



Questions?
Dave Morgan
U.S. Geological Survey
2130 SW 5th Ave.
Portland, OR 97201
503.251.3263
dsmorgan@usgs.gov

Mosier Ground-Water Project Update

Mosier Watershed Council Meeting, September 19, 2007

Ground-Water Pumping for Irrigation, 2007 monitoring study

Wasco SWCD (Jennifer Clark and Shilah Olsen) has collected data from 12 irrigation wells serving 10 orchards. Monitoring began in April and will continue through October.

April-August pumping was very similar in 2006 and 2007 on 6 orchards where we have comparable data in both years.

Pumping rates show variation that probably reflects differences in the timing of rainfall and soil moisture (fig. 1), but the total pumping at the end of August is very similar in both years (fig. 2).

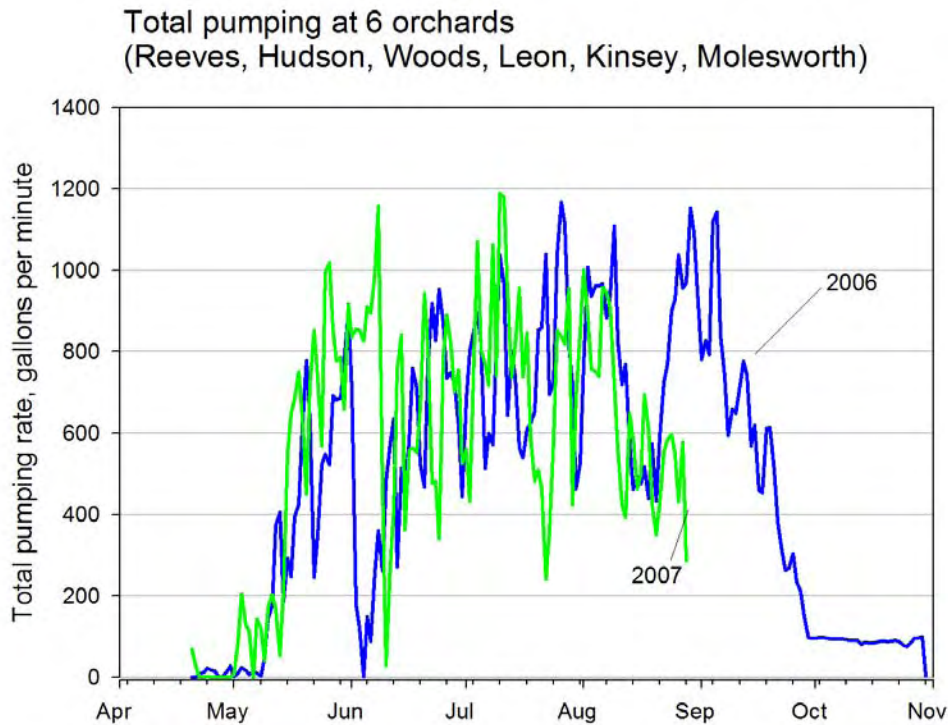


Figure 1--Pumping rates at six orchards, 2006 and 2007

Cumulative pumping at 6 orchards
(Reeves, Hudson, Woods, Leon, Kinsey, Molesworth)

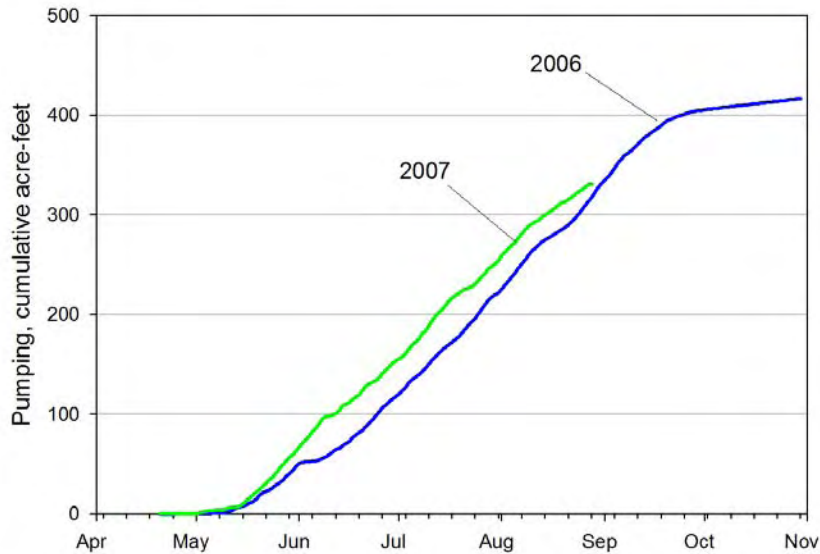


Figure 2--Cumulative pumping at six orchards, 2006 and 2007

There was less need for irrigation in June 2006 because a wet Dec-January and then wet conditions in late May and early June. Precipitation in WY 2007 is about 4 inches behind 2006.

