



SPECIAL FOCUS-- FLOODING AND LAND USE IN CALIFORNIA

CHANGING FLOOD MANAGEMENT TO PREVENT FUTURE DISASTERS

By Jeffrey Mount

The New Year's Floods of 1997 in the Central Valley of California illustrate numerous weakness within current approaches to flood management, and remind us that we cannot prevent all flooding of the floodplain. These include our approach to land use planning and our attempts to engineer rivers. In addition, our traditional response to flooding, which includes erecting more and larger levees and dams, locks us into a cycle of "serial engineering" that ensures that future flooding disasters will be even more costly.

Since the 1993 floods on the upper Mississippi River Basin, there has been a national call for reform. I suggest that we consider turning the traditional flood control paradigm on its head: the solution to flooding disasters is not more flood control, but an integrated, watershed wide program of flood promotion, and an institutional willingness to get out, and stay out, of harm's way.

Lessons learned

We cannot prevent flooding. California boasts of almost 6,000 miles of levees and more than 1400 dams. With this elaborate infrastructure we currently capture, control and consume more than two thirds of the water that runs off of the surface of the state. This highly managed system was not, and is not, capable of preventing flooding. If you live on a floodplain, eventually you will be flooded. But a recent Field Poll showed that 7 out of 10 Californians believe their regions are not at risk.

Multipurpose Dams are for Water Storage

We rely heavily on dams. But most "multipurpose" dams fulfill only one purpose: water supply. At the start of the New Year's storms, each of the region's large reservoirs had a certain amount of space set aside to absorb runoff and prevent flooding. For example, at the New Don Pedro Dam on the Tuolumne River, a token 15% of the

reservoir storage is dedicated to flood control. With the exception of Folsom Reservoir on the American River, this space was rapidly overwhelmed by the intense rain and snowbelt that hit the region. Regrettably, various design constraints on these dams and the channel systems that lie immediately downstream prevent rapid lowering of the reservoir in anticipation of a large storm.

There is a bright spot. After the floods of 1986, the operating procedures at Folsom Dam, along the American River immediately upstream of the Sacramento Metropolitan area, were substantially revised - 40 % of the reservoir's capacity is reserved for flood control. Moreover, in anticipation of the large storm, the dam operators started releasing water a whole week in advance. Although the volume of the 3-day runoff was the highest ever recorded on the American River, the flood was handled without major concerns and the flood control reservation was restored within a week of the storm.

Four key lessons from 1997 Floods

- É Levees and dams cannot eliminate flooding
- É California's multipurpose dams are for water supply
- É Levees fail to prevent large floods and exacerbate damage
- É A cycle of serial engineering increases potential for flood damage

Levees Fail.

We are addicted to levees as the first and foremost line of defense against floods. Levee building started shortly after the gold rush and continued for much of the next 100 years, spurred on by support from federal agencies. Today, we are coping with the results of the unanticipated fallout from this ambitious over-engineering program.
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News from IEH

The Institute for Ecological Health seeks solutions to problems in the relationships between people, economy, land and nature. The recent flood events provide vivid examples of past mistakes and future possibilities. This issue of *Linkages* focuses on flooding and land use, with major articles by leading experts and sketches of situations on additional rivers. In order to take advantage of this opportunity, we postponed our issue on conservation planning to later in the year.

Three times in the last four years, we have witnessed the results of trying to live against nature, rather than with nature. After the Mississippi floods of 1993, and the California floods of 1995 and 1997, the experts showed us how our conventional flood control systems of dams, plus rivers constricted into narrow channels by levees, exacerbate flooding. Some changes are occurring in the Mississippi Basin - homes moved uphill, flood-adsorbing wetlands restored. We hope that California can learn the lessons from recent floods, and start trying to live with nature.

New board member

We welcome David Forrest to our board of directors. Dave is a cattle rancher in Stanislaus County who practices holistic resource management (HRM). He is vitally concerned about conservation of rangelands in the Sierra foothills and coast ranges, as well as meeting the needs and concerns of landowners. Dave adds a great deal to our board and will be a major help to IEH. We plan to continue expanding our board to include individuals from a variety of land issues.

The HRM approach to grazing can dramatically improve range condition, bring back perennial bunch grasses and other native plants to overgrazed rangelands, as well as aid water adsorption and reduce soil erosion. We will explore these and related issues in future issues of *Linkages*

Our New Web Site

We expect to launch our new site in the next few weeks.. Many thanks to Anne Kao for designing this new site. We will retain our current Web address (url), <http://thecity.sfsu.edu/users/IEH>. We thank The City program at San Francisco State University for its generous assistance in providing this site.

