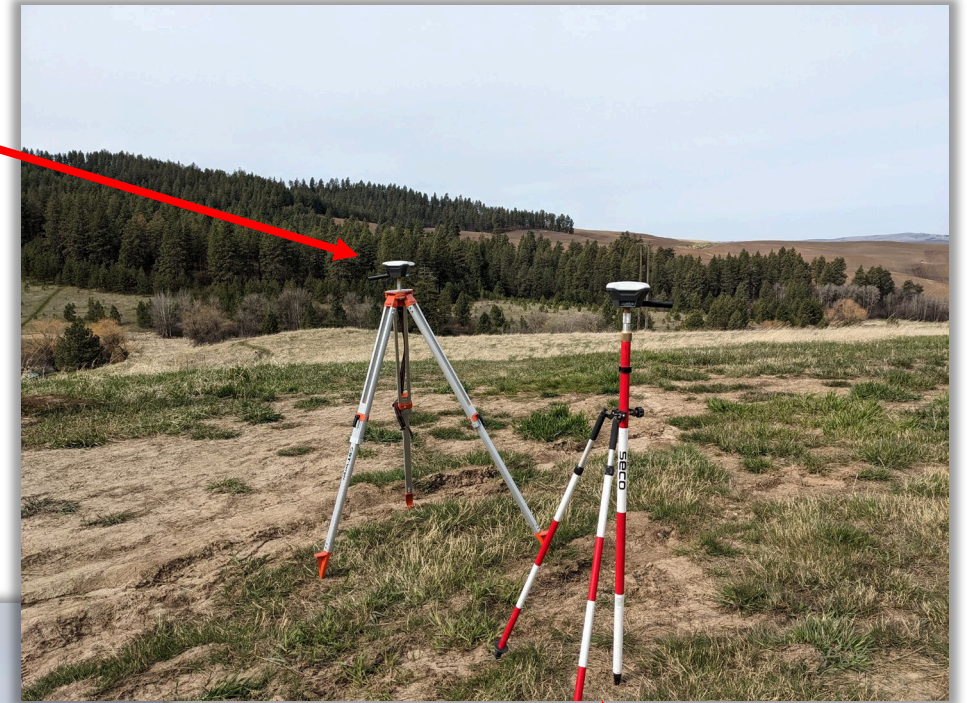
**Zone 2:** Multi-use trail proposed (Active zone)

**Zone 3:** Tree planting and unsuitable soils (avoid)

# Drone Mission

- April 26<sup>th</sup> at Phillips Farm Park
- Myself, along with UI students and the PI of the Drone Lab, Dr. Jason Karl
- DJI Mavic Pro
- Real-Time kinematic (RTK) base station and rover (absolute accuracy)
- 10 ground control points (GPS coordinates)

