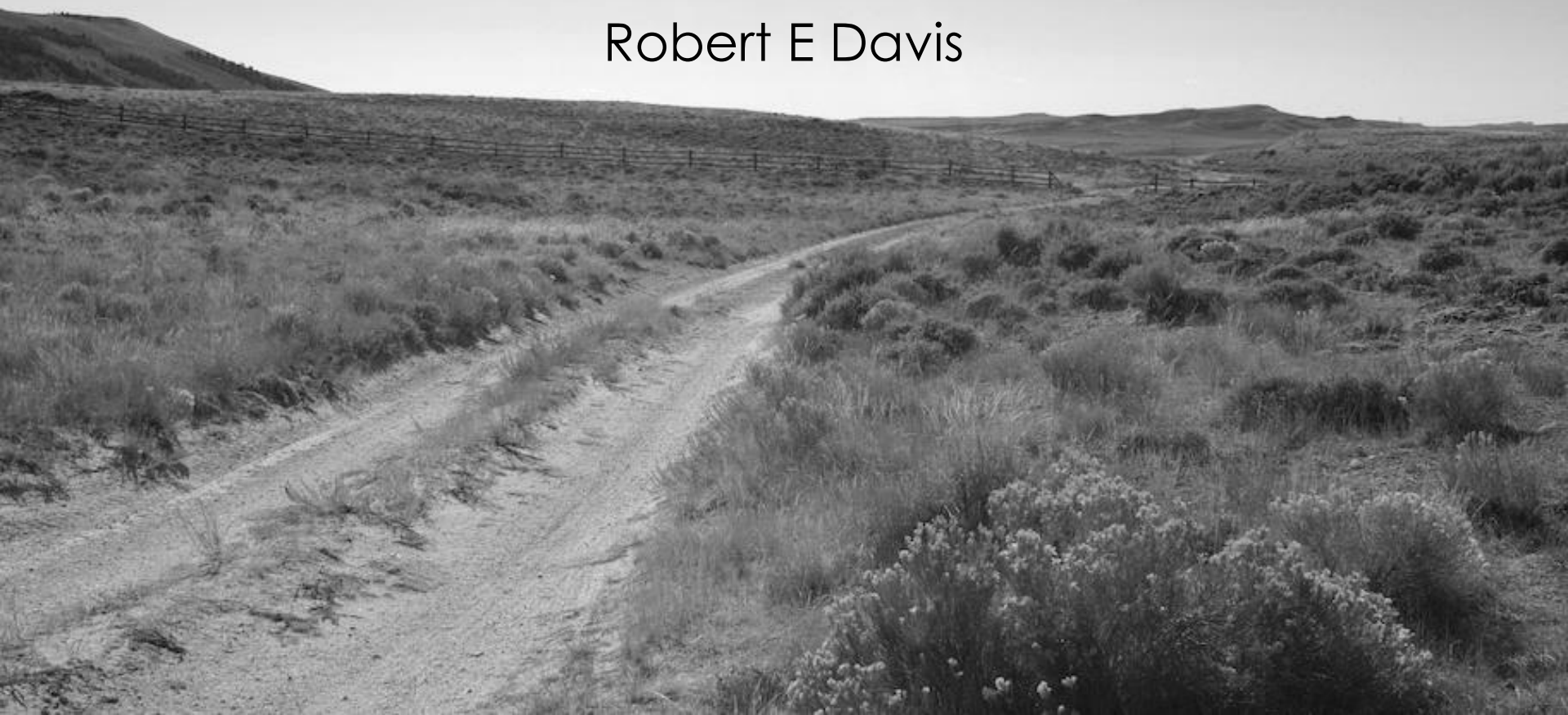
SOUTHWEST WYOMING NINETEENTH CENTURY EMIGRANT TRAILS

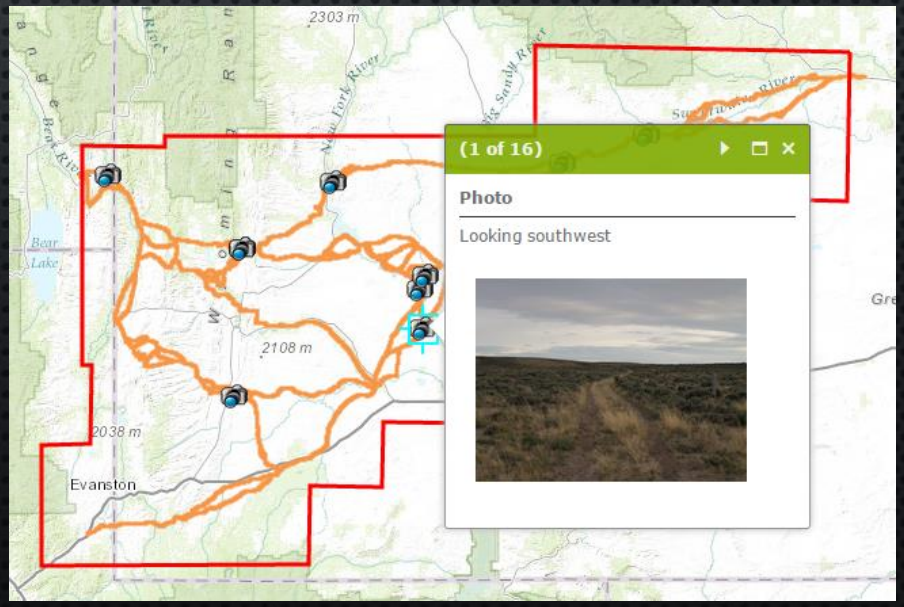
Robert E Davis

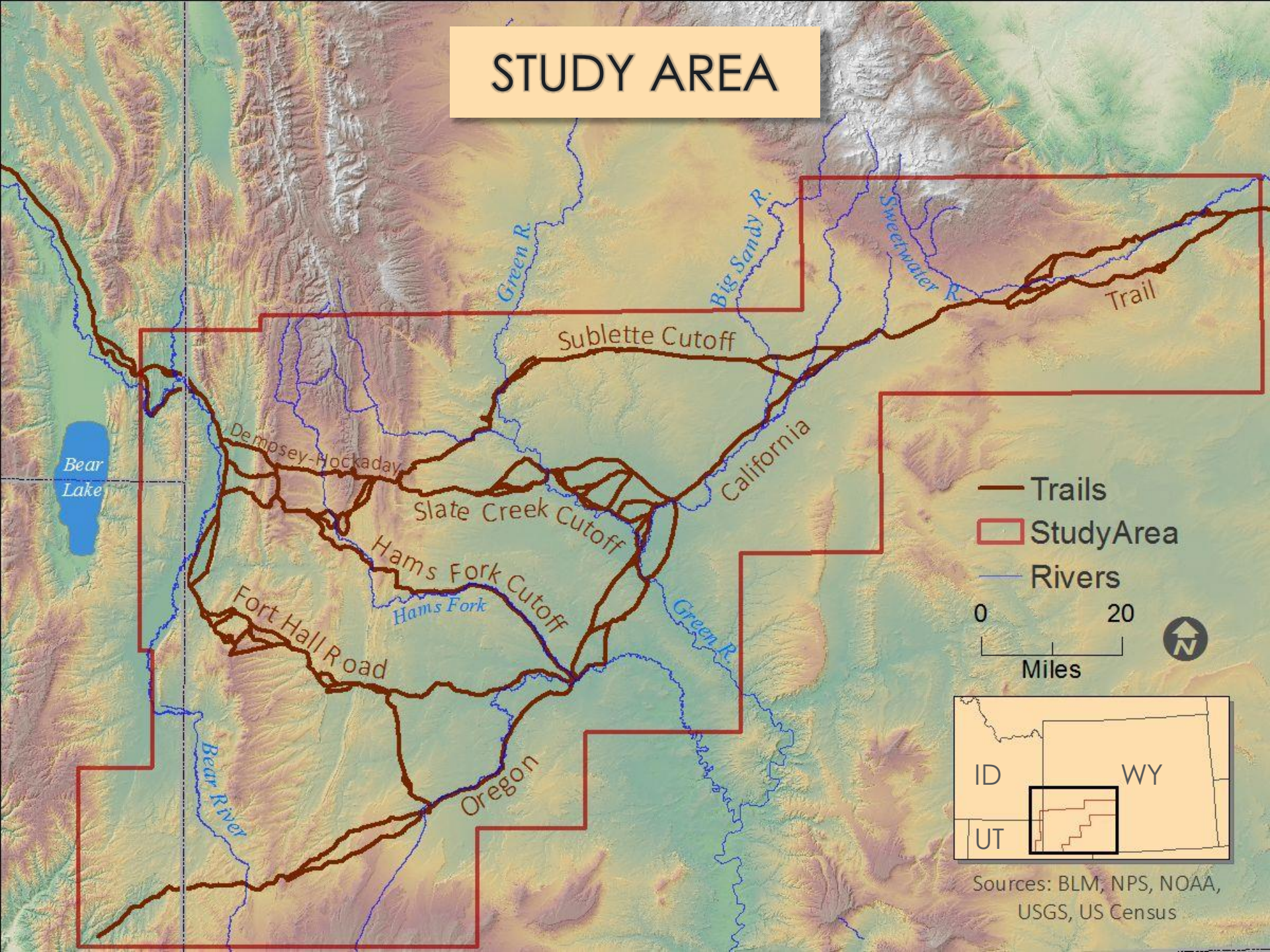


THE WAY FORWARD

- INTRODUCTION – TIME AND PLACE
- LEAST-COST CORRIDORS AND PATHS
- NETWORK ANALYSIS
- ELEVATION PROFILES
- INCORPORATION INTO A WEBSITE
- CONCLUSIONS

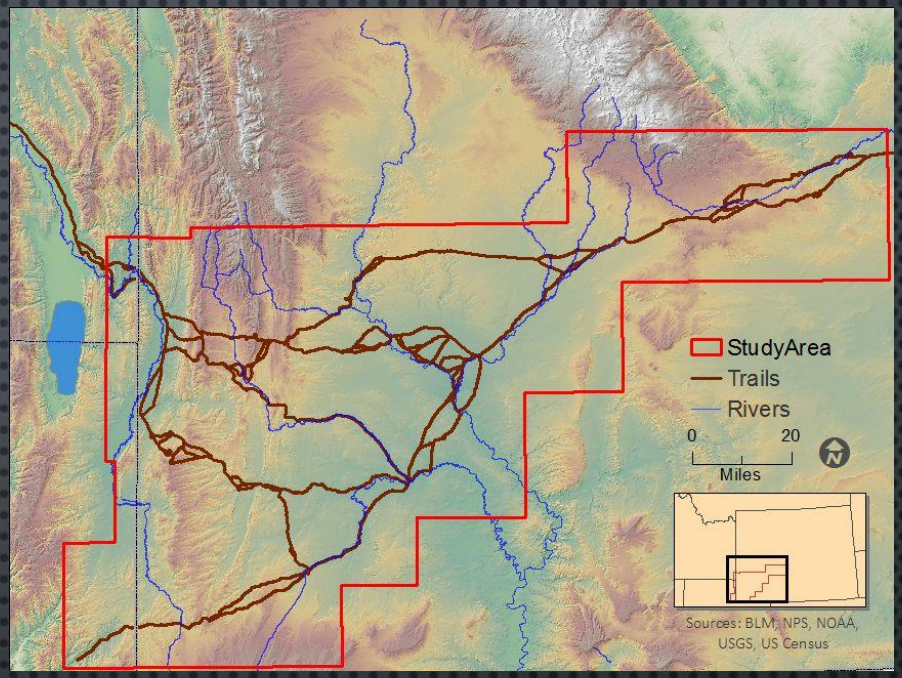

Emigrant Trail

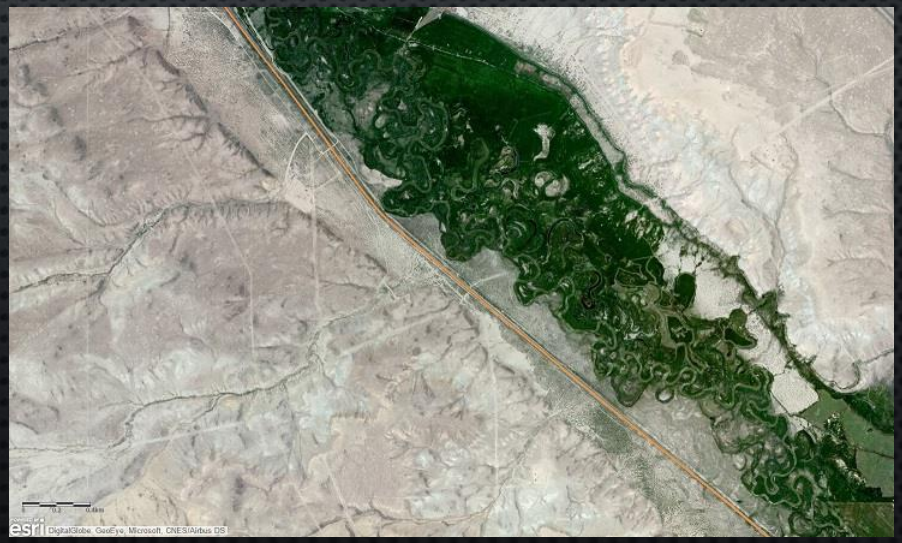



STUDY AREA
Green R.
Big Sandy R.
Sweetwater R.
Trail
Sublette Cutoff
Dempsey-Hockaday
Bear Lake
California
Slate Creek Cutoff
Hams Fork Cutoff
Hams Fork
Fort Hall Road
Green R.
Bear River
Oregon
Trails
StudyArea
Rivers
0
20
Miles
ID
WY
UT
Sources: BLM, NPS, NOAA, USGS, US Census