IEH is committed to providing a Web site that provides visitors with useful information on a range of issues, as well as hot links to a wide variety of additional sites. We will update our site with additional material every few weeks. We will soon start a discussion system on our web site, focusing on two or three major topics. One topic will be *How can we make conservation planning work for nature, people, and local government?*

Membership in IEH

We are receiving a steady flow of new IEH members, as well as an encouragingly high rate of renewals. A great many thanks to all enthusiastic supporters of our goals and activities. Individual donors are the critical foundation of IEH. We have adopted annual goals for increasing our membership over the next five years. We need the support of you, our readers, at whatever level you can afford. We hope you will join us (please use the coupon on page 12). Thank you for your support.

Institute for Ecological Health

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Our newsletter provides information on California land use topics, including conservation biology, planning and economics, development, urban design, and agriculture. We will discuss techniques important to citizens groups. We wish to explore the needs of different interests and creative solutions. Readers are encouraged to submit articles, ideas, or letters for future issues to IEH.

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The floods of 1997 taught us that levees placed adjacent to river channels are doomed to eventual failure both figuratively and literally. The floods of 1993 in the Mississippi dramatically demonstrated that levees increase the elevation of floods. By divorcing rivers from their floodplains, levees eliminate flood storage on the valley floor, concentrating the flow into a narrow channel. This causes rapid rises in flood stage and, when coupled with levee failures and over-topping, leads to catastrophic flooding. In addition, by creating bottlenecks within flood systems, levees tend to exacerbate upstream and downstream flooding, leading to the inevitable call for more levees.

About 80 percent of California's levees are not engineered to federal standards and were the sites of most failures. But several spectacular failures occurred on engineered levees, including one that had been well-maintained, checked and recently certified.

ABC of Central Valley Levees

1,100 miles of levees in the Sacramento River Basin, and 600 miles in the San Joaquin River Basin, are part of the Central Valley Flood Control Project. While newer levees in this system were built to federal design standards, there are also old levees not built to rigorous design standards.

There are also hundreds of miles of private levees. They were constructed sometimes 80 or 100 years ago to protect farmland. They are often made of sand or dredge spoils. They are not inspected, subject to any standards, or eligible for state or federal disaster relief. Houses built, or orchards planted, behind these levees are extremely vulnerable to damage by periodic flooding.

No matter how rigorous the engineering, design constraints dictate that even the best levees will fail. Levees, more than any other flood engineering effort, fail because they usually conflict with, rather than conform to, natural river processes. They disrupt the dynamic equilibrium of unregulated river channels in two key ways. First, by placing levees against rivers, we are effectively asking one of the world's most changeable and dynamic physical systems to hold still. The result is that during large floods rivers will undercut, erode, and tear down their levees as they attempt to migrate across their floodplains. Second, the close placement of levees alters the fundamental hydraulic conditions of a river. In response, a river will attempt to establish a new form that reflects this change in conditions. In virtually all cases, this new form is in sharp contrast with the form imposed upon it by the levee system.

This contest of forms will eventually be won by the river. The floods on the Mississippi repeatedly showed that levee failures took pressure off the river and protected other

“Levees fail because they usually conflict with, rather than conform to, natural river processes”

levees. It is widely recognized that the more than 1000 levee breaks in the upper Mississippi River basin may have saved St. Louis from catastrophic flooding. It is also arguable that levee failures within the Central Valley, most notably along the San Joaquin River, may have averted a calamity in the relatively fragile Delta system, and almost certainly prevented catastrophic flooding in numerous other areas.

The Folly of Serial Engineering

It is a difficult lesson to acknowledge, but more than 100 years of levee construction in the Central Valley has not prevented catastrophic flooding. Indeed, it may have increased it. For this reason, levees that are placed against rivers are an untrustworthy ally in flood control. The term “flood control” implies that we can somehow control and even prevent flooding. In reality, all that can reasonably be accomplished is to reduce the frequency of floods.

By controlling the small and intermediate floods with levees, dams and a so-called 100-year floodplain, we have locked ourselves into a cycle of serial engineering of our rivers and floodplains. This cycle typically begins with the construction of levees in order to increase use of the floodplain for agriculture. Once established, these levees produce extended periods of tranquillity where once there was frequent nuisance flooding. This tranquillity, in turn, stimulates the initiation and growth of urban centers, virtually within the shadows of the levees.

Superimposed on this is the Federal Emergency Management Agency (FEMA)-inspired 100-year floodplain, which encourages development up to some imaginary line in the sand. This line's accuracy does not, in any way, match the precision with which it is placed. The line represents a statistical best-guess based on a skimpy historical data base and a host of assumptions. The most it accomplishes is limiting development that would be inundated by small and intermediate floods.

The response to the inevitable flooding is a demand for immediate action, followed by forgetting the flood problem. There is a call for newer, larger engineering solutions, including raising or expanding levees, erection

of new multipurpose dams, and river channeling and straightening. But within six months, most of us will have forgotten the flood tragedy.

