2008 Compliance Monitoring Report
Karnowsky Creek Restoration Project
Central Coast Ranger District
Siuslaw National Forest

Oregon Watershed Enhancement Board Project 201-424

(1) Description of any maintenance performed
No maintenance has been done on the stream channels since 2005, nor is any planned in the near future. Riparian plantings were released until they were large enough to grow above the surrounding grass and brush. The alders and willow are over 10 feet tall, and most of the conifers are now above the grass and brush.

(2) An accounting of any costs associated with maintenance and monitoring.
Monitoring cross-sections: $555/year (last done in 20xx)
Temperature Monitoring: $444/year (ongoing)
Photo point monitoring: $111/year (last done September 2008)
Groundwater monitoring: $60/month, $720/year (last done November 2007)
Salmon spawning survey: $1200/year (last done 2008)
Juvenile salmon snorkel counts: $900/year (last done 2008)
General reconnaissance: $900/year (ongoing)
Monitoring costs per year: $4830

(3) An assessment of whether the project continues to meet the goals specified in the grant agreement.

The original goals of the project included:
1. Restore natural meander geometry from the property line near the mouth of the creek to the upper part of the valley that had been ditched.
2. Raise the water table and the extent of associated wetlands in the valley floor.
3. Restore riparian plant communities to provide shade and wildlife habitat.
4. Encourage floodplain connection several times per year during storm events.
5. Add large wood to the channel and valley floor to provide channel complexity, improve hiding cover, and encourage overbank flow.

Goals met/not met:

1. **Natural meander geometry:** This topic was thoroughly covered in the 2006 and 2007 monitoring reports. The stream is stable. Two meander cutoffs are developing, which is adding to the complexity of the stream morphology and channel habitat.

2. **Raise the water table and extent of associated wetlands:** The elevation of the water table in groundwater wells have been monitored from 2001 through 2007. The data suggests that the water table is higher, and the water table stays higher later into the summer in the lower and middle portions of the mainstem.

Although the wetter winters of 2006-2007 and 2007-2008 may be partially responsible for this result, groundwater elevations in Tributary 2, which was not restored, and can be used as a control, show no change through the years. These observations suggest that restoring the meandering channel that is connected to the floodplain has resulted in more groundwater storage. In addition, the higher groundwater tables that last later into the summer may be a factor in keeping water temperatures cool. See Appendix A for a complete report and analysis on the groundwater monitoring data.

3. Restore riparian plant communities to provide shade and wildlife habitat.
Riparian vegetation is growing far beyond expectations, with limited browse occurring from deer and elk. Beaver present in lower valley and have taken out some conifers and willows. High value conifers were caged in the spring of 2006. See Appendix B for the photo points that show the riparian vegetation growth.

4. Encourage floodplain connection several times per year during storm events.
The valley floor floods on a regular basis with winter storms. There is excellent floodplain connection all winter, even in moderate sized flows**.** There is no change in this condition from the 2006 and 2007 monitoring report.

5. Add large wood to the channel and valley floor to provide channel complexity, improve hiding cover, and encourage overbank flow.
The large wood that was added to the channel and valley floor is functioning as expected. Much of it is now covered by grass, and hidden by the trees and shrubs.

6. A summary of any public awareness or educational activities related to the project, including identification of any tours or presentations and copies of newspaper or other media coverage about the project.
See the 2006 and 2007 monitoring reports.

In addition:
Field visit in April 2008 by:

- Florian Leischner, Salmon Restoration Biologist for the Nisqually Indian Tribe, Olympia, Washington,
- Kimberlie Gridley, Assessment and Monitoring Project Manager, South Puget South Salmon Enhancement Group
- Eli Asher, Habitat Restoration Project Manager, South Puget South Salmon Enhancement Group

This team was interested in learning about the Karnowsky Project because they are doing a similar project. Paul Burns, Barbara Ellis-Sugai and Johan Hogervorst hosted their visit and explained the design and construction process.

Appendix A: Groundwater Monitoring at Karnowsky Creek 2002-2007

Introduction

Groundwater monitoring was done to test the following hypothesis: restoring a more natural, meandering channel that was connected with the floodplain, and filling in the incised ditches that were efficient at removing water from the valley, would raise the water table, and sustain higher groundwater levels later into the dry season.

Methods:

Several well transects were established that crossed the mainstem valley and tributary valleys. See Figures 1 and 2 for the location of the groundwater monitoring wells. At the beginning of every month between 2002 and 2007, the depth of the groundwater table was measured and recorded. The new mainstem channel was dug in 2002, and streamflow was introduced into the new channel in 2003. Therefore, there was one year of pre-project groundwater data.

In this document, the data gatherered for the months of May, June and July for each year is compared. These months were chosen for analysis because the transition from the rainy to the dry season occurs during this time of year. If water tables are sustains later into the dry season, these are months that would show that result.

Cumulative rainfall from October of the preceeding year through the month analyzed is shown in Figure 3. Data is from the Goodwin Peak RAWS (Remote Automated Weather Station), which is approximately 6 miles southeast of Karnowsky Creek.

The new channel was dug during the late summer of 2002; however, the water wasn't diverted from the ditches into the new channel until late summer 2003. Therefore, the first two years of data shown in this report, 2002 and 2003, for the wells is prior to the ditch filling and introducing water into the new channel.

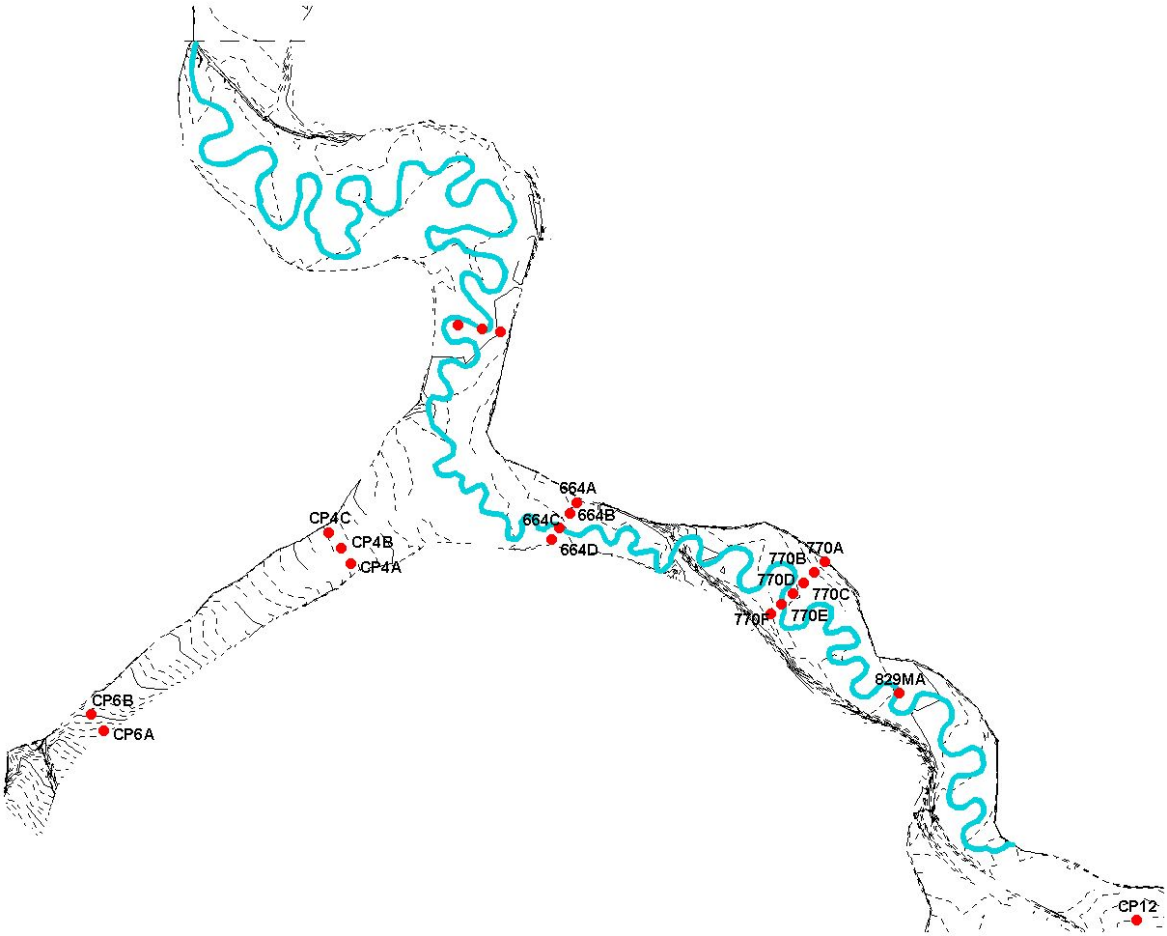


Figure 1: Map of well locations in the lower Karnowsky Creek Valley.

