



# Characterizing Historical Patterns of Ownership in McKean County, Pennsylvania

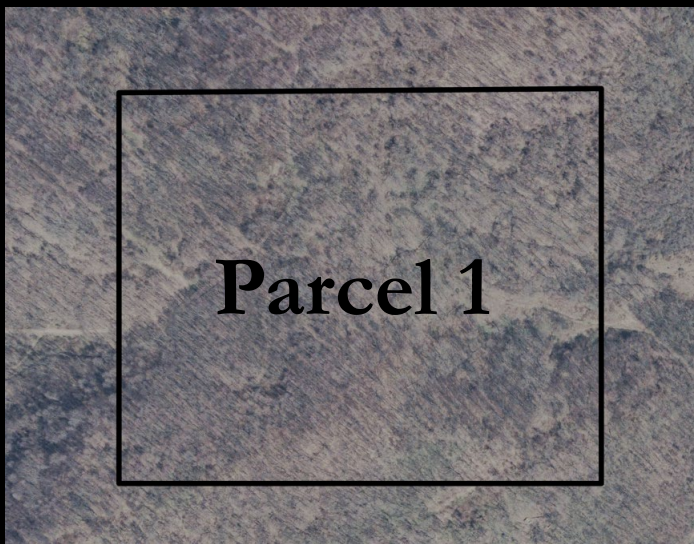
**GEOG 596A Project Proposal | Penn State University**

**Jessica Smucker**

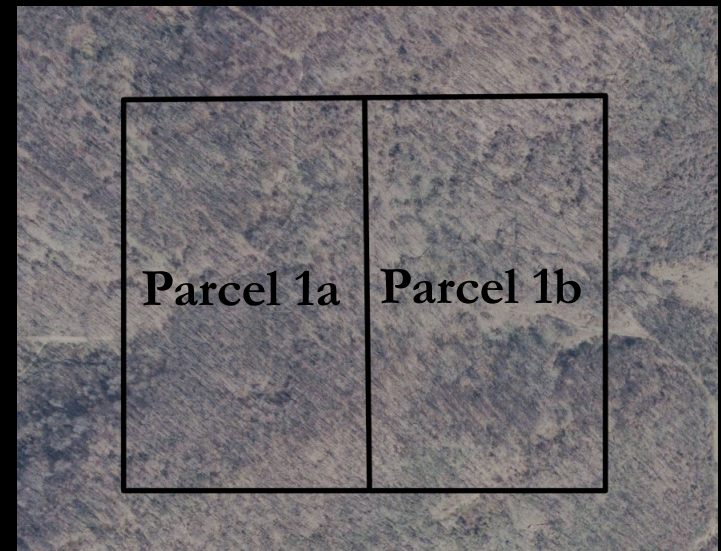
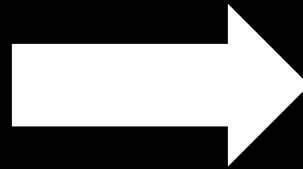
**Advisor: Dr. Erica A. H. Smithwick**

# Introduction

- A **parcel** represents the extent to which an individual or agency owns real estate.
- **Parcelization** can be defined as an increase in subdivision of parcels over time.