Wasco Butte Cumulative Precipitation, Water Years 2006 and 2007

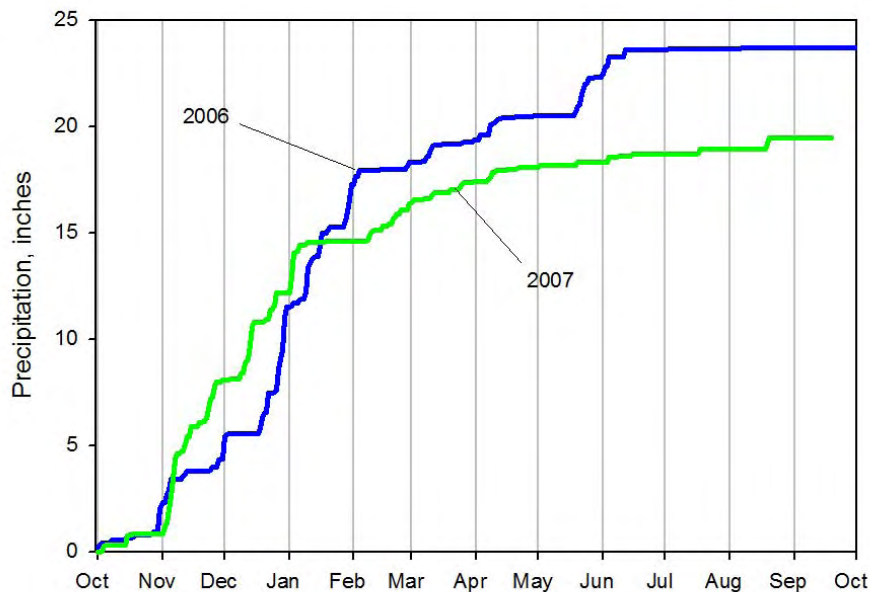


Figure 3--Cumulative precipitation, WY 2006 and 2007

Hydrologic Budget for the Mosier Watershed

A hydrologic budget is an accounting of all the inflows and outflows from the ground-water basin. We have estimated several of the components of the budget and will be using the ground-water model to estimate others.

The hydrologic budget equation:

$$\text{INFLOW} - \text{OUTFLOW} = \text{CHANGE IN STORAGE}$$

Components of INFLOW:

- Infiltration of rainfall and snowmelt*
- Return flow from septic*
- Ground-water inflow
- Stream losses*

Components of OUTFLOW:

- Stream gains*
- Pumping*
- Springs
- Evapotranspiration
- Ground-water outflow

CHANGE IN STORAGE:

Changes in storage occur when INFLOW and OUTFLOW are out of balance. When INFLOW is less than OUTFLOW, water levels decline and water is removed from storage. This is a source of water, but the system has limited storage capacity. We have estimated the rate that ground water is being removed from storage using well data, but will rely on the model for assessing the effects of long-term pumping on changes in storage.

* Components estimated using data; other components will be estimated using ground-water model

Infiltration of rainfall and snowmelt

Potential recharge (PR) from infiltration of rain and snowmelt was estimated for the 1953-2006 period (fig. 3). Potential recharge is the net after evapotranspiration and runoff are subtracted from precipitation. PR varies from less than 10,000 af/y in dry years to over 25,000 af/y in wet years. The mean for the 54-year period is about 20,000 af/y.

