Flooding and Fragmentation: How Physical Features Structure Political Conflict Over Flood Control in California's Pajaro Valley

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Abstract
Rivers that have been designated political boundaries are harder to manage because of inter-jurisdictional discord. This case study analyzes the array of competing local interests frustrating efforts to manage flooding along a river serving as a political boundary. The Pajaro River on California's Central Coast has flooded repeatedly over the past 40 years, causing millions of dollars of flood damages. The original levee system, expanded and re-built in 1949 by the U.S. Army, was designed on insufficient hydrologic data, and local efforts to re-construct it and maintain the flood channel have been tangled up in inter-jurisdictional discord. The chief political boundaries between the four counties in the watershed are based on physical features: the river itself and the mountains created by the San Andreas Fault. The four counties in the watershed all have different stakes in flood protection and different geographies of taxation, hobbling efforts to prevent further flooding. The unusual geography of the watershed resists efforts to structure an equitable taxation scheme, further illustrating the problem of managing rivers that serve as political boundaries. Efforts to build consensus about taxation schemes within the basin will likely be more successful if they focus on the ecosystem services provided to the upstream counties by flood control measures in the downstream counties.

Introduction

In the 19th century, John Wesley Powell recommended that in the arid West, political units such as water management agencies be laid out according to the logic of natural watershed (Worster 1985). He anticipated the problems resulting from a politically fragmented system of government trying to manage a riverine ecosystem. Because rivers connect large landscapes, they appear to be particularly vulnerable to conflicting ideas about management, and land and resource management decisions in one part of a watershed can have severe impacts on adjacent or distant political decisions. In the American West, several major rivers suffer from inter-jurisdictional discord: the Columbia River between Oregon and Washington, the Rio Grande between the U.S. and Mexico, and the Colorado River between seven western states and Mexico (Resiner 1986).

The Pajaro River provides an opportunity to investigate the geography of political conflict over river management at a smaller scale. Its watershed is the second largest on California's Central Coast, covering 1340 square miles, and is entirely contained within the state (Mount 1995). Over the past decade, farmers, local agencies and county officials have been engaged in public conflict over how to address flood control problems. Farmers along the river in the lower basin have suffered substantial losses from flood damage, and this paper seeks to explain the history of flooding and analyze the geography of regional political conflict over water issues. A complex of geographic features have structured the political conflicts over water issues in the region and mitigate against their resolution: the unusual physical geography of the watershed, the multiple horizontal political jurisdictions responsible for flood control, taxpayer resistance to the uneven spatial distribution of benefits by proposed flood, and the peripheral location of this river in relationship to regional centers of power which has constrained the legitimacy of local flood management agencies.

The towns of Watsonville and Pajaro were built in the Pajaro River floodplain and have suffered repeated floods this century, causing many millions of dollars in property damage, severe disruption of local agriculture, and loss of life. Original flood control structures, expanded and re-built in 1940s by the U.S. Army, have not adequately protected these towns and their surrounding fields during seven major floods over the past 50 years. The Corps acknowledges the inadequacy of the flood control design and structures, yet regional political discord has frustrated the public consensus the Corps requires to design and construct a solution. Community-based and social learning processes, often suggested as models for resolving natural resource conflicts (Daniels and Walker 1996), are only now being implemented to address water issues in this region. Successful watershed planning requires building a community-based

infrastructure that can support the political strain of planning and management (McGinnis 1999). Such efforts are underway in the Pajaro Valley, but it is not clear that they will be successful in negotiating these conflicts.

The Unusual Lay of the Landscape

The Pajaro River Watershed has a complex and irregular shape, extending some 80 miles west from its headwaters in the Diablo Range to its mouth on the Monterey Bay (Map 1). The watershed forms the shape of a lopsided, horizontal "Y" with the elongated southern arm formed by the San Benito River (Applied Science and Engineering 1999). The area drained by the San Benito River covers almost two thirds of the entire watershed, although it contributes proportionately less stream flow. Like most rivers in the Central Coast region, the Pajaro is relatively small, has a short lag time for flood flows, has high peak runoffs, and is subject to winter flooding (Mount 1995).

