PennState College of Arts and Architecture

STUCKEMANSCHOOL

A LA GD

ECOLOGY+ DESIGN

CLEARWATER conservancy

Tough Clients / Complex Sites: Using Geodesign to Prioritize Community Desires

Musser Gap to Valley Lands – MG2V
State College, PA

Project Site with View of Mount Nittany
State College, PA
Image Credit: Dan Meehan

Dan Meehan
Geodesign Program Manager
The Pennsylvania State University

Lisa DuRussel - RLA, LEED AP
Assistant Teaching Professor
Practitioner in Residence
The Pennsylvania State University

AGENDA

1 - Background

2 - Geodesign Process

3 - Our Process

4 - Decision / Negotiation

5 - Next Steps

Scenic View through Site
Image Credit: Lucy Rummler

1
BACKGROUND

Musser Gap to Valleylands Project
State College, PA

Image Credit:
Dan Meehan

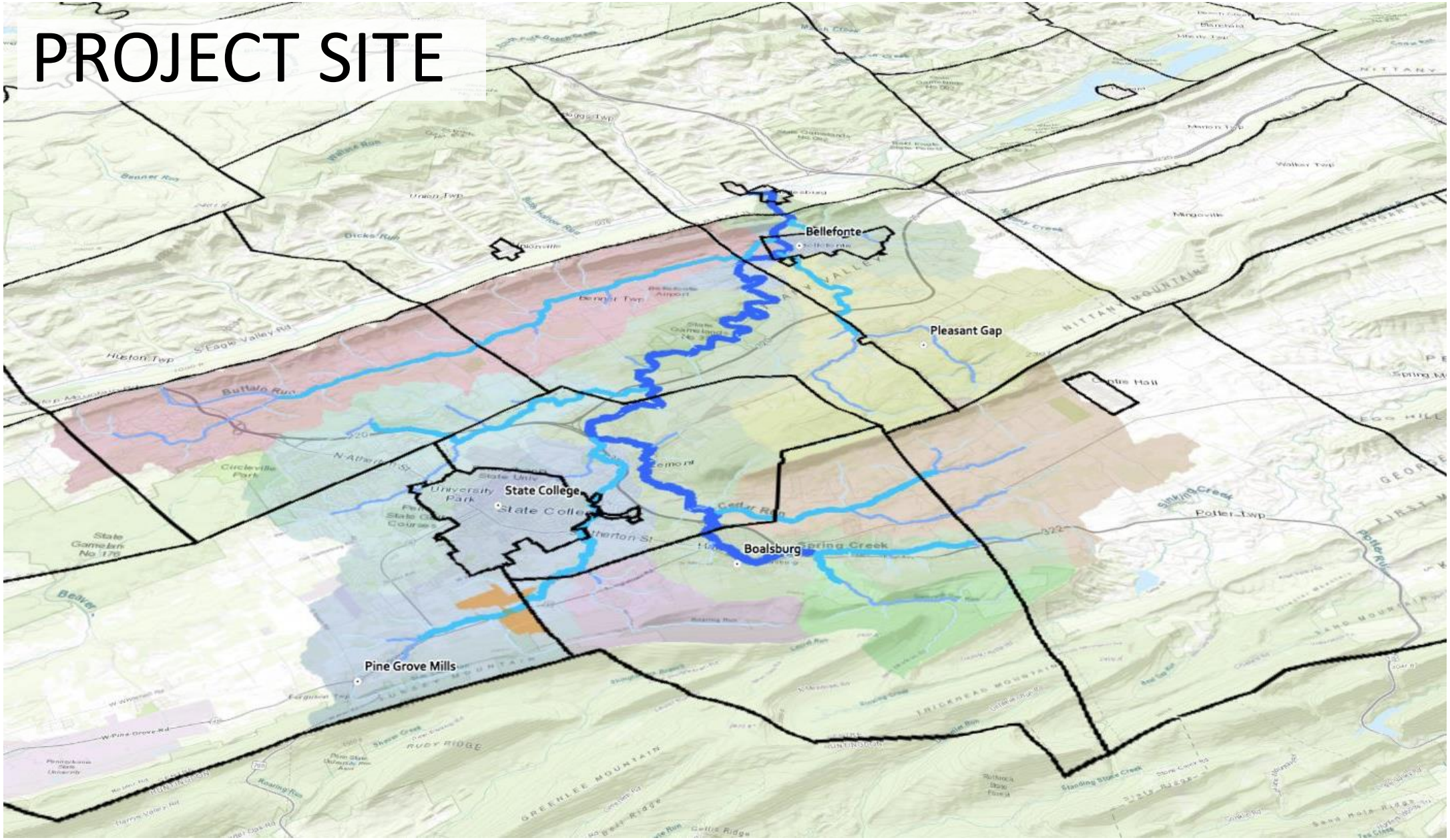
THE UNIVERSITY'S CHARGE

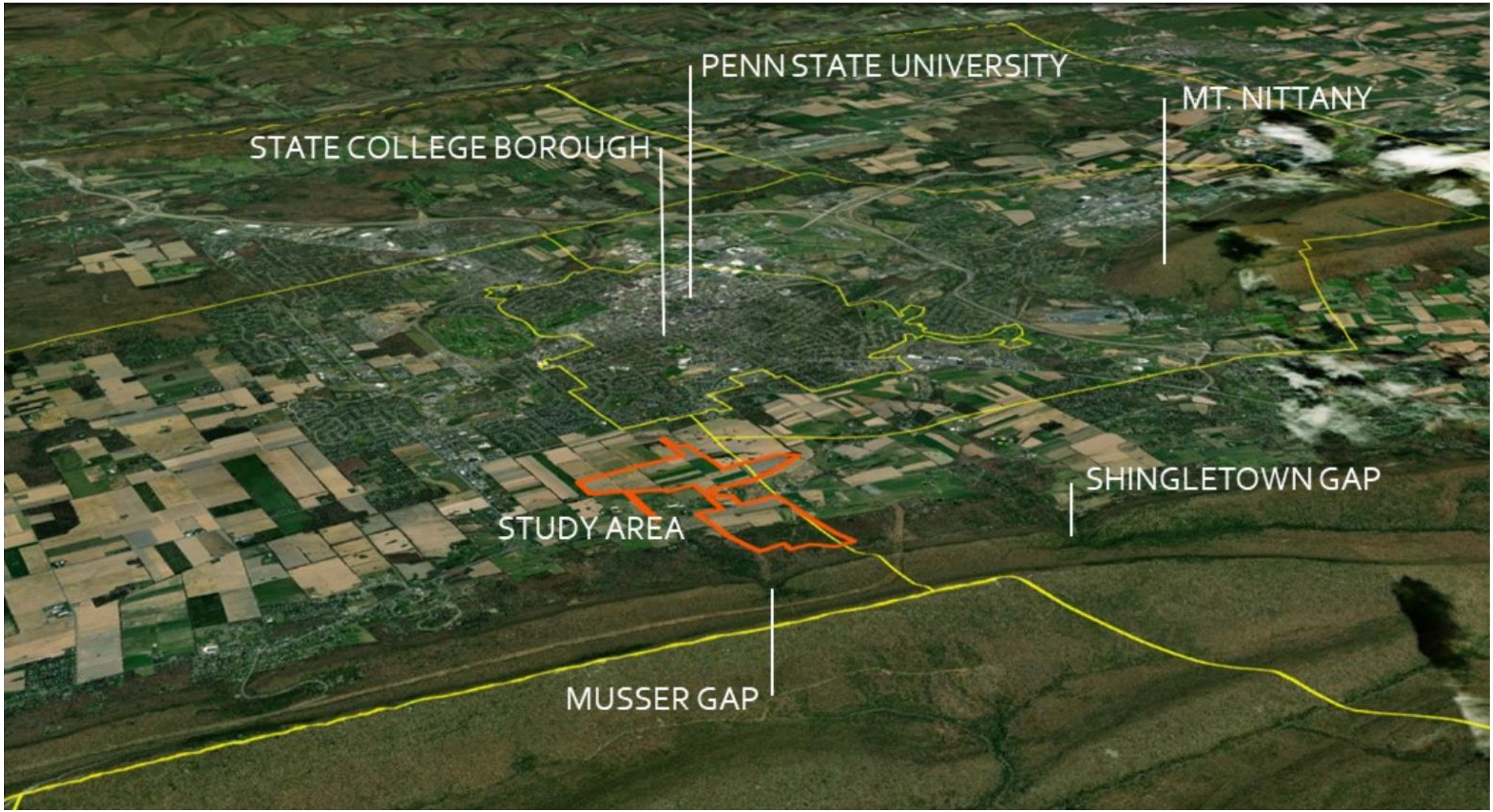
". . . to help protect the water supply, plant and animal species, and retain the land as a place where people can continue to enjoy nature, learn about the environment and be inspired."

