

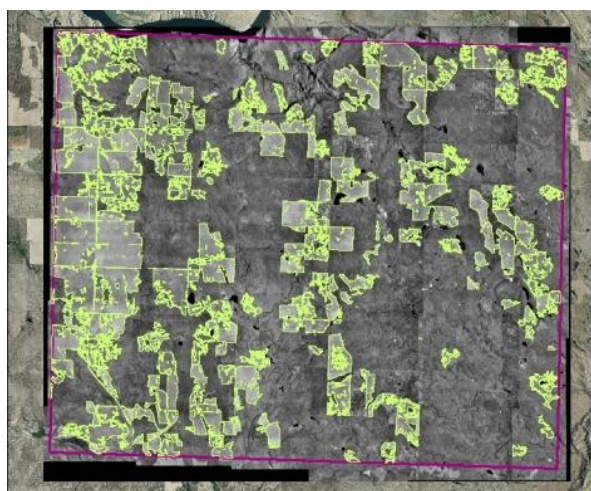


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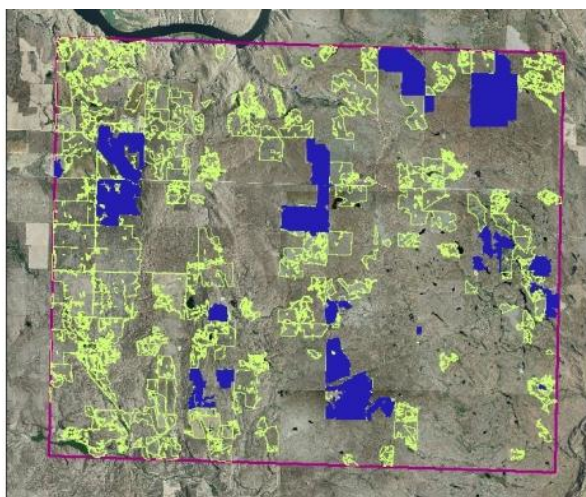
Introduction: In arid regions such as the sage shrub steppe of the interior Columbia basin, small depressional ponds and the wetlands surrounding them anchor key habitats for plants and wildlife. Historic aerial photographs have been used to detect wetland change and habitat fragmentation, but aerial photography alone allows for a limited comparison of change between a few dates. This analysis offers a more complete picture by considering visible changes in open water area and surrounding agricultural land uses, as well as the influences of the underlying geology, basin topography, and precipitation.

Wetland and agricultural lands delineation using object based feature extraction:

Object based feature extraction involves the analyst classifying the objects of interest so that the pixels in an image are “seen” by the computer in a way similar to the human eye. Traditional pixel-based classification methods rely on spectral signatures to classify each pixel, where as hierarchical object-based feature extraction allows for use of additional variables such as texture, shape, and complexity to classify features. This process can improve accuracy results especially with images that do not have high spectral resolution, but may have high spatial resolution, such as black and white aerial photographs



1955 image of complete study area with plowed fields classification (in light green)



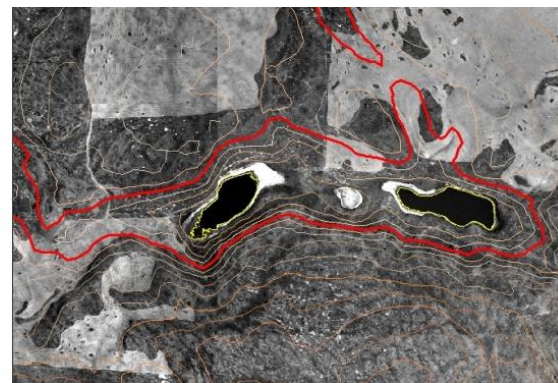
2006 image of complete study area with 2006 plowed areas (blue) classification over 1955 (light green)

Applications:

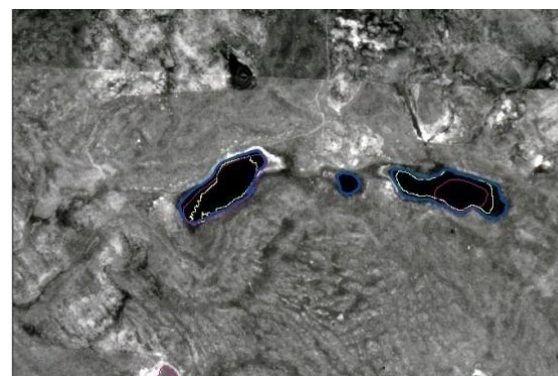
The results of this analysis can enhance our understanding of long term wetland changes, and help identify potential factors for further study, such as the impacts of land use decisions, local wetland functions, or climatic influences. This study can be used to help identify more persistent wetlands for long-term habitat protection, such as exclusion from grazing or restoration. The analysis offers an example of combining the information visible in historic aerial photographs with other spatial and quantitative data to create a more complete picture of landscape changes.

Future research:

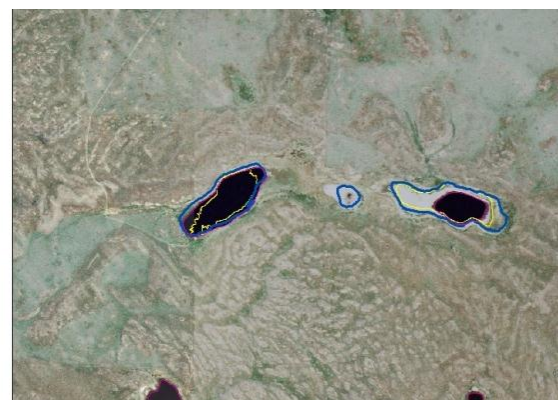
This monitoring showed the need for more study of the complex influences of surface and ground water movement on to local wetland water budgets and on where ponds persist. This study also showed areas that have as yet been unplowed and shrub steppe habitat may be of highest quality, if no lingering degradation by cattle and consistent water resources on the ground can be verified.



1955 photograph with wetland extraction (yellow) and basin topography outlined



1978 photograph with wetland extractions for 1955 (yellow), 1978 (blue), and 2006 (magenta)



2006 photograph with wetland extractions 1955 (yellow), 1978 (blue), and 2006 (magenta)

THE ISSUE: An understanding of the long term variability of small ponds and the wetlands surrounding them in arid regions can tell us about their potential to persist into the future. This analysis measures changes in open water and nearby land uses from high resolution historic aerial photographs, and correlates them with precipitation data, and underlying geology and basin topography mapping.

THE KEY QUESTIONS:

Can historical aerial photographs help to monitor landscape scale long term changes in wetlands and land use?