Movement of the San Andreas Fault has given the Pajaro watershed its unusual shape and formed the most important divisions – geographic and political – within it. In the upper basin, the San Benito River follows the fault northwest for approximately 65 miles before it turns north and enters the Pajaro River. Just downstream of this confluence, the river is controlled by geologic structure as it flows between the Santa Cruz Mountains to the north and the Gabilan Range to the south, crossing the San Andreas Fault at Pajaro Gap (also known as Chittenden Gap). The watershed is divided into distinct upper and lower basins by the San Andreas Fault at the Pajaro Gap.[1] The upper basin covers 1212 of the watershed's 1340 square miles. Tributaries in the

[1] During the Pleistocene, hills formed by the fault enclosed the upper valley and created Pleistocene Lake San Benito. Geologists have suggested that Elkhorn Slough may have

upper basin contribute roughly 90% of the flow to the Pajaro River by the time it enters the Pajaro Gap (Applied Science and Engineering 1999). The river exits the gap at Murphy's Crossing and flows 12 miles across an alluvial plain past Watsonville, and enters the Bay. The lower basin is shaped in a rough triangle formed by the Santa Cruz Mountains on the east, Monterey Bay on the west, and the North Monterey Hills on the south, with the river running across the lower quarter of the triangle. The lower basin is 128 square miles, or about one sixth of the entire watershed. The hydrology of the watershed has been compared to a funnel draining into Monterey Bay.

The Pajaro Gap is the critical hydrologic, riverine, agroecological, and political feature in this watershed. It functions as a threshold between upper and lower basins. All the upper basin creeks and both rivers are joined into the Pajaro immediately before it flows through the Coast Range at the gap. It divides groundwater basins, county jurisdictions, and local climatic conditions (and thus crops grown). Most of the upper basin has sunny and warm summers, but the lower basin remains cool under marine influence, and it has become a center of California's profitable strawberry production (Wells 1996).

When Santa Cruz and Monterey County residents refer to the "Pajaro Valley" they usually refer only to the lower basin, ignoring the 83% of the watershed above the gap. The lower basin is a hinterland for the commercial and political centers of counties: the city of Santa Cruz for Santa Cruz County, and Salinas and Monterey for Monterey County. The river serves as the boundary these two counties, but the agricultural and business activities of the lower basin serve to unite the lower valley. Residents of the larger and more populous upper basin are oriented toward the San Jose area, and have generally ignored the consequences of their land use

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been fashioned by a catastrophic flood through a landform similar to the Pajaro Gap (Jenkins 1973).

decisions on the lower basin. The Santa Cruz Mountains and Gabilan Ranges, running parallel to the San Andreas Fault, veil the views up and down the valley, constrain transportation between the upper and lower basin, and obstruct popular awareness of the ecological relationships with the watershed.

For the past several thousand years, the Pajaro River has passed west from the Pajaro Gap to the ocean, meandering across the alluvial plain, forming a "wet corridor" of creeks, ponds, marshes and wetlands during the winters. This wetland system held large quantities of water late into the season and facilitated the recharge of the lower basin's groundwater (Gordon 1974/1995; Oliver 1995). Early European agriculture in the valley did little to modify this aquatic system. Ranching and wheat production around the Franciscan missions and on Mexican land grants employed limited and crude irrigation. Changes began in earnest in the early 1870s when railroad service come to the valley along with Chinese laborers who came to the Pajaro and Salinas Valleys to find agricultural work. Many of these immigrants were from the Kwangtung Province -- which has climate and terrain similar to California's Central Coast -- and were experienced at converting swamp and wetlands to arable land. Landowners leased wetlands to Chinese for free in exchange for clearing it. Berries, potatoes, sugar beets, and apples came to dominate agriculture in the valley, which was centered around the town of Watsonville. It is not clear when the citizens of Watsonville recognized that they built their downtown in the 100 year floodplain.

The original rationale for levee placement can probably never be known, although it is likely that they were laid out to maximize protection for arable land with little awareness of how rivers behave in their floodplains (Brookes 1988). Apparently, the first levees were constructed on the Santa Cruz side to protect Watsonville, but not the Monterey County side. The first

recorded flood along the Pajaro was in the town of what was then known as Brooklyn, a Chinatown established in 1888 when the Chinese community of Watsonville agreed to move south across the river (and county line) and re-establish themselves on the site of the modern town of Pajaro. The first of many floods took place two years later when four feet of water flowed through Brooklyn. Chinese residents learned to move their possessions to the second floor of their dwellings to protect them from water damage (Lydon 1985).

