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VALUE IN METEOROLOGISTS AND HYDROLOGISTS WORKING TOGETHER

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As we move toward a modernized NWS, one message is quite clear. Meteorologists and hydrologists will be working together much more closely in the future. We are fortunate in the Western Region that cooperation already exists between the two disciplines. The two examples below highlight the value of the current cooperation and might provide some food for thought on how the two disciplines can work more closely in the future.

Quantitative precipitation forecasts (QPF) and temperature forecasts have been used by Western Region River Forecast Centers for many years. The hydrology program has received good support from those WSFOs that provide QPFs, but we in hydrology have not always communicated our requirements very clearly.

Figure 1 demonstrates the value of the QPF in the case of a storm in southwestern Oregon. The morning QPF issued by WSFO Portland, indicated that two rain events were in store for the Umpqua River Basin. The first produced a rise to warning stage level; the second produced a minor rise on the recession of the hydrograph about 24 hours later. As the storm progressed, it became more and more obvious to the WSFO Portland meteorologists that the second storm was going to strike much sooner. At 10:00 p.m., an updated QPF was issued, which essentially combined the two storms into one event. Based on the updated QPF, an excellent flood forecast was issued, giving the local response agency about 16 hours warning before the flood event. Updating QPFs during storm events is a very important part of hydrologic forecasting efforts.

Another very important consideration in our mountainous West is that precipitation amounts at individual sites can vary dramatically with a change in wind direction. With southerly flow, many valley stations will experience heavy precipitation, while headwaters areas will receive light precipitation. Conversely, mountain stations will receive much heavier precipitation during zonal flow than the nearby valley stations. It is not uncommon for mountain stations to receive 5 to 10 times as much precipitation as valley stations in these situations. In individual basins, a small change in wind direction (20^0 - 30^0) can make a big difference in precipitation totals. Any information the meteorologist can convey on spatial distribution of precipitation is directly usable in hydrologic modelling and forecasting.

In many western U.S. watersheds, flood events, which result from combinations of snowmelt and rainfall, occur. Local knowledge of how much snow is available to runoff is critical to the hydrologic analysis. Occasionally, frozen ground conditions will exist, which greatly enhances the runoff (flood) potential. Local input can aid the hydrologist in performing the correct analysis of frozen ground conditions.

In the second example illustrated in Figure 2, the meteorological input (QPF and forecast temperatures) is the same for all examples, only the basin initial conditions have changed. Four separate hydrographs on Hangman Creek near Spokane demonstrate the importance of basin initial conditions. The lower hydrograph (runoff percent (ROP) = 17%) represents a basin response in the fall or early winter before soil moisture is elevated. The next hydrograph (ROP=60%, no snow) represents the basin response in mid-winter when soils are somewhat wet. The third hydrograph has the same soil moisture, but the basin is now 70% snow covered (snowline 2450') and active snow melt is occurring. The combination of rain and snow melt produces a markedly different hydrologic response. Lastly, if the frozen ground conditions are added, a serious flood condition exists. Because the soil now acts like concrete, runoff will be more efficient, the river will respond more quickly, and the peak will be much earlier. This is very important since lead time for warnings will be reduced significantly.

As mentioned above, any information the local NWS office can provide about basin conditions in their area is very useful to the hydrologist and often critical in providing the correct hydrologic analysis. As we move toward a modernized NWS, let's look for ways to share our expertise so that the users are better served.

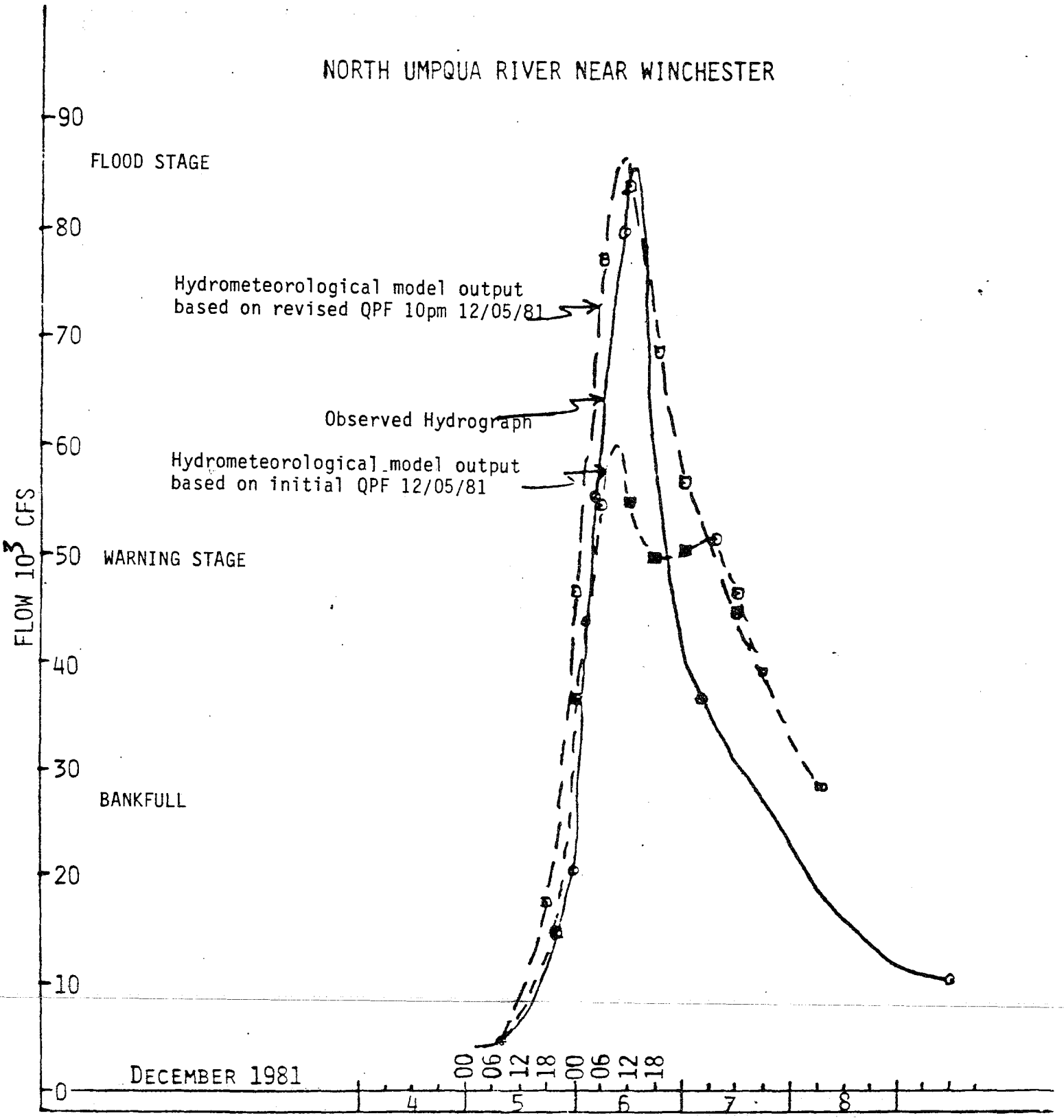

FIGURE 1. EXAMPLE OF FLOOD HYDROGRAPH ON NORTH UMPQUA RIVER FROM UPDATED QPF

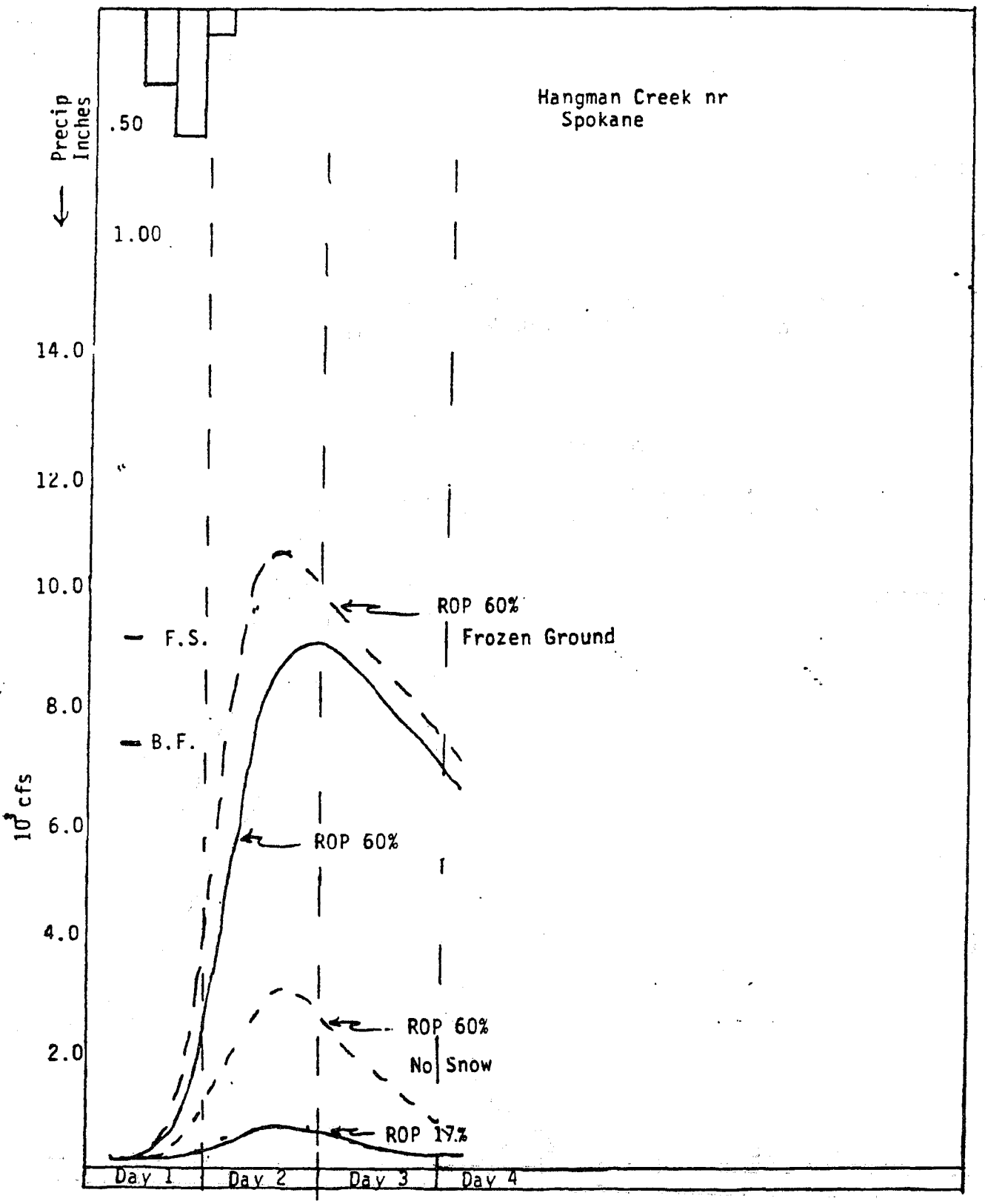

FIGURE 2 - Importance of basin initial conditions to resultant streamflow