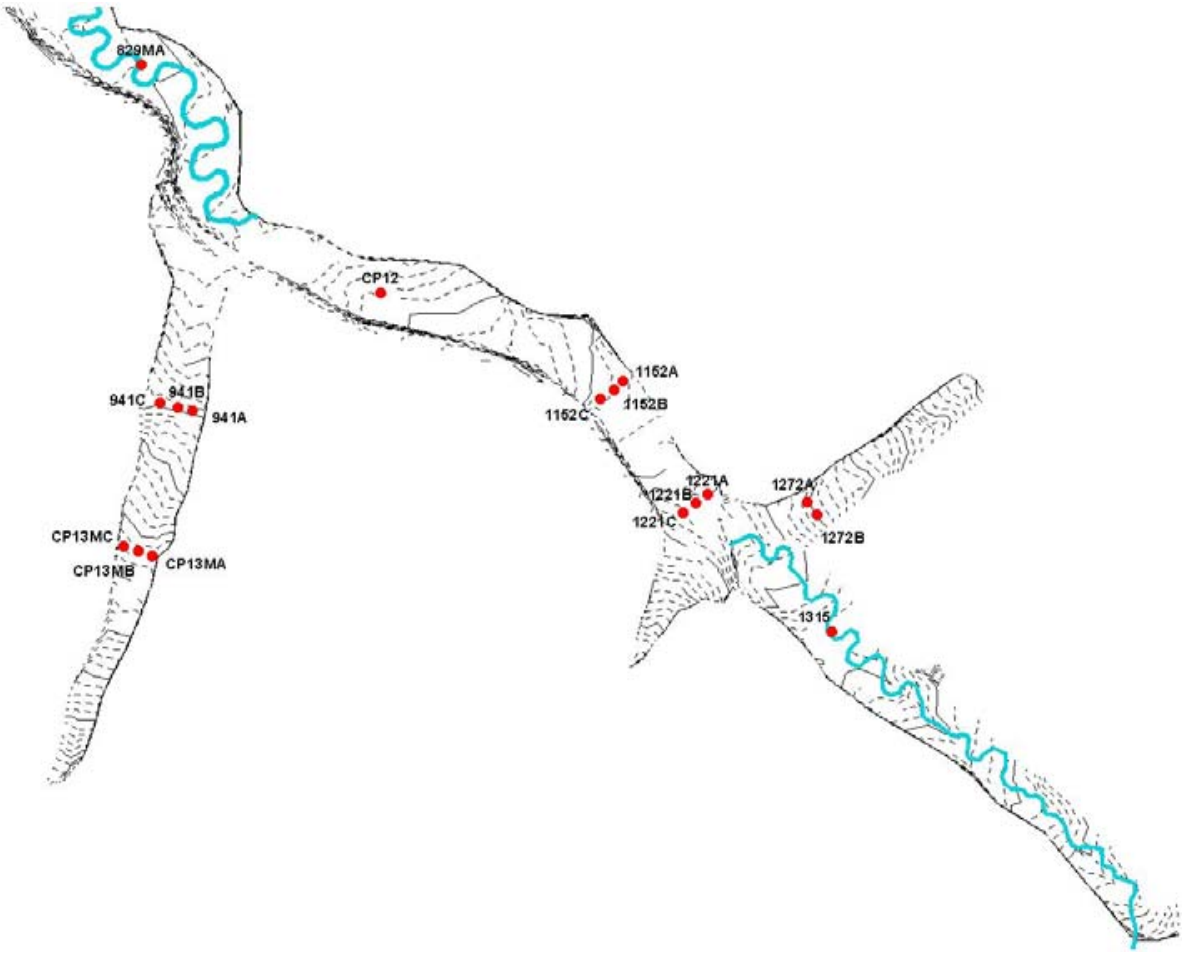


Figure 2: Map of the well locations in the upper Karnowsky Creek valley.

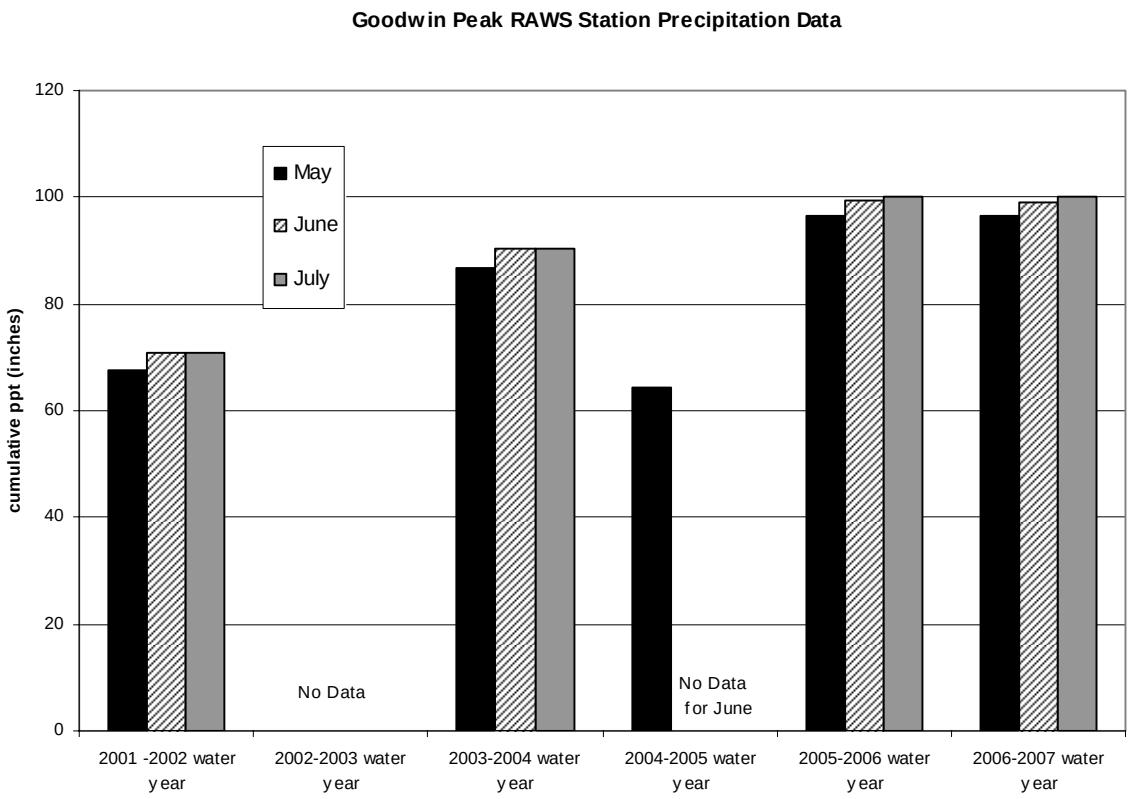
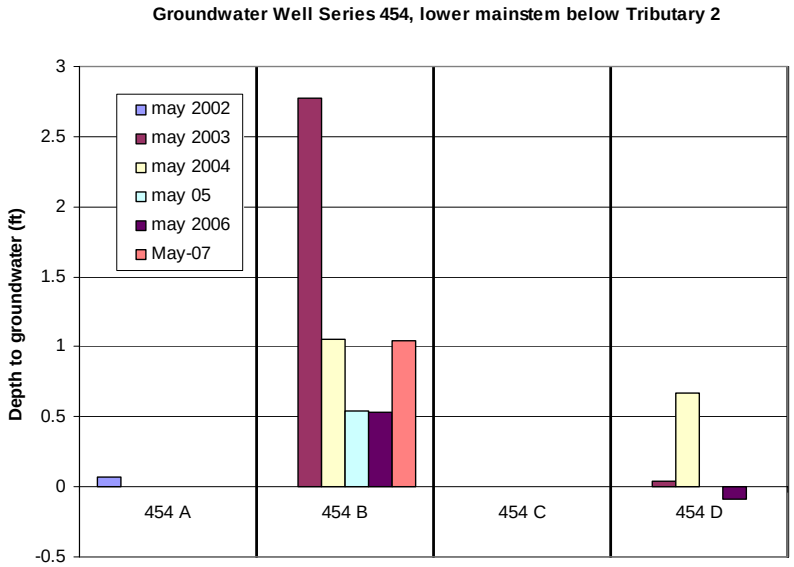


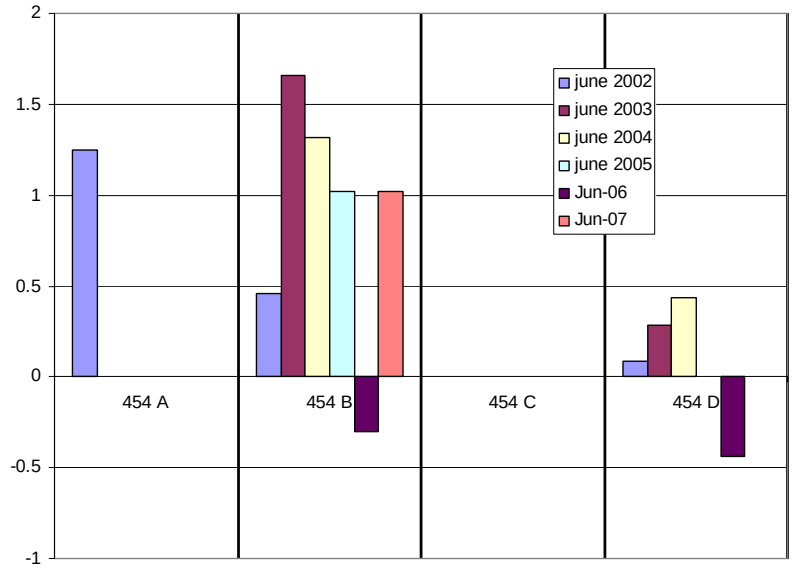
Figure 3. Cumulative precipitation data from the Goodwin Peak Remote Automated Weather Station (RAWS). Data is cumulative from October of the preceeding year through May, June or July of the following year. Water years in western Oregon run from October 1 through September 30. No data was included for the 2002-2003 water year because two months of data were missing. Likewise, only the May data for the 2004-2005 water year is shown because the June 2005 data is missing. Note that the later years in the data set are wetter than the earlier years.

MAINSTEM WELLS

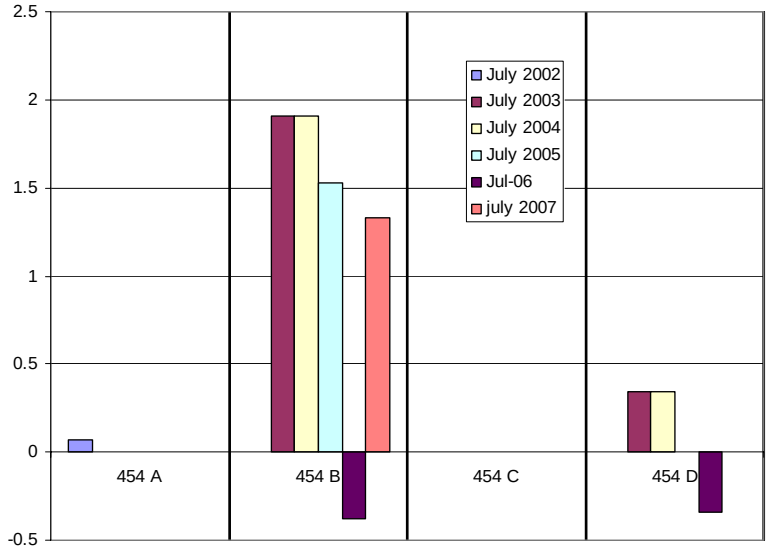
Groundwater Well Series 454, lower mainstem valley below Tributary 2.