Sometimes Too Much

All of the streamside towns in California's Central Coast developed flood control structures during the first few decades of statehood. Many levees were initially built about 100 years ago by farmers who often straightened the river course at the same time (Curry 2000). The first efforts funded by the Federal government were initiated by the WPA in the mid-1930s (CH2M Hill 1996). Santa Cruz and Monterey County public works agencies requested further help from the U.S. government. In 1936, U.S. Congress authorized the U.S. Army to rebuild and enhance flood control levees along the Pajaro River, but before designs were complete, Watsonville suffered its worst flood to date in 1938. World War II delayed levee construction, but in 1949 levees were completed as far upstream as Murphy's Crossing with $748,000 of Federal funds. Some of these levees were built on surplus war materials, such as concrete landing strips.

Once built, the flood control structures were turned over to the counties of Santa Cruz and Monterey for maintenance, on a 50-50 cost share basis. The Army required the county public works agencies to agree to maintain the structures according to the "Operations Manual" (U.S. Army Corps of Engineers n.d.). This manual detailed a specific vegetation maintenance protocol

in the channel. Given the design and statements made by the USACE, the region expected the system would provide protection of a one percent chance flood in the urban areas and two percent chance flood elsewhere.[2] Within ten years of levee completion, two major floods exceeded the design capacity of the levee system, in 1955 and 1958, requiring $1.3 million in emergency levee repairs (County of Santa Cruz 1999).

The USACE designed the Pajaro flood protection system with a capacity of 19,000 cubic feet per second (cfs) at Pajaro Gap, yet this level was substantially exceeded in 1955 and 1958 (see Figure 1). In response to a Congressional resolution, USACE released a report in 1963 titled "Interim Report for Flood Control—Pajaro River Basin" which found that "…the existing Federal flood control project in the Pajaro Valley of the Pajaro River Basin is inadequate for protection of the area" (from County of Santa Cruz, 1999). In other words, the USACE recognized that the flood protection in place did not meet the "Congressionally intended" level. With new data from the floods in the 1950s, the USACE recognized that levees designed to handle 19,000 cfs were able to handle a four percent discharge ("25 year flood") instead of a one percent urban/two percent rural flood.

Congress authorized reconstruction of the flood control system in 1966 (PL 89-789; and again in 1986) but never funded it (County of Santa Cruz 1999). During the 1970s, the Corps proposed several options for redesigning the levee system, but these would have involved expanding the footprint of the levees. Opposition to the condemnation of agricultural land, the

[2] Terms such as "hundred year flood" and "fifty year flood" have been updated; see Mount (1995).

high price of the plan, and a drought cycle that pushed flood concerns to the back of public consciousness scuttled the Corps' efforts to fix the levee system.[3]

March 11 1995: More than a twist of fate

The drought cycle was broken by heavy precipitation from El Niño storms beginning in 1995, resulting in record river flows. In March of 1995, the river level reached 21,000 cfs. Some time in the early morning of Saturday, March 11, the south side levee broke at rivermile 9, about two miles downstream of Murphy's Crossing and four miles upstream of Watsonville. A tremendous amount of the river's flow poured into the fields on the Monterey County side, eventually flooding 3000 acres of superior farm land and the town of Pajaro. Instead of flowing to the ocean, the floodwaters were obstructed by the State Highway 1 causeway, causing the river pond up. This causeway formed a "barrier to exit" for the river waters. Once it was backed up, these waters rose as high as 14 feet, and began to flow through the old Watsonville Creek and into Elkhorn Slough and eventually into the ocean (Oliver 1995). Eventually the USACE had to breach the levees near the Highway 1 causeway to allow this area to begin to drain back into the river channel.

The "cause" of this flood is extremely controversial, and perceptions of negligence by public officials continue to enflame passions more than five years later. A court case ensued, in which 253 plaintiffs – residents, farms, and businesses -- sued nine local public agencies and

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[3] Previously, 100% of the costs of levee redesign and reconstruction were covered by the federal government, but in the early 1970s, local agencies were required to fund 25% of the project (this portion has since grown to 35%). The prospect of raising $5-9 million (1975 dollars) deflated the local support for improved flood protection that existed. Even though many of the large farmers in the valley have been financially successful, the town of Watsonville is relatively poor (Gomez n.d.), and any tax increases are perceived to be burdensome.

governments. The plaintiffs were successful in the trial, claiming losses of $50 million, but the case is now under appeal. While it may be convenient for some political actors to blame "fate" or "Mother Nature," it is clear that human decisions play at least as important a role as environmental factors in determining the degree of damage done by a storm-induced flood event. Examples of human agency include land use decisions, levee design, and maintenance of flood control structures (Fridirici and Shelton 2000).