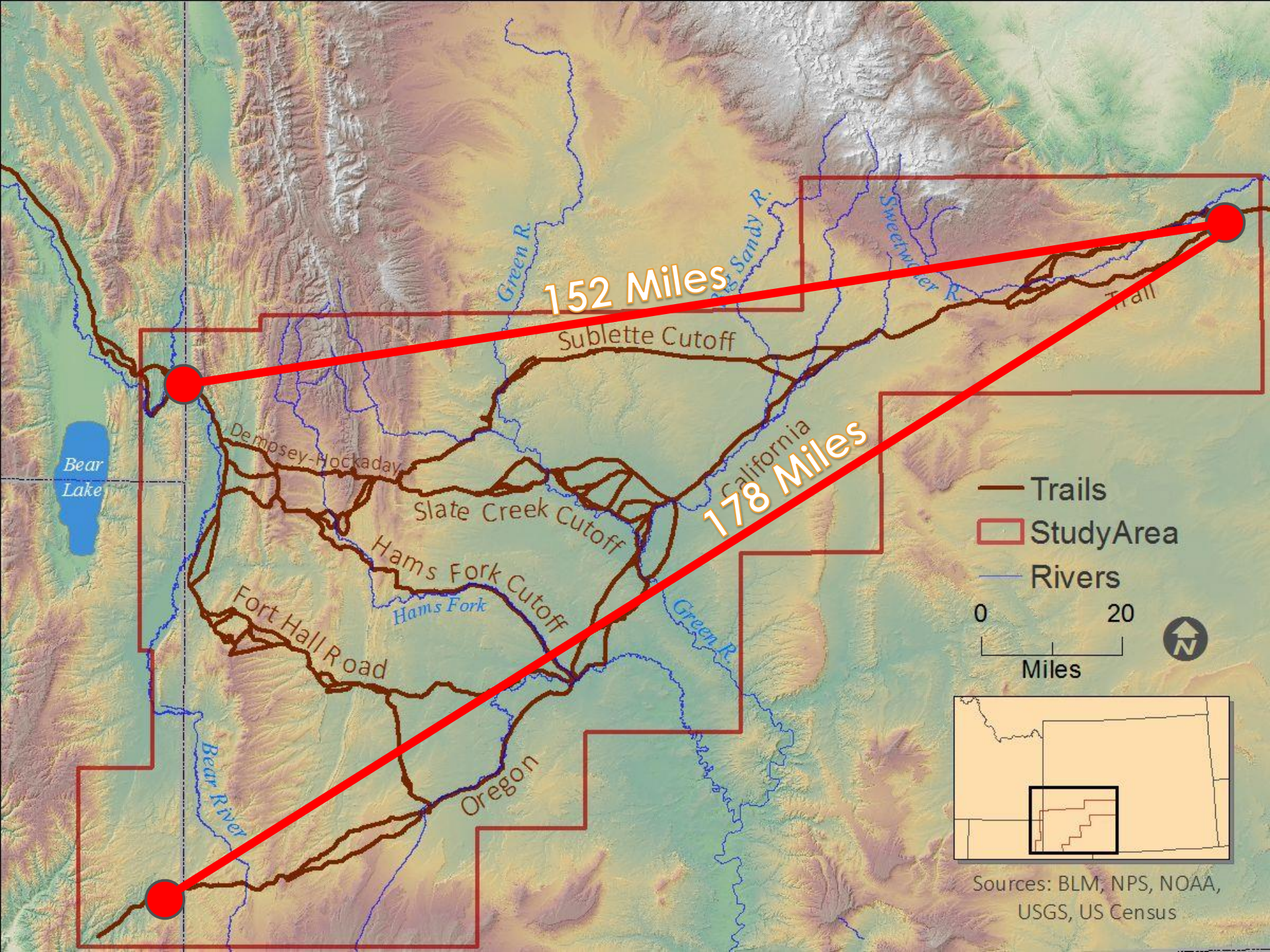
Introduction

- Mid 19th Century
- Americans are migrating to the West, many by wagon
- The wagon trail took several routes in the southwest corner of Wyoming
  - Oregon or California
  - The most direct route across the terrain
  - Resource needs of wagon travel: grass, water, firewood
  - Emigrants create or use 949 miles of trail to cross roughly 150 miles of terrain



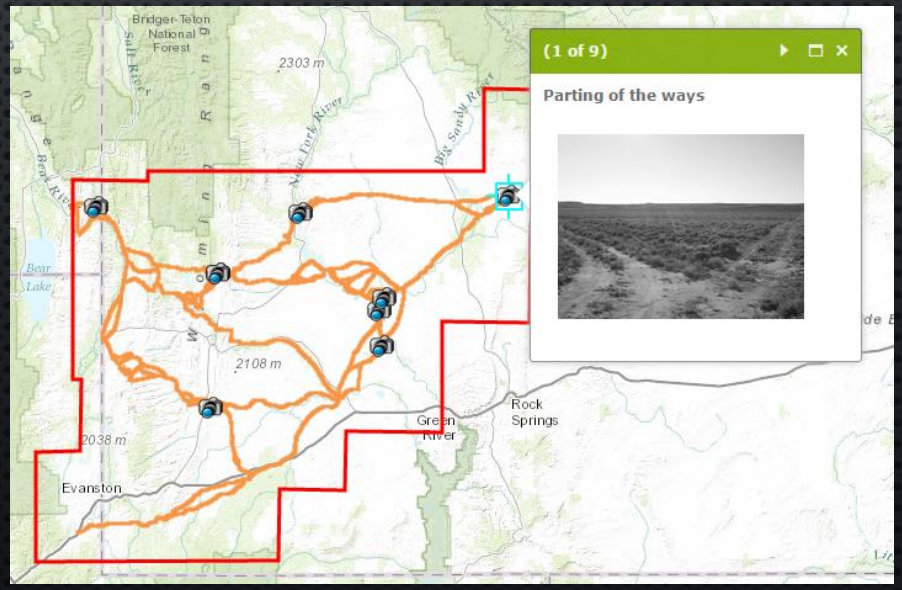


Green River


152 Miles
178 Miles
Sublette Cutoff
Dempsey-Hockaday
Slate Creek Cutoff
Hams Fork Cutoff
Fort Hall Road
California
Oregon
Trail
Green R.
Big Sandy R.
Sweetwater R.
Hams Fork
Green R.
Bear River
Bear Lake
Trails
StudyArea
Rivers
0
20
Miles
N
Sources: BLM, NPS, NOAA, USGS, US Census

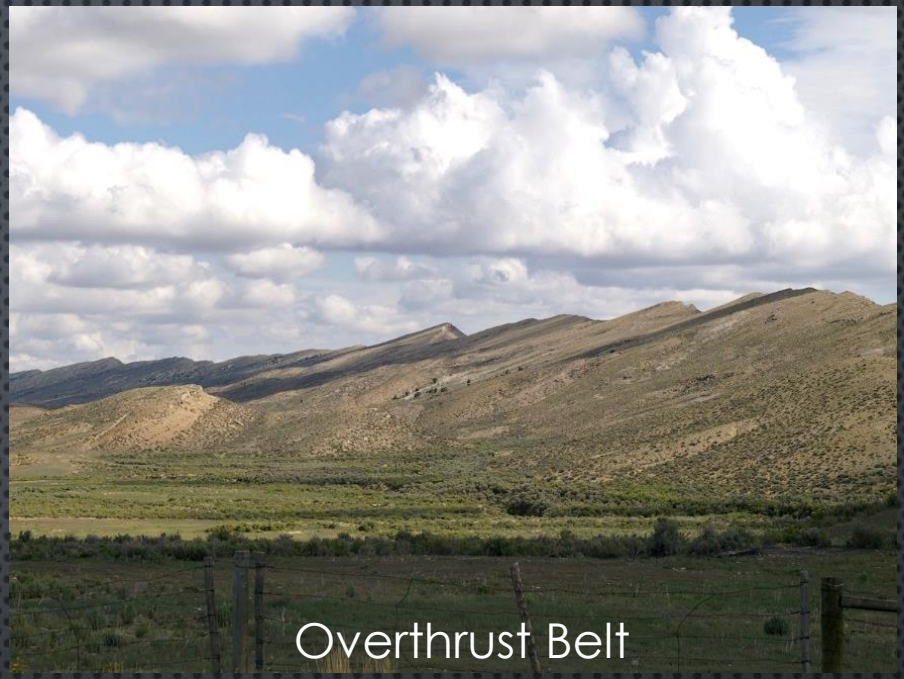
Introduction

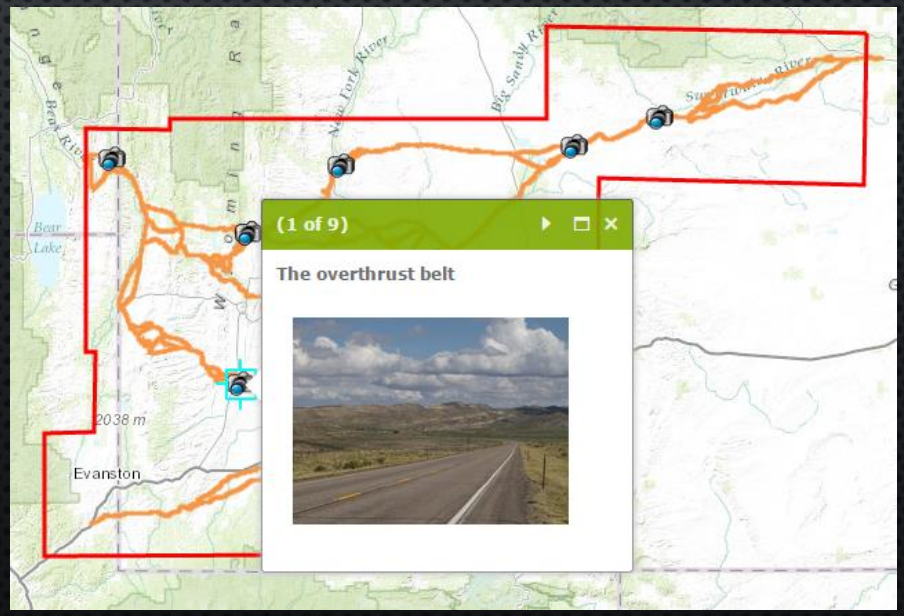
- Considering:
  - The study area
  - The short route, or the resource route
  - And the terrain
- Which were the best routes across the study area?
- Did the emigrants take these routes?
- Can this information fit on the web? (In short, yes)



