Quantitative methods for vulnerability characterization cannot be meaningfully applied at the provincial scale due to the lack of available detailed hydrogeological data at this scale. A GIS based approach for broadly evaluating the relative vulnerability of bedrock coastal aquifers to seawater intrusion in unserviced areas of the province was therefore developed. The approach uses available provincial spatial datasets, such as digital elevation models, civic address points, and well logs data, to evaluate relative vulnerability based on the following derived criteria: distance to the coast, land slope, development density, non-residential groundwater use, water level, and well water salinity problems reported by well drillers during well construction.

A provincial relative vulnerability map was produced using this GIS approach, and compared to available chemistry data. The map identifies areas that may already be experiencing seawater intrusion or are at greatest relative risk to additional groundwater withdrawals, sea level rise, or decreased groundwater recharge. The scoping approach/mapping could be used by groundwater managers to help identify emerging seawater intrusion problem areas, to identify suitable coastal aquifer monitoring well locations and areas for more detailed quantitative analyses, and to help inform land use planning decisions. Improvements to the quality and resolution of input data layers are recommended to improve the reliability of the assessment tool.

SESSION T2-B: GW/SW INTERACTION III

Tuesday, September 18 • 13:00-15:15 • Strategy Room 2

Chairs: Fereidoun Rezanezhad, Adrian Butler

801- Impact of trees on groundwater balances

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The role of trees in water balances is largely unknown and underestimated. On the one hand, trees enhance cloud formation and decrease runoff increasing infiltration. On the other hand trees uptake unsaturated zone water reducing recharge, some of them (phreatophytes) even tapping groundwater or its capillary fringe water directly. The impact of trees upon groundwater depends mainly on the climatic conditions of the investigated area, depth of groundwater table and type of tree species and density. In general, the drier the condition and the shallower water table, the larger is the impact of trees upon groundwater balances.

When water is abundant in the unsaturated zone, trees typically use it as the first source target following the lowest energy principle of water use. That water use does not affect directly groundwater resources, but by reducing recharge it affects groundwater resources indirectly. However, when unsaturated zone water is scarce within the tree root access, as during droughts or long dry seasons, to survive, many tree species uptake groundwater by deep rooting systems (sinkers), this way affecting groundwater directly. Field experiments have already proven that the largest impact of trees upon groundwater is observed in water limited environments (WLE). Considering that WLE are typically characterized by low recharge and long dry seasons when trees may use a significant amount of groundwater, such groundwater "consumption" can be comparable with recharge input therefore must not be neglected in groundwater balances and water resources management. In practice, groundwater uptake by trees is either underestimated or disregarded, mainly because of limited knowledge about the phenomenon and because tree measurement methods are typically not known to hydrogeologists.

This presentation reviews current methods of assessing tree water use and the role of trees in groundwater balances. By presenting examples, it is shown that by underestimating or omitting groundwater discharges by trees, significant errors can made in groundwater balances carried out with numerical groundwater models, particularly for dry WLE. Problems involved in this research are highlighted and possible future research directions discussed.