Some Major California Floods

1862	Central Valley & Los Angeles region
1884	San Fernando Valley, Orange County
1934	Los Angeles River
1938	Santa Ana River
1955	Feather and San Lorenzo Rivers
1964	Eel River
1995	Central Valley & Southern California creeks
1997	Central Valley, Truckee & Walker Rivers
	frequent Russian River

The combination of a short flood memory and our desire to construct some perceived solution locks us into the serial engineering cycle. Even before we complete our supposed fix, we are back at it - populating the floodplain, expanding urban centers directly in harm's way, and forgetting the tragedy of the recent past.

Toward a New Flooding Paradigm

Given today's political, economic, and environmental realities, the traditional federally-supported large-scale river engineering approaches are no longer viable. As experts throughout the world are noting, it is time to take a second look. The essence of reform lies in breaking the cycle of serial engineering. To effectively reduce future flood damage, we must move toward measures that either work with or minimize resistance to a river. There are three steps: 1) stay out of harm's way; 2) get out of harm's way; and 3) do no harm.

Stay Out of Harm's Way

Flooding is catastrophic because we choose to get in the way. The most cost-effective solution, both monetarily and in terms of human suffering, is to stop making the bad choices that perpetuate the cycle of serial engineering. But, thirty years of federal encouragement has not worked well. Moreover, designating an ill-defined 100-year floodplain actually induces development of the floodplain and concentrates populations at risk. It is time to consider scrapping this approach to land use planning.

Finally, it is important to acknowledge that local control is part of the problem, not the solution. The need to raise money through development is a compelling drive for making bad choices in the floodplain. Traditional local solutions to flood control, which usually meet some

minimum standard, tend to transfer problems elsewhere in the floodplain. Regional floodplain management, which is integrated over a watershed and recognizes progressive changes in a watershed, is a more effective land use planning tool.

Get Out of Harm's Way

The Mississippi River floods ignited the current debate over traditional flood control methods, and generated a call for new, creative solutions. The 1977 floods reinforce this call.

Mitigation for those who already reside in the floodplain involves elevation of structures, flood proofing, development of ring dikes around urban centers, and strengthening (but not raising or expanding) existing urban levees to reduce the likelihood of their failure.

We can allocate more space behind "multi-purpose" dams for flood control, as is done at Folsom. This will decrease the water supply during drought years.

The expensive approach of relocation may be the only cost-effective way to reduce damages in some communities. While politically unpalatable, it can reduce costs and human suffering in the long run, as shown in the Mississippi Basin.

Do No Harm

The most important step in breaking the cycle of serial engineering in California involves abandoning more than a century of floodplain management tradition. Levees placed close to rivers, along with their supportive "multipurpose" dams, exact high economic and environmental costs and should be viewed only as a very last, rather than first resort.

Answering recent calls for more dams and levees will further entrench us in the cycle of serial engineering, guaranteeing more costly future disasters. Flood promotion, rather than flood prevention, may be the key to flood management. Throughout the world, there are numerous experiments in non-traditional approaches that enhance flood control. Most of these reunite rivers with their historic floodplains.

In the Central Valley of California there are at least three methods ways to reduce the impact of flooding without



doing additional harm to the rivers. These include levee-setbacks, development and expansion of flood bypasses, and installation of “circuit breakers” within the levee system.

Levee Setbacks

We are seeing increased demand for the establishment of levee setbacks. This approach has multiple benefits. First, when applied correctly, setbacks increase overall flood storage by allowing river's access to their floodplains. Second, this additional storage lowers flood stage, reducing the potential for catastrophic flooding associated with levee failures. Third, when large enough, levee setbacks allow rivers room enough to restore their form, to adjust to the new local hydrologic conditions. Fourth, setback levees restore regular flooding to the floodplain. Along with ending the uncontrolled urbanization of the floodplain, this flooding can co-exist with and even support a variety of land uses, including farming, and expansion of wetlands habitat and riparian corridors.

Setbacks and Bypasses

Levee setbacks are just that - replacing levees that constrain rivers within narrow banks by levees set farther back. The new configuration is less liable to flood. The additional land within setbacks can provide wildlife habitat, or summer cropland, and provides room for the river to meander over time.

Bypasses provide an alternative channel for floodwaters. The Sacramento River has an excellent bypass system. Bypass lands provide summer croplands or wetland habitat.

But levee setbacks are not a one-size-fits-all solution. Modeling in the Mississippi River Basin has shown that improperly placed or sized setbacks can actually exacerbate flooding by creating dead storage that does not reduce flood peaks. Levee setbacks have to be part of a program that integrates diverse approaches.

Flood Bypasses

The Sutter and Yolo Bypass systems on the Sacramento River remain a model for modern flood management techniques. During very high discharge events, weirs allow as much as 4/5 of the flow to drain through the levees of the Sacramento into the Bypass, greatly reducing the flood peak and conveying this water around the Sacramento metropolitan area. The rich soils of the Bypass are farmed annually, and development is, logically, prevented.