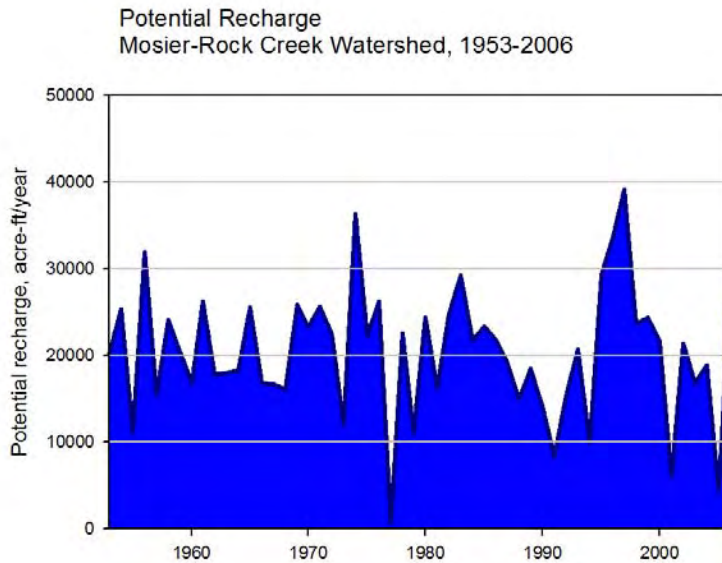


Figure 4--Estimated potential recharge

Pumping

Pumping by domestic wells was estimated using Wasco County building permit information, census data, and household water use data (fig. 4). Domestic pumping increased rapidly with residential development in the watershed beginning in the 1970s. In 2006 total domestic pumping is estimated at about 70 million gallons per year (Mgy). It is estimated that about 50% of the water pumped is consumptively used and the remainder is returned to ground-water through the septic system.

Estimated pumping by domestic wells in the Mosier Watershed, 1893-2006

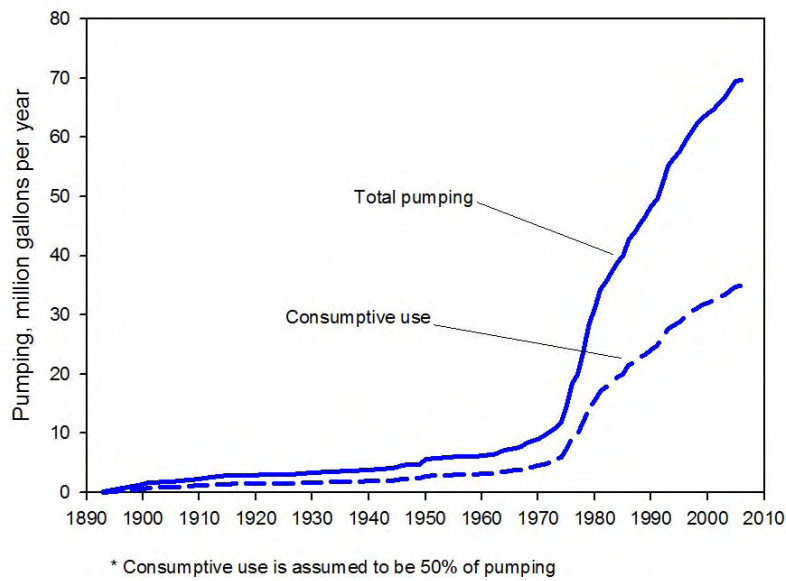
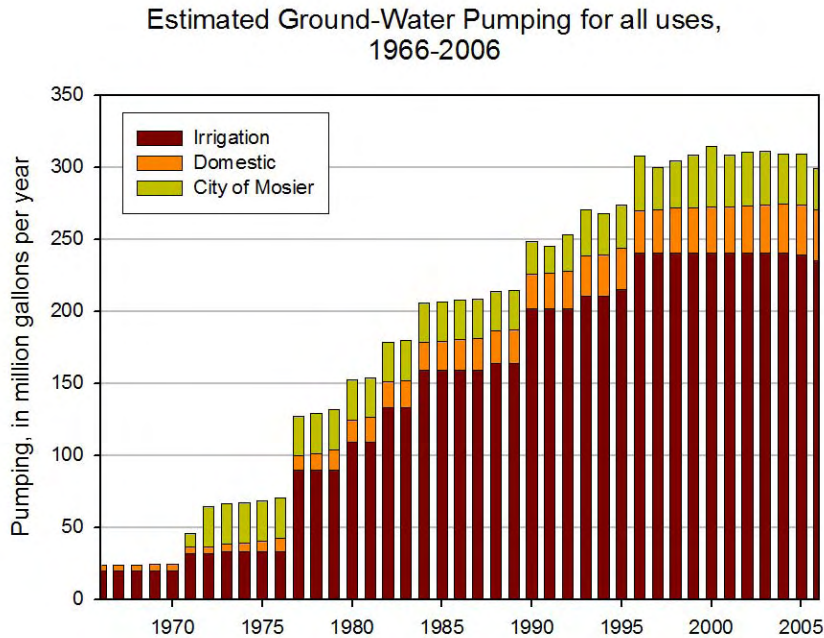