RTK Base station



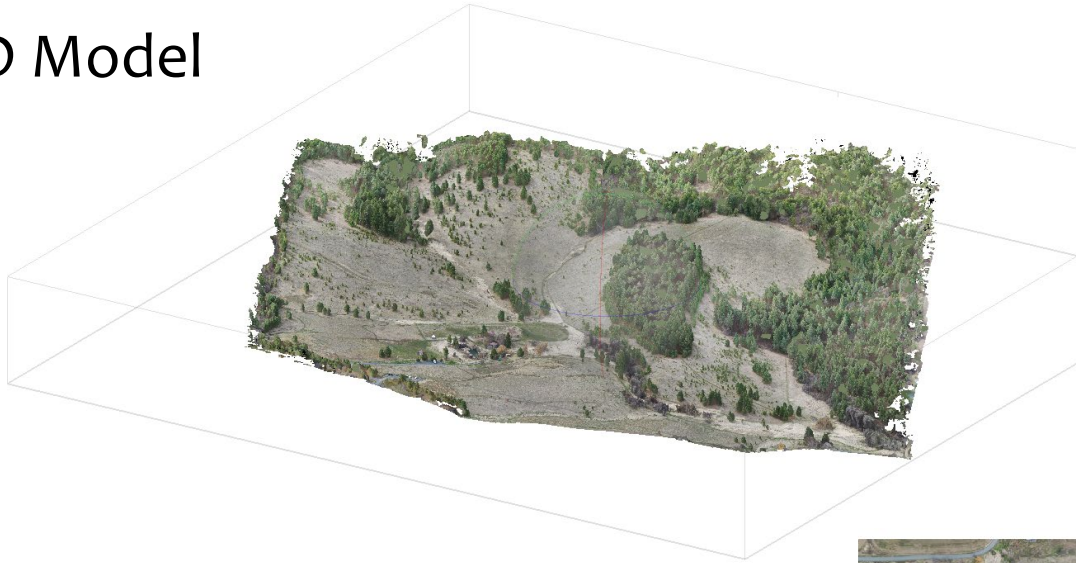
RTK Rover



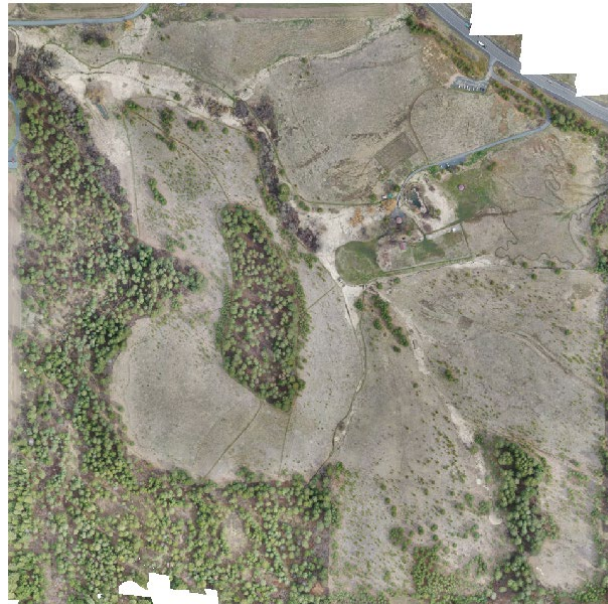
# Photogrammetry Outputs

Orthographic

## 3D Model

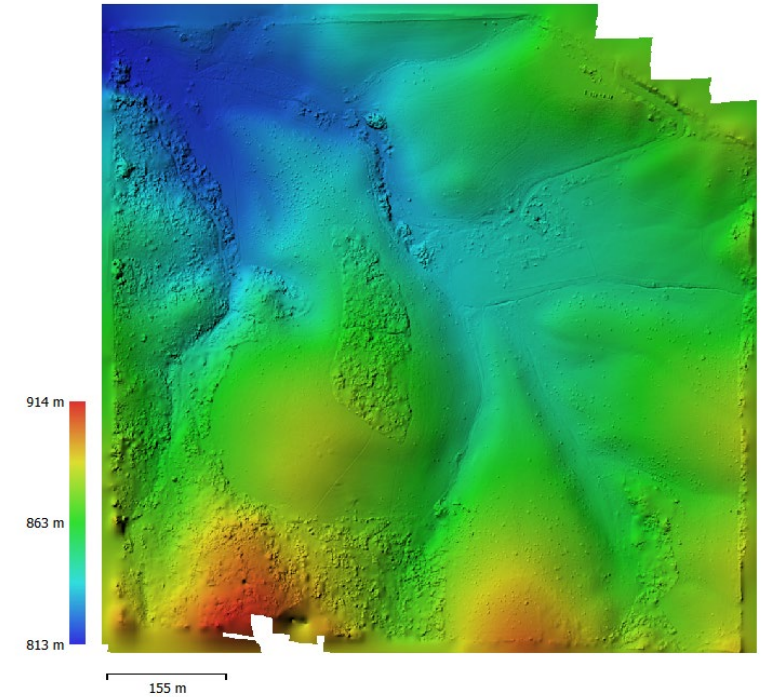