The success of the suit was based primarily on findings that public agencies had not properly maintained the flood channel, but the full story is somewhat more complicated. From the perspective of Santa Cruz County, the levee failure demonstrates that the original design was flawed because the precipitation and runoff data was inadequate and upstream land development has contributed to higher flood flows (Cota-Robles 2000). Most local farmers blame local flood control agencies for improperly maintaining the flood channel (Miller 2000). All parties agree that the channel maintenance plan in the Army's Operations Manual was not followed, although the relevance of and reasons for this are disputed. Disagreement is centered on the clearing of vegetation in the channel and the physical upkeep of the levee's structural integrity.

The Operations Manual called for maintaining scattered large cottonwood trees on the channel benches, but controlling the growth of small and emergent trees and brush. This approach would maximize the structural strength offered to the levees by large trees and their root masses, but keep them sufficiently spread apart so that if they fell in the channel, they would not seriously impair floodstage flows. It would also protect the integrity of the sand and gravel levees while minimizing the hydraulic friction of the channel. Keeping smaller vegetation under control is critical to maximizing the channel's hydraulic capacity, yet maintaining some

vegetation, especially trees, on the upper and lower channel bank is important to controlling erosion, necessary to ensure structural integrity of the levees.

Santa Cruz County was warned by both farmers and a professional hydrologist about the condition of the channel during the years prior to the 1995 flood, but took no action to clear the channel. Local residents and hydraulic engineers who had walked the levees prior to the flood reported that the channel was blocked with downed trees, thick emergent vegetation, and excessive sediment.

Determining which counties are responsible for the 1995 flood is now tangled up with trying to raise the funds necessary to fix the levee system. After the flood, local officials pleaded with the region's state and Federal officials to help them secure the funds necessary to provide a comprehensive solution to the flooding. Yet county officials realized that they would have to be able to raise significant funds from local sources as well. The Corps' preliminary estimate was that proper repairs would cost between $70 and $100 million, which meant that local sources of at least $30 million would have to be found. Just who would pay taxes to raise this co-payment is the source of significant local political conflict. Assemblymember Fred Keeley, representing portions of Santa Cruz County, was successful in passing legislation in Sacramento that established a Joint Powers Authority (JPA), an inter-county governmental body that would have the authority to raise taxes and sell bonds to repair flood control structures within its district. This was done over the vigorous protests of local officials from the upstream counties, who saw the JPA as an effort to blame the rapidly developing upstream counties for flooding when the real problem was the failure to maintain the flood channel.

Who You Think Should Pay Depends on Where You Stand

Most of the persons working for solutions to Pajaro flooding express a great deal of frustration with the lack of results thus far. To date, the passage of the JPA has not changed the conflicting perspectives on responsibility for flood control; it has only provided a structure for local officials to continue to fight to minimize the tax liability of their constituents. How does this story cast light on the geographic dimension of local political processes and relationship between humans and nature? Physical and political boundaries have played a leading role in the formation and perpetuation of flooding problems in the Pajaro Watershed, and public squabbles about who should pay to repair them continue to hobble efforts to reconstruct flood control structures.

The Pajaro Gap divides the watershed into upper and lower basins, and in this dispute, it serves as important physical and political boundary. There is considerable variation in rainfall within the watershed (Map 2), as well as considerable year-to-year difference in the amount of precipitation in the upper watershed. The San Benito River normally contributes a small portion of the flow into the Pajaro, but if a large, moist, El Niño storm were to stall out over the San Benito Valley, all of the rainfall would find its way into the Pajaro River, and probably quickly. The precipitation that floods the lower basin does not fall on the downstream counties, but rather the upstream two, and this is a recipe for disagreement.