Comparing depth to groundwater from the month of May, 2002-2007.



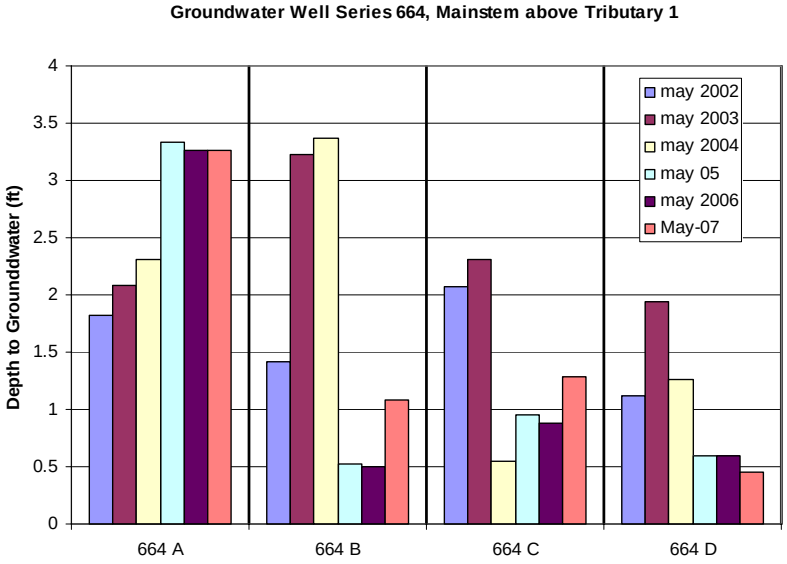
Comparing depth to groundwater from the month of June, 2002-2007.



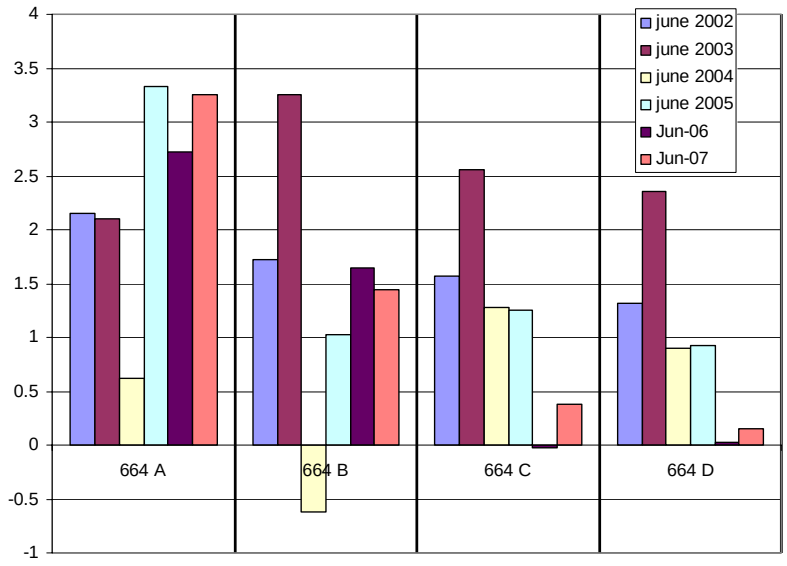
Comparing depth to groundwater for the month of July, 2002-2007.

DISCUSSION: Well 464A is on the east side of the valley, where the ground surface is at a higher elevation. No data was available for the years 2003-2007 for this well. The general trend for the well in the middle of the valley, 464-B was toward higher groundwater levels over time.

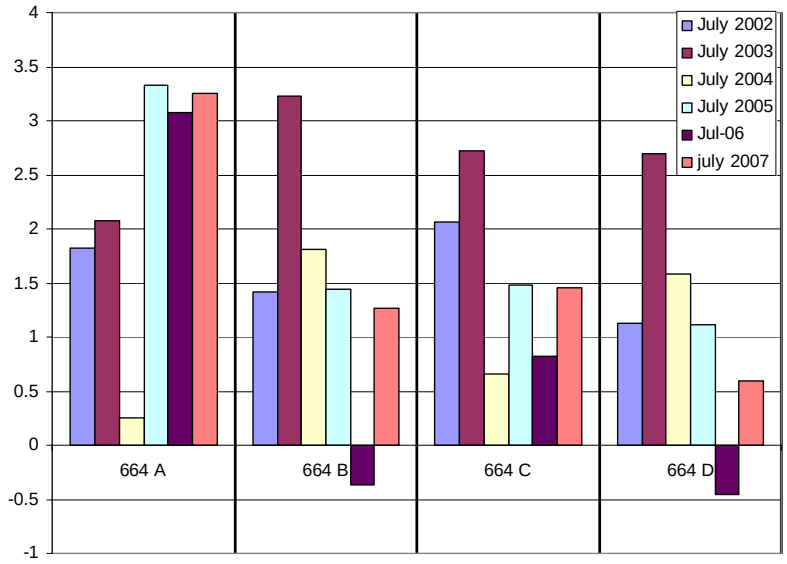
Groundwater Well Series 664, Mainstem valley above Tributary 1



Comparing depth to groundwater for the month of May, 2002-2007.



Comparing depth to groundwater for the month of June, 2002-2007.



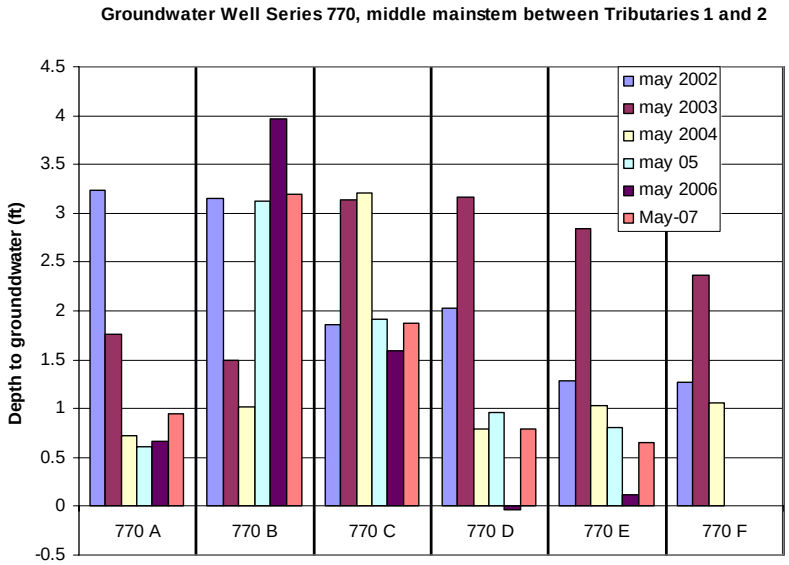
Comparing depth to groundwater for the month of July, 2002-2007.

DISCUSSION:

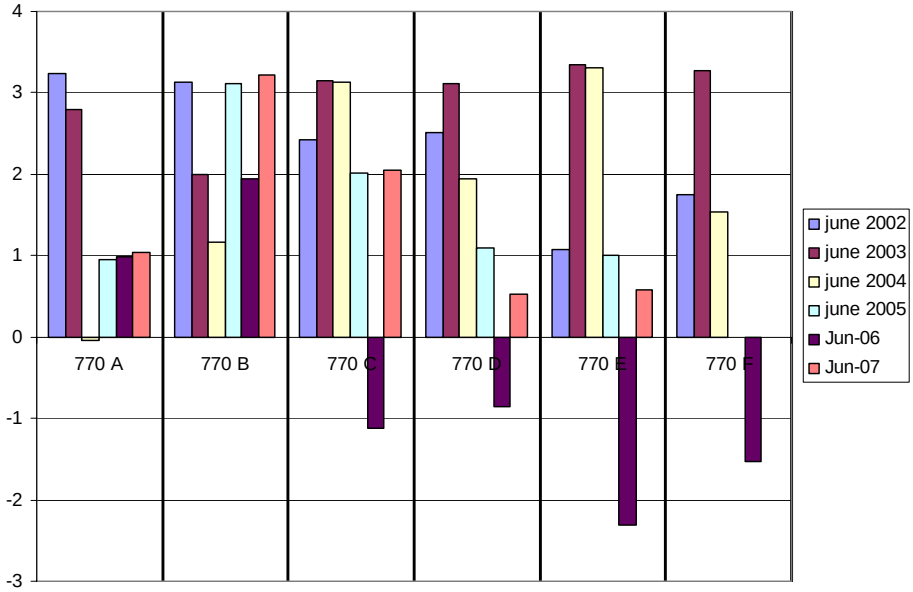
Well 664A is on the northeast side of the valley, where the ground elevation is higher, and where the old drainage ditch was. Well 664C is near the new channel, and well 664D is near on the south side of the valley.

The ditch was filled and the water was diverted into the new channel during the summer of 2003. After that, the groundwater level near well 664-A, which was near the old ditch, dropped for the following years. For the other wells, the groundwater shows a general trend of getting shallower, indicating that the water table has come up.

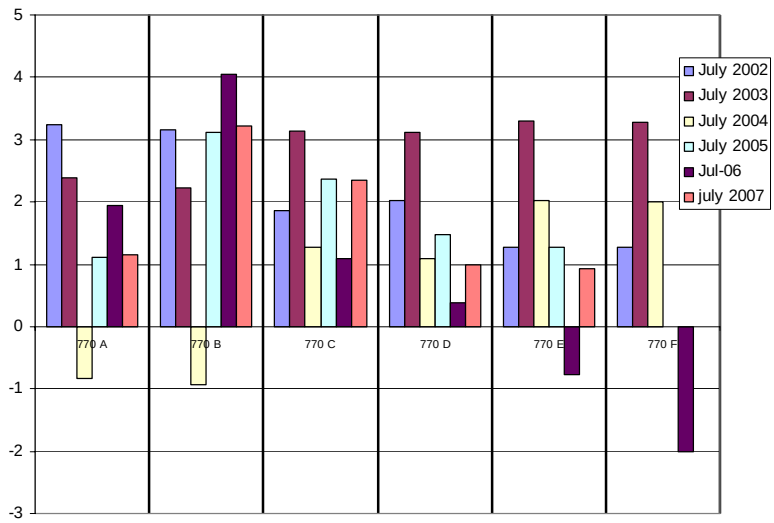
Groundwater Well Series 770, mainstem between Tributaries 1 and 2.