Year 1



Year 2

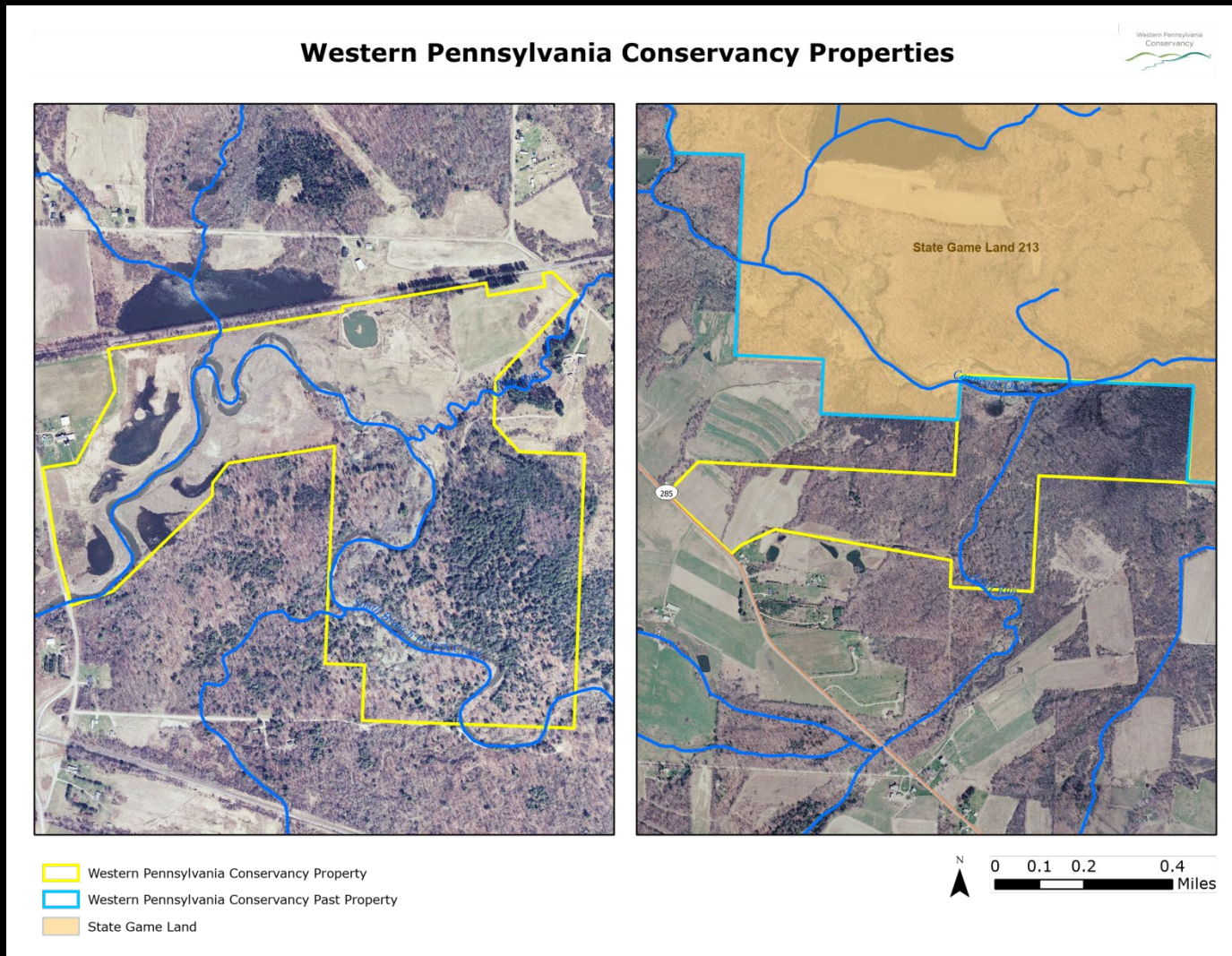
# Introduction

- Parcel shape is strongly linked to land use contours (Benduch, 2019).



# Introduction

- Western Pennsylvania Conservancy works