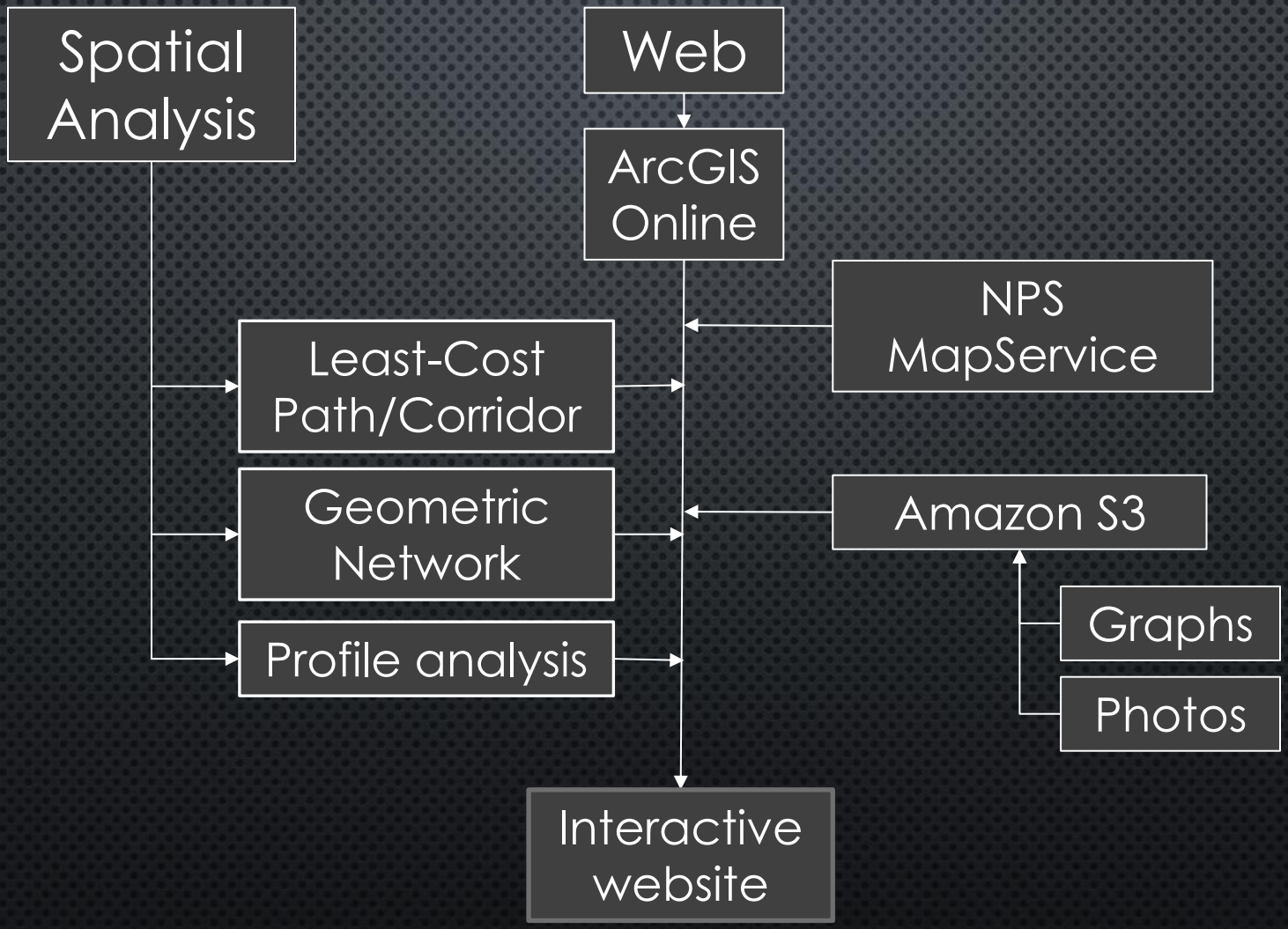
METHOD

- DATA USED:
  - USGS DIGITAL ELEVATION MODELS (10M AND 30M)
  - NOAA RIVER DATA
  - BLM AND NPS TRAIL DATA
- NAD 1983, UTM 12


Overthrust Belt



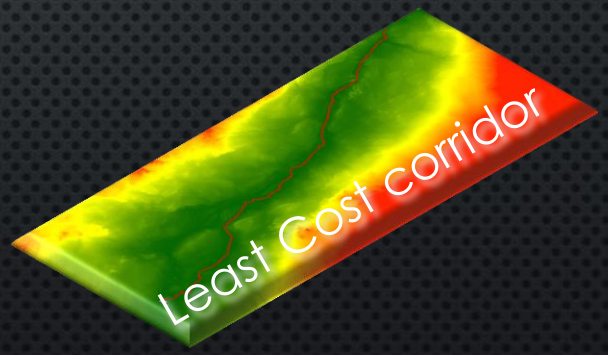
METHOD


Spatial Analysis
Web
ArcGIS Online
NPS MapService
Least-Cost Path/Corridor
Geometric Network
Amazon S3
Graphs
Photos
Profile analysis
Interactive website