Penn State University President, Dr. Eric Barron
January 2019

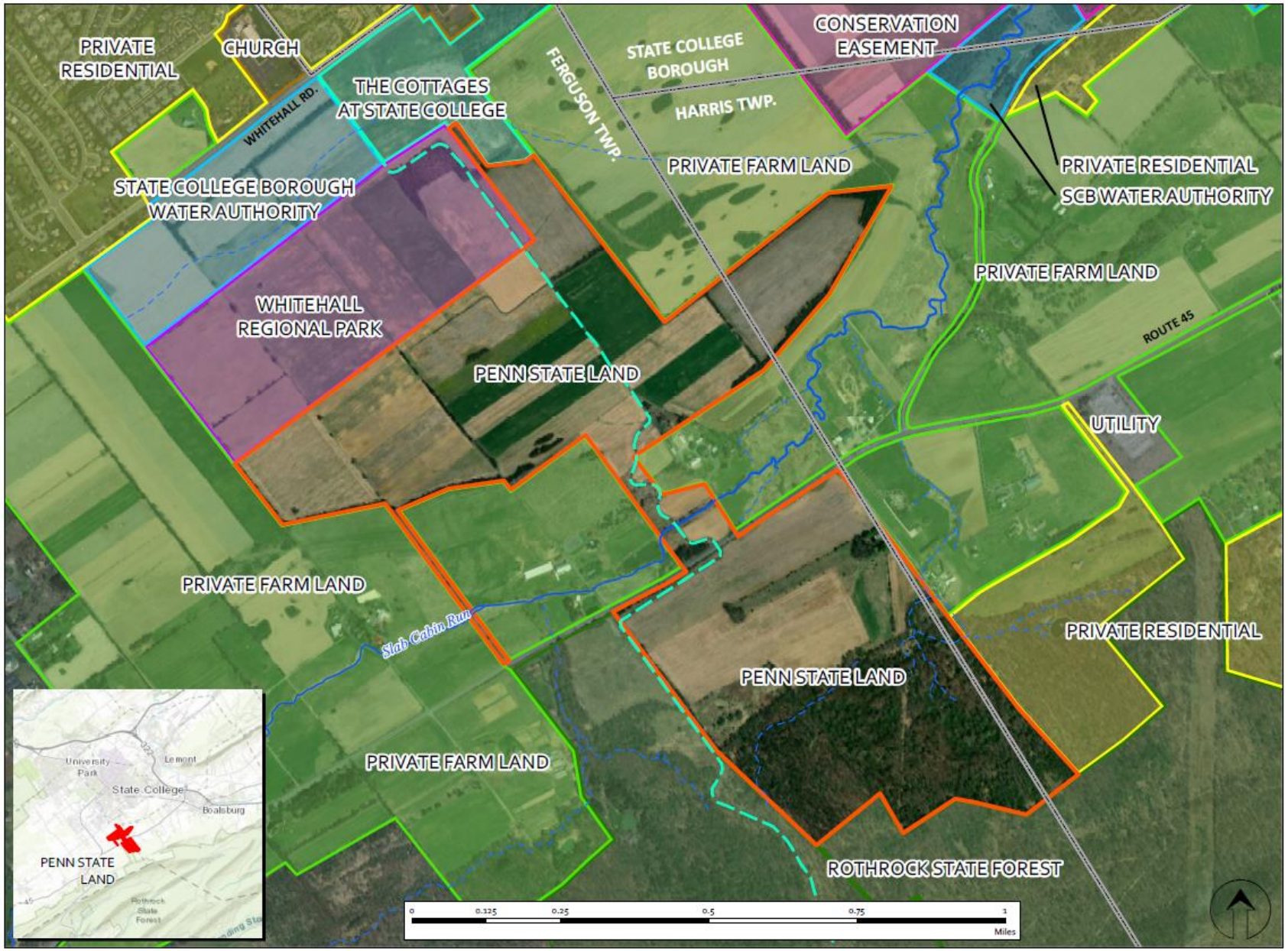
Upper Slope
Image Credit: Lucy Rummler

PROJECT SITE



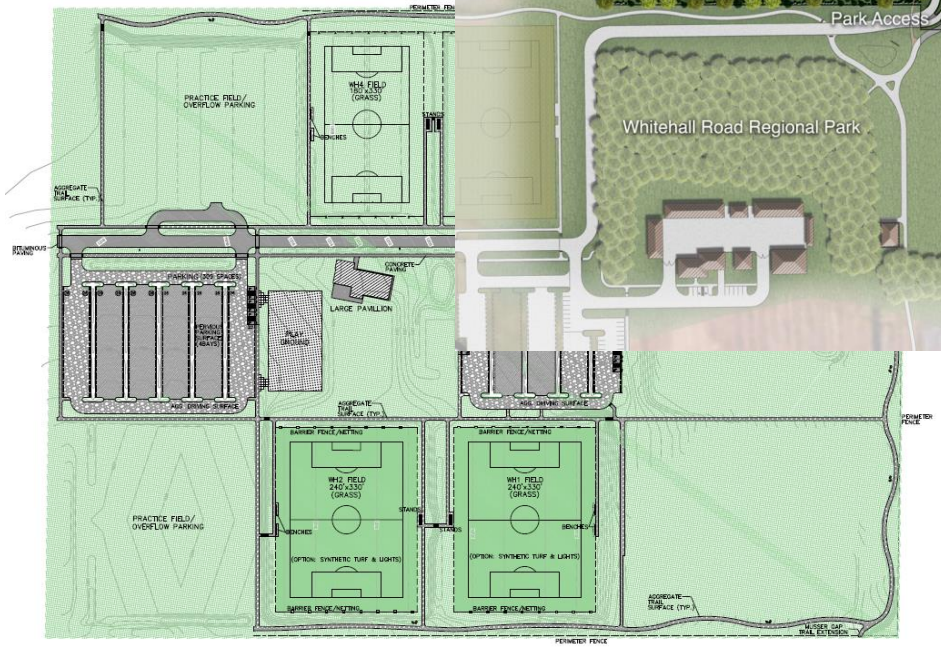

PENN STATE UNIVERSITY
MT. NITTANY
STATE COLLEGE BOROUGH
SHINGLETOWN GAP
STUDY AREA
MUSSER GAP

- 365-acres
- University owned
- Connecting Trail
- Current land used for traditional ag – soybeans / corn
- Unique context



CONTENTOUS SITE

- Toll Brothers Luxury Student Housing
- Proximity to Water Recharge
- Growth Boundary
- Public Outcry



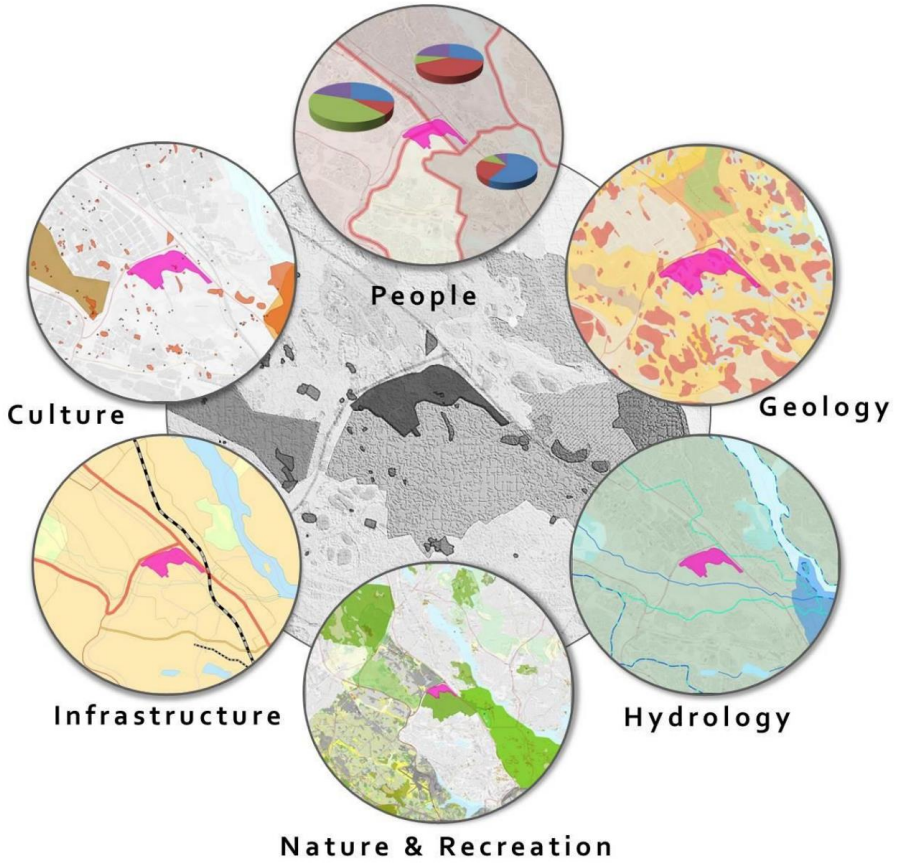

Whitehall Road Regional Park
Drainage Easement

2
GEODESIGN PROCESS

Musser Gap to Valleylands Project
State College, PA

Image Credit:
Lucy Rummler

GEODESIGN IS…



Geodesign Process
Image Credit: Filip Linders

"…. a design and planning method which tightly couples the creation of design proposals with impact simulations informed by geographic contexts."

- Dr. Michael Flaxman

"… a process that uses geospatial tools and other predictive models to help make decisions about how you design a landscape at certain scales."

- Me

Steinitz Framework for Geodesign

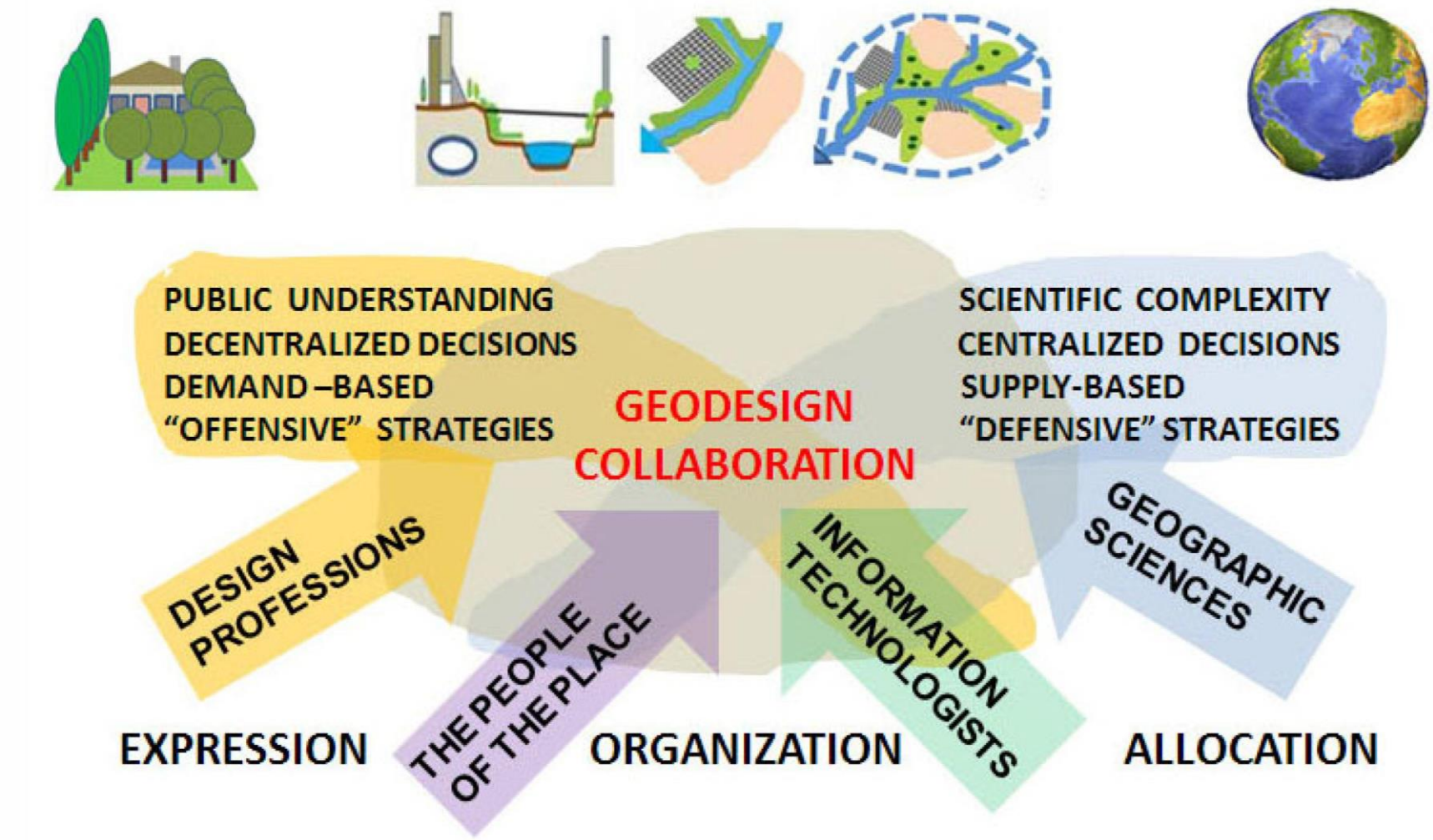
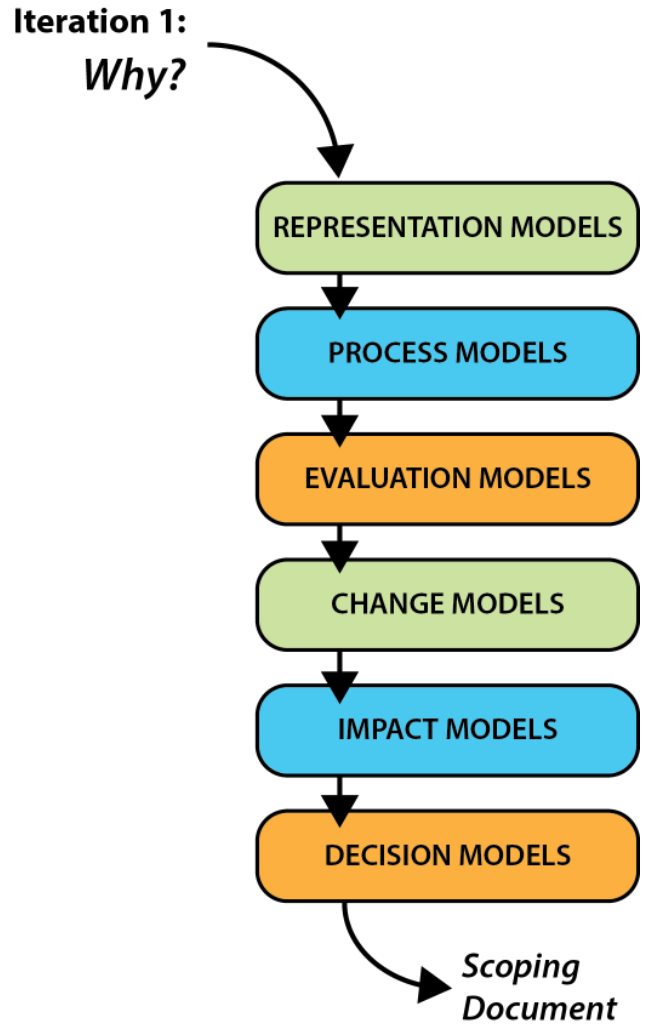


