Preliminary Analysis Report
Hinkle Creek Stream temperature
2002

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In July of 2002, forty-five Vemco data loggers, sampling at 30-minute intervals, were placed in the headwaters of Hinkle Creek as part of an extensive study of the local aquatic ecosystem system lead by Roseburg Forest Products (See attached map). Twenty-four of the units were placed in locations designed to provide overall pretreatment calibration data for a pair of watersheds; one control and one pretreatment. The remaining twenty-one units were placed in the treatment watershed to establish local pretreatment temperature profiles in individual tributaries. One set of sites included three placements in a recent harvest unit (2001) that showed a distinctive rise and recovery pattern. The supplemental study had the added benefit of providing detailed synoptic profiles from several tributaries in the same area.

Data from an ongoing project by the Umpqua Basin Watershed Council (UBWC) was available to provide a watershed and basin context to the Hinkle Creek Data.

Temporal Variation

Past work from the UBWC study has shown that a characteristic summer seasonal pattern is typically apparent on all of the stream temperature data in the central Umpqua basin.

The top chart in Figure 1 shows 2002 downstream data from the Oakland area. The middle chart is from the mouth of the treatment watershed and the lower chart is representative of data from the upper reaches of the control watershed.

Note the diminishing amplitude of the diurnal variation and the persistence of the seasonal pattern. Also, while the Hinkle Creek data loggers were deployed later in the season, it is apparent that, with the exception of early July, all of

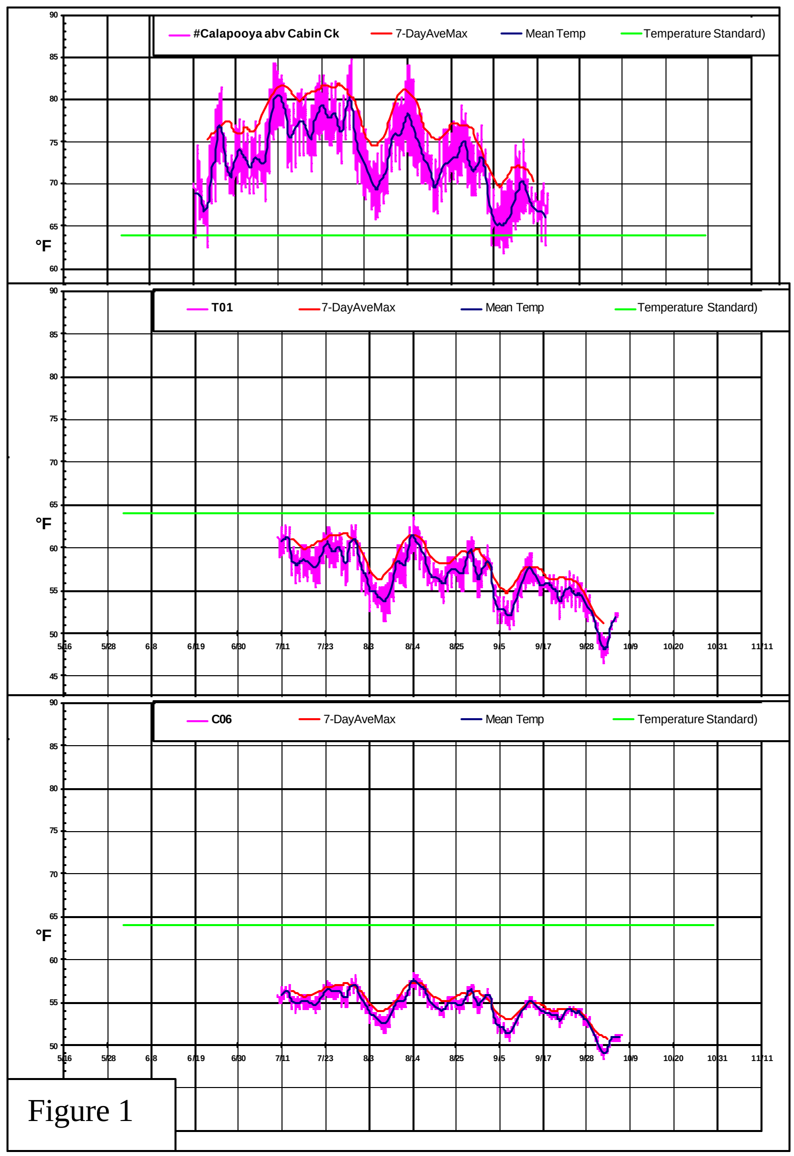

Figure 1

the summer high temperature events were recorded.

Spatial Distribution

The UBWC data has shown that, on a watershed scale, plotting a temperature statistic against distance from the watershed divide is often a useful indication of the downstream heating characteristics of a particular watershed. For example, Figure 2 shows the result using the 7 day moving average of the maximum daily values (7DADM) statistic.

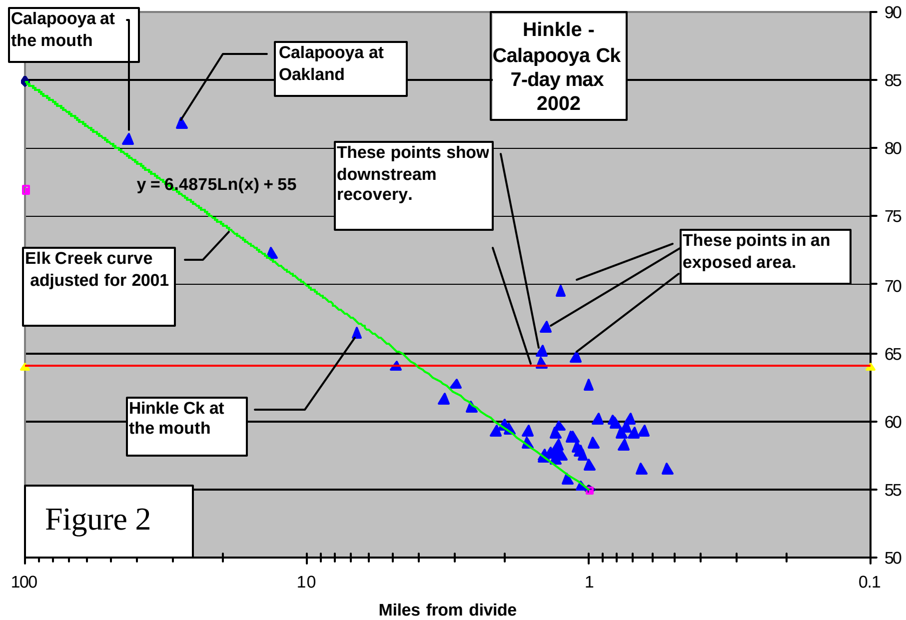

Figure 2

Note the logarithmic scale on the horizontal axis. The line shown on the chart represents a similar fit from a study in the Elk Creek (Elkton-Drain area) in 1998 and was also consistent with the 1999 Calapooya watershed temperature study. As a point of interest, the data from the rest of the interior basin, Cow Ck, S Umpqua, Lower N Umpqua and the Main Umpqua showed a lower rate of increase (about 77°F at 100 miles).

At the local sub-watershed scale, using the watershed divide as the reference point has limitations due, at least in part to the variability of the source water emergence point which causes horizontal scatter. However, at this local scale, the distance between consecutive points on a stream can be measured accurately and the resulting temperature profile can provide some information about the variability between sites in terms of the local rate of heating.

For example, Figure 3 shows a comparison of data from the main branch of the S Fork with data from the first two tributaries in the South Fork. The data shown is the maximum, mean and minimum values measured on 8/14/02. It is interesting to note that the *X1, *X2 and *X3 segment is located within a recent (2001) harvest area and shows the expected temperature increase but the down-unit site has a lower value than the mid-unit site, suggesting that local conditions can exceed the cumulative effect. (The *X3 unit has more brush and debris shading.) Also note that the minimum (night) temperatures are noticeably lower in the exposed area which is consistent with night radiant cooling concepts. The net effect of these changes is that the maximum temperature increased about 8°F at site *X2 while the mean temperature increased only about 2°F.

The local temperature profiles may also be providing a relative indication of the groundwater hydrology in the area. For example, the upper curve has a mid-slope road within about 400 feet of the east side of the tributary that could be affecting the groundwater contribution to this portion of the stream. Likewise, the site *B3 is located on the downstream side of a skidroad crossing that could be responsible for more cold groundwater inflow.

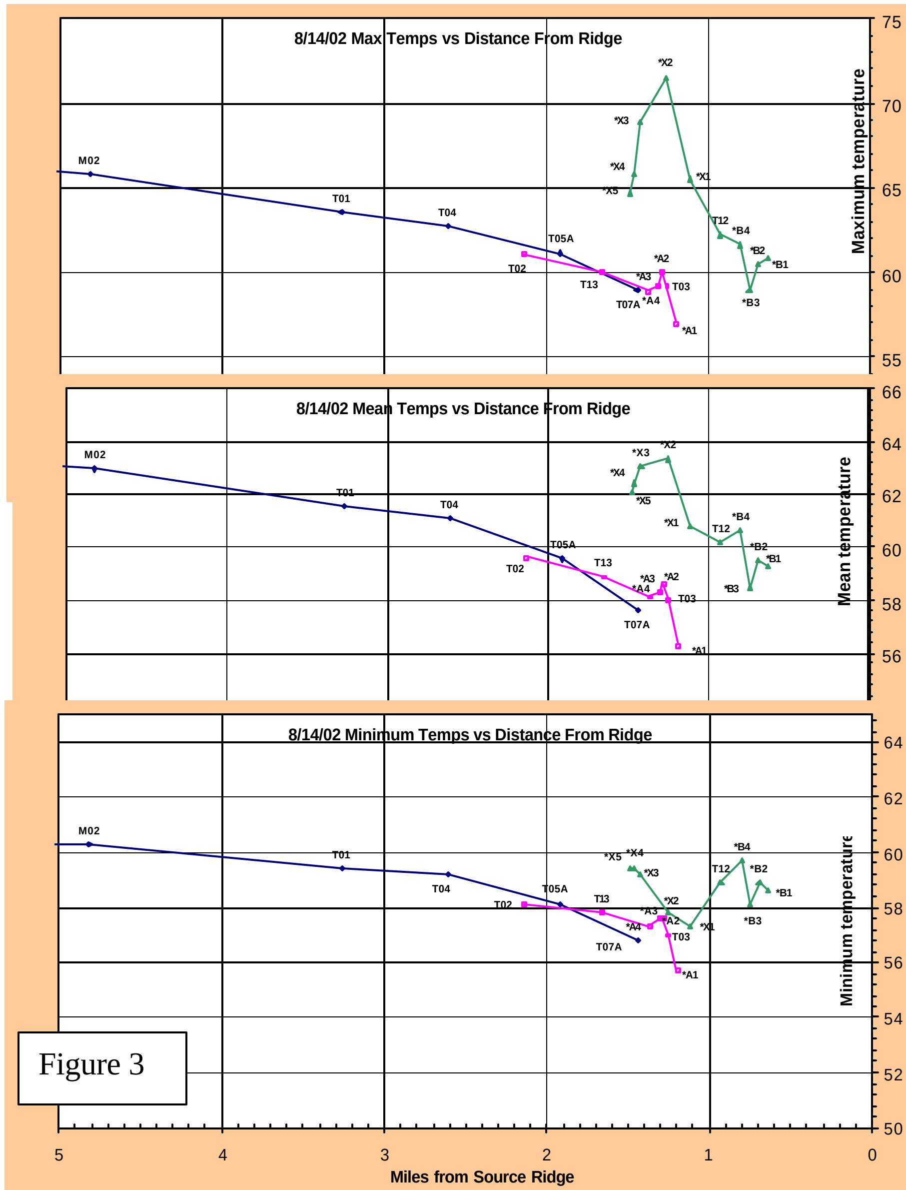

Figure 3

The blip associated with T03 and *A2 could be associated with the road crossing immediately above T03. Both increased solar exposure and reduced groundwater could be contributing to this effect.

It should be noted that the unit *A1 was, at times, partially covered with silt which could account for a lower value.

The data from the other tributaries show similar patterns and can be examined in a similar manner. Since there wasn't a pre-project control, interpretation is somewhat speculative. However, it is apparent that this type of detailed temperature information can provide a better understanding of the local environmental factors that affect stream temperature in small, headwater streams during the critical low-flow conditions.

During the midseason audit, one site was found exposed due to receding streamflow. The data is of interest because it shows the temperature conditions on exposed gravel surface. The small diurnal variation is characteristic of the small stream near the point of emerging flow.

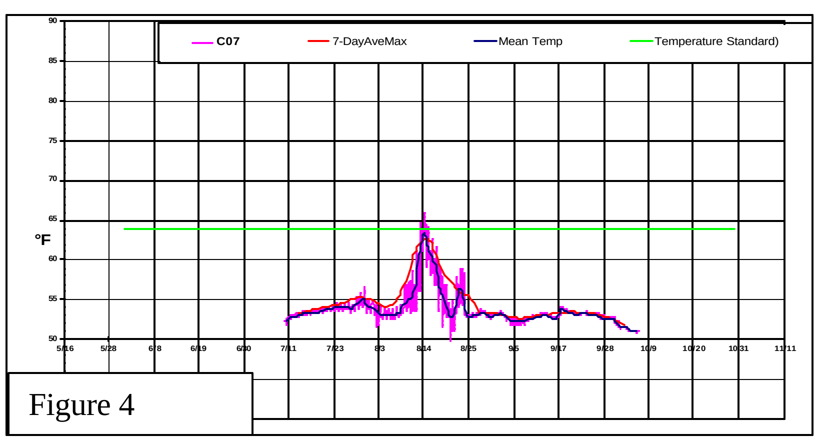

Figure 4