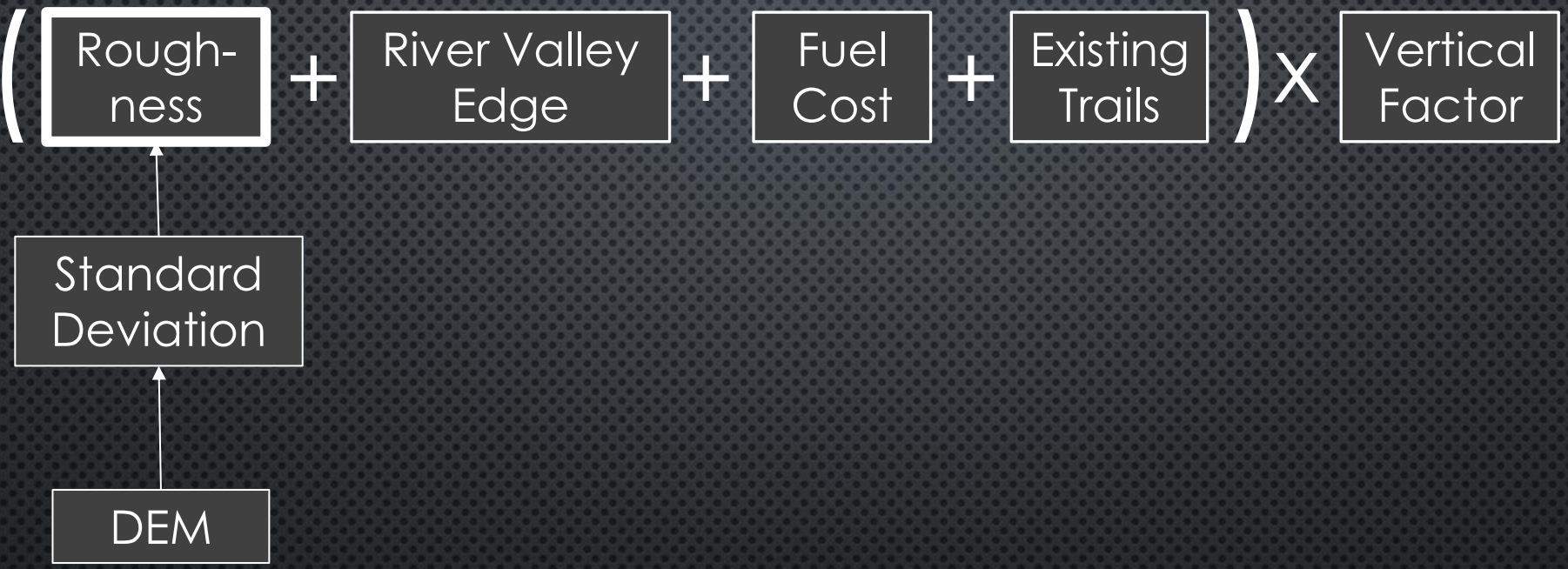
METHOD: DETERMINE THE PATH OF LEAST RESISTANCE AND MAXIMUM RESOURCES

COST PATH TOOL

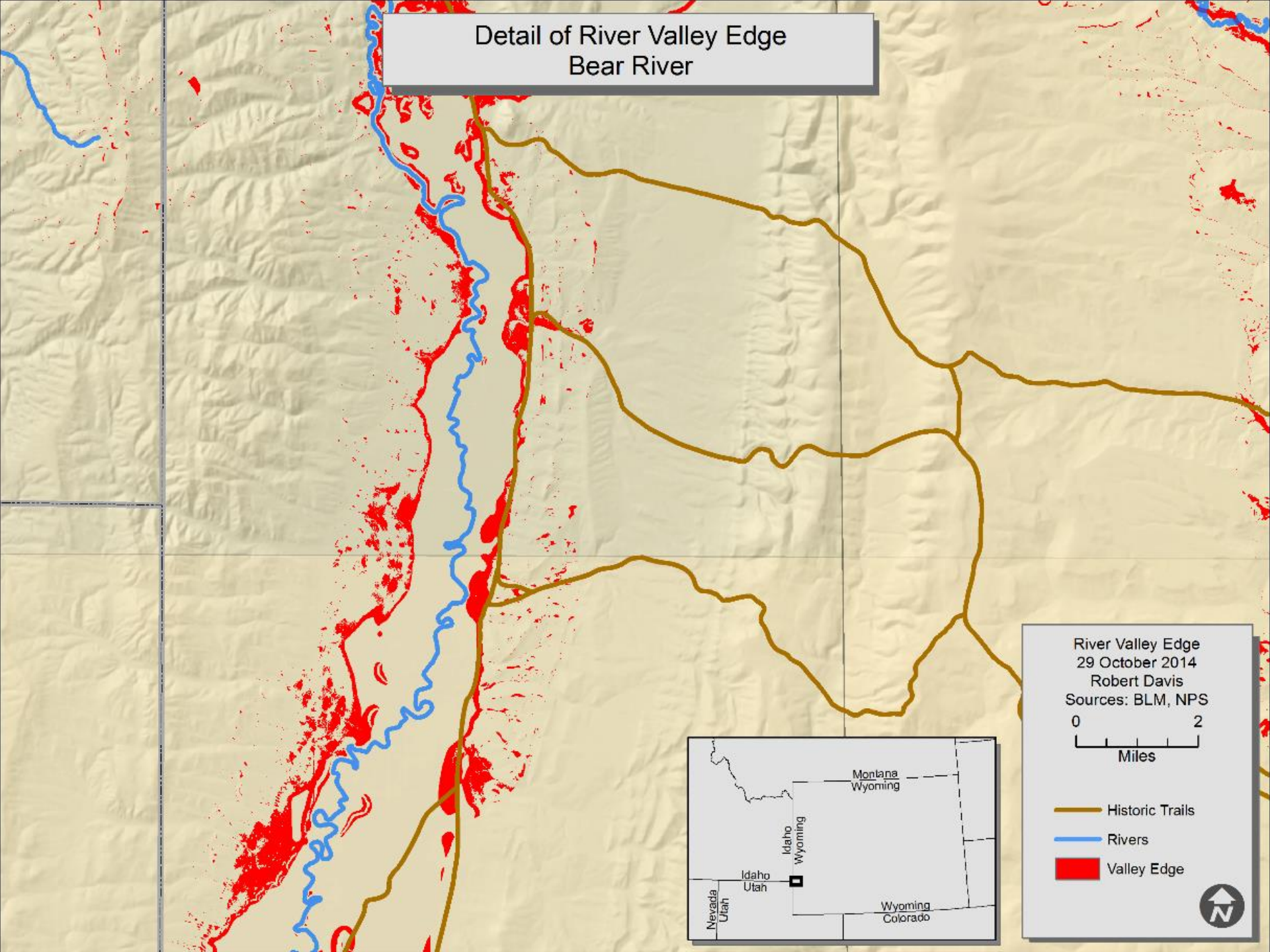
CORRIDOR TOOL



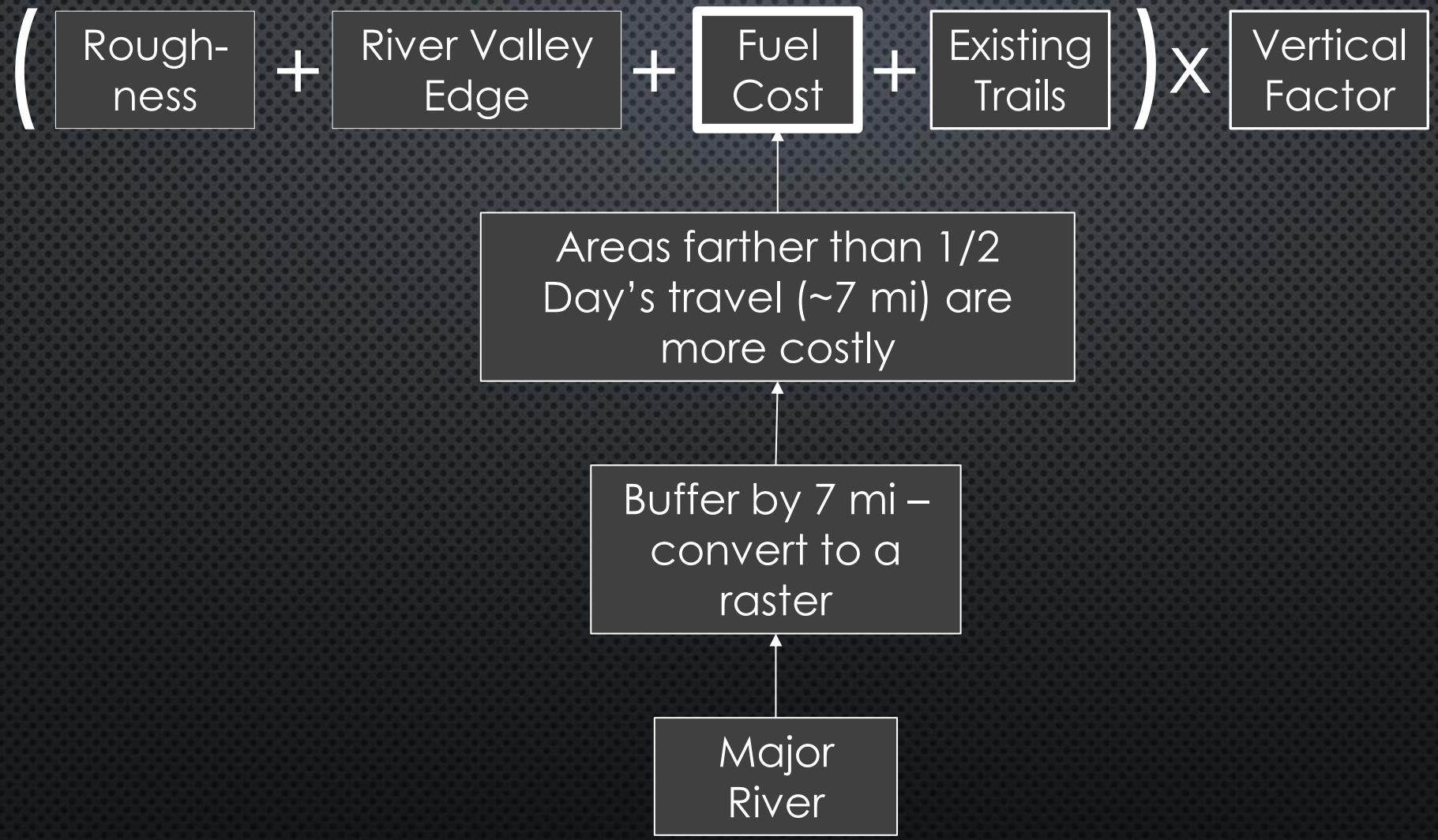
METHOD – COST SURFACE



METHOD – COST SURFACE


Detail of River Valley Edge
Bear River
River Valley Edge
29 October 2014
Robert Davis
Sources: BLM, NPS
0
2
Miles
Historic Trails
Rivers
Valley Edge
N
Montana
Wyoming
Idaho
Wyoming
Idaho
Utah
Nevada
Utah
Wyoming
Colorado

METHOD – COST SURFACE

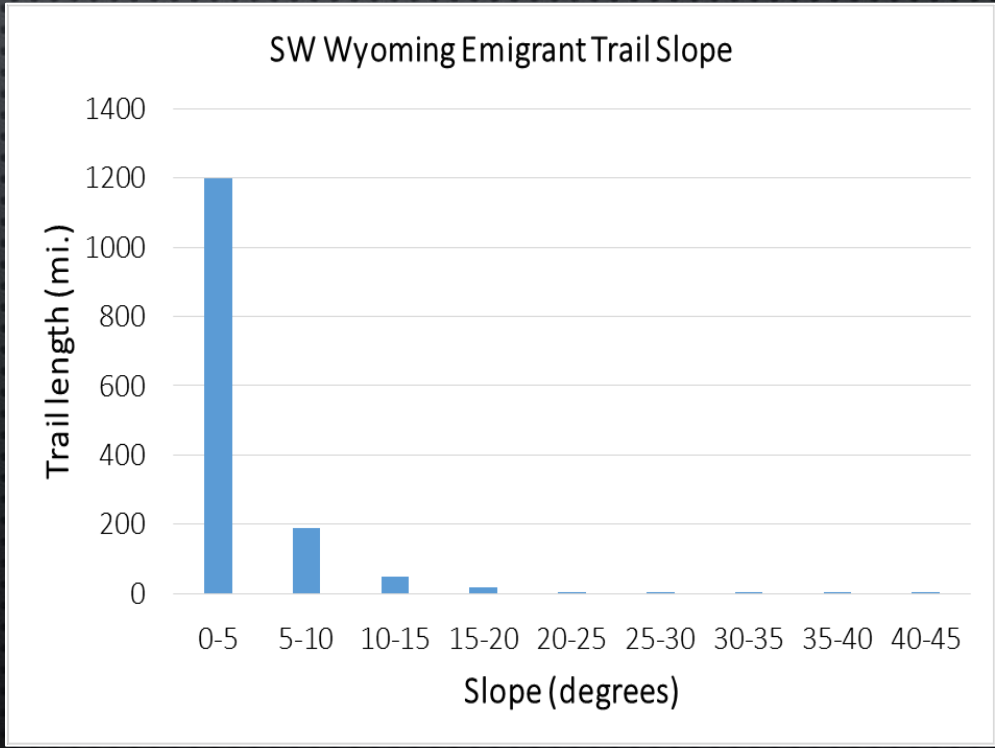


METHOD – COST SURFACE

METHOD – COST PATH

(Rough-ness + River Valley Edge + Fuel Cost + Existing Trails) x Vertical Factor

- A SLOPE RASTER WAS CREATED FROM A DEM
- RECLASSIFIED EVERY FIVE DEGREES
- CONVERTED TO A POLYGON LAYER WITH SLOPE AS AN ATTRIBUTE
- TRAIL LAYER WAS "IDENTIFIED" TO THE POLYGON'S SLOPE



METHOD – COST PATH

(Rough-ness + River Valley Edge + Fuel Cost + Existing Trails) x Vertical Factor

TRAIL (DEG)	LENGTH	COST
0-5	1200 MI.	1
5-10	188 MI.	8
10-15	50 MI.	30
15-20	17 MI.	84
20-25	3 MI.	471
25-45	1 MI.	785

Total length / slope length = Cost
e. g. 1460 / 188 = 8

METHOD – COST PATH

(Rough-ness + River Valley Edge + Fuel Cost + Existing Trails) x Vertical Factor

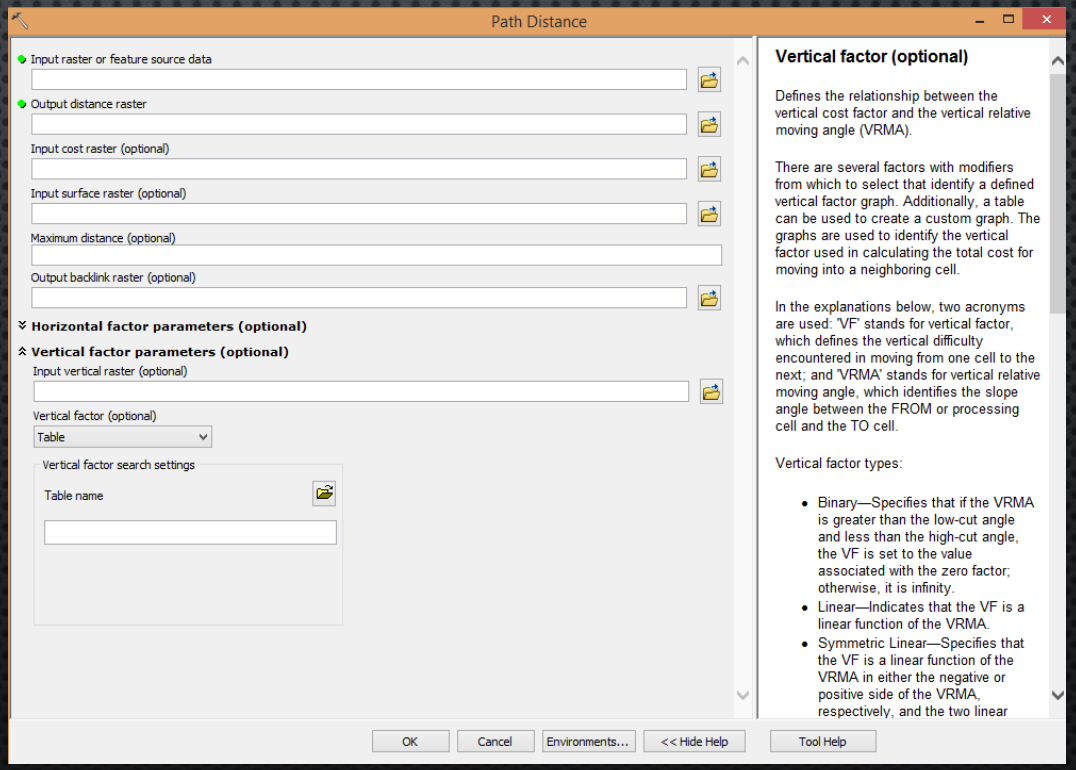
- A WEIGHT IS ASSIGNED TO BALANCE THE VF TO THE SUM OF THE MAXIMUMS OF THE OTHER FACTORS
- RESULTS IN A TABLE OF VERTICAL FACTORS:

SLOPE	VF
0-5	1.04
5-10	1.4
10-15	2.4
15-20	4.8
20-25	22.3
25-45	36.5

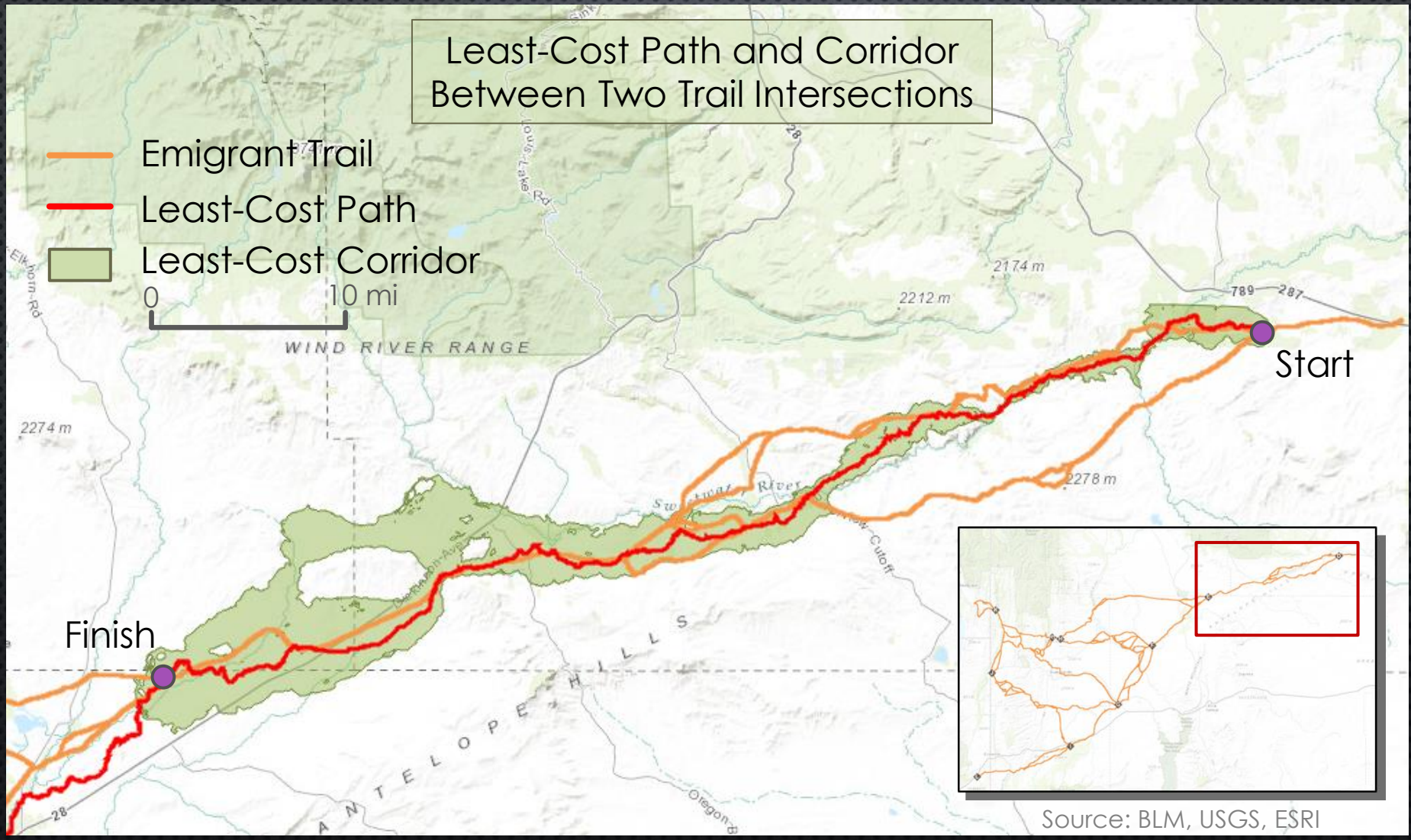
METHOD – COST PATH

(Rough-ness + River Valley Edge + Fuel Cost + Existing Trails) x Vertical Factor

-45	100
-40	10
-35	2
-30	.7
-25	.6
-20	.5
-15	.6
-10	.7
-5	.8
0	1.0
5	1.4
10	2.4
15	4.8
20	22.3
>25	36.5