Image Credit: Carl Steninitz

- **First Iteration – Scoping**
  Why the study should happen?

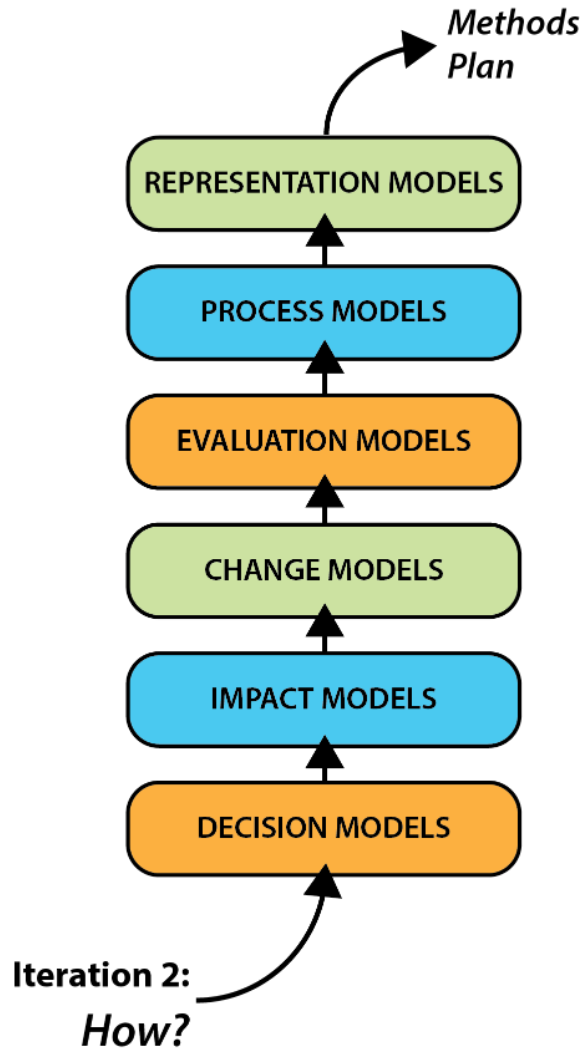
  - How should the study area be described?
  - How does the study area operate?
  - Is the current study area working well?
  - How might the study area be altered?
  - What differences might the change cause?
  - How should the study area be changed?



Adapted by Goldberg from Carl Steinitz. A Framework for Geodesign. (2012)

- **Second Iteration – Methods**
  How should the study happen?

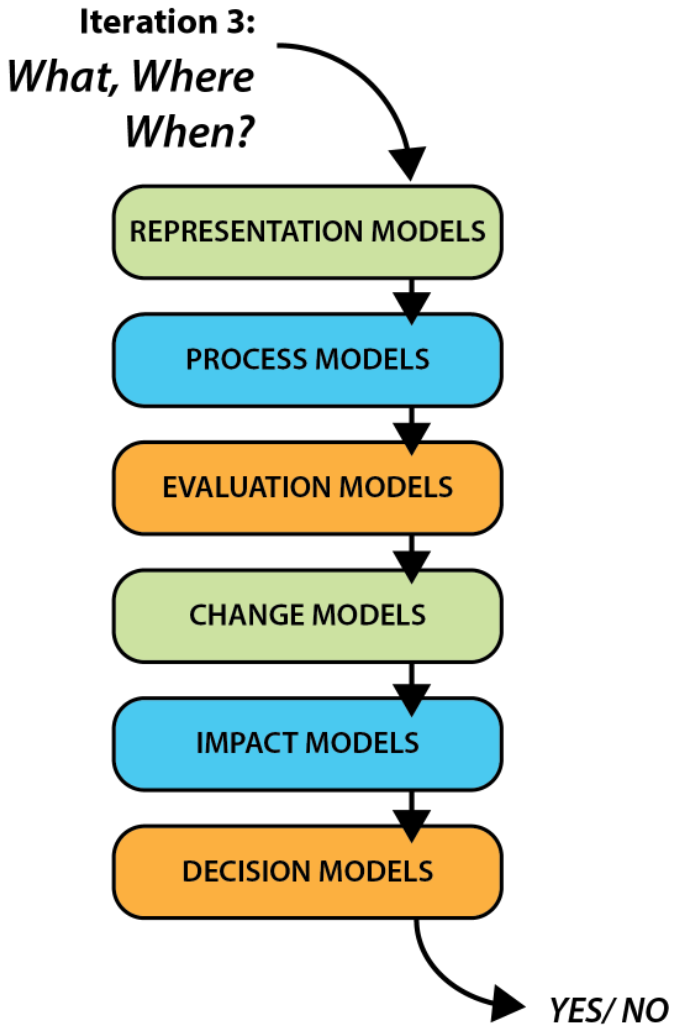
  - How will decisions be made? By whom?
  - Which impacts of possible changes are most important?
  - Who defines the assumptions and requirements for change? How are they determined?
  - What are the measures for evaluation?
  - Which process models should be included?
  - Which data is needed for the study and how shall it be represented?



Adapted by Goldberg from Carl Steinitz. A Framework for Geodesign. (2012)

- **Third Iteration – Perform the Study**
  What, where, when?

  - Organize Data with appropriate technology and visualize over space and time.
  - Implement and test process models
  - Evaluate past and present conditions
  - Propose and simulate future change
  - Assess impacts of change on processes
  - Compare the impacts of the changes and decide Yes / No.



Adapted by Goldberg from Carl Steinitz. A Framework for Geodesign. (2012)