The lower San Joaquin River, by contrast, is a narrow, highly leveed reach of river, separated from its floodplain

by relatively fragile levees. The extensive network of farms and limited (so far) urban areas makes this reach ideal for a bypass system. We need to seize the current opportunity.

Circuit- breakers

The final solution is analogous to the circuit breakers that keep a house from burning down. The levee failures that occurred on the Mississippi River and on the rivers of the Central Valley reduced and localized catastrophe. Modeling after the floods on the Mississippi showed that overtopping of agricultural levees was one of the most effective ways to reduce the peaks of flood hydrographs.

One approach to management of very large flood events is to design failure into a levee system. These “circuit breakers” allow planners to choose where natural disasters are going to have their greatest impact, thereby preserving urban areas or other key regions like the Delta.

SUMMARY

The floods of 1997 in California have reinforced the key lesson learned from the Mississippi River floods of 1993: traditional approaches to flood management do not prevent flooding. Rather, inherited wisdom, which has locked us in a cycle of serial engineering, pits our engineers against one of nature's most dynamic systems. But we have an unusual opportunity to change course, because ideologies are shifting in key federal and state agencies. Now is the time to break the cycle of serial engineering.

Dr. Mount is chair of the Department of Geology, University of California, Davis. This article is excerpted from testimony he presented in Washington, to the House Subcommittee on Water Resources and Environment, in March 1997.

Further Reading

Faber, S. 1996. *On Borrowed land: Public Policies for Floodplains*. Lincoln Institute of Land Policy, Cambridge, MA. 32 p.

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Newspaper archive articles you can access via the IEH web site (<http://thecity.sfsu.edu/users/IEH>)

FLOOD MANAGEMENT AND ECOLOGICAL ENHANCEMENT GOALS ON THE COSUMNES RIVER

By Elizabeth S. Andrews and Philip B. Williams

The 1997 New Year's flood event on the Cosumnes River was a record flood event, with many levee breaks. It resulted in the evacuation of thousands of people and the flooding of 56 structures, as well as the closure of Interstate 5 and Highway 99.

As the flood waters receded along the river, public officials have raised the call for a wide variety of flood management solutions along the river, ranging from the construction of new dams, higher and reinforced levee systems, to relocated homes and relocated levees. A study of the Cosumnes, presently being completed for The Nature Conservancy, shows that the type of the flood management selected could either greatly enhance or greatly degrade the unique floodplain and river ecosystem.

The 1997 New Year's floods present a significant opportunity to achieve the dual goals of achieving sound flood management *and* riverine habitat enhancement. Examples of such actions include levee setbacks or the acquisition of floodplain easements. The dual purpose nature of such actions, along with their potential to reduce long-term levee maintenance costs, could make them the most cost-effective choice as well. Above all, flood control projects which attempt to achieve flood management at the expense of the river ecosystem must be avoided.

The Cosumnes is the only major Sierra Nevada river still undammed and with a significant riparian forest in the Central Valley reaches

The Cosumnes : Natural Resource Legacy and Promise

The Cosumnes River is the only major Sierra river without a large reservoir affecting its hydrologic conditions. It has the largest remaining stand of riparian oak woodland in California's Central Valley. Several resource conservation entities, including The Nature Conservancy and Ducks Unlimited, have land holdings along the Cosumnes, .

River corridor lands are almost entirely agricultural. Many areas are frequently flooded, particularly along the lower portions of the river near its confluence with the

Mokelumne River. As a result of the frequent flooding and the relatively natural flow regime still experienced on these lands, there are many areas with recognized high wetland, riparian, and habitat values. Lands in this region that are not presently flooded on a regular basis have also been identified as areas with high potential for habitat restoration and enhancement.

California's Quest to Restore River Dependent Ecosystems

In recent years, California's voters and the U.S. Congress have authorized the expenditure of millions of dollars for activities to mitigate environmental impacts of the state's water management projects. Habitat enhancement and mitigation projects in the Sacramento-San Joaquin Delta and its tributaries comprise a large proportion of the anticipated expenditures under these programs.

One aspect of riverine habitat restoration—largely unrecognized until recently—is the role of frequent, moderate flooding. This maintains beneficial channel conditions and provides the ecologically-valuable physical disruption, vegetative generation, energy transfer, and habitat conditions typical of a healthy floodplain ecosystem. In particular, there is growing recognition of the benefits of frequent floodplain inundation to fish populations, a key concern in the Delta and its tributaries.

Historic Flood Management and the Cosumnes

Historically, most flood management activities have had no interaction with natural resource management programs and interest groups except the relatively recent need to comply with regulation and mitigation requirements. Yet an examination of the historic flood control actions taken on the Cosumnes River indicates an important relationship between historic flood management actions and conditions along the river. Channel survey data and channel conditions along the river show that the Cosumnes has experienced significant levels of channel incision, or lowering of the channel bed, in the 60 to 70 years since levee construction.