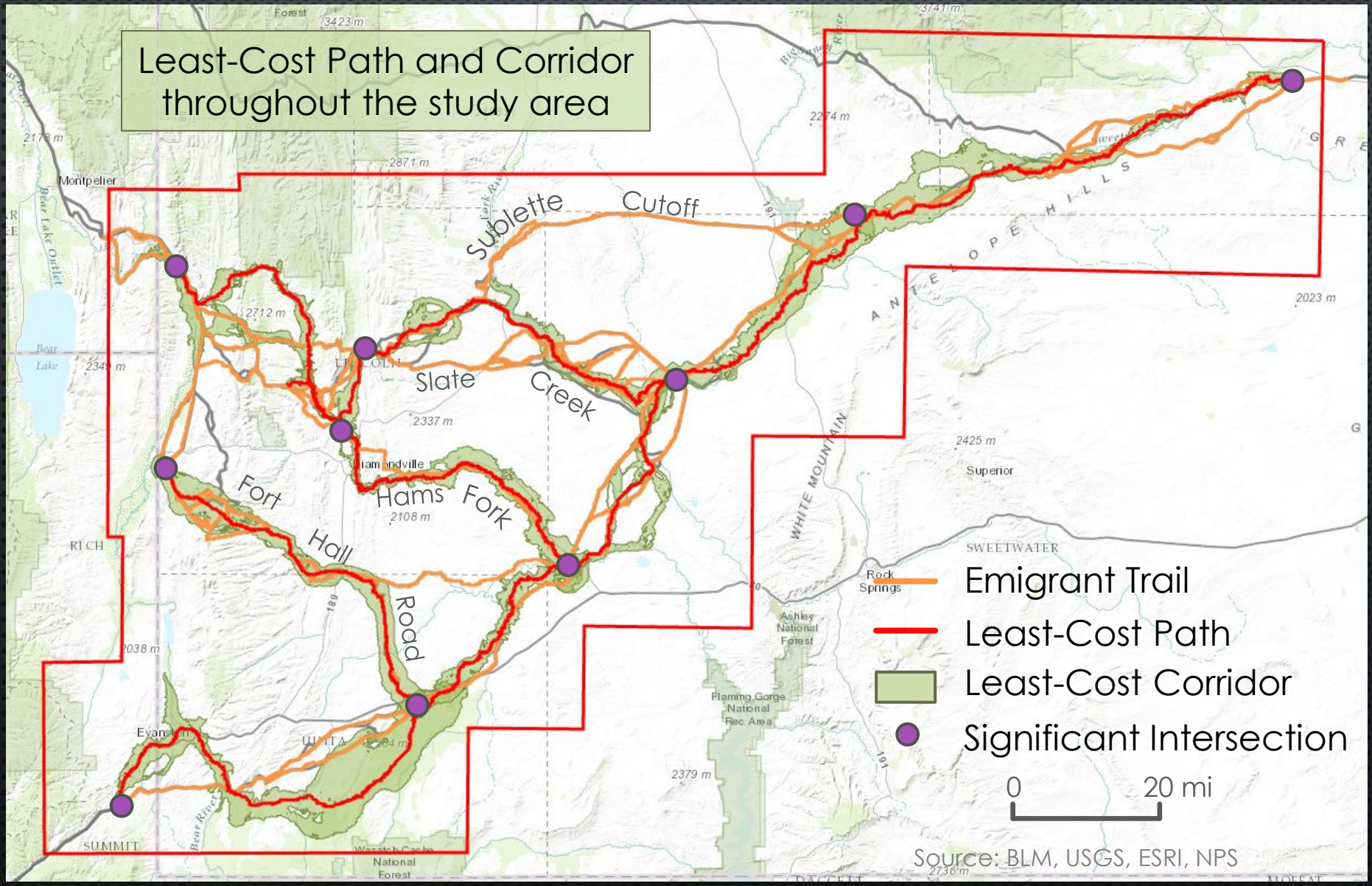


RESULTS OF LEAST-COST ANALYSIS

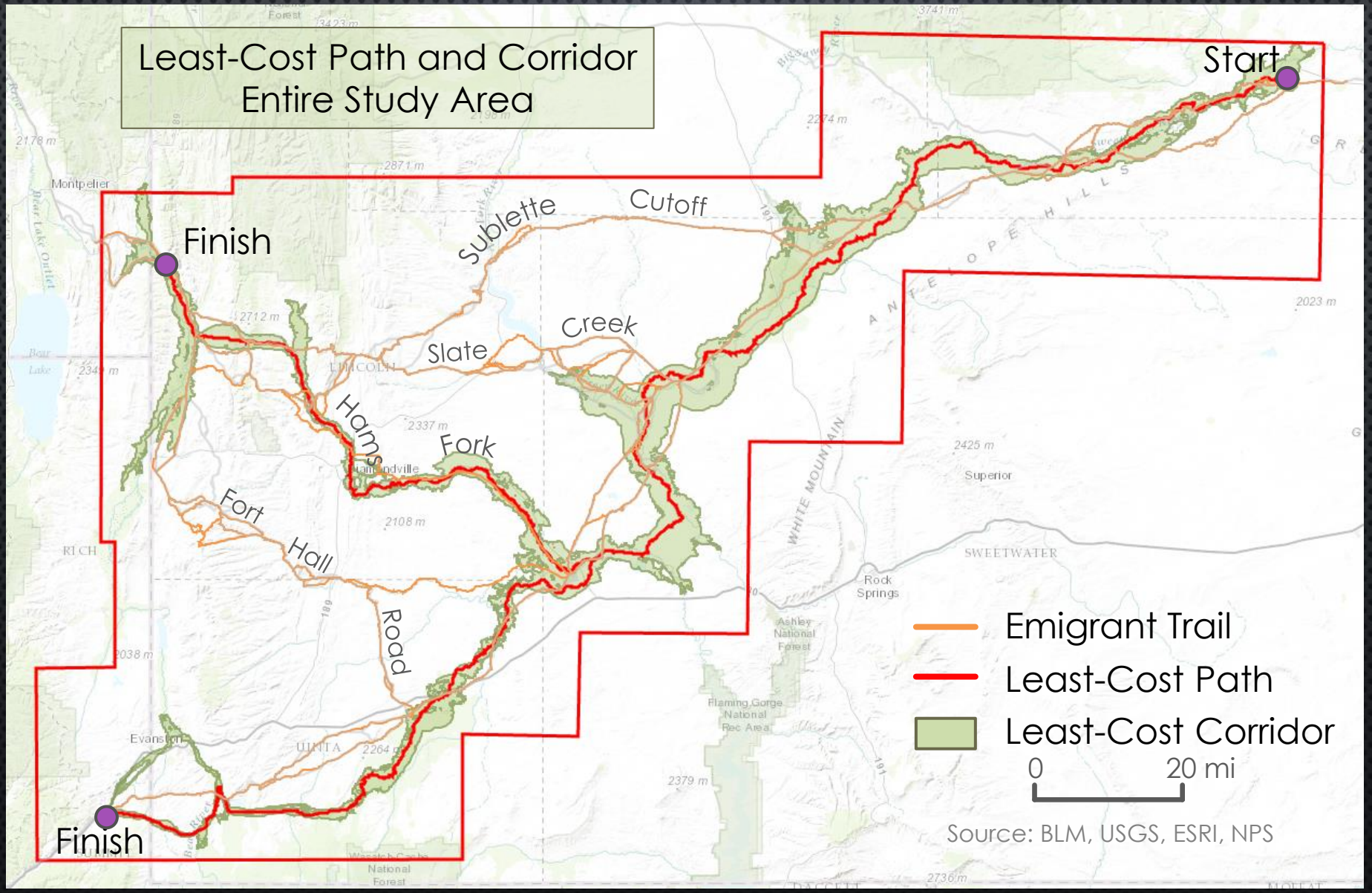


Source: BLM, USGS, ESRI

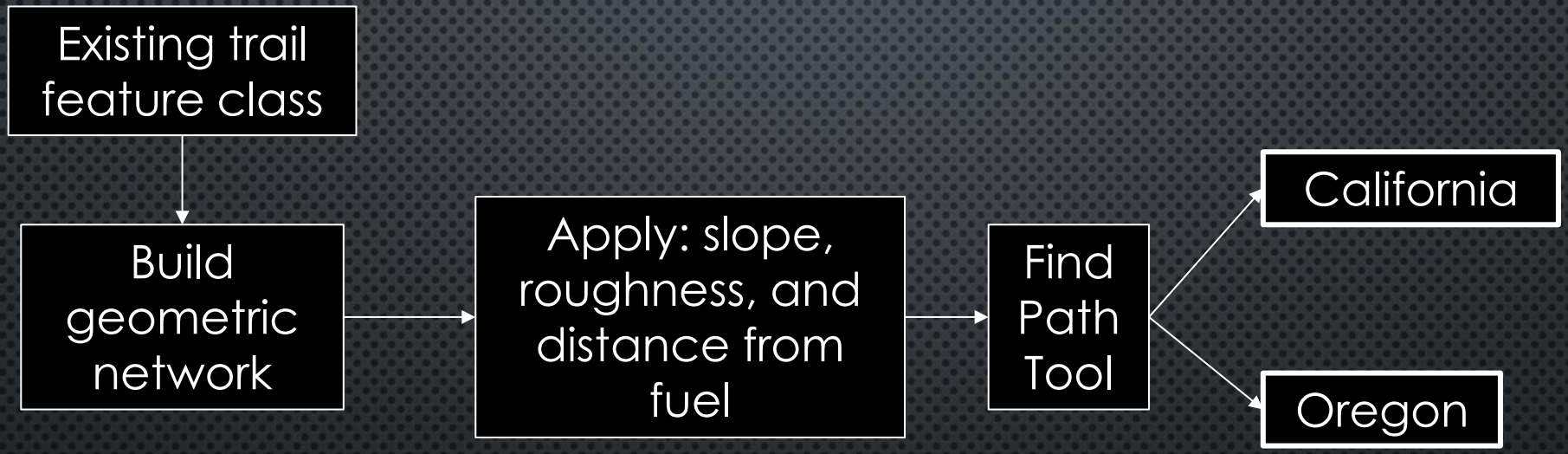
RESULTS OF LEAST-COST ANALYSIS



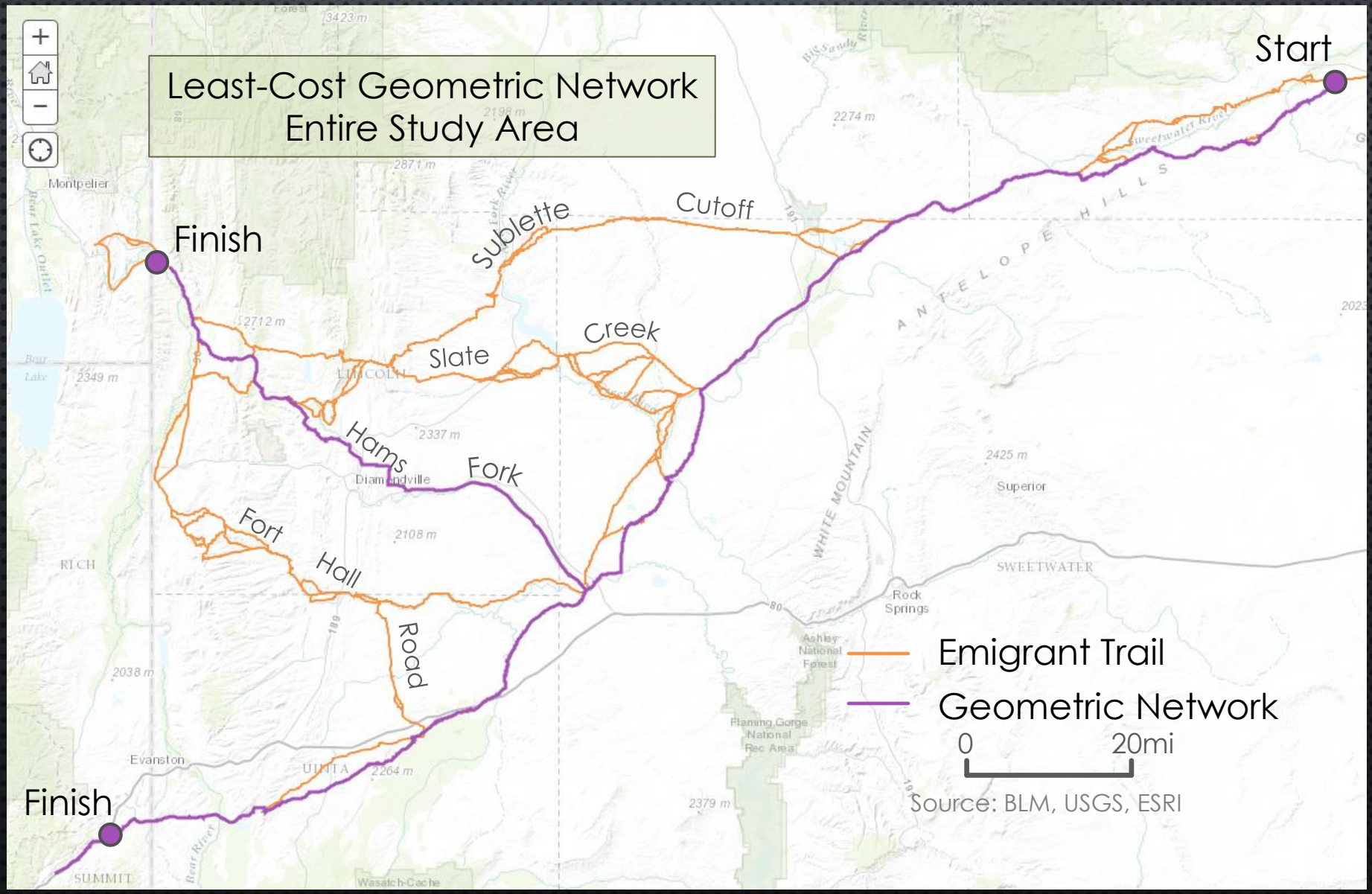
ENTIRE STUDY AREA LEAST-COST