3
OUR PROCESS

Musser Gap to Valleylands Project
State College, PA

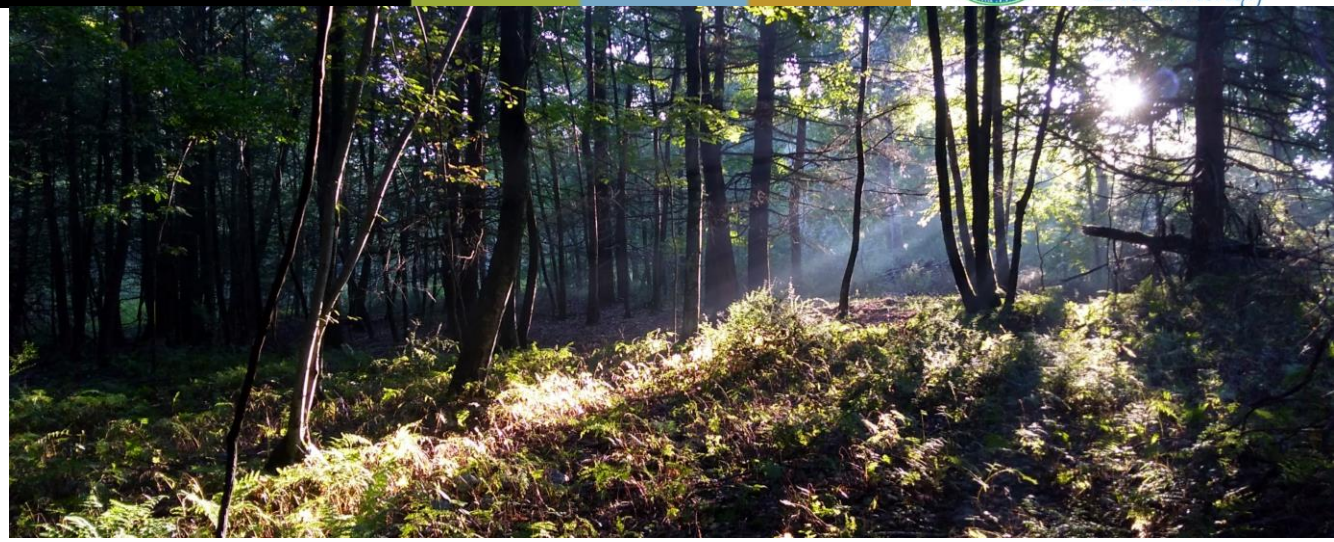
Image Credit:
Damian Heltman-Gray

COURSEWORK

- Fall 2018: (AUG – DEC)
  History. Context. Analysis

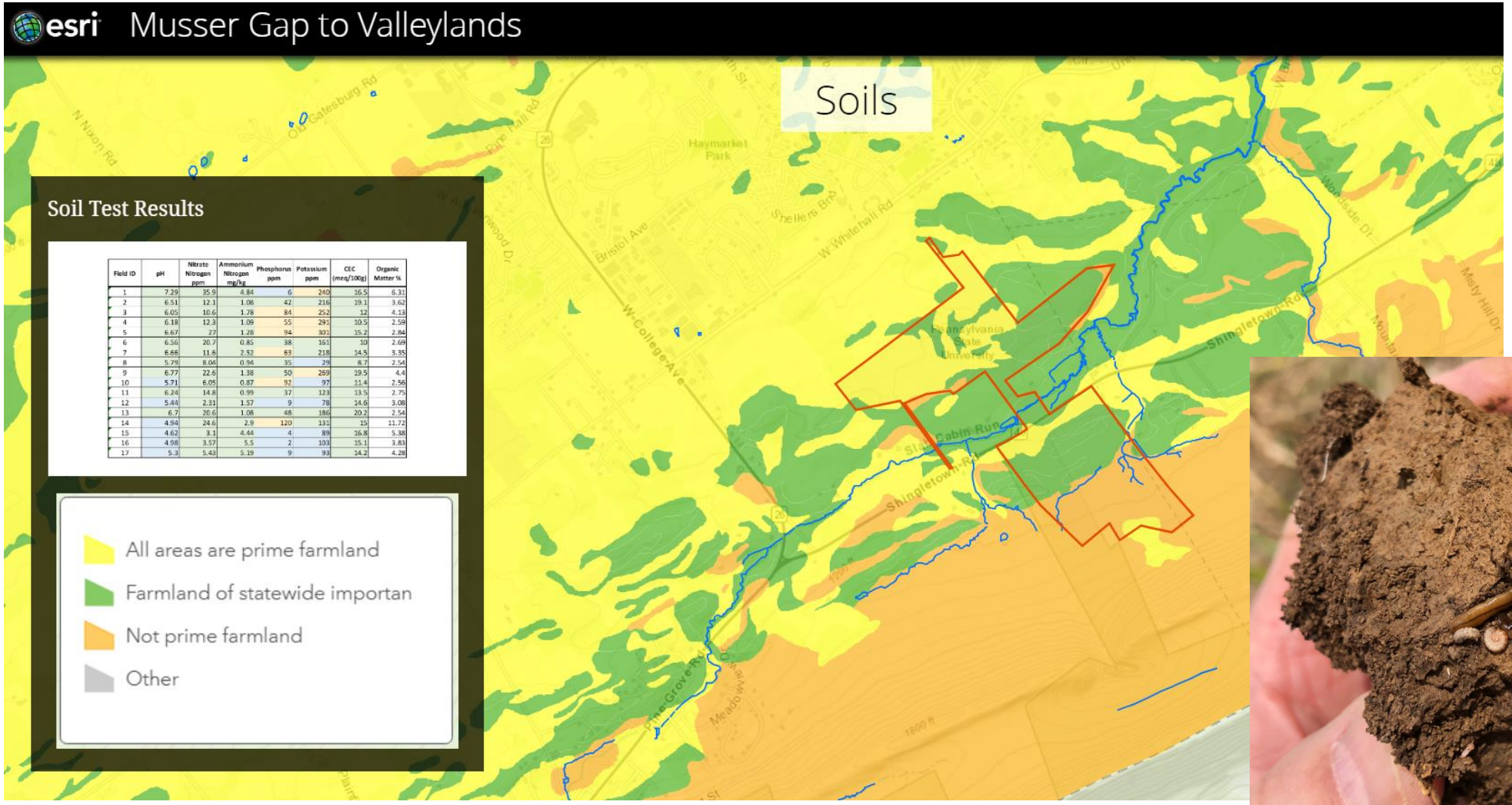
- Spring 2019: (JAN – MAY)
  Community Engagement &
  Design Ideas

- Summer / Fall 2019: (Ongoing)
  Feasibility & Decision



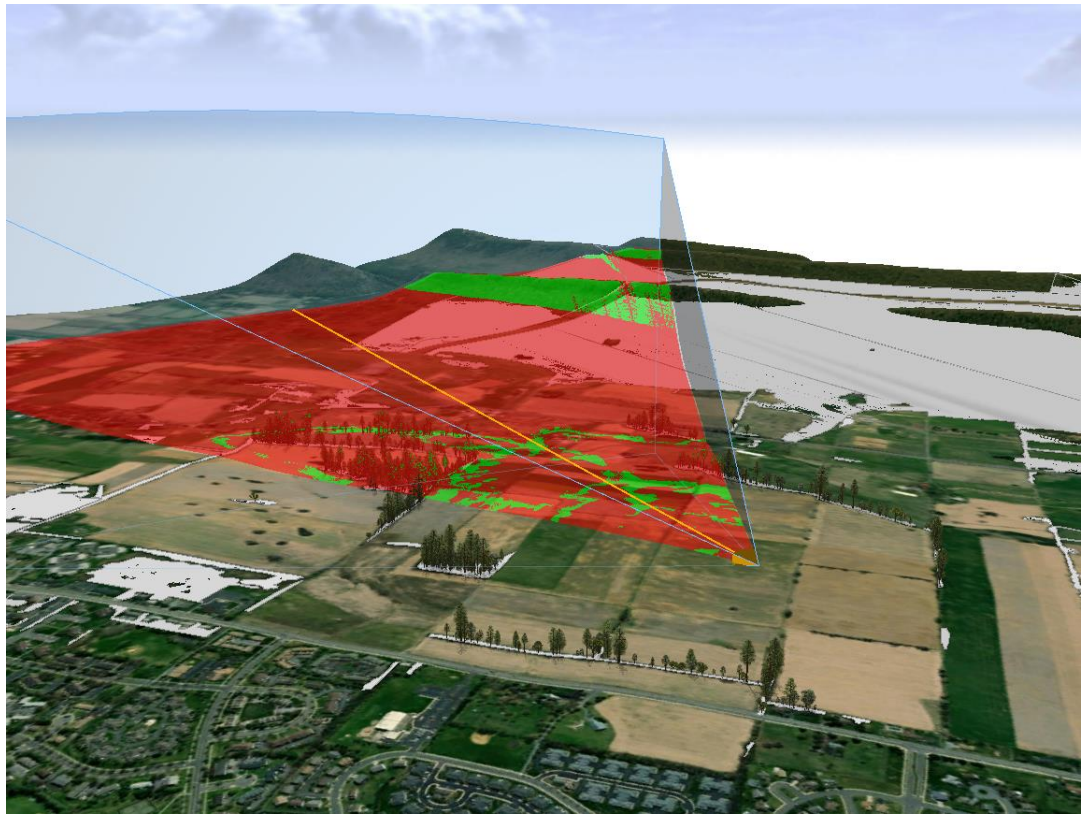
Site Photos
Image Credit: Lucy Rummler

ANALYSIS PHASE

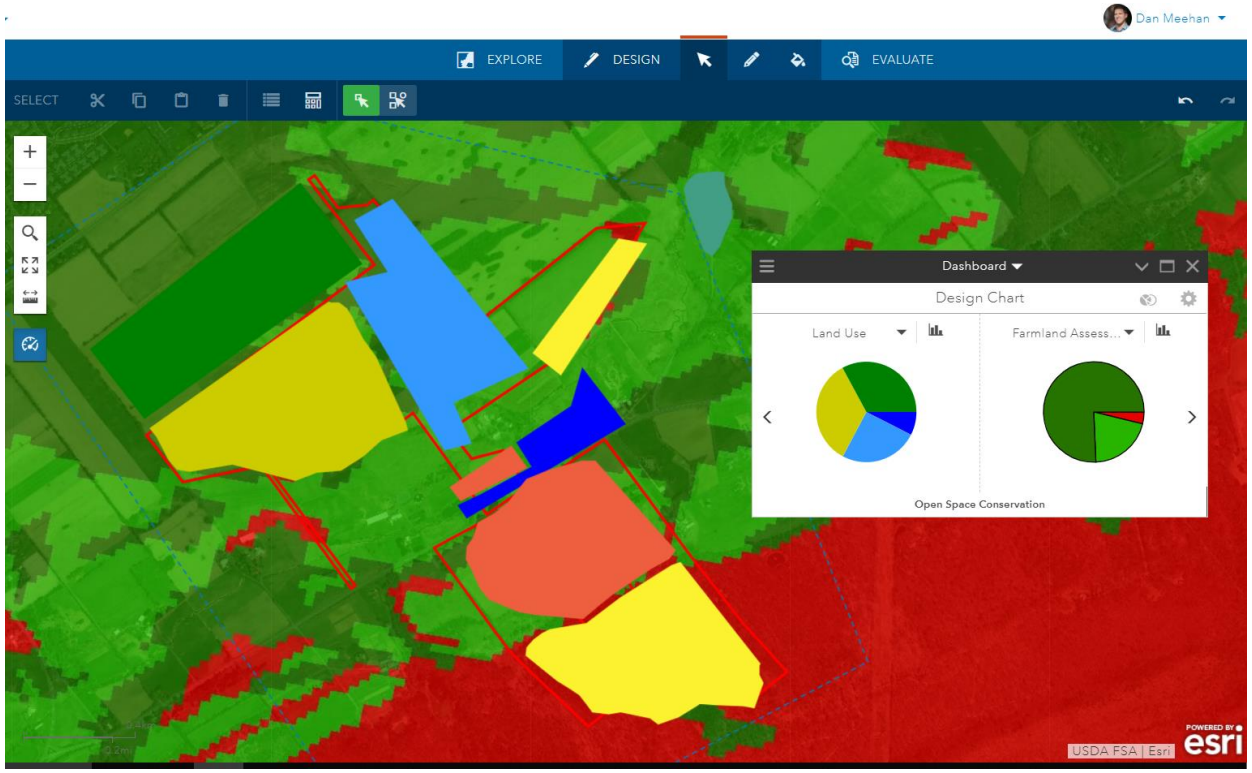


Field ID	pH	Nitrate Nitrogen ppm	Ammonium Nitrogen mg/kg	Phosphorus ppm	Potassium ppm	CEC (meq/100g)	Organic Matter %
1	7.29	35.9	4.84	6	240	16.5	6.31
2	6.51	12.1	1.08	42	216	19.1	3.62
3	6.05	10.6	1.78	84	252	12	4.13
4	6.18	12.3	1.09	55	291	10.5	2.59
5	6.67	27	1.28	94	301	15.2	2.84
6	6.56	20.7	0.85	38	161	10	2.69
7	6.66	11.6	2.52	63	218	14.5	3.35
8	5.79	8.04	0.94	35	29	8.7	2.54
9	6.77	22.6	1.38	50	269	19.5	4.4
10	5.71	6.05	0.87	92	97	11.4	2.56
11	6.24	14.8	0.99	37	123	13.5	2.75
12	5.44	2.31	1.57	9	78	14.6	3.08
13	6.7	20.6	1.08	48	186	20.2	2.54
14	4.94	24.6	2.9	120	131	15	11.72
15	4.62	3.1	4.44	4	89	16.8	5.38
16	4.98	3.57	5.5	2	103	15.1	3.83
17	5.3	5.43	5.19	9	93	14.2	4.28

