A Conceptual Model for Evaluating Hydrologic Connectivity in Geographically Isolated Wetlands

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Knowledge about hydrologic connectivity between aquatic resources is critical to understanding and managing watershed hydrology and to the legal status of those resources. In particular, information is needed on the hydrologic connectivity and effects of geographically isolated wetlands (GIWs) on downstream waters. GIWs mostly consist of depressions that typically lack surface water connections to other water bodies. However, GIWs may connect to downstream waters at a range of time scales through either surface water fill and spill events during flooding or through groundwater. Investigations of such connectivity are few, and have been limited to specific regional types of GIWs. An understanding of the general factors that control hydrologic connectivity of GIWs and downstream waters is lacking. Here we present a conceptual model that describes these general factors. By combining elements of the hydrologic budget with site and regional characteristics, we classify GIWs by type and magnitude of potential hydrologic connectivity. Combining this information with hydrologic landscape characteristics that are generally available throughout the US could allow GIW hydrologic connectivity to be evaluated. For example, GIWs that occur in areas that have high rainfall and/or snowmelt relative to basin capacity, that have low soil permeability, and occur on a high slope would have a higher probability of fill and spill connectivity. For these same climatic and basin characteristics, high soil and aquifer permeability would favor groundwater connectivity. We illustrate the conceptual model with several case studies of different GIW types.

Invited Presentation to session on “Downstream Connectivity of Headwater Resources,” 2013 AGU Fall Meeting, San Francisco, CA, December 9-13, 2013.