

Process-Based Design

Illustrated at

Doty Ravine

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U.S. Fish and Wildlife Service
Workshop on Ecological Restoration of Streams, Floodplains and Meadows

Overview

1. Restoration Actions and Design Criteria
2. Application of Process Based Design Criteria
3. Biogeomorphic Outcomes
4. Demo of Stream Evolution Corridor Analysis

Foundational Goal – Restore fluvial processes that create and maintain dynamic, complex, high quality habitat

- *Increase instream habitat complexity for native aquatic fauna*
- *Improve and increase riparian habitat*
- *Increase water storage*
- *Control invasive plant species*
- *Integrate active livestock operation*



2 Types of Design criteria: answer essential questions

Performance – **What will the project accomplish?**

- **Open/reconnect space for flood pulse energy**
- Restore shifting habitat mosaic (Bio-geomorphic cycle)

Prescriptive – **How will the project be accomplished?**

- Use site system energy (e.g. Flood pulse energy)
- Use ecologically appropriate materials

Except!!



When modifying or removing infrastructure then infrastructure design criteria apply





1. Constructed wetlands
2. Riparian Planting / Oak Planting drip irrigated
3. Riparian Fencing and off stream Water Structures

Design criteria

Plant survival

Acres wetland constructed

Riparian acres protected



Design criteria

Dynamic space reopened

Shifting habitat types

1. Beaver Peace Treaty
2. Levee Removal
3. Beaver Dam Support and Beaver Dam Analogues
4. Complex Small Wood Jams
5. Floodplain culvert







2011

Stable Terrestrial Habitat



2017

Dynamic Aquatic

Dynamic
Change

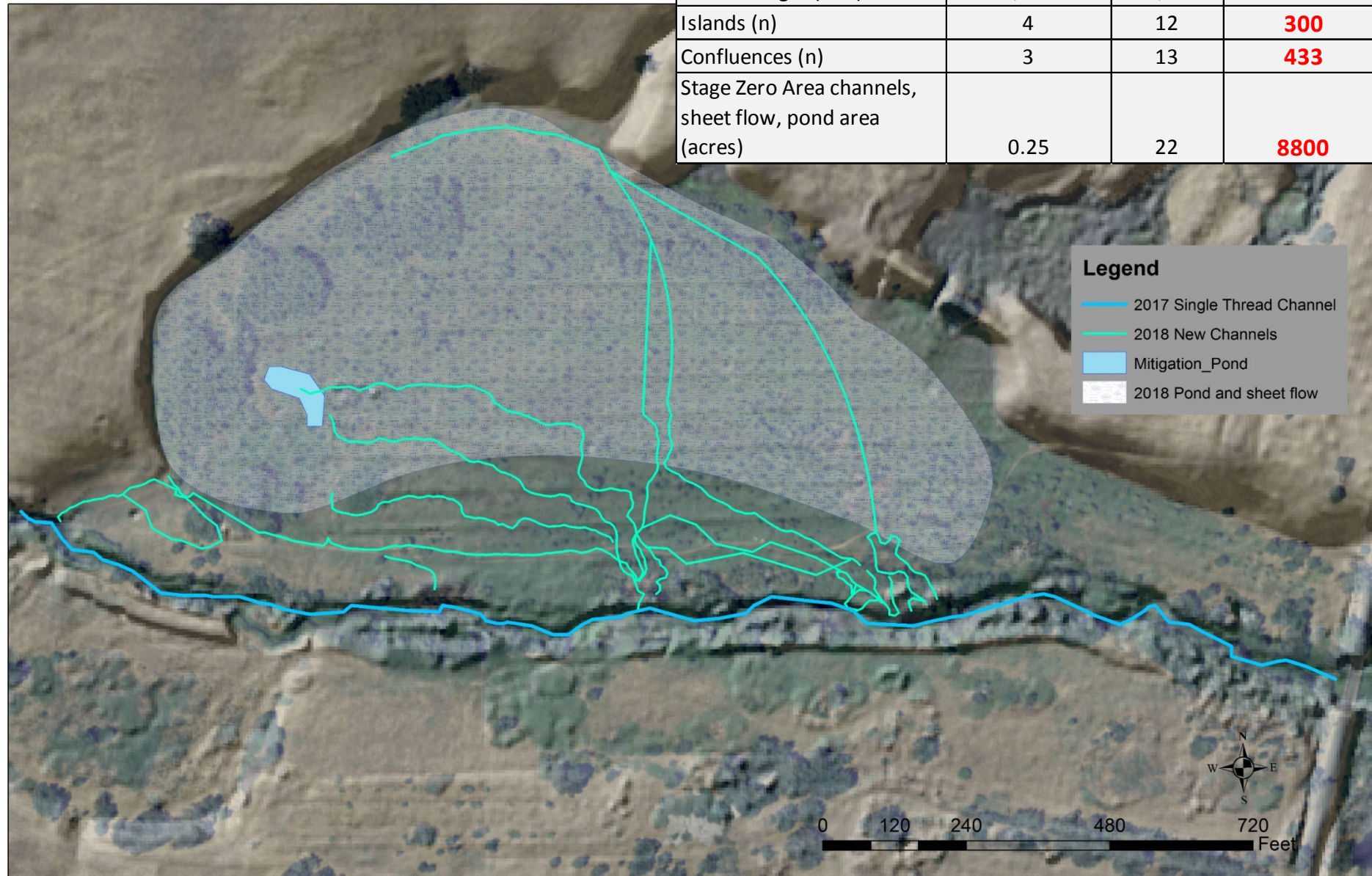


Biog-eomorphic
cycle starting

2018

Gauging Evolution to Stage Zero

Habitat Attributes	2017	2018	% Increase
Stream length (feet)	2,383	10,478	440
Islands (n)	4	12	300
Confluences (n)	3	13	433
Stage Zero Area channels, sheet flow, pond area (acres)	0.25	22	8800



Controlling chaos, predicting chaos, embracing chaos

Aggrading incised channels and breaching levees

Are land managers/stakeholders ready for restored dynamics?