ANALYSIS PHASE

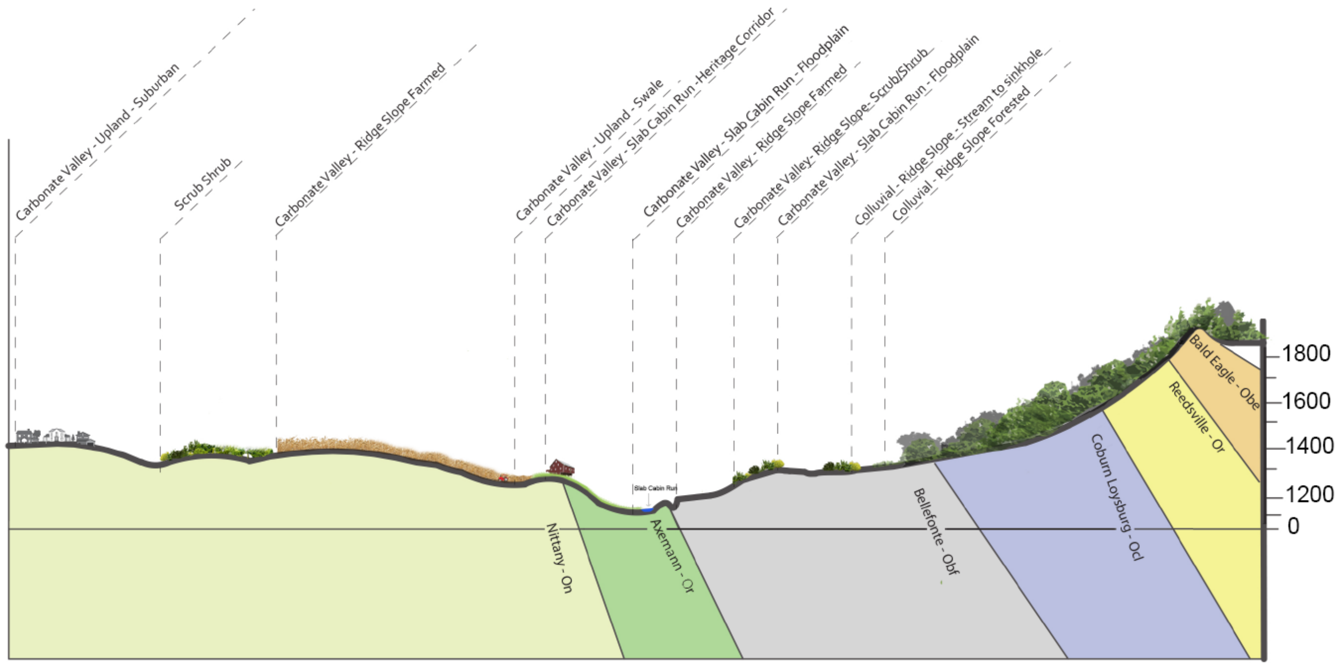


City Engine



GeoPlanner

Cross Section



Geology

GEOLOGY

The MOZV parcel is located in the Nittany Valley of Central Pennsylvania, bounded by Bald Eagle Ridge to the north and Tussey Ridge to the south. This ridge-and-valley system is part of the larger Ridge and Valley physiographic province, which extends from New England down through the Mid-Atlantic to several of the Gulf Coast states (Figs. 5 and 6). Nittany Valley and its associated ridges are underlain by 6000-8000 ft.. of interbedded formations of three primary lithologies: carbonate, siltstone, and sandstone (Fig. 7). At the surface, carbonate rocks, mainly limestone and dolomite, are found beneath the valley floor, siltstone is present on the mountain slopes, and sandstone caps the ridges (Fail, 1999). This configuration is the result of tectonic and erosional forces during the region's long geologic history (Fulton et al., 2005).

GEOLOGIC HISTORY

Deposition

Approximately 550 million years ago (mya), during the Cambrian period, the eastern portion of North America was close to the equator. As a result, much of modern-day Pennsylvania lay beneath a shallow tropical sea. These conditions facilitated the growth and persistence of coral reefs, leading to the de-position of thick layers of carbonate minerals over the course of 50 million years. Eventually, intense pressure transformed these carbonates into the limestone and dolomite rocks that underlie much of present-day Nittany Valley (Fail, 1999).

The sedimentation of carbonate material continued until the Taconic Orogeny, a mountain-building event that occurred to the east of present-day Penn-sylvania. The orogeny created uplift and initiated erosion that generated fine silt and clay sediments, which moved west into the shallow sea. This influx

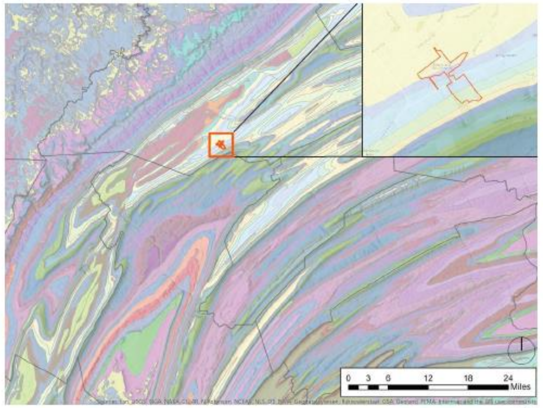


Figure 5
Location of the site parcel in the context of local geologic formations

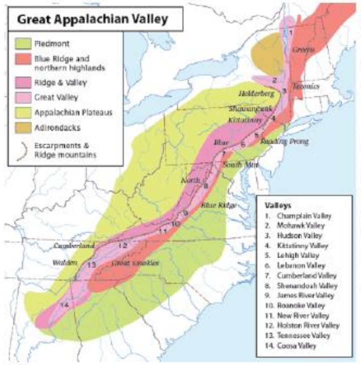


Figure 6
Physiographic provinces of the Great Appalachian Valley

of silt and clay covered previously deposited layers and also prevented further accumulation of carbonate by halting the growth of coral reefs. As the Taconic Orogeny proceeded over the next 60-70 million years, the sediments eroding from the young mountains grew larger, creating thicker, sandier layers at the bottom of the increasingly shallow sea. With time and pressure, the fine-grain silt and clay layers became Reedsville Shale and the coarse-grain sand layers became the Bald Eagle and Tuscarora Sandstones (Fail, 1999). Following the Taconic Orogeny, additional sequences of interbedded shales and sandstones were deposited due to the Acadian Orogeny, which took place during the Devonian Period, 375 mya.

Deformation

Throughout much of the Paleozoic Era, the rock layers present in what is now central Pennsylvania remained relatively horizontal. However, during the late Paleozoic, the African proto-continent collided with the North American continent, scraping and folding the top layers of rock as it moved northwest. Though the African proto-continent eventually receded, the sequences deposited by the Taconic and Acadian orogenies remained tilted and folded, resembling the present-day Himalayas or Alps (Hatcher et al. 1989).

Erosion

Counter-intuitively, the ridges in our present-day landscape are not the remains of the ancient Al-leghenian mountains—they are the remnants of the former valleys, while the present-day valleys are all that persist from the former ridges (Fail 1999, Fulton et al. 2006). This topographic inversion is the result of the variable susceptibility of bedrock layers to dissolution and weathering. Carbonate rocks are easily weathered, dissolving upon contact with the weak acids formed naturally as rain water reacts with carbon dioxide; in contrast, the sandstone layers are more durable, generally weathering only under physical forces, such as water, wind, or freeze-thaw cycles. Since mountain peaks tend to experience physical weathering more intensely than valley floors, the older carbonate layers were exposed there sooner; once at the surface, the limestone and dolomite rocks quickly weathered, creating valleys where there once had been ridges. In contrast, the sandstone and siltstone covering the ancient valleys remained relatively intact, eventu-ally becoming ridges as the old mountains eroded below (Fail 1999, Fulton et al. 2006). Weathering and

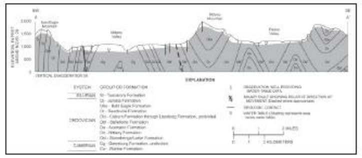


Figure 7
Lithology of the Nittany Valley

COMMUNITY AND STAKEHOLDER ENGAGEMENT

- Multi-pronged approach:
  - Online Public Survey
  - Key Informant Interviews
  - Community Conversations + Evaluation/Feedback
  - Geodesign Workshop




Background
Musser Gap to Valleylands Project

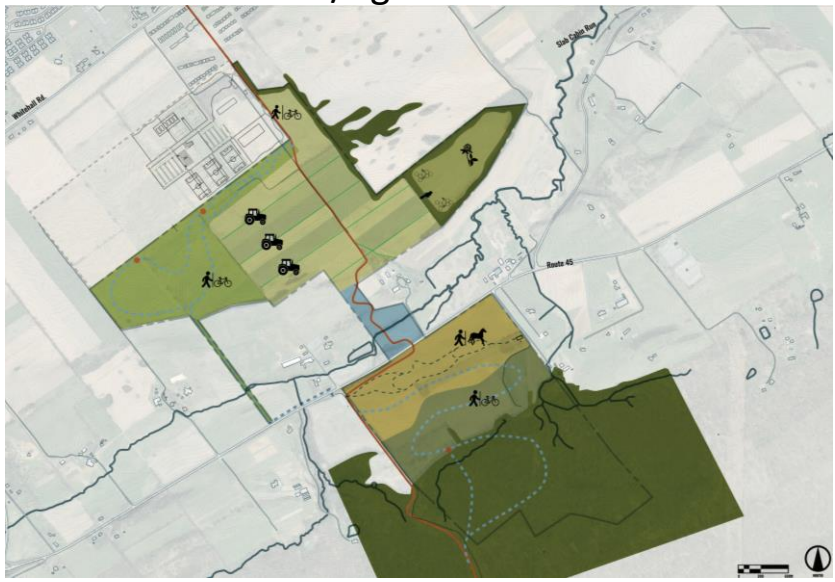
Image Credit:
Damian Heltman-Gray

CONSISTENCY IN CONVERSATION

Habitat Creation:

Water Resource Protection:

Passive Recreation/Agriculture Preservation:



Background
Musser Gap to Valleylands Project

Image Credit:
Students from the MG2V Spring 2019 Course

PennState College of Arts and Architecture

STUCKEMANSCHOOL

A LA GD

ECOLOGY+ DESIGN

CLEARWATER conservancy

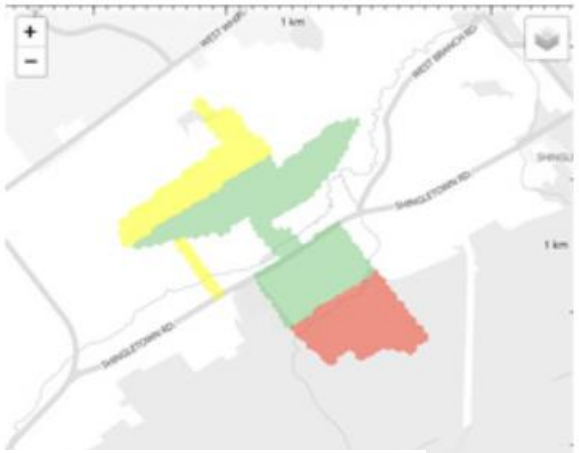
4
DECISION / NEGOTIATION

Musser Gap to Valleylands Project
State College, PA

Image Credit:
Damian Heltman-Gray

Evaluation of Systems

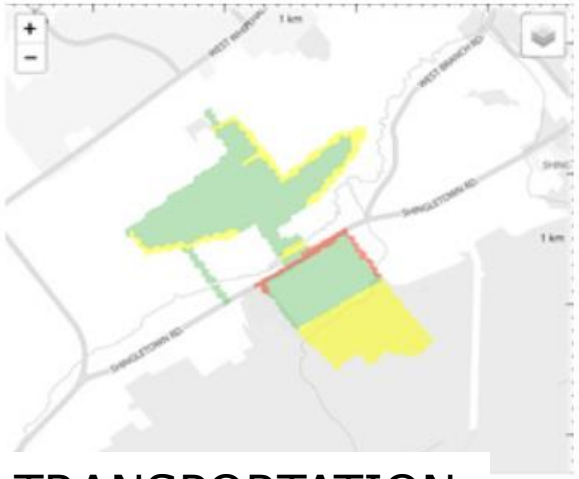
Feasable	Suitable	Capable	Not Appropriate	Existing

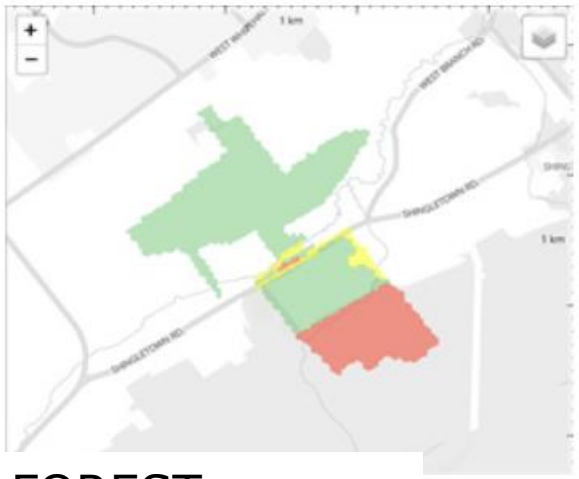

BIODIVERSITY


AMENITY

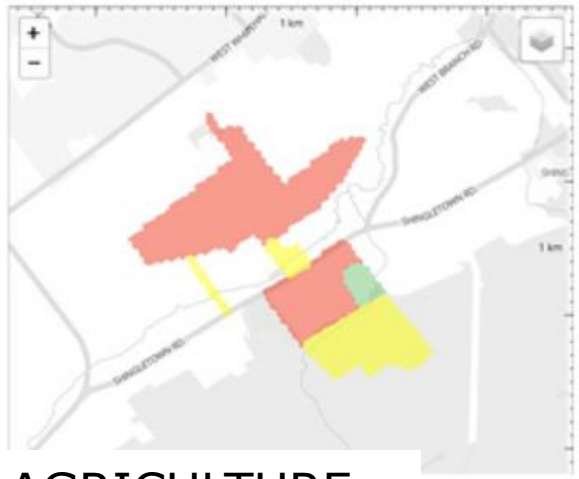

UTILITY


PROTECTED AREA


TRANSPORTATION

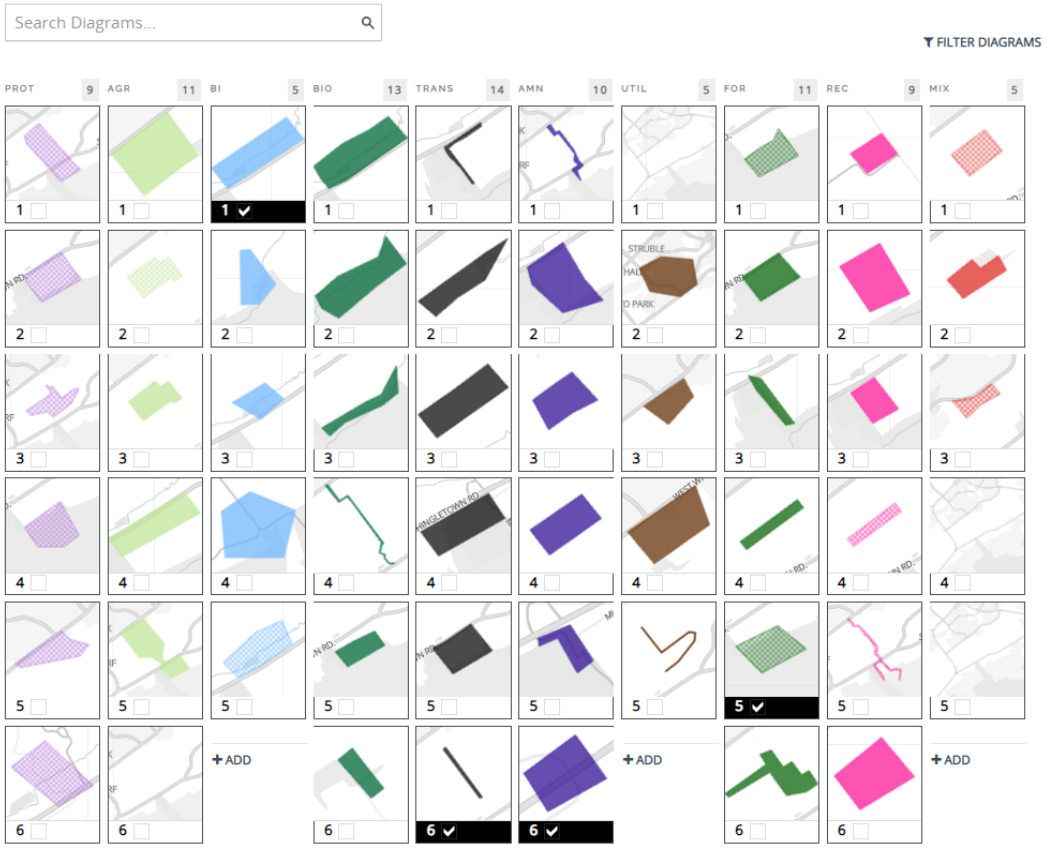

FOREST


RECREATION


AGRICULTURE

Diagrams and Data Collection

USER CREATED DIAGRAMS



GEOFORAGE

We are running a survey to get your opinion on things that are not working well or ideas to improving your experience of your neighborhood and the future for Musser Gap area.

How do I do that?

WATCH 20-SECOND VIDEO

Find a place for your idea

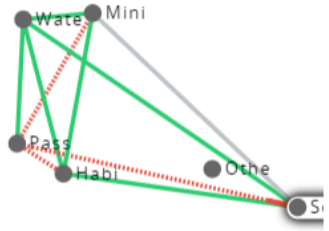
Zoom in on the map and move the dots

Give it a name

ENHANCED BIKE TRAIL

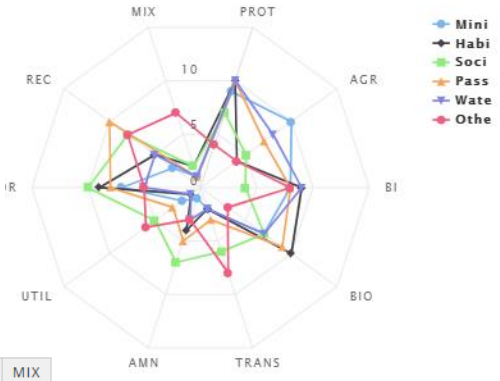
DESIGN COMPARISON

NEGOTIATION



COMPATIBILITY

VALUE COMAPRISON

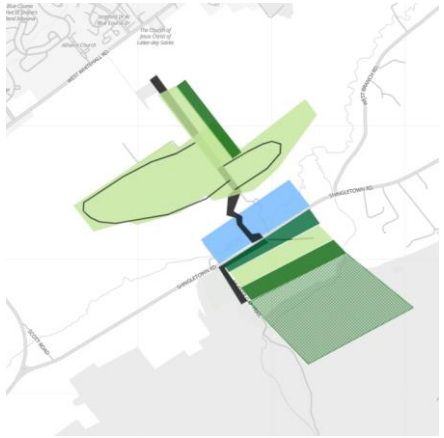


	PROT	AGR	BI	BIO	TRAN	AMN	UTIL	FOR	REC	MIX
1			5							
2		1		1						
3										
4										
5						1	1	5		
6					5	3		1		
7		3				1		1		
8		1			2	1		1		
9	1	1				1		1		
10		1				1		1		
11		1		1				1		
12				1	5					
13				1	4					