The portions of the four counties that comprise the Pajaro watershed could hardly be more different and still adjacent. San Benito County, in the southeast corner of the watershed, comprises 62.5% of the watershed land base, yet the river does not flow through the county. The county's only river, the San Benito, is a principle tributary of the Pajaro, although its section of the watershed is generally arid, and normally contributes very little run off to the Pajaro River

flow. It is predominantly rural, yet in the late 1990s it was the fastest growing county in the state. Even though its population is relatively small, it has had the greatest rate of increase. In the northeast portion of the watershed, Santa Clara County has the second largest land base in the watershed, yet economically and politically, the watershed's residents in this county are oriented toward San Jose. Twenty five years ago, this portion of the county was rural, but it has now recorded the greatest numerical increase in residents in the watershed. Gilroy, San Martin, and Morgan Hill are bedroom communities for Silicon Valley, and many residents are unaware that they do not live in the same watershed as the San Francisco Bay. Nonetheless, Santa Clara County now has approximately 50% of the watershed's residents.

The two downstream counties comprise less than 10% of the watershed area, yet all of the flooding impacts have occurred here. Significant differences mark the two, however. Santa Cruz County's land base in the watershed is 109 square miles, while Monterey's is only 19, a little over 1% of it (Table 1, Figure 1a). Likewise, the population in Monterey County's portion of the watershed is quite small, about 2% (Figure 1b). With a relatively stable population of less than 5000 residents in its portion of the watershed, Monterey County logically sees the 100,000+ persons in Santa Clara County as the source for tax revenue. The result is that even though land and business owners in Monterey County's portion of the Pajaro Valley have a substantial financial stake in the physical security of the lands in the lower basin, their needs are not likely to be significant in the eyes of county officials.

Despite this small land base, Monterey County's revenue from agriculture in the Pajaro Valley is about $250 million annually, roughly equal to that of Santa Cruz and not much less

than agricultural revenue in Santa Clara and San Benito County combined (Figure 1c).[4] At the same time, the total agricultural economy in Monterey County is huge. At almost $2.2 billion, its agricultural economy is more than three times the size of the other three counties combined (Figure 1d). Monterey County has the third largest agricultural economy in the state. This means that even though Monterey County as a whole has a huge agricultural economy, it is not likely to be as concerned as other counties with what happens in the Pajaro Valley because only 12% of its agricultural economy is in this valley, on the county periphery (Figure 1e). In contrast, 90% of Santa Cruz County's agriculture is in the lower Pajaro Valley. If you are interested in agriculture in Santa Cruz County, you are interested in the Pajaro Valley. Growers in both counties' Farm Bureaus have generally looked upon the whole Pajaro Valley, including the Monterey side, as Santa Cruz Farm Bureau "territory." Santa Cruz County has taken a great deal of interest in addressing the flooding issues, in part because the county's second largest city is adjacent to the river and almost all of its agricultural economy is within a dozen miles of the river.

The result is that even though land and business owners in Monterey County's portion of the Pajaro Valley have a substantial financial stake in the physical security of the lands in the lower basin, their needs are not likely to be significant in the eyes of county officials. Monterey County residents and the one county supervisor from this area expressed great frustration at being unable to convince other county officials that they needed to address flooding issues along their far northern border. In the words of Clint Miller, a local strawberry grower who has been organizing local residents for flood protection for over two decades, "we can be ignored without political consequences" (Miller 2000). Because the town of Pajaro is unincorporated, it has not

[4] Monterey County's agriculture is not worth five times as much per square mile as that of Santa Cruz. Monterey County is home to several successful strawberry processing plants, skewing the statistics.

been able to garner enough political power to be able to participate in discussions with other government entities, even though its residents have suffered more inconvenience and damage from flooding than any other group. Pajaro residents have had to organize informal local citizens groups to speak with any power, even though most of the meetings have been held across the river in Watsonville for lack of public spaces in Pajaro.

The small land base on the Monterey side also imposes fiscal constraints. With only 4,832 residents, the Monterey County portion of the watershed is a very small tax base. After the 1995 floods, local citizens led a campaign to increase the assessment in zone 1 from $8 to $55 per acre of farmland or per residence. In 1995, Zone 1 only raised $40,000. With the passage of the increased assessment, the district was able to raise $280,000 and obtain a loan from the county for $900,000 worth of repairs to the levees. This was used to re-surface some of the levees, allowing the system to handle the record 1998 floods without failing. This $900,000 seems to have been quite well spent. The result is that even though land and business owners in Monterey County's portion of the Pajaro Valley have a substantial financial stake in the physical security of the lands in the lower basin, their needs are not significant in the eyes of county officials.