faces: 89,943,869 vertices: 45,018,962



## Orthomosaic

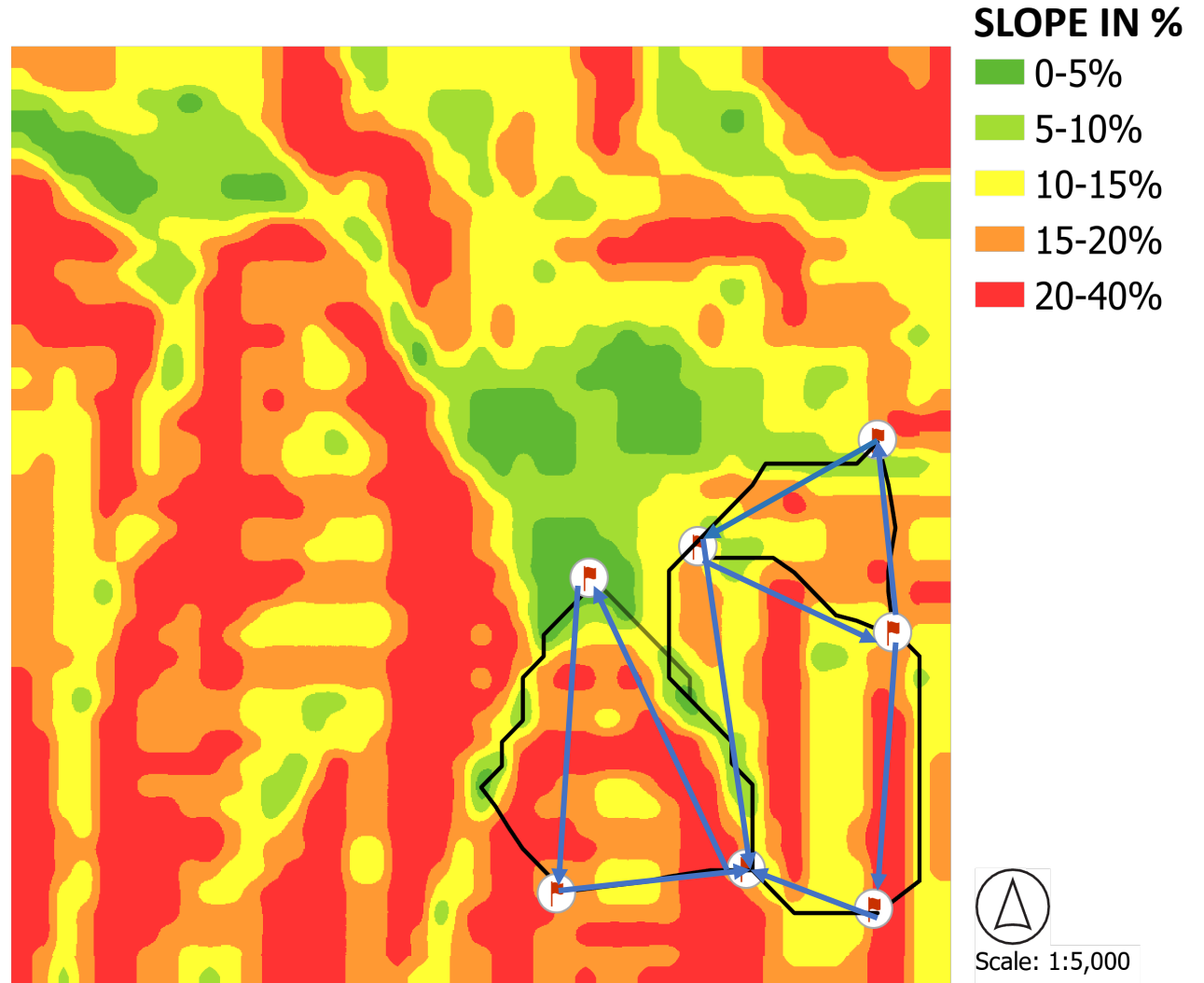
## DEM



# Least-Cost Path Analysis

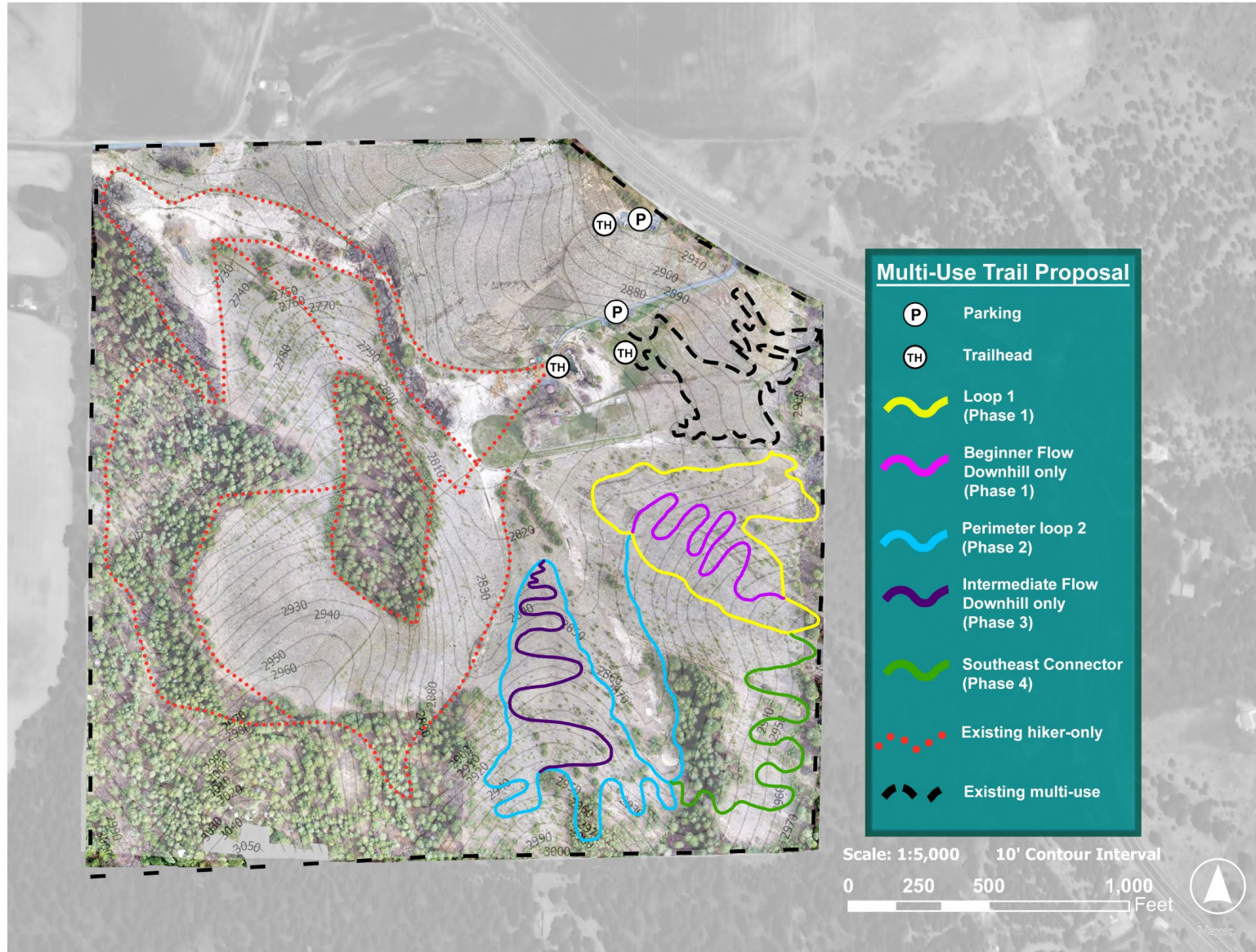
# Least Cost Path Concept

- 9 different segments were evaluated
- Illustrates that each segment takes the path of least resistance or the most efficient slope grade
- A helpful analysis for an initial layout that can then be re-evaluated



