Integrated Management Plan Stakeholders Meeting
Twin Platte Natural Resources District
May 23, 2005

Stakeholders present: Phil Armstrong, Don Colvin, Burdette Cooley, Jim Goeke, Jim Hawks, John Kilpatrick, Steve Krajewski, Marion Kroeker, Tina Kurtz, Frank Kwapnioski, Jim Meismer, Roric Paulman, Robert Petersen, Page Peterson, Dennis Schilz, Kenneth Schilz, Jerry Steinke, Doug Teaford, Steve Van Boening, Joe Wahlgren, Jerry Weaver, Mike Wheeler, Robert Wiseman.
Stakeholders absent: Todd Kramer, Dudley Oltmans, Mike Svoboda,
Resource People: Jim Cannia, Ann Diers, Amy Mapes, Kent Miller, Duane Woodward

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The Stakeholders Meeting was called to order at 7:30 p.m. CDT.

Introductions
Guest speakers were introduced: Jim Goeke is Hydrogeologist, UNL Conservation & Survey Division. Duane Woodward is an Engineering Hydrologist with Central Platte Natural Resources District.

Announcements
Lisa Dominisse will be joining the Stakeholders group at our next meeting in June. She is the new DEVCO director in North Platte.

Educational Presentation:
Interrelationship of Ground Water and Surface Water – Jim Goeke
As demands for both surface and ground water grow there is increasing interest in understanding how these two are joined and how uses impact availability of water from both sources. Jim shared the following information with the group:

- Average annual precipitation in Nebraska ranges from 15 to 34 inches with an average recharge to ground water of 1 to 4 inches (compared to just ½ an inch in Texas). Soil type impacts recharge rate.
- Nebraska is one of eight states in the High Plains with access to vast underground water supplies in the Ogallala Aquifer and other smaller aquifers. Aquifer water levels have dropped 50 to 100 feet in Texas. In Nebraska some areas have had declines of as much as 50 feet while other areas have actually seen a rise in ground water levels.
- In 1980 there was an estimated 3.25 billion acre-feet of drainable water storage below these 8 states with 66% of the water below Nebraska, 12% below Texas, 10% below Kansas and the remaining 12% below Colorado, Wyoming, South Dakota, Oklahoma and New Mexico.
- Predevelopment to 1980 there was approximately 166 million acre-feet depletion with 70% of this being drawn out by Texas and none by Nebraska.
- Water models used to estimate inputs and outputs to water supply can never be totally accurate, but are useful for planning purposes. High Plains Regional Aquifer System models projecting changes from 1980 to 2020 estimate that ground water levels could decline in excess of 100 feet in some parts of the region. Even with best management practices drops of 50 to 100 feet in many areas are anticipated.
- Actual monitored changes in ground water from 1980 to 2002 reveal up to 40-foot declines in Southwest Nebraska while Southeast Nebraska saw 20 to 40 foot rises due to heavier than normal rainfall in the 80s and 90s. In the same time period there were declines of 40 to 60 feet in some parts of Kansas, Oklahoma and Texas.
- Total drop in water storage in the High Plains Aquifer, predevelopment to 2003 has been 235.2 million acre-feet of the total 3.25 million acre-feet of storage. Only ½ of 1% of the 2.145 billion acre-feet of water in Nebraska has been depleted. This relatively small amount is significant

because of the impact on stream flows. Most ground water in Nebraska flows in the same direction as stream flows and augments the streams. Near Grand Island the subsurface flow is away from the river so at times in the summer the Platte River will dry up completely along this stretch.

- The primary source of surface water in the Platte River system is melting snowfall in the Rockies. Surface water in the Republican System is primarily from rain runoff. Droughts can significantly impact surface water in these systems. A chart of droughts since the year 1220 found that droughts have lasted from 5 to 30+ years.
- The topography in the Twin Platte Natural Resource District is very diverse with bluffs, flood plains, sandhills, tablelands and lots of different types of soils. These differences mean that ground water moves at different speeds and is impacted in different ways throughout the district. Location and type of wells can create different impacts even when drilled relatively close together. A significant amount of the flow in a number of river systems comes from ground water discharge so increased pumping impacts surface water flows. If drilling causes the water table to drop below the level of the streambed an unsaturated layer is created with ground water flowing below the stream rather than into it. Even wells a distance away from a stream can impact surface water although the impact may not be seen for 30 to 40 years due to a lag effect as subsurface water slowly moves toward streams.
- In response to droughts in the 1930s and the 1947 flood more than 100,000 high capacity wells were drilled and reservoirs were built for flood control. Jim shared a number of graphs showing the consequent impact on ground water in different water systems.
- The Gerald Gentleman Power Plant provides 40% to 50% of power in 80 counties in Nebraska and utilizes water for cooling. Drought conditions and heavy demands on surface water led NPPD to install 38 wells with 2,000-3,000 gallons/minute pumping capacity as a back-up water supply if needed. COHYST models project that if these wells are used, ground water levels could drop 2 to 5 feet south of the Sutherland Reservoir and increase on the north side from recharge of water leaking from the lake.
- Between 1970 and 2000 there was a considerable increase in hydrogeology studies and test wells so better information is available along with greater understanding of hydrogeologic connections. This has facilitated improved models (like COHYST) to predict impacts of various actions on ground and surface water flows.
- There is an inescapable connection between surface and ground water. The degree of connection, conductivity, geology and lag times are the variables that must be factored into any models to guide decisions in the future.