Comparing depth to groundwater for the month of May, 2002-2007.



Comparing depth to groundwater for the month of June, 2002-2007.

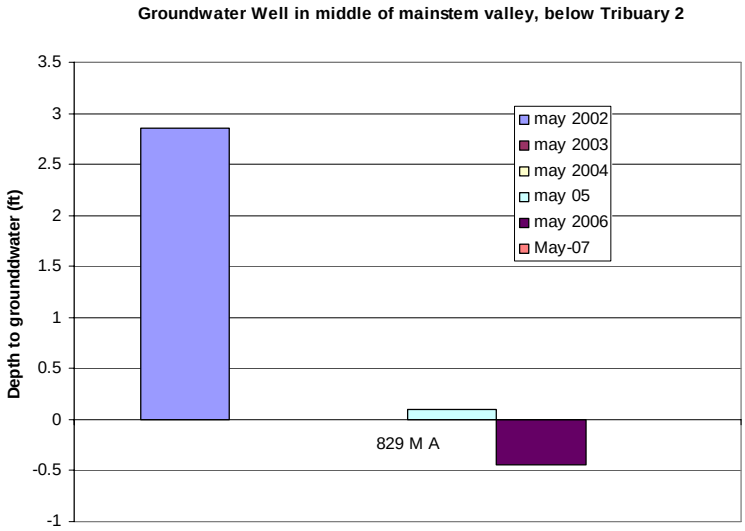


DISCUSSION:
Well 770-A is near the old auxiliary ditch that captured small tributary flow from the northern hillslope. Wells 770-C and 770-D are closest to the new channel. Well 770-D is near the south side of the valley.

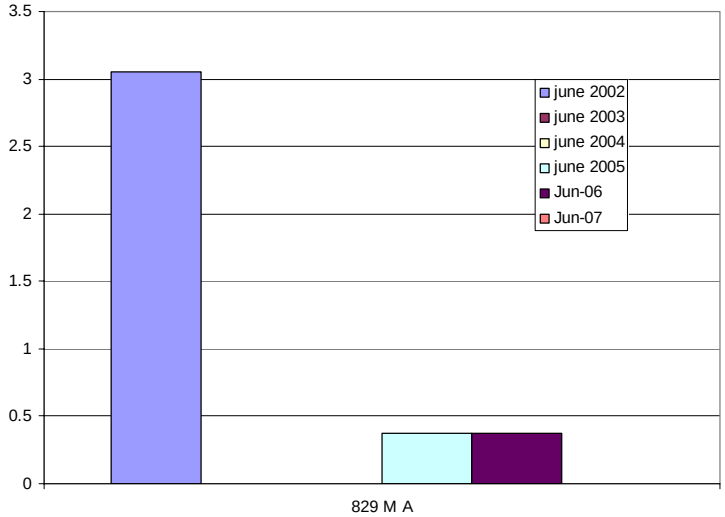
After the auxiliary ditch on the north side of the valley was filled, the water level well 770-A rose. Well 770-B, which is on the valley floor between the north slope and the new channel has fluctuated, but hasn't changed much over time. It may be that the water coming off the north slope is seeping into the ground in the vicinity of well 770-A, now that the ditch is filled and raising the water table next to the slope.

The wells closest to the new channel show a rising groundwater trend over time.

Groundwater well 829-MA in the middle of the mainstem valley below Tributary 2



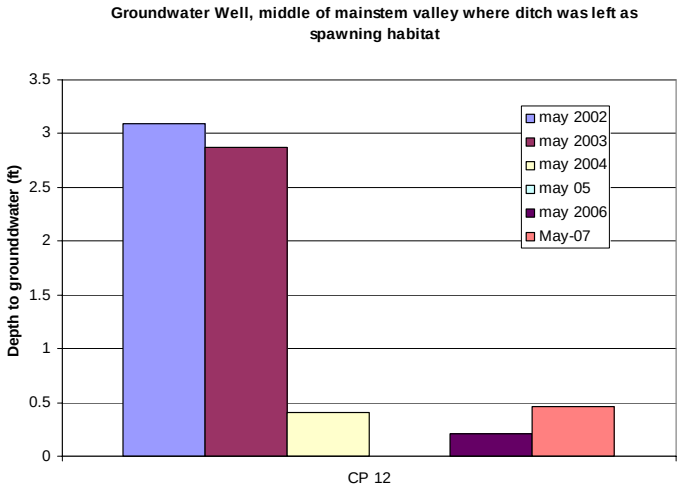
Comparing depth to groundwater for the month of May, 2002-2007.



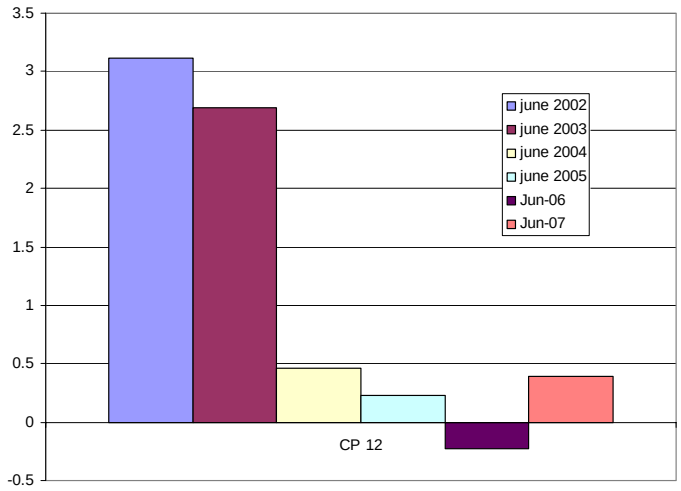
Comparing depth to groundwater for the month of June, 2002-2007.

DISCUSSION: Only the May and June data is shown, the July data seemed to have problems. The well is in the middle of the valley, and the last two years show a higher groundwater table than the level before the new channel was constructed.

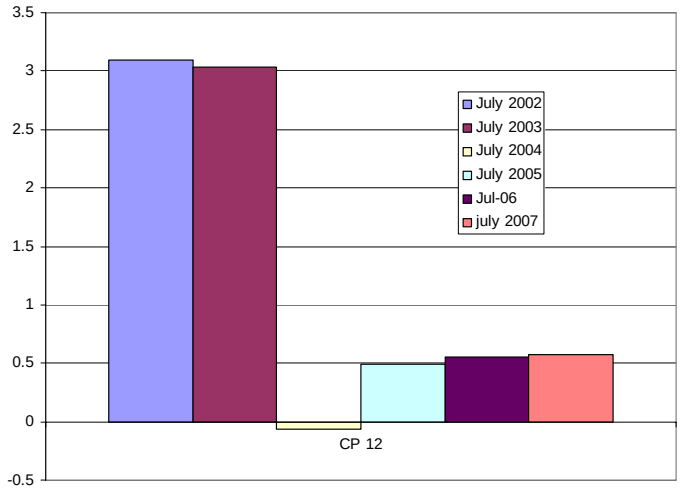
Groundwater well CP-12, middle of the mainstem valley between Tributaries 2 and 3



Comparing depth to groundwater for the month of May, 2002-2007.

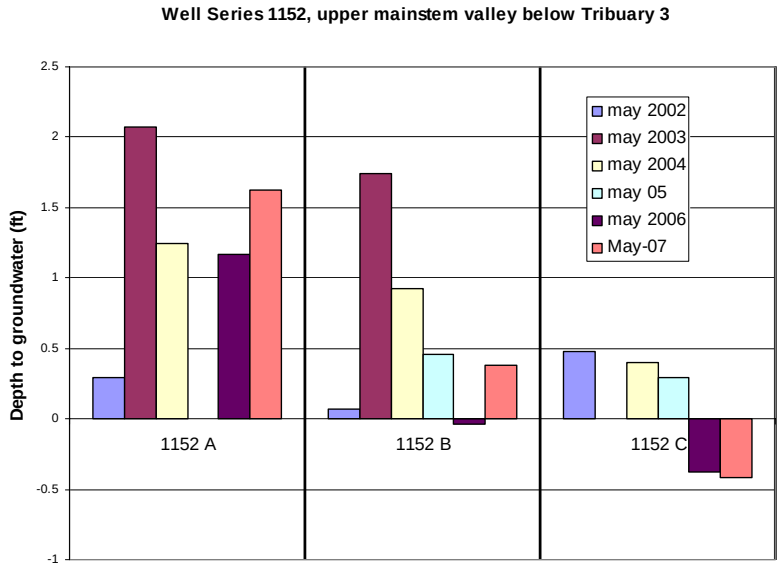


Comparing depth to groundwater for the month of June, 2002-2007.