- Livestock
- Infrastructure (roads, trails, recreational access)
- Previous restoration investments (oaks, riparian fencing, off stream watering)
- PLT vision for the site
- **Am I ready for dynamics?**



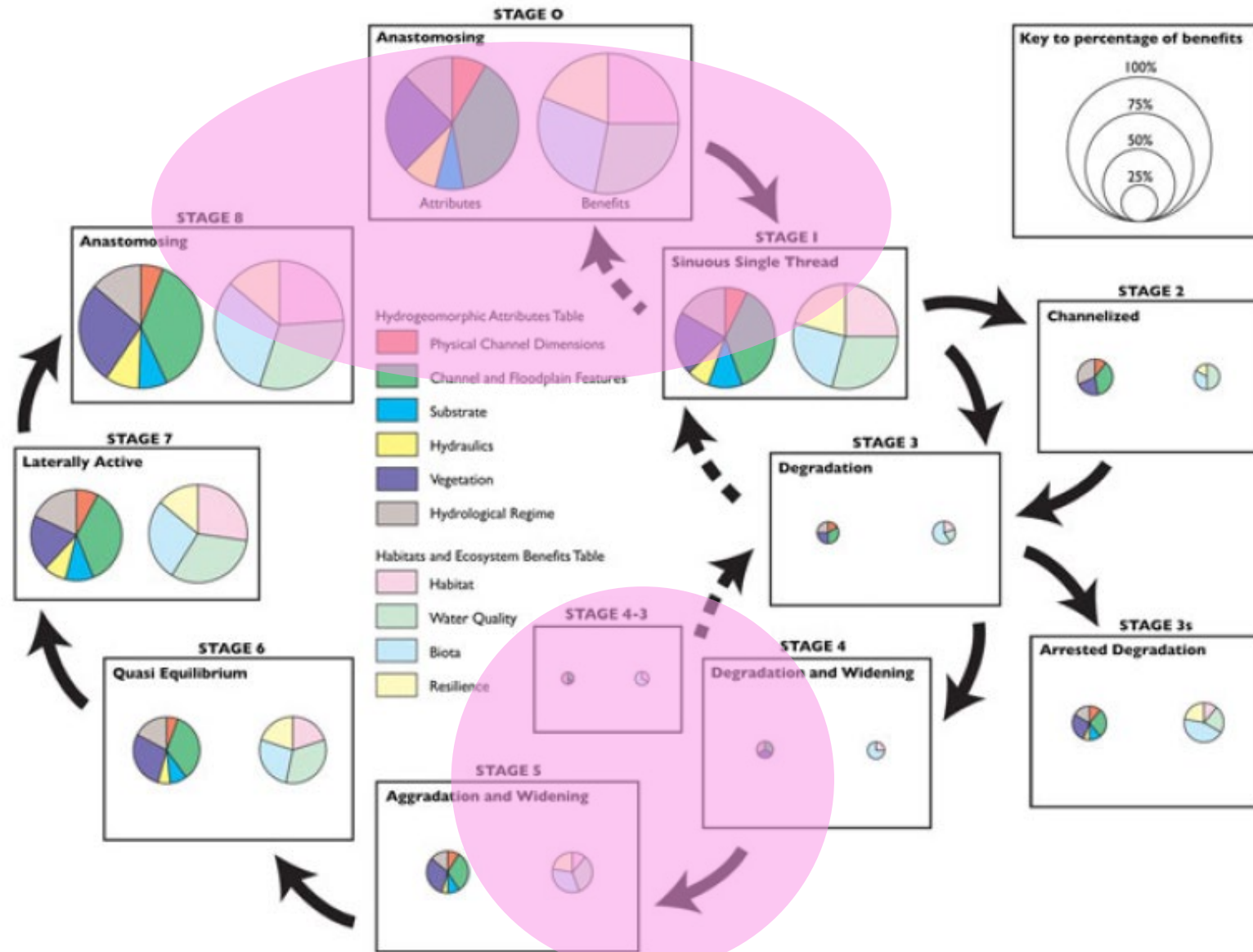


Process space
reconnected

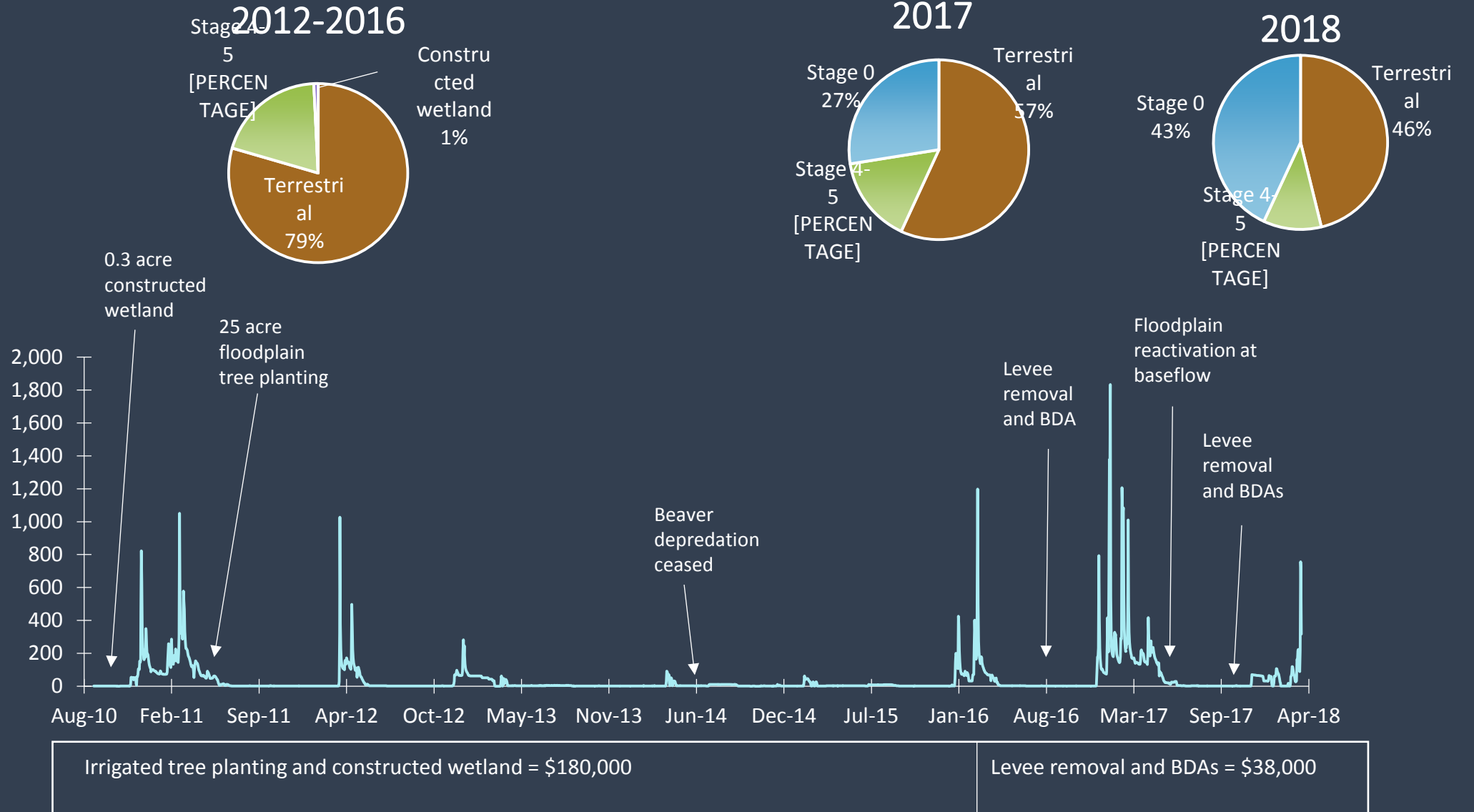
Constriction Dam