The levees along the Cosumnes were built in the manner typical of their time. They are largely private levees, informally constructed, and placed at the very edge of the river channel, effectively cutting off the river from its natural floodplain. Such levees have been used successfully for decades to protect Californians from

floods. They work most of the time, although they may fail in prolonged floods, overtop in very large events, or simply fail due to poor construction or inadequate maintenance.

The Cosumnes levees eliminated the multiple threads of the river's channel that existed in some reaches, forcing the river to remain largely within a single, narrow corridor. Because the levees essentially "concentrated" the river's flow into a narrow channel even in floods, they also increased the erosive forces working on the channel bed. Just since the 1950's they are probably the primary cause of up to 10 feet of lowering in the channel bed in the reaches upstream of tidal influence



When channels erode in this fashion, they do not simply become deeper. As the channel cuts down, the base of the bank also erodes and causes large portions of the bank to slough off - often creating a near-vertical bank. The most eroded portions of the Cosumnes channel today reveal 25-foot tall vertical banks, devoid of vegetation. The single line of trees left at the top of the bank in many areas are beginning to topple towards the channel. In many areas rip-rap (apparently placed at the toe of the bank for erosion protection) is now isolated four feet above the incised channel bottom. Long reaches are almost devoid of the gravel that historically formed large bars along the river, bars that were quite visible in aerial photographs taken in the 1930's.

Options and Opportunities on the Cosumnes

Flood management options on the Cosumnes can either enhance or further degrade the ecologic conditions on this unique California river. Two options under discussion will clearly degrade the natural resources of the river: a dam and/or reinforcement of the existing levee system.

Dams impound sediment. They also disrupt the natural hydrologic cycle of the river, creating ecologic effects which we are only now beginning to understand. Even a dam with the sole purpose of flood control will create significant changes in the flow regime. But it is unlikely that any new dam project would be built without call for diversion of impounded waters for other uses, so the effect of a new dam on the river's flow regime is likely to be quite substantial.

Reinforcement of the existing levees is an option that is very likely to be targeted for implementation. Yet this

option, which may appear relatively inexpensive compared to other flood management options, includes significant long-term maintenance expenses. Construction of the levee system appears to have created a cycle of significant channel lowering on the Cosumnes.

Over the long-term, reinforcement of the existing levee system is likely to incur very substantial and increasing costs in the form of continued bed and bank reinforcement as the existing levees are further threatened by erosion. Reinforcement of channel banks through the use of hard materials such as grout and rip-rap may further accelerate channel erosion as stabilizing vegetation is removed and channel velocities increase. In many locations, it will eventually be necessary to move the levees back from their existing locations as the channel deepens and subsequently widens. In addition, costs of reinforcing or replacing bridge crossings must be included in the long term costs of maintaining the existing levee configuration.

Lastly, activities such as these have a natural resource cost component that cannot be ignored. They worsen natural habitat conditions, reducing channel vegetation, and causing further loss of natural channel morphology and spawning gravels. They reduce the opportunities—or increase the costs—for future habitat enhancement (the deeper channel will result in less floodplain flooding even when adjoining areas are purchased specifically for that purpose).

Cottonwood Trees

Seeds of the fast growing cottonwood need fresh soil deposited by recent floods to germinate. Cottonwoods germinating after levee breaks on Nature Conservancy land along the Cosumnes river are over 5 feet high in two years, 40 feet high in twelve years. Old cottonwoods dotting various California waterways are not being replaced, because of absence of periodic flooding.

Other flood management options have the potential to both meet flood hazard reduction goals *and* to conserve and enhance the considerable ecosystem values that remain on the Cosumnes. In general, these consist of options that reverse the processes leading to continued channel incision and increase the floodplain areas subject to inundation.

One option is the use of setback levees (see page 5), with flood easements or purchase of lands between the levees and the river. Another option is acquisition of fee title or a flood easement on lands subjected to flooding by recent levee breaches, in lieu of repair. Setback levees are not necessary here. Areas within flood easements could

either be maintained as natural riparian areas, or devoted to floodable agricultural uses near the levee and natural riparian areas in a buffer zone along the river corridor.

These flood management options provide a number of key flood management *and* natural resource enhancement benefits:

U Development of additional floodplain storage areas, which can significantly reduce downstream peak flows and flood hazards, as well as providing highly valuable habitat and ecosystem functions.

U Reduction of forces leading to continued channel incision by spreading flood flows across a wider area while still protecting key areas from flood flows. Reduced or reversed channel incision will help to protect existing spawning gravels, channel stability, and existing riverine and riparian resources.

U Development of a more defensible and resilient levee system that will be less subject to channel erosion and less expensive to maintain.

U Increase in the area subject to flooding, thereby increasing groundwater infiltration in the region. Groundwater elevations have decreased about 60 feet in

the vicinity of the Highway 99 crossing of the Cosumnes since development of the area. Lowered groundwater levels are recognized as a significant resource problem in the region.