to conserve land through acquiring parcels and preserving land through conservation easements.



# Introduction

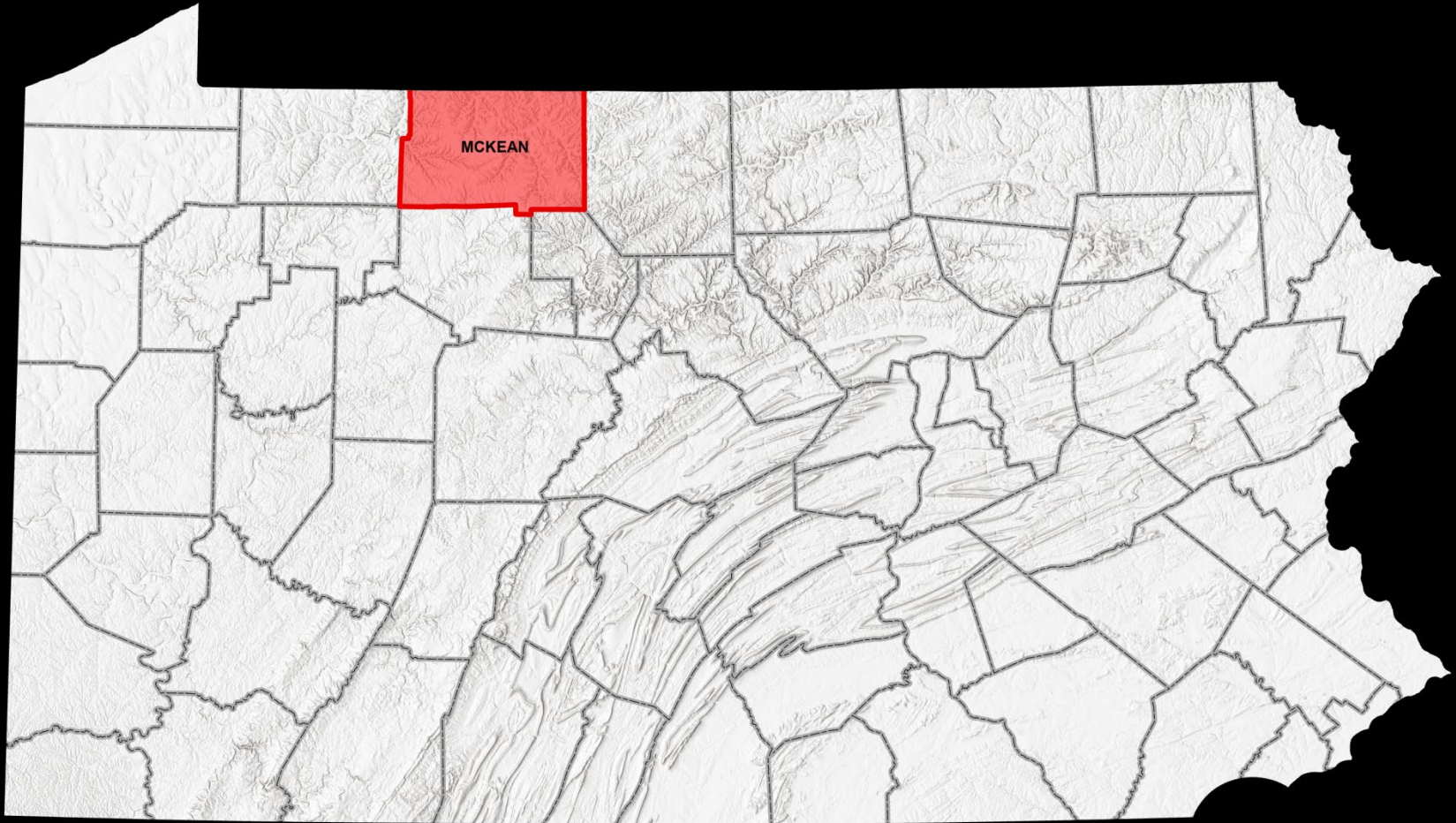
Conservation professionals are concerned that:

- Forestland has become increasingly parcelized over the past century in many parts of the United States.
- Timberland Investment Management Organizations (TIMOs) have recently replaced industrial ownership – still unknowns.
- Ownership type and parcelization have both been linked to changes in landscape condition.
- Limited information about parcelization and ownership trends specific to the Allegheny Plateau region of Pennsylvania.

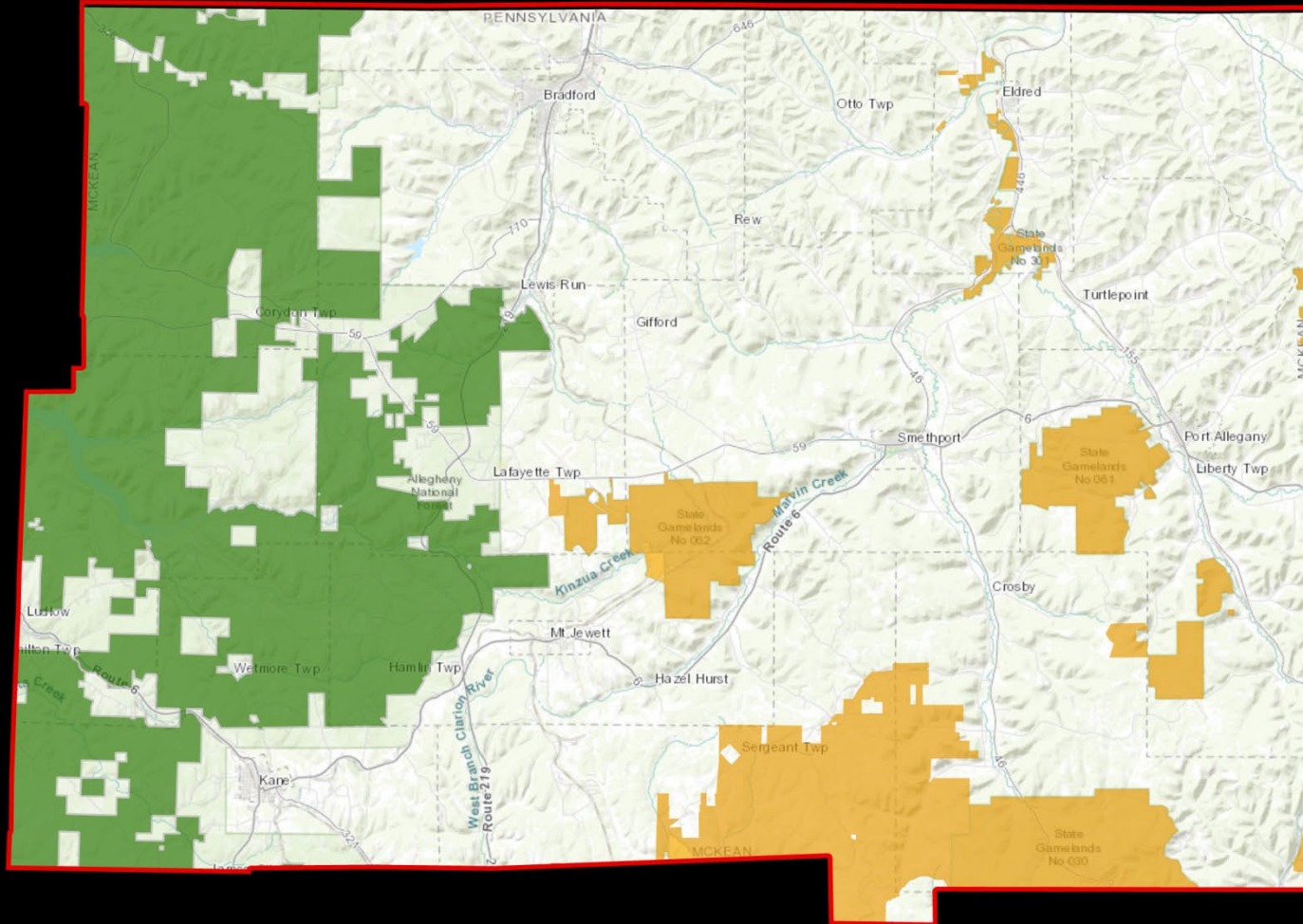
# Research Questions

1. What are the ownership trends specific to McKean County, Pennsylvania?
2. Is parcelization increasing at the level of the study site?
3. Are there identifiable ownership trends linked to specific parcelization types?

# McKean County, Pennsylvania



# Who owns land in McKean County?





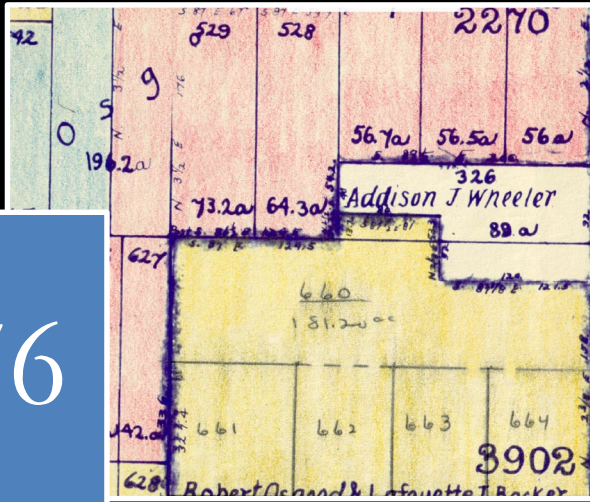
# History of McKean County



Figure 2. Workers cutting down hemlock for tanneries in New York. Adapted from "Hemlock and Hide: The Tanbark History in Old New York". Northern Woodlands. Retrieved from: <https://northernwoodlands.org/articles/article/hemlock-and-hide-the-tanbark-industry-in-old-new-york#prettyPhoto>

