Future development along Santa Barbara's coast: a hydrologic prospective on where and how should we build.

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The quantity and quality of stormwater runoff is an increasingly common concern in urban and suburban areas. As population continues to increase in southern California and specifically in Santa Barbara County, the demand for additional residential, commercial and agricultural space and an improved urban infrastructure will increase. While planning concepts, design methodologies, innovative technologies, and our understanding of watershed science continue to improve, we are still faced with the question: where and how to meet the demands of an increasing population? Depending on "where and how" these new demands are met, significant impacts can occur to the health and functionality of our watersheds, creeks and beaches.

Building on and manipulating the landscape typically increases impermeable or impervious surfaces (parking lots, streets, rooftops, etc.) resulting in more rainfall being converted directly to runoff because of the reduction in general infiltration. While dependant on the use and management of urban and agricultural lands, there is also a general increase in both point and non-point source pollution that is transported to our creeks by surface and subsurface runoff.

In southern California, there is another factor that dictates how much runoff is generated for a given amount of impervious area: orographic rainfall. Orographic rainfall is created as the moist air comes inland from the ocean and is forced to rise over the mountains. The rising air cools, becomes saturated and forms clouds and precipitation. The coastal watersheds near Santa Barbara range in size from 10 to 50 square kilometers. The distance from the watershed divide in the Santa Ynez Mountains to the coastline ranges from 5 to 10 kilometers, and the change in elevation over this distance ranges from 500 to 1500 meters. This dramatic change in elevation and the typical onshore flow of moisture associated with winter storm events results in significant orographic rainfall enhancement.

On average, the difference in annual rainfall between the mountains to coastline ranges from approximately 10 to 14 cm. Thus, if one square kilometer of land were converted to impervious surface in the mountains, it would produce roughly 50 percent more runoff than open land. Not only does urbanization increase runoff volume, it also decreases the time required for runoff to get into the streams (i.e., travel time). When large-scale development occurs, it decreases the travel time so that the increased runoff arrives at the outlet sooner than before development. This increased peak flow and shorter travel time has serious consequences for flood control efforts and erosion of creek banks.

As housing demands increase, land use planners and managers must consider the hydrologic impacts of developing lands in a way that increases runoff. Local planning departments are implementing development standards that require no net increase in runoff due to development. There are many creative designs and engineering options to

decrease impervious surfaces and retain more runoff on site in new developments. Depending on the available development alternatives, evaluating the impacts of orographic rainfall and the spatial development pattern may provide valuable insight for selecting the most viable alternative and applicable stormwater control measures.

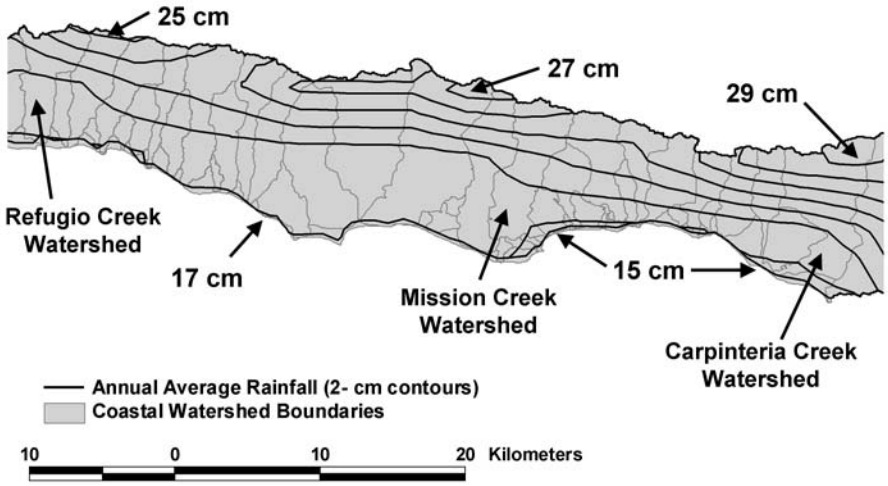

Figure1.jpg
Annual average precipitation contours and coastal watershed boundaries near Santa Barbara, CA (Refugio Creek to the West and Carpinteria Creek to the East).