Although the Pajaro River is roughly equidistant from the county seats of Santa Cruz and Salinas, the Pajaro does not garner the same attention from the Monterey County Government as from Santa Cruz. At the same time that they observe Santa Cruz County more involved than Monterey County with the Pajaro area, valley residents perceive a certain disregard of the valley by the Santa Cruz County government and a bias against agriculture and farmers. Clint Miller points to the difference between the channel maintenance of the San Lorenzo River in urban, downtown Santa Cruz and that of the Pajaro. The San Lorenzo in Santa Cruz has minimal

riparian vegetation and no trees, while the Pajaro has had many trees potentially blocking flood flows, and continues to have some growing in some sections of the levee system. Santa Cruz County has annually notified the DFG of their intent to clear the San Lorenzo channel on an "emergency" basis, although this was not done in the Pajaro channel until after the 1995 flood. In the eyes of those living near the Pajaro River, the "environmentalists in Santa Cruz" want the psychological comfort of knowing there is a more-natural river system along the southern border of the county without having to expose themselves to the danger of living along side it – a danger that the "environmentalists in Santa Cruz" are not willing to tolerate in their own city. The Millers also see an anti-farmer bias in the television news reports after the 1995 flood. Helicopters flying over the flooded valley shot footage of hundreds of bright blue 55 gallon barrels that had been dispersed by the flood, and reporters speculated that they might contain pesticides. In reality, these were brand new, empty plastic barrels brought in to the Smucker's plant anticipation of harvest for packing strawberries.

Some of the residents who suffered loss express frustration at all county officials. They feel like they can hardly get Monterey County to acknowledge their existence, and that Santa Cruz County treats the lower Pajaro Valley as its "agricultural colony." From the perspective of growers, the Santa Cruz County Board of Supervisors is more interested in appeasing the pro-environmental vote in urban areas of the county than helping agriculture survive. From the perspective of those who repeatedly warned the county about the blockages on the Pajaro, the Latino residents of Watsonville and the farmers in the fields adjacent to the levees were put at

risk by public officials more interested in bird habitat and the possibility of an endangered species occupying the riparian zone.[5]

An additional irony about differences between Santa Cruz and Monterey County: the levee that failed was on land in Santa Cruz County even though it was on the Monterey County side of the river. Since the original establishment of the county boundary, the river has been redirected in several places by those who laid out the levees, in this case, at rivermile 9, by a Croatian farmer named Pekoch. He probably did this to maximize the arable land available to him. This resulted in both levees of this section of the river laying on land in Santa Cruz County, and so when the south side levee failed, flood waters flowed across the county line into Monterey County to cause damage. Even though both counties were jointly responsible for maintaining the levees, there are accusations that Santa Cruz County was willing to "sacrifice" farmers on the Monterey side for the security of the land on its side. Rumors have circulated that the levee was sabotaged on the Monterey side so as to save the land in Santa Cruz County (Miller 2000).

Justice, Nature and the Geography of Taxation

The counties disagree about how to structure taxation, and thus political responsibility, for raising the necessary local co-payment on levee reconstruction. In the face of significant expenses from flood damage and re-constructing the levee system, it is much easier for a political leader to blame and bill a neighboring county than to raise the taxes among his or her

[5] Prior to the flood, some environmentalists had suggested that the Pajaro was suitable habitat for the Long-toed Salamander, and suggested that its vegetation be preserved for it. Clint Miller (2000) states that no Long-toed Salamander has ever been seen along this river, and this species is not listed on the current "special-status species" list for the Pajaro valley.

own constituents. Political leaders in upstream counties believe that they are being blamed problems that are not theirs; in their view, the problems with flooding in the lower basin are due to levees which were poorly designed or poorly built or poorly maintained, or simply old and in need of replacement. Political leaders in the downstream counties believe that part of the reason for the record floods in the 1990s can be attributed to accelerating land development –increasing the impervious area -- in the upper counties.

These differing perspectives raise challenging questions about a geography to shape tax assessment.