# Data

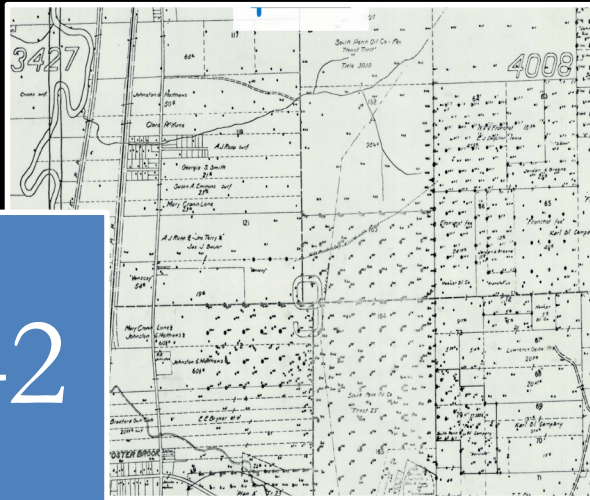
1876



1930



1942



2019

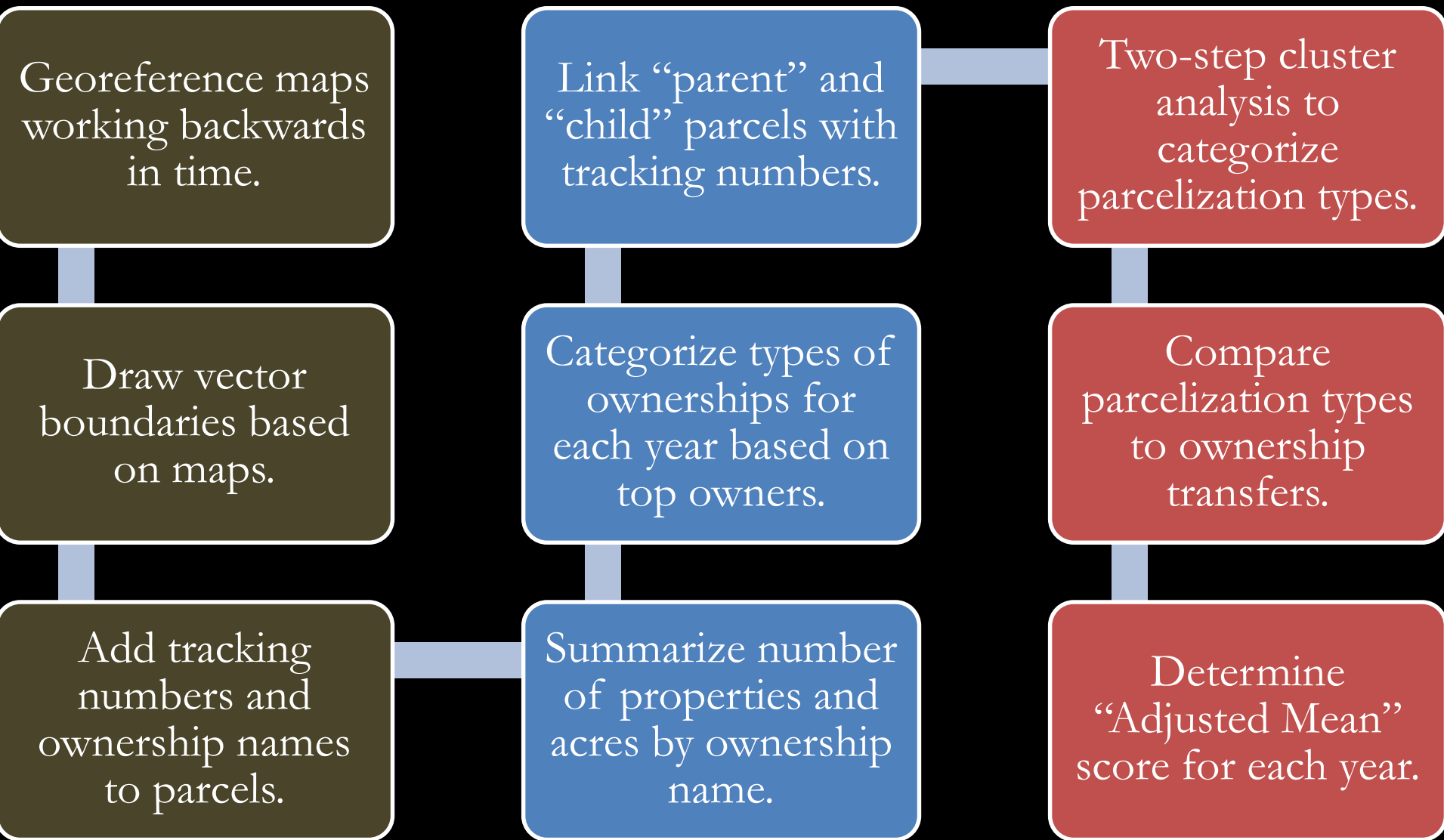


# Data

## Parcel Maps and Surveys

- 1876 – Warrant boundaries. Major ownerships noted.
- 1930 – Ownerships noted for each warrant.
- 1934 – Individual lots & ownership noted.
- 1942 – Well locations noted.
- 1956, 1978, & 1997 – Map created & boundaries updated by hand.
- Early 2000s – GIS database developed for McKean County.
- 2019 – Current tax parcels include ownership, tracking numbers, and latest acquisition information.

# Methods



# Methods – Georeferencing

- Maps will be georeferenced backwards through time starting with the current 2019 parcels.
- PA MAP 2003 aerial imagery, street vector data, and parcel boundaries will be used as reference for control points.



# Methods – Characterizing Parcelization – Landscape Level

- “Adjusted Mean” methods from Kilgore et al., 2013, which is defined as

$$\left( \frac{\text{\% of private forestland in parcels below size threshold}}{\text{mean parcel size}} \right) \times (\text{private forestland hectares})$$

- Which simplifies to:

$$(\text{\% of private forestland in parcels below a parcel size threshold}) \times (\text{number of private forestland parcels})$$

- The size threshold chosen is based on the common smallest size that forest can be managed, which Kilgore et al., 2013 determined to be 40 acres.

4 acres	4 acres	
4 acres	1	1
	1	1

Adjusted mean:  $(.25) \times 7 = 1.75$

Mean size = 2.28 acres




4 acres	1	1
	1	1
4 acres	1	1
	1	1

Adjusted mean:  $(.50) \times 10 = 5$

Mean size = 1.6 acres

# Methods – Characterizing Parcelization – Parcel Level

- Methods from Donnelly & Evans, 2007 to group parcelization type based on range ratio and number of parcels.
- Types are then created by clustering based on number of child parcels, and then clustering again based on the range ratio.