Figure 5--Estimated domestic well pumping and consumptive use, 1893-2006

Pumping discharge has been estimated for irrigation, municipal (City of Mosier), and private domestic wells in the watershed (fig. 5). The City of Mosier began supplying ground-water from the Priest Rapids aquifer (Well #3) in 1971 and pumping has varied mostly in response to variation in demand due to climate. Domestic (net) and municipal pumping together equal about 25 percent of total pumping as of 2006.



**Figure 6--Estimated pumping in the Mosier-Rock Creek Watershed for all uses, 1966-2006.
Change in ground-water storage**

When OUTFLOW (pumping, streams, springs, etc) exceeds INFLOW (infiltration, streams, septic, etc), water levels drop and water is removed from ground-water storage. We estimated how much water has been taken from storage using the long-term record of water level measurements at the Dayl Ann well (WASC 2759) which been measured by OWRD since 1974. By fitting a curve to the spring measurements, we estimated the change in water level (and storage) at 2-month intervals. Using an assumed storage coefficient and area of decline, we estimate that an average of 500 af/y were removed from storage between 1974-2007. The estimated rates vary on a scale that appears to reflect effects of climate and pumping variability.

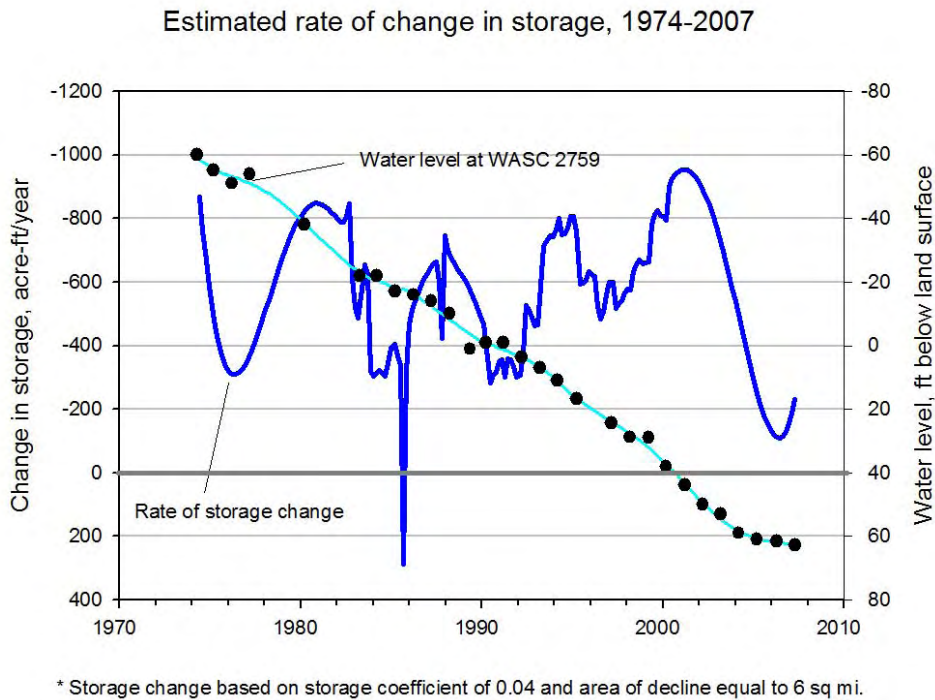


Figure 7--Estimated rate of removal of water from storage, 1974-2007

Other Activities

- The ground-water monitoring network will be discontinued after measurements in October. OWRD Watermaster will continue to measure a limited number of wells in the watershed.
- Work is continuing on the ground-water model and meetings with the Model Advisory Committee will begin in October.
- Progress was slowed (office move, staff commitments on other projects, vacations) over the past quarter and we are approximately 2 months behind schedule. We have had another hydrologist added to our team who will pick some of the modeling tasks.
- If the gaging station on Mosier Creek is to be continued after September 30 we need to draft a new agreement.

Model Advisory Committee (MAC)

- First meeting (proposed): Tuesday, October 30, 2007. Mosier Grange at 6:30 pm. An agenda and materials will be sent out approximately one week prior.