Educational Presentation:
Cooperative Hydrology Study (COHYST) – Duane Woodward

COHYST is a process to develop databases and analytical tools to improve understanding of hydrologic and geologic conditions in the Platte River Basin – specifically the interaction and interrelationship of surface water and ground water.

Evidence that ground and surface water are connected ranges from simple observation (of ground water becoming surface water through spring fed tributaries) to complex studies. One study by USGS for the North Platte NRD in the Dutch Flats area in the Panhandle analyzed over 2000 ground and surface water samples to determine relative ages of the water and flow paths of groundwater. The results confirmed that seepage from canals provided more recharge than precipitation and that it quickly enters the groundwater system and quickly discharges as return flows.

Another illustration of groundwater and surface water interaction is found in Platte River flows. For 117 days in 2003, 40,000 acre-feet of water flowed past Kearney and then disappeared into the aquifer before reaching Grand Island.

Seven NRDs, two power districts, two state agencies, three cities, three statewide farm and irrigation organizations and two environmental organizations sponsored COHYST. Scientists and technical experts completed the study utilizing scientific advice and data provided by the US Geological

Survey, the University of Nebraska and Natural Resources Conservation Service. Three modelers were hired to do the actual modeling. Total cost of the six-year study was $7 million including a $2.9 million grant provided by the Nebraska Environmental Trust and in-kind services by sponsors and partners.

Groundwater flow cannot be readily observed and moves very slowly making it difficult to measure. Models replicate groundwater movement using variables that impact groundwater including geology, soil types, surrounding water tables and connections to nearby streams. Since there are big differences in geologic characteristics and rainfall along the Platte River, the COHYST plan was divided into three areas (Panhandle, Central, Eastern) with detailed groundwater flow models developed for each region.

Steps used to complete the COHYST model: *Step 1* - Establish a plan of work to develop databases and models. *Step 2* - Hire experienced hydrologists to help set up systems and review work to insure it meets industry standards. *Step 3* – Use the model to simulate groundwater elevations and interactions with rivers, streams and drains under a variety of conditions and over time.

The COHYST model was constructed using the Conceptualization and Characterization process, which involves organizing and defining databases, constructing the model, calibrating and testing the model, and completing different runs to explore different scenarios.

Surface Characterization looks at characteristics of rivers or streams, groundwater recharge from canal seepage, soil types, land use and location of wells. This data is combined to estimate expected pumpage and recharge using a Soil Water Budget approach.

Geologic and Hydrogeologic Characterization looks at physical characteristics and hydraulic properties of groundwater aquifers and different layers above the base of aquifers, confining layers that slow water movement, hydraulic conductivity of each layer, and historic groundwater elevations.

Ground Water System Characterization takes data for individual nodes and ties them together with all adjacent notes using high-speed, high capacity computers capable of calculating the millions of possible combinations of the 65,000 different nodes in the three COHYST regional models.

After databases are established, the model is calibrated by systematically varying model inputs within reasonable ranges to simulate water levels and groundwater flow to and from streams so that they match observed conditions. To verify accuracy, models were first calibrated to pre-groundwater development conditions (before 1950) and then during development conditions (1950-1998) and compared to historic groundwater level changes and stream flows during those same time periods.

Comprehensive, independent peer review of all parts of the modeling process is being completed by Eagle Resources, a nationally recognized consulting firm. The Study will be continually improved as more information is gathered and provides a foundation for improved water management in much of Nebraska. Specifically COHYST models can be used to:

- Increase understanding of ground water and surface water relationships and evaluate options for conjunctive management of these resources to assure a sustainable irrigation water supply.
- Assist in water management decisions required by the Platte River Cooperative Agreement
- Evaluate management and regulation options relating to groundwater and surface water
- Provide data and information to Nebraska policy makers who must devise integrated management plans for fully appropriated and overappropriated basins.
- Provide tools to analyze opportunities for future municipal, industrial and commercial development

Questions:

1. *COHYST developed a Water Budget for 3 areas. Can you also create Water Budgets by node?*

   Yes. Models have been calibrated for all three areas now and after peer review (by September or October) it should be possible to do alternate runs by nodes.

2. *After peer review, will there be an opportunity to correct assumptions made by the state when establishing the boundaries for overappropriated areas?*

   Internal reviews provide good confidence that peer review will not result in major changes in the model. Overappropriated designations on the Platte River upstream from Overton have been fixed by legislation. Integrated management plans are designed to move overappropriated areas to fully appropriated status over a 10 year time period. COHYST models can be used to evaluate different approaches to accomplishing this.

3. *Why might some people have trouble with this model?*
   Critics of the model question whether all the complexity of a water system can be reflected in a model. This is a fair question but the model seeks to get around this by using multiple levels and making assumptions on a node-by-node basis.
4. *What is the future for this model?*
   Sponsors of the COHYST project are currently discussing this. The interlocal agreement to develop the model will effectively end when the peer review is completed and final modifications are done. But the model needs to be continued to provide a tool for DNR and NRDs to use as they manage water resources into the future. NPNRD, SPNRD and TPNRD will also need to develop models like this and may want to consider sharing resources to hire a modeler to work for all three districts.

Future Meetings

Stakeholders were asked to contact Kent Miller with any additional ideas for speakers or educational topics to be covered in the coming months.

The next Stakeholders Meeting will be held **Monday, June 28th at the Holiday Inn Express in North Platte from 6:30 to 10:00 p.m. CDT.** Speakers will be Roger Patterson (Surface water administration and the role of DNR in the IMP) and Kent Miller (TPNRD Ground Water Management Plan and ground water development within the TPNRD).

The meeting was adjourned at 10:05 p.m. CST.