Type (n)	Parent area (ha)	Range ratio	Number of Child parcels (n)	Example
0 (4393)	Small (18)	NA	NA	
1 (353)	Small (17)	Low (30)	Low (2)	
2 (269)	Large (32)	High (80)	Low (2)	
3 (92)	Large (36)	Low (41)	High (5–13)	
4 (226)	Small (26)	Med (51)	Low (3)	
5 (71)	Large (36)	Med (53)	Low (4)	

# Methods – Characterizing Ownership

- The name of the owner will be entered for each parcel at all points in time.
- Ownership names will be summarized using the Summary Statistics tool in ArcPro.
- Ownership types will then be generated based on the summary & research.
- Although seemingly simple, ownership type can be difficult to define (Is private/public land completely private/public?)
- Possible categories of ownership, studied in Suming & Sadar, 2006:
  - Non-industrial private forestland owner (NIPF)
  - Industrial forestland owner
  - Timberland Investment Management Organization (TIMO)
  - Real Estate Investment Trust (REIT)
  - Non-Government Organizations
    - Federal
    - State
    - Municipality
    - Others

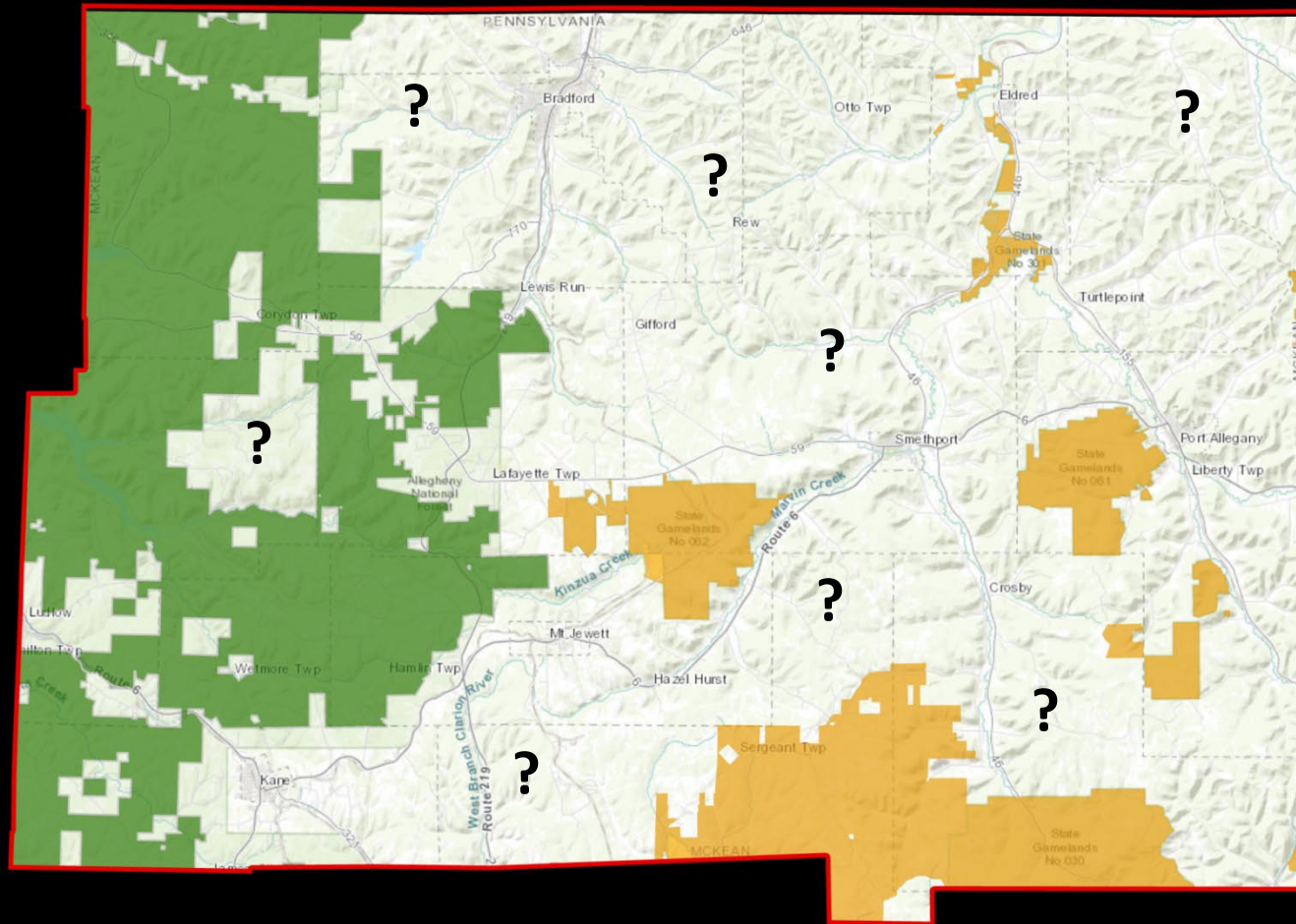


# Anticipated Results

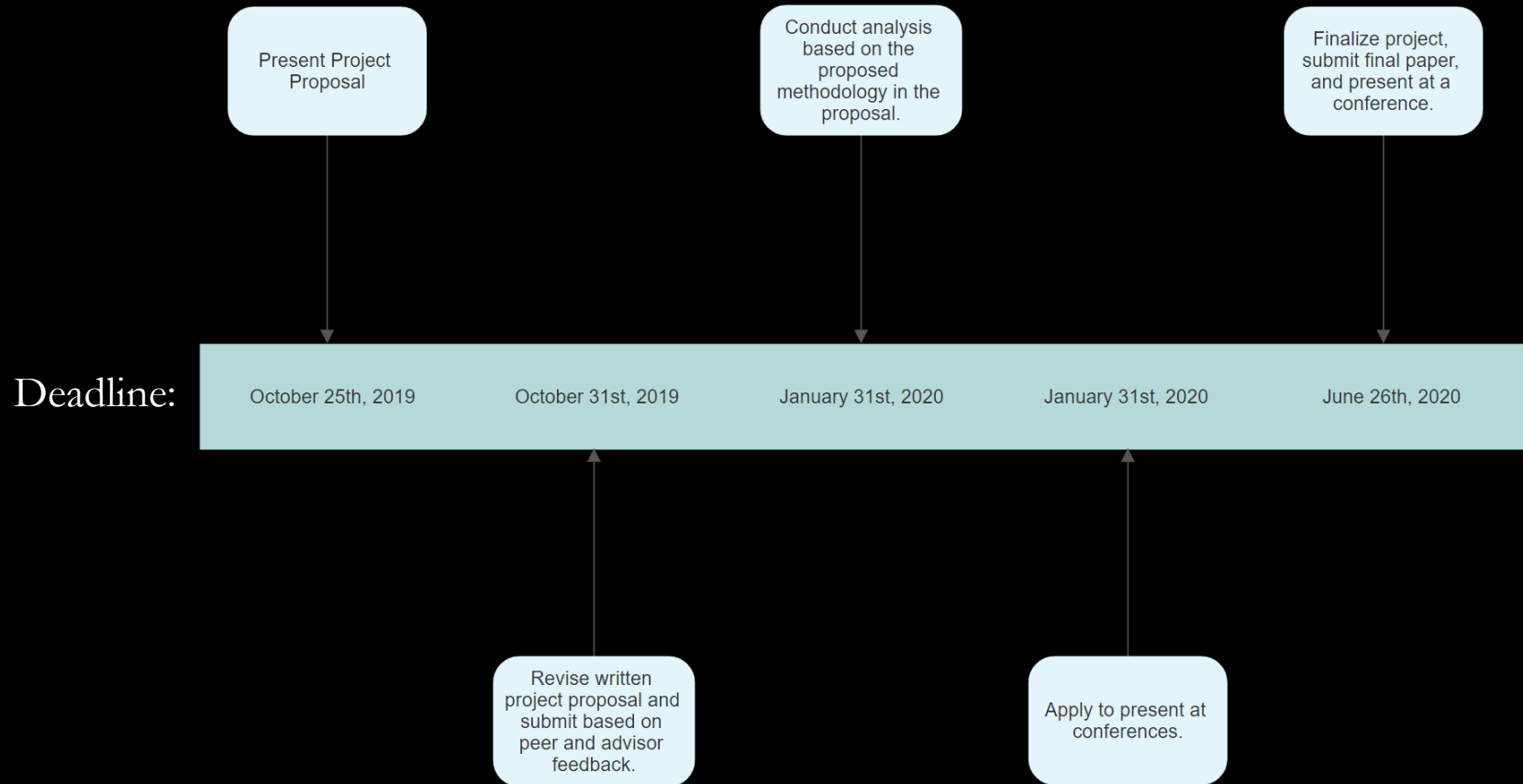
- Increase in number and types of owners through time.
- Increasing parcelization through time.
- Certain parcelization types characteristic of ownership transfers.
- Transfer of land from industrial forestland owners to TIMOs and REITs between 1978 and 1997.

# Conservation Implications

- How can the ownership and parcelization history inform where to prioritize conservation?