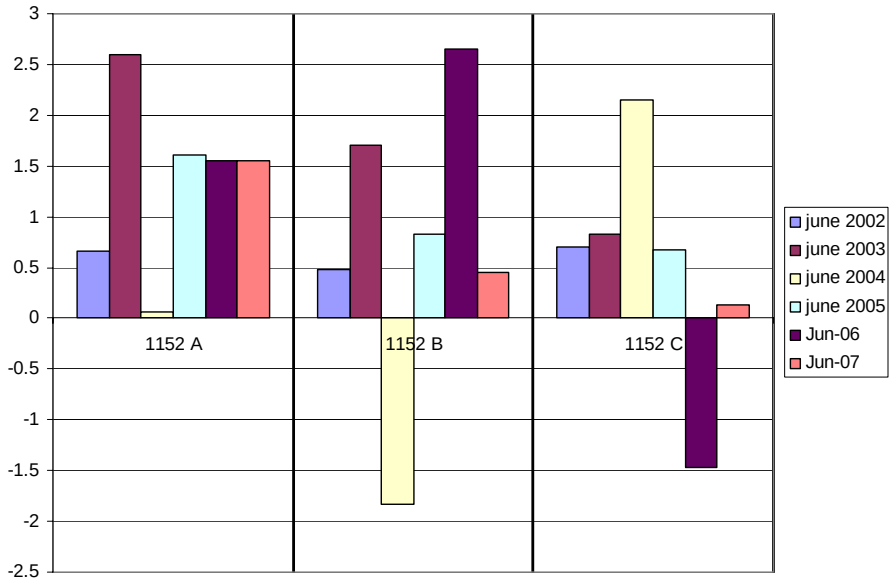


DISCUSSION:
This well location is interesting because it is in the middle of the mainstem valley between Tributaries 2 and 3. This portion of the valley did not have a new channel constructed. Instead, the existing ditch was left as spawning habitat. Even though this portion of the valley was left "as is", the groundwater level still shows a response after the rest of the ditches were filled in 2003 and the new channel had flowing water. The groundwater in this portion of the valley has also shown a rising trend.

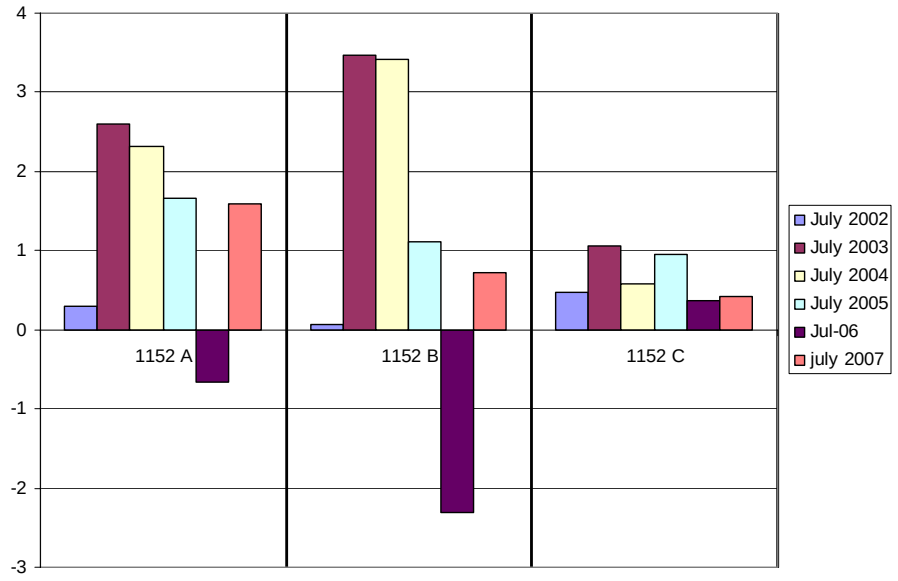
Well Series 1152, mainstem valley below Tributary 3



Comparing depth to groundwater for the month of May, 2002-2007.

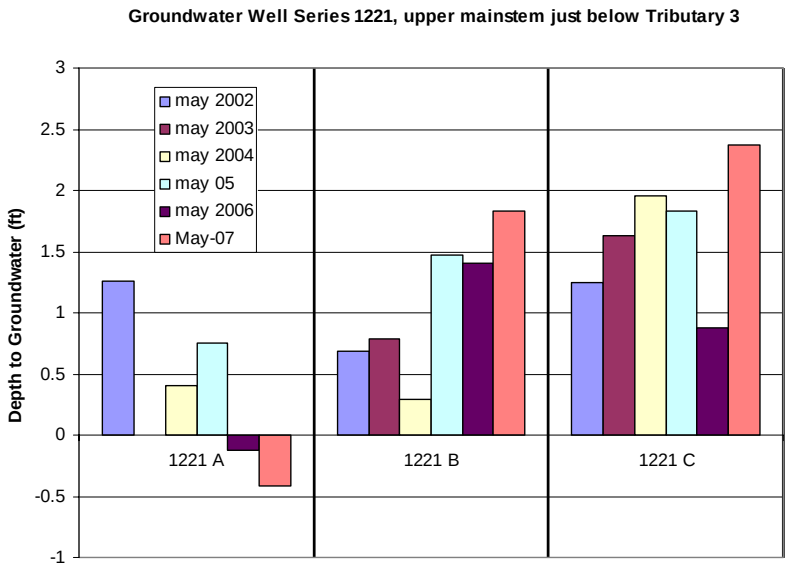


Comparing depth to groundwater for the month of June, 2002-2007.

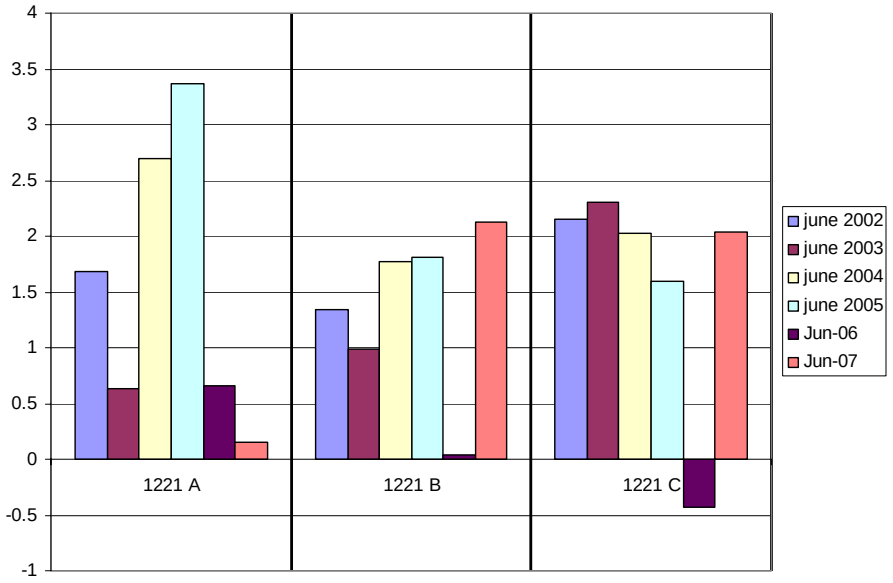


DISCUSSION:
Overall, there seems to be a positive groundwater response in this series of wells; however, some of the data is hard to explain, such as the fluctuating levels in 2006 in the middle well.

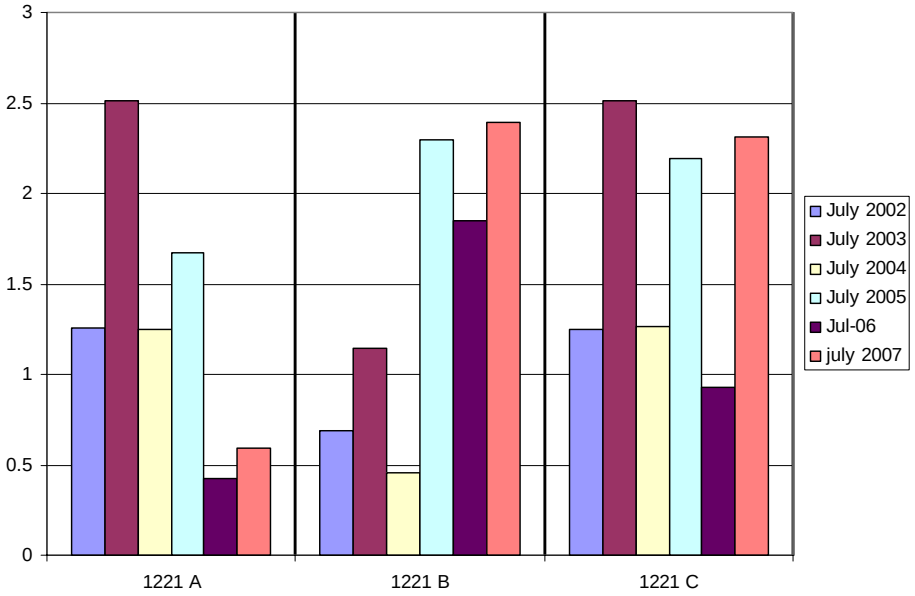
Groundwater Well Series 1221, upper mainstem just below Tributary 3



Comparing depth to groundwater for the month of May, 2002-2007.



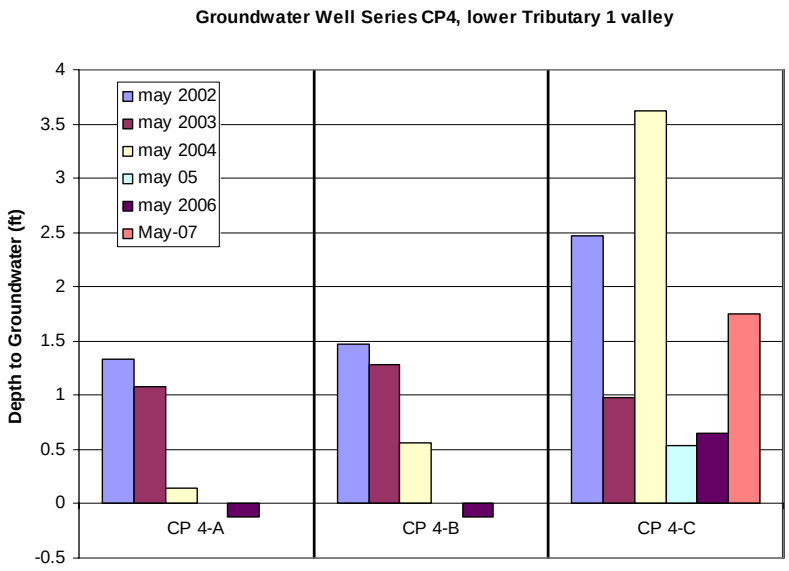
Comparing depth to groundwater for the month of June, 2002-2007.