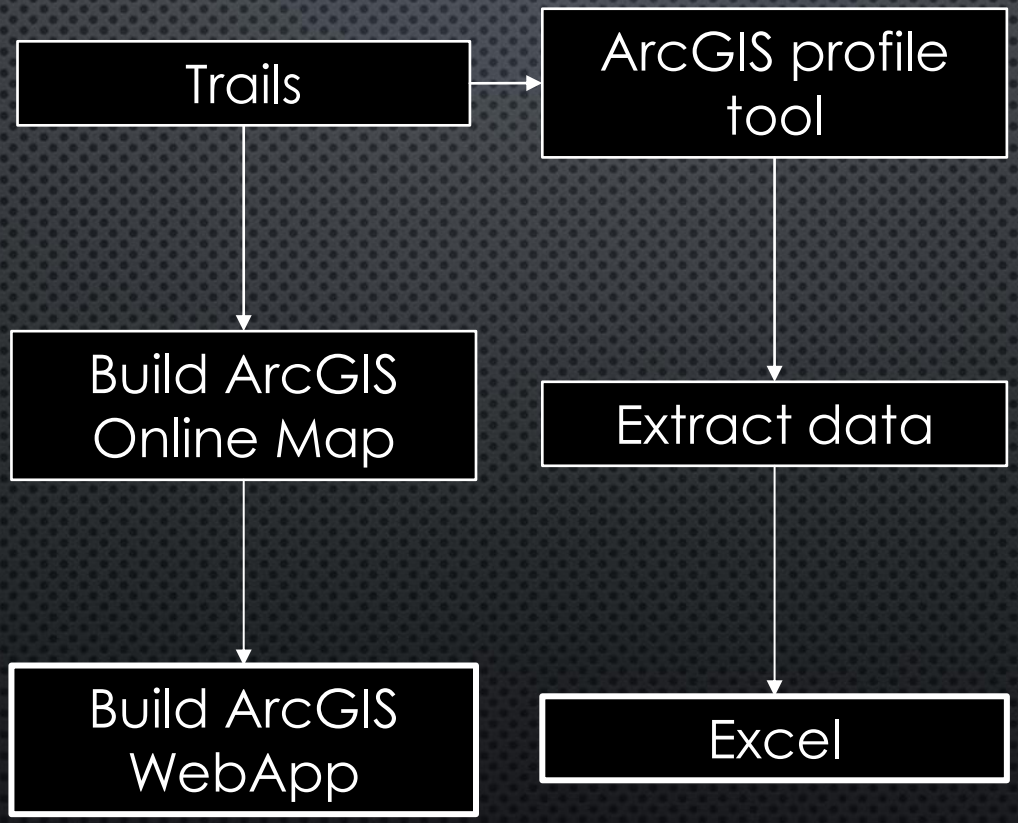
METHOD: GEOMETRIC NETWORK



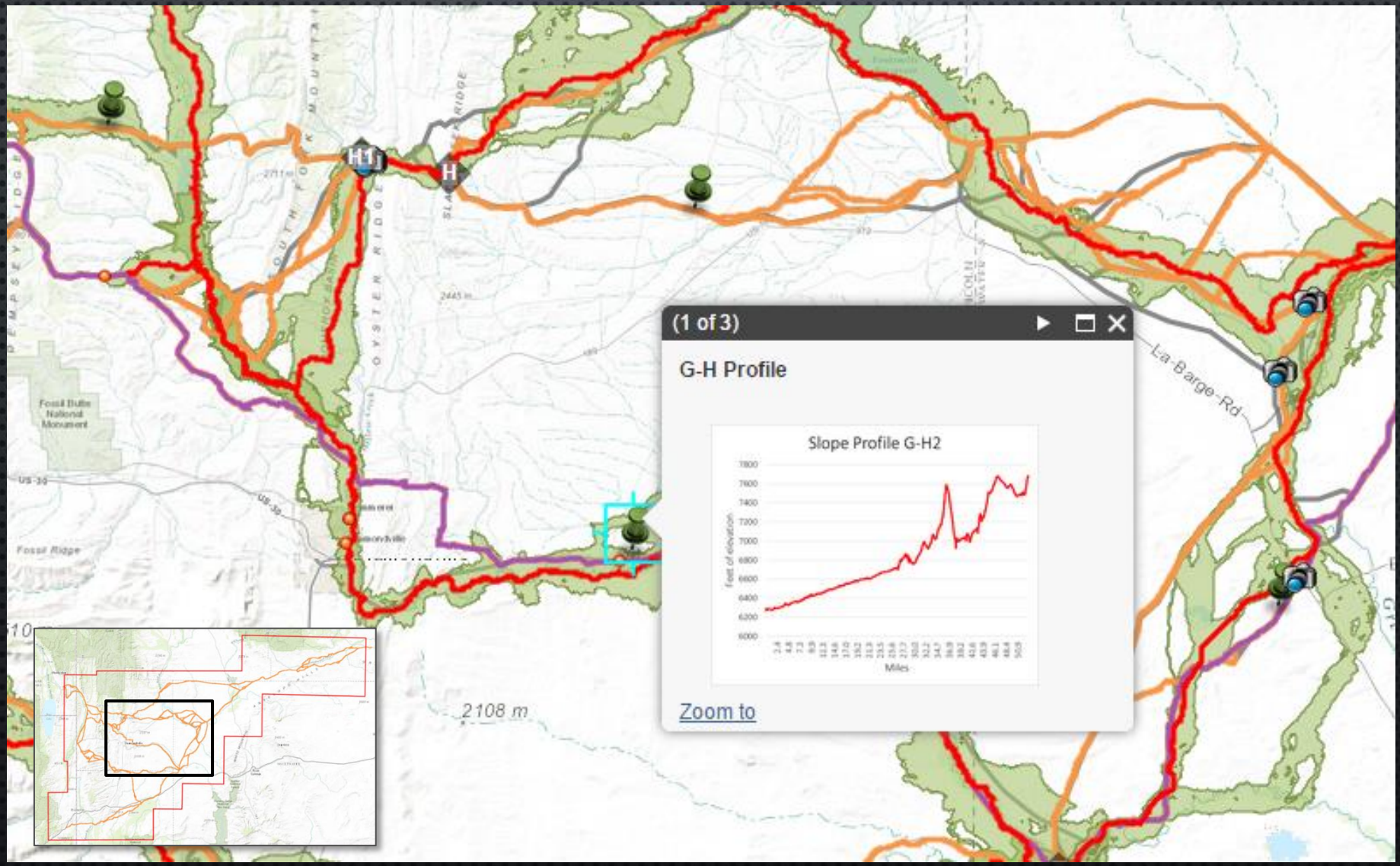
RESULTS: GEOMETRIC NETWORK



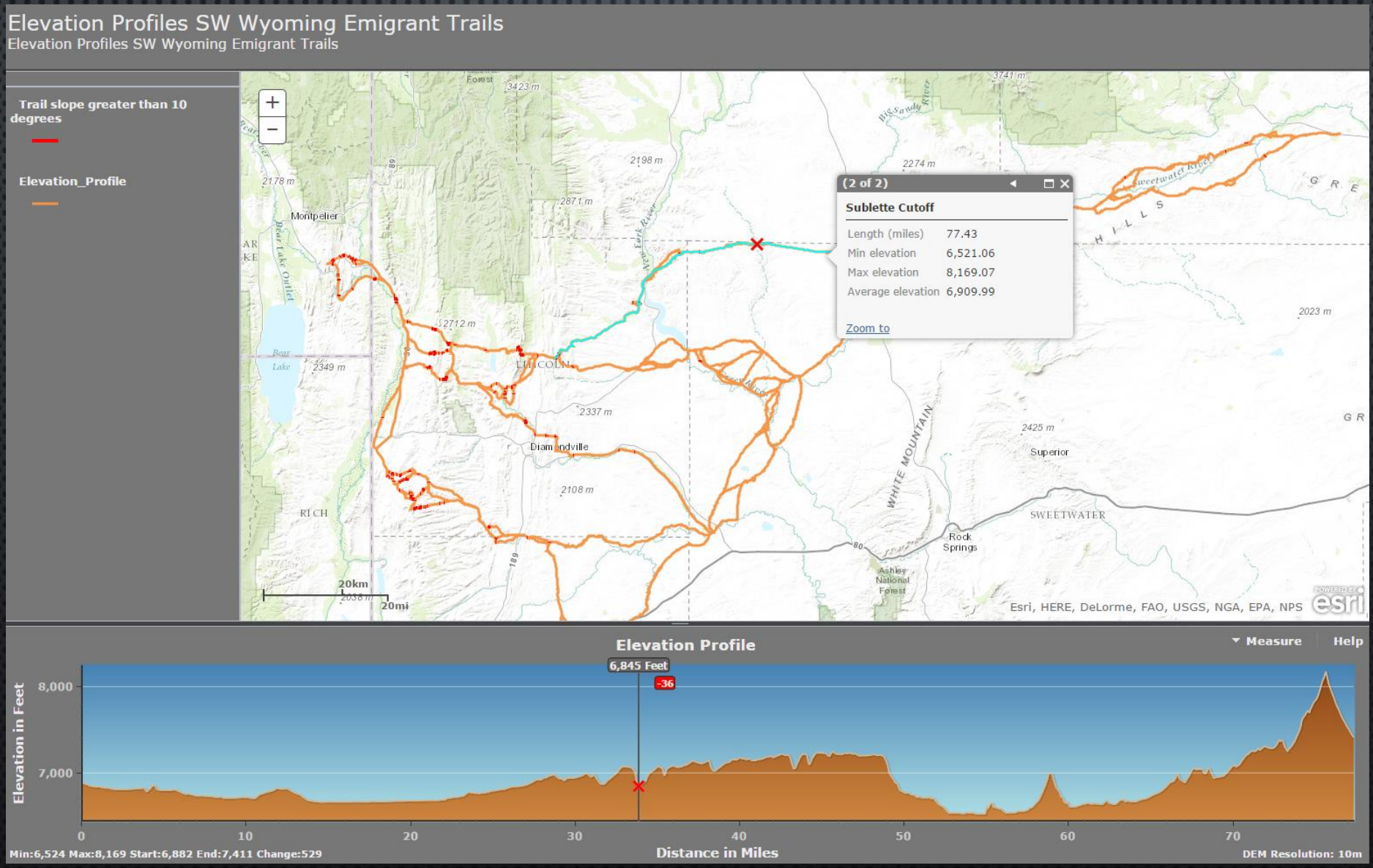
METHOD: ELEVATION PROFILES



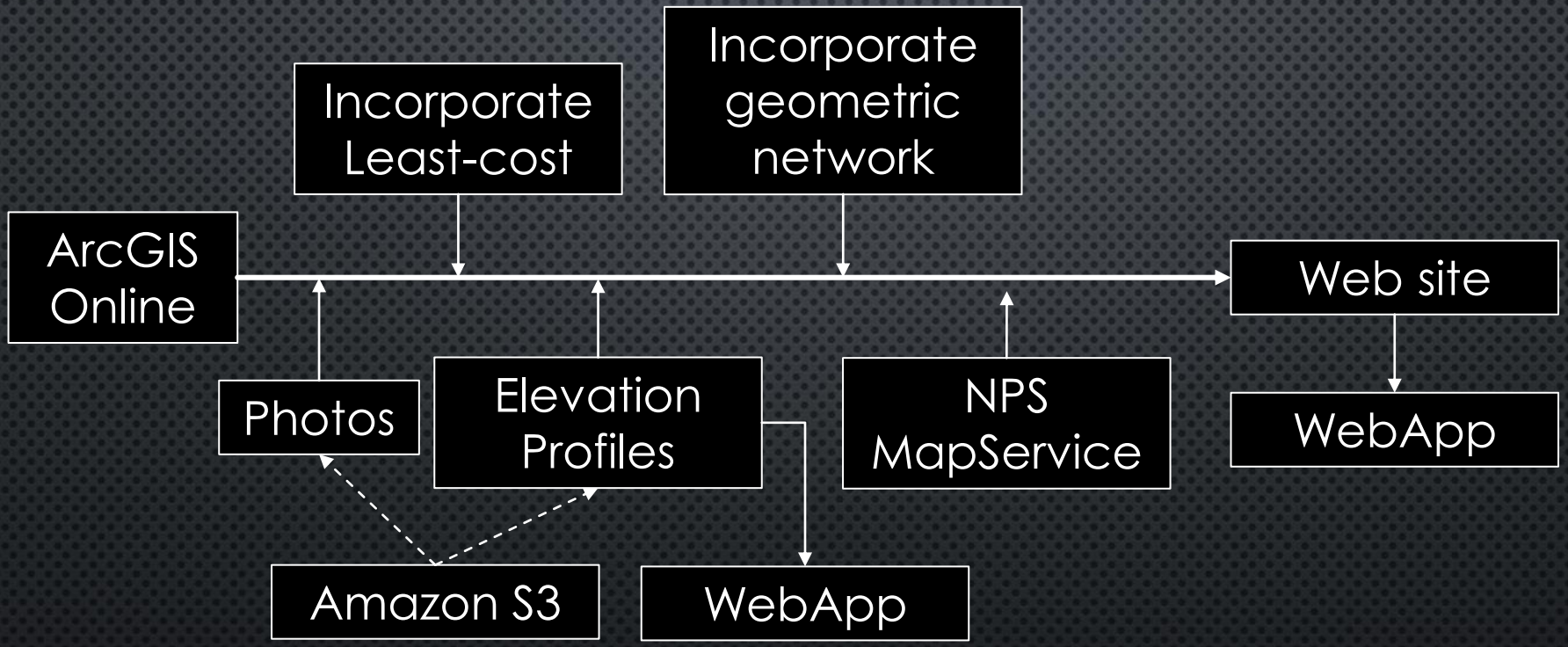
RESULTS: EXCEL ELEVATION PROFILE