- Should the amount of impervious area (development) of each county be the basis? San Benito and Santa Clara Counties have grown dramatically over the past twenty years, and downstream county officials believe that this has exacerbated flooding problems. Downstream counties proposed this based on the "asphalt blame" theory during JPA negotiations in 1999. Upstream county officials were outraged.
- Should the tax be per capita in the watershed? Downstream counties would also favor this because the upstream counties are larger and more heavily populated.
- Should it be based on the relative land base of each county in the watershed? San Benito would be a big loser and Monterey the big winner in this approach.
- Should it be based on increasing local sales taxes? Napa County took this approach to funding restoration of the Napa River (Ellison 2000). It would take into account both the urban development yet include other economic activity as well, and has the potential to raise $7.5 million annually if residents in the watershed imposed a 0.5% tax on themselves (Press 1998). Santa Clara County would have to pay over 63% of this tax, and would be unlikely to support it. Monterey County would contribute almost nothing. Even though its agricultural economy is

worth a quarter billion dollars, very few retail transactions occur in the Monterey portion of the watershed.

- Could a formula be devised that calculated stream miles within each county and then allowed each county to raise its portion of the taxes as it sees fit? Would it be appropriate to increase the weight of the stream miles bounded by the levee system?
- How should levee history be taken into account? All four counties signed on to the 1949 USACE operations and maintenance plan to be responsible for the levee system. Apparently the upstream counties ignored this agreement, and in practice, maintenance fell only to the downstream counties, although a case could be made that their efforts were deficient too.
- Should it be based on the hydrologic contribution of each county to the flow of the Pajaro River? The proposal has not been made in public, even though it has merits.

The Pajaro River Watershed is a dynamic system. Most of the year, there is scant water in the river channel. Most years, the river does not climb the sides of the levees in any significant way. But during an El Niño event or a "Pineapple Express" (a very wet storm from the south Pacific), large quantities of water fall over the upper basin, and much of this water runs off very quickly through the flood channel of the lower basin. Roughly 90% of the Pajaro River's flow in the lower basin comes from the upper basin's 1212 square miles (90% of the watershed's land base) (Applied Science and Engineering 1999).

The public officials in Monterey and Santa Cruz County who have been working for years to improve the capacity of the levee system face dual obstacles. Floods are episodic events, and the public is quickly able to forget the damage done by them, even when the damage is in one's own county. This is exacerbated when floodwaters pass from one local political jurisdiction to another, and in this case, the floodwaters "disappear" into the mountains at the

Pajaro Gap. For upstream county political leaders, the waters conveniently go "away," and it will be difficult to persuade them and their constituents to pay for flood protection in another county.

Might it be possible to frame this discussion in terms of "ecosystem services?" (Costanza et al. 1997). Upstream residents might properly be accused of being "free riders," dispensing themselves of their floodwaters without compensating their neighbors who have to deal with the ecological and financial consequences. This approach assumes that everyone within a watershed is equally responsible for providing flood protection for those vulnerable to flooding, an assumption that those in the upper basin may not share, even though this author does. In an ideal world, no one would live in a floodplain, but in U.S. society, we are unlikely to evict all those who do. Wise land use planning would prevent further development from taking place in floodplains, but little to address the needs of those who presently live adjacent to the river.

During most winters, the coastal, downstream counties experience higher levels of precipitation, but during the kinds of storms that cause flooding, the upstream counties contribute a greater proportion of the floodwaters. Runoff from the downstream counties could be accommodated easily if the upstream counties did not contribute theirs, and it appears that when it rains heavily on the coast but not in the upper basin, no flooding results. Upper basin counties have not ever contributed to flood protection from the impacts of their floodwaters. Any solution will have to involve them. Downstream counties are probably making a tactical mistake in decrying upper basin development. They would probably be more successful if they repeatedly drew attention to the fact that 90% of the watershed is in the upper basin counties. This geographic fact is less controvertible than any increase in floodwater flows due to suburban sprawl and its impervious surfaces.

In theory, each county would pay for its proportion of the flood protection based on its proportional contribution to flood flows. Research into the dynamics of the watershed at floodstage reveals a more complicated dynamic. An analysis of the seven high water events (15,000 cfs at Pajaro Gap) since the construction of the levees in 1949 reveals that the San Benito River's contribution to the Pajaro has ranged from 14-87%; an analysis of the four worst flood years (1955, 1958, 1995, 1998) shows the San Benito River's contribution to range from 31-79%, with an average contribution of 59% (U.S. Geological Survey 2001). Heavy precipitation along California's Central Coast is highly localized, and intense rainfall in either the northeast (Santa Clara County portion of the Pajaro River) or the southeast (San Benito River watershed) can result in flooding. Both upstream counties depend on the downstream counties to carry their floodwaters to Monterey Bay, although the floodstage data suggests that San Benito County, with its larger land base, contributes a slight majority of the floodwaters during the worst floods.

