

Deschutes Watershed Agricultural Characterization Study

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Introduction

The 2015 Deschutes River Total Maximum Daily Load Report by Washington State Department of Ecology recommended actions to improve bacteria, temperature, dissolved oxygen, pH and fine sediment conditions in the Deschutes watershed, south Puget Sound. There is a need to address agricultural nonpoint source pollution, but contributions of agricultural activity to water quality degradation remain unknown. The objective of this research project has been to develop a protocol to characterize agricultural activity in multiple subbasins of the Deschutes River watershed to evaluate potential contributions to non-point source water pollution.

The long-term goal of this project is to understand the intersection between water resource management and farmland management. By determining the quantity and types of agricultural activity and over laying this with available data on natural resource concerns, the project intended to improve understandings of the impact agricultural activity may have in the Deschutes watershed. The data will be utilized to better target outreach efforts, engage landowners voluntarily, and pursue cost-share funding to implement best management practices (BMPs).

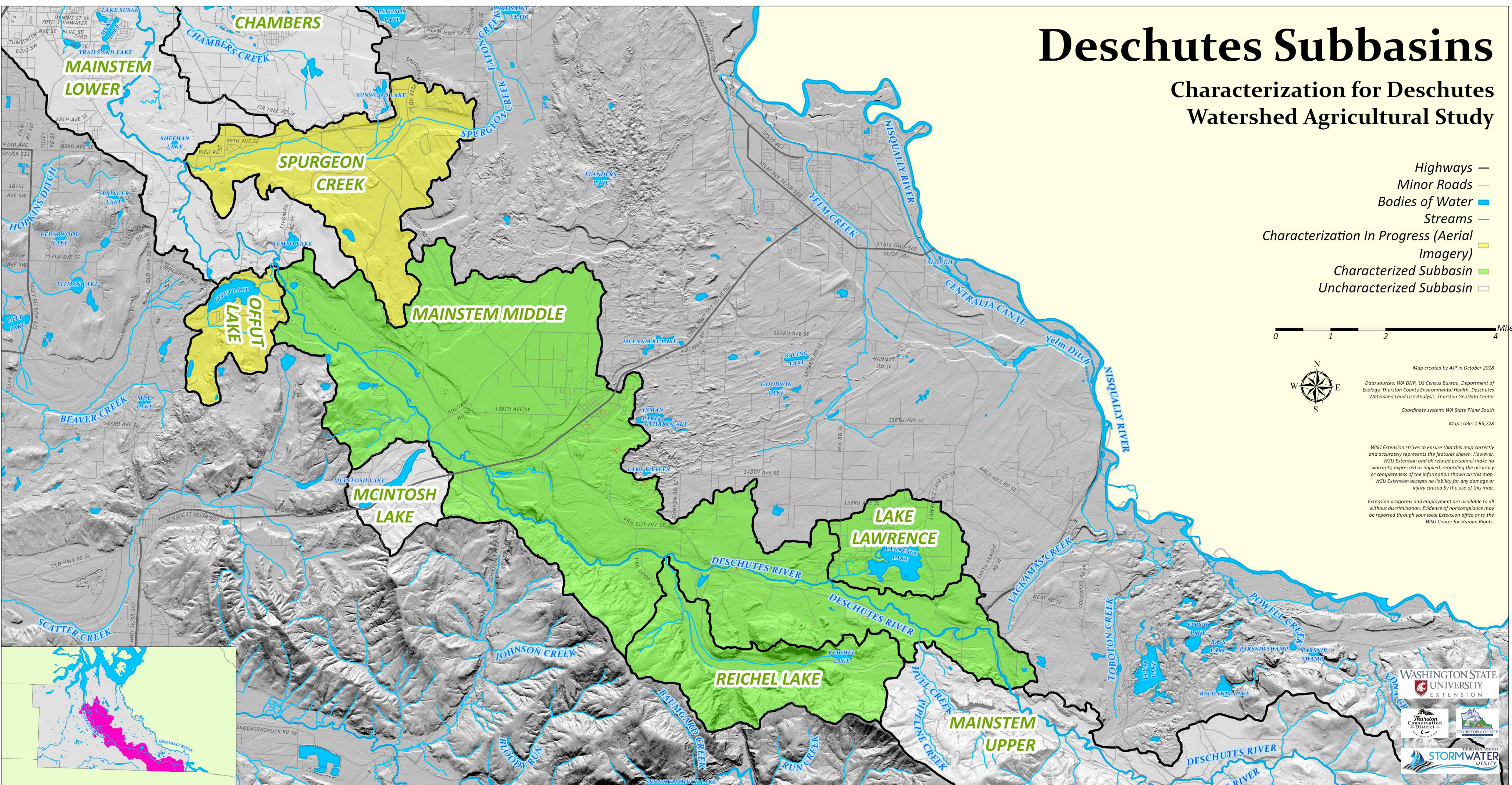
Methodology

Data was collected in-field using ESRI's Collector app through surveys conducted both by car and by bicycle, using a standardized windshield survey protocol. For areas not visible from roads or bicycle paths, 2017 NAIP aerial imagery from the USGS was utilized for agricultural characterization.