Plan for Action, Plan for the Future

It is imperative that decision-makers faced with flood management responsibilities on the Cosumnes pursue only those options which lead also to enhancement of the riverine ecosystem. These are setback levees and acquisition of flood easements or fee title for floodable lands. The choices that will be made in response to the severe 1997 flooding along the Cosumnes River will shape the conditions that society will be grappling with for decades to come. The devastation wreaked by nature has created an opportunity to significantly rethink the way flood management concerns are addressed there. We would be unwise to ignore the potential for addressing the dual needs for resource enhancement and flood management where they are compatible.

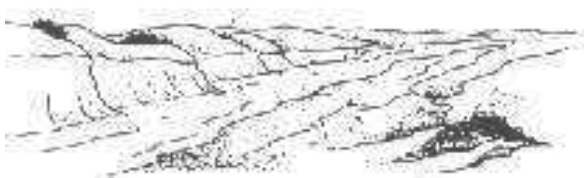
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SAN JOAQUIN RIVER POSSIBILITIES AND SOUTHERN CALIFORNIAN CONSTRAINTS

Communities across California repeatedly allow development in flood prone areas. For decades experts have warned against this, and proposed hazard area zoning. In some cases, such as the San Joaquin River, there is still time to rectify many of the problems. In others, such as the Los Angeles River, extensive development on historic floodplains now prevents effective solutions.

San Joaquin River

Rivers of the San Joaquin Valley and southern Sierra are engineered to provide water for agricultural and urban uses.



Last winter's floods showed the lack of storm runoff capacity. The lower San Joaquin River, in particular, is constrained into a narrow channel, with a small capacity as it heads toward the Delta. There are no bypasses.

Levees broke in many places, as they were not designed to withstand a serious flood on the San Joaquin River. The Tuolumne River broke its banks in Modesto when the foothill Don Pedro Reservoir reached capacity. Many people in San Joaquin County saw their homes under water for weeks. There was flooding north of Fresno, where there are dwellings along the historic San Joaquin River bottom and landowners seek approval for more development.

It is possible to re-engineer parts of the San Joaquin River, so that the next major flood event does not cause another disaster. In addition, local planners should not place reliance on levee systems and approve new development proposals in floodplains. Decisions must be made soon. The current pattern of rapid urban growth in the northern San Joaquin Valley, especially proposals for new towns in areas that should remain floodplain, will remove our ability to correct past mistakes and ensure future disasters.



VIEW OF SAN JOAQUIN RIVER BY MISSOURI, ILL.

The Bypass Option

One option is a bypass system from the confluence with the Merced River to the edge of the Delta, which requires flood easements on farmland. The land would be suitable for row crops and habitat restoration, but not orchards or houses. This approach will avoid future expense of flooding of proposed riverside and floodplain developments, as these short-sighted development proposals would not occur.

Opportunities for Levee Setbacks

There are excellent opportunities to reconnect the San Joaquin River with portions of its historic floodplain.

One opportunity exists near the confluence of the Tuolumne and San Joaquin Rivers. Here there are San Joaquin River National Wildlife Refuge lands, and other land available from willing sellers. The US Fish and Wildlife Service proposes a 3,112 acre demonstration project here, restoring the historic floodplain width and restoring wetlands and riparian forests. This will allow floodwaters to spread over the floodplain, and reduce downstream peak flows.

There are additional possibilities for re-connection with the historic floodplain in Merced County, where the San Joaquin River passes by the Grasslands Ecological Area. This region possesses a third of California's remaining wetlands in a complex of national wildlife refuges, duck clubs and state wildlife areas. There are important opportunities to breach levees and allow national wildlife refuge wetlands to be floodwater catchment areas.

Southern California

Recent floods focused public attention on the Central Valley. Southern California rivers also have a major flooding history (see page 4 for some examples). Often, flooding is compounded by massive erosion. The San Gabriel mountains, in particular, are very steep and highly erosive. Massive amounts of rock and dirt slide into tributaries of the Los Angeles and other rivers during storms. Historically, the massive storm runoffs of water and debris caused rivers to cut new channels from time to time.

In January 1862 a large portion of the coastal plain and interior valleys of the Los Angeles Basin was a lake, as the Santa Ana and Los Angeles rivers overflowed during a month of heavy rains - 12 inches in one 24 hour period alone. In 1938, there was 30 inches of rain in the San Gabriel and San Bernardino Mountains over a 24 hour period. Over 200,000 acres of Orange County were under water.