Accelerate Process –widening and tree recruitment
using stream energy



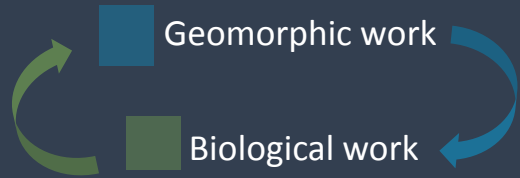


Gauging system recovery





Biogeomorphic Process



3,200 cy sediment
deposition on floodplain





BDA Biogenic
Structure





Depositional Zone

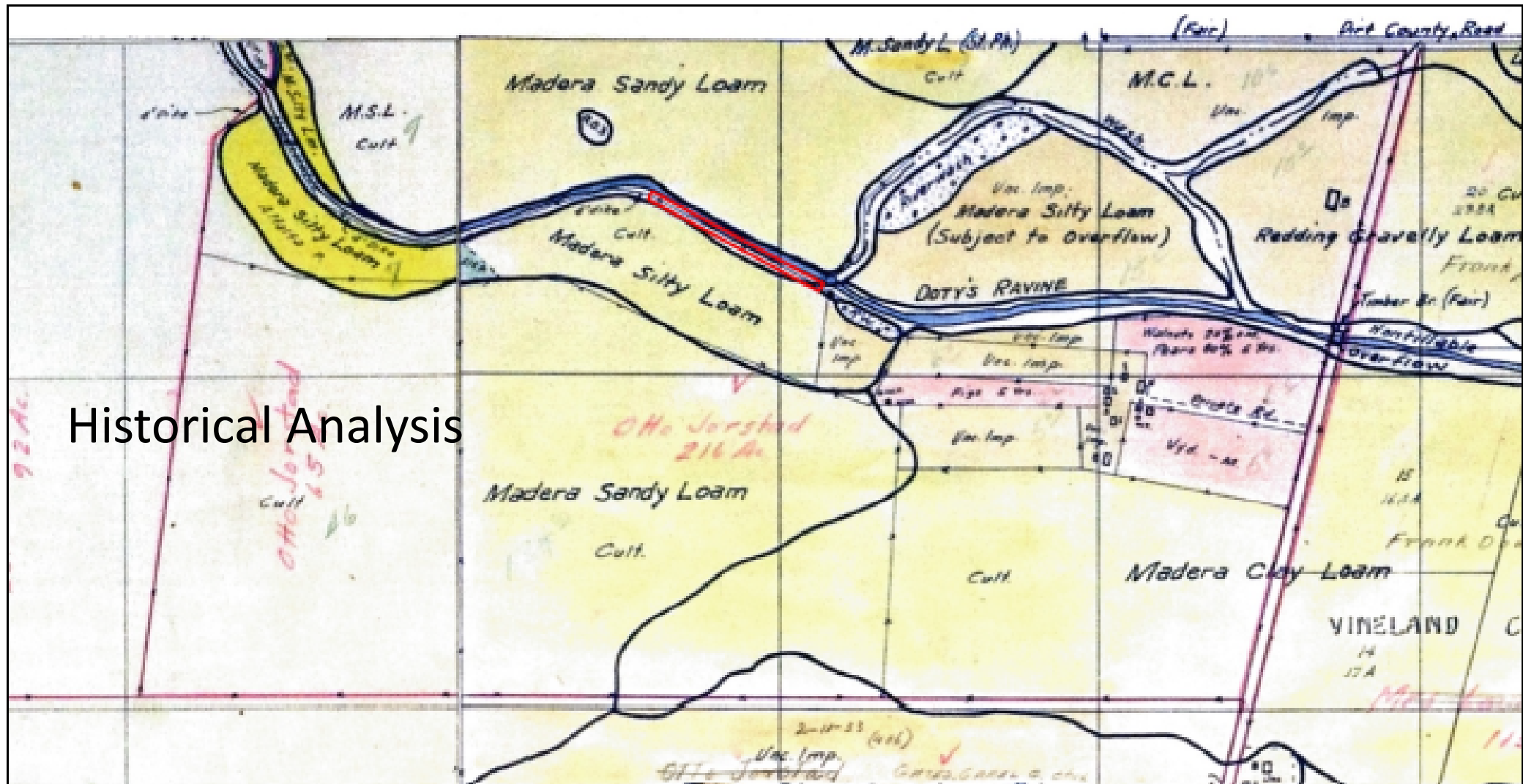


Process Based Design

Design Criteria:

1. Open Dynamic Space
2. Use System Energy
3. Ecologically Appropriate Material Structure

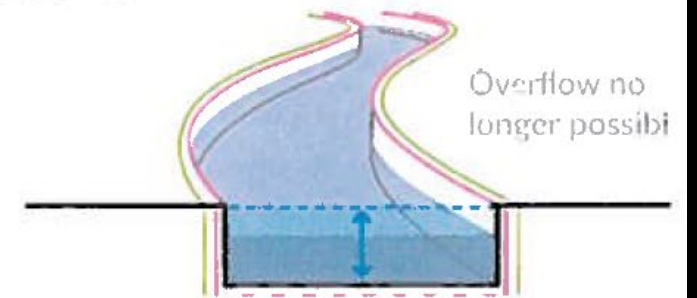
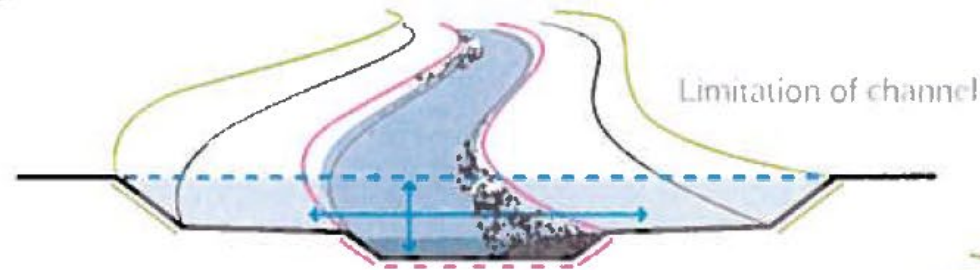
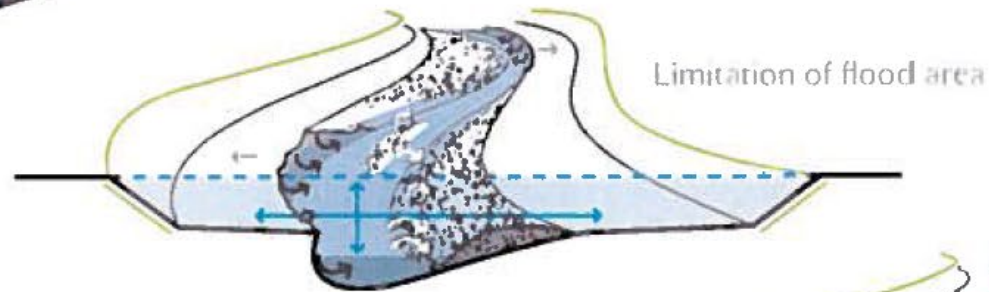
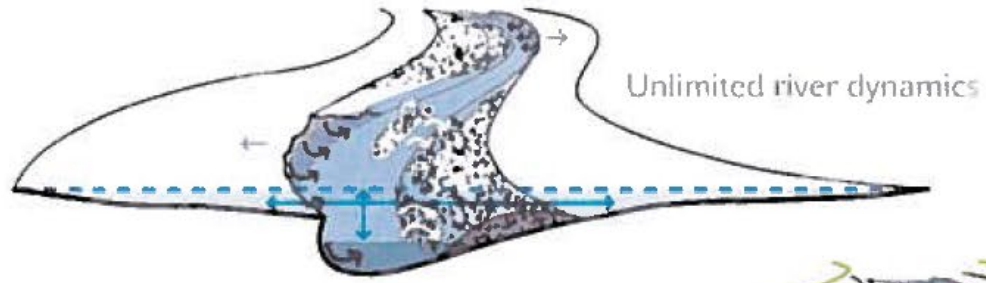
This map displays the Doty Ravine Project Watershed, highlighted in light blue, and the PLT_Property area, outlined in red. The map includes a north arrow and a scale bar indicating distances up to 4 miles. The watershed is situated in a region with various roads, including Kilgus Springs Rd, Big Ben Rd, Mt Pleasant Rd, and Lincoln-Newcastle Hwy. The map also shows surrounding areas like the Hidden Falls Regional Park and the Turkey Creek Golf Club. The legend in the bottom left corner identifies the blue shaded area as the 'Doty Ravine Project Watershed' and the red outline as 'PLT_Property'.



Historical Analysis

Figure 3: Placer County Assessment roll and map dating circa 1901, depicting Township 13 North/Range 6 East, portions of Sections 33 and 34. The map shows useful detail including the Towle Ranch layout, fencing, orchard, and pasture plots, and the south bank levee labelled as "4' dike." Red polygon outlines location of proposed USFWS-Placer Land Trust levee breach.

