

Teasley, R.L., M. Milke, J.F. Raffensperger, and M. Zargar (2010) Common Pool Water Markets and their Role in Facilitating Land Use Change in Drying Climates Abstract H11F-0875 presented at 2010 Fall Meeting, AGU, San Francisco, Calif., 13-17 Dec.

Common Pool Water Markets and their Role in Facilitating Land Use Change in Drying Climates

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Concern is growing worldwide that climate change will lead to drier climates in many regions and in turn diminish water resources. To protect these limited resources, users may need to shift water use to more economically productive areas. However, changing the land use associated with water permits can be quite difficult, because water is not easily traded. Water markets have been well researched as a method for trading water between users, but these markets can often be difficult and costly requiring one-to-one trades between buyers and sellers. In contrast to a one-to-one market, a common pool market can reduce the transaction costs associated with trading water. In this research, a common pool market is applied to an example groundwater system set up in GWM2000 with ten users and various environmental constraints. The users represent three types of the largest groundwater users in the Canterbury region of New Zealand: agricultural, dairy and livestock. The response matrix from GWM2000 is used to develop constraints in the market model along with user bids. Bids are calculated from economic and water use data for Canterbury, New Zealand. Varying spatial distributions of water users by type are evaluated for the effect on the market under drying conditions. These conditions are simulated from climate change scenarios produced by the National Institute of Water and Atmospheric Research in New Zealand. The results demonstrate potential land use changes falls under drying conditions. As water availability falls, the price for additional water increases, particularly near environmental constraints, driving the land and water towards more efficient uses.