Conclusion

The Pajaro River Watershed suffers from political fragmentation. Each of the four counties with portions in the watershed has different needs and agendas, and some times they conflict. When these local governments and agencies cannot agree, political stalemate is generally the result. No one entity, or even a plurality of entities, can successfully undertake an initiative here. In the case of Watsonville, the local government has the responsibility for addressing the consequences of flooding by protecting residents and cleaning up the resulting mess, but lacks the political power and fiscal resources to prevent the problem from re-occurring.

According to former Watsonville Mayor Dennis Osmer, "Our system of government is an obstacle to finding a solution" (Merril 1998).

These boundaries and the obstacles they present to flood protection efforts shape the uneven array of political power across this landscape. Consequences of various political actions – inadequate maintenance of the channel and levees, construction in the floodplain, upstream development and gravel mining -- are all meted out on those residing in a concentrated area. Those who suffer loss due to flooding, or are at risk of this, have been petitioning local agencies and governments for years and met mostly with frustration. Some feel that environmentalists have more influence over Santa Cruz County government than agriculture, even though it is the county's leading industry. Some Monterey farmers feel that their county is unconcerned about their plight. The centers of political power in these counties, Santa Cruz, Salinas, and Hollister and San Jose, were not direct witnesses to the flood damage, and once the "crisis" is over, the issue of preventing future damage tumbles from the agenda of political leaders. Downstream counties contend that upstream counties must take responsibility for the damage caused by their land use policies, and that their perceived callousness is related to their distance from the damage and suffering caused by floods. The upstream counties are now engaged in the JPA only through state legislative force.

To create a genuine solution to raising the funds needed to repair the levees will require the education of the (taxpaying) public about the watershed in which they live. The "psychic boundary" of the Santa Cruz Mountains and Gabilan Range must be broken, especially in the minds of residents in the upper basin counties, so that they can take responsibility for the floodwaters that flow across their landscape. Lower basin counties will likely have greater success in persuading their neighbors to contribute to funding levee re-construction by working

to determine the hydrologic contribution of each county, and structure the overall financial contribution of each county to conform to it.

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Table 1. Comparison of land, population, agriculture, and Pajaro River flood control expenses by county.

	San Benito (1997)	Santa Clara (1998)	Santa Cruz (1997)	Monterey (1997)
Square miles in watershed	838	374	109	19
Percentage of watershed	62.5	27.9	8.1	1.4
Population of towns/cities in PV(2000)	31,330	73,250	38,100	3,332
Rural pop in Pajaro Valley (est.)	18,470	30,000	13,800	1500
Total pop in Pajaro Valley (est.)	49,800	103,250	51,900	4832
Population per square mile of county portion in watershed	59	276	47	254
Value of Agriculture in County	$164 million	$160 million	$290 million	$2,192 million
Value of Agriculture in Pajaro Watershed	$164 million	$120 million	$261 million	$254 million
Percentage of each county's agriculture in Pajaro Watershed	100%	75%	90%	12%
Pajaro valley flood zone budget	--	--	$1,200,000 (1999)	$40,000 (1995); $280,000 (1999)

Sources: Santa Cruz County Farm Bureau, Monterey County Agriculture Commissioner, San Benito County Agriculture Commissioner, Santa Clara County Agriculture Commissioner, California Department of Finance, Monterey County Department of Public Works, Santa Cruz County Public Works Department/zone 7, ASI 1999.

Table 2. High water and flood events on the Pajaro River, and the contribution of San Benito River to the Pajaro's flood flows

High water (15K cfs) and flood (20K cfs) events since 1949 (year.month.day)	***San Benito River (cfs)***	***Pajaro River at Pajaro Gap (cfs)***	***Percentage contribution of San Benito River***
1983.03.02	13900	15800	87%
1997.01.03	2140	15800	14%
1969.02.25	8900	17800	50%
1995.03.11	16700	21500	77%
1958.04.03	11600	23500	49%
1955.12.24	7460	24000	31%
1998.02.03	19800	25100	79%

Source: (U.S. Geological Survey 2001)

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