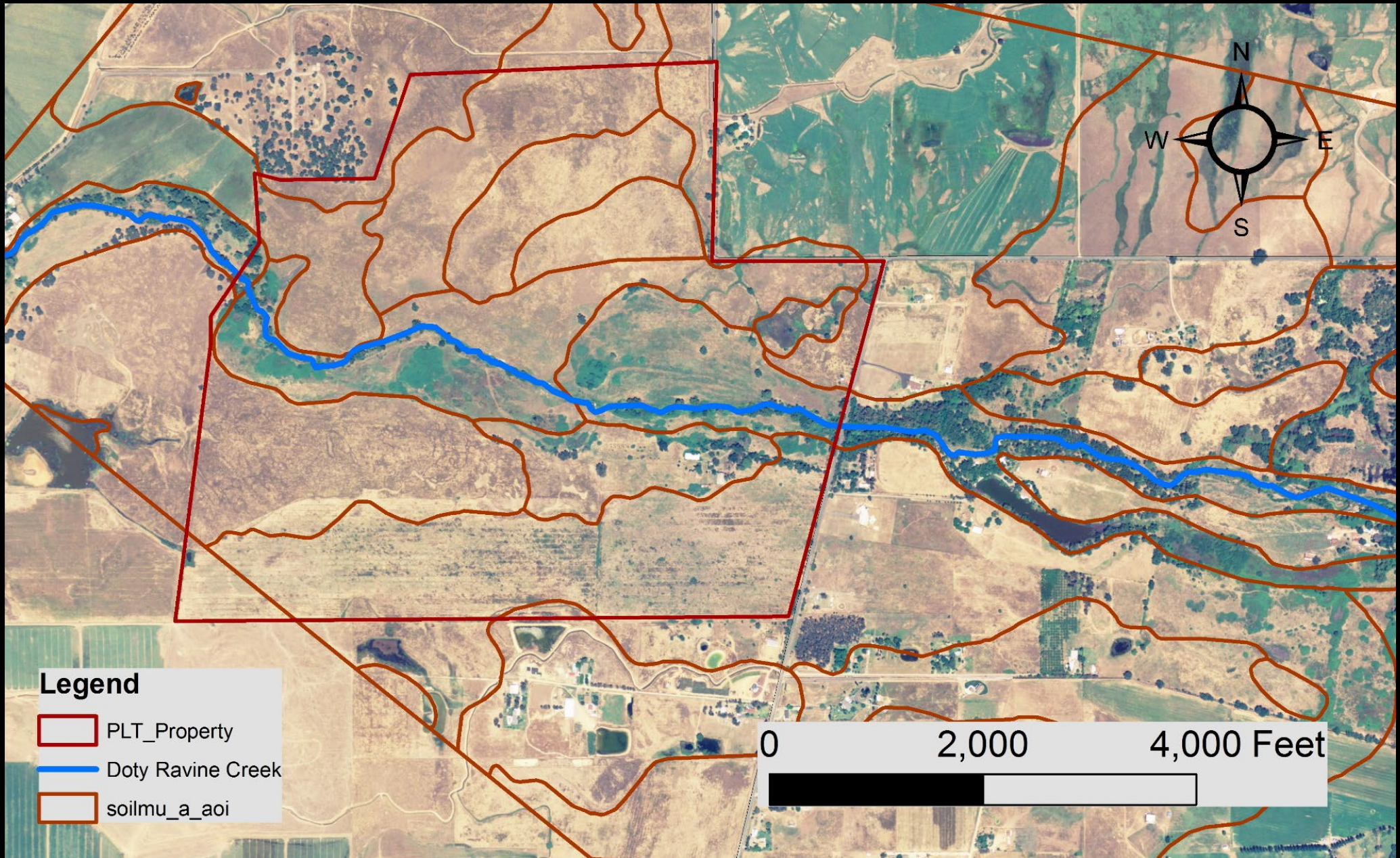
Hoda map

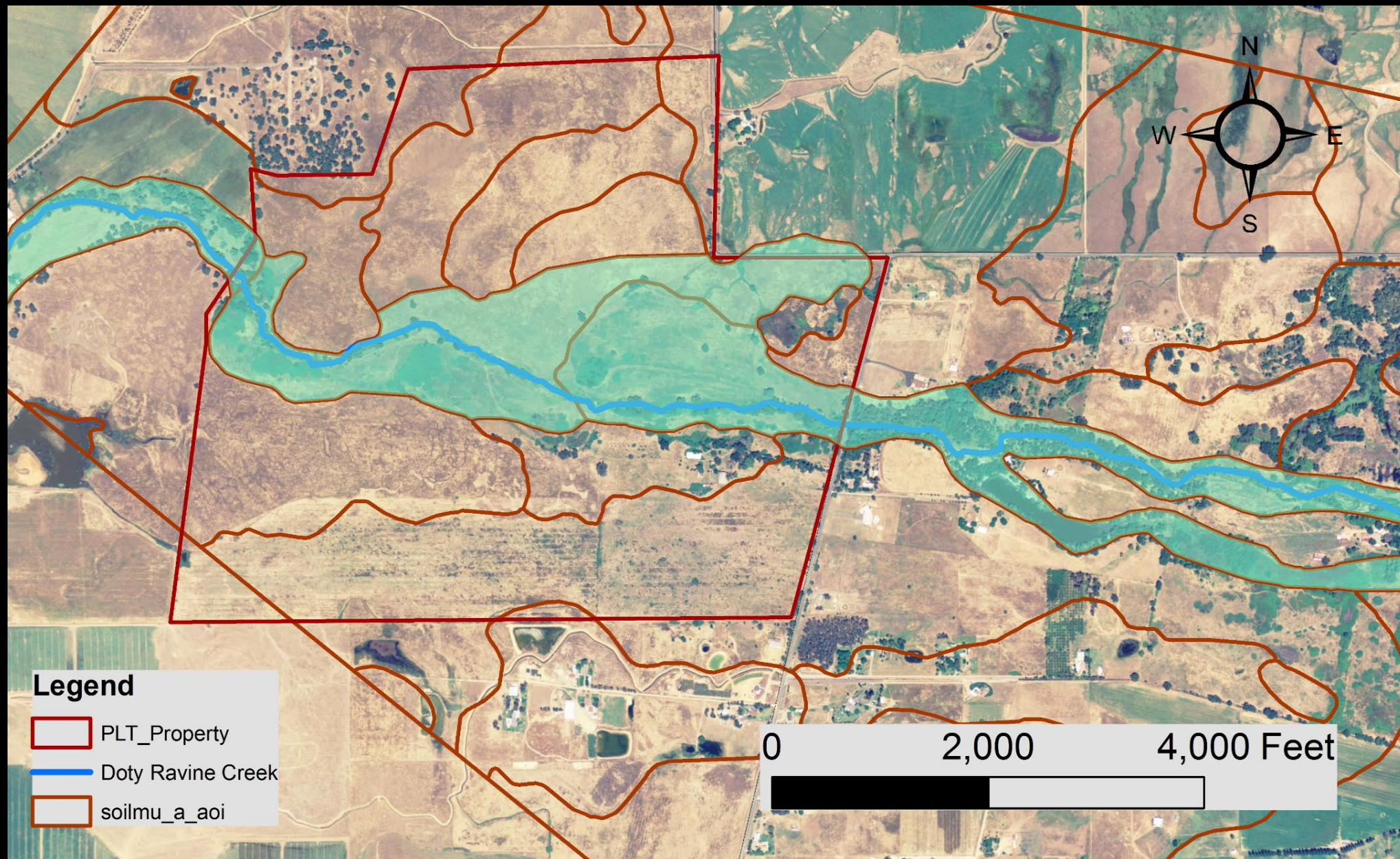


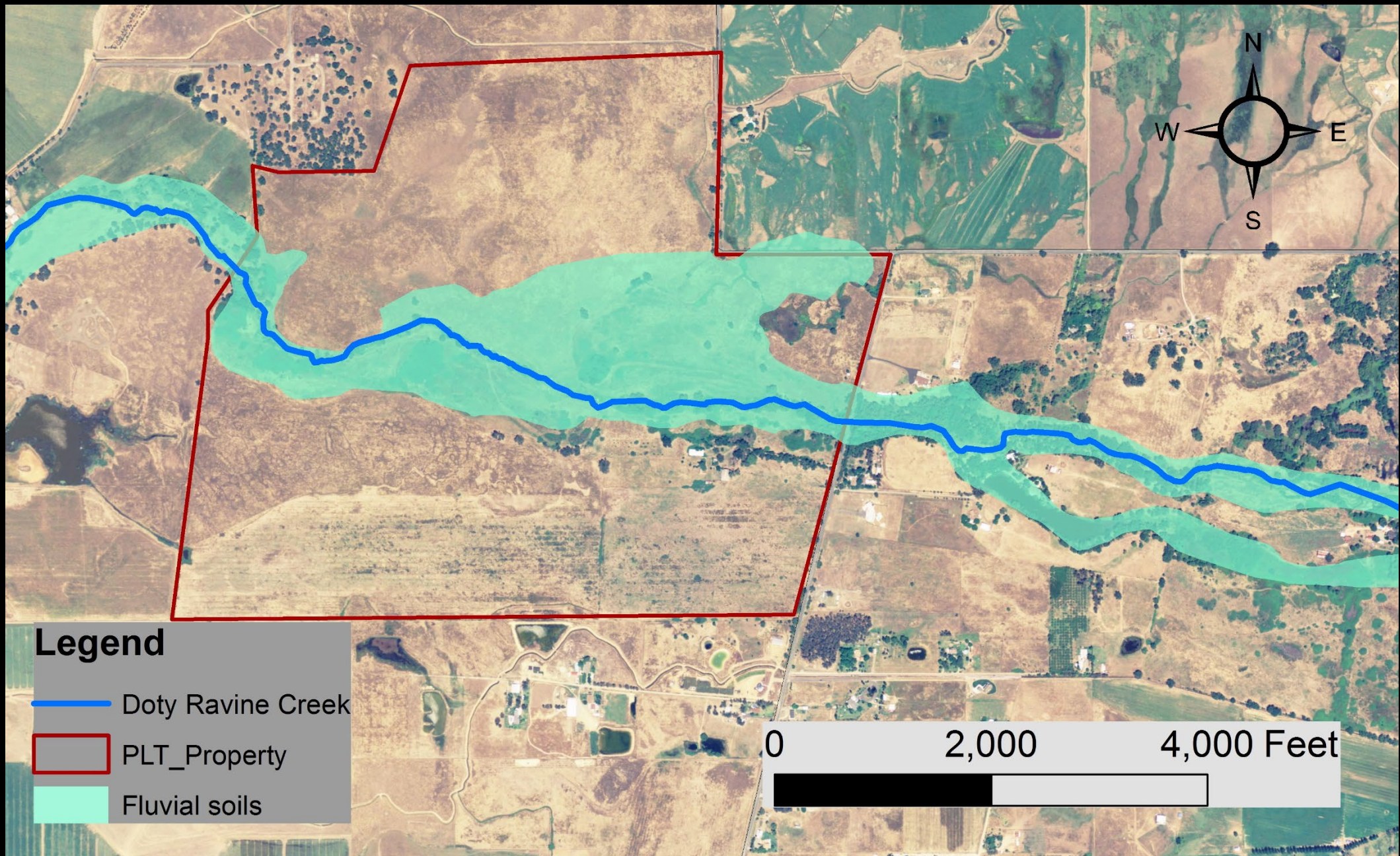
1. What is the natural extent of fluvial dynamic space?
2. What is the current extent of dynamic fluvial space?
3. What are the anthropogenic impacts to fluvial dynamics?
