

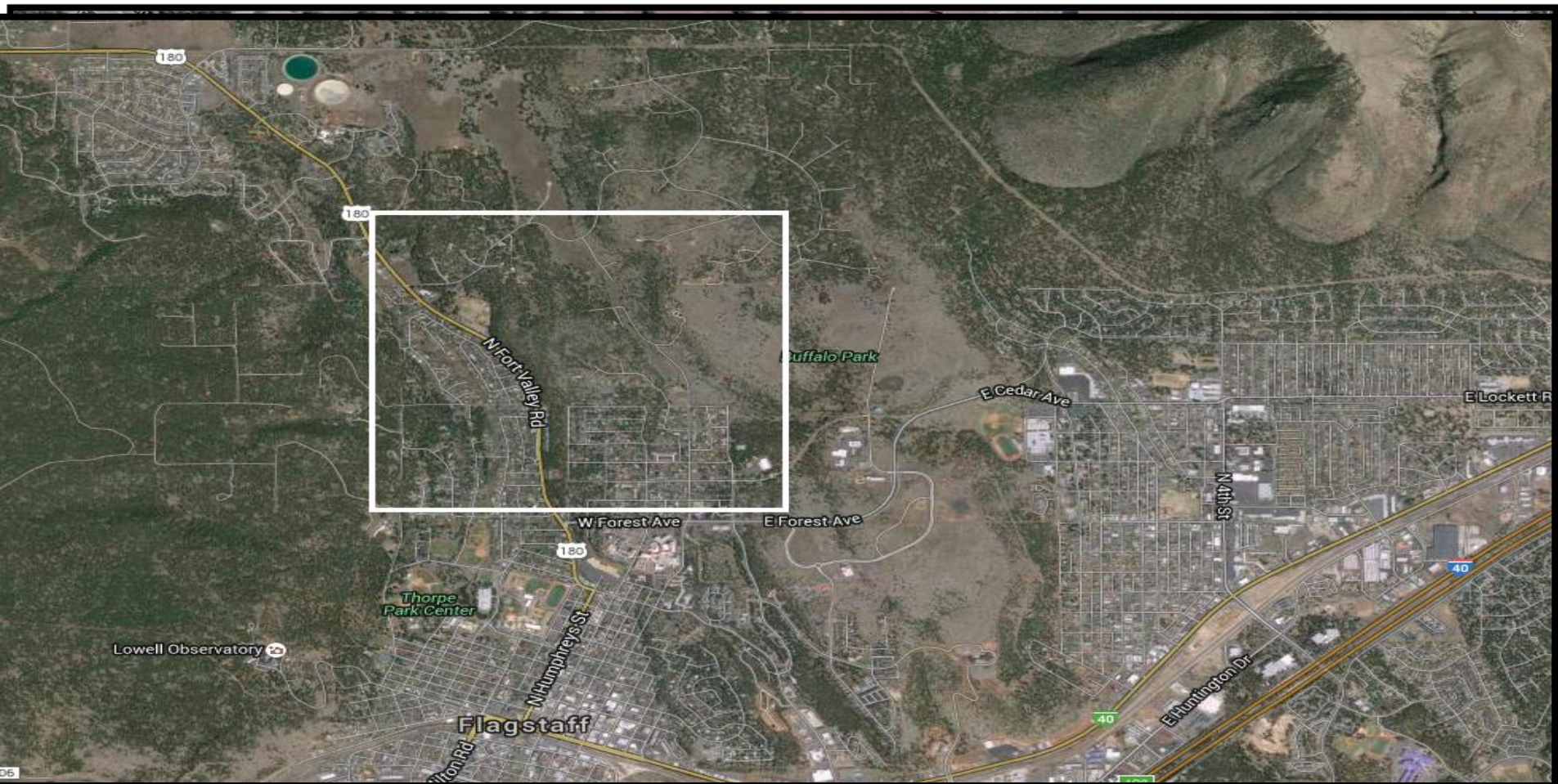
MUSEUM OF NORTHERN ARIZONA MEADOW RIPARIAN HABITAT ENHANCEMENT PROPOSAL

GREENGREYENGINEERING



CENE 486 C

- > Noor Alsadi
- > Matthew Sorenson
- > Jasem Alrumaidheen
- > Khaled Alazmi



➤ PROJECT RELEVANCE

- Land owned by the Museum of Northern Arizona (MNA)
- Coyote Springs is one of the natural functioning springs in the San Francisco Peaks area
- 100 years ago cattle - 40 years ago nursery - currently for **recreational usage**
- **PROJECT OBJECTIVE:** Assess the riparian area and provide design alternatives that:
 - Promote proper function of the channel
 - Promote wildlife & plant diversity
 - Preserve culture heritage & add educational experiences

