Ground Water- Surface Water Interactions at a Losing Stream: Their Relationship to the Disappearance of Interdunal Wetlands at Great Sand Dunes National Monument, Colorado

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Abstract. Water level data from a network shallow ground water monitoring wells were used to understand the ground water dynamics supporting interdunal wetlands at Great Sand Dunes National Monument and draw conclusions pertaining to their disappearance during the last 60 years. Stable isotopes of oxygen and hydrogen were used to confirm that Sand Creek, a nearby seasonal stream, is the primary source of recharge to the unconfined aquifer supporting interdunal wetlands. When Sand Creek is flowing seepage through its bed creates a ground water mound under the creek. The seasonal development of the ground water mound generates a pressure wave that migrates through the aquifer, causing water table fluctuations up to 2 km from Sand Creek. A simple analytical solution predicted the measured seasonal fluctuations at wells within 0.50 m.

Although some wetlands disappeared because migrating dunes buried them, the primary factors contributing to wetland disappearance were Sand Creek channel incision and climatic fluctuations during the last century. Incision of Sand Creek's channel reduced the height of the ground water mound approximately 2.5 m, thereby reducing seasonal water table fluctuations approximately 0.20 m at interdunal wetland sites. A long dry period between 1950 and 1980 reduced the length and seasonal permanence of the ground water mound under Sand Creek. Consequently, the water table dropped during successive dry years, destroying interdunal wetlands. Additional evidence indicates long-term cycles of wet and dry periods are more important controls on the elevation of the water table than channel incision. Hence, interdunal wetlands are features that exist temporarily in this landscape. They reach their maximum numbers following consecutive years of above average discharge in Sand Creek and then disappear as the water table drops during prolonged dry periods.