In 1938, the San Gabriel and San Bernardino Mountains received 30 inches of rain in 24 hours - over 200,000 acres flooded in Orange County

In 1941, the state Planning Commission called for hazard zoning and restrictions on floodplain development in response to the disasters caused by major floods. But the U.S. Army Corps of Engineers already was on a different path. By the mid thirties, construction of debris basins and concrete channels was under way, focusing on the Los Angeles, Santa Ana and San Gabriel Rivers and their tributaries. 470 miles of river are now concrete drainage ditches, rushing water to the ocean. There is a vast system of debris and catch basins. Even now, the walls of the Los Angeles "River" are being raised to contain larger storm run offs. Development has run rampant over floodplains, alluvial cones and swamps.

The history of urban development in the Los Angeles Basin is a history of fighting nature, rather than learning to live with it. What happens when we get another winter of 1862, or even greater storms?

AGENCIES LOOK AT FLOOD MANAGEMENT

The state Resources Agency has evaluated flood management. As of mid May, the report is in the governor's office. The agency has expressed major interest in "non structural" alternatives, including bypasses, levee setbacks and land-use planning. Information will be available from the Department of Water Resources this summer. We will include an update in the next issue of *Linkages*, and links through our Web site.

The U.S. Army Corps of Engineers is carrying out a comprehensive evaluation of the Central Valley basins, including some consideration of non-structural alternatives.

Citizens' groups have released flood management principles.

IS VENTURA COUNTY GETTING SERIOUS ABOUT SAVING FARMLAND?

By Ron Bottorff

There is a tide developing in Ventura County, originating from a few modest swells but growing steadily. It could result in the first genuine attempt by a Southern California county to protect its agricultural and open space lands in the face of rampant development pressures.

Ventura County now has about 105,000 irrigated acres, which support a \$ 2.4-billion farm industry . We have been losing agricultural land at the rate of about 1100 acres per year, a trend which, if not curtailed, will cause the industry to eventually perish as it did in Orange County.

The tide arose from two basic sources. The first was the passage in November 1995 of the City of Ventura's Measure I, the so-called S.O.A.R. Initiative (Save Our Agricultural Resources). It requires a vote of the citizenry for any amendment to the city's General Plan that involves conversion of land zoned for agriculture to some other use.

The second was the study *The Value of Agriculture to Ventura County: An Economic Analysis*, done by the Ventura County Agricultural Land Trust, and released in March 1996.

Since those two landmark events, a number of late developments are indicative of a strong trend towards farmland preservation.

U S.O.A.R. Initiative proponents have begun a process to place a county-wide measure on the November 1998 ballot.

U The Ventura County Farm Bureau has released a new Mission Statement calling for the protection of the county's greenbelts, something it had not previously supported.

U The Ventura County Board of Supervisors are in the process of setting up a task force to study a series of reforms aimed at saving agriculture.

The passage of the City of Ventura's S.O.A.R. Initiative in 1995 by a 52-48 margin in the face of massive farm industry opposition has to be considered one of the key developments in the current tide. It not only protected the City's farmlands, but also caused intense public debate.

County Farm Bureau Changes Course

The Ventura County Farm Bureau re-evaluated its position in the face of this debate, and released a revised Mission Statement on April 9, 1997. Among the key provisions in the new policy:

- (1) cities must accept finite geographic limits and recognize that expansion beyond these limits imperils the long-term viability of agriculture;
- (2) the County General Plan must be strengthened and other zoning regulations changed to support agricultural greenbelts;
- (3) a new greenbelt should be created covering the area between Fillmore and the Los Angeles County line;
- (4) land-use policies should be made by elected representatives, not through referendums or initiatives.

The Ventura County Farm Bureau calls on cities to accept finite geographic limits and promotes agricultural greenbelts

The first three policies represent a completely new direction by the Bureau, which in the past had emphasized property rights, while in general supporting the viability of agriculture.

Study of the County's Farm Economy

The *Value of Agriculture* study referred to previously, was financed by the State Coastal Conservancy and the local Hansen Trust and conducted by several agricultural specialists at the University of California. The study illustrates the cost of allowing development on farmland. It shows how, by keeping development within cities or adjacent to city limits, thousands of farmland jobs and tens of millions in agricultural sales can be retained.

The report states that agriculture, Ventura County's number one industry, provides more than 8% of the personal income earned in the county. Ventura County's exceptionally rich soil allowed farmers to earn an average of \$1,143 for each irrigated acre in 1992, almost three times the state average. However, Ventura County's population continues to grow at about 1% per year, with resulting pressure for cities to expand into the surrounding agricultural land. If current sprawl development trends continue, housing for new residents will consume an additional 10,000 acres, much of it farmland, by 2010. If cities opt for more compact development, about 4,000 acres of this land can be saved.

The report predicted collapse of the farm industry if total county acreage were to fall below about 64,000 acres.

County Officials take up Farmland Protection

County planning officials have recently been quite active in presenting the economic study results to city councils, LAFCO, and other decision-making bodies. (LAFCO, the Local Agency Formation Commission, must approve all city annexations of unincorporated land).

