Geophysical Research Abstracts
Vol. 16, EGU2014-9840, 2014
EGU General Assembly 2014

Ecohydrology applications to ecosystem reconstruction after oil-sand mining

Carl Mendoza (1) and Kevin Devito (2)

(1) University of Alberta, Edmonton, AB, Canada (Carl.Mendoza@UAlberta.ca), (2) University of Alberta, Edmonton, AB, Canada (Kevin.Devito@UAlberta.ca)

Oil-sand deposits in northeast Alberta, Canada comprise some of the world's largest oil reserves. Open-pit mining of these resources leads to waste-rock piles, tailings ponds and open pits that must be reclaimed to "equivalent landscape capability", with viable forests and wetlands, using only native vegetation. Understanding ecohydrological processes in natural systems is critical for designing the necessary landforms and landscapes.

A challenge is the cold, sub-humid climate, with highly variable precipitation. Furthermore, there are competing demands, needs or uses for water, in both quantity and quality, for reclamation and sustainability of forestlands, wetlands and end-pit lakes. On average there is a potential water deficit in the region, yet wetlands cover half of the undisturbed environment. Water budget analyses demonstrate that, although somewhat unpredictable and uncontrollable, the magnitude and timing of water delivery largely control water storage and conservation within the landscape.

The opportunity is to design and manipulate these reconstructed landscapes so that water is stored and conserved, and water quality is naturally managed. Heterogeneous geologic materials can be arranged and layered, and landforms sculpted, to minimize runoff, enhance infiltration, and promote surface and subsurface storage. Similarly, discharge of poor quality water can be minimized or focused. And, appropriate vegetation choices are necessary to conserve water on the landscape. To achieve these ends, careful attention must be paid to the entire water budget, the variability in its components, interconnections between hydrologic units, in both space and time, and coupled vegetation processes.

To date our knowledge is guided primarily by natural analogues. To move forward, it is apparent that numerous priorities and constraints, which are potentially competing, must be addressed. These include geotechnical and operational requirements, material limitations or excesses, time, money and performance expectations. Careful landform design and integration of ecohydrological principles can be used to address some of these issues.