PROJECT STAKEHOLDERS

Project Proposal Goal >



Client: Dr. Larry Stevens >



< Grader & Technical Advisor: Dr. Wilbert Odem



^ Stakeholder 1



^ Stakeholder 2



^ Stakeholder 3

CURRENT SITUATION



CURRENT SITUATION



METHODS OF DESIGN

➤ FIELD EVALUATION

➤ Surveying

➤ Pathway:

- Asphalt sidewalk from The Peaks to Flagstaff Urban Trail

➤ Existing dirt trail

➤ Stream Reaches:

- Reach A: partial stream length 225 ft
- Reach B: partial stream length 195 ft



METHODS OF DESIGN

➤ PHOTO-TRAPPING PLAN

➤ Adopted from:

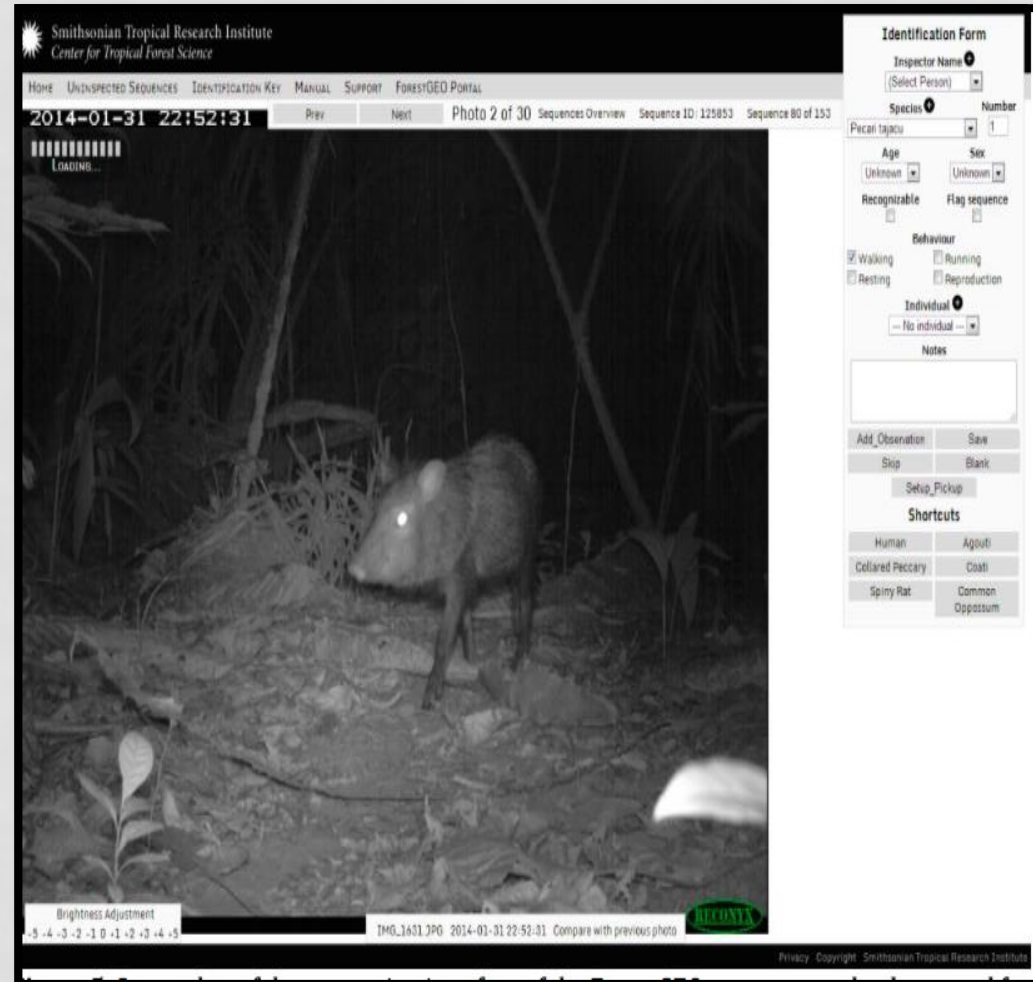
The Smithsonian Tropical Research Institute Center for Tropical Forest Science protocol for camera-trap surveys of mammals