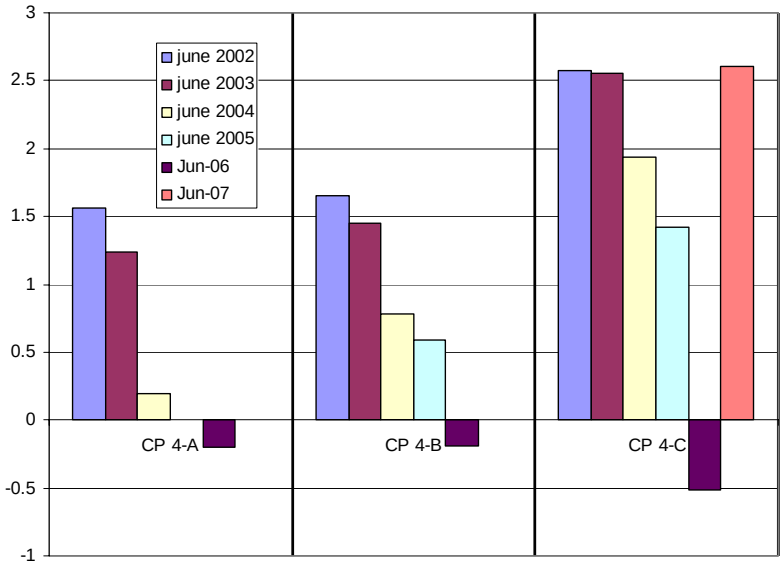
DISCUSSION

Well 1221-A is nearest to the ditch which was left as a channel. Restoration work in Tributary 3 may be increasing storage capacity in the alluvial fan at the base of Tributary 3, and increasing groundwater flows just downstream. Wells 1221-B and C are farther from the channel and water levels appear to have remained the same or dropped over time.

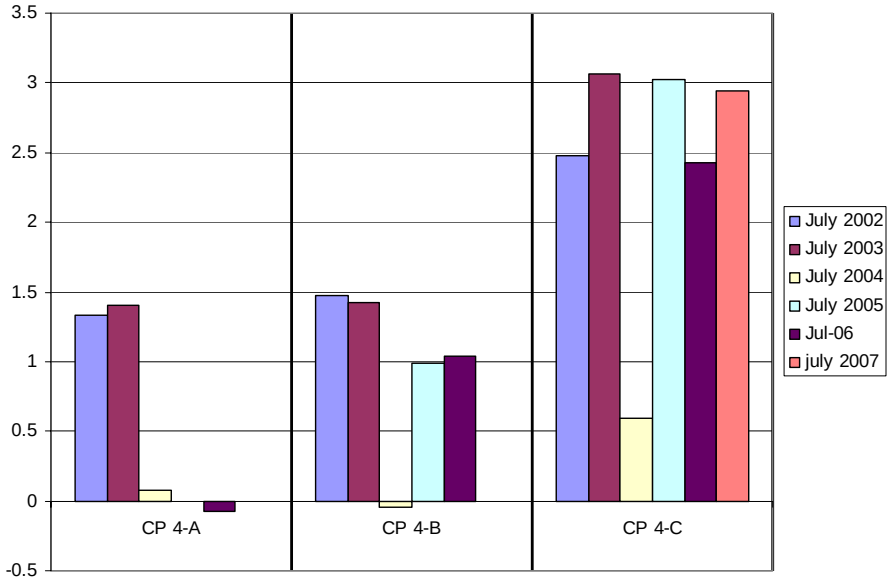
TRIBUTARY 1 WELLS



Comparing depth to groundwater for the month of May, 2002-2007.



Comparing depth to groundwater for the month of June, 2002-2007.

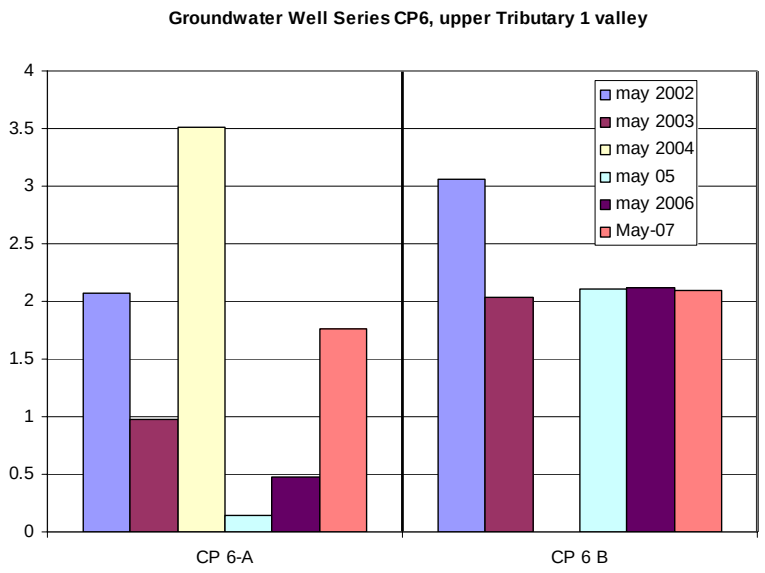


Comparing depth to groundwater for the month of July, 2002-2007.

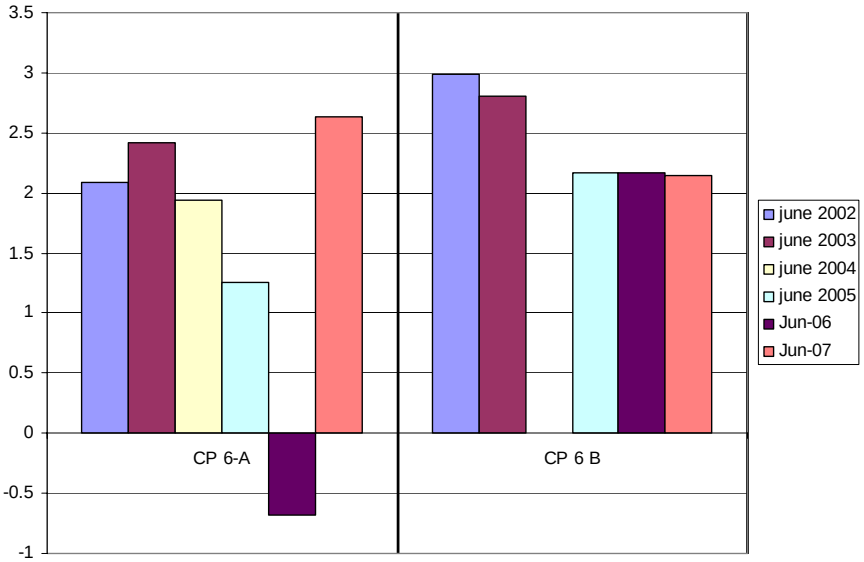
DISCUSSION:
Stream restoration of Tributary 1, which consisted of building 6 new meanders off of the existing ditch, occurred in the summer of 2003. Therefore, the first two years of well data were collected prior to reconfiguring the ditch so that is has a lower gradient, and a more natural stream morphology.

Well CP4-A is on the southwest side of the tributary valley, and farthest from the channel. Well CP4-C is closest to the channel. There is a wetland along the bottom of the tributary 1 valley, which is deeper on the southern side of valley. Interestingly, the wells farthest from the channel shows a consistent trend in rising groundwater levels, especially after 2004. The well closest to the channel fluctuates, but doesn't seem to have a consistent trend. It may be because it is higher up on the alluvial fan, and farther from the wetlands.

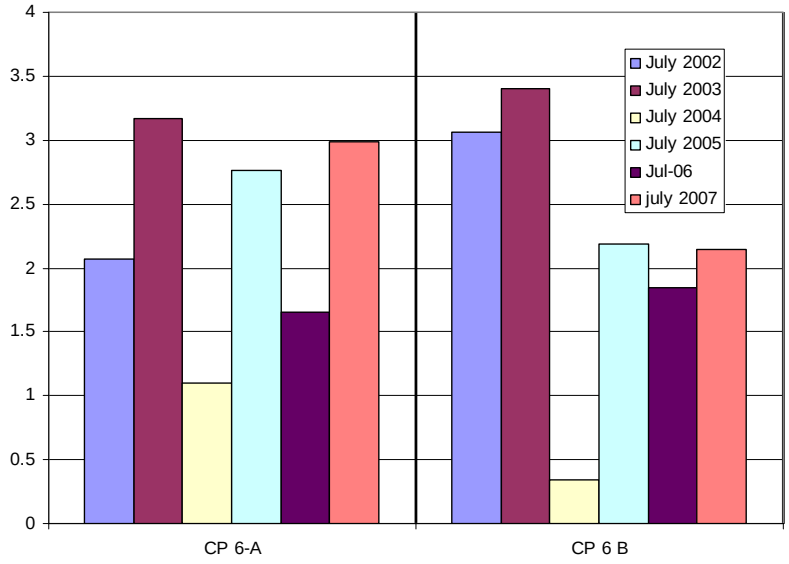
Groundwater Well Series CP6, Upper Tributary 1 valley



Comparing depth to groundwater for the month of May, 2002-2007.



Comparing depth to groundwater for the month of June, 2002-2007.

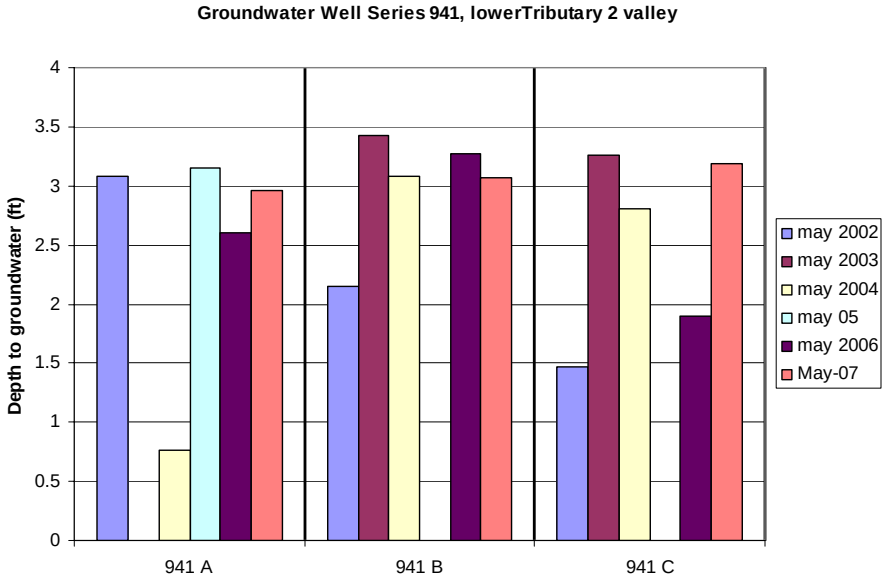


Comparing depth to groundwater for the month of June, 2002-2007.

