



*Creating the Nation's first BioPark*

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Letter From the Desk of David Challinor  
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This year the Potomac River, which flows through Washington, D.C., has had two 50-year floods: one in January and one in September. This is unusual, but I believe they portend an increased frequency of such floods even should the rainfall pattern remain relatively unchanged. I base my conclusion primarily on the expansion of the paving of the Potomac watershed.

This expansion has deep roots in American social history. Since WWII a social and economic goal of North Americans has been to own a detached house in the suburbs -- a worthy aim indeed. The consequences were not immediately evident when developers first converted vast agricultural tracts to housing developments for land then seemed relatively plentiful. The government, furthermore, encouraged home ownership with low interest, federally insured mortgage loans, as it still does today with the deduction of mortgage interest payments from taxable income. With such an economic (and politically untouchable) incentive, it is no wonder that housing development continues at a rapid pace today and that housing starts are still an important indicator of the nation's economic health.

The environmental cost of this construction is now becoming increasingly evident. New home buyers are forced to live even further from the city's center as close-in developable land disappears. The money saved in cheaper housing in the suburbs is somewhat offset by the time and cost of commuting. Urban sprawl has replaced the rural atmosphere of fields and forests with such necessary amenities as schools, churches and shopping centers, all requiring large paved surfaces drained by elaborate storm sewer systems. We are thereby creating the conditions for more frequent floods.

Although floods can and generally do cause extensive damage to riparian structures, there are some long-term environmental benefits such as scoured river banks and realigned channels. When a river's flow is controlled by dams for irrigation or power generation, however, the volume of water released seldom is adequate to accomplish either of the above benefits. Limiting water release from irrigation dams in the arid west is now being successfully challenged by river tour guides, rafters and fishers. They recently prevailed on the Bureau of Reclamation to release enough water from Lake Powell into the Colorado River to re-establish sand beaches for camping and to flush the silt from



the gravel river bottoms to create suitable conditions for spawning of important fish species. The results of these experimental releases are still being studied, but the preliminary results indicate that there may be measurable benefits for both sport fishing and river camping. These specific benefits, however, must be weighed against the loss of some water for irrigation.

Irrigated crops grow well in the arid west, especially in frost-free areas. Cloudless days promote maximum photosynthesis and thus rapid growth. Elaborate federally financed dams and canals bring fresh water from northern California to the central Imperial Valley, one of the most highly productive croplands in the world. Water is allocated to farmers on an acre foot basis (the amount of water needed to cover a flat acre with 1' of water). The cost of this water is subsidized and thus there is little incentive to conserve it. For example, where there is low relative humidity (>10%) a large fraction of the water sprayed through overhead irrigation systems evaporates and never reaches the ground. Even the water carried in long, open irrigation canals loses a significant percentage of its volume to the atmosphere.

Our profligate use of potable water for irrigating crops, lawns and gardens as well as for washing cars or flushing sidewalks may soon be ending as competing demands outbid traditional uses. For example, in California farmers can sell their water rights to cities such as Los Angeles, which has an insatiable need for new water sources. An extreme example of a city's fresh water back-up system is that of Santa Barbara's municipal desalination plant. This oil-fueled facility has yet to open on a full scale as the drought which triggered its construction ended a few years ago and winter rains have since been adequate to meet local requirements.

Droughts and floods are part of natural cycles and it seems unlikely that humans will ever control their occurrences. We can, however, reduce drought consequences by conserving potable water. The rapidity of its developing scarcity throughout much of the world will increase as our human population expands and requires this essential resource for its very survival. Not only did earthly life begin in water, but each of us consists mostly of water (about 70%). We are absolutely dependent on it. Its relative scarcity is strikingly illustrated by the fact that of all the water on earth, only 3% is fresh; 1% of that fresh water is liquid and the other 2% is ice. The 97% balance of earth's water is non-potable salt water.

To help prepare the Zoo's visitors (about 3 million/year) for what may easily become a global crisis in the next century, we are planning a major exhibition and education program on the importance of all water, especially fresh, a commodity that even today is sold in stores at a price per unit volume higher than gasoline. We plan to build the exhibit around other existing exhibits such as Amazonia. We will be assembling several groups from the private and public sectors to discuss the water issue and advise us on the exhibit.

This exhibit, for example, might show how crucial river discharge is to coastal fisheries, and how important the Amazon is in that it furnishes 20% of all fresh water flowing into the world's oceans. Watershed run-off is a crucial source of nutrients for near shore fish populations, which explains in part the relative paucity of fish in the almost landlocked Mediterranean. Not many rivers empty into this sea and the damming of the Nile has severely limited the enormous discharge of nutrients in the heretofore annual flood surge through its delta.

The exhibit could also emphasize the importance of lakes and oceans as a food source. Cannery Row disappeared from Monterey after the sardines vanished, and the New England and Canadian fishing banks, once considered a limitless source of ground fish such as cod, are now closed in a belated effort to let the commercially valuable species restock themselves. Because ocean fisheries are generally open to all comers who can exploit them, there has been little effort to conserve this resource through catch limits, which are difficult to enforce and generally effective only after the stock is so depleted that fishers cannot catch their quotas in any case.

One promising solution to the depletion of natural fish populations is aquaculture. Raising salmon in pens is now such a successful business that the market is glutted and the wholesale price has collapsed. This price drop was also triggered by two consecutive above-average spawning runs of wild salmon. But many problems still remain to be addressed, such as the long-term effect of interbreeding between wild salmon and escaped pen-raised ones. Another concern is the ability of the waters surrounding these pens to neutralize the wastes produced by dense congregations of such large fish.

Other exhibits might illustrate how water can be saved through drip irrigation as opposed to overhead sprinkling and thus promote the use of secondary treated water for lawns, gardens and car washing. It is very likely that potable water will have to be delivered to homes via a separate system, and that tap water will be safe only for dish washing and cooking (where the water is boiled). In fact here in Washington recently the citizens

were warned to boil tap water because the municipal water department was not certain the bacteria count was below the legal limits. The large doses of chlorine added to tap water following this warning led many who could afford it to drink only bottled water.

The signs and portents are all about us and as responsible citizens we should initiate conservation action now. The Zoo is planning a major effort to alert citizens to present and future problems caused by our profligate use of water. Until now there has been relatively little discussion of water shortages so the average citizen can hardly be blamed for not recognizing a problem about which he/she is unaware. All of us can be more aware of the problem and help spread the word about the practical remedies we can now start to take.

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