# Conceptual Trails Plan Proposal

# Final Design



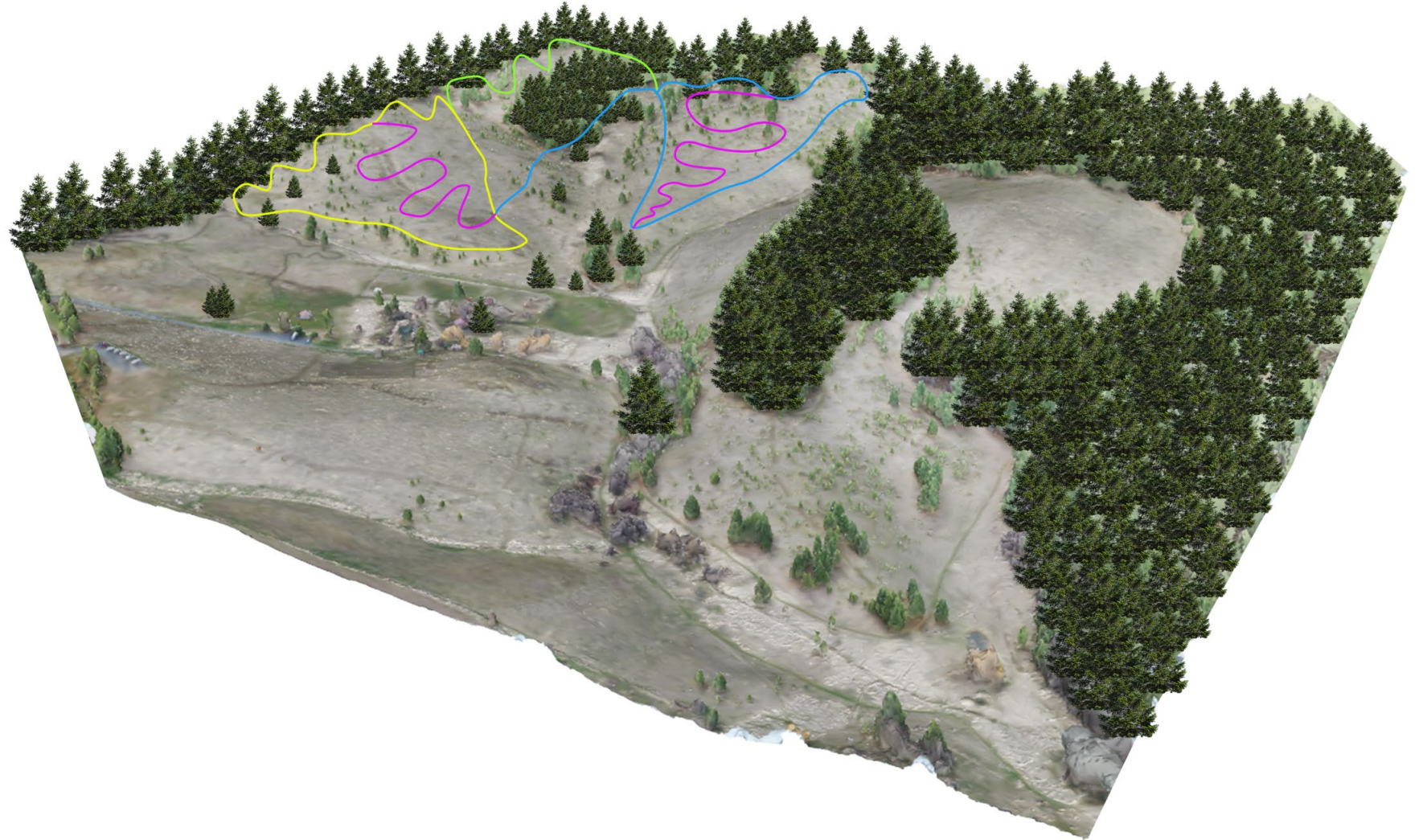
## Key Elements

- Downhill only for fun/playfulness and safety
- Front-country location for access, security, and safety
- 5 stacked loops for variety, connectivity, exercise, and challenge
- Opportunities for connection with nature, friends/family, and solitude