➤ Settings:

Two cameras placed at Eastern & Western outer limits

➤ Results:

Captured mule deer, feral cats, raccoons, and black tailed jackrabbits



HYDROLOGY DESIGN CONCEPT

- **Spring Box:**
 - Coyote Spring is a hill-slope spring
 - Fix door with smart polymer glass
 - Prevent access of pollutants



Figure 1- Spring box flow in fall 2015



Figure 2- Spring box flow in spring 2016



Figure 3- Sketchup spring box solution

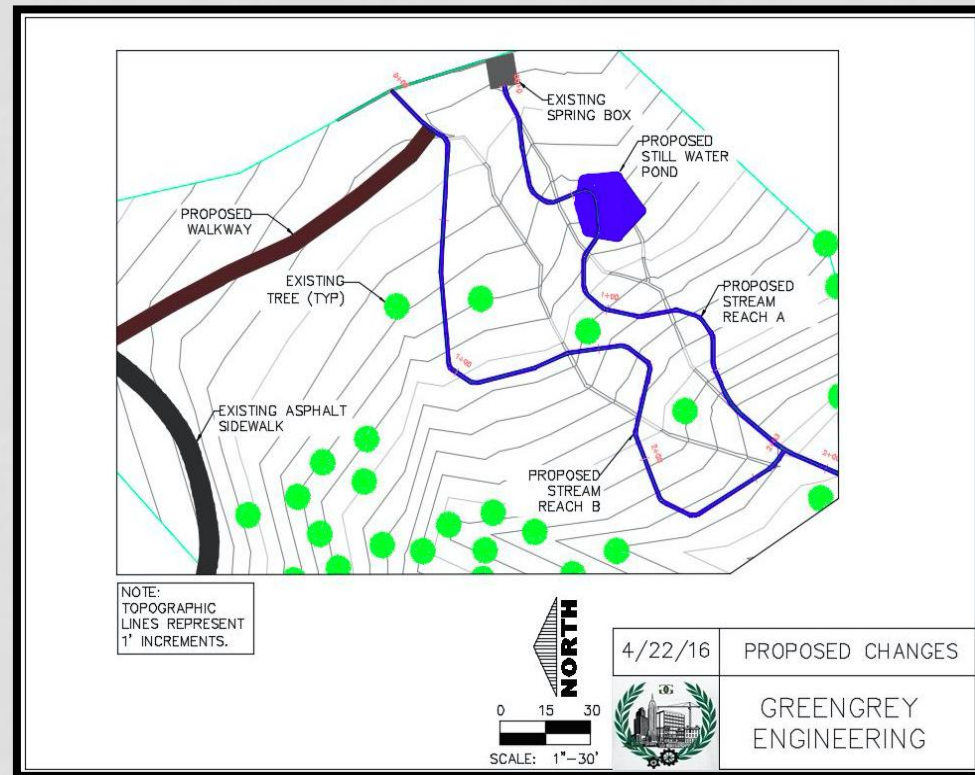
HYDROLOGY DESIGN CONCEPT

➤ Stream Morphology

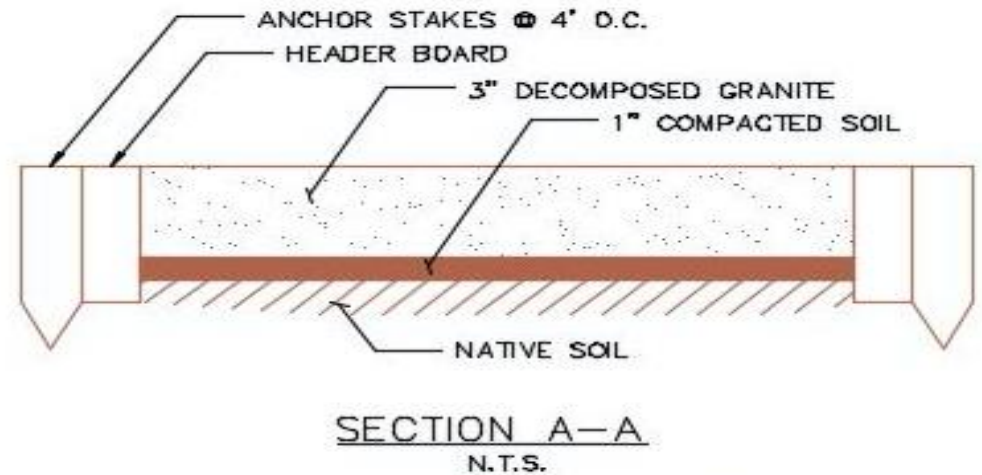
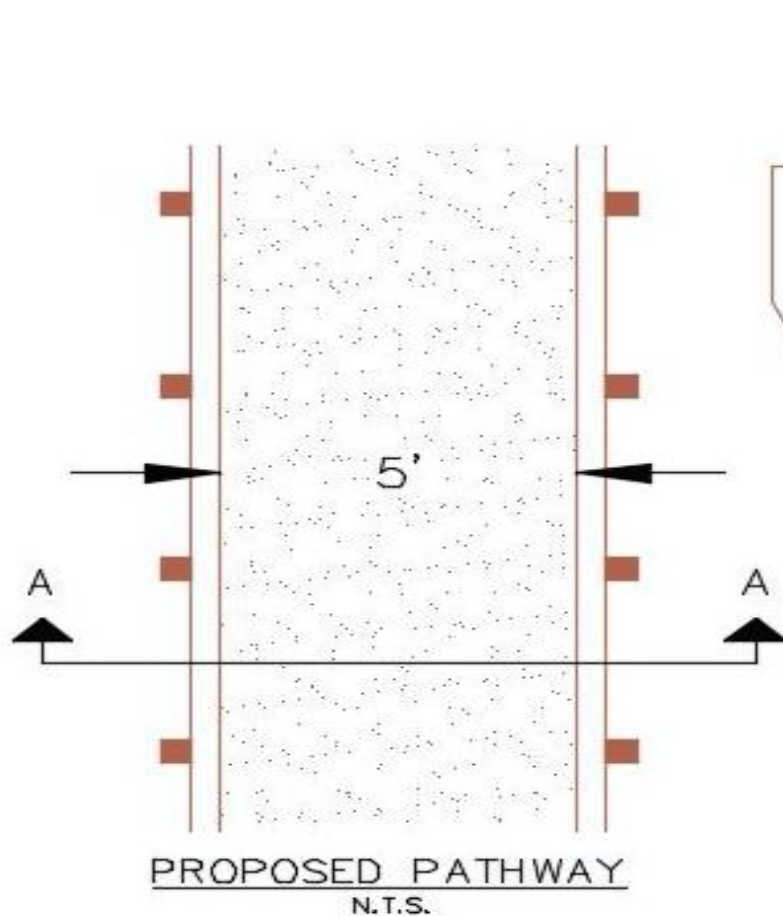
- Cross sectional area: 1 ft x 1 ft
- Total stream length: 1360 ft
- Total valley length: 1346 ft
- Existing stream sinuosity: 1.06 ft/ft
- Proposed stream sinuosity: 1.22 ft/ft
- Coyote Springs discharge: 0.040 cfs