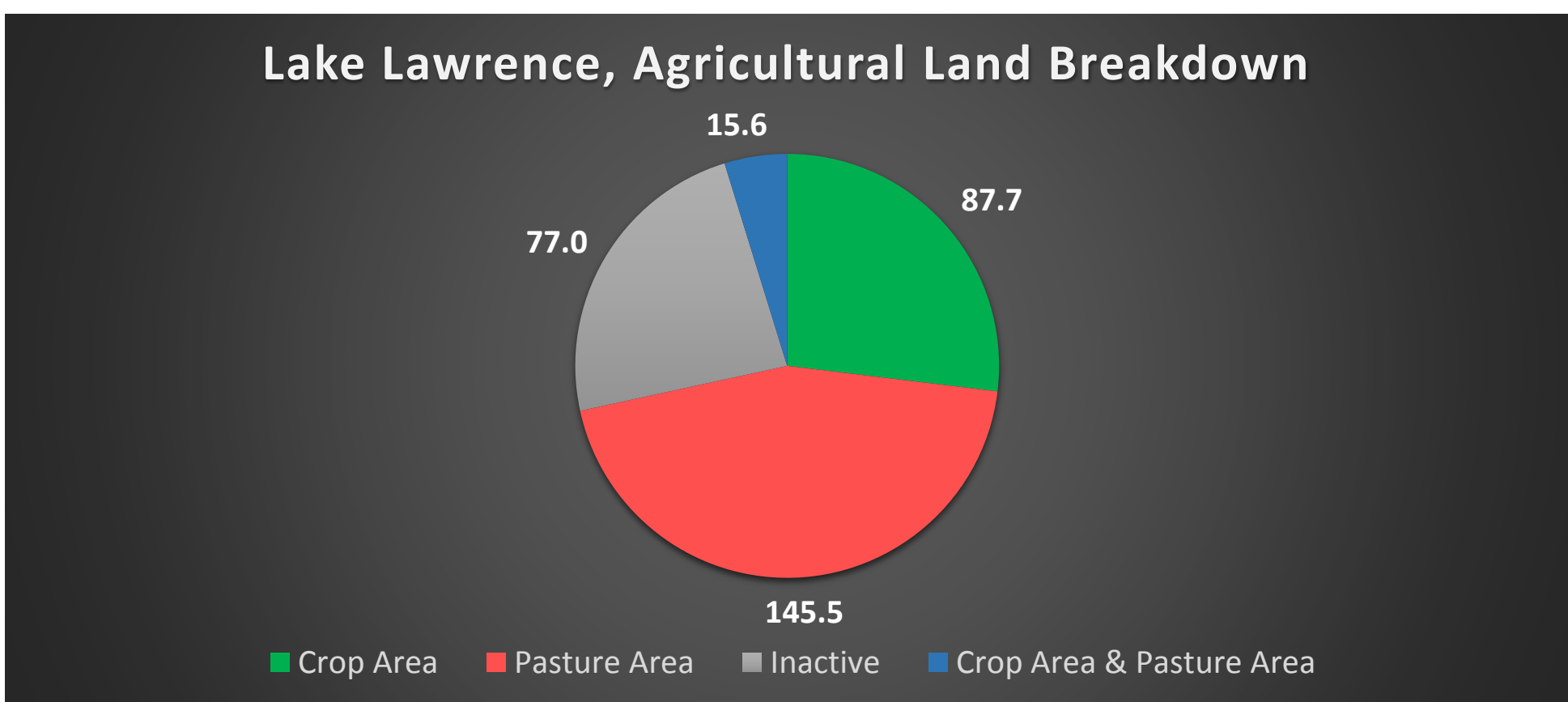
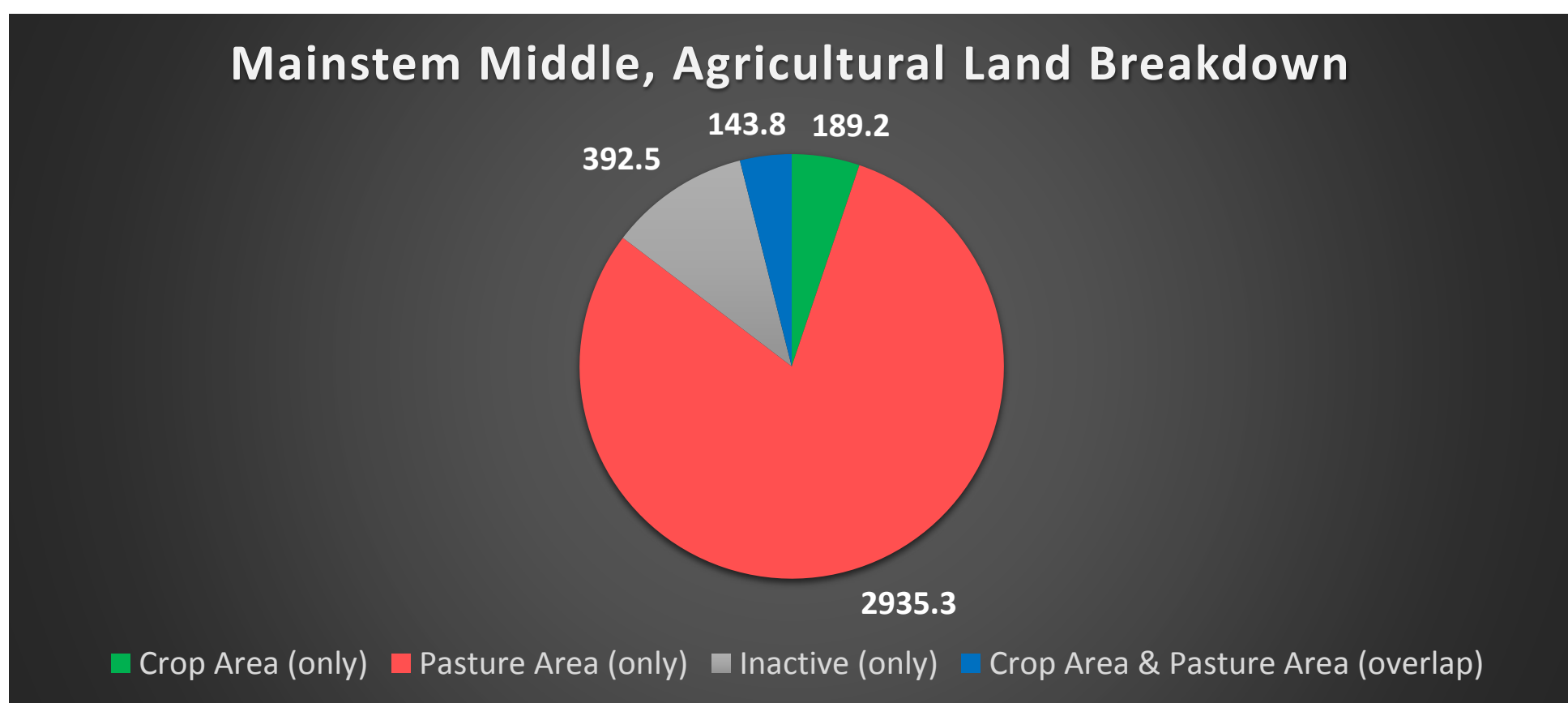
After the completion of data collection from the field and aerial imagery, the combined collected data is processed using a model developed in ModelBuilder in ArcGIS Pro 2.2.1. This model summarizes agricultural activity within each subbasin and apportions livestock across contiguous grazing areas. So far, this process has been run for Lake Lawrence and Mainstem Middle subbasins.