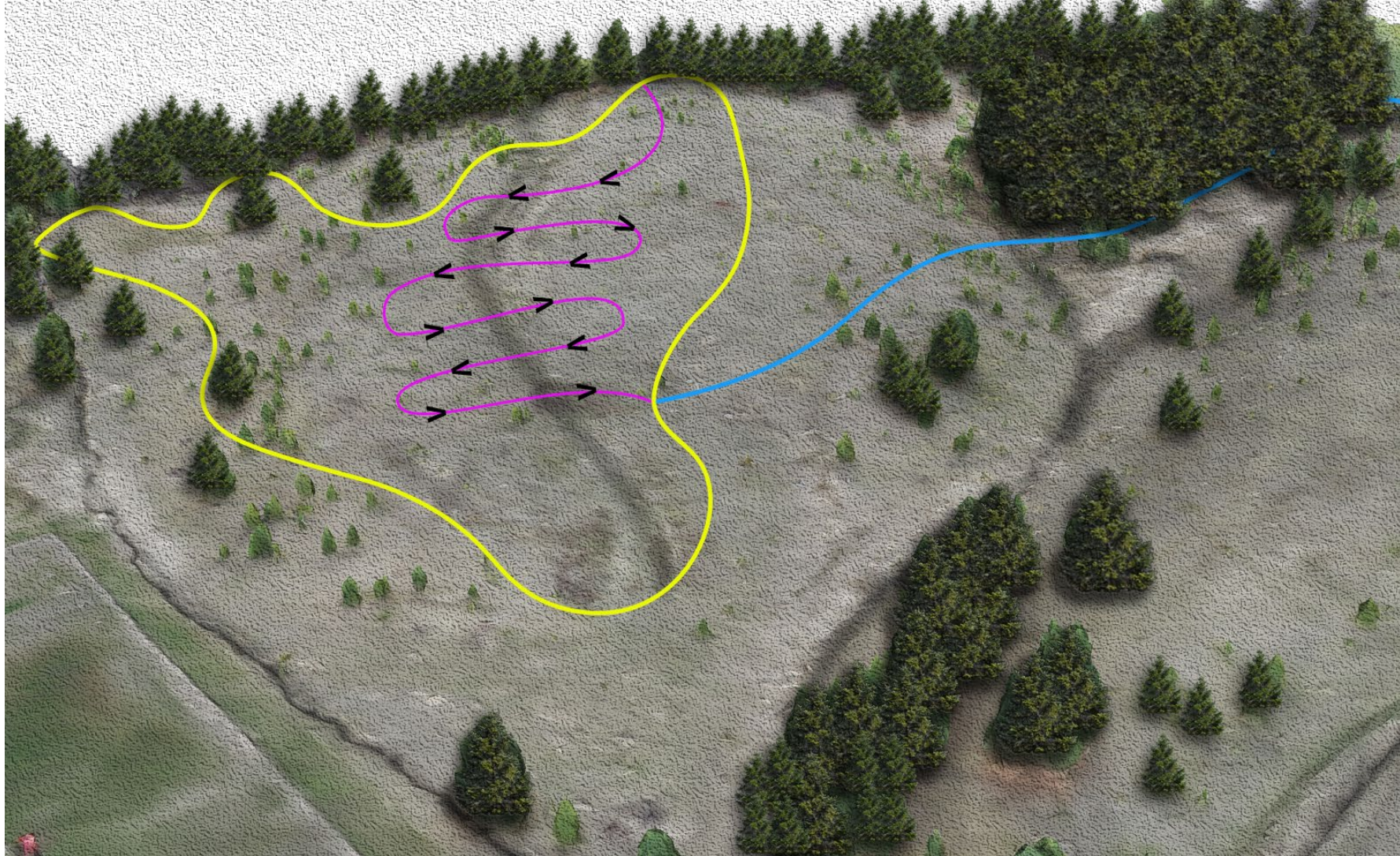


# Recap of Goals

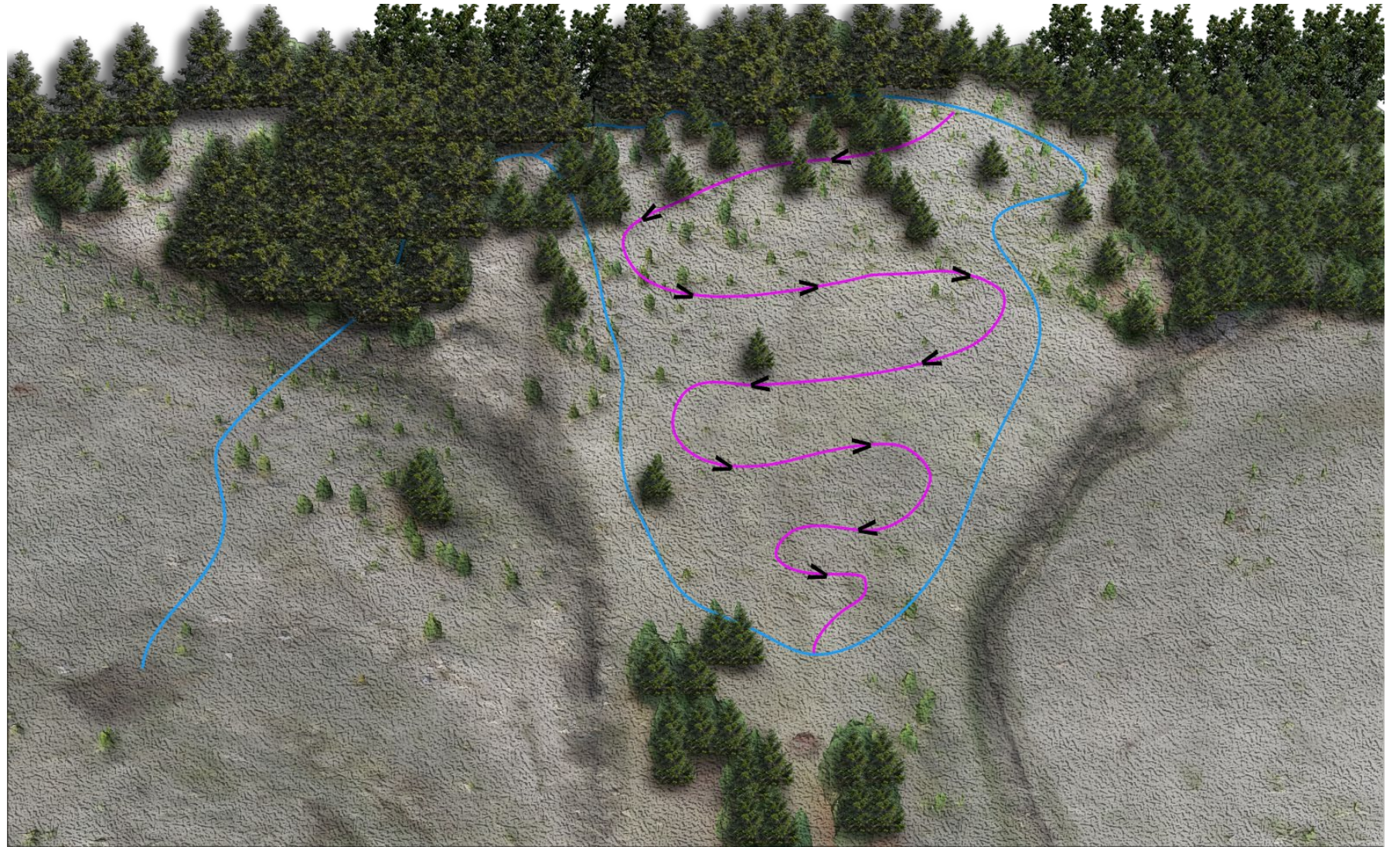
- Welcomes a diverse group of recreationists (hikers, cyclists, and trail runners)
- Embraces that this area is the active zone at the park and does not infringe on other areas
- Analyzes the topography to ensure it is both socially and environmentally sustainable
- Provides accessibility to the community as a network that is close to home and easy to access



