**Overall Title:** Ecological Drought Assessment of a Geologically Complex Region of the Northern Great Plains, USA

**Chapter Titles:**

Chapter 1. Overview of Hydrological and Ecological Drought Assessment

Chapter 2. Hydrological Drought Assessment for Catchments with a Short Period of Record in a Geologically Complex Region of the Northern Great Plains, USA

Chapter 3. Downscaling Regional Hydrological Drought Assessments to Ungauged Catchments using gSSURO Data

Chapter 4. Ecological Drought Assessment of a Geologically Complex Region of the Northern Great Plains, USA

Chapter 5: Conclusions and Future Work

**Problem Statements:** *What are the problems the research will address?*

**Problem Statement Chapter 2**

Streamflow records data of sufficient length are the basis for comprehensive water resources planning, water quality impairment and stream health evaluation, and flow-based goal proscription in the restoration of impaired streams (Kannan et al. 2018). For catchments of interest with short periods of record, the missing streamflow data is typically simulated using hydrologic models or estimated from similar stations using double-mass curves. However, hydrological modeling efforts may be prohibitively expensive for States or Tribal Nations, and uncertainty may exist in the identification of similar stations in geologically complex regions. We propose an alternative approach using dimensionality-reduction and model-based clustering to identify streamflow clusters based on mean daily, seven-day, and thirty-day streamflow discharge volumes. We apply the clustering approach to identify flow regimes for gaged catchments in a geologically complex region of the Northern Great Plains. We characterize catchment response to drought using an approximately thirty-year time period that includes one of wettest decades followed by one of the driest decades of the period of record.

**Problem Statement Chapter 3**

**Problem Statement Chapter 4**

**Writing Checklist**

1. Title – 13 words or fewer
2. Abstract
3. Introduction
   1. Problem Statement
   2. Literature
4. Method
5. Results
6. Discussion
7. Conclusion

**Problem Statements:** *What is the problem that the research will address?*

*The ultimate goal of a statement of the problem is to transform a generalized problem (something that bothers you; a perceived lack) into a targeted, well-defined problem; one that can be resolved through focused research and careful decision-making.*

*The statement of the problem will also serve as the basis for the introductory section of your final proposal, directing your reader’s attention quickly to the issues that your proposed project will address and providing the reader with a concise statement of the proposed project itself.*

*A good research problem should have the following characteristics:*

1. *It should address a gap in knowledge.*
2. *It should be significant enough to contribute to the existing body of research*
3. *It should lead to further research*
4. *The problem should render itself to investigation through collection of data*
5. *It should be of interest to the researcher and suit his/her skills, time, and resources*
6. *The approach towards solving the problem should be ethical*

*A persuasive statement of problem is usually written in three parts:*

***Part A (The ideal):****Describes a desired goal or ideal situation; explains how things should be.*

***Part B (The reality):*** *Describes a condition that prevents the goal, state, or value in Part A from being achieved or realized at this time; explains how the current situation falls short of the goal or ideal.*

***Part C******(The consequences):*** *Identifies the way you propose to improve the current situation and move it closer to the goal or ideal.*

**References**

Kannan, N., Anandhi, A., and Jeong, J. (2018). “Estimation of Stream Health Using Flow-Based Indices.” *Hydrology*, 5(1), 20–20.