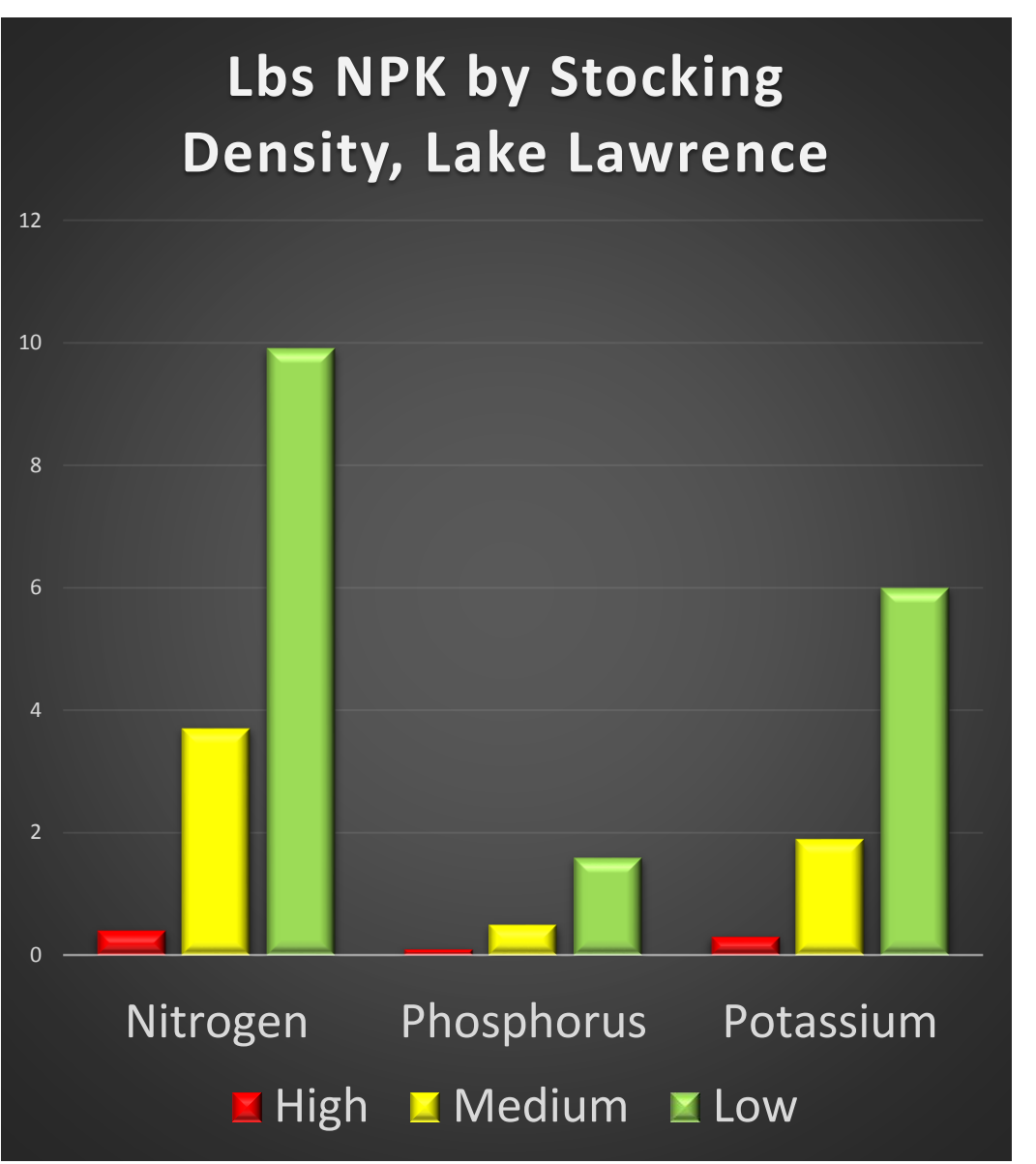
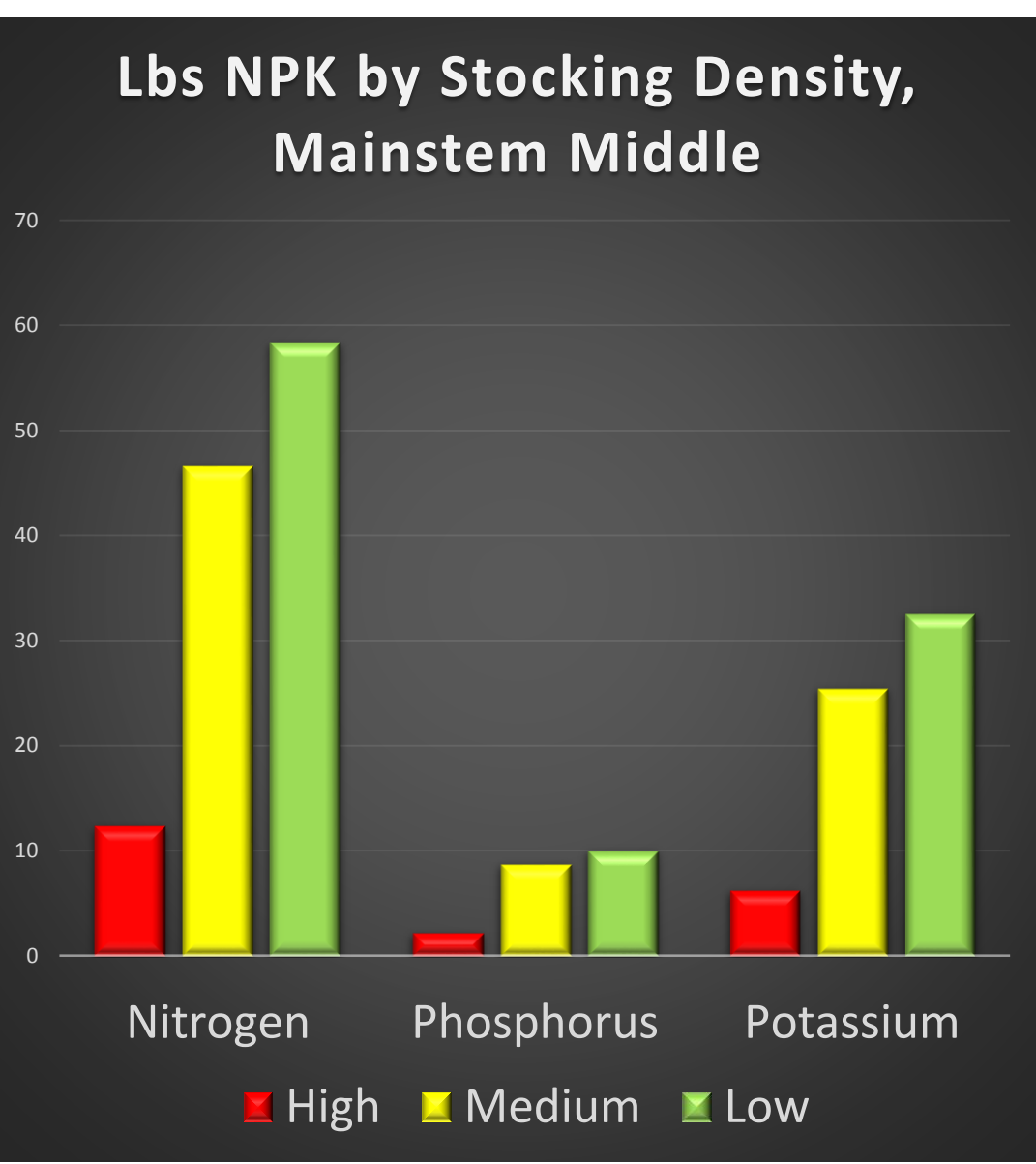
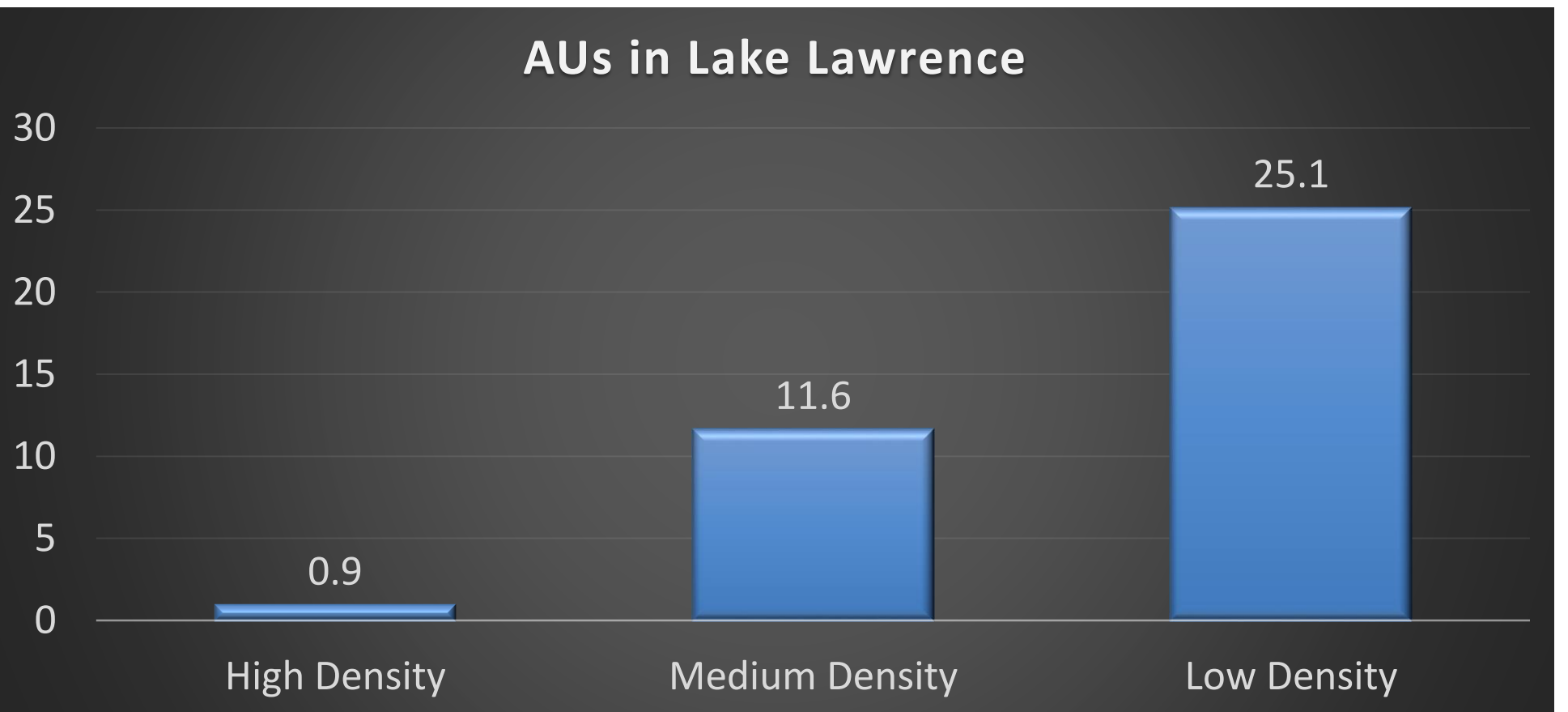
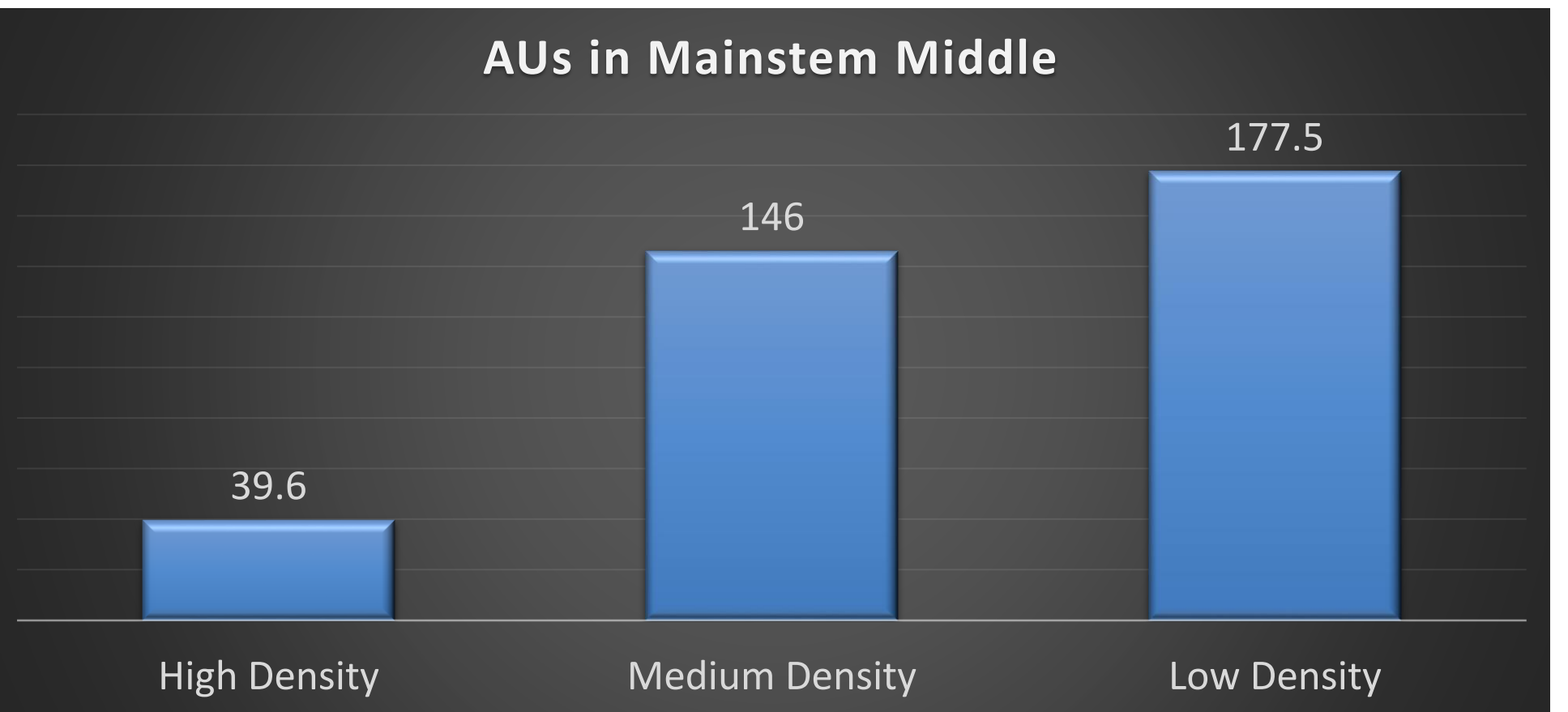
Data collection was also taken on the presence or absence of vegetative buffers and exclusion fencing around major streams and rivers, where this was visible from roads or bicycle paths as show in the above photo. Such data helps inform how nutrients from agricultural activity may interact with the watershed.