RESULTS: ELEVATION PROFILE WEBAPP

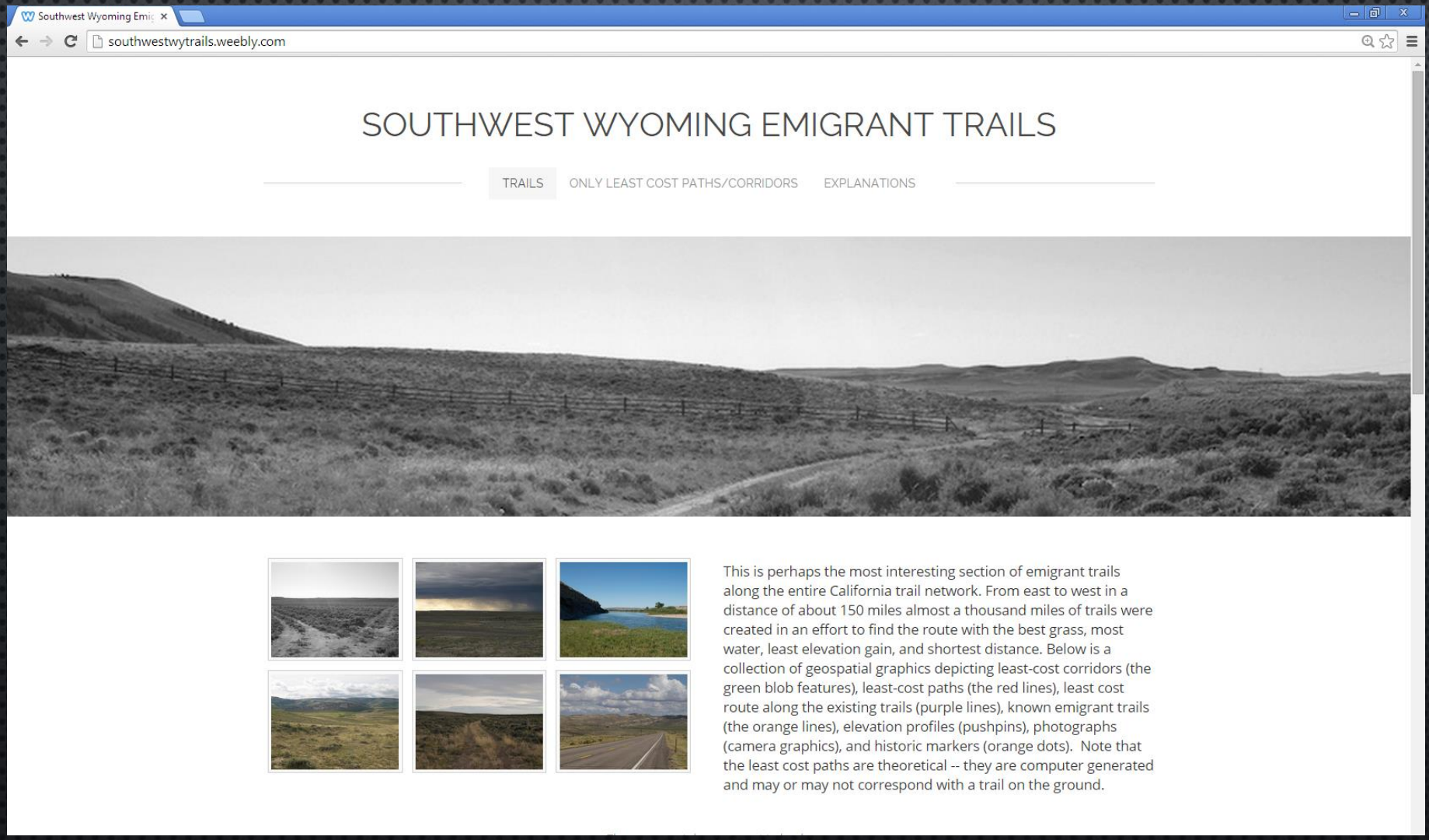


METHOD: INTEGRATION INTO THE WEB



www.southwestwytrails.weebly.com

RESULTS: WEBSITE



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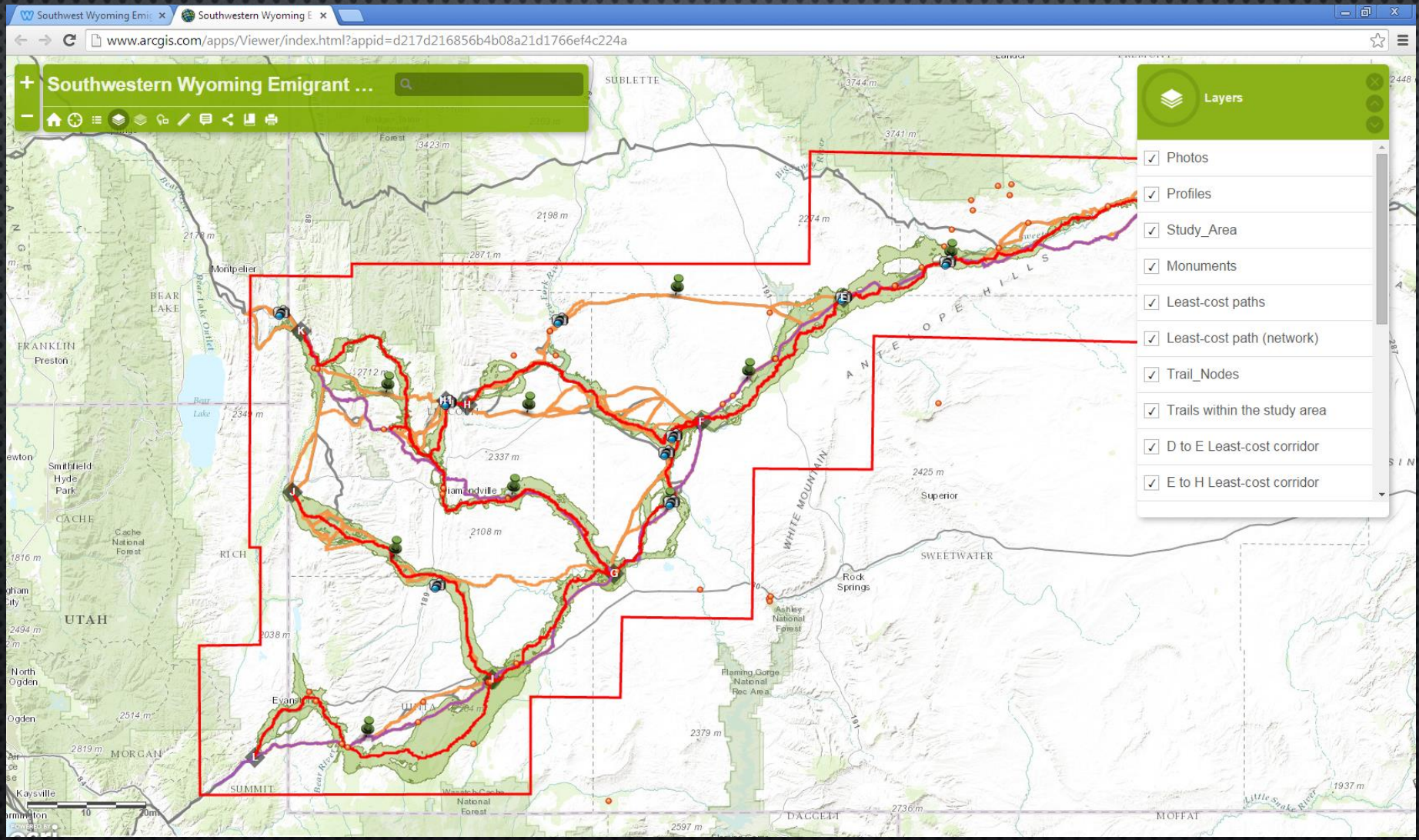
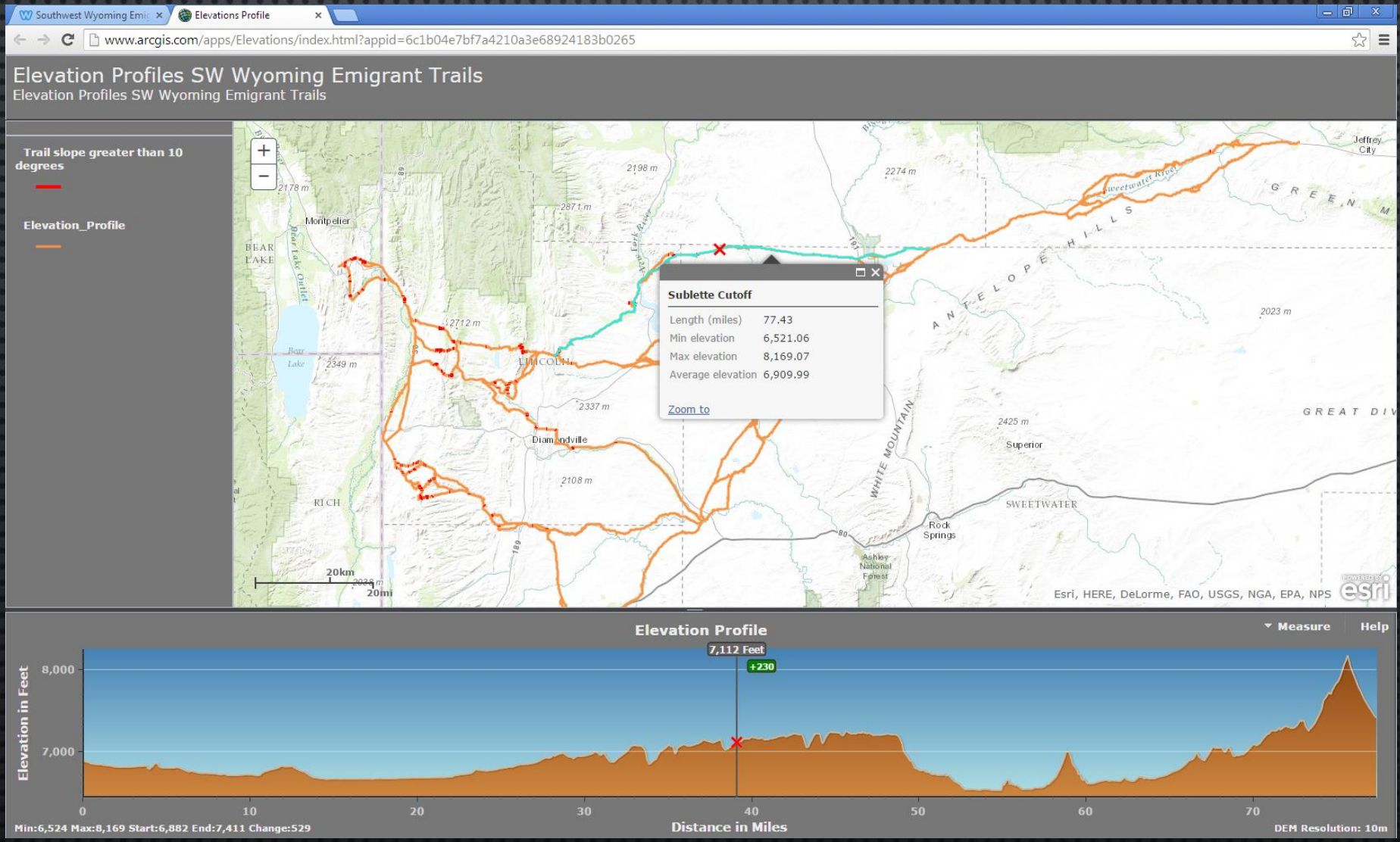