# Loop 1 & Beginner Downhill trails



# Perimeter loop and Intermediate Flow downhill








# Performance Evaluation

# Evaluating for Trail Rating

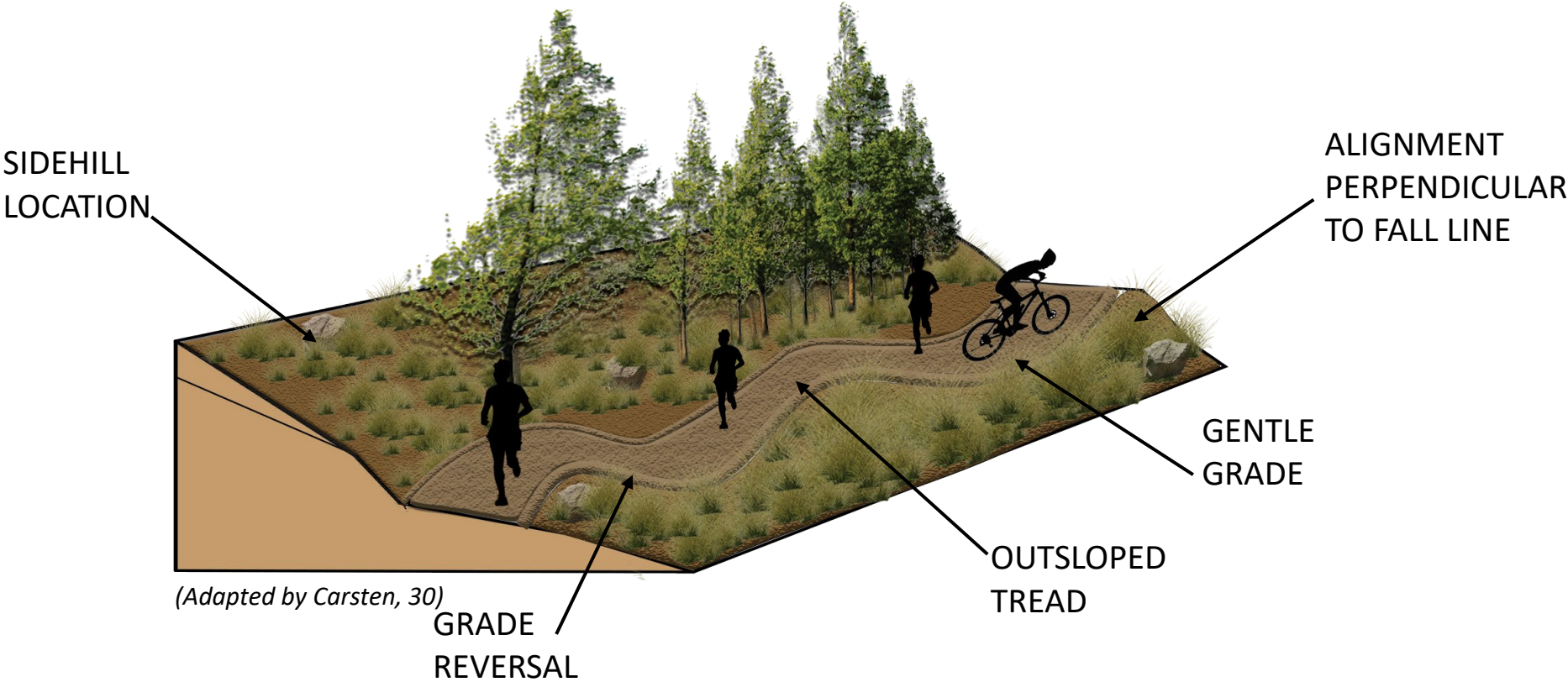
- Rating trails for user awareness
- Add Surface Information tool to calculate average and maximum grade
- Beginner friendly

Trail	Average Slope	Maximum Slope
Loop 1	3%	13%
Beginner Flow (Downhill Only)	3%	11%
Perimeter Loop 2	2%	11%
Intermediate Flow (Downhill Only)	2%	12%
Southeast Connector	4%	11%

IMBA Trail Difficulty Rating System <span style="float: right;">(I) (M) (B) (A)</span>					
	 EASIEST WHITE CIRCLE	 EASY GREEN CIRCLE	 MORE DIFFICULT BLUE SQUARE	 VERY DIFFICULT BLACK DIAMOND	 EXTREMELY DIFFICULT DBL. BLACK DIAMOND
TRAIL WIDTH	72" (1,800 mm) or more	36" (900 mm) or more	24" (600 mm) or more	12" (300 mm) or more	6" (150 mm) or more
TREAD SURFACE	Hardened or surfaced	Firm and stable	Mostly stable with some variability	Widely variable	Widely variable and unpredictable
AVERAGE TRAIL GRADE	Less than 5%	5% or less	10% or less	15% or less	20% or more
MAXIMUM TRAIL GRADE	Max 10%	Max 15%	Max 15% or greater	Max 15% or greater	Max 15% or greater
NATURAL OBSTACLES AND TECHNICAL TRAIL FEATURES (TTF)	None	Unavoidable obstacles 2" (50 mm) tall or less  Avoidable obstacles may be present  Unavoidable bridges 36" (900 mm) or wider	Unavoidable obstacles 8" (200 mm) tall or less  Avoidable obstacles may be present  Unavoidable bridges 24" (600 mm) or wider  TTF's 24" (600 mm) high or less, width of deck is greater than 1/2 the height	Unavoidable obstacles 15" (380 mm) tall or less  Avoidable obstacles may be present  May include loose rocks  Unavoidable bridges 24" (600 mm) or wider  TTF's 48" (1,200 mm) high or less, width of deck is less than 1/2 the height  Short sections may exceed criteria	Unavoidable obstacles 15" (380 mm) tall or less  Avoidable obstacles may be present  May include loose rocks  Unavoidable bridges 24" (600 mm) or narrower  TTF's 48" (1,200 mm) high or greater, width of deck is unpredictable  Many sections may exceed criteria