The larger size of the Mainstem Middle is reflect in its overall greater size of agricultural activity. The largest type of agricultural land in both subbasins was pasture, recorded as land on which livestock were seen to be present or assumed to be based on visual clues. This trend was stronger in the Mainstem Middle than for Lake Lawrence. As a percentage, Crop Area made up over a quarter of all agricultural land. In both the Mainstem Middle and Lake Lawrence, the main crop was Hay or Haylage. Inactive farmland, recorded to be land which represented an agricultural resource not currently in use, was more present in the Lake Lawrence subbasin than the Mainstem Middle subbasin.



Animal Units (AUs), representing a unit of livestock standardized by animal weight, were calculated for the two subbasins. These numbers were also quantified by the observed stocking density, a measure holding particular relevance for livestock nutrient management. Stocking densities were grouped into high (>1.0 animal unit/acre), medium (≥0.5 to <1 animal unit/acre), and low (<0.5 animal unit/acre). Only a minority of animal units were found in areas with high stocking densities, with most grouping in pasture areas that had medium or low stocking densities.



Livestock numbers and types were also used to calculate the estimated their daily output of nitrogen, phosphorus, and potassium. These numbers represent gross output and are not adjusted for land or manure management strategies, which were beyond the scope of this work.

For both subbasins, the majority of nutrients were produced by livestock kept in low and medium stocking densities, indicating that much of the nutrient production from livestock across these two subbasins is not particularly concentrated.

Conclusions

A majority of land in both subbasins is used as pasture area for livestock. Overall, the majority of livestock, along with their emissions of nitrogen, phosphorus, and potassium, are mostly associated with medium or low stocking density rates. The majority of crop land, which is more prevalent in Lake Lawrence in percent terms than for the Mainstem Middle, is used for production of Hay and Haylage.

Next Steps

Further analysis will be conducted on the data for Lake Lawrence and the Mainstem Middle, particularly relating to vegetative buffer and livestock exclusion fencing. Data collection from NAIP aerial imagery will be completed in the near future for both Spurgeon Creek and Offut Lake subbasins. Ultimately, a comprehensive analysis will be conducted for all collected metrics for the five subbasins targeted in this study.

Acknowledgements

Funding for this project was provided by the Thurston County Stormwater Utility. Several state and county agencies, divisions and individuals generously offered guidance and data to this project, including Thurston County Environmental Health, Thurston County Long-Range Planning, the Thurston Regional Planning Council, and Washington State Department of Ecology.