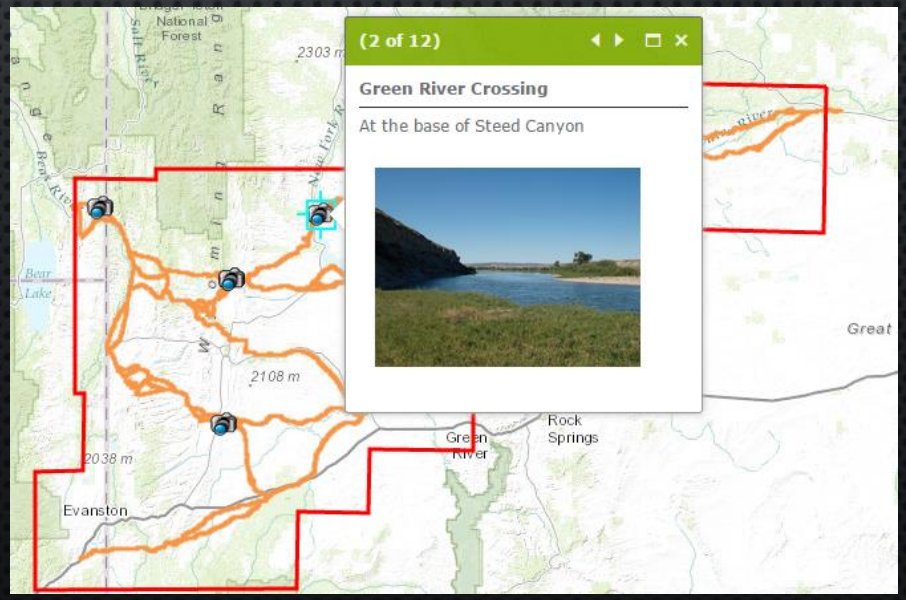
RESULTS: WEBSITE



Conclusions

- Generally, emigrants did use the least cost paths, corridors, and networks
- Significant exception
  - Sublette cutoff
    - Shorter and more direct
    - 1850: 9 of 11 emigrants took the Sublette Cutoff
  - Yet with the criteria selected, neither least-cost path or network path chose this route
    - It's dry
    - Rough country
  - Perhaps it is an issue of time

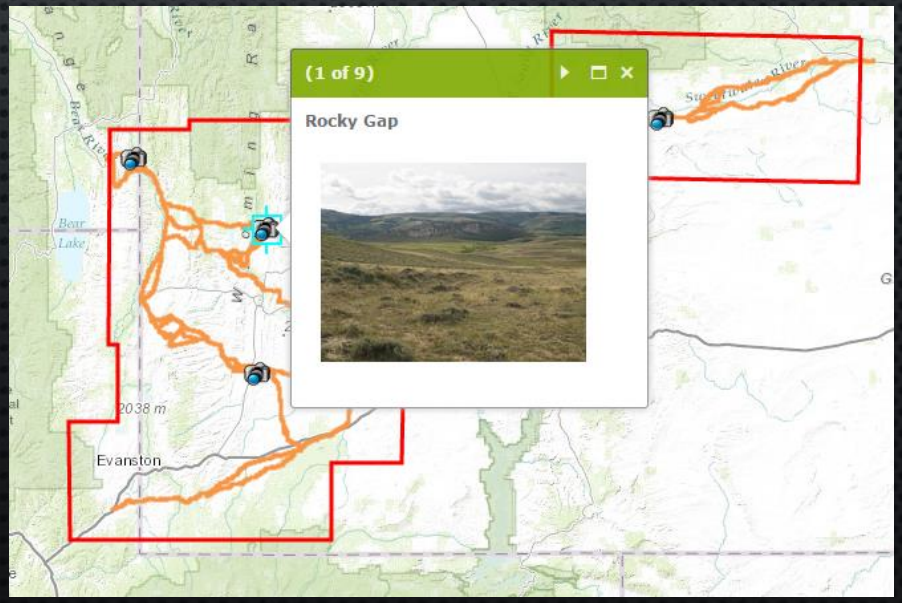

Green River



REVIEW

- Introduced the historical aspects
- Discussed least-cost corridors and paths
- Network analysis
- Elevation profiles, excel and web based
- Incorporation into a website
- Conclusions – Sublette Cutoff


Rocky Gap



Acknowledgments

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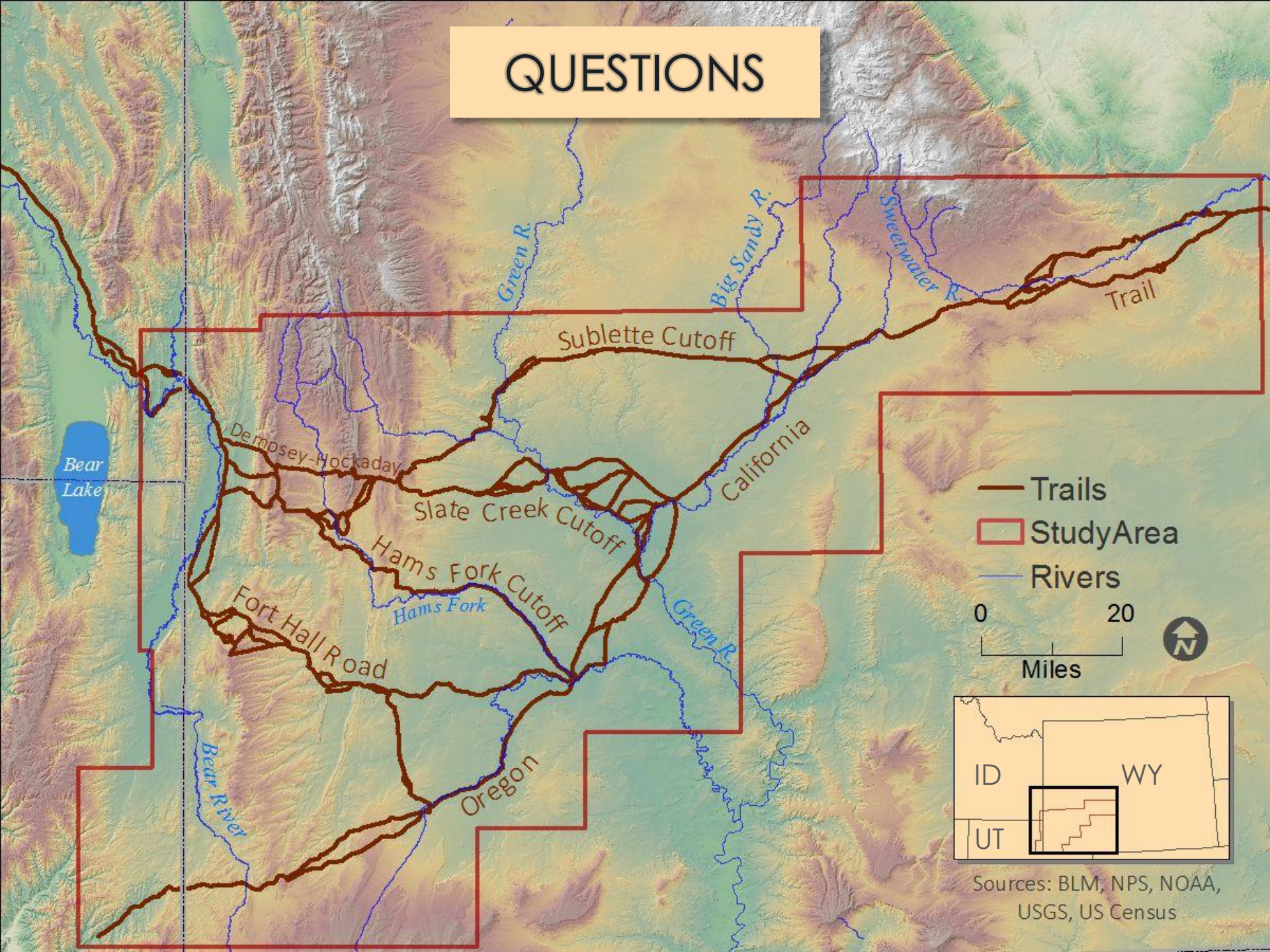
- Dr. Richard L. Rieck, PHD, University of Michigan
- Mr. Donald Buck, Oregon California Trails Association

SOURCES

- Knowles, A. K. 2008. GIS and History. In *Placing History: how maps, spatial data, and GIS are changing historical scholarship*, 2–26. Redlands, CA: ESRI Press.
- Meldahl, K. 2007. *Hard Road West: History & Geology along the Gold Rush Trail*. Chicago, IL: University of Chicago Press.
- Mitchell, A. 2012. *The Esri Guide to GIS Analysis. Modeling Suitability, Movement, and Interaction Volume 3*. Redlands, Calif.: Esri Press.
- Paden, I. D. 1949. *Prairie Schooner Detours*. New York: The Macmillan Company.
- Davis, R. E., 2013. *Following Sarah*. Twentynine Palms, CA: Quiet Creek Corporation.
- Rieck, R. L. 1993. Geography of the California Trails, Part I. *Overland Journal* 11 (4):12–22.
- US Bureau of Land Management. 2014. historictrail. *historictrail*. http://www.blm.gov/wy/st/en/resources/public_room/gis/datagis/state/historictrail.html (last accessed 25 October 2014).
- USGS National Map. 2014. The National Map. http://nationalmap.gov/ (last accessed 7 September 2014).
- Wyoming GIS Science Center. 2014. Wyoming GeoLibrary. *Wyoming GeoLibrary*. http://wygl.wygisc.org/wygeolib/catalog/main/home.page (last accessed 20 June 2014).

QUESTIONS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