# Timeline and Possible Venues



## Possible Venues:

American Association of Geographers Conference

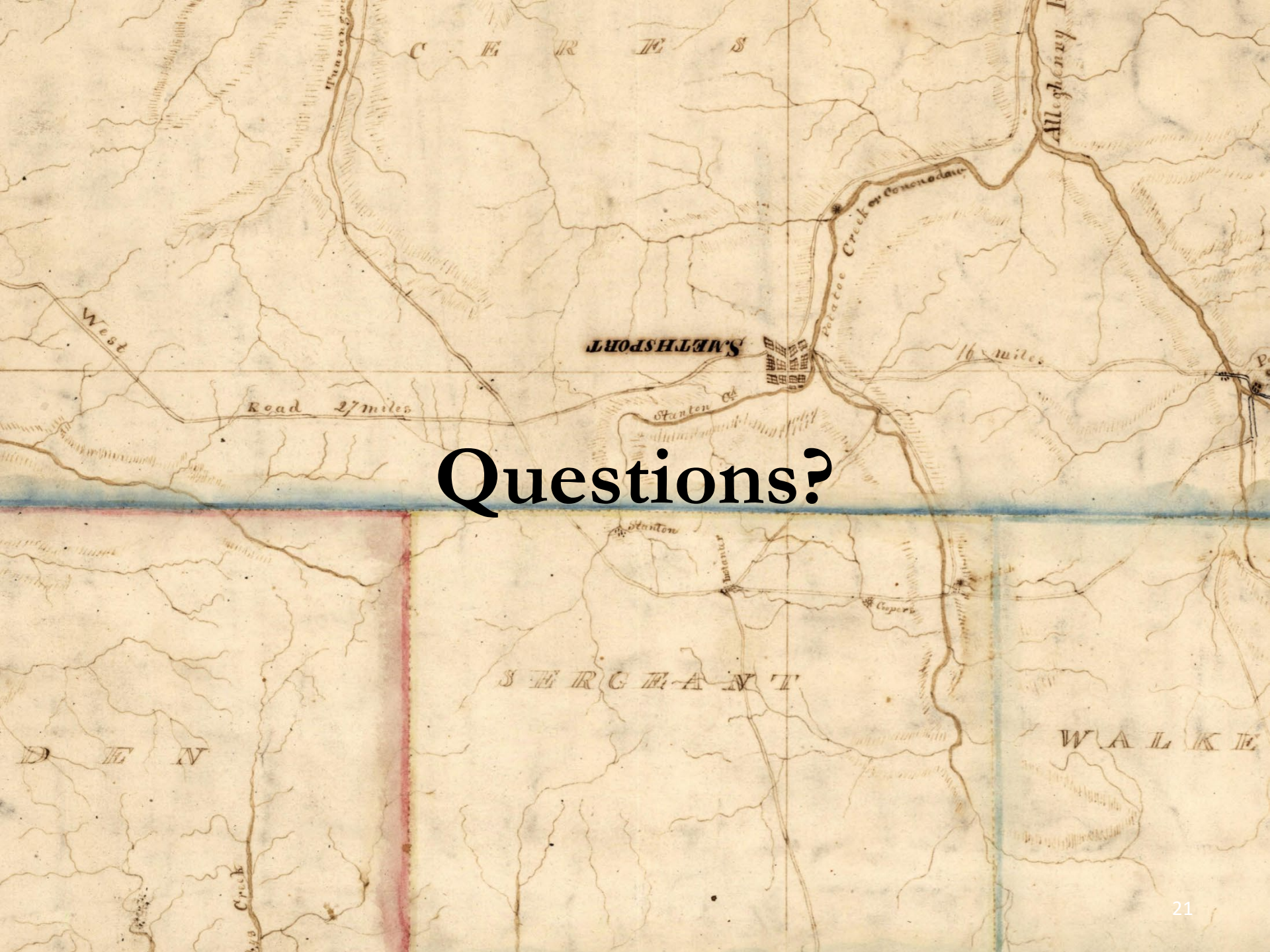
Deadline to submit abstract January 31<sup>st</sup>, 2020.

International Association for Landscape Ecology Conference

Deadline to submit abstract February 20<sup>th</sup>, 2020.

# References

- Benduch P. The study of dependency between land-use coverage and parcel boundaries. *E3S Web of Conferences*. 2019;86:6.
- Cohen WB, Spies TA, Alig RJ, Oetter DR, Maier sperger TK, Fiorella M. Characterizing 23 years (1972-95) of stand replacement disturbance in western oregon forests with landsat imagery. *Ecosystems*. 2002;5(2):122-137.
- Donnelly S, Evans TP. Characterizing spatial patterns of land ownership at the parcel level in south-central indiana, 1928–1997. *Landscape Urban Plann.* 2008;84(3):230-240.
- Haines AL, Kennedy TT, McFarlane DL. Parcelization: Forest change agent in northern wisconsin. *J For.* 2011;109(2):101.
- Haugen K, Karlsson S, Westin K. New forest owners: Change and continuity in the characteristics of swedish non-industrial private forest owners (NIPF owners) 1990–2010. *Small-scale Forestry*. 2016;15(4):533-550.
- L’Roe AW, Rissman AR. Factors that influence working forest conservation and parcelization. *Landscape Urban Plann.* 2017;167:14-24.
- Metcalf AL, Gruver JB, Finley JC, Luloff AE. Segmentation to focus outreach: Behavioral intentions of private forest landowners in pennsylvania. *J For.* 2016;114(4):466-473.
- Mundell J, Taff SJ, Kilgore MA, Snyder SA. Using real estate records to assess forest land parcelization and development: A minnesota case study. *Landscape Urban Plann.* 2010;94(2):71-76.
- United States Department of Agriculture (USDA), 2016. Forests of Pennsylvania, 2016. Retrieved from: [https://www.fs.fed.us/nrs/pubs/ru/ru\\_fs132.pdf](https://www.fs.fed.us/nrs/pubs/ru/ru_fs132.pdf)
- Zhang D, Butler BJ, Nagubadi RV. Institutional timberland ownership in the US south: Magnitude, location, dynamics, and management. *J For.* 2012;110(7):355-361.



Questions?