# Evaluating for Environmental Sustainability

## Rolling Contour Trail

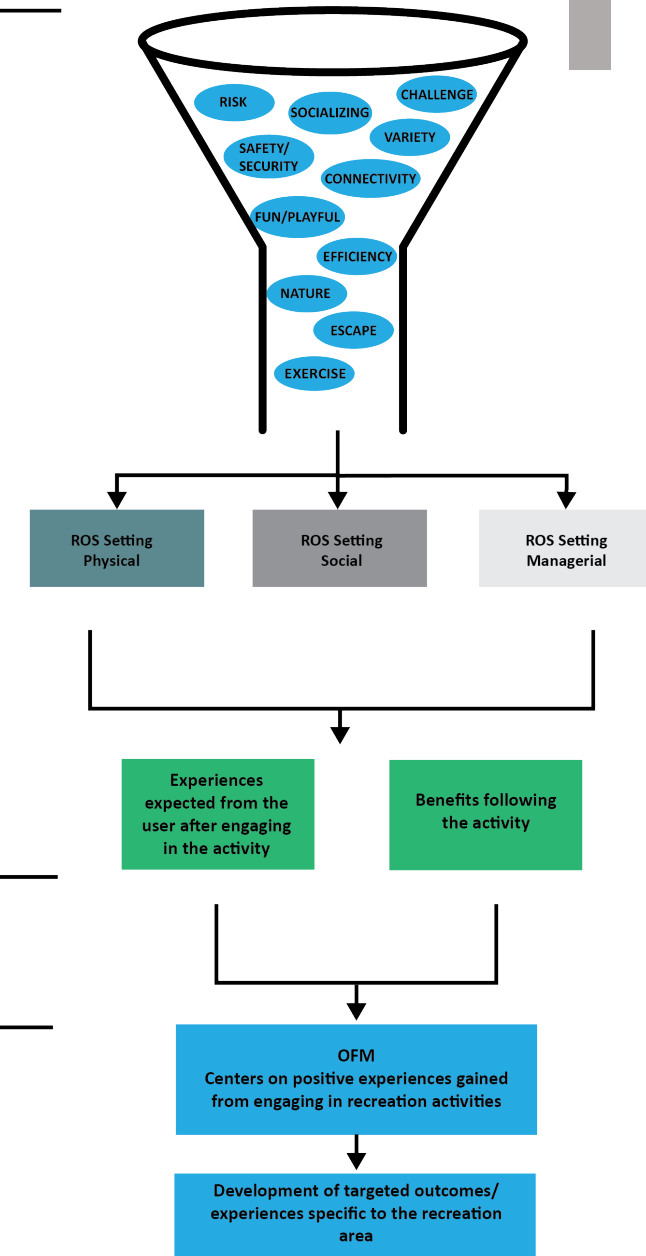


# Evaluating for Social Sustainability

## Recap Social Sustainability

- **Meeting the demands and needs of users**
  - Recreation Opportunity Spectrum  
*Specific to the individual*
  - Outcomes-Focused management  
*Management response to the ROS*  
*Focuses on providing targeted, positive experiences*
- **Suggested data-gathering techniques**
  - Survey stakeholders
  - Design charrettes/community engagement meetings

Recreation Opportunity Spectrum stages  
(based on individual stakeholder/user input)



Outcomes-Focused  
(based on management response to the ROS stages identified by users)

# Research Reflection



- Prioritize social sustainability

Applying the ROS, OFM, and trail objectives to trail planning

- Drones as effective tools in planning and design

- Future development

Additional design charrettes

Surveying users

Maintenance and management plans for economic sustainability

Community partners

Moscow Area Mountain Biking Association

Friends of Phillips Farm

Palouse Road Runners

Palouse Land Trust

Palouse Composite (Youth mountain biking team)





**QUESTIONS?**