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Flooding, continued from front page

It is impossible to overstate the trauma and anguish of those displaced from their homes, or fail to extend deepest sympathies to those who have lost family or friends. Such wounds heal slowly, if at all. Yet important lessons arise from crisis like floods, and as unpalatable as they may be to confront, we should not retreat from thoughtful evaluation of such events. With this in mind, I would like to present some information about the nature of floods in general and various environmental aspects concerning flooding.

With the exception of extensive damming, which is not always a guarantee, most rivers flood on a relatively regular basis. This is clear from historical data. China's Yellow River has the unfortunate distinction of being one of the world's larger river systems most prone to flooding. Records show it has overflowed its banks around 1500 times, and in 1887 a colossal flood drown more than 900,000 people. This astonishing fatality figure reflects that the Yellow River floodplain is a very large and fertile area for agricultural production, in addition to being heavily populated in various locales along its course. Heavy silt loads carried downstream and deposited during floods create rich soils, and people are naturally attracted to such regions.

Similar situations are found on other river floodplains around the globe. The Nile, Mississippi, Colorado, and Sacramento Rivers are just a few of the larger and more well known rivers where fertile soils, extensive agriculture, and cities attempt to co-exist.

Aesthetic and recreational needs also draw people to settle along rivers. This accounts for the majority of people adjacent to the Russian River, although the enterprises of agriculture and gravel mining are clearly a presence as well. Agriculture, mining, land development, natural beauty and recreation are not cryptic concepts. They play a major role in the lives of all of us. Yet they often come into conflict with natural rhythms like severe flooding. This is where some words can be offered in the defense of floods, as unpopular as that may be in the aftermath of recent events.

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Natural Floods Beneficial

Natural floods are beneficial to the environment in many ways. According to *Stream Hydrology: An Introduction for Ecologists.*

"Floods and drought can have significant impacts on riverine species. Periodic scouring of banksides and inundation of floodplains regulate plant growth and nutrient input to the stream. The patterns of flooding affect the distribution of plant species both within the stream and along a gradient from the river's edge to upland areas. Prolonged flooding of wetlands is needed for water birds to feed, rest and reproduce. The survival of juvenile fish may also depend on the inundation of floodplains, billabongs, and backwaters. Moreover, floods turn over rocks, altering the configuration of the streambed and 'resetting' the ecosystem by allowing a succession of organisms to recolonize the substrate."

It is important to note that this paragraph presents just a few of the more outstanding biological events put into motion by flooding. Myriad other complex natural reactions are triggered by flooding as well. Some fish migrations and spawning activities are believed to be stimulated by high volume flows. Also, temperature and salinity may lower or rise depending on the event, and thereby inhibit or promote plant growth.

When flooding is prolonged, many plants simply die. On the other hand, plants like willows, cotton woods, alders, various berries, shrubs and herbaceous plants have evolved unique physiology and strategies not only to withstand the effects of flooding and waterlogged soils, but thrive in them. Animals often benefit from flooding as well. After the Mississippi River flooded in 1993, it was noticed that ducks and other waterfowl experienced higher reproductive success.

Promoting Natural Flood Control

What becomes clear from this rough thumb-nail sketch of the natural process of flood dynamics is that many organisms have developed multitude of schemes to survive and exploit the "destructiveness" of these cyclical events. These organisms are part and parcel of the broader complexity of the surrounding ecosystem and contribute to its general well being. It is not surprising, therefore, that efforts are underway by some scientists, environmentalists, bureaucrats, and politicians to promote more natural flood-like rhythms along certain key waterways.

One such waterway is the Colorado River on its journey through Arizona's Grand Canyon National Park. Glen Canyon Dam, located upstream, creates the gigantic reservoir Lake Powell. The dam is operated primarily to satisfy power requirements for neighboring states, in addition to regulating water releases for downstream agriculture, and to a lesser extent, spring flood control.

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It has become clear in recent years that the riparian ecosystem of the park has suffered as a result of the upstream impoundment's. The dam releases more water at certain times than others, and this causes flow fluctuations of as much as four meters in some sections of the canyon.

These fluctuations are responsible for destruction of sandbars and related loses of biomass, primarily in the form of vegetation. Prior to the Glen Canyon Dam, the Colorado carried an estimated 500,000 tons of sediment daily through the canyon, and great seasonal floods once scoured the inner gorge. As they retreated new beaches were laid down creating habitat for plants and animals. These ancient cycles no longer exist.

To mimic historic rhythms, many scientists contend, would return the Grand Canyon to a more natural state and stave-off possible extinction of several threatened species. This would be accomplished by high-volume releases during carefully regulated periods to optimize the benefits of such actions while minimizing hazards to people and property. Challenges to this plan come from interests who argue that to release precious water at times not geared for maximum generation of electricity, or to serve agriculture is a foolish waste of resources.

The issues surrounding water use along the Colorado River are emblematic of the principal controversies virtually all rivers face: water use, waste discharge, degradation of riparian ecosystems, and flood control.

In the case of the Russian River, the first three of these issues have been covered in depth in the E.I.R. Flooding and engineering for flood control, however, seem to become sexy topics during ties of hardship such as the 1986 and the recent January 1995 floods.

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January 1995 flood, Sebastopol, Highway 12. Photo: JVW

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The hydrology and geomorphology of the Russian River watershed are complex topics beyond the scope of this article. However, it is generally recognized that within the 1500 square mile range of the Russian River watershed, timber harvesting, agriculture, gravel mining, livestock grazing, urban development, and watercourse channelization have exacerbated problems in flood prone areas.

For example, the Laguna de Santa Rosa is the "back door" reservoir for the Russian River during times of flooding. Unnaturally high silt loads from upstream sources have caused the Laguna to fill in, and decrease its ability to accept as much water backing up into an area as in historic times. As a result, more water remains constricted to the main channel during high volume flows, thereby intensifying flooding.

In addition, roughly 40% of the vegetation along the Russian River has been lost due to some or all of the human activities listed above. Here, in stark contrast to the Laguna filling in, defoliation and hemming-in of the river by various forms of development has caused the river to entrench or down-cut its channel. Typically this is the consequence of rapid sediment transport coupled with the river's inability to meander in a natural manner. Watercourse down-cutting like this crates a plethora of negative biological and geomorphic effects.

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