THE OREGON STORY

Earthwatch Oregon

Watersong

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ary effect, more economic than environmental, is the further decrease of water available for power generation. The net result is an increased demand for alternative power systems such as coal and thermonuclear sources. Coal systems (Boardman, Oregon) are highly water intensive and thermonuclear systems (Rainier) use water as a coolant.

As early as 1966, thirty-three and one-tenth million acre-feet of surface and ground water were diverted to irrigate the seven and three-tenths million irrigated acres in the Columbia-North Pacific region. Return flows amounted to seventeen and seven-tenths million acre-feet, resulting in a net depletion of the region's water supply of fifteen and four-tenths million acre-feet. About ninety percent of the diversions came from surface sources (including storage) and was used on eighty-five percent of the lands. The remaining ten percent of water supply came from ground water and was used on the remainder of the irrigated area.

Approximately one-half of the water removed from the Columbia River is lost to the system. The remaining one-half returns to the system after being cycled through the irrigation process. Of that water lost approximately fourteen percent is estimated lost through evaporation and transpiration along waterways in other seeped, non-cropped areas. This loss is referred to as non-beneficial consumptive use because the water does not contribute to irrigated crop production. The remaining eighty-six percent of loss returns to surface and ground water sources.

Surface runoff of the region is estimated to average two hundred and seventy-eight million acre-feet annually, including fifty-four million acre-feet entering from Canada. Estimated figures for the year 2020 indicate that approximately forty-one million acre-feet will be required to handle the irrigation needs of the crops within the area. Assuming a constant runoff of two hundred and seventy-eight million acre-feet, the projected analysis indicates that approximately one part in eight will be cycled through the irrigation process. A year in which only two-thirds of the available supply is present will amplify the percentage used for irrigation.

Water returned to the river system as a result of irrigation is directly affected by the introduction of toxic substances, various salts, nutrients, sediments, and increased temperatures. Such pollutants are called "nonpoint source" pollutants because of their amorphous origin and, as such, are extremely difficult to analyze. However, recent studies have indicated that at least seventy percent of streams in Oregon, Washington, and Idaho are water quality limited because of nonpoint source pollutants.

Irrigation practices also perpetuate the following problems: stream flows reduced by withdrawals for irrigation; bacteria in the form of fecal coliforms are high in runoff; stream temperatures are high in late summer because of depleted flows, and; high nutrient levels contribute to choking algae blooms and poor water quality in reservoirs.

Phosphorous contamination of streams is believed to be mainly a result of erosion. Nitrogen from animal wastes can contaminate ground water. In terms of pollution control, the nitrates are the most significant since they are soluble and can be leached into the ground water or washed to the surface waters.

Most of the annual precipitation in the Columbia River Basin is concentrated in the winter months with the bulk of the precipitation falling in mountainous areas as snow to be stored in deep snow packs awaiting the warmth of spring for its release. As a result, the winter streamflows are generally low with high sustained runoff flows occurring during August through the autumn months. Irrigation practices are exceptionally high during this period.

It is also during this period that the summer and fall salmon runs transit the Columbia River. Perhaps the most important aspect of Columbia River salmon runs is that all species, regardless of when they enter the river, spawn during the autumn months.

Degradation in water quality during the low flow periods is due primarily to an increase in water temperature and a decrease in the dissolved oxygen saturation, or the ability of a body of water to hold oxygen. Thus, for a river with a relatively low bio-chemical oxygen demand load, the dissolved oxygen may approach saturation. In such a case, water temperature would become the critical water quality determinant in the production of anadromous fish (salmon, steelhead, etc.). Excessive temperatures allow the introduction of warm water species (bass, carp, etc.) which further increase competition for available oxygen and food.

Using Chinook salmon as an indicator specie, optimal temperatures for streams are as follows: migration routes, forty to sixty degrees Farenheit; spawning areas, forty-five to fifty-

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