➤ Concrete Box => Pond

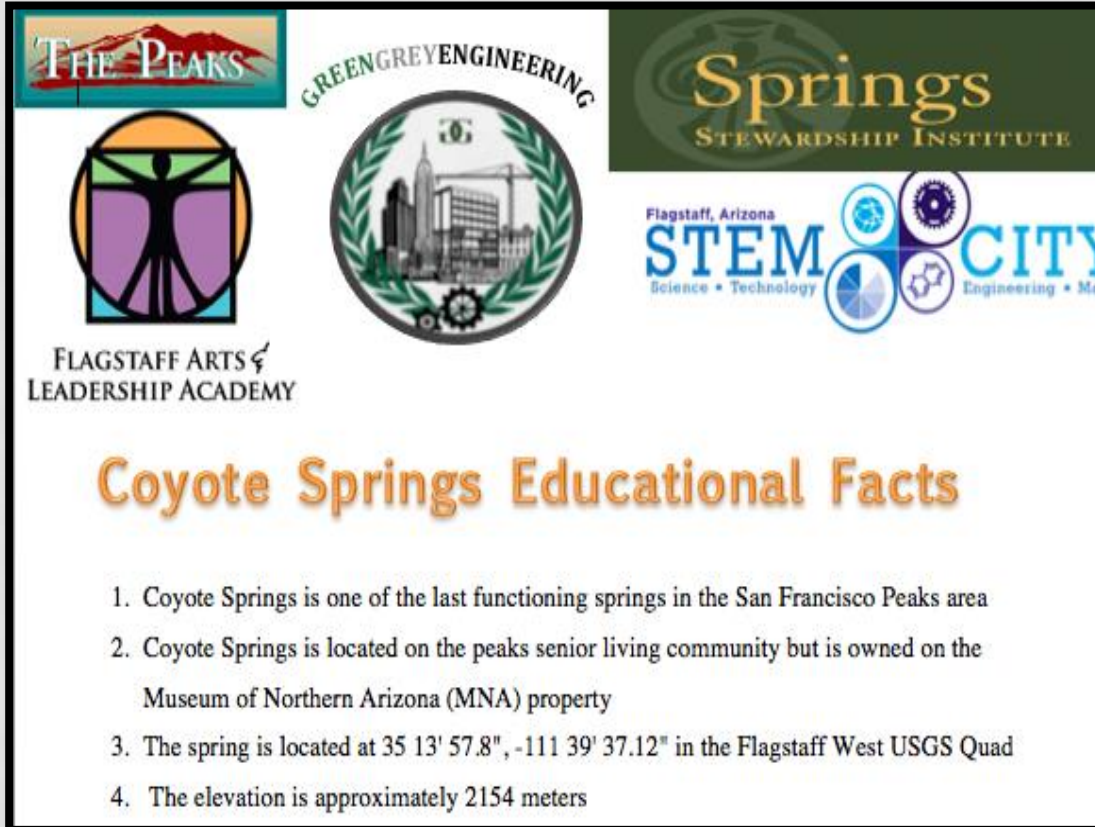
- Seepage through the concrete box results in still water