FREQUENCY

Habitat Creation

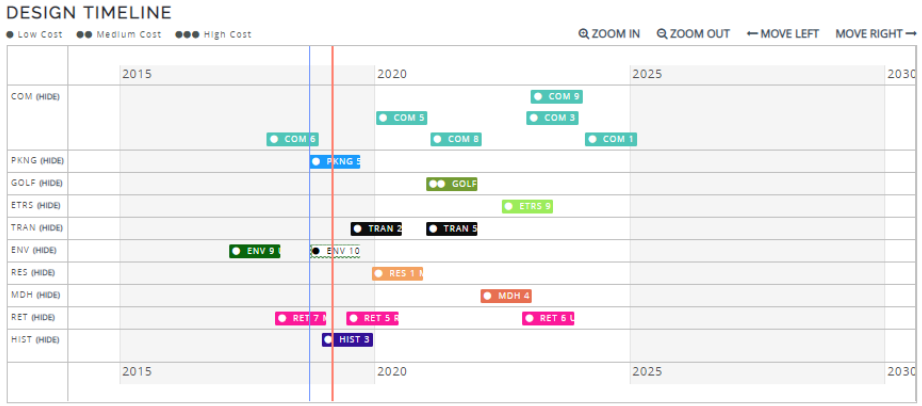
Socially Integrated Agriculture

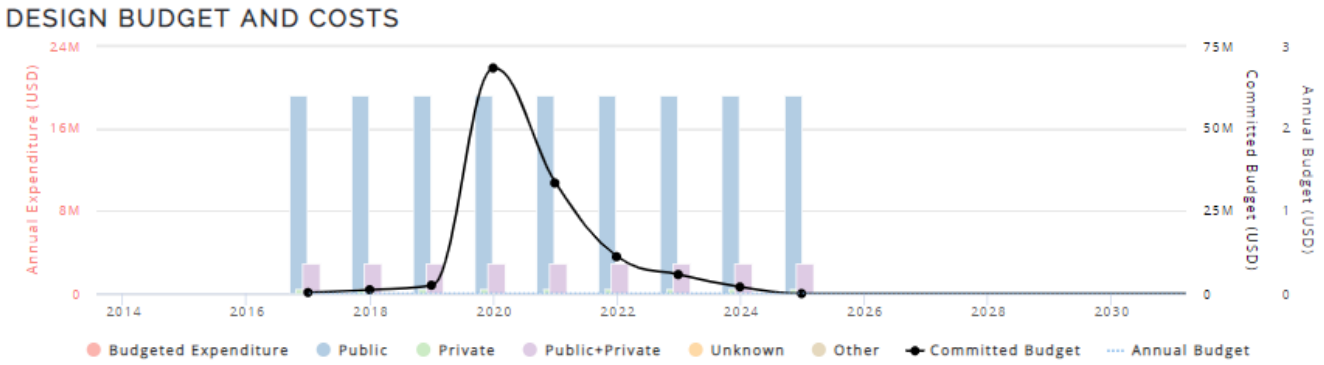


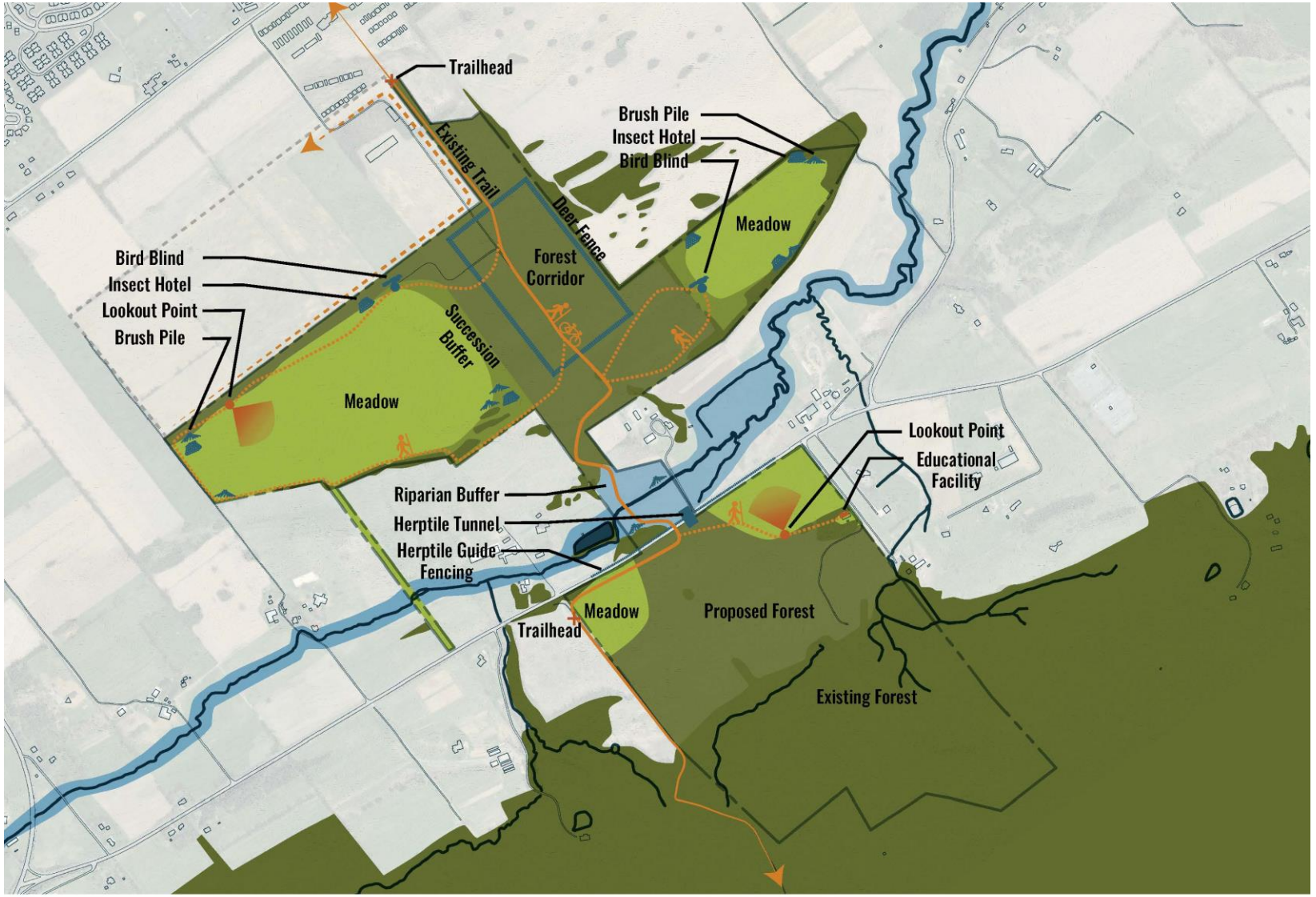
Minimal Intervention

Water Resource Protection

Passive Recreation





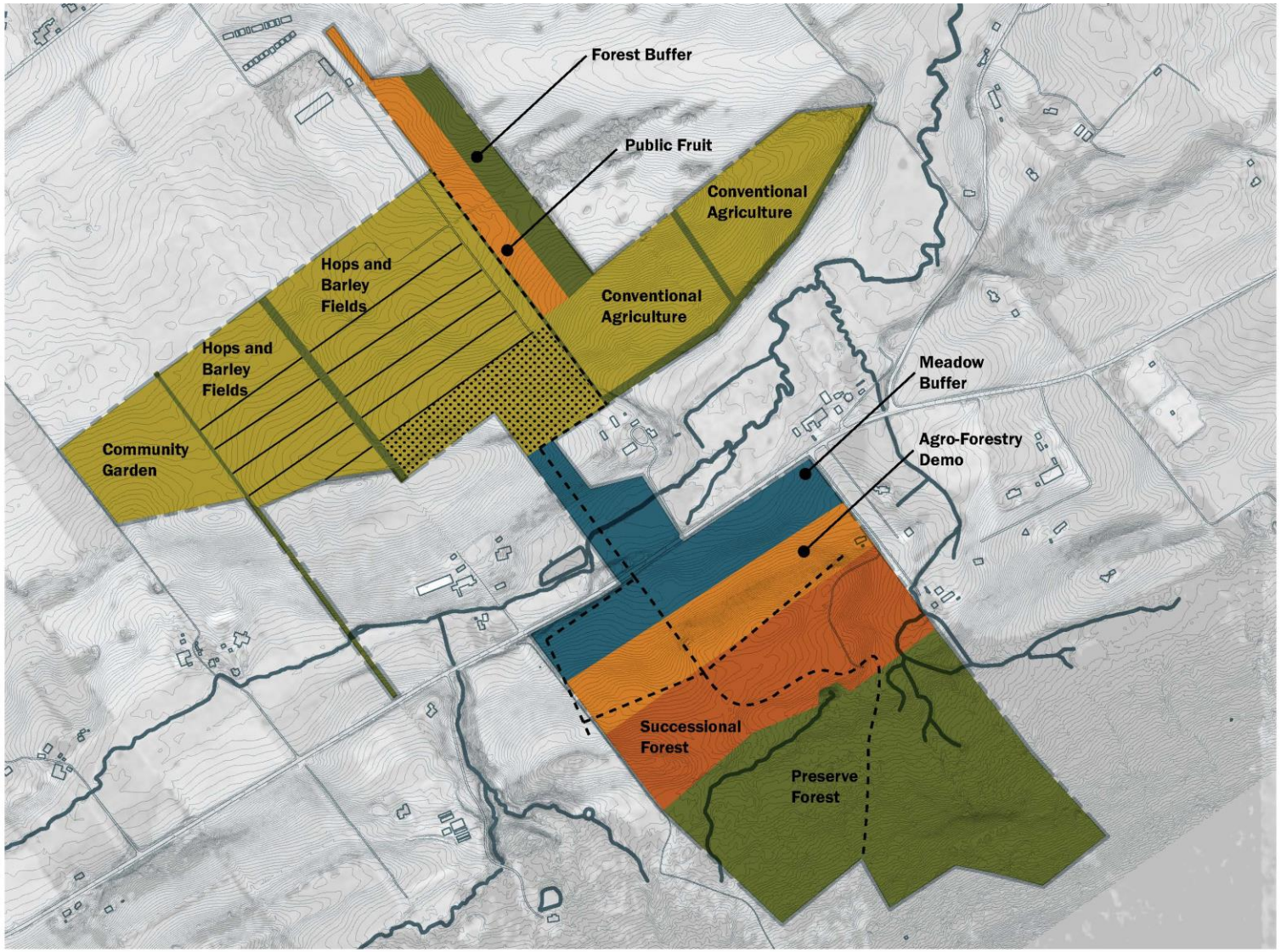


Student Design:
Eva Blankenhorn
Jeff Wertheim

Musser Gap to Valleylands Project

Idea #1: Habitat Creation

25 April 2019

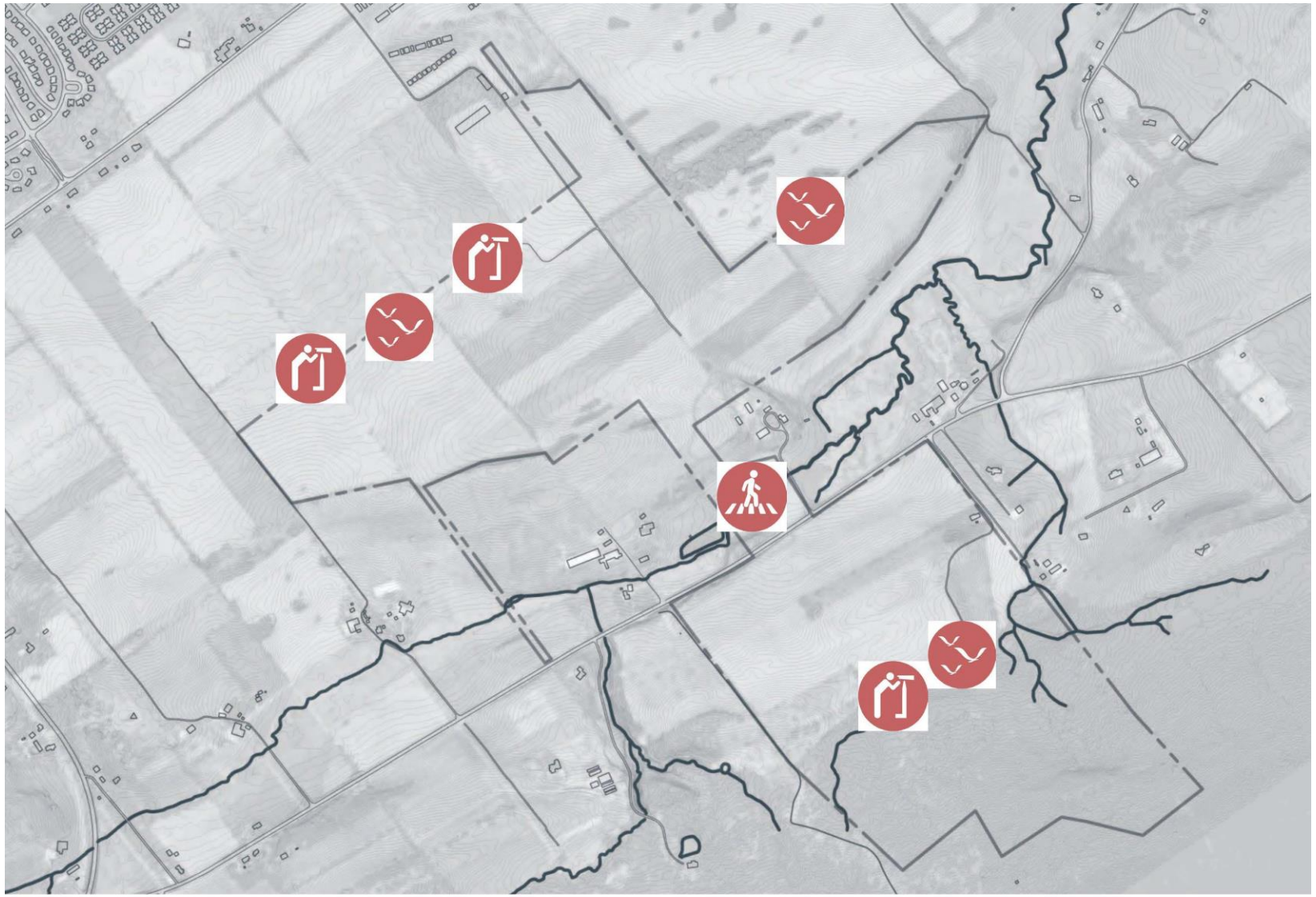


Student Design:
Jake Tiernan
Bryce Brucker

Musser Gap to Valleylands Project

Idea #2: Progressive Agriculture

25 April 2019

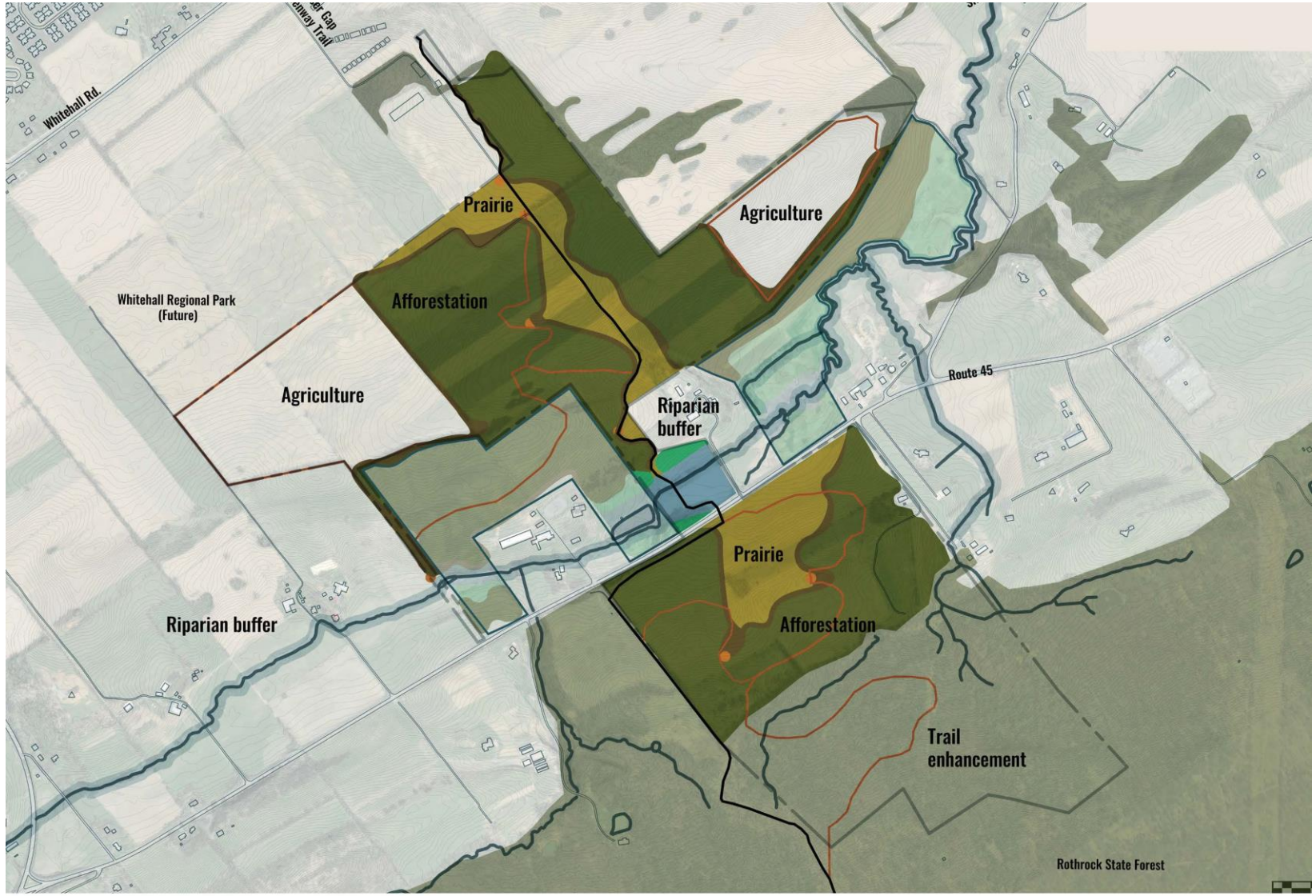


Student Design:
Tim Gould
Sean Sweeney

Musser Gap to Valleylands Project

Idea #3: Friends of Musser Gap (Passive Recreation)

25 April 2019

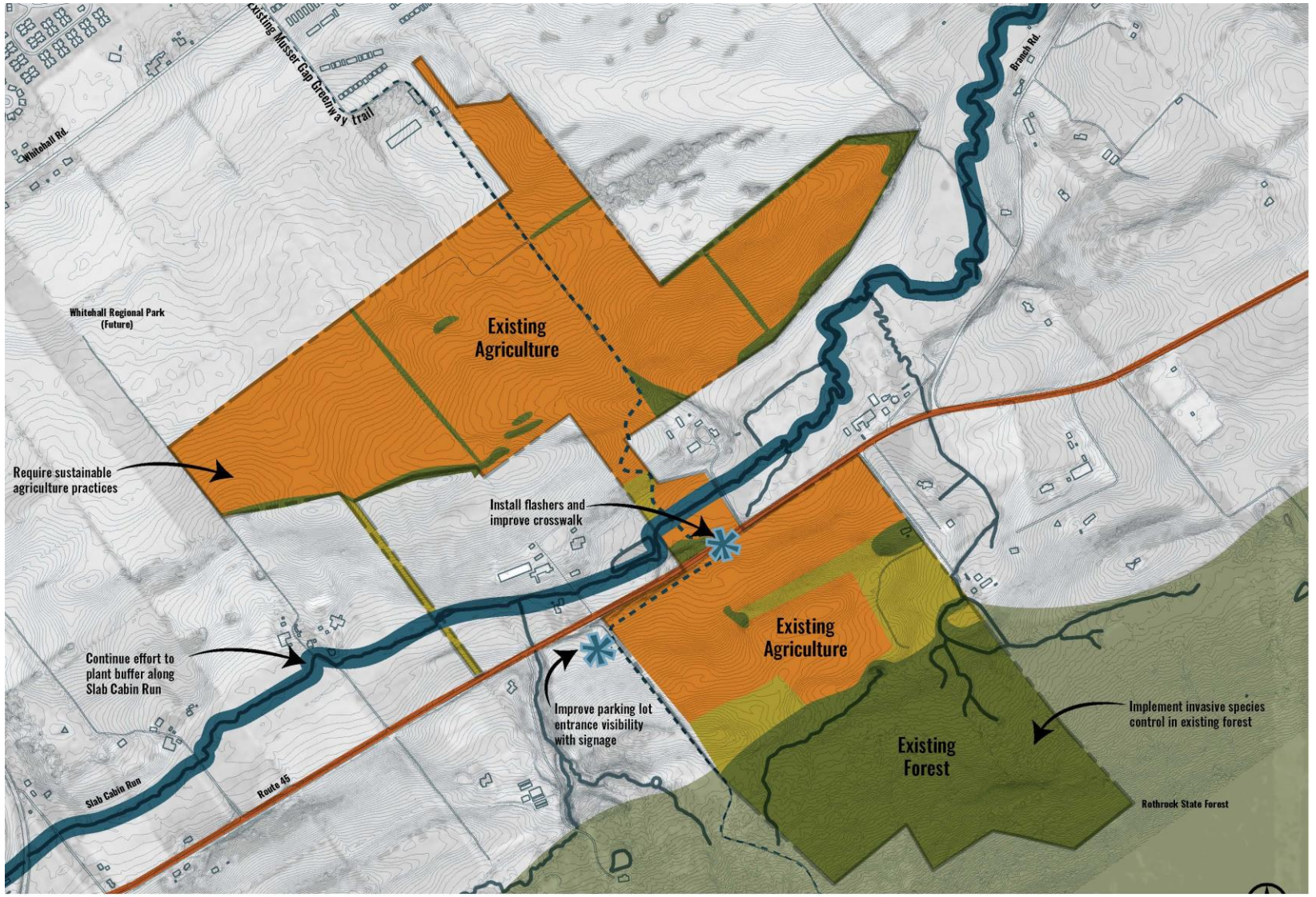


Student Design:
Zoe Roane- Hopkins
Logan Staley
Ben Chronister

Musser Gap to Valleylands Project

Idea #4: Water Resource Protection