Efforts currently underway by the Ventura County Board of Supervisors to set up a task force on farmland preservation are expected to show results before the end of 1997. This broad-based panel, made up of about 15 persons, would be charged with developing a series of reforms that would make it much more difficult for cities to annex greenbelt

lands for development, and to present these reforms to city councils.

Supervisors Kathy Long and John Flynn have been the leaders in this approach. Long was recently quoted by the L.A. Times as saying that, "Frankly, we may want to draw lines in the sand and say these are urban limit lines."

Flynn has been quoted as being very encouraged by the recent change in Farm Bureau policy. Steve Bennett, the Ventura City Councilman who co-sponsored the original S.O.A.R. Initiative, has said that interest in preserving farmland is so keen now because of fears his slow-growth coalition's continuing efforts will be successful in putting county-wide farmland and open space measures on the 1998 ballot.

The tide is rising. Stay tuned.....

Ron Bottorff is a member of the Ventura County LAFCO, President of the Friends of the Santa Clara River, and a Director of IEH.

RESOURCES

National

The New Urbanism : Hope or Hype for American Communities? William Fulton. The Lincoln Institute of Land Policy. 1996. 32pp \$14

William Fulton's analysis, based on a workshop exploring New Urbanism, provides a balanced and useful critique. This catch-all phrase covers the basic attributes of urban design also known as livable communities or neotraditional design (see *Linkages*, issue #1). Fulton's work examines the principles of New Urbanism, the history of the movement, and example projects. There is a frank consideration of some of the problems faced by New Urbanism projects, including local government codes and the need for effective marketing.

Fulton points out that while New Urbanism has attracted more interest than any other urban planning approach in decades, it is only part of the solution. He points out that neotraditional design goals " must be reinforced by regional planning and economic policies to reshape the urban and suburban fabric" and be "linked to a consistent set of policies and programs in all areas of metropolitan development". Examples of the later are taxation and transportation policies. This is an extremely useful work for anyone wishing to understand the realities New Urbanists face.

Readers should bear in mind that the largest New Urbanism project, Laguna West south of Sacramento, has overcome many of the problems so beloved by movement critics. The project came onto the market at the beginning of a major real estate recession, so naturally faired poorly. A recent Sacramento Bee article focuses on how well

Laguna West is doing now. Writer Gary Delsohn predicts "Twenty years from now, when planners, neighborhood activists, critics and politicians look at Laguna West, they'll want to know why all the new-growth areas of Sacramento weren't built this way." *Order this and the following publication from: Lincoln Institute of Land Policy. 113 Brattle St., Cambridge, MA 02138. Phone (617) 661-3016.*

On Borrowed Land : Public Policies for Floodplains. Scott Faber. The Lincoln Institute of Land Policy. 1996. 32pp \$14

Scott Faber examines the 1993 Mississippi floods, and the impacts of land uses and flood management systems on these floods. Most of the report focuses on solutions to minimize the risk and expense of future flooding. These include local actions, watershed planning and other regional strategies, and various structural and land use changes.

Biodiversity in Managed Landscapes : Theory and Practice. Eds. Robert Szaro and David Johnston. Oxford University Press. 1996. 778 pp \$55

The work provides a tremendous wealth of information, focusing on what we need to do to preserve biodiversity across the landscape. It is based on a symposium held in Sacramento several years ago. But the authors updated their work, and many chapters are useful and timely

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explanations of key topics. A number of chapters are technical, and focus on very specialized topics like regional

scale monitoring or the comparative utility of vegetation maps prepared at different scales. But several chapters provide readable accounts of issues crucial to land management and biodiversity conservation. These include the impacts of human disturbance across a southern California landscape, issues of managing biodiversity on private lands, maintenance and restoration of biodiversity on range lands, and habitat fragmentation.

California

California Rivers and Streams : The Conflict Between Fluvial Process and Land Use. Jeffrey F. Mount. University of California Press. 1995. 359 pp. \$19.95

An invaluable explanation of how California's rivers function and evolve. There is extensive discussion of key river or fluvial processes such as change in course over time and sediment transport, and an examination of human impacts on the state's rivers over the last 200 years. Chapters on effects of dams, mining, logging, farming, and urbanization. Examines the frequency and magnitude of floods, including consideration of society's myths and misconceptions. Mount looks to the future, considering global warming and how it may effect the rivers.

Back Issues of Linkages Available

Spring 1996. Central Valley Focus

Central Valley Needs a Vision — Providing for Nature in the Central Valley — Key Protected Areas and Conservation Projects — San Joaquin River Parkway — Watershed Management in Central Valley Farmland — CAFF

Fall 1996. Sierra Foothills Focus

What is the Future of the Sierra Foothills ? — Politics of Growth in Tuolumne County — Sierra Foothill Biodiversity — The SNEP Report — Sierra Wealth Index — Sierra Nevada Alliance — Barriers to Livable Communities.

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