Shifting Waters:
Tribal Governments' Management of Lost Lands

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Introduction

The study focuses on the southern border of the Kiowa Comanche Apache Reservation (**Fig.1**) on the Red River, partially forming the border of Oklahoma and Texas (**Fig. 2**) in the United States of America. This river was chosen because of its variation in channel migration and its impact on land value.

- **How does cattle-grazing in the Red River riparian zone influence channel morphology?**

Rivers as Boundaries

Rivers serve as a natural boundary. The river can be relatively wide in areas, where the gradient is low, forming braided streams up to a mile wide. As land becomes more valuable, having a more readily and accurately defined boundary becomes more important (Edwards, n.d.). Early in American cadastral systems, many descriptions used rivers natural features as recognizable markers. Riparian boundaries move with the changing channel of the river. Hydrogeological processes -which contribute to accretion, erosion, reliction, and sometimes avulsion- makes describing the sinuosity of riparian boundaries difficult. Migrating river boundaries cause land management difficulties.

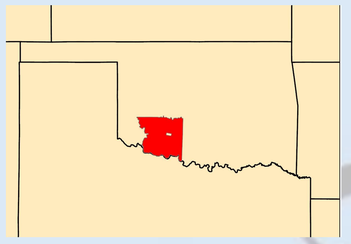

Fig. 1 Oklahoma, Kiowa Comanche Apache Reservation as established in 1867.

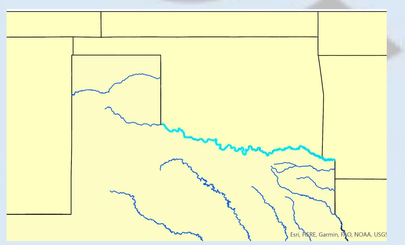

Fig. 2 Shows, highlighted in blue, the Red River forming the boundary of Oklahoma and Texas.

Grazing Management Practices

Research has addressed the effects of grazing management practices along riparian streams and their watersheds. Grudzinksi and Daniels (2018), research focuses on whether grazing practices drive significant changes in channel morphology based on heavy, light or rotational levels of cattle and bison grazing. The study of these grazing management practices analyzed the impacts each type of practice had on stream morphology, vegetational coverage, and stream bank runoff; to determine the best management practice to limit significant changes in stream morphology. In **figure 3** the diagram indicates the benefits and health of pasture lands depending upon the different grazing management practices. The figure is also applicable to pasture lands with riparian streams. Hillenbrand et al. (2019) used American Bison, a natural grazer, as a comparison to cattle in terms of overall ecosystem health along and inside streams and their watersheds. A similar study analyzed the collective controls of grazing practices along with the addition of no-grazing and newly introduced grazing within an un-grazed riparian area (Kamp et al. 2013). Conducting research on the implementation of re-vegetation along riparian streams with minimal to no vegetation coverage is vital to reducing stream bank erosion in the Oklahoma Red River basin. Further research analysis must be conducted to understand if the implementation of re-vegetation along riparian streams induces stream stabilization and reduces significant change of channel morphology.

Image 1-4. The images to the left and above show the damages continuous cattle grazing cause along riparian streams and the restoration of the riparian zone once cattle are removed from overgrazing.

Image 5-6. The images above are of the Oklahoma Red River

Methods

Like Grudnzinski and Daniels (2018), light cattle grazing, rotational cattle grazing, and heavy cattle grazing will be implemented to assess the impacts of grazing management practices within the riparian zone of the Red River. SPOT imagery, NAIP imagery, and LandSat imagery will be used to aid in vegetation monitoring and land use. Land cover tracking will be used when implementing cattle grazing management practices and revegetation in the riparian zone of the Red River. The usage of satellite photos is essential for understanding how land transforms throughout time. The following methods will be implemented in analyzing the effects of stream morphology in the Red River riparian zone:

- Lidar imagery
- Historical Land survey maps (**Fig. 4**)
- Incorporation of past grazing management practices
- Revegetation within the Riparian stream of the Red River
- Introduction of new grazing management practices

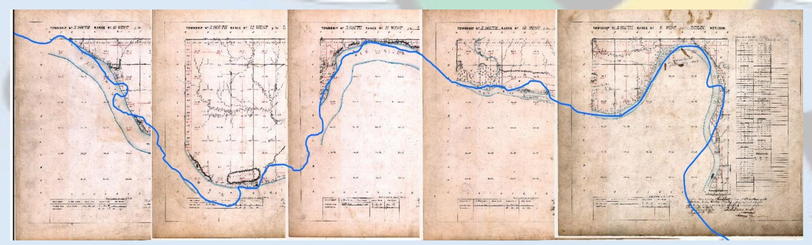

Fig. 4 Shows Land Survey maps from 1874 indicating the route of the river during that time. The blue line within the figure is the current route of the Red River.

History of the Red River Boundary

According to the Adams-Onís Treaty, the south bank of the Red River set the US-Mexico border (**Fig. 5**). Oklahoma-Texas court battles over the boundary line are ongoing. Court cases lead to forming the 1999 Red River Compact which establishes the OK-TX state lines based upon a vegetation line.

Fig. 5 Established US-Mexico border according to Adams-Onis Treaty of 1819.

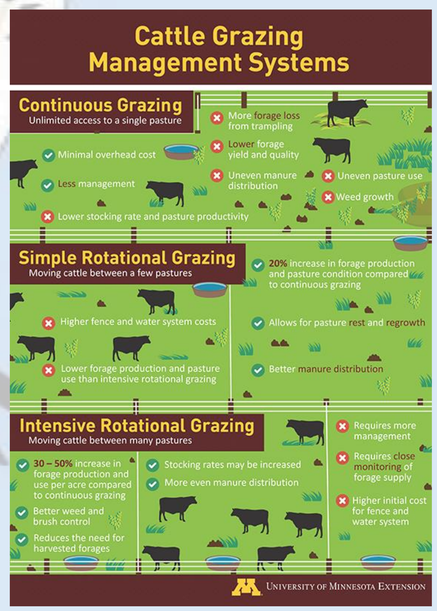

Fig. 3 The different grazing management practices display a variety of benefits and health of pasture lands showing the pros and cons of vegetation coverage for foraging.

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References

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