

Assessment of Water Level Fluctuations for Major Wild Rice -Producing Lake on the White Earth Reservation



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Background

Wild Rice (*Zizania Palustris*) is an aquatic grass species indigenous to North America that grows in the shallow lakes and rivers of Minnesota, Wisconsin, and western Ontario. The seeds of this grass are harvested each year, which is a sacred food of the Anishinaabe people of the Great Lakes Region. Extreme fluctuations in water levels can have detrimental impacts on wild rice at different growth stages throughout the growing season. Low water levels can impact the crop by drying out the plant and killing it. High water levels can drown out the plant also causing the plant to die. Lower Rice Lake, which produces more than 200,000 lbs. of wild rice each year, is the largest wild-rice producing lake on the White Earth Indian Reservation and in Northern Minnesota. The lake is 6.2 miles long and 1.25 miles wide, with the maximum depth at 6 feet and the minimum depth lower than 1 inch. Water level management of this lake is critically important to the people of the White earth Nation. If this lake were to decrease in size then it means fewer rice stands will flourish. Increased water levels can mean more wild rice stands for harvest.

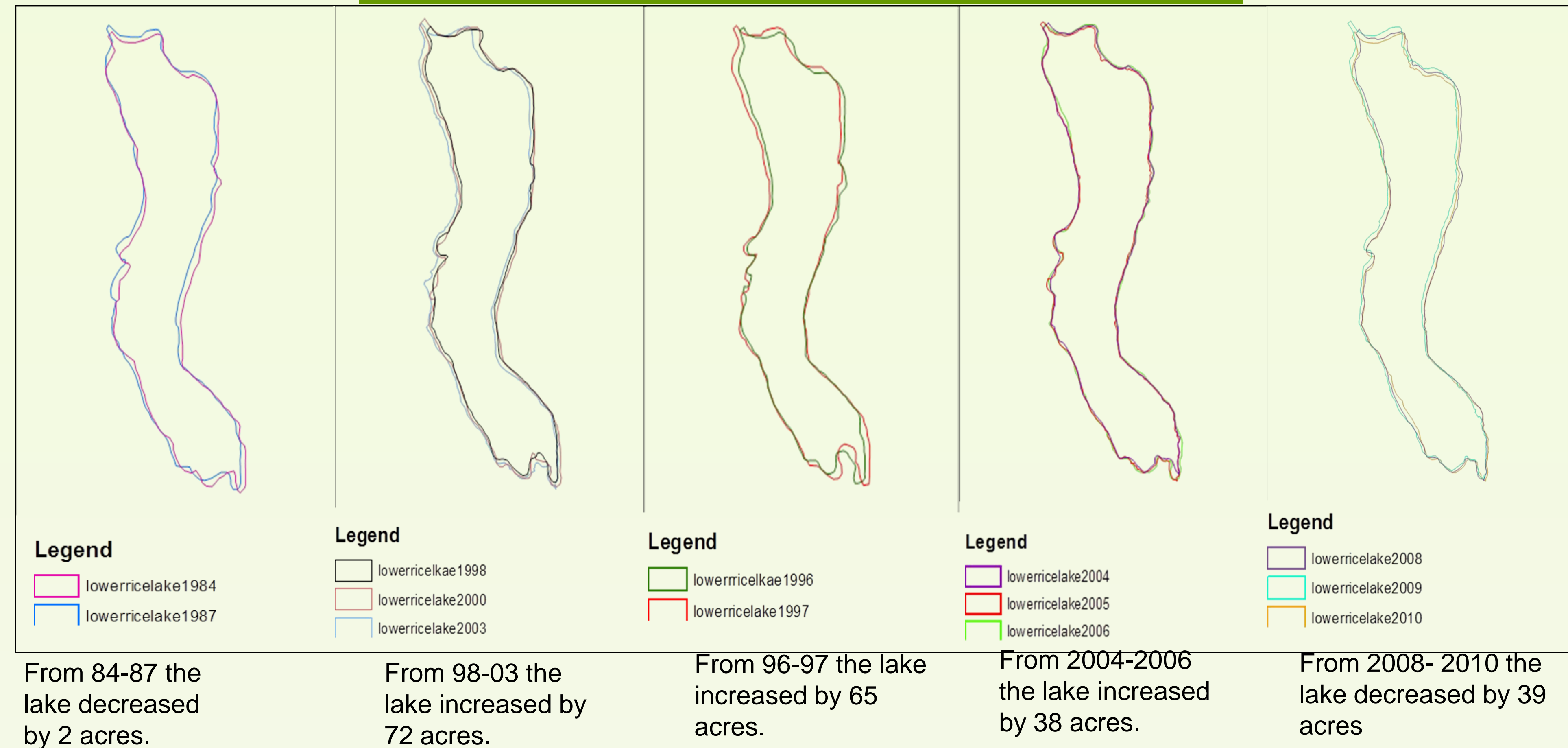
Objectives

The objective of this project is to assess fluctuations in water levels utilizing geo-spatial information from NASA images, historical aerial photos, and historical maps.

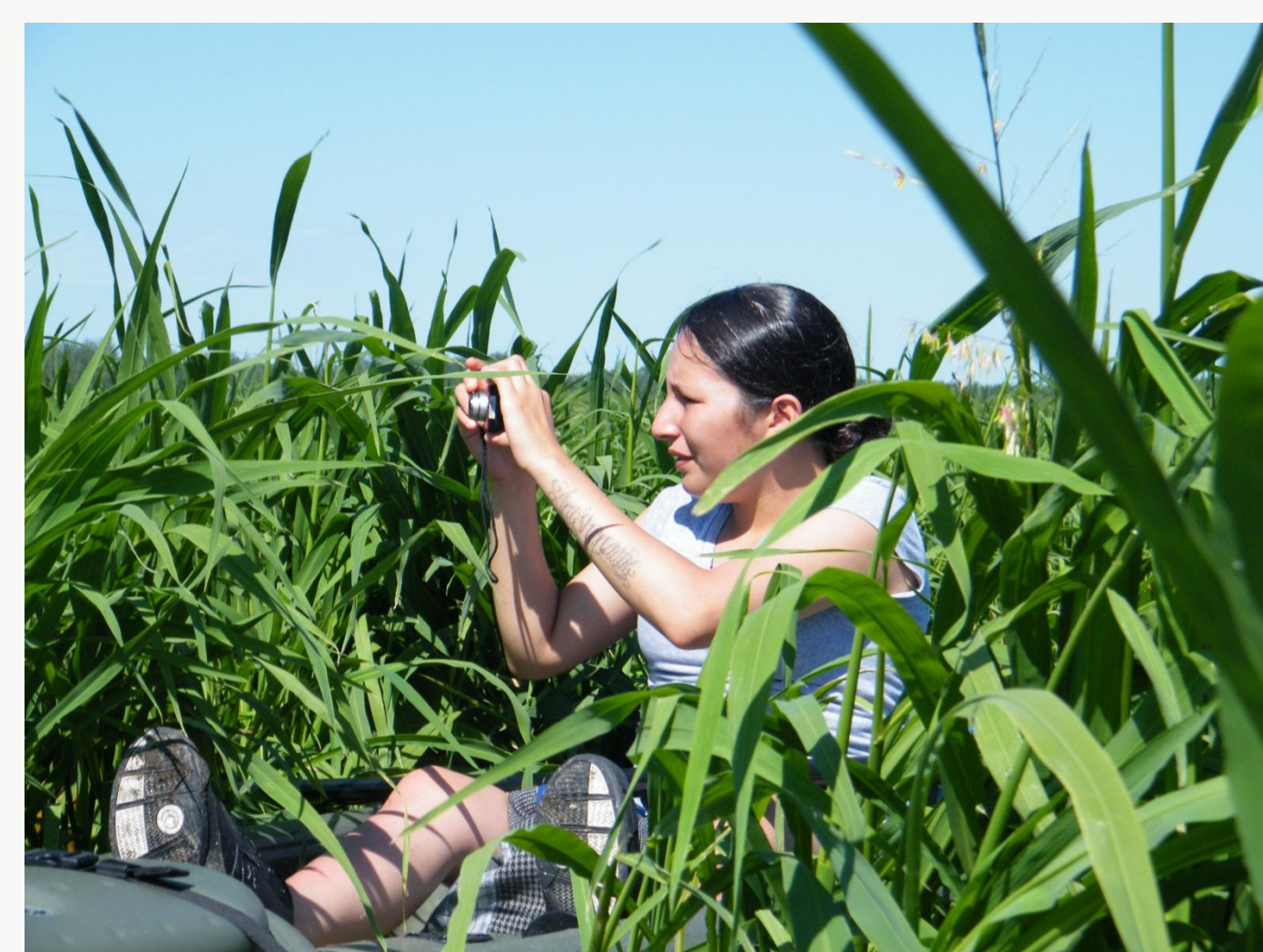
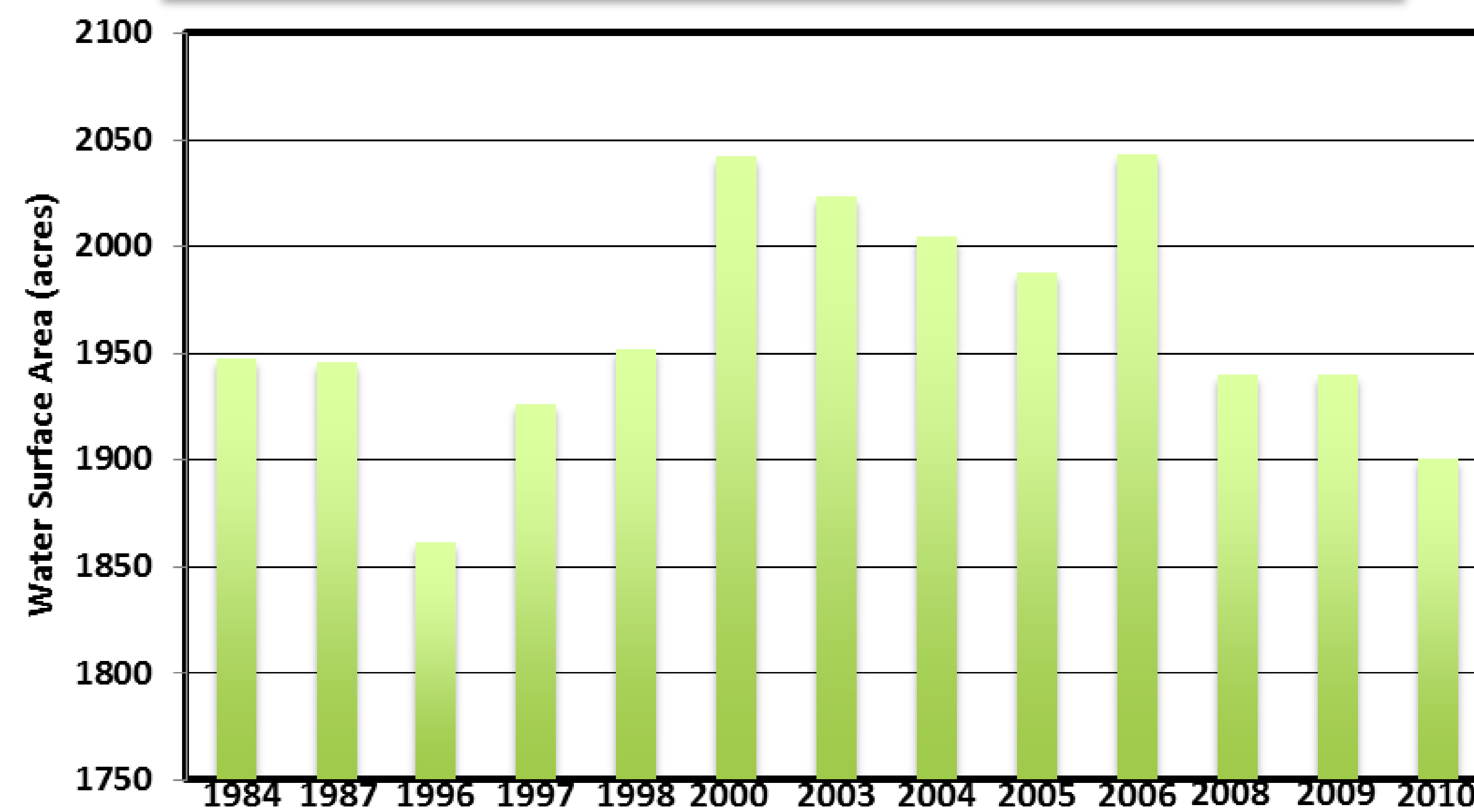
Methods

Using historic maps and geospatial technology, an assessment of Lower Rice Lake was conducted to determine how the lake level perimeters have changed over a period of time. The study relied upon data over a 26-year period (1984-2010). Using Ortho images from 1984-2010, vector layers were created and digitized to see minor changes in lake perimeter. Landsat 4&5 images were downloaded and digitized to create vector shapefiles which were overlaid onto the images to see perimeter changes. Using the ArcMap10 field calculator, the areas within the lake perimeters were calculated into acres for each of the study years and graphed for comparison.

Results



Comparison of water surface area at Lower Rice Lake (acres)



Conclusion

Within this 26-year timeframe, the maximum area of the study area in 2006 at 2,042.842 acres and the minimum area was in 1997 at 1,925.881 acres. The standard deviation of lake level fluctuations was 116.961. According to the vector images of the lake, most of the fluctuations occurred in the northern and southern regions of the lake, whereas the eastern and western edge boundaries remained consistent. Further statistical testing is needed to determine significant changes to fluctuations. Recommendations for future research are to: 1) assess the bathymetry of the lake depth and 2) analyze changes in growth and distribution of wild rice using remote sensing analysis.

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