**Issues in the Development of a Water Leasing Model in the Mimbres Basin, NM**

**Introduction**

**Overview:** Tucked away in the southwest (Figure 1) corner of New Mexico lies a rural farmland basin, the Mimbres. The Mimbres basin has one small river flowing through it with one reservoir (Bear Canyon Reservoir) upstream from the rivers. The State Engineer, faced with the prospect of a priority call on the river is interested in the possibilities of a water leasing system in the basin. The Mimbres is an ideal setting for further efforts in developing water-leasing models. The river is fully adjudicated with property rights completely defined and represented within a GIS system, with the area of interest being small and the farming operations relatively homogeneous.

**Problem:** In response to continuing drought in New Mexico, general rules and regulations for administering Active Water Resource Management (AWRM) were finalized by the State Engineer on December 3, 2004. The objective of these rules is to establish a framework for the state engineer to carry out his responsibility to supervise the physical distribution of water, to protect senior water rights owners, to assure compliance with compacts, and to prevent waste caused by administration of water rights. The state engineer is required to adopt rules based on appropriate hydrologic models and expended marketing and leasing with districts subject to priority administration. AWRM encourages the development of replacement plans that prevent serious and imminent economic harm. Specifically, these replacement plans provide a mechanism by which junior water rights holders will be able to temporarily acquire senior water rights in an expedited manner. The Mimbres basin has been selected as a demonstration water leasing market which may be extended into priority basins throughout New Mexico.

**Physical Model**

**Design Structure:** Using GIS mapping that is available for the entire basin that details each field (Figure 5) and associated water right, ditch, domestic irrigation system and domestic well, a hydrological model has been developed using dynamics in Powersim Studio 2005. The hydrological model links surface-groundwater hydrology together. The model will be interconnectively linked to the State Engineer’s geospatial water rights database. Model development requires active participation by basin water users, those with knowledge of the hydrology, water rights, and operations of the irrigation systems. Their input to the model has been made through a series of meetings in which information has been exchanged and model operations reviewed. The data that is used in the hydrologic model comes from multiple sources, in particular USGS stream gaging data, Weather Service temperature and rainfall gage data and water rights/water use data from the New Mexico Office of the State Engineer. The spatial resolution of the hydrologic model was defined by active ditches within the AWRM. The river system was divided into 9 conceptual units referred to as reaches, based on the locations of point diversions and returns of 9 agricultural ditches. An interconnected aquifer with compartments that match the surface water reaches that overlie it is also modeled. Smaller aquifers that coincide with the tributaries to the upper Mimbres and interact with the alluvial aquifers provide a shallow, quick path for recharge to affect stream flow. The model runs on a daily time step, and data was operated from 1964 to 1972 for calibration. This is the only period of historical gage data where two pages on the upper Mimbres (McKnight and Neathour) were operational. During the calibration period, parameters in both the surface water and groundwater model are manipulated to match observed stream flows at the Near Mimbres Gage, internal to the modeled area, as closely as possible at each time step, and with no net error for the 9-year calibration period.

**Market Model**

**Design Structure:** A market model that utilizes a double oral auction will be the vehicle to facilitate leasing of water amongst the users in the basin. An initial meeting was held in July of 2006 in which partial buy-in was indicated by the user group. A follow up meeting was then held in December of 2006 to demonstrate software that was developed for the Middle Rio Grande, with a second demonstration of the software being held on March 9th to a larger group of users. On May 7th 2007 a meeting was held to allow users to display the preliminary trading interface and receive feedback to make modifications to the interface. The current interface is displayed in Figure 4.

There are three main parts to this interface. The first part is the large box comprising the left two thirds which has nine rows, one for each ditch. The interface is programmed so that one person can enter all the necessary information. For example if the Grijalva ditch would like to lease the water the moderator would click on the green icon on the left hand column next to the ditch name. A call is placed to the user and the user enters the amount of water he would like to lease to another user, the user is then able to use the amount of water that has been used during the growing season, the “Bank” (bought sold) column is the amount of water that the Grijalva ditch has bought or sold on the market place.

The “Bank Balances” column shows the priority date and amount of water that has been bought for that priority date, the appropriated left column is the amount of water left (App.-Used App.), the bid column would only be full only if Grijalva has placed a bid to lease water and the offer column is full only if Grijalva has an offer to lease water to other users. The left third of the trading interface consists of three boxes. The top box is a history of all transactions in the current round of trading, this box displays who has engaged in the lease transaction, the price paid, the acre feet traded and the priority date attached with this lease. The second box is where the moderator would click to post submit bids to engage in a leases, or offers to lease water. Below this box the moderator enters the price and quantity of water to be leased, with the last box below this being the priority date that is being asked or leased. An example of a bid to engage in a lease can be seen under the grijalva row for the bid column. The bid would be entered in the offer column and the priority date that is being asked for this lease.

The market is open multiple offers to lease water and bids to engage in leases to fill this interface.

**Stakeholder Interaction**

To date four meeting have been held with the ditch masters and users in the basin. The first meeting was held on July 13th 2006 at the firehouse in San Lorenzo. The second meeting was held on the campus of Western New Mexico University on December 7th 2006. The third meeting was held at the Mimbres Lodge in the upper Mimbres on March 9th 2007. The fourth meeting was again held at the Mimbres Lodge in the upper Mimbres on May 7th 2007.

1) July 13th 2006 – received buy in from the ditch master to design a leasing market. Decision was made to continue meeting with the Upper Mimbres Advisory Committee until the market design was ready to be presented to the full basin.

2) December 7th 2007 – Presented a stylized water leasing system as developed for the Middle Rio Grande with the Upper Mimbres Advisory Committee.

3) March 9th 2007 – Again presented a stylized water leasing system as developed for the Middle Rio Grande to a larger group of stakeholders. Also presented the basics of the developed hydrologic model. Stakeholders stated in this meeting that they would like to be able to engage in both wet water leases within the AWRM and paper leases within the whole Mimbres basin. The possibility of trading outside the AWRM would require a modification to rules that govern an AWRM.

4) May 7th 2007 – Presented the trading interface (figure 6) to a large group of stakeholders. During this meeting the legal problem of “stacking” of water was brought up. Stakeholders were adamant that “stacking” must be allowed in order to have a successful leasing market. It was agreed that “stacking” of water would be explored through market experiments. Upon the completion of these experiments a meeting will then be held to discuss “stacking” of water.

**Status**

Currently the market interface is undergoing final programming to be completed for testing in early fall of 2007. Once the interface has been tested experiments will be run at the University of New Mexico under some field conditions where stacking is not allowed and not allowed. This will allow us to analyze the effects of stacking which will be presented to the users and the State Engineer.