4. What modifications can be made to infrastructure and management to expand fluvial space now or in the future?

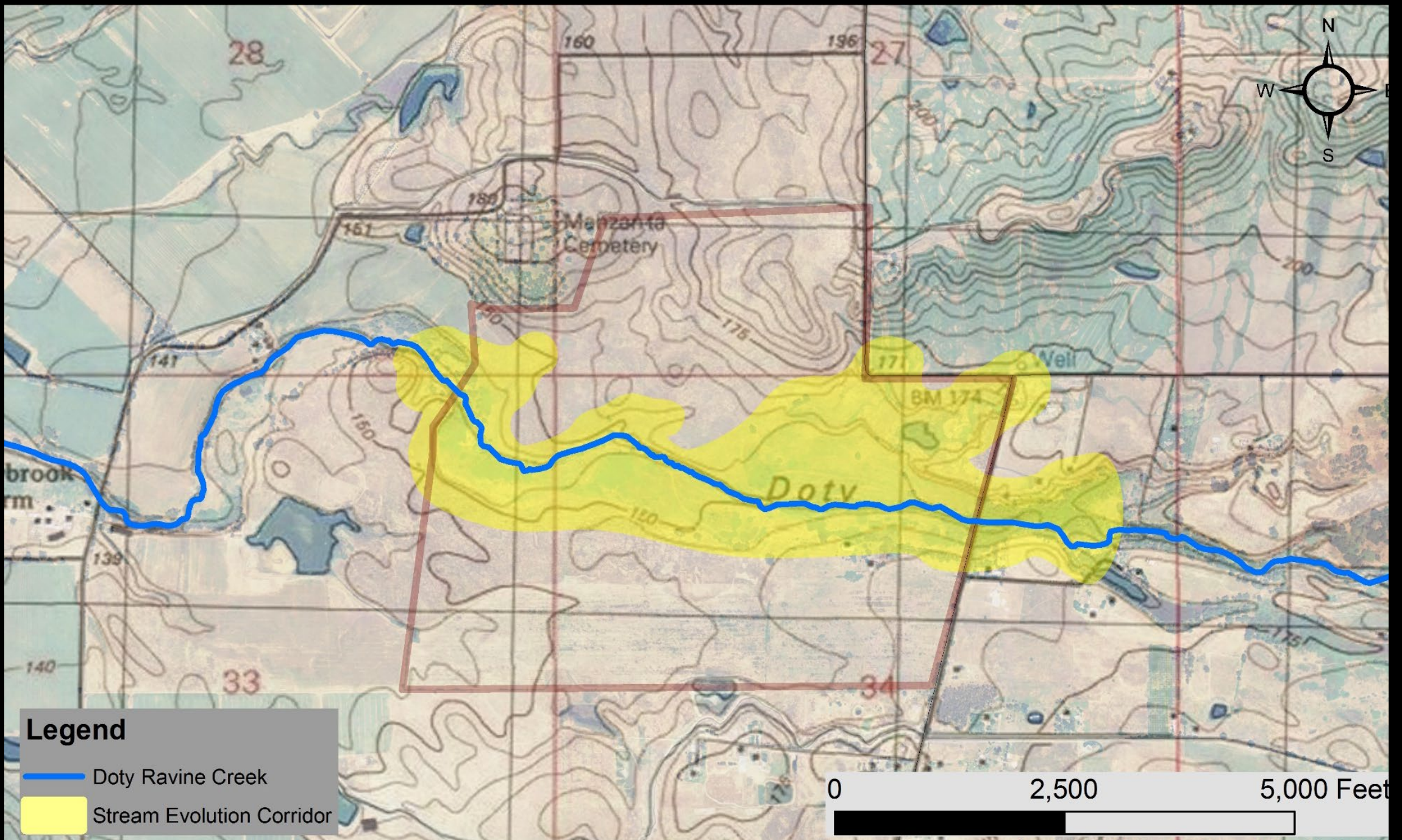
1. Where is or max fluvial dynamic space?
2. Where is our current dynamic fluvial space?
3. Anthropogenic disconnections?
4. Where can we open fluvial space?