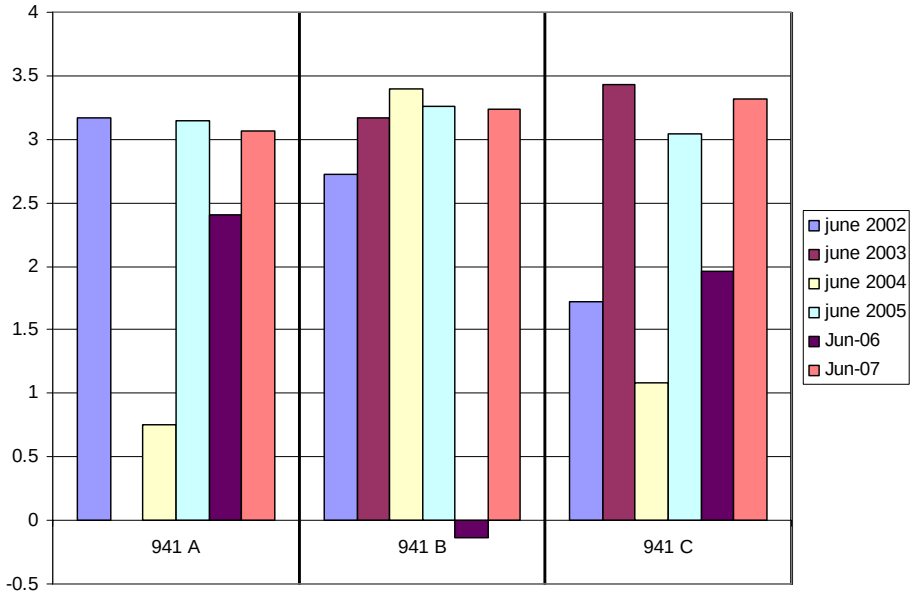
DISCUSSION: Well CP6-B is closest to the channel. The well farthest from the channel, CP6-A shows no consistent trend, and doesn't appear to have changed groundwater levels overall. The well closest to the channel, however, appears to have a rising trend in groundwater levels. Groundwater appears to have come up by approximately 1 foot.

TRIBUTARY 2 WELLS

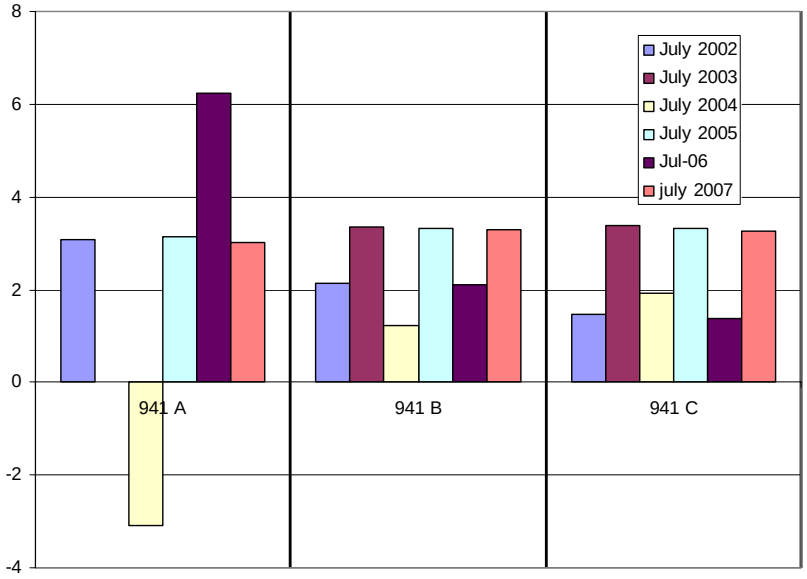
Groundwater Well Series 941, lower Tributary 2 valley



Comparing depth to groundwater for the month of May, 2002-2007.



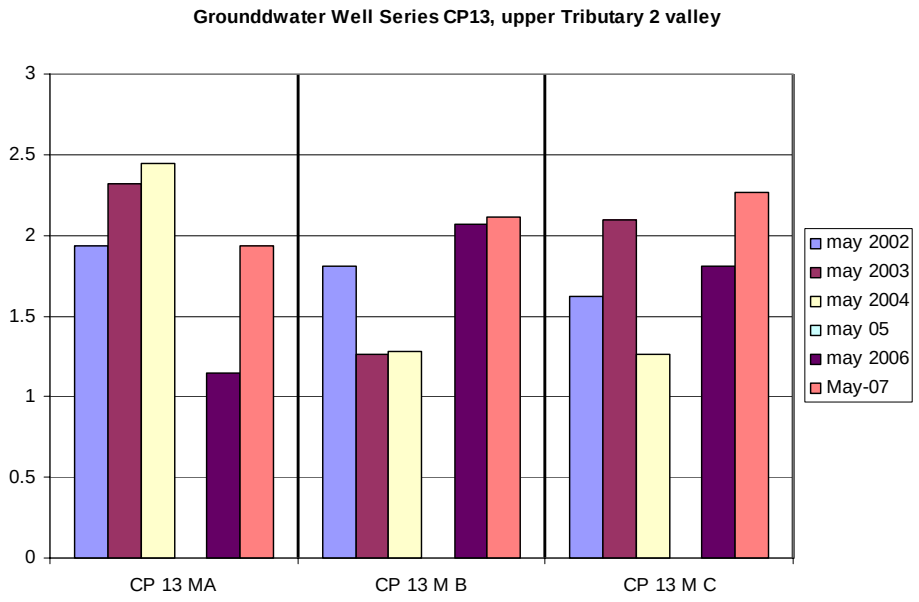
Comparing depth to groundwater for the month of June, 2002-2007.

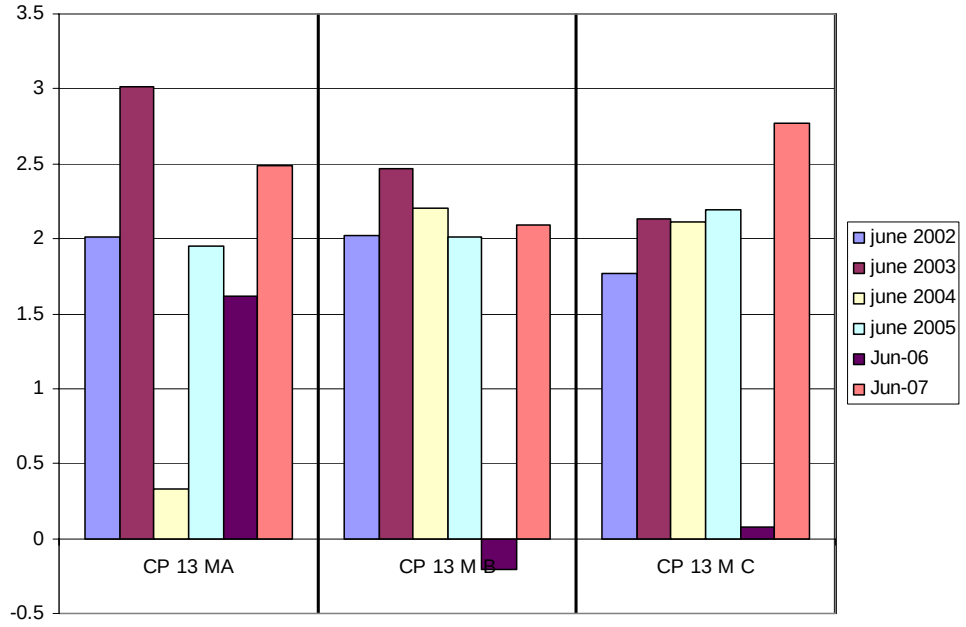


Comparing depth to groundwater for the month of June, 2002-2007.

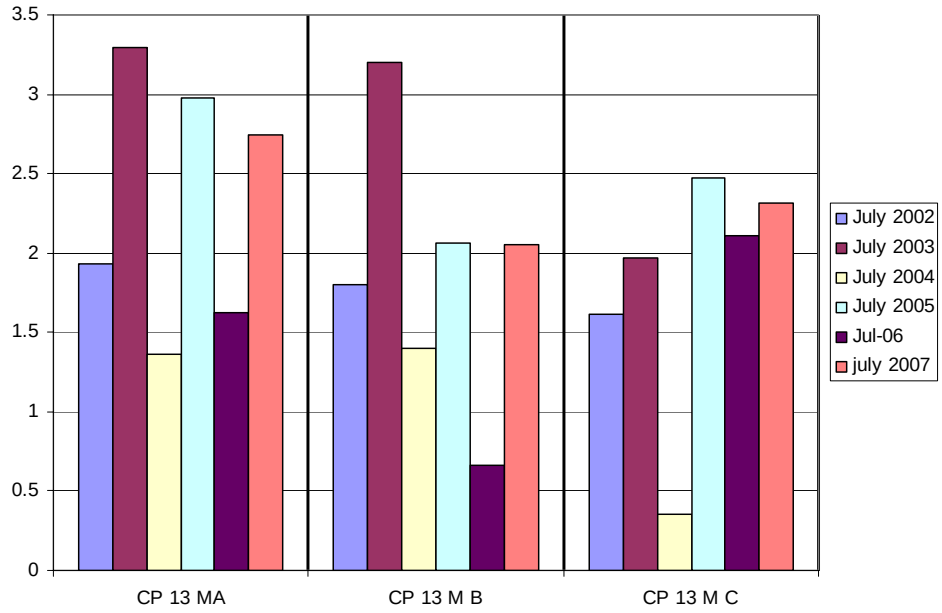
DISCUSSION:

No restoration work was done in Tribuary 2, with the exception of building a connector channel to the new mainstem channel at the bottom of the valley. As a result, Tributary 2 could be considered a “control” for the groundwater wells in the parts of the Karnowsky valley that were restored. Although groundwater levels have fluctuated, overall, they appear to have remained at approximately the same level.





Comparing depth to groundwater for the month of June, 2002-2007.

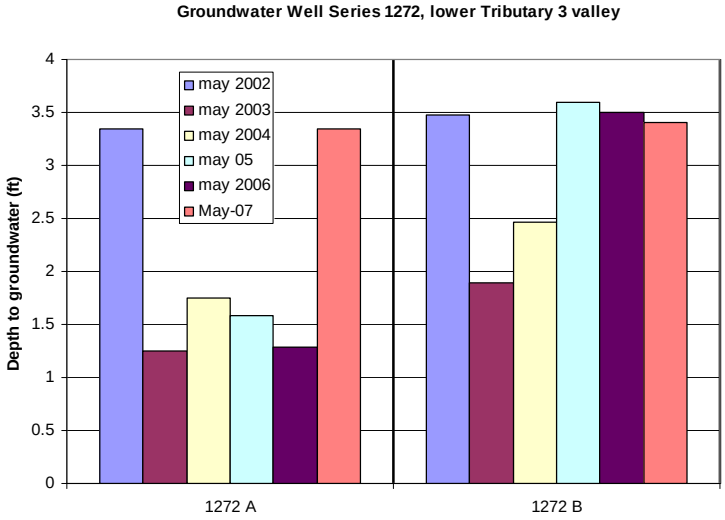


Comparing depth to groundwater for the month of June, 2002-2007.

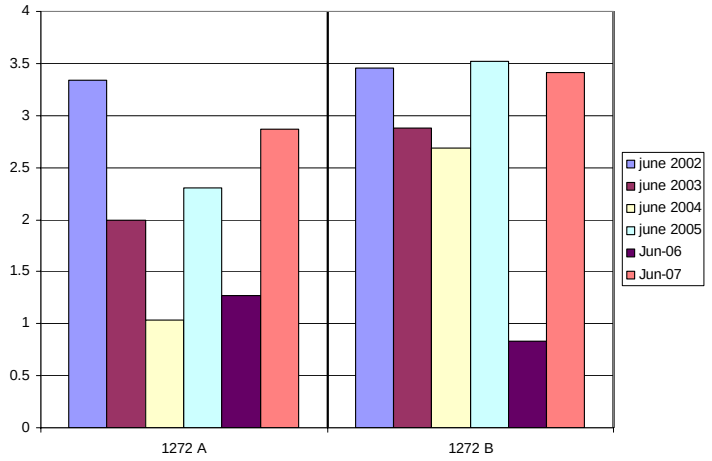
DISCUSSION:
Well CP13-MA is closest to the ditch. No obvious trend is noticeable in any of the wells across the upper part of the Tributary 2 valley.

TRIBUTARY 3 WELLS

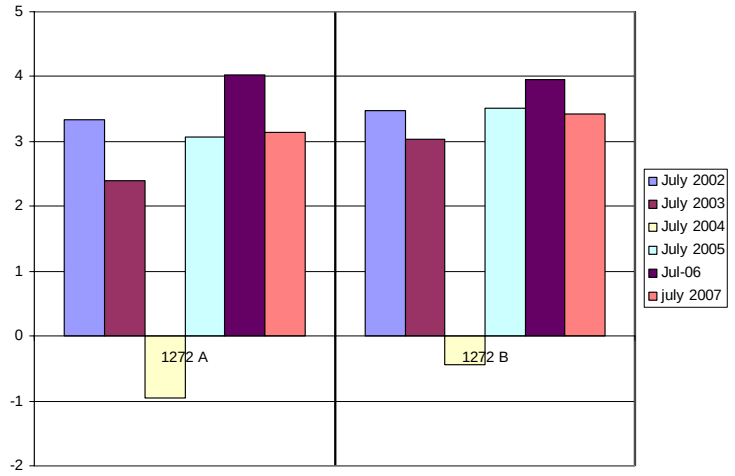
Groundwater Well Series 1272, lower Tributary 3 valley.



Comparing depth to groundwater for the month of May, 2002-2007.



Comparing depth to groundwater for the month of June, 2002-2007.

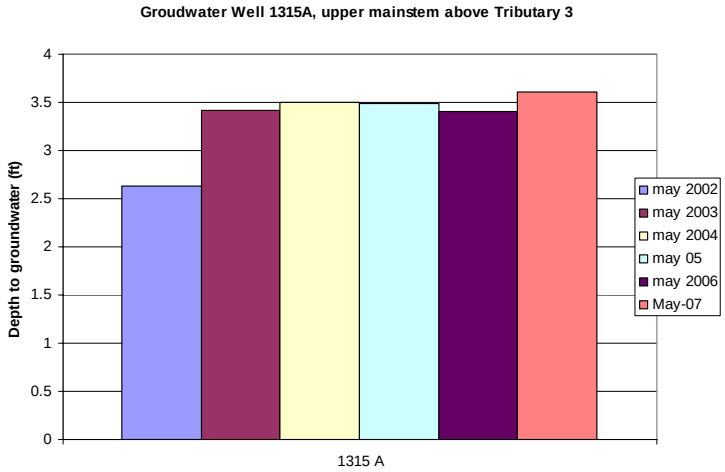


Comparing depth to groundwater for the month of July, 2002-2007.

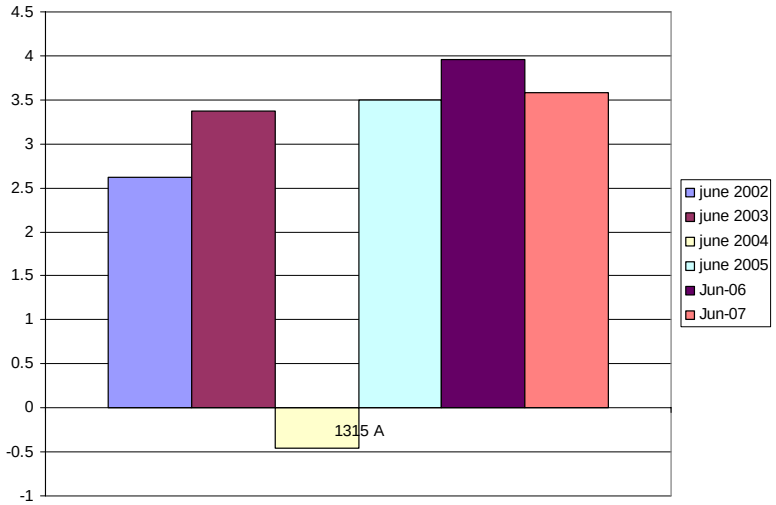
DISCUSSION:
No trend is noticeable in groundwater depths in tributary 3.

UPPER MAINSTEM VALLEY ABOVE TRIBUTARY 3

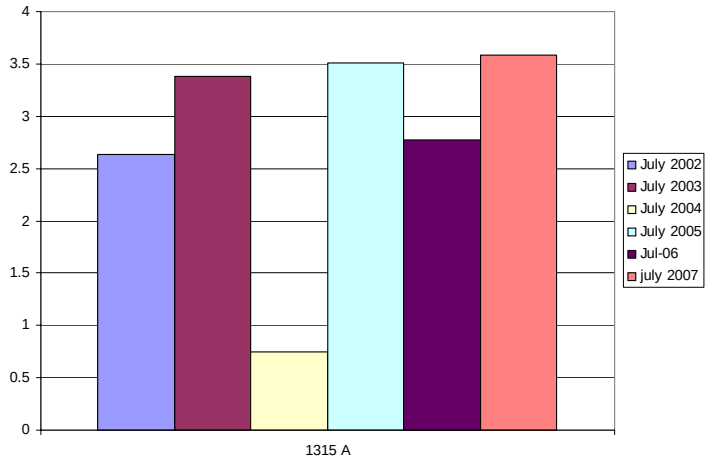
Grounddwater well 1315, near new channel in upper mainstem valley.



Comparing depth to groundwater for the month of May, 2002-2007.



Comparing depth to groundwater for the month of June, 2002-2007.



Comparing depth to groundwater for the month of July, 2002-2007.

DISCUSSION: Groundwater water levels appear to have stayed the same over time. The deep ditch on the side of valley was dissected by plugs, and portions of the old ditch were left as ponds. These ponds may still be acting as "sinks" for the groundwater.

CONCLUSIONS:

Groundwater levels appear to have risen in the lower and middle portions of the mainstem. There is less noticeable change in the tributaries and the upper portion of the mainstem above Tributary 3.

According the the rainfall data from Goodwin Peak, the winters of 2005-2006 and 2006-2007 were wetter than the previous 4 years. The wetter years may account for some of the rise in groundwater levels. However, the water levels in Tributary 2, where no restoration work was done, don't show a response to the wetter years. This fact implies that the restoration has had a positive effect on raising groundwater levels in the lower and middle mainstem valley.

Appendix B: Karnowsky Creek: Photos of cross-section locations taken in 2002 and 2008.

Fig. 1. Cross-section 3, looking downstream, 2002

Fig 2. Cross-section 3, looking downstream, 2008

Fig 3. Cross-section 5, looking downstream 2002

Fig. 4. Cross-section 5, looking downstream, 2008

Fig 5. Cross-section 6, looking upstream, 2002

Fig 6. Cross-section 6, looking upstream, 2008

Fig 7. Cross-section 8, looking downstream, 2002

Fig 8. Cross-section 8, looking downstream 2008, close view.

Fig 9. Cross-section 8, looking downstream, 2008, broad view.

Fig 10. Cross-section 9, looking downstream, 2002

Fig 11. Cross-section 9, looking downstream 2008

Fig 12. Cross-section 11, looking downstream, 2002

Fig 13. Cross-section 11, looking downstream, 2008

Fig 14. 2004 air photo of main channel between Tributary 1 (upper tributary valley on left) and Tributary 2 (lower tributary valley on left).

Fig 15. 2007 air photo of main channel. Note the increase in vegetation on the valley floor.

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