25 April 2019



Student Design:
Olivia Shotyk
Paula Neder
Eva Blankenhorn

Musser Gap to Valleylands Project

Idea #5: Minimal Intervention

25 April 2019

5
NEXT STEPS

Musser Gap to Valleylands Project
State College, PA

Image Credit:
Dan Meehan

DOCUMENTATION / DISSEMINATION

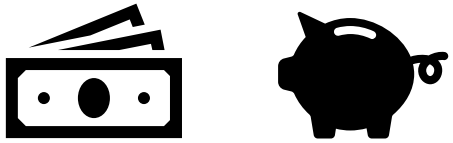
MG2V Volume 1

MG2V Volume 2

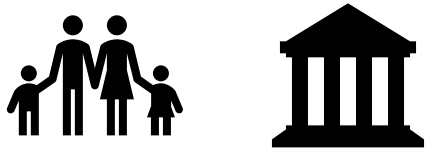
Document Creation:
Sarah Rothman & Lucy Rummler

Second Iteration – Decision Makers

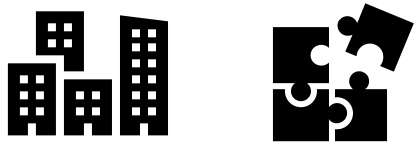
Finance & Business



Local Government & Community Relations



Facilities & Planning



Decision Makers

- All teams meet to analyze results
- Negotiate ideas / options
- Move forward with feasibility study of ideas with other units
- DECIDE!

PennState College of Arts and Architecture

STUCKEMANSCHOOL

A LA GD

E+D ECOLOGY+ DESIGN

CLEARWATER conservancy

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