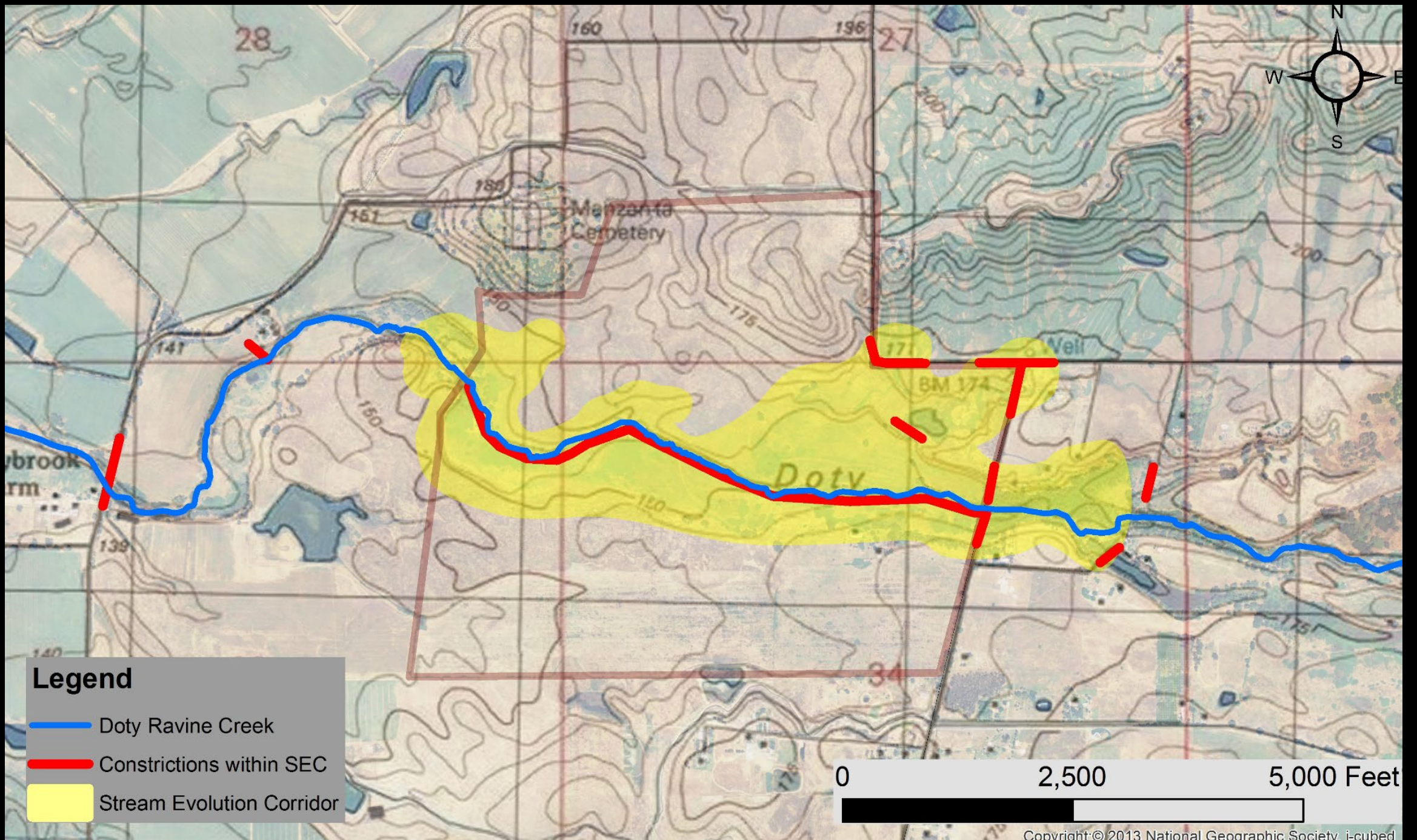


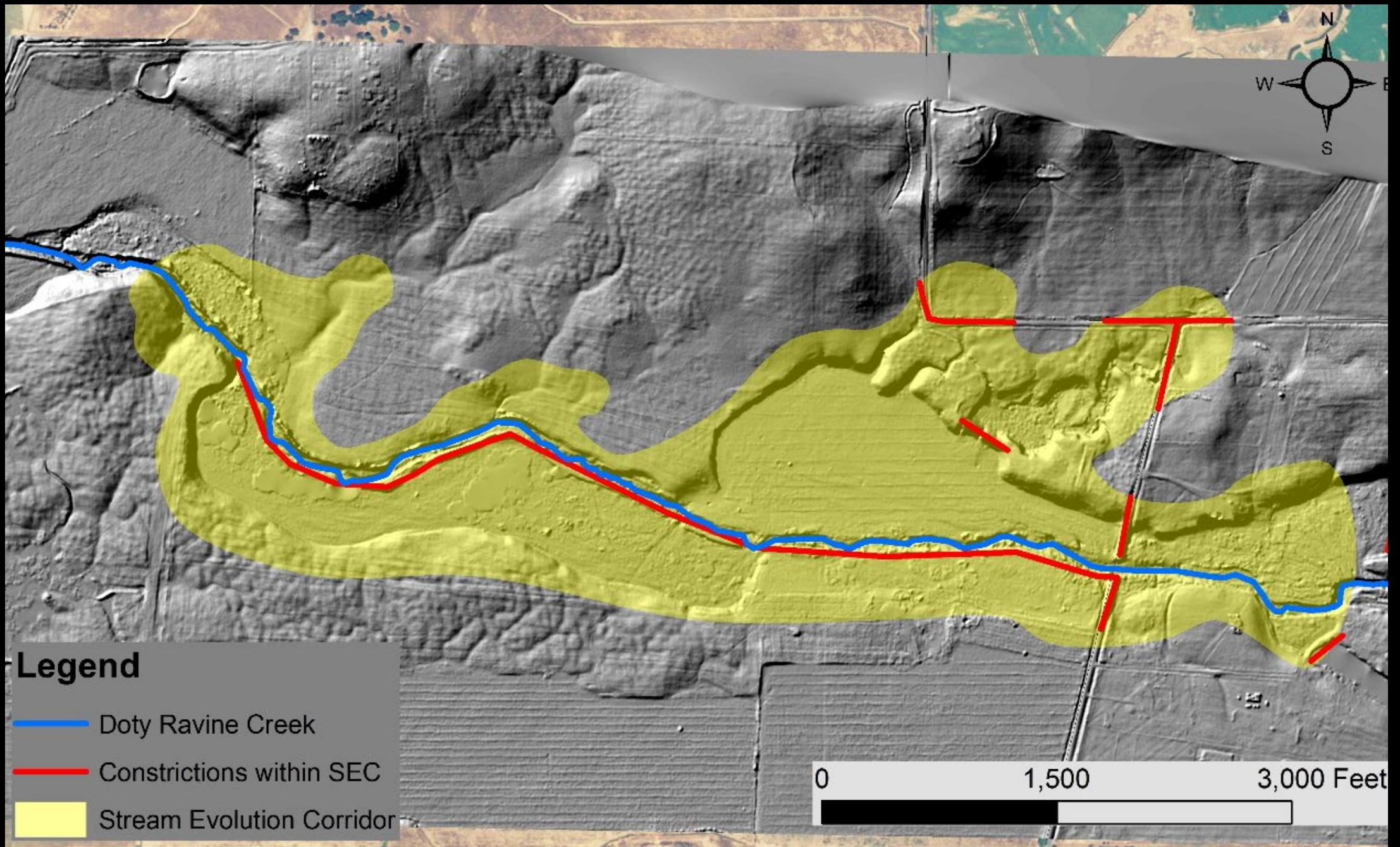


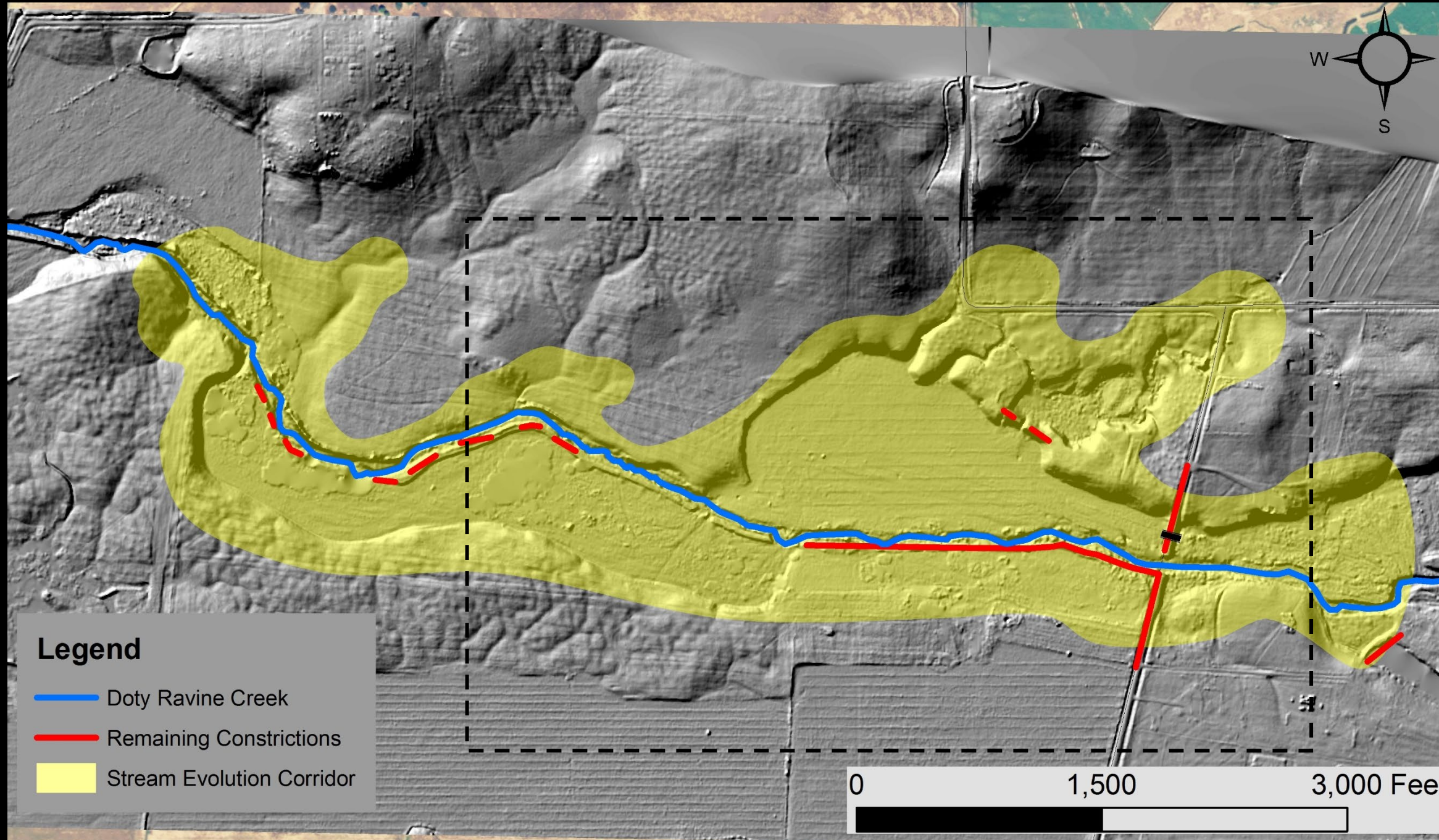












Legend

-  Doty Ravine Creek
-  Remaining Constrictions
-  Stream Evolution Corridor