PATHWAY DESIGN CONCEPT



EDUCATIONAL CONCEPT



THE PEAKS

GREENGREY ENGINEERING

Springs
STEWARDSHIP INSTITUTE

Flagstaff, Arizona
STEM CITY
Science • Technology Engineering • Math

FLAGSTAFF ARTS LEADERSHIP ACADEMY

Coyote Springs Educational Facts

1. Coyote Springs is one of the last functioning springs in the San Francisco Peaks area
2. Coyote Springs is located on the peaks senior living community but is owned on the Museum of Northern Arizona (MNA) property
3. The spring is located at 35 13' 57.8", -111 39' 37.12" in the Flagstaff West USGS Quad
4. The elevation is approximately 2154 meters

Figure 6- Section on the website



Figure 4- Example "No Bikes" sign



Figure 5- Example flip educational sign

SKETCHUP- BEFORE



SKETCHUP- AFTER



SCHEDULE



Tasks	Date
1.0 Data Collection	Jan. 19 to Feb. 5
2.0 Methods	Jan. 1 - March 15
2.1 Field Evaluation	Jan. 1 - March 10
2.2 Photo-Trapping Evaluation	Feb. 4 to March 10
2.3 Software	Feb. 4 to April
3.0 Design Modeling Concept	Feb. 1 to March 15
3.1 Hydrology	Feb. 1 - March 10
3.2 Pathway	Feb. 1 - March 10
3.3 Education	Feb. 1 - March 10
4.0 Analysis	March. 14 - April. 29
4.1 Cost of Implementing Design	March. 21 to April 6
4.2 Operation & Maintenance Plan	April. 3 - 6
4.2 Final Report Review	April. 22
5.0 Final Report and Website	May. 12
5.1 Final Presentation	May. 6

Finished On Time
Finished, Behind Schedule
Future 2 weeks

COST OF DESIGN

Classification	Billing Rate \$/hr	Hours	Cost (\$)
Project Manager	114	172	19,677
Software Engineer	91	380	34,485
Lab Technician	48	120	5,775
Design Specialist	31	40	1,254
Personnel Total		712	61,191

Table 2- Predicted engineering cost

Classification	Billing Rate \$/hr	Hours	Cost (\$)
Project Manager	114	103	11,783
Software Engineer	91	176	15,972
Lab Technician	48	110	5,294
Design Specialist	31	32	1,003
Personnel Total		421	34,052

Table 3- Actual engineering cost

COST OF DESIGN

DIV	Description	Materials	Equipment	Subcontract	Cost/SF	Line Total
1	General Requirements	\$700	\$3,000		\$30	\$3,730
4	Excavation			\$4,330	\$2.92	\$4,333
5	Demolition			\$700	\$20	\$720
6	Equipment					\$0
7	Special Cleaning			\$1,000		\$1,000
8	Maintenance			\$400	\$0.44	\$400
Sales Tax	4.95%	\$34	\$148.50	\$287	\$1.73	\$471.23
Contingency	20%	\$140	\$600	\$1,160	\$7	\$1,907
Totals		\$874	\$3,749	\$7,247	\$44.62	\$12,561

Table 4- Cost of implementing design

ENVIRONMENTAL IMPACTS

- Expand meadow wetlands
- Reduce water pollution
- Low damage to vegetation
- Promote wildlife
- Promote plant diversity
- Low soil erosion and compaction



SOCIAL, HEALTH & CULTURE IMPACTS

- Promote recreational activities
- Increase levels of tourism
- Venue for small events, especially for the senior living community
- Enhance community engagement
- Preserve culture heritage
- Enhance educational experience



ECONOMIC IMPACTS

- Increase the nearby property value
- Low maintenance cost
- Low design construction cost
- Expand small business growth



REFERENCES

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- [4] Sherer, P. M. (2006). The Benefits of Parks. *East Shore Park*. Retrieved April 21, 2016, from http://www.eastshorepark.org/benefits_of_parks_tpl.pdf
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