Prairie Pothole Region, Canada

Submitted by Irena Creed, Western University

Figure 1. The Prairie Pothole Region (Gala et al. 2011).

Background Information:

The Prairie Pothole Region (PPR) covers approximately 750,000 km^2 of central Canada and the United States. The term "pothole" refers to the small closed basins that litter the landscape. The millions of potholes were formed following glacial retreat during the Wisconsin. Potholes are often underlain by fine glacial till with low permeability, which severely limits groundwater discharge and/or recharge, forming ponds fed mainly by surface water from spring snowmelt and rainwater. Potholes range in size, depth and connectivity, but the majority have a surface area <1ha and rarely become connected through surface hydrologic pathways.

Main Research and Management Problems:

Wetlands in the PPR of Canada are being lost at an alarming rate, with figures of between 60 and 90% wetland loss often reported. Wetland loss in the PPR is predominately due to expansion of agricultural lands for cropping. Urbanization and industrial development also account for a significant portion of wetland loss. These extremely high rates of wetland loss have led to an increasing focus on wetland conservation and restoration.

Research into the ecosystem services provided by wetlands in the PPR is increasing, including the development of remote methods using GIS and remote sensing to determine indicators of wetland function, value and ecosystem services. One of the key barriers to assessing wetland loss, functions, values and ecosystem services in the PPR is the existence of a comprehensive wetland inventory. Irena Creed (Western) is currently investigating various GIS and remote sensing

techniques to define wetlands in the PPR. This research will greatly improve the ability to assess wetlands over broad spatial scales and better understand the feedbacks associated with wetland loss.

Possible End-Users:
In addition to the researchers mentioned in the previous section, research on the PPR would be of interest to the following stakeholders: Policy makers, land managers, the Alberta, Saskatchewan and Manitoba provincial governments, Ducks Unlimited and other wetland conservation groups, Alberta Environment, the Ministry of Natural Resources, and land owners in the PPR.

Site Conditions:
The PPR extends from Iowa in the central US to Alberta in central western Canada in the Prairie Ecozone. The climate of the Canadian PPR can be varied with periods of heavy rainfall followed by extended drought. The PPR typically has a north-south and west-east precipitation gradient with areas in the northwest receiving less rainfall than the southeast. The majority of wetlands within the PPR receive their water from spring snowmelt; however, there is a complex system of groundwater interactions throughout the region. Wetlands in the region can be either groundwater recharge or discharge areas, which dictates the water chemistry at each site. The complex biological, hydrological, geological and climatological systems of the PPR make it a unique and distinct ecosystem warranting conservation.

Monitoring and Data:
Meteorological, hydrological (surface water and groundwater well data), physicochemical, carbon sequestration and flux, land use and land cover, SAR, SPOT, Aerial Photography, LiDAR derived DEM, from the Lake Naivasha basin are available.

Publications:

Publications by GWEN Members:

Gala TS, Aldred DA, Carlyle S, Creed IF (2011) Topographically based spatially averaging of SAR data improves performance of soil moisture models. *Remote Sensing of Environment* 115: 3507-3516.

Creed IF, Bourbonniere RA, Adams J, Spitale S (Submitted) Hydrologic profiling for greenhouse gas effluxes from natural grasslands in the prairie pothole region of Canada. *Global Biogeochemical Cycles.*