



## CHAPTER 4 – WATER BALANCE

RCW 90.82.070 requires preparation of a water balance, the components of which are contained in the Level 1 Watershed Technical Assessment (ENTRIX, 2006) and The Water Balance of the Okanogan Watershed, Watershed analysis (Lutz 2009). [See appendices]

The two water balances, prepared at the request of the Okanogan Watershed Planning Unit, looked at the water budget in the Okanogan Basin from opposite perspectives. The ENTRIX water balance was prepared from the perspective of “the bottom up.” That is, it looked at what water is left in the various streams and calculated backwards to ascertain the other components of the water balance equation, such as precipitation, evapotranspiration, and ground water infiltration. The Lutz water balance, on the other hand, begins by looking at the amount of precipitation that falls on the watershed. From there, evapotranspiration, soil infiltration, and stream outflows were entered into the overall water balance equation.

Both approaches to calculating a water balance have their short-comings. Because weather records are generally available only for low elevation points in the watershed, precipitation, and evapotranspiration values for the entire watershed are necessarily interpolated. These interpolated values are reasonably accurate at the watershed scale, but may be inaccurate when particular points or small areas are examined.

The value of the ENTRIX water balance is that, because it looks at the resultant instream flows, amounts taken for irrigation can be calculated. The Lutz water balance, on the other hand, does not take in to account irrigation withdrawals. The model assumes if the plants do not use it then it runs into the Columbia River. However, the modeled data in the Lutz water balance is robust when comparing subwatershed to subwatershed in Okanogan.

The Lutz water balance calculations derive precipitation data from the PRISM (Parameter-elevation Regressions on Independent Slopes Model) Group at Oregon State University. They take all quality meteorological data from the United States and make relationships between those stations and elevations and climate by interpolating between places. The downfall is that the meteorological stations are usually in low elevation places. There is no affect of aspect on data collected from PRISM. Nevertheless, with an area as large as the Okanogan Watershed, it is not a bad estimation for the watershed as a whole.

The Thornthwaite model, used by Dr. Lutz, has been used for more than 50 years and it is simple to understand. It is easy to interpret because of the easily understood input



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parameters such temperature and precipitation. There is an error factor because groundwater infiltration is not accounted for in the final balance calculations. As well, the ENTRIX calculations do not account for deep percolation.

The Okanogan Watershed Planning Unit has chosen to include both water balance studies as they both contain quality information. Using the information in the future should be based upon what the user is trying to ascertain. If the user is more interested in water withdrawals, then the ENTRIX study should be used. Conversely, if the user is more interested in the amount of precipitation that